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16. Abstract

This report documents the development of guidelines for the decision whether to install a traffic signal at a marginally warranted intersection. The recommendations are based on field and simulation studies of a number of intersections across Texas which were identified as marginally warranted by various TxDOT districts. The research included both delay and accident studies.

The TEXAS simulation model was used for the delay studies. Eight different intersection geometries and twelve generic 24-hour volume patterns representing marginally warranted conditions were simulated. Each combination of intersection geometry and volume pattern was simulated as a two-way stop, an all-way stop, and an actuated traffic signal. Safety studies considered the frequency of accidents by severity and accident type. Five years of accident data were analyzed at each of the seventy-two marginally warranted intersections across the state. The intersections were classified into six groups, namely, low-speed rural, low-speed urban, high-speed rural, high-speed urban, rural by population, or rural by MUTCD definition.

The simulation results showed that in all cases studied, actuated traffic signals yielded significantly greater delays than two-way stops, and all-way stop control generated significantly greater delays than actuated traffic signals. However, in one out of the six intersection categories, namely low-speed rural conditions, signalization showed the potential to significantly reduce certain types of accidents.

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IMPACTS OF TRAFFIC SIGNAL INSTALLATION AT MARGINALLY WARRANTED INTERSECTIONS

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IMPLEMENTATION STATEMENT

The Texas Manual on Uniform Traffic Control Devices (Texas MUTCD, Ref. 4) establishes minimum requirements for the installation of traffic signals at an intersection in the form of a series of twelve warrants. These requirements are in terms of intersection volume, pedestrian volume, delay, size and frequency of gaps, accidents, and other measures of intersection operation. The Texas MUTCD states that traffic signals "should not be installed unless one or more of the signal warrants...are met. The satisfaction of a warrant or warrants is not in itself justification for a signal" (Sec. 4C-2). Furthermore, an engineering study should be conducted and indicate that "the installation of a traffic signal will improve the overall safety and/or operation of the intersection" (Sec. 4C-2).

The results of this study provide information to the traffic engineer in situations where one or more of the warrants is only marginally satisfied. Information on intersection operation is provided in terms of total and stopped delay and the number of stops. Accidents are used as a measure of intersection safety. Thus, the potential improvement or deterioration of intersection operation and safety can be estimated when a two-way stop is replaced by actuated traffic signals. The effects on intersection operation of adding all-way stops is also addressed, but data limitation precluded an analysis of the safety aspects of adding all-way stops.

These results assist the traffic engineer in applying the Texas MUTCD and provide specific operational and safety information that can be used in discussions with political bodies and the general public. These results could be added to the Texas MUTCD as an appendix or inserted into the Traffic Operations Manual in order to provide a readily available reference for traffic engineers.

DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the Federal Highway Administration or the Texas Department of Transportation. This report does not constitute a standard, a specification, or regulation.

Not intended for construction, bidding, or permit purposes.

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Several students assisted in the data collection and analysis. Dr. Seth Asante and Mr. Ousama Shebeeb collected the intersection data statewide and Mr. Murali Prabhala assisted in the accident analysis. The authors are grateful for their expertise and hard work.

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CHAPTER 1

INTRODUCTION

1.1 Problem Definition.

The traffic engineer is often faced with requests for traffic signals from the media, government officials, developers, and the general public. After the engineering study, if the traffic signal is only marginally warranted or not warranted, the traffic engineer must be able to tell the public, in terms they understand, why the addition of the signal may make the situation worse.

This explanation must include information on the efficiency of intersection operation (delays, number of stops, queue lengths, etc.) and safety (accidents). This is a particularly difficult task at marginally warranted intersections because the intersection does not experience high enough volumes or delays to make the proposed traffic signal clearly beneficial. The engineer must be able to quantify the impact of the traffic signal installation in terms of additional overall delay and potential increase of certain types of accidents, then relate this information to the requesting citizens.

Guidelines are needed for making quantitative assessments of the impact of installation of signals at marginally warranted intersections. The assessment must consider both efficiency and safety, using field and simulation studies. Once such impacts are quantified in statistically significant terms, the results must be summarized to provide an effective tool for traffic engineers to communicate their decision to the public, community leaders, and officials.

1.2. Study Objectives.

The study objectives are twofold:

1. Develop a procedure to evaluate and determine impacts of signal installation at marginally warranted locations. The procedure includes quantitative means of

determining efficiency and safety consequences of signal installations at such locations. The analytical procedures are based on (1) a review of current departmental procedures for such evaluations, (2) simulation studies of a variety of commonly encountered geometric and volume conditions at marginally warranted locations, and (3) accident data analysis for intersections with similar geometric and volume conditions, but differing controls.

2. Develop guidelines for the traffic engineer to effectively communicate to the general public the decisions made based on the analysis. To this end, a document containing a step-by-step procedure to be used by the traffic engineer in applying these guidelines is developed.

1.3. Previous Studies.

While the impact of traffic signals on intersections has been addressed at length (Refs. 1, 2, 3), not much is known about their impact when only marginally warranted. The engineer often relies on his/her judgment in assessing whether installation of the signal will improve overall traffic flow and safety at the intersection. Simply satisfying one or more of the warrants does not necessarily justify the installation of a traffic signal (Refs. 1, 4, 5). Furthermore, specific evaluation tools will greatly enhance the engineer's ability to communicate to the general public his/her decision not to install the traffic signal.

Installation of a traffic signal at a marginally warranted intersection could have a detrimental effect on traffic flow and safety. Delays and traffic accidents could increase in already congested areas. Vehicle emissions may also increase due to more frequent and lengthier stops. Despite the disadvantages of installing signals, particularly at marginally warranted sites, no systematic studies of the impact of such installation have been conducted. A search of the traffic engineering literature to date has revealed virtually no such studies which the engineer could refer to as a guide and in support of his/her decision on installing or not installing signals at marginally warranted sites. Only recently, the Texas Section of the Institute of Transportation Engineers (TexITE) has undertaken the task of preparing

an informational brochure to inform the public, in anecdotal terms, of the purpose of traffic signals, discussing the advantages as well as their disadvantages.

To this end, guidelines and procedures are needed for analyzing marginally warranted traffic signal locations. Development of these guidelines involves a detailed study of intersection operation under these conditions. This study includes an investigation of intersection delays, accident potential, and their tradeoff with both stop sign and traffic signal control. The impact of all-way stop control is separately analyzed with respect to intersection operation as it is often considered an alternative to the installation of traffic signals.

1.4. Study Approach.

Following input from various districts of the Texas Department of Transportation (TxDOT), a number of marginally warranted intersections with various geometric, control, and volume conditions were identified. Accident data by type and severity were obtained at these locations. Seventeen of these intersections, representing a range of geometric and control conditions were selected for field studies. Field studies involved collection of peak and off-peak volumes, along with delay and conflict counts from the same periods. This information is described in chapter 2.

Since it was not possible to find a full range of volume and geometric conditions in the field, simulation studies were used to complement the field data. Initially, each of the seventeen intersections, for which field data were available, was simulated on the TEXAS Model for Intersection Traffic (Ref. 6) using the observed field volumes. The TEXAS Model delay results were then compared to the field study results as a means of calibrating the simulation model.

Following the calibration procedure in chapter 2, simulation runs were conducted to obtain intersection operational measures of effectiveness (chapter 3). The TEXAS Model was executed for a variety of intersection geometric and volume conditions. Each intersection was simulated as a signalized, a two-way stop controlled, and an all-way stop controlled intersection under a variety of volume

patterns representing the various combinations of warranting (or near warranting) volumes.

Finally, accident studies were conducted for intersections with similar geometric and volume conditions, but different traffic controls, e.g., two-way and four-way stop, and fixed-time or actuated signals (chapter 4). Accident data were obtained on the marginally warranted intersections identified by the TxDOT districts using the State Master Accident Listing. Accidents were grouped by type and severity.

The data from simulation studies and accident studies were statistically analyzed to assess the consequences of installing signals at marginally warranted intersections under different volume and geometric conditions. Based on these analyses, guidelines were developed (chapter 5) to identify intersection conditions under which installation of marginally warranted signals would result in statistically unacceptable increases in delays and/or accidents.

CHAPTER 2

FIELD STUDIES

Field studies were conduced at 17 intersections across the state to provide data to aid in the selection of the simulation model. Details of the simulation work are provided in the next chapter, while site selection, field studies, and the comparison of simulation models are discussed below.

2.1. Site Selection.

Each district was asked to provide information on four or five intersections for which (1) traffic signal warrant studies had been conducted within the previous five years, and (2) the warrant studies indicated marginal conditions, i.e., that the traffic conditions were either just above or just below the warrants. The districts were asked to suggest intersections whether or not signals had been installed as a result of the study. The districts were asked to send the completed Warrant Sheets for each intersection submitted and the volume counts conducted for the warrant studies.

The intersections submitted from the districts are listed in table 2.1. Each intersection is identified by its district, thus, intersection 3,2 is intersection 2 in District 3. The names of districts appearing in table 2.1 are identified with their numbers in table 2.2. Diamond interchanges are noted by a ◊, and were excluded, as the additional complexities of a diamond over a conventional intersection placed them beyond the scope of this study. A total of 72 intersections (excluding the diamond interchanges) were submitted.

The city and county in which each intersection is located are also shown in table 2.1, along with the population of the city and the speed on the major street at the intersection. This information was generally taken from the warrant sheets, and is used to classify an intersection as either urban or rural, which is noted on the

Table 2.1 - List of Intersections Supplied by Districts

District, Number	Intersection	City, County	Population	Major Street Speed	Control Type	Warrants Used			Warrants Met
						Rural (pop)	Rural (speed)	Urban	
1,1	US 82 & SH 78	Bonham, Fannin	7,357	45	A	X	X		12
1,2	US 75 & FM 120	Dennison, Grayson	12,884	55	A		X		9,12
1,3	Main St & Davis St	Sulphur Springs, Hopkins	14,300	30	F			X	7
1,4	US 82 & 42nd St	Paris, Lamar	25,498	50	2W		X		9,12
2,1 ◊	IH 820 & Clifford St	Fort Worth, Tarrant	385,138	42	A		X		11,12
2,2 ◊	IH 20 & Winscott Road	Benbrook, Tarrant	13,579	42	A		X		11,12
2,3	Clifford St & GD Entrance	White Settlement, Tarrant	13,508	38	A			X	11,12
2,4	Clifford St & Cherry Lane	White Settlement, Tarrant	13,508	38	A			X	9,11,12
3,1	FM 2179 & Cliff Drive	Graham, Young	9,170	35	F	X			8,9,11,12
3,2	US 183 & FM 422	Seymour, Baylor	3,657	30	A	X			12
3,3	US 82 & Weaver St	Gainesville, Cooke	14,077	35	2W			X	9,11,12
3,4	SH 59 & Lovers Ln	Bowie, Montague	5,610	40	2W	X			---

Table 2.1 - Continued

District, Number	Intersection	City, County	Population	Major Street Speed	Control Type	Warrants Used			Warrants Met
						Rural (pop)	Rural (speed)	Urban	
4,1	FM 1151 & Osage	rural, Randall	<10,000	55	2W	X	X		9,11,12
4,2	SH 136 & Cornell	Fritch, Hutchison	<10,000	34	A	X			12
7,1	US 377 & LP 481	Junction, Kimble	2,593	40	2W	X			---
7,2	US 67 & SH 137	Big Lake, Reagan	3,672	35	F	X			11
7,3	US 90 & RM 334	Brackettville, Kinney	1,676	45	1W (T)	X	X		9,12
7,4	LP 166 & RM 334	Brackettville, Kinney	1,676	30	4W	X			12
7,5	RM 584 & Industrial Ave	San Angelo, Tom Green	84,000	40	1W (T)			X	9,11
8,1	SH 350 & 37th St	Snyder, Scurry	12,741	35	A			X	1,8,9,11,12
8,2	FM 89 & Antilley	Abilene, Taylor	106,000	45	A		X		9,11,12
8,3	SP 471 & 17th St	Colorado City, Mitchell	5,405	35	A	X			1,2,8,9,11,12
8,4	US 87 & 18th St	Big Spring, Howard	24,804	35	A			X	12
9,1	US 77 & FM 3148	Robinson, McLennan	7,111	50	A	X	X		2,7,9
9,2	SH 317 & 6th St	McGregor, McLennan	4,653	30	A	X			1,12

Table 2.1 - Continued

District, Number	Intersection	City, County	Population	Major Street Speed	Control Type	Warrants Used			Warrants Met
						Rural (pop)	Rural (speed)	Urban	
9,3	FM 2063 & FM 3476	Hewitt, McLennan	8,983	45	F	X	X		6
9,4	US 84 & 19th St	Gatesville, Coryell	6,260	30	2W	X			5,7,10
9,5	US 77 & New Land	Robinson, McLennan	6,074	45	2W	X	X		2,9,11,12
11,1 ◊	LP 287 & FM 324	Lufkin, Angelina	30,206	50	4W		X		---
11,2 ◊	LP 287 & FM 819	Lufkin, Angelina	30,206	45	4W		X		9,12
11,3 ◊	LP 287 & FM 325	Lufkin, Angelina	30,206	51	2W		X		---
11,4	SH 94 & Franklin	Lufkin, Angelina	30,206	40	2W			X	---
11,5	US 190 & High School Entrance	Livingston, Polk	4,928	54	A	X	X		11,12
12,1	FM 1960 & Wortham	uninc, Harris	>10,000	50	?		X		11
12,2	FM 2004 & Co Rd 400	uninc, Brazoria	<10,000	55	2W	X	X		11
12,3	SH 6 & Mustang Rd	uninc, Galveston	<10,000	55	?		X		---
12,4	US 90A & Richmond-Sugarland Rd	Sugarland, Fort Bend	8,826	45 or 55	?	X	X		11,12
12,5	SH 36 & Co Rd 354	uninc, Brazoria	<10,000	55	?		X		---

Table 2.1 - Continued

District, Number	Intersection	City, County	Population	Major Street Speed	Control Type	Warrants Used			Warrants Met
						Rural (pop)	Rural (speed)	Urban	
12,6	SH 105 & Wilson Rd	Conroe, Montgomery	18,034	45	?		X		---
13,1	US 90 & FM 609	Flatonia, Fayette	<10,000	30	2W	X			---
13,2	SH 60 & Hamman Rd	Bay City, Matagorda	<10,000	45	A	X	X		9,11,12
13,3	FM 794 & St. Andrews	Gonzales, Gonzales	<10,000	30	2W	X			9,12
13,4	US 183 & St. Andrews	Gonzales, Gonzales	<10,000	30	2W	X			2,9,11,12
13,5	US 77 & College St	Schulenburg, Fayette	<10,000	35	2W	X			---
13,6	US 90 & FM 155	Weimar, Colorado	<10,000	35	2W	X			---
13,7	SH 238 & FM 1090	Port Lavaca, Calhoun	<10,000	30	2W	X			7,9,11,12
14,1	US 290 & Scenic Brook Dr	uninc, Travis	<10,000	55	1W (T)	X	X		9,12
14,2	FM 734 & Adelphi	Austin, Travis	>10,000	55	1W (T)		X		9,11,12
14,3	SH 123 & Leah	San Marcos, Hays	23,743	45	2W		X		9,11,12
14,4	LP 418 & FM 971	Georgetown, Williamson	<10,000	45	2W	X	X		9,11,12

Table 2.1 - Continued

District, Number	Intersection	City, County	Population	Major Street Speed	Control Type	Warrants Used			Warrants Met
						Rural (pop)	Rural (speed)	Urban	
16,1	SH 44/SH 359 & Highland	Alice, Jim Wells	20,961	40	A			X	5,12
16,2	US 59 & Commercial	Goliad, Goliad	1,990	45	A	X	X		12
16,3	SH 202 & St Mary	Beeville, Bee	14,574	46	2W		X		9,12
17,1	US 190 & FM 1600	Cameron, Milam	5,721	35	2W	X			2,8,9,11,12
17,2	US 79 & Center St	Buffalo, Leon	1,555	35	2W	X			1,2,8,9,11,12
17,3	FM 2154 & N Graham Rd	uninc, Brazos	<10,000	55	2W	X	X		11,12
17,4	SH 19 & FM 980	Riverside, Walker	451	55	2W or 4W	X	X		6,9,12
18,1	FM 720 & County Rd	Frisco, Collin	6,141	30	2W	X			9,11
18,2	SH 5 & FM 2786	Allen, Collin	18,309	55	2W		X		12
18,3	SH 78 & East Grand	Dallas, Dallas	904,078	42	A		X		7,9,11,12
18,4	SH 34 & Hall St	Ennis, Ellis	12,110	45	A		X		12
19,1	US 82 & Red River Army Depot (E Gate)	uninc, Bowie	<10,000	55	A	X	X		7,11,12
19,2	US 59 & FM 125	Linden, Cass	2,443	53	A	X	X		12
19,3	US 67 & US 271	Mt. Pleasant, Titas	11,003	55	4W		X		2,7,9,12

Table 2.1 - Concluded

District, Number	Intersection	City, County	Population	Major Street Speed	Control Type	Warrants Used			Warrants Met
						Rural (pop)	Rural (speed)	Urban	
19,4	US 271 & Old Coffeeville Rd	Gilmer, Upshur	5,167	50	A	X	X		7,9,12
20,1	SH 87 & Church St	Orange, Orange	23,000	40	F			X	5,7
20,2	US 190 & SH 87	Newton, Newton	1,620	45	?	X	X		6,12
20,3	US 96 & FM 82	Kirbyville, Jasper	1,970	55	?	X	X		7,9,11,12
20,4	US 69 & Wheeler Rd	Lumberton, Hardin	2,480	55	?	X	X		7
20,5	US 96 & Victoria/ Candlestick	Lumberton, Hardin	2,480	50	?	X	X		9,12
23,1	US 183 & Ave B	Lampasas, Lampasas	<10,000	<40	2W	X			2,9,11,12
23,2	FM 3064 & Good Shepherd	Brownwood, Brown	19,396	<40	4W			X	---
23,3	FM 3064 & Stephen F. Austin Dr.	Brownwood, Brown	19,396	<40	4W			X	--
24,1	FM 259 & Bosque Rd	El Paso, El Paso	425,259	50	A		X		8,11,12
24,2	FM 76 & Moon Rd	El Paso, El Paso	425,259	?	2W		X		1
24,3	FM 258 & Passmore	Socorro, El Paso	23,000	45	2W		X		8
24,4	FM 258 & Dindinger Rd	Socorro, El Paso	23,000	?	2W		X		2

Table 2.2 - Names for Districts Identified in Table 2.1

District Number	District Name	District Number	District Name
1	Paris	13	Yoakum
2	Fort Worth	14	Austin
3	Wichita Falls	16	Corpus Christi
4	Amarillo	17	Bryan
7	San Angelo	18	Dallas
8	Abilene	19	Atlanta
9	Waco	20	Beaumont
11	Lufkin	23	Brownwood
12	Houston	24	El Paso

table. An intersection is considered rural if it is in an urban area of less than 10,000 population and/or if the speed on the main street is greater than 64 km/h (40 mph). Thus, rural intersections are classed as rural by population (urban area less than 10,000) or rural by speed (major street speed greater than 64 km/h, or 40 mph) or both.

Finally, the warrants met by each intersection are shown in table 2.1. Some of the intersections had been evaluated before Revision 4 of the Texas MUTCD (Ref. 4) was issued. Before revision 4, there were eight warrants and an additional one for actuated signals only. The actuated warrant (old Warrant 9) considered four volume conditions: eight high hours, four high hours, two high hours, and peak hour. With revision 4, the four hour warrant for actuated signals became Warrant 9 and applied to all signals. Similarly, the peak hour warrant became Warrant 11. The remainder of the old Warrant 9 (eight and two high hours) was renumbered as Warrant 12, and continues to apply to actuated signals only. In all cases where the intersections were evaluated with the warrants before revision 4 to the Texas

MUTCD, the warrant numbers were revised to reflect the current Texas MUTCD, and are thus shown in table 2.1.

These intersections were used for three parts of this study:

1. Field studies were conducted at 17 intersections to provide data for the selection of a simulation model. Intersections were selected to provide a wide range of control conditions as well as a representative sample of urban and rural locations statewide.
2. The volume counts provided for each of the intersections were used to generate twelve typical daily volume patterns at marginally warranted signals. Each pattern represents a composite of several of these intersections. The typical daily volume patterns along with the simulation studies are discussed in chapter 3.
3. Accident studies were performed with records gathered from the Master Accident Listing for most of the intersections listed in table 2.1. Accident data was collected for a five-year period in most cases. The accident studies are discussed in chapter 4.

2.2. Field Studies and Model Testing.

Intersections were selected from table 2.1 to provide a wide sample of control and location conditions. There are four possible control types: two-way stop, all-way stop, fixed-time traffic signal, and actuated traffic signal. Only signalized control was used in the simulation model testing, since (1) the simulation studies only considered two-way stop, all-way stop, and actuated control (see chapter 3), and (2) traffic flows were so light on the minor street approaches (the approaches with STOP signs in the two-way stop condition), that random fluctuations (within the stochastic framework of the two simulation models tested) resulted in large variations in the measures of effectiveness (MOEs) in the replications. Since the major street traffic did not have to stop in the two-way stop condition, little change was seen from replication to replication, with the delays

and number of stops being near zero (occasionally a vehicle turning left would have to stop for opposing traffic).

Two computer simulation models are widely available for isolated intersections: TEXAS (Ref. 6) and TRAF-NETSIM (Ref. 7). The TEXAS model is designed specifically for isolated intersections and can simulate any type of control. The model is microscopic, i.e., detailed car-following, queue-discharge, and lane-changing models are used to guide the vehicles through the intersection. Thus, vehicle movements are followed on a second-by-second basis and measures of effectiveness (MOEs) are accumulated for each approach and the entire intersection.

TRAF-NETSIM is also a microscopic model, but is designed to model traffic networks with a number of intersections. As a result, traffic flow within an intersection is modelled in considerably less detail than in TEXAS. (Note: A new version of TRAF-NETSIM has been recently released which incorporates many of the detailed vehicle movement algorithms from TEXAS, but was unavailable for this study.) As such, the TEXAS model was selected for this study.

2.3. Model Calibration Results.

Stopped delay studies at eight signalized intersections were used in the model testing. Three hours of stopped delay studies were conducted at each intersection: noon peak hour, either morning or afternoon peak hour, and one off-peak hour. The stopped delay was summed separately for each approach for each hour at each intersection, resulting in 92 observations (8 intersections × 3 hours × 4 approaches yields 96 observations, less one hour of lost field data, i.e., 4 observations). Two tests were used to compare the field studies with the simulation results: simple linear regression and a visual comparison of the data.

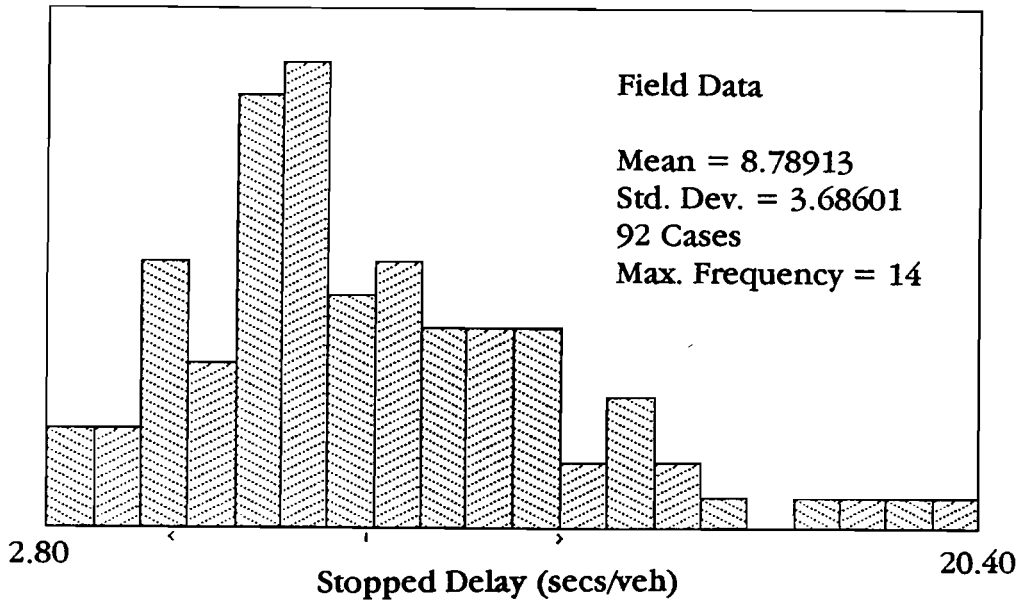
The regression relation between the field and simulated data was

$$\text{Delay}_{\text{FIELD}} = (0.873)\ \text{Delay}_{\text{SIM}}\ .$$

Further testing indicated that the coefficient was not significantly different from one. Therefore, the simulation results could be used directly as estimates of the actual stopped delay.

The second "test" was more informal as it involved a visual inspection of the distribution of the field and simulated stopped delays. Two bar charts are shown in figure 2.1. The values on the horizontal axis represent the stopped delay in seconds/vehicle, and the height of the bars represents the relative frequency of observations. Note that the distributions have very similar shapes, corresponding with the results of the regression.

Therefore, the TEXAS Model was selected, and there was no need for further calibration. The results of the simulation studies are reported in detail in the next chapter.



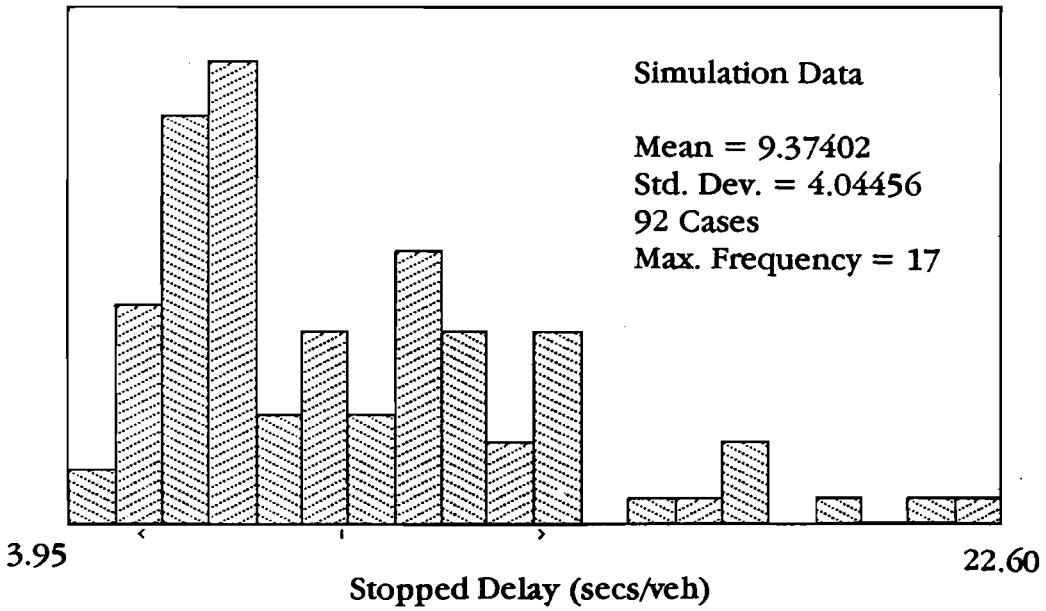


Figure 2.1 - Comparison of Stopped Delay Distributions

CHAPTER 3

SIMULATION STUDIES

Simulation was used to provide a more comprehensive assessment of the effects on intersection operation (measured by total and stopped delay and the number of stops) of the addition of a traffic signal than would be possible using field studies alone. As indicated in the previous chapter, the TEXAS Model for Intersection Traffic (Ref. 6) was selected as it provided an adequate description of traffic at lightly travelled intersections. This chapter includes a brief description of the design of the simulation experiments and presents the results of the analysis.

3.1. Design of Simulation Experiments.

The warrants for traffic signals in the MUTCD (Ref. 5) are designed to be applied to any intersection, regardless of the variation of the traffic throughout the day. However, specific daily variations, which determine which warrants are met, play a great role in determining the amount of delay experienced at the intersection. For example, intersection volumes which just satisfy Warrant 1 (Minimum Intersection Volumes) will result in delays which are very different from volumes which just meet Warrant 11 (Peak Hour Warrant). For that matter, volumes at two intersections which both satisfy a single warrant may result in very different delays due to possible variations in their daily traffic patterns. Thus, there are a virtually infinite number of daily volume patterns which can marginally satisfy one or more of the traffic signal warrants.

Since evaluating all possible daily volume patterns is not practical, a series of representative daily volume patterns were developed for the simulation study. When the districts submitted intersections for this study (as described in chapter 2), they provided the volume counts that were used in evaluating each intersection.

By and large, twelve hour volumes were supplied, generally 7 am to 7 pm or 8 am to 8 pm. However, in developing the representative daily volume patterns, 24 hours of volumes were needed to assess the impact of the traffic signal. In three cases, 24-hour counts were provided, and, as expected, the volumes were very low overnight. These low volumes, virtually nil on the minor street, were assumed for all the representative daily volumes.

The submitted intersections were taken to be representative of all intersections which only marginally meet the warrants. All 72 intersections were classed into general daily volume patterns, based on (1) number of peaks (morning, noon, and/or afternoon), (2) the total intersection volume (sum of all four entering approaches) during the largest peak, (3) the relative size of the peaks, and (4) the ratio of major to minor street traffic. A total of twelve general daily volume patterns were defined based on the intersections submitted by the districts. Volume Patterns 1 through 12 are plotted in figures 3.1 through 3.12, and briefly described below. The top line plotted in each figure represents the total intersection volume (sum of all four approaches). Each approach volume is also plotted in each figure. A tabular listing of hourly volumes by approach for each Volume Pattern is included in the appendix (tables A.1 through A.12).

Volume Patterns 1, 11, and 12 have a single prominent peak hour in the afternoon of around 1200, 3000, and 600 veh/hour, respectively. In all three cases, traffic tends to increase steadily throughout the day, with volumes of about half the peak hour between 7 and 8 am. Volume Pattern 12 shows a slight noon peak.

Volume Pattern 2 is similar to Volume Pattern 1, except the single peak is in the morning. Traffic decreases steadily all day, to about half the peak volume between 4 and 5 pm.

Volume Patterns 3 and 4 represent conditions where there are no distinct peaks, and remain relatively constant between 7 am and 5 pm. The day-long peaks are 600 and 1050 veh/hour for Volume Patterns 3 and 4, respectively.

Volume Patterns 5 and 6 each show two peaks of roughly the same size: at noon and in the afternoon. Traffic in the morning is about half the noon and

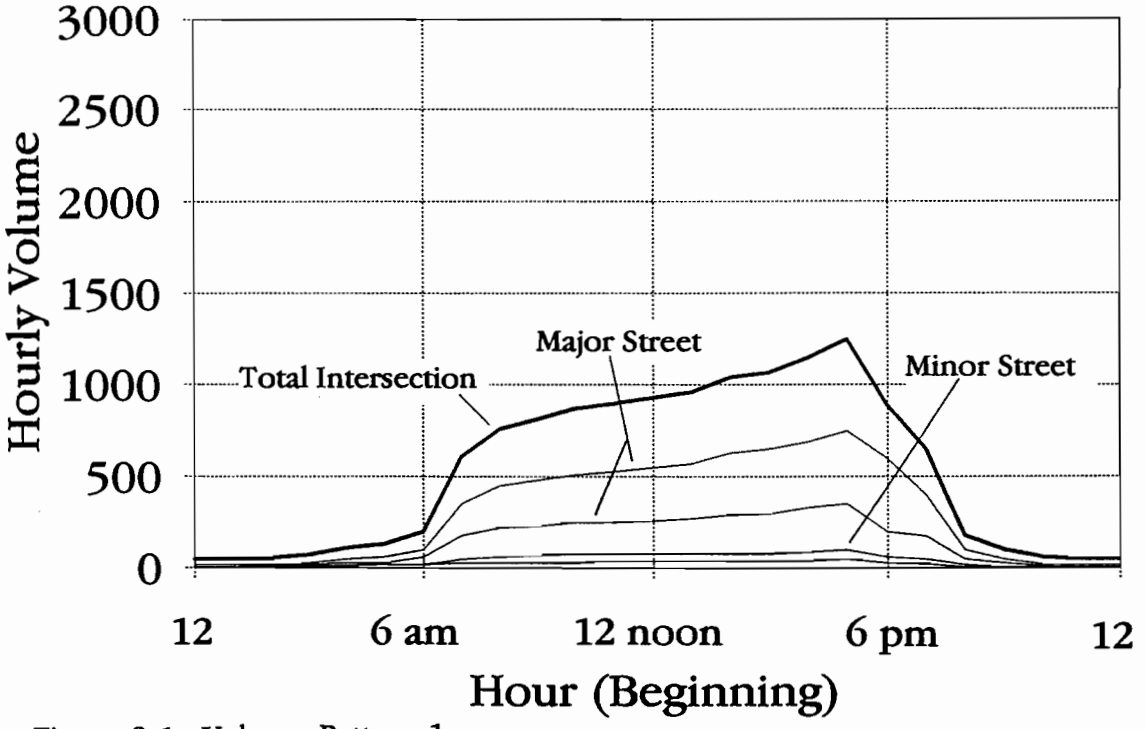


Figure 3.1 - Volume Pattern 1

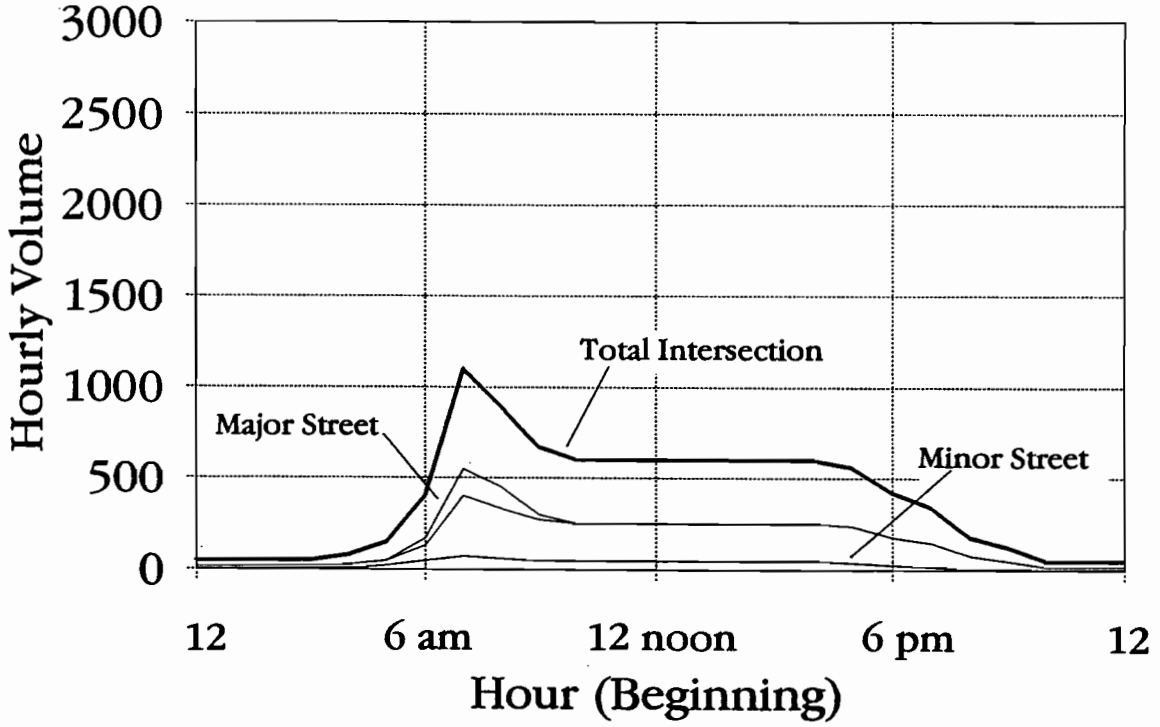


Figure 3.2 - Volume Pattern 2

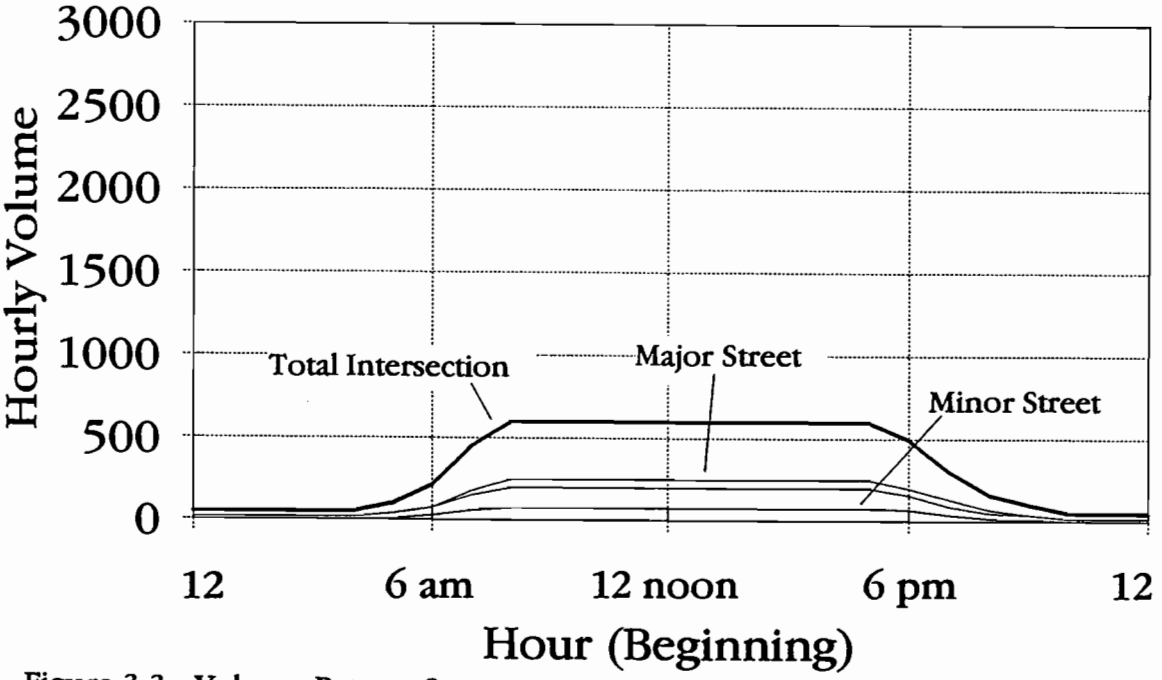


Figure 3.3 - Volume Pattern 3

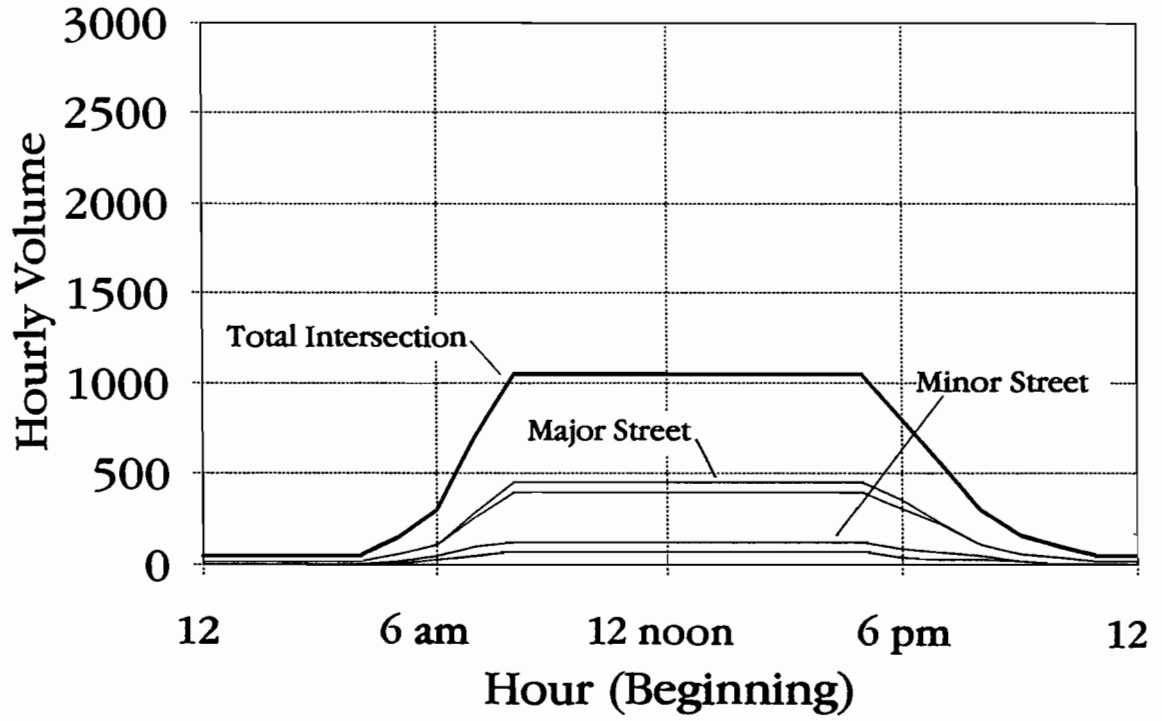


Figure 3.4 - Volume Pattern 4

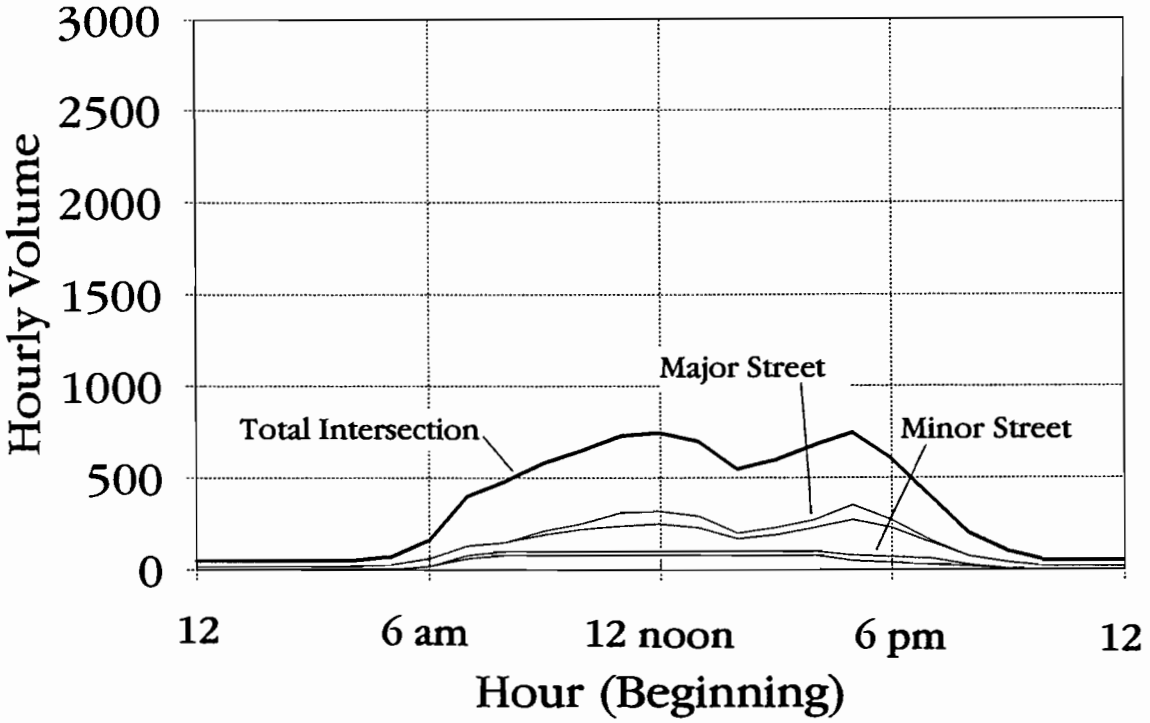


Figure 3.5 - Volume Pattern 5

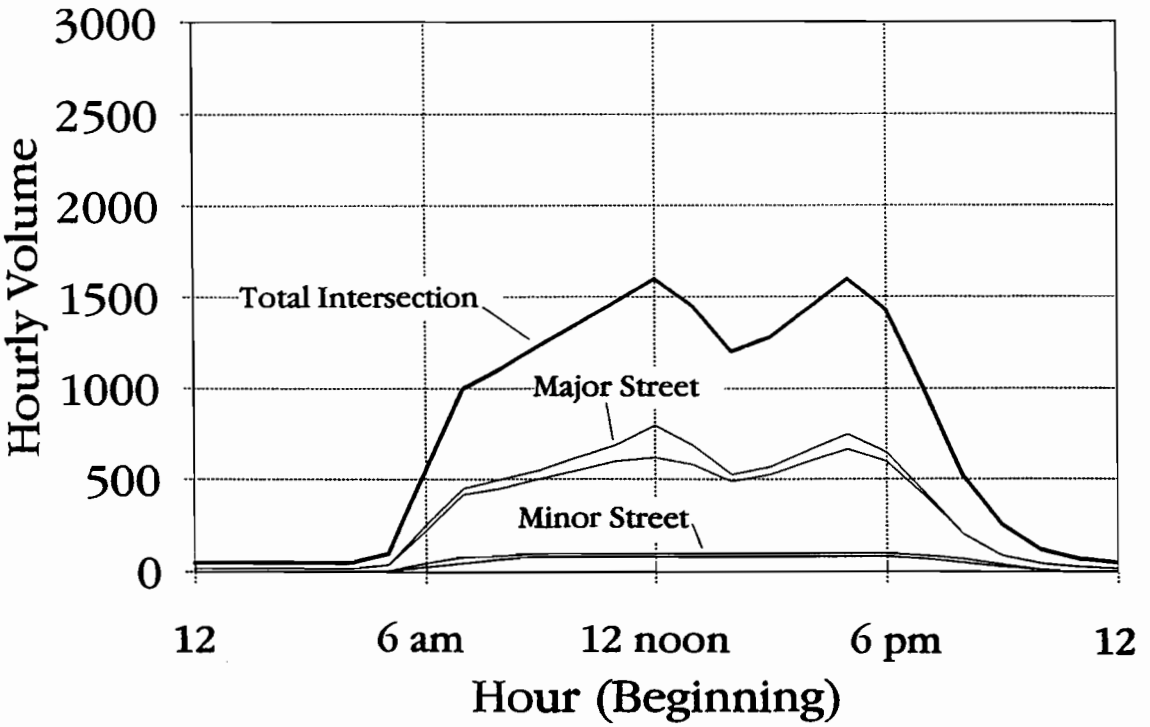


Figure 3.6 - Volume Pattern 6

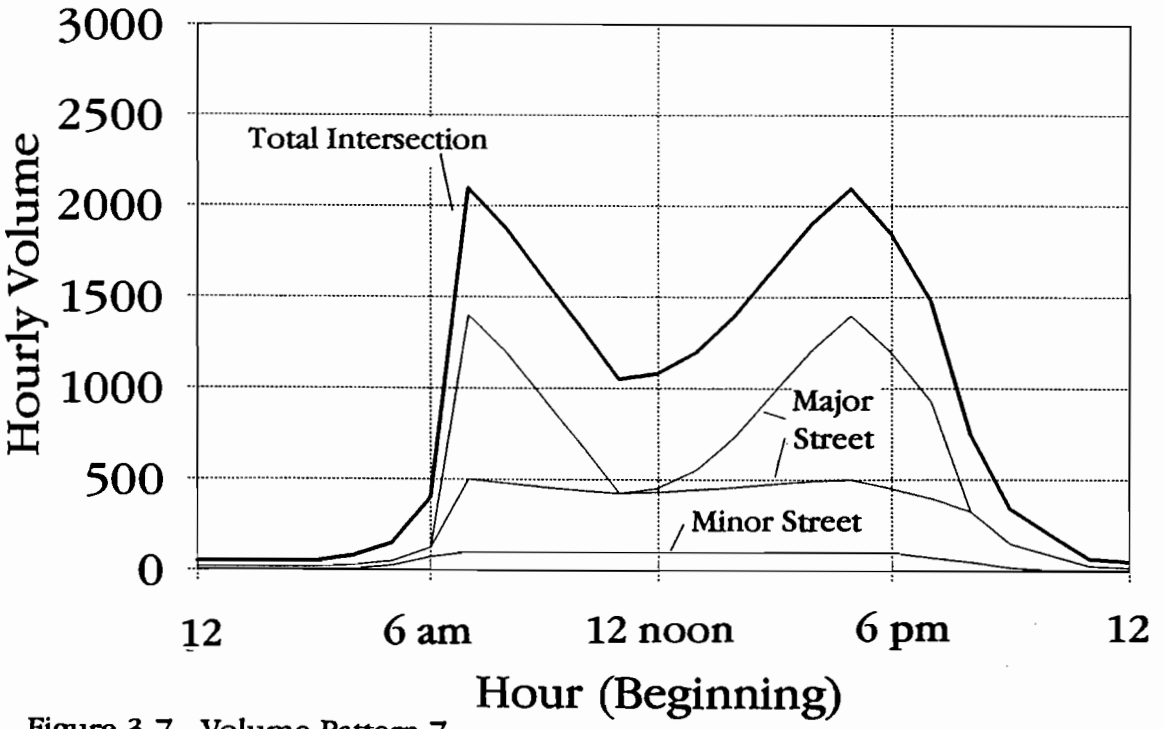


Figure 3.7 - Volume Pattern 7

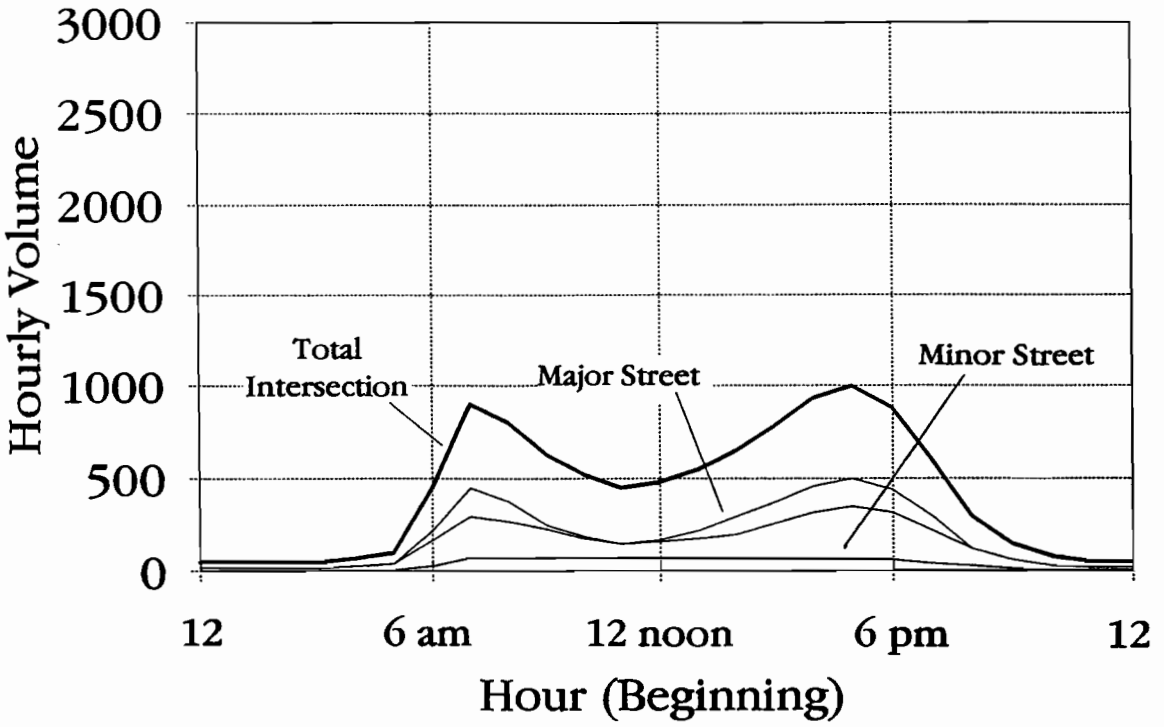


Figure 3.8 - Volume Pattern 8

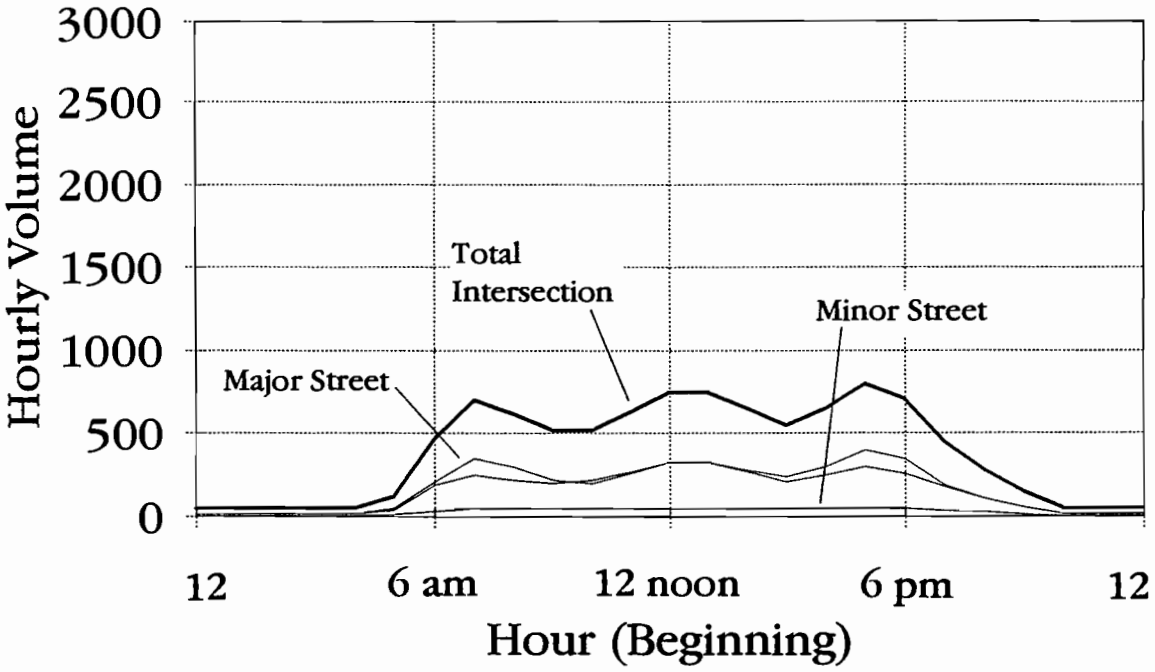


Figure 3.9 - Volume Pattern 9

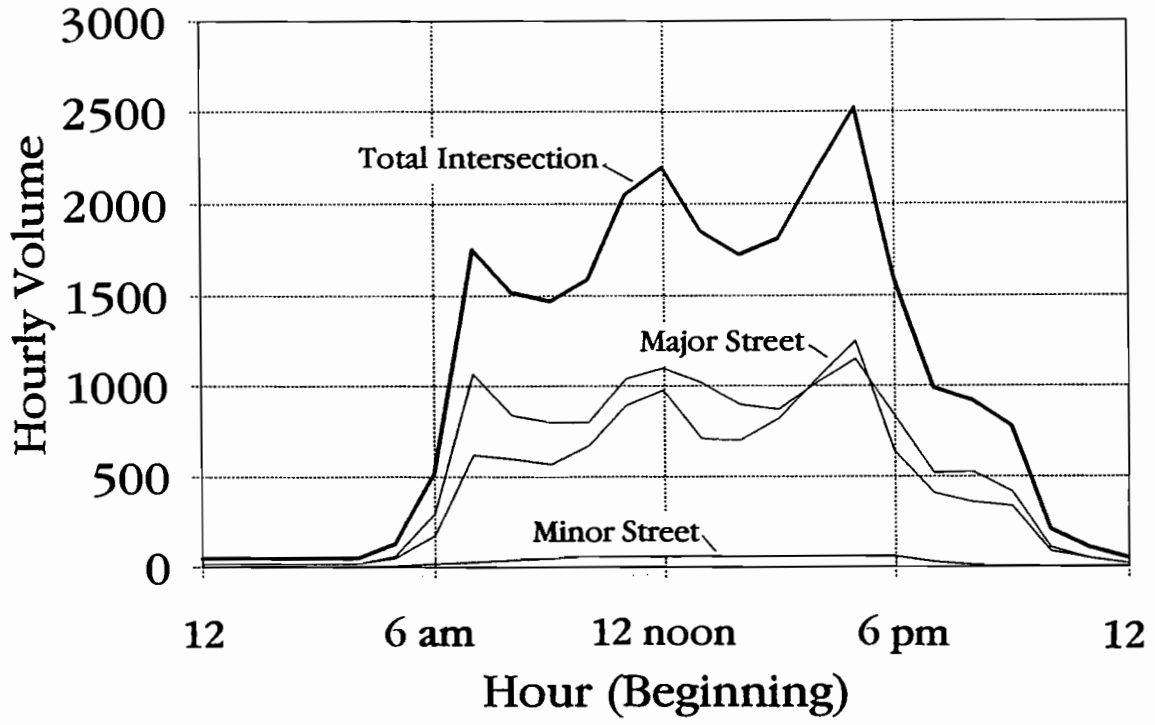


Figure 3.10 - Volume Pattern 10

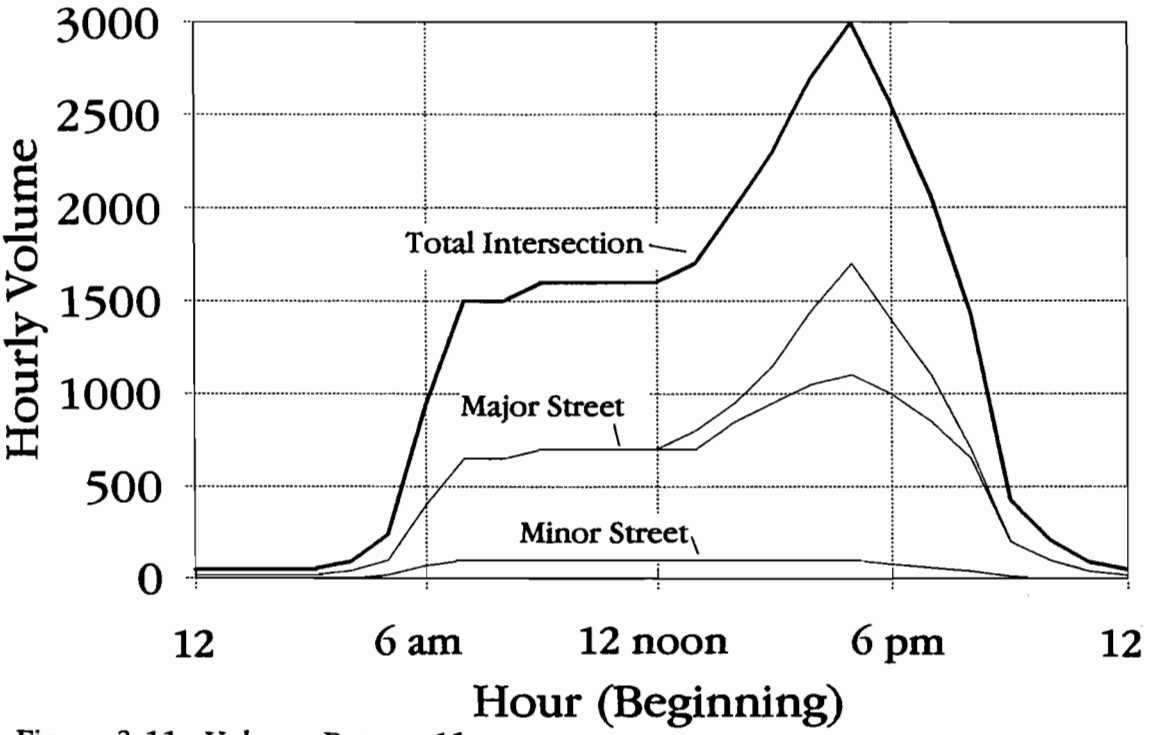


Figure 3.11 - Volume Pattern 11

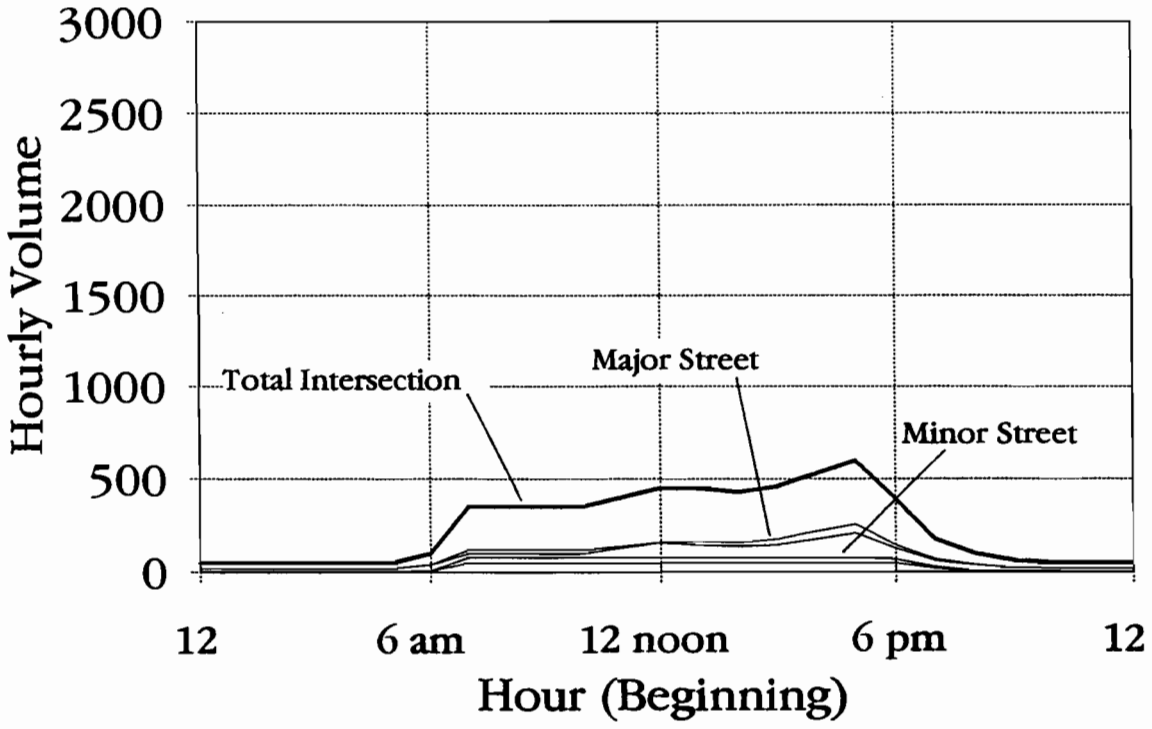


Figure 3.12 - Volume Pattern 12

afternoon peaks. The peaks are 750 veh/hour in Volume Pattern 5, and 1600 veh/hour in Volume Pattern 6.

Volume Patterns 7 and 8 also show two peaks of about the same size, but in the morning and the afternoon. Traffic at noon is about half that of the peaks. The peaks in Volume Pattern 7 (just over 2000 veh/hour) are roughly twice those in Volume Pattern 8 (between 900 and 1000 veh/hour).

Three peaks are shown in Volume Patterns 9 and 10. In both cases, the noon peak is slightly higher than the morning peak, and the afternoon peak is slightly higher than the noon peak. The afternoon peak in Volume Pattern 9 is 800 veh/hour and is about one-third the afternoon peak in Volume Pattern 10 (about 2500 veh/hour).

A thorough evaluation requires an hour-by-hour simulation of each volume pattern. The hourly volumes from each of the twelve volume patterns were concatenated, and the duplicated hourly volumes were eliminated, resulting in 172 one-hour volumes to be evaluated. Hourly volume conditions were considered the same when each of the four approach flows in one volume condition matched their respective approach flows in another volume condition. A complete list of the 172 volume conditions is given in the appendix in table A.13. Each hourly volume of the twelve volume patterns is identified by its volume condition (tables A.1 through A.12). Thus, simulation results for each of the twelve volume patterns could be calculated by summing the results from the specific hourly volume conditions that made up each pattern.

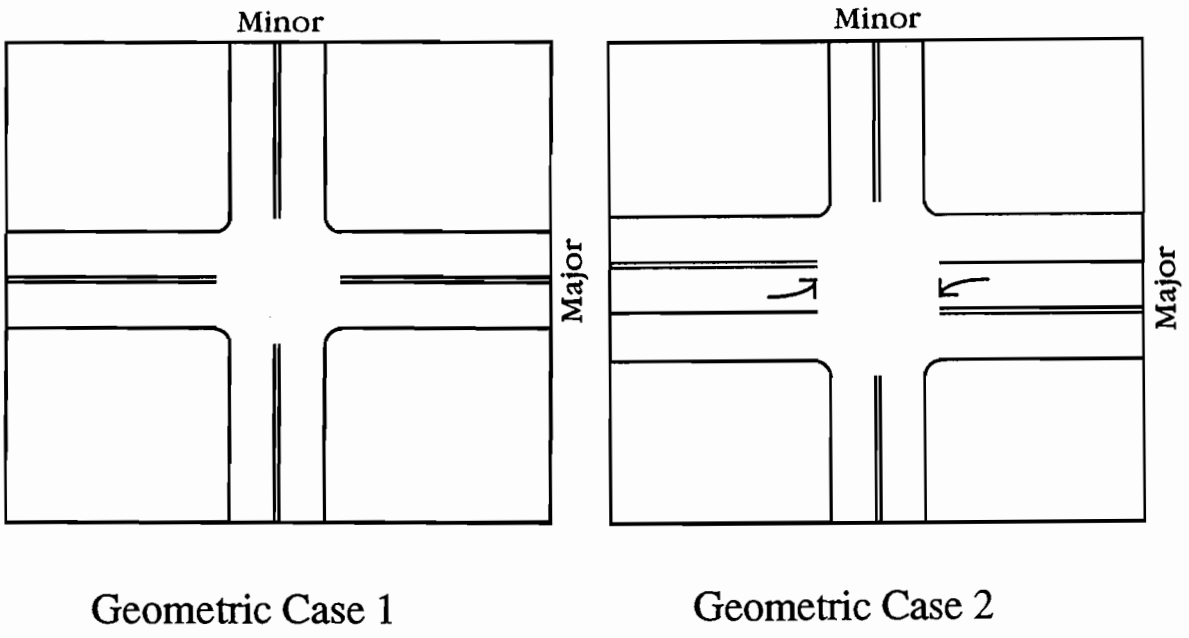
An additional factor is needed, however. The number of lanes on each approach is a crucial factor when evaluating intersection operation as well as a direct input when performing a warrant study. For example, under the same volume conditions, a two-lane approach will yield larger gaps between vehicles than a one-lane approach, thus increasing the capacity of any cross street. In addition, left-turn bays can increase the approach capacity by removing left-turning vehicles from the through lanes. Although the presence of left-turn lanes is not evaluated in a warrant analysis, their effect on delays can be significant. Therefore,

each one-hour volume condition was evaluated for eight geometric cases: one and two lanes on the major street approaches, one and two lanes on the minor street approaches, and presence or absence of a left-turn bay on the major street approaches. The eight geometric cases are defined in table 3.1 and shown schematically in figure 3.13.

Finally, three traffic control schemes were evaluated: two-way stop, all-way stop, and full-actuated traffic signal. These represent the most commonly used traffic control at intersections which are marginally warranted. Based on the intersections submitted by the districts, there were relatively few all-way stops and fixed-time traffic signals. All-way stops will always result in greater delay than two-way stops, particularly at low volume intersections, and were not often used on the state system. However, they are widely used in some cities at minor intersections. Also, all-way stops are often proposed as an alternative to a traffic signal, and a

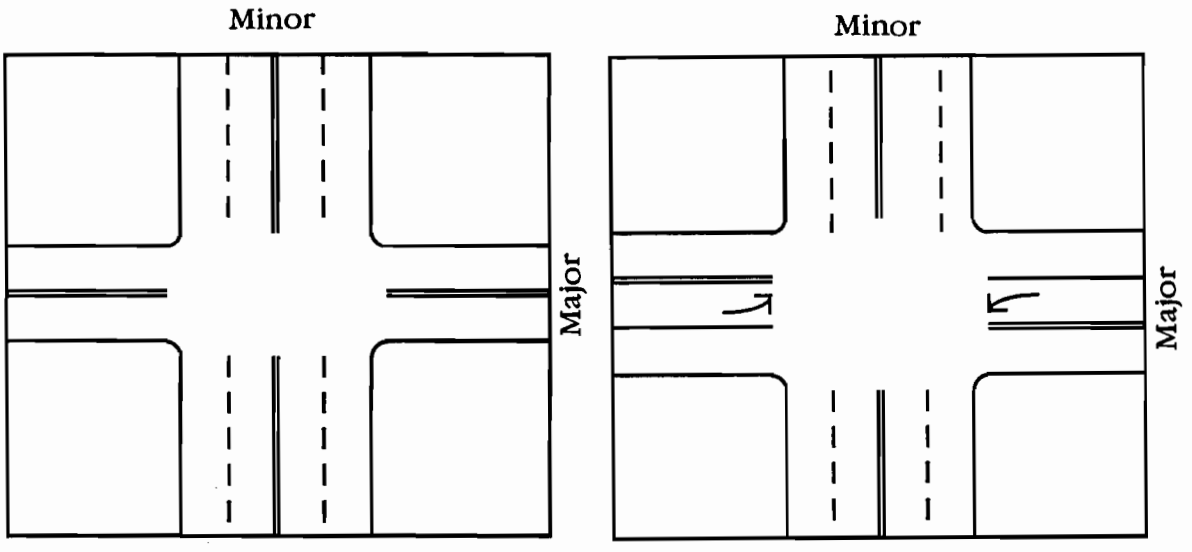
Table 3.1. Intersection Geometric Cases for the Simulation Study.

Geometric Case	No. of Lanes per Approach		Left-Turn Bay?
	Major Street	Minor Street	
1	1	1	No
2	1	1	Yes
3	1	2	No
4	1	2	Yes
5	2	1	No
6	2	1	Yes
7	2	2	No
8	2	2	Yes



Geometric Case 1

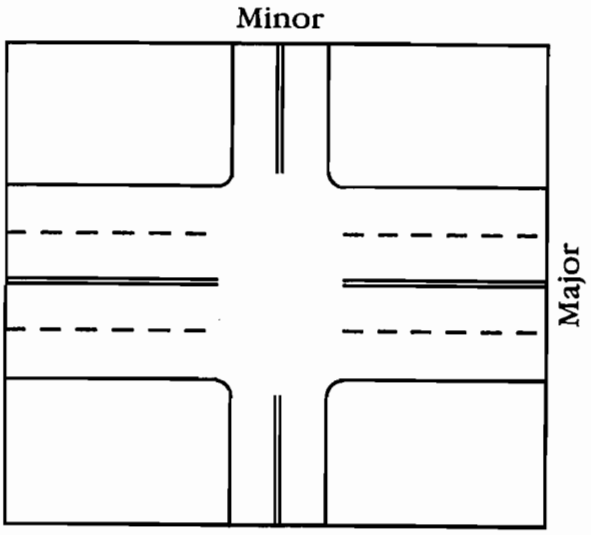
Geometric Case 2



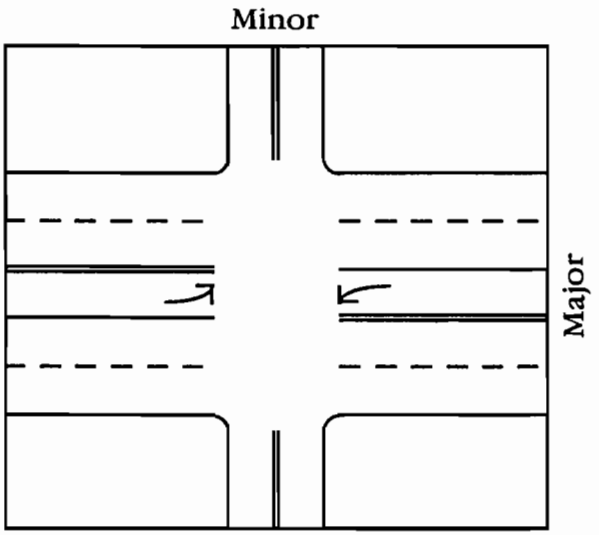
Geometric Case 3

Geometric Case 4

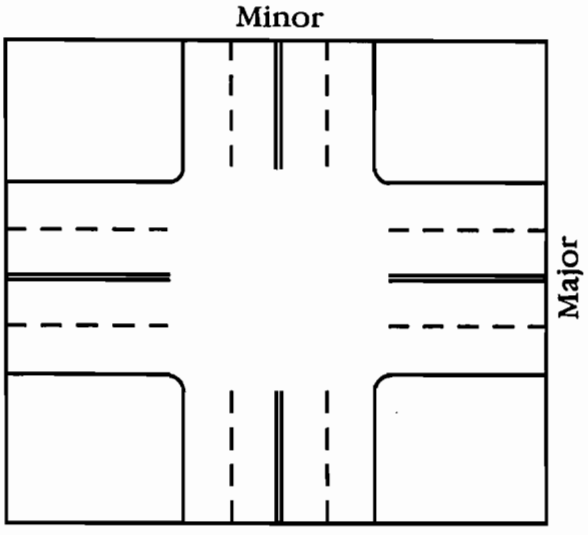
Figure 3.13 - Intersection diagrams for Geometric Cases 1 through 8, showing the number of lanes on each intersection approach.



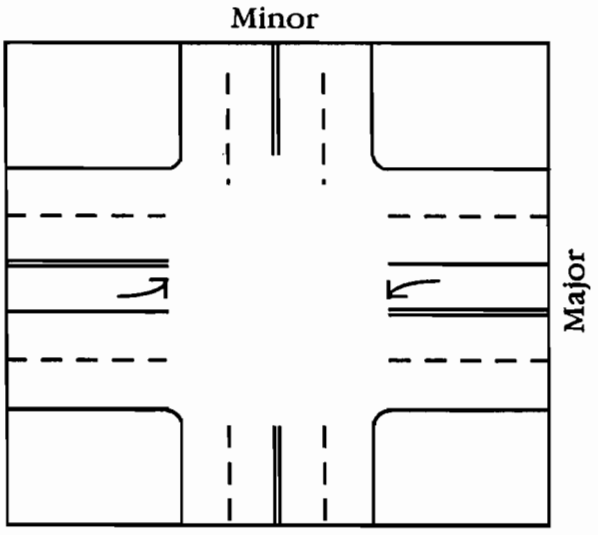
Geometric Case 5



Geometric Case 6



Geometric Case 7



Geometric Case 8

Figure 3.13 - Concluded

quantitative evaluation may assist traffic engineers in responding to requests for all-way stops.

The marginally-warranted intersections submitted by the districts tended to be isolated (with respect to nearby signalized intersections), leading to the general use of actuated signals. At low volumes, isolated intersections will experience higher delays if fixed-time operation is used. Often, traffic signals are operated as fixed-time (or semi-actuated) if they are interconnected and provision is then made for continuous flow through two or more signals. In these cases, an intersection can not be evaluated individually, but as part of the system. The simulations performed as part of this study considered only isolated intersections.

The stop signs were placed on the minor street approaches in the two-way stop cases, and on all four approaches in the all-way stop cases. Two-phase operation was used for the actuated signals in simulation, i.e., there were no protected left-turns. While some of the submitted intersections provided for left-turn protection, the additional phases greatly increase the delay, and are typically not needed at these relatively low volume intersections. A minimum green of 5 seconds with a 3-second extension and a maximum green of 30 seconds were used for both the major and minor street phases. The major street was placed on minimum recall so that the traffic signal would dwell on the major street, but would only have to time out the minimum green if a call came on the minor street immediately after the major street green was recalled.

The major street speed limit was set at 64 km/h (40 mph), and the minor street speed limit at 48 km/h (30 mph). The following detectors were placed in the intersection: 1.8×9.1 m (6×30-foot) presence detectors at the stop line on the minor street approaches; 1.8×6.1 m (6×20-foot) presence detectors at the stop line on the major street approaches (including the left-turn bay, when used); and 1.8×1.8 m (6×6-foot) pulse detectors 54.9 m (180 feet) before the stop line on the major street approaches. These timings and detector locations represent a fairly typical installation based on the intersections submitted by the districts with

actuated traffic signals. The same detector placement and signal timings were used for all volume conditions in the simulation.

Because the TEXAS Model for Intersection Traffic is a stochastic model, a single run for each condition would not be representative of average conditions. Therefore, for each condition, ten replications were made and the results averaged. When running replications, only the random number seed used when starting the simulation was changed from run to run.

The total number of simulation runs made was: (172 volume conditions) × (8 geometric cases) × (3 traffic control schemes) × (10 replications) or 41,280 simulation runs.

3.2. Simulation Results.

Total delay, stopped delay, and the number of stops were summed for each of the twelve volume patterns and each of the eight geometric cases from the results of the simulation of the 172 volume conditions. The results are shown for each volume pattern/geometric case combination in the appendix in tables A.14 through A.109, each table representing a single combination and appearing on a single page. Total delay summaries are shown at the top of each page, stopped delay in the center, and the number of stops at the bottom. Totals of each measure of effectiveness (MOE), representing values summed over a 24-hour period, are shown for each control type (two-way stop, all-way stop, or traffic signal) and for each intersection approach individually as well as the intersection as whole. Approaches (legs) 1 and 3 represent the minor street, and approaches 2 and 4, the major street. In this way, the effect of changing the type of intersection control can be easily seen for each volume pattern/geometric case combination.

Comparisons between the three intersection controls are also shown in each table for each of the MOEs. The three intersection controls result in three comparisons:

1. Two-Way Stop vs. All-Way Stop. These values represent percentage increases when two-way stop control is replaced by all-way stop control. A positive

value indicates an increase in delay or the number of stops when the control is converted to all-way. For example, in table A.14, total delay on approach 1 is reduced from 3.97 vehicle-hours to 2.77 vehicle-hours when all-way stops replace two-way stops, or a reduction of 30% (shown as negative in the table).

2. Two-Way Stop vs. Actuated Traffic Signal. These values represent percentage increases in delay or number of stops when actuated traffic signal control replaces two-way stop control. As before, a negative value indicates a reduction when the traffic signals are installed.

3. All-way Stop vs. Actuated Traffic Signal. These values indicate percentage increases when all-way stop is replaced by actuated traffic signals. Again, a negative entry represents a reduction in delay or the number of stops when traffic signals replace all-way stop control.

A hypothesis test, using a two-tailed *t*-test, was set up to examine each of the MOE comparisons, resulting in 4,320 hypothesis tests: 3 comparisons (two-way stop vs. all-way stop, two-way stop vs. traffic signal, all-way stop vs. traffic signal) × 5 (four intersection approaches plus the total intersection summary) × 3 MOEs × 8 geometric cases × 12 volume patterns. In each case, the null hypothesis was no change in the MOE (i.e., zero percent change). The variances for each MOE were not assumed to be equal, which allowed the computation of the *t* statistic using the sample variance for each mean, which resulted from the ten replications for each case (ref. 8). Virtually all changes shown in tables A.14 and A.109 were significant at the 95% level, those that were found to be not significant are marked and footnoted in the tables.

Replacing a two-way stop with an all-way stop decreased total delay on the minor approaches, but greatly increased delay on the major approaches (due to the higher volumes on the major approaches), resulting in an overall increase in total delay in each case. Similar results were found for stopped delay. For the most part, the number of stops showed no significant change for the minor approaches, but increases for the major approaches and the intersection as a whole were found for

all cases. Under higher volume conditions, the number of stops on the minor streets generally showed small increases.

When a traffic signal replaced a two-way stop, total delay and stopped delay tended to increase for both minor and major approaches. In many cases, however, total delay on the minor street approaches decreased, especially for the heavier volumes. In particular, these decreases were evident in volume patterns 7, 10, 11, and 12, especially the geometric cases with fewer lanes (which result in higher volumes per lane). These decreases, however, were small, and total delay for the entire intersection always increased with the addition of traffic signals. These characteristics (decreased delay for minor approaches under heavier volumes) were also evident for stopped delay, but were much less pronounced. With only two exceptions (volume pattern 11, geometric cases 1 and 2), adding a traffic signal resulted in small decreases in the number of stops on the minor street approaches, and, in all cases, increases on the major street approaches and for the intersection overall.

When an all-way stop was replaced by a traffic signal, the minor street approaches experienced an increase in total delay, while the major street approaches and the overall intersection total delay decreased. In a few cases (volume pattern 12, in particular), total delay decreased for all approaches. Similar results were found for stopped delay (increases on minor approaches and decreases on major approaches and the entire intersection), with one exception (volume pattern 12, geometric case 8), which showed decreased delay on all four approaches. The number of stops were reduced on all approaches for all cases when traffic signals replaced all-way stop control, except volume pattern 11, geometric case 1, which showed increased stops on the major approaches and the intersection as a whole. This increase, however, was only about one percent for the entire intersection.

The overall intersection totals for the three MOEs in tables A.14 through A.109 are summarized in table 3.2. These values represent 24-hour totals for each volume pattern/geometric case combination. The percent differences of the three

Table 3.2 - Intersection Totals for Each Volume Pattern/Geometric Case Combination

Volume Pattern 1

	Total Delay (veh-hrs)			Stopped Delay (veh-hrs)			Number of Stops		
Geometric Case	2-Way Stop	All-Way Stop	Traffic Signal	2-Way Stop	All-Way Stop	Traffic Signal	2-Way Stop	All-Way Stop	Traffic Signal
1	13.49	187.79	33.17	3.44	51.39	11.96	1,984	11,617	4,794
2	11.55	156.16	26.35	3.20	43.23	10.26	1,886	12,108	4,405
3	12.14	187.78	29.69	2.89	51.89	10.19	1,816	11,632	4,418
4	10.68	155.95	25.14	9.28	51.65	12.14	1,959	13,291	5,308
5	9.18	51.61	20.71	2.88	16.25	9.54	1,887	12,985	4,338
6	9.10	48.35	20.21	2.88	17.10	9.58	1,880	13,008	4,347
7	8.16	52.47	19.54	2.59	17.03	9.07	1,787	12,984	4,216
8	8.10	48.03	18.89	2.59	17.21	9.00	1,783	12,994	4,201

Volume Pattern 2

	Total Delay (veh-hrs)			Stopped Delay (veh-hrs)			Number of Stops		
Geometric Case	2-Way Stop	All-Way Stop	Traffic Signal	2-Way Stop	All-Way Stop	Traffic Signal	2-Way Stop	All-Way Stop	Traffic Signal
1	8.14	59.72	16.39	2.38	17.20	6.54	1,611	9,274	3,130
2	7.53	50.46	14.40	2.34	15.82	6.04	1,570	9,349	3,033
3	7.68	60.31	15.63	2.25	17.86	6.11	1,553	9,272	2,994
4	7.08	50.25	13.87	2.24	15.96	5.79	1,515	9,350	2,917
5	6.59	29.87	12.37	2.23	11.71	5.79	1,566	9,432	2,975
6	6.53	29.02	12.32	2.19	12.14	5.87	1,561	9,420	3,022
7	6.03	29.83	11.84	2.11	11.96	5.63	1,524	9,414	2,922
8	6.22	28.79	11.71	2.29	12.19	5.62	1,589	9,424	2,946

Volume Pattern 3

	Total Delay (veh-hrs)			Stopped Delay (veh-hrs)			Number of Stops		
Geometric Case	2-Way Stop	All-Way Stop	Traffic Signal	2-Way Stop	All-Way Stop	Traffic Signal	2-Way Stop	All-Way Stop	Traffic Signal
1	8.52	31.69	15.18	3.04	10.93	6.76	2,098	8,144	3,370
2	8.40	30.17	14.40	3.10	11.33	6.65	2,098	8,169	3,363
3	7.92	31.76	14.40	2.94	11.43	6.47	2,080	8,131	3,334
4	7.66	29.83	13.60	2.97	11.48	6.37	2,049	8,147	3,305
5	7.77	24.00	13.27	2.94	10.23	6.62	2,086	8,170	3,411
6	7.81	23.76	13.16	2.96	10.63	6.54	2,084	8,164	3,384
7	6.99	23.69	12.58	2.83	10.47	6.43	2,060	8,161	3,303
8	7.06	23.26	12.40	2.87	10.62	6.34	2,073	8,166	3,289

Table 3.2 - Continued

Volume Pattern 4

Geometric Case	Total Delay (veh-hrs) 2-Way Stop	All-Way Stop	Traffic Signal	Stopped Delay (veh-hrs) 2-Way Stop	All-Way Stop	Traffic Signal	Number of Stops 2-Way Stop	All-Way Stop	Traffic Signal
1	16.45	140.45	39.61	4.97	36.24	16.46	2,978	13,696	6,206
2	15.07	96.34	33.14	4.85	26.13	14.85	2,848	13,802	5,867
3	14.39	139.66	34.65	4.45	36.37	14.08	2,798	13,707	5,771
4	13.01	94.92	29.61	4.31	26.56	13.20	2,755	13,810	5,518
5	13.17	49.03	26.74	4.63	17.03	12.95	2,877	13,891	5,729
6	12.94	47.96	26.78	4.52	18.26	13.28	2,848	13,906	5,846
7	11.01	48.74	24.57	4.09	17.79	12.13	2,763	13,886	5,516
8	10.88	46.60	23.95	4.01	18.20	12.05	2,763	13,899	5,584

Volume Pattern 5

Geometric Case	Total Delay (veh-hrs) 2-Way Stop	All-Way Stop	Traffic Signal	Stopped Delay (veh-hrs) 2-Way Stop	All-Way Stop	Traffic Signal	Number of Stops 2-Way Stop	All-Way Stop	Traffic Signal
1	10.03	36.83	18.36	3.48	11.99	8.15	2,366	8,772	3,951
2	9.82	34.31	17.43	3.51	12.32	7.99	2,349	8,772	3,886
3	8.98	36.91	17.38	3.29	12.61	7.80	2,320	8,767	3,849
4	8.61	33.77	16.27	3.29	12.55	7.59	2,305	8,772	3,776
5	9.12	26.74	15.53	3.36	11.05	7.71	2,344	8,801	3,842
6	9.15	26.56	15.40	3.38	11.54	7.70	2,344	8,790	3,866
7	7.85	26.05	14.55	3.16	11.26	7.43	2,310	8,784	3,789
8	7.87	25.52	14.36	3.16	11.47	7.39	2,308	8,798	3,791

Volume Pattern 6

Geometric Case	Total Delay (veh-hrs) 2-Way Stop	All-Way Stop	Traffic Signal	Stopped Delay (veh-hrs) 2-Way Stop	All-Way Stop	Traffic Signal	Number of Stops 2-Way Stop	All-Way Stop	Traffic Signal
1	36.58	379.32	112.28	13.13	108.08	43.32	3,954	15,718	10,144
2	21.91	324.37	51.77	7.07	92.27	21.29	3,114	16,777	7,434
3	23.39	378.26	71.42	6.15	108.32	24.02	3,131	15,742	8,320
4	18.48	318.90	46.05	5.32	90.25	18.04	2,864	16,828	6,895
5	16.33	84.65	38.75	5.59	23.76	18.36	3,121	19,075	7,109
6	16.02	77.69	37.35	5.48	25.29	18.38	3,085	19,094	7,137
7	13.53	85.52	34.71	4.50	25.01	16.46	2,904	19,076	6,702
8	13.28	76.65	33.49	4.41	25.27	16.37	2,870	19,080	6,711

Table 3.2 - Continued

Volume Pattern 7

Geometric Case	Total Delay (veh-hrs) 2-Way Stop	Total Delay (veh-hrs) All-Way Stop	Total Delay (veh-hrs) Traffic Signal	Stopped Delay (veh-hrs) 2-Way Stop	Stopped Delay (veh-hrs) All-Way Stop	Stopped Delay (veh-hrs) Traffic Signal	Number of Stops 2-Way Stop	Number of Stops All-Way Stop	Number of Stops Traffic Signal
1	122.6	351.39	185.88	48.47	103.32	61.64	6,680	16,195	13,080
2	68.73	298.81	109.86	39.26	88.86	31.42	3,246	17,002	10,703
3	71.64	349.24	141.98	15.68	103.03	34.24	4,529	16,246	11,932
4	50.49	296.65	96.94	23.77	87.99	24.30	3,179	17,041	9,729
5	23.56	281.10	55.40	8.81	79.67	23.99	3,640	20,800	8,550
6	21.64	239.07	49.57	7.91	69.33	22.99	3,517	21,467	8,453
7	17.83	274.52	47.87	5.85	77.15	20.60	3,338	20,888	7,962
8	17.00	233.03	43.71	5.53	66.28	19.95	3,287	21,559	7,878

Volume Pattern 8

Geometric Case	Total Delay (veh-hrs) 2-Way Stop	Total Delay (veh-hrs) All-Way Stop	Total Delay (veh-hrs) Traffic Signal	Stopped Delay (veh-hrs) 2-Way Stop	Stopped Delay (veh-hrs) All-Way Stop	Stopped Delay (veh-hrs) Traffic Signal	Number of Stops 2-Way Stop	Number of Stops All-Way Stop	Number of Stops Traffic Signal
1	10.68	73.57	22.30	3.39	20.65	9.37	2,223	10,504	4,246
2	10.08	56.38	20.08	3.36	17.23	8.81	2,190	10,566	4,117
3	9.87	73.18	21.03	3.18	20.84	8.66	2,157	10,488	4,092
4	9.24	56.51	19.03	3.17	17.61	8.33	2,132	10,570	3,972
5	8.95	34.38	17.20	3.18	13.22	8.36	2,190	10,642	4,056
6	8.93	33.57	16.97	3.16	13.79	8.36	2,193	10,596	4,082
7	8.03	34.32	16.28	3.00	13.64	8.04	2,144	10,595	3,963
8	8.03	33.12	16.02	3.00	13.89	8.02	2,140	10,613	3,974

Volume Pattern 9

Geometric Case	Total Delay (veh-hrs) 2-Way Stop	Total Delay (veh-hrs) All-Way Stop	Total Delay (veh-hrs) Traffic Signal	Stopped Delay (veh-hrs) 2-Way Stop	Stopped Delay (veh-hrs) All-Way Stop	Stopped Delay (veh-hrs) Traffic Signal	Number of Stops 2-Way Stop	Number of Stops All-Way Stop	Number of Stops Traffic Signal
1	7.86	47.33	15.94	2.27	13.55	6.34	1,605	9,621	3,218
2	7.41	42.05	14.95	2.25	13.55	6.26	1,572	9,636	3,213
3	7.49	48.24	15.38	2.15	14.25	6.11	1,536	9,626	3,124
4	7.00	42.37	14.47	2.15	13.86	6.05	1,519	9,638	3,133
5	6.56	30.01	12.86	2.17	11.93	6.08	1,581	9,660	3,134
6	6.55	29.46	12.70	2.16	12.42	6.06	1,569	9,652	3,148
7	6.08	30.42	12.43	2.06	12.37	5.97	1,533	9,700	3,084
8	6.05	29.31	12.13	2.06	12.53	5.87	1,524	9,649	3,064

Table 3.2 - Concluded

Volume Pattern 10

Geometric Case	Total Delay (veh-hrs) 2-Way Stop	All-Way Stop	Traffic Signal	Stopped Delay (veh-hrs) 2-Way Stop	All-Way Stop	Traffic Signal	Number of Stops 2-Way Stop	All-Way Stop	Traffic Signal
1	202.3	489.68	288.95	81.51	141.23	109.32	9,186	16,164	14,110
2	42.93	463.68	104.77	16.24	133.47	39.97	2,454	17,468	8,056
3	101.5	487.62	208.54	22.45	140.26	52.12	5,625	16,235	12,940
4	33.11	460.23	81.31	8.37	131.10	21.03	2,023	17,534	7,476
5	20.08	347.79	58.49	6.00	88.57	24.18	2,544	24,661	7,308
6	17.30	239.46	43.03	4.88	62.35	18.52	2,370	25,521	6,751
7	15.48	333.14	43.39	3.55	81.98	16.33	2,084	24,828	6,473
8	14.29	224.51	38.27	3.21	56.29	15.65	1,955	25,656	6,254

Volume Pattern 11

Geometric Case	Total Delay (veh-hrs) 2-Way Stop	All-Way Stop	Traffic Signal	Stopped Delay (veh-hrs) 2-Way Stop	All-Way Stop	Traffic Signal	Number of Stops 2-Way Stop	All-Way Stop	Traffic Signal
1	251.7	542.69	357.67	121.10	165.17	144.11	10,245	17,400	17,581
2	70.74	525.68	173.86	37.98	159.52	68.34	3,395	18,634	13,088
3	150.7	541.23	244.33	46.94	164.87	67.25	8,207	17,426	15,916
4	67.90	521.62	129.25	28.68	157.01	34.14	3,170	18,826	11,836
5	52.31	392.88	151.46	29.44	108.19	67.61	4,077	26,480	12,258
6	35.84	318.99	69.46	17.96	91.75	33.24	3,886	27,348	10,182
7	24.93	379.80	82.80	8.83	101.20	31.05	3,586	26,648	10,394
8	21.66	299.57	57.83	7.34	82.04	25.46	3,379	27,572	9,434

Volume Pattern 12

Geometric Case	Total Delay (veh-hrs) 2-Way Stop	All-Way Stop	Traffic Signal	Stopped Delay (veh-hrs) 2-Way Stop	All-Way Stop	Traffic Signal	Number of Stops 2-Way Stop	All-Way Stop	Traffic Signal
1	6.34	19.81	10.00	2.36	7.75	4.56	1,720	5,917	2,548
2	6.30	19.23	9.74	2.38	8.00	4.54	1,723	5,938	2,538
3	5.85	19.70	9.55	2.30	8.01	4.41	1,707	5,914	2,508
4	5.73	18.84	9.18	2.31	8.05	4.35	1,707	5,916	2,490
5	6.00	16.52	9.10	2.31	7.48	4.49	1,716	5,920	2,543
6	6.03	16.51	9.07	2.33	7.68	4.50	1,717	5,918	2,541
7	5.37	16.20	8.55	2.24	7.60	4.32	1,704	5,939	2,494
8	5.42	16.03	8.51	2.27	7.71	4.32	1,709	5,921	2,498

MOEs for each of the three comparisons are averaged in table 3.3. First, percent differences for each volume pattern are averaged over all eight geometric cases and shown in table 3.3a. Next, average percent differences for each geometric case (averaged over all twelve volume patterns) are shown in table 3.3b. Average percent differences taken over all twelve volume patterns and eight geometric cases (96 combinations) are shown in table 3.3c.

When two-way stop control was replaced by all-way stop control, these studies showed that total delay increased by 586%, stopped delay by 551%, and the number of stops by 438%. When two-way stop control was replaced by actuated traffic signals, total delay increased by 109%, stopped delay by 165%, and the number of stops by 113%. When all-way stop control was replaced by actuated traffic signals, total delay decreased by 62%, stopped delay by 51%, and the number of stops by 57%.

Note that delay at intersections with actuated traffic signals is very sensitive to the detector locations and controller settings (particularly the minimum green and extension). These values reflect the detector locations and controller settings used in this study, which allowed for little wasted time as greens were terminated to serve the next phase.

Individual volume pattern/geometric case combinations show that, in all cases, total delay and stopped delay, when summed over all four approaches (table 3.2), is increased when two-way stop control is replaced by either all-way stop

Table 3.3c - Percent Differences, Averaged over all Volume Patterns and Geometric Cases

	2-Way vs. All-Way	2-Way vs. Traf. Sig.	All-Way vs. Traf. Sig.
Total Delay	586	109	-62
Stopped Delay	551	165	-51
Number of Stops	438	113	-57

Table 3.3a - Percent Differences, Averaged over All Geometric Cases for Each Volume Pattern

Volume Pattern	Total Delay			Stopped Delay			Number of Stops		
	2-Way vs. All-Way	2-Way vs. Traf. Sig.	All-Way vs. Traf. Sig.	2-Way vs. All-Way	2-Way vs. Traf. Sig.	All-Way vs. Traf. Sig.	2-Way vs. All-Way	2-Way vs. Traf. Sig.	All-Way vs. Traf. Sig.
1	910	134	-72	859	214	-61	573	140	-64
2	494	94	-66	536	163	-58	500	92	-68
3	250	75	-50	269	121	-40	292	61	-59
4	501	123	-59	445	204	-41	389	103	-58
5	245	81	-47	256	132	-35	277	65	-56
6	909	160	-68	850	245	-52	472	141	-57
7	776	111	-70	621	125	-66	416	156	-46
8	425	101	-59	413	167	-47	387	87	-62
9	439	101	-62	505	182	-53	521	102	-67
10	1154	141	-74	1150	224	-67	724	185	-55
11	729	128	-66	475	109	-56	455	182	-40
12	204	57	-48	237	92	-43	246	47	-57

Table 3.3b - Percent Differences, Averaged over all Volume Patterns for each Geometric Case

Geometric Case	Total Delay			Stopped Delay			Number of Stops		
	2-Way vs. All-Way	2-Way vs. Traf. Sig.	All-Way vs. Traf. Sig.	2-Way vs. All-Way	2-Way vs. Traf. Sig.	All-Way vs. Traf. Sig.	2-Way vs. All-Way	2-Way vs. Traf. Sig.	All-Way vs. Traf. Sig.
GC 1	492	97	-59	444	139	-46	298	91	-45
GC 2	612	103	-66	526	139	-56	421	132	-55
GC 3	632	110	-65	670	161	-60	343	105	-49
GC 4	708	106	-69	598	124	-62	453	135	-57
GC 5	508	113	-57	450	175	-42	465	111	-62
GC 6	475	99	-57	460	173	-46	484	109	-63
GC 7	677	127	-61	659	205	-50	510	113	-64
GC 8	586	117	-60	603	205	-50	527	113	-64

control or actuated traffic signals, with all-way stop control yielding much higher delays than actuated traffic signals. Each of these differences is significant at a 95% confidence level. Similar results were found for the number of stops, with one exception: volume pattern 11, geometric case 1 showed at one percent increase in the number of stops when actuated traffic signals replaced all-way stops. Each difference is significant at a 95% confidence level (including the exception noted above).

3.3. Summary of Findings.

In general, these results show that two-way stop control yields the best operating conditions in terms of delay and the number of stops, and that all-way stop control results in the worst operation, with actuated traffic signals falling between the two. Based on these results, a traffic signal should not be installed when traffic volumes only marginally warrant the signal. However, other factors should be considered, including safety, which is addressed in the next chapter.

CHAPTER 4

ACCIDENT STUDIES

Occasionally neighborhood groups or local officials petition the traffic engineer to install a signal at a non-warranted or a marginally warranted intersection. One of the common reasons for such requests is a high number of accidents or one or two severe accidents. In such cases, the traffic engineer must decide whether or not the accident experience at the site in question is abnormally high, and, if so, whether installation of a signal would effectively mitigate the problem.

It is considerably easier for engineers to defend their decision if the judgment is based on scientific principles and established guidelines which can be easily explained to the parties of interest. As such, a simple statistical procedure based on analysis of accident data is proposed to address the questions above. The procedure establishes normal and abnormal ranges of accidents for signalized versus unsignalized intersections. These ranges can then be used to assess whether the site in question is indeed exhibiting a statistically higher than normal accident experience and if accidents can be reduced by installation of a signal.

4.1. Data Collection.

The accident data were obtained from the Texas DOT Master Accident Listing for 68 intersections across the state. These sites have been identified as marginally warranted intersections by various TxDOT districts but are not necessarily signalized. A listing of these intersections is provided in table 2.1. As shown in table 2.1, several characteristics for each intersection were identified, including the population of the community where the intersection is located, the major street approach speed, the type of control and the MUTCD (Ref. 4) signal warrant numbers which were met at that intersection.

Several intersection attributes were considered in developing the guidelines. Key among them is the approach speed of the major approach to the intersection. The MUTCD classifies all intersections which have an approach with a speed higher than 64 km/h (40 mph) as high speed. A second consideration is whether the intersection is located in a rural (isolated community less than 10,000 in population) or an urban setting. These attributes allow the classification of intersection conditions into the six groups discussed below.

It should be noted that, due to the size of the database, incorporating specific approach speeds or geometric conditions in the analysis procedure was not possible. If separate normal/abnormal accident levels were to be established for each possible combination of speed and geometry, a much larger database would be required for establishing statistically significant accident ranges. Alternatively, the speed and geometric effects can be implicitly considered by categorizing the accidents into three groups by severity (fatality, injury, or property damage only) and four types (head-on, right angle, sideswipe, and rear-end). This is so since accident types and severity are generally correlated with the approach speed and geometric conditions.

4.2. Data Analysis.

As mentioned above, for analysis purposes, the data were classified into three groups by severity, as follows

1. Injuries (the number of persons injured per year at a given intersection),
2. Injury accidents (the number of accidents per year involving injuries), and
3. Property damage only (the number of accidents per year which did not involve any injuries).

A normal/abnormal range is identified for each of the above decision variables in cases where a significant difference in the numbers were observed between the two intersection treatments, i.e., signalized and unsignalized. Intersections with fatality accidents were so rare in the accident database studies

that no statistically significant conclusions could be reached using the fatality data. As such, when encountered, fatal accidents were also classified as injury accidents.

To capture the effects of approach speed and population characteristics, the intersections were further grouped into six categories according to the major street approach speed and population. An isolated community having a population of less than 10,000 was classified as rural. Otherwise, the intersection was classified as located in an urban area. The six categories were as follows:

1. Low-Speed Rural: Rural area (population < 10,000) with approach speed not exceeding 64 km/h (40 mph).
2. High-Speed Urban: Urban area (population > 10,000)with approach speed exceeding 64 km/h (40 mph).
3. High-Speed Rural: Rural area (population < 10,000) with approach speed exceeding 64 km/h (40 mph).
4. Low-Speed Urban: Urban area (population > 10,000) with approach speed not exceeding 64 km/h (40 mph).
5. Rural by Population: Includes all intersections in a rural setting (population < 10,000) regardless of the approach speed.
6. Rural by Definition: Includes, in accordance with the definition of rural conditions in the MUTCD, all intersections located within the built-up area of an isolated community with population less than 10,000 and/or approach speed exceeding 64 km/h (40 mph).

These classifications are used in tables 4.1 and 4.2 in analyses of accidents by severity and type, respectively. Table 4.1 shows the mean number of accidents per year for the signalized versus unsignalized intersections in each of the above six categories. The mean accident numbers were obtained using five-year accident data for each of the 68 marginally warranted intersections identified by the TxDOT district offices. In some cases, where an intersection had recently (less than five

Table 4.1 - Comparison of the Average Annual Number of Accidents by Severity for Signalized versus Unsignalized Marginally Warranted Intersections

Intersection Type	Number of Observations	Control Type	Injury Accidents					Number of Injuries				
			Mean	StD	df	t(calc)	t	Mean	StD	df	t(calc)	t
Low Speed Urban	5	Signal	2.56	1.26	8	1.64	1.86	4.44	2.50	8	1.07	1.86
	5	No Signal	1.48	0.77				2.96	1.82			
High Speed Urban	4	Signal	1.30	1.99	4	-0.29	2.13	2.98	3.45	4	0.25	2.13
	12	No Signal	1.61	1.45				2.51	2.40			
Low Speed Rural	5	Signal	0.68	0.30	16	-1.40	1.75	0.90	0.49	17	-2.13	1.74
	15	No Signal	1.01	0.75				1.84	1.48			
								No Signal > Signal				
High Speed Rural	6	Signal	2.45	1.93	6	1.22	1.94	3.40	2.06	9	0.79	1.83
	16	No Signal	1.43	1.12				2.61	2.18			
Rural by Population	11	Signal	1.65	1.66	13	0.79	1.77	2.26	1.98	18	0.04	1.73
	31	No Signal	1.23	0.97				2.23	1.89			
Rural by Definition	15	Signal	1.55	1.69	18	0.47	1.74	2.45	2.34	22	0.21	1.71
	43	No Signal	1.33	1.12				2.31	2.02			

Table 4.1 - Concluded

Intersection Type	Number of Observations	Control Type	Property Damage Only					Total Accidents				
			Mean	StD	df	t(calc)	t	Mean	StD	df	t(calc)	t
Low Speed Urban	5	Signal	4.00	1.82	8	2.13	1.86	6.48	2.82	8	2.06	1.86
	5	No Signal	1.60	1.74				3.08	2.39			
			Signal > No Signal					Signal > No Signal				
High Speed Urban	4	Signal	2.08	3.23	3	-0.10	2.35	3.33	5.12	3	-0.15	2.35
	12	No Signal	2.25	1.70				3.74	2.90			
Low Speed Rural	5	Signal	0.86	0.48	17	-2.91	1.74	1.54	0.50	17	-2.79	1.74
	15	No Signal	2.30	1.73				3.30	2.28			
			No Signal > Signal					No Signal > Signal				
High Speed Rural	6	Signal	2.95	3.58	5	1.06	2.02	5.37	5.36	5	1.20	2.02
	16	No Signal	1.38	0.89				2.69	1.84			
Rural by Population	11	Signal	2.00	2.77	12	0.21	1.78	3.63	4.30	12	0.48	1.78
	31	No Signal	1.82	1.42				2.98	2.05			
Rural by Definition	15	Signal	2.02	2.78	16	0.11	1.75	3.55	4.34	16	0.30	1.75
	43	No Signal	1.94	1.49				3.20	2.31			

Table 4.2 - Comparison of the Average Annual Number of Accidents by Type for Signalized versus Unsignalized Marginally Warranted Intersections

Intersection Type	Number of Observations	Control Type	Right Angles					Rear Ends				
			Mean	StD	df	t(calc)	t	Mean	StD	df	t(calc)	t
Low Speed Urban	5	Signal	2.10	0.67	8	1.27	1.86	2.86	1.69	8	2.33	1.86
	5	No Signal	1.44	0.95				0.84	0.95			
								Signal > No Signal				
High Speed Urban	4	Signal	1.90	3.05	3	0.05	2.35	0.60	0.77	9	-1.36	1.83
	12	No Signal	1.82	1.57				1.34	1.33			
Low Speed Rural	5	Signal	0.50	0.32	17	-3.54	1.74	0.72	0.23	17	-0.14	1.74
	15	No Signal	1.65	1.13				0.75	0.72			
			No Signal > Signal									
High Speed Rural	6	Signal	2.23	2.22	6	1.00	1.94	1.87	2.59	5	0.86	2.02
	16	No Signal	1.28	1.15				0.94	0.88			
Rural by Population	11	Signal	1.45	1.82	13	-0.02	1.77	1.35	1.93	11	0.83	1.80
	31	No Signal	1.46	1.14				0.85	0.80			
Rural by Definition	15	Signal	1.57	2.10	17	0.02	1.74	1.15	1.70	17	0.34	1.74
	43	No Signal	1.56	1.26				0.99	0.99			

Table 4.2 - Concluded

Intersection Type	Number of Observations	Control Type	Side Swipes					Head-On				
			Mean	StD	df	t(calc)	t	Mean	StD	df	t(calc)	t
Low Speed Urban	5	Signal	0.20	0.14	8	1.51	1.86	1.08	0.54	8	1.58	1.86
	5	No Signal	0.08	0.11				0.56	0.50			
High Speed Urban	4	Signal	0.10	0.20	4	0.56	2.13	0.58	0.96	3	0.45	2.35
	12	No Signal	0.04	0.14				0.36	0.33			
Low Speed Rural	5	Signal	0.04	0.09	9	-0.39	1.83	0.28	0.30	16	-1.34	1.75
	15	No Signal	0.06	0.12				0.59	0.73			
High Speed Rural	6	Signal	0.10	0.11	6	1.45	1.94	0.80	0.81	5	1.5	2.02
	16	No Signal	0.03	0.07				0.29	0.30			
Rural by Population	11	Signal	0.07	0.10	18	0.57	1.73	0.56	0.66	16	0.54	1.75
	31	No Signal	0.05	0.10				0.44	0.56			
Rural by Definition	15	Signal	0.08	0.13	21	1.07	1.72	0.57	0.71	19	0.80	1.73
	43	No Signal	0.04	0.11				0.41	0.51			

years) undergone changes in its control, accident numbers for the number of years corresponding to each existing intersection control were used. In either case, the total number of accidents was divided by the number of intersection-years to obtain the mean accident numbers per year per intersection reported in tables 4.1 and 4.2.

4.3. Results and Discussion.

Examining table 4.1, it can be seen, for Low-Speed Urban areas (group 1), the number of property damage only accidents per year is significantly more for signalized intersections (4.0 accidents/year) as compared to unsignalized intersections (1.6 accidents/year). Similar statistically significant results are obtained for the total number of accidents for the Low-Speed Urban case.

Cases where statistically significant differences in the number of accidents were found are summarized in table 4.3 for accident severity and in table 4.4 for

Table 4.3 - Cases Where the Number of Accidents by Severity Are Significantly Different at Signalized versus Unsignalized Marginally Warranted Intersections

Intersection Type	Injury Accidents	Number of Injuries	Property Damage Only	Total Accidents
Low Speed Urban			Signal > No Signal	Signal > No Signal
High Speed Urban				
Low Speed Rural		No Signal > Signal	No Signal > Signal	No Signal > Signal
High Speed Rural				
Rural by Population				
Rural by Definition				

accident type. In terms of accident severity, as mentioned earlier, the signalized intersections showed significantly higher accident numbers in the Low-Speed Urban category. This observation is valid for both the number of property damage only accidents and the total number of accidents. However, a significantly lower number of accidents was observed at signalized intersections at Low-Speed Rural sites. This indicates that, solely based on accident severity, marginally warranted intersections with high accident experience in Low-Speed Rural areas should be considered for signalization. However, such intersections should perhaps remain unsignalized in Low-Speed Urban situations, where unsignalized intersections appear to have a significantly lower number of accidents by severity.

Table 4.4 summarizes the conditions under which significant differences in the number of accidents by type were observed between the signalized and unsignalized intersections. As shown, in Low-Speed Rural conditions, signalized

Table 4.4 - Cases Where the Number of Accidents by Type Are Significantly Different at Signalized versus Unsignalized Marginally Warranted Intersections

Intersection Type	Right Angles	Rear Ends	Side Swipes	Head On
Low Speed Urban		Signal > No Signal		
High Speed Urban				
Low Speed Rural	No Signal > Signal			
High Speed Rural				
Rural by Population				
Rural by Definition				

intersections have a significantly lower number of right-angle accidents. It can therefore be argued that under such conditions (Low Speed Rural), marginally warranted unsignalized intersections which experience a high number of right-angle accidents may be made safer if signalized. However, an opposite conclusion can be reached under Low-Speed Urban conditions, where rear-end accidents are considerably higher for signalized intersections. For all other cases and accident types, no significant differences in accident numbers for signalized versus unsignalized intersections were observed.

In cases where significant differences in the number of accidents of different types and severity were observed (tables 4.3 and 4.4), threshold accident values can be established to determine the accident numbers which can be considered "abnormally" high for a given set of conditions. Using the 85^{th}-percentile criterion, as is common in most traffic engineering studies, confidence interval bands were established for cases indicated as significant in tables 4.3 and 4.4. The results are summarized in figure 4.1 for cases where signalization improves safety and figure 4.2 for cases where signalization could increase the number of accidents. The upper and lower boundaries of the confidence bands in figures 4.1 and 4.2 correspond to about one standard deviation above and below the mean, i.e., the 85^{th}- and 15^{th}-percentile values, respectively.

Figure 4.1 confirms that at low speed intersections (approach speed $\leq$ 64 km/h, or 40 mph) in rural areas, the number of injuries, property-damage-only accidents, and total accidents per year are all significantly lower at signalized intersections. Figure 4.1 further establishes the expected range for each accident category for signalized and unsignalized intersections. For example, if a marginally warranted unsignalized intersection at a rural low speed site experiences on the average more than 1.4 injuries per year, the number of injuries are likely to be reduced through signalization. The corresponding threshold values for property-damage-only accidents and the total number of accidents are 1.3 and 2.0 accidents per year, respectively.

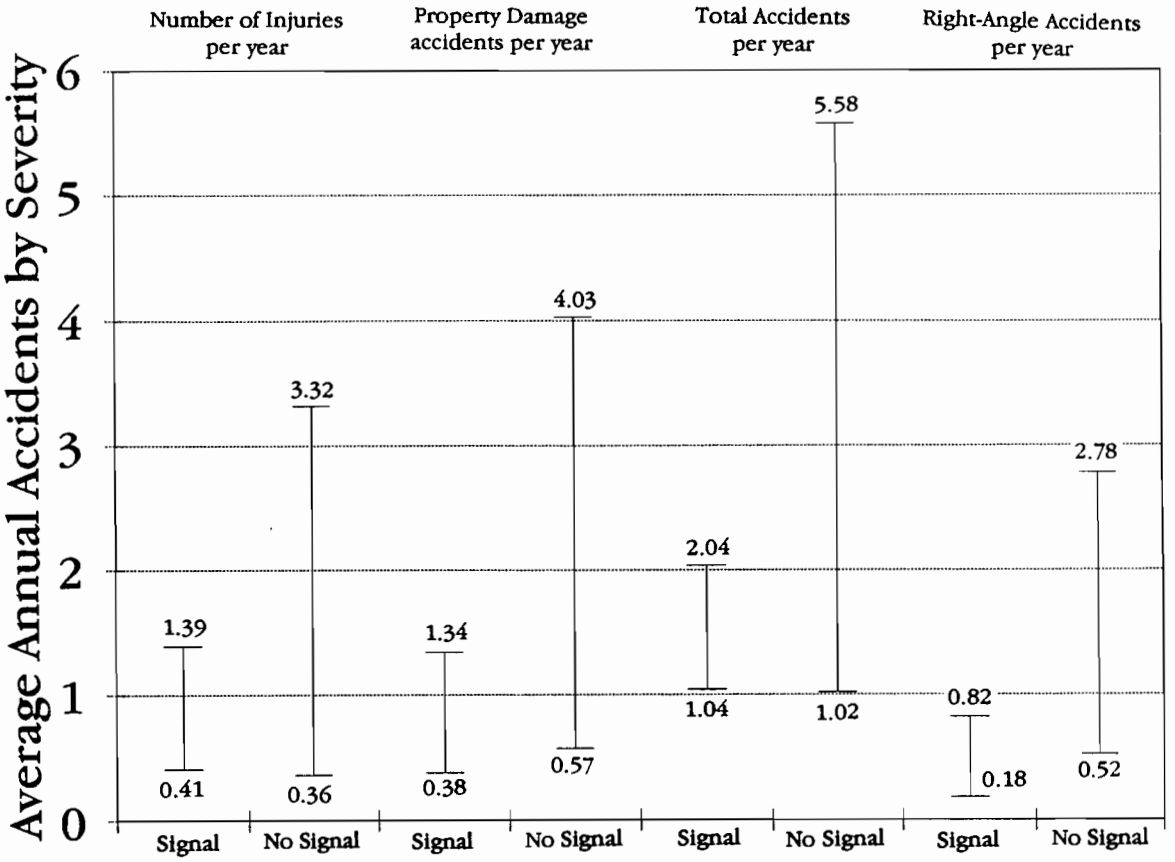


Figure 4.1 - Cases where signalized intersections had significantly fewer accidents: intersections in low-speed rural areas. The lower and upper bounds correspond to the 15% and 85% values, respectively.

It should be noted that Low Speed Rural conditions are the only case where signalization shows a potential for lowering the number of accidents. Figure 4.2, on the other hand, highlights the conditions under which signalization could result in a higher number of accidents. This is the case only for the Low Speed Urban conditions, where signalization could result in higher property damage accidents, particularly of the rear-end type. In the Low Speed Urban case, for example, a range of 0 to 3.3 property damage accidents can be considered to be typical for an

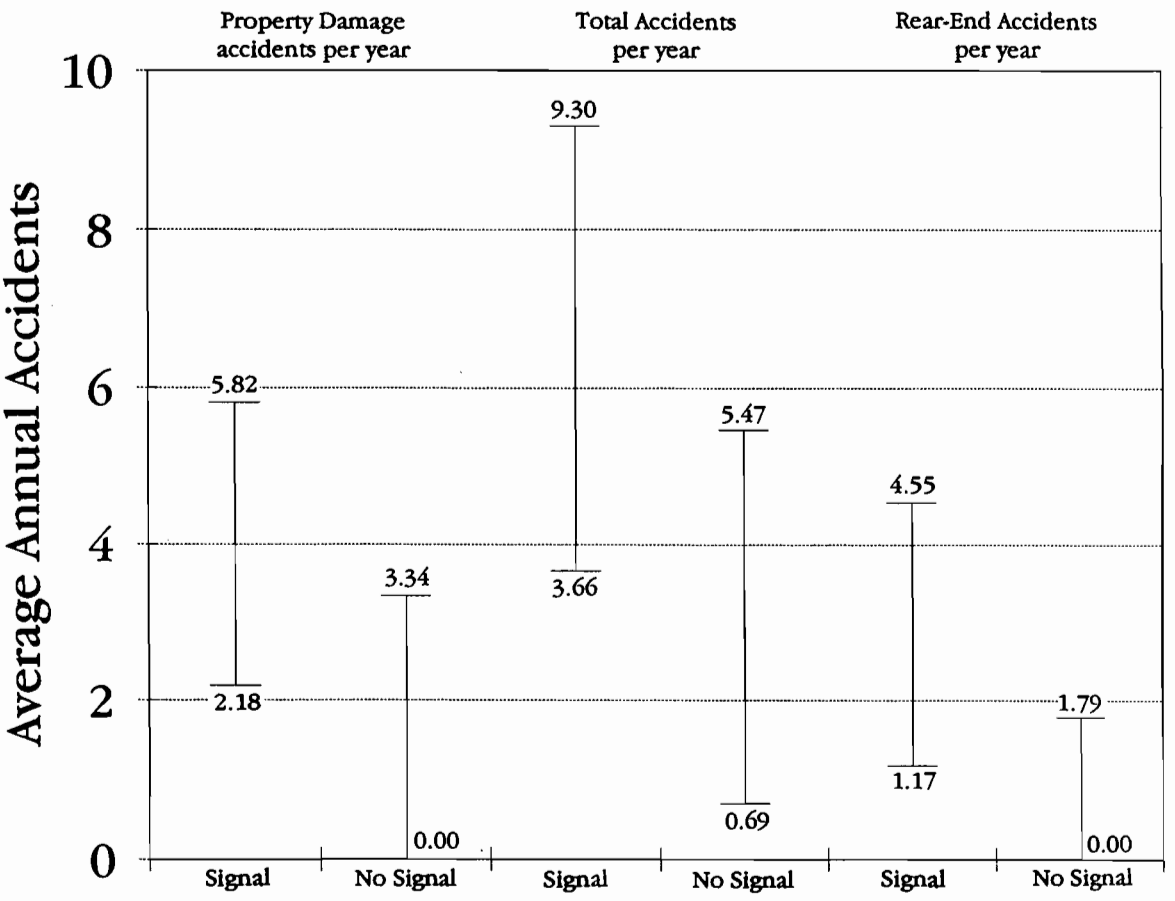


Figure 4.2 - Cases where signalized intersections had significantly higher accidents: intersections in low-speed urban areas. The lower and upper bounds correspond to the 15% and 85% values, respectively.

unsignalized intersection; and signalizing the intersection could result in a higher number of property damage accidents (2.2 to 5.8 accidents per year).

In summary, figures 4.1 and 4.2 highlight conditions for which signalization could improve intersection safety as well as conditions where this is likely not to be the case. In addition, accident threshold values are established to determine what number of accidents per year is excessively high or within the expected range for a given set of intersection conditions. These findings along with the analysis of the operational efficiency of marginally warranted intersections are summarized in

chapter 5. The summary is in the form of guidelines to assess whether or not signalizing a marginally warranted unsignalized intersection could improve the safety and/or operational efficiency of the intersection.

CHAPTER 5

SUMMARY OF RESULTS

Field and simulation studies have been conducted to determine conditions under which installation of a signal at a marginally warranted intersection may be recommended. The impact of signalization on both the intersection safety and efficiency have been considered. The safety analysis was based on accident studies at 68 marginally warranted intersections across Texas. The evaluation of intersection efficiency was based on 41,280 TEXAS Model simulation runs for 12 generic 24-hour volume patterns (based on volume patterns at 72 intersections statewide) under various geometric and intersection control conditions.

As expected, the simulation studies indicated that, for every case, signalization resulted in statistically higher total and stopped delays and number of stops for the overall intersection. On average, addition of actuated traffic signals more than doubled the delays and the number of stops. The use of all-way stops resulted in more than a six-fold increase in total and stopped delays, and more than a five-fold increase in the number of stops. Again, this increase was statistically significant for the overall intersection in every case. If actuated traffic signals replace all-way stops, the delay and number of stops were halved. This difference was also statistically significant in all cases. (Note: The relative safety aspects of all-way stops were not examined due to the small number of all-way stop controlled intersections.)

The simulation results show beyond a doubt that signalizing a marginally warranted intersection, whether in an urban or rural area, will not improve the intersection efficiency. Therefore, if delay and the fraction of vehicles stopped were the only factors to be considered, a traffic signal should not be installed when the signal is only marginally warranted. As discussed below, safety is the only other

major criterion based on which signalizing a marginally warranted intersection may be called for.

Safety studies considered frequency of accidents by severity and accident type. The 68 marginally warranted intersections studied were classified into six groups, namely, Low-Speed Rural, Low-Speed Urban, High-Speed Rural, High-Speed Urban, Rural by Population, and Rural by (MUTCD) Definition. The accident types considered were right-angle collisions, rear-end collisions, sideswipes, and head-on accidents. Accidents were also classified by severity in terms of whether they involved an injury (or fatality) or not.

Five years of accident data were analyzed at each site. Analyses were performed to assess which type of marginally warranted intersections were more likely to experience a statistically significant improvement in safety through signalization. It was found that signalization would significantly reduce accident frequency only under Low-Speed Rural conditions. Both the number of injuries and the number of property-damage-only accidents were found to be significantly lower for signalized Low-Speed Rural intersections. Therefore:

> **Signalization can be recommended when a marginally-warranted intersection at a Low-Speed (approach speed ≤ 64 km/h, or 40 mph) Rural setting has experienced more than 1.4 accident injuries per year or more than 1.3 property-damage-only accidents per year or more than 2.0 total accidents per year over the past five years.**

In considering the accident types, it was found that the number of right-angle collisions could be reduced through signalization, but in only one case, namely, under Low-Speed Rural conditions. Therefore:

Signalization can be recommended when a marginally warranted intersection at a Low-Speed Rural setting has experienced more than 0.8 right-angle accident per year over the past five years.

The above-mentioned case was the only situation where signalizing a marginally-warranted intersection can be recommended on safety grounds. However, in another case, namely the Low-Speed Urban conditions, the number of accidents by type or severity were significantly fewer for the unsignalized condition. Therefore, at an 85% level of confidence, installation of signals at marginally warranted intersections under Low-Speed Urban conditions are not recommended. Finally, it should be mentioned that, in the other four groups, accident numbers were not found to be significantly different, neither by severity nor by type, at signalized versus unsignalized conditions.

In conclusion, when signalization is only marginally warranted at an intersection, the public's perception that delay and number of stops can be reduced through signalization is generally false. Furthermore, safety enhancements through signalization may only be achieved under very few circumstances. These include marginally warranted intersections in a Low-Speed Rural setting which experience a high number of injuries or property damage only accidents as well as a high number of right-angle accidents.

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APPENDIX

Table A.1 - Volume Pattern 1

Hour (Beg)	Approach Volumes					Volume Condition
	Major		Minor		Total	
0	20	10	10	10	50	1
1	20	10	10	10	50	1
2	20	15	10	10	55	2
3	30	20	15	10	75	6
4	50	30	15	15	110	13
5	60	30	20	20	130	18
6	100	60	20	20	200	31
7	350	180	50	30	610	99
8	450	220	60	30	760	113
9	480	230	70	30	810	121
10	510	250	80	30	870	125
11	530	250	80	40	900	127
12	550	260	80	40	930	130
13	570	270	80	40	960	133
14	630	290	80	40	1040	137
15	650	300	80	40	1070	138
16	690	330	90	40	1150	142
17	750	350	100	50	1250	148
18	600	200	60	30	890	135
19	400	175	50	25	650	105
20	100	50	20	10	180	30
21	50	30	10	10	100	12
22	25	15	10	10	60	4
23	20	10	10	10	50	1

Table A.2 - Volume Pattern 2

Hour (Beg)	Approach Volumes					Volume Condition
	Major		Minor		Total	
0	20	20	5	5	50	3
1	20	20	5	5	50	3
2	20	20	5	5	50	3
3	20	20	5	5	50	3
4	30	30	10	10	80	8
5	50	50	25	25	150	17
6	170	130	50	50	400	51
7	550	400	75	75	1100	131
8	450	330	60	60	900	115
9	300	270	50	50	670	92
10	250	250	50	50	600	79
11	250	250	50	50	600	79
12	250	250	50	50	600	79
13	250	250	50	50	600	79
14	250	250	50	50	600	79
15	250	250	50	50	600	79
16	250	250	50	50	600	79
17	240	240	40	40	560	74
18	180	180	30	30	420	55
19	150	150	20	20	340	44
20	80	80	10	10	180	27
21	50	50	10	10	120	16
22	20	20	5	5	50	3
23	20	20	5	5	50	3

Table A.3 - Volume Pattern 3

Hour (Beg)	Approach Volumes					Volume Condition
	Major		Minor		Total	
0	20	20	5	5	50	3
1	20	20	5	5	50	3
2	20	20	5	5	50	3
3	20	20	5	5	50	3
4	20	20	5	5	50	3
5	40	40	10	10	100	10
6	75	75	30	30	210	26
7	180	150	60	60	450	53
8	250	200	75	75	600	75
9	250	200	75	75	600	75
10	250	200	75	75	600	75
11	250	200	75	75	600	75
12	250	200	75	75	600	75
13	250	200	75	75	600	75
14	250	200	75	75	600	75
15	250	200	75	75	600	75
16	250	200	75	75	600	75
17	250	200	75	75	600	75
18	200	160	70	70	500	59
19	130	90	40	40	300	40
20	70	50	20	20	160	23
21	40	40	10	10	100	10
22	20	20	5	5	50	3
23	20	20	5	5	50	3

Table A.4 - Volume Pattern 4

Hour (Beg)	Approach Volumes					Volume Condition
	Major		Minor		Total	
0	20	20	5	5	50	3
1	20	20	5	5	50	3
2	20	20	5	5	50	3
3	20	20	5	5	50	3
4	20	20	5	5	50	3
5	60	60	20	10	150	21
6	110	110	50	30	300	36
7	290	260	100	50	700	89
8	450	400	125	75	1050	116
9	450	400	125	75	1050	116
10	450	400	125	75	1050	116
11	450	400	125	75	1050	116
12	450	400	125	75	1050	116
13	450	400	125	75	1050	116
14	450	400	125	75	1050	116
15	450	400	125	75	1050	116
16	450	400	125	75	1050	116
17	450	400	125	75	1050	116
18	360	310	90	40	800	103
19	230	220	70	30	550	73
20	110	110	50	30	300	36
21	60	60	20	20	160	22
22	40	40	10	10	100	10
23	20	20	5	5	50	3

Table A.5 - Volume Pattern 5

Hour (Beg)	Approach Volumes					Volume Condition
	Major		Minor		Total	
0	20	20	5	5	50	3
1	20	20	5	5	50	3
2	20	20	5	5	50	3
3	20	20	5	5	50	3
4	20	20	5	5	50	3
5	30	30	5	5	70	7
6	60	60	20	20	160	22
7	130	130	80	60	400	41
8	150	150	100	80	480	46
9	210	190	100	80	580	66
10	250	220	100	80	650	77
11	310	240	100	80	730	94
12	320	250	100	80	750	95
13	290	230	100	80	700	88
14	200	170	100	80	550	60
15	230	190	100	80	600	72
16	270	230	100	80	680	56
17	350	270	80	50	750	101
18	270	230	70	40	610	85
19	160	150	60	30	400	48
20	75	75	30	20	200	25
21	40	40	10	10	100	10
22	20	20	5	5	50	3
23	20	20	5	5	50	3

Table A.6 - Volume Pattern 6

Hour (Beg)	Approach Volumes					Volume Condition
	Major		Minor		Total	
0	20	20	5	5	50	3
1	20	20	5	5	50	3
2	20	20	5	5	50	3
3	20	20	5	5	50	3
4	20	20	5	5	50	3
5	40	40	10	10	100	10
6	250	220	50	30	550	76
7	450	420	80	50	1000	117
8	500	450	90	70	1110	123
9	550	500	100	80	1230	132
10	620	550	100	80	1350	136
11	690	600	100	80	1470	145
12	800	620	100	80	1600	151
13	690	580	100	80	1450	144
14	530	490	100	80	1200	129
15	570	530	100	80	1280	134
16	660	600	100	80	1440	141
17	750	670	100	80	1600	149
18	650	600	100	80	1430	139
19	430	410	90	70	1000	110
20	200	200	70	50	520	62
21	90	90	40	30	250	29
22	45	45	15	15	120	11
23	30	30	5	5	70	7

Table A.7 - Volume Pattern 7

Hour (Beg)	Approach Volumes					Volume Condition
	Major		Minor		Total	
0	20	20	5	5	50	3
1	20	20	5	5	50	3
2	20	20	5	5	50	3
3	20	20	5	5	50	3
4	30	30	10	10	80	8
5	50	50	25	25	150	17
6	125	125	75	75	400	39
7	1400	500	100	100	2100	169
8	1200	480	100	100	1880	168
9	940	460	100	100	1600	158
10	690	440	100	100	1330	143
11	425	425	100	100	1050	109
12	430	450	100	100	1080	111
13	445	555	100	100	1200	112
14	460	740	100	100	1400	119
15	475	975	100	100	1650	120
16	490	1210	100	100	1900	122
17	500	1400	100	100	2100	124
18	450	1200	100	100	1850	118
19	400	930	75	75	1480	107
20	325	325	50	50	750	98
21	150	150	20	20	340	44
22	90	90	10	10	200	28
23	30	30	5	5	70	7

Table A.8 - Volume Pattern 8

Hour (Beg)	Approach Volumes					Volume Condition
	Major		Minor		Total	
0	20	20	5	5	50	3
1	20	20	5	5	50	3
2	20	20	5	5	50	3
3	20	20	5	5	50	3
4	30	30	5	5	70	7
5	40	40	10	10	100	10
6	220	170	30	30	450	68
7	450	300	75	75	900	114
8	380	270	75	75	800	104
9	250	230	75	75	630	78
10	190	180	75	75	520	58
11	150	150	75	75	450	45
12	160	170	75	75	480	50
13	180	220	75	75	550	57
14	200	300	75	75	650	64
15	260	370	75	75	780	84
16	320	460	75	75	930	97
17	350	500	75	75	1000	102
18	320	440	60	60	880	96
19	220	300	40	40	600	71
20	120	120	30	30	300	38
21	60	60	15	15	150	20
22	30	30	10	10	80	8
23	20	20	5	5	50	3

Table A.9 - Volume Pattern 9

Hour (Beg)	Approach Volumes					Volume Condition
	Major		Minor		Total	
0	20	20	5	5	50	3
1	20	20	5	5	50	3
2	20	20	5	5	50	3
3	20	20	5	5	50	3
4	20	20	5	5	50	3
5	50	40	15	15	120	14
6	210	190	35	35	470	65
7	350	250	50	50	700	100
8	300	220	50	50	620	91
9	220	200	50	50	520	70
10	200	220	50	50	520	63
11	260	270	50	50	630	82
12	325	325	50	50	750	98
13	325	325	50	50	750	98
14	270	280	50	50	650	87
15	210	240	50	50	550	67
16	250	300	50	50	650	80
17	300	400	50	50	800	93
18	260	350	50	50	710	83
19	180	190	40	40	450	56
20	110	110	30	30	280	35
21	60	60	15	15	150	20
22	20	20	5	5	50	3
23	20	20	5	5	50	3

Table A.10 - Volume Pattern 10

Hour (Beg)	Approach Volumes					Volume Condition
	Major		Minor		Total	
0	20	20	5	5	50	3
1	20	20	5	5	50	3
2	20	20	5	5	50	3
3	20	20	5	5	50	3
4	20	20	5	5	50	3
5	60	50	10	10	130	19
6	300	180	20	20	520	90
7	1070	620	30	30	1750	163
8	840	600	40	40	1520	154
9	800	570	50	50	1470	150
10	800	670	60	60	1590	152
11	1040	890	60	60	2050	162
12	1100	980	60	60	2200	165
13	1020	710	60	60	1850	160
14	900	700	60	60	1720	157
15	870	820	60	60	1810	156
16	1020	1040	60	60	2180	161
17	1150	1250	60	60	2520	167
18	840	640	60	60	1600	155
19	520	410	30	30	990	126
20	530	360	15	15	920	128
21	420	340	10	10	780	108
22	110	90	5	5	210	34
23	50	50	5	5	110	15

Table A.11 - Volume Pattern 11

Hour (Beg)	Approach Volumes					Volume Condition
	Major		Minor		Total	
0	20	20	5	5	50	3
1	20	20	5	5	50	3
2	20	20	5	5	50	3
3	20	20	5	5	50	3
4	40	40	5	5	90	9
5	100	100	20	20	240	33
6	400	400	70	70	940	106
7	650	650	100	100	1500	140
8	650	650	100	100	1500	140
9	700	700	100	100	1600	147
10	700	700	100	100	1600	147
11	700	700	100	100	1600	147
12	700	700	100	100	1600	147
13	800	700	100	100	1700	153
14	950	850	100	100	2000	159
15	1150	950	100	100	2300	166
16	1450	1050	100	100	2700	171
17	1700	1100	100	100	3000	172
18	1400	1000	80	80	2560	170
19	1100	850	60	60	2070	164
20	700	650	40	40	1430	146
21	200	200	15	15	430	61
22	100	100	5	5	210	32
23	40	40	5	5	90	9

Table A.12 - Volume Pattern 12

Hour (Beg)	Approach Volumes					Volume Condition
	Major		Minor		Total	
0	20	20	5	5	50	3
1	20	20	5	5	50	3
2	20	20	5	5	50	3
3	20	20	5	5	50	3
4	20	20	5	5	50	3
5	20	20	5	5	50	3
6	40	40	10	10	100	10
7	120	100	80	50	350	37
8	120	100	80	50	350	37
9	120	100	80	50	350	37
10	120	100	80	50	350	37
11	140	130	80	50	400	42
12	160	160	80	50	450	49
13	170	150	80	50	450	52
14	160	140	80	50	430	47
15	180	150	80	50	460	54
16	220	180	80	50	530	69
17	260	210	80	50	600	81
18	150	130	70	50	400	43
19	70	60	30	20	180	24
20	40	40	10	10	100	10
21	25	25	5	5	60	5
22	20	20	5	5	50	3
23	20	20	5	5	50	3

Table A.13 - Hourly Volumes for Each Volume Condition

Volume Condition	Approach Volumes				
	Major		Minor		Total
1	20	10	10	10	50
2	20	15	10	10	55
3	20	20	5	5	50
4	25	15	10	10	60
5	25	25	5	5	60
6	30	20	15	10	75
7	30	30	5	5	70
8	30	30	10	10	80
9	40	40	5	5	90
10	40	40	10	10	100
11	45	45	15	15	120
12	50	30	10	10	100
13	50	30	15	15	110
14	50	40	15	15	120
15	50	50	5	5	110
16	50	50	10	10	120
17	50	50	25	25	150
18	60	30	20	20	130
19	60	50	10	10	130
20	60	60	15	15	150
21	60	60	20	10	150
22	60	60	20	20	160
23	70	50	20	20	160
24	70	60	30	20	180
25	75	75	30	20	200
26	75	75	30	30	210
27	80	80	10	10	180
28	90	90	10	10	200
29	90	90	40	30	250
30	100	50	20	10	180
31	100	60	20	20	200
32	100	100	5	5	210
33	100	100	20	20	240
34	110	90	5	5	210
35	110	110	30	30	280
36	110	110	50	30	300
37	120	100	80	50	350
38	120	120	30	30	300
39	125	125	75	75	400
40	130	90	40	40	300

Table A.13 - Continued

Volume Condition	Approach Volumes				
	Major		Minor		Total
41	130	130	80	60	400
42	140	130	80	50	400
43	150	130	70	50	400
44	150	150	20	20	340
45	150	150	75	75	450
46	150	150	100	80	480
47	160	140	80	50	430
48	160	150	60	30	400
49	160	160	80	50	450
50	160	170	75	75	480
51	170	130	50	50	400
52	170	150	80	50	450
53	180	150	60	60	450
54	180	150	80	50	460
55	180	180	30	30	420
56	180	190	40	40	450
57	180	220	75	75	550
58	190	180	75	75	520
59	200	160	70	70	500
60	200	170	100	80	550
61	200	200	15	15	430
62	200	200	70	50	520
63	200	220	50	50	520
64	200	300	75	75	650
65	210	190	35	35	470
66	210	190	100	80	580
67	210	240	50	50	550
68	220	170	30	30	450
69	220	180	80	50	530
70	220	200	50	50	520
71	220	300	40	40	600
72	230	190	100	80	600
73	230	220	70	30	550
74	240	240	40	40	560
75	250	200	75	75	600
76	250	220	50	30	550
77	250	220	100	80	650
78	250	230	75	75	630
79	250	250	50	50	600
80	250	300	50	50	650

Table A.13 - Continued

Volume Condition	Approach Volumes				
	Major		Minor		Total
81	260	210	80	50	600
82	260	270	50	50	630
83	260	350	50	50	710
84	260	370	75	75	780
85	270	230	70	40	610
86	270	230	100	80	680
87	270	280	50	50	650
88	290	230	100	80	700
89	290	260	100	50	700
90	300	180	20	20	520
91	300	220	50	50	620
92	300	270	50	50	670
93	300	400	50	50	800
94	310	240	100	80	730
95	320	250	100	80	750
96	320	440	60	60	880
97	320	460	75	75	930
98	325	325	50	50	750
99	350	180	50	30	610
100	350	250	50	50	700
101	350	270	80	50	750
102	350	500	75	75	1000
103	360	310	90	40	800
104	380	270	75	75	800
105	400	175	50	25	650
106	400	400	70	70	940
107	400	930	75	75	1480
108	420	340	10	10	780
109	425	425	100	100	1050
110	430	410	90	70	1000
111	430	450	100	100	1080
112	445	555	100	100	1200
113	450	220	60	30	760
114	450	300	75	75	900
115	450	330	60	60	900
116	450	400	125	75	1050
117	450	420	80	50	1000
118	450	1200	100	100	1850
119	460	740	100	100	1400
120	475	975	100	100	1650

Table A.13 - Continued

Volume Condition	Approach Volumes				
	Major		Minor		Total
121	480	230	70	30	810
122	490	1210	100	100	1900
123	500	450	90	70	1110
124	500	1400	100	100	2100
125	510	250	80	30	870
126	520	410	30	30	990
127	530	250	80	40	900
128	530	360	15	15	920
129	530	490	100	80	1200
130	550	260	80	40	930
131	550	400	75	75	1100
132	550	500	100	80	1230
133	570	270	80	40	960
134	570	530	100	80	1280
135	600	200	60	30	890
136	620	550	100	80	1350
137	630	290	80	40	1040
138	650	300	80	40	1070
139	650	600	100	80	1430
140	650	650	100	100	1500
141	660	600	100	80	1440
142	690	330	90	40	1150
143	690	440	100	100	1330
144	690	580	100	80	1450
145	690	600	100	80	1470
146	700	650	40	40	1430
147	700	700	100	100	1600
148	750	350	100	50	1250
149	750	670	100	80	1600
150	800	570	50	50	1470
151	800	620	100	80	1600
152	800	670	60	60	1590
153	800	700	100	100	1700
154	840	600	40	40	1520
155	840	640	60	60	1600
156	870	820	60	60	1810
157	900	700	60	60	1720
158	940	460	100	100	1600
159	950	850	100	100	2000
160	1020	710	60	60	1850

Table A.13 - Concluded

Volume Condition	Approach Volumes				
	Major		Minor		Total
161	1020	1040	60	60	2180
162	1040	890	60	60	2050
163	1070	620	30	30	1750
164	1100	850	60	60	2070
165	1100	980	60	60	2200
166	1150	950	100	100	2300
167	1150	1250	60	60	2520
168	1200	480	100	100	1880
169	1400	500	100	100	2100
170	1400	1000	80	80	2560
171	1450	1050	100	100	2700
172	1700	1100	100	100	3000

Table A.14 - Volume Pattern 1 -- Geometric Case 1: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.97	5.93	1.75	1.85	13.49
All-Way Stop	2.77	165.69	1.36	17.98	187.79
Traffic Signal	5.10	18.74	2.26	7.06	33.17
Percent Change					
2-Way vs. All-Way	-30	2,692	-22	874	1,292
2-Way vs. Traffic Signal	29	216	30	282	146
All-Way vs. Traffic Signal	85	-89	67	-61	-82

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.16	0.13	0.98	0.17	3.44
All-Way Stop	1.07	44.92	0.60	4.81	51.39
Traffic Signal	3.50	4.08	1.51	2.86	11.96
Percent Change					
2-Way vs. All-Way	-50	34,304	-39	2,684	1,393
2-Way vs. Traffic Signal	62	3,028	55	1,558	248
All-Way vs. Traffic Signal	226	-91	154	-40	-77

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,104	162	587	131	1,984
All-Way Stop	1,103	6,300	584	3,630	11,617
Traffic Signal	961	2,222	504	1,107	4,794
Percent Change					
2-Way vs. All-Way	*	3,779	*	2,675	485
2-Way vs. Traffic Signal	-13	1,268	-14	746	142
All-Way vs. Traffic Signal	-13	-65	-14	-70	-59

* Difference not significant at the 95% level (two-tailed test).

Table A.15 - Volume Pattern 1 -- Geometric Case 2: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.88	4.44	1.75	1.49	11.55
All-Way Stop	2.99	135.36	1.45	16.37	156.16
Traffic Signal	4.87	14.18	2.15	5.15	26.35
Percent Change					
2-Way vs. All-Way	-23	2,950	-17	1,001	1,252
2-Way vs. Traffic Signal	26	220	23	247	128
All-Way vs. Traffic Signal	63	-90	49	-69	-83

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.07	0.06	0.97	0.10	3.20
All-Way Stop	1.26	36.21	0.68	5.08	43.23
Traffic Signal	3.30	3.52	1.38	2.06	10.26
Percent Change					
2-Way vs. All-Way	-39	60,243	-30	4,973	1,250
2-Way vs. Traffic Signal	59	5,773	42	1,957	221
All-Way vs. Traffic Signal	162	-90	103	-59	-76

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,105	96	587	99	1,886
All-Way Stop	1,104	6,783	586	3,636	12,108
Traffic Signal	948	1,996	504	957	4,405
Percent Change					
2-Way vs. All-Way	*	6,995	*	3,580	542
2-Way vs. Traffic Signal	-14	1,987	-14	869	134
All-Way vs. Traffic Signal	-14	-71	-14	-74	-64

* Difference not significant at the 95% level (two-tailed test).

Table A.16 - Volume Pattern 1 -- Geometric Case 3: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.29	5.57	1.66	1.62	12.14
All-Way Stop	2.59	165.08	1.37	18.75	187.78
Traffic Signal	4.86	17.19	2.16	5.48	29.69
Percent Change					
2-Way vs. All-Way	-21	2,864	-18	1,054	1,447
2-Way vs. Traffic Signal	48	209	30	237	145
All-Way vs. Traffic Signal	87	-90	58	-71	-84

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.87	0.03	0.95	0.04	2.89
All-Way Stop	1.20	44.75	0.67	5.28	51.89
Traffic Signal	3.49	3.40	1.46	1.84	10.19
Percent Change					
2-Way vs. All-Way	-36	144,770	-30	14,659	1,696
2-Way vs. Traffic Signal	86	10,918	53	5,042	253
All-Way vs. Traffic Signal	191	-92	119	-65	-80

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,104	70	584	58	1,816
All-Way Stop	1,103	6,305	582	3,643	11,632
Traffic Signal	954	2,018	501	944	4,418
Percent Change					
2-Way vs. All-Way	*	8,907	*	6,181	541
2-Way vs. Traffic Signal	-14	2,783	-14	1,528	143
All-Way vs. Traffic Signal	-13	-68	-14	-74	-62

* Difference not significant at the 95% level (two-tailed test).

Table A.17 - Volume Pattern 1 -- Geometric Case 4: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.27	4.35	1.64	1.42	10.68
All-Way Stop	2.69	134.58	1.41	17.27	155.95
Traffic Signal	4.58	13.70	2.08	4.78	25.14
Percent Change					
2-Way vs. All-Way	-18	2,992	-14	1,118	1,360
2-Way vs. Traffic Signal	40	215	27	237	135
All-Way vs. Traffic Signal	70	-90	47	-72	-84

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	4.41	0.32	4.51	0.04	9.28
All-Way Stop	1.42	37.89	0.83	11.51	51.65
Traffic Signal	3.73	3.66	1.91	2.85	12.14
Percent Change					
2-Way vs. All-Way	-68	11,715	-82	29,255	457
2-Way vs. Traffic Signal	-15	1,042	-58	7,155	31
All-Way vs. Traffic Signal	162	-90	131	-75	-76

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,182	75	640	63	1,959
All-Way Stop	1,196	7,236	672	4,186	13,291
Traffic Signal	1,025	2,048	577	1,658	5,308
Percent Change					
2-Way vs. All-Way	1	9,574	5	6,566	578
2-Way vs. Traffic Signal	-13	2,638	-10	2,540	171
All-Way vs. Traffic Signal	-14	-72	-14	-60	-60

Table A.18 - Volume Pattern 1 -- Geometric Case 5: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.63	2.74	1.66	1.15	9.18
All-Way Stop	2.98	36.19	1.43	11.01	51.61
Traffic Signal	4.43	10.09	1.97	4.22	20.71
Percent Change					
2-Way vs. All-Way	-18	1,221	-14	858	462
2-Way vs. Traffic Signal	22	268	18	267	126
All-Way vs. Traffic Signal	49	-72	38	-62	-60

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.84	0.07	0.89	0.08	2.88
All-Way Stop	1.26	10.20	0.67	4.12	16.25
Traffic Signal	2.87	3.58	1.24	1.86	9.54
Percent Change					
2-Way vs. All-Way	-31	14,756	-25	5,176	465
2-Way vs. Traffic Signal	56	5,117	39	2,278	232
All-Way vs. Traffic Signal	127	-65	86	-55	-41

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,104	104	586	93	1,887
All-Way Stop	1,103	7,657	585	3,640	12,985
Traffic Signal	952	1,943	488	955	4,338
Percent Change					
2-Way vs. All-Way	*	7,263	*	3,822	588
2-Way vs. Traffic Signal	-14	1,768	-17	929	130
All-Way vs. Traffic Signal	-14	-75	-17	-74	-67

* Difference not significant at the 95% level (two-tailed test).

Table A.19 - Volume Pattern 1 -- Geometric Case 6: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.61	2.67	1.67	1.15	9.10
All-Way Stop	3.13	32.73	1.50	10.99	48.35
Traffic Signal	4.40	9.70	2.00	4.11	20.21
Percent Change					
2-Way vs. All-Way	-13	1,127	-10	854	431
2-Way vs. Traffic Signal	22	263	19	257	122
All-Way vs. Traffic Signal	41	-70	33	-63	-58

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.81	0.08	0.89	0.10	2.88
All-Way Stop	1.39	10.48	0.74	4.50	17.10
Traffic Signal	2.82	3.66	1.24	1.86	9.58
Percent Change					
2-Way vs. All-Way	-23	13,221	-18	4,601	494
2-Way vs. Traffic Signal	56	4,556	39	1,843	233
All-Way vs. Traffic Signal	103	-65	69	-59	-44

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,104	95	588	93	1,880
All-Way Stop	1,106	7,670	586	3,646	13,008
Traffic Signal	953	1,956	491	947	4,347
Percent Change					
2-Way vs. All-Way	*	7,991	*	3,812	592
2-Way vs. Traffic Signal	-14	1,963	-16	916	131
All-Way vs. Traffic Signal	-14	-75	-16	-74	-67

* Difference not significant at the 95% level (two-tailed test).

Table A.20 - Volume Pattern 1 -- Geometric Case 7: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.07	2.53	1.55	1.02	8.16
All-Way Stop	2.67	37.09	1.38	11.32	52.47
Traffic Signal	4.05	9.61	1.92	3.96	19.54
Percent Change					
2-Way vs. All-Way	-13	1,367	-10	1,013	543
2-Way vs. Traffic Signal	32	280	25	289	139
All-Way vs. Traffic Signal	52	-74	39	-65	-63

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.69	0.02	0.85	0.03	2.59
All-Way Stop	1.31	10.66	0.70	4.37	17.03
Traffic Signal	2.76	3.36	1.26	1.70	9.07
Percent Change					
2-Way vs. All-Way	-23	51,188	-18	16,711	557
2-Way vs. Traffic Signal	63	16,061	47	6,428	250
All-Way vs. Traffic Signal	111	-68	80	-61	-47

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,104	50	582	51	1,787
All-Way Stop	1,103	7,658	582	3,640	12,984
Traffic Signal	950	1,865	496	905	4,216
Percent Change					
2-Way vs. All-Way	*	15,216	*	7,010	627
2-Way vs. Traffic Signal	-14	3,630	-15	1,667	136
All-Way vs. Traffic Signal	-14	-76	-15	-75	-68

* Difference not significant at the 95% level (two-tailed test).

Table A.21 - Volume Pattern 1 -- Geometric Case 8: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.07	2.46	1.55	1.01	8.10
All-Way Stop	2.72	32.92	1.42	10.97	48.03
Traffic Signal	4.01	9.18	1.87	3.83	18.89
Percent Change					
2-Way vs. All-Way	-12	1,236	-9	984	493
2-Way vs. Traffic Signal	31	273	21	278	133
All-Way vs. Traffic Signal	48	-72	32	-65	-61

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.69	0.02	0.85	0.03	2.59
All-Way Stop	1.35	10.65	0.73	4.49	17.21
Traffic Signal	2.71	3.41	1.20	1.68	9.00
Percent Change					
2-Way vs. All-Way	-20	60,153	-15	15,878	564
2-Way vs. Traffic Signal	61	19,194	40	5,859	247
All-Way vs. Traffic Signal	101	-68	65	-63	-48

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,105	42	583	53	1,783
All-Way Stop	1,104	7,664	582	3,643	12,994
Traffic Signal	940	1,875	490	896	4,201
Percent Change					
2-Way vs. All-Way	*	18,149	*	6,800	629
2-Way vs. Traffic Signal	-15	4,364	-16	1,597	136
All-Way vs. Traffic Signal	-15	-76	-16	-75	-68

* Difference not significant at the 95% level (two-tailed test).

Table A.22 - Volume Pattern 2 -- Geometric Case 1: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.20	2.02	2.10	1.82	8.14
All-Way Stop	1.77	35.86	1.72	20.36	59.72
Traffic Signal	2.44	6.11	2.42	5.42	16.39
Percent Change					
2-Way vs. All-Way	-19	1,676	-18	1,021	634
2-Way vs. Traffic Signal	11	203	15	198	101
All-Way vs. Traffic Signal	37	-83	40	-73	-73

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.15	0.04	1.10	0.08	2.38
All-Way Stop	0.76	10.02	0.76	5.66	17.20
Traffic Signal	1.49	1.76	1.50	1.78	6.54
Percent Change					
2-Way vs. All-Way	-34	23,392	-32	6,932	623
2-Way vs. Traffic Signal	30	4,033	36	2,106	175
All-Way vs. Traffic Signal	97	-82	99	-69	-62

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	734	60	737	80	1,611
All-Way Stop	727	3,993	735	3,819	9,274
Traffic Signal	614	968	628	921	3,130
Percent Change					
2-Way vs. All-Way	-1	6,600	*	4,650	476
2-Way vs. Traffic Signal	-16	1,523	-15	1,046	94
All-Way vs. Traffic Signal	-16	-76	-15	-76	-66

* Difference not significant at the 95% level (two-tailed test).

Table A.23 - Volume Pattern 2 -- Geometric Case 2: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.22	1.70	2.10	1.51	7.53
All-Way Stop	1.89	29.02	1.86	17.70	50.46
Traffic Signal	2.31	5.22	2.36	4.52	14.40
Percent Change					
2-Way vs. All-Way	-15	1,606	-12	1,075	570
2-Way vs. Traffic Signal	4	207	12	200	91
All-Way vs. Traffic Signal	22	-82	27	-74	-71

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.17	0.03	1.10	0.04	2.34
All-Way Stop	0.87	8.54	0.87	5.54	15.82
Traffic Signal	1.38	1.65	1.42	1.58	6.04
Percent Change					
2-Way vs. All-Way	-26	31,011	-20	12,992	577
2-Way vs. Traffic Signal	18	5,915	30	3,625	158
All-Way vs. Traffic Signal	59	-81	63	-72	-62

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	734	45	736	55	1,570
All-Way Stop	730	4,060	734	3,824	9,349
Traffic Signal	603	938	622	870	3,033
Percent Change					
2-Way vs. All-Way	*	8,963	*	6,827	495
2-Way vs. Traffic Signal	-18	1,995	-16	1,476	93
All-Way vs. Traffic Signal	-17	-77	-15	-77	-68

* Difference not significant at the 95% level (two-tailed test).

Table A.24 - Volume Pattern 2 -- Geometric Case 3: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.04	1.96	1.95	1.73	7.68
All-Way Stop	1.76	35.96	1.71	20.88	60.31
Traffic Signal	2.37	5.93	2.26	5.07	15.63
Percent Change					
2-Way vs. All-Way	-13	1,738	-12	1,105	685
2-Way vs. Traffic Signal	16	203	15	193	103
All-Way vs. Traffic Signal	34	-84	32	-76	-74

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.13	0.02	1.07	0.03	2.25
All-Way Stop	0.87	10.16	0.85	5.99	17.86
Traffic Signal	1.50	1.63	1.43	1.55	6.11
Percent Change					
2-Way vs. All-Way	-23	64,277	-21	19,852	694
2-Way vs. Traffic Signal	33	10,240	33	5,067	172
All-Way vs. Traffic Signal	73	-84	68	-74	-66

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	734	34	738	47	1,553
All-Way Stop	727	3,994	735	3,817	9,272
Traffic Signal	622	920	606	846	2,994
Percent Change					
2-Way vs. All-Way	-1	11,646	*	7,986	497
2-Way vs. Traffic Signal	-15	2,607	-18	1,692	93
All-Way vs. Traffic Signal	-14	-77	-17	-78	-68

* Difference not significant at the 95% level (two-tailed test).

Table A.25 - Volume Pattern 2 -- Geometric Case 4: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.03	1.64	1.94	1.47	7.08
All-Way Stop	1.78	28.64	1.77	18.06	50.25
Traffic Signal	2.22	5.06	2.19	4.41	13.87
Percent Change					
2-Way vs. All-Way	-12	1,643	-9	1,128	609
2-Way vs. Traffic Signal	9	208	13	200	96
All-Way vs. Traffic Signal	24	-82	23	-76	-72

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.14	0.01	1.08	0.01	2.24
All-Way Stop	0.90	8.42	0.91	5.72	15.96
Traffic Signal	1.38	1.55	1.38	1.47	5.79
Percent Change					
2-Way vs. All-Way	-21	109,768	-15	44,312	613
2-Way vs. Traffic Signal	21	20,123	28	11,335	159
All-Way vs. Traffic Signal	54	-82	51	-74	-64

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	734	18	737	26	1,515
All-Way Stop	731	4,057	736	3,827	9,350
Traffic Signal	610	886	607	814	2,917
Percent Change					
2-Way vs. All-Way	*	21,950	*	14,848	517
2-Way vs. Traffic Signal	-17	4,717	-18	3,080	93
All-Way vs. Traffic Signal	-17	-78	-17	-79	-69

* Difference not significant at the 95% level (two-tailed test).

Table A.26 - Volume Pattern 2 -- Geometric Case 5: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.14	1.25	2.06	1.15	6.59
All-Way Stop	1.90	14.00	1.84	12.13	29.87
Traffic Signal	2.15	4.28	2.20	3.74	12.37
Percent Change					
2-Way vs. All-Way	-11	1,020	-11	958	353
2-Way vs. Traffic Signal	*	242	6	227	88
All-Way vs. Traffic Signal	13	-69	19	-69	-59

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.10	0.03	1.06	0.04	2.23
All-Way Stop	0.87	5.24	0.87	4.73	11.71
Traffic Signal	1.24	1.69	1.30	1.55	5.79
Percent Change					
2-Way vs. All-Way	-21	15,739	-18	12,415	426
2-Way vs. Traffic Signal	13	5,013	23	4,004	160
All-Way vs. Traffic Signal	43	-68	50	-67	-51

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	730	46	737	52	1,566
All-Way Stop	735	4,118	736	3,842	9,432
Traffic Signal	587	919	614	855	2,975
Percent Change					
2-Way vs. All-Way	*	8,776	*	7,231	502
2-Way vs. Traffic Signal	-20	1,881	-17	1,531	90
All-Way vs. Traffic Signal	-20	-78	-17	-78	-68

* Difference not significant at the 95% level (two-tailed test).

Table A.27 - Volume Pattern 2 -- Geometric Case 6: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.14	1.21	2.05	1.13	6.53
All-Way Stop	1.94	13.39	1.92	11.77	29.02
Traffic Signal	2.16	4.18	2.20	3.78	12.32
Percent Change					
2-Way vs. All-Way	-9	1,010	-6	938	344
2-Way vs. Traffic Signal	1	247	7	234	89
All-Way vs. Traffic Signal	11	-69	15	-68	-58

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.09	0.02	1.05	0.04	2.19
All-Way Stop	0.92	5.38	0.93	4.92	12.14
Traffic Signal	1.24	1.72	1.28	1.62	5.87
Percent Change					
2-Way vs. All-Way	-16	23,616	-11	13,558	453
2-Way vs. Traffic Signal	14	7,488	22	4,409	167
All-Way vs. Traffic Signal	36	-68	37	-67	-52

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	730	39	738	54	1,561
All-Way Stop	728	4,121	738	3,833	9,420
Traffic Signal	593	937	622	870	3,022
Percent Change					
2-Way vs. All-Way	*	10,412	*	6,946	504
2-Way vs. Traffic Signal	-19	2,290	-16	1,499	94
All-Way vs. Traffic Signal	-18	-77	-16	-77	-68

* Difference not significant at the 95% level (two-tailed test).

Table A.28 - Volume Pattern 2 -- Geometric Case 7: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.95	1.14	1.90	1.05	6.03
All-Way Stop	1.75	14.09	1.75	12.25	29.83
Traffic Signal	2.05	4.16	2.04	3.59	11.84
Percent Change					
2-Way vs. All-Way	-10	1,135	-8	1,066	395
2-Way vs. Traffic Signal	5	265	8	242	96
All-Way vs. Traffic Signal	17	-70	17	-71	-60

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.06	0.01	1.03	0.01	2.11
All-Way Stop	0.88	5.32	0.89	4.87	11.96
Traffic Signal	1.24	1.65	1.25	1.49	5.63
Percent Change					
2-Way vs. All-Way	-17	45,099	-13	37,350	466
2-Way vs. Traffic Signal	18	13,916	22	11,326	167
All-Way vs. Traffic Signal	41	-69	40	-69	-53

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	726	29	737	32	1,524
All-Way Stop	722	4,120	735	3,837	9,414
Traffic Signal	588	904	608	822	2,922
Percent Change					
2-Way vs. All-Way	*	14,008	*	12,042	518
2-Way vs. Traffic Signal	-19	2,997	-18	2,500	92
All-Way vs. Traffic Signal	-19	-78	-17	-79	-69

* Difference not significant at the 95% level (two-tailed test).

Table A.29 - Volume Pattern 2 -- Geometric Case 8: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.16	1.06	1.96	1.04	6.22
All-Way Stop	1.79	13.40	1.80	11.80	28.79
Traffic Signal	2.05	4.02	2.03	3.60	11.71
Percent Change					
2-Way vs. All-Way	-17	1,160	-8	1,033	363
2-Way vs. Traffic Signal	-5	278	4	246	88
All-Way vs. Traffic Signal	15	-70	13	-69	-59

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.21	0.01	1.06	0.01	2.29
All-Way Stop	0.91	5.41	0.93	4.95	12.19
Traffic Signal	1.23	1.64	1.23	1.51	5.62
Percent Change					
2-Way vs. All-Way	-25	57,874	-13	75,407	434
2-Way vs. Traffic Signal	2	17,490	16	22,995	146
All-Way vs. Traffic Signal	36	-70	33	-69	-54

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	781	22	768	16	1,589
All-Way Stop	729	4,117	739	3,839	9,424
Traffic Signal	595	910	607	834	2,946
Percent Change					
2-Way vs. All-Way	-7	18,961	-4	24,510	493
2-Way vs. Traffic Signal	-24	4,113	-21	5,249	85
All-Way vs. Traffic Signal	-18	-78	-18	-78	-69

Table A.30 - Volume Pattern 3 -- Geometric Case 1: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.13	1.38	2.96	1.05	8.52
All-Way Stop	2.75	15.31	2.73	10.89	31.69
Traffic Signal	2.98	5.46	3.05	3.68	15.18
Percent Change					
2-Way vs. All-Way	-12	1,011	-8	937	272
2-Way vs. Traffic Signal	-5	296	3	251	78
All-Way vs. Traffic Signal	8	-64	12	-66	-52

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.51	0.03	1.47	0.03	3.04
All-Way Stop	1.18	4.82	1.20	3.73	10.93
Traffic Signal	1.64	2.02	1.74	1.36	6.76
Percent Change					
2-Way vs. All-Way	-22	16,525	-18	13,202	260
2-Way vs. Traffic Signal	9	6,874	18	4,749	122
All-Way vs. Traffic Signal	38	-58	45	-64	-38

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,015	54	1,004	26	2,098
All-Way Stop	1,020	3,354	1,008	2,762	8,144
Traffic Signal	766	1,056	776	772	3,370
Percent Change					
2-Way vs. All-Way	0	6,112	*	10,689	288
2-Way vs. Traffic Signal	-25	1,856	-23	2,914	61
All-Way vs. Traffic Signal	-25	-69	-23	-72	-59

* Difference not significant at the 95% level (two-tailed test).

Table A.31 - Volume Pattern 3 -- Geometric Case 2: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.17	1.22	3.04	0.96	8.40
All-Way Stop	2.89	14.15	2.81	10.32	30.17
Traffic Signal	2.98	5.04	3.04	3.35	14.40
Percent Change					
2-Way vs. All-Way	-9	1,057	-8	971	259
2-Way vs. Traffic Signal	-6	312	*	247	71
All-Way vs. Traffic Signal	3	-64	8	-68	-52

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.52	0.02	1.53	0.03	3.10
All-Way Stop	1.31	4.89	1.27	3.86	11.33
Traffic Signal	1.62	2.02	1.70	1.32	6.65
Percent Change					
2-Way vs. All-Way	-14	32,029	-17	14,487	266
2-Way vs. Traffic Signal	7	13,155	11	4,898	115
All-Way vs. Traffic Signal	23	-59	33	-66	-41

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,026	33	1,014	26	2,098
All-Way Stop	1,019	3,355	1,012	2,783	8,169
Traffic Signal	768	1,073	785	737	3,363
Percent Change					
2-Way vs. All-Way	-1	10,129	*	10,603	289
2-Way vs. Traffic Signal	-25	3,171	-23	2,734	60
All-Way vs. Traffic Signal	-25	-68	-22	-74	-59

* Difference not significant at the 95% level (two-tailed test).

Table A.32 - Volume Pattern 3 -- Geometric Case 3: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.86	1.35	2.67	1.04	7.92
All-Way Stop	2.58	15.49	2.48	11.21	31.76
Traffic Signal	2.88	5.22	2.84	3.47	14.40
Percent Change					
2-Way vs. All-Way	-10	1,047	-7	977	301
2-Way vs. Traffic Signal	*	286	6	234	82
All-Way vs. Traffic Signal	11	-66	15	-69	-55

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.50	0.02	1.41	0.01	2.94
All-Way Stop	1.25	5.01	1.21	3.97	11.43
Traffic Signal	1.64	1.87	1.68	1.28	6.47
Percent Change					
2-Way vs. All-Way	-17	31,206	-15	75,853	290
2-Way vs. Traffic Signal	9	11,579	19	24,360	120
All-Way vs. Traffic Signal	31	-63	39	-68	-43

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,020	43	1,007	10	2,080
All-Way Stop	1,020	3,350	1,007	2,754	8,131
Traffic Signal	775	1,063	770	726	3,334
Percent Change					
2-Way vs. All-Way	*	7,656	*	26,381	291
2-Way vs. Traffic Signal	-24	2,360	-23	6,881	60
All-Way vs. Traffic Signal	-24	-68	-24	-74	-59

* Difference not significant at the 95% level (two-tailed test).

Table A.33 - Volume Pattern 3 -- Geometric Case 4: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.83	1.19	2.70	0.93	7.66
All-Way Stop	2.66	14.32	2.51	10.35	29.83
Traffic Signal	2.82	4.79	2.81	3.17	13.60
Percent Change					
2-Way vs. All-Way	-6	1,099	-7	1,015	290
2-Way vs. Traffic Signal	*	301	4	241	78
All-Way vs. Traffic Signal	6	-67	12	-69	-54

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.51	0.01	1.46	0.00	2.97
All-Way Stop	1.35	4.97	1.26	3.89	11.48
Traffic Signal	1.63	1.86	1.67	1.20	6.37
Percent Change					
2-Way vs. All-Way	-10	103,993	-13	437,313	286
2-Way vs. Traffic Signal	8	38,905	15	135,350	114
All-Way vs. Traffic Signal	20	-63	33	-69	-45

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,020	15	1,011	3	2,049
All-Way Stop	1,020	3,354	1,007	2,766	8,147
Traffic Signal	782	1,037	786	699	3,305
Percent Change					
2-Way vs. All-Way	*	21,966	*	98,686	298
2-Way vs. Traffic Signal	-23	6,724	-22	24,871	61
All-Way vs. Traffic Signal	-23	-69	-22	-75	-59

* Difference not significant at the 95% level (two-tailed test).

Table A.34 - Volume Pattern 3 -- Geometric Case 5: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.10	0.94	2.93	0.79	7.77
All-Way Stop	2.85	10.46	2.77	7.92	24.00
Traffic Signal	2.91	4.48	2.87	3.02	13.27
Percent Change					
2-Way vs. All-Way	-8	1,008	-5	901	209
2-Way vs. Traffic Signal	-6	374	-2	281	71
All-Way vs. Traffic Signal	2	-57	4	-62	-45

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.47	0.02	1.43	0.02	2.94
All-Way Stop	1.28	4.29	1.26	3.40	10.23
Traffic Signal	1.56	2.10	1.58	1.38	6.62
Percent Change					
2-Way vs. All-Way	-13	19,584	-12	14,324	248
2-Way vs. Traffic Signal	7	9,526	11	5,772	125
All-Way vs. Traffic Signal	22	-51	25	-59	-35

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,015	38	1,007	25	2,086
All-Way Stop	1,019	3,380	1,012	2,759	8,170
Traffic Signal	782	1,109	772	748	3,411
Percent Change					
2-Way vs. All-Way	0	8,702	*	11,024	292
2-Way vs. Traffic Signal	-23	2,789	-23	2,915	64
All-Way vs. Traffic Signal	-23	-67	-24	-73	-58

* Difference not significant at the 95% level (two-tailed test).

Table A.35 - Volume Pattern 3 -- Geometric Case 6: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.12	0.92	2.98	0.79	7.81
All-Way Stop	2.97	10.10	2.87	7.83	23.76
Traffic Signal	2.91	4.44	2.81	3.00	13.16
Percent Change					
2-Way vs. All-Way	-5	992	-4	896	204
2-Way vs. Traffic Signal	-7	380	-6	282	69
All-Way vs. Traffic Signal	-2	-56	-2	-62	-45

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.47	0.01	1.46	0.03	2.96
All-Way Stop	1.36	4.37	1.35	3.56	10.63
Traffic Signal	1.55	2.12	1.49	1.37	6.54
Percent Change					
2-Way vs. All-Way	-7	34,379	-8	14,314	259
2-Way vs. Traffic Signal	6	16,639	2	5,457	121
All-Way vs. Traffic Signal	14	-51	11	-61	-38

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,019	25	1,012	29	2,084
All-Way Stop	1,019	3,371	1,012	2,762	8,164
Traffic Signal	778	1,089	761	756	3,384
Percent Change					
2-Way vs. All-Way	*	13,492	*	9,492	292
2-Way vs. Traffic Signal	-24	4,292	-25	2,524	62
All-Way vs. Traffic Signal	-24	-68	-25	-73	-59

* Difference not significant at the 95% level (two-tailed test).

Table A.36 - Volume Pattern 3 -- Geometric Case 7: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.75	0.89	2.63	0.73	6.99
All-Way Stop	2.61	10.55	2.50	8.03	23.69
Traffic Signal	2.74	4.28	2.69	2.87	12.58
Percent Change					
2-Way vs. All-Way	-5	1,092	-5	996	239
2-Way vs. Traffic Signal	*	384	2	292	80
All-Way vs. Traffic Signal	5	-59	8	-64	-47

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.42	0.01	1.40	0.00	2.83
All-Way Stop	1.29	4.41	1.26	3.51	10.47
Traffic Signal	1.57	1.99	1.57	1.30	6.43
Percent Change					
2-Way vs. All-Way	-9	55,739	-10	143,473	270
2-Way vs. Traffic Signal	10	25,138	12	52,950	127
All-Way vs. Traffic Signal	21	-55	25	-63	-39

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,019	22	1,011	7	2,060
All-Way Stop	1,020	3,376	1,008	2,758	8,161
Traffic Signal	779	1,057	764	703	3,303
Percent Change					
2-Way vs. All-Way	*	14,970	*	38,206	296
2-Way vs. Traffic Signal	-24	4,618	-24	9,661	60
All-Way vs. Traffic Signal	-24	-69	-24	-75	-60

* Difference not significant at the 95% level (two-tailed test).

Table A.37 - Volume Pattern 3 -- Geometric Case 8: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.77	0.87	2.68	0.75	7.06
All-Way Stop	2.65	10.19	2.54	7.89	23.26
Traffic Signal	2.74	4.21	2.67	2.78	12.40
Percent Change					
2-Way vs. All-Way	-4	1,072	-5	956	229
2-Way vs. Traffic Signal	-1	384	*	273	76
All-Way vs. Traffic Signal	3	-59	5	-65	-47

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.42	0.01	1.43	0.00	2.87
All-Way Stop	1.32	4.43	1.29	3.58	10.62
Traffic Signal	1.55	1.99	1.54	1.26	6.34
Percent Change					
2-Way vs. All-Way	-7	48,552	-10	89,436	271
2-Way vs. Traffic Signal	9	21,729	8	31,422	121
All-Way vs. Traffic Signal	18	-55	20	-65	-40

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,019	31	1,011	12	2,073
All-Way Stop	1,019	3,374	1,011	2,762	8,166
Traffic Signal	774	1,049	763	703	3,289
Percent Change					
2-Way vs. All-Way	*	10,855	*	22,917	294
2-Way vs. Traffic Signal	-24	3,305	-25	5,757	59
All-Way vs. Traffic Signal	-24	-69	-25	-75	-60

* Difference not significant at the 95% level (two-tailed test).

Table A.38 - Volume Pattern 4 -- Geometric Case 1: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	6.39	3.94	3.14	2.99	16.45
All-Way Stop	4.74	85.80	2.34	47.57	140.45
Traffic Signal	7.72	14.75	3.64	13.50	39.61
Percent Change					
2-Way vs. All-Way	-26	2,079	-25	1,494	754
2-Way vs. Traffic Signal	21	274	16	352	141
All-Way vs. Traffic Signal	63	-83	55	-72	-72

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.10	0.12	1.66	0.10	4.97
All-Way Stop	1.61	22.30	0.93	11.39	36.24
Traffic Signal	4.89	4.45	2.34	4.79	16.46
Percent Change					
2-Way vs. All-Way	-48	19,159	-44	11,700	629
2-Way vs. Traffic Signal	58	3,740	41	4,860	231
All-Way vs. Traffic Signal	203	-80	151	-58	-55

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,690	175	980	132	2,978
All-Way Stop	1,682	5,743	980	5,291	13,696
Traffic Signal	1,396	2,161	741	1,908	6,206
Percent Change					
2-Way vs. All-Way	-0	3,178	*	3,908	360
2-Way vs. Traffic Signal	-17	1,134	-24	1,345	108
All-Way vs. Traffic Signal	-17	-62	-24	-64	-55

* Difference not significant at the 95% level (two-tailed test).

Table A.39 - Volume Pattern 4 -- Geometric Case 2: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	6.36	3.07	3.16	2.48	15.07
All-Way Stop	5.20	53.05	2.51	35.58	96.34
Traffic Signal	7.61	11.78	3.82	9.94	33.14
Percent Change					
2-Way vs. All-Way	-18	1,626	-21	1,336	539
2-Way vs. Traffic Signal	20	283	21	301	120
All-Way vs. Traffic Signal	46	-78	52	-72	-66

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.06	0.07	1.67	0.06	4.85
All-Way Stop	2.00	13.70	1.08	9.36	26.13
Traffic Signal	4.74	3.94	2.46	3.71	14.85
Percent Change					
2-Way vs. All-Way	-35	20,720	-35	15,384	439
2-Way vs. Traffic Signal	55	5,890	48	6,031	206
All-Way vs. Traffic Signal	137	-71	128	-60	-43

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,686	105	980	76	2,848
All-Way Stop	1,682	5,836	976	5,308	13,802
Traffic Signal	1,380	2,038	754	1,695	5,867
Percent Change					
2-Way vs. All-Way	*	5,448	*	6,884	385
2-Way vs. Traffic Signal	-18	1,837	-23	2,131	106
All-Way vs. Traffic Signal	-18	-65	-23	-68	-57

* Difference not significant at the 95% level (two-tailed test).

Table A.40 - Volume Pattern 4 -- Geometric Case 3: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	5.05	3.61	2.88	2.85	14.39
All-Way Stop	4.13	83.95	2.33	49.26	139.66
Traffic Signal	7.01	13.38	3.64	10.62	34.65
Percent Change					
2-Way vs. All-Way	-18	2,227	-19	1,630	871
2-Way vs. Traffic Signal	39	271	26	273	141
All-Way vs. Traffic Signal	70	-84	56	-78	-75

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.75	0.03	1.64	0.03	4.45
All-Way Stop	1.83	21.31	1.09	12.15	36.37
Traffic Signal	4.80	3.69	2.42	3.17	14.08
Percent Change					
2-Way vs. All-Way	-33	75,687	-34	44,513	718
2-Way vs. Traffic Signal	74	13,015	48	11,531	216
All-Way vs. Traffic Signal	162	-83	123	-74	-61

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,682	73	980	63	2,798
All-Way Stop	1,682	5,755	979	5,290	13,707
Traffic Signal	1,377	1,980	760	1,654	5,771
Percent Change					
2-Way vs. All-Way	*	7,762	*	8,324	390
2-Way vs. Traffic Signal	-18	2,605	-22	2,533	106
All-Way vs. Traffic Signal	-18	-66	-22	-69	-58

* Difference not significant at the 95% level (two-tailed test).

Table A.41 - Volume Pattern 4 -- Geometric Case 4: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	5.00	2.88	2.77	2.36	13.01
All-Way Stop	4.39	52.26	2.40	35.88	94.92
Traffic Signal	6.92	10.43	3.55	8.71	29.61
Percent Change					
2-Way vs. All-Way	-12	1,714	-13	1,418	630
2-Way vs. Traffic Signal	39	262	28	269	128
All-Way vs. Traffic Signal	58	-80	48	-76	-69

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.73	0.02	1.53	0.03	4.31
All-Way Stop	2.09	13.60	1.19	9.68	26.56
Traffic Signal	4.78	3.10	2.38	2.94	13.20
Percent Change					
2-Way vs. All-Way	-24	89,235	-23	33,160	516
2-Way vs. Traffic Signal	75	20,240	55	9,999	206
All-Way vs. Traffic Signal	129	-77	101	-70	-50

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,678	42	980	54	2,755
All-Way Stop	1,678	5,848	976	5,306	13,810
Traffic Signal	1,385	1,792	780	1,560	5,518
Percent Change					
2-Way vs. All-Way	*	13,693	*	9,727	401
2-Way vs. Traffic Signal	-17	4,126	-20	2,789	100
All-Way vs. Traffic Signal	-17	-69	-20	-71	-60

* Difference not significant at the 95% level (two-tailed test).

Table A.42 - Volume Pattern 4 -- Geometric Case 5: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	6.29	2.05	3.01	1.82	13.17
All-Way Stop	5.19	22.56	2.56	18.72	49.03
Traffic Signal	6.48	9.15	3.40	7.70	26.74
Percent Change					
2-Way vs. All-Way	-17	1,001	-15	929	272
2-Way vs. Traffic Signal	3	347	13	323	103
All-Way vs. Traffic Signal	25	-59	33	-59	-45

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.92	0.07	1.55	0.09	4.63
All-Way Stop	2.05	7.37	1.15	6.46	17.03
Traffic Signal	3.83	3.69	2.10	3.32	12.95
Percent Change					
2-Way vs. All-Way	-30	10,252	-26	7,247	268
2-Way vs. Traffic Signal	31	5,079	36	3,679	180
All-Way vs. Traffic Signal	87	-50	83	-49	-24

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,683	111	980	103	2,877
All-Way Stop	1,678	5,924	976	5,314	13,891
Traffic Signal	1,342	1,937	800	1,650	5,729
Percent Change					
2-Way vs. All-Way	*	5,227	*	5,049	383
2-Way vs. Traffic Signal	-20	1,642	-18	1,499	99
All-Way vs. Traffic Signal	-20	-67	-18	-69	-59

* Difference not significant at the 95% level (two-tailed test).

Table A.43 - Volume Pattern 4 -- Geometric Case 6: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	6.17	2.02	3.00	1.76	12.94
All-Way Stop	5.51	21.46	2.70	18.29	47.96
Traffic Signal	6.53	9.02	3.29	7.95	26.78
Percent Change					
2-Way vs. All-Way	-11	962	-10	938	270
2-Way vs. Traffic Signal	6	347	10	351	107
All-Way vs. Traffic Signal	19	-58	22	-57	-44

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.85	0.07	1.52	0.08	4.52
All-Way Stop	2.25	7.77	1.24	7.02	18.26
Traffic Signal	3.82	3.93	1.97	3.56	13.28
Percent Change					
2-Way vs. All-Way	-21	11,321	-19	8,681	304
2-Way vs. Traffic Signal	34	5,677	29	4,353	194
All-Way vs. Traffic Signal	70	-49	59	-49	-27

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,683	104	981	80	2,848
All-Way Stop	1,686	5,915	982	5,324	13,906
Traffic Signal	1,307	2,015	759	1,764	5,846
Percent Change					
2-Way vs. All-Way	*	5,566	*	6,588	388
2-Way vs. Traffic Signal	-22	1,830	-23	2,117	105
All-Way vs. Traffic Signal	-22	-66	-23	-67	-58

* Difference not significant at the 95% level (two-tailed test).

Table A.44 - Volume Pattern 4 -- Geometric Case 7: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	4.86	1.88	2.69	1.59	11.01
All-Way Stop	4.25	22.93	2.40	19.15	48.74
Traffic Signal	5.81	8.64	3.07	7.05	24.57
Percent Change					
2-Way vs. All-Way	-12	1,118	-11	1,108	343
2-Way vs. Traffic Signal	20	358	14	345	123
All-Way vs. Traffic Signal	37	-62	28	-63	-50

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.59	0.02	1.46	0.02	4.09
All-Way Stop	2.01	7.71	1.19	6.88	17.79
Traffic Signal	3.75	3.50	1.96	2.92	12.13
Percent Change					
2-Way vs. All-Way	-22	38,675	-19	31,333	335
2-Way vs. Traffic Signal	45	17,485	34	13,232	197
All-Way vs. Traffic Signal	86	-55	65	-58	-32

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,679	56	980	47	2,763
All-Way Stop	1,678	5,912	980	5,316	13,886
Traffic Signal	1,343	1,863	760	1,549	5,516
Percent Change					
2-Way vs. All-Way	*	10,382	*	11,164	403
2-Way vs. Traffic Signal	-20	3,204	-22	3,182	100
All-Way vs. Traffic Signal	-20	-68	-22	-71	-60

* Difference not significant at the 95% level (two-tailed test).

Table A.45 - Volume Pattern 4 -- Geometric Case 8: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	4.79	1.83	2.66	1.61	10.88
All-Way Stop	4.37	21.58	2.43	18.23	46.60
Traffic Signal	5.73	8.31	2.93	6.98	23.95
Percent Change					
2-Way vs. All-Way	-9	1,081	-9	1,032	328
2-Way vs. Traffic Signal	20	355	10	334	120
All-Way vs. Traffic Signal	31	-62	21	-62	-49

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.51	0.02	1.45	0.03	4.01
All-Way Stop	2.10	7.87	1.21	7.01	18.20
Traffic Signal	3.68	3.57	1.82	2.99	12.05
Percent Change					
2-Way vs. All-Way	-16	41,076	-16	25,344	354
2-Way vs. Traffic Signal	46	18,596	26	10,735	201
All-Way vs. Traffic Signal	75	-55	50	-57	-34

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,678	46	980	59	2,763
All-Way Stop	1,678	5,920	976	5,325	13,899
Traffic Signal	1,332	1,918	738	1,595	5,584
Percent Change					
2-Way vs. All-Way	*	12,882	*	8,956	403
2-Way vs. Traffic Signal	-21	4,107	-25	2,613	102
All-Way vs. Traffic Signal	-21	-68	-24	-70	-60

* Difference not significant at the 95% level (two-tailed test).

Table A.46 - Volume Pattern 5 -- Geometric Case 1: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	4.22	1.52	3.01	1.29	10.03
All-Way Stop	3.74	17.53	2.64	12.91	36.83
Traffic Signal	4.23	5.93	3.15	5.04	18.36
Percent Change					
2-Way vs. All-Way	-11	1,054	-12	902	267
2-Way vs. Traffic Signal	*	290	5	291	83
All-Way vs. Traffic Signal	13	-66	20	-61	-50

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.95	0.03	1.46	0.04	3.48
All-Way Stop	1.50	5.21	1.12	4.16	11.99
Traffic Signal	2.34	2.08	1.79	1.93	8.15
Percent Change					
2-Way vs. All-Way	-23	17,743	-24	10,809	245
2-Way vs. Traffic Signal	20	7,016	23	4,969	134
All-Way vs. Traffic Signal	57	-60	60	-54	-32

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,290	41	982	54	2,366
All-Way Stop	1,289	3,470	982	3,030	8,772
Traffic Signal	1,026	1,140	782	1,002	3,951
Percent Change					
2-Way vs. All-Way	*	8,406	*	5,512	271
2-Way vs. Traffic Signal	-20	2,695	-20	1,756	67
All-Way vs. Traffic Signal	-20	-67	-20	-67	-55

* Difference not significant at the 95% level (two-tailed test).

Table A.47 - Volume Pattern 5 -- Geometric Case 2: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	4.27	1.36	3.04	1.15	9.82
All-Way Stop	3.88	15.73	2.79	11.91	34.31
Traffic Signal	4.25	5.50	3.15	4.54	17.43
Percent Change					
2-Way vs. All-Way	-9	1,057	-8	936	250
2-Way vs. Traffic Signal	*	304	3	295	78
All-Way vs. Traffic Signal	9	-65	13	-62	-49

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.96	0.03	1.49	0.03	3.51
All-Way Stop	1.62	5.18	1.25	4.28	12.32
Traffic Signal	2.33	2.06	1.76	1.84	7.99
Percent Change					
2-Way vs. All-Way	-18	20,978	-16	14,762	251
2-Way vs. Traffic Signal	19	8,302	18	6,304	128
All-Way vs. Traffic Signal	44	-60	41	-57	-35

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,290	33	982	44	2,349
All-Way Stop	1,290	3,472	982	3,028	8,772
Traffic Signal	1,024	1,121	774	967	3,886
Percent Change					
2-Way vs. All-Way	*	10,487	*	6,721	273
2-Way vs. Traffic Signal	-21	3,318	-21	2,077	65
All-Way vs. Traffic Signal	-21	-68	-21	-68	-56

* Difference not significant at the 95% level (two-tailed test).

Table A.48 - Volume Pattern 5 -- Geometric Case 3: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.55	1.49	2.69	1.25	8.98
All-Way Stop	3.24	17.99	2.44	13.24	36.91
Traffic Signal	3.94	5.66	2.96	4.82	17.38
Percent Change					
2-Way vs. All-Way	-9	1,110	-9	956	311
2-Way vs. Traffic Signal	11	281	10	284	93
All-Way vs. Traffic Signal	21	-69	22	-64	-53

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.83	0.01	1.44	0.01	3.29
All-Way Stop	1.54	5.47	1.20	4.40	12.61
Traffic Signal	2.34	1.91	1.77	1.78	7.80
Percent Change					
2-Way vs. All-Way	-16	57,854	-17	39,481	283
2-Way vs. Traffic Signal	27	20,147	23	15,897	137
All-Way vs. Traffic Signal	52	-65	48	-60	-38

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,290	21	982	26	2,320
All-Way Stop	1,290	3,474	981	3,022	8,767
Traffic Signal	1,023	1,098	775	953	3,849
Percent Change					
2-Way vs. All-Way	*	16,287	*	11,347	278
2-Way vs. Traffic Signal	-21	5,081	-21	3,509	66
All-Way vs. Traffic Signal	-21	-68	-21	-68	-56

* Difference not significant at the 95% level (two-tailed test).

Table A.49 - Volume Pattern 5 -- Geometric Case 4: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.53	1.33	2.65	1.10	8.61
All-Way Stop	3.30	15.94	2.49	12.05	33.77
Traffic Signal	3.84	5.24	2.84	4.35	16.27
Percent Change					
2-Way vs. All-Way	-7	1,103	-6	991	292
2-Way vs. Traffic Signal	9	295	7	294	89
All-Way vs. Traffic Signal	16	-67	14	-64	-52

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.85	0.01	1.43	0.01	3.29
All-Way Stop	1.62	5.30	1.27	4.36	12.55
Traffic Signal	2.29	1.91	1.69	1.70	7.59
Percent Change					
2-Way vs. All-Way	-12	76,784	-11	52,176	281
2-Way vs. Traffic Signal	24	27,639	18	20,287	130
All-Way vs. Traffic Signal	41	-64	33	-61	-40

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,290	16	981	18	2,305
All-Way Stop	1,290	3,472	981	3,028	8,772
Traffic Signal	1,017	1,070	765	924	3,776
Percent Change					
2-Way vs. All-Way	*	22,159	*	16,720	281
2-Way vs. Traffic Signal	-21	6,762	-22	5,033	64
All-Way vs. Traffic Signal	-21	-69	-22	-69	-57

* Difference not significant at the 95% level (two-tailed test).

Table A.50 - Volume Pattern 5 -- Geometric Case 5: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	4.20	1.04	2.96	0.91	9.12
All-Way Stop	3.89	11.02	2.77	9.06	26.74
Traffic Signal	3.98	4.61	2.92	4.02	15.53
Percent Change					
2-Way vs. All-Way	-7	962	-7	892	193
2-Way vs. Traffic Signal	-5	344	-1	340	70
All-Way vs. Traffic Signal	2	-58	6	-56	-42

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.89	0.03	1.42	0.02	3.36
All-Way Stop	1.61	4.43	1.23	3.79	11.05
Traffic Signal	2.11	2.11	1.60	1.89	7.71
Percent Change					
2-Way vs. All-Way	-15	17,530	-13	16,615	229
2-Way vs. Traffic Signal	12	8,306	12	8,232	130
All-Way vs. Traffic Signal	31	-52	30	-50	-30

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,290	33	982	39	2,344
All-Way Stop	1,294	3,481	986	3,041	8,801
Traffic Signal	1,009	1,092	761	980	3,842
Percent Change					
2-Way vs. All-Way	*	10,513	*	7,737	275
2-Way vs. Traffic Signal	-22	3,230	-23	2,426	64
All-Way vs. Traffic Signal	-22	-69	-23	-68	-56

* Difference not significant at the 95% level (two-tailed test).

Table A.51 - Volume Pattern 5 -- Geometric Case 6: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	4.22	1.03	2.98	0.91	9.15
All-Way Stop	4.00	10.79	2.85	8.93	26.56
Traffic Signal	3.98	4.54	2.96	3.92	15.40
Percent Change					
2-Way vs. All-Way	-5	943	-4	882	190
2-Way vs. Traffic Signal	-6	339	*	332	68
All-Way vs. Traffic Signal	*	-58	4	-56	-42

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.90	0.02	1.43	0.02	3.38
All-Way Stop	1.71	4.59	1.30	3.95	11.54
Traffic Signal	2.10	2.12	1.61	1.88	7.70
Percent Change					
2-Way vs. All-Way	-10	19,834	-9	16,649	241
2-Way vs. Traffic Signal	10	9,118	12	7,866	128
All-Way vs. Traffic Signal	23	-54	24	-52	-33

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,290	32	982	39	2,344
All-Way Stop	1,290	3,483	983	3,033	8,790
Traffic Signal	1,015	1,105	770	976	3,866
Percent Change					
2-Way vs. All-Way	*	10,785	*	7,718	275
2-Way vs. Traffic Signal	-21	3,353	-22	2,416	65
All-Way vs. Traffic Signal	-21	-68	-22	-68	-56

* Difference not significant at the 95% level (two-tailed test).

Table A.52 - Volume Pattern 5 -- Geometric Case 7: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.45	0.97	2.60	0.84	7.85
All-Way Stop	3.26	11.18	2.46	9.15	26.05
Traffic Signal	3.58	4.43	2.69	3.85	14.55
Percent Change					
2-Way vs. All-Way	-5	1,057	-5	994	232
2-Way vs. Traffic Signal	4	358	4	360	85
All-Way vs. Traffic Signal	10	-60	10	-58	-44

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.77	0.01	1.37	0.01	3.16
All-Way Stop	1.59	4.57	1.23	3.87	11.26
Traffic Signal	2.07	1.99	1.56	1.80	7.43
Percent Change					
2-Way vs. All-Way	-10	67,323	-11	40,875	256
2-Way vs. Traffic Signal	17	29,325	14	18,995	135
All-Way vs. Traffic Signal	30	-56	27	-53	-34

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,290	16	982	22	2,310
All-Way Stop	1,290	3,482	982	3,030	8,784
Traffic Signal	1,000	1,065	768	956	3,789
Percent Change					
2-Way vs. All-Way	*	22,223	*	13,673	280
2-Way vs. Traffic Signal	-22	6,728	-22	4,244	64
All-Way vs. Traffic Signal	-22	-69	-22	-68	-57

* Difference not significant at the 95% level (two-tailed test).

Table A.53 - Volume Pattern 5 -- Geometric Case 8: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.47	0.96	2.61	0.83	7.87
All-Way Stop	3.32	10.80	2.49	8.91	25.52
Traffic Signal	3.57	4.31	2.69	3.78	14.36
Percent Change					
2-Way vs. All-Way	-4	1,025	-5	968	224
2-Way vs. Traffic Signal	3	349	3	354	83
All-Way vs. Traffic Signal	8	-60	8	-58	-44

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.77	0.01	1.38	0.01	3.16
All-Way Stop	1.63	4.62	1.26	3.97	11.47
Traffic Signal	2.06	1.98	1.55	1.80	7.39
Percent Change					
2-Way vs. All-Way	-8	79,908	-9	45,671	263
2-Way vs. Traffic Signal	16	34,171	12	20,705	133
All-Way vs. Traffic Signal	26	-57	23	-55	-36

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,291	13	982	21	2,308
All-Way Stop	1,294	3,486	984	3,034	8,798
Traffic Signal	1,004	1,064	764	960	3,791
Percent Change					
2-Way vs. All-Way	*	26,306	*	14,213	281
2-Way vs. Traffic Signal	-22	7,958	-22	4,426	64
All-Way vs. Traffic Signal	-22	-69	-22	-68	-57

* Difference not significant at the 95% level (two-tailed test).

Table A.54 - Volume Pattern 6 -- Geometric Case 1: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	8.99	11.95	5.55	10.09	36.58
All-Way Stop	3.86	197.62	2.79	175.05	379.32
Traffic Signal	8.40	51.35	6.04	46.49	112.28
Percent Change					
2-Way vs. All-Way	-57	1,554	-50	1,635	937
2-Way vs. Traffic Signal	-7	330	9	361	207
All-Way vs. Traffic Signal	118	-74	117	-73	-70

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	5.96	1.59	3.62	1.96	13.13
All-Way Stop	1.32	56.49	1.02	49.24	108.08
Traffic Signal	5.96	15.62	4.26	17.49	43.32
Percent Change					
2-Way vs. All-Way	-78	3,455	-72	2,417	723
2-Way vs. Traffic Signal	*	883	18	794	230
All-Way vs. Traffic Signal	351	-72	316	-64	-60

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,488	666	1,151	649	3,954
All-Way Stop	1,485	6,601	1,156	6,476	15,718
Traffic Signal	1,266	4,156	1,000	3,722	10,144
Percent Change					
2-Way vs. All-Way	*	892	*	898	298
2-Way vs. Traffic Signal	-15	524	-13	473	157
All-Way vs. Traffic Signal	-15	-37	-13	-43	-35

* Difference not significant at the 95% level (two-tailed test).

Table A.55 - Volume Pattern 6 -- Geometric Case 2: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	6.67	5.76	4.61	4.86	21.91
All-Way Stop	4.21	172.73	3.02	144.41	324.37
Traffic Signal	7.89	20.55	5.85	17.47	51.77
Percent Change					
2-Way vs. All-Way	-37	2,897	-35	2,871	1,381
2-Way vs. Traffic Signal	18	257	27	259	136
All-Way vs. Traffic Signal	87	-88	94	-88	-84

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.79	0.26	2.72	0.30	7.07
All-Way Stop	1.61	48.86	1.24	40.56	92.27
Traffic Signal	5.46	5.88	4.05	5.90	21.29
Percent Change					
2-Way vs. All-Way	-58	18,718	-54	13,648	1,206
2-Way vs. Traffic Signal	44	2,164	49	1,901	201
All-Way vs. Traffic Signal	240	-88	227	-85	-77

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,492	236	1,155	230	3,114
All-Way Stop	1,485	7,157	1,153	6,982	16,777
Traffic Signal	1,243	2,780	973	2,438	7,434
Percent Change					
2-Way vs. All-Way	-0	2,927	*	2,935	439
2-Way vs. Traffic Signal	-17	1,076	-16	960	139
All-Way vs. Traffic Signal	-16	-61	-16	-65	-56

* Difference not significant at the 95% level (two-tailed test).

Table A.56 - Volume Pattern 6 -- Geometric Case 3: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	5.25	7.82	3.97	6.35	23.39
All-Way Stop	3.49	197.72	2.65	174.40	378.26
Traffic Signal	7.61	32.44	5.62	25.74	71.42
Percent Change					
2-Way vs. All-Way	-34	2,428	-33	2,648	1,517
2-Way vs. Traffic Signal	45	315	41	306	205
All-Way vs. Traffic Signal	118	-84	112	-85	-81

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.22	0.18	2.48	0.28	6.15
All-Way Stop	1.51	56.48	1.19	49.14	108.32
Traffic Signal	5.61	7.24	4.12	7.05	24.02
Percent Change					
2-Way vs. All-Way	-53	30,988	-52	17,741	1,662
2-Way vs. Traffic Signal	75	3,883	67	2,459	291
All-Way vs. Traffic Signal	271	-87	247	-86	-78

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,490	231	1,156	254	3,131
All-Way Stop	1,484	6,610	1,153	6,495	15,742
Traffic Signal	1,239	3,271	988	2,821	8,320
Percent Change					
2-Way vs. All-Way	-0	2,764	*	2,457	403
2-Way vs. Traffic Signal	-17	1,317	-15	1,011	166
All-Way vs. Traffic Signal	-17	-51	-14	-57	-47

* Difference not significant at the 95% level (two-tailed test).

Table A.57 - Volume Pattern 6 -- Geometric Case 4: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	4.87	5.41	3.77	4.43	18.48
All-Way Stop	3.67	171.26	2.79	141.18	318.90
Traffic Signal	7.22	18.43	5.30	15.10	46.05
Percent Change					
2-Way vs. All-Way	-25	3,066	-26	3,086	1,626
2-Way vs. Traffic Signal	48	241	41	241	149
All-Way vs. Traffic Signal	97	-89	90	-89	-86

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.88	0.06	2.32	0.07	5.32
All-Way Stop	1.72	48.19	1.35	38.98	90.25
Traffic Signal	5.29	4.60	3.87	4.28	18.04
Percent Change					
2-Way vs. All-Way	-40	82,835	-42	59,469	1,596
2-Way vs. Traffic Signal	84	7,820	67	6,435	239
All-Way vs. Traffic Signal	208	-90	186	-89	-80

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,490	107	1,156	112	2,864
All-Way Stop	1,484	7,180	1,154	7,010	16,828
Traffic Signal	1,229	2,498	964	2,204	6,895
Percent Change					
2-Way vs. All-Way	-0	6,623	*	6,181	488
2-Way vs. Traffic Signal	-18	2,239	-17	1,875	141
All-Way vs. Traffic Signal	-17	-65	-16	-69	-59

* Difference not significant at the 95% level (two-tailed test).

Table A.58 - Volume Pattern 6 -- Geometric Case 5: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	5.62	3.54	4.05	3.12	16.33
All-Way Stop	4.18	43.74	2.97	33.77	84.65
Traffic Signal	7.07	14.22	5.01	12.44	38.75
Percent Change					
2-Way vs. All-Way	-26	1,136	-27	984	418
2-Way vs. Traffic Signal	26	302	24	299	137
All-Way vs. Traffic Signal	69	-67	69	-63	-54

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.87	0.25	2.21	0.26	5.59
All-Way Stop	1.61	11.38	1.20	9.58	23.76
Traffic Signal	4.71	5.31	3.35	4.99	18.36
Percent Change					
2-Way vs. All-Way	-44	4,512	-46	3,534	325
2-Way vs. Traffic Signal	64	2,052	51	1,793	228
All-Way vs. Traffic Signal	193	-53	180	-48	-23

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,490	241	1,151	239	3,121
All-Way Stop	1,486	8,642	1,154	7,793	19,075
Traffic Signal	1,238	2,591	948	2,332	7,109
Percent Change					
2-Way vs. All-Way	*	3,489	*	3,163	511
2-Way vs. Traffic Signal	-17	976	-18	877	128
All-Way vs. Traffic Signal	-17	-70	-18	-70	-63

* Difference not significant at the 95% level (two-tailed test).

Table A.59 - Volume Pattern 6 -- Geometric Case 6: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	5.60	3.41	3.97	3.04	16.02
All-Way Stop	4.47	38.56	3.20	31.46	77.69
Traffic Signal	7.05	13.48	5.02	11.81	37.35
Percent Change					
2-Way vs. All-Way	-20	1,033	-20	935	385
2-Way vs. Traffic Signal	26	296	26	288	133
All-Way vs. Traffic Signal	58	-65	57	-62	-52

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.82	0.25	2.13	0.28	5.48
All-Way Stop	1.84	11.77	1.40	10.28	25.29
Traffic Signal	4.64	5.41	3.30	5.02	18.38
Percent Change					
2-Way vs. All-Way	-35	4,619	-34	3,523	361
2-Way vs. Traffic Signal	64	2,071	55	1,669	235
All-Way vs. Traffic Signal	153	-54	135	-51	-27

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,491	221	1,152	221	3,085
All-Way Stop	1,490	8,649	1,159	7,796	19,094
Traffic Signal	1,248	2,602	949	2,338	7,137
Percent Change					
2-Way vs. All-Way	*	3,810	1	3,431	519
2-Way vs. Traffic Signal	-16	1,076	-18	959	131
All-Way vs. Traffic Signal	-16	-70	-18	-70	-63

* Difference not significant at the 95% level (two-tailed test).

Table A.60 - Volume Pattern 6 -- Geometric Case 7: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	4.42	3.09	3.37	2.66	13.53
All-Way Stop	3.60	44.68	2.73	34.52	85.52
Traffic Signal	6.33	12.79	4.65	10.94	34.71
Percent Change					
2-Way vs. All-Way	-19	1,348	-19	1,200	532
2-Way vs. Traffic Signal	43	314	38	312	156
All-Way vs. Traffic Signal	76	-71	71	-68	-59

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.43	0.07	1.93	0.07	4.50
All-Way Stop	1.67	11.94	1.31	10.09	25.01
Traffic Signal	4.47	4.57	3.28	4.14	16.46
Percent Change					
2-Way vs. All-Way	-31	18,305	-32	14,355	456
2-Way vs. Traffic Signal	84	6,946	70	5,836	266
All-Way vs. Traffic Signal	167	-62	150	-59	-34

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,489	132	1,154	130	2,904
All-Way Stop	1,486	8,646	1,153	7,792	19,076
Traffic Signal	1,224	2,397	947	2,134	6,702
Percent Change					
2-Way vs. All-Way	*	6,450	*	5,912	557
2-Way vs. Traffic Signal	-18	1,716	-18	1,547	131
All-Way vs. Traffic Signal	-18	-72	-18	-73	-65

* Difference not significant at the 95% level (two-tailed test).

Table A.61 - Volume Pattern 6 -- Geometric Case 8: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	4.36	2.97	3.37	2.57	13.28
All-Way Stop	3.70	38.75	2.80	31.39	76.65
Traffic Signal	6.14	12.19	4.63	10.53	33.49
Percent Change					
2-Way vs. All-Way	-15	1,203	-17	1,119	477
2-Way vs. Traffic Signal	41	310	38	309	152
All-Way vs. Traffic Signal	66	-69	66	-66	-56

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.39	0.06	1.91	0.06	4.41
All-Way Stop	1.76	11.86	1.38	10.28	25.27
Traffic Signal	4.28	4.63	3.24	4.22	16.37
Percent Change					
2-Way vs. All-Way	-26	19,633	-28	18,584	473
2-Way vs. Traffic Signal	80	7,595	69	7,572	271
All-Way vs. Traffic Signal	144	-61	135	-59	-35

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,488	119	1,154	108	2,870
All-Way Stop	1,484	8,648	1,153	7,794	19,080
Traffic Signal	1,204	2,397	949	2,160	6,711
Percent Change					
2-Way vs. All-Way	*	7,180	*	7,116	565
2-Way vs. Traffic Signal	-19	1,918	-18	1,900	134
All-Way vs. Traffic Signal	-19	-72	-18	-72	-65

* Difference not significant at the 95% level (two-tailed test).

Table A.62 - Volume Pattern 7 -- Geometric Case 1: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	20.86	38.47	17.95	45.35	122.64
All-Way Stop	3.93	154.07	3.81	189.58	351.39
Traffic Signal	8.95	74.62	8.10	94.21	185.88
Percent Change					
2-Way vs. All-Way	-81	300	-79	318	187
2-Way vs. Traffic Signal	-57	94	-55	108	52
All-Way vs. Traffic Signal	128	-52	112	-50	-47

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	17.03	9.24	14.63	7.57	48.47
All-Way Stop	1.33	44.13	1.33	56.54	103.32
Traffic Signal	6.35	24.26	5.63	25.41	61.64
Percent Change					
2-Way vs. All-Way	-92	378	-91	647	113
2-Way vs. Traffic Signal	-63	163	-62	236	27
All-Way vs. Traffic Signal	377	-45	324	-55	-40

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,447	1,787	1,420	2,025	6,680
All-Way Stop	1,500	6,594	1,474	6,626	16,195
Traffic Signal	1,312	4,730	1,248	5,789	13,080
Percent Change					
2-Way vs. All-Way	4	269	4	227	142
2-Way vs. Traffic Signal	-9	165	-12	186	96
All-Way vs. Traffic Signal	-13	-28	-15	-13	-19

Table A.63 - Volume Pattern 7 -- Geometric Case 2: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	20.46	12.12	20.55	15.59	68.73
All-Way Stop	4.28	125.17	4.19	165.17	298.81
Traffic Signal	8.76	40.49	8.16	52.45	109.86
Percent Change					
2-Way vs. All-Way	-79	933	-80	959	335
2-Way vs. Traffic Signal	-57	234	-60	236	60
All-Way vs. Traffic Signal	104	-68	95	-68	-63

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	17.24	1.96	17.57	2.49	39.26
All-Way Stop	1.63	36.23	1.64	49.37	88.86
Traffic Signal	6.16	9.29	5.64	10.34	31.42
Percent Change					
2-Way vs. All-Way	-91	1,746	-91	1,884	126
2-Way vs. Traffic Signal	-64	374	-68	315	-20
All-Way vs. Traffic Signal	278	-74	243	-79	-65

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,345	287	1,313	301	3,246
All-Way Stop	1,500	6,926	1,476	7,101	17,002
Traffic Signal	1,295	3,678	1,268	4,462	10,703
Percent Change					
2-Way vs. All-Way	12	2,315	12	2,258	424
2-Way vs. Traffic Signal	-4	1,183	-3	1,381	230
All-Way vs. Traffic Signal	-14	-47	-14	-37	-37

Table A.64 - Volume Pattern 7 -- Geometric Case 3: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	8.17	24.35	8.40	30.72	71.64
All-Way Stop	3.54	153.14	3.45	189.11	349.24
Traffic Signal	8.00	53.59	7.48	72.91	141.98
Percent Change					
2-Way vs. All-Way	-57	529	-59	516	388
2-Way vs. Traffic Signal	-2	120	-11	137	98
All-Way vs. Traffic Signal	126	-65	117	-61	-59

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	5.95	1.92	6.28	1.53	15.68
All-Way Stop	1.53	43.58	1.52	56.40	103.03
Traffic Signal	5.93	10.59	5.50	12.21	34.24
Percent Change					
2-Way vs. All-Way	-74	2,169	-76	3,592	557
2-Way vs. Traffic Signal	*	451	-12	699	118
All-Way vs. Traffic Signal	288	-76	262	-78	-67

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,499	747	1,474	808	4,529
All-Way Stop	1,500	6,617	1,474	6,655	16,246
Traffic Signal	1,280	4,157	1,248	5,247	11,932
Percent Change					
2-Way vs. All-Way	*	786	*	723	259
2-Way vs. Traffic Signal	-15	456	-15	549	163
All-Way vs. Traffic Signal	-15	-37	-15	-21	-27

* Difference not significant at the 95% level (two-tailed test).

Table A.65 - Volume Pattern 7 -- Geometric Case 4: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	13.40	10.44	13.55	13.10	50.49
All-Way Stop	3.76	125.77	3.66	163.46	296.65
Traffic Signal	7.81	35.22	7.38	46.54	96.94
Percent Change					
2-Way vs. All-Way	-72	1,104	-73	1,148	488
2-Way vs. Traffic Signal	-42	237	-46	255	92
All-Way vs. Traffic Signal	108	-72	102	-72	-67

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	11.19	0.52	11.46	0.61	23.77
All-Way Stop	1.77	36.09	1.74	48.39	87.99
Traffic Signal	5.80	5.99	5.47	7.05	24.30
Percent Change					
2-Way vs. All-Way	-84	6,867	-85	7,857	270
2-Way vs. Traffic Signal	-48	1,056	-52	1,059	2
All-Way vs. Traffic Signal	227	-83	214	-85	-72

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,445	157	1,414	163	3,179
All-Way Stop	1,501	6,948	1,471	7,122	17,041
Traffic Signal	1,261	3,238	1,232	3,997	9,729
Percent Change					
2-Way vs. All-Way	4	4,331	4	4,274	436
2-Way vs. Traffic Signal	-13	1,965	-13	2,355	206
All-Way vs. Traffic Signal	-16	-53	-16	-44	-43

Table A.66 - Volume Pattern 7 -- Geometric Case 5: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	6.78	4.63	6.74	5.42	23.56
All-Way Stop	4.18	108.11	4.05	164.76	281.10
Traffic Signal	7.83	18.77	7.24	21.57	55.40
Percent Change					
2-Way vs. All-Way	-38	2,237	-40	2,941	1,093
2-Way vs. Traffic Signal	15	306	7	298	135
All-Way vs. Traffic Signal	87	-83	79	-87	-80

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.87	0.52	3.96	0.46	8.81
All-Way Stop	1.54	30.42	1.53	46.18	79.67
Traffic Signal	5.30	6.70	4.87	7.11	23.99
Percent Change					
2-Way vs. All-Way	-60	5,812	-62	10,044	804
2-Way vs. Traffic Signal	37	1,202	23	1,462	172
All-Way vs. Traffic Signal	243	-78	220	-85	-70

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,501	317	1,478	345	3,640
All-Way Stop	1,501	8,366	1,474	9,460	20,800
Traffic Signal	1,264	2,845	1,229	3,212	8,550
Percent Change					
2-Way vs. All-Way	*	2,541	*	2,644	471
2-Way vs. Traffic Signal	-16	798	-17	831	135
All-Way vs. Traffic Signal	-16	-66	-17	-66	-59

* Difference not significant at the 95% level (two-tailed test).

Table A.67 - Volume Pattern 7 -- Geometric Case 6: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	6.40	4.05	6.38	4.80	21.64
All-Way Stop	4.50	94.44	4.33	135.80	239.07
Traffic Signal	7.58	16.00	7.19	18.81	49.57
Percent Change					
2-Way vs. All-Way	-30	2,230	-32	2,728	1,005
2-Way vs. Traffic Signal	18	295	13	292	129
All-Way vs. Traffic Signal	68	-83	66	-86	-79

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.52	0.38	3.65	0.36	7.91
All-Way Stop	1.81	27.47	1.76	38.30	69.33
Traffic Signal	5.07	6.21	4.74	6.97	22.99
Percent Change					
2-Way vs. All-Way	-49	7,084	-52	10,502	777
2-Way vs. Traffic Signal	44	1,523	30	1,831	191
All-Way vs. Traffic Signal	181	-77	170	-82	-67

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,503	259	1,477	278	3,517
All-Way Stop	1,503	8,602	1,477	9,885	21,467
Traffic Signal	1,256	2,770	1,244	3,183	8,453
Percent Change					
2-Way vs. All-Way	*	3,219	*	3,456	510
2-Way vs. Traffic Signal	-16	969	-16	1,045	140
All-Way vs. Traffic Signal	-16	-68	-16	-68	-61

* Difference not significant at the 95% level (two-tailed test).

Table A.68 - Volume Pattern 7 -- Geometric Case 7: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	4.77	3.77	4.80	4.48	17.83
All-Way Stop	3.59	107.45	3.53	159.94	274.52
Traffic Signal	6.97	15.81	6.50	18.59	47.87
Percent Change					
2-Way vs. All-Way	-25	2,747	-27	3,474	1,440
2-Way vs. Traffic Signal	46	319	35	315	169
All-Way vs. Traffic Signal	94	-85	84	-88	-83

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.76	0.12	2.85	0.12	5.85
All-Way Stop	1.63	30.07	1.63	43.82	77.15
Traffic Signal	5.03	5.19	4.68	5.70	20.60
Percent Change					
2-Way vs. All-Way	-41	25,552	-43	37,747	1,219
2-Way vs. Traffic Signal	82	4,323	64	4,825	252
All-Way vs. Traffic Signal	208	-83	187	-87	-73

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,496	181	1,477	185	3,338
All-Way Stop	1,496	8,397	1,473	9,522	20,888
Traffic Signal	1,228	2,602	1,205	2,928	7,962
Percent Change					
2-Way vs. All-Way	*	4,534	*	5,053	526
2-Way vs. Traffic Signal	-18	1,336	-18	1,484	139
All-Way vs. Traffic Signal	-18	-69	-18	-69	-62

* Difference not significant at the 95% level (two-tailed test).

Table A.69 - Volume Pattern 7 -- Geometric Case 8: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	4.68	3.51	4.65	4.15	17.00
All-Way Stop	3.72	92.31	3.62	133.38	233.03
Traffic Signal	6.80	13.96	6.41	16.55	43.71
Percent Change					
2-Way vs. All-Way	-21	2,528	-22	3,112	1,271
2-Way vs. Traffic Signal	45	297	38	298	157
All-Way vs. Traffic Signal	83	-85	77	-88	-81

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.64	0.11	2.69	0.09	5.53
All-Way Stop	1.72	26.04	1.71	36.81	66.28
Traffic Signal	4.85	4.96	4.56	5.58	19.95
Percent Change					
2-Way vs. All-Way	-35	23,670	-36	39,437	1,098
2-Way vs. Traffic Signal	84	4,426	70	5,892	261
All-Way vs. Traffic Signal	183	-81	167	-85	-70

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,501	154	1,478	154	3,287
All-Way Stop	1,500	8,648	1,474	9,937	21,559
Traffic Signal	1,227	2,562	1,210	2,878	7,878
Percent Change					
2-Way vs. All-Way	*	5,515	*	6,353	556
2-Way vs. Traffic Signal	-18	1,564	-18	1,769	140
All-Way vs. Traffic Signal	-18	-70	-18	-71	-63

* Difference not significant at the 95% level (two-tailed test).

Table A.70 - Volume Pattern 8 -- Geometric Case 1: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.33	1.90	3.17	2.28	10.68
All-Way Stop	2.78	25.59	2.66	42.54	73.57
Traffic Signal	3.62	6.95	3.58	8.15	22.30
Percent Change					
2-Way vs. All-Way	-17	1,246	-16	1,768	589
2-Way vs. Traffic Signal	9	266	13	258	109
All-Way vs. Traffic Signal	30	-73	35	-81	-70

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.66	0.05	1.62	0.06	3.39
All-Way Stop	1.16	6.88	1.12	11.49	20.65
Traffic Signal	2.19	2.40	2.18	2.60	9.37
Percent Change					
2-Way vs. All-Way	-30	13,516	-31	19,937	510
2-Way vs. Traffic Signal	32	4,649	35	4,442	177
All-Way vs. Traffic Signal	89	-65	94	-77	-55

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,048	64	1,034	77	2,223
All-Way Stop	1,054	4,016	1,038	4,396	10,504
Traffic Signal	827	1,225	845	1,348	4,246
Percent Change					
2-Way vs. All-Way	1	6,136	*	5,594	373
2-Way vs. Traffic Signal	-21	1,802	-18	1,647	91
All-Way vs. Traffic Signal	-22	-69	-19	-69	-60

* Difference not significant at the 95% level (two-tailed test).

Table A.71 - Volume Pattern 8 -- Geometric Case 2: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.35	1.65	3.19	1.88	10.08
All-Way Stop	2.95	20.89	2.80	29.74	56.38
Traffic Signal	3.48	6.02	3.63	6.96	20.08
Percent Change					
2-Way vs. All-Way	-12	1,165	-12	1,479	459
2-Way vs. Traffic Signal	4	264	14	270	99
All-Way vs. Traffic Signal	18	-71	30	-77	-64

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.66	0.04	1.63	0.04	3.36
All-Way Stop	1.30	6.29	1.26	8.38	17.23
Traffic Signal	2.04	2.20	2.18	2.40	8.81
Percent Change					
2-Way vs. All-Way	-22	16,644	-23	23,255	413
2-Way vs. Traffic Signal	23	5,745	34	6,584	163
All-Way vs. Traffic Signal	58	-65	73	-71	-49

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,047	53	1,034	56	2,190
All-Way Stop	1,049	4,025	1,033	4,459	10,566
Traffic Signal	818	1,170	850	1,279	4,117
Percent Change					
2-Way vs. All-Way	*	7,523	*	7,920	383
2-Way vs. Traffic Signal	-22	2,115	-18	2,200	88
All-Way vs. Traffic Signal	-22	-71	-18	-71	-61

* Difference not significant at the 95% level (two-tailed test).

Table A.72 - Volume Pattern 8 -- Geometric Case 3: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.99	1.84	2.85	2.19	9.87
All-Way Stop	2.62	26.19	2.49	41.87	73.18
Traffic Signal	3.39	6.46	3.45	7.73	21.03
Percent Change					
2-Way vs. All-Way	-12	1,324	-13	1,811	641
2-Way vs. Traffic Signal	14	251	21	253	113
All-Way vs. Traffic Signal	30	-75	39	-82	-71

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.60	0.02	1.55	0.02	3.18
All-Way Stop	1.24	7.23	1.19	11.18	20.84
Traffic Signal	2.11	2.04	2.19	2.32	8.66
Percent Change					
2-Way vs. All-Way	-22	46,065	-23	50,707	555
2-Way vs. Traffic Signal	32	12,929	41	10,427	172
All-Way vs. Traffic Signal	70	-72	84	-79	-58

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,054	32	1,034	37	2,157
All-Way Stop	1,049	4,014	1,032	4,393	10,488
Traffic Signal	818	1,153	843	1,278	4,092
Percent Change					
2-Way vs. All-Way	-0	12,444	*	11,709	386
2-Way vs. Traffic Signal	-22	3,503	-18	3,334	90
All-Way vs. Traffic Signal	-22	-71	-18	-71	-61

* Difference not significant at the 95% level (two-tailed test).

Table A.73 - Volume Pattern 8 -- Geometric Case 4: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.97	1.60	2.83	1.84	9.24
All-Way Stop	2.71	21.20	2.58	30.02	56.51
Traffic Signal	3.27	5.75	3.37	6.64	19.03
Percent Change					
2-Way vs. All-Way	-9	1,223	-9	1,529	512
2-Way vs. Traffic Signal	10	259	19	261	106
All-Way vs. Traffic Signal	21	-73	30	-78	-66

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.59	0.01	1.55	0.01	3.17
All-Way Stop	1.35	6.42	1.30	8.55	17.61
Traffic Signal	2.03	2.00	2.14	2.18	8.33
Percent Change					
2-Way vs. All-Way	-16	60,102	-16	67,389	456
2-Way vs. Traffic Signal	27	18,626	38	17,072	163
All-Way vs. Traffic Signal	51	-69	65	-75	-53

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,049	21	1,035	27	2,132
All-Way Stop	1,050	4,025	1,034	4,461	10,570
Traffic Signal	812	1,109	840	1,211	3,972
Percent Change					
2-Way vs. All-Way	*	18,887	*	16,545	396
2-Way vs. Traffic Signal	-23	5,130	-19	4,418	86
All-Way vs. Traffic Signal	-23	-72	-19	-73	-62

* Difference not significant at the 95% level (two-tailed test).

Table A.74 - Volume Pattern 8 -- Geometric Case 5: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.24	1.23	3.10	1.38	8.95
All-Way Stop	2.93	13.17	2.82	15.46	34.38
Traffic Signal	3.21	5.02	3.26	5.71	17.20
Percent Change					
2-Way vs. All-Way	-10	972	-9	1,021	284
2-Way vs. Traffic Signal	-1	309	5	314	92
All-Way vs. Traffic Signal	10	-62	15	-63	-50

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.56	0.04	1.54	0.04	3.18
All-Way Stop	1.29	5.00	1.28	5.66	13.22
Traffic Signal	1.82	2.19	1.88	2.47	8.36
Percent Change					
2-Way vs. All-Way	-17	13,282	-17	15,855	316
2-Way vs. Traffic Signal	16	5,759	22	6,871	163
All-Way vs. Traffic Signal	40	-56	47	-56	-37

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,047	52	1,034	57	2,190
All-Way Stop	1,061	4,047	1,042	4,491	10,642
Traffic Signal	802	1,162	828	1,264	4,056
Percent Change					
2-Way vs. All-Way	1	7,682	1	7,752	386
2-Way vs. Traffic Signal	-23	2,135	-20	2,110	85
All-Way vs. Traffic Signal	-24	-71	-21	-72	-62

Table A.75 - Volume Pattern 8 -- Geometric Case 6: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.23	1.22	3.11	1.37	8.93
All-Way Stop	3.02	12.76	2.89	14.89	33.57
Traffic Signal	3.21	4.93	3.29	5.54	16.97
Percent Change					
2-Way vs. All-Way	-6	948	-7	984	276
2-Way vs. Traffic Signal	*	305	6	303	90
All-Way vs. Traffic Signal	6	-61	14	-63	-49

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.56	0.04	1.54	0.03	3.16
All-Way Stop	1.37	5.18	1.34	5.91	13.79
Traffic Signal	1.80	2.23	1.87	2.45	8.36
Percent Change					
2-Way vs. All-Way	-12	14,187	-13	17,284	336
2-Way vs. Traffic Signal	16	6,051	22	7,118	164
All-Way vs. Traffic Signal	32	-57	40	-58	-39

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,051	52	1,038	52	2,193
All-Way Stop	1,048	4,036	1,034	4,478	10,596
Traffic Signal	806	1,176	831	1,269	4,082
Percent Change					
2-Way vs. All-Way	*	7,662	*	8,511	383
2-Way vs. Traffic Signal	-23	2,162	-20	2,341	86
All-Way vs. Traffic Signal	-23	-71	-20	-72	-61

* Difference not significant at the 95% level (two-tailed test).

Table A.76 - Volume Pattern 8 -- Geometric Case 7: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.86	1.14	2.76	1.28	8.03
All-Way Stop	2.66	13.41	2.57	15.68	34.32
Traffic Signal	3.00	4.77	3.03	5.47	16.28
Percent Change					
2-Way vs. All-Way	-7	1,072	-7	1,128	327
2-Way vs. Traffic Signal	5	317	10	328	103
All-Way vs. Traffic Signal	13	-64	18	-65	-53

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.49	0.01	1.48	0.02	3.00
All-Way Stop	1.31	5.19	1.29	5.85	13.64
Traffic Signal	1.80	2.05	1.86	2.33	8.04
Percent Change					
2-Way vs. All-Way	-12	44,795	-13	37,796	355
2-Way vs. Traffic Signal	21	17,679	25	14,980	168
All-Way vs. Traffic Signal	38	-60	44	-60	-41

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,048	27	1,034	35	2,144
All-Way Stop	1,050	4,038	1,035	4,472	10,595
Traffic Signal	795	1,123	822	1,223	3,963
Percent Change					
2-Way vs. All-Way	*	14,969	*	12,603	394
2-Way vs. Traffic Signal	-24	4,090	-20	3,375	85
All-Way vs. Traffic Signal	-24	-72	-21	-73	-63

* Difference not significant at the 95% level (two-tailed test).

Table A.77 - Volume Pattern 8 -- Geometric Case 8: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.86	1.13	2.77	1.27	8.03
All-Way Stop	2.71	12.88	2.62	14.92	33.12
Traffic Signal	2.99	4.67	3.04	5.32	16.02
Percent Change					
2-Way vs. All-Way	-5	1,036	-6	1,079	312
2-Way vs. Traffic Signal	4	312	10	320	99
All-Way vs. Traffic Signal	10	-64	16	-64	-52

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.49	0.01	1.49	0.01	3.00
All-Way Stop	1.35	5.27	1.33	5.95	13.89
Traffic Signal	1.77	2.07	1.85	2.32	8.02
Percent Change					
2-Way vs. All-Way	-10	43,787	-11	43,800	362
2-Way vs. Traffic Signal	19	17,158	24	17,032	167
All-Way vs. Traffic Signal	32	-61	39	-61	-42

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,048	25	1,034	32	2,140
All-Way Stop	1,051	4,042	1,039	4,480	10,613
Traffic Signal	798	1,128	824	1,224	3,974
Percent Change					
2-Way vs. All-Way	*	15,941	*	13,728	396
2-Way vs. Traffic Signal	-24	4,375	-20	3,679	86
All-Way vs. Traffic Signal	-24	-72	-21	-73	-63

* Difference not significant at the 95% level (two-tailed test).

Table A.78 - Volume Pattern 9 -- Geometric Case 1: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.10	1.79	2.07	1.90	7.86
All-Way Stop	1.77	20.46	1.72	23.38	47.33
Traffic Signal	2.34	5.48	2.29	5.82	15.94
Percent Change					
2-Way vs. All-Way	-16	1,043	-17	1,131	502
2-Way vs. Traffic Signal	11	206	11	206	103
All-Way vs. Traffic Signal	32	-73	33	-75	-66

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.08	0.04	1.10	0.05	2.27
All-Way Stop	0.77	5.73	0.78	6.27	13.55
Traffic Signal	1.41	1.73	1.40	1.80	6.34
Percent Change					
2-Way vs. All-Way	-29	14,551	-29	11,837	497
2-Way vs. Traffic Signal	31	4,312	28	3,325	179
All-Way vs. Traffic Signal	84	-70	80	-71	-53

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	735	63	738	69	1,605
All-Way Stop	734	3,997	735	4,155	9,621
Traffic Signal	619	959	622	1,017	3,218
Percent Change					
2-Way vs. All-Way	*	6,224	*	5,939	500
2-Way vs. Traffic Signal	-16	1,418	-16	1,378	101
All-Way vs. Traffic Signal	-16	-76	-15	-76	-67

* Difference not significant at the 95% level (two-tailed test).

Table A.79 - Volume Pattern 9 -- Geometric Case 2: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.12	1.58	2.07	1.63	7.41
All-Way Stop	1.88	18.22	1.83	20.11	42.05
Traffic Signal	2.29	5.06	2.30	5.30	14.95
Percent Change					
2-Way vs. All-Way	-11	1,052	-12	1,135	468
2-Way vs. Traffic Signal	8	220	11	226	102
All-Way vs. Traffic Signal	21	-72	25	-74	-64

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.09	0.03	1.10	0.03	2.25
All-Way Stop	0.87	5.69	0.88	6.11	13.55
Traffic Signal	1.35	1.72	1.38	1.81	6.26
Percent Change					
2-Way vs. All-Way	-20	19,156	-20	18,604	502
2-Way vs. Traffic Signal	24	5,732	25	5,437	178
All-Way vs. Traffic Signal	55	-70	56	-70	-54

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	736	46	738	52	1,572
All-Way Stop	734	4,003	736	4,163	9,636
Traffic Signal	616	953	628	1,016	3,213
Percent Change					
2-Way vs. All-Way	*	8,679	*	7,844	513
2-Way vs. Traffic Signal	-16	1,989	-15	1,840	104
All-Way vs. Traffic Signal	-16	-76	-15	-76	-67

* Difference not significant at the 95% level (two-tailed test).

Table A.80 - Volume Pattern 9 -- Geometric Case 3: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.96	1.76	1.93	1.84	7.49
All-Way Stop	1.75	20.88	1.72	23.89	48.24
Traffic Signal	2.28	5.28	2.22	5.60	15.38
Percent Change					
2-Way vs. All-Way	-11	1,087	-11	1,197	544
2-Way vs. Traffic Signal	16	200	15	204	105
All-Way vs. Traffic Signal	30	-75	29	-77	-68

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.07	0.02	1.06	0.02	2.15
All-Way Stop	0.85	5.97	0.86	6.58	14.25
Traffic Signal	1.41	1.60	1.40	1.69	6.11
Percent Change					
2-Way vs. All-Way	-20	39,966	-19	41,868	562
2-Way vs. Traffic Signal	33	10,657	32	10,716	184
All-Way vs. Traffic Signal	65	-73	63	-74	-57

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	735	32	737	32	1,536
All-Way Stop	733	3,999	736	4,158	9,626
Traffic Signal	628	920	614	962	3,124
Percent Change					
2-Way vs. All-Way	*	12,396	*	12,735	527
2-Way vs. Traffic Signal	-15	2,776	-17	2,868	103
All-Way vs. Traffic Signal	-14	-77	-17	-77	-68

* Difference not significant at the 95% level (two-tailed test).

Table A.81 - Volume Pattern 9 -- Geometric Case 4: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.95	1.54	1.92	1.59	7.00
All-Way Stop	1.80	18.51	1.77	20.29	42.37
Traffic Signal	2.19	4.90	2.18	5.20	14.47
Percent Change					
2-Way vs. All-Way	-8	1,101	-8	1,176	505
2-Way vs. Traffic Signal	12	218	13	227	107
All-Way vs. Traffic Signal	22	-74	23	-74	-66

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.07	0.01	1.06	0.01	2.15
All-Way Stop	0.92	5.81	0.92	6.21	13.86
Traffic Signal	1.35	1.61	1.37	1.72	6.05
Percent Change					
2-Way vs. All-Way	-14	53,822	-13	57,536	544
2-Way vs. Traffic Signal	26	14,873	29	15,887	181
All-Way vs. Traffic Signal	47	-72	48	-72	-56

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	736	22	738	23	1,519
All-Way Stop	736	4,002	737	4,162	9,638
Traffic Signal	622	914	620	977	3,133
Percent Change					
2-Way vs. All-Way	*	18,093	*	18,154	534
2-Way vs. Traffic Signal	-15	4,056	-16	4,184	106
All-Way vs. Traffic Signal	-15	-77	-16	-77	-67

* Difference not significant at the 95% level (two-tailed test).

Table A.82 - Volume Pattern 9 -- Geometric Case 5: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.07	1.22	2.03	1.24	6.56
All-Way Stop	1.91	12.78	1.83	13.50	30.01
Traffic Signal	2.23	4.13	2.19	4.32	12.86
Percent Change					
2-Way vs. All-Way	-8	952	-10	985	357
2-Way vs. Traffic Signal	7	240	8	247	96
All-Way vs. Traffic Signal	17	-68	20	-68	-57

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.04	0.03	1.06	0.04	2.17
All-Way Stop	0.88	4.97	0.88	5.21	11.93
Traffic Signal	1.30	1.71	1.29	1.79	6.08
Percent Change					
2-Way vs. All-Way	-15	14,758	-17	14,225	450
2-Way vs. Traffic Signal	25	4,998	22	4,816	180
All-Way vs. Traffic Signal	47	-66	47	-66	-49

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	736	52	737	57	1,581
All-Way Stop	741	4,016	736	4,167	9,660
Traffic Signal	609	926	624	975	3,134
Percent Change					
2-Way vs. All-Way	1	7,683	*	7,236	511
2-Way vs. Traffic Signal	-17	1,694	-15	1,617	98
All-Way vs. Traffic Signal	-18	-77	-15	-77	-68

* Difference not significant at the 95% level (two-tailed test).

Table A.83 - Volume Pattern 9 -- Geometric Case 6: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.08	1.20	2.03	1.23	6.55
All-Way Stop	1.96	12.47	1.90	13.13	29.46
Traffic Signal	2.21	4.04	2.20	4.26	12.70
Percent Change					
2-Way vs. All-Way	-6	936	-6	967	350
2-Way vs. Traffic Signal	7	235	8	246	94
All-Way vs. Traffic Signal	13	-68	15	-68	-57

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.04	0.03	1.06	0.03	2.16
All-Way Stop	0.93	5.16	0.93	5.40	12.42
Traffic Signal	1.28	1.71	1.28	1.80	6.06
Percent Change					
2-Way vs. All-Way	-11	16,912	-12	15,939	475
2-Way vs. Traffic Signal	23	5,535	21	5,236	181
All-Way vs. Traffic Signal	38	-67	37	-67	-51

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	736	44	738	50	1,569
All-Way Stop	737	4,007	738	4,169	9,652
Traffic Signal	609	930	628	980	3,148
Percent Change					
2-Way vs. All-Way	*	8,925	*	8,172	515
2-Way vs. Traffic Signal	-17	1,994	-15	1,845	101
All-Way vs. Traffic Signal	-17	-77	-15	-76	-67

* Difference not significant at the 95% level (two-tailed test).

Table A.84 - Volume Pattern 9 -- Geometric Case 7: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.90	1.13	1.89	1.16	6.08
All-Way Stop	1.78	12.98	1.75	13.91	30.42
Traffic Signal	2.12	3.99	2.08	4.24	12.43
Percent Change					
2-Way vs. All-Way	-6	1,052	-7	1,095	401
2-Way vs. Traffic Signal	12	254	10	264	105
All-Way vs. Traffic Signal	19	-69	19	-70	-59

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.01	0.01	1.02	0.01	2.06
All-Way Stop	0.90	5.14	0.90	5.44	12.37
Traffic Signal	1.30	1.65	1.28	1.75	5.97
Percent Change					
2-Way vs. All-Way	-11	46,130	-12	42,440	501
2-Way vs. Traffic Signal	28	14,749	25	13,597	190
All-Way vs. Traffic Signal	44	-68	42	-68	-52

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	736	27	738	32	1,533
All-Way Stop	736	4,010	736	4,218	9,700
Traffic Signal	612	892	618	963	3,084
Percent Change					
2-Way vs. All-Way	*	14,864	*	13,083	533
2-Way vs. Traffic Signal	-17	3,227	-16	2,910	101
All-Way vs. Traffic Signal	-17	-78	-16	-77	-68

* Difference not significant at the 95% level (two-tailed test).

Table A.85 - Volume Pattern 9 -- Geometric Case 8: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.90	1.11	1.90	1.14	6.05
All-Way Stop	1.80	12.53	1.78	13.19	29.31
Traffic Signal	2.11	3.90	2.05	4.07	12.13
Percent Change					
2-Way vs. All-Way	-5	1,028	-6	1,056	385
2-Way vs. Traffic Signal	11	251	8	257	101
All-Way vs. Traffic Signal	17	-69	15	-69	-59

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.01	0.01	1.03	0.01	2.06
All-Way Stop	0.92	5.23	0.93	5.46	12.53
Traffic Signal	1.27	1.64	1.25	1.71	5.87
Percent Change					
2-Way vs. All-Way	-9	55,236	-10	49,570	508
2-Way vs. Traffic Signal	25	17,265	22	15,420	185
All-Way vs. Traffic Signal	38	-69	35	-69	-53

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	736	22	738	28	1,524
All-Way Stop	736	4,009	736	4,168	9,649
Traffic Signal	611	897	619	937	3,064
Percent Change					
2-Way vs. All-Way	*	17,796	*	14,787	533
2-Way vs. Traffic Signal	-17	3,904	-16	3,247	101
All-Way vs. Traffic Signal	-17	-78	-16	-78	-68

* Difference not significant at the 95% level (two-tailed test).

Table A.86 - Volume Pattern 10 -- Geometric Case 1: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	11.69	91.04	12.04	87.55	202.31
All-Way Stop	1.68	260.68	1.73	225.59	489.68
Traffic Signal	4.83	146.69	4.80	132.63	288.95
Percent Change					
2-Way vs. All-Way	-86	186	-86	158	142
2-Way vs. Traffic Signal	-59	61	-60	51	43
All-Way vs. Traffic Signal	187	-44	178	-41	-41

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	10.19	26.03	10.58	34.71	81.51
All-Way Stop	0.60	75.44	0.64	64.54	141.23
Traffic Signal	3.72	47.19	3.66	54.75	109.32
Percent Change					
2-Way vs. All-Way	-94	190	-94	86	73
2-Way vs. Traffic Signal	-64	81	-65	58	34
All-Way vs. Traffic Signal	517	-37	470	-15	-23

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	723	3,968	741	3,754	9,186
All-Way Stop	750	7,531	772	7,111	16,164
Traffic Signal	664	6,823	687	5,936	14,110
Percent Change					
2-Way vs. All-Way	4	90	4	89	76
2-Way vs. Traffic Signal	-8	72	-7	58	54
All-Way vs. Traffic Signal	-12	-9	-11	-17	-13

Table A.87 - Volume Pattern 10 -- Geometric Case 2: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	6.69	16.60	7.07	12.57	42.93
All-Way Stop	1.85	247.02	1.91	212.90	463.68
Traffic Signal	4.83	51.48	4.91	43.55	104.77
Percent Change					
2-Way vs. All-Way	-72	1,388	-73	1,594	980
2-Way vs. Traffic Signal	-28	210	-31	247	144
All-Way vs. Traffic Signal	162	-79	157	-80	-77

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	5.48	2.57	5.85	2.32	16.24
All-Way Stop	0.76	71.32	0.81	60.58	133.47
Traffic Signal	3.72	15.35	3.73	17.17	39.97
Percent Change					
2-Way vs. All-Way	-86	2,672	-86	2,507	722
2-Way vs. Traffic Signal	-32	496	-36	639	146
All-Way vs. Traffic Signal	391	-78	361	-72	-70

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	708	491	731	524	2,454
All-Way Stop	751	8,238	772	7,706	17,468
Traffic Signal	655	3,658	688	3,056	8,056
Percent Change					
2-Way vs. All-Way	6	1,578	6	1,371	612
2-Way vs. Traffic Signal	-7	645	-6	483	228
All-Way vs. Traffic Signal	-13	-56	-11	-60	-54

Table A.88 - Volume Pattern 10 -- Geometric Case 3: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	4.97	50.03	5.01	41.53	101.53
All-Way Stop	1.68	259.26	1.77	224.91	487.62
Traffic Signal	4.72	112.12	4.58	87.12	208.54
Percent Change					
2-Way vs. All-Way	-66	418	-65	442	380
2-Way vs. Traffic Signal	-5	124	-9	110	105
All-Way vs. Traffic Signal	181	-57	159	-61	-57

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.94	6.93	3.99	7.59	22.45
All-Way Stop	0.73	74.59	0.79	64.14	140.26
Traffic Signal	3.73	22.48	3.61	22.30	52.12
Percent Change					
2-Way vs. All-Way	-82	976	-80	746	525
2-Way vs. Traffic Signal	-5	224	-10	194	132
All-Way vs. Traffic Signal	414	-70	355	-65	-63

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	743	2,038	764	2,080	5,625
All-Way Stop	758	7,566	778	7,133	16,235
Traffic Signal	666	6,348	663	5,263	12,940
Percent Change					
2-Way vs. All-Way	2	271	2	243	189
2-Way vs. Traffic Signal	-10	211	-13	153	130
All-Way vs. Traffic Signal	-12	-16	-15	-26	-20

Table A.89 - Volume Pattern 10 -- Geometric Case 4: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	4.60	13.76	4.87	9.88	33.11
All-Way Stop	1.74	245.04	1.85	211.60	460.23
Traffic Signal	4.68	40.72	4.61	31.31	81.31
Percent Change					
2-Way vs. All-Way	-62	1,680	-62	2,042	1,290
2-Way vs. Traffic Signal	*	196	-5	217	146
All-Way vs. Traffic Signal	168	-83	150	-85	-82

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.63	0.46	3.89	0.40	8.37
All-Way Stop	0.82	69.69	0.90	59.70	131.10
Traffic Signal	3.71	7.02	3.67	6.63	21.03
Percent Change					
2-Way vs. All-Way	-77	15,091	-77	14,946	1,466
2-Way vs. Traffic Signal	*	1,430	-6	1,570	151
All-Way vs. Traffic Signal	353	-90	310	-89	-84

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	740	254	764	264	2,023
All-Way Stop	752	8,261	774	7,748	17,534
Traffic Signal	660	3,325	671	2,820	7,476
Percent Change					
2-Way vs. All-Way	2	3,147	1	2,835	767
2-Way vs. Traffic Signal	-11	1,207	-12	968	270
All-Way vs. Traffic Signal	-12	-60	-13	-64	-57

* Difference not significant at the 95% level (two-tailed test).

Table A.90 - Volume Pattern 10 -- Geometric Case 5: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.13	7.45	3.38	6.12	20.08
All-Way Stop	1.74	216.55	1.80	127.71	347.79
Traffic Signal	4.32	27.21	4.31	22.65	58.49
Percent Change					
2-Way vs. All-Way	-44	2,806	-47	1,986	1,632
2-Way vs. Traffic Signal	38	265	28	270	191
All-Way vs. Traffic Signal	149	-87	140	-82	-83

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.97	0.86	2.21	0.97	6.00
All-Way Stop	0.65	54.40	0.71	32.81	88.57
Traffic Signal	3.24	9.32	3.20	8.43	24.18
Percent Change					
2-Way vs. All-Way	-67	6,220	-68	3,289	1,375
2-Way vs. Traffic Signal	64	982	45	771	303
All-Way vs. Traffic Signal	399	-83	350	-74	-73

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	746	507	770	520	2,544
All-Way Stop	752	12,596	774	10,539	24,661
Traffic Signal	652	3,227	678	2,751	7,308
Percent Change					
2-Way vs. All-Way	1	2,383	*	1,925	869
2-Way vs. Traffic Signal	-13	536	-12	429	187
All-Way vs. Traffic Signal	-13	-74	-12	-74	-70

* Difference not significant at the 95% level (two-tailed test).

Table A.91 - Volume Pattern 10 -- Geometric Case 6: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.90	6.27	3.01	5.12	17.30
All-Way Stop	1.88	139.86	1.92	95.81	239.46
Traffic Signal	4.19	19.08	4.28	15.47	43.03
Percent Change					
2-Way vs. All-Way	-35	2,130	-36	1,770	1,284
2-Way vs. Traffic Signal	45	204	42	202	149
All-Way vs. Traffic Signal	123	-86	123	-84	-82

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.74	0.56	1.86	0.73	4.88
All-Way Stop	0.78	35.01	0.82	25.74	62.35
Traffic Signal	3.10	6.51	3.11	5.80	18.52
Percent Change					
2-Way vs. All-Way	-55	6,194	-56	3,442	1,178
2-Way vs. Traffic Signal	78	1,071	68	697	280
All-Way vs. Traffic Signal	296	-81	278	-77	-70

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	746	415	768	441	2,370
All-Way Stop	749	13,212	772	10,788	25,521
Traffic Signal	654	2,930	695	2,473	6,751
Percent Change					
2-Way vs. All-Way	*	3,085	*	2,345	977
2-Way vs. Traffic Signal	-12	606	-10	460	185
All-Way vs. Traffic Signal	-13	-78	-10	-77	-74

* Difference not significant at the 95% level (two-tailed test).

Table A.92 - Volume Pattern 10 -- Geometric Case 7: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.42	5.95	2.62	4.50	15.48
All-Way Stop	1.62	206.30	1.70	123.51	333.14
Traffic Signal	3.98	19.79	4.04	15.59	43.39
Percent Change					
2-Way vs. All-Way	-33	3,370	-35	2,645	2,052
2-Way vs. Traffic Signal	64	233	54	246	180
All-Way vs. Traffic Signal	145	-90	137	-87	-87

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.49	0.20	1.66	0.21	3.55
All-Way Stop	0.70	49.75	0.76	30.77	81.98
Traffic Signal	3.06	5.44	3.11	4.72	16.33
Percent Change					
2-Way vs. All-Way	-53	25,156	-54	14,604	2,207
2-Way vs. Traffic Signal	106	2,663	88	2,154	360
All-Way vs. Traffic Signal	335	-89	309	-85	-80

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	750	286	771	277	2,084
All-Way Stop	752	12,702	774	10,600	24,828
Traffic Signal	650	2,832	670	2,320	6,473
Percent Change					
2-Way vs. All-Way	*	4,335	*	3,724	1,091
2-Way vs. Traffic Signal	-13	889	-13	737	211
All-Way vs. Traffic Signal	-14	-78	-13	-78	-74

* Difference not significant at the 95% level (two-tailed test).

Table A.93 - Volume Pattern 10 -- Geometric Case 8: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.35	5.36	2.47	4.11	14.29
All-Way Stop	1.70	130.32	1.78	90.72	224.51
Traffic Signal	3.90	16.98	3.93	13.46	38.27
Percent Change					
2-Way vs. All-Way	-28	2,333	-28	2,105	1,471
2-Way vs. Traffic Signal	66	217	59	227	168
All-Way vs. Traffic Signal	130	-87	121	-85	-83

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.40	0.13	1.52	0.16	3.21
All-Way Stop	0.77	31.23	0.83	23.45	56.29
Traffic Signal	2.97	5.18	3.00	4.51	15.65
Percent Change					
2-Way vs. All-Way	-45	24,732	-45	14,660	1,655
2-Way vs. Traffic Signal	112	4,014	97	2,738	388
All-Way vs. Traffic Signal	284	-83	260	-81	-72

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	750	202	770	234	1,955
All-Way Stop	750	13,288	776	10,842	25,656
Traffic Signal	650	2,698	670	2,235	6,254
Percent Change					
2-Way vs. All-Way	*	6,491	1	4,541	1,212
2-Way vs. Traffic Signal	-13	1,238	-13	857	220
All-Way vs. Traffic Signal	-13	-80	-14	-79	-76

* Difference not significant at the 95% level (two-tailed test).

Table A.94 - Volume Pattern 11 -- Geometric Case 1: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	30.86	98.15	26.60	96.16	251.77
All-Way Stop	3.64	268.74	3.62	266.69	542.69
Traffic Signal	9.35	174.40	8.59	165.35	357.67
Percent Change					
2-Way vs. All-Way	-88	174	-86	177	116
2-Way vs. Traffic Signal	-70	78	-68	72	42
All-Way vs. Traffic Signal	157	-35	137	-38	-34

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	27.24	30.97	23.40	39.50	121.10
All-Way Stop	1.20	81.57	1.24	81.16	165.17
Traffic Signal	6.83	65.40	6.19	65.69	144.11
Percent Change					
2-Way vs. All-Way	-96	163	-95	106	36
2-Way vs. Traffic Signal	-75	111	-74	66	19
All-Way vs. Traffic Signal	471	-20	399	-19	-13

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,240	4,043	1,228	3,734	10,245
All-Way Stop	1,427	7,314	1,409	7,250	17,400
Traffic Signal	1,266	7,660	1,211	7,444	17,581
Percent Change					
2-Way vs. All-Way	15	81	15	94	70
2-Way vs. Traffic Signal	2	89	-1	99	72
All-Way vs. Traffic Signal	-11	5	-14	3	1

Table A.95 - Volume Pattern 11 -- Geometric Case 2: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	19.55	20.78	15.58	23.03	70.74
All-Way Stop	4.02	259.32	3.94	258.39	525.68
Traffic Signal	9.44	88.78	8.76	66.88	173.86
Percent Change					
2-Way vs. All-Way	-79	1,148	-75	1,022	643
2-Way vs. Traffic Signal	-52	327	-44	190	146
All-Way vs. Traffic Signal	135	-66	122	-74	-67

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	16.69	2.63	13.19	11.96	37.98
All-Way Stop	1.48	78.17	1.51	78.36	159.52
Traffic Signal	6.88	24.74	6.27	30.45	68.34
Percent Change					
2-Way vs. All-Way	-91	2,868	-89	555	320
2-Way vs. Traffic Signal	-59	839	-52	155	80
All-Way vs. Traffic Signal	366	-68	314	-61	-57

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,192	614	1,130	518	3,395
All-Way Stop	1,426	7,927	1,408	7,873	18,634
Traffic Signal	1,265	6,139	1,232	4,452	13,088
Percent Change					
2-Way vs. All-Way	20	1,190	25	1,421	449
2-Way vs. Traffic Signal	6	899	9	760	286
All-Way vs. Traffic Signal	-11	-23	-13	-43	-30

Table A.96 - Volume Pattern 11 -- Geometric Case 3: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	15.47	67.79	13.25	54.25	150.75
All-Way Stop	3.30	268.21	3.28	266.44	541.23
Traffic Signal	8.55	122.10	7.97	105.72	244.33
Percent Change					
2-Way vs. All-Way	-79	296	-75	391	259
2-Way vs. Traffic Signal	-45	80	-40	95	62
All-Way vs. Traffic Signal	159	-54	143	-60	-55

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	13.17	10.13	11.16	12.48	46.94
All-Way Stop	1.41	80.93	1.43	81.10	164.87
Traffic Signal	6.55	29.37	6.05	25.29	67.25
Percent Change					
2-Way vs. All-Way	-89	699	-87	550	251
2-Way vs. Traffic Signal	-50	190	-46	103	43
All-Way vs. Traffic Signal	365	-64	323	-69	-59

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,391	2,938	1,372	2,506	8,207
All-Way Stop	1,423	7,336	1,406	7,261	17,426
Traffic Signal	1,220	6,988	1,206	6,502	15,916
Percent Change					
2-Way vs. All-Way	2	150	3	190	112
2-Way vs. Traffic Signal	-12	138	-12	159	94
All-Way vs. Traffic Signal	-14	-5	-14	-10	-9

Table A.97 - Volume Pattern 11 -- Geometric Case 4: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	12.52	25.20	14.45	15.17	67.90
All-Way Stop	3.52	259.33	3.48	255.29	521.62
Traffic Signal	8.46	70.93	7.93	41.93	129.25
Percent Change					
2-Way vs. All-Way	-72	929	-76	1,583	668
2-Way vs. Traffic Signal	-32	181	-45	176	90
All-Way vs. Traffic Signal	141	-73	128	-84	-75

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	10.70	0.42	12.49	5.54	28.68
All-Way Stop	1.62	77.74	1.66	76.00	157.01
Traffic Signal	6.53	11.36	6.07	10.18	34.14
Percent Change					
2-Way vs. All-Way	-85	18,321	-87	1,272	447
2-Way vs. Traffic Signal	-39	2,591	-51	84	19
All-Way vs. Traffic Signal	303	-85	267	-87	-78

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,228	300	1,309	408	3,170
All-Way Stop	1,424	8,004	1,403	7,994	18,826
Traffic Signal	1,209	5,504	1,192	3,932	11,836
Percent Change					
2-Way vs. All-Way	16	2,565	7	1,861	494
2-Way vs. Traffic Signal	-2	1,732	-9	865	273
All-Way vs. Traffic Signal	-15	-31	-15	-51	-37

Table A.98 - Volume Pattern 11 -- Geometric Case 5: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	13.98	11.86	13.80	12.67	52.31
All-Way Stop	3.79	228.96	3.69	156.43	392.88
Traffic Signal	8.47	86.35	7.56	49.08	151.46
Percent Change					
2-Way vs. All-Way	-73	1,830	-73	1,135	651
2-Way vs. Traffic Signal	-39	628	-45	287	190
All-Way vs. Traffic Signal	123	-62	105	-69	-61

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	10.98	1.87	10.96	5.63	29.44
All-Way Stop	1.34	64.40	1.31	41.14	108.19
Traffic Signal	6.04	32.18	5.28	24.11	67.61
Percent Change					
2-Way vs. All-Way	-88	3,345	-88	630	268
2-Way vs. Traffic Signal	-45	1,621	-52	328	130
All-Way vs. Traffic Signal	350	-50	304	-41	-38

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,357	724	1,342	653	4,077
All-Way Stop	1,423	11,974	1,403	11,680	26,480
Traffic Signal	1,240	5,764	1,173	4,082	12,258
Percent Change					
2-Way vs. All-Way	5	1,554	5	1,688	550
2-Way vs. Traffic Signal	-9	696	-13	525	201
All-Way vs. Traffic Signal	-13	-52	-16	-65	-54

Table A.99 - Volume Pattern 11 -- Geometric Case 6: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	10.48	7.56	10.41	7.38	35.84
All-Way Stop	4.10	198.05	4.04	112.80	318.99
Traffic Signal	8.08	28.49	7.26	25.64	69.46
Percent Change					
2-Way vs. All-Way	-61	2,520	-61	1,428	790
2-Way vs. Traffic Signal	-23	277	-30	247	94
All-Way vs. Traffic Signal	97	-86	80	-77	-78

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	7.44	0.90	7.55	2.08	17.96
All-Way Stop	1.62	57.32	1.61	31.20	91.75
Traffic Signal	5.66	10.32	4.89	12.37	33.24
Percent Change					
2-Way vs. All-Way	-78	6,287	-79	1,400	411
2-Way vs. Traffic Signal	-24	1,050	-35	494	85
All-Way vs. Traffic Signal	250	-82	205	-60	-64

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,416	527	1,392	551	3,886
All-Way Stop	1,424	12,503	1,408	12,013	27,348
Traffic Signal	1,237	4,210	1,184	3,551	10,182
Percent Change					
2-Way vs. All-Way	1	2,272	1	2,079	604
2-Way vs. Traffic Signal	-13	698	-15	544	162
All-Way vs. Traffic Signal	-13	-66	-16	-70	-63

Table A.100 - Volume Pattern 11 -- Geometric Case 7: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	5.80	7.51	6.07	5.54	24.93
All-Way Stop	3.24	224.53	3.18	148.85	379.80
Traffic Signal	7.56	42.22	7.05	25.98	82.80
Percent Change					
2-Way vs. All-Way	-44	2,888	-48	2,585	1,423
2-Way vs. Traffic Signal	30	462	16	369	232
All-Way vs. Traffic Signal	133	-81	121	-83	-78

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.85	0.28	4.20	0.50	8.83
All-Way Stop	1.40	60.94	1.38	37.48	101.20
Traffic Signal	5.69	10.40	5.26	9.69	31.05
Percent Change					
2-Way vs. All-Way	-64	21,726	-67	7,474	1,047
2-Way vs. Traffic Signal	48	3,626	25	1,858	252
All-Way vs. Traffic Signal	308	-83	282	-74	-69

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,422	401	1,397	366	3,586
All-Way Stop	1,426	12,058	1,403	11,761	26,648
Traffic Signal	1,190	4,504	1,196	3,505	10,394
Percent Change					
2-Way vs. All-Way	*	2,906	0	3,117	643
2-Way vs. Traffic Signal	-16	1,023	-14	859	190
All-Way vs. Traffic Signal	-17	-63	-15	-70	-61

* Difference not significant at the 95% level (two-tailed test).

Table A.101 - Volume Pattern 11 -- Geometric Case 8: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	5.32	6.11	5.34	4.90	21.66
All-Way Stop	3.41	192.01	3.32	100.83	299.57
Traffic Signal	7.26	24.49	6.67	19.41	57.83
Percent Change					
2-Way vs. All-Way	-36	3,041	-38	1,959	1,283
2-Way vs. Traffic Signal	37	301	25	296	167
All-Way vs. Traffic Signal	113	-87	101	-81	-81

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.37	0.18	3.47	0.32	7.34
All-Way Stop	1.54	52.88	1.50	26.12	82.04
Traffic Signal	5.38	7.79	4.87	7.42	25.46
Percent Change					
2-Way vs. All-Way	-54	29,810	-57	7,957	1,017
2-Way vs. Traffic Signal	59	4,307	40	2,189	247
All-Way vs. Traffic Signal	250	-85	224	-72	-69

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,425	255	1,404	295	3,379
All-Way Stop	1,423	12,658	1,404	12,086	27,572
Traffic Signal	1,199	3,800	1,175	3,261	9,434
Percent Change					
2-Way vs. All-Way	*	4,860	*	4,000	716
2-Way vs. Traffic Signal	-16	1,389	-16	1,006	179
All-Way vs. Traffic Signal	-16	-70	-16	-73	-66

* Difference not significant at the 95% level (two-tailed test).

Table A.102 - Volume Pattern 12 -- Geometric Case 1: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.09	0.81	1.76	0.68	6.34
All-Way Stop	2.89	8.40	1.63	6.89	19.81
Traffic Signal	2.82	2.99	1.68	2.50	10.00
Percent Change					
2-Way vs. All-Way	-7	932	-8	921	212
2-Way vs. Traffic Signal	-9	268	-5	271	58
All-Way vs. Traffic Signal	-2	-64	3	-64	-50

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.43	0.01	0.91	0.01	2.36
All-Way Stop	1.25	3.09	0.77	2.63	7.75
Traffic Signal	1.47	1.18	0.91	1.00	4.56
Percent Change					
2-Way vs. All-Way	-13	29,842	-15	31,064	229
2-Way vs. Traffic Signal	3	11,315	*	11,693	94
All-Way vs. Traffic Signal	18	-62	17	-62	-41

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,031	19	652	18	1,720
All-Way Stop	1,030	2,258	652	1,978	5,917
Traffic Signal	820	663	523	543	2,548
Percent Change					
2-Way vs. All-Way	*	11,909	*	10,887	244
2-Way vs. Traffic Signal	-20	3,426	-20	2,916	48
All-Way vs. Traffic Signal	-20	-71	-20	-73	-57

* Difference not significant at the 95% level (two-tailed test).

Table A.103 - Volume Pattern 12 -- Geometric Case 2: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.11	0.76	1.78	0.65	6.30
All-Way Stop	2.99	7.93	1.70	6.61	19.23
Traffic Signal	2.84	2.80	1.70	2.40	9.74
Percent Change					
2-Way vs. All-Way	-4	940	-5	921	205
2-Way vs. Traffic Signal	-9	268	-5	271	55
All-Way vs. Traffic Signal	-5	-65	*	-64	-49

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.44	0.01	0.92	0.01	2.38
All-Way Stop	1.33	3.12	0.84	2.71	8.00
Traffic Signal	1.47	1.15	0.90	1.01	4.54
Percent Change					
2-Way vs. All-Way	-8	33,374	-9	29,284	237
2-Way vs. Traffic Signal	2	12,269	-2	10,843	91
All-Way vs. Traffic Signal	11	-63	8	-63	-43

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,032	19	652	20	1,723
All-Way Stop	1,034	2,261	657	1,987	5,938
Traffic Signal	820	651	526	542	2,538
Percent Change					
2-Way vs. All-Way	*	11,675	1	9,641	245
2-Way vs. Traffic Signal	-21	3,290	-19	2,555	47
All-Way vs. Traffic Signal	-21	-71	-20	-73	-57

* Difference not significant at the 95% level (two-tailed test).

Table A.104 - Volume Pattern 12 -- Geometric Case 3: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.69	0.81	1.67	0.68	5.85
All-Way Stop	2.55	8.53	1.58	7.05	19.70
Traffic Signal	2.62	2.89	1.59	2.46	9.55
Percent Change					
2-Way vs. All-Way	-5	957	-5	930	237
2-Way vs. Traffic Signal	-3	258	-5	259	63
All-Way vs. Traffic Signal	3	-66	*	-65	-52

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.39	0.00	0.90	0.01	2.30
All-Way Stop	1.26	3.19	0.81	2.75	8.01
Traffic Signal	1.45	1.11	0.88	0.97	4.41
Percent Change					
2-Way vs. All-Way	-9	84,241	-9	44,013	248
2-Way vs. Traffic Signal	4	29,374	-3	15,550	92
All-Way vs. Traffic Signal	15	-65	7	-65	-45

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,032	10	652	14	1,707
All-Way Stop	1,030	2,255	652	1,977	5,914
Traffic Signal	823	634	514	538	2,508
Percent Change					
2-Way vs. All-Way	*	22,452	*	14,023	246
2-Way vs. Traffic Signal	-20	6,240	-21	3,740	47
All-Way vs. Traffic Signal	-20	-72	-21	-73	-58

* Difference not significant at the 95% level (two-tailed test).

Table A.105 - Volume Pattern 12 -- Geometric Case 4: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.68	0.75	1.66	0.64	5.73
All-Way Stop	2.57	8.00	1.60	6.68	18.84
Traffic Signal	2.56	2.72	1.55	2.34	9.18
Percent Change					
2-Way vs. All-Way	-4	961	-4	945	229
2-Way vs. Traffic Signal	-4	261	-6	267	60
All-Way vs. Traffic Signal	-0	-66	-3	-65	-51

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.40	0.00	0.90	0.01	2.31
All-Way Stop	1.30	3.16	0.84	2.75	8.05
Traffic Signal	1.43	1.10	0.85	0.97	4.35
Percent Change					
2-Way vs. All-Way	-7	91,523	-7	44,073	248
2-Way vs. Traffic Signal	2	31,697	-5	15,532	88
All-Way vs. Traffic Signal	9	-65	2	-65	-46

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,031	10	652	14	1,707
All-Way Stop	1,030	2,256	652	1,978	5,916
Traffic Signal	820	624	511	534	2,490
Percent Change					
2-Way vs. All-Way	*	22,456	*	14,026	247
2-Way vs. Traffic Signal	-20	6,140	-22	3,714	46
All-Way vs. Traffic Signal	-20	-72	-22	-73	-58

* Difference not significant at the 95% level (two-tailed test).

Table A.106 - Volume Pattern 12 -- Geometric Case 5: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.08	0.64	1.74	0.55	6.00
All-Way Stop	2.97	6.39	1.67	5.50	16.52
Traffic Signal	2.78	2.54	1.64	2.14	9.10
Percent Change					
2-Way vs. All-Way	-4	907	-4	903	175
2-Way vs. Traffic Signal	-10	300	-6	291	52
All-Way vs. Traffic Signal	-6	-60	-1	-61	-45

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.41	0.01	0.88	0.01	2.31
All-Way Stop	1.31	2.86	0.81	2.51	7.48
Traffic Signal	1.43	1.19	0.87	1.00	4.49
Percent Change					
2-Way vs. All-Way	-7	31,677	-8	22,674	224
2-Way vs. Traffic Signal	1	13,117	*	8,991	94
All-Way vs. Traffic Signal	9	-58	8	-60	-40

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,029	16	652	19	1,716
All-Way Stop	1,030	2,256	652	1,981	5,920
Traffic Signal	822	655	526	539	2,543
Percent Change					
2-Way vs. All-Way	*	13,659	*	10,219	245
2-Way vs. Traffic Signal	-20	3,895	-19	2,708	48
All-Way vs. Traffic Signal	-20	-71	-19	-73	-57

* Difference not significant at the 95% level (two-tailed test).

Table A.107 - Volume Pattern 12 -- Geometric Case 6: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	3.11	0.63	1.75	0.54	6.03
All-Way Stop	3.05	6.31	1.70	5.45	16.51
Traffic Signal	2.78	2.49	1.67	2.13	9.07
Percent Change					
2-Way vs. All-Way	-2	900	-3	901	174
2-Way vs. Traffic Signal	-11	295	-5	292	50
All-Way vs. Traffic Signal	-9	-61	-2	-61	-45

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.43	0.01	0.89	0.01	2.33
All-Way Stop	1.37	2.92	0.84	2.56	7.68
Traffic Signal	1.43	1.18	0.87	1.01	4.50
Percent Change					
2-Way vs. All-Way	-4	30,422	-5	21,845	229
2-Way vs. Traffic Signal	*	12,276	-1	8,588	93
All-Way vs. Traffic Signal	4	-59	4	-60	-42

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,029	18	652	19	1,717
All-Way Stop	1,030	2,257	652	1,979	5,918
Traffic Signal	818	653	526	545	2,541
Percent Change					
2-Way vs. All-Way	*	12,725	*	10,428	245
2-Way vs. Traffic Signal	-21	3,609	-19	2,800	48
All-Way vs. Traffic Signal	-21	-71	-19	-72	-57

* Difference not significant at the 95% level (two-tailed test).

Table A.108 - Volume Pattern 12 -- Geometric Case 7: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.64	0.59	1.62	0.51	5.37
All-Way Stop	2.57	6.48	1.59	5.55	16.20
Traffic Signal	2.48	2.43	1.54	2.09	8.55
Percent Change					
2-Way vs. All-Way	-3	990	-2	981	202
2-Way vs. Traffic Signal	-6	310	-5	307	59
All-Way vs. Traffic Signal	-3	-62	-3	-62	-47

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.37	0.00	0.86	0.01	2.24
All-Way Stop	1.30	2.93	0.83	2.55	7.60
Traffic Signal	1.37	1.13	0.84	0.97	4.32
Percent Change					
2-Way vs. All-Way	-5	87,723	-4	47,719	240
2-Way vs. Traffic Signal	*	33,790	-2	18,150	93
All-Way vs. Traffic Signal	6	-61	2	-62	-43

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,030	10	652	13	1,704
All-Way Stop	1,034	2,260	657	1,989	5,939
Traffic Signal	816	631	516	532	2,494
Percent Change					
2-Way vs. All-Way	*	23,438	1	14,967	248
2-Way vs. Traffic Signal	-21	6,471	-21	3,927	46
All-Way vs. Traffic Signal	-21	-72	-21	-73	-58

* Difference not significant at the 95% level (two-tailed test).

Table A.109 - Volume Pattern 12 -- Geometric Case 8: 24-Hour Summaries

Total Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	2.67	0.59	1.64	0.52	5.42
All-Way Stop	2.61	6.34	1.61	5.47	16.03
Traffic Signal	2.48	2.41	1.53	2.09	8.51
Percent Change					
2-Way vs. All-Way	-2	971	-2	959	196
2-Way vs. Traffic Signal	-7	306	-7	305	57
All-Way vs. Traffic Signal	-5	-62	-5	-62	-47

Stopped Delay (veh-hrs)

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1.39	0.00	0.88	0.01	2.27
All-Way Stop	1.32	2.95	0.85	2.59	7.71
Traffic Signal	1.36	1.13	0.83	0.99	4.32
Percent Change					
2-Way vs. All-Way	-4	88,330	-3	38,072	239
2-Way vs. Traffic Signal	-2	33,760	-5	14,475	90
All-Way vs. Traffic Signal	3	-62	-2	-62	-44

Number of Stops

Control	Leg 1 (minor)	Leg 2 (major)	Leg 3 (minor)	Leg 4 (major)	Total Intersection
2-Way Stop	1,032	9	652	16	1,709
All-Way Stop	1,031	2,258	652	1,980	5,921
Traffic Signal	812	633	511	542	2,498
Percent Change					
2-Way vs. All-Way	*	24,448	*	12,273	247
2-Way vs. Traffic Signal	-21	6,783	-22	3,288	46
All-Way vs. Traffic Signal	-21	-72	-22	-73	-58

* Difference not significant at the 95% level (two-tailed test).