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SCHOOL OF
CIVIL ENGINEERING
INDIANA
DEPARTMENT OF HIGHWAYS

JOINT HIGHWAY RESEARCH PROJECT

JHRP-83-1

TRAFFIC SPEED REPORT NO. 116

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G. K. Stafford

PURDUE UNIVERSITY

JOINT HIGHWAY RESEARCH PROJECT

JHRP-83-1

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G. K. Stafford

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TO: H. L. Michael, Director
Joint Highway Research Project

February 9, 1983

FROM: R. M. Shanteau, Research Associate
Joint Highway Research Project

File: 8-3-3

Project: C-36-10C

The attached Progress Report No. 116 is the report of the July-September 1982 study of free flow automobile and truck speeds on tangent, level and dry sections of rural interstate, 4-lane and 2-lane highways and on urban interstate highways in Indiana. The report has been prepared by Mr. A. J. van Wijk, Graduate Instructor in Research on our staff, with assistance from Ms. P. J. Tirschman, drafting assistant on our staff. The data were collected by Mr. G. K. Stafford of our staff. All phases of the study were directed by Professor R. M. Shanteau, Research Associate on our staff.

The overall results show an average free flow speed of 56.8 mph, down by 0.1 mph from 1981. In fact, speeds have not changed much since the implementation of the 55 mph speed limit in 1974.

This report includes a chart, Figure 2 on page 9, that graphically summarizes the results of summer free flow speed monitoring since 1970. This chart shows that speeds of all classes of vehicles on all types of highways have not changed much since 1974. Generally speaking, the 55 mph speed limit caused the 85th percentile passenger car speeds to drop by about 7 mph, while the 15th percentile speeds remained unchanged.

Copies of this report will be sent to the Indiana DOH. Copies of this report are requested for release to the Indiana State Police and other highway safety agencies, as is normal procedure for these reports.

Respectfully submitted,

Robert M. Shanteau

Robert M. Shanteau
Research Associate

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Interim Report

TRAFFIC SPEED REPORT NO. 116

by

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Project No.: C-36-10C

File No.: 8-3-3

Prepared as Part of an Investigation

Conducted by

Joint Highway Research Project
Engineering Experiment Station
Purdue University

in Cooperation with the
Indiana Department of Highways

Purdue University
West Lafayette, Indiana
February 9, 1983

TRAFFIC SPEED REPORT NO. 116

This report is an analysis of spot speed observations made during the summer months, viz. June, July, August and September, of 1982 in Indiana. All observations were made of free-flowing vehicles on level, tangent sections of rural and urban highways under favorable conditions. All the observations were made during daylight.

This is the second report with exclusively summer observations since 1975. From 1976 until 1980 (Traffic Speed Reports Nos. 95 through 114) 14 primary and secondary stations as well as another 14 randomly selected stations were monitored every quarter. During 1981 and 1982 only 14 primary stations were monitored.

A total of 14 speed monitoring stations were used for the study reported herein. These stations are divided into four categories, including four rural interstate locations, four rural four-lane locations, four rural two-lane locations and two urban interstate locations. These 14 locations are the same as the primary and secondary control stations monitored since 1975 in Indiana. Prior to 1975 only the twelve rural stations were monitored. The locations of the 12 rural stations are essentially the same since 1970 except for stations 4L-32 (old number 6 on US 52) and 2L-54 (old number 11 on US 31), which changed in 1975.

The speed limit at all the stations is 55 mph.

The site locations are given in Table 1 and shown in Figure 1.

The vehicles were classified as Indiana or Non-Indiana Passenger Cars and light (less than 5000 lbs. gross weight) or heavy (equal to or more than 5000 lbs. gross weight) trucks. Analysis was performed for each vehicle classification and for combined passenger cars or trucks.

Sample Size

A minimum of 200 vehicles in each direction were recorded using the free flow technique at each station. At least 25 of these vehicles were required to be heavy trucks (in each direction).

Table 1: Monitoring Locations

Rural Interstate Highways		
RI-6	I-65	7.5 Miles North of State Road 160
RI-21	I-69	1.6 Miles South of State Road 18
RI-12	I-74	0.1 Miles West of 109 Mile Marker
RI-34	I-65	2 Miles South of State Road 39
4-Lane Highways		
4L-17	US 52	150 Feet East of County Road 475 West
4L-32	US 30	2.9 Miles West of Wanatah City Limit Sign
4L-20	US 41	1.1 Miles North of State Road 2
4L-21	US 31	1.1 Miles South of State Road 38
2-Lane Highways		
2L-18	US 35	2.5 Miles East of I-69
2L-54	US 231	1.1 Miles South of State Road 234
2L-79	SR 25	0.7 Miles South of Americus
2L-91	SR 43	2 Miles South of Chalmers
Urban Interstate Highways		
UI-6	I-65	Just East of White River
UI-1	I-80	First Bridge East of Burr Street Interchange

Equipment and Field Procedure

The observations for this study were obtained by use of a Radar Speed Meter. The meter was located in a van type vehicle parked as a disabled vehicle on the right shoulder or as a normally parked vehicle in an access driveway to the road. The van was equipped with one-way vision windows on the rear and side facing traffic so that approaching vehicles could not observe the speed measurement process. The observers were also equipped with CB radio equipment so as to monitor possible radio notification of the speed measurement and of police vehicles in the area. When any such incidents occurred speeds were not taken for at least 15 minutes. This problem primarily occurs on interstates.

FIGURE 1 LOCATIONS OF SPEED-STUDY STATIONS

The speed was measured at a distance from the van so that the angle of measurement with the highway center line was always less than 10°. No corrections of speed were necessary at these small angles. The accuracy of the meter was checked at the beginning of each data recording session, every time the sampling technique was changed, and at other times when deemed necessary.

Results of Analysis

The data collected were analyzed and are summarized in the Appendix. Tables A1 through A14 include the data for the free flow data on each individual station. Tables A15 through A18 summarize the free flow data by highway classification. Table A19 is the summary for all highways.

The results of the free flow data expressed by highway classification and vehicle type are as follows:

Table 2: Average Speed MPH

	<u>Interstate</u>		<u>Other Rural</u>		All
	Urban	Rural	Four Lane	Two Lane	
<u>Passenger Cars:</u>					
Indiana	57.7	58.4	56.6	55.8	56.9
Non-Indiana	57.8	59.5	57.6	57.2	58.4
All Passenger Cars	57.7	58.9	56.8	56.0	57.3
85 Percentile (all)	61.9	62.2	61.1	60.2	61.4
<u>Trucks:</u>					
Less than 5000 lbs.	56.8	58.0	55.1	54.8	55.9
5000 lbs. or more	55.7	58.2	55.7	54.9	56.3
<u>All Vehicles:</u>					
Average	58.6	58.6	56.3	55.5	56.8
85 Percentile	62.1	62.1	61.8	60.0	61.2

Table 3: Percent of Vehicles Exceeding 55 MPH

	<u>Interstate</u>		<u>Other Rural</u>		All
	Urban	Rural	Four Lane	Two Lane	
<u>Passenger Cars:</u>					
Indiana	67.7	79.3	61.6	54.0	64.1
Non-Indiana	75.2	83.3	67.6	62.2	75.4
All Passenger Cars	69.6	80.9	62.9	55.0	66.9
<u>Trucks:</u>					
Less than 5000 lbs.	68.3	74.6	45.4	45.7	55.5
5000 lbs. or more	58.4	75.4	54.7	46.6	59.5
<u>All Vehicles:</u>	66.4	78.8	58.6	51.4	63.4

Table 4: Percent of Vehicles Exceeding 60 MPH

	Interstate		Other Rural		All
	Urban	Rural	Four Lane	Two Lane	
<u>Passenger Cars:</u>					
Indiana	22.9	30.2	17.8	14.9	20.4
Non-Indiana	24.4	39.1	26.6	24.4	32.0
All Passenger Cars	23.4	33.9	19.8	16.0	23.3
<u>Trucks:</u>					
Less than 5000 lbs.	20.3	29.0	17.2	12.3	18.7
5000 lbs. or more	16.0	31.3	17.5	14.4	20.6
All Vehicles:	21.0	32.6	18.9	15.0	22.0

Table 5: Percent of Vehicles Exceeding 65 MPH

	Interstate		Other Rural		All
	Urban	Rural	Four Lane	Two Lane	
Passenger Cars:					
Indiana	5.6	3.8	2.7	2.6	3.3
Non-Indiana	4.0	7.2	4.1	3.4	5.4
All Passenger Cars	5.2	5.2	3.0	2.7	3.9
Trucks:					
Less than 5000 lbs.	4.1	4.5	0.8	3.1	2.9
5000 lbs. or more	1.3	3.0	2.3	1.7	2.2
All Vehicles:	2.0	4.6	2.5	2.6	3.3

The results of this study and similar studies conducted since 1970 are tabulated in Table 6. The speeds given in the table up to 1974 were obtained from Traffic Speed Report No. 92. The speed values for 1975 to 1978 were calculated from the tables given in the respective appendices of the reports (nos. 94, 98, 102, 106) for the 14 locations used in this study. The 15th and 85th percentile speed values for 1979, through 1982 were calculated by interpolation over 1 mph speed intervals in the raw data.

Table 6. Summary of Spot Speed Observations on Indiana Highways
(Free-Moving Vehicles on Level, Tangent Sections)

	Passenger Cars				Trucks		
	Indiana Mean	Non-Indiana Mean	All Mean	All 85%	Light Mean	Heavy Mean	All Mean
2-Lane Highways:							
1970	62.3	62.8	62.3	68.9	59.0	54.8	56.7
1971	61.4	60.9	61.3	68.0	58.0	54.0	55.6
1972	62.0	62.4	62.0	68.7	53.3	55.6	56.7
1973	62.1	61.4	62.1	68.7	58.7	56.4	57.3
1974	56.8	55.9	56.7	61.8	55.3	54.5	54.8
1975	57.2	57.4	57.8	62.9	57.5	56.2	56.9
1976	56.0	57.3	56.1	61.5	54.9	55.0	54.9
1977	56.7	56.2	56.7	62.3	56.3	54.7	55.4
1978	56.8	57.1	56.8	61.9	55.4	55.9	55.7
1979	56.4	56.0	56.4	60.5	55.1	55.6	55.4
1980	55.2	58.4	55.3	59.7	55.1	54.9	55.0
1981	55.7	56.2	55.8	60.2	55.0	54.7	54.8
1982	55.8	57.2	56.0	60.2	54.8	54.9	54.9
4-Lane Highways:							
1970	64.6	64.3	64.5	70.6	59.7	55.0	54.2
1971	64.3	65.4	64.7	70.7	59.8	56.4	57.4
1972	64.3	64.3	64.3	70.9	59.4	55.2	57.1
1973	64.0	63.7	63.9	70.9	60.8	57.8	59.1
1974	58.0	57.9	58.0	63.1	56.8	54.4	55.3
1975	57.6	58.1	57.7	62.8	56.4	55.9	56.1
1976	57.0	57.2	57.1	62.3	55.5	56.6	54.7
1977	57.7	58.7	57.9	62.9	56.0	57.3	56.9
1978	57.5	57.8	57.5	62.5	56.0	57.7	56.9
1979	56.3	57.0	56.5	61.1	55.7	56.4	56.1
1980	55.9	57.4	56.2	60.5	55.3	56.4	55.9
1981	56.5	58.0	56.8	61.1	56.3	56.1	56.2
1982	56.6	57.6	56.8	61.1	55.1	55.7	55.4
Rural Interstate Highways:							
1970	69.1	69.2	69.2	74.6	63.8	59.6	60.5
1971	68.3	68.7	68.5	73.7	64.8	59.4	60.8
1972	69.1	69.6	69.3	74.4	63.7	60.9	61.8
1973	69.3	70.1	69.6	74.8	64.1	61.6	62.3
1974	58.3	59.3	58.7	62.6	56.7	56.4	56.5
1975	59.7	60.2	59.9	64.2	58.2	59.3	58.9
1976	59.0	60.3	59.4	63.0	58.5	58.9	58.3
1977	60.4	60.5	60.4	65.4	58.4	59.7	59.3
1978	59.2	60.3	59.7	63.7	58.9	59.8	59.5
1979	58.4	58.9	58.6	62.4	57.6	59.3	58.7
1980	58.4	59.7	58.8	62.3	57.6	57.2	58.3
1981	57.9	59.6	58.6	62.3	57.4	58.8	58.4
1982	58.9	59.5	58.9	62.2	58.0	58.2	58.1

Figure 2 represents a graphical presentation of the results from this and similar studies since 1970. The speed values plotted in Figure 2 were obtained in the same way as those in Table 6, except for the values from 1970 to 1974, which were obtained from a similar graph in the Traffic Speed Report No. 92. This was done to be consistent with the annual traffic speed reports up to 1974. Only data collected at the 12 rural stations were used to calculate the values given in Figure 2.

Table 7 displays the average speeds for all passenger cars, trucks of more than 5000 lbs. as well as trucks less than 5000 lbs. with and without the two urban interstate stations. The urban interstates were first monitored in 1975.

Table 7. Average Speeds (mph)

Year	Passenger Cars		Trucks Less Than 5000 lbs.		Trucks 5000 lbs. or more	
	12 Rural Stations	All 14 Stations	12 Rural Stations	All 14 Stations	12 Rural Stations	All 14 Stations
1975	58.5	58.7	57.2	57.4	57.8	57.5
1976	57.5	57.6	56.3	56.4	56.4	56.6
1977	58.2	58.2	57.7	57.8	57.0	57.1
1978	58.2	58.2	57.9	57.8	56.6	56.6
1979	57.1	61.8	57.2	57.0	56.0	56.1
1980	56.7	56.8	56.8	56.6	56.0	56.1
1981	57.0	57.1	56.7	56.3	56.1	56.6
1982	57.2	57.3	55.8	55.9	56.4	56.3

CONCLUSIONS

The average speed of passenger cars on all types of highways in 1982 increased 0.2 mph from 1981. The largest increases were on rural interstates and 2-lane highways with increases of 0.3 mph and 0.2 mph respectively. The average speed of light trucks (trucks less than 5000 lbs.) decreased by 0.4 mph. The largest decrease occurred in the 4-lane highways with a decrease of average speed of 1.2 mph. This was followed by a decrease of 0.4 mph on urban interstates. These decreases in speed basically offset the increases on the same highways the previous year. There was an increase of 0.6 mph in the mean speed of light trucks on level rural interstates. The average speed for heavy trucks (5000 lbs. or more) decreased slightly, by 0.3 mph since 1981. The largest decrease, 0.8 mph, occurred on

the urban interstates and the only increase, 0.2 mph, on 2-lane highways. The increase again offsets the decrease of the previous year. The changes in the average speeds on the different highways are small. (Tables A15 - A19).

The very small changes are also illustrated by Figure 2. The mean speeds of cars, light and heavy trucks on rural highways remained virtually the same since 1979. The mean speeds dropped sharply from the summer of 1973 to the summer of 1974. They increased a little in 1975 and remained fairly constant until 1978, except for a slight drop in 1976. A slight drop in mean speeds occurred in 1979 and they have remained almost constant since then.

Since the average speeds are in most cases almost the same for the 12 combined (Table 7), there is no reason to expect the results to change if the urban interstate stations are included in the analysis.

The 85th percentile speed of cars on all rural highways decreased sharply between 1973 and 1974. They increased a little in 1975, but remained fairly constant until 1978, except for an increase of 1.5 mph in the 85th percentile speed of cars on rural interstates in 1977. The 85th percentile speed remained essentially the same on the rural interstates from 1979 to 1982. For the other rural highways it showed a slight reduction in 1980 and leveling off towards 1982 (Figure 2).

The 15th percentile speeds of heavy trucks on rural highways showed no marked change since 1974. The 15th percentile speed of heavy trucks on rural interstates is basically the same as in 1970. The 15th percentile speed of heavy trucks on the other rural highways increased a little. There seems to be a slight downward trend in the 15th percentile speed of heavy trucks on rural highways from 1978 to 1982 (Figure 2).

The difference in 85th percentile speeds of passenger cars and the 15th percentile of heavy trucks on all rural highways was reduced sharply from 1973 to 1974. Since then it remained fairly constant up to 1982, with the smallest and most constant differences during 1978 to 1982.

The average speeds of vehicles on all highways seem to have remained essentially the same since 1979. The differences in 85th percentile speeds of passenger cars and 15th percentile speeds of heavy trucks remained almost the same since 1978 on all rural highways and are much less than what they were before 1973. The differences seem to increase slightly, due to the slight decrease in 15th percentile speeds of the heavy trucks.

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The 85th percentile speed of cars on all rural highways decreased sharply between 1973 and 1974. They increased a little in 1975, but remained fairly constant until 1978, except for an increase of 1.5 mph in the 85th percentile speed of cars on rural interstates in 1977. The 85th percentile speed remained essentially the same on the rural interstates from 1979 to 1982. For the other rural highways it showed a slight reduction in 1980 and leveling off towards 1982 (Figure 2).

The 15th percentile speeds of heavy trucks on rural highways showed no marked change since 1974. The 15th percentile speed of heavy trucks on rural interstates is basically the same as in 1970. The 15th percentile speed of heavy trucks on the other rural highways increased a little. There seems to be a slight downward trend in the 15th percentile speed of heavy trucks on rural highways from 1978 to 1982 (Figure 2).

The difference in 85th percentile speeds of passenger cars and the 15th percentile of heavy trucks on all rural highways was reduced sharply from 1973 to 1974. Since then it remained fairly constant up to 1982, with the smallest and most constant differences during 1978 to 1982.

The average speeds of vehicles on all highways seem to have remained essentially the same since 1979. The differences in 85th percentile speeds of passenger cars and 15th percentile speeds of heavy trucks remained almost the same since 1978 on all rural highways and are much less than what they were before 1973. The differences seem to increase slightly, due to the slight decrease in 15th percentile speeds of the heavy trucks.

FIG. 2: INDIANA RURAL SPEED TRENDS 1970-1981

APPENDIX A

Speed Data (Tables A1 to A19)

TABLE A1 :SPEED DATA

STATION: UT-01 HIGHWAY: I-80 LOCATION: FIRST BRIDGE EAST OF BURR STREET INTERCHANGE

NO. OF LANES: 6 TYPE OF SURFACE: BLACKTOP WEATHER: CLEAR

THIS OBSERVATION LAST PREVIOUS OBSERVATION (SPEED REPORT NO. 115)

DATE: 6-30-1982

TIME: 10:50 - 11:10 AM EB

10:10 - 10:32 AM WB

DATE: 6-11-1982

TIME: 11:10 - 11:35 AM EB

11:15 - 11:45 AM WB

OBSERVATION	PASSENGER CARS										TRUCKS																			
	ALL					INDIANA					NON-INDIANA					ALL					<5000 LBS.					>5000 LBS.				
	LAST	PRES- ENT	LAST	PRES- ENT	LAST	LAST	PRES- ENT	LAST	PRES- ENT	LAST	LAST	PRES- ENT	LAST	PRES- ENT	LAST	LAST	PRES- ENT	LAST	PRES- ENT	LAST	LAST	PRES- ENT	LAST	PRES- ENT	LAST	PRES- ENT				
NUMBER OF VEHICLES	232	201	153	120	79	81	109	224	49	58	140	166																		
AVE. SPEED (MPH)	56.20	56.51	55.70	56.26	57.20	57.14	55.90	55.54	55.50	55.74	56.00	55.46																		
STANDARD DEVIATION	4.303	4.052	4.355	4.022	4.031	4.064	4.505	5.031	3.742	4.851	4.748	5.105																		
PERCENT																														
OF																														
VEHICLES	1.3	.5	2.0	.8	5.1	3.7	1.6	3.6	0	1.7	2.1	4.2																		
TRAVELING	7.3	4.5	8.5	5.0	19.0	19.8	9.0	12.1	2.0	10.3	11.4	12.7																		
LESS THAN	28.4	24.4	33.3	27.5	69.6	72.8	37.0	36.2	49.0	36.2	32.9	36.1																		
OR	75.9	75.6	79.1	77.5	98.7	96.3	78.8	76.8	85.7	75.9	76.4	77.1																		
EQUAL TO	90.7	97.5	98.7	98.3	98.7	96.3	99.5	99.1	100.0	98.3	99.3	99.4																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
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	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
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	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	100.0	100.0	100.0																											

TABLE A1 : SPEED DATA

STATION: UI-01 HIGHWAY: I-80 LOCATION: FIRST BRIDGE EAST OF BURR STREET INTERCHANGE

NO. OF LANES: 6 TYPE OF SURFACE: BLACKTOP WEATHER: CLEAR

THIS OBSERVATION LAST PREVIOUS OBSERVATION (SPEED REPORT NO. 115)

DATE: 6-30-1982

DATE: 6-11-1982

TIME: 10:50 - 11:10 AM EB

TIME: 11:10 - 11:35 AM EB

10:10 - 10:30 AM HB

11:15 - 11:45 AM HB

PASSENGER CARS

TRUCKS

OBSERVATION	ALL			INDIANA			NON-INDIANA			ALL			<5000 LBS.			>5000 LBS.		
	PRES- LAST	PRES- ENT	PRES- LAST	PRES- ENT	PRES- LAST	PRES- ENT	PRES- LAST	PRES- ENT	PRES- LAST	PRES- ENT	PRES- LAST	PRES- ENT	PRES- LAST	PRES- ENT	PRES- LAST	PRES- ENT	PRES- LAST	PRES- ENT
NUMBER OF VEHICLES	232	201	153	120	79	81	109	224	43	58	140	166						
Avg. SPEED (MPH)	56.20	56.51	55.70	56.26	57.20	57.14	55.90	55.54	55.50	55.74	56.00	55.46						
STANDARD DEVIATION	4.303	4.052	4.355	4.022	4.031	4.064	4.505	5.071	3.742	4.851	4.748	5.105						
PERCENT OF VEHICLES TRAVELING LESS THAN OR EQUAL TO																		
24 MPH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 MPH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34 MPH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39 MPH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44 MPH	1.3	5	2.0	8	5.1	3.7	9.0	3.6	0	1.7	2.1	4.2						
49 MPH	7.3	4.5	8.5	5.0	19.0	19.0	37.0	12.1	2.0	10.3	11.4	12.7						
54 MPH	28.4	24.4	33.3	27.5	69.6	72.8	78.0	36.2	49.0	36.2	32.9	36.1						
59 MPH	75.9	75.6	79.1	77.5	98.7	96.3	99.5	76.8	85.7	75.9	76.4	77.1						
64 MPH	90.7	97.5	99.7	99.3	100.0	100.0	100.0	99.1	100.0	98.3	99.3	99.4						
69 MPH	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0						
74 MPH	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0						
79 MPH	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0						
84 MPH	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0						
89 MPH	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0						
DIRECTION: EB																		
N OF VEHICLES	125	113	80	63	49	50	81	100	28	29	53	71						
AVERAGE SPEED	56.60	56.34	56.20	55.63	57.20	57.20	56.00	54.76	56.00	54.97	56.00	54.68						
DIRECTION: HB																		
N OF VEHICLES	103	88	73	57	30	31	108	124	21	29	87	95						
AVERAGE SPEED	55.70	56.97	55.10	56.93	57.20	57.03	55.80	56.16	54.90	56.52	56.00	56.05						

TABLE A3 : SPEED DATA

STATION: RI-06			HIGHWAY: I-65			LOCATION: 7.5 MI NORTH OF SR160			WEATHER: HAZY		
NO. OF LANES: 4			TYPE OF SURFACE: BLACKTOP			LAST PREVIOUS OBSERVATION (SPEED REPORT NO. 115)					
THIS OBSERVATION			DATE: 07-28-1982			DATE: 06-09-1981					
TIME: 9:00 - 10:04 AM NB			TIME: 1:00 - 1:45 PM NB			TIME: 1:00 - 1:45 PM NB					
8:11 - 8:52 AM SB			12:01 - 12:45 PM SB			12:01 - 12:45 PM SB					
PASSENGER CARS											
ALL			INDIANA			NON-INDIANA			ALL		
ALL			ALL			ALL			ALL		

TABLE A4 : SPEED DATA

STATION: R1-12 HIGHWAY: I-74 LOCATION: 0.1 MI WEST OF 109 MI MARKER

NO. OF LANES: 4 TYPE OF SURFACE: CONCRETE WEATHER: SUNNY

THIS OBSERVATION LAST PREVIOUS OBSERVATION (SPEED REPORT NO. 115)

DATE: 07-01-1982 DATE: 06-10-1981

TIME: 10:12 - 10:44 AM EB TIME: 11:35AM - 12:20PM EB

10:48 - 11:19 AM WB 10:40 - 11:20 AM WB

PASSENGER CARS										TRUCKS									
ALL			INDIANA			NON-INDIANA			ALL	<5000 LBS.			>5000 LBS.			PRES-	ENT	LAST	PRES-
OBSERVATION	LAST	PRES-	LAST	PRES-	LAST	LAST	PRES-	LAST		LAST	PRES-	ENT	LAST	PRES-	ENT				
NUMBER OF VEHICLES	273	265	176	143	97	116	153	160	53	53	63	98	97	98	97				
AVE. SPEED (MPH)	58.70	59.59	58.00	58.64	60.00	60.81	59.10	58.59	59.00	58.05	58.05	59.10	58.94	59.10	58.94				
STANDARD DEVIATION	4.900	5.154	4.823	4.039	5.029	6.109	4.319	4.857	4.528	5.895	4.221	4.038	4.038	4.221	4.038				
PERCENT OF VEHICLES TRAVELING LESS THAN OR EQUAL TO																			
24 MPH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
29 MPH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
34 MPH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
39 MPH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
44 MPH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
49 MPH	4.0	1.5	5.1	2.0	2.1	8.6	1.3	1.9	1.8	3.2	1.0	1.0	1.0	1.0	1.0				
54 MPH	16.1	11.3	19.9	13.4	9.3	46.6	14.4	18.1	14.5	23.8	14.3	14.4	14.4	14.3	14.4				
59 MPH	56.4	50.6	63.6	53.7	43.3	83.6	56.2	54.4	58.2	57.1	55.1	52.6	52.6	55.1	52.6				
64 MPH	91.2	89.4	92.6	94.0	83.7	92.6	91.5	92.5	92.7	88.9	90.8	94.8	94.8	90.8	94.8				
69 MPH	97.8	96.6	98.3	100.0	96.9	92.2	98.7	98.8	98.2	98.4	99.0	99.0	99.0	99.0	99.0				
74 MPH	98.9	98.1	99.4	100.0	97.9	95.7	99.3	100.0	98.2	100.0	100.0	100.0	100.0	100.0	100.0				
79 MPH	99.6	98.9	100.0	100.0	99.0	97.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0				
84 MPH	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0				
89 MPH	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0				
DIRECTION: EB																			
N OF VEHICLES	127	128	83	81	44	47	87	85	29	30	58	55	55	58	55				
AVERAGE SPEED	59.00	59.28	59.00	58.65	59.00	60.36	59.50	58.66	60.10	57.90	59.20	59.07	59.07	59.20	59.07				
DIRECTION: WB																			
N OF VEHICLES	146	137	93	68	53	69	66	75	26	33	40	42	42	40	42				
AVERAGE SPEED	58.40	59.88	57.10	58.62	50.80	61.12	58.40	58.51	57.80	58.18	58.00	58.76	58.76	58.00	58.76				

TABLE A6 : SPEED DATA

STATION: RI-34 HIGHWAY: I-65 LOCATION: 2 MI SOUTH OF SR39

NO. OF LANES: 4 TYPE OF SURFACE: BLACKTOP WEATHER: HAZY

THIS OBSERVATION
 DATE: 06-15-1982
 TIME: 10:39 - 11:05 AM NB
 10:02 - 10:29 AM SB

LAST PREVIOUS OBSERVATION (SPEED REPORT NO. 115)
 DATE: 06-15-1981
 TIME: 10:45 - 11:15 AM NB
 10:00 - 10:25 AM SB

OBSERVATION	PASSENGER CARS						TRUCKS					
	ALL			INDIANA			NON-INDIANA			ALL		
	PRES- LAST	PRES- ENT	PRES- LAST	PRES- ENT	PRES- LAST	PRES- ENT	PRES- LAST	PRES- ENT	PRES- LAST	PRES- LAST	PRES- ENT	PRES- ENT
NUMBER OF VEHICLES	283	279	144	174	139	105	142	144	58	58	84	86
AVE. SPEED (MPH)	58.10	59.01	57.50	58.70	58.70	59.40	57.60	57.51	56.80	57.26	58.10	57.69
STANDARD DEVIATION	3.915	4.022	4.049	4.014	3.685	4.025	4.489	4.313	4.418	4.922	4.479	3.869
PERCENT OF VEHICLES TRAVELING LESS THAN OR EQUAL TO	24 MPH 29 MPH 34 MPH 39 MPH 44 MPH 49 MPH 54 MPH 59 MPH 64 MPH 69 MPH 74 MPH 79 MPH 84 MPH 89 MPH	0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0
DIRECTION: NB	141	147	67	62	74	65	70	66	26	23	44	43
AVERAGE SPEED	58.50	59.41	58.50	59.17	58.40	59.72	57.20	58.65	56.30	59.52	57.70	58.19
DIRECTION: SB	142	132	77	92	65	40	72	78	32	35	40	43
AVERAGE SPEED	57.70	58.57	56.60	58.43	58.90	58.88	58.00	56.55	57.20	55.77	58.60	57.19

TABLE AB :SPEED DATA

STATION: 4L-20 HIGHWAY: US 41 LOCATION: 1.1 MI NORTH OF SR2

NO. OF LANES: 4 TYPE OF SURFACE: BLACKTOP WEATHER: CLEAR

THIS OBSERVATION

DATE: 06-10-1982
TIME: 9:58 - 11:05 AM NB
12:13 - 1:17 PM SB

LAST PREVIOUS OBSERVATION (SPEED REPORT NO. 115)

DATE: 06-02-1981
TIME: 10:20 - 11:33 AM NB
11:45AM - 12:40PM SB

OBSERVATION	PASSENGER CARS						TRUCKS					
	ALL			INDIANA			NON-INDIANA			ALL		
	PRES- LAST	PRES- ENT	PRES- LAST	PRES- ENT	PRES- LAST	PRES- ENT	PRES- LAST	PRES- ENT	PRES- LAST	PRES- ENT	PRES- LAST	PRES- ENT
NUMBER OF VEHICLES	281	242	225	185	56	57	146	184	51	67	95	117
AVE. SPEED (MPH)	56.50	57.12	56.30	56.81	57.40	58.12	55.30	55.27	56.50	55.96	54.60	54.88
STANDARD DEVIATION	5.639	5.159	5.523	5.243	6.045	4.785	5.570	6.082	5.718	5.661	5.403	6.300
PERCENT OF VEHICLES TRAVELING LESS THAN OR EQUAL TO	24 MPH	0	0	0	0	0	0	0	0	0	0	0
	29 MPH	0	0	0	0	0	0	0	0	0	0	0
	34 MPH	0	0	0	0	0	0	0	0	0	0	0
	39 MPH	.7	.8	.9	1.1	0	0	1.1	0	0	0	1.7
	44 MPH	2.5	1.2	2.7	1.6	1.8	3.4	6.0	0	6.0	5.3	6.0
	49 MPH	10.0	7.0	10.7	7.0	7.1	15.8	15.8	11.8	11.9	17.9	17.9
	54 MPH	32.4	28.1	32.9	30.8	30.4	37.0	38.6	37.3	34.3	36.8	41.0
	59 MPH	73.3	69.8	74.2	73.0	69.6	80.1	75.5	68.6	71.6	86.3	77.8
	64 MPH	93.6	94.6	94.7	93.1	89.3	95.9	94.6	94.1	95.5	96.8	94.0
	69 MPH	98.6	99.6	99.6	99.5	94.6	99.3	100.0	98.0	100.0	100.0	100.0
	74 MPH	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	79 MPH	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	84 MPH	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	89 MPH	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
DIRECTION: NB												
N OF VEHICLES	140	123	111	98	29	25	70	89	31	37	39	52
AVERAGE SPEED	56.00	56.32	55.60	55.81	57.40	58.32	53.50	51.07	56.40	53.92	51.30	50.40
DIRECTION: SB												
N OF VEHICLES	141	119	114	87	27	32	76	95	20	30	56	65
AVERAGE SPEED	57.10	57.95	57.00	57.94	57.40	57.97	56.90	58.46	56.80	58.47	57.00	58.46

TABLE ALL-SPEED DATA

STATION: 2L-18 HIGHWAY: US 35 LOCATION: 2.5 MI EAST OF I-69

NO. OF LANES: 2 TYPE OF SURFACE: BLACKTOP WEATHER: CLEAR

THIS OBSERVATION

DATE: 06-22-1982

TIME: 10:00AM - 12:00PM EB

10:00AM - 12:00PM WB

LAST PREVIOUS OBSERVATION (SPEED REPORT NO. 115)

DATE: 06-03-1981

TIME: 10:20AM - 12:25PM EB

10:20AM - 12:25PM WB

PASSENGER CARS										TRUCKS									
ALL					INDIANA					NON-INDIANA					ALL				
OBSERVATION		LAST		PRES-	LAST		PRES-	LAST		LAST		PRES-	LAST		LAST		PRES-	LAST	
		ENT		ENT	ENT		ENT	ENT		ENT		ENT	ENT		ENT		ENT	ENT	
NUMBER OF VEHICLES		311		254	277		196	34		58		133	165		50		70	83	
AVE. SPEED (MPH)		56.00		56.87	56.00		56.40	56.60		56.45		54.70	55.50		56.20		56.26	53.00	
STANDARD DEVIATION		4.805		5.046	4.748		5.158	5.279		4.325		5.426	5.599		5.600		6.225	5.146	
24 MPH		0		0	0		0	0		0		0	0		0		0	0	
29 MPH		0		0	0		0	0		0		0	0		0		0	0	
34 MPH		0		0	0		0	0		0		0	0		0		0	0	
39 MPH		0		0	0		0	0		0		0	.6		0		0	0	
44 MPH		.3		1.2	.4		1.5	0		0		4.5	2.4		4.0		4.3	4.8	
49 MPH		10.3		6.7	10.5		8.7	8.8		0		16.5	13.3		14.0		11.4	18.1	
54 MPH		34.4		28.3	35.0		31.6	29.4		17.2		48.1	43.6		36.0		37.1	55.4	
59 MPH		76.0		72.0	77.6		73.0	70.6		69.0		76.7	78.2		70.0		75.7	80.7	
64 MPH		96.8		93.7	97.1		93.4	94.1		94.8		97.0	96.4		92.0		94.3	100.0	
69 MPH		99.0		98.8	99.3		99.0	97.1		98.3		99.2	98.8		98.0		97.1	100.0	
74 MPH		100.0		99.6	100.0		100.0	100.0		100.0		100.0	99.4		100.0		98.6	100.0	
79 MPH		100.0		100.0	100.0		100.0	100.0		100.0		100.0	100.0		100.0		100.0	100.0	
84 MPH		100.0		100.0	100.0		100.0	100.0		100.0		100.0	100.0		100.0		100.0	100.0	
89 MPH		100.0		100.0	100.0		100.0	100.0		100.0		100.0	100.0		100.0		100.0	100.0	
DIRECTION: EB		165		126	153		111	7		15		65	83		26		38	39	
N OF VEHICLES		55.90		56.46	55.90		56.42	57.00		56.73		55.10	56.49		57.50		56.66	53.60	
AVERAGE SPEED		146		128	119		85	27		43		68	82		24		32	44	
DIRECTION: WB		56.20		57.27	56.10		56.38	56.60		59.05		54.30	54.50		54.90		55.78	54.00	
N OF VEHICLES		50			50			50		50			50		50			50	
AVERAGE SPEED		53.68			53.68			53.68		53.68			53.68		53.68			53.68	

TABLE A12:SPEED DATA

STATION: 2L-54 HIGHWAY: US 231 LOCATION: 1.1 MI SOUTH OF SR 234

NO. OF LANES: 2 TYPE OF SURFACE: BLACKTOP WEATHER: CLEAR

THIS OBSERVATION LAST PREVIOUS OBSERVATION (SPEED REPORT NO. 115)

DATE: 06-14-1982 DATE: 06-04-1981
 TIME: 10:10AM - 1:32PM NB TIME: 10:00AM - 12:35PM NB
 10:10AM - 1:32PM SB 10:00AM - 12:35PM SB

PASSENGER CARS										TRUCKS									
		ALL		INDIANA		NON-INDIANA		ALL		<5000 LBS.		>5000 LBS.							
OBSERVATION	LAST	PRES- ENT	LAST	PRES- ENT	LAST	PRES- ENT	LAST	PRES- ENT	LAST	PRES- ENT	LAST	PRES- ENT	LAST	PRES- ENT	LAST	PRES- ENT	LAST	PRES- ENT	LAST
NUMBER OF VEHICLES	260	236	241	216	19	20	173	183	69	89	104	94							
AVE. SPEED (MPH)	54.80	55.33	54.80	55.31	55.60	55.50	54.20	55.53	53.60	54.58	54.50	56.48							
STANDARD DEVIATION	5.761	5.112	5.834	5.032	4.787	6.057	6.001	5.669	5.336	5.791	6.404	5.421							
PERCENT OF VEHICLES TRAVELING LESS THAN OR EQUAL TO	24 MPH 29 MPH 34 MPH 39 MPH 44 MPH 49 MPH 54 MPH 59 MPH 64 MPH 69 MPH 74 MPH 79 MPH 84 MPH 89 MPH	0 0 .4 .4 3.8 16.2 46.5 81.2 95.0 98.8 99.6 100.0 100.0 100.0	0 0 .4 .4 1.7 10.6 43.2 82.2 97.0 99.6 99.6 100.0 100.0 100.0	0 0 1.4 10.6 43.1 82.4 97.2 99.5 99.6 99.6 100.0 100.0 100.0	0 0 1.4 10.6 43.1 82.4 97.2 99.5 99.6 99.6 100.0 100.0 100.0	0 0 5.0 10.0 45.0 80.0 95.0 100.0 100.0 100.0 100.0 100.0 100.0	0 0 15.8 42.1 78.9 94.7 100.0 100.0 100.0 100.0 100.0 100.0 100.0	0 0 20.8 49.7 82.7 97.1 100.0 100.0 100.0 100.0 100.0 100.0 100.0	0 0 13.1 39.3 77.6 97.8 99.5 100.0 100.0 100.0 100.0 100.0 100.0	0 0 21.7 56.5 89.9 100.0 100.0 100.0 100.0 100.0	0 0 4.3 13.5 46.1 84.3 98.9 100.0 100.0 100.0 100.0	0 0 1.9 10.6 20.2 45.2 77.9 95.2 100.0 100.0 100.0 100.0	0 0 2.2 5.6 13.5 46.1 84.3 98.9 100.0 100.0 100.0 100.0	0 0 1.4 4.3 21.7 56.5 89.9 100.0 100.0 100.0 100.0	0 0 1.1 3.3 13.1 39.3 77.6 97.8 99.5 100.0 100.0 100.0 100.0	0 0 1.7 6.1 20.8 49.7 82.7 97.1 100.0 100.0 100.0 100.0	0 0 1.1 3.3 13.1 39.3 77.6 97.8 99.5 100.0 100.0 100.0 100.0	0 0 1.9 5.6 13.5 46.1 84.3 98.9 100.0 100.0 100.0 100.0	0 0 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1
DIRECTION: NB																			
N OF VEHICLES	140	115	134	107	6	8	79	95	33	45	46	50							
AVERAGE SPEED	54.80	56.44	54.80	56.49	53.80	55.88	54.70	56.21	54.30	55.58	54.90	56.78							
DIRECTION: SB																			
N OF VEHICLES	120	121	107	109	13	12	94	88	36	44	58	44							
AVERAGE SPEED	54.80	54.27	54.50	54.17	56.50	55.25	53.70	54.85	53.00	53.57	54.20	56.14							

TABLE A13: SPEED DATA

STATION: 2L-79 HIGHWAY: SR25 LOCATION: 0.7 MI SOUTH OF AMERICUS

NO. OF LANES: 2 TYPE OF SURFACE: BLACKTOP WEATHER: HAZY

THIS OBSERVATION

DATE: 06-08-1982 NB AND 06-09-1982 SB

TIME: 7:53 - 10:14 AM NB

7:53 - 10:14 AM SB

LAST PREVIOUS OBSERVATION (SPEED REPORT NO. 115)

DATE: 06-19-1981

TIME: 10:10 - 11:50 AM NB

10:10 - 11:50 AM SB

OBSERVATION	PASSENGER CARS										TRUCKS									
	ALL					INDIANA					NOTI-INDIANA					ALL				
	LAST	PRES-ENT	LAST	PRES-ENT	LAST	LAST	PRES-ENT	LAST	PRES-ENT	LAST	LAST	PRES-ENT	LAST	PRES-ENT	LAST	LAST	PRES-ENT	LAST	PRES-ENT	LAST
NUMBER OF VEHICLES	295	251	259	235	26	16	140	167	58	79	82	88								
AVE. SPEED (MPH)	55.50	55.76	55.50	55.77	54.80	55.56	54.20	54.10	54.40	54.90	54.00	53.38								
STANDARD DEVIATION	5.314	4.518	5.484	4.514	3.033	4.718	4.663	5.324	4.055	5.701	5.069	4.881								
24 MPH	0	0	0	0	0	0	0	0	0	0	0	0								
29 MPH	0	0	0	0	0	0	0	0	0	0	0	0								
34 MPH	0	0	0	0	0	0	0	0	0	0	0	0								
39 MPH	0	0	0	0	0	0	0	0	0	0	0	0								
44 MPH	1.4	0.8	1.5	0.9	0	0	1.4	1.2	0	2.5	2.4	0								
49 MPH	9.2	7.6	9.7	7.7	3.8	6.3	2.9	4.2	1.7	3.8	3.7	4.5								
54 MPH	43.4	36.7	42.8	36.6	50.0	37.5	11.4	15.0	10.3	11.4	12.2	18.2								
59 MPH	84.7	80.9	84.0	80.9	92.3	81.3	49.3	53.3	48.3	44.3	50.0	61.4								
64 MPH	95.3	96.4	94.8	96.2	100.0	100.0	88.6	88.6	89.7	86.1	87.8	90.9								
69 MPH	98.3	100.0	98.1	100.0	100.0	100.0	99.3	97.6	100.0	96.2	98.8	98.9								
74 MPH	99.3	100.0	99.3	100.0	100.0	100.0	100.0	99.4	100.0	98.7	100.0	100.0								
79 MPH	99.7	100.0	99.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0								
84 MPH	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0								
89 MPH	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0								
DIRECTION: NB																				
N OF VEHICLES	145	115	120	103	25	12	78	96	33	38	45	58								
AVERAGE SPEED	54.50	55.36	54.50	55.35	54.80	55.33	54.00	53.73	54.30	54.03	53.80	53.53								
DIRECTION: SB																				
N OF VEHICLES	150	136	149	132	1	4	62	71	25	41	37	30								
AVERAGE SPEED	56.40	56.10	56.40	56.10	56.00	56.25	54.40	54.59	54.40	55.71	54.30	53.07								

TABLE A14: SPEED DATA

STATION: 2L-91 HIGHWAY: SR43 LOCATION: 2 MI SOUTH OF CHALMERS

NO. OF LANES: 2 TYPE OF SURFACE: BLACKTOP WEATHER: CLEAR

THIS OBSERVATION LAST PREVIOUS OBSERVATION (SPEED REPORT NO. 115)
DATE: 08-11-1982 NB AND 09-11-1982 SB DATE: 06-17-1981
TIME: 8:59 - 11:01 AM NB TIME: 9:55AM - 12:10PM NB
8:59 - 11:01 AM SB 9:55AM - 12:10PM SB

OBSERVATION	PASSENGER CARS										TRUCKS																			
	ALL					INDIANA					NON-INDIANA					ALL					<5000 LBS.					>5000 LBS.				
	LAST	PRES-ENT	LAST	PRES-ENT	LAST	LAST	PRES-ENT	LAST	PRES-ENT	LAST	LAST	PRES-ENT	LAST	PRES-ENT	LAST	LAST	PRES-ENT	LAST	PRES-ENT	LAST	LAST	PRES-ENT	LAST	PRES-ENT	LAST	PRES-ENT	LAST	PRES-ENT		
NUMBER OF VEHICLES	264	258	251	233	13	25	163	163	163	72	86	91	77																	
AVE. SPEED (MPH)	56.70	55.93	56.70	55.85	58.50	56.72	56.20	54.24	56.00	53.84	56.30	54.69																		
STANDARD DEVIATION	5.448	5.168	5.530	5.235	3.178	4.514	4.722	5.449	5.842	5.240	3.632	5.674																		
PERCENT OF VEHICLES TRAVELING LESS THAN OR EQUAL TO	24 MPH	0	0	0	0	0	0	0	0	0	0	0	0																	
	29 MPH	0	0	0	0	0	0	0	0	0	0	0	0																	
	34 MPH	0	0	0	0	0	0	0	0	0	0	0	0																	
	39 MPH	0	0	0	0	0	0	0	0	0	0	0	0																	
	44 MPH	1.1	1.9	1.2	2.1	0	0	0	0	0	0	0	0																	
	49 MPH	6.8	7.4	7.2	8.2	0	0	0	0	0	0	0	0																	
	54 MPH	31.4	37.6	32.3	37.3	15.4	40.0	27.6	29.2	58.1	26.4	40.3																		
	59 MPH	74.6	77.5	75.7	78.1	53.8	72.0	81.6	88.3	77.8	89.5	87.0																		
	64 MPH	92.4	95.3	92.0	95.3	100.0	95.0	96.9	96.9	93.1	96.5	97.4																		
	69 MPH	98.1	99.2	98.0	99.1	100.0	100.0	100.0	99.4	100.0	100.0	98.7																		
	74 MPH	99.2	99.6	99.2	99.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	79 MPH	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	84 MPH	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
	89 MPH	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0																		
DIRECTION: NB	N OF VEHICLES	127	117	118	105	9	12	89	93	42	54	47	39																	
	AVERAGE SPEED	55.90	55.96	55.80	55.67	57.70	58.50	55.80	53.74	55.50	54.07	56.10	53.28																	
DIRECTION: SB	N OF VEHICLES	137	141	133	128	4	13	74	70	30	32	44	38																	
	AVERAGE SPEED	57.50	55.91	57.40	56.00	60.30	55.08	56.60	54.90	56.90	53.44	56.40	56.13																	

TABLE A18: SPEED DATA

STATION: 2LALL HIGHWAY: 2 - LANE

THIS OBSERVATION
DATE: JUNE TO AUGUST 1982LAST PREVIOUS OBSERVATION (SPEED REPORT NO. 115)
DATE: JUNE TO AUGUST 1981

OBSERVATION	PASSENGER CARS										TRUCKS																			
	ALL					INDIANA					NON-INDIANA					ALL					<5000 LBS.					>5000 LBS.				
	LAST	PRES- ENT	LAST	PRES- ENT	LAST	LAST	PRES- ENT	LAST	PRES- ENT	LAST	LAST	PRES- ENT	LAST	PRES- ENT	LAST	LAST	PRES- ENT	LAST	PRES- ENT	LAST	LAST	PRES- ENT	LAST	PRES- ENT	LAST	PRES- ENT	LAST	PRES- ENT		
NUMBER OF VEHICLES	0	999	0	880	0	119	0	678	0	324	0	354	0	54.82	0	54.87	0	54.82	0	54.91	0	54.82	0	54.82	0	54.82	0	54.82	0	54.82
AVE. SPEED (MPH)	0	55.99	0	55.82	0	57.20	0	54.87	0	54.82	0	54.82	0	54.82	0	54.87	0	54.82	0	54.82	0	54.82	0	54.82	0	54.82	0	54.82	0	54.82
STANDARD DEVIATION	0	4.991	0	4.989	0	4.857	0	5.546	0	5.763	0	5.347	0	5.763	0	5.546	0	5.763	0	5.347	0	5.763	0	5.763	0	5.763	0	5.763	0	5.763
24 MPH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 MPH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34 MPH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39 MPH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44 MPH	0	1.4	0	1.5	0	0.8	0	1.2	0	4.3	0	3.7	0	4.3	0	4.0	0	4.3	0	3.7	0	4.3	0	4.3	0	4.3	0	4.3	0	4.3
49 MPH	0	8.0	0	8.8	0	2.5	0	13.4	0	12.7	0	14.1	0	12.7	0	13.4	0	12.7	0	14.1	0	12.7	0	12.7	0	12.7	0	12.7	0	12.7
54 MPH	0	36.3	0	37.3	0	29.4	0	46.3	0	46.9	0	45.8	0	46.9	0	46.3	0	46.9	0	45.8	0	46.9	0	46.9	0	46.9	0	46.9	0	46.9
59 MPH	0	78.1	0	78.8	0	73.1	0	83.0	0	84.3	0	81.9	0	84.3	0	83.0	0	84.3	0	81.9	0	84.3	0	84.3	0	84.3	0	84.3	0	84.3
64 MPH	0	95.6	0	95.6	0	95.8	0	97.2	0	96.6	0	97.7	0	96.6	0	97.2	0	96.6	0	97.7	0	96.6	0	96.6	0	96.6	0	96.6	0	96.6
69 MPH	0	99.4	0	99.4	0	99.2	0	99.3	0	98.8	0	99.7	0	98.8	0	99.3	0	98.8	0	99.7	0	98.8	0	98.8	0	98.8	0	98.8	0	98.8
74 MPH	0	99.7	0	99.8	0	99.2	0	99.9	0	99.7	0	100.0	0	99.7	0	99.9	0	99.7	0	100.0	0	99.7	0	99.7	0	99.7	0	99.7	0	99.7
79 MPH	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0
84 MPH	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0
89 MPH	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0	0	100.0
PERCENT OF VEHICLES TRAVELING LESS THAN OR EQUAL TO																														

PERCENT
OF
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TRAVELING
LESS THAN
OR
EQUAL TO

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**SCHOOL OF
CIVIL ENGINEERING**

INDIANA

DEPARTMENT OF HIGHWAYS

JOINT HIGHWAY
RESEARCH PROJECT
JHRP-83-2

ENGINEERING SOILS MAP OF
PIKE COUNTY, INDIANA

Chen-Tair Huang

PURDUE UNIVERSITY

Final Report

ENGINEERING SOILS MAP OF PIKE COUNTY, INDIANA

TO: H. L. Michael, Director
Joint Highway Research Project

February 9, 1983

Project: C-36-51B

FROM: R. D. Miles

File: 1-5-2-68

Attached is the Final Report on the "Engineering Soils Map of Pike County, Indiana". The map and report have been prepared by Mr. Chen-Tair Huang, Graduate Assistant on our staff under the direction of Professor Robert D. Miles.

This is the 67th county map which has been completed by using aerial photography and available information. The map and report should be very useful in planning and developing engineering facilities in Pike County.

The Report is presented to the Board as a final report showing completion of the Pike County engineering soils mapping project.

Sincerely,

Robert D. Miles

Robert D. Miles

RDM:ms

cc: A. G. Altschaeffl
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Final Report
ENGINEERING SOILS MAP OF PIKE COUNTY, INDIANA

by

Chen-Tair Huang
Graduate Assistant

Joint Highway Research Project

Project No.: C-36-51B

File No.: 1-5-2-68

Prepared as Part of an Investigation

Conducted by

Joint Highway Research Project
Engineering Experiment Station
Purdue University

In Cooperation with

Indiana Department of Highways

Purdue University
West Lafayette, Indiana
February 9, 1983

ACKNOWLEDGMENTS

The author wishes to thank Dr. D. W. Levandowski and Dr. T. R. West, Department of Geosciences, Purdue University for their assistance on this project. Special thanks is due Professor Robert D. Miles for guidance on the soil mapping and for review of the report. The author also wishes to thank the members of the Board of the Joint Highway Research Project for their support of the county soil mapping project.

All airphotos used in connection with the preparation of this report were obtained by the Indiana Department of Highways and the United States Department of Agriculture.

Engineering Soils Map of Pike County, Indiana

Introduction

The engineering soils map of Pike County, Indiana which accompanies this report was done primarily by airphoto interpretation. The aerial photographs used in this study, having an approximate scale of 1:24,000, were taken on October 17, 1977 by the Indiana Department of Highways. Aerial photographic interpretation of land forms, parent materials and engineering soils of this county was accomplished in accordance with accepted principles of observation and inference (1).

A field trip was made to the area for the purposes of resolving ambiguous details and correlating aerial photographic patterns with soil texture. The final land form and parent material boundaries were graphically reduced to produce the engineering soil map (1 inch = 1 mile). Standard symbols developed by the staff of the Airphoto Interpretation Laboratory, School of Civil Engineering, Purdue University, were employed to delineate land forms, parent materials and soil textures. Parent material symbols were grouped according to land form and origin, and textural symbols were superimposed to indicate the relative compositions of the parent materials. The text of this report largely represents an effort to overcome the limitation imposed by adherence to a standard symbolism and map presentation.

The map also includes a set of soil profiles which indicate the general soil profiles in the various land form-parent

material areas. The soil profiles were compiled from the agricultural literature and from the boring data of roadway soil surveys along S.R. 57, S.R. 64, and S.R. 25 (Appendix B). These data were supplied by the Indiana Department of Highways. Liberal reference was made to the "Formation Distribution and Engineering Characteristic of Soils" (2).

Description of the Area

General

Pike County is located in the southwestern part of Indiana (Figure 1). The county seat, Petersburg, is 115 miles southwest of Indianapolis, and 45 miles northeast of Evansville. The county is bounded on the east by Dubois County, on the west by Gibson County, on the south by Warrick County and on the north by Knox and Daviess Counties. The total area of the county is 338 square miles or 216,320 acres.

Drainage Features

Drainage features of Pike County are shown in Figure 2, "Drainage Map - Pike County, Indiana", prepared by the Joint Highway Research Project, Purdue University 1953 (3). Pike County lies within three drainage basins of the state (4). The southern part is in the Minor Ohio basin. The central part is in the Patoka basin. The northern fourth is divided between the White River basin proper and the East Fork White River subdivision of this basin.

FIG. 1 LOCATION MAP OF PIKE COUNTY

FIG. 2
DRAINAGE MAP
PIKE COUNTY
INDIANA

The Ohio River is the master stream which eventually receives all the drainage of the county. The extreme southeastern and southwestern parts drain directly into the Ohio River, but the rest of the drainage reaches the Ohio River indirectly through the Patoka, White and Wabash Rivers. The Patoka River drains two-thirds of the county, and the White River drains the rest except for the very small areas that drain into the Ohio River.

The White and East Fork White Rivers acted as glacial sluiceways. Preglacial watershed divides occur in the northern and eastern parts. The southeasterly course of Flat Creek is noticeable. Cup Creek flows in a northerly direction. The Patoka River is a sluggish stream flowing through an aggraded valley except in the eastern part where it flows in a narrow, deep valley. Its course is meandering in the eastern part. The lower portion of the valley of South Fork Patoka River is aggraded. Both the lower reach of the Patoka River and the South Fork Patoka River are ditched to improve runoff.

Surface drainage is thoroughly developed in the uplands. Erosion has been active. Upland drainage is integrated in many places. Drainage patterns are fine-textured rectangular systems in most of the dissected uplands with the exception of a few flat areas on the main divides and several extensive slackwater plains in the vicinity of Cato, Otwell, and Alford. The county is well drained. The southwestern one-third, with its greater relief and deep V-shaped valleys, is excessively drained. In general, the

streams through the lacustrine plain exhibit low gradients. Flat Creek drains an old lakebed; it has a low gradient. In the northeastern part, streams draining into the East Fork White River are small. Likewise, most tributaries of the Patoka River from the north are small. There are no natural lakes in Pike County.

The courses of the natural drainageways are disrupted in many places due to strip mining operations. Ditches are dredged in the lakebed areas and some of the larger streams are straightened by dredging. The Patoka River is dredged in the western part. The abandoned meanders of Patoka River exist in the flood plain.

A stream gaging station is located on White River at Petersburg (5). The drainage area of White River above Petersburg is about 11,000 square miles (5).

Climate

Pike County is in a section characterized by warm humid summers and moderately cold winters. There are wide differences between the summer and winter temperatures and the mild winters are frequently broken by severe cold snaps. The rainfall is, in general, well distributed throughout the year, but a period of drought may occur during July and August.

The average length of the frost-free season is 184 days, from April 16, the average date of the latest recorded frost, to

October 17, the average date of the earliest.

Table 1, compiled from the records of the United States Weather Bureau Station at Princeton, Gibson County, give the essential data regarding weather conditions in Pike County.

Physiography

Pike County lies wholly within the Sullivan Lowland physiographic region of the state (Figure 3). With respect to the physiographical situation in the United States, the northwestern third of the county is in the Till plains section of the Central Lowland Province and the remainder of the county is in the Interior Low Plateau Province (4).

The main physiographic features of the Sullivan Lowland in Pike County are the filled-in or aggraded valleys and the presence of monadnocks (island hills). An area of such character is 1.5 miles northeast of Stendal.

Topography

The topography of the county is diversified (Figure 4). The county is partially a glacial plain and partially a residual plain. It may be divided into four divisions. The rough, highly dissected, southeastern part extends westward toward Spurgeon and northwestward toward Pikeville, Augusta, and Winslow. This section is characterized by moderately long, narrow, sharp ridges having little change in summit elevation from the 600-foot level, with hillsides sloping sharply into narrow V-shaped valleys.

Table 1. Normal and Extreme Monthly Temperature and Precipitation of Princeton, Gibson County

Month	Temperature			Precipitation			
	Mean F°	Absolute Maximum F°	Absolute Minimum F°	Mean Inches	Driest Year (1930)	Wettest Year (1882)	Average Snowfall
January	31.8	72	-18	3.66	1.00	2.50	8.6
February	34.0	76	-20	2.98	3.40	3.50	6.8
March	44.6	88	2	4.22	1.70	2.84	4.7
April	55.3	91	20	3.63	2.30	3.62	0.4
May	65.0	100	28	3.78	6.10	4.10	Trace
June	74.1	105	39	4.09	0.10	5.35	0.0
July	77.7	111	48	3.09	1.00	9.68	0.0
August	75.9	106	43	3.27	0.25	12.85	0.0
September	69.7	105	27	3.43	2.10	2.00	0.0
October	57.2	95	21	2.68	1.00	6.47	Trace
November	45.2	82	-4	3.25	3.90	3.00	0.8
December	35.5	71	-12	3.48	5.10	3.15	5.3
Year	55.5	111	-20	41.56	27.95	59.06	26.6

FIG. 3 Map of Indiana showing bedrock physiographic units. Slightly modified from Indiana Geol. Survey Rept. Prog. 7, fig. 3.

FIG. 4 TOPOGRAPHIC MAP OF PIKE COUNTY

The rolling, highly dissected, western part of the county extending south of Oatsville and Glezen through Muren and Spurgeon is a remnant of a former peneplain developed near the 500-ft level in the soft shale and sandstone. This rolling section is characterized by long, smooth and rounded hills.

The action of the Illinoian ice sheet, or glacier, from the northwest is directly or indirectly responsible for the smooth relief of the northern part of the county. Two types of land surface occur here - the one a flat stream-dissected lake plain and the other a more thoroughly dissected rolling till plain at about the same level of 500 feet. The advent of the ice sheet resulted in the blocking of the preglacial White River and its four northwesterly flowing tributaries from the present Potoka drainage basin. This blocking and derangement of streams with the consequent ponding of their waters formed the present lake plain in the northeastern part of the county. Near Cato the glacial lake section is a flat featureless plain from which the sandstone plain to the south rises abruptly. The northern boundary of this lake plain grades into the till plain at about the same elevation in some places, but in most places the difference in elevation of the two plains ranges from 5 to 10 feet.

The surface of the glacial till plain is marked by long broad ridges, a few of which have smooth flat tops. The ridges drop sharply, over steep non-agricultural hillsides, into deeply

entrenched V-shaped valleys in the upper stream courses, but the valleys broaden abruptly where they join other streams. Owing to the unconsolidated parent material and the steep slopes, erosion is active and stream cutting is rapid.

Probably the highest elevation is 2 1/2 miles southeast of Stendal where a series of hills rises to a height of 660 feet. The minimum elevation is 400 feet at the points where the Patoka and White Rivers leave the county. The average elevation is about 525 feet. The southeastern corner probably exhibits the greatest local relief. The ridge southeast of Augusta, with an elevation of 620 feet, drops to 440 feet along Beadens Creek. The elevation at Stendal is 620 feet; Augusta, 560 feet; Pikeville, 520 feet; Winslow, 480 feet; Velpen, 520 feet; Spurgeon, 500 feet; Little, 500 feet; White Oak, 580 feet; Otwell, 500 feet; Petersburg, 480 feet; and Union, 460 feet (9).

Geology

The surface and near surface geologic ages represented in Pike County are the Quaternary period and the Pennsylvanian age. The Quaternary materials are both pleistocene and recent in age.

Figure 5 shows a generalized bedrock geology map of Pike County (6). Except for parts of the eastern and northwestern parts of the county, which are underlain by rock units of the Raccoon Creek Group (Mansfield, Brazil and Staunton Formations) and the Lower McLeansboro Group (Shelburn and Patoka Formations) respectively, most of the county rests on the Alleghenian

LEGEND

(After Gray, Henry H., etal. 1970)

- - Racoon Creek Group
shale, sandstone, limestone, clay & coal
- - Top of Buffaloville coal member
- - Carbondale Group
shale, sandstone, limestone, clay & coal
- - Top of Springfield coal member
- - McLeansboro Group lower part
shale, sandstone, limestone & thin coal

FIG. 5 UNCONSOLIDATED MATERIAL OF PIKE COUNTY

Carbondale Group (Linton, Petersburg and Dugger Formations). Small outcrops of the Shelburn and Patoka Formations are present in the southwestern corner of the county. Figure 6 gives a columnar section showing bedrock units for the county (6).

Land Form and Engineering Soil Areas

The engineering soils in Pike County are derived both from the unconsolidated material and from weathering of sandstone and shale bedrock (Figure 5). The unconsolidated materials include glacial deposits, fluvial deposits, and eolian deposits (Figure 7). The sandstone and shale belt, comprising 40 percent of the county, lies in the vicinity of and southward from Winslow. It is the most rolling section of the county and is characterized, particularly in the western part, by sharp V-shaped valleys and narrow ridge tops.

In the unconsolidated part, the relief ranges from that of a flat lake plain to that of a moderately rolling, loess covered, till plain.

The entire county essentially is covered by loess of varying depth as indicated in Figure 8 and tabulated in Appendix A (7). The deepest deposit occurs at the northwestern corner of the county and the depth decreases toward the northeastern corner.

Fluvial Deposited Materials

The fluvial drift in Pike County include: alluvial plains, terraces, valley trains and lacustrine plains.

TIME UNIT		MAP UNIT	THICKNESS(feet)	LITHOLOGY	ROCK UNIT			
PERIOD	EPOCH				SIGNIFICANT MEMBER	FORMATION	GROUP	
PENNSYLVANIAN	CONEMAUGHIAN	P ₄	150 200		Shoal Creek Ls	Bond Fm.	McLeansboro	
						Patoka Fm.		
		P ₃	200 350		West Franklin Ls	Shelburn Fm.		
	ALLEGHENIAN	P ₂	300 400		Danville Coal (VII)	Dugger Fm.	Carbondale	
					Springfield Coal (V)	Petersburg Fm.		
					Survant Coal (IV)	Linton Fm.		
	POTTSVILLIAN	P ₁	250 500		Seelyville Coal (III)	Staunton Fm.	Raccoon Creek	
					Buffaloville Coal	Brazil Fm.		
					Lower Block Coal			
						Manfield Fm.		
MISSISSIPPIAN	CHESTERIAN	M ₆	250 300			Kinkaid Ls		

(After Gray, Henry H., et al. 1970)

FIG. 6 COLUMNAR SECTION SHOWING BEDROCK UNITS PIKE COUNTY

FIG. 7 CONSOLIDATED MATERIAL OF PIKE COUNTY

LEGEND

(After Fehrenbacher)

- Upland Area
- Lowland Area
- Alluvium, Terrace & Lacustrine plain
- Isothickness line of total Loess
- Location of Loess thickness measurement

FIG. 8 ISOPACHOUS MAP OF LOESS DEPOSIT IN PIKE COUNTY

1. Alluvial Plains

The great bulk of the fluvial drifts are sandy silts, silts and clays that have been deposited upon the flood plains of the many stream valleys in the county. The two largest alluvial plain areas (bounded by sawteeth on the map) are along the White River and Patoka River. The tributaries to these streams also have small alluvial plains. Annual flooding is anticipated within the areas.

Parent material, at a depth of 30 in. to 60 in. (76-152 cm) is usually stratified silty or sandy loam (A-4 soils), or loam (A-2 soils). The thickness of the surface layer varies from 8 in. to 55 in (20-140 cm) and is silty clay loam (A-6 soils) or silt loam (A-4 soils). The subsoil, at a depth of 8 in. to 40 in. (20-102 cm) is silty clay loam (A-6 soils) or silt loam (A-4 soils).

Boring data from sites #1 to #3 reveal the variability of the texture of the alluvial deposits. At site Nos. 1 and 2 silty clay (A-6 soil) is found immediately below the topsoil and the sandy loam (A-2-4) further down. At site No. 3, sandy loam (A-2-4) is found below the top soil. The sandy loam is composed of 71% sand, 10% silt, and 19% clay. Below this is a silty clay loam (A-6) and at depth a loose sandy loam (A-2-4) soil layer occurs. Flooding is the major problem in this area.

2. Terraces and Valley Trains

Along the White River there are a few terraces and valley train deposits. They are about 10 to 20 feet (3 to 6 m) higher than the bottom land adjacent to them. The break between the upland and the terraces and valley trains is clearly defined.

The soil profile consists of a sandy loam to silty clay loam topsoil underlain by a silty clay loam to clay then a gravelly to a sandy clay subsoil.

3. Lacustrine Plains

The soils developed from lacustrine deposits occupy the flat plain extending from the vicinity of Cato to Jasper in Dubois County (9).

The topography of the lacustrine plain is a nearly level plain broken only by widely spaced drainage channels. The dendritic or leaflike plan of the deposits shows that the lakes occupied valley systems that had been eroded earlier by streams. The upper surfaces of the lake deposits are nearly flat, and therefore, the deposits are thin in upstream branches and thicker down valley (10).

The soil is developed partly from the thin loess cover and partly from the sheet wash materials. The thickness of the top soils varies from 15 in. to 23 in. (38-58 cm) and is silt loam (A-4 or A-6 soils). The subsoil at depth of 15 in. to 55 in. (38-140 cm) is silt loam (A-6 soils) or silty clay loam (A-7 soils). Stratified silty clay loam, silty clay, silt loam or

sandy loam (A-4, A-6, or A-7 soil) is found as underlying soils.

Most engineering problems associated with the lacustrine deposits are the result of the behavior of contained water within the soil. The lacustrine material is very porous, and, in most places, it is water saturated. Typically, the more permeable materials are scattered through the lake deposits as thin horizontal layers and lenses and they provide the only effective avenues for water movement. In undisturbed samples these layers are usually recognized because they are oxidized and are slightly rusty colored, in contrast to the dull blue-gray of the less permeable, saturated, finer material.

Eolian Drift

There are extensive eolian (wind) deposits in Pike County. The eolian deposits are subdivided into two groups: sand deposits and loess deposits.

1. Windblown Sand Deposits

Windblown sand deposits are very limited in Pike County. They are scattered along the southern part of the White River bluffs and occur as dunes.

The materials of the sand dune are predominantly fine, uniform, windblown sand including a considerable amount of silt and some clay particles mixed with the sand especially in the surface layer.

On the aerial photographs the surface of the sand area appears to have a very coarse texture when compared with that of loess. In the sand area, drainage is mainly internal thus reducing the number of gullies to a minimum. As the water infiltrates the sand it tends to form slight infiltration areas producing a somewhat darker area on the airphoto pattern. These darker areas create a speckled appearance which contrasts with the more uniform gray tone or mohair appearance of the loess (8).

The soil profile of sand dune deposits consists of a loamy fine sand, (A-2), fine sand (A-3) or sandy loam (A-4) topsoil, overlaying a sandy clay loam to sandy loam (A-4) subsoil.

Little or no problems other than stabilization and compaction are expected in this area. However, if deep cuts are required the characteristic of the underlying till materials should be taken into account.

2. Windblown Silt Deposits

The silt deposits were blown by northwest winds from the river valley and lacustrine plains and were deposited on the hills during the Wisconsin glacial period and recent times.

About one fifth of Pike County is considered as loess hills. The loess deposits are thicker (about 25 feet or 7.5 m) at the northwestern corner of the county as illustrated in Figure 6 and Appendix A.

In Pike County, the land form of the loess is influenced by the underlying material. As a result of its method of deposition the loess tends to modify and smooth out the existing topography. The resulting effect gives the interpreter the impression that a mantle has been placed over the area giving it a smooth, gently rolling surface, thus, reducing minor differences in elevation and streamlining irregular topography. This streamlining or windswept appearance and the overall mantling effect are important features in the identification of loess.

(a) Moderately Deep Loess Deposits Covered Till Plains

The till plains covered with moderately deep loess deposits contain pedological soils known as the Alford soil. The parent material is leached loess more than 5 feet (1.5 m) thick. The soil profile of loessial deposits consists of silt loam (A-4) topsoil and silty clay loam (A-6) subsoil. The material below the loess is till.

Boring sites #4 to #6 shows that a 5-8 ft. (1.5m - 2.4m) silty clay loam (A-4) is followed by 2.5 ft. (0.7m) of clay (A-8) and then 5-8 ft. (1.5m - 2.4m) of clay loam (A-4) before the bedrock (Shale) is reached.

The engineering problems in this area are primarily the control of moisture during construction and compaction of the silty material. The subgrade is weak under adverse moisture or due to frost action in winter. Pumping and erosion are potential problems in this region.

(b) Loess Covered Sandstone-Shale

About one ninth of Pike County is classified as loess covered sandstone-shale area. The deposit is confined mainly to the neighborhood of Campbelltown and Glezen. The region is dissected by streams and gullies.

Since the sandstone-shale bedrock is covered by a blanket of loess with a thickness which varies from 48 to 72 inches (1.2 m to 1.8 m) the upper soil profile is derived from the leached loess material. The top soil is silt loam (A-4 or A-6 soils). The subsoils are predominantly silty clay loam (A-6 or A-7 soils) with a fragipan (A-6 or A-7 soils). The weathered sandstone-shale residual soil is sandy loam, silt loam or clay under the loess deposits.

Engineering problems in this soil region are generally associated with the different characteristics of the underlying residual bedrock soils and bedrock materials. A shallow cut and fill alignment encounters several different materials in a short distance.

(c) Discontinuous Loess Over Weathered Sandstone and Shale

The sandstones and shales occupy about 39 percent of the county and occur principally in the southern part. In the southeastern part the sandstone is harder and more resistant to weathering, but in the southwestern part, the sandstone is softer and shale is more abundant.

The area may be covered by loess from 18 to 40 inches (45 to 100 cm). The soil parent materials are weathered Pennsylvanian siltstone, shale and sandstone and the overlying loess. The topsoil is silt loam (A-4 or A-6 soils). The subsoils range from silt loam (A-4 or A-6) to silty clay loam (A-6 soils) with fragipan (A-4 or A-6 soils). The underlying material is silt loam, loam or sandstone and shale.

The engineering problems associated with this region are associated with the cuts and fills. Different types and characteristics of residual soils or bedrock are encountered within short distances both horizontally and vertically.

Miscellaneous

Strip Mines

Intensive coal mining operations are observed on the aerial photographs of Pike County. The strip mines are mapped using the 1977 airphotos. Many new mines have been opened and old mine areas expanded since the 1977 photography; therefore, the areas marked on the engineering soils map are considered accurate as of the 1977 date.

Organic Deposits

There are no mappable organic deposits identified by the airphoto interpretation method in this county.

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APPENDIX A

LOESS THICKNESS MEASUREMENT IN PIKE COUNTY: BY J. B. FEHRENBACHER

<u>Site No.</u>	<u>Township</u>	<u>Range</u>	<u>Section</u>	<u>Total Depth in Inches</u>	<u>Underlying Material</u>
1	1N	6W	19, NE40, SE10	80	silt loam Illinoian till
2	1N	6W	29, NE160, NE40	75	silty clay loam Illinoian till
3	1N	7W	7, NE10	84?	-
4	1N	7W	8, NW160, NE40	110	very red Illinoian out wash soil
5	1N	7W	27, center	72	Illinoian till
6	1N	8W	22, NW160, NE40	110	red Sangamon soil
7	1N	8W	30, NW160	120	gritty subsoil (till)?
8	1N	9W	31, SE10	110	silt loam Illinoian lacustrine
9	1N	9W	34, NW160, SW40	100	silt loam Illinoian lacustrine
10	1S	7W	12, NW160	48	Illinoian till
11	1S	8W	9, NE40, SE10	75	silt loam Illinoian till
12	1S	8W	16, SW160	72	Illinoian till
13	1S	8W	21, SE40, NW10	55	Residuum
14	1S	9W	11, NE160, NE40	80	silt loam Illinoian till
15	2S	6W	18, NW160, SE40	45	sandstone soil
16	2S	8W	13, NW160, SW40	55	sandstone residuum
17	3S	7W	11, NE40	45	shale and sandstone soil

APPENDIX B
ENGINEER SOIL TEST RESULTS

Site	Station	Offset (ft.)	Depth (ft.)	Texture	Classifi- cation	Gravel	Sand	Silt	Clay	L.L.	P.L.	P.I.
1	1078+00	25 Rt	2.0- 4.0	A-0(18)	Silty Cl.	0	0.2	64.8	35	39	23	16
2	1083+00	30 Lt	3.5- 5.0	A-6(14)	Silty Cl. L.	0	0.7	73.3	26	35	22	13
3	1097+00	60 Lt	3.5- 5.0	A-z-4(0)	Sandy L.	0	71	10	19	24	18	6
4	1270+11	25 Lt	11.0-12.5	A-4(7)	Silty Cl. L.	0	13.7	60.5	17.1	34.4	27.6	6.8
5	1270+02	18 Rt	16.0-17.5	A-6(6)	Clay	0	35.1	34.6	14.8	37.5	25.8	11.7
6a	1269+96	19 Rt	2.0- 4.0	A-6(13)	Clay	3	18	34.0	24.8	39.5	22.4	17.1
6b	1269+96	19 Rt	16.0-18.0	A-7-6(27)	Clay	0	0.4	22.9	32.6	48.9	25.6	23.3
7a	1270+00	125 Rt	0.5- 5.5	A-6(12)	Clay	4.6	18.8	36.7	12.4	36.6	18.9	17.7
7b	1270+00	75 Rt	0.5- 5.5	A-4(5)	Silty L.	0	8.1	72.5	7.8	26.8	20.2	6.6
8	227+00	16 Rt	8.5-10.0	A-7-6(17)	Clay	0.6	20.0	39.7	39.7	40.8	18.2	22.6
9a	226+90	77 Lt	2.0- 4.0	A-6(9)	Clay L.	0	23.9	46.2	29.9	32.7	19.1	13.6
9b	226+90	76 Lt	1.0- 2.5	A-6(13)	Clay	0	17.9	49.6	32.5	36.0	19.1	16.9
10a	226+99	95 Rt	4.0- 6.0	A-6(6)	Clay L.	0	33.9	43.5	22.6	28.5	16.0	12.5
10b	226+99	95 Rt	12.0-13.6	A-6(15)	Silty Cl. L.	0	3.7	73.4	22.9	37.1	23.0	14.1
11	199+53	20 Rt	19.5-21.0	A-4(3)	Silt	0	3.5	81.5	15	18	11	7
12	200+59	20 Lt	4.5- 6.0	A-4(2)	Silty L.	0	11	77	12	22	17	5
13	203+25	20 Lt	29.5-31.0	A-4(0)	Silty L.	0	38	53			np	

* Cl. means Clay, L. means Loam.

The soil test data tabulated above was obtained from consultant's reports prepared for the Indiana State Highway Commission. The location of the site is shown on the attached engineering soils map.