A SUPPLEMENTARY LEGEND AT FOUR-WAY STOP INTERSECTIONS

JULY, 1957
NO. 24

by

B.K. COOPER

Joint Highway Research Project

PURDUE UNIVERSITY
LAFAYETTE INDIANA

Final Report

A SUPPLEMENTARY LEGEND AT

FOUR-WAY STOP INTERSECTIONS

TO: K. B. Woods, Director
        Joint Highway Research Project   July 24, 1957

FROM: H. L. Michael, Assistant Director   File 8-4-17
                                        Project C-36-17Q

      Attached is a final report entitled "A Supplementary Legend
at Four-Way Stop Intersections" by Billy Kay Cooper, Graduate
Assistant on our staff. This report has also been used by Mr. Cooper
as his thesis in partial fulfillment of the requirements for the
degree of Master of Science in Civil Engineering. The study was
approved by the Board on January 24, 1957, and was performed under
the direction of Doctor D. S. Berry.

      Mr. Cooper attended Purdue University under a fellowship from
the Automotive Safety Foundation. As a result this research was
conducted at very little cost to the Project.

      The purpose of this study was to determine whether the
efficiency of four-way stop intersections could be improved with
the addition of the supplementary legend "4-Way" on the standard
stop sign.

      The report is presented for the record.

                              Respectfully submitted,

                              Harold L. Michael

                              Harold L. Michael, Assistant Director

HLM:bjk

Attachment

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FINAL REPORT
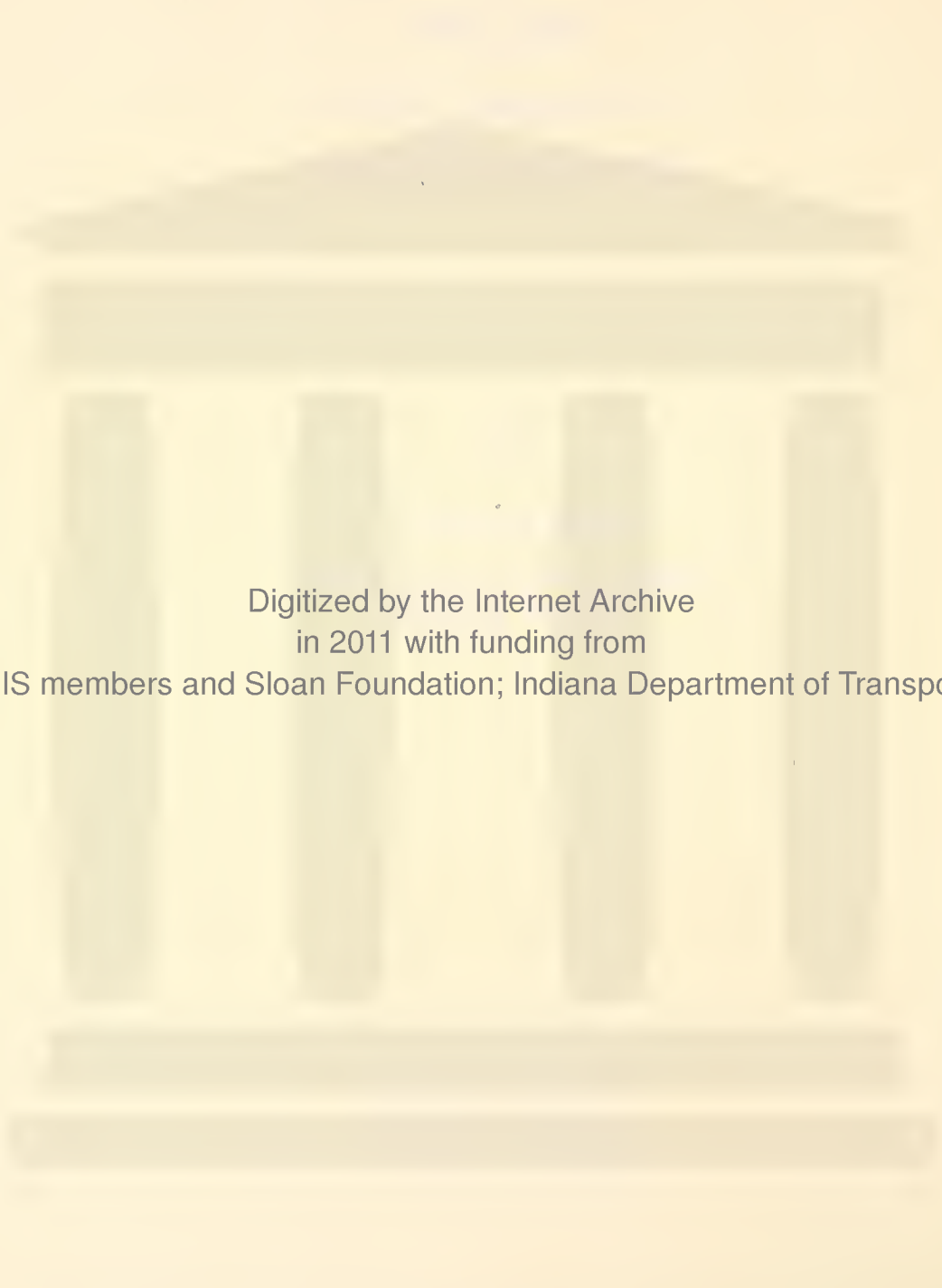
A SUPPLEMENTARY LEGEND AT

FOUR-WAY STOP INTERSECTIONS

by

Billy Kay Cooper

Joint Highway Research Project
Project C-36-17J
File: 8-4-17

Purdue University

Lafayette, Indiana

July 24, 1957

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The author wishes to acknowledge the assistance of Dr. Donald S. Barry, Professor of Transportation Engineering, under whose supervision this thesis was prepared. He also wishes to thank Professor C. R. Hicks and James H. Stapleton, both of the Statistics Department, who devoted much time to the statistical design and analysis of the data and review of the manuscript. The help and encouragement of the staff of the Joint Highway Research Project has been invaluable in the preparation of this thesis.

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ABSTRACT

Cooper, Billy Kay, M.S.C.E., Purdue University, August 1957. A
Supplementary Legend at Four-Way Stop Intersections. Major Professor:
Doctor Donald S. Berry.

The purpose of this study was to determine whether the efficiency
of four-way stop intersections could be improved with the addition of
the supplementary legend "4-Way" on the standard STOP sign.

Standard stop signs were used for the "Before" study. The supple-
mentary legend was painted in the upper panel of the existing signs for
the "After" study.

Two observers were placed at the intersection so that each could
observe two approaches to the intersection. A stop watch was utilized
for measuring the accepted or rejected time lag in the traffic stream by
both local and foreign motorists. The observers also recorded driver
observance of stop signs.

Some of the more important findings are as follows: The critical lag
of intersections, which are similar to the intersections included in this
study, can usually be reduced by adding the supplementary legend, thus
increasing the possible capacity; the addition of the supplementary legend
will generally decrease the observance of stop signs; an intersection has
approximately the same critical lag for different periods of the day,
different days of the week and different weeks; local motorists accept a
shorter time lag than foreign motorists; and each intersection has a
different critical lag which depends upon many variables.

INTRODUCTION

One of the more important elements limiting the capacity of any facility, especially that of city streets, is the intersection at grade (1)*. In the application of any type of traffic control at these intersections, care should be taken to evaluate properly the effects of the proposed traffic control device on the movement of vehicles and pedestrians. However, the proper application of traffic control devices, despite the existence of some accepted standards, is still subject to much uncertainty and even to open disagreement.

The stop-sign is considered a useful, important tool of the traffic engineer in reducing accidents and promoting orderly traffic flow. Little effort, however, has been expended to study the ramifications involved in the various uses of the stop-sign. Relative inexpensiveness of stop-sign installations has contributed materially to this laxness of effort.

One use is the four-way stop, when traffic on all four approaches to an intersection is required to halt. This form of traffic control is being used, more and more, by traffic engineers to regulate traffic. The standard stop sign, now in use at four-way stop intersections, does not indicate to the motorist that the vehicles on the other street also have to stop before entering the intersection. There are indications that this failure of the driver to know what is happening at the intersection may cause confusion and added delay which will result in a lower capacity.

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* Numbers in parentheses refer to the Bibliography.

Observations of the behavior of motorists and their response to four-way stop control have shown some uncertainty as to their right-of-way privileges and even lack of recognition of the four-way stop control being in effect. This lack of recognition has created a growing demand for acquainting drivers with the control they are entering by adding the supplementary message "4-Way" on each approach to the intersection (2). The addition of the supplementary legend should help to prove or disprove the argument that if a motorist is stopped on an approach at a four-way stop and a vehicle is in the cross flow but has not yet come to a stop then the first vehicles will proceed through the intersection if he knows he is protected on all approaches by stop signs. If the motorist is unaware of the four-way stop then he may be delayed until the other vehicle comes to a full stop. Careful analysis of both stop sign observance and time lag acceptance at a four-way stop is needed to help solve this problem.

Definitions

"Before" study--The study made of the intersection before the supplementary legend was added.

"After" study--A study made, under the same conditions as the "Before" study, after the supplementary legend had been added.

Stop line--An imaginary line on the approach of an intersection at which a driver stops in observance to his stop sign.

Opposing vehicle--A vehicle which is entering the intersection from another approach and may hinder the desired movement of the motorist.

Time Lag--The interval in seconds between the arrival of a vehicle at its stop line and the later arrival of an opposing vehicle at its stop line.

Accepted lag—The time lag or time advantage for the motorist who enters the intersection without waiting for the opposing vehicle to stop.

Rejected lag—The time lag or time advantage for the motorist who waits for an opposing vehicle to stop before he starts to enter the intersection.

Foreign vehicles—A vehicle bearing the license plate of any state other than Indiana.

Local vehicles—A vehicle bearing the license plate of the State of Indiana.

PURPOSE AND SCOPE

The purpose of this study is to determine driver reaction and delay at four-way stop intersections before and after a supplementary legend "4-Way" is added to the existing standard STOP signs.

Observance of Stop Signs

The purpose of the observance study was to determine driver observance and reaction by both local and foreign motorists at four-way stop intersections before and after the supplementary legend "4-Way" was installed.

The existing standard stop signs were used for the "Before" study (see Plate I). The supplementary legend "4-Way" was painted directly above the word STOP on the existing signs for the "After" study (see Plate II).

The field study was made at two existing four-way stop intersections in Lafayette, Indiana. The first was at the intersection of Union Street (S.R. 25) and North Sixth Street and will hereafter be referred to as Intersection A (see Plate III and Figure 1). The second was the intersection of North Fourteenth Street (S.R. 25) and Greenbush Street and will be referred to as Intersection B (see Plate IV and Figure 2).

Intersections of city streets with state highway city routes were selected because part of this study is to observe the reaction of foreign or out-of-state motorists.

Plate I - Existing Standard Stop Sign - Before Study

Plate II - Stop Sign with Supplementary Legend - After Study

The results of the observance study will indicate how the observance of the two types of motorists vary and will also indicate if the observance of signs decreases with the addition of the supplementary legend.

Acceptance or Rejection of Time Lag

The purpose of this study was to determine whether the motorist will accept a shorter time lag in the opposing traffic stream after the supplementary legend "4-Way" is added. The study included both local and foreign vehicles.

By accepting a shorter time lag the drivers will be showing that they are less confused as to the behavior of the opposing traffic, be having less delay, and will therefore be increasing the practical capacity of the intersection. If the observance of the stop signs is good initially and it does not decrease significantly, then the additional messages on the stop signs do not have any adverse effects.

Intersections A and B were also used for this study.

PROCEDURE

Observance of Stop Signs

The observance of stop signs at Intersections A and B in Lafayette, Indiana, was made in a "before" and "after" study. Two observers were stationed so that each could observe two approaches to the intersection and record the actions of the drivers as they approached the stop sign (3). Prepared field sheets were used to record drivers who made voluntary full stop, were stopped by traffic, entered slow (0 to 3 mph) or entered fast (greater than 3 mph). They were also classified either local or foreign. The totals of each approach for an intersection were combined to give the observance of stop signs for the intersection as a whole.

The only equipment needed was a clipboard and prepared field sheets. Speeds of vehicles which did not stop were determined by visual inspection.

Acceptance or Rejection of Time Lag

Each motorist approaching a four-way stop intersection is faced with a time lag, which is the time-interval between his arrival at his stop line and the later arrival of a vehicle on the intersecting street. If the motorist enters the intersection before the opposing vehicle stops, he is said to accept his lag. However, if he waits until the opposing vehicle has stopped before entering the intersection, he is said to reject his lag (4).

It is reasonable to expect that more drivers facing long lags will accept them than drivers facing short lags. This suggests the idea of arranging the lags according to their size and noting the relative numbers of each size accepted and rejected. This idea was used in preparing field sheets for the study. Lag cell lengths were broken down into 0.5 second intervals.

Two observers were stationed so that each could observe two approaches to the intersection. The time lag was determined by timing, with a stop watch, the interval between the time one vehicle reaches its "stop" line, and the time the vehicle from the intersecting street reaches its respective "stop" line (5). The motorist which reached the stop line first was recorded as having accepted or rejected the time lag and also as being local or foreign.

Both the "before" and "after" studies were made during two different periods of the day, two different days of the week and two different weeks. This procedure was followed for both intersections. This method permits a comparison of time lags for each period of the day, day of the week, and each week to determine whether there is a significant difference due to time periods alone.

The "before" studies were made in March and the "after" studies were made in April, two weeks after the supplementary legend had been added.

Intersection A has a peak hour volume of approximately 800 vehicles with traffic on the two streets about evenly divided. There are parking restrictions adjacent to the intersection and pedestrian traffic is light. The physical characteristics of the intersection are shown in

Figure 1 and Plate III with the streets in the picture shown in the same direction as in the scaled drawing.

Intersection B has a peak hour volume of approximately 750 vehicles with traffic on the two streets about evenly divided. There are a large number of school children crossing at school closing time. The physical characteristics of the intersection are shown in Figure 2 and Plate IV.

Plate III - Intersection A

N

HOUSE

STREET

HOUSE

UNION

STREET

HOUSE

SIXTH

HOUSE

NO PARKING
STOP SIGN

SCALE 1"= 40'
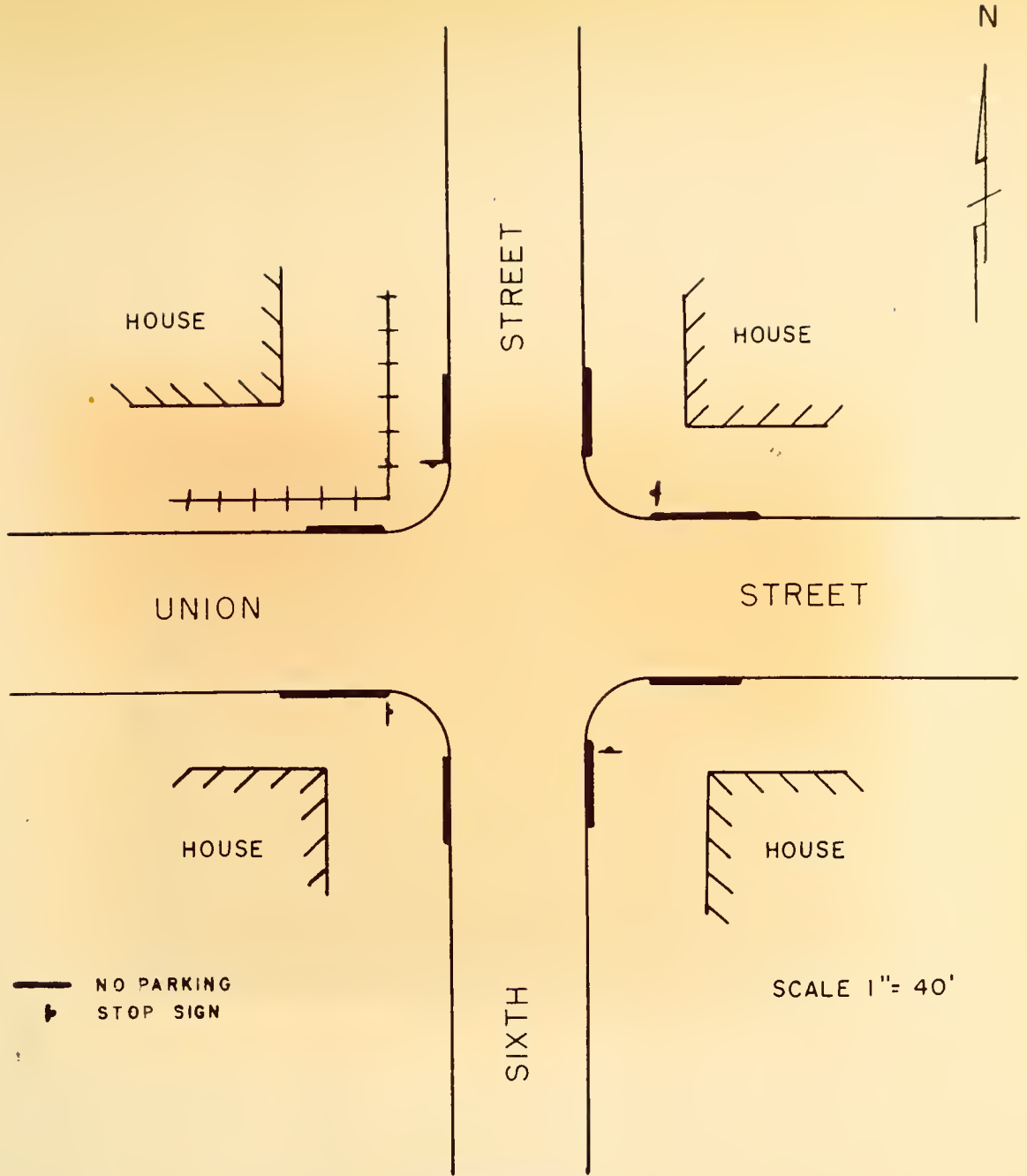
FIGURE 1

PLAN VIEW
INTERSECTION A

Plate IV - Intersection B

N

HOUSE

SCHOOL

STREET

GREENBUSH   STREET

HOUSE

HOUSE

FOURTEENTH

NO PARKING
STOP SIGN

SCALE 1" = 40'
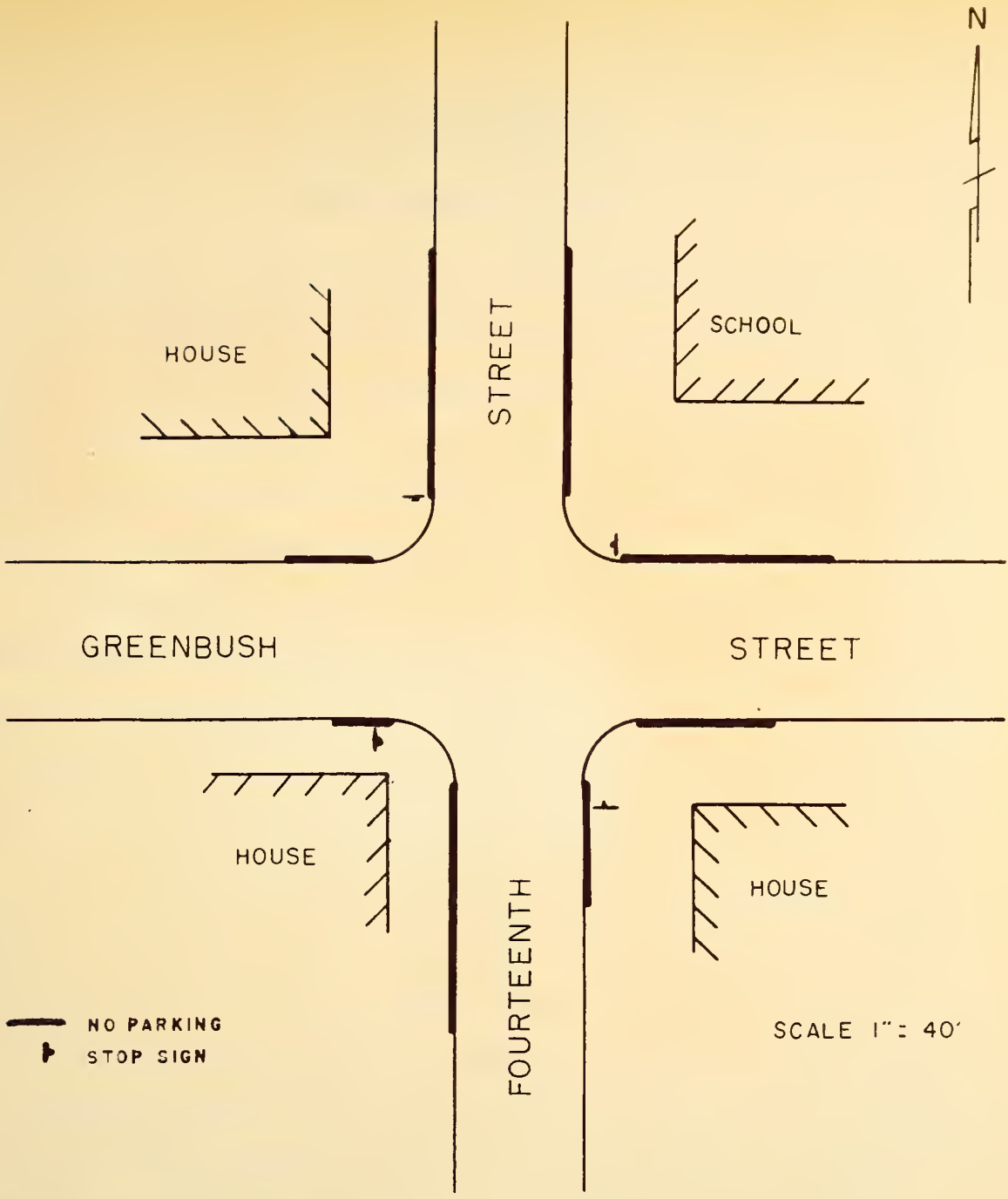
FIGURE 2

PLAN VIEW
INTERSECTION B

STATISTICAL ANALYSIS

Observance of Stop Signs

The number of observations for the before study at intersection A on local motorists was 1,792 while 883 observations were made on foreign motorists. The after study contained 1,800 and 800 respectively. The number of observations for the before study at intersection B on local motorists was 1,650 while 812 observations were made on foreign motorists. The after study contained 1,600 and 800 respectively.

It was assumed for this study that vehicles which had stopped, or entered slow, or were traveling between 0 and 3 miles per hour, were observing the stop signs adequately. Therefore, all vehicles which appeared to be entering faster than 3 miles per hour were classified as "entering fast." This classification was used in making the field study.

Table 1 shows the number and percent of local and foreign motorists observed at each intersection for both the before and after study. The motorists observed in the study were classified as making a voluntary full stop, being stopped by traffic, "entering slow," or "entering fast."

Frequency polygons showing the percentages of vehicles observed were plotted for each observance grouping for both intersections, for both types of vehicles, and for both periods of study (see Figures 3, 4, 5, and 6). The frequency polygons indicate that the driver observance was different at each intersection for both the before and after studies and also for local and foreign motorists.

TABLE 1

DRIVER OBSERVANCE OF STOP SIGNS

Intersection A

"Before"

	Voluntary Full Stop	Stopped by Traffic	Entered Slow	Entered Fast
Local	475	577	665	93
%	25.5	32.2	37.1	5.2
Foreign	328	289	232	34
%	37.1	32.7	26.3	3.9

"After"

	Voluntary Full Stop	Stopped by Traffic	Entered Slow	Entered Fast
Local	333	543	807	117
%	18.5	30.2	44.8	6.5
Foreign	243	210	307	40
%	30.3	26.3	38.4	5.0

Intersection B

"Before"

	Voluntary Full Stop	Stopped by Traffic	Entered Slow	Entered Fast
Local	430	593	528	99
%	26.0	35.9	32.1	6.0
Foreign	295	230	253	34
%	36.3	28.3	31.2	4.2

"After"

	Voluntary Full Stop	Stopped by Traffic	Entered Slow	Entered Fast
Local	257	553	678	112
%	16.1	34.6	42.3	7.0
Foreign	258	203	299	40
%	32.2	25.4	37.4	5.0

FIGURE 3

DRIVER OBSERVANCE OF STOP SIGNS
LOCAL VEHICLES
INTERSECTION A
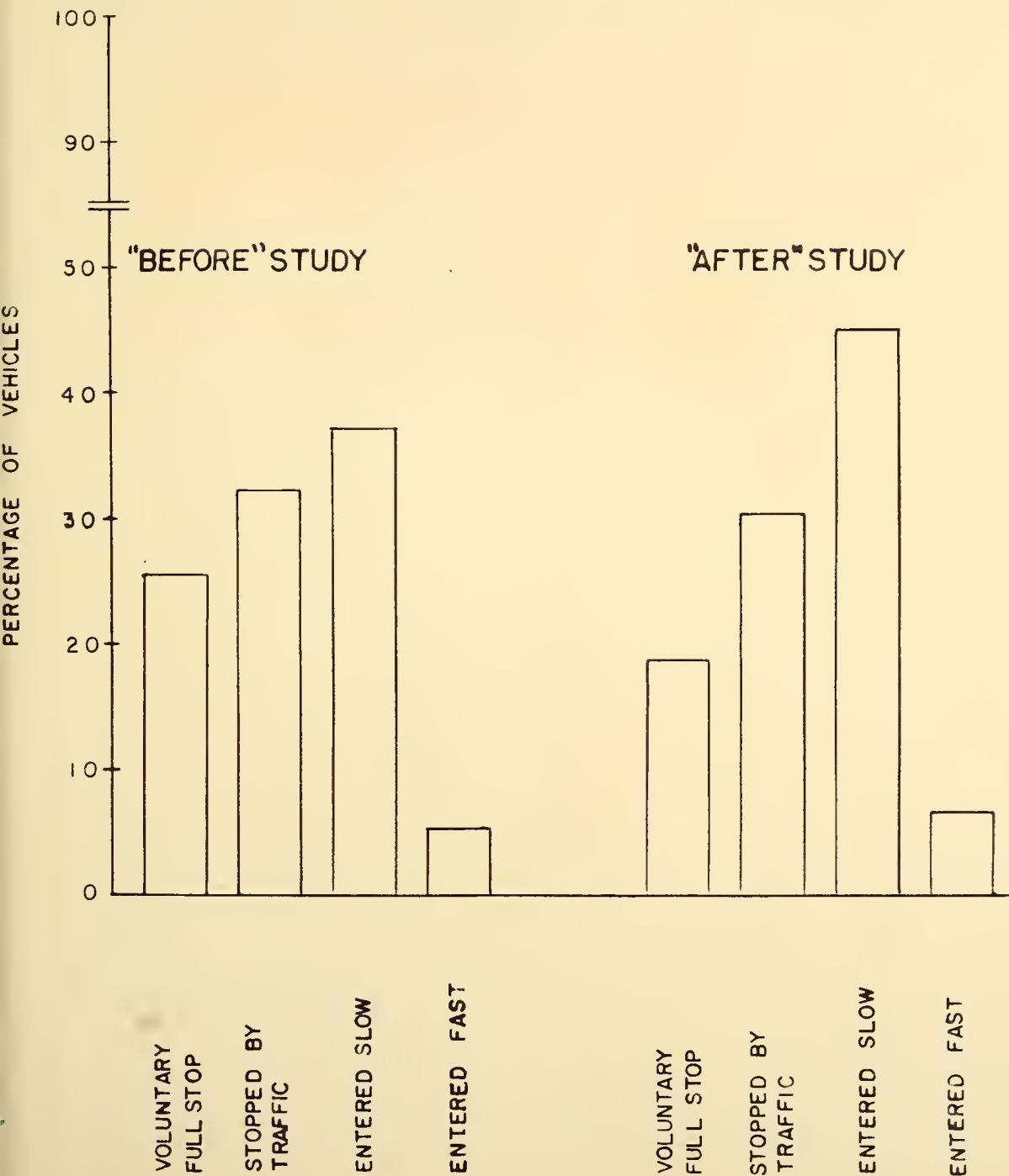
FIGURE 4

DRIVER OBSERVANCE OF STOP SIGNS
FOREIGN VEHICLES
INTERSECTION A
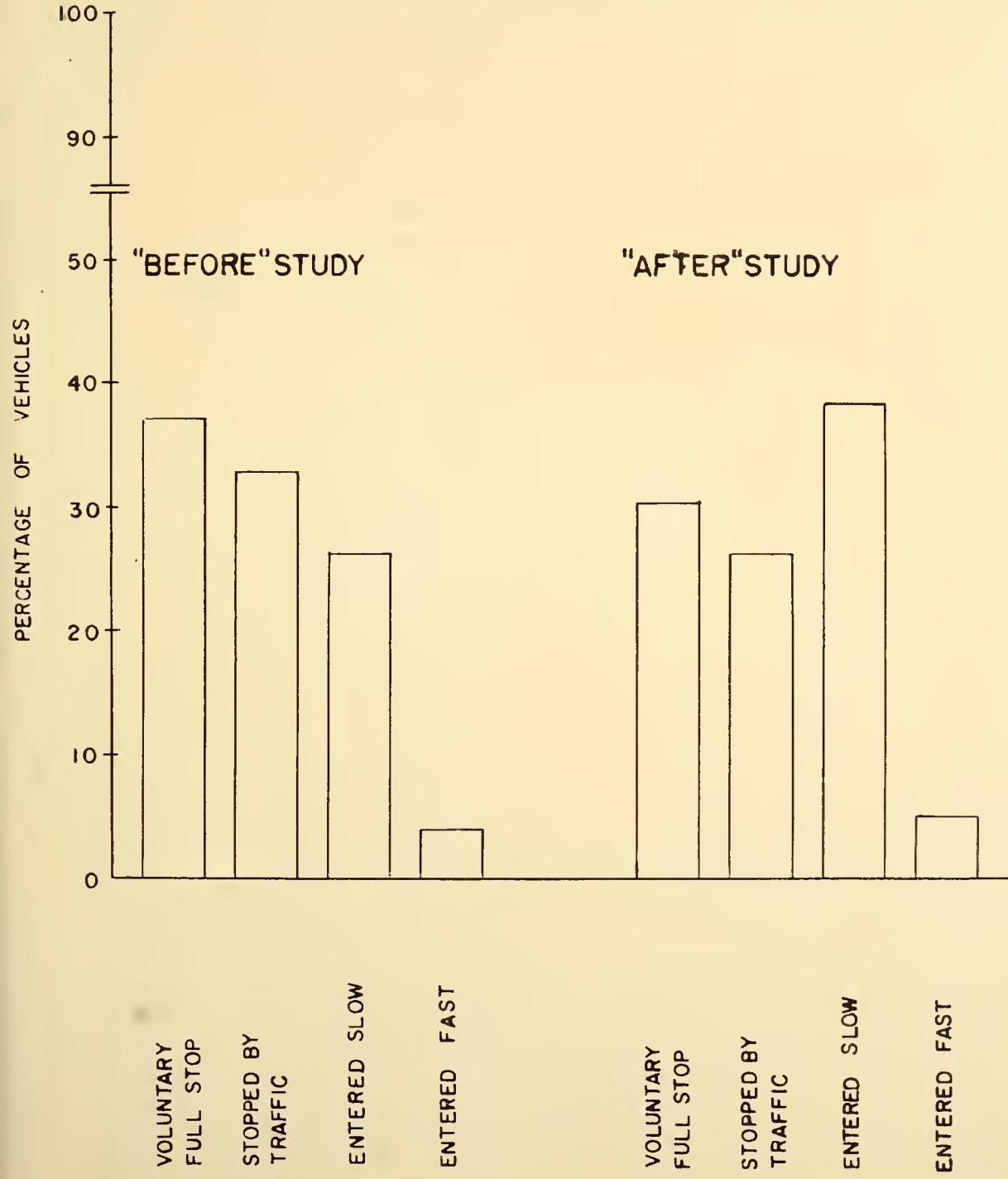
FIGURE 5

DRIVER OBSERVANCE OF STOP SIGN
LOCAL VEHICLES
INTERSECTION B
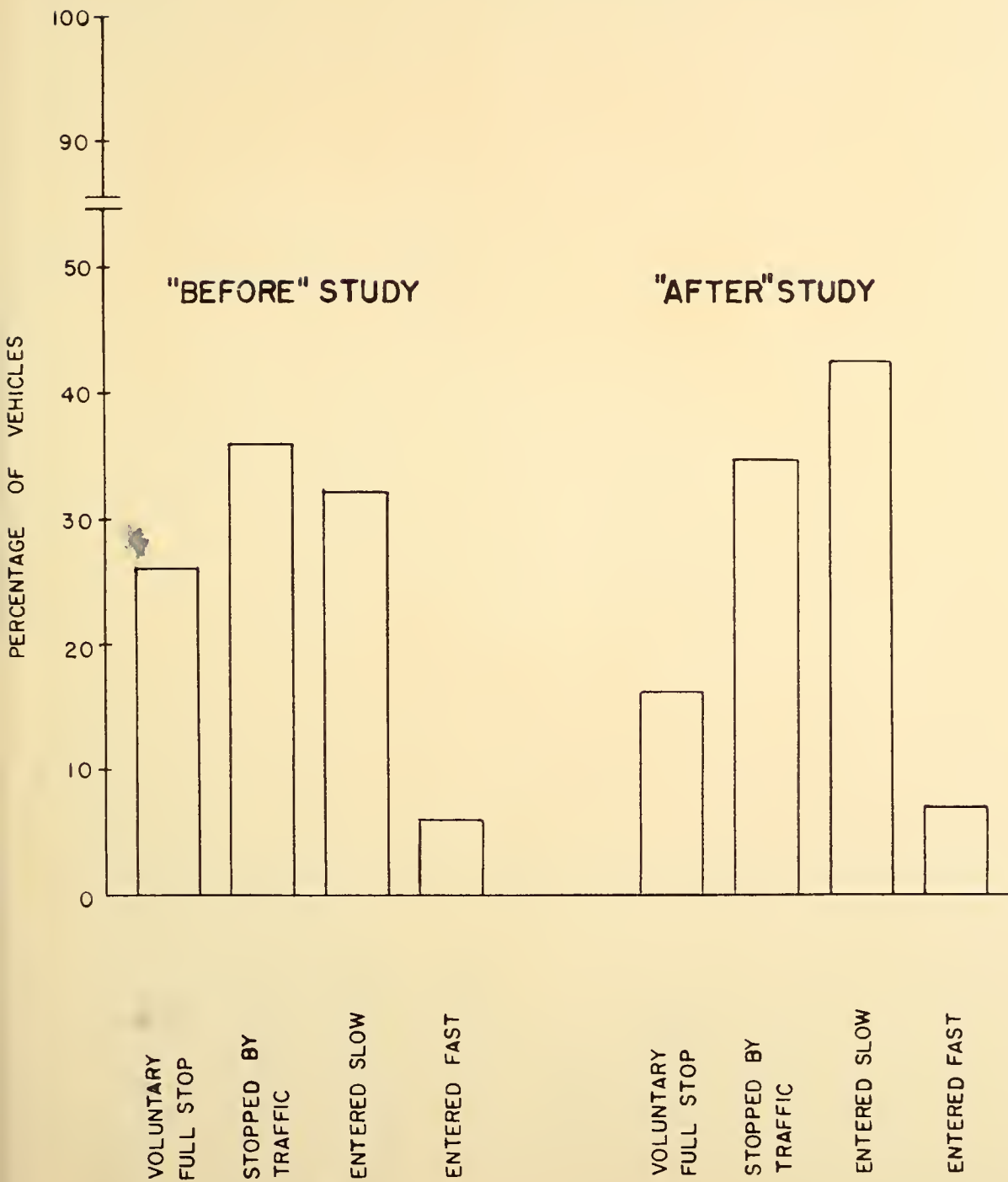
FIGURE 6

DRIVER OBSERVANCE OF STOP SIGNS
FOREIGN VEHICLES
INTERSECTION B
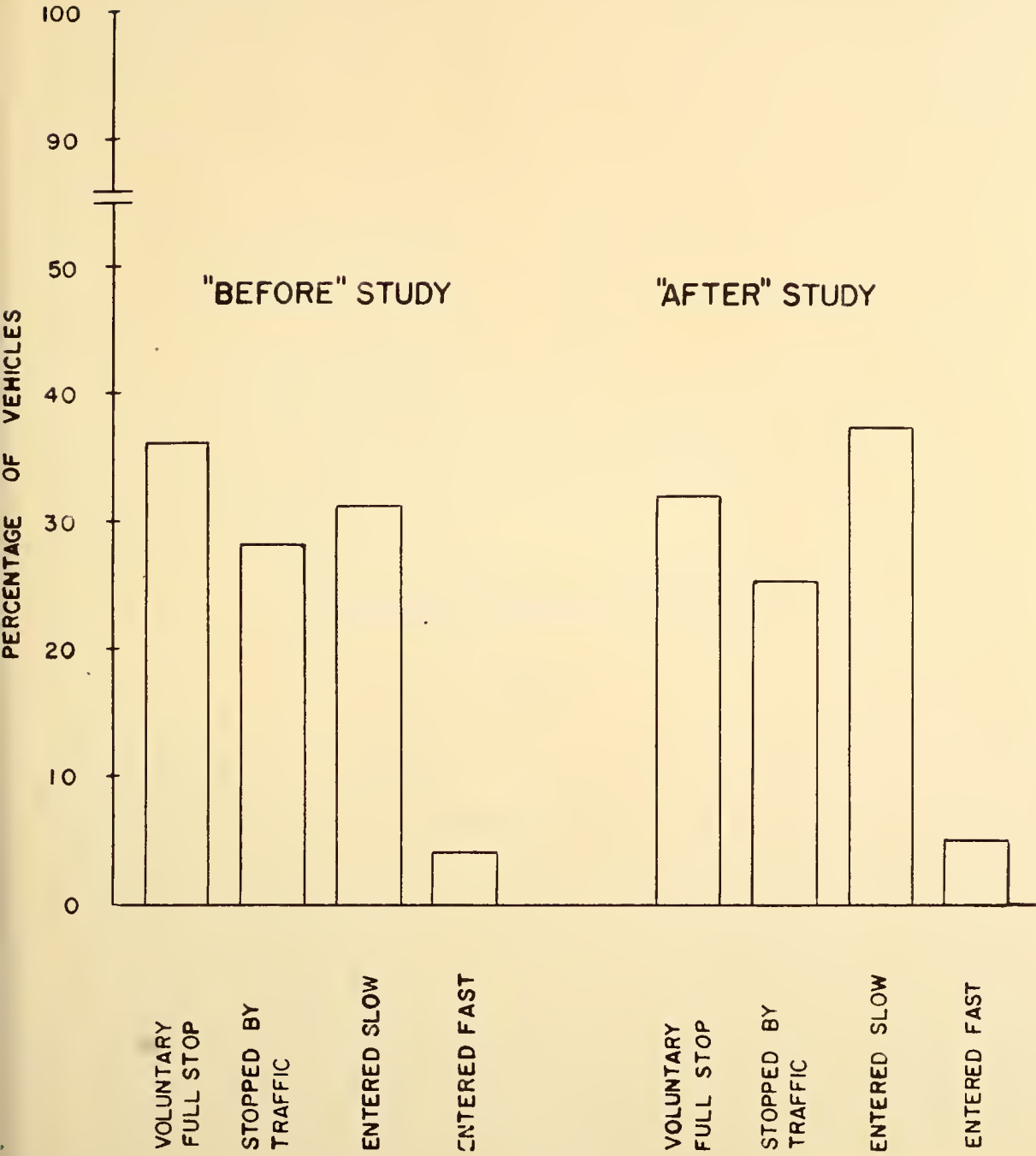
The percentage of local motorists which violated the stop signs (classified as "entering fast") at Intersection A increased from 5.2 percent to 6.5 percent after the supplementary legend was added. Similarly, the percentage of foreign motorists which violated the stop signs increased from 3.9 percent to 5.0 percent. At Intersection B, the percentage of local motorists which violated the stop signs increased from 6.0 percent to 7.0 percent. The percentage of foreign motorists that violated the stop signs increased from 4.2 percent to 5.0 percent.

Both intersections showed these slight increases in violations of the stop signs with the addition of the supplementary legend "4-Way." However, since each intersection is controlled by a four-way stop and the motorists have their vehicles under control, this slight increase in "rolling stops" should not have any adverse effects on the traffic operation of the intersection.

Acceptance or Rejection of Time Lag

General

A motorist who approaches a four-way stop intersection may proceed immediately into the intersection after his stop, or he may wait for an opposing vehicle to stop or go through. Which choice he will make depends principally on how far away (in time, rather than in distance) the nearest opposing vehicle is from the intersection. If the nearest opposing vehicle is only two seconds away, he may decide to wait. In such a case, he has faced a time lag of two seconds and has rejected it. This case would be tabulated as a 2-second "rejected lag."

If the interval from the arrival of a motorist until the arrival of the next opposing vehicle were ten seconds, the motorist would in all probability accept the 10-second lag, that is, he would enter the intersection before the opposing vehicle stopped.

It is desirable to have a single quantity which can be used to summarize the entire pattern of acceptance and rejection of lags at an intersection. The critical lag serves this purpose, and is defined in this study as follows:

> The critical lag L is the size time lag which has the property that the number of accepted lags shorter than L is the same as the number of rejected lags longer than L.

Determination of Critical Lag

The critical lag is determined by plotting two cumulative distribution curves on the same graph: the number of accepted time lags shorter than t and the number of rejected lags longer than t. The value of t for which these two curves intersect is the critical lag L.

Figure 7 and 8 present typical lag curves for intersection A and B. These curves were plotted using data from tables in the Appendices. Lag curves were plotted for each morning and afternoon time period and each Tuesday and Thursday of two different weeks for both local and foreign motorists. Tables 2 and 3 present a summary of critical lags by intersection, time, vehicle type, day of the week, and week for the before and after studies.

Analysis of Variance

A summary of the analysis of variance carried out on the critical lag values is shown in Table 4.

FIGURE 7   23

DISTRIBUTION OF ACCEPTED AND REJECTED LAGS
INTERSECTION A

LOCAL VEHICLES

BEFORE
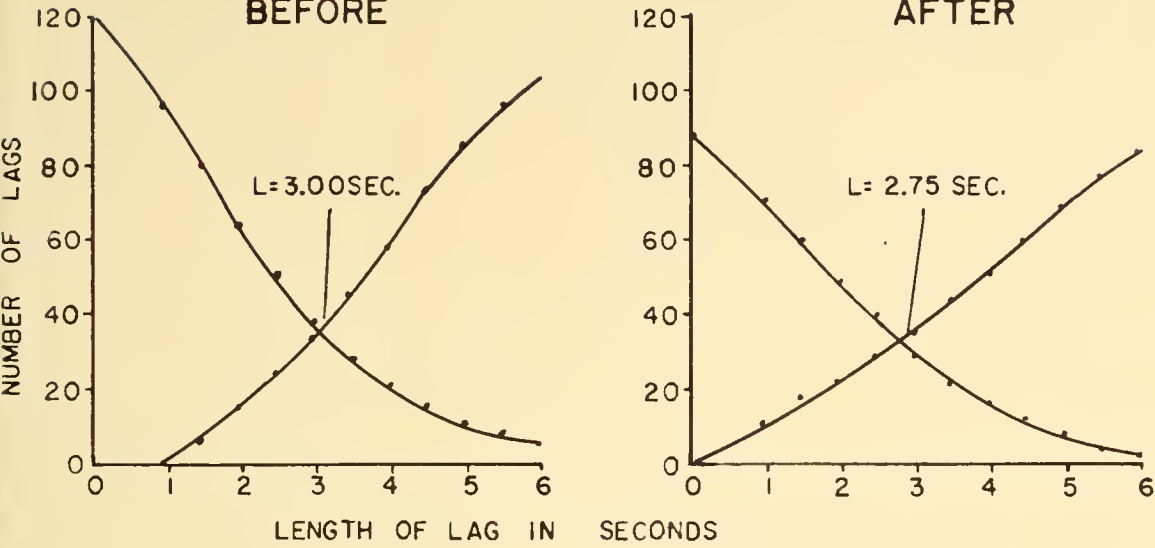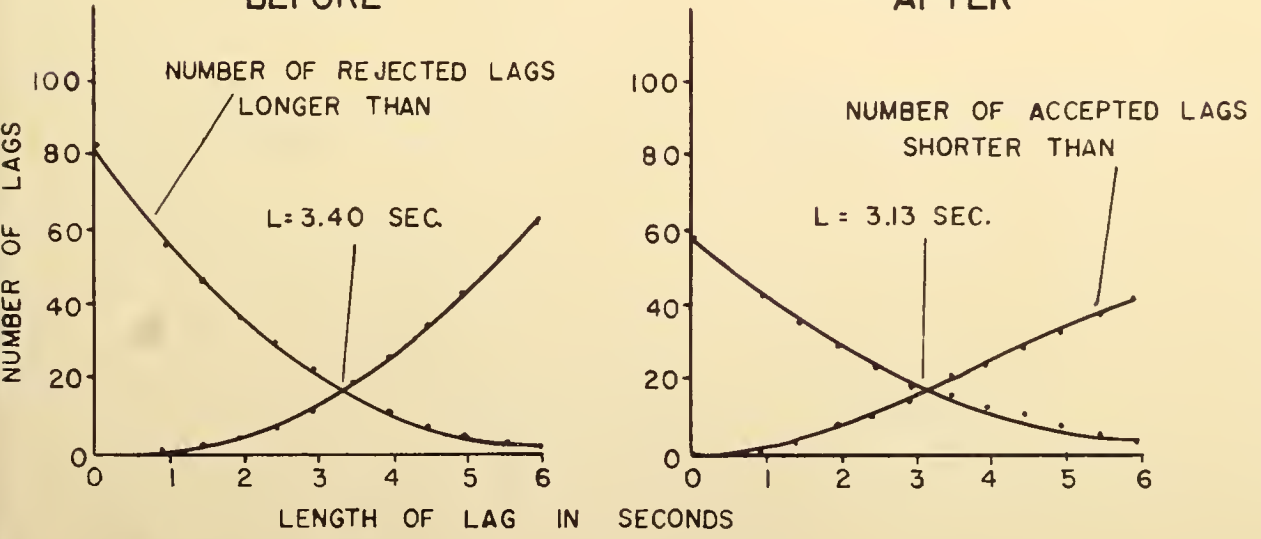
L=3.00 SEC.

AFTER

L= 2.75 SEC.

NUMBER OF LAGS

LENGTH OF LAG IN SECONDS

FOREIGN VEHICLES

BEFORE

NUMBER OF REJECTED LAGS LONGER THAN

L= 3.40 SEC.

AFTER

NUMBER OF ACCEPTED LAGS SHORTER THAN

L = 3.13 SEC.

NUMBER OF LAGS

LENGTH OF LAG IN SECONDS

FIGURE 8

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DISTRIBUTION OF ACCEPTED AND REJECTED LAGS
INTERSECTION B

LOCAL VEHICLES

BEFORE

AFTER

L= 3.15 SEC.

L= 3.00 SEC.

NUMBER OF LAGS

LENGTH OF LAG IN SECONDS

FOREIGN VEHICLES

BEFORE

AFTER

NUMBER OF REJECTED LAGS
LONGER THAN

NUMBER OF ACCEPTED LAGS
SHORTER THAN

L= 3.90 SEC.

L= 3.15 SEC.

NUMBER OF LAGS
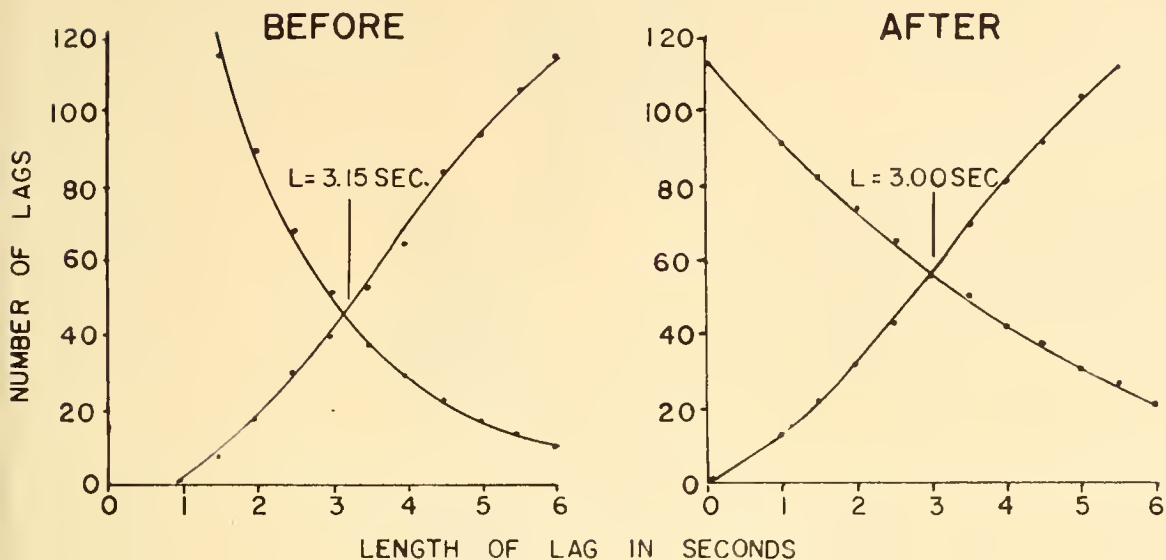
LENGTH OF LAG IN SECONDS
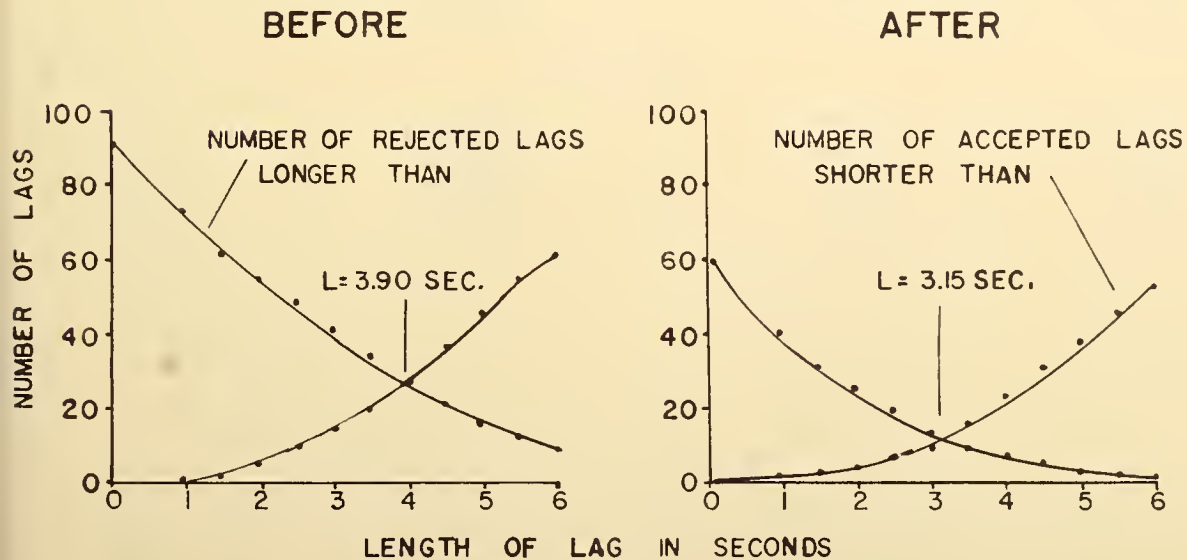
TABLE 2

SUMMARY OF CRITICAL LAGS IN SECONDS

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Intersection A

<u>"Before"</u>

First Week

Time	Vehicle Type	Tuesday	Thursday
PM	Local	3.05	3.00
	Foreign	3.50	3.40
AM	Local	3.15	3.04
	Foreign	3.57	3.45

Second Week

PM	Local	3.07	2.95
	Foreign	3.42	3.44
AM	Local	3.00	2.90
	Foreign	3.52	3.58

"After"

First Week

PM	Local	2.92	2.75
	Foreign	3.02	3.13
AM	Local	2.85	2.78
	Foreign	3.04	3.10

Second Week

PM	Local	3.04	2.76
	Foreign	3.05	3.17
AM	Local	3.01	2.84
	Foreign	3.15	3.06

TABLE 3

SUMMARY OF CRITICAL LAGS IN SECONDS

Intersection B

"Before"

First Week

Time	Vehicle Type	Tuesday	Thursday
PM	Local	3.20	3.15
	Foreign	3.90	3.90
AM	Local	3.22	3.20
	Foreign	3.90	3.80

Second Week

PM	Local	3.13	3.05
	Foreign	3.75	3.80
AM	Local	3.25	3.20
	Foreign	3.95	3.85

"After"

First Week

PM	Local	2.92	3.00
	Foreign	3.20	3.15
AM	Local	2.85	2.80
	Foreign	3.23	3.12

Second Week

PM	Local	2.95	2.90
	Foreign	2.98	3.02
AM	Local	2.75	2.82
	Foreign	2.85	3.15

Due to the fact that the intersections are considered as fixed locations, the results of the analysis can only be used to reach conclusions about those particular intersections and no others. Since this is the case, each source of variation must be compared against the error variance to test for significance.

The results of the analysis of variance indicate that there is a significant difference between critical lags at different intersections, vehicle types, and sign types. However, there is no significant difference due to time of day. The results also indicate that the interaction effect between the combinations of intersections and time, and time and vehicle is non-significant. However, the interaction of the following factors is significant: intersection and vehicle, intersection and sign, time and sign, and vehicle and sign.

A significant interaction would mean that there is a significant effect of the combination of factors over and above what would be expected of their average effects, that is, the factors combine to produce an added effect not due to one of them alone. The significant interaction between intersections and vehicle types shows that the difference between vehicle types at Intersection B is greater than the difference at Intersection A. An interaction between intersections and signs indicates that there is a greater difference in the before and after study at Intersection B than at Intersection A. The interaction of time and sign was only slightly significant. This shows that there was a very small difference in the before and after study for the morning and afternoon time periods. The significant interaction between vehicle type and sign shows that the

difference between the before and after study on foreign vehicles was greater than the difference for local vehicles.

The facts arising from the analysis of variance of critical lags indicates that there was a significant decrease in the critical lag for both intersections. However, Intersection A has an overall shorter critical lag than Intersection B. This difference seems reasonable since the sight distance at Intersection A is greater than at Intersection B. There was also a pronounced difference between critical lags for local and for foreign motorists. It is reasonable to assume that local motorists, who pass through the intersection frequently, would accept a shorter lag than the unfamiliar out-of-state motorist; therefore, the addition of the supplementary legend would tend to aid the foreign motorist to an even greater extent than the local motorist. This fact indicates that the addition of the supplementary legend at four-way stop intersections on rural highways would be even more desirable than intersections of city streets since a greater percentage of the traffic would be foreign motorists.

Confidence Interval

Figure 9 shows the mean critical lags for the before and after study on both local and foreign vehicles for Intersections A and B. These sample means are unbiased estimates of the true means. However, it is desirable to establish confidence intervals for estimating the true difference between the before and after means for both local and foreign vehicles at Intersection A and B. Choosing a 95 percent confidence interval, the results are as follows:

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TABLE 4

ANALYSIS OF VARIANCE

Sources of Variation	Code	Mean	Std. Error of Mean	dF	SS	F-Test	Signif.
Inter-section	A	3.115	0.015	1	0.2795	36.00	S
	B	3.248	"				
Time	AM	3.186	"	1	0.0015	0.19	NS
	PM	3.177	"				
Vehicle	Local	2.984	"	1	2.5003	322.00	S
	Foreign	3.379	"				
Sign	Before	3.384	"	1	2.6122	364.36	S
	After	2.980	"				
Inter-section & Time	A AM	3.127	0.022	1	0.0023	0.37	NS
	A PM	3.104	"				
	B AM	3.246	"				
	B PM	3.250	"				
Inter-section & Vehicle	A Local	2.944	"	1	0.0435	5.61	S
	A Foreign	3.287	"				
	B Local	3.024	"				
	B Foreign	3.471	"				
Inter-section & Sign	A Before	3.252	"	1	0.2743	35.33	S
	A After	2.979	"				
	B Before	3.515	"				
	B After	2.980	"				

TABLE 4 (Continued)

Source of Variation	Code	Mean	Std. Error of Mean	dF	SS	F-Test	Signif.
	AM						
	Local	2.978	0.022				
Time &	AM						
Vehicle	Foreign	3.395	"	1	0.0070	0.90	NS
	PM						
	Local	2.990	"				
	PM						
	Foreign	3.364	"				
	AM						
	Before	3.411	0.0220				
Time &	AM						
Sign	After	2.962	"	1	0.0319	4.11	S
	PM						
	Before	3.356	"				
	PM						
	After	2.997	"				
	Local						
	Before	3.097	"				
Vehicle &	Local						
Sign	After	2.871	"	1	0.5058	65.15	S
	Foreign						
	Before	3.670	"				
	Foreign						
	After	3.088	"				
Error	-	-	-	53	0.4115	-	-
Total	-	-	-	63	6.2593	-	-

Note: Since the MS column is equal to the SS column it has been omitted.

FIGURE 9

DISTRIBUTION OF MEAN CRITICAL LAG

CRITICAL LAG IN SECONDS
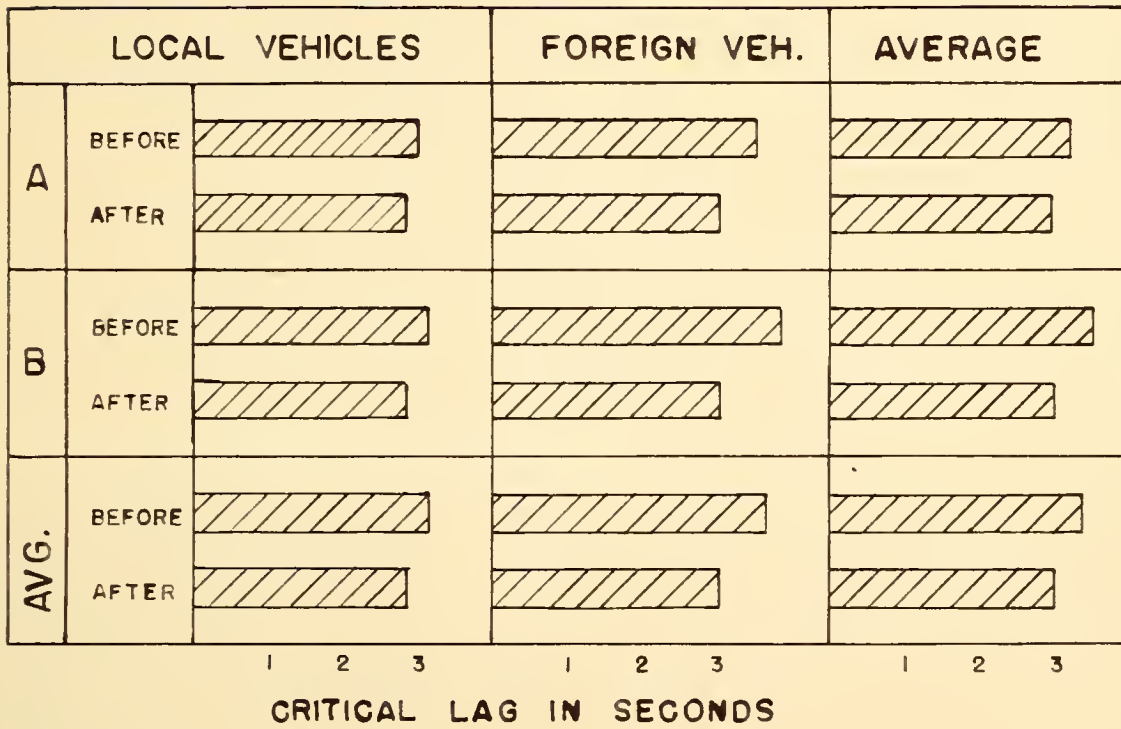
Intersection A - Local Vehicles

$(3.020 - 2.869) = 0.088$ Interval $(0.063, 0.239)$

Intersection A - Foreign Vehicles

$(3.485 - 3.090) = 0.088$ Interval $(0.307, 0.483)$

Intersection B - Local Vehicles

$(3.175 - 2.874) = 0.088$ Interval $(0.213, 0.399)$

Intersection B - Foreign Vehicles

$(3.856 - 3.088) = 0.088$ Interval $(0.680, 0.856)$

We have 95 percent confidence that the true difference between means will be in intervals as shown above.

COMPARISON WITH OTHER STUDIES

In the state of Illinois, a study was made of results obtained by adding the supplementary legend "4-Way" in the upper panel above the word STOP on each approach to ten, four-way stop intersections. After frequent observations by traffic engineers and state police, it was found the results were so favorable that the new sign was adopted as standard for four-way stop installations throughout the state. A brief survey of public opinion was also taken and to the question, "Is the '4-Way' message on the stop sign of value in eliminating confusion?" 91 percent of the total motorists answered YES, and the other 9 percent answered NO (6).

A study was also made at Hartford, Connecticut, by Mr. J. R. Doughty, on the merit of placing a small plaque directly below the existing stop sign with the legend "4-Way" on the plaque. The results of this study indicated that the supplementary legend increased driver observance and decreased the critical lag. This study combined both vehicle types, time of day, days of week and also weeks to determine the critical lag (7).

CONCLUSIONS AND RECOMMENDATIONS

It is important to remember that this study has been based on observations made at two particular intersections in Lafayette, Indiana; therefore, the following conclusions apply only to the Lafayette area.

1. The addition of the supplementary legend "4-Way" will generally increase slightly the percentage of drivers exceeding three miles per hour when passing stop signs. However, this increase probably would not cause any adverse effects.

2. The critical lag of an intersection can usually be decreased with the addition of the supplementary legend, thus decreasing delay.

3. An intersection has approximately the same critical lag for di different periods of the day, different days of the week and different weeks.

4. Local motorists accept a shorter time lag than drivers of vehicles registered outside the state.

5. Each intersection has a different critical lag which depends on many variables.

These observations were made on traffic volumes considerably below the capacity of the intersections. Since the critical lag is reduced 0.27 to 0.53 seconds per vehicle at Intersections A and B respectively, it is reasonable to assume that the capacity of the intersections under higher volume conditions would be increased. It is recommended that studies be made of the effect on capacity under higher volume conditions.

Another factor of vast importance in this study is driver observance
of stop signs. Many contend that a motorist who does not come to a com-
plete stop has violated the control. However, a motorist that makes a
rolling stop (0 to 8 miles per hour) has his vehicles under control and
would not seem to create additional hazards. Perhaps the full stop rule
at four-way stop intersections can be revised by a change of sign type.
It is recommended that further study be directed toward a different type
of four-way stop sign. Such a sign might read "4-Way Rolling Stop,"
with "4-Way" on the upper panel, "STOP" in the center and "Rolling" on
the lower panel.

Discussion

The critical lag is a single value which indicates how large a time
advantage the typical driver needs to decide to enter an intersection.
It represents the behavior of the typcial motorist, because it is defined
in such a way that the drivers who are more cautious than the average
are exactly counterbalanced by the drivers who are bolder than the average;
therefore, the critical lag is an indication of the average delay incurred
by the typical motorist at a four-way stop intersection. Since the criti-
cal lag at both intersections was decreased by 0.27 to 0.53 seconds, the
average delay was decreased by the same amount. However, this decrease
in delay only applies to motorists who were affected by opposing vehicles
which represented approximately 50 percent of the total volume. The re-
maining volume was not affected by opposing vehicles. There is an indi-
cation that these motorists had less delay because the observance study
showed that there was a slight decrease in the percent of motorists who

make a full stop.

Since this investigation of the improvement of four-way stop inter-
sections was made over a period of only three months, it was impossible
to compare the before and after accident experience. This information
would help balance the many arguments that may arise over adding the
legend.

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APPENDIX

TABLE 5

INTERSECTION A: FIRST WEEK - BEFORE

LOCAL VEHICLES

	PM - TUESDAY		AM - TUESDAY	
Lag Cell Length	No. Accepted	No. Rejected	No. Accepted	No. Rejected
0.0-0.9	0	23	0	20
1.0-1.4	5	15	4	15
1.5-1.9	7	12	6	12
2.0-2.4	8	11	8	10
2.5-2.9	8	10	9	9
3.0-3.4	9	9	9	8
3.5-3.9	11	6	10	7
4.0-4.4	14	5	14	6
4.5-4.9	15	3	12	5
5.0-5.4	11	3	9	3
5.5-5.9	9	2	7	3
6.0-6.4	8	2	8	2
6.5-6.9	5	1	5	1
7.0-7.4	6	1	4	1
7.5-7.9	3	1	2	0
8.0-8.4	2	0	2	0
8.5-8.9	3	0	1	0
9.0-9.4	2	0	0	0
9.5-9.9	3	0	0	0
10.0-	5	0	4	0

	PM - THURSDAY		AM - THURSDAY	
0.0-0.9	0	24	1	22
1.0-1.4	6	16	5	16
1.5-1.9	9	16	8	14
2.0-2.4	9	14	8	12
2.5-2.9	10	12	9	10
3.0-3.4	11	10	10	8
3.5-3.9	13	7	12	6
4.0-4.4	15	6	14	6
4.5-4.9	12	4	13	5
5.0-5.4	10	3	10	3
5.5-5.9	8	3	8	3
6.0-6.4	8	1	8	2
6.5-6.9	6	1	6	1
7.0-7.4	5	2	5	1
7.5-7.9	2	0	3	1
8.0-8.4	3	1	2	0
8.5-8.9	2	0	2	0
9.0-9.4	2	0	1	0
9.5-9.9	1	0	1	0
10.0-	10	0	2	0

TABLE 6

INTERSECTION A: FIRST WEEK – BEFORE

FOREIGN VEHICLES

Lag Cell Length	PM – TUESDAY		AM – TUESDAY	
	No. Accepted	No. Rejected	No. Accepted	No. Rejected
0.0–0.9	0	14	0	8
1.0–1.4	2	7	1	7
1.5–1.9	3	6	2	6
2.0–2.4	4	6	2	8
2.5–2.9	5	6	3	7
3.0–3.4	5	6	3	7
3.5–3.9	6	7	5	5
4.0–4.4	7	4	5	3
4.5–5.9	7	4	6	3
5.0–5.4	7	2	9	1
5.5–5.9	6	2	10	1
6.0–6.4	6	1	6	0
6.5–6.9	6	0	3	0
7.0–7.4	5	1	2	1
7.5–7.9	4	0	1	0
8.0–8.4	1	0	1	0
8.5–8.9	1	0	0	0
9.0–9.4	1	0	0	0
9.5–9.9	0	0	0	0
10.0–	0	0	0	0

Lag Cell Length	PM – THURSDAY		AM – THURSDAY	
0.0–0.9	0	27	0	19
1.0–1.4	1	10	1	11
1.5–1.9	3	9	3	10
2.0–2.4	3	7	4	10
2.5–2.9	5	7	3	9
3.0–3.4	6	6	5	9
3.5–3.9	8	6	7	6
4.0–4.4	8	4	7	3
4.5–4.9	9	3	8	3
5.0–5.4	9	2	8	2
5.5–5.9	9	1	9	0
6.0–6.4	6	0	7	1
6.5–6.9	5	1	6	0
7.0–7.4	3	0	7	1
7.5–7.9	3	0	6	0
8.0–8.4	2	0	4	0
8.5–8.9	1	0	2	0
9.0–9.4	0	0	1	0
9.5–9.9	0	0	0	0
10.0–	0	0	0	0

TABLE 7

INTERSECTION A: SECOND WEEK - BEFORE

LOCAL VEHICLES

Lag Cell Length	PM - TUESDAY		AM - TUESDAY	
	No. Accepted	No. Rejected	No. Accepted	No. Rejected
0.0-0.9	1	23	0	32
1.0-1.4	3	15	3	12
1.5-1.9	7	14	6	9
2.0-2.4	9	12	6	8
2.5-2.9	10	11	7	7
3.0-3.4	11	8	8	7
3.5-3.9	13	8	9	5
4.0-4.4	15	5	9	4
4.5-4.9	13	4	9	3
5.0-5.4	11	4	10	2
5.5-5.9	9	3	10	1
6.0-6.4	7	2	9	1
6.5-6.9	7	2	9	0
7.0-7.4	5	1	6	1
7.5-7.9	3	1	5	0
8.0-8.4	2	0	5	0
8.5-8.9	0	0	3	0
9.0-9.4	1	0	2	0
9.5-9.9	1	0	1	0
10.0-	2	0	1	0

Lag Cell Length	PM - THURSDAY		AM - THURSDAY	
0.0-0.9	0	30	2	36
1.0-1.4	4	14	4	13
1.5-1.9	8	16	6	12
2.0-2.4	10	12	6	10
2.5-2.9	10	12	8	8
3.0-3.4	11	9	10	7
3.5-3.9	13	6	10	5
4.0-4.4	14	5	11	3
4.5-4.9	12	5	12	3
5.0-5.4	12	3	10	2
5.5-5.9	10	2	11	1
6.0-6.4	9	1	9	1
6.5-6.9	7	1	7	1
7.0-7.4	5	0	5	1
7.5-7.9	4	0	3	1
8.0-8.4	3	0	2	0
8.5-8.9	2	0	1	0
9.0-9.4	1	0	1	0
9.5-9.9	1	0	0	0
10.0-	0	0	4	0

TABLE 8

INTERSECTION A: SECOND WEEK - BEFORE

FOREIGN VEHICLES

Lag Cell Length	PM - TUESDAY		AM - TUESDAY	
	No. Accepted	No. Rejected	No. Accepted	No. Rejected
0.0-0.9	0	17	0	12
1.0-1.4	2	8	2	5
1.5-1.9	1	8	2	5
2.0-2.4	3	7	1	5
2.5-2.9	3	7	2	6
3.0-3.4	4	7	2	4
3.5-3.9	6	5	2	4
4.0-4.4	8	4	3	3
4.5-4.9	8	1	2	1
5.0-5.4	9	1	4	0
5.5-5.9	10	0	4	1
6.0-6.4	7	0	5	0
6.5-6.9	4	0	4	0
7.0-7.4	2	1	7	0
7.5-7.9	1	0	5	1
8.0-8.4	0	0	6	0
8.5-8.9	1	0	5	0
9.0-9.4	0	0	2	0
9.5-9.9	1	0	2	0
10.0-	1	0	2	0

Lag Cell Length	PM - THURSDAY		AM - THURSDAY	
0.0-0.9	0	13	0	13
1.0-1.4	2	7	3	5
1.5-1.9	2	8	2	6
2.0-2.4	2	7	2	5
2.5-2.9	3	6	3	5
3.0-3.4	2	5	4	4
3.5-3.9	3	4	3	4
4.0-4.4	4	3	4	3
4.5-4.9	4	1	4	2
5.0-5.4	4	2	5	2
5.5-5.9	8	0	4	1
6.0-6.4	9	1	5	2
6.5-6.9	10	0	4	1
7.0-7.4	9	0	5	0
7.5-7.9	8	0	4	0
8.0-8.4	7	1	6	0
8.5-8.9	4	0	4	1
9.0-9.4	2	0	4	0
9.5-9.9	2	0	1	0
10.0-	1	0	1	0

Table 9

INTERSECTION A: FIRST WEEK - AFTER

LOCAL VEHICLES

Lag Cell Length	PM - TUESDAY No. Accepted	No. Rejected	AM - TUESDAY No. Accepted	No. Rejected
0.0-0.9	8	18	5	16
1.0-1.4	6	7	4	7
1.5-1.9	4	6	4	6
2.0-2.4	8	5	3	6
2.5-2.9	6	5	6	5
3.0-3.4	10	5	4	6
3.5-3.9	6	5	8	3
4.0-4.4	6	3	4	3
4.5-4.9	7	5	9	2
5.0-5.4	6	4	5	2
5.5-5.9	8	2	5	1
6.0-6.4	9	3	7	1
6.5-6.9	6	2	5	0
7.0-7.4	7	1	6	1
7.5-7.9	5	1	5	0
8.0-8.4	4	0	4	1
8.5-8.9	4	0	3	0
9.0-9.4	2	0	4	0
9.5-9.9	3	0	1	0
10.0-	2	0	2	0

Lag Cell Length	PM - THURSDAY No. Accepted	No. Rejected	AM - THURSDAY No. Accepted	No. Rejected
0.0-0.9	11	18	7	15
1.0-1.4	7	10	4	10
1.5-1.9	4	11	4	11
2.0-2.4	7	9	5	9
2.5-2.9	6	11	4	9
3.0-3.4	9	7	6	8
3.5-3.9	7	6	7	5
4.0-4.4	9	4	5	4
4.5-4.9	9	4	8	2
5.0-5.4	8	4	6	1
5.5-5.9	7	2	6	0
6.0-6.4	7	1	9	0
6.5-6.9	7	0	9	1
7.0-7.4	5	1	8	0
7.5-7.9	6	0	2	0
8.0-8.4	3	0	3	0
8.5-8.9	2	0	3	0
9.0-9.4	1	0	2	0
9.5-9.9	0	0	3	0
10.0	1	0	1	0

TABLE 10

INTERSECTION A: FIRST WEEK - AFTER

FOREIGN VEHICLES

Lag Cell Length	PM - TUESDAY No. Accepted	No. Rejected	AM - TUESDAY No. Accepted	No. Rejected
0.0-0.9	3	10	0	10
1.0-1.4	4	6	2	6
1.5-1.9	3	5	2	5
2.0-2.4	4	5	3	3
2.4-2.9	3	4	4	6
3.0-3.4	5	4	2	4
3.5-3.9	2	3	4	2
4.0-4.4	6	2	3	2
4.5-4.9	5	2	2	1
5.0-5.4	2	3	5	1
5.5-5.9	4	1	2	0
6.0-6.4	3	2	4	1
6.5-6.9	5	1	2	0
7.0-7.4	6	0	2	0
7.5-7.9	3	1	3	1
8.0-8.4	2	0	6	0
8.5-8.9	1	0	2	0
9.0-9.4	0	0	0	0
9.5-9.9	1	0	1	0
10.0	1	0	0	0

Lag Cell Length	PM - THURSDAY No. Accepted	No. Rejected	AM - THURSDAY No. Accepted	No. Rejected
0.0-0.9	0	16	1	18
1.0-1.4	4	7	2	6
1.5-1.9	4	7	1	5
2.0-2.4	3	5	3	3
2.5-2.9	5	5	3	4
3.0-3.4	5	3	2	3
3.5-3.9	3	3	4	2
4.0-4.4	5	2	5	2
4.5-4.9	4	3	4	1
5.0-5.4	6	2	5	1
5.5-5.9	3	2	3	1
6.0-6.4	5	1	4	0
6.5-6.9	4	1	4	1
7.0-7.4	5	1	3	0
7.5-7.9	3	0	2	1
8.0-8.4	2	1	4	0
8.5-8.9	1	0	3	0
9.0-9.4	2	0	2	0
9.5-9.9	1	0	1	0
10.0	1	0	1	0

Table 11

INTERSECTION A: SECOND WEEK - AFTER

LOCAL VEHICLES

	PM - TUESDAY		AM - TUESDAY	
Lag Cell Length	No. Accepted	No. Rejected	No. Accepted	No. Rejected
0.0-0.9	8	20	2	14
1.0-1.4	4	8	3	7
1.5-1.9	6	7	2	6
2.0-2.4	3	7	4	5
2.5-2.9	8	6	2	6
3.0-3.4	4	5	5	3
3.5-3.9	7	4	4	3
4.0-4.4	6	4	3	2
4.5-4.9	8	5	7	3
5.0-5.4	5	3	4	0
5.5-5.9	8	2	3	1
6.0-6.4	6	3	5	0
6.5-6.9	9	1	6	0
7.0-7.4	4	1	4	1
7.5-7.9	6	0	5	0
8.0-8.4	5	1	6	0
8.5-8.9	5	0	3	0
9.0-9.4	3	0	2	0
9.5-9.9	2	0	1	0
10.0-	1	0	0	0

	PM - THURSDAY		AM - THURSDAY	
0.0-0.9	6	27	5	12
1.0-1.4	6	11	3	5
1.5-1.9	8	5	3	4
2.0-2.4	5	7	2	4
2.5-2.9	8	5	5	5
3.0-3.4	6	5	4	3
3.5-3.9	11	4	3	3
4.0-4.4	7	3	5	2
4.5-4.9	12	4	4	2
5.0-5.4	9	3	6	3
5.5-5.9	5	2	5	1
6.0-6.4	6	3	6	1
6.5-6.9	6	1	4	1
7.0-7.4	4	0	5	0
7.5-7.9	6	1	4	0
8.0-8.4	3	0	5	0
8.5-8.9	4	0	4	0
9.0-9.4	3	1	2	0
9.5-9.9	1	0	2	0
10.0-	3	0	1	0

Table 12

INTERSECTION A: SECOND WEEK - AFTER

FOREIGN VEHICLES

Lag Cell Length	PM - TUESDAY No. Accepted	No. Rejected	AM - TUESDAY No. Accepted	No. Rejected
0.0-0.9	4	10	0	10
1.0-1.4	2	6	2	3
1.5-1.9	4	5	1	5
2.0-2.4	3	6	2	5
2.5-2.9	4	5	4	4
3.0-3.4	4	4	3	4
3.5-3.9	5	2	4	2
4.0-4.4	4	1	2	1
4.5-4.9	5	2	3	2
5.0-5.4	4	1	4	1
5.5-5.9	6	2	4	0
6.0-6.4	3	2	5	1
6.5-6.9	8	1	2	0
7.0-7.4	3	2	2	1
7.5-7.9	6	0	3	1
8.0-8.4	3	1	2	0
8.5-8.9	3	0	1	0
9.0-9.4	4	0	2	0
9.5-9.9	2	1	1	0
10.0-	2	0	1	0

Lag Cell Length	PM - THURSDAY No. Accepted	No. Rejected	AM - THURSDAY No. Accepted	No. Rejected
0.0-0.9	7	7	2	9
1.0-1.4	4	5	2	5
1.5-1.9	4	4	3	4
2.0-2.4	5	6	2	5
2.5-2.9	3	3	4	4
3.0-3.4	4	4	3	3
3.5-3.9	2	3	5	3
4.0-4.4	5	3	4	2
4.5-4.9	2	3	2	2
5.0-5.4	5	4	4	1
5.5-5.9	3	1	3	1
6.0-6.4	1	2	3	1
6.5-6.9	6	2	3	0
7.0-7.4	3	1	2	1
7.5-7.9	1	2	4	1
8.0-8.4	2	1	2	0
8.5-8.9	1	0	2	0
9.0-9.4	0	1	1	0
9.5-9.9	1	0	0	0
10.0-	0	0	1	0

Table 13

INTERSECTION B: FIRST WEEK — BEFORE

LOCAL VEHICLES

Lag Cell Length	PM — TUESDAY No. Accepted	No. Rejected	AM — TUESDAY No. Accepted	No. Rejected
0.0-0.9	0	13	0	14
1.0-1.4	7	18	3	13
1.5-1.9	11	16	5	11
2.0-2.4	13	15	6	9
2.5-2.9	14	16	8	10
3.0-3.4	12	13	7	9
3.5-3.9	10	8	9	8
4.0-4.4	16	10	6	4
4.5-4.9	13	6	9	5
5.0-5.4	9	5	6	2
5.5-5.9	7	3	5	1
6.0-6.4	5	4	3	1
6.5-6.9	6	2	4	1
7.0-7.4	4	1	2	0
7.5-7.9	2	1	2	0
8.0-8.4	3	2	1	0
8.5-8.9	1	0	2	0
9.0-9.4	0	0	1	0
9.5-9.9	2	1	1	0
10.0-	5	0	3	0

Lag Cell Length	PM — THURSDAY No. Accepted	No. Rejected	AM — THURSDAY No. Accepted	No. Rejected
0.0-0.9	0	25	0	15
1.0-1.4	7	24	2	12
1.5-1.9	11	26	4	10
2.0-2.4	12	22	6	8
2.5-2.9	10	16	6	9
3.0-3.4	13	14	8	9
3.5-3.9	11	8	10	8
4.0-4.4	19	7	7	3
4.5-4.9	10	5	7	2
5.0-5.4	12	3	5	1
5.5-5.9	10	4	6	2
6.0-6.4	9	3	4	1
6.5-6.9	6	1	3	1
7.0-7.4	4	2	1	0
7.5-7.9	5	2	2	0
8.0-9.4	3	1	0	0
8.5-8.9	4	1	1	0
9.0-9.4	6	0	0	0
9.5-9.9	7	0	1	0
10.0-	16	0	2	0

Table 14

INTERSECTION B: FIRST WEEK — BEFORE

FOREIGN VEHICLES

| | PM — TUESDAY | | AM — TUESDAY | |
Lag Cell Length	No. Accepted	No. Rejected	No. Accepted	No. Rejected
0.0-0.9	0	16	0	12
1.0-1.4	1	14	0	11
1.5-1.9	4	9	1	10
2.0-2.4	5	8	2	8
2.5-2.9	4	7	3	6
3.0-3.4	7	8	3	4
3.5-3.9	8	9	4	5
4.0-4.4	12	6	5	4
4.5-4.9	8	5	6	4
5.0-5.4	10	6	5	2
5.5-5.9	6	4	3	1
6.0-6.4	7	3	3	1
6.5-6.9	4	2	1	0
7.0-7.4	5	3	2	0
7.5-7.9	3	1	1	0
8.0-8.4	2	0	0	0
8.5-8.9	1	0	1	0
9.0-9.4	1	0	0	0
9.5-9.9	0	0	0	0
10.0-	6	0	0	0
	PM — THURSDAY		AM — THURSDAY	
0.0-0.9	0	18	0	11
1.0-1.4	1	11	0	10
1.5-1.9	4	7	1	9
2.0-2.4	4	6	1	9
2.5-2.9	5	8	2	6
3.0-3.4	6	7	2	5
3.5-3.9	7	7	3	3
4.0-4.4	10	6	4	2
4.5-4.9	9	5	5	2
5.0-5.4	9	4	6	1
5.5-5.9	6	3	4	1
6.0-6.4	5	2	4	1
6.5-6.9	5	3	3	0
7.0-7.4	4	2	2	0
7.5-7.9	2	1	0	0
8.0-8.4	3	1	1	0
8.5-8.9	2	0	0	0
9.0-9.4	1	0	0	0
9.5-9.9	0	0	0	0
10.0-	5	0	0	0

Table 15

INTERSECTION B: SECOND WEEK - BEFORE

LOCAL VEHICLES

| | PM - TUESDAY | | AM - TUESDAY | |
Lag Cell Length	No. Accepted	No. Rejected	No. Accepted	No. Rejected
0.0-0.9	1	19	0	15
1.0-1.4	5	15	2	11
1.5-1.9	9	17	4	9
2.0-2.4	14	19	5	8
2.5-2.9	13	16	8	9
3.0-3.4	11	11	8	8
3.5-3.9	9	7	9	7
4.0-4.4	12	8	7	4
4.5-4.9	15	7	6	3
5.0-5.4	10	6	5	2
5.5-5.9	8	4	5	2
6.0-6.4	6	2	4	1
6.5-6.9	4	1	3	1
7.0-7.4	5	2	3	1
7.5-7.9	3	1	2	0
8.0-8.4	1	0	2	0
8.5-8.9	2	1	1	0
9.0-9.4	1	0	1	0
9.5-9.9	0	0	1	0
10.0-	3	0	2	0

	PM - THURSDAY		AM - THURSDAY	
0.0-0.9	3	11	0	20
1.0-1.4	9	22	1	15
1.5-1.9	14	20	3	14
2.0-2.4	18	25	6	9
2.5-2.9	12	16	7	7
3.0-3.4	13	18	9	7
3.5-3.9	12	11	10	5
4.0-4.4	19	8	9	4
4.5-4.9	16	5	8	3
5.0-5.4	9	6	6	2
5.5-5.9	6	4	7	2
6.0-6.4	6	3	5	1
6.5-6.9	3	1	4	1
7.0-7.4	3	2	3	0
7.5-7.9	3	1	3	0
8.0-8.4	2	2	2	0
8.5-8.9	1	0	1	0
9.0-9.4	1	1	1	0
9.5-9.9	0	0	1	0
10.0-	3	0	0	0

Table 16

INTERSECTION B: SECOND WEEK – BEFORE

FOREIGN VEHICLES

Lag Cell Length	PM – TUESDAY No. Accepted	No. Rejected	AM – TUESDAY No. Accepted	No. Rejected
0.0-0.9	0	10	0	15
1.0-1.4	2	9	1	9
1.5-1.9	4	5	1	7
2.0-2.4	3	4	2	7
2.5-2.9	5	6	2	5
3.0-3.4	9	10	3	5
3.5-3.9	7	8	5	4
4.0-4.4	11	6	5	4
4.5-4.9	10	7	4	3
5.0-5.4	8	4	5	3
5.5-5.9	7	2	6	2
6.0-6.3	4	1	4	1
6.5-6.9	6	3	3	1
7.0-7.4	3	1	3	1
7.5-7.9	1	0	2	0
8.0-8.4	4	1	0	0
8.5-8.9	2	0	1	0
9.0-9.4	0	0	0	0
9.5-9.9	1	0	1	0
10.0-	4	0	0	0

Lag Cell Length	PM – THURSDAY No. Accepted	No. Rejected	AM – THURSDAY No. Accepted	No. Rejected
0.0-0.9	0	11	0	14
1.0-1.4	2	10	1	8
1.5-1.9	5	8	2	7
2.0-2.4	6	7	2	5
2.5-2.9	5	6	3	5
3.0-3.4	7	8	3	3
3.5-3.9	6	7	4	4
4.0-4.4	9	7	4	3
4.5-4.9	8	4	5	3
5.0-5.4	7	4	6	2
5.5-5.9	5	3	5	2
6.0-6.4	6	4	4	1
6.5-6.9	4	2	2	1
7.0-7.4	3	1	2	1
7.5-7.9	2	1	1	0
8.0-8.4	1	0	1	0
8.5-8.9	3	1	0	0
9.0-9.4	2	0	1	0
9.5-9.9	1	0	0	0
10.0-	1	0	0	0

Table 17

INTERSECTION B: FIRST WEEK - AFTER

LOCAL VEHICLES

	PM - TUESDAY		AM - TUESDAY	
Lag Cell Length	No. Accepted	No. Rejected	No. Accepted	No. Rejected
0.0-0.9	10	22	7	11
1.0-1.4	9	10	8	6
1.5-1.9	9	9	8	8
2.0-2.4	10	7	9	6
2.5-2.9	9	7	14	8
3.0-3.4	12	6	8	7
3.5-3.9	13	7	11	8
4.0-4.4	13	4	6	3
4.5-4.9	11	5	9	5
5.0-5.4	9	4	2	5
5.5-5.9	7	5	4	2
6.0-6.9	13	2	1	4
6.5-6.9	5	4	2	2
7.0-7.4	8	2	1	2
7.5-7.9	4	3	2	2
8.0-8.4	6	1	1	1
8.5-8.9	1	2	0	0
9.0-9.4	4	1	1	0
9.5-9.9	1	0	1	0
10.0-	0	0	1	0

	PM - THURSDAY		AM - THURSDAY	
0.0-0.9	13	21	4	19
1.0-1.4	9	9	6	8
1.5-1.9	10	8	4	8
2.0-2.4	11	9	7	6
2.5-2.9	13	8	4	6
3.0-3.4	13	7	7	4
3.5-3.9	12	8	9	3
4.0-4.4	11	4	11	5
4.5-4.9	12	7	7	1
5.0-5.4	8	4	8	5
5.5-5.9	10	6	6	1
6.0-6.4	7	3	5	2
6.5-6.9	8	5	2	1
7.0-7.4	4	3	1	0
7.5-7.9	8	4	2	0
8.0-8.4	3	1	1	0
8.5-8.9	3	3	0	0
9.0-9.4	2	1	1	0
9.5-9.9	1	1	0	0
10.0-	0	0	0	0

Table 18

INTERSECTION B: FIRST WEEK - AFTER

FOREIGN VEHICLES

Lag Cell Length	PM - TUESDAY		AM - TUESDAY	
	No. Accepted	No. Rejected	No. Accepted	No. Rejected
0.0-0.9	2	13	4	9
1.0-1.4	2	4	2	4
1.5-1.9	6	7	3	5
2.0-2.4	2	4	3	3
2.5-2.9	4	6	4	6
3.0-3.4	3	5	3	4
3.5-3.9	5	3	2	3
4.0-4.4	2	3	5	1
4.5-4.9	6	2	2	3
5.0-5.4	3	1	4	2
5.5-5.9	7	2	2	1
6.0-6.4	6	1	3	2
6.5-6.9	5	2	4	1
7.0-7.4	7	1	3	1
7.5-7.9	4	0	3	0
8.0-8.4	3	0	2	0
8.5-8.9	1	0	2	0
9.0-9.4	1	0	1	0
9.5-9.9	1	0	1	0
10.0-	0	0	1	0

Lag Cell Length	PM - THURSDAY		AM - THURSDAY	
0.0-0.9	1	19	2	12
1.0-1.4	1	9	2	6
1.5-1.9	2	6	2	6
2.0-2.4	3	6	4	6
2.5-2.9	2	6	4	4
3.0-3.4	7	3	6	4
3.5-3.9	7	3	6	3
4.0-4.4	8	2	4	3
4.5-4.9	7	2	5	2
5.0-5.4	8	1	3	2
5.5-5.9	7	1	3	1
6.0-6.4	6	0	3	0
6.5-6.9	7	1	2	1
7.0-7.4	4	0	3	0
7.5-7.9	3	0	1	1
8.0-8.4	1	0	2	0
8.5-8.9	1	0	1	0
9.0-9.4	0	0	0	0
9.5-9.9	1	0	1	0
10.0-	0	0	1	0

Table 19

INTERSECTION B: SECOND WEEK -- AFTER

LOCAL VEHICLES

Lag Cell Length	PM -- TUESDAY		AM -- TUESDAY	
	No. Accepted	No. Rejected	No. Accepted	No. Rejected
0.0-0.9	8	14	6	13
1.0-1.4	4	9	6	6
1.5-1.9	6	9	7	8
2.0-2.4	4	8	8	6
2.5-2.9	7	7	9	7
3.0-3.4	9	7	9	6
3.5-3.9	7	6	8	6
4.0-4.4	9	6	6	6
4.5-4.9	8	4	6	4
5.0-5.4	7	4	5	4
5.5-5.9	4	1	3	1
6.0-6.4	3	1	2	1
6.5-6.9	1	0	1	1
7.0-7.4	1	0	1	0
7.5-7.9	0	0	0	0
8.0-8.4	1	0	1	0
8.5-8.9	0	0	1	0
9.0-9.4	0	0	0	0
9.5-9.9	0	0	0	0
10.0-	0	0	0	0

Lag Cell Length	PM -- THURSDAY		AM -- THURSDAY	
0.0-0.9	9	13	5	7
1.0-1.4	5	8	4	6
1.5-1.9	4	8	5	6
2.0-2.4	7	6	7	8
2.5-2.9	5	8	10	8
3.0-3.4	7	6	10	7
3.5-3.9	6	5	8	6
4.0-4.4	7	4	7	4
4.5-4.9	5	5	4	4
5.0-5.4	8	4	4	1
5.5-5.9	4	2	2	1
6.0-6.4	7	1	1	1
6.5-6.9	3	1	0	1
7.0-7.4	3	1	1	0
7.5-7.9	1	0	0	0
8.0-8.4	1	0	1	0
8.5-8.9	0	0	1	0
9.0-9.4	1	0	1	0
9.5-9.9	0	0	0	0
10.0-	0	0	0	0

Table 20

INTERSECTION B: SECOND WEEK - AFTER

FOREIGN VEHICLES

	PM - TUESDAY		AM - TUESDAY	
Lag Cell Length	No. Accepted	No. Rejected	No. Accepted	No. Rejected
0.0-0.9	8	19	4	9
1.0-1.4	4	9	3	5
1.5-1.9	7	8	2	5
2.0-2.4	3	8	3	4
2.5-2.9	7	8	2	5
3.0-3.4	4	7	3	4
3.5-3.9	5	4	4	2
4.0-4.4	6	6	4	3
4.5-4.9	4	3	5	2
5.0-5.4	5	4	3	1
5.5-5.9	4	1	5	0
6.0-6.4	5	2	5	1
6.5-6.9	5	1	3	0
7.0-7.4	4	0	3	1
7.5-7.9	6	1	4	0
8.0-8.4	3	0	2	0
8.5-8.9	4	0	3	0
9.0-9.4	3	0	1	0
9.5-9.9	2	0	0	0
10.0-	1	0	1	0

	PM - THURSDAY		AM - THURSDAY	
0.0-0.9	5	1	2	11
1.0-1.4	2	9	2	8
1.5-1.9	5	7	1	6
2.0-2.4	3	6	3	6
2.5-2.9	4	7	2	7
3.0-3.4	5	5	3	5
3.5-3.9	3	6	2	3
4.0-4.4	6	3	4	2
4.5-4.9	5	3	3	1
5.0-5.4	2	1	5	0
5.5-5.9	5	0	6	1
6.0-6.4	2	1	5	0
6.5-6.9	3	0	7	0
7.0-7.4	1	1	6	1
7.5-7.9	2	0	4	0
8.0-8.4	1	0	2	0
8.5-8.9	0	0	1	0
9.0-9.4	2	0	0	0
9.5-9.9	1	0	1	0
10.0-	0	0	2	0