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THE EFFECT OF DOTTED EXTENDED LANE LINES ON RIGHT, SINGLE DECELERATION LANE USE

BY

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16. Abstract

With the use of dotted extended lines at tapered and parallel single deceleration lanes at right hand freeway exits, a significantly greater proportion of exiting traffic entered the deceleration lane earlier in nine out of ten study sites. Two foot (0.6 meter) lines with 25 foot (7.6 meter) gaps were placed in the neutral area of five tapered and five parallel deceleration lanes on interstate freeways in New Jersey. The application followed a before study while leaving a sufficient time prior to an after study at each location. Two control sites were also studied and did not receive dotted lines. Four additional exits were treated with dotted lines to help relieve a possible novelty effect. The installation of dotted lines appeared to have a more pronounced effect on the paths of exiting traffic using the longer deceleration lanes.

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SUMMARY AND CONCLUSIONS

In the 1970 Manual on Uniform Traffic Control Devices (MUTCD), a dotted extension of the right edge line is optional for deceleration lanes. The objective of this study was to determine the effectiveness of the optional dotted lines.

Twelve deceleration lane sites were utilized in the study, five were categorized as parallel deceleration and five as tapered deceleration types with two control sites both of the tapered variety. Exit maneuvers were classified by three longitudinal zones for parallel and two zones for tapered deceleration lanes. Before and after studies were conducted at each site. Exiting traffic by zone and volumes for exiting and through traffic movements were counted at four hour per day intervals before and after the installation of extended dotted lane lines. Dotted lines were two feet (0.6 meter) long with 25 foot (7.6 meter) gaps. The spacing was determined by visual judgement and is within the constraints provided by the MUTCD. The before and after rates of exiting maneuvers by zone were matched on a 10-minute interval basis, by time of day and day of the week, to see if the rates changed with a statistical significance at the 95% level of confidence. The following major inferences were drawn from the results of the Wilcoxon test of matched pairs and the subsequent analysis.

1. The dotted extension of a right-edge line was more effective than no dotted line at tapered and parallel deceleration lanes in orienting exiting traffic into the deceleration lane sooner.

2. No significant change was noted in Zone 3 exits (crossing the painted gore regions) at parallel deceleration lanes.

It was observed that exiting vehicles use the shorter deceleration lanes with less variation, since there is less room to maneuver. As a result, the use of dotted lane lines did not have as marked a longitudinal effect on orienting vehicles into the shorter deceleration lanes sooner.

INTRODUCTION

Traffic control devices, such as signs and markings, are the primary means of regulating, warning, or guiding traffic on all streets and highways. The need for well-designed, adequately maintained devices grows in proportion to the density of traffic, speed of operation, and the complexity of maneuvering areas on highways and at intersections. Markings have definite and important functions to perform in a proper scheme of traffic control. They are used to supplement the regulation and warnings of other devices, such as traffic signals, and they are used alone to produce results which cannot be obtained by other devices.[1]

Pavement markings at interchange ramps provide a neutral area which reduces the probability of collision with the curb nose and also directs exiting traffic at the proper angle for smooth divergence into the ramp. Presently, in the Manual on Uniform Traffic Control Devices (MUTCD) there is a provision for an optional dotted extension of the right edge line of parallel and tapered deceleration lanes. The dotted extension is usually formed by short segments, normally two feet in length, and gaps, normally four feet or longer.[1]

The objective of this study is to determine the effectiveness of the optional dotted extension of the right edge line at deceleration lanes.

A pilot study had been conducted by the New Jersey Department of Transportation at a parallel deceleration lane.[2] The study was successful in demonstrating a more effective channelization of traffic with a treatment of extended dotted lane lines. The pilot study, performed in the Fall of 1974, dealt with only one of several kinds of interchange/deceleration lanes. Tapered and parallel deceleration

lanes are used with various interchange geometries in New Jersey. It is felt that different exit ramp and approach geometries may interact to cause variations in driver performance which may be affected by the extended dotted lane lines.[3]

In the summer of 1975, the New Jersey Department of Transportation in cooperation with the Federal Highway Administration performed a study of the effect of dotted lines at both tapered and parallel right-hand, single, deceleration lane exits with varying approach and exit ramp geometries on New Jersey's interstate system.

AREA CHARACTERISTICS

Observation of traffic was conducted at two different geographic locations in the state. In the northeast sections of the state, Routes 440 and I-287 were utilized, while in the southern section, Route I-295 in Camden County served as the location of many sites (see Figures 1 & 2). Sixteen sites were selected in all; twelve were used for actual study, while the remaining four were immediate upstream sites which had extended dotted lane lines installed, to help reduce a possible novelty effect at the twelve study sites.

Of the twelve study sites utilized, seven were categorized as tapered deceleration types and five as parallel deceleration types. Tapered and parellel lanes were differentiated by length. Deceleration lanes shorter than 400 feet (122 meters) are referred to as being tapered, because drivers used them as such. Two sites (Nos. 7 & 12) were selected as control sites. No dotted lane lines were applied to the control sites in order to determine if any significant changes in exiting behavior occurred during the study period. Table 1 presents a brief summary of the study site locations.

An elimination process was carried out to select a limited number of representative sites feasible for study. Extensive use was made of the New Jersey Highway Photo Inventory in order to determine the most commonly found types of parallel and tapered deceleration lanes in the state. Construction and maintenance schedules were checked to be sure that work crews would not interfere with the before or after studies. Field investigations were conducted to locate the best possible sites for study based upon the types found to be most prevalent throughout the state.

STUDY SITES ON ROUTES 440 & 287

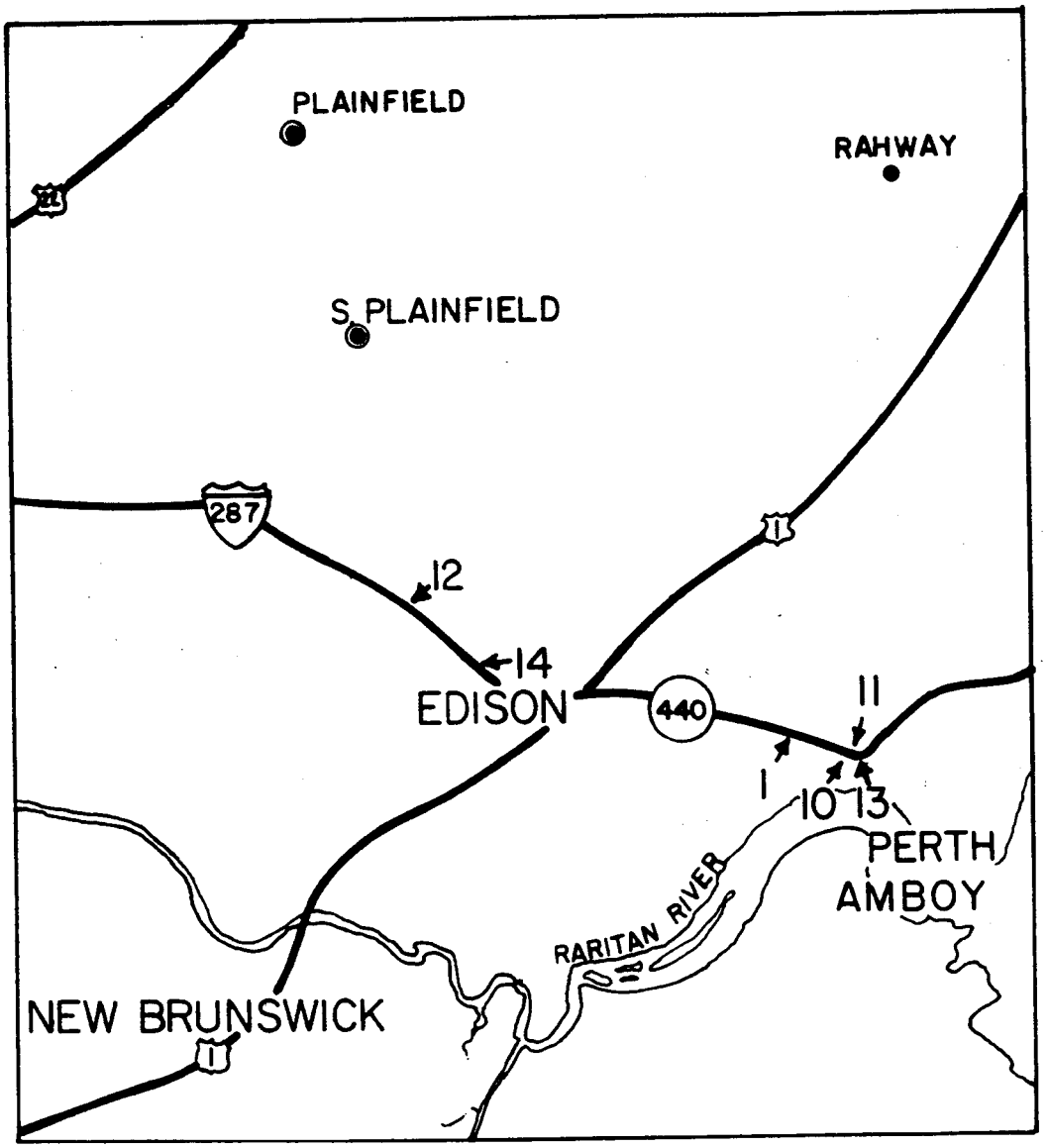


Figure 1

STUDY SITES ON ROUTE 295

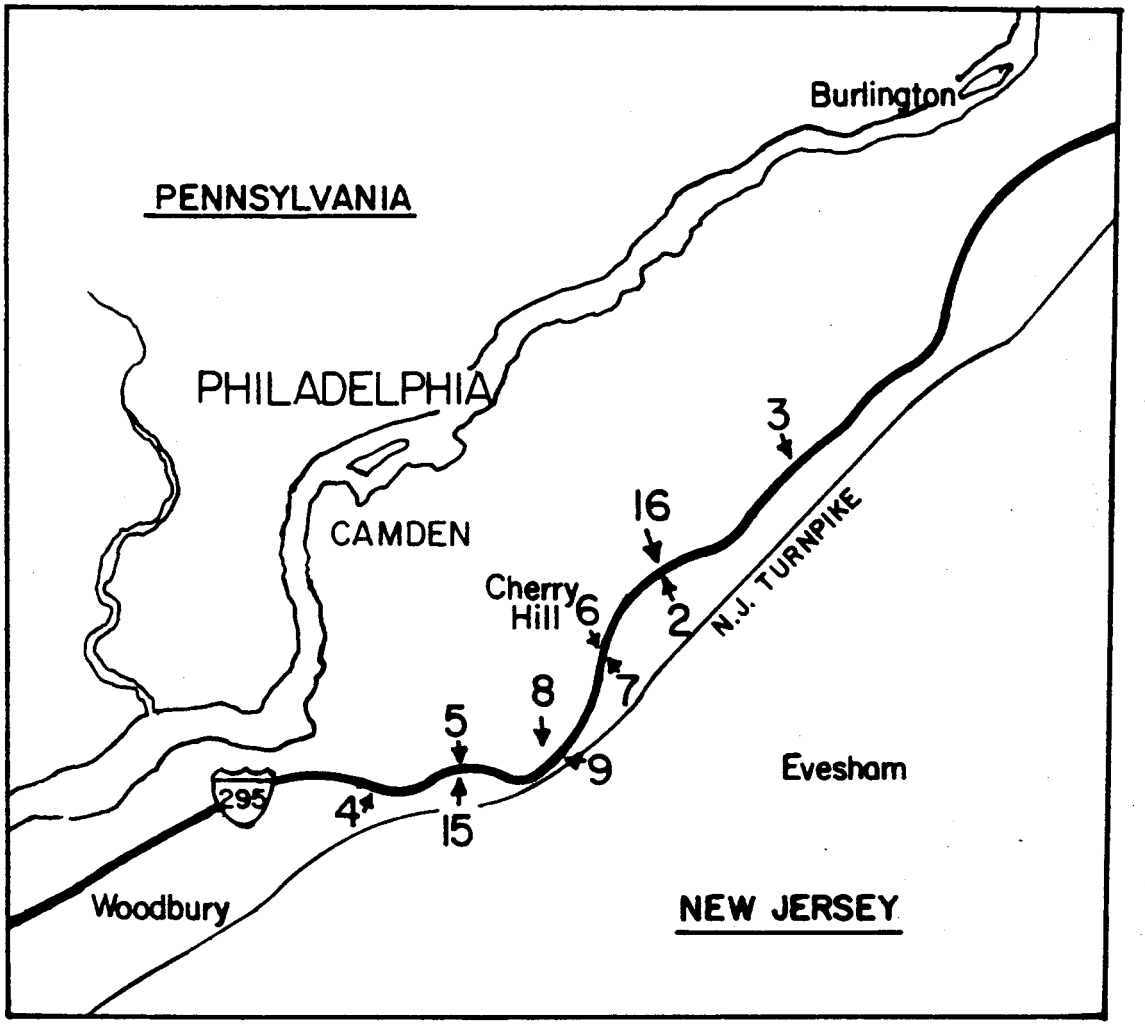


Figure 2

TABLE 1
EXIT SITE INFORMATION

SITE NO.	EXIT LOCATION	TYPE	REMARKS
1	Smith St. & Industrial Ave. Exit, on Rt. 440 East	Tapered Decel.	-
2	Rt. 73 South Exit, on Rt. I-295 North	Tapered Decel.	-
3	Rt. 38 North Exit, on Rt. I-295 South	Parallel Decel.	-
4	Rt. 168, Runnemede Exit, on Rt. I-295 North	Parallel Decel.	-
5	Rt. 30, Barrington Exit, on Rt. I-295 South	Tapered Decel.	-
6	Rt. 70 West Exit, on Rt. I-295 South	Tapered Decel.	Non-study location, no data collected, dotted lane lines applied to eliminate uniqueness aspect
7	Rt. 70 East Exit, on Rt. I-295 North	Tapered Decel.	Selected as a Control Site. No dotted lane lines were applied.
8	Rt. 561, Haddonfield Exit, on Rt. I-295 South	Tapered Decel.	-
9	Rt. 561, Haddonfield Exit, on Rt. I-295 North	Tapered Decel.	-
10	Rt. 9 South Exit, on Rt. 440 East	Parrellel Decel.	-
11	Rt. 9 South and Parkway South Exit, on Rt. 440 West	Parallel Decel.	-
12	Durham Ave. Exit, on Rt. I-287 North	Tapered Decel.	Selected as a control site, no dotted lane lines were applied.

TABLE 1 (cont'd)

SITE NO.	EXIT LOCATION	TYPE	REMARKS
13	Parkway South Exit, on Rt. 440 East	Parallel Decel.	-
14	Rt. 27 North Exit, on Rt. I-287 North	Tapered Decel.	Non-study site, no data collected. Dotted lane lines applied to eliminate uniqueness aspect.
15	Rt. 30, Barrington Exit, on Rt. I-295 North	Tapered Decel.	Non-study site, no data collected. Dotted lane lines applied.
16	Rt. 73 North Exit, on Rt. I-295 South	Parallel Decel.	Non-study site, no data collected. Dotted lane lines applied.

STUDY DESIGN

Project Scope

The project scope consists of the evaluation of the twelve dotted lane line sites in order to determine if any change in traffic channelization can be attributed to the use of dotted lane lines. Determining the effect of the lines will aid New Jersey and other states in deciding whether or not to implement the MUTCD extended lane line option at deceleration lanes. In order to carry out the data collection procedures for the project, the following work tasks were performed:

1. Before Studies - Skip lines at tapered deceleration lanes were removed prior to before studies. Each study site was divided up into a predetermined number of longitudinal zones. Manual counts of through and exit volumes and counts of vehicles exiting in each of the different longitudinal zones were made. The data yields the rate of vehicles exiting into each deceleration lane per zone.
2. Installation of Extended Dotted Lane Lines - Dotted lane lines were provided at each study site once "before" studies were completed. Several days were provided at each individual study site between installation of the dotted lane lines and the start of "after" studies. Dotted lane lines were also placed at deceleration lanes near the study sites to eliminate the uniqueness aspect.
3. After Studies - After study counts of through and exit volumes and counts of vehicles exiting in each longitudinal zone were made. All "after" study counts were matched by zone, the day of the week, and the time of day for the data collected in the "before" study.

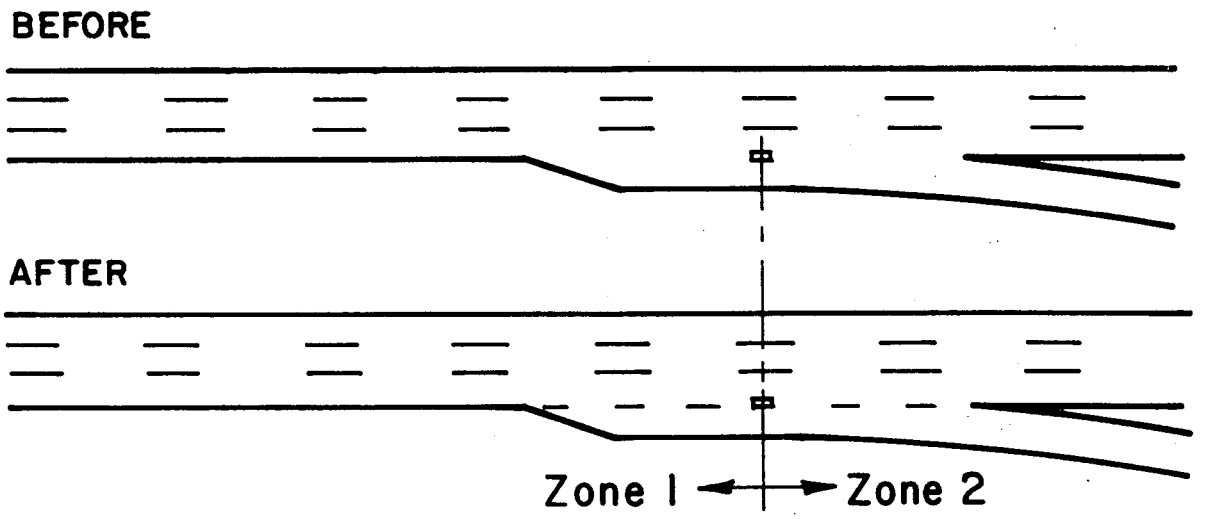
After data collection was completed, all data were summarized and tabulated. A statistical analysis was used to compare the before and after study rates in order to determine if any significant changes occurred in exit zone maneuvers.

Preparation of Study Sites

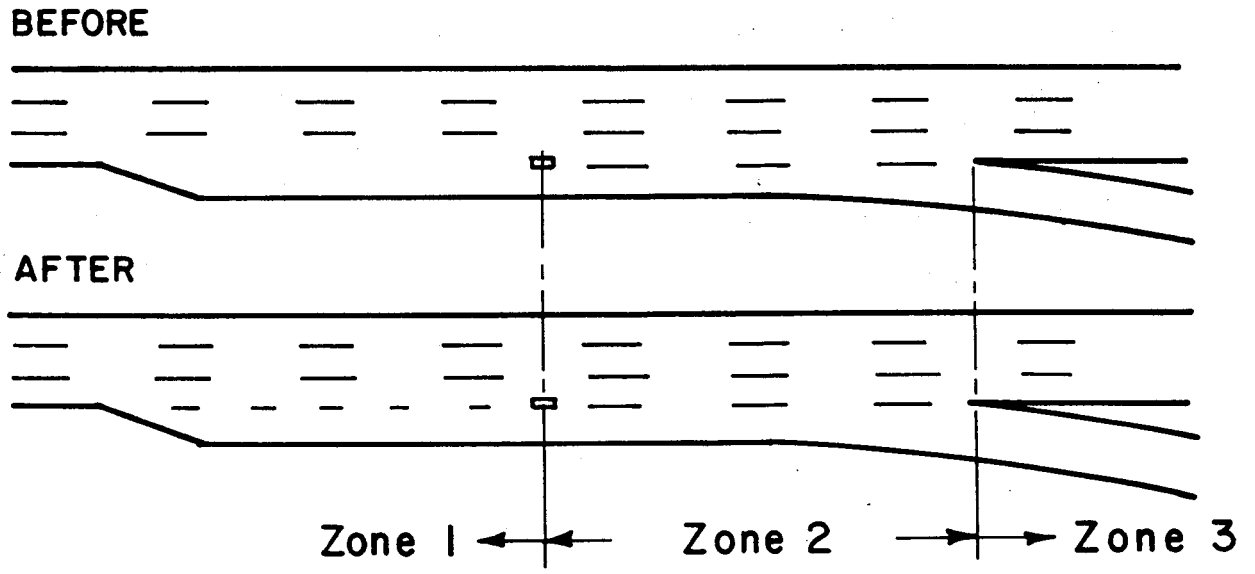
The deceleration lanes used for the study were first standardized according to MUTCD guidelines prior to the before study. For parallel deceleration lanes, fifteen foot skip-lines extended from the beginning of the gore area upstream to a distance of one-half the length of the full width deceleration lane. At tapered deceleration lanes, all existing skip-lines upstream from the gore point were removed. For the after study, extended dotted lane lines were installed from the gore point on tapered deceleration lanes and where the skip-lines ended on parallel deceleration lanes, upstream to the point where the edge line begins to taper, thus showing the beginning of the exit lane (see Figure 3). The dotted lane lines were made up of two foot (0.6 meter) strips placed every 27 feet (8.2 meters) on center. The spacing was visually determined by observing several gap lengths applied at a deceleration lane. On page 179, the MUTCD notes that a dotted line is normally two feet (0.6 meter) long with gaps of four feet (1.2 meters) or longer.

Extended dotted lane lines were also placed at exit sites upstream of the study sites to help reduce the uniqueness effect. The reasoning behind this application is that if a motorist sees extended dotted lane lines at only certain sites, he may regard them as special or unique and react in a special manner in performing exiting maneuvers.

At each study site, a painted reference point was used to help define the zones for observers. Each vehicle entrance into the deceleration lane was classified by the observers according to the zone entered. The reference point was either the beginning or end of an



Tapered Deceleration Lane



Parallel Deceleration Lane

EXPERIMENTAL CHANGE

FIGURE 3

existing stripe or a 12" by 8" (30 cm by 20 cm) white stripe which was placed down prior to the start of the before study. The same reference point was used for the after study. The sites which had a reference point placed on the roadway surface for the before study, then had the point incorporated as a wide dotted lane line for the after study.

The placement of the reference point was not at a geometrically predetermined point on the deceleration lane. The reference point was located at a point on the deceleration lane where there was a one to one proportion of Zone 1 and Zone 2 exiting maneuvers, as determined by the observation of traffic prior to the before study. It was felt that an equal distribution of Zone 1 and Zone 2 exiting maneuvers would provide the most sensitive measure of a change in exiting behavior.

Parallel deceleration lanes were divided into three longitudinal zones and tapered deceleration lanes were divided into two longitudinal zones. At parallel deceleration lanes, the reference point separated Zones 1 and 2, and the painted gore point separated Zones 2 and 3. At tapered deceleration lanes, the reference point separated Zones 1 and 2, Zone 2 being everything downstream of the reference point including the gore area.

For a car to have been recorded as a Zone 1 exit, the left rear tire had to pass upstream of the reference point. If it ran over the reference point, it was recorded as a Zone 2 exit. At a parallel deceleration lane, a car was recorded as a Zone 2 exit if the left rear tire passed upstream of the gore point and either on or downstream of the reference point. If the tire crossed any part of the gore area, it was considered as a Zone 3 exit. At tapered

deceleration lanes, if the left rear tire of a car passed on top of the reference point or downstream of it, it was considered a Zone 2 exit.

Other types of maneuvers counted include crossing into the deceleration lane and then crossing back out into the through traffic. This event was labeled a Type 4 maneuver.

The placement of the reference point was the chief reason for having only two zones at tapered deceleration lanes. At a number of deceleration lanes, the distance between the reference point and the gore point would have been too short to be meaningful.

Data Collection

Data was collected at the 12 sites by three hidden observers. One observer counted total exiting traffic, which had two axles only, and all total through traffic regardless of the number of axles. The other two observers independently counted two axled exiting vehicles by maneuver type.

Observation of traffic was conducted between the hours of 10:00 a.m. to 12:10 p.m. and from 1:00 p.m. to 3:10 p.m. with a 10 minute break at 11:00 and at 2:00. A total of four hours of traffic data was recorded per day, Monday through Friday. For each day of data collected, the before and after conditions were matched to the day and time of week, three weeks later.

The two control sites used in the study (Sites No. 7 & 12), which were located at each of the two geographic locations, are shown by Figures 1 and 2. Traffic was observed at each control site for the first three days of before studies, for three days between the before and after studies, and for the last three days of after studies (see Table 2).

TABLE 2

DATES OF BEFORE AND AFTER STUDIES

1975

SITE NO.	DATES OF BEFORE STUDY	DATES OF AFTER STUDY
1	7/24 & 7/25	8/14 & 8/15
2	7/16 - 7/18	8/6 - 8/8
3	7/16 - 7/18	8/6 - 8/8
4	7/21 & 7/22	8/11 & 8/12
5	7/21 & 7/22	8/11 & 8/12
8	7/14 & 7/15	8/4 & 8/5
9	7/14 & 7/15	8/4 & 8/5
10	7/28 & 7/29	8/18 & 8/19
11	7/23 - 7/25	8/13 - 8/15
13	7/28 & 7/29	8/18 & 8/19

CONTROL SITES

SITE NO.	DATES OF BEFORE STUDY	DATE BETWEEN BEFORE & AFTER STUDIES	DATES OF AFTER STUDY
7	7/9 - 7/11	7/30 - 8/1	8/20 - 8/22
12	7/9 - 7/11	7/30 - 8/1	8/20 - 8/22

The study plan included a provision for an adequate quantity of data from each study site. The study sites were divided into high and low volume sites. The sites selected in the high volume category had the six highest exiting volumes of the twelve sites. Each week was separated by studying high volume sites on Monday and Tuesday and low volume sites on Wednesday, Thursday, and Friday. This gave the lower volume sites more matched data periods than the higher volume sites, but the latter had larger samples in each data period.

Only two axle vehicles were counted for exit and #4 type maneuvers. The opinion is that vehicles with more than two axles do not exit in the same fashion as two axle vehicles, and because of their often very large size, they cannot physically drive into a given zone as can a two axle vehicle. The placement of the reference points were designed only for two axle vehicles.

The total through traffic volume was counted regardless of number of axles, since it was felt that a driver's exit behavior may be dependent on the amount of through traffic from which he exits. As an example, with a high amount of through traffic, a motorist may be more conscious of his relation to other vehicles and thus exit earlier to get out of the stream of traffic. Conversely, with a small amount of through traffic, a motorist may either become more lax in his driving awareness or choose a more direct exiting method and, therefore, exit later into a deceleration lane.

Method of Evaluation

Before and after rates of exit maneuvers, by time of day and day of the week, were matched in order to see if the rates changed with

statistical significance at the 95% confidence level. A significant difference is declared when the standard deviation is 1.64 or greater, thus representing significance at the 95% level of confidence or better, using a one-tailed test.

Differences between before and after rates were tested by using the conservative, non-parametric, Wilcoxon matched-pairs, signed-ranks test.[4]

RESULTS

Table 3 presents a comparison of total exit maneuver rates by zone for each study site. The data for exit maneuvers were paired between before and after studies by type of maneuver by time of day and day of the week. Exit maneuver rates were broken down into 10 minute intervals for each hour of data collected. The differences between rates for each 10 minute interval were tested statistically by using the conservative non-parametric, Wilcoxon matched-pairs, signed-ranks test. A significant difference is declared when the standard deviation ("Z" value) is equal to or greater than +1.645, thus representing significance at the 95 percent level of confidence or better with a one-tailed test.

From Table 3 it can be noted, with the exception of site number 1 that there is a significant increase in Zone 1 exit maneuvers and a corresponding decrease in Zone 2 exit maneuvers after dotted lane lines were installed. This is a beneficial effect as far as orienting exiting traffic into the deceleration lane sooner. No significant change was noted in before and after rates for Zone 3 exit maneuvers on parallel deceleration lanes.

Table 4 and 5 presents a statistical summary of each site location. As can be seen from the table, only Sites 1, 2, and 10 were subject to any substantial accumulation of Type 4 maneuvers. It would appear that the Type 4 maneuver problem is caused by driver unawareness or unfamiliarity. It should be noted that Sites 1 and 10 are both located on Route 440 east. There are several exits within a one to two mile (1.6 to 3.2 kilometers) distance in this vicinity, where a motorist may become confused when selecting his proper exit route. Refer to photos for Sites 1, 10 and 13. However, when all the Type 4 maneuvers for each site are compared to the through volume, they constitute less than 1% of the total volume.

TABLE 3

COMPARISON OF TOTAL EXIT MANEUVER RATES

Site No.	Route	% EXIT MANEUVERS BY ZONE Before 1	Before 2	Before 3	After 1	After 2	After 3	Statistically Signif. (Zones 1 & 2 only)	Length of Deceleration in Feet (1) Zone 1	Zone 2	Painted Gore	Total Length
TAPERED DECELERATION LANE												
1	440	48	52	--	47	53	--	No	168	404	312	572
2	295	45	55	--	69	31	--	Yes	218	280	138	498
5	295	41	59	--	64	36	--	Yes	204	278	168	482
8	295	58	42	--	60	40	--	Yes	236	260	128	496
9	295	60	40	--	77	23	--	Yes	222	256	138	478
PARALLEL DECELERATION LANE												
3	295	54	46	0	66	33	1	Yes	316	332	124	772
4	295	31	66	3	50	48	2	Yes	50C	328	160	994
10	440	24	75	1	37	62	1	Yes	247	226	134	607
11	440	70	30	0	75	25	0	Yes	330	236	140	706
13	440	45	53	2	51	47	2	Yes	354	122	178	654
CONTROL LANES (BOTH ARE TAPERED)												
		Before 1	Before 2		Between 1	Between 2		After 1	After 2			
7	295	55	45		52	48		60	40	Yes	210	254	138	464
12	287	50	50		58	42		56	44	Yes	152	360	222	512

(1) Meters = Feet x 0.3048

TABLE 4

STATISTICAL SUMMARY - EXPERIMENTAL SITES

		SITE NUMBER									
		1	2	3	4	5	8	9	10	11	13
No. of Days Studied (Before & After)		4	6	6	4	4	4	4	6	6	4
Total Exit Volume	Before	1124	2007	1804	1389	1281	1794	1553	2304	2332	2369
	After	1074	2082	1604	1329	1310	1398	1607	2379	2647	2603
Total Thru Volume	Before	7669	14645	7758	9476	10264	6251	8259	9085	3204	2629
	After	7273	14362	7957	10580	10397	8767	7746	8804	3668	2812
Type 4 Manuevers	Before	23	66	--	3	1	4	2	57	13	10
	After	5	34	11	4	2	6	5	37	10	7
"Z"Value Wilcoxon Test of Before and After Exit Maneuver Rates by Zone	Zone 1	.207 NS	7.07 S	5.85 S	5.36 S	5.78 S	2.33 S	4.99 S	6.14 S	3.59 S	2.34 S
	Zone 2	.207 NS	7.07 S	6.07 S	5.33 S	5.78 S	2.42 S	4.99 S	5.97 S	3.49 S	2.55 S
	Zone 3	---	---	--- NS	.483 NS	---	----	---	--- NS	--- NS	.441 NS
No. of Matched Pairs	Zone 1	41	69	67	38	44	41	33	65	67	39
	Zone 2	41	69	67	38	44	41	33	65	67	40
	Zone 3	--	--	0	15	--	--	--	--	--	23

S - Significant difference at 95% level of confidence

NS - Non-Significant difference

TABLE 5

STATISTICAL SUMMARY

CONTROL SITES

SITE NUMBER

		7	12		7	12
No. of Days Studied (Before & After)		6	6		6	6
Total Exit Volume	Before	3553	2143	Between	3819	2415
	Between	3819	2415	After	3028	2594
Total Thru Volume	Before	17102	17122	Between	14322	16319
	Between	17122	16471	After	16319	17669
Type 4 Maneuvers	Before	13	1	Between	7	4
	Between	7	4	After	58	2
"Z" Value Wilcoxon Test of Before & AFter Exit Maneuver Rates by Zone	Zone 1	2.77 S	4.84 S		5.30 S	2.17 S
	Zone 2	2.77 S	5.28 S		5.30 S	2.17 S
No. of Matched Pairs	Zone 1	67	61		49	71
	Zone 2	67	59		69	71

Site 8 experienced a high increase in through volume (40%), while the exit volume decreased by 22% for the period between the before and after studies. This large variance may be indicative of a bias effect on exit maneuver rates. The rest of the sites experienced less than a 15 percent change of volume.

Table 3 also presents a summary of exit maneuver rates and the length of each deceleration zone for the two control sites. As can be seen from the Table, significant changes in exit maneuver rates occurred for each combination of data collection periods compared. Since no dotted lane lines were installed at the control sites, the changes in exiting maneuvers would indicate that the drivers path of divergence from the highway is constantly changing at tapered type deceleration lanes.

The graphic presentations in Figures 4 and 5 of Zone 1 exiting percentages comparing experimental and control site results shows the negligible effect that control site percentages have in an analytical comparison with experimental site percentages. Using a simple arithmetic correction of experimental site percentages, the difference in percentages between points on the control site curve at the dates of each experimental site's before and after studies are subtracted from or added to the experimental percentage obtained in the after study, depending on the direction of the difference. As an example, in Figure 5 , a correction of Zone 1 results at Site 11, involves subtracting the difference between control percentages interpolated for July 24 and August 14 from the percentage determined for the Site 11 after study. The difference in this case is about 1.5%, thus changing the actual increase of 5% at Site 11 to an apparent effective increase of 3.5%.

FIGURE 4

COMPARISON OF ZONE I EXIT MANEUVER PERCENTAGE AT I-295 SITES

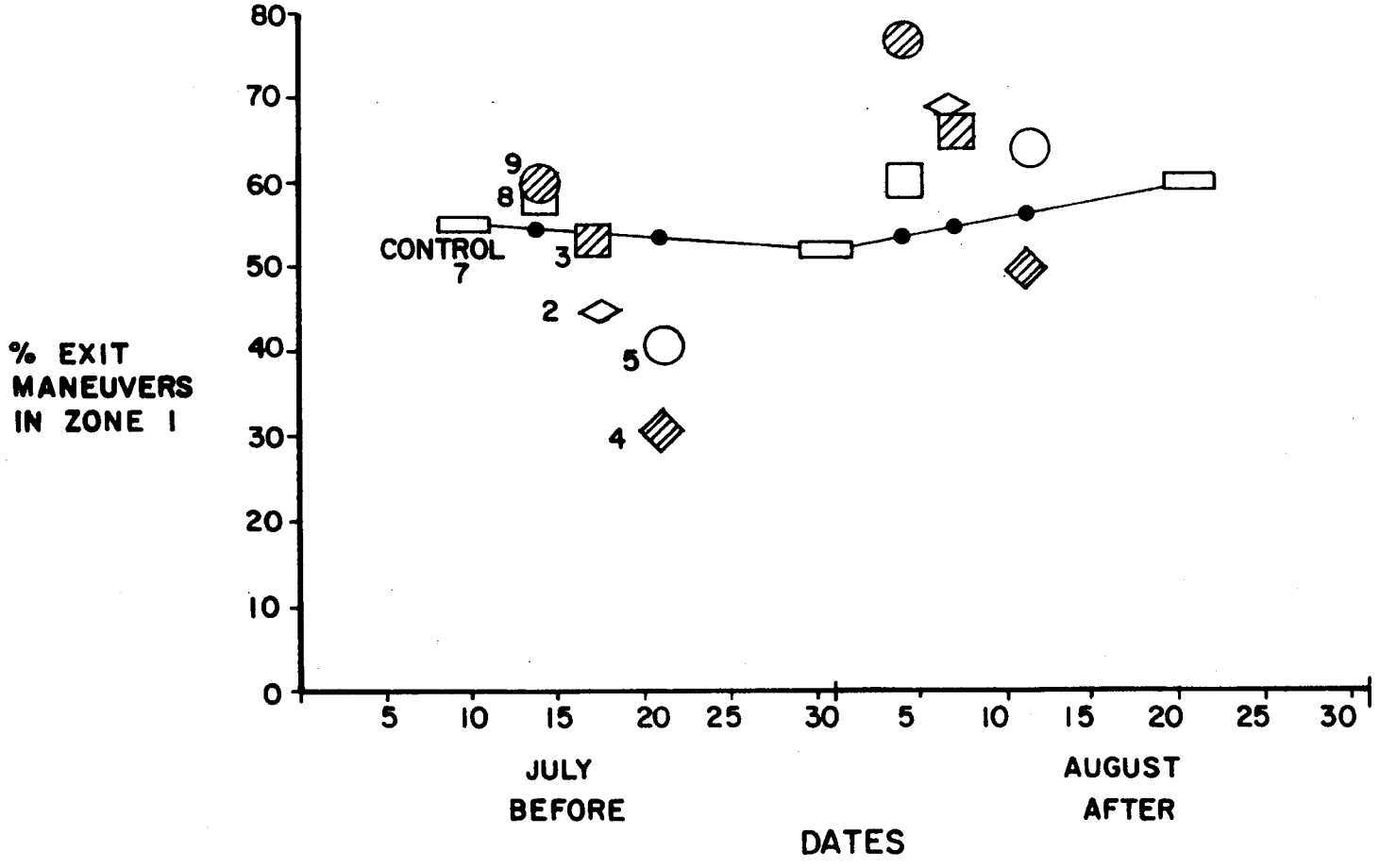


FIGURE 5

COMPARISON OF ZONE I EXIT MANEUVER PERCENTAGES AT I-287 AND 440 SITES

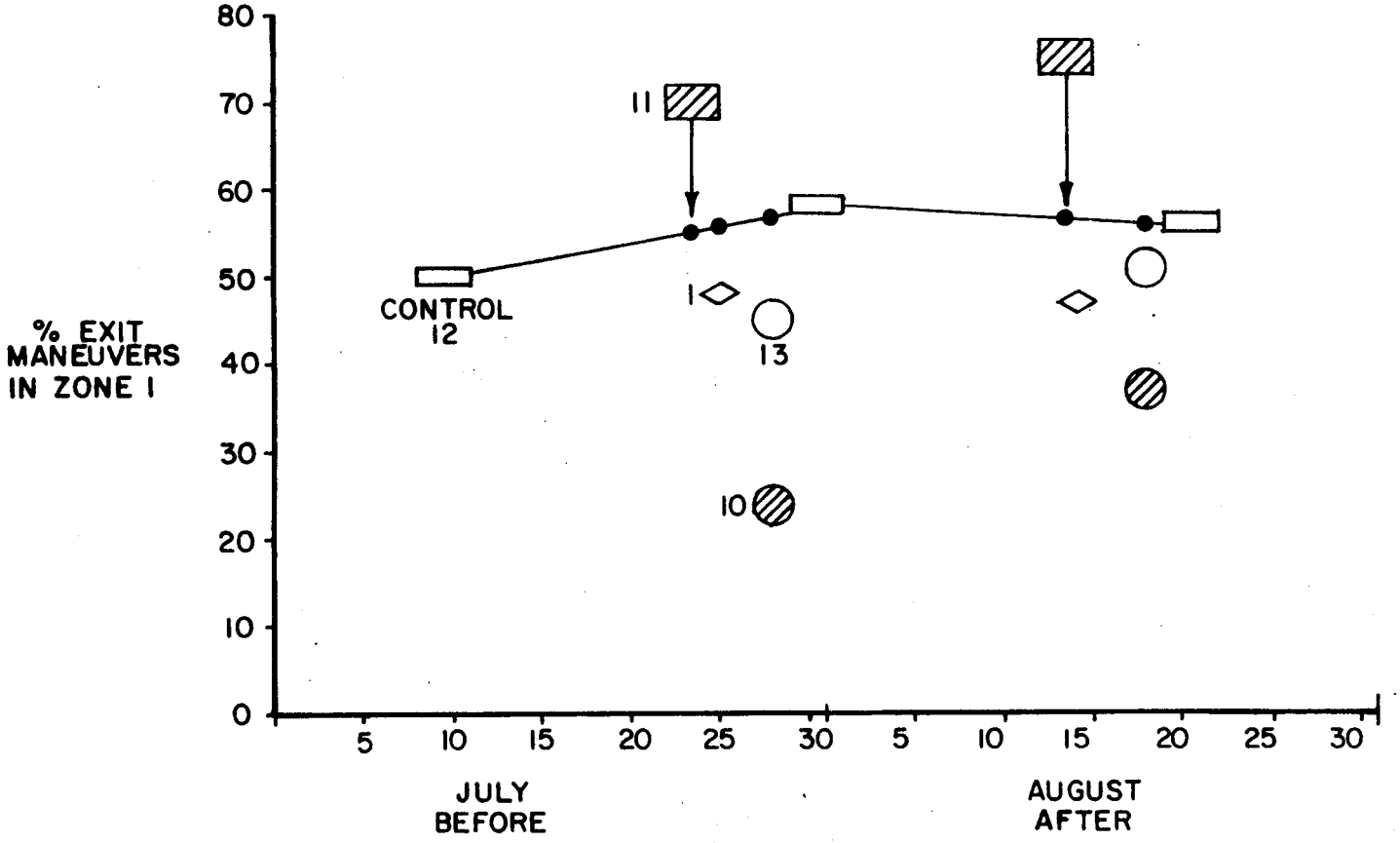


Figure 6

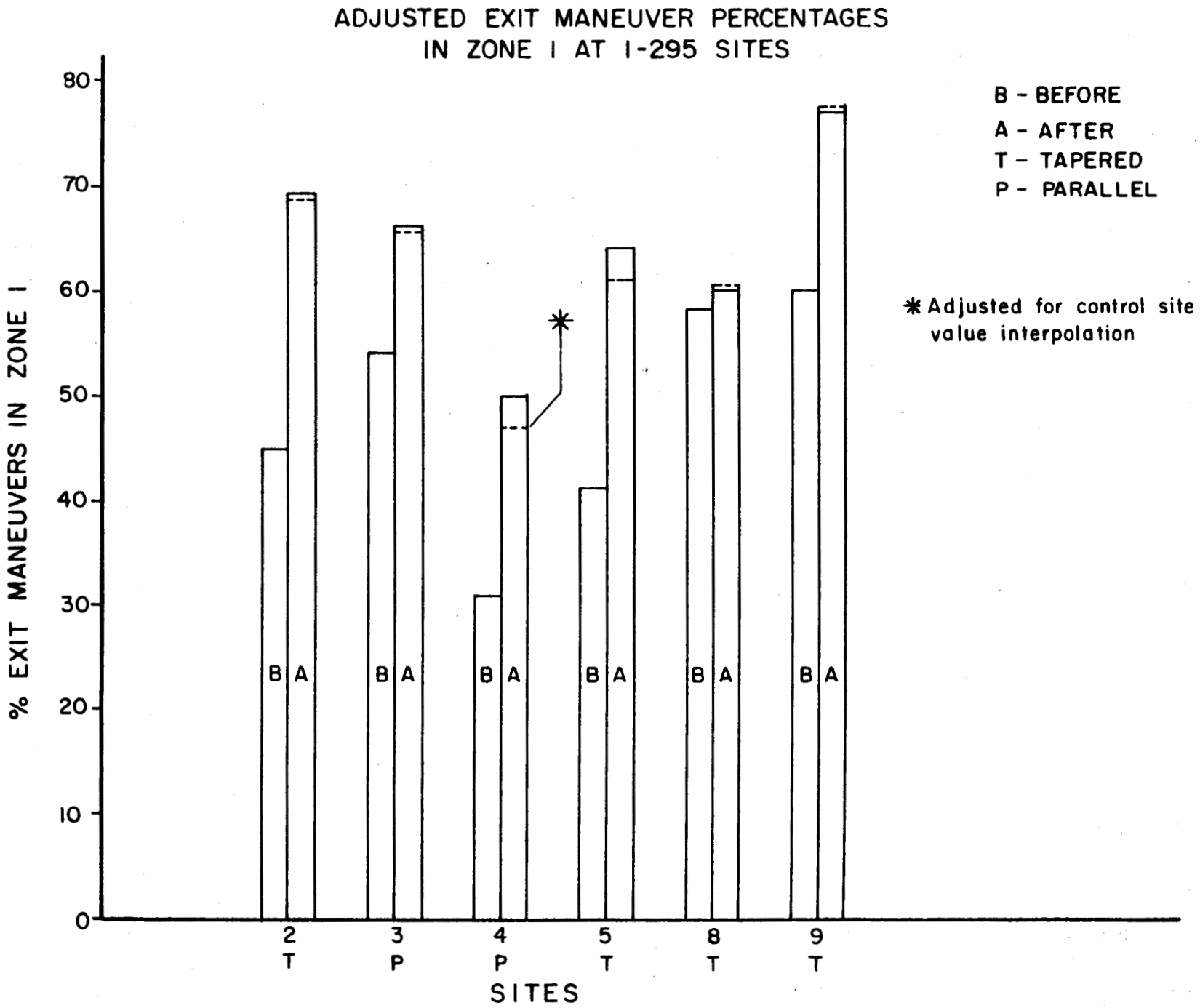
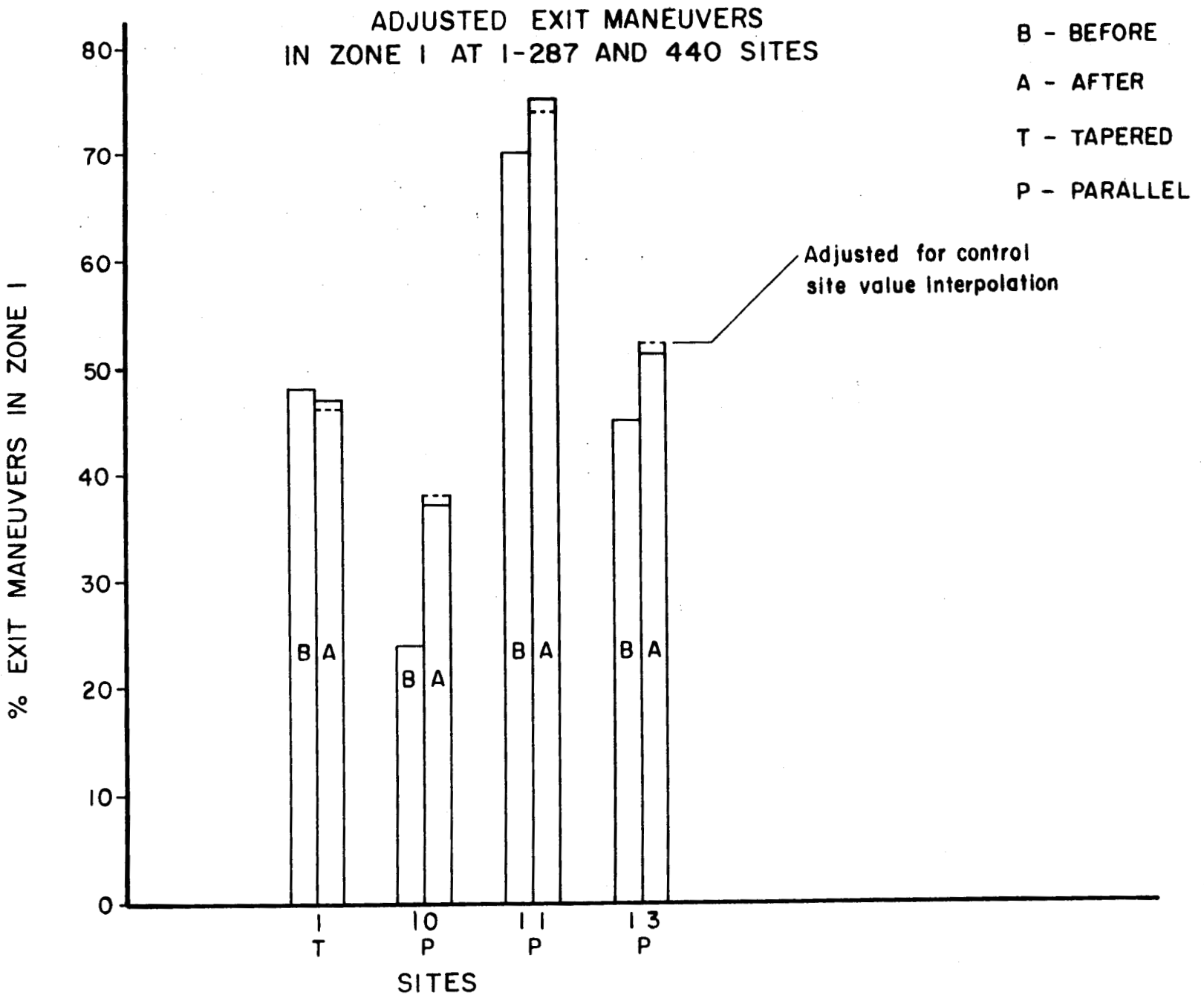

ADJUSTED EXIT MANEUVER PERCENTAGES
IN ZONE I AT I-295 SITES
% EXIT MANEUVERS IN ZONE I
0
10
20
30
40
50
60
70
80
B - BEFORE
A - AFTER
T - TAPERED
P - PARALLEL
* Adjusted for control site value interpolation
B A
2 T
3 P
4 P
5 T
8 T
9 T
SITES

Figure 7


ADJUSTED EXIT MANEUVERS
IN ZONE I AT I-287 AND 440 SITES
B - BEFORE
A - AFTER
T - TAPERED
P - PARALLEL
Adjusted for control site value interpolation
% EXIT MANEUVERS IN ZONE I
80
70
60
50
40
30
20
10
0
B A
B A
B A
B A
1 T
10 P
11 P
13 P
SITES

Using this procedure for all sites from the results of applicable control site data, does not produce any more than a minor change in the overall results. The corrections applied vary from 0 to 1.5% for I-287 and 440 sites and from .5 to 3% for I-295 sites. The two sites receiving a 3% correction on I-295 are reduced from 19% and 23% before to after differences which only makes a minor change in the results. The sites receiving the .5% correction are increased from a 2% and a 17% difference which, again, only produces a minor effect on the results.

Since the control sites are not identical to the experimental sites they represent, it is not actually known what the precise corrections should be. The correction accuracy is also limited by the validity of assuming linear relationships between the percentage of exit maneuvers in Zone 1 and the passage of time as determined by only three points representing control site variation. A visual examination of Figures 6 and 7 verifies that control site rates do not produce a major effect on the outcome of the comparisons when the rates are adjusted with interpolated values.

DISCUSSION

The use of extended dotted lane lines at both parallel and tapered deceleration lanes appears to be beneficial in orienting traffic into the deceleration lane sooner. The cost of providing the additional dotted lines is minimal and should be worth the effect of reducing the late movements into the deceleration lane.

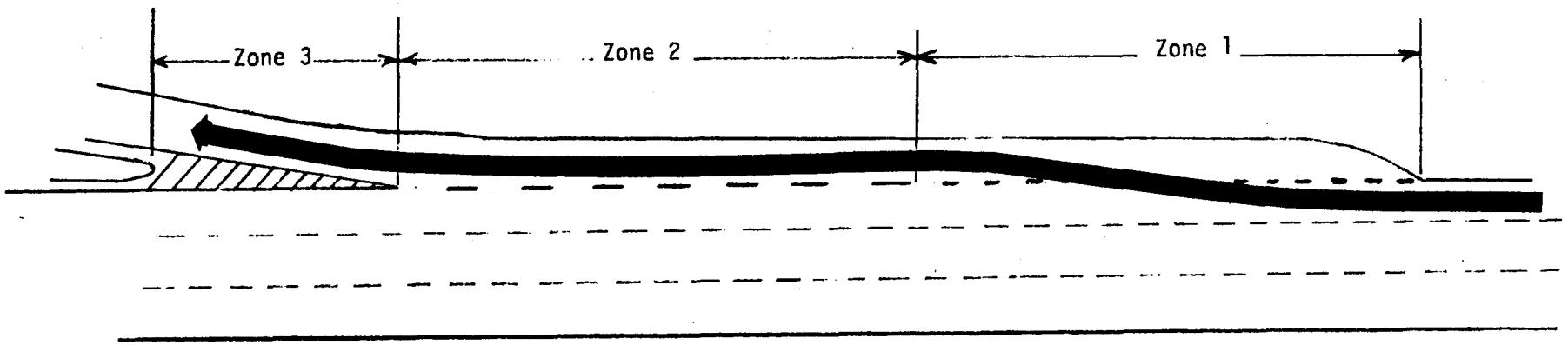
The use of dotted lane lines may prove to be more useful at parallel deceleration lanes due to the path of divergence used by exiting motorists. At short tapered deceleration lanes the motorist often chooses the simplest, most direct path of divergence. The use of dotted lane lines may not have a noticeable effect in orienting the driver into the deceleration lane sooner, since there is a limited amount of exit space. However, at long parallel deceleration lanes, there may often be long wide stretches of unmarked pavement before dashed skip lanes and the painted gore area is reached.

Drivers' exit paths at these deceleration lanes are often more complex. The average driver will first enter the deceleration lane, then travel down the lane before exiting. Figure 8 indicates common types of paths followed by vehicles exiting at tapered and parallel deceleration lanes. It was noted that at Sites 1 and 8, both short deceleration lanes, exiting behavior was less affected by the installation of dotted lane lines than at other sites. Exiting vehicles were taking a nearly straight path of divergence, with only slight deviation, due to the limited size of the deceleration lane.

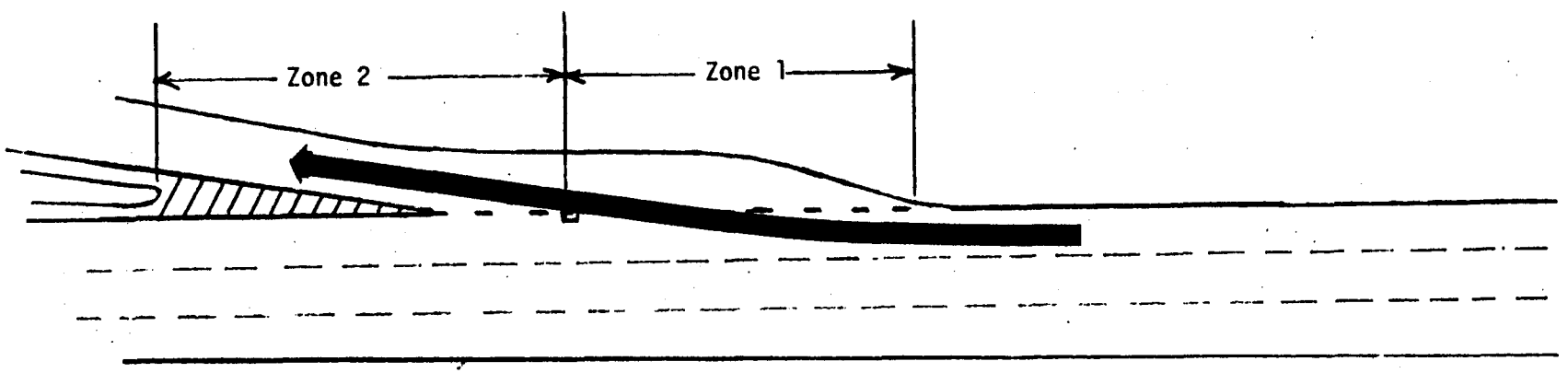
FIGURE 8

PATHS OF DIVERGENCE FOR TAPERED AND PARALLEL DECELERATION LANES

PARALLEL DECELERATION LANE



TAPERED DECELERATION LANE



At the longer tapered deceleration lanes and parallel deceleration lanes, which provided longer exiting paths, exiting behavior was significantly affected by the dotted lane line extension in that traffic was oriented into the exiting lane sooner. Although not within the scope of this study, dotted extended lines may provide an additional benefit during periods of limited visibility.

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