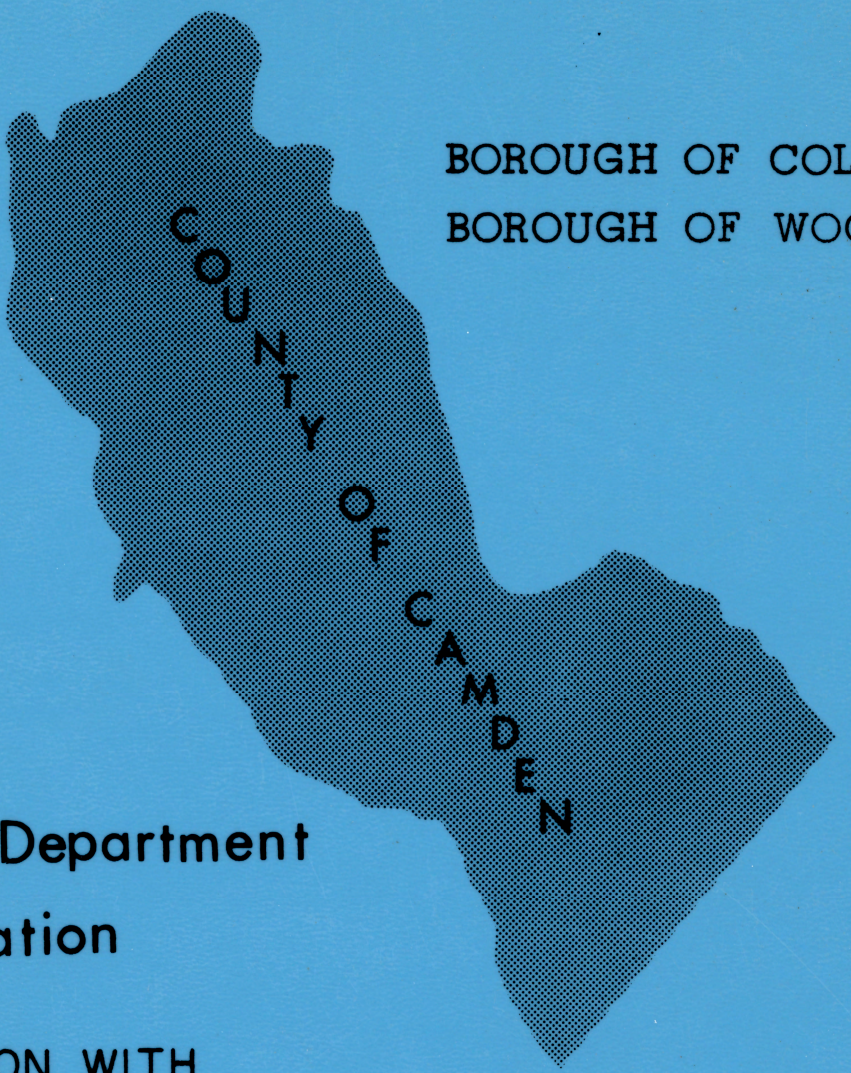
TOPICS STUDY



BOROUGH OF COLLINGSWOOD
BOROUGH OF WOODLYNNE

T-4002(6)

PREPARED
FOR

New Jersey Department
of Transportation

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Federal Highway Administration

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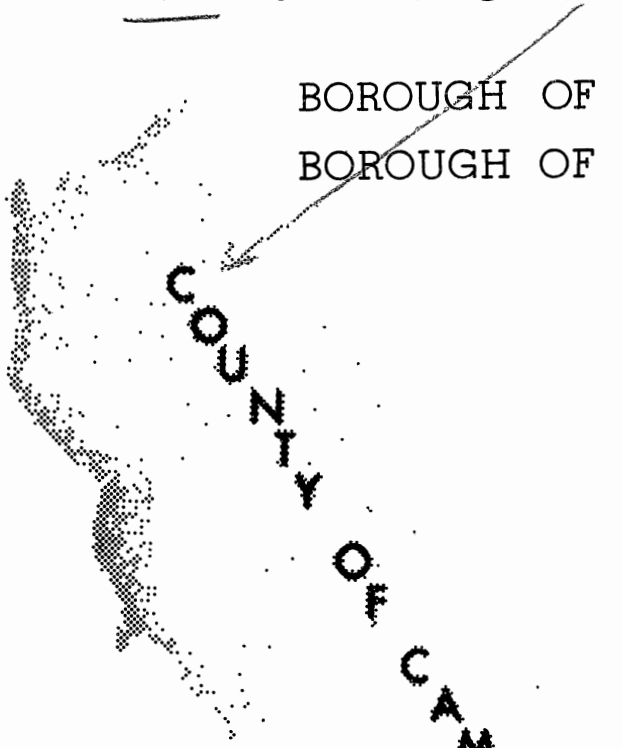
KAMMERER, SYMES ASSOCIATES INC.
CONSULTING ENGINEERS
CHERRY HILL NEW JERSEY

January 1974

TOPICS STUDY

BOROUGH OF COLLINGSWOOD
BOROUGH OF WOODLYNNE



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January 31, 1974

Mr. John C. Kohl
Commissioner of Transportation
N.J. Department of Transportation
1035 Parkway Avenue
Trenton, New Jersey 08625

Director of the Board of
Chosen Freeholders
Camden County Freeholders Office
Court House
Camden, New Jersey

Re: TOPICS Study

Gentlemen:

We are pleased to submit our TOPICS (Traffic Operations Program to Increase Capacity and Safety) Study for the County of Camden. The recommendations included are designed to improve the flow and safety for major roadways within the specific municipalities mentioned in this report.

The report summarizes the studies conducted for the purpose of analyzing the conditions on the existing arterial and collector roadways, identifying major problem areas and recommending short and long range solutions to major problem areas.

We are most appreciative of the opportunity to have been of service to the Department of Transportation and the County of Camden on this assignment.

Respectfully Submitted,

KAMMERER, SYMES & ASSOCIATES, INC.

Allan M Kammerer

Allan M. Kammerer, P.E.,P.P.
Executive Vice-President

AMK:hes

ACKNOWLEDGEMENTS

We are most appreciative to the following organizations and agencies for their assistance and cooperation during the course of this study:

FEDERAL HIGHWAY ADMINISTRATION

NEW JERSEY DEPARTMENT OF TRANSPORTATION

NEW JERSEY DIVISION OF MOTOR VEHICLES

COUNTY OF CAMDEN

BOROUGH OF AUDUBON

BOROUGH OF AUDUBON PARK

BOROUGH OF BARRINGTON

BOROUGH OF BELLMAWR

BOROUGH OF BERLIN

TOWNSHIP OF BERLIN

BOROUGH OF BROOKLAWN

TOWNSHIP OF CHERRY HILL

BOROUGH OF CLEMENTON

BOROUGH OF COLLINGSWOOD

BOROUGH OF GIBBSBORO

CITY OF GLOUCESTER

TOWNSHIP OF GLOUCESTER

TOWNSHIP OF HADDON

BOROUGH OF HADDONFIELD

BOROUGH OF HADDON HEIGHTS

BOROUGH OF HI-NELLA

ACKNOWLEDGEMENTS, CONTINUED

BOROUGH OF LAUREL SPRINGS

BOROUGH OF LAWNSIDE

BOROUGH OF LINDENWOLD

BOROUGH OF MAGNOLIA

BOROUGH OF MERCHANTVILLE

BOROUGH OF MOUNT EPHRAIM

BOROUGH OF OAKLYN

TOWNSHIP OF PENNSAUKEN

BOROUGH OF PINE HILL

BOROUGH OF PINE VALLEY

BOROUGH OF RUNNEMEDE

BOROUGH OF SOMERDALE

BOROUGH OF STRATFORD

BOROUGH OF TAVISTOCK

TOWNSHIP OF VOORHEES

TOWNSHIP OF WATERFORD

BOROUGH OF WOODLYNNE

DELAWARE RIVER PORT AUTHORITY

DELAWARE VALLEY REGIONAL PLANNING COMMISSION

HERBERT H. SMITH ASSOCIATES

TRANSPORT OF NEW JERSEY

URBAN ENGINEERS

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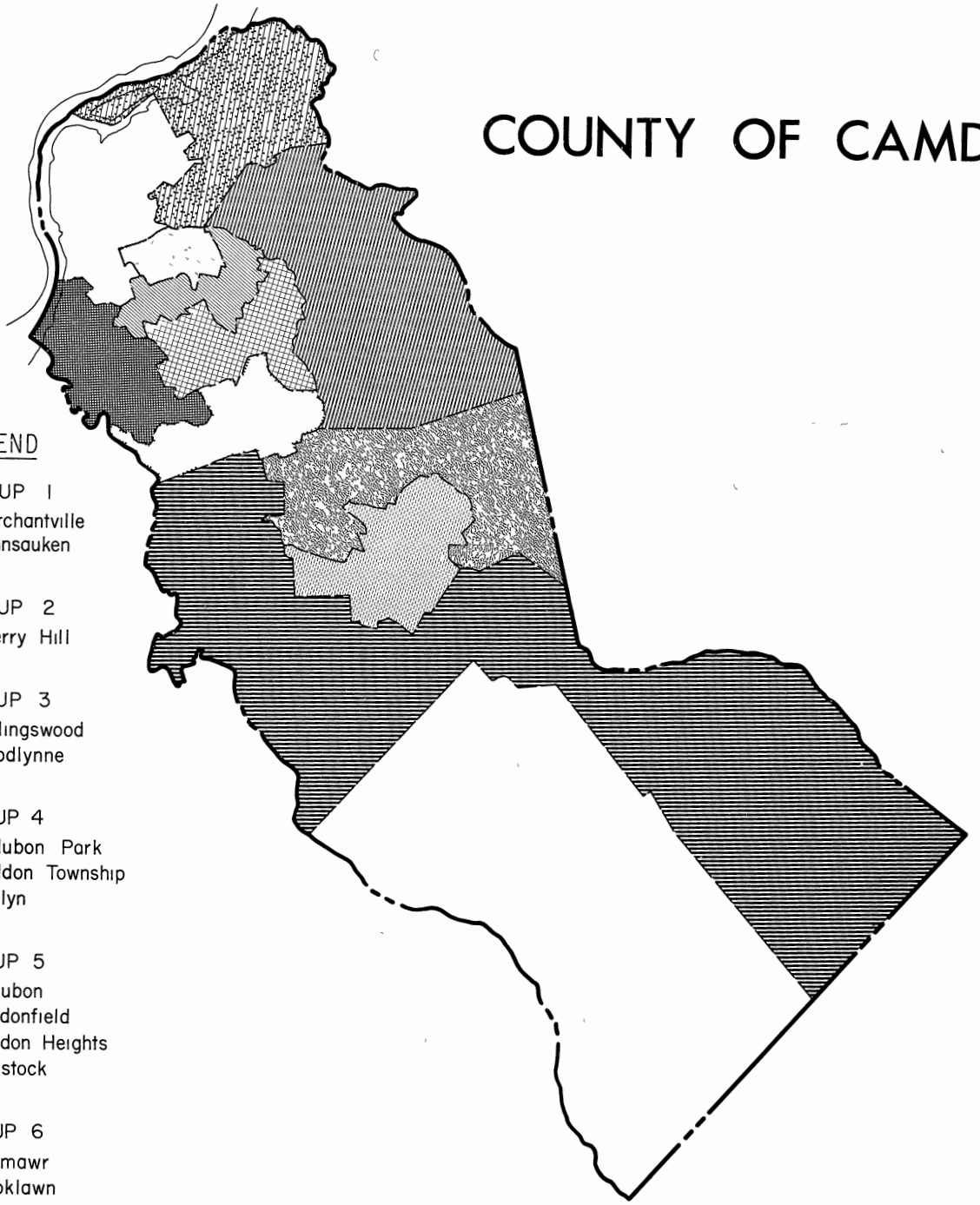
COUNTY OF CAMDEN



LEGEND

GROUP 1
Merchantville
Pennsauken

GROUP 2
Cherry Hill

GROUP 3
Collingswood
Woodlynne

GROUP 4
Audubon Park
Haddon Township
Oaklyn

GROUP 5
Audubon
Haddonfield
Haddon Heights
Tavistock

GROUP 6
Bellmawr
Brooklawn
Gloucester City
Mt Ephraim

GROUP 7
Barrington
Lawnside
Magnolia
Runnemede

GROUP 8
Hi Nella
Laurel Springs
Somerdale
Stratford
Voorhees Township

GROUP 9
Clementon
Gibbsboro
Lindenwold

GROUP 10
Berlin
Berlin Township
Gloucester Township
Pine Hill
Pine Valley
Waterford Township

AREA MAP

EXHIBIT NO. 1

Kammerer, Symes & Assoc
Consulting Engineers

CHAPTER 1

THE TOPICS PROGRAM

The authorization, scope and objectives of the TOPICS Program and its ultimate aims are set forth in the following:

> "Policy and Procedure Memorandum 21-18", of May 12, 1972, Federal Highway Administration, United States Department of Transportation, refers to "-- the development of a TOPICS plan based on a systematic traffic engineering analysis --". TOPICS means Traffic Operations Program to Increase Capacity and Safety. The objective of the Program is not to supplant long range planning but to complement it.
>
> The Program is administered under the authority provided by Section 10 of the Federal-Aid Highway Act of 1968, approved August 23, 1968, which amended Chapter 1 of Title 23, United States Code, by adding a new Section 135, "Urban Area Traffic Operations Improvement Programs".

This report provides traffic improvement recommendations under the Camden County TOPICS Program for Collingswood Borough and Woodlynne Borough, based on the type of systematic traffic engineering analyses called for by the Act of 1968, as amended.

The objective of TOPICS is to obtain better use of existing streets and roadways by improvements which will fit into and become part of a general long range highway plan. In brief, it will be a series of short range improvements which will mesh with those for the long range.

Among the more important considerations are adequate traffic engineering, up-dated pavement marking systems, more efficient channeling of intersecting traffic, more responsive signals, improved street lighting, and construction or reconstruction of short sections of highway where traffic problems exist.

The following is a list of the types of improvements which may be eligible for financing under the TOPICS Program.

a. Channelization of intersections.

b. Widening traffic lanes.

c. Provide additional traffic lanes on approaches to signalized intersections.

d. Install traffic control systems to make traffic signal operation responsive to traffic conditions.

e. Install traffic surveillance systems.

f. Upgrade traffic control signs and pavement markings.

g. Provide improved areas for loading and unloading bus passengers including separate bus lanes and shelters.

h. Upgrade highway and or street lighting.

i. Modifications associated with restricting curb parking.

j. Construction of pedestrian grade separations or highway grade separations at complex intersections.

k. Limited construction or reconstruction where such an improvement is essential for route continuity along a street of otherwise adequate width.

The report which follows describes the study findings and sets forth recommended solutions to existing problem areas.

CHAPTER 2

SUMMARY OF RECOMMENDATIONS

The following summary of recommendations outlines the recommended improvements which are detailed later in this report:

TRAFFIC SIGNALS - BOROUGH OF COLLINGSWOOD

All of the existing signalized intersections within the Borough are overloaded during the early morning and evening rush hours and during the heavy evening shopping hours. From the total of seven (7) signalized intersections, three (3) are equipped with fixed time signals and four (4) are semi-actuated signals. A flashing signal is located on Collings Avenue west of Route 30 and a flashing signal manually operated during school hours is located on Route 130 south of the Collingswood Circle. Recommendations to provide additional turning lanes and adjustment to the signal phasing are also included in this report. No new traffic signals have been proposed in the Borough. However, recommended projects are included in Chapter 13 of this report for the reconstruction and or modification of traffic signals at the following locations:

a. Cuthbert Road and Park Avenue

b. Haddon Avenue and Cuthbert Road

TRAFFIC SIGNALS - BOROUGH OF WOODLYNNE

Both of the existing signalized intersections within the Borough are overloaded during the early morning and evening rush hours and during the heavy evening shopping hours. Both signals are of the semi-actuated type. Recommendations to provide for a new signal, additional turning lanes and adjustment to the signal phasing are included in this report. A recommended project is included in Chapter 13 of this report relocating the traffic signal from the intersection of Route 130 and Richey Avenue to Route 130 and Dwight Avenue.

ROADWAY GEOMETRY

Major roadways have exceeded their capacity with present traffic. With traffic continuing to increase, recommendations have been included to widen main arteries and improve geometry.

TRAFFIC FLOW

Recommendations have been included regarding the improvement of the flow of traffic for the 600 Block of Collings Avenue in the Borough of Collingswood and are discussed in Chapter 13 of this report.

The smooth flow of traffic in the Borough is hampered by heavy volumes and congestion at the Collingswood Circle. This problem, however, can only be corrected by major revisions and is currently being studied by the New Jersey Department of Transportation. See Chapter 12 of this report.

PARKING CONTROLS

Restriction of parking in certain areas of the Boroughs will greatly facilitate the smooth flow of traffic. Included in Chapter 13 of this report are recommendations for the elimination of parking adjacent to the buildings in shopping areas and on main collector streets within residential neighborhoods.

Parking should be restricted on the following roads:

a. Collings Avenue

b. Park Avenue

c. Mount Ephraim Avenue

d. Woodlynne Avenue

SIGNS AND PAVEMENT MARKINGS

Many locations are deficient in signing and pavement markings. Specific recommendations include standardizing signs and pavement markings, providing restricted turning lanes at signalized and unsignalized intersections and additional regulatory signs as required.

TRAFFIC REGULATIONS AND ENFORCEMENT

The analysis of the existing traffic regulations in the Borough of Collingswood and the Borough of Woodlynne indicates that they cover the requirements of the Municipalities. However, the analysis of the enforcement of existing regulations indicates that greater emphasis should be placed on the enforcement of parking, speed limits, stop controls and yield controls.

LONG RANGE PLANNING

Many of the improvements recommended in this report will solve immediate traffic problems in the study area. With the growth anticipated during the seventies and beyond in this area, steps should be taken to plan for the additional capacity which will be required along existing routes plus the need for additional routes to by-pass built up areas. With this end in mind, the Camden County Planning Department has prepared a report titled "Master Plan for Highways", amended May, 1971, which provides a guide for developing an improved highway system.

To insure that adequate right of way is available for future expansion, restrictions should be placed on the development of remaining lands adjacent to existing roads. This can be accomplished through the local Planning and Zoning Boards.

CHAPTER 3

STUDY DESCRIPTION

STUDY AREA - COUNTY OF CAMDEN - BOROUGH OF COLLINGSWOOD

The Borough of Collingswood is a residential and commercial community located in the northwestern part of Camden County bounded on the north by the Cooper River and on the south by Newton Lake. The 1970 population of seventeen thousand, four hundred (17,400) people is approximately the same as the 1960 population denoting a rather insignificant change in the growth rate of the Borough.

Several major connector and arterial roads in addition to Routes 30 and 130 pass through various parts of the Borough. Along with heavy commuter and commercial traffic, which has existed for many years, additional traffic has been generated by commuters using the Collingswood station of the Rapid Transit System which takes commuters to and from Philadelphia. *(See Exhibit Nos. 2 and 3).*

Collingswood is one of the smaller municipalities in Camden County occupying an area of two (2) square miles. The Borough's Central Business District (C.B.D.) is located along Haddon Avenue between Knight Avenue and Frazer Avenue. There are no industrial areas as such within the Borough. *(See Exhibit No. 2).*

The terrain within the study area is composed of generally flat and gently rolling grades and has little adverse effect on the movement of traffic.

STUDY AREA - COUNTY OF CAMDEN - BOROUGH OF WOODLYNNE

The Borough of Woodlynne is a residential and commercial community located in the northwestern part of Camden County. The Borough is bounded on the north and west by the City of Camden, on the east by Collingswood Borough and on the south by the North Branch of Newton Creek. The 1970 population of three thousand, one hundred (3,100) people is slightly less than the 1960 population denoting a rather insignificant decrease in the growth rate of the Borough.

Several major connector roads pass through the Borough, and several arterial roads bound the Borough. These roads receive heavy commuter traffic which is constantly being increased due to the opening of the Ferry Avenue station of the Rapid Transit System which is located adjacent to the Borough proper. *(See Exhibit Nos. 2 and 3).*

Woodlynne is one of the three (3) smallest municipalities in Camden County occupying an area of two-tenths (0.2) of a square mile. The Borough's Central Business District (C.B.D.) is located along Woodlynne Avenue, approximately in the center of the community. There are no industrial areas as such within the Borough. *(See Exhibit No. 2).*

The study area is comprised of generally flat terrain which has no adverse effect on the movement of traffic. Many streets, however, are narrow, and where parking is permitted, some restriction of traffic movement does exist.

STUDY ROADWAY SYSTEM

The roadways and intersections included in the initial study system were developed through field inspections by the Consultant and meetings with Municipal, County and State Officials.

The study system was composed of existing Federal-Aid Urban, Federal-Aid Primary and Secondary routes and major connector and collector streets within the two (2) Boroughs. *(See Exhibit No. 3).*

Through the initial investigation of traffic volumes and accident data, the study system was reduced to that shown also on *Exhibit No. 3* and consists of the Federal-Aid Urban System, Federal-Aid Primary, Type I, Federal-Aid Secondary and Federal-Aid Primary, Type II roads. The Federal-Aid Primary Type II system is composed of major connector and collector streets located within the two (2) Municipalities. Road mileage for each system is included on *Exhibit No. 3.*

THE ANALYTICAL APPROACH

A sequence was developed by which those locations exhibiting poor traffic operation characteristics were identified, corrective measures formulated, relative importance of each location compared and an improvement schedule developed. The roadways were analyzed in terms of their accident history, or safety, their ability to handle traffic volume, or capacity, and their ability to move traffic, or travel quality.

The first step in the study was the collection of data. The following is the data which was collected relative to the roadways within the study network:

1. Traffic data from Municipal, County and State Officials including ordinances relating to traffic, accident records and traffic volumes.

2. Traffic operation data from extensive ground surveys including rights of way, signs, pavement markings, inventories of intersections, public transportation and traffic signals.

3. Peak and off-peak traffic volumes and intersection turning movements.

4. Classification of traffic as to passenger cars, buses, trucks and tractor-trailers.

5. Spot speed checks and time delay studies for peak and off-peak hours.

OPERATIONAL REVIEW

During the operational review, data was gathered at various locations. This review included the analysis of the data collected for the purpose of identifying operational problems and developing workable solutions.

PROJECT PRIORITY

Following the development of solutions to problem areas, a tentative priority was developed for each project based on the accident history, volume-capacity ratio and quality of flow established from the time delay studies. Project priorities developed were reviewed with Municipal and County Officials and the final list of priorities, as presented in this report, reflects the results of those meetings.

LAND USE MAP

EXHIBIT NO 2

CITY OF
CAMDEN

FERRY AVENUE (CO. RTE. 603)

MT. EPHRAIM AVENUE (CO. RTE. 605)

WOODLYNNE AVENUE

CLAY AVENUE

BLVD.

WOODLYNNE

CRESCENT

HARRISON AVE.

(U.S. RTE. 130)

(U.S. RTE. 30)

PIKE

AVENUE

MAGILL

COLLINGS

AVENUE

HORSE

AVENUE

CHAMPION

NEWTON AVENUE

WHITE

PARK AVENUE (CO. RTE. 612)

ROAD (CO. RTE.

BROWNING

HADDON AVENUE (CO. RTE. 561)

PARK AVENUE

ZANE AVENUE

COLLINGSWOOD

(CO. RTE. 630)

COLFORD AVENUE

PARK DRIVE (CO. RTE. 732)

SOUTH PARK DRIVE (CO. RTE. 629)

HIGHLAND AVENUE

VINEYARD BLVD.

HARVARD AVENUE

WOODLAWN AVENUE

LINCOLN AVENUE

KING AVENUE

TERRACE

HADDON AVENUE

SOUTH ATLANTIC AVENUE

BETTLEWOOD AVENUE

PARK AVENUE

STILES AVENUE

ORIENTAL AVENUE

(CO. RTE. 641)

(CO. RTE. 561)

MERRICK LEES AVENUE

AVENUE LANE

LEES

CUTH BERT ROAD

(CO. RTE. 636)

BOROUGH OF
OAKLYN

TOWNSHIP OF
HADDON

- Business & Professional
- Residential
- Governmental , Educational & Civic
- Parks & Recreation
- Industrial
- Lakes & Streams
- Undeveloped Land

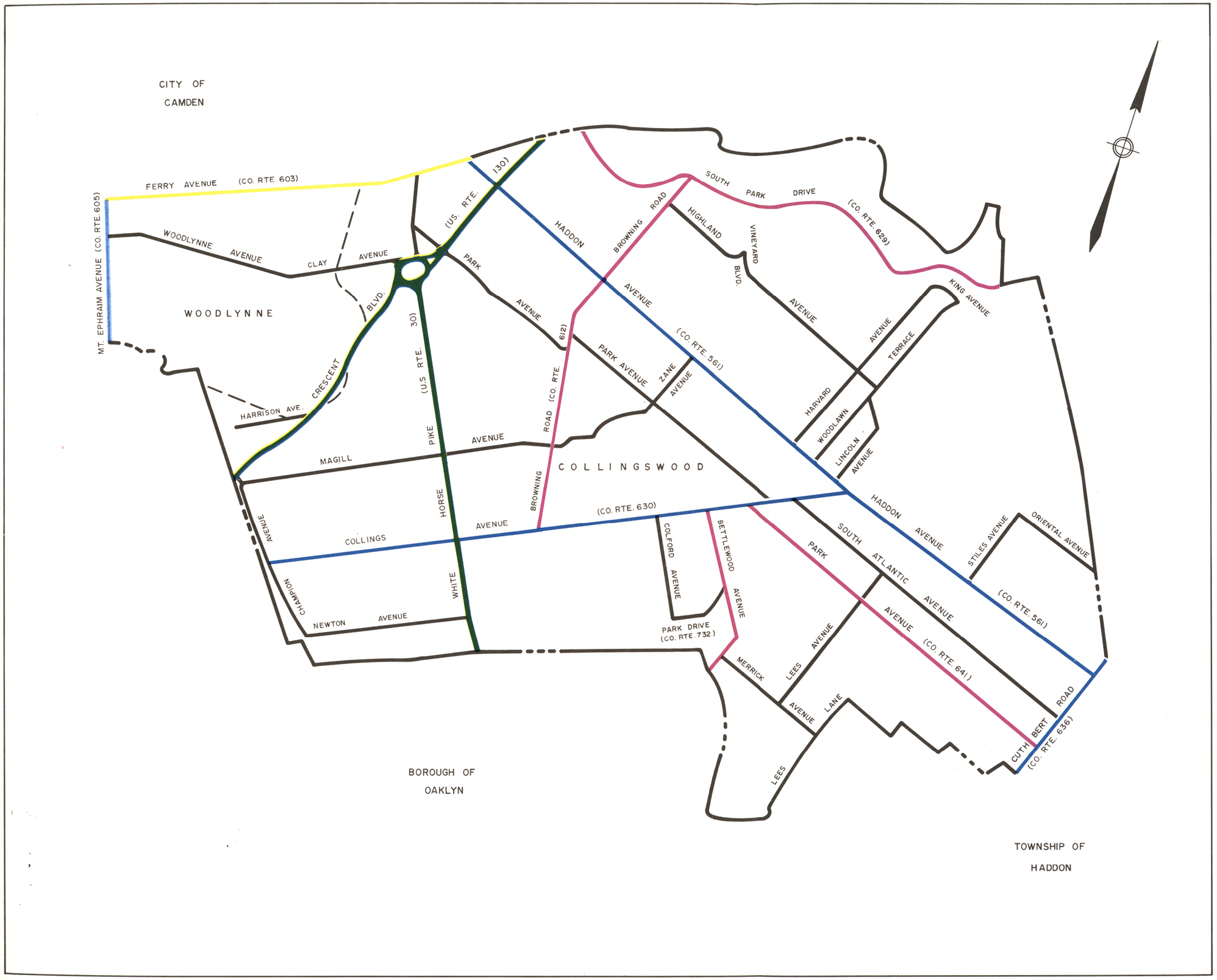
LAND USE MAP

EXHIBIT NO. 2

Kammerer, Symes & Assoc.
Consulting Engineers

INITIAL STUDY SYSTEM &
RECOMMENDED FEDERAL AID SYSTEM MAP

EXHIBIT NO. 3



INITIAL STUDY SYSTEM &
RECOMMENDED FEDERAL AID SYSTEM MAP

EXHIBIT NO. 3

Kammerer, Symes & Assoc.
Consulting Engineers

Upon completion of the preparation of preliminary design and cost estimates, a schedule for the implementation of the projects on the priority list was developed.

CHAPTER 4

DATA COLLECTION

Data for the TOPICS study was collected during the period March 1971 through September 1972 by the Consultant and included the following:

a. Traffic Volumes - traffic volumes and turning movements were determined at specific locations for various durations.

b. Roadway Inventory - right of way and roadway widths, type and condition of pavement, location of curbs, shoulders, sidewalks, poles and trees, etc.

c. Traffic Control Devices - location of and condition of traffic control devices such as traffic signals, signs and pavement markings.

d. Accident History - records of all reported accidents were reviewed, but only locations where five (5) or more accidents occurred per year for the years 1968, 1969 and 1970, were studied extensively and included in this report.

e. Time and Delay - travel speeds on roads within the study area were graphically recorded, using electronic equipment, for peak and off-peak periods.

f. General Observations - during the study period, observations were made by both the Consultant and local officials of traffic operations, pedestrian problem areas, roadway lighting and the enforcement of existing traffic regulations.

At the outset of the project, meetings were held with Municipal and County Officials, members of the Police Departments and the Consultant to introduce personnel, to develop lines of communication and to explain the various procedures to be used.

At the completion of the field inventory phase of the work, the Consultant contacted Municipal and County Officials to review the data collected, familiarize them with the TOPICS Program and to obtain their views on problems within the study area.

CHAPTER 5

ACCIDENT RECORDS

Accident records for locations reporting five (5) or more accidents per year for any one year from 1968 through 1970, enabled comparisons to be made for several different factors. An analysis was made of the data collected for the purpose of developing accident patterns which might be based on day or night, weather conditions, roadway conditions, traffic control and traffic density.

CAUSES - BOROUGH OF COLLINGSWOOD

In the Borough of Collingswood all eleven (11) of the locations which can be classed as accident breeding had accident experience of five (5) or more accidents per year. Of these, four (4) repeated in each of the three (3) reporting years, three (3) repeated twice, and four (4) only once each.

From the accident data collected, seven (7) types of accidents were noted. In order of their frequency of occurrence, they were:

1. Left Turn
2. Right Angle
3. Same Direction
4. Fixed Object
5. Pedestrian
6. Head On
7. Overturned

Table No. 4 lists all accidents that were identifiable by type. Most significant were those classified as left turn. These accounted for thirty-one point four (31.4) percent of all accidents. Failure of the driver to exercise safe driving habits, misjudging speed of traffic and failure to obey traffic control devices were contributing factors to this condition. Our findings indicate that sixty-one (61) percent of all accidents occurred during the daylight hours. This report will include recommendations to attempt to materially reduce the number of accidents.

CAUSES - BOROUGH OF WOODLYNNE

In the Borough of Woodlynne, one (1) of the two (2) intersections which can be classed as accident breeding had accident experience of five (5) or more accidents per year. This particular intersection repeated in each of the three (3) reporting years.

From the accident data collected four (4) types of accidents were noted. In order of their frequency of occurrence, they were:

1. Left Turn
2. Same Direction
3. Right Angle
4. Fixed Object

TABLE NO. 4

SUMMARY OF ACCIDENT TYPES
PERIOD JAN 1968 - DEC. 1970
LOCATIONS WITH 5 OR MORE ACCIDENTS PER YEAR

BOROUGH OF COLLINGSWOOD

TYPE	TOT NO	NIGHT	DAY	ROAD CONDITION			INJURIES	FATALITIES	% TOTAL ACCIDENTS
				WET	DRY	ICE			
RIGHT ANGLE (R A)	92	30	62	18	72	2	38	0	28 0
LEFT TURN (L T)	103	37	66	13	89	1	24	0	31 4
SAME DIRECTION (S D.)	89	36	53	18	69	2	26	0	27 1
FIXED OBJECT (F O)	27	17	10	8	19	0	9	0	8 2
PEDESTRIAN (PED)	8	5	3	1	7	0	8	0	2 4
HEAD ON (H O)	6	2	4	2	3	1	3	0	1.9
OVERTURNED	3	1	2	1	2	0	2	0	1 0
TOTAL	328	128	200	61	261	6	110	0	100 0

Table No. 5 lists all accidents that were identifiable by type. Most significant were those classified as left turn. These accounted for seventy-two point eight (72.8) percent of all accidents. Failure of the driver to exercise safe driving habits, misjudging speed of traffic and failure to obey traffic control devices were contributing factors to this condition. Our findings indicate that seventy-seven (77) percent of all accidents occurred during the daylight hours. This report will include recommendations to attempt to materially reduce the number of accidents.

SUMMARY

In order to make effective recommendations, it is necessary to detail the number of each accident type at the reporting locations. *Table No. 6 (Woodlynne) and Table No. 7 (Collingswood)* present a summary of this data. From the accident reports filed for these locations, collision diagrams were prepared and a detailed analysis based on the circumstances and conditions surrounding each accident was made. The number and severity of the occurrences at any given location became an integral part of the decision making process required to select the locations needing improvement. The nature of the individual accidents at a specific location became a decisive factor in the design of the appropriate improvement.

TABLE NO. 5

SUMMARY OF ACCIDENT TYPES
PERIOD JAN 1968 - DEC 1970
LOCATIONS WITH 5 OR MORE ACCIDENTS PER YEAR

BOROUGH OF WOODLYNNE

TYPE	TOT NO	NIGHT	DAY	ROAD CONDITION			INJURIES	FATALITIES	% TOTAL ACCIDENTS
				WET	DRY	ICE			
RIGHT ANGLE (R A)	2	0	2	1	1	0	0	0	9 1
LEFT TURN (L T)	16	4	12	7	9	0	3	0	72 8
SAME DIRECTION (S D)	3	0	3	1	2	0	0	0	13 6
FIXED OBJECT (F O)	1	1	0	1	0	0	0	0	4 5
HEAD ON (H O)	0	0	0	0	0	0	0	0	0.0
TOTAL	22	5	17	10	12	0	3	0	100.0

TABLE NO. 6

SUMMARY OF ACCIDENTS AT REPORTING LOCATIONS
BOROUGH OF WOODLYNNE

INTERSECTION	YEAR	TOTAL	RIGHT ANGLE	LEFT TURN	SAME DIRECT	FIXED OBJECT	HEAD ON
MT EPHRAIM AVE & WOODLYNNE AVE.	1968	5	1	3	1	0	0
	1969	8	1	4	2	1	0
	1970	9	0	9	0	0	0

TABLE NO. 7

SUMMARY OF ACCIDENTS AT REPORTING LOCATIONS

BOROUGH OF COLLINGSWOOD

INTERSECTION	YEAR	TOTAL	RIGHT ANGLE	LEFT TURN	SAME DIRECT	FIXED OBJECT	PEDEST.	HEAD ON
600 BLOCK OF COLLINGS AVENUE	1968	3	0	0	1	2	0	0
	1969	6	4	0	0	2	0	0
	1970	4	1	1	0	1	1	0
COLLINGSWOOD CIRCLE COMPLEX (CLAY AVENUE, OLD WHITE HORSE PIKE, ROUTE 30 & ROUTE 130)	1968	42 ★	8	19	9	5	0	0
	1969	30 ★	7	8	10	4	0	0
	1970	33 ★	3	16	7	5	1	0
PARK AVENUE & COLLINGS AVENUE	1968	2	1	1	0	0	0	0
	1969	9	6	0	1	1	0	1
	1970	6	6	0	0	0	0	0
ROUTE 30 & COLLINGS AVENUE	1968	14	1	7	4	1	1	0
	1969	19	7	8	3	0	1	0
	1970	18	4	11	1	1	1	0
ROUTE 30 & DWIGHT AVENUE	1968	3	1	0	2	0	0	0
	1969	5	0	0	4	0	0	1
	1970	2	1	0	1	0	0	0
ROUTE 30 & FERRY AVENUE	1968	6	5	0	0	0	1	0
	1969	4	4	0	0	0	0	0
	1970	1	0	1	0	0	0	0
ROUTE 30 & GRANT AVENUE	1968	6	4	0	2	0	0	0
	1969	5	5	0	0	0	0	0
	1970	2	1	0	1	0	0	0
ROUTE 130 & HADDON AVENUE	1968	16	1	7	7	0	0	1
	1969	15	3	5	2	3	2	0
	1970	10	0	6	3	1	0	0
ROUTE 130 & RICHEY AVENUE	1968	4	0	0	4	0	0	0
	1969	1	0	0	1	0	0	0
	1970	6	0	0	5	1	0	0
CUTHBERT ROAD & PARK AVENUE	1968	4	1	0	3	0	0	0
	1969	6	5	0	1	0	0	0
	1970	6	2	1	2	0	0	1
HADDON AVENUE & CUTHBERT ROAD	1968	12	1	4	6	0	0	1
	1969	15	6	5	4	0	0	0
	1970	13	4	3	5	0	0	1

CHAPTER 6

TRAFFIC VOLUMES

Data for projection of traffic volumes and the conversion of traffic counts to Average Annual Daily Traffic (A.A.D.T.) was furnished by the New Jersey Department of Transportation. This data was supplemented by traffic counts taken at specific locations for various durations.

TRAFFIC VOLUMES

The weekday traffic volumes encountered during the survey periods were higher than the A.A.D.T. volumes due in part to the monthly variations. *Chart No. 8* indicates traffic variations by months for Route 130 in the Borough of Collingswood and the Borough of Woodlynne. The A.A.D.T. volumes for Route 130 are seventy-seven (77) percent of the volume of traffic recorded on an average June day. This chart confirms the uniform traffic volumes experienced during the year in urbanized areas such as the Borough of Collingswood and the Borough of Woodlynne.

The daily traffic counts taken at specific locations indicate that traffic is generally uniform throughout the week. Sunday traffic volumes were the lowest with Friday traffic volumes the highest when compared to an average day.

The average daily traffic exhibits a morning peak between 7:30 a.m. and 8.30 a.m., declines slightly, then increases again between 12:30 p.m. and 1:30 p.m., declines once again and reaches an afternoon peak at 5:30 p.m. before tapering off in the evening hours.

1970 A.A.D.T. volumes on the study roadways are illustrated on *Exhibit No. 9*. Mount Ephraim Avenue, Haddon Avenue, Collings Avenue, Route 30 and Route 130 carry the heaviest volumes in the study area. The above mentioned roads and Cuthbert Road serve as the main arterial roads for the study area. They carry heavy commuter traffic and intersect with the collector and feeder streets from the residential areas.

The volumes on the roadway system will increase appreciably upon completion of Route 90 which will connect the new Delair Bridge to the regional highway network within the study area.

SYSTEM CAPACITY

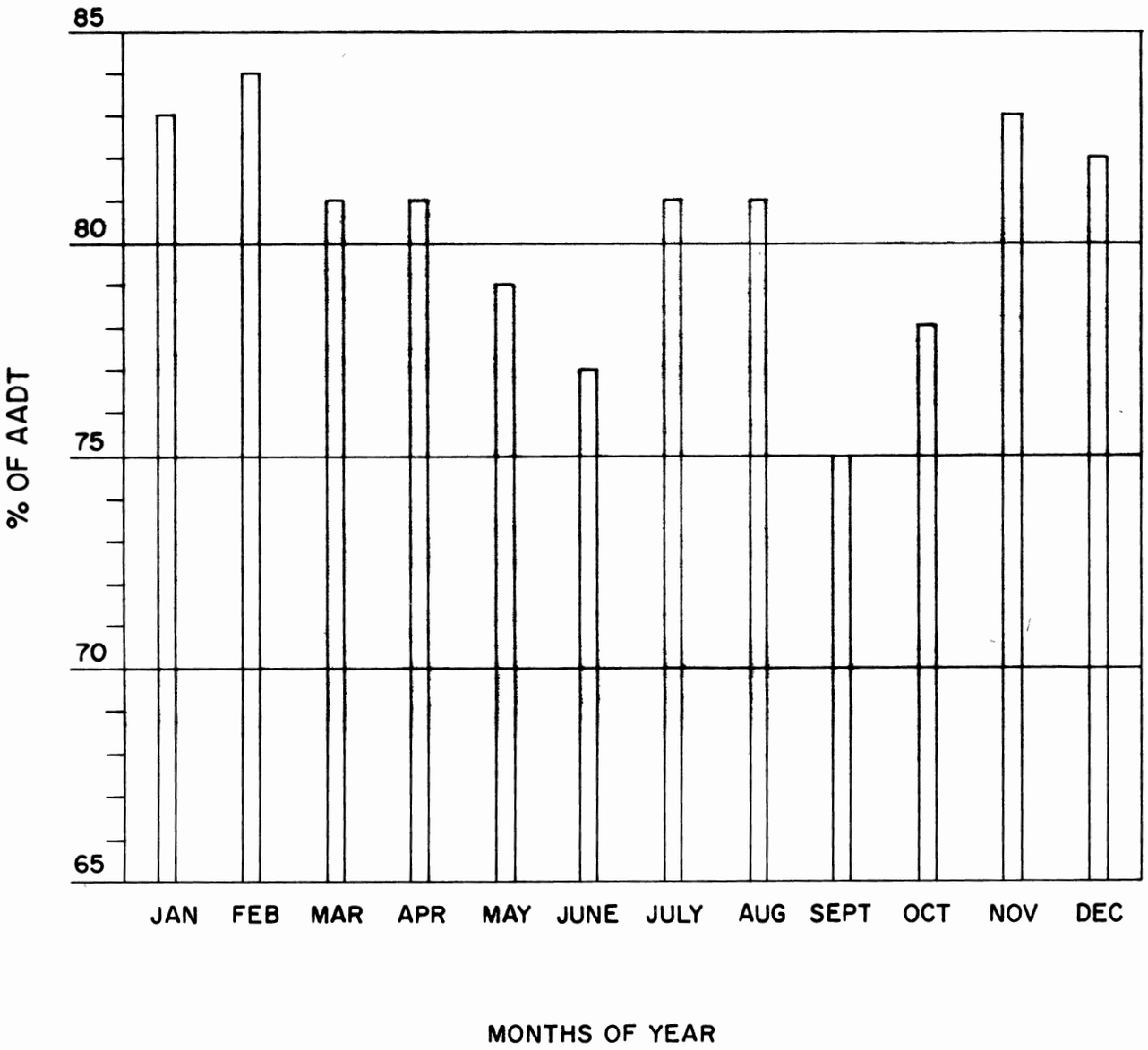
The relationship of traffic volume to roadway capacity is an accepted method of measuring the ability of a street to carry existing and projected traffic. The nature of the street system in this study area is such that intersection capacities are the controlling factors in determining the overall capacities of the roadways to handle traffic.

The capacity of the major intersection approaches was calculated and compared to the peak hour traffic volume. The peak hour traffic volume was used in computing levels of service.

The capacity (as defined in the 1965 Highway Capacity Manual) was computed for critical segments of the roadways in the study area for use in making a comparison with the demand hourly volumes. The resulting quotient, termed volume-capacity ratio (i.e., the V/C ratio), is a useful index for identifying locations deficient in capacity. As the value of the ratio approaches one (1), the intersection approach volume

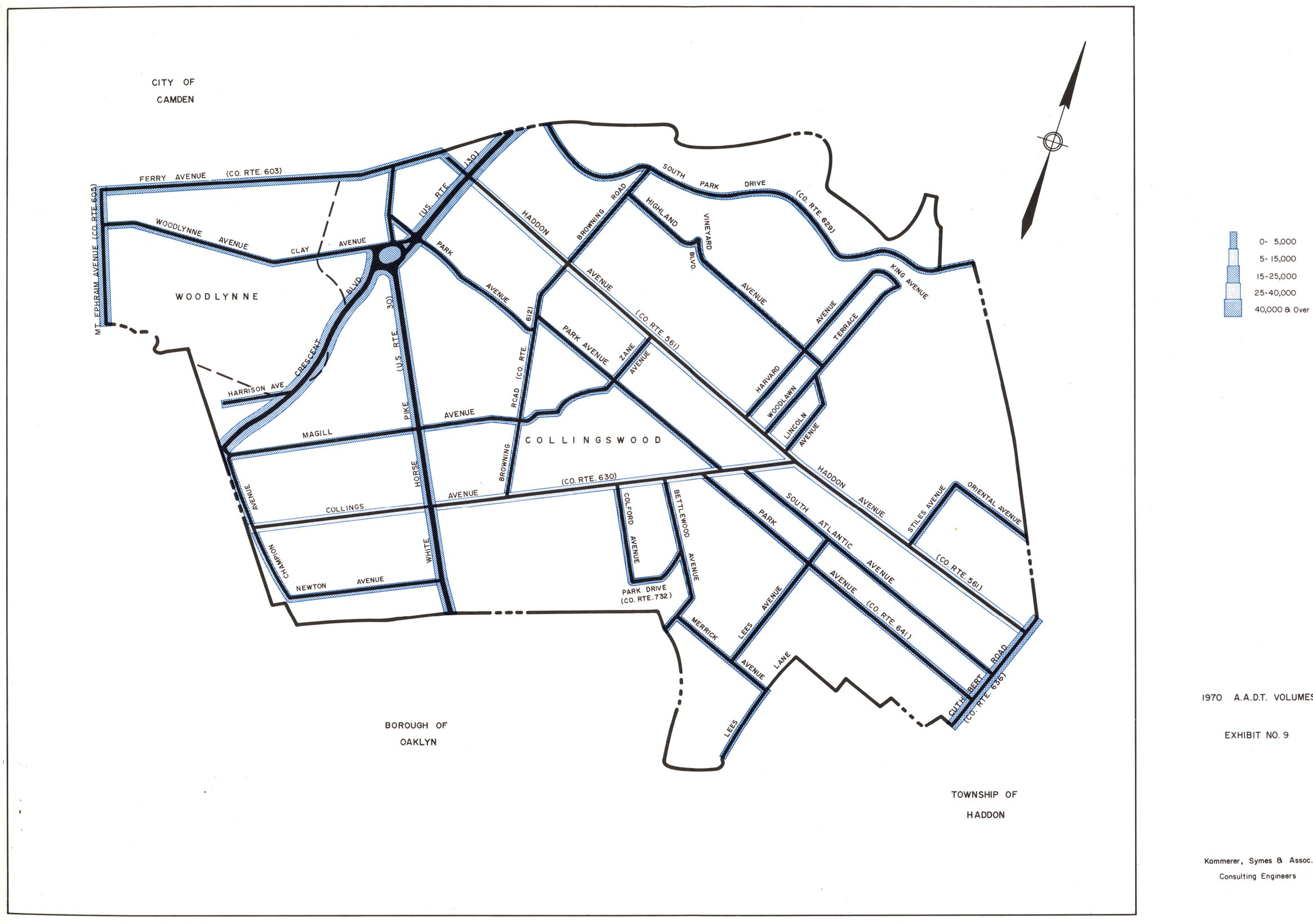
CHART NO. 8

MONTHLY TRAFFIC VARIATION OF A TYPICAL WEEKDAY ON ROUTE 130 AS % OF AADT



1970 A A D T VOLUMES

EXHIBIT NO 9



1970 A.A.D.T. VOLUMES

EXHIBIT NO. 9

Kammerer, Symes & Assoc.
Consulting Engineers

converges to the maximum number of vehicles possible under prevailing roadway and traffic conditions, regardless of delay or restricted maneuverability.

Inspection of the resulting V/C ratios indicated the following locations are deficient in capacity.

BOROUGH OF COLLINGSWOOD

a. Haddon Avenue and Cuthbert Road

b. 600 Block of Collings Avenue

c. Collingswood Circle Complex

d. Route 130

BOROUGH OF WOODLYNNE

a. Mount Ephraim Avenue and Ferry Avenue

b. Mount Ephraim Avenue and Woodlynne Avenue

CHAPTER 7

TRAFFIC INFLUENCES

This chapter discusses the traffic influences exerted by parking supply and usage, traffic control devices, roadway lighting, pedestrian movements and roadway geometry.

PARKING - BOROUGH OF COLLINGSWOOD

At present there is metered parking on some streets within the Borough. Parking is restricted on most of the roads making up the study system.

Business is conducted primarily along Haddon Avenue between Knight Avenue and Frazer Avenue. There are few off-street parking facilities at these locations. Traffic congestion is caused by shoppers parking on roads adjacent to business establishments thereby restricting the number of traffic lanes. Recommendations for parking restrictions are included in Chapter 13 of this report.

PARKING - BOROUGH OF WOODLYNNE

At present there is no metered parking within the Borough. Parking is restricted on most of the roads making up the study system.

Business is conducted along Woodlynne Avenue, approximately in the center of the community and there are no industrial areas as such within the Borough. There is little off street parking in the residential areas.

TRAFFIC CONTROL DEVICES - BOROUGH OF COLLINGSWOOD

Traffic signals are located and operating at the following intersections

LOCATION	TYPE	WARRANT SATISFIED	SIGNAL APPROVAL
a. Collings Avenue and Haddon Avenue	Semi-Actuated	2	*
b. Collings Avenue and Richey Avenue	Flashing	N.A.	*
c. Route 130 and Richey Avenue	Manually Operated	2	Approved
d. Haddon Avenue and Browning Road	Semi-Actuated	2	*
e. Haddon Avenue and Cuthbert Road	Fixed Time	1	*
f. Lees Avenue and Park Avenue	Fixed Time	2	*

LOCATION	TYPE	WARRANT SATISFIED	SIGNAL APPROVAL
g. Park Avenue and Cuthbert Road	Fixed Time	2	*
h. Route 30 and Collings Avenue	Semi-Actuated	2	Approved
i. Route 30 and Magill Avenue	Semi-Actuated	2	Approved

* Denotes signals where approvals could not be found.

Exhibit No. 10 shows the existing traffic signal locations in the Borough. All of these signals are warranted in accordance with the Manual on Uniform Traffic Control Devices For Streets and Highways. Additional signal installations accompanied by improvements to existing facilities will be discussed under "Detailed Recommendations".

Timing cycles vary from ninety (90) seconds to sixty (60) seconds for all of the signals within the Borough.

TRAFFIC CONTROL DEVICES - BOROUGH OF WOODLYNNE

Traffic signals are located and operating at the following intersections

LOCATION	TYPE	WARRANT SATISFIED	SIGNAL APPROVAL
a. Mount Ephraim Avenue and Fairview Avenue	Semi-Actuated	1	Approved
b. Mount Ephraim Avenue and Ferry Avenue	Semi-Actuated	2	*

* Denotes signals where approvals could not be found.

Exhibit No. 10 shows the existing traffic signal locations in the Borough. These signals are warranted in accordance with the Manual on Uniform Traffic Control Devices for Streets and Highways. Additional signal installations accompanied by improvements to existing facilities will be discussed under "Detailed Recommendations".

PEDESTRIAN MOVEMENTS - BOROUGH OF COLLINGSWOOD

Pedestrian traffic is heaviest at Collings Avenue and Park Avenue especially at the beginning and ending of school hours. Crossing guards control the pedestrian traffic at intersections utilized by school children in the Borough. The crossing guards have little or no adverse effect on traffic.

Pedestrian traffic is not considered to be a major problem in the Borough of Collingswood.

PEDESTRIAN MOVEMENTS - BOROUGH OF WOODLYNNE

The only heavy pedestrian movements within the Borough occur at the beginning and ending of school hours. Crossing guards control the pedestrian traffic at all major intersections utilized by school children in the Borough. The crossing guards have little or no adverse effect on traffic.

Pedestrian traffic is not considered to be a major problem in the Borough.

ROADWAY LIGHTING

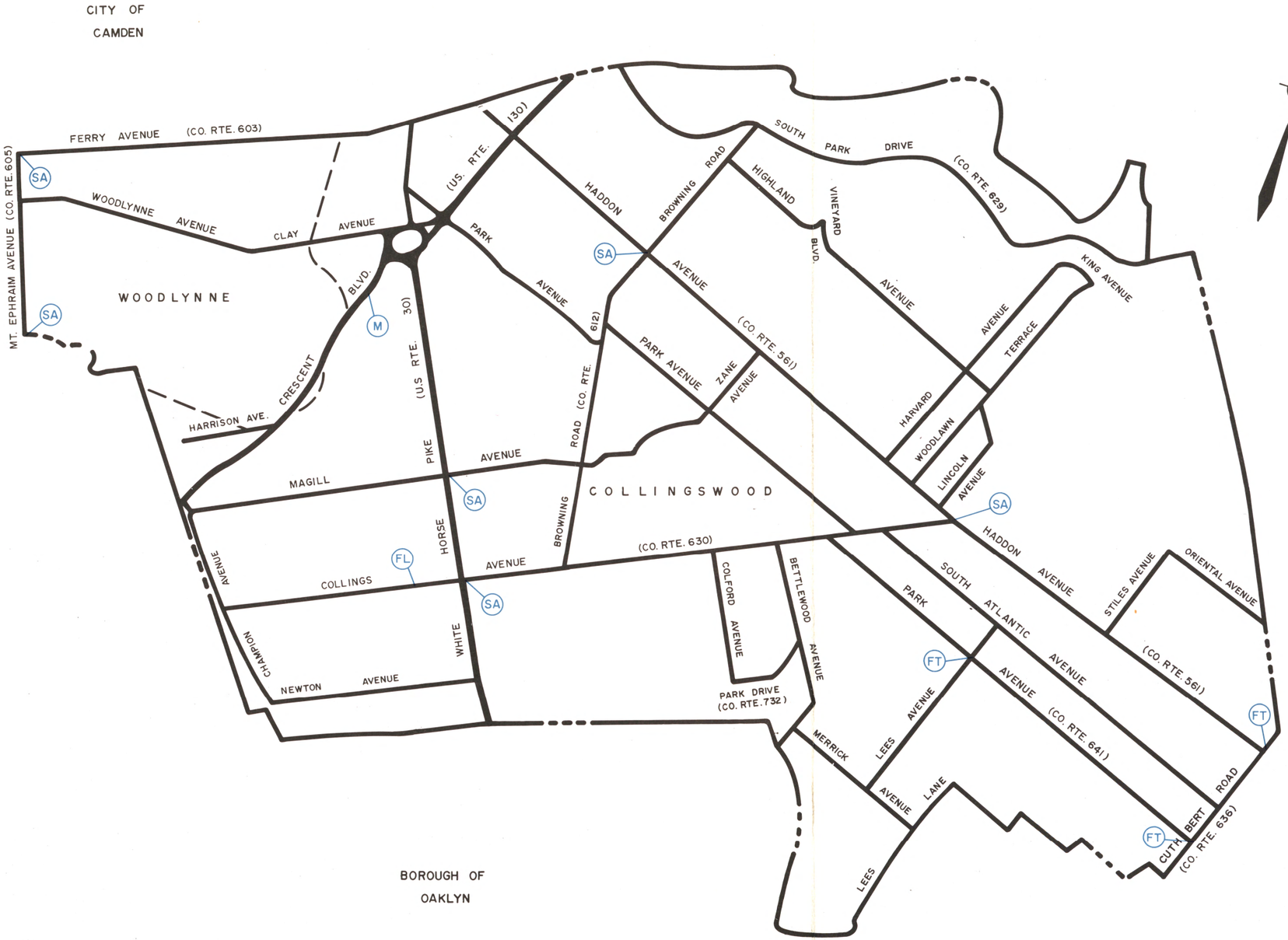
Most of the roadways in the Borough of Collingswood and the Borough of Woodlynne appear to be only fairly lighted. Only a very small percentage of residential streets have modernized lighting systems. Lighting on the County Roads is, in general, confined to the intersections. Even though some of the County roads may be reconstructed in the near future, there is a present need for additional lighting on these roadways.

ROADWAY GEOMETRY

Geometry on most of the roadways in the Borough of Collingswood and in the Borough of Woodlynne is good to fair. Some of the collector streets have cartways varying from thirty (30) feet to forty (40) feet. These roads are suitable for two (2) lane but not four (4) lane operation, especially with parking on one or, in some cases, both sides of the roadway. In many cases where separate turning lanes have been provided, their effectiveness has been reduced due to inadequate width and length.

LOCATIONS OF EXISTING
TRAFFIC SIGNALS

EXHIBIT NO 10



SA Semi - Actuated

FT Fixed Time

FL Flashing

M Flashing - Manually Operated During School Hours

LOCATIONS OF EXISTING TRAFFIC SIGNALS

EXHIBIT NO. 10

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Consulting Engineers

CHAPTER 8

BUS AND TRUCK OPERATIONS

BUS SERVICE

BOROUGH OF COLLINGSWOOD

Transport of New Jersey operates fifteen (15) routes serving the Borough of Collingswood. The routes connect Collingswood with Philadelphia in addition to many southern New Jersey communities. Transportation service is provided by all the routes during week-days between 5:00 a.m. and midnight. Service is augmented during the peak travel hours by operating at five (5) minute intervals. All routes have Saturday service and Sunday service is offered by most of them. Buses operate at sixty (60) minute intervals on Saturdays and Sundays.

BOROUGH OF WOODLYNNE

Transport of New Jersey operates one (1) route serving the Borough of Woodlynne. This route connects Woodlynne with Philadelphia in addition to many southern New Jersey communities. Service is provided daily at half hour intervals only during the peak hours of commuter travel, i.e., 6:00 a.m. to 9:30 a.m. and 2 30 p.m. to 6.00 p.m. Saturday and Sunday are on an abbreviated schedule. The route is easily accessible to all residents of Woodlynne.

TRUCK OPERATIONS

There are no major truck operations or terminals other than local deliveries in either the Borough of Collingswood or the Borough of Woodlynne.

INFLUENCE ON TRAFFIC

BOROUGH OF COLLINGSWOOD

Truck operations have no adverse effect on the flow of traffic. However, bus operations cause significant problems, especially along Route 30, Haddon Avenue and at the Collingswood Circle. This is due to the high traffic volumes, poor stop locations and inadequate road shoulders for buses to move out of the through lane.

BOROUGH OF WOODLYNNE

The current traffic volumes and patterns of trucks and buses have no adverse effect on the flow of traffic within the Borough of Woodlynne.

CHAPTER 9

TRAFFIC REGULATION AND ENFORCEMENT

This chapter is concerned with Municipal ordinances and State laws, the enforcement thereof and the effects on traffic.

ORDINANCES

Title 39 of the Revised Statutes of the State of New Jersey "Motor Vehicles and Traffic Regulations" governs the regulating powers of local municipalities with respect to local roadways. In accordance with R.S. 39.4-197, the municipality has the power to adopt ordinances concerning traffic and parking as follows:

a. Speed Limits.

b. One-way streets.

c. Placement of stop and yield signs.

d. Areas of restricted parking.

e. Restricting heavy commercial vehicles on certain streets.

f. Establishing bus and taxi stops.

g. Establishing curb loading zones.

h. Traffic signals.

All ordinances pertaining to the above must be approved by the Commissioner of the New Jersey Department of Transportation.

CODIFICATION AND APPROVAL

BOROUGH OF COLLINGSWOOD

Traffic laws and ordinances for the Borough of Collingswood have not been codified. Twenty-one (21) have been proposed of which sixteen (16) have been approved. The categories cover traffic regulation and parking.

BOROUGH OF WOODLYNNE

Sections 16, 27, 52, 56, 61, 66, 67 and 69 of the Code of the Borough of Woodlynne concern traffic control and parking. There are eleven (11) ordinances involved of which only two (2) have been approved.

GENERAL

It is the recommendation of the Consultant that where all necessary ordinances have not been proposed and approved, expeditious action be taken to accomplish this goal. Also, it is the Consultant's recommendation that all ordinances concerning traffic regulation, control and enforcement be codified into one (1) section.

ENFORCEMENT

The enforcement of parking and signal regulations appears to be generally satisfactory in both the Borough of Collingswood and the Borough of Woodlynne. There does, however, seem to the Consultant a need for increased stringency in enforcing the parking regulations on certain streets, particularly narrow streets. Means should be provided to restrict, and enforce the restriction of double parking on major streets and near professional offices and in the Central Business Districts in both Boroughs.

ACCIDENT RECORDS

BOROUGH OF COLLINGSWOOD

Accident records indicate that thirty-one point four (31.4) percent of the occurrences were left turn accidents and twenty-eight (28) percent were right angle accidents. There seems to be clear indication from these records and field observations that the major causes are failure to obey traffic control devices, misjudging speed of traffic and failure to exercise safe driving habits. Improvement in enforcing these regulations and in restricting the indiscriminate use of STOP signs, YIELD signs and speed limits on roads not included in the study system is definitely warranted.

BOROUGH OF WOODLYNNE

Accident records indicate that seventy-two point eight (72.8) percent of the occurrences were left turn accidents and thirteen point six (13.6) percent were same direction accidents. The same comments made by the Consultant regarding causation in the case of Collingswood apply with equal force to Woodlynne.

GENERAL

Traffic would flow more freely on local streets if the enforcement of all Municipal and State parking regulations were improved. The Consultant believes that many serious accidents could be eliminated by a program of strictly enforcing existing traffic control devices.

New Jersey State Library

CHAPTER 10

GENERAL INFORMATION ON IMPROVEMENTS

IMPROVEMENTS

This report covers four (4) basic areas of recommended improvements for the Borough of Collingswood and the Borough of Woodlynne. They are.

a. Traffic control devices.

b. Physical roadway system.

c. Traffic flow.

d. Parking.

TRAFFIC CONTROL DEVICES

This area covers proposed traffic signals, reconstruction of existing signals, pavement markings, signing and channelization.

Some traffic signal installations have been in operation for many years, and should be reconstructed to conform to the Manual on Uniform Traffic Control Devices for Streets and Highways. Other signals need reconstruction to efficiently control the increased traffic demands.

Traffic signal installations reach maximum efficiency when they are set up to be responsive to traffic demands with provisions for fluctuations by means of semi and fully actuated controllers in order to optimize the distribution of green time. Existing and proposed signals can be timed to provide progressive movement of traffic for various volumes which are encountered during the day.

Through the use of pavement markings and/or signs, more efficient use of existing traffic lanes can be achieved. Recommendations include revision of non-standard devices and the placement of traffic control devices on the study network with the objective that increased safety, capacity and desirable quality of flow will be achieved.

PHYSICAL ROADWAY SYSTEM

Recommendations will be made covering renovations to the geometry of the roadway system within the study area to provide additional capacity and smoother traffic flow. Areas of consideration include widening of roadways, restricted turning lanes, channelization and improved riding quality. In areas where geometric improvements have been considered, specific recommendations have been made in an effort to stay within existing rights of way. The area of additional right of way which may be required to construct proposed improvements has been kept to a minimum.

TRAFFIC FLOW

The major roadways in the study area are operating at capacity during peak hours. All indications of growth in Camden County denote a continued increase in the volumes of traffic. With the existing restrictions on right of way, it will be necessary to reduce the rate of growth of traffic by encouraging traffic to use alternate routes, car pools, or mass transportation.

PARKING - BOROUGH OF COLLINGSWOOD

There are no major parking problems as such within the Borough except for the Central Business District. The parking problems in this area are caused by illegal parking, even though this area is posted for restricted parking.

PARKING - BOROUGH OF WOODLYNNE

Narrow streets, high density housing, new and old buildings with inadequate off street parking provide the ingredients for many parking problems within the Borough.

As old buildings are replaced with new ones, it is imperative that adequate off street parking be provided on the site to service the tenants and patrons of the new facilities. Recommendations are made in this report restricting parking in certain streets within the Borough.

CHAPTER 11

AREA WIDE CONSIDERATIONS

LAND USE

Traffic flow on the road network studied in this report is heavily influenced by the land use patterns of not only Collingswood Borough and Woodlynne Borough but also the surrounding communities. In this study, consideration has been given to the changing land use patterns of the entire area.

GROWTH FACTORS

Development of realistic growth factors for use in projecting 1971 traffic volumes to the volumes expected in 1976 and 1981 took into consideration the land use, area, population growth and data on growth of traffic volumes on surrounding roadways.

IMPROVED CRITERIA

Improvements recommended in this report are based on the TOPICS concept of improving the safety, capacity and quality of traffic flow on a selected street system.

A detailed analysis has been made of locations on the study system that are deficient in capacity, have a poor quality of travel, and a high accident incidence to determine those traffic engineering improvements which would be best suited to solving specific problems.

PROJECT PRIORITIES

In the interest of comparing the needs of each location found deficient in the TOPICS Study with that of the other locations, a priority has been developed for each project. The method used considered accident experiences, the volume to capacity ratios and the travel time delays. Through the use of these parameters a tentative priority number was assigned to each deficient area to develop a tentative project list. The priority listing was then reviewed with local and County officials. The final project priorities were established following the review with these officials.

PROBLEM AREAS - BOROUGH OF COLLINGSWOOD

The following problem areas were established in the order of their priority.

Project No. CO-1 Haddon Avenue and Cuthbert Road

Project No. CO-2 Park Avenue and Collings Avenue

Project No. CO-3 600 Block of Collings Avenue

Project No. CO-4 Cuthbert Road and Park Avenue

PROBLEM AREAS - BOROUGH OF WOODLYNNE

The following problem areas were established in the order of their priority:

*Project No. WO-1 Mount Ephraim Avenue and Woodlynne Avenue

Project No. WO-2 U.S. Route 130 and Dwight Avenue

*This Project was designed in conjunction with the intersection of Mount Ephraim Avenue and Ferry Avenue which was included in the TOPICS Report submitted for the City of Camden by Urban Engineers.

PROBLEM AREAS - GENERAL

Project No. G-1 Typical Left Turn Lane Pavement Markings

Project No. G-2 General Speed Limits

CHAPTER 12

INTERSECTIONS INVOLVING STATE HIGHWAYS - GROUP THREE

The following is a summary on the status of intersections involving State Highways in the Borough of Collingswood and the Borough of Woodlynne, which were studied under the Camden County TOPICS Program. The Borough of Collingswood has seven (7) such locations while the Borough of Woodlynne has one (1). The New Jersey Department of Transportation employs a continuing program of study, evaluation and improvement of the State Highway System in its entirety. A meeting was held with State Officials in March of 1972, regarding the problems encountered on State Highways and intersections involving State Highways. Outlined below are the results of that meeting.

BOROUGH OF COLLINGSWOOD

1. PROBLEM LOCATIONS WHICH WERE PREVIOUSLY STUDIED AND CORRECTED BY THE NEW JERSEY DEPARTMENT OF TRANSPORTATION

   a. U.S. Route 30 and Collings Avenue

2. PROBLEM LOCATIONS WHICH ARE CURRENTLY UNDER STUDY BY THE NEW JERSEY DEPARTMENT OF TRANSPORTATION

   a. U.S. Route 130 and Haddon Avenue

   * b. Collingswood Circle Complex

3. LOCATIONS WHICH WERE STUDIED BUT ARE NOT CONSIDERED AS PROBLEM AREAS

   a. U.S. Route 30 and Grant Avenue

   b. U.S. Route 30 and Dwight Avenue

   c. U.S. Route 130 and Richey Avenue

4. PROBLEM LOCATIONS WHICH WERE STUDIED BY URBAN ENGINEERS UNDER THE CAMDEN CITY TOPICS PROGRAM

   a. U.S. Route 30 and Ferry Avenue

* Denotes project which is included in the 1972 New Jersey Department of Transportation Master Plan.

BOROUGH OF WOODLYNNE

1. PROBLEM LOCATIONS FOR WHICH RECOMMENDED SOLUTIONS ARE STATED IN NARRATIVE FORM IN CHAPTER 13 OF THIS REPORT

   a. U.S. Route 130 and Dwight Avenue

CHAPTER 13

DETAILED RECOMMENDATIONS

The detailed recommendations presented in this Chapter are divided into two (2) main categories: (1) improvements requiring changes in geometry, and (2) those minor changes requiring only signing or pavement markings.

Eight (8) recommended projects for improvement are included in this report, four (4) in the Borough of Collingswood, two (2) in the Borough of Woodlynne and two (2) are general in nature. Several projects involve more than one (1) location within the Study Area. The major changes are presented graphically showing the existing and proposed geometry in addition to an aerial photograph of the location. Minor changes have been presented in narrative or graphic form, depending on the nature of the recommendation. *Exhibit No. 11* shows the locations of the recommended improvements.

The recommendations presented have taken into consideration the following:

a. Traffic flow problems.

b. Accidents.

c. Capacity requirements for existing and future traffic flow.

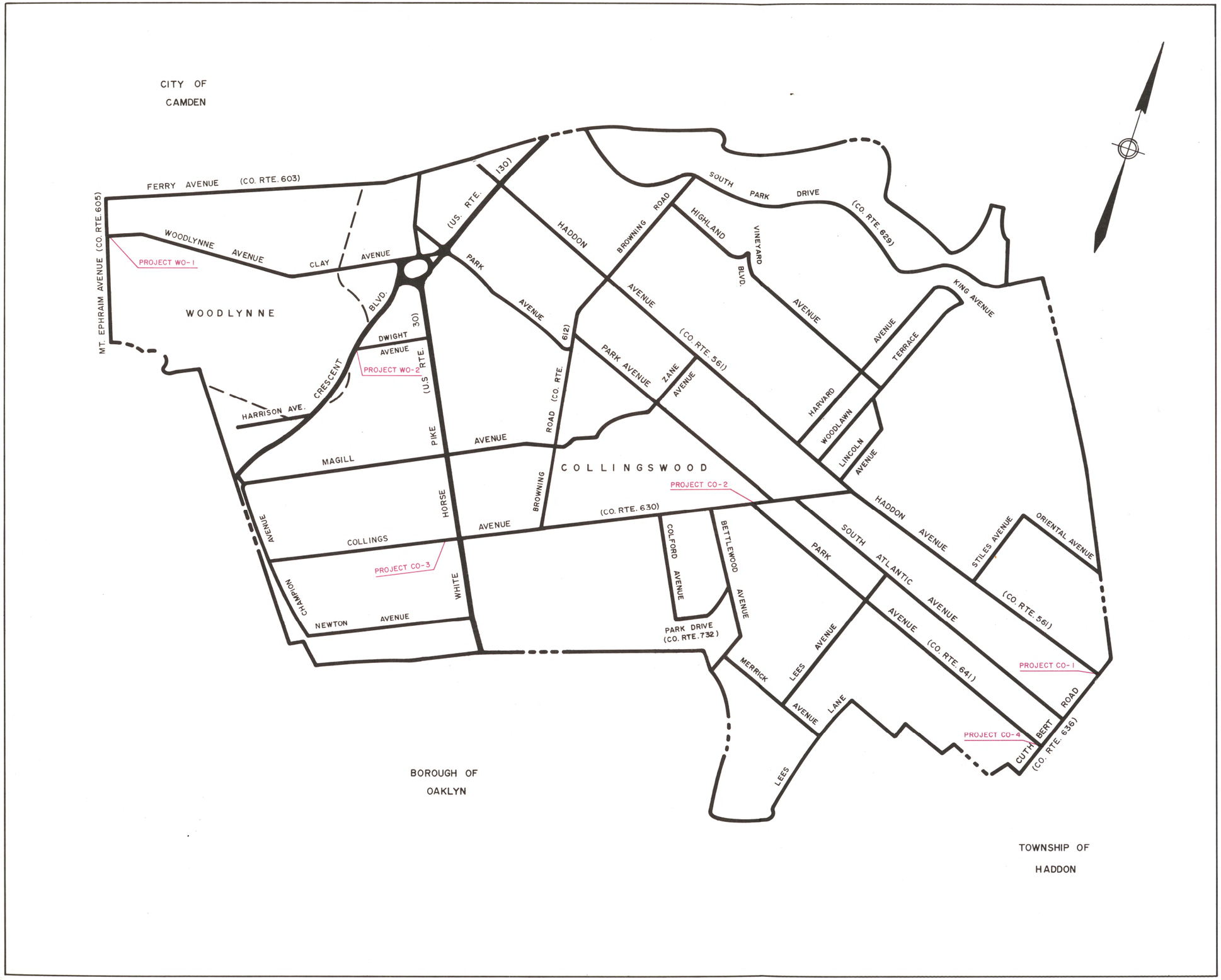
d. Existing topography and land use proposed for each location.

e. Existing and planned geometry of the roadways.

The recommended improvements which follow are listed in the order of priority previously established in conjunction with the Boroughs and the County.

LOCATIONS OF
RECOMMENDED IMPROVEMENTS

EXHIBIT NO 11



LOCATIONS OF
RECOMMENDED IMPROVEMENTS

EXHIBIT NO. 11

Kammerer, Symes & Assoc.
Consulting Engineers

PROJECT IMPROVEMENTS

BOROUGH OF COLLINGSWOOD

Kammerer, Symes & Associates, Inc.
CONSULTING ENGINEERS

PROJECT NO. CO-1 HADDON AVENUE AND CUTHBERT ROAD
BOROUGH OF COLLINGSWOOD

Project No. CO-1 covers the reconstruction of the intersection of Haddon Avenue and Cuthbert Road. *(Exhibit No. 12).*

a. PROBLEMS

(1) Present levels of service, for left turn movements are "F" on the north, east and west approaches, and "E" on the south approach. The 1972 peak left turn volumes for each approach compared to the 1972 average volumes are summarized below:

	1972 PEAK LEFT TURN VOLUME VEH./HR.	1972 AVERAGE LEFT TURN VOLUME VEH./HR.
Cuthbert Road North Approach	273	184
Cuthbert Road South Approach	92	65
Haddon Avenue East Approach	123	83
Haddon Avenue West Approach	141	115

(2) Present levels of service for through and right turn movements are "F" on the south and east approaches, "D" on the north approach and "C" on the west approach. The 1972 peak through and right turn volumes for each approach compared to the 1972 average volumes are summarized below:

	1972 PEAK THROUGH AND RIGHT TURN VOLUME VEH./HR.	1972 AVERAGE THROUGH AND RIGHT TURN VOLUME VEH./HR.
Cuthbert Road North Approach	739	487
Cuthbert Road South Approach	530	512
Haddon Avenue East Approach	641	593
Haddon Avenue West Approach	531	400

NOTE: This intersection is shared with Haddon Township.

(3) The approach roadways on Haddon Avenue and Cuthbert Road are not wide enough to safely accommodate turning movements. The percentage of turning movements is as follows.

	% LEFT TURNS	% RIGHT TURNS
Cuthbert Road North Approach	27	5
Cuthbert Road South Approach	15	20
Haddon Avenue East Approach	16	25
Haddon Avenue West Approach	21	13

(4) Near side bus stops restrict right turn movements on the east and west approaches at the intersection of Haddon Avenue and Cuthbert Road.

(5) Corner radii are not large enough to accommodate safe turning movements.

(6) Accident records indicate a total of forty (40) accidents during the three (3) year period from 1968 through 1970. Of this total, fifteen (15) were classified as same direction accidents, twelve (12) were classified as left turn accidents, eleven (11) were classified as right angle accidents and two (2) were classified as head on collisions.

(7) The Faith Christian High School is located on the northwest corner, children going to and from school must cross at this intersection.

b. RECOMMENDATIONS

(1) Reconstruct all four (4) approaches to provide two (2) lanes for through and right turn traffic in addition to a separate left turn lane with adequate stacking space.

(2) Increase all corner radii.

(3) Provide an advance green indication for the north approach of Cuthbert Road and a separate phase for both approaches of Haddon Avenue.

(4) Relocate the bus stops to the far side corners on Haddon Avenue.

(5) Provide pedestrian signal indications on all four (4) corners.

(6) Prohibit parking on all four (4) approaches.

PROJECT NO. CO-1 HADDON AVENUE AND CUTHBERT ROAD
BOROUGH OF COLLINGSWOOD

c. BENEFITS

(1) The capacity and levels of service of the intersection will be improved.

(2) Accident potential will be reduced.

(3) By relocating the bus stops, the friction between buses and other traffic will be reduced.

(4) A safer and smoother flow of traffic will be achieved.

(5) A safer crossing for pedestrians will be provided.

d. ESTIMATED COSTS

(1) Engineering	$ 22,900.00
(2) Construction	105,000.00
(3) Signs and Markings	1,600.00
(4) Traffic Signals	8,000.00
(5) Right of Way	112,000.00
Total Estimated Cost	$249,500.00

PROJECT NO. CO - 1

HADDON AVENUE AND CUTHBERT ROAD

EXHIBIT NO. 12

PROJECT NO. CO - 1

HADDON AVENUE AND CUTHBERT ROAD

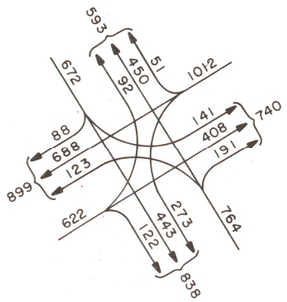
EXHIBIT NO. 12



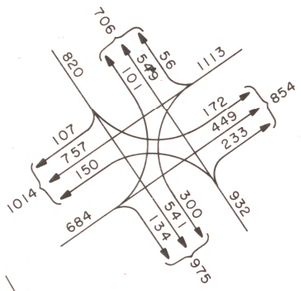
PROJECT NO. CO-1

HADDON AVENUE AND CUTHBERT ROAD

EXHIBIT NO. 12



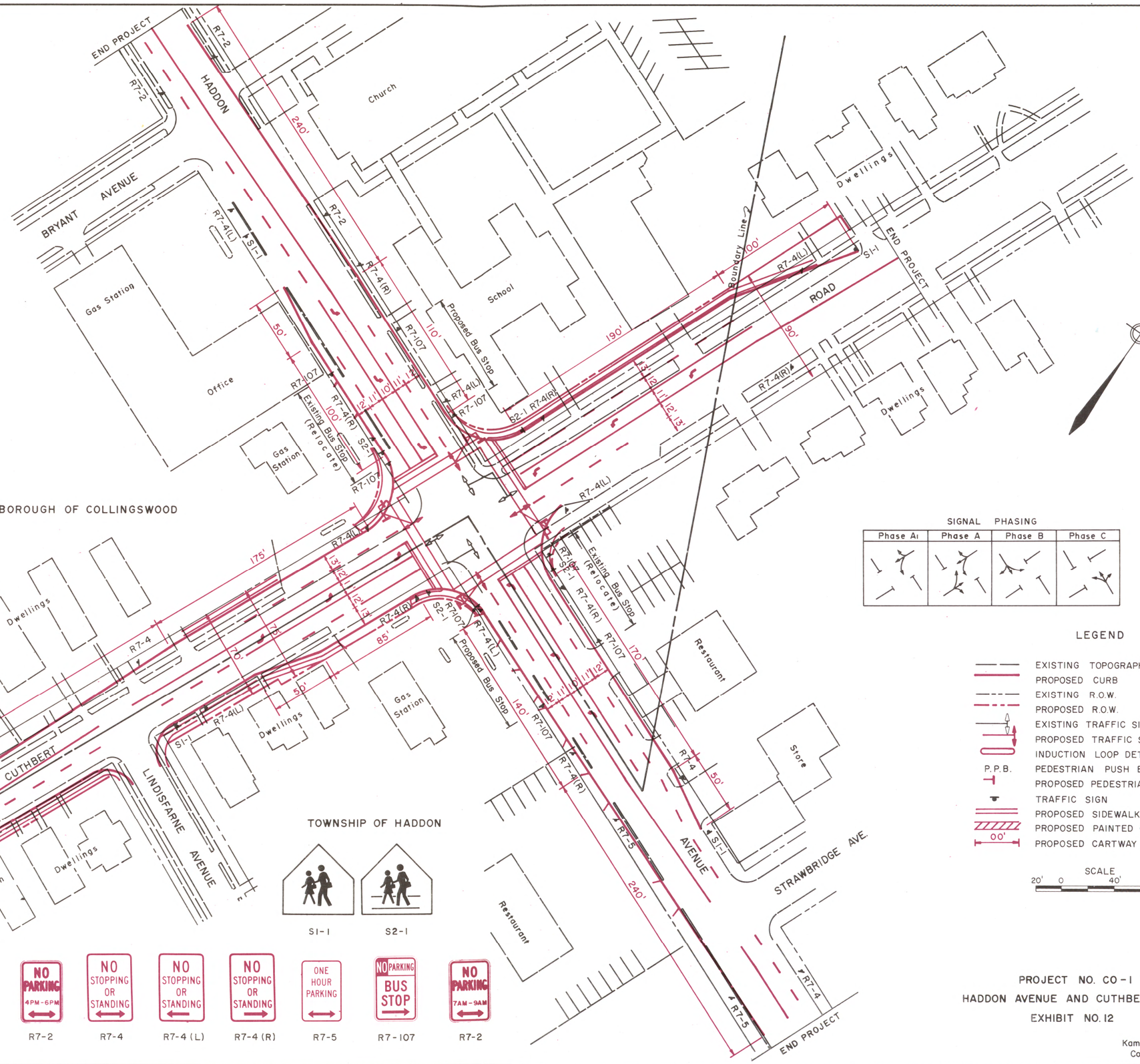
1972 Weekday Peak Hour
Traffic Volume



BOROUGH OF COLLINGSWOOD

TOWNSHIP OF HADDON

1982 D.H.V.



SIGNAL PHASING

Phase A1	Phase A	Phase B	Phase C

LEGEND

- EXISTING TOPOGRAPHY
- PROPOSED CURB
- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING TRAFFIC SIGNAL
- PROPOSED TRAFFIC SIGNAL
- INDUCTION LOOP DETECTOR
- P.P.B. PEDESTRIAN PUSH BUTTON
- PROPOSED PEDESTRIAN SIGNAL
- TRAFFIC SIGN
- PROPOSED SIDEWALK
- PROPOSED PAINTED CHANNELIZATION
- 00' PROPOSED CARTWAY OR R.O.W. WIDTH

SCALE
20' 0 40' 80'

S1-1 S2-1

R7-2	R7-4	R7-4 (L)	R7-4 (R)	R7-5	R7-107	R7-2
NO PARKING 4PM-6PM	NO STOPPING OR STANDING	NO STOPPING OR STANDING	NO STOPPING OR STANDING	ONE HOUR PARKING	NO PARKING BUS STOP	NO PARKING 7AM-9AM

PROJECT NO. CO-1
HADDON AVENUE AND CUTHBERT ROAD
EXHIBIT NO. 12

Kammerer, Symes & Assoc.
Consulting Engineers

PROJECT NO. CO-2 PARK AVENUE AND COLLINGS AVENUE
BOROUGH OF COLLINGSWOOD

Project No. CO-2 covers the reconstruction of the intersection of Park Avenue and Collings Avenue. *(Exhibit No. 13)*.

a. PROBLEMS

(1) The south approach of Park Avenue intersects Collings Avenue at a flat angle.

(2) The north approach of Park Avenue is offset causing confusion to drivers traveling in a northbound direction.

(3) The sight distance for traffic exiting from the south approach of Park Avenue onto Collings Avenue is restricted by trees located on the southwest corner.

(4) The south approach roadway is too narrow, and the corner radii are not large enough to accommodate safe turning movements. The percentage of turning movements on the south approach is as follows:

	% LEFT TURNS	% RIGHT TURNS
Park Avenue South Approach	41	12

(5) The southwest corner radius is not large enough to allow traffic, particularly buses and trucks to turn right without crossing into the opposing lane of traffic.

(6) Accident records indicate a total of seventeen (17) accidents during the three (3) year period from 1968 through 1970. Of this total, thirteen (13) were classified as right angle accidents, one (1) was classified as a left turn accident, one (1) was a same direction accident, one (1) was classified as a collision with a fixed object and one (1) was a head on collision.

b. RECOMMENDATIONS

(1) Reconstruct the intersection as shown on the plan.

(2) Remove the trees located within the right of way to improve the sight distance for the traffic exiting from the south approach.

(3) Install a STOP AHEAD sign on the south approach of Park Avenue.

(4) Prohibit parking on all four (4) approaches.

PROJECT NO. CO-2 PARK AVENUE AND COLLINGS AVENUE
BOROUGH OF COLLINGSWOOD

c. BENEFITS

(1) A safer and smoother flow of traffic will be achieved.

(2) Sight distance will be improved.

(3) Accident potential will be reduced.

d. ESTIMATED COSTS

(1) Engineering	$ 4,200.00
(2) Construction	20,000.00
(3) Signs and Markings	900.00
(4) Right of Way	900.00
Total Estimated Cost	$26,000.00

PROJECT NO. CO-2

PARK AVENUE AND COLLINGS AVENUE

EXHIBIT NO. 13

PROJECT NO. CO-2

PARK AVENUE AND COLLINGS AVENUE

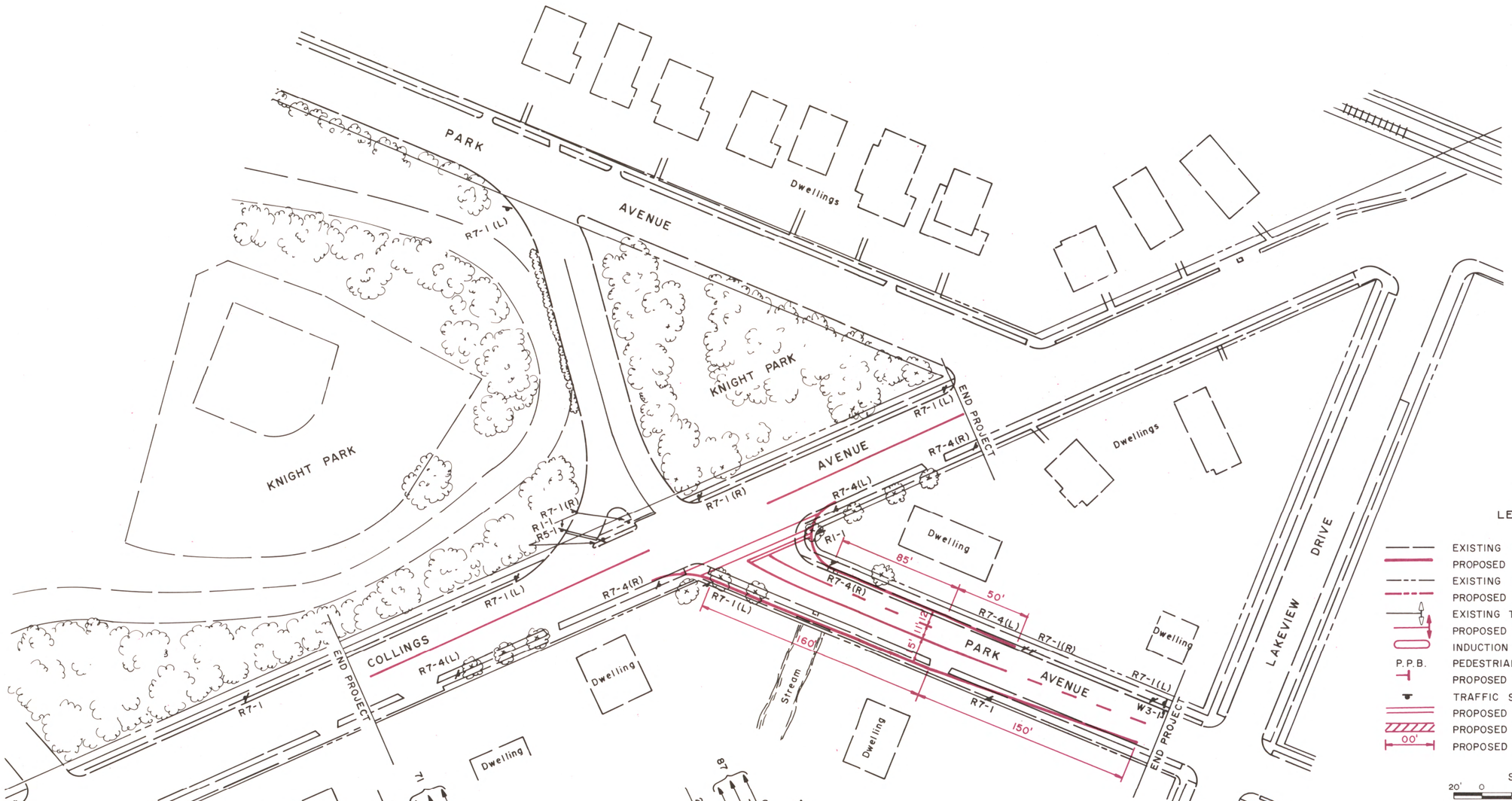
EXHIBIT NO. 13



PROJECT NO. CO-2

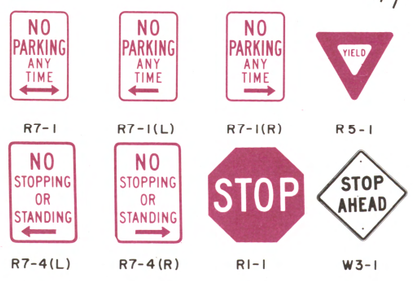
PARK AVENUE AND COLLINGS AVENUE

EXHIBIT NO. 13



1972 Weekday Peak Hour Traffic Volume

1982 D.H.V.



LEGEND

- EXISTING TOPOGRAPHY
- PROPOSED CURB
- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING TRAFFIC SIGNAL
- PROPOSED TRAFFIC SIGNAL
- INDUCTION LOOP DETECTOR
- P.P.B. PEDESTRIAN PUSH BUTTON
- PROPOSED PEDESTRIAN SIGNAL
- TRAFFIC SIGN
- PROPOSED SIDEWALK
- PROPOSED PAINTED CHANNELIZATION
- 00' PROPOSED CARTWAY OR R.O.W. WIDTH

SCALE
20' 0 40' 80'

PROJECT NO. CO-2
PARK AVENUE AND COLLINGS AVENUE
EXHIBIT NO. 13

Kammerer, Symes & Assoc.
Consulting Engineers

PROJECT NO. CO-3 600 BLOCK OF COLLINGS AVENUE
BOROUGH OF COLLINGSWOOD

Project No. CO-3 covers the improvements to the 600 Block of Collings Avenue.

a. PROBLEMS

(1) Present level of service during the peak hour is "C" on the 600 Block of Collings Avenue.

(2) Corner radii are not large enough, at the intersections of Collings Avenue and Richey Avenue, and Collings Avenue and Route 30 for safe turning movements.

(3) The roadway is not wide enough, thirty-three (33) feet, to permit parking on both sides of the block.

(4) Existing parking restrictions are not adequate to provide a safe and smooth flow of traffic on this roadway.

b. RECOMMENDATIONS

(1) Increase all corner radii, at the intersections of Collings Avenue and Richey Avenue and Collings Avenue and Route 30 to forty (40) feet.

(2) Prohibit parking from 7:00 a.m. to 9:00 a.m. and from 4:00 p.m. to 6:00 p.m. on both sides of the 600 Block of Collings Avenue from the south curb line of Route 30 for a minimum of two hundred (200) feet.

c. BENEFITS

(1) Safe turning movements will be provided.

(2) Safer and smoother flow of traffic will be achieved.

d. ESTIMATED COSTS

(1) Engineering	$1,400.00
(2) Construction	7,000.00
(3) Signs and Markings	600.00
Total Estimated Cost	$9,000.00

PROJECT NO. CO-4 CUTHBERT ROAD AND PARK AVENUE
BOROUGH OF COLLINGSWOOD

Project No. CO-4 covers the reconstruction of the intersection of Cuthbert Road and Park Avenue. *(Exhibit No. 14).*

a. PROBLEMS

(1) Present levels of service are "F" on the west approach, "D" on the north approach and "B" on the south and east approaches. The 1971 peak volumes for each approach compared to the 1971 average volumes are summarized below:

	1971 PEAK VOLUME VEH./HR.	1971 AVERAGE VOLUME VEH./HR.
Cuthbert Road North Approach	852	788
Cuthbert Road South Approach	641	605
Park Avenue East Approach	389	302
Park Avenue West Approach	451	291

(2) The approach roadways on Cuthbert Road and Park Avenue are too narrow to safely accommodate turning movements. The percentage of turning movements is as follows:

	% LEFT TURNS	% RIGHT TURNS
Cuthbert Road North Approach	7	2
Cuthbert Road South Approach	2	6
Park Avenue East Approach	30	23
Park Avenue West Approach	13	23

(3) Corner radii are not large enough to accommodate safe turning movements.

(4) Traffic traveling on Park Avenue encounters a severe dip as it crosses Cuthbert Road.

NOTE: This intersection is shared with Haddon Township.

(5) Accident records indicate a total of sixteen (16) accidents during the three (3) year period from 1968 through 1970. Of this total, eight (8) were classified as right angle accidents, six (6) were classified as same direction accidents, one (1) was classified as a left turn accident and one (1) was classified as a head on collision.

b. RECOMMENDATIONS

(1) Widen all approaches to the intersection.

(2) Provide a restricted left turn lane with adequate stacking space on the east and west approaches of Park Avenue.

(3) Cuthbert Road should be widened to fifty (50) feet throughout the Borough of Collingswood and the Township of Haddon.

(4) Prohibit parking on all four (4) approaches.

c. BENEFITS

(1) The capacity and levels of service of the intersection will be improved.

(2) Accident potential will be reduced.

(3) A safer and smoother flow of traffic will be achieved.

d. ESTIMATED COSTS

(1) Engineering	$ 18,300.00
(2) Construction	78,000.00
(3) Signs and Markings	1,500.00
(4) Traffic Signals	12,000.00
(5) Right of Way	18,200.00
Total Estimated Cost	$128,000.00

PROJECT NO. CO-4

CUTHBERT ROAD AND PARK AVENUE

EXHIBIT NO. 14

PROJECT NO. CO-4

CUTHBERT ROAD AND PARK AVENUE

EXHIBIT NO. 14



PROJECT NO. CO-4

CUTHBERT ROAD AND PARK AVENUE

EXHIBIT NO. 14

END PROJECT

R7-1

R3-7(L)

125'

50'

50'

AVENUE

3' 12' 15'

56'

105'

125'

R7-1 (R)

R3-7 (L)
RIO-3
P.P.B.

R7-1(L)

RIO-3
P.P.B.

BOROUGH OF COLLINGSWOOD

Dwellings

Dwellings

Store

SOUTH ATLANTIC

NORTH ATLANTIC

ROAD

Delaware River Port Authority

AVENUE

STOKES AVENUE

375'

165'

R7-1(R)

R7-1

CUTHBERT

END PROJECT

R7-1

R7-1(R)

65'

31' 12'

R7-1(R)

25'

12' 8'

R7-1

TO MATCH WITH PROJECT NO. CO-1

Boundary Line

R7-1(L)

50'

170'

R7-1(R)

P.P.B.
RIO-3

R7-1(L)

160'

R7-1

140'

R7-1(R)

P.P.B.
RIO-3
R3-7(L)

R7-4(L)

R7-4(R)

Dwellings

Dwellings

AVENUE

STOKES

15' 12' 15'

56'

130'

160'

R7-4(R)

R7-4(L)

50'

175'

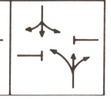
PARK

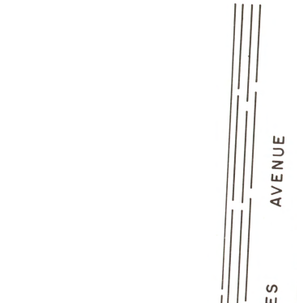
R3-7(L)

END PROJECT

TOWNSHIP OF HADDON

SIGNAL PHASING

Phase A	Phase B
	



1971 Weekday Peak Hour
Traffic Volume

1981 D.H.V.

NO PARKING ANY TIME

R7-1(R)

NO PARKING ANY TIME

R7-1

NO PARKING ANY TIME

R7-1(L)

NO STOPPING OR STANDING

R7-4(R)

NO STOPPING OR STANDING

R7-4(L)

PUSH BUTTON FOR GREEN LIGHT

R10-3

LEFT LANE MUST TURN LEFT

R3-7(L)

LEGEND

- EXISTING TOPOGRAPHY
- PROPOSED CURB
- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING TRAFFIC SIGNAL
- PROPOSED TRAFFIC SIGNAL
- INDUCTION LOOP DETECTOR
- P.P.B. PEDESTRIAN PUSH BUTTON
- PROPOSED PEDESTRIAN SIGNAL
- TRAFFIC SIGN
- PROPOSED SIDEWALK
- PROPOSED PAINTED CHANNELIZATION
- 00' PROPOSED CARTWAY OR R.O.W. WIDTH

SCALE
20' 0 40' 80'

PROJECT NO. CO-4
CUTHBERT ROAD AND PARK AVENUE
EXHIBIT NO. 14

Kammerer, Symes & Assoc.
Consulting Engineers

PROJECT IMPROVEMENTS

BOROUGH OF WOODLYNNE

Kammerer, Symes & Associates, Inc.
CONSULTING ENGINEERS

PROJECT NO. WO-1 MOUNT EPHRAIM AVENUE AND WOODLYNNE AVENUE
BOROUGH OF WOODLYNNE

Project No. WO-1 covers the reconstruction of the intersection and installation of a new traffic signal at Mount Ephraim Avenue and Woodlynne Avenue. *(Exhibit No. 15).*

a. PROBLEMS

(1) High traffic volumes on Mount Ephraim Avenue restrict and cause excessive delays to traffic exiting from Woodlynne Avenue.

(2) The Woodlynne Avenue approach is not wide enough to accommodate safe turning movements. The percentage of turning movements is as follows:

	% LEFT TURNS	% RIGHT TURNS
Woodlynne Avenue East Approach	81	19

(3) Near side bus stops on the north, south and east approaches of Mount Ephraim Avenue restrict the flow of traffic.

(4) The number of accidents has increased during the three (3) year period from 1968 through 1970. Accident records indicate a total of twenty-two (22) accidents during this period. In 1968, there was a total of five (5) accidents; in 1969, a total of eight (8) accidents and in 1970, a total of nine (9) accidents. Of the total number of accidents, sixteen (16) were classified as left turn accidents, three (3) were classified as same direction accidents, two (2) were right angle accidents and one (1) was a collision with a fixed object.

b. RECOMMENDATIONS

(1) Reconstruct the intersection as shown on the plan.

(2) Install a semi-actuated traffic signal with pedestrian push buttons. Warrant No. 2, Interruption of Continuous Traffic, is satisfied.

(3) Interconnect this new traffic signal to the existing signal at Mount Ephraim Avenue and Ferry Avenue to provide progressive movement of traffic along Mount Ephraim Avenue.

(4) Relocate the bus stops on Mount Ephraim Avenue to the far side and to mid block on Woodlynne Avenue.

(5) Prohibit parking on all three (3) approaches.

New Jersey State Library

PROJECT NO. WO-1 MOUNT EPHRAIM AVENUE AND WOODLYNNE AVENUE BOROUGH OF WOODLYNNE

c. BENEFITS

(1) Accident potential will be reduced.

(2) Safer and smoother flow of traffic will be achieved.

d. ESTIMATED COSTS

(1) Engineering	$ 7,200.00
(2) Construction	19,300.00
(3) Signs and Markings	800.00
(4) Traffic Signals	16,000.00
(5) Right of Way	500.00
Total Estimated Cost	$43,800.00

PROJECT NO. WO-1

MT. EPHRAIM AVENUE AND WOODLYNNE AVENUE

EXHIBIT NO. 15

PROJECT NO. WO-1

MT. EPHRAIM AVENUE AND WOODLYNNE AVENUE

EXHIBIT NO. 15



PROJECT NO. WO-1

MT. EPHRAIM AVENUE AND WOODLYNNE AVENUE

EXHIBIT NO. 15

CITY OF CAMDEN

BOROUGH OF WOODLYNNE

Boundary Line

Trailer Park

END PROJECT

MT. EPHRAIM AVENUE

Proposed Bus Stop

R7-4(R)

R7-107

13'

12'

R10-3 P.P.B.

R7-4

Existing Bus Stop (Relocate)

R7-4(L)

To match with Urban Engineers Plan for Mt. Ephraim Avenue & Ferry Avenue

AVENUE

FERRY

Gas Station

Diner

Existing Bus Stop (Relocate)

Proposed Bus Stop

AVENUE

180'

195'

15'

12'

13'

Dwellings

WOODLYNNE

75'

50'

R7-4(R)

R7-4(L)

END PROJECT

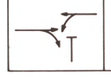
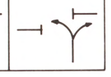
MAPLE

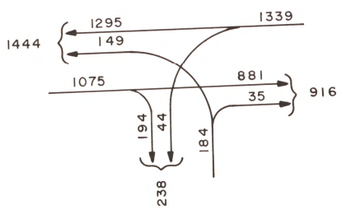
AVENUE

CROSSLYNNE AVENUE

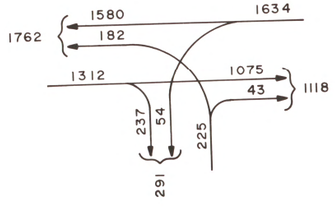
Dwellings

SIGNAL PHASING

Phase A	Phase B
	



1971 Weekday Peak Hour Traffic Volume



1981 D.H.V.



R7-107



R7-4(R)



R7-1.



R7-4(L)



R10-3

LEGEND

- EXISTING TOPOGRAPHY
- PROPOSED CURB
- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING TRAFFIC SIGNAL
- PROPOSED TRAFFIC SIGNAL
- INDUCTION LOOP DETECTOR
- P.P.B. PEDESTRIAN PUSH BUTTON
- PROPOSED PEDESTRIAN SIGNAL
- TRAFFIC SIGN
- PROPOSED SIDEWALK
- PROPOSED PAINTED CHANNELIZATION
- 00' PROPOSED CARTWAY OR R.O.W. WIDTH

SCALE
20' 0 40' 80'

PROJECT NO. WO-1

MT. EPHRAIM AVENUE AND WOODLYNNE AVENUE

EXHIBIT NO. 15

Kammerer, Symes & Assoc.
Consulting Engineers


U.S.
ROUTE
130
DWIGHT
AVENUE

PROJECT NO. WO-2 U.S. ROUTE 130 AND DWIGHT AVENUE
BOROUGH OF WOODLYNNE

Project No. WO-2 covers the relocation of a pedestrian-actuated signal at the intersection of Route 130 and Dwight Avenue.

a. PROBLEMS

(1) Children from both Collingswood and Woodlynne must cross Route 130 in order to attend school in this area.

(2) A pedestrian-actuated signal is located at Richey Avenue and Route 130 on a curve approximately two hundred (200) feet south of the Collingswood Circle and four hundred (400) feet north of Dwight Avenue.

(3) Richey Avenue does not lead toward the center of Woodlynne.

(4) Dwight Avenue is presently used by pedestrians when crossing Route 130.

b. RECOMMENDATIONS

(1) Relocate the present pedestrian-actuated signal located at Richey Avenue and Route 130 to Dwight Avenue and Route 130.

(2) Provide pedestrian signal indications.

(3) Provide crosswalk markings at this location to direct pedestrian movements.

(4) Install School and Pedestrian Crossing signs on both approaches of Route 130 in order to warn drivers of pedestrians.

(5) Final signal layout and operation is to be determined by the New Jersey Department of Transportation.

c. BENEFITS

(1) A more direct route for schools and the center of Woodlynne will be provided.

(2) The signal will be located further away from the Collingswood Circle and not on a curve.

d. ESTIMATED COSTS

(1) Engineering	$1,200.00
(2) Construction	5,600.00
(3) Signs and Markings	400.00
Total Estimated Cost	$7,200.00

GENERAL RECOMMENDATIONS

PROJECT NO. G-1 TYPICAL LEFT TURN LANE PAVEMENT MARKINGS

Several of the arterial and collector roads in the study area do not have sufficient width to be marked for two (2) lanes of traffic in each direction. Provisions for left turn lanes are desirable at many of the major intersections with connector streets. *(Exhibit No. G-1)*.

a. PROBLEMS

(1) Roads on the study system with cartway widths between thirty-six (36) and forty (40) feet are marked for one lane of travel in each direction.

(2) Vehicles desiring to turn into the main connector streets within a residential area must straddle the centerline while waiting to turn.

(3) On-coming traffic receives no pre-warning that a vehicle is straddling the centerline.

b. RECOMMENDATIONS

(1) Construct painted channelization to provide one (1) lane of through traffic in each direction plus a center lane for turning vehicles at locations in the study system which have cartway widths between thirty-six (36) and forty (40) feet and are marked for one lane of travel in each direction.

c. BENEFITS

(1) Will provide a protected area for vehicles to wait for clearance to make left turn movements, thereby reducing exposure to head-on, rear-end and same direction accidents.

(2) Driver confusion will be eliminated.

d. ESTIMATED COSTS

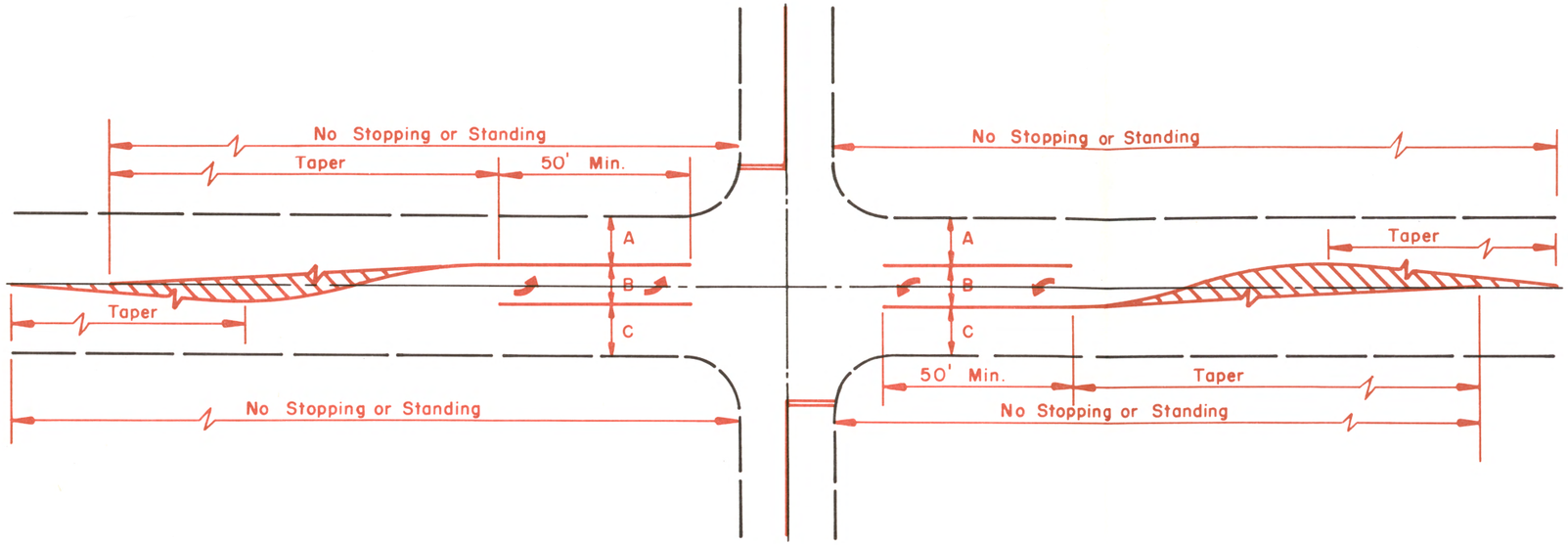
(1) Engineering	$150.00
(2) Signs and Markings	750.00
*Total Estimated Cost	*$900.00

*Denotes cost of typical intersection

PROJECT NO. G-1

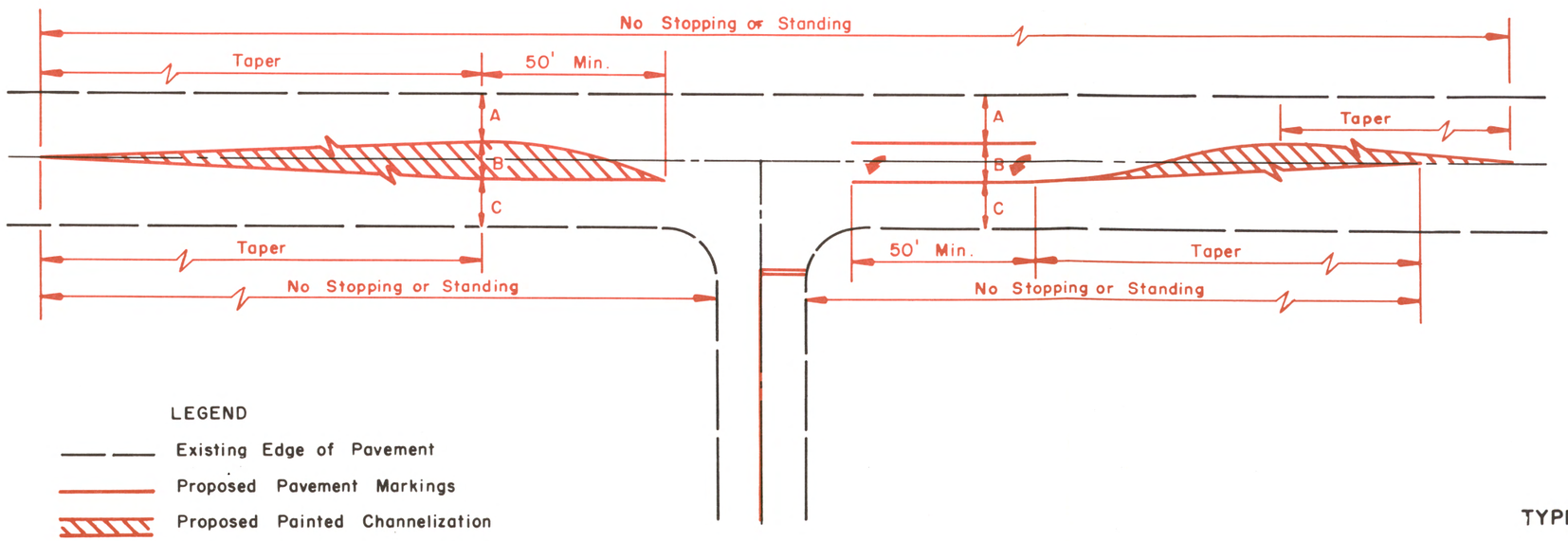
TYPICAL LEFT TURN LANE PAVEMENT MARKINGS

EXHIBIT NO. G-1



TYPICAL FOUR WAY INTERSECTION

TRAFFIC LANE	CARTWAY WIDTH		
	36'	38'	40'
A	13'	13'	14'
B	10'	12'	12'
C	13'	13'	14'
TAPER	200'	240'	240'



TYPICAL THREE WAY INTERSECTION

TRAFFIC LANE	CARTWAY WIDTH		
	36'	38'	40'
A	13'	13'	14'
B	10'	12'	12'
C	13'	13'	14'
TAPER	200'	240'	240'

PROJECT NO. G-1

TYPICAL LEFT TURN LANE PAVEMENT MARKINGS

EXHIBIT NO. G-1

Kammerer, Symes & Assoc.
Consulting Engineers

PROJECT NO. G-2 GENERAL SPEED LIMITS

Project No. G-2 covers general speed limits within the study area.

a. PROBLEMS

(1) Unrealistically low speed limits are in force on many roads within the study area.

(2) Unrealistic speed limits result in driver disrespect for speed limit signs.

(3) Drivers who obey these speed limits actually create a hazardous condition.

b. RECOMMENDATIONS

(1) Arterial roadways should be speed zoned in accordance with the Manual on Uniform Traffic Control Devices.

c. BENEFITS

(1) A safer and smoother flow of traffic will be achieved.

(2) Greater respect for traffic control measures will be gained.

CHAPTER 14

IMPLEMENTATION

The basis for the selection of Projects for proposed improvements as stated previously was the increase of intersection and roadway capacities, improvement of the quality of travel and the reduction of accident potential.

The requirements of the TOPICS Program for the Study Area referred to in this report states that a feasible schedule of time and costs be established to implement the projects within a five (5) year period, 1973 - 1978. This Chapter presents a summary of the parameters used for implementation.

RIGHT OF WAY

Several of the Projects will require the acquisition of additional right of way. While these projects may not be scheduled for construction in the early phases, the acquisition of right of way should proceed as scheduled to restrict development of vacant land and take advantage of the lowest possible price. The acquisition of right of way by a governmental agency is a complex process which involves many functions from the time the right of way plans are completed by the engineers until the right of way personnel can begin their job of acquisition. Right of way estimates given in this report have been escalated at an annual rate of six (6) percent per year. It should be noted that acquisition for rights-of-way on all highway projects must comply with the following statutes:

a. STATE - Chapter 361, Laws of New Jersey 1971.
Assembly Bill No. 504, approved December 21, 1971.
"Eminent Domain Act of 1971".

b. STATE - Chapter 47, Laws of New Jersey 1972.
Senate Bill No. 987, approved June 1, 1972.
"Uniform Transportation Replacement Housing and Relocation Act".

c. FEDERAL- Public Law 91-646, 91st Congress.
Senate Bill No. 1, approved January 2, 1971.
"Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970".

CONSTRUCTION COSTS

The estimated costs for recommended projects are based on the experience of the Consultant and the cost of similar work.

In recent years, the "Engineering News Record" Construction Cost Index has increased an average of five (5) percent per year; however, in 1968, the increase in the index was ten (10) percent. The costs shown in the schedules in this Chapter have been escalated at the rate of eight (8) percent per year.

ENGINEERING

In addition to the early acquisition of right of way, early preparation of plans and specifications is essential to the orderly completion of the projected schedule.

A minimum period of one (1) year should be scheduled to obtain project approvals, obtain right of way and prepare engineering drawings for each project. On more complex and expensive projects, the period will be considerably longer.

Estimated engineering fees include the preparation of right of way plans, preliminary design, final design, construction layout and construction inspection. A factor of twenty (20) percent of the estimated construction cost was used to estimate the engineering fees. The fees estimated in this schedule have been escalated at the rate of six (6) percent per year.

CHAPTER 15

SYSTEMS MAINTENANCE AND EVALUATION

The projects recommended in this report do not increase the road mileage within the study area. One (1) new signal has been added to the system in Woodlynne at the intersection of Mount Ephraim Avenue and Woodlynne Avenue.

Signals, signs and pavement markings on State Highways are maintained by the State. The changes recommended with the exception of initial cost would have an insignificant change in the maintenance budget. The estimated maintenance cost for the recommended changes would be two hundred ($200.00) dollars for the Borough of Collingswood and five hundred ($500.00) dollars for the Borough of Woodlynne, which would increase the current maintenance budgets to one thousand, two hundred ($1,200.00) dollars and three thousand, two hundred ($3,200.00) dollars respectively.

TRAFFIC SIGNALS

Traffic signals on municipal and county roads are currently maintained by the individual municipalities. It is the recommendation of this report that the County of Camden take a more active part in the design and installation of traffic signals on County Roads. More specifically, it is felt that the County should review and approve the design, participate financially in the construction cost and take the responsibility for maintaining the signal after installation.

Since only one (1) new signal has been recommended in this report, the estimate for maintenance of signals within the Borough of Woodlynne should be increased slightly.

SIGNS AND PAVEMENT MARKINGS

Provisions should be made in the Municipal Budgets for annual repainting of pavement markings on a pre-determined schedule. The schedule should be based on past experience of traffic volumes. Additional monies should be budgeted for signs to cover the cost of painting, cleaning, replacement, vandalism and placement of new signs as changes in traffic volumes and experience require.

EVALUATION

The improvements recommended should be evaluated by a qualified traffic engineer as to their effectiveness. Through such a study, the effectiveness of each project can be evaluated in eliminating the problem areas outlined in the report.

APPENDIX

DEFINITIONS

ACTUATED SIGNALS: A type of traffic control signal in which the intervals are varied in accordance with the demands of traffic as registered by the actuation of detectors.

AVERAGE ANNUAL DAILY TRAFFIC: The total yearly volume divided by the number of days in the year, commonly abbreviated as A.A.D.T.

CAPACITY: The maximum number of vehicles which has a reasonable expectation of passing over a given section of a lane or a roadway in one direction (or in both directions for a two-lane or a three-lane highway) during a given time period under prevailing roadway and traffic conditions.

CARTWAY WIDTHS: Widths of roadways between curbs or travel way including shoulders.

CENTRAL BUSINESS DISTRICT (C.B.D.): That portion of a municipality in which the dominant land use is for intense business activity.

CHANNELIZATION OF TRAFFIC: The separation or regulation of conflicting traffic movements into definite paths of travel by use of pavement markings, raised islands, or other suitable means to facilitate the safe and orderly movement of traffic, both vehicular and pedestrian.

COLLECTOR STREETS: Streets providing through movements between major arterials and local streets and having direct access to abutting property.

CORNER RADII: The radius, in feet, for curb or edge of paving joining intersecting roadways.

DESIGN HOUR VOLUME (D.H.V.): The future hourly volume used for design (two-way unless otherwise specified), usually the thirtieth (30th) highest hourly volume of the design year.

FIXED TIME SIGNALS: A type of traffic control signal which directs traffic to stop and permits it to proceed in accordance with predetermined time schedules.

GEOMETRY: Engineering data, which defines the alinement of roadways and intersections, consisting of curve radii, angles and distances.

GREEN TIME: The actual time that a green traffic light is on for a given approach during one cycle.

INTERSECTION CAPACITY: The computed maximum number of vehicles per hour that can be handled by an intersection.

JUGHANDLE: A separate lane turning off of a roadway expressly for accommodating turning movements, frequently used to eliminate left turn movements from the main roadway.

LEVEL OF SERVICE: A qualitative measure of the effect of a number of factors, which include speed and travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience and operating costs.

PEAK-HOUR TRAFFIC: The highest number of vehicles found to be passing over a section of a lane or a roadway during sixty (60) consecutive minutes.

PROGRESSIVE TIMING SYSTEM: A signal system in which the successive signal faces controlling a given street give "go" indications in accordance with a time schedule to permit (as nearly as possible) continuous operation of groups of vehicles along the street at a planned rate of speed, which may vary in different parts of the system.

RIGHT OF WAY: An easement giving the right to pass across land; as that portion of land dedicated for use as a travel way and within which roadways are constructed.

SPOT SPEED CHECKS: A method used to measure the instantaneous speed of a vehicle at a specified location.

THE THIRTIETH (30TH) HIGHEST HOUR VOLUME: The hourly volume on a given roadway that is exceeded by twenty-nine (29) hourly volumes during a designated year.

TIME DELAY STUDIES: Studies to determine the average travel time on an arterial or highway and the points of, duration and cause of delays.

TOPICS: Traffic Operations Program to Increase Capacity and Safety.

TRAFFIC VOLUME: The number of vehicles that pass over a given section of a lane or a roadway during a time period of one hour or more. Volume can be expressed in terms of daily traffic or annual traffic, as well as on an hourly basis.

VOLUME/CAPACITY RATIO: Ratio of actual vehicular volume or demand to the computed possible capacity for a given section of roadway.

WARRANTS FOR TRAFFIC SIGNAL INSTALLATION

Traffic control signals should not be installed unless one or more of the signal warrants in the Manual on Uniform Traffic Control Devices are met. Information should be obtained by means of engineering studies and compared with the requirements set forth in the warrants. If these requirements are not met, a traffic signal should neither be put into operation nor continued in operation (if already installed).

The warrants are as follows:

a. WARRANT NO. 1 - MINIMUM VEHICULAR VOLUME

b. WARRANT NO. 2 - INTERRUPTION OF CONTINUOUS TRAFFIC

c. WARRANT NO. 3 - MINIMUM PEDESTRIAN VOLUME

d. WARRANT NO. 4 - SCHOOL CROSSING

e. WARRANT NO. 5 - PROGRESSIVE MOVEMENT

f. WARRANT NO. 6 - ACCIDENT EXPERIENCE

g. WARRANT NO. 7 - SYSTEMS WARRANT

h. WARRANT NO. 8 - COMBINATION OF WARRANTS