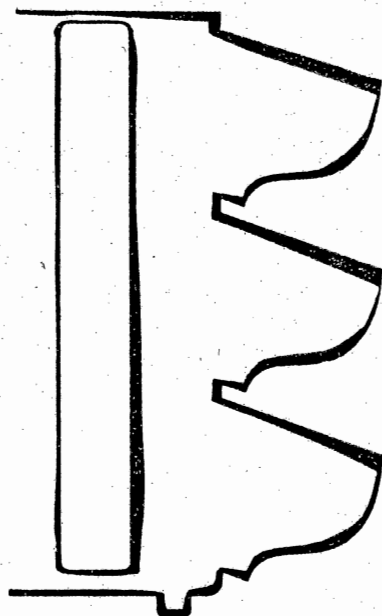


90 R628

1966b



AN OBJECTIVE APPROACH TO TRAFFIC SIGNALS

NEW JERSEY STATE HIGHWAY DEPARTMENT

New Jersey State Library

INTRODUCTION

The New Jersey State Highway Department has become aware in recent months that some legislators, county and municipal officials, and private citizens seem unsure of the "ground rules" for installation of traffic signals on State highways.

There have been a few statements to the effect that the Department is indifferent to requests for such signals. The record of recent years indicates otherwise, however, the Department believes the residents of New Jersey are at all times entitled to know the basis for the Department's actions.

The purpose of this booklet is to explain and illustrate in detail the professional criteria and the procedures which must be followed when analyzing the need for a proposed traffic signal. It is hoped that this explanation will resolve any misunderstandings regarding the interests of the Department's traffic engineers, who have a very human concern and professional pride in protecting the lives of New Jersey citizens by engineering and equipping the State Highway System with adequate and efficient traffic signal installations.

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THE LAW

The basic law that gives the State Highway Department the right to install traffic signals on routes under its jurisdiction is spelled out in Title 39 of the Revised New Jersey Statutes. These laws are also known as the Motor Vehicles and Traffic Regulations.

Briefly these laws state:

1. That traffic control signals shall be placed only by the public body or official having jurisdiction and only for the purpose of regulating traffic.
2. That the State Highway Commissioner has jurisdiction over Traffic signals on State highways and their intersections.
3. That the Director of the Division of Motor Vehicles has jurisdiction over Traffic Signals on all county roads and municipal roads and streets.
4. That the State Highway Commissioner may install traffic lights upon State roads in the vicinity of firehouse if an engineering survey clearly indicates that such control is necessary.
5. That any county or municipality may request the State Highway Commissioner to install traffic signals where in its opinion a dangerous intersection has been created by reason of the construction of a State highway within the municipality.

The full text of the laws covering these points is given in Appendix A.

PROFESSIONAL STANDARDS

The basic document dealing with the problems of traffic signal installation is a book bearing the imposing title, "Manual on Uniform Traffic Control Devices for Streets and Highways", published by the Bureau of Public Roads of the United States Department of Commerce.

This book, which first appeared in 1951 and was revised in 1961, contains the practical lessons learned by traffic engineers throughout the country over a good number of years. The organizations that have contributed to this document represent every facet of engineering discipline, expressed through a National Joint Committee. These organizations are:

- . American Association of State Highway Officials
- . Institute of Traffic Engineers
- . National Committee on Uniform Traffic Laws and Ordinances
- . National Association of County Officials
- . American Municipal Association

The idea behind this 300-page book is simple - to set forth standards for traffic control devices that would be used throughout the United States.

NEED FOR STANDARDS

In a mobile economy such as ours, where people in ever-increasing numbers travel country-wide, it is imperative that a motorist from one state encounter familiar traffic controls as he travels across state lines. That most motorists don't realize there is such a thing as uniformity is the best tribute to the fact that uniformity exists. For example, most motorists would agree that the 'red' color of a traffic signal should always mean 'Stop', and they accept this as natural and

obvious. But it was not always so - even today some obsolete traffic signals bear the legend 'Stop' on the red lens.

It was only through the efforts of such organizations as those mentioned previously that such 'obvious' standards became well-known and accepted.

In the same vein, but in a more subtle fashion, has come the conviction that traffic controls should be installed for the nationally accepted standard reasons. Why? Over a period of years it was found that some traffic signals worked very well - they separated the streams of traffic the way they were supposed to; they caused no needless delays; they prevented, or at least helped, prevent accidents.

Other signals, however, did not do as well - there was confusion, backups, congestion, accidents. The professionals working in this field began to see certain correlations, began to see why this signal worked but why that one didn't. From these pooled findings came a set of "warrants" - a list of the circumstances under which signals can be expected to function properly.

WARRANTS

These warrants - codified, discussed, analyzed, criticized, revised and finally set forth in great detail - help the practicing traffic engineer to decide when a signal should be installed. Such decisions are not easy to make and are very seldom even clear-cut. Often a request for signals stems from a point of view, for while the local motorist may want a signal at the intersection where he enters the highway, he does not want to be delayed by additional signals once he becomes part of the main stream.

What the individual motorist may not realize is that he may be only one of many, many thousands clamoring for traffic signals at their particular intersections along the main stream.

The individual is almost certainly not able to foresee the chaos that would ensue should each request be granted. Only a professional, trained to look at the complete picture, and using uniform standards, can make unemotional, detached decisions.

It is not the purpose of this booklet to enumerate or discuss the warrants in detail. Since it would be to the advantage of the motoring public in general, and to the advantage of the traffic engineering profession in particular, for the Manual to have as widespread a distribution as possible, the interested reader is urged to obtain a copy for his own use. Local officials, certainly, should be familiar with its provisions. Copies may be obtained from the Superintendent of Documents, Washington, D.C., for \$2.00 a copy.

Briefly, the primary standards used to evaluate traffic conditions at an intersection for which a signal has been requested are six in number:

- Warrant 1 : Minimum vehicular volume
- Warrant 2 : Interruption of continuous traffic
- Warrant 3 : Minimum pedestrian volume
- Warrant 4 : Progressive movement
- Warrant 5 : Accident experience
- Warrant 6 : Combination of warrants

WHY TRAFFIC SIGNALS ARE INSTALLED

The philosophy of the traffic engineering profession, as expressed in the Manual, is that when properly located and operated, traffic signals offer the following advantages:

1. They provide for orderly movement of traffic.
2. They reduce the frequency of certain types of accidents.
3. They can be co-ordinated to provide nearby continuous movement of traffic at a definite speed along a given route.
4. They can be used to interrupt heavy traffic at intervals to permit other traffic to cross.

In New Jersey, of course, most traffic signals are installed on State highways because of the volume of traffic. The explanation for this is simple: New Jersey State Highways carry five times more traffic than the National Average!

AT JUG HANDLES

The traffic-signalized jug handle, combined with a continuous center barrier, is one of the most important elements in New Jersey's program to modernize existing land-service roads. Used in this manner, traffic signals become one of the highway designer's most useful tools.

Much thought is given to the spacing of these jug handles from both the standpoint of service to an area and the proper distance for synchronization. Through experience the Department has learned that there are certain critical distances, depending on the prevailing speed on the road and the cycle length of the signals, that must be maintained to obtain smooth traffic flow. Once this pattern has been decided upon and the traffic flow stabilized, the basis for disturbing this smooth operation by introducing signals at random intervals should understandably be well justified.

AT PEDESTRIAN CROSSINGS

Traffic signals installed primarily for the benefit of pedestrians are rather rare on New Jersey State highways. Almost without exception they were installed in connection with a school pedestrian crossing. It is, of course, standard practice to install pedestrian push-buttons at signalized intersections but most intersections are signalized because of the vehicular volumes rather than the number of pedestrians.

Unfortunately, pedestrian behavior even at signals installed for their special benefit has been so erratic as to cast doubt on the effectiveness of any pedestrian signal that does not include a special police officer to oversee its use.

AT OR NEAR FIRE HOUSES

New Jersey law gives the Highway Commissioner the right to install traffic control signals on State highways at or near fire houses when an "investigation and survey.....clearly indicate a special hazard existing because of heavy traffic congestion or of traffic speed upon such road at the locality in question".

It should be apparent that this is an area where there may be differences of opinion between the engineers in the Department and the personnel of the fire houses as to what constitutes a special hazard. Since there are no definite warrants in the Manual to cover this type of situation, the decision is largely a matter of judgement.

The Department has tried to use a liberal approach in these decisions. For example, an accident would almost always be acceptable evidence that a "special hazard" exists. This statement has sometimes given rise to the curious misunderstanding that the Department must have an accident before such a signal will be installed. This is not so. If there is sufficient evidence that the volume of traffic is great and the speeds are high, the "special hazard" is presumed to exist and signals are installed without waiting for accidents to occur.

An alternate solution to the fire house traffic signal can often be obtained through fire house control of existing signals. For this, the fire house is interconnected with the signal controller (either directly or over leased telephone wires) at the intersection. A special sequence is then added to the signal timing so that when a button is depressed in the fire house the signal will go through a predetermined cycle that will clear traffic out of the intersection and give the right-of-way to the fire apparatus when it arrives at the intersection.

In some cases, when interconnection is not feasible, the fire-police are given keys to the manual controls at the signals.

In any event, the Department recognizes the valuable work these men (often volunteers) do for their communities, and does everything it can to make their emergency trips safe ones.

WHY TRAFFIC SIGNALS ARE NOT INSTALLED

If traffic signals were the panacea to all our control and accident problems, no traffic engineer in his right mind would deny a request for additional signals. However, a traffic signal can only function by stopping traffic, and it is axiomatic that anytime a motor vehicle is stopped on the traveled portion of a highway an accident potential is created. It does not matter whether the stop is prompted by a flat tire, a left-turn into a hot-dog stand, or by a traffic signal: the danger exists that a following motorist will not notice the stopped vehicle until it is too late. What motorist has not experienced that sickening feeling that occurs when a traffic signal suddenly turns amber a few hundred feet in front of him? To paraphrase Hamlet: to stop or not to stop?

The accident files of the Division of Motor Vehicles bulge with the records of those unwary motorists who made the wrong decision too soon or the right decision too late.

A second reason for not installing traffic signals is the aggravating hopelessness motorists experience when waiting in a long line of cars for a traffic signal to change, moving ahead ten or twelve car-lengths, seeing the signal go to amber and red - and then going through the same process at the next signal a few hundred feet away. Another traffic signal would only increase the aggravation.....and the accident potential.

There are, then, two major reasons why the Department does not grant every request for a traffic signal: A signal in the wrong location can cause accidents, or it can cause congestion, or both.

It must be remembered that the function of the Department is to keep traffic moving. Our whole economy is geared to the concept of huge numbers of vehicles moving from home - to - work, from home to the shore, to the mountains, to the shopping centers - but moving. Each and every traffic signal installed on a State highway detracts from this traffic movement. Traffic engineers have evolved all sorts of systems with various actuated equipment, channelization, and techniques of progression, but there is a point beyond which even the most sophisticated device will not MOVE TRAFFIC.

One of the arts of the traffic engineering profession, then, is to find the point where a signal will relieve more congestion than it will cause.

Here, again, the standards in the Manual are called into use. The experience reflected in the warrants has shown that if the traffic volumes are below a certain value (that varies with the physical characteristics of the two roadways) the chances are that the signal will impose time-loss penalties on both the major road and the side road. If, for example, a solitary motorist must wait 90 seconds for a signal to turn green, whereas without the signal he might have had a safe gap in traffic within 15 or 20 seconds, he obviously would be better off without the signal.

The motorist, of course, has no way of calculating whether or not he would be better off with or without the signal. As he sits at an unsignalized intersection waiting for a safe gap, time seems to stretch out to eternity, whereas in reality even during peak periods it may be no longer than 30 seconds.....and at most of our signalized intersections on State highways the side road must almost always wait 50 seconds or more for the green to appear.

When this is pointed out to most motorists they grasp the idea very quickly. It is tacitly expressed in the requests of the local officials in recreational areas who request that traffic signals "be turned off" or put on flashing during the winter months when traffic volumes drop off.

Unfortunately, this explanation cannot be given to each and every motorist who complains that "what is needed is a traffic signal". About all the traffic engineer can do is rely on the time-worn but accurate phrase, "signals are not warranted because the volumes are too low", which is communicated to the local officials who relayed the complaint.

WHAT THE MUNICIPALITY MUST DO

If the governing officials of a municipality believe that a traffic signal would improve conditions at an intersection on a State highway within their municipal boundaries, they may ask the Highway Department to install one. They may also request that traffic signals be installed to protect a school crossing, or to provide access for emergency fire equipment.

The Department relies on the judgement of the local officials in passing on to the Department only those requests which the municipal officials sincerely feel will benefit the public. For this reason, when a request is received from a private individual, the sender is notified he must first refer his request to the local officials. It is pointed out to the individual that such a procedure enables the Department to take advantage of the intimate knowledge that the local officials have of the intersections within their municipality, assures the Department that the municipality will be willing to participate in the cost of the installation, should it be found warranted.

After the formal request is made, the municipality need do nothing more until a decision is reached by the Department.

One specific legal point should be stressed: the municipality does not have to apply to the Director of the Division of Motor Vehicles for approval of any signal on a State highway. This approval is obtained by the Highway Department. Every traffic signal on the State Highway System must have this approval to be a legal installation.

If signals are found to be warranted and a decision is made to install them, the Department prepares a drawing of the intersection on which the location of the signal indications and other appurtenances are shown. The signal layout is then submitted to the State Highway Commissioner for his approval. If he approves, the design is turned over to the Electrical Bureau.

From the information and dimensions on the drawing, the Electrical Bureau calculates the quantities of materials that are required. Once this is done, cost estimates are made and formal agreements are prepared.

Once signed, these agreements, which are legal documents, establish a contractual relationship between the Department and the municipality. A sample of the formal agreement is shown in Appendix B, while the letter of transmittal, which contains the salient points of the agreement, is shown as Figure 1.



Traffic Signals
Route U.S. 9 & Blank Rd.
Borough Township
Twentysecond County

State of New Jersey
STATE HIGHWAY DEPARTMENT
DWIGHT R. G. PALMER, COMMISSIONER
TRENTON 25

May 1, 1966

Mr. Township Clerk
Borough Township
New Jersey

Dear Mr. Clerk:

We are prepared to recommend to Commissioner Dwight R. G. Palmer that a semi-actuated traffic signal and multiple lighting be installed at the intersection of Route U.S. 9 and Blank Road, Borough Township, Twentysecond County.

The traffic signal installation cost is estimated to be \$6,450.00. It is the policy of the State Highway Department to make this installation, providing the Township of Borough will assume 25% of the installation cost, which would be approximately \$1,612.50. The remaining 75% of the installation cost is assumed by the State Highway Department. Upon completion of the installation, the Township of Borough will pay the electric current operating cost, while the State Highway Department maintains, relamps, repairs and replaces the traffic signal system whenever required.

It will be necessary for the Township of Borough to adopt a resolution requesting the State Highway Commissioner to make the installation as outlined above. The resolution should also authorize the Mayor and Clerk to sign and seal the attached agreement forms. As soon as the agreement has been properly processed by the Township of Borough, it should be returned to this office, with a copy of the resolution. The agreement should not be dated. When the State Highway Department has completed its action, it will date the agreement forms and will return a copy to you for your files.

Very truly yours,

STATE HIGHWAY DEPARTMENT

Highway Traffic Operations

It should be noted that the agreement indicates to the municipality exactly what type of signal will be installed: In this hypothetical case, one that will have treadles or vehicle detectors (i.e., semi-traffic-actuated) and can also be operated by pedestrians. The agreement also gives the estimated cost of the installation and the portion which the municipality is expected to bear.

In this particular instance, the municipality's share has been calculated at 25%, which indicates that the intersection is one with four "legs" or approaches. Had the intersection been a three-legged or "T" intersection the figure would have been 15%. These percentages are for intersections of State highways and local roads. Had the intersection been formed by two State highways, there would be no installation cost to the municipality.

When necessary, the Department spells out the parking regulations for the local road which will be needed for efficient operations of the signal. Since parking on the local roads is under the jurisdiction of the local municipality, the Department requests that the local officials ban it by ordinance. This, too, can be made part of the agreement.

Parking on the State highway is another matter. While Title 39 gives the Highway Commissioner the legal right to ban parking on State highways, this power is never used in an arbitrary manner. Invariably, the Traffic Regulation Section of the Department contacts the municipality, explains what and why parking must be denied, and asks it to concur in a regulation which the Commissioner will promulgate.

WHAT THE HIGHWAY DEPARTMENT DOES

Upon receipt of a request from a municipality for a traffic signal at an intersection on a State highway, the Department immediately begins a formal investigation. The phrase, 'at an intersection on a State highway', should be noted, for very often newly installed local officials send all requests for traffic signals to the Highway Department.

The Highway Department has jurisdiction only over intersections on the State Highway System. As a matter of courtesy, of course, all requests are forwarded to the correct agency, with an acknowledgement and an explanation of the correct course to follow. Much paperwork could be avoided, and time saved, if the requests were properly directed to the proper agency in the first place.

The investigation that the Department makes may be considered in three parts: a count of the traffic volumes; an analysis of the accident records; and a field study by a traffic engineer.

TRAFFIC COUNT

The traffic count is made by Department personnel in the Division of Planning. The counts are made manually by a traffic enumerator who records the movement of each vehicle through the intersection for an 8-hour period. Normally, these eight hours are from 10 a.m. until 6 p.m., but in certain instances, as when early-morning pedestrians or late-evening shoppers are involved, the counts may be extended to cover 16 hours, or the time period shifted to earlier or later in the day. A sample count is shown in FIGURE 2.

This bit of mathematical legerdemain produces a set of numbers which traffic and highway design engineers agree, on a national basis, are reasonable and practical. It would not, for example, be reasonable to design for the highest hourly volume ever recorded at an intersection; that particular volume may never occur again. Using this sort of reasoning, combined with many years of experience, the professionals in the field have agreed that they would ignore the 29 highest hourly volumes and would use the volumes that represented the 30th highest hour.

These actual or 'raw' counts are then adjusted to reflect seasonal, monthly, weekly and daily variations. The 'raw' counts are first summarized onto an 8-hour turning-movement form, FIGURE 3; expanded to represent the Average Annual Day, FIGURE 4; and factored to show the 30th peak hour, FIGURE 5.

NEW JERSEY STATE HIGHWAY DEPARTMENT
BUREAU OF PLANNING & TRAFFIC - HIGHWAY USE SURVEY SECTION
INTERSECTION COUNTS

LOCATION N.J. RT. 10 & RIDGEDALE AVE. COUNTY MORRIS MUNICIPALITY EAST HANOVER TWP. CODE

From <u>EAST HANOVER</u>							From <u>HANOVER</u>						From <u>FLORHAM PARK</u>						From <u>WHIPPANY</u>					
On Leg 1 <u>RIDGEDALE AVE.</u>							On Leg 2 <u>N.J. RT. 10</u>						On Leg 3 <u>RIDGEDALE AVE.</u>						On Leg 4 <u>N.J. RT. 10</u>					
Time To	(2)	(3)	(4)	5	6	Total	(3)	(4)	5	6	(1)	Total	(4)	5	6	(1)	(2)	Total	5	6	1	(2)	(3)	Total
10-11	31	67	69			167	32	354			18	404	129			167	46	342			—	432	171	603
11-12	44	57	93			194	45	379			35	459	112			136	59	307			—	453	195	648
12-1	44	72	97			213	37	452			35	524	152			160	48	360			—	531	201	732
1-2	36	67	75			178	61	480			37	578	126			135	52	313			—	502	209	711
2-3	48	62	74			184	44	469			26	539	144			151	47	342			1	514	238	753
3-4	37	101	95			233	49	603			42	694	167			174	66	407			2	593	244	839
4-5	48	110	178			336	64	1209			58	1331	266			294	61	621			—	972	487	1459
5-6	41	94	144			279	31	1402			44	1477	253			307	60	620			—	864	406	1270
Total	329	630	825			1784	363	5348			295	6006	1349			1524	439	3312			3	4861	2151	7015

PEDESTRIANS							U-TURNS						SUMMARY								
CROSSING							ON						From	To	Leg 1	Leg 2	Leg 3	Leg 4	Leg 5	Leg 6	Inbound Total
Time To	6	(1)	(2)	(3)	(4)	Total	(1)	(2)	(3)	(4)	5	Total	Leg 1	Leg 2	Leg 3	Leg 4	Leg 5	Leg 6			
10-11		—	—	—	—	—	—	—	—	—		—	Leg 1		329	630	825			1784	
11-12		1	—	—	—	1	1	1	—	—		2	Leg 2	295		363	5348			6006	
12-1		—	—	—	—	—	—	—	—	—		—	Leg 3	1524	439		1349			3312	
1-2		1	—	—	—	1	—	—	—	—		—	Leg 4	3	4861	2151				7015	
2-3		—	—	—	—	—	—	—	—	—		—	Leg 5								
3-4		—	—	—	—	—	—	—	—	—		—	Leg 6								
4-5		—	—	—	—	—	—	—	—	—		—	Outbound Total	1822	5629	3144	7522			18117	
5-6		—	—	—	1	1	—	—	—	—		—	Inbound	1784	6006	3312	7015			18117	
Total		2	—	—	1	3	1	1	—	—	—	2	Both Directions	3606	11635	6456	14537			36234	

DAY THURSDAY DATE 2-10-66 WEATHER CLOUDY TEMPERATURE 41° RECORDER H. FORREST

REMARKS:

NEW JERSEY STATE HIGHWAY DEPARTMENT
BUREAU OF PLANNING AND TRAFFIC - HIGHWAY USE SURVEY SECTION
TRAFFIC FLOW DIAGRAM

COUNTY MORRIS
MUNICIPALITY EAST HANOVER TWP.
LOCATION N.J. RT. 10 & RIDGEDALE AVE.
DATE THURS. 2-10-66 TIME: FROM: 10 A.M. TO: 6 P.M.

8-HR. COUNT

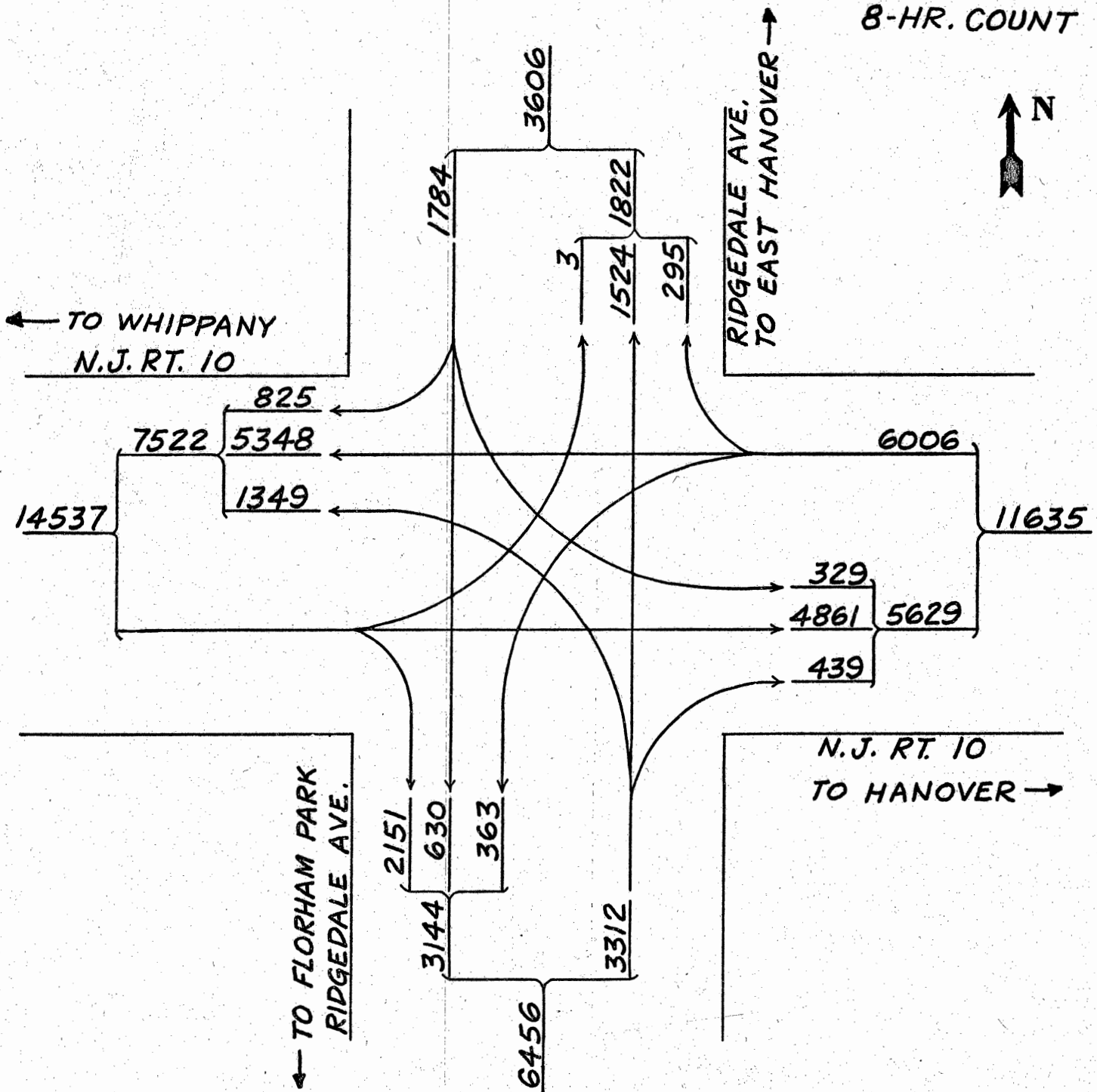


Fig. 3

NEW JERSEY STATE HIGHWAY DEPARTMENT
BUREAU OF PLANNING AND TRAFFIC - HIGHWAY USE SURVEY SECTION

TRAFFIC FLOW DIAGRAM

COUNTY MORRISMUNICIPALITY EAST HANOVER TWP.LOCATION N.J. RT. 10 & RIDGEDALE AVE.

DATE _____ TIME: _____ FROM: - _____ TO: - _____

FEB, 1966 AADT

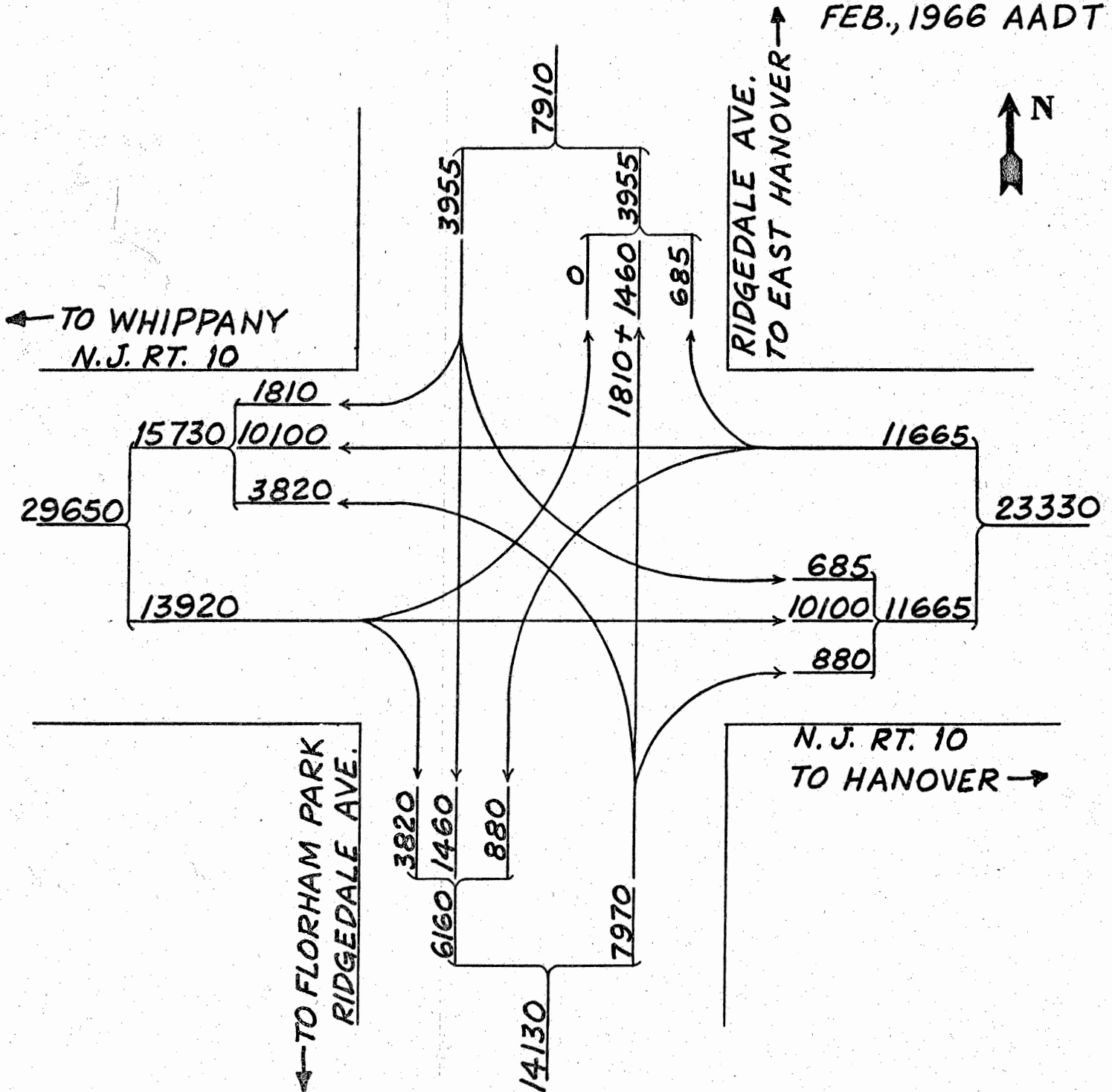


Fig. 4

NEW JERSEY STATE HIGHWAY DEPARTMENT
BUREAU OF PLANNING AND TRAFFIC - HIGHWAY USE SURVEY SECTION
TRAFFIC FLOW DIAGRAM

COUNTY MORRIS
MUNICIPALITY EAST HANOVER TWP.
LOCATION N. J. RT. 10 & RIDGEDALE AVE.
DATE _____ TIME: _____ FROM: _____ TO: _____

FEB., 1966
30TH PEAK HR.

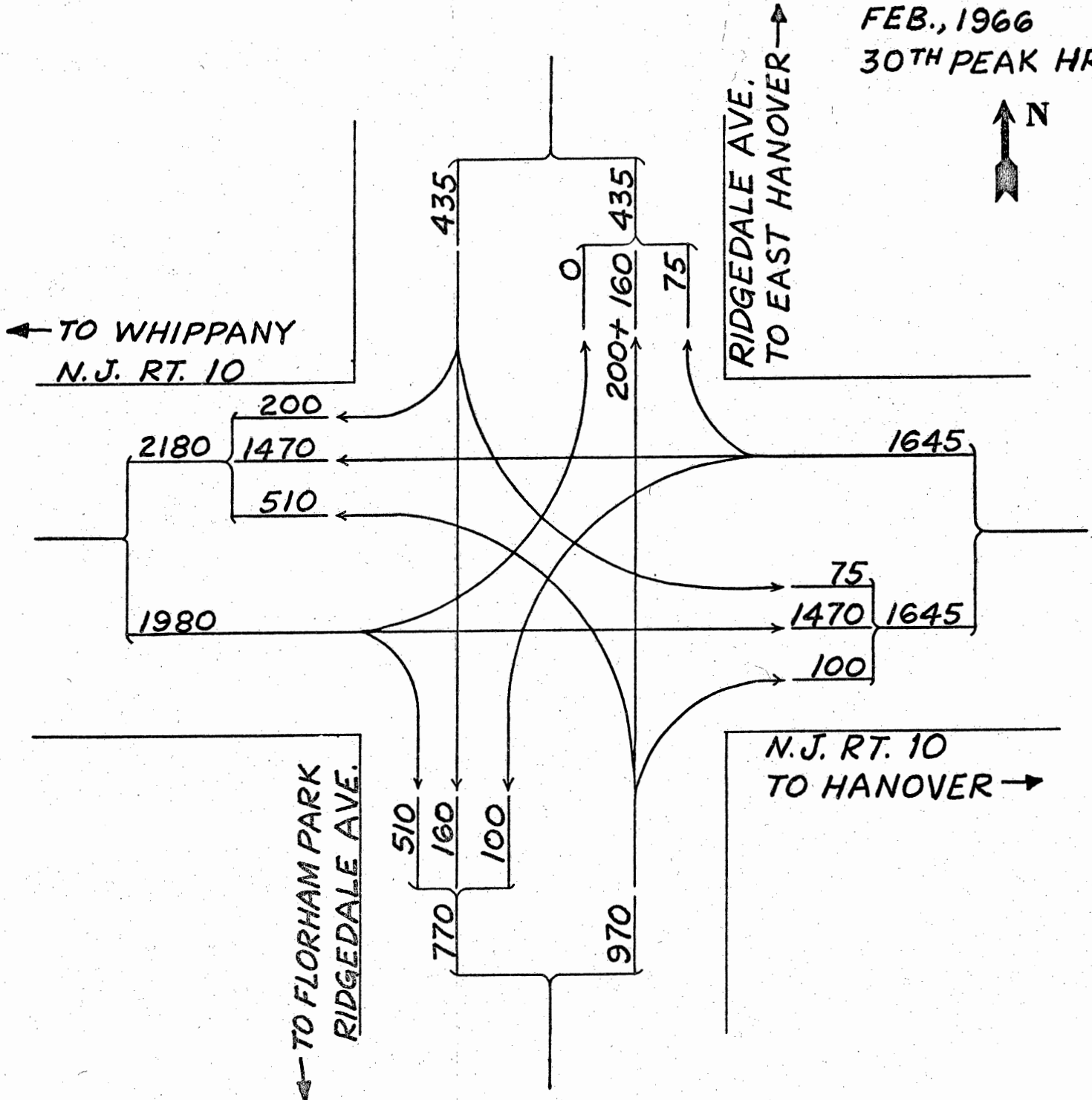


Fig. 5

ACCIDENT RECORDS

The information on accidents is obtained through the cooperation of the Traffic Safety Service of the Division of Motor Vehicles. This organization, which is the official repository of all accident records in New Jersey, supplies accident information in two forms. The first, shown in FIGURE 6, is a simplified short form that is used when an intersection has had few or no accidents. The second, shown in FIGURE 7, is more detailed. The second form contains a brief account of the accident and lists the physical conditions at the time of happening.

Since the files of the Traffic Safety Section are kept for a maximum of five years, the standard accident search is for a 5-year period. This time span has been found to be adequate for the projection of trends. Often, of course, intersections which have been previously investigated have a much larger accident file.

As has been previously noted, not all types of accidents can be corrected by traffic signals. The information that is shown on the form, FIGURE 8, enables the traffic engineers to distinguish between the types of accidents which are correctable by signals and those which are not.

To the average citizen, an accident is an accident. He knows that two cars were involved in a terrific smash-up at Route 75 and Main Street, but little else. His reaction often is, "Why don't they do something about conditions at that intersection?" Being the average hard-working, safe-driving Joe Citizen, he doesn't have access to the true facts, nor the time to weigh them if he had. His reaction is based on his compassion for the victims and his scorn for the supposedly indifferent officials who permit such things to happen.

The traffic engineer is trained to see things in a different light. In the first place, he tries to get the facts straight. Oddly enough, the accident may not have occurred at the intersection at all, for one of the most common errors is attributing an accident to an intersection which was not involved, merely because the intersection makes a handy reference point. For this reason, the traffic engineer prefers to use official sources for his information: the files of the Division of Motor Vehicles or police records.

Secondly, the traffic engineer tries to deduce what happened, and if at all possible, why. Knowing these two items permits him to establish the type of accident, so that he may cull from the list of accidents those that have no bearing on a signal request. Foremost among this category are ran-off-the-roadway and fixed-object accidents, for it is obvious that a traffic signal will not prevent a motorist from running into a tree.

What may not be obvious is that traffic signals may not even prevent motorists from running into each other, if their behavior after the signals are installed is no different from their behavior before. Left-turn accidents tend to fall into that category: experience has taught us that unless special provision is made for the left-turn, through the use of jug handles or left-turn slots, traffic signals will not improve the accident picture.

Same-direction type accidents often increase in number when the signals are installed. This type of accident is so prevalent on our high-speed, high-volume highways that the Department has had to resort to electrically-interconnected advance warning signs bearing the message "Signal Ahead - Red", wherein the word 'red' begins to flash at a pre-determined time prior to the actual red indication.

BUREAU OF TRAFFIC SAFETY
Research and Records Section

DATE 4-11-66

MEMORANDUM TO:

In accordance with the attached request, the following transcript of accident information is submitted for the years indicated below.

Should there be any further information required, please submit an additional request containing any special information required on your studies.

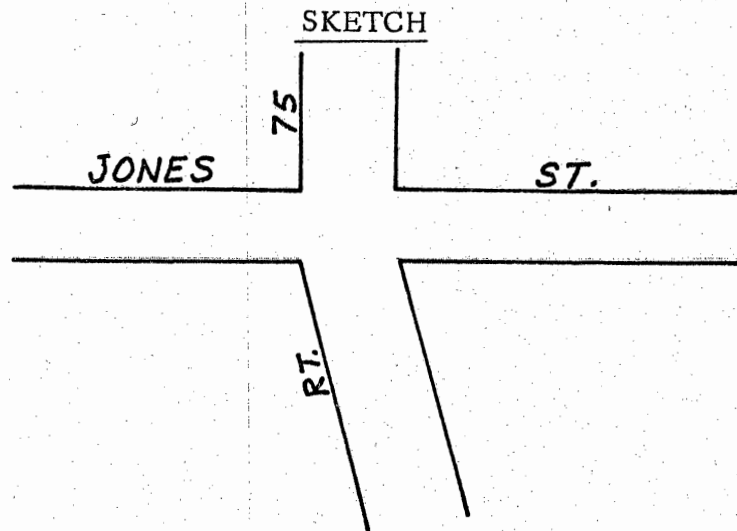
LOCATION: RTE. 75 & MAIN ST.

Year	No. of Acc.	No. Injured	No. Killed	Right Angle	Same Dir.	Left Turn	Head On	Fixed Obj.	Ped.	Other
1961	N O N E R E P O R T E D									
1962	N O N E R E P O R T E D									
1963	1	1	-	-	1	-	-	-	-	-
1964	1	1	-	1	-	-	-	-	-	-
1965	N O N E R E P O R T E D									
TOTAL	2	2	-	1	1	-	-	-	-	-

Fig. 6

ACCIDENT SUMMARY TOTAL SHEET

Type Paving _____ Type Control _____ Date <u>4-11-66</u> By _____	Location <u>RT. 75 AT JONES ST.</u> Municipality _____ County _____
---	---

 PERIOD COVERED FROM 1-1-61 TO 1-1-66


TYPE VEHICLE		WEATHER		ROAD CONDITION		MISCELLANEOUS	
Passenger	<u>78</u>	Clear	<u>22</u>	Dry	<u>21</u>	Skidding	<u>5</u>
Truck	<u>9</u>	Rain	<u>15</u>	Wet	<u>16</u>	Lost Control	<u>2</u>
Tr. Trailer	<u>2</u>	Snow	<u>4</u>	Icy	<u>—</u>	Ran off Road	<u>—</u>
Bus	<u>—</u>	Fog	<u>1</u>	Snow	<u>5</u>	Disreg. Traf. Control	<u>32</u>
Not Stated	<u>—</u>	Not Stated	<u>—</u>	Not Stated	<u>—</u>		
OTHER	<u>—</u>						

	12	1	2	3	4	5	6	7	8	9	10	11	NS	TOT
AM	<u>1</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>2</u>	<u>6</u>	<u>1</u>	<u>3</u>	<u>3</u>	<u>—</u>	<u>16</u>
PM	<u>1</u>	<u>3</u>	<u>4</u>	<u>2</u>	<u>6</u>	<u>3</u>	<u>1</u>	<u>3</u>	<u>1</u>	<u>—</u>	<u>2</u>	<u>—</u>	<u>—</u>	<u>26</u>

J	F	M	A	M	J	J	A	S	O	N	D	TOT
<u>3</u>	<u>3</u>	<u>8</u>	<u>5</u>	<u>6</u>	<u>2</u>	<u>6</u>	<u>2</u>	<u>—</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>42</u>

S	M	T	W	T	F	S	TOT
<u>2</u>	<u>6</u>	<u>5</u>	<u>9</u>	<u>4</u>	<u>6</u>	<u>10</u>	<u>42</u>

Killed —
 Injured 40
 Total Acc. 42

	N	D	TOT
Fatal	<u>—</u>	<u>—</u>	<u>—</u>
Non-Fatal	<u>2</u>	<u>19</u>	<u>21</u>
Prop Damage	<u>4</u>	<u>17</u>	<u>21</u>
TOTAL	<u>6</u>	<u>36</u>	<u>42</u>
R.A.	<u>6</u>	<u>27</u>	<u>33</u>
S.D.	<u>—</u>	<u>7</u>	<u>7</u>
L.T.	<u>—</u>	<u>—</u>	<u>—</u>
H.O.	<u>—</u>	<u>1</u>	<u>1</u>
F.O.	<u>—</u>	<u>—</u>	<u>—</u>
PED.	<u>—</u>	<u>1</u>	<u>1</u>
OTHER	<u>—</u>	<u>—</u>	<u>—</u>
TOTAL	<u>6</u>	<u>36</u>	<u>42</u>

TS-R6

ACCIDENT SUMMARY AT INTERSECTION

Location RT. 75 AT JONES ST. Municipality _____ County _____

	Date	Day	Time	Night	Day	Weather & Road Cond.	Skid	Lost Control	Disregarded Traffic Control	Ran off Roadway	Type Vehicle	Severity	Manner of Collision	Diagram	Remarks:
1963	3/8	FRI	3 ¹⁰ / _P	D	C-D						TRK	1°	PED		S.B. #1 TURNING LEFT & STRUCK PEDESTRIAN CROSSING S.B.
"	4/18	THU	8 ⁴¹ / _A	D	R-W			✓			=	2°	RA		W.B. #1 DRIVER CLAIMS STOPPED FOR STOP SIGN - BEGAN CROSSING & COLLIDED WITH S.B. #2.
"	5/29	WED	2 ¹⁰ / _P	D	R-W			✓			=	2°	RA		S.B. #1 COLLIDED WITH E.B. #2 - NO DETAILS GIVEN ON REPORT.
"	5/29	WED	4 ³⁰ / _P	D	R-W			✓			=	-	RA		W.B. #1 FAILED TO STOP AT INTERSECTION & COLLIDED WITH N.B. #2 - N.B. #3 RAN INTO REAR OF N.B. #2
"	7/5	FRI	11 ³⁰ / _A	D	C-D						=	4°	SD		S.B. #1 SLOWING TO TURN RIGHT & WAS HIT IN REAR BY S.B. #2.
"	7/13	SAT	11 ¹⁵ / _A	D	C-D			✓			=	-	RA		S.B. #1 COLLIDED WITH W.B. #2 WHO FAILED TO STOP AT STOP SIGN.
"	7/15	MON	6 ⁰⁰ / _P	D	C-D						=	-	SD		S.B. #1 SLOWING TO TURN RIGHT & WAS HIT BY S.B. #2.
"	12/23	MON	2 ⁰⁰ / _P	D	S-S	✓		✓			=	2°	RA		N.B. #1 COLLIDED WITH E.B. #2 - #2 THEN SWERVED INTO W.B. #3.

Fig. 8

FIELD INVESTIGATION

The Department is not blind to the fact that statistics may be misleading. For this reason, each request for a signal is referred to a traffic engineer who is familiar with the area involved, so that no matter how imposing the statistics for or against the signal there will be an expert opinion available.

After studying the traffic counts and the accident records, the traffic engineer makes one or more field inspections to observe the physical characteristics of the intersection and the behavior of traffic. When necessary, he contacts the local police and other officials to obtain from them their first-hand accounts of the traffic conditions.

Upon completion of the field investigation, the engineer submits a report containing a summary of the traffic and accident records, a discussion of the physical features and other pertinent facts he has obtained through his field work, and his recommendations as to whether or not the signal should be installed.

Some of the points that the traffic engineer looks for in the field are the type and condition of the roads; the presence or absence of curves, hills or other impairments to sight distance; the presence of large traffic generators, such as shopping centers, large restaurants, drive-in movies, hamburger stands and the like; the existence of parking prohibitions, one-way streets, bus stops and other traffic control features; and the proximity of other traffic signals. All of these may have a bearing on whether the signal is needed or should be installed.

If it is determined that a traffic signal is warranted, a plan of the intersection is prepared, showing the layout of the signals. Each installation must conform to the requirements of the law (Title 39) and to the professional standards on uniformity shown in the Manual. Many of the installations involve simple three-way or four-way intersections which can be signalized without any extensive changes. However, some involve geometric re-design, and detailed plans showing these changes must be prepared by the Department's design engineers.

It must not be assumed that once a signal is installed the job of the traffic engineer is at an end. The correct operation of the signal depends on proper timing which in turn is dependent upon the traffic volumes. The same counts that are used to justify the signal are used in determining the initial signal timing. However, after a signal is installed, changes may occur in the traffic patterns in the area, necessitating changes in the signal timing.

ANSWERS TO TYPICAL QUESTIONS

Q. Why does the Highway Department insist that someone be killed before they install a traffic signal?

A. The Highway Department does not insist that anyone be killed - or that anyone be injured or even have an accident - before considering a signal. What the Department says is that if there are a significant number of accidents that can be corrected by signals, that fact alone may indicate signals are needed. The key words are "corrected by signals". Some accidents, such as accidents involving left-turns off of the highway, cannot be eliminated by signals alone. Some types of collisions actually increase after signals are installed.

Q. Why does it take so long to get a decision about a traffic signal?

A. A professional traffic engineer makes decisions, not snap judgments. Decisions are based on an examination of the data, which require time to collect. At the present time, it takes between three and four months to gather and analyze the traffic counts and accident records.

It should be pointed out that requests which may eventually be denied take at least as much time and effort as those requests that are approved. The Department gives professional objective attention to every request received from a municipality.

Q. If a request is denied, how soon may the municipality request another study?

A. At any given time the Department may have a backlog of 50 to 60 signal requests. It would not be fair to have one intersection investigated several times while others waited their first turn. Thus, while a municipality may submit as many requests as it likes, the chances are that it will

be six months to a year before the Department can take a second look. This does not mean that once a request is denied, the Department's engineers forget it. On the contrary, the traffic engineers, each of whom is assigned an area, consider it a point of personal satisfaction and pride to be familiar with the potential trouble spots in their area.

Q. I have heard that there was going to be a traffic signal installed at Route 75 and Main Street six months ago - but the Highway Department hasn't done a thing since then. Why?

A. We will assume that what you originally heard was correct - that the Department did approve and is going to install a signal at that intersection. The Department has been doing something - it has been drawing the plans; estimating the cost of the materials; entering into the contractual agreements; purchasing the poles, the lights and the control equipment; calculating the signal timing. While it was not necessary here, right-of-way must sometimes be purchased to enable the designer to round off a corner or to widen the approaches. The actual installation of the signal can be done quickly - often within a week or two - but you can't install something unless you know what it is and where it's going.

Q. Why doesn't the Highway Department install a traffic signal at Route 75 and Jones Street - what do they use taxpayers money for, anyway?

A. One point must be stressed: the Department never "refuses to install a traffic signal because it costs money". Traffic signals, and other control devices, when justified and needed, are as much a part of the highway system as the pavement - or the middle span of a bridge. The Department's only function is to serve the motoring public - by providing pavement, bridges and traffic signals, when needed.

APPENDIX A

39:4-120.1

Placing official traffic signals: Official traffic control signals shall be placed only by the authority of a public body or official having jurisdiction as authorized by law and only for the purpose of regulating traffic.

39:4-121.

Signals on State roads near fire houses: The State Highway Commissioner after proper investigation and survey, subject to the approval of the director, may install and maintain traffic lights upon State roads in suburban districts wherever a fire engine house is located within one thousand feet of such road or is located upon such road. The investigation and survey must clearly indicate a special hazard existing because of heavy traffic congestion or of traffic speed upon such road at the locality in question.

39:4-121.1

Traffic signals on State roads; application by municipality; approval. Any county or municipality, wherein a dangerous intersection has been established by reason of the construction of a State highway within the territorial limits thereof, may apply to the State Highway Commissioner for installation and maintenance of traffic lights at such intersection, and after an application is so made the Commissioner shall cause to be made a proper investigation and survey concerning the traffic hazards which exist at such intersection. The State Highway Commissioner, after an investigation and survey, may install and maintain traffic lights at any location where an application, as herein before provided for, has been made, but the installation of any traffic lights pursuant to this section shall receive the approval of the director.

APPENDIX B

T H I S A G R E E M E N T, Made the day of
A. D. One Thousand Nine Hundred and Sixty-Six,

BETWEEN The (NAME OF MUNICIPALITY), in the County of _____,
hereinafter called the ("Township", or "City", or "Town", or "Borough"),
party of the first part,

AND The STATE OF NEW JERSEY acting through its State Highway
Commissioner, hereinafter called the "State", party of the second part:

WHEREAS, a dangerous traffic condition exists at the intersection
of State Highway (Name of Intersection), in the (Name of Municipality),
in the County of _____, which requires the installation and
operation of a (semi-actuated traffic signal, with pedestrian push buttons,
or semi-actuated traffic signal, or fixed time traffic signal, or manual
flasher traffic signal), in order to minimize the danger of accidents,
and to expedite the safe movement of traffic; and

WHEREAS, it is the purpose of this agreement to provide for
the participation of the State and the (Township, or City, or Town, or
Borough) in the cost of installation, maintenance and operation of the
said (type of installation as listed above), at the intersection aforesaid;

THEREFORE, WITNESSETH: That for and in consideration of the
mutual covenants and agreements contained herein, the (Township, or City,
or Town, or Borough) and State agree as follows:

1. The State will apply to the Director of the Division of
Motor Vehicles for a proper permit for the erection and operation of a
(type of signal as above) at the intersection aforesaid.

2. The State and (Township, or City, or Town, or Borough) agree that the State will assume (75%, or 85%) and the Township, or City, or Town, or Borough 25%, or 15% of the total cost of installation of said (type of signal as above).

3. The State will provide all necessary material and equipment and will perform all labor by its own or by contract forces in installing the (type of signal as above).

4. The State will paint such lane and pavement markings, and erect such signs on the crossing street or roadway, as may be required to properly direct the flow of traffic into, out of, or across the State highway. The (Township, or City, or Town, or Borough) will maintain or replace the lane and pavement markings and signs beyond the jurisdiction line of the State highway. The State will maintain and replace the lane and pavement markings, or signs, on the State highway.

5. When the said traffic signal has been installed, the total cost shall be computed, which cost shall include the cost of equipment, materials, labor, supervision and all other charges properly chargeable to the work. Immediately thereafter, the (Township, or City, or Town, or Borough) shall reimburse the State in an amount equal to (25% or 15% of the total cost of installation).

6. The State will periodically inspect and maintain the complete installation, including the relamping thereof.

7. The (Township, or City, or Town, or Borough) will provide through the utility company for necessary electric current and pay all bills for electric current.

8. The State reserves the right to rescind this agreement on giving to the (Township, or City, or Town, or Borough) six months' notice in writing of its intention to rescind, which notice shall be served upon

the Clerk of the said (Township, or City, or Town, or Borough).

9. The (Township, or City, or Town, or Borough) certifies that all things required by law to be done and performed by it to enable it to carry out this agreement have been done and performed.

IN WITNESS WHEREOF, the said parties hereto have caused this agreement to be duly executed the day and year first above written.

(TOWNSHIP OF, OR CITY, OR TOWN, OR BOROUGH)

By _____
Mayor

Attest:

Clerk

STATE OF NEW JERSEY

By _____
State Highway Commissioner

Attest:

Secretary, State Highway Department

APPENDIX C

SIGNALS INSTALLED - 1965

<u>Route</u>	<u>Intersection</u>	<u>Municipality</u>	<u>County</u>	<u>Description</u>
U.S.1&9	Ramps to Newark Airport	Newark	Essex	Semi-actuated
U.S.1&9	Rt. 93 (Grand Ave.)	Ridgefield	Bergen	Fixed-time
4	Relocated Ramp "A"-River Rd.- Northumberland Rd.	Teaneck Twp.	Bergen	Semi-actuated
U.S.9	Craig Rd.	Freehold-Manalapan Twps.	Monmouth	Semi-actuated; jug- handle
U.S.9	Freneau Rd.	Madison Twp.	Middlesex	Semi-actuated; jug- handles
U.S.9	Intermediate "U" turn	Freehold Twp.	Monmouth	Semi-actuated; jug- handles
U.S.9	Intermediate "U" turn	Freehold Twp.	Monmouth	Semi-actuated; jug- handle
U.S.9	Intermediate "U" turn	Manalapan-Marlboro Twps.	Monmouth	Semi-actuated; jug- handles
10	Broadlawn-Tiffany Dr.	Livingston Twp.	Essex	Semi-actuated
17	Ramp & South Summit Ave.	Hackensack	Bergen	Semi-actuated
23	Myrtle Ave.	Cedar Grove Twp.	Essex	Flasher; emergency signal
24	Indiana Ave.	Maplewood	Essex	Semi-actuated
24	Port Murray Rd.	Mansfield Twp.	Warren	Flasher
26	Nassau St.	New Brunswick-No. Brunswick Twp.	Middlesex	Semi-actuated
27	Fairmount Ave.	Elizabeth	Union	Semi-actuated
27	How Lane	New Brunswick- No. Brunswick Twp.	Middlesex	Semi-actuated
27	New Rd.	So. Brunswick Twp.	Middlesex	Semi-actuated
27	Oliver St.-Franklin Blvd.	New Brunswick- Franklin Twp.	Middlesex- Somerset	Semi-actuated

SIGNALS INSTALLED - 1965 cont'd.

Route	Intersection	Municipality	County	Description
28	Centennial-Springfield Aves.	Cranford Twp.	Union	Fixed-time
28	Country Club Rd.-First Ave.	Bridgewater Twp.- Raritan Boro	Somerset	Semi-actuated
28	Elizabeth Ave.	Cranford Twp.	Union	Semi-actuated
28	Greenbrook Rd.-Orchard Rd.	Middlesex Boro	Middlesex	Semi-actuated
29	Lower Ferry Rd.	Ewing Twp.	Mercer	Semi-actuated; jug- handle
U.S.30	Franklin Ave.	Berlin Boro	Camden	Semi-actuated
33	Jumping Brook Rd.-Old Corlies Ave.	Neptune Twp.	Monmouth	Semi-actuated
34	Lloyd Rd.	Matawan Twp.	Monmouth	Semi-actuated; inter- connected advance warning sign
35	Grant Ave.	Seaside Heights	Ocean	Fixed-time
35	West Bergen Place	Red Bank	Monmouth	Semi-actuated
36	Stone Rd.	Raritan Twp.	Monmouth	Semi-actuated; jug- handle
37	Washington St.	Dover Twp.	Ocean	Semi-actuated; jug- handle
U.S.40	Main Rd.-Co.Rd. 555	Franklin Twp.	Gloucester	Flasher
42	Intermediate "U" turn (bus turnout)	Washington Twp.	Gloucester	Semi-actuated; jug- handle
U.S.46	Boulevard	Mountain Lakes Boro	Morris	Semi-actuated
U.S.46	New Road	Parsippany-Troy Hills Twp.	Morris	Semi-actuated; jug- handles
U.S.46	Mount Olive Rd.	Mount Olive Twp.	Morris	Semi-actuated; jug- handles
U.S.46	Channelized "T" Intersector	Rockaway Twp.	Morris	Semi-actuated

SIGNALS INSTALLED - 1965 cont'd.

<u>Route</u>	<u>Intersection</u>	<u>Municipality</u>	<u>County</u>	<u>Description</u>
54	Third St.	Hammonton	Atlantic	Fixed-time
63	Oakdene Ave.	Ridgefield Boro	Bergen	Fixed-time w/special fire sequence
67	Horizon Rd.	Fort Lee Boro	Bergen	Semi-actuated
69	Klinesville-Bartles Corner Rd.	Raritan Twp.	Hunterdon	Flasher
69&U.S. 202	Copper Hill Bypass	Raritan Twp.	Hunterdon	Semi-actuated; jug-handle
69&U.S. 202	County Club Rd.	Raritan Twp.	Hunterdon	Semi-actuated; jug-handle
69&U.S. 202	Old York Rd.	East Amwell Twp.	Hunterdon	Semi-actuated; reverse loops
69&U.S. 202	Raritan Ave.	Raritan Twp.	Hunterdon	Semi-actuated; jug-handle
69&U.S. 202	Reaville-Sergeantsville Rd.	Raritan Twp.	Hunterdon	Semi-actuated; jug-handle
69&U.S. 202	South Main St.	Raritan Twp.	Hunterdon	Semi-actuated; jug-handle
69&U.S. 202	Wertsville Rd.	East Amwell Twp.	Hunterdon	Semi-actuated; jug-handles
69&U.S. 202	Intermediate "U" turn	Raritan Twp.	Hunterdon	Semi-actuated; jug-handles
69&U.S. 202	Intermediate "U" turn	Raritan Twp.	Hunterdon	Semi-actuated; jug-handles
70	Co. Rd. 539	Manchester Twp.	Ocean	Semi-actuated
70	Donahue Ave.	Cherry Hill Twp.	Camden	Semi-actuated; jug-handle
70	Lexington Ave.	Pennsauken Twp.	Camden	Semi-actuated; jug-handle
70	McClellan Ave.	Pennsauken Twp.	Camden	Semi-actuated; jug-handle

SIGNALS INSTALLED - 1965 cont'd.

<u>Route</u>	<u>Intersection</u>	<u>Municipality</u>	<u>County</u>	<u>Description</u>
72	Barnegat Ave.	Ship Bottom Boro	Ocean	Semi-actuated
72	Morris Blvd.	Stafford Twp.	Ocean	Semi-actuated
79	Co. R.. 537-Spring-Center Sts.	Freehold Boro	Monmouth	Semi-actuated
82	Rahway-Lousons Ave.	Union Twp.	Union	Manual-flasher
82	Sayre-Greenwood Rds.	Union Twp.	Union	Semi-actuated
U.S.130	Cedar Lane	Florence Twp.	Burlington	Semi-actuated
168	Smiths Lane-8th Ave.	Runnemede Boro	Camden	Semi-actuated
280	Rel. Main St. & Arlington St.	East Orange	Essex	Fixed-time
280	Rel. Main St. & Grove St.	East Orange	Essex	Fixed-time
280	New Main St. & Munn Ave.	East Orange	Essex	Fixed-time
280	Rel. Main St. & Pedestrian Crossing (vic. of Maple Ave.)	East Orange	Essex	Pedestrian-actuated
280	New Main St. & Steuben St.	East Orange	Essex	Fixed-time
440	Briarwood Rd.	Jersey City	Essex	Semi-actuated; jug-handle
440	Carbon Place	Jersey City	Essex	Semi-actuated
440	Kellogg St.	Jersey City	Essex	Semi-actuated; jug-handle

