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VOLUME II

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**TR AVERS
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CONSULTANTS

TRANSPORTATION AND
TRAFFIC ENGINEERING

AREA 201 - 365-0510

December 27, 1972

New Jersey Department of Transportation
1035 Parkway Avenue
Trenton, New Jersey 08625

Attention: Mr. George S. Horner, Acting Chief
Bureau of Local Federal Aid Programs

Re: Areawide TOPICS Study
Mercer County, New Jersey
Final Report: Report Area II

Gentlemen:

We submit herewith the second volume of our Final Report in relation to Report Area II of the Mercer County Areawide TOPICS Study; the other volumes relate to Report Area I and Report Area III. It is noted that Part A of each report is identical, describing data collection, survey, and evaluation procedures, and providing other study information of countywide scope. Part B of each report relates to the detailed proposals in the respective report areas.

Supporting data used in preparation of the reports have been bound and submitted under separate cover. The Technical Memoranda relative to Report Area II are as follows:

Traffic Signal Inventory
Intersection Counts
Motor Vehicle Accident Summaries
Speed Surveys
Speed-Delay Survey

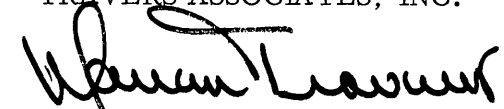
New Jersey Department of Transportation.

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We should like to express our appreciation for the assistance we received to representatives of the County of Mercer, the New Jersey Department of Transportation, the Federal Highway Administration, the Townships of Ewing, Hopewell, and Lawrence, and others concerned with this effort.

Very truly yours,

TR AVERS ASSOCIATES, INC.



Warren Travers, P.E., President
John R. Cade, P.E., Project Manager
Jack A. Artale, P.E., Project Engineer

WT/JRC/JAA:mc

ACKNOWLEDGEMENTS

Funding for the project was made available by the County of Mercer, the New Jersey Department of Transportation, and the Federal Highway Administration.

The study was completed in cooperation with the Townships of Ewing, Hopewell, and Lawrence and various offices of the contributing agencies.

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SYNOPSIS OF THE TOPICS STUDY

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PART A
Synopsis of the TOPICS Study

The Areawide TOPICS Study for the County of Mercer is aimed at providing relatively modest improvements in an effort to enhance traffic flow and minimize accidents on the existing roadway network. The Federal Aid Urban Area includes a total study network of 233 miles of streets and highways* which was subdivided for the purposes of the study as follows:

- . Report Area I: Princeton Borough and a portion of Princeton Township surrounding the Borough.
- . Report Area II: Ewing Township, a major portion of Lawrence Township, and the section of Hopewell Township immediately adjacent to Ewing Township.
- . Report Area III: Hamilton Township.

The findings and recommendations of the study focus on intersection improvements - in particular, signalized intersections together with related signal systems. Other street and highway improvements are also recommended. Throughout the study, the emphasis has been on the specific problems and requirements of the local street network. Deficiencies on State highways and possible means of relief are also discussed, but, generally, proposed improvements on the State highway network have not been scheduled for implementation.

*The 233 miles of study roadways do not include streets and highways located in the City of Trenton, which were the subject of an independent study completed by others.

The total estimated cost for all proposed improvements is \$2,998,300.00. It is anticipated that portions of the projects will be implemented annually and completed within a five-year program. Projects have been allocated within five priority groupings on the basis of functional need, proximity to related improvements, and effect on overall costs. The first priority is comprised of those improvements being completed under an Early Implementation program and are already under design as this report is being prepared.

Signalized Intersection and Signal System Improvements

Proposed improvements relative to the signalization of intersections comprise a major part of the study effort and estimated implementation costs. A total of 53 locations have been recommended for improvement, of which 33 relate to existing signalized intersections and 20 to proposed traffic signal control at non-signalized intersections. These proposals do not include signalization improvements contemplated in conjunction with the proposed arterial highway projects discussed below. The total cost of the scheduled signalized intersection improvements is estimated to be \$1,077,100.00.*

*Thirty-seven of the 53 signalized intersection projects have been scheduled for improvement under the TOPICS program. Another 15 are located on State highways and are not considered eligible for improvement at this time under the Department's guidelines, and one intersection is to be improved by the County.

It is proposed to incorporate most of the signalized intersections in the study area (both existing and proposed) within one of several signal systems. The total cost of providing these systems is estimated at \$51,000.00. Signalized intersection improvements, together with signal system improvements, result in a total estimated cost of \$1,128,100.00.

Arterial Highway Improvements

Proposed improvements to portions of two major arterial highways comprise another major part of the study effort and estimated implementation costs. Proposed North Olden Avenue Extension and Princeton Avenue projects include improvements to two of the most heavily traveled and accident prone roadways within the study area. Proposed improvements include widening the highways, defining abutting driveways, and improving five existing signalized intersections and two proposed signalized intersections. The total cost of the projects is estimated at \$723,900.00.

CBD Parking

Parking in the central business district of Princeton Borough was the subject of another major study effort. The removal of curb parking at specified locations has been recommended in conjunction with the construction of new off-street parking facilities at an estimated cost of \$217,000.00.

Other Improvements

A total of 21 improvement projects have been recommended at non-signalized intersections and include proposed flashing signal control, channelization, and sight distance improvements for a total estimated cost of \$69,100.00. Eight other locations between intersections also have been proposed for improvement and include reconstruction of a railroad grade crossing and the replacement of two bridges at a total estimated cost of \$827,700.00.

Three additional scheduled projects relate to the regulation of traffic along sections of roadway and involve operation improvements through parking control, posting of speed limits, and upgrading of bus stops. The total cost of these projects is estimated at \$32,500.00.

Proposed Federal Aid Roadways

The total system of existing Federal Aid roadways is estimated to be 118.1 miles within the study area. A new category of Federal Aid roadways is to be established and is to include selected major collector streets and connectors, arterial highways, and other facilities having particularly heavy concentrations of traffic. These roadways are to be designated as Primary Type II. As a result of the Areawide TOPICS Study, a total of 38.2 miles of Federal Aid, Primary Type II roadways have been recommended.

The study network includes 233 miles of streets and highways within the study limits, of which 25 miles are located in Report Area I, 103 in Report Area II, and 105 in Report Area III. A total of 74 signalized intersections are located within the three report areas, most of which are located on existing Federal Aid roadways.

The Report

Three distinct reports have been prepared, one for each of the report areas. Part A of each of the reports is identical and treats the general aspects of the Areawide TOPICS Study including a summary of the findings, a description of the procedures that were used, and a summary of costs and priorities. Part B of each report is unique and gives detailed recommendations for each of the report areas respectively.

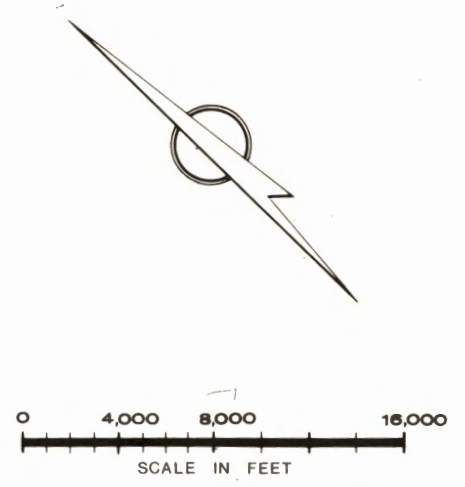
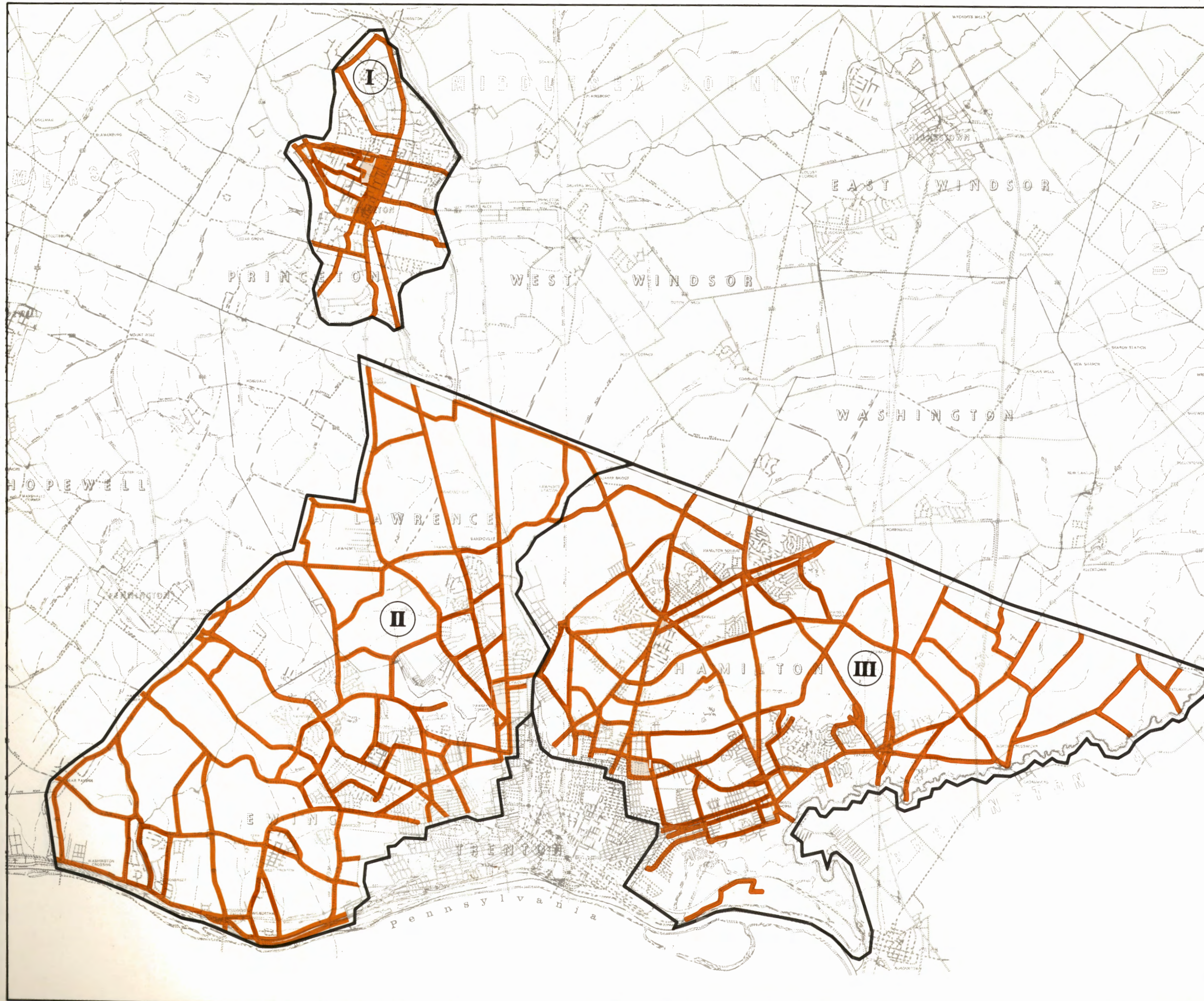
The recommendations presented herein are accompanied by existing conditions, deficiencies, proposed improvements, benefits, and estimates of costs. Functional design drawings have been prepared to illustrate the more complex improvements. Discussions relative to proposed improvements on State highways that have not been scheduled for implementation generally are not accompanied by cost estimates or illustration.

In accordance with the request of the Federal Highway Administration, the governing bodies of the respective areas involved in the study were advised of all improvement locations to determine possible conflict between the proposed improvement projects and other planned construction programs. Accordingly, it is not anticipated that the improvements recommended herein will be encroached upon by Urban Renewal, Model Cities, or similar programs.

Surveys and Data Collection

The collection of field data and the inventory of traffic control devices, regulations, and practices affecting roadway operation constituted approximately one-third of the study effort. Previously compiled data was made available by State, County, and municipal officials and included reports, vehicular volume counts, intersection plans, traffic ordinances, and related information. These data were updated and supplemented by comprehensive field checks. Additional traffic counts were made, speed-delay data recorded, and geometric roadway features measured where physical roadway improvements have been proposed. Accident records were transcribed for the three-year period of 1968 through 1970, and all parking facilities in the Princeton central business district were inventoried. Other work items completed in preparation for the engineering analysis included an inventory of public transportation routes and operations, a review of existing traffic ordinances, and the completion of speed surveys along selected roadways. Summaries of the data were completed and have been bound separately from the study report.

Figure A1



- Legend
-  STUDY AREA
 -  STUDY AREA BOUNDARY
 -  STUDY ROADWAYS

AREAWIDE TOPICS STUDY
Mercer County, N.J.

STUDY NETWORK

NEW JERSEY DEPARTMENT OF TRANSPORTATION
September 1972 Travers Associates Consultants

Accidents: Data relative to 5519 accidents at 312 locations were recorded for the three-year study period of 1968 through 1970. In each instance, the date of the accident, day of week, time of day, weather and roadway conditions, type of vehicle(s), severity, and manner of collision were recorded. In addition, a diagram of each accident was noted when the information was feasible to retrieve from the police files.

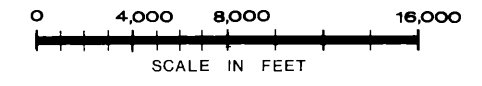
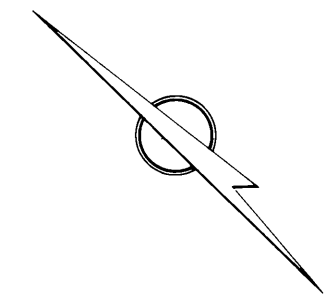
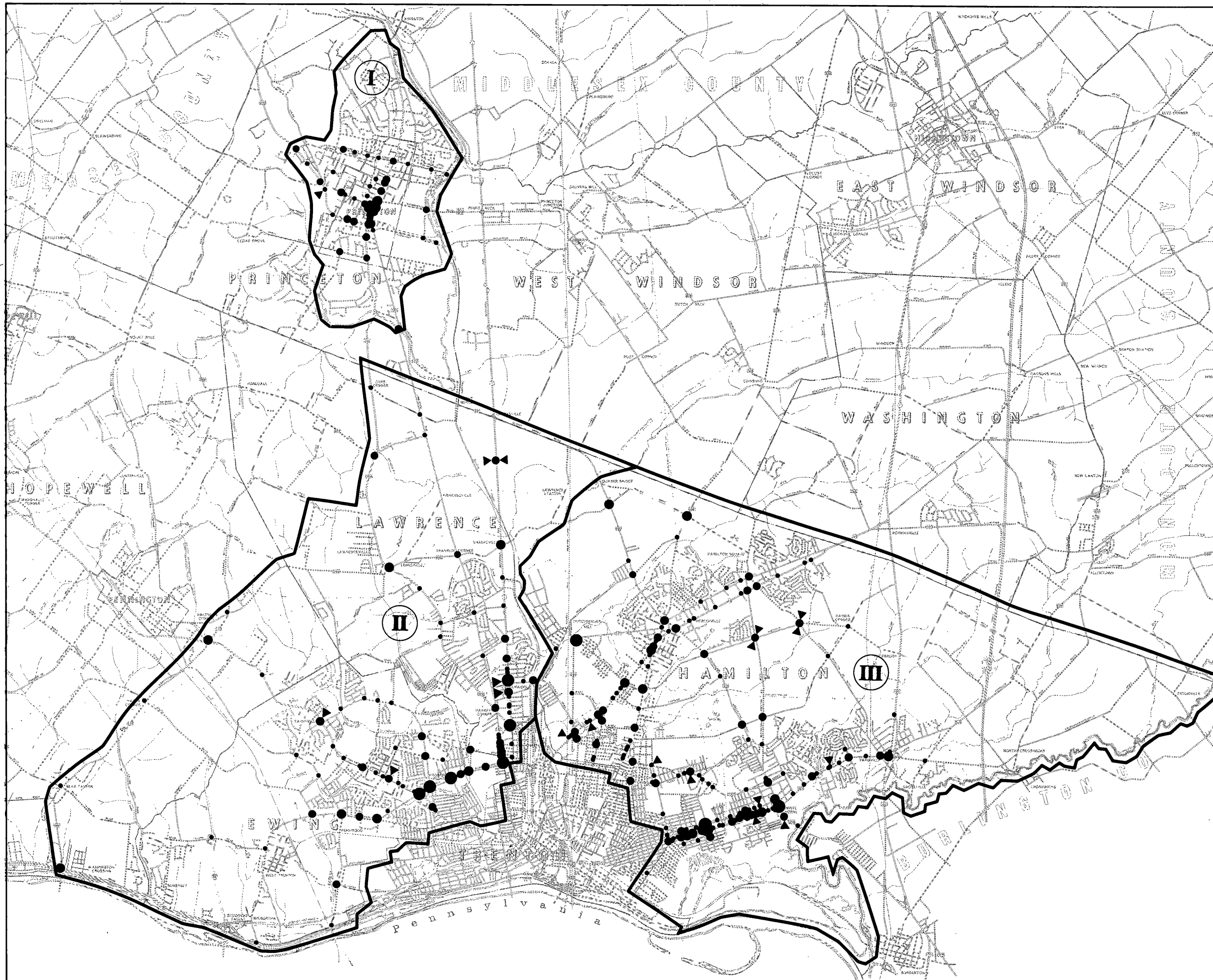
Accident data were recorded when a history of six or more accidents was noted at an intersection during the three-year study period. Figure A2 graphically illustrates the frequency and location of all intersection accidents and is summarized as follows:

Accident Frequency 1968-1970	Number of Intersections			
	Area I	Area II	Area III	Total
6-14	24	50	99	173
15-29	18	21	44	83
30-49	1	10	12	23
50 or more	1	6	4	11

With respect to between intersection accidents, data was recorded when a history of three or more accidents was noted at a particular location during the three-year study period. The total number of locations recorded, however, were few due to the much lower incidence of between intersection accidents as compared to the incidence of accidents at intersections, and because of the difficulty encountered in pinpointing specific between intersection accident locations.

Traffic Volumes: The characteristic of traffic flow most commonly referred to by traffic analysts is vehicle volume, the number of vehicles passing a particular point on a roadway during a specified period, generally expressed in terms of vehicles per hour. Accordingly, vehicle volume intersection counts completed during peak periods of traffic flow were a key element in the study analysis. Counts were conducted at 83 intersections, generally for periods of four or eight hours. Another 25 counts furnished by State and County officials were also utilized.

Figure A 2



Legend

- 6 - 14 ACCIDENTS
- 15 - 29 ACCIDENTS
- 30 - 49 ACCIDENTS
- 50 OR MORE ACCIDENTS
- ▲ SINGLE FATAL ACCIDENT

AREAWIDE TOPICS STUDY
Mercer County, N.J.

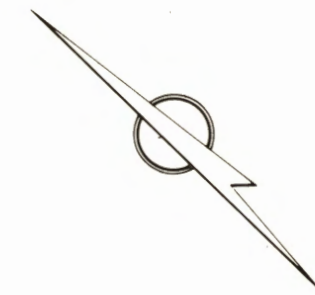
ACCIDENT HISTORY
AT INTERSECTIONS
1968-1970

A simplified growth factor method was employed in developing future traffic volume estimates. Utilizing historical traffic volume data furnished by the State, it was determined that a uniform growth rate of 3.5% per year for all three report areas was appropriate. Figure A3 graphically illustrates estimated 1975 daily traffic volumes and is based on applying the foregoing annual growth rate for a period of five years to the 1970 volumes. Similarly, 1980 traffic volumes can be estimated by applying a factor of 1.175 to the 1975 volumes.

In developing the traffic volumes shown in Figure A3, no attempt was made to modify the projected traffic flows as a result of new highway construction. At locations where improvements are proposed, however, possible reduction in future traffic levels as well as increases greater than normal were considered where new roadway facilities would be available in the near future and would appreciably affect traffic volumes on existing facilities.

Speed-Delay Studies: Speed-delay studies were conducted on all routes in order to obtain an overview of traffic operations throughout the study area. Survey runs were made in both directions on all arterial roads during the morning and evening peak periods of traffic flow as well as during the off-peak period. Runs on the minor roads were completed during the evening peak period only, unless operational problems were observed, in which case runs were then made during the morning peak and off-peak periods. In each instance, the cause of any delay was noted and the average speeds between principal intersections, or delay points, were computed. The speed-delay data was found to be of principal value in confirming points of traffic congestion initially identified through other sources, since, typically, the problem locations were major intersections already scheduled for detailed study. Identification of less obvious problem locations was difficult because of the short duration of the traffic peaks (less than one-half hour) when restricted traffic flow resulted in congested operation. The speed-delay data, however, did lead field investigators to locations where observations confirmed problem situations.

Figure A3



ESTIMATED TRAFFIC VOLUMES
(VEHICLES PER DAY)

MULTIPLY 1975 VOLUMES BY FACTOR OF 1.175 TO OBTAIN
ESTIMATED 1980 VOLUMES

AREAWIDE TOPICS STUDY
Mercer County, N.J.

1975 TRAFFIC VOLUMES

NEW JERSEY DEPARTMENT OF TRANSPORTATION
September 1972 Travers Associates Consultants

Study Procedure: During the course of the study, investigations were made of a total of 255 locations. These included intersections with an accident history averaging five or more per year, between intersection locations averaging one or more accidents per year, and all locations where a fatal accident occurred during the three-year study period. The studies also included all signalized intersections, locations where State, County, or municipal officials advised investigation was warranted, and at other locations where operational or other deficiencies were determined to exist. Field investigation generally involved noting the existing traffic controls, the travel speeds of approaching vehicles, the characteristics of pedestrian and vehicular activity, and physical deficiencies such as sight distance restrictions and roadway geometrics. Beyond the investigation of these problem spots, other areawide studies - such as the CBD parking and bus stop studies - were also made, as well as the operational studies involving speed-delay and speed limits.

Capacity studies were made for major segments of the roadway network and for principal intersections. These studies were based on study procedures specified in the 1965 edition of the Highway Capacity Manual. Capacity calculations for Level of Service C* formed the basis for determining the relationship of traffic demand to the traffic capacity limitations imposed by study roadways and intersection locations. Analyses included a determination of capacity under prevailing conditions and for

*Traffic volumes at Level of Service C are such that traffic flow is stable with some restrictions imposed on drivers relative to choice of speeds and maneuverability, and accompanied by occasional back-ups at intersections.

proposed improved conditions. Where the analysis indicated that traffic volumes could not be accommodated at Level of Service C, alternate computations were made for Level of Service D.*

High frequency accident locations were analyzed to determine accident causes and possible preventive measures. The need for signal control at non-signalized intersections was determined on the basis of joint considerations of accident experience and traffic volumes, all in accordance with the "Manual on Uniform Traffic Control Devices for Streets and Highways." In other instances where it was determined that traffic volumes were not at a level that warranted traffic signal control, but that the accident history was significant, other traffic control measures and/or physical improvements were considered. At existing signalized intersections, physical features of the roadway, signal display, as well as signal operation were evaluated for conformity with accepted design criteria.

The study also included an examination of roadway improvements now in the planning, design, or construction stages. These projects will affect the improvements recommended in the TOPICS study in varying degrees depending upon their nature, timing, and location. The projects of particular significance are discussed in various sections of the report in the context of those specific locations considered for improvement which will be directly affected.

*Level of Service D encompasses traffic flows undergoing increasing restrictions approaching instability, and accompanied by substantial intersection delays for short periods during peak operations.

In accordance with a New Jersey Department of Transportation directive, no improvements on State highways have been scheduled for TOPICS implementation except where a proposed improvement would principally benefit local traffic. Thus, deficiencies on State roadways and possible means of relief are discussed in the report, but no cost estimates have been made, nor have the improvements been scheduled for implementation. It is the intent of the Department to implement improvements in other programs as funds become available.

Other Considerations

The completion of the improvements proposed herein does not necessarily assure that the benefits to be achieved initially will continue indefinitely. Often the quality of traffic operations depends upon the quality of maintenance, especially of the traffic control devices. Timing adjustments of the signals, replacement of missing signs and burned out signal lamps, and repainting of pavement markings will consistently provide motorists with the intended control. Undoubtedly, the most effective means of accomplishing such a goal is through an all-inclusive preventive maintenance program.

The traffic related functions of the County of Mercer are organized within the engineering department and are staffed by skilled technicians and a traffic engineer. Their expertise has enabled them to undertake traffic studies and complete the design and construction of traffic signal installations. Accordingly, it is anticipated that any new signals, or other traffic control devices that may be installed as a result of the Areawide TOPICS Study, will be properly maintained.

It has been also noted that the County has made significant progress relative to the replacement of traffic signs and pavement markings in conformance with the latest standards of the "Manual on Uniform Traffic Control Devices for Streets and Highways." In general, the municipalities are not as far advanced as the County. Accordingly, it is recommended that, where the replacement of nonconforming signs and markings has not been scheduled, programs be initiated to complete their installation in relation to their normal service life.

The principal public transit services available in Mercer County are provided by several bus lines as follows:

- . Blue Bus Line operates four round trips daily between Trenton and Lambertville in Hunterdon County, New Jersey.
- . Mercer Metro is the principal bus line in Mercer County and is discussed in greater detail below.
- . Transport of New Jersey operates 23 round trips per day between Trenton and Philadelphia.
- . Starr Transport Company operates one or two round trips per day between Trenton and Hightstown.
- . Suburban Transit Company operates 18 round trips per day between Trenton and Princeton.

Mercer Metro provides the only areawide bus service in the County. Since 1968, the line has been operating as a publicly controlled facility under the jurisdiction of the Mercer County Improvement Authority, reflecting the results of declining patronage and dependence on financial subsidy originating from State and County sources. The bus line management has conducted advertising campaigns and also continually appraises existing bus service, modifying or extending routes or hours of operation in an attempt to attract riders.

Existing Service

Mercer Metro operates ten bus routes within the urbanized area of Mercer County and also provides service on an eleventh route between the City of Trenton and Fort Dix-McGuire Air Force Base. As shown in Figure A4, existing bus routes are widely distributed over major travel corridors serving principal concentrations of population. Most routes operate on minimum headways of half an hour, generally commencing operation between 5:00 and 6:00 A.M. The various bus routes begin their last trip as follows:

G, H, L, S, X	6:00- 7:00 P.M.
K, Q, R, T	8:40-10:30 P.M.
P	11:50 P.M.

Bus Stops

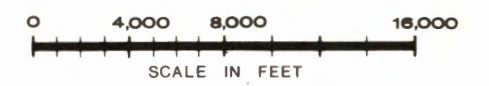
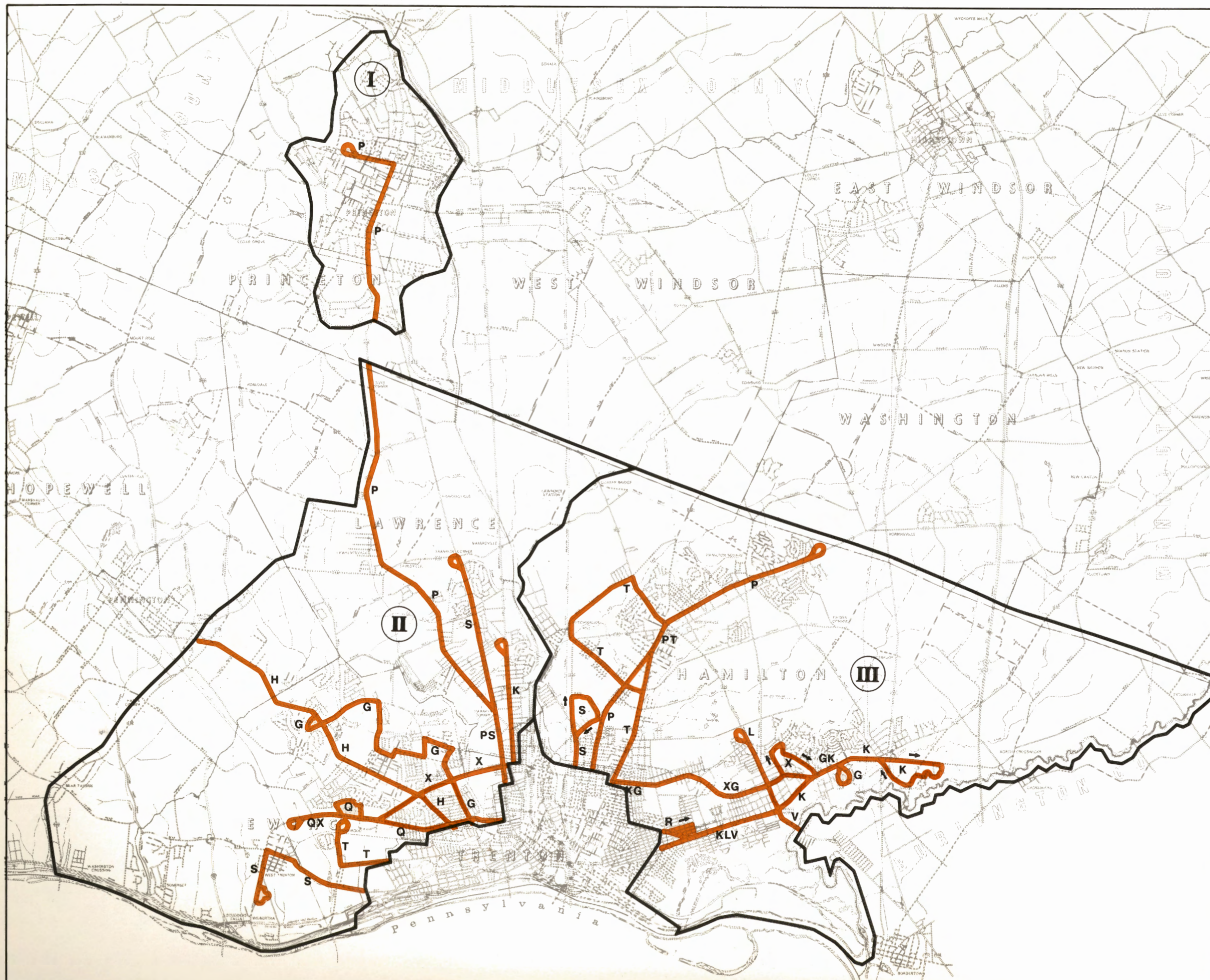
Field investigations indicated that most locations where buses stop are not identified, or are marked by signs that are worn with age. In many instances, maneuverability of buses is hampered due to insufficient length provided for the bus stop. The frictional effects of both bus operation and traffic in general were particularly evident on the more urbanized streets where curbing restricts the lateral movement of vehicles.

Conclusions

It is evident that Mercer Metro is providing rather broad coverage - eleven routes serving seven municipalities - in the face of deficit operations. The question of whether the bus line can continue to provide good service and possibly expand operations will depend upon the extent that subsidization plays in the future of Mercer Metro. There is evidence that as a nation we are recognizing the value of public transit facilities as important elements of our transportation systems. As a result, there has been increased interest in assisting the industry with subsidies and other programs to make public transit more attractive. Accordingly, there is reason to be optimistic toward the future of public transit in general and bus operation in Mercer County in particular.

The improvements recommended in Part B of the report relate principally to the bus stops and their relation to traffic operations. The proposed lengthening of existing bus stops will permit buses to pull out of the stream of traffic benefitting overall traffic flow, while reducing the potential for accidents and making it easier for patrons to board. The recommendation of far-side corner bus stops where practical will minimize conflicts between buses and right turning vehicles, and the proposed signing will serve to readily identify the bus stops to patrons and parking motorists.

Figure A4



Notes
ALL ROUTES SHOWN ARE THOSE OF THE
MERCER METRO BUS LINE.

AREAWIDE TOPICS STUDY
Mercer County, N.J.

EXISTING BUS ROUTES

NEW JERSEY DEPARTMENT OF TRANSPORTATION
September 1972 Travers Associates Consultants

Estimated Costs

All costs summarized in this section include construction and engineering, and it is assumed that improvements will be accomplished over a period of five years. Accordingly, costs were summarized in five increments and identified as priorities 1 through 5. The total cost of all TOPICS improvements throughout the study area is estimated as follows:

Report Area I	\$ 831,000.00
Report Area II	1,004,200.00
Report Area III	<u>1,163,100.00</u>
Total	\$2,998,300.00

In addition, Figure A5 illustrates the location of the proposed improvements in relation to three cost categories: under \$5,000.00, \$5,000.00 to \$30,000.00, and over \$30,000.00. Two arterial projects are also shown and have been classified as costing over \$200,000.00 and over \$400,000.00 respectively.

Priorities

The prime considerations in establishing priorities related to the need for the relief of existing roadway traffic operations in terms of capacity and safety. Secondary considerations suggested the grouping of specific improvements to achieve the full potential of benefits of several projects in proximity to each other. While not directly related to functional urgency, costs nevertheless influence priority grouping in terms of providing a reasonable cost balance. The priorities outlined herein are at best a guide, and it is anticipated that they will be modified from time to time in response to opportunities which may develop in accordance with the availability of funds. It is noted that implementation of Priority 1 has already commenced as Early Implementation projects.

COST SUMMARY

<u>Priority</u>	<u>Cost</u>
Priority 1	\$ 973,700.00
Priority 2	660,900.00
Priority 3	532,200.00
Priority 4	424,500.00
Priority 5	407,000.00
TOTAL ESTIMATED COST	\$2,998,300.00

PRIORITY 1 (EARLY IMPLEMENTATION)

<u>Improvement</u>	<u>Report Area</u>	<u>Estimated Cost</u>
Arterial Improvements		
North Olden Avenue Extension	II	\$499,000.00
Intersection Improvements		
Ewingville Road/Eggert Crossing Road	II	36,400.00
Parkway Avenue/Scotch Road	II	25,200.00
Washington Crossing Pennington Road/ Scotch Road	II	49,700.00
Mercerville Whitehorse Road/South Olden Avenue	III	35,400.00
Mercerville Whitehorse Road/Kuser Road	III	49,300.00
Mercerville Whitehorse Road/Klockner Road	III	65,500.00
Mercerville Quakerbridge Road/Sloane Avenue-Flock Road	III	49,500.00
Mercerville Quakerbridge Road/Youngs Road	III	46,000.00
Klockner Avenue/East State Street Extension	III	56,400.00
South Olden Avenue/Arena Drive	III	61,300.00
	Subtotal	\$474,700.00
	Total Priority 1	\$973,700.00

Figure A5



Notes
IMPROVEMENTS RELATED TO PARKING, SPEED LIMITS, AND BUS STOPS ARE NOT SHOWN.

- Legend**
- LESS THAN \$5,000
 - \$5,000 TO \$30,000
 - OVER \$30,000
 - ARTERIAL IMPROVEMENT OVER \$200,000
 - - - ARTERIAL IMPROVEMENT OVER \$400,000

AREAWIDE TOPICS STUDY
Mercer County, N.J.

**IMPROVEMENT LOCATIONS
AND COSTS**

NEW JERSEY DEPARTMENT OF TRANSPORTATION
September 1972 Travers Associates Consultants

PRIORITY 2

Improvement	Report Area	Estimated Cost
Arterial Improvements		
Princeton Avenue	II	\$224,900.00
Signalized Intersections		
N. J. Route 27 (Nassau Street)/Mercer Street-University Place	I	19,800.00
N. J. Route 27 (Nassau Street)/Witherspoon Street	I	18,900.00
N. J. Route 27 (Nassau Street)/Washington Road-Vandeventer Avenue	I	29,100.00
N. J. Route 27 (Nassau Street)/Harrison Street	I	31,000.00
Harrison Street North/Hamilton Avenue	I	30,500.00
Witherspoon Street/Wiggins Street	I	19,800.00
Harrison Street North/Valley Road	I	41,700.00
Washington Road/Faculty Road	I	3,000.00
Parkside Avenue/Spruce Street Extension	II	39,400.00
East State Street/Nottingham Way	III	10,000.00
Nottingham Way/Mercerville Quakerbridge Road	III	2,000.00
White Horse Avenue/Arena Drive	III	2,800.00
Liberty Street/Newkirk Avenue	III	20,800.00
Nottingham Way/Ward Avenue	III	29,400.00
White Horse Avenue/South Clinton Avenue-Locust Avenue	III	29,100.00
Subtotal		\$327,300.00

PRIORITY 2 (Continued)

Improvement	Report Area	Estimated Cost
Non-Signalized Intersections and Between Intersection Improvements		
U.S. Route 206/Witherspoon Street-Valley Road	I	\$ 9,700.00
Avalon Place-Wiggins Street/Chambers Street-John Street	I	6,000.00
N. J. Route 33 (Greenwood Avenue)/Nottingham Way	III	2,600.00
Hamilton Avenue/Liberty Street-Kuser Road	III	3,700.00
Hamilton Square Yardville Road/Klockner Road	III	20,500.00
Cedar Lane/Sylvan Street	III	800.00
Hamilton Avenue/Ward Avenue	III	400.00
Hamilton Square Whitehorse Road/Kuser Road	III	4,800.00
Hamilton Square Whitehorse Road/Klockner Road	III	4,500.00
South Clinton Avenue/Fetter Avenue	III	4,200.00
Cornell Heights Bridge	III	500.00
Subtotal		\$ 57,700.00
Signal Systems		
Report Area	I	8,000.00
Report Area	II	18,000.00
Report Area	III	25,000.00
Subtotal		\$ 51,000.00
Total Priority 2		\$660,900.00

PRIORITY 3

Improvement	Report Area	Estimated Cost
Signalized Intersections		
Parkway Avenue/Lower Ferry Road	II	\$ 73,400.00
Parkway Avenue/North Olden Avenue Extension	II	19,400.00
Chambers Street/Cedar Lane	III	100.00
East State Street/Johnston Avenue	III	6,200.00
South Olden Avenue/Liberty Street	III	5,600.00
South Olden Avenue/Cedar Lane	III	1,700.00
Chambers Street/South Clinton Avenue	III	28,800.00
Nottingham Way/Hamilton Square Yardville Road-Mercer Street	III	37,000.00
South Broad Street/Yardville Allentown Road	III	50,700.00
Whitehead Road/Sweet Briar Avenue	III	52,200.00
Subtotal		\$275,100.00

PRIORITY 3 (Continued)

Improvement	Report Area	Estimated Cost
Non-Signalized Intersections and Between Intersection Improvements		
N. J. Route 29/Delaware Avenue	II	\$ 200.00
N. J. Route 29/Jacobs Creek Road	II	1,000.00
Princeton Pike/Provinceline Road	II	1,000.00
Scotch Road, north of Carlton Avenue	II	2,300.00
N. J. Route 156/South Broad Street	III	9,700.00
Cypress Lane	III	3,000.00
Klockner Road, between Kuser Road and U.S. Route 130	III	21,800.00
Kuser Road, 3000 feet east of Hamilton Square Whitehorse Road	III	300.00
Yardville Allentown Road at N. J. Turnpike Overpass	III	800.00
Subtotal		\$ 40,100.00
CBD Parking		
Report Area	I	217,000.00
Total Priority 3		\$532,200.00

PRIORITY 4

Improvement	Report Area	Estimated Cost
Bridge Improvement		
Mercer Street over Stony Brook	I	\$392,000.00
Traffic Operations		
Report Area	III	3,900.00
Speed Limits		
Report Area	I	3,600.00
Report Area	II	7,000.00
Report Area	III	<u>3,600.00</u>
	Subtotal	\$ 14,200.00
Public Transit		
Report Area	I	900.00
Report Area	II	7,300.00
Report Area	III	<u>6,200.00</u>
	Subtotal	\$ 14,400.00
	Total Priority 4	\$424,500.00

PRIORITY 5

Improvement	Report Area	Estimated Cost
Bridge Improvement		
Whitehead Road over the Assunpink Creek	III	\$407,000.00
	Total Priority 5	\$407,000.00

Existing Federal Aid Roadways

The total system of existing Federal Aid roadways is estimated at 118.1 miles within the study area and is subdivided as follows:

Federal Aid Roadway Classification	Mileage by Report Area			
	I	II	III	Total
Primary Type I	6.3	25.4	11.4	43.1
Secondary	2.1	25.3	23.8	51.2
Urban	-	7.6	16.2	23.8
Total	8.4	58.3	51.4	118.1

Figure A6 shows these roadways coded by color. It is noted that the existing 2.8-mile section of Interstate Route 95 in Report Area II is classified in the illustration as a Federal Aid, Primary Type I roadway since Federal funds amounted to 50% of the cost of construction, rather than 90% typically allocated to Interstate highways.

Also indicated in the illustration by dashed lines are the proposed Federal Aid Secondary roadways. These are official classifications presently on record. The total of 51.2 miles of Secondary roadways in the study area does not include the proposed sections shown in Figure A6.

Proposed Federal Aid, Primary Type II Roadways

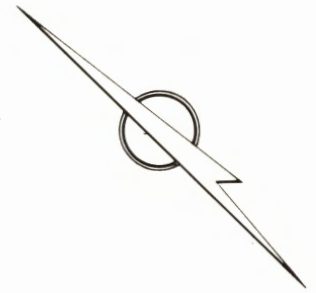
The recommended extension of the Federal Aid system as Primary Type II roadways is shown in orange in the illustration and has been chosen on the following basis:

- Roadways that have been proposed for improvement as a result of the Areawide TOPICS Study.
- Major collector streets or connectors.
- Roadway extensions which by virtue of being designated as Primary Type II would complete a roadway network and avoid "stub" sections on the Federal Aid system.

The proposed Primary Type II roadways are subdivided within the study area as follows:

Report Area I	7.0 miles
Report Area II	14.9 miles
Report Area III	<u>16.3 miles</u>
Total	38.2 miles

Figure A 6



Notes

I. THE PROPOSED FEDERAL AID SECONDARY ROADWAYS (SHOWN DASHED) HAVE BEEN PREVIOUSLY DESIGNATED BY OTHERS AND ARE SHOWN ONLY TO CLARIFY THE CONTINUITY OF THE FEDERAL AID SECONDARY SYSTEM.

Legend

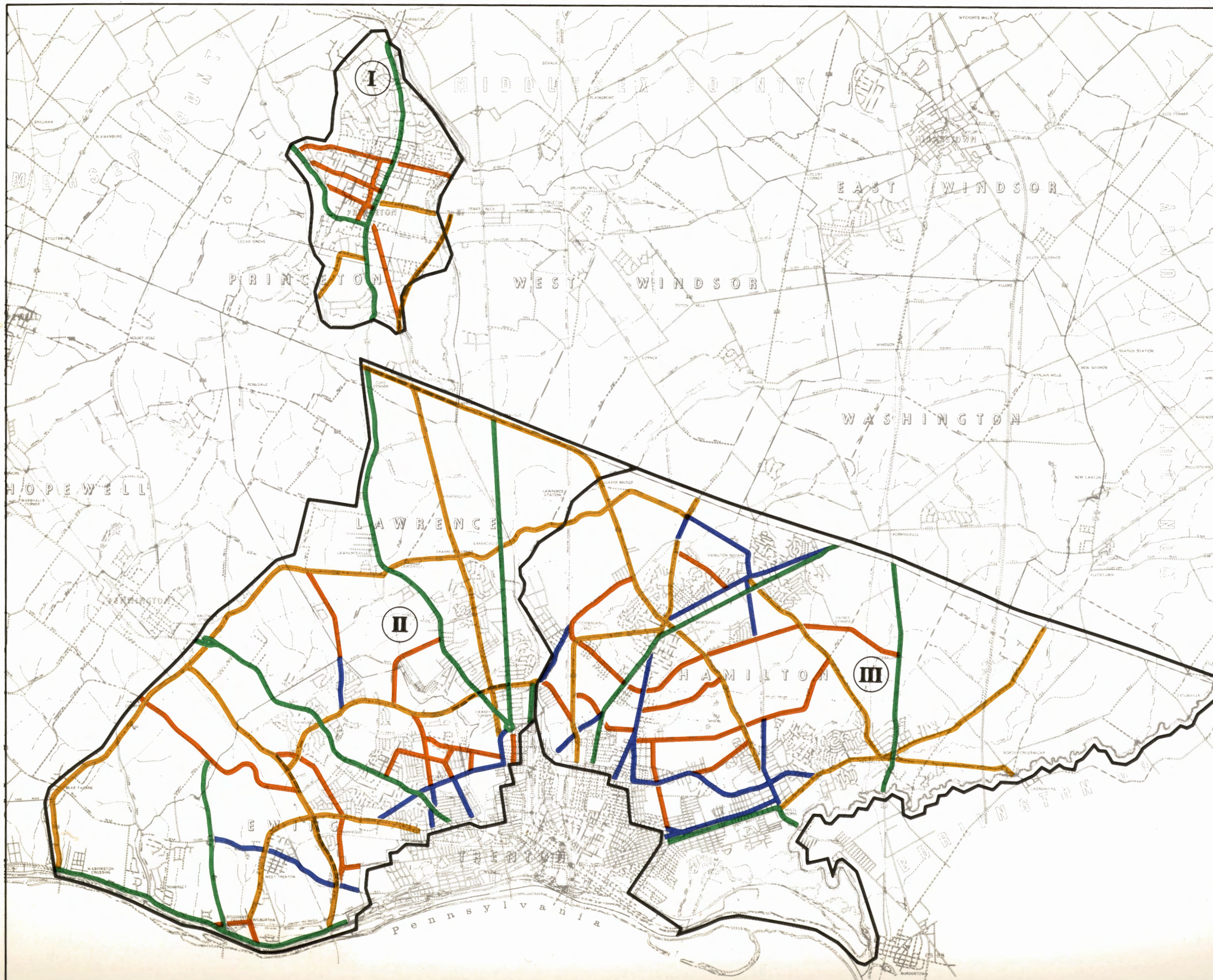
- PRIMARY TYPE I
- SECONDARY
- URBAN
- PRIMARY TYPE II (PROPOSED)

FEDERAL AID ROADWAYS	MILEAGE			
	AREA I	AREA II	AREA III	TOTAL
PRIMARY TYPE I	6.3	25.4	11.4	43.1
SECONDARY *	2.1	25.3	23.8	51.2
URBAN	—	7.6	16.2	23.8
PRIMARY TYPE II (PROP.)	7.0	14.9	16.3	38.2
TOTAL	15.4	73.2	67.7	156.3

* EXCLUDING PROPOSED SECTIONS

AREAWIDE TOPICS STUDY
Mercer County, N.J.

**PROPOSED
FEDERAL AID ROADWAYS**



The specific purposes of the TOPICS program are to facilitate the flow of traffic and reduce the potential for accidents. The success of the program is, to some degree, measurable through the use of traffic data that can be collected after completion of construction, and after an appropriate period of exposure. The project evaluations are to be based on a comparison of "before" and "after" data, and will be a major consideration relative to the future availability of Federal funds. Thus, a necessary final step in a TOPICS project is the completion of evaluations by the State, County, or municipality whose jurisdiction encompasses the street or highway where an improvement is located.

Speed-Delay

It is anticipated that the proposed signal systems will lead to improved travel speeds and reduced congestion and delays. Accordingly, speed-delay information should be gathered along the routes where the systems have been completed and the results compared with the speed-delay data collected during the study. It should be noted, however, that dramatic reductions in travel time are not anticipated, but perceptible benefits are expected, especially when evaluations are taken over an

extended length of roadway. It is further noted that the success of a signal system will very much depend upon the timing relationships that are ultimately programmed. Thus, the time settings initially proposed for each system should be adjusted in accordance with the findings of trial runs made during both peak and off-peak travel periods.

Accidents

The extensive accident data collected will also be useful toward completing evaluations of specific projects. Most intersections which were proposed for signalization had histories principally involving right angle accidents. At locations where improvements were proposed at existing signalized intersections, the accident history typically indicated a high number of same direction type and left turn type accidents. Other improvement locations listed below also suggested for evaluation are non-signalized intersections where right angle type accidents have been notable and the arterial highways which have experienced a high proportion of both right angle and same direction type accidents.

Existing Signalized Intersections: The following existing signalized intersections had three-year accident histories of 25 or more and are especially recommended for evaluation.

Location	Report Area
N. J. Route 27 (Nassau Street)/Witherspoon Street	I
N. J. Route 27 (Nassau Street)/Washington Road-Vandeventer Avenue	I
Witherspoon Street/Wiggins Street	I
North Olden Avenue Extension/Pennington Road	II
North Olden Avenue Extension/Parkside Avenue	II
North Olden Avenue Extension/Prospect Street	II
North Olden Avenue Extension/Princeton Avenue	II
Parkway Avenue/Lower Ferry Road	II
Parkway Avenue/North Olden Avenue Extension	II
Princeton Avenue/Spruce Street	II
Nottingham Way/Mercerville Quakerbridge Road	III
White Horse Avenue/Arena Drive	III

Proposed Signalized Intersections: The following locations have been recommended for traffic signal control and also had accident histories of 25 or more; accordingly, they are particularly suited for evaluation.

Location	Report Area
Harrison Street North/Valley Road	I
Parkside Avenue/Spruce Street Extension	II
Klockner Road/East State Street Extension	III
Liberty Street/Newkirk Avenue	III
Mercerville Whitehorse Road/Kuser Road	III
Mercerville Whitehorse Road/Klockner Road	III
Mercerville Quakerbridge Road/Youngs Road	III
Nottingham Way/Ward Avenue	III
South Broad Street/Yardville Allentown Road	III
South Olden Avenue/Arena Drive	III

Non-Signalized Intersection Improvements and Between Intersection Improvements: The following locations, with a three-year history of 15 or more accidents, are suggested for evaluation:

<u>Location</u>	<u>Report Area</u>
Mercer Street over Stony Brook	I
Witherspoon Street/Valley Road	I
N. J. Route 33 (Greenwood Avenue)/Nottingham Way	III
N. J. Route 156/South Broad Street	III
Cedar Lane/Sylvan Street	III
Hamilton Avenue/Ward Avenue	III
Hamilton Square Yardville Road/Klockner Road	III
Hamilton Square Whitehorse Road/Klockner Road	III
Hamilton Square Whitehorse Road/Kuser Road	III
South Clinton Avenue/Fetter Avenue	III

Arterial Highways: It is anticipated that the proposed improvements to North Olden Avenue Extension and Princeton Avenue will result in a substantial reduction of accidents both at intersections and between intersections. Accordingly, evaluation of these two projects is also recommended.

PART B

Detailed Proposals for Report Area II

SUMMARY

The Areawide TOPICS Study for Report Area II involved a total of 103 miles of streets and highways which comprised the study network and included all existing Federal Aid roadways together with other State and local roadway segments.

The findings and recommendations of the study focus on intersection improvements - in particular, signalized intersection improvements together with related signal systems. Other street and highway improvements are also recommended.

The total estimated cost for all improvements is \$1,004,200.00. It is anticipated that implementation of the program will be scheduled over a five-year period with project priorities reflecting consideration of functional urgency, safety, system influence, proximity to related physical improvements, and effect on cost balance.

Accidents

The accident history of 87 intersections was recorded for the three-year study period of 1968-1970 at locations where six or more accidents had occurred. These are summarized in Table A of the Appendix. Each of the 37 intersections which had a history of 15 or more accidents in three years was investigated.

The incidence of between intersection accidents was noted to be appreciably less than the incidence of accidents at intersections and therefore of less significance in the overall accident analysis. The between intersection accident histories along North Olden Avenue Extension and Princeton Avenue, however, were an exception and of a magnitude to influence the proposed improvements. A location on Scotch Road has been similarly recommended for improvement partly as a result of its between intersection accident history.

A total of six fatal accidents occurred in Report Area II at five intersections during the three-year study period. Each of these locations was investigated.

State Highway Improvements

The New Jersey Department of Transportation has directed that no improvements on State highways be scheduled for TOPICS implementation at this time. Where an improvement is proposed at the intersection of a State highway and a local road, however, the Department's guideline permits programming the project with TOPICS funds if the principal beneficiary is local traffic. In other instances, where the proposed improvement is primarily on the State highway, the deficiencies and possible relief measures are discussed, but no cost estimate has been made, nor has the improvement been scheduled for TOPICS implementation. The intent of the Department is to implement the improvements as funds become available.

Arterial Highway Improvements

Proposed improvements to portions of two major arterial highways comprise a major part of the study effort and estimated implementation costs. The proposed North Olden Avenue Extension and Princeton Avenue projects include improvements to two of the most heavily traveled and accident prone roadways within the study area.

The improvement of the mile long section of North Olden Avenue between Pennington Road and the Korvette City shopping center has been scheduled for Early Implementation. The proposal recommends widening of the highway to provide four through lanes and a continuous left turn center lane, in addition to the reconstruction of four principal intersections. Three existing signal installations are recommended for modernization and one new signal installation proposed. The total cost of the project is estimated at \$499,000.00.

The half-mile long Princeton Avenue improvement between North Olden Avenue and the Brunswick Circle Extension also provides a five-lane cross section throughout most of its length. The project includes reconstruction of two existing signalized intersections and the signalization of a third location. The total cost of the project is estimated at \$224,900.00.

Other Improvements

Proposed improvements relative to other signalized intersections also comprise a substantial portion of the study. Two existing installations are scheduled for reconstruction, and four unsignalized intersections

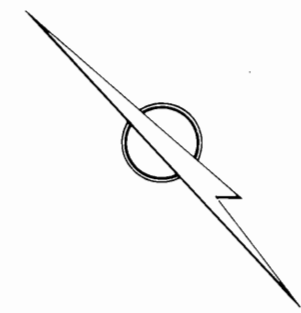
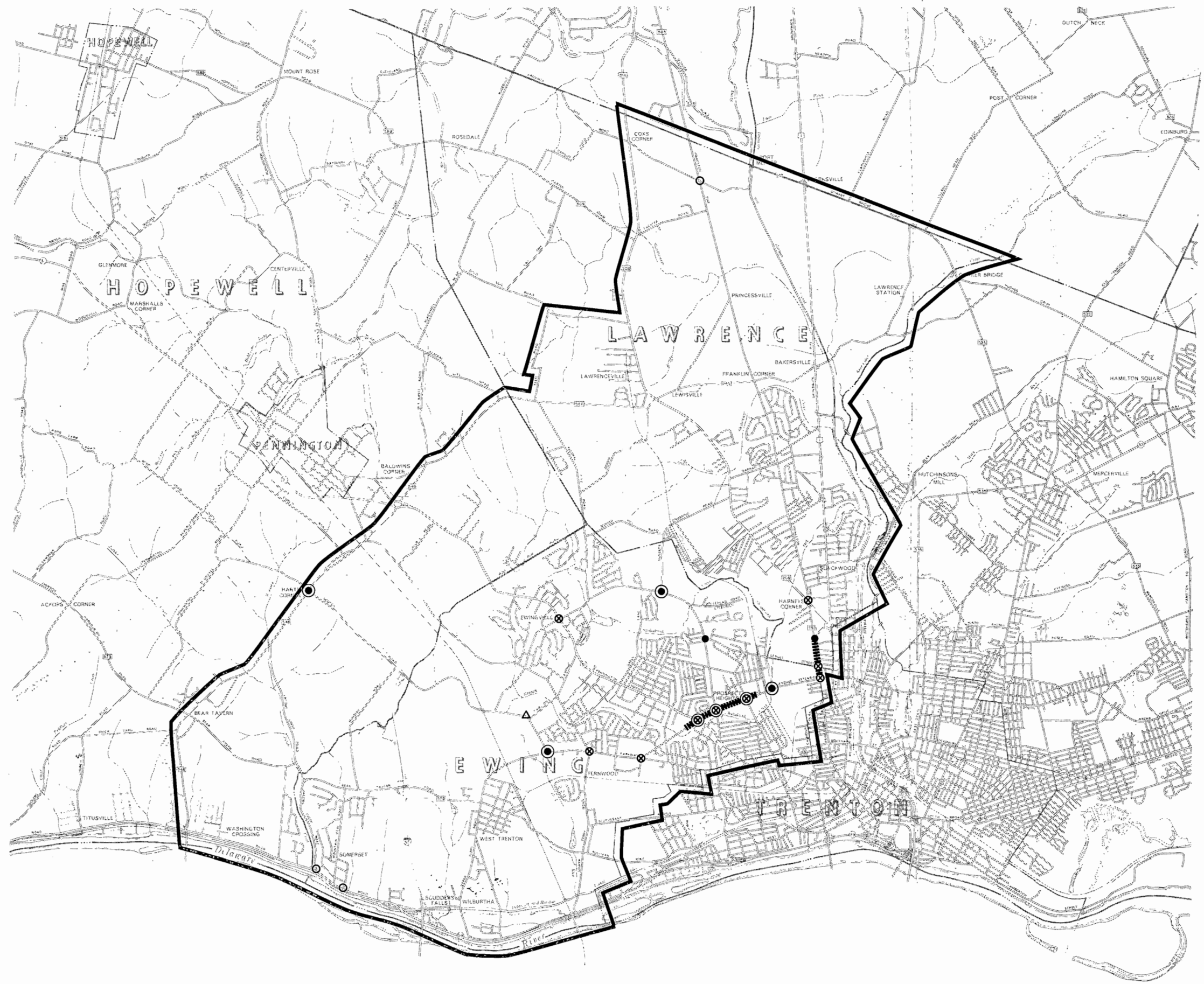
are recommended for traffic signal control. Three of the new installations are proposed for Early Implementation. The total cost for all six projects is estimated at \$243,500.00.* All proposed signalized intersection improvements as well as other projects are shown in Figure B1.

Of the ultimate 42 signalized intersections within Report Area II, 32 are proposed for interconnection in one of five signal systems that have been recommended. Two systems include a total of 17 signalized intersections on the County network, while 15 other locations relate to signals on State highways. The total cost of providing the two County signal systems is estimated at \$18,000.00.

Three improvement projects have been recommended at non-signalized intersections, as well as three other projects related to a section of curved roadway, the posting of speed limits, and bus stop improvements. The total estimated cost of these six scheduled improvements is estimated at \$18,800.00.

*Existing and proposed traffic signal locations are listed in Table B of the Appendix. Improvements have been proposed to two other signalized intersections located on the State highway system; these have not been scheduled.

Figure B1



Legend

- EARLY IMPLEMENTATION
- ⊗ EXISTING SIGNALIZED INTERSECTIONS (9)
- PROPOSED SIGNALIZED INTERSECTIONS (6)
- NON-SIGNALIZED INTERSECTIONS (3)
- △ BETWEEN INTERSECTION LOCATIONS (1)
- ▬ ARTERIAL ROADWAYS

AREAWIDE TOPICS STUDY
Mercer County, N.J.
Report Area II

IMPROVEMENT LOCATIONS

NEW JERSEY DEPARTMENT OF TRANSPORTATION
September 1972 Travers Associates Consultants

EARLY IMPLEMENTATION
NORTH OLDEN AVENUE EXTENSION IMPROVEMENTS

EARLY IMPLEMENTATION
NORTH OLDEN AVENUE EXTENSION IMPROVEMENTS (Figures B2, B3, and B4)

North Olden Avenue Extension accommodates some 30,000 vehicles a day and functions as an arterial roadway while also serving the access needs of the abutting commercial development. Accordingly, traffic operation on the County roadway is adversely affected by the conflicting demands of through traffic and driveway traffic. This section of the report relates specifically to the one-mile section of North Olden Avenue west of the Korvette City shopping center up to and including N.J. Route 31 (Pennington Road).

Existing Conditions

Along the Korvette City frontage, North Olden Avenue Extension is divided by a median island with channelization that accommodates shopping center access. West of the center, the roadway becomes a four-lane undivided facility. Parking is prohibited along both sides, and traffic signals presently operate at the Pennington Road, Parkside Avenue, and Prospect Street intersections. Traffic volumes at each of these intersections are at, or above, capacity levels during peak periods of operation.

For the most part, North Olden Avenue is uncurbed, a condition which permits indiscriminate ingress to and egress from the various commercial establishments. The slower speeds of shopper vehicles turning into and out of these sites are in continued conflict with through motorists who typically travel at speeds of 40 mph. More than half of

the 433 accidents that occurred between 1968 and 1970 along this section of North Olden Avenue took place between intersections. Of these, 132 were same direction type accidents and 68 were right angle type; both categories relate directly to vehicular maneuvers at the numerous driveways along the heavily developed section of the roadway. While the total number of head-on type accidents is not great, these incidents usually result in serious injuries or fatalities to the persons involved. It is noted that seven of the ten head-on type accidents occurred between intersections.

Proposed Improvements

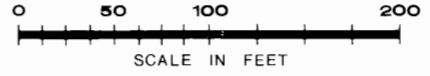
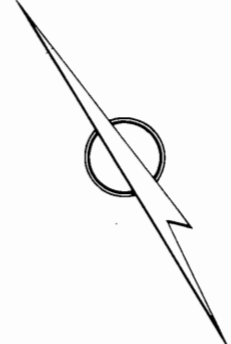
It is proposed to reconstruct principal intersections, including signal control, and to widen North Olden Avenue Extension between Pennington Road and the Korvette City shopping center as an Early Implementation project.* It is anticipated that no right-of-way acquisition will be required to complete the following improvements:

*Present volumes meet the Minimum Vehicular Volume Warrant for traffic signal control at the Pennington Road, Parkside Avenue, Prospect Street, and Artic Parkway intersections.

- . Widen North Olden Avenue Extension to 66 feet to accommodate four operating traffic lanes plus a center left turn lane usable by both directions of traffic.
- . Install curbing along North Olden Avenue Extension, providing appropriate curb cuts for access to abutting land use in a manner consistent with the needs of each establishment.
- . Install long lasting thermoplastic pavement markings to mark four through lanes and a single two-way left turn lane in the manner prescribed by the "Manual on Uniform Traffic Control Devices for Streets and Highways."
- . Install either ground mounted or overhead signs reserving the center lane for left turns only.
- . Provide channelization at the Pennington Road, Parkside Avenue, Prospect Street, and Artic Parkway intersections to guide traffic movements and define turning lanes.

- . Widen Pennington Road to provide a median lane for vehicles turning left into North Olden Avenue Extension and replace all existing signal hardware. Provide three-phase, semi-actuated traffic signal control, with gap reduction capability, accommodating left turns from Pennington Road on one of the actuated phases.
- . Replace all signal hardware at the Parkside Avenue and Prospect Street intersections, and operate the new semi-actuated signals with five-phase, "dual-left" control to accommodate left turns from North Olden Avenue Extension.
- . Provide semi-actuated traffic signal control at Artic Parkway which is presently unsignalized. Four-phase operation is proposed which will permit left turn signaling for North Olden Avenue Extension together with special phasing for Artic Parkway.
- . Interconnect the four aforementioned signal installations with the signals at the Korvette City driveway and those on Parkway Avenue and Princeton Avenue as proposed in the SIGNAL SYSTEMS section of this report.

Figure B2

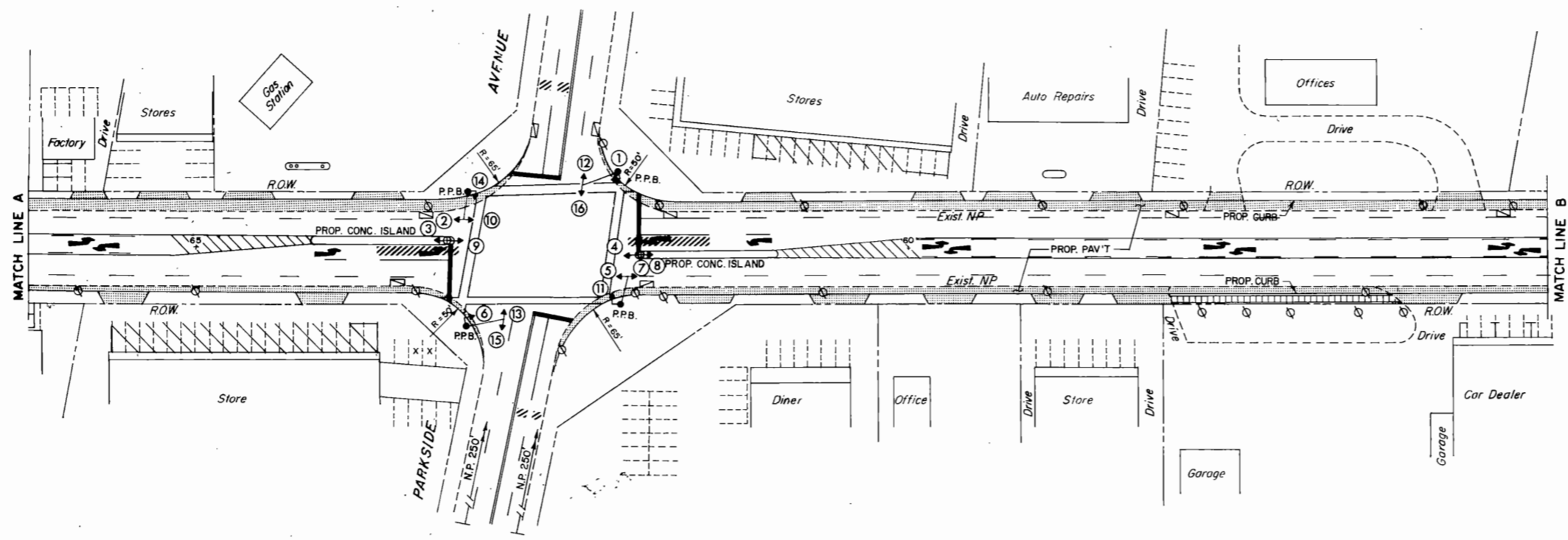
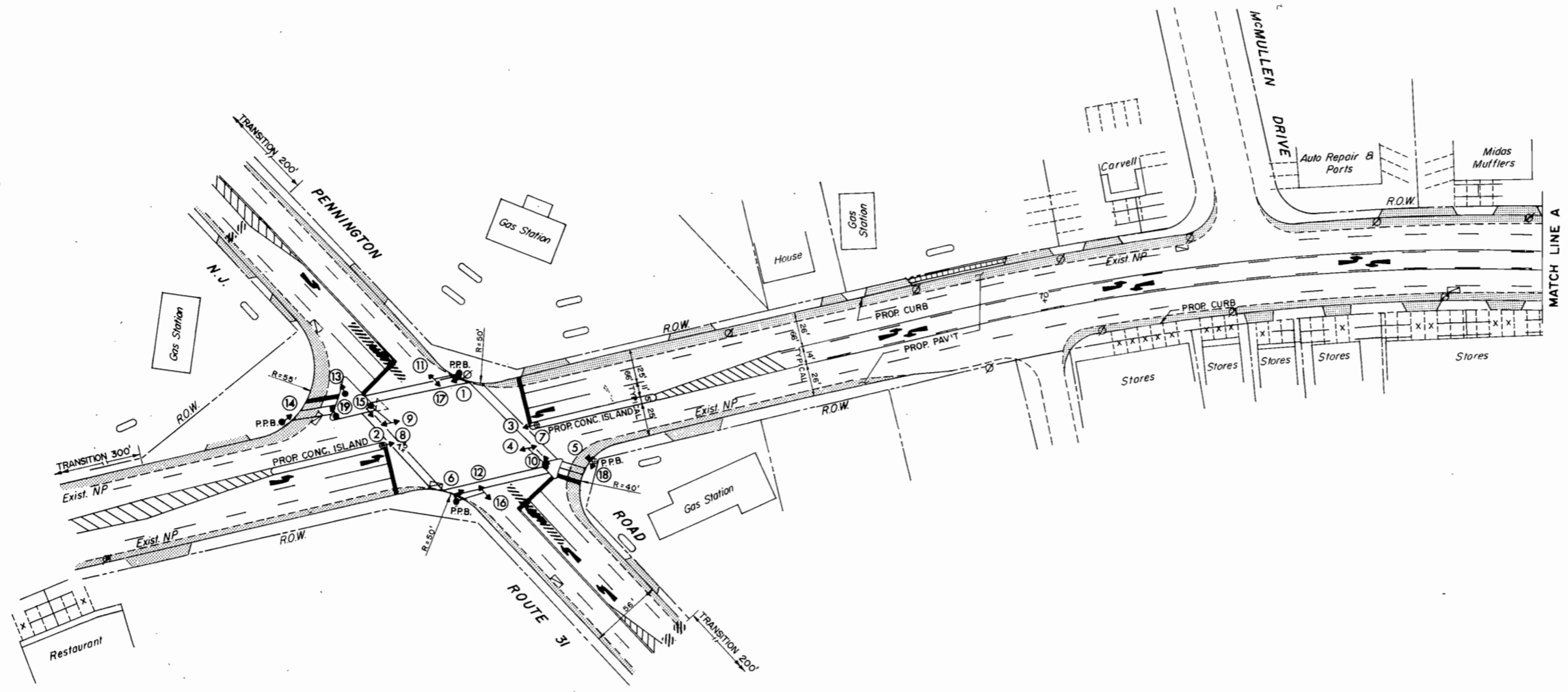


Notes

1. Existing noted by lower case lettering.
2. PROPOSED NOTED BY UPPER CASE LETTERING.
3. SIGN DESIGNATIONS WITH THE PREFIX R OR W REFER TO SIGNS DESCRIBED IN THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS"
4. ALL EXISTING SIGNS ARE TO REMAIN UNLESS OTHERWISE NOTED.
5. PARKING PROHIBITIONS DESIGNATED BY NP FOR NO PARKING AND NSS FOR NO STOPPING OR STANDING.
6. EXISTING R.O.W. IS APPROXIMATE AND BASED ON INVENTORY DATA.

Legend

- PROPOSED SIGNAL POLE
- ⊕ PROPOSED PEDESTAL
- EXISTING SIGNAL POLE OR PEDESTAL
- ⊗ EXISTING UTILITY POLE
- ➔ PROPOSED SIGNAL FACE
- EXISTING SIGNAL FACE
- ▭ EXISTING INLET
- ▬ PROPOSED PRESSURE DETECTOR
- ▬ EXISTING PRESSURE DETECTOR
- ▨ PROPOSED LOOP DETECTOR
- ▬ PROPOSED PEDESTRIAN PUSH BUTTON
- ▭ PROPOSED PARKING STALL
- ▭ EXISTING PARKING STALL TO REMAIN
- ▭ EXISTING PARKING STALL TO BE ELIMINATED
- ▨ PROPOSED PAVEMENT
- ▨ PROPOSED SIDEWALK



AREAWIDE TOPICS STUDY
Mercer County, N.J.
 Report Area II • Ewing Township
NORTH OLDEN AVENUE EXTENSION

Other Considerations

The reconstruction of North Olden Avenue and the installation of curbing will affect the present parking arrangement of some of the abutting properties. Those establishments that presently have little parking depth and have continuous uncurbed access across their property frontage will be most affected. In several instances, present operation permits parked vehicles to occupy a portion of the right-of-way. A study was made to determine the effect that roadway reconstruction and controlled driveway access will have on parking. One possible parking arrangement is shown in Figures B2, B3, and B4. The plan would result in the elimination of an estimated total of 13 spaces on the north side of North Olden Avenue and 25 spaces on the south side.

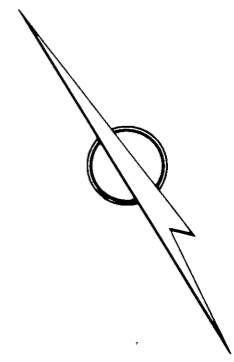
Another item that has been considered relative to the proposed improvement is the reconstruction of the existing bridge over the Shabakunk Creek west of Artic Parkway. This will be necessary to accommodate the widening of North Olden Avenue. The County of Mercer has made a decision to replace the structure in its entirety rather than widen the existing span, and will complete the reconstruction as a separate project outside of the TOPICS program.

Benefit

It is anticipated that the proposed North Olden Avenue Extension improvements will benefit traffic operations in terms of both increased capacity and safety. Each of the signalized intersections will accommodate left turns from North Olden Avenue in separate, reserved lanes, and left turn signal phasing will permit protected maneuvers. Accordingly, same direction type and left turn type accidents will potentially be reduced and intersection capacity increased.

The center lane extending throughout the length of the project will provide a refuge area for those vehicles turning left into the various private drives. Thus, the same benefits as described above, in terms of reduced accident potential, will accrue along the entire roadway. Delays to through traffic will also be minimized. Moreover, vehicles exiting from the driveways can also make use of the center lane for left turns, requiring acceptable gaps in only one direction of traffic thereby reducing the potential for right angle type accidents. Finally, pedestrians crossing North Olden Avenue can also seek refuge in the center lane, adding to their safety.

Figure B3

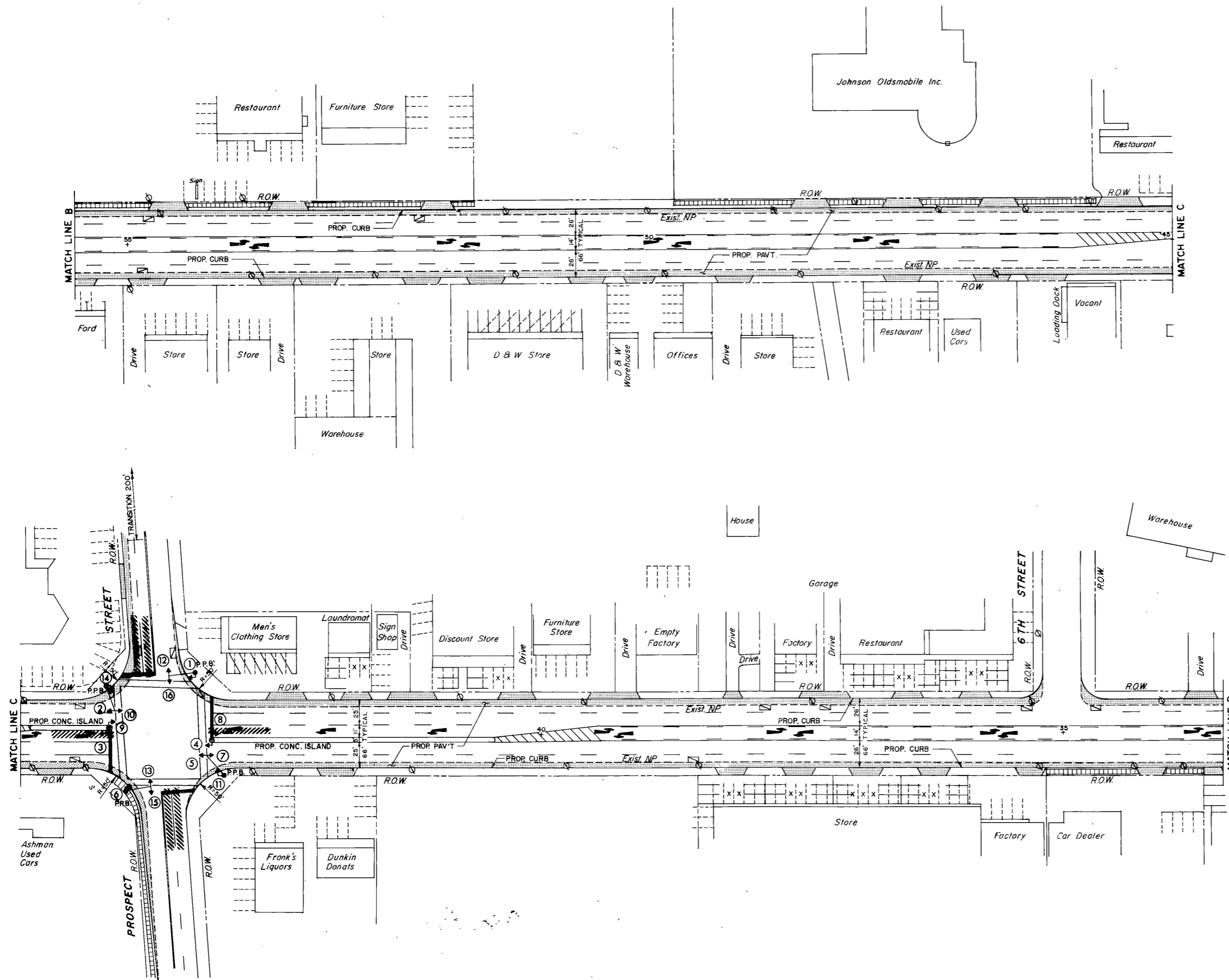


Notes

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Legend

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- ⊗ EXISTING UTILITY POLE
- ➔ PROPOSED SIGNAL FACE
- ➔ EXISTING SIGNAL FACE
- ⊞ EXISTING INLET
- PROPOSED PRESSURE DETECTOR
- ▭ EXISTING PRESSURE DETECTOR
- ▨ PROPOSED LOOP DETECTOR
- PPB. PROPOSED PEDESTRIAN PUSH BUTTON
- ▭ PROPOSED PARKING STALL
- ▭ EXISTING PARKING STALL TO REMAIN
- X EXISTING PARKING STALL TO BE ELIMINATED
- ▨ PROPOSED PAVEMENT
- ▨ PROPOSED SIDEWALK



AREAWIDE TOPICS STUDY
Mercer County, N.J.
Report Area II • Ewing Township
NORTH OLDEN AVENUE EXTENSION

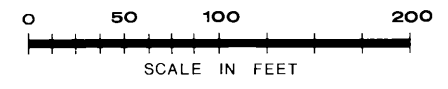
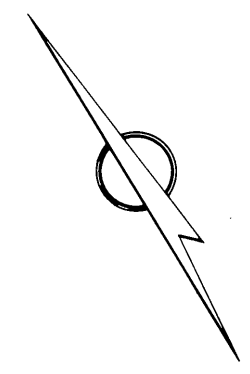
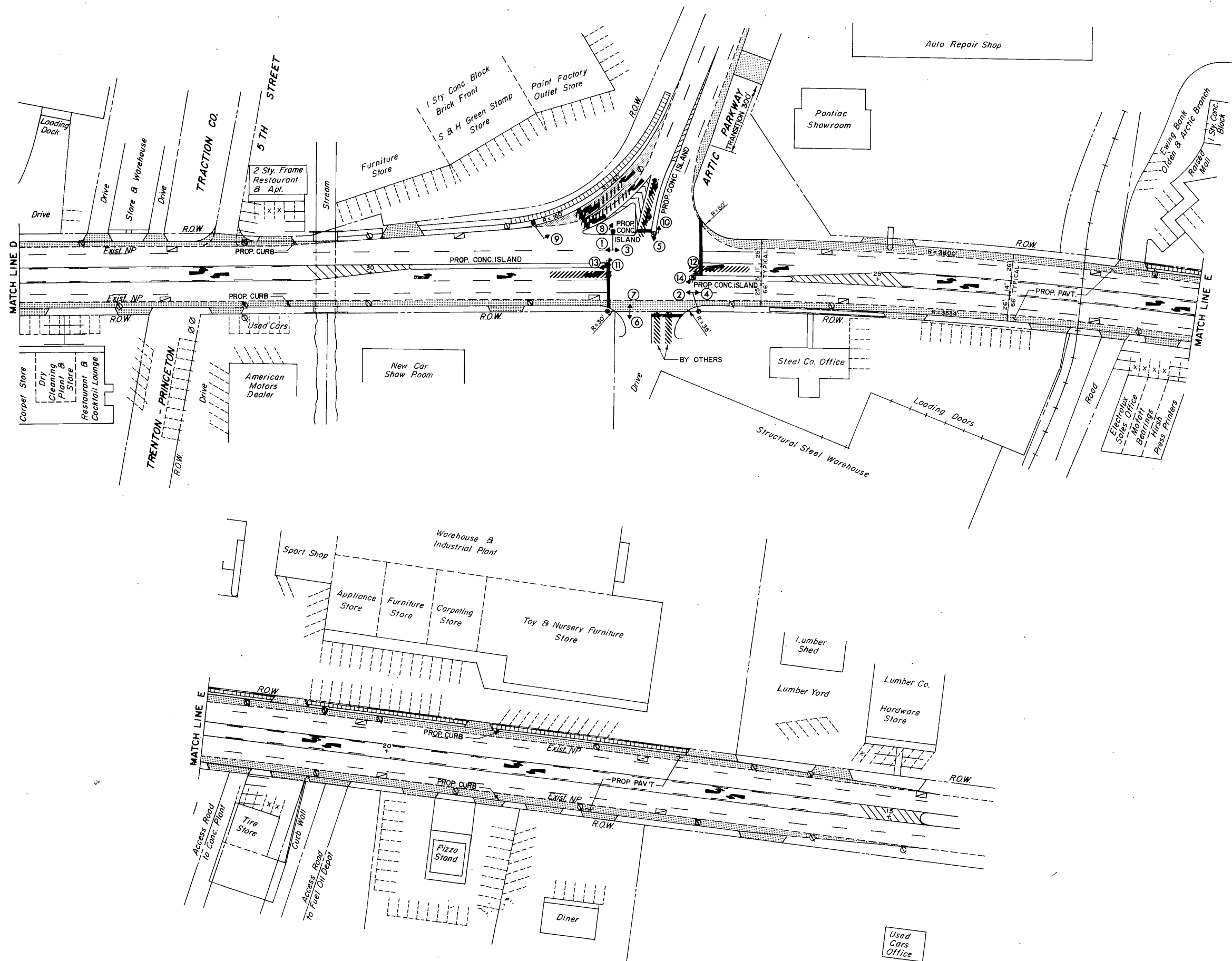
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September 1972 Travers Associates Consultants

Cost Estimate

The following estimate of construction and engineering lists separate costs for each of the four proposed intersection improvements (including signalization) and all between intersection improvements along North Olden Avenue as a single item. Costs of the proposed signal system are not included in the estimate, but are included in the SIGNAL SYSTEMS section of the report.

<u>Intersection Improvements</u>	<u>Construction</u>	<u>Engineering</u>	<u>Total</u>
Pennington Road	\$ 74,000.00	\$ 8,900.00	\$ 82,900.00
Parkside Avenue	53,600.00	6,400.00	60,000.00
Prospect Street	61,600.00	7,400.00	69,000.00
Artic Parkway	<u>78,900.00</u>	<u>9,500.00</u>	<u>88,400.00</u>
Subtotal	\$268,100.00	\$32,200.00	\$300,300.00
<u>Between Intersection Improvements</u>			
North Olden Avenue	<u>\$177,400.00</u>	<u>\$21,300.00</u>	<u>\$198,700.00</u>
TOTAL	\$445,500.00	\$53,500.00	\$499,000.00

Figure B4



- Notes**
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 - ▨ PROPOSED LOOP DETECTOR
 - RB. PROPOSED PEDESTRIAN PUSH BUTTON
 - PROPOSED PARKING STALL
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 - ▨ PROPOSED PAVEMENT
 - ▨ PROPOSED SIDEWALK

AREAWIDE TOPICS STUDY
 Mercer County, N.J.
 Report Area II • Ewing Township
NORTH OLDEN AVENUE EXTENSION
 NEW JERSEY DEPARTMENT OF TRANSPORTATION
 September 1972 Travers Associates Consultants

EARLY IMPLEMENTATION - INTERSECTION IMPROVEMENTS

EARLY IMPLEMENTATION - INTERSECTION IMPROVEMENTS

During the initial phases of the study, it became apparent that certain locations would obviously qualify for improvement under the TOPICS program due to their poor accident history or inadequate capacity to accommodate traffic. Consideration of these facts and discussions with interested officials led to choosing three intersections for early analysis and implementation and resulted in proposals for providing traffic signal control at each location. The discussion for each of the following Early Implementation projects is accompanied by a drawing illustrating the recommended improvements:

Ewingville Road/Eggert Crossing Road
Parkway Avenue/Scotch Road
Washington Crossing Pennington Road/Scotch Road

EWINGVILLE ROAD-EGGERT CROSSING ROAD (Figure B5)

Existing Conditions

Ewingville Road, in conjunction with Parkside Avenue and Upper Ferry Road, serves as a circumferential route around the central portion of Ewing Township. North of the intersection, Ewingville Road has a 52-foot wide pavement while to the south it is 40 feet wide. Eggert Crossing Road begins at Ewingville Road and extends in a northeasterly direction, meeting Route 206 at a signalized "T" intersection. At Ewingville Road the paved roadway width of Eggert Crossing Road is 29 feet. School buses travel along Eggert Crossing Road daily, eastbound in the morning and westbound in the evening, picking up and discharging children in the vicinity of Ewingville Road.

Analysis of the capacity of the intersection indicates a deficiency, which in part is reflected by delays to Eggert Crossing Road traffic attempting to enter Ewingville Road. Observed delays during a recent survey by the New Jersey Department of Transportation averaged over 100 seconds per vehicle between 4:00 and 5:00 P.M. Review of the three-year accident history at the intersection indicates that, of the 13 total accidents, five were same direction type, four involved fixed objects, and three were right angle type.

Proposed Improvements

Present volumes meet the Minimum Vehicular Volume Warrant for traffic signal control; furthermore, the New Jersey Department of Transportation has authorized a traffic signal installation at the Ewingville

Road/Eggert Crossing Road intersection. Accordingly, the following improvements are recommended:

- . Widen the southerly leg of Ewingville Road to 52 feet and widen Eggert Crossing Road to 42 feet.
- . Provide three-phase, semi-actuated signal control with a lagging green phase for southbound vehicles.

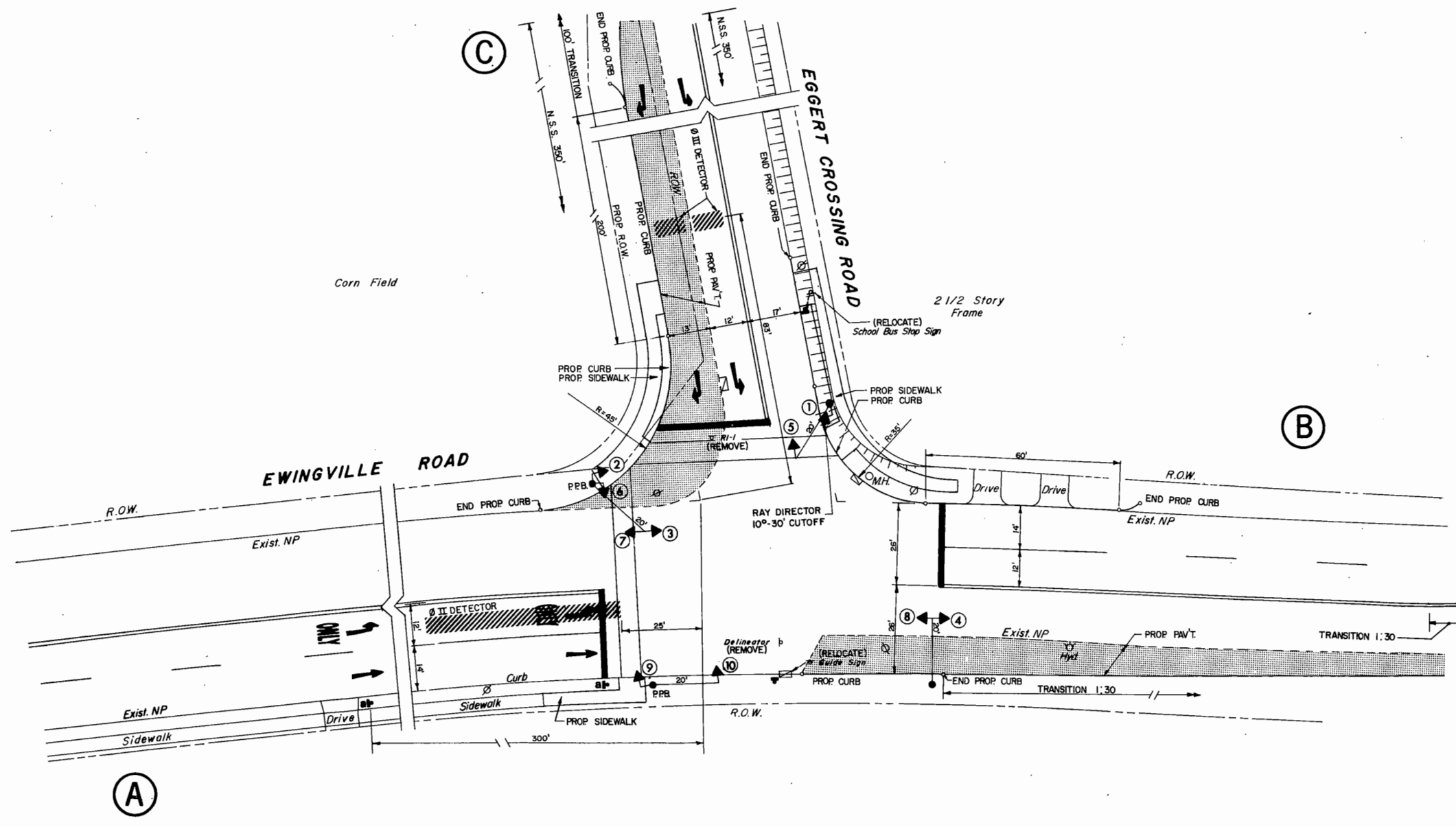
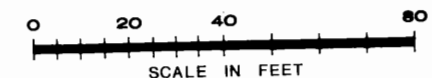
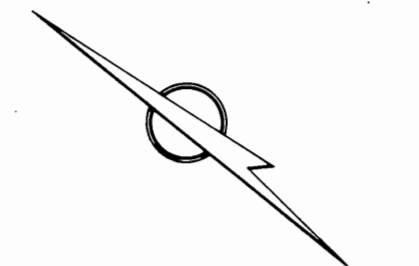
Benefit

The widening of the southerly leg of Ewingville Road will reduce the potential hazard caused by the present offset while permitting two approach lanes for southbound traffic. The additional width on Eggert Crossing Road will permit separate approach lanes for left and right turning traffic, thereby providing greater intersection capacity. The proposed signal installation will reduce intersection delay, and the potential for right angle type accidents.

Cost Estimate

Construction	\$32,500.00
Engineering	<u>3,900.00</u>
Total	\$36,400.00

Figure B5

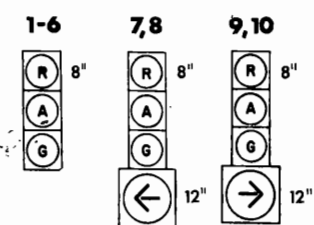
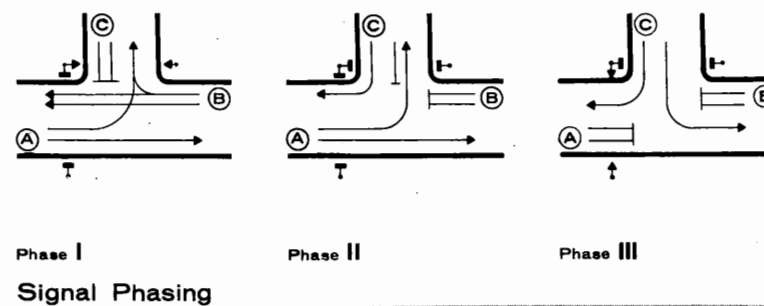
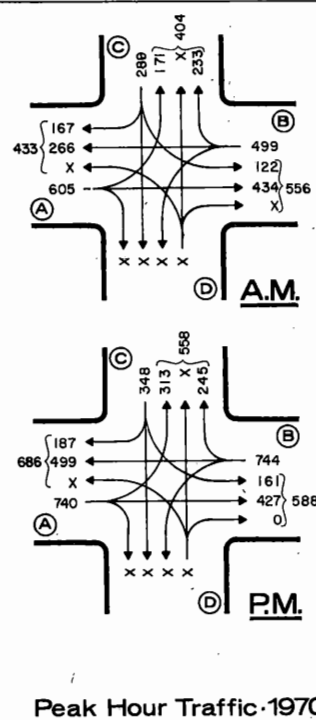
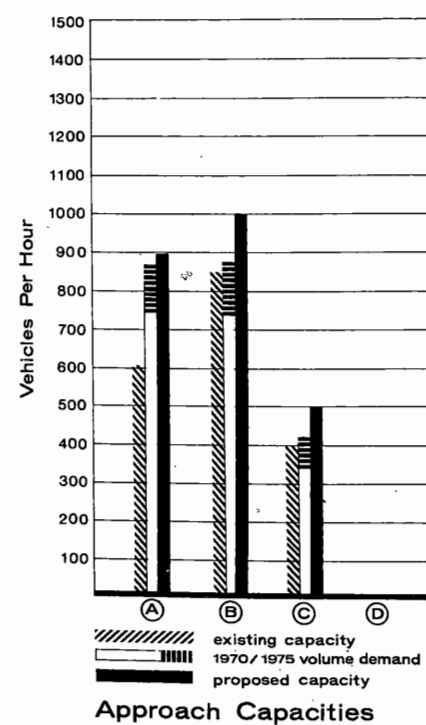


Notes

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2. PROPOSED NOTED BY UPPER CASE LETTERING.
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4. ALL EXISTING SIGN TO REMAIN UNLESS OTHERWISE NOTED.
5. PARKING PROHIBITIONS DESIGNATED BY NP FOR NO PARKING AND NSS FOR NO STOPPING OR STANDING.
6. EXISTING R.O.W. IS APPROXIMATE AND BASED ON INVENTORY DATA.

Legend

- PROPOSED SIGNAL POLE
- ⊕ PROPOSED PEDESTAL
- EXISTING SIGNAL POLE OR PEDESTAL
- ⊗ EXISTING UTILITY POLE
- ▶ PROPOSED SIGNAL FACE
- ◀ EXISTING SIGNAL FACE
- ▭ EXISTING INLET
- ▨ PROPOSED PRESSURE DETECTOR
- ▭ EXISTING PRESSURE DETECTOR
- ▨ PROPOSED LOOP DETECTOR
- ▭ EXISTING LOOP DETECTOR
- PPB PROPOSED PEDESTRIAN PUSH BUTTON
- ⬆ PROPOSED SIGN
- ⬆ EXISTING SIGN
- ▨ PROPOSED PAVEMENT



AREAWIDE TOPICS STUDY
 Mercer County, N.J.
 Report Area II · Ewing Township

**EWINGVILLE ROAD
 EGGERT CROSSING ROAD**

NEW JERSEY DEPARTMENT OF TRANSPORTATION
 September 1972 Travers Associates Consultants

PARKWAY AVENUE AND SCOTCH ROAD (Figure B6)

Existing Conditions

Parkway Avenue is a four-lane facility with pavement widths of 48 feet south of Scotch Road and 54 feet north of the intersection. Scotch Road is a two-lane facility throughout, except at Parkway Avenue where it is four lanes wide with curbed channelizing islands. Sylvia Street, located opposite Scotch Road, is an unpaved roadway that leads to a nursery school. The school, however, makes use of other access facilities; accordingly, Sylvia Street is presently not in use.

Analysis of the capacity of the intersection indicates no deficiencies. The traffic volumes on Parkway Avenue, however, exceed 1500 vph from 3:00 to 5:00 P.M., a condition which results in considerable delay to left turning traffic from Scotch Road. Of the 17 recorded accidents occurring at the intersection during the 36-month study period, 11 were of the same direction type and five were of the right angle type. Five of the same direction accidents occurred on the Scotch Road approach and probably were, in part, the result of left turning vehicles making false starts.

Proposed Improvements

Based on the data from the four-hour traffic count, it is estimated that present volumes meet the Interruption of Continuous Traffic Warrant when the traffic volumes are reduced to 70% of those required where the 85th percentile speed exceeds 40 mph. It is also noted that the New

Jersey Department of Transportation has authorized signalization at the Parkway Avenue/Scotch Road intersection. Accordingly, the following improvements are recommended:

- . Realign and curb a portion of the westerly edge of Parkway Avenue south of the intersection.
- . Provide two-phase, semi-actuated traffic signal control with a leading green for southbound Parkway Avenue traffic.

Benefit

The realignment of the southerly leg of Parkway Avenue will reduce the potential hazard to southbound traffic caused by the present pavement offset. Traffic signal control will permit Scotch Road traffic to interrupt the flow of Parkway Avenue traffic, thereby reducing delays as well as false starts and the potential for accidents resulting therefrom. The signal will also reduce the potential for right angle type accidents.

Cost Estimate

Construction	\$22,500.00
Engineering	<u>2,700.00</u>
Total	\$25,200.00

WASHINGTON CROSSING PENNINGTON ROAD AND SCOTCH ROAD (Figure B7)

Existing Conditions

The 20-foot wide traveled way of Washington Crossing Pennington Road is flanked by eight-foot wide bituminous shoulders. Scotch Road is paved 24 feet wide north of Washington Crossing Pennington Road and 38 feet wide south of the intersection. Washington Crossing Pennington Road is the principal east-west arterial in Hopewell Township and has witnessed an increase in traffic of more than one-third during the last five years. The greatest traffic activity at the subject intersection occurs on the east leg, notably during the peak hour of 4:00 to 5:00 P.M. when more than half of the westbound traffic turns left into Scotch Road, while a comparable volume of northbound traffic turns right into Washington Crossing Pennington Road.

Analysis of the capacity of the intersection indicates that the two aforementioned approaches are deficient. The intersection accident history indicates that during the 36-month study period a total of seven reportable accidents occurred, of which five were right angle type and two same direction type.

Proposed Improvements

Present volumes meet the Minimum Vehicular Volume Warrant for traffic signal control for six of the eight required hours when reduced to 70% of the prescribed volumes where the 85th percentile speed exceeds 40 mph. It is anticipated that in the near future volumes will increase to a level where the volume warrant will be fully met. It is also noted

that the New Jersey Department of Transportation has authorized signalization at the subject intersection. Accordingly, the following improvements are recommended.

- . Widen the easterly leg of Washington Crossing Pennington Road and provide a pavement transition along the north side of the westerly leg.
- . Widen the southerly approach of Scotch Road to provide two approach lanes, and separate opposing traffic with a curbed island.
- . Provide two-phase, semi-actuated traffic signal control.

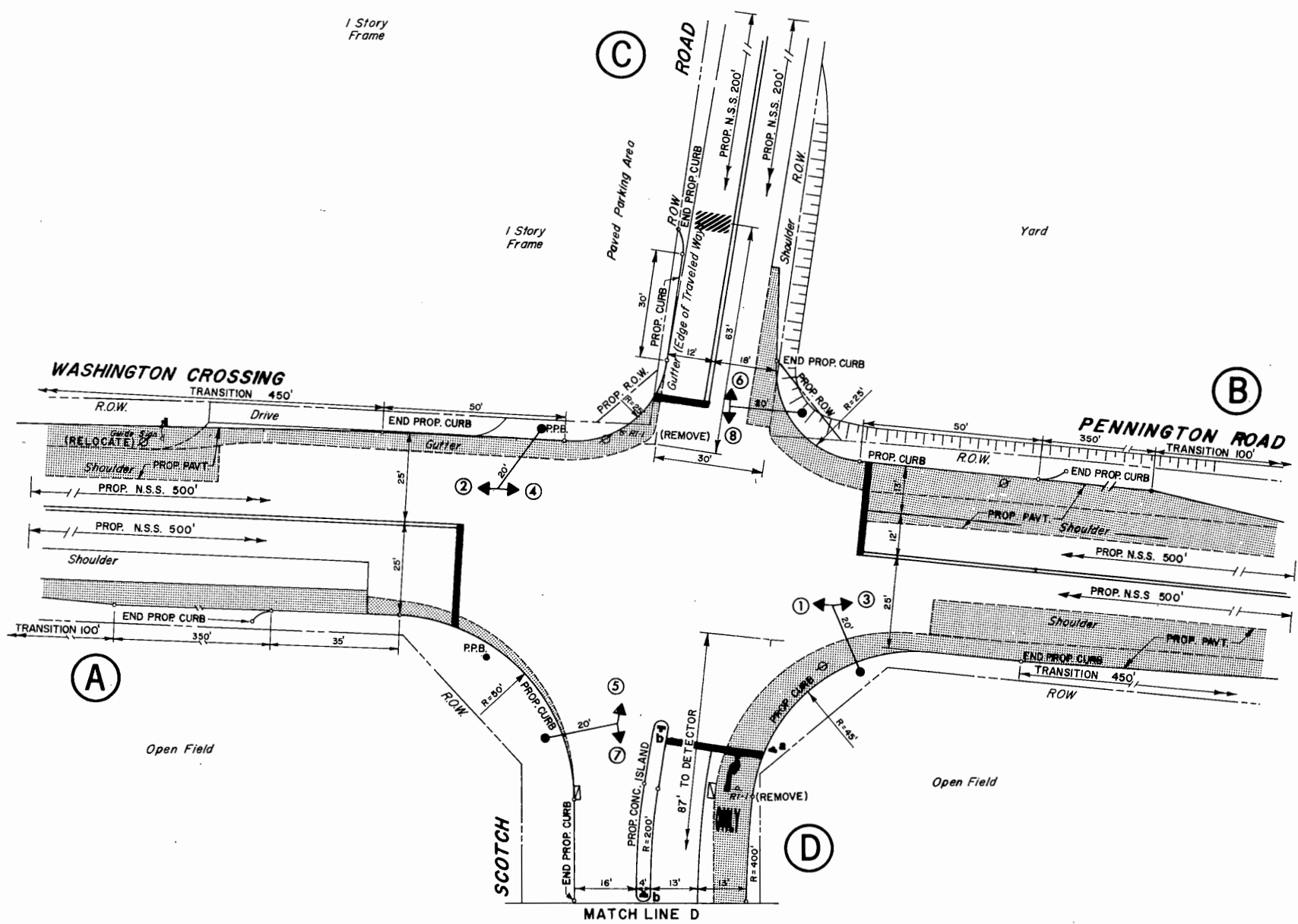
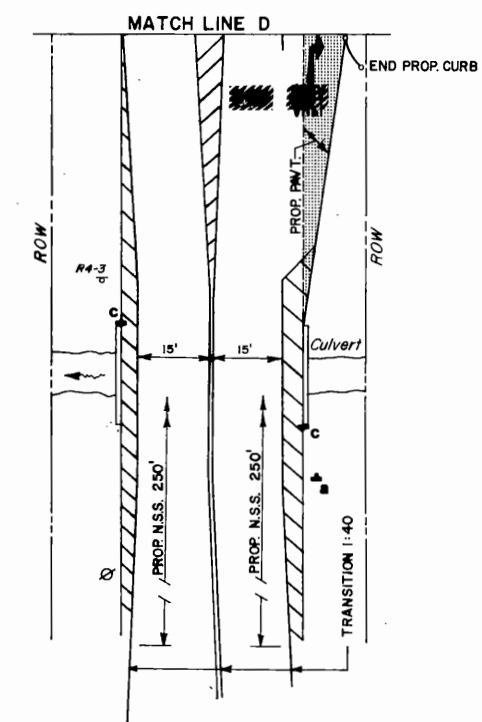
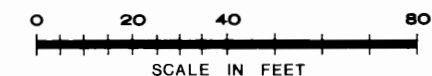
Benefit

It is anticipated that the proposed improvements will result in increased intersection capacity and reduced delay, as well as in providing intersection geometry compatible with future traffic needs.

Cost Estimate

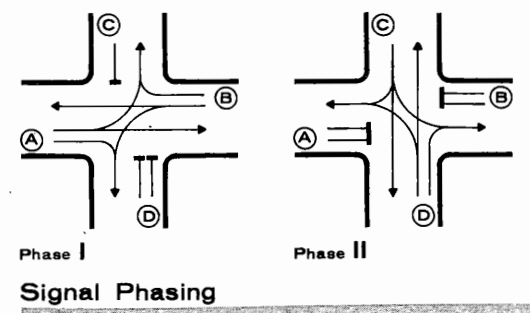
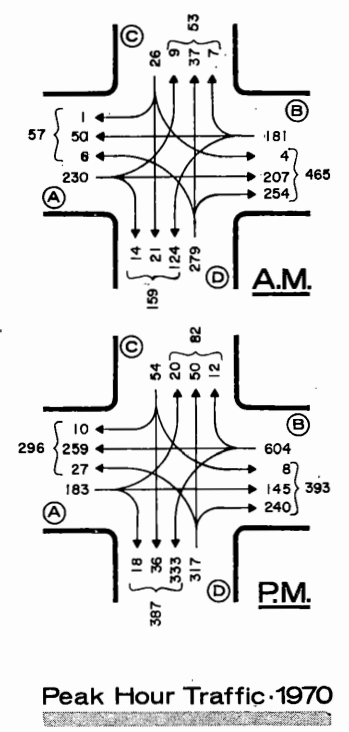
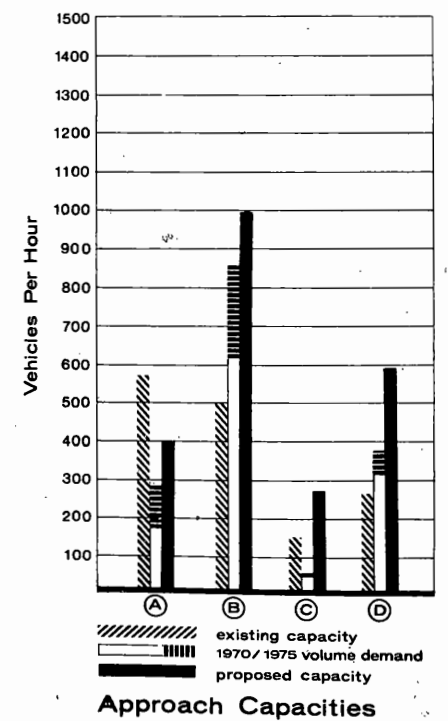
Construction	\$44,400.00
Engineering	<u>5,300.00</u>
Total	\$49,700.00

Figure B7



- Notes**
- Existing noted by lower case lettering.
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- Legend**
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 - ⊗ EXISTING UTILITY POLE
 - ➔ PROPOSED SIGNAL FACE
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 - ▩ EXISTING LOOP DETECTOR
 - PPB PROPOSED PEDESTRIAN PUSH BUTTON
 - ▶ PROPOSED SIGN
 - ◻ EXISTING SIGN
 - ▨ PROPOSED PAVEMENT



AREAWIDE TOPICS STUDY
 Mercer County, N.J.
 Report Area II • Hopewell Township
**WASHINGTON CROSSING
 PENNINGTON ROAD
 SCOTCH ROAD**
 NEW JERSEY DEPARTMENT OF TRANSPORTATION
 September 1972 Travers Associates Consultants



PRINCETON AVENUE IMPROVEMENTS

Princeton Avenue, between North Olden Avenue Extension and the Brunswick Circle Extension, is designated as U.S. Route 1 Alternate and is unique in its function and in the type of land development that it must also serve. Traffic operations and safety problems on this half mile section of the study network are intensified because of the dual role that the facility fulfills in accommodating through traffic and the movements into and out of the private driveways.

Existing Conditions

The four-lane roadway is used by some 30,000 vehicles a day which are not readily accommodated because of capacity restraints at the signalized intersections of the arterial with North Olden Avenue Extension and with Spruce Street. Both locations experience heavy eastbound left turn movements into Princeton Avenue and complementing right turns from Princeton Avenue. Abutting the roadway are several quick-food restaurants, service stations, a car wash, as well as a number of retail outlets and residences. Vehicle movements into and out of these properties result in continual conflict with through traffic flows.

Accidents on Princeton Avenue between North Olden Avenue Extension and the Brunswick Circle Extension amounted to 314 during the three-year study period, with right angle type and same direction type accidents predominating overwhelmingly. The greatest number of right

angle accidents occurred in the vicinity of the Myrtle Street intersection, but virtually all of these 39 accidents were related to the restaurant exit driveway opposite Myrtle Street. Right angle accident histories were also notable at the North Olden Avenue and Mulberry Street intersections. Same direction type accidents were predominant at North Olden Avenue and Spruce Street (each had a history of 18), while 33 such accidents occurred at locations between intersections.

Traffic on the Brunswick Circle Extension, to and from Princeton Avenue, presently moves uncontrolled through the intersection of the two roadways, as does southbound Princeton Avenue traffic. Northbound Princeton Avenue traffic, continuing north, is required to stop. The accident history at the intersection indicated a total of ten, four of which were the same direction type, with six involving fixed objects. The channelization geometry at the intersection is of such configuration as to encourage northbound vehicles to stop beyond the STOP sign. This deficiency results from the apparent protection that the larger island (to the motorists' right) seems to afford.

The County of Mercer is presently preparing construction plans for the improvement of Princeton Avenue from the Brunswick Circle Extension to U.S. Route 206 (at Harneys Corner). The improvement will consist of a 48-foot wide curbed roadway and sidewalks.

Proposed Improvements

It is proposed to widen Princeton Avenue between North Olden Avenue Extension and the Brunswick Circle Extension and to provide improved traffic signal operation. It is noted that present volumes meet the Minimum Vehicular Volume Warrant at both existing signalized intersections and at the Brunswick Circle Extension where signalization is proposed. Accordingly, the following improvements are recommended:

- . Widen Princeton Avenue to 50 feet between North Olden Avenue and Spruce Street.
- . Widen Princeton Avenue to 57 feet between Spruce Street and Brunswick Circle Extension, and install thermoplastic pavement markings to provide four through lanes and a center two-way left turn lane.*
- . Provide a southbound right turn lane on Princeton Avenue at Spruce Street. This improvement will require the acquisition of additional right-of-way to a depth of 13 feet over a distance of approximately 300 feet.
- . Install either ground mounted or overhead signs, reserving the center lane for left turns only.
- . Replace existing signal hardware at North Olden Avenue and provide three-phase operation with a leading green phase for eastbound traffic.

*Pavement markings are to conform to the "Manual on Uniform Traffic Control Devices for Streets and Highways" for five-lane operation.

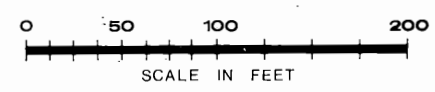
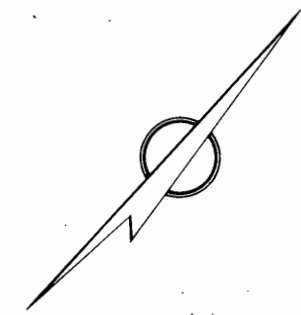
- . Retain three-phase, semi-actuated operation of the signals at Spruce Street and relocate existing hardware as required.
- . Channelize the Princeton Avenue and Brunswick Circle Extension intersection and provide two-phase, semi-actuated signal control.
- . Interconnect the three aforementioned traffic signals with the signals on North Olden Avenue Extension and Parkway Avenue as proposed in the SIGNAL SYSTEMS section of the report.

Alternate Plan

In consideration of the relatively high number of right angle accidents that have occurred between intersections, an alternate proposal was evaluated which would have provided a continuous median island between Spruce Street and the Brunswick Circle Extension. The barrier would permit cross movements and left turns only at signalized intersections. All other traffic utilizing the minor streets and private drives would be restricted to right turns to and from Princeton Avenue. Such a plan would minimize conflicting movements, greatly reducing the potential for left turn and right angle type accidents. And, the anticipated benefits were considered to be greater than those provided by the five-lane plan.

The median barrier proposal was contingent upon the construction of a jughandle turning roadway at the north end of the improvement, on property of the New Jersey Department of Transportation, to accommodate U-turns from the northbound to the southbound direction. The plan was rejected, however, because of the unavailability of the required State property, which was acquired for the construction of the future Route 31 Freeway.

Figure B8

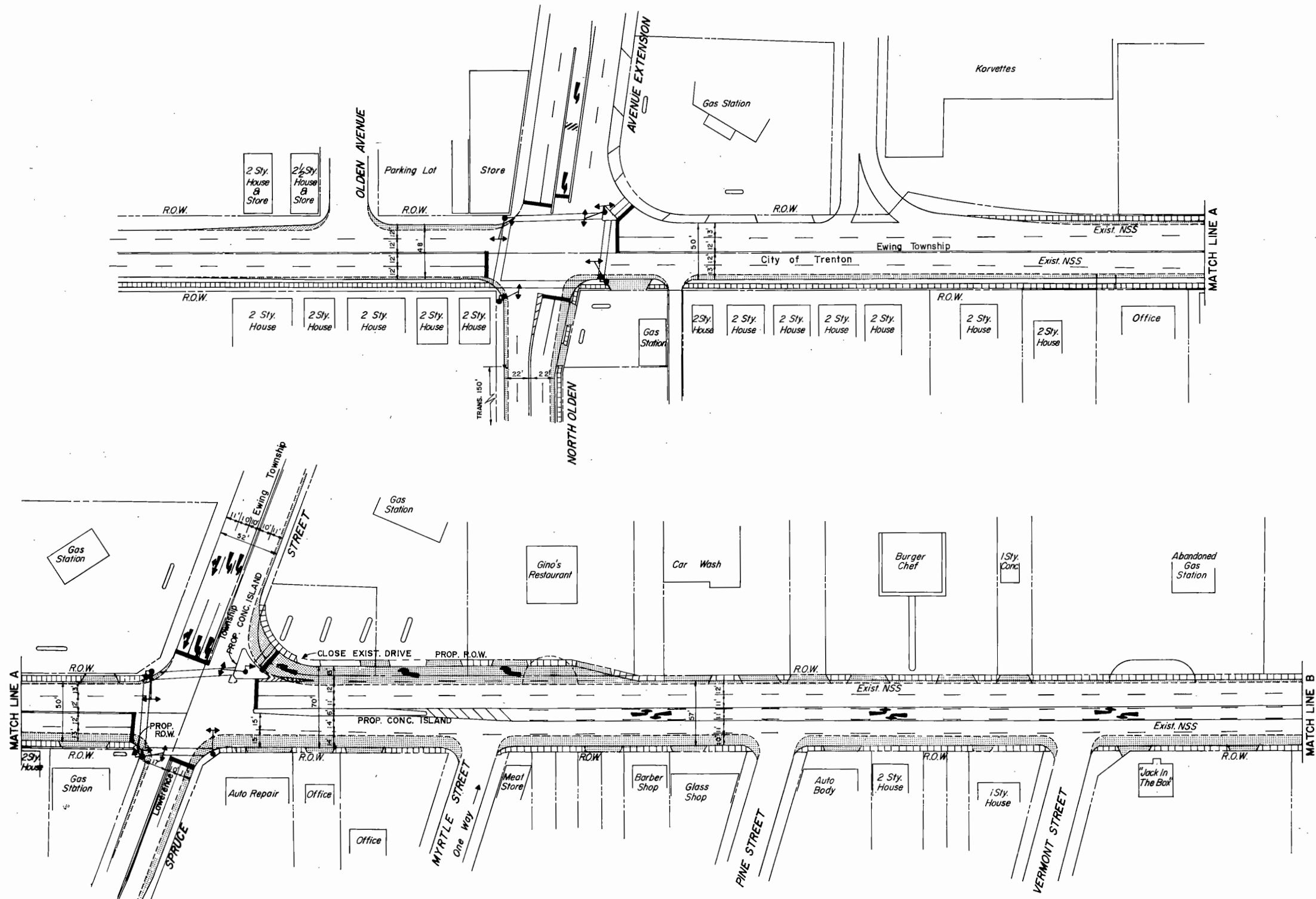


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Legend

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- ⊗ EXISTING UTILITY POLE
- ➔ PROPOSED SIGNAL FACE
- EXISTING SIGNAL FACE
- ▭ EXISTING INLET
- ▬ PROPOSED PRESSURE DETECTOR
- ▭ EXISTING PRESSURE DETECTOR
- ▨ PROPOSED LOOP DETECTOR
- ▨ EXISTING LOOP DETECTOR
- PRB PROPOSED PEDESTRIAN PUSH BUTTON
- ▶ PROPOSED SIGN
- ◀ EXISTING SIGN
- ▨ PROPOSED PAVEMENT
- ▨ PROPOSED SIDEWALK



AREAWIDE TOPICS STUDY
Mercer County, N.J.
 Report Area II · Ewing Township
 Lawrence Township
 City of Trenton
PRINCETON AVENUE

Benefit

It is anticipated that the principal benefit that the proposed widening of Princeton Avenue will have relates to a reduction in the frequency of accidents. Drivers will utilize the median lane as a refuge area permitting through traffic to bypass them, thereby reducing delays and reducing the potential for same direction accidents. A reduction in left turn accidents is also expected since left turning motorists will be less compelled to accept short gaps in the opposing stream of traffic.

The principal benefit at the North Olden Avenue intersection will be increased capacity as a result of the proposed widening. Benefits at the Spruce Street intersection include increased capacity through introduction of an additional lane which will permit southbound right turning vehicles to move on two of the three signal phases. Furthermore, the proposed design provides for a 30-foot wide northbound roadway on Princeton Avenue north of Spruce Street. This will permit the double left turns from Spruce Street to move more freely and more efficiently.

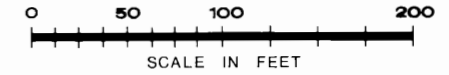
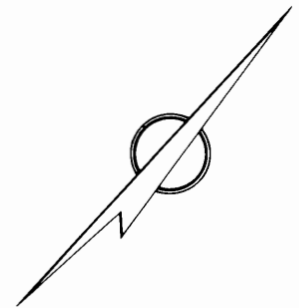
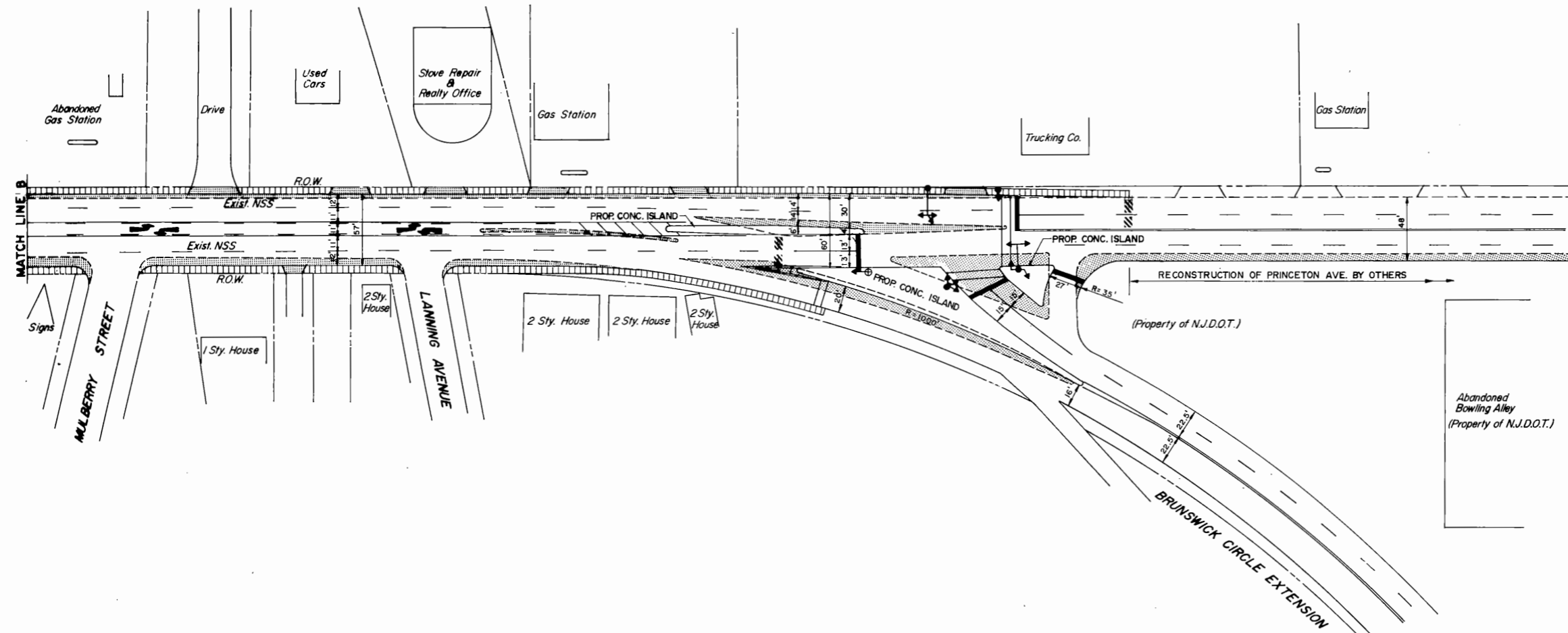
The proposed improvement at the Princeton Avenue/Brunswick Circle Extension intersection will provide two operating lanes for each of the three principal movements which will come under traffic signal control. Such a design is more compatible with the proposed four-lane County improvement than the existing geometry. The proposed channelization and traffic signal control also has a greater potential to accommodate the anticipated increase in traffic flows.

Cost Estimate

The following estimate for construction and engineering lists separate costs for each of the three proposed intersection improvements (including signalization) and the Princeton Avenue improvement between Spruce Street and the Brunswick Circle Extension. Costs for the proposed signal system are not included in the estimate but are included in the SIGNAL SYSTEMS section of the report.

<u>Intersection Improvements</u>	<u>Construction</u>	<u>Engineering</u>	<u>Total</u>
No. Olden Ave. Ext.	\$ 39,000.00	\$ 4,700.00	\$ 43,700.00
Spruce St.	54,700.00	6,600.00	61,300.00
Brunswick Circle Ext.	56,900.00	6,800.00	63,700.00
Subtotal	\$150,600.00	\$18,100.00	\$168,700.00
 <u>Between Intersection Improvements</u>			
Princeton Ave.	\$ 50,200.00	\$ 6,000.00	\$ 56,200.00
TOTAL	\$200,800.00	\$24,100.00	\$224,900.00

Figure B9



Notes

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Legend

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- ▭ PROPOSED SIDEWALK

AREAWIDE TOPICS STUDY
 Mercer County, N.J.
 Report Area II · Ewing Township
 Lawrence Township
 City of Trenton

PRINCETON AVENUE

SIGNALIZED INTERSECTION IMPROVEMENTS

Existing Signalized Intersections

A total of 36 traffic signal installations are presently in operation in Report Area II. Of these, 23 are located on the State highway system and 12 are under the jurisdiction of the County of Mercer. One other installation, at Parkway Avenue/Lower Ferry Road, is not on the State highway system, but is owned and operated by the State.

All existing signalized intersections were investigated relative to their physical and operational adequacy. Five installations are being modified by the County and generally require minor additions or changes to qualify for State approval.* It is anticipated that the deficiencies will be corrected in the near future and that State approval will be issued for the following installations:

- North Olden Avenue Extension/Korvette City Driveway
- Parkside Avenue/Buttwood Drive
- Parkway Avenue/General Motors Crosswalk
- Princeton Pike/Benjamin Franklin Road
- Sullivan Way/Lower Ferry Road

Reconstruction of five other existing County signal installations is discussed in other sections of the report in conjunction with the proposed improvements to North Olden Avenue Extension and Princeton Avenue. It is anticipated that the three unapproved installations included in these projects will qualify them for approval.

*The required modifications are of a minor nature except at Princeton Pike/Benjamin Franklin Road where the County is planning to replace the signal hardware and install vehicle detectors.

Several other existing signalized intersections are discussed in the TRAFFIC OPERATIONS section of the report and relate principally to locations on the State highway system. Many of these are presently under study by the Department. Others would require major reconstruction and, as required by the Department's guidelines, cannot be scheduled for improvement as TOPICS projects. Modification of the timing of the Route 31/Ewingville Road-Upper Ferry Road signal and physical improvement to the U.S. Route 206/Princeton Avenue installation, however, have been recommended.

Two existing signal installations, located as follows, are discussed in this section of the report and are recommended for improvement:

- Parkway Avenue/Lower Ferry Road
- Parkway Avenue/North Olden Avenue Extension

Proposed Signalized Intersections

As a result of the Areawide TOPICS Study, the installation of traffic signals has been recommended at six intersections in Report Area II. One of these has been recommended as an Early Implementation project in conjunction with the proposed North Olden Avenue Extension improvements. Three others are proposed as separate intersection projects and have also been scheduled for Early Implementation. One other is proposed for signalization as part of the Princeton Avenue project.

One other intersection where traffic signalization is proposed is presented in this section of the report. The relatively high traffic volumes and poor accident history at Parkside Avenue and Spruce Street led to the determination of the need for signal control.

PARKWAY AVENUE AND LOWER FERRY ROAD (Figure B10)

Existing Conditions

Parkway Avenue is a four-lane arterial roadway, and Lower Ferry Road accommodates three lanes on its south leg and two lanes on its north leg. As described in the TRAFFIC OPERATIONS section of the report, the principal offices of the New Jersey Department of Transportation are located on the southeast corner of the intersection, generating traffic volumes during commuter hours which, in combination with other traffic, exceed the capacity of the intersection. Operation of the existing two-phase, semi-actuated traffic signal includes a seven-second advance green interval for westbound Parkway Avenue traffic.

A review of the three-year accident history at the intersection indicates a total of 47 accidents, of which the principal classifications were ten left turn type, nine same direction type, and seven right angle type.

Proposed Improvements

Present volumes meet the Minimum Vehicular Volume Warrant for traffic signal control. Accordingly, it is recommended that the following improvements be made:

- Provide three-phase, semi-actuated traffic signal control with actuated phases for Lower Ferry Road and westbound left turns from Parkway Avenue.

- Widen Parkway Avenue to 56 feet.
- Widen the south leg of Lower Ferry Road to 50 feet.

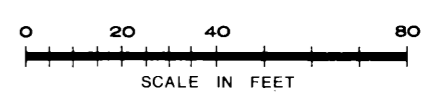
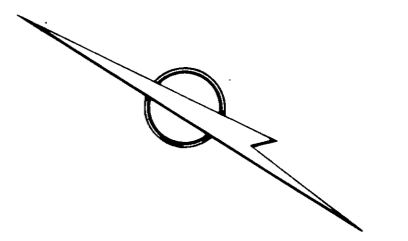
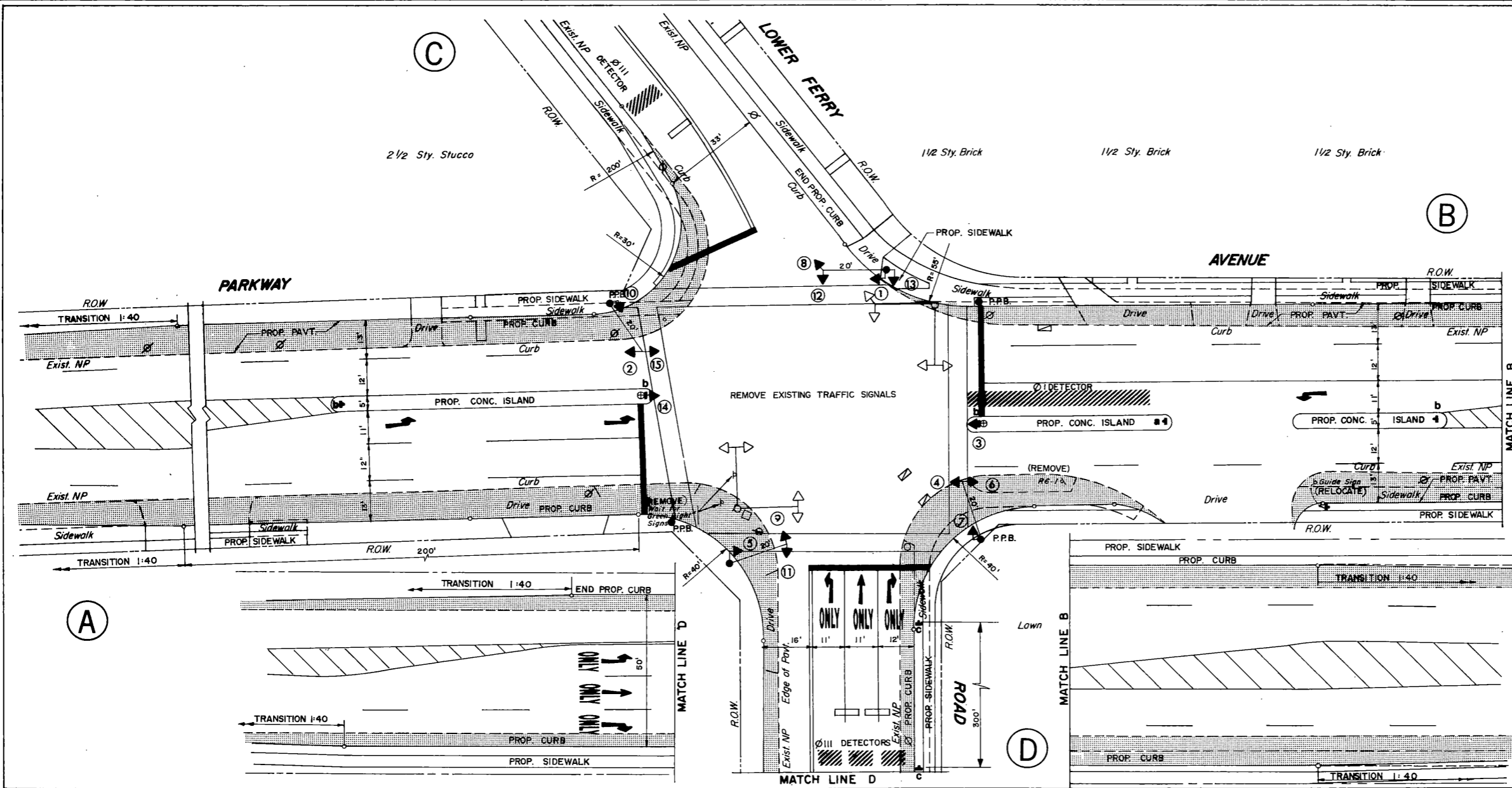
Benefit

The proposed physical improvements to Parkway Avenue and Lower Ferry Road will provide sufficient capacity to accommodate present needs as well as anticipated traffic growth. The widening on Parkway Avenue will provide a refuge area for left turning vehicles, thereby reducing the potential for same direction accidents, and the actuated left turn signal phase will potentially reduce left turn accidents.

Cost Estimate

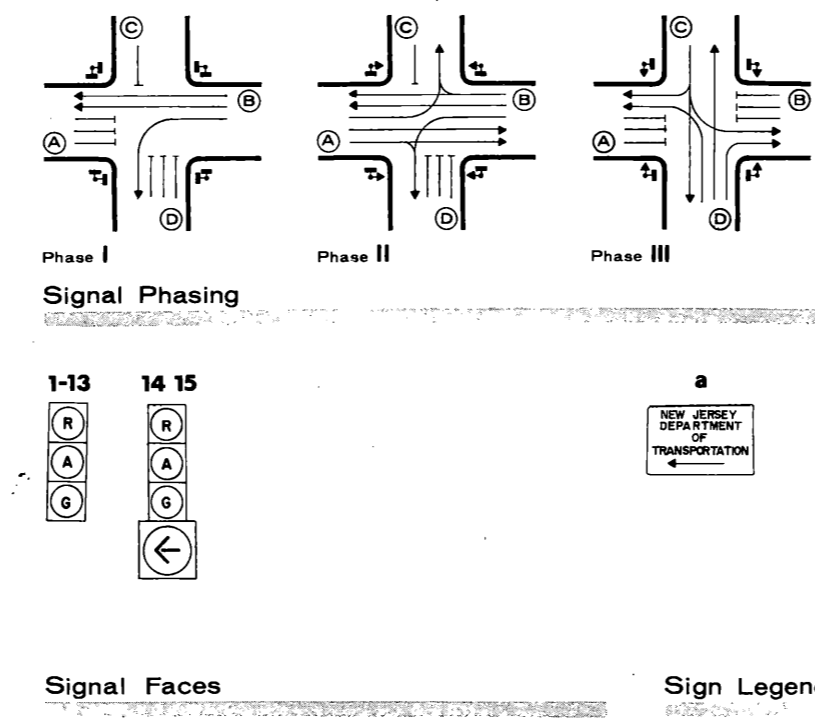
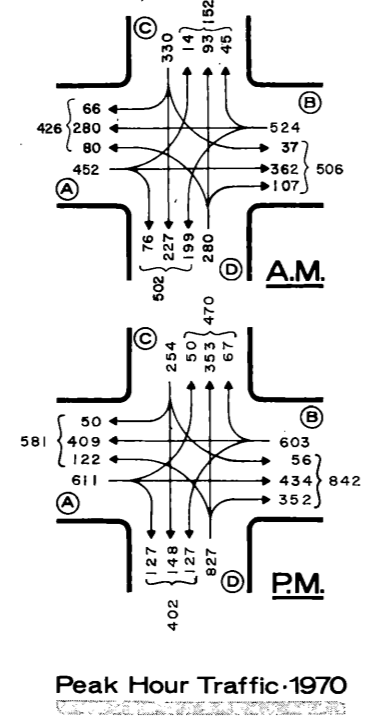
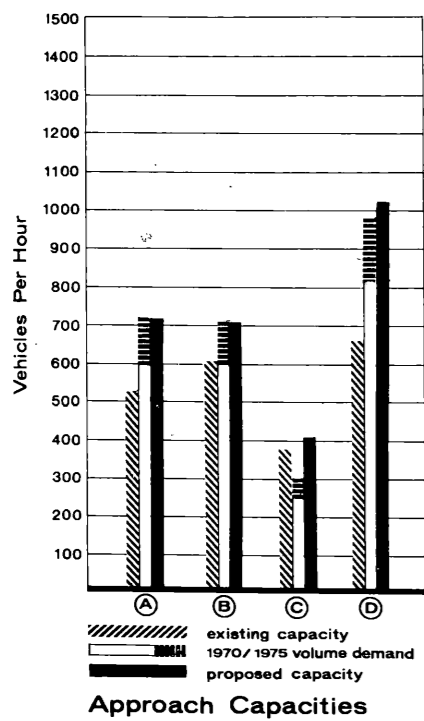
Construction	\$65,600.00
Engineering	<u>7,800.00</u>
Total	\$73,400.00

Figure B10



- Notes**
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 - INSTALL SIGN d AT ALL PUSH BUTTONS.
 - THE PROPOSED SIGNAL ARRANGEMENT IS SUBJECT TO REVISION BASED ON A DETAILED STUDY BY THE N.J.D.O.T.

- Legend**
- PROPOSED SIGNAL POLE
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 - PRB PROPOSED PEDESTRIAN PUSH BUTTON
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 - ⬆ EXISTING SIGN
 - ▨ PROPOSED PAVEMENT



AREAWIDE TOPICS STUDY
 Mercer County, N.J.
 Report Area II • Ewing Township

**PARKWAY AVENUE
 LOWER FERRY ROAD**

NEW JERSEY DEPARTMENT OF TRANSPORTATION
 September 1972 Travers Associates Consultants

PARKWAY AVENUE AND NORTH OLDEN AVENUE EXTENSION (Figure B11)

Existing Conditions

North Olden Avenue Extension meets Parkway Avenue at an acute angle with the principal flow of traffic occurring between North Olden and the northerly leg of Parkway. Both roadways serve as major arterials accommodating traffic volume levels approximately equal to the capacity of the intersection. Lexington Avenue, a local street, intersects Parkway Avenue, opposite North Olden Avenue, forming the fourth leg of the intersection. Each of the three principal approaches accommodates three traffic lanes, with two exclusive right turn lanes on North Olden and one exclusive left turn lane on each of the Parkway Avenue approaches.

The semi-actuated signal utilizes three phases to control intersection traffic with the heavy right turn movement from North Olden moving simultaneously with the southbound Parkway phase.

The three-year accident history indicates a total of 39, with a predominant number of same direction type accidents. Analysis of the data indicates that, of the 15 same direction type accidents related to the north approach of Parkway Avenue, nine involved side swiping vehicles making the double left turn. A similar, but less severe, accident history has been experienced on the North Olden Avenue approach.

Proposed Improvements

Present volumes meet the Minimum Vehicular Volume Warrant for traffic signal control. Accordingly, it is recommended that the following improvements be made:

- . Cut back the median island on the North Parkway Avenue leg and increase the radius on the northeast corner.
- . Reconstruct the median island in North Olden Avenue Extension to provide a protected turning lane.
- . Modify the signal hardware and retain three-phase, semi-actuated signal operation.
- . Reserve two left turn lanes on the North Parkway Avenue approach.

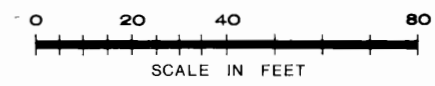
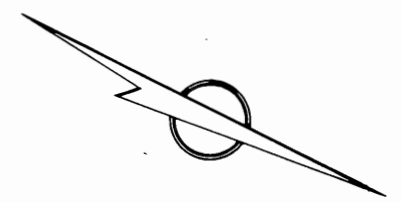
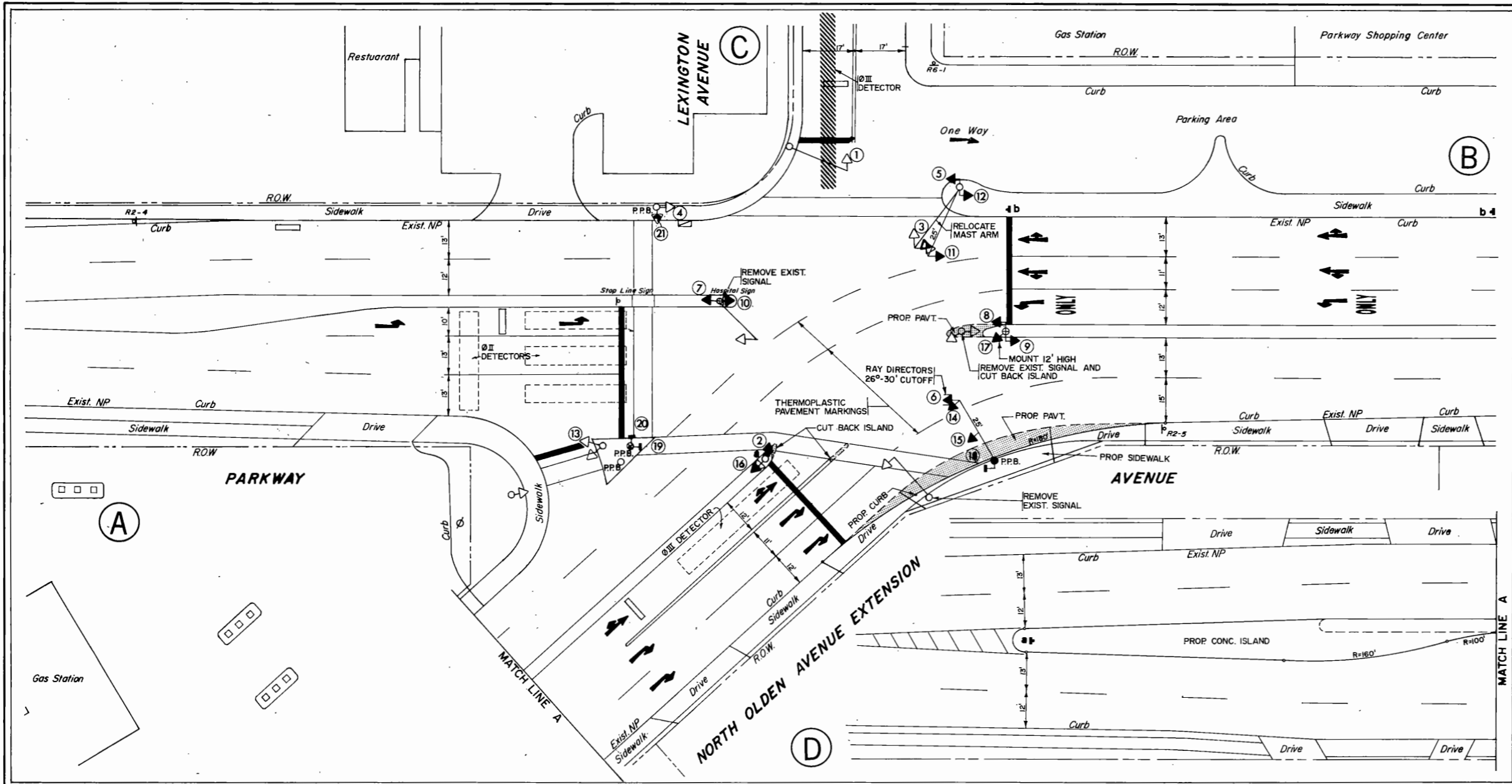
Benefit

The reduction in the same direction type accidents is anticipated by virtue of the improved signal display and physical modifications to the intersection.

Cost Estimate

Construction	\$17,300.00
Engineering	<u>2,100.00</u>
Total	\$19,400.00

Figure B11

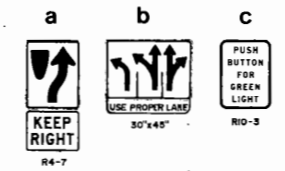
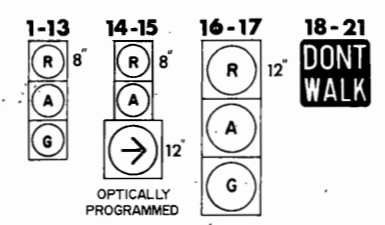
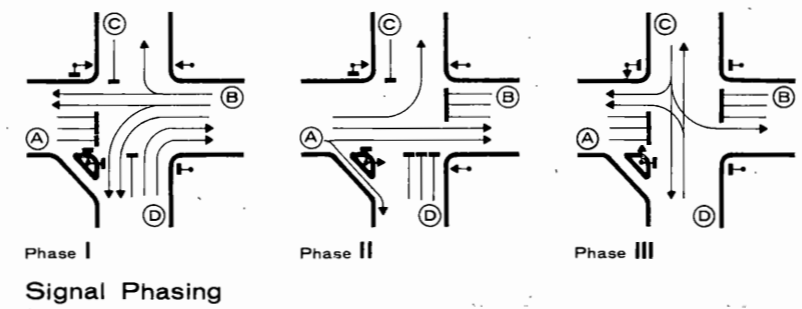
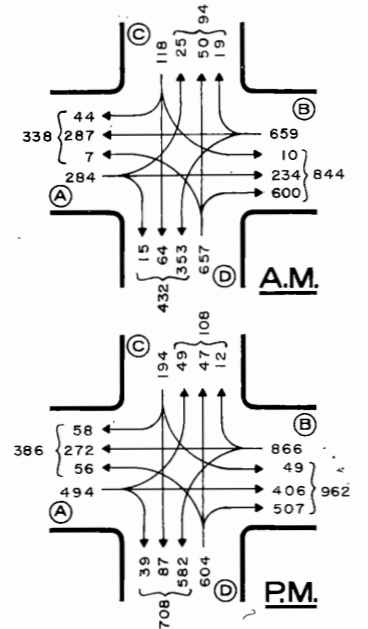
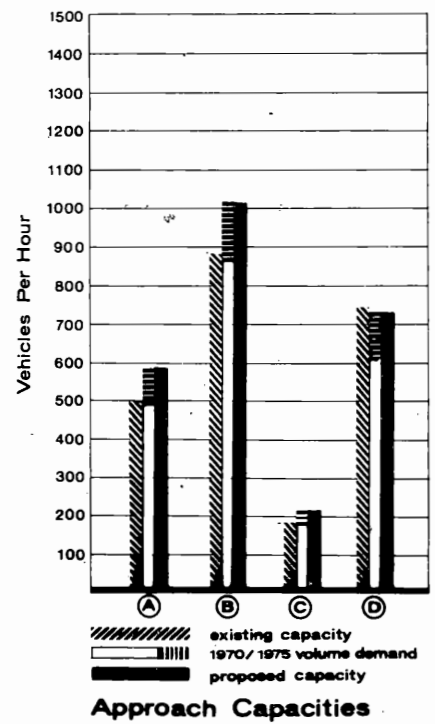


Notes

- Existing noted by lower case lettering.
- PROPOSED NOTED BY UPPER CASE LETTERING.
- SIGN DESIGNATIONS WITH THE PREFIX R OR W REFER TO SIGNS DESCRIBED IN THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS".
- ALL EXISTING SIGNS ARE TO REMAIN UNLESS OTHERWISE NOTED.
- PARKING PROHIBITIONS DESIGNATED BY NP FOR NO PARKING AND NSS FOR NO STOPPING OR STANDING.
- EXISTING R.O.W. IS APPROXIMATE AND BASED ON INVENTORY DATA.
- INSTALL SIGN c AT ALL PUSH BUTTONS.

Legend

- PROPOSED SIGNAL POLE
- ⊕ PROPOSED PEDESTAL
- EXISTING SIGNAL POLE OR PEDESTAL
- EXISTING UTILITY POLE
- ➔ PROPOSED SIGNAL FACE
- ➔ EXISTING SIGNAL FACE
- ▭ EXISTING INLET
- ▭ PROPOSED PRESSURE DETECTOR
- ▭ EXISTING PRESSURE DETECTOR
- ▭ PROPOSED LOOP DETECTOR
- ▭ EXISTING LOOP DETECTOR
- PPB PROPOSED PEDESTRIAN PUSH BUTTON
- ▭ PROPOSED SIGN
- ▭ EXISTING SIGN
- ▭ PROPOSED PAVEMENT



AREAWIDE TOPICS STUDY
Mercer County, N.J.
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**PARKWAY AVENUE
 NORTH OLDEN AVENUE EXTENSION**

NEW JERSEY DEPARTMENT OF TRANSPORTATION
 September 1972 Travers Associates Consultants

PARKSIDE AVENUE AND SPRUCE STREET EXTENSION (Figure B12)

Existing Conditions

Spruce Street Extension meets Parkside Avenue as a "T" type intersection at a location between the minor "T" intersections of Poland Street and Mable Street. During the evening peak hour, approximately 40% of the traffic from Spruce turns left into Parkside Avenue. Simultaneously, a heavy volume of southbound Parkside traffic turns left into Spruce Street and is opposed by some 500 northbound vehicles. The heavy conflicting movements exceed capacity during peak operating periods resulting in delays to Spruce Street traffic and left turning vehicles from Parkside Avenue.

Of the 28 accidents that were recorded during the three-year study period, 12 were same direction type, seven were right angle type, and five involved left turns. Four of the right angle type accidents occurred at the Parkside Avenue/Poland Street intersection, which points to the difficulty of Poland Street traffic to penetrate Parkside Avenue traffic during peak periods, and also to the restricted sight distance to Poland Street traffic to the northeast.

Proposed Improvements

Present volumes meet the Minimum Vehicular Volume Warrant for traffic signal control. Accordingly, the following improvements are recommended:

- . Reconstruct the existing channelization and widen Parkside Avenue along its westerly side.
- . Provide three-phase, semi-actuated traffic signal control.
- . Prohibit left turns from Poland Street.

Consideration was given to making Poland Street one-way from Parkside, thereby requiring traffic entering the arterial to do so from Mable Street. A review of the existing street arrangement, however, indicates that Poland Street serves a greater number of local residents more directly than does Mable Street.

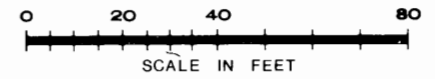
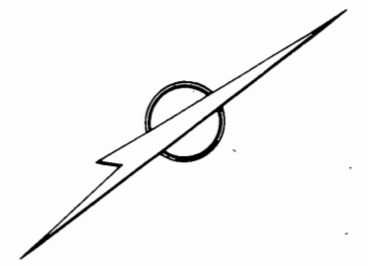
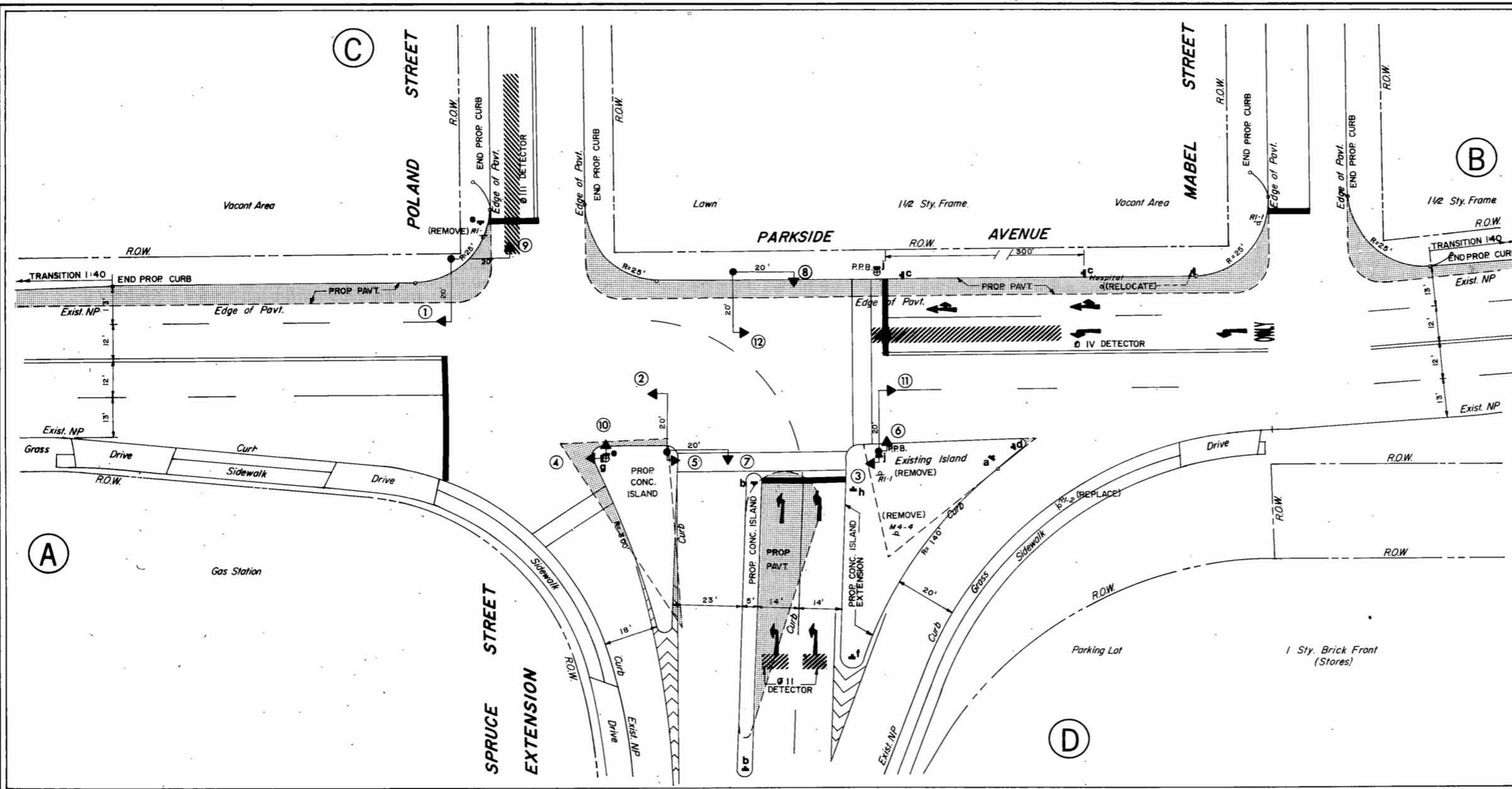
Benefit

Traffic signalization of the Parkside Avenue and Spruce Street intersection will permit left turning traffic from Spruce and Parkside to maneuver with a minimum of conflict with each other and with through Parkside movements. As a result, delays will be reduced as will the potential for right angle, left turn, and same direction accidents.

Cost Estimate

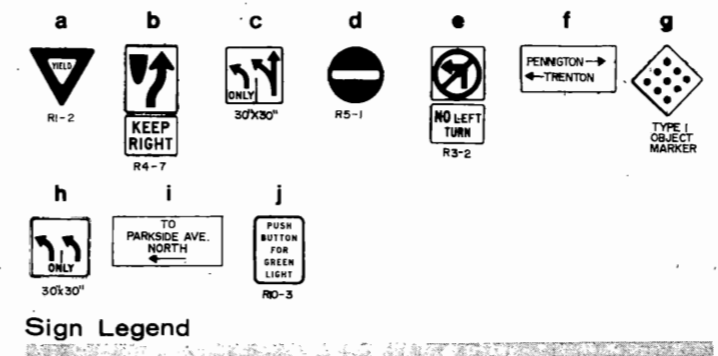
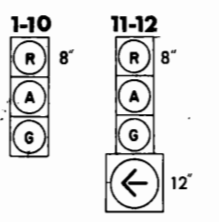
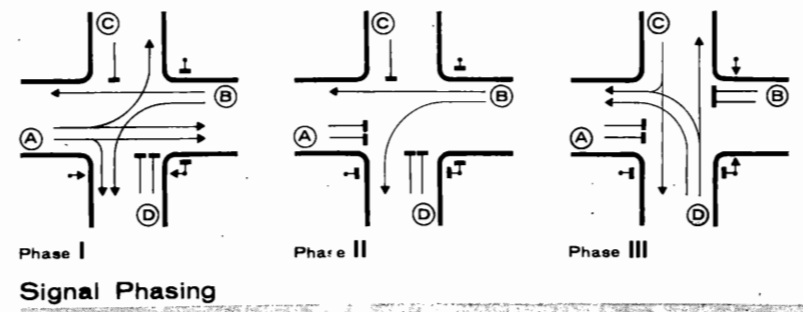
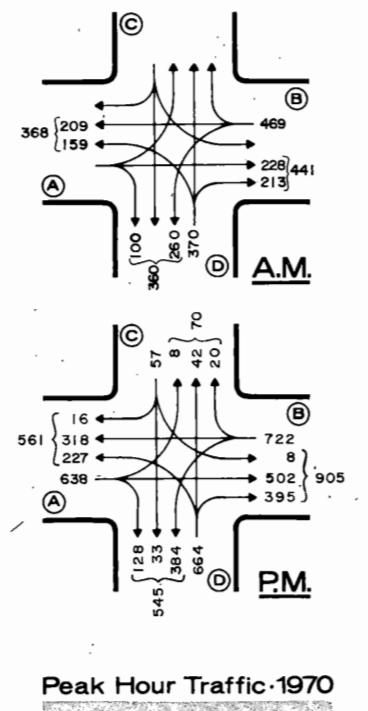
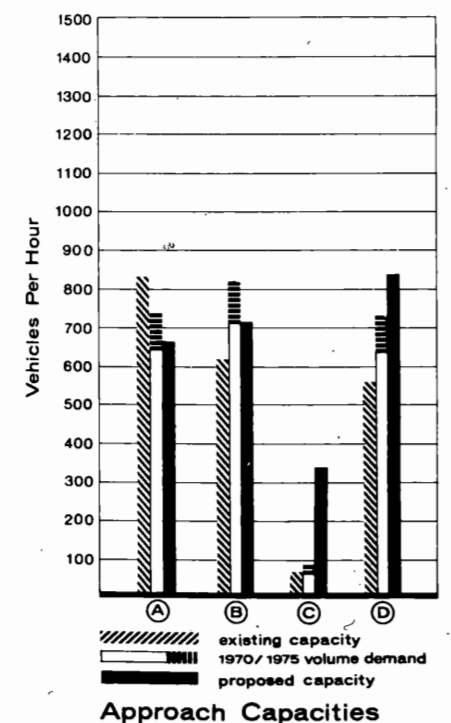
Construction	\$35,200.00
Engineering	<u>4,200.00</u>
Total	\$39,400.00

Figure B12



- Notes**
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 - EXISTING R.O.W. IS APPROXIMATE AND BASED ON INVENTORY DATA.
 - INSTALL SIGN I AT INTERSECTION OF RAY STREET AND POLAND STREET FACING EASTBOUND TRAFFIC.

- Legend**
- PROPOSED SIGNAL POLE
 - ⊕ PROPOSED PEDESTAL
 - EXISTING SIGNAL POLE OR PEDESTAL
 - ⊗ EXISTING UTILITY POLE
 - ➔ PROPOSED SIGNAL FACE
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**PARKSIDE AVENUE
 SPRUCE STREET EXTENSION**

NEW JERSEY DEPARTMENT OF TRANSPORTATION
 September 1972 Travers Associates Consultants

NON-SIGNALIZED INTERSECTION IMPROVEMENTS
AND BETWEEN INTERSECTION IMPROVEMENTS

NON-SIGNALIZED INTERSECTION IMPROVEMENTS
AND BETWEEN INTERSECTION IMPROVEMENTS

Four locations are discussed in this section of the report and involve three intersections and one between intersection improvement on the TOPICS network which are not traffic signal controlled and where signal control is not justified. The locations described herein were found to be deficient in some manner, usually in relation to safety.

Improvement of the existing sight distance restrictions is recommended at the three intersections, and the fourth project calls for improvements at a sharp curve on Scotch Road. Illustrations were not considered necessary for these projects located as follows:

N. J. Route 29/Delaware Avenue
N. J. Route 29/Jacobs Creek Road
Princeton Pike/Province Line Road
Scotch Road, north of Carlton Road

The intersections of Washington Crossing Pennington Road/Trenton Harbourton Road and Washington Crossing Pennington Road/Blackwell Road were also considered for improvement, but were dropped from the study upon indication that the County was proceeding with improvements at the two locations.

N. J. ROUTE 29 AND DELAWARE AVENUE (Not Illustrated)

Existing Conditions

Delaware Avenue forms a "T" type intersection with N. J. Route 29 and is controlled by a STOP sign. The sight distance to the north along the highway from a stopped position is approximately 200 feet and is limited principally by a hedge row located on the northeast corner of the intersection. Several existing trees, also located on the same corner, do not seriously affect sight distance. The posted speed limit on the highway is 50 mph.

Proposed Improvements

It is recommended that the following improvement be made:

- Clear the northeast corner of the intersection of vegetation and other objects higher than 30 inches above the pavement to provide a sight distance of 500 feet to the north along Route 29, measured from the position of a stopped vehicle on Delaware Avenue. It is recommended, however, that the existing trees be retained.

Benefit

The improved sight distance afforded by the proposed clearing will reduce the potential for right angle type accidents.

Cost Estimate

Construction	\$200.00
Engineering	-
Total	\$200.00

N. J. ROUTE 29 AND JACOBS CREEK ROAD (Not Illustrated)

Existing Conditions

Jacobs Creek Road forms a "T" type intersection with N. J. Route 29 and is controlled by a STOP sign. The sight distance to the north and south along the highway from a stopped position is approximately 350 feet in each direction. Small trees are the principal impediment to greater sight distance. The posted speed limit on the highway is 50 mph.

Proposed Improvements

It is recommended that the following improvement be made:

- Clear the northeast and southeast corners of the intersection of vegetation and other objects higher than 30 inches above the pavement to provide a sight distance of 500 feet to the north and to the south along Route 29, measured from the position of a stopped vehicle on Jacobs Creek Road. It is recommended that a few trees be left standing if they can be selected so as not to pose a serious impediment to the required sight distance.

Benefit

The improved sight distance afforded by the proposed clearing will reduce the potential for right angle type accidents.

Cost Estimate

Construction	\$1,000.00
Engineering	<u> -</u>
Total	\$1,000.00

PRINCETON PIKE AND PROVINCE LINE ROAD (Not Illustrated)

Existing Conditions

The intersection of Princeton Pike and Province Line Road has experienced a total of nine accidents during the three-year study period, seven of which were the right angle type. Province Line Road is controlled by STOP signs and the prevailing speeds on Princeton Pike are typically 50 mph. An embankment, approximately five feet in height, limits the sight distance to the south along the Pike to approximately 100 feet from a stopped position on the east approach of Province Line Road.

Proposed Improvements

It is recommended that the following improvement be made:

- Regrade the southeast corner to provide a sight distance of 600 feet to the south along Princeton Pike, measured from the position of a stopped vehicle on the east approach of Province Line Road.

Benefit

The improved sight distance afforded by the regrading will reduce the potential for right angle type accidents.

Cost Estimate

Construction	\$1,000.00
Engineering	<u> -</u>
Total	\$1,000.00

SCOTCH ROAD, NORTH OF CARLTON AVENUE (Not Illustrated)

Existing Conditions

Scotch Road, north of Carlton Avenue, turns sharply to the west and can be negotiated at a speed of only 10 mph in both directions as determined by use of a ball bank indicator. Large Arrow signs and markers delineate the outside edge of roadway, and advance warning Turn signs advise motorists of the turn, but no Advisory Speed plates are posted. The roadway is approximately 25 feet in width and its surface is in poor condition, a condition which tends to make control of a vehicle difficult. Five accidents were recorded during the three-year study period and have been identified as having occurred on or near the curve. Four accidents involved vehicles leaving the roadway, and one was a head-on collision.

Proposed Improvements

It is recommended that the following improvements be made:

- Repave the curved portion of Scotch Road for a total distance of 300 feet.

- Provide pavement markings consisting of white edge lines and a yellow centerline.
- Provide Advisory Speed plates of 10 mph as additions to the existing Turn signs.

Benefit

The repaved roadway will provide a stable surface, thereby making it easier and safer to negotiate the turn. The pavement markings will serve to delineate the turn, and the 10 mph advisory speed will give motorists better notice of its severity.

Cost Estimate

Construction	\$2,000.00
Engineering	<u>300.00</u>
Total	\$2,300.00

Several synchronous, noninterconnected signal systems are presently maintained in Report Area II; each of these provides balanced progression capability that functions 24 hours a day. They are as follows:

- . The system on U.S. Route 1 extends to the north from Cherry Tree Lane and includes all the signals on the highway in Report Area II, as well as many more beyond the limits of the study area. The system operates on a 90-second background cycle.
- . N. J. Route 31 (Pennington Road) signals at Parkway Avenue and Parkside Avenue are coordinated, as well as the four signals between Central Avenue and Ewingville Road-Upper Ferry Road. Both systems operate on a 70-second background cycle.
- . The Parkway Avenue and North Olden Avenue system includes nine intersections between the General Motors plant and Princeton Avenue and operates on a 70-second background cycle.

The principal limitation of these systems is their dependence upon coordination through synchronous motors, a situation which requires frequent maintenance by trained personnel. Furthermore, the systems cannot be programmed to accommodate directional variations in traffic flows. Accordingly, conversion to interconnected coordination has been recommended for all existing systems.

The master control equipment available for signal coordination runs the gamut from inexpensive coordinating units to costly computerized controllers sensitive to minute-to-minute variations in traffic flow. However, an analysis of existing traffic operations along principal arterials indicates that traffic patterns are generally repetitive so that traffic sensing equipment is not necessary. Moreover, the choice of appropriate cycle lengths is often limited by local intersection needs. Thus, the flexibility of cycle and offset functions offered by the more sophisticated, and more costly, control equipment has not been found necessary.

In selecting the type of interconnected operation that has been recommended, traffic volume data was reviewed and operation specified on the basis of demonstrated traffic needs. This has resulted in low-cost, programmed type master control provided by time clocks and simple coordinating units. Thus, maintenance will be simplified and maintenance costs will be reduced.

The use of leased telephone lines has been recommended for all interconnected systems. A modest monthly charge is involved, but this method of interconnection is preferred to the use of interconnect cable. Initial installation costs are avoided with leased lines, and maintenance service is provided by the utility company.

The traffic signal systems recommended in Report Area II are illustrated in Figure B13 and are as follows:

System A: U.S. Route 1

The present noninterconnected signal system operating on Route 1 extends a distance of some 20 miles from Lawrence Township in Report Area II north to New Brunswick. The relatively uniform speed of traffic, the spacing of the signals, the control of turning movements, and frequent maintenance are factors that permit the system to provide a high level of traffic progression capability. Nevertheless, the offset relationship at each controller must be checked frequently by maintenance personnel to maintain the coordinated operation.

In keeping within the Department's guidelines relative to the scheduling of improvements on the State highway system, a minimum of traffic data on Route 1 was collected. Furthermore, the traffic count data furnished by the Department was insufficient to permit an analysis of the characteristics of traffic flow on the highway. Nevertheless, ease of offset maintenance suggests the desirability of interconnecting Route 1. In addition, it is recommended that the Department examine volumes and flow distribution throughout the system to determine the need for system programs that reflect variations in traffic flow.

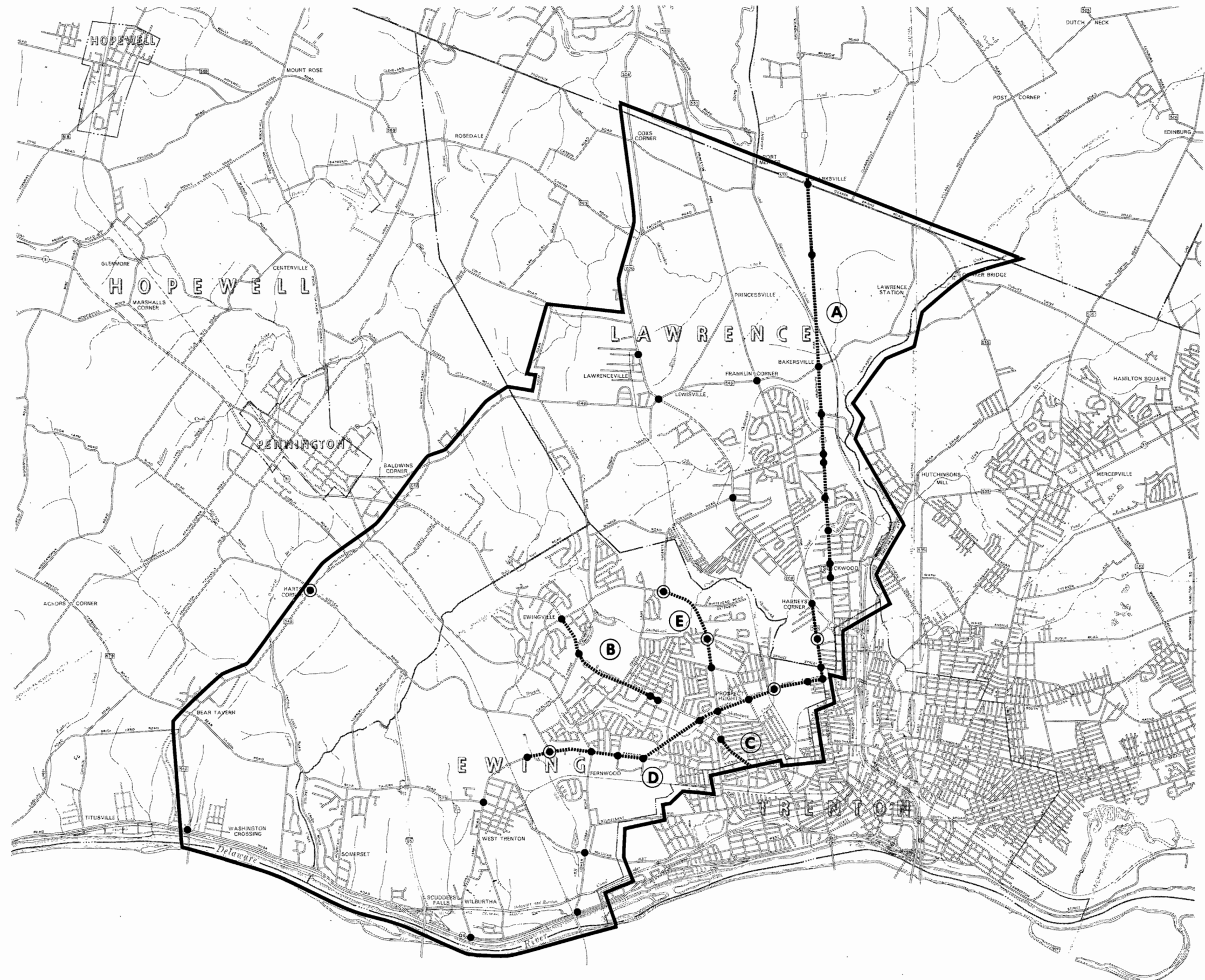
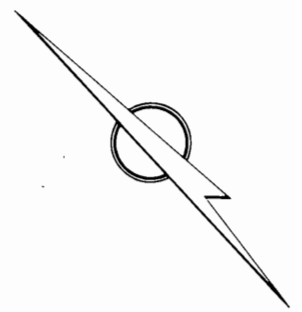
System B: N. J. Route 31, Central Avenue to Ewingville Road

Traffic volume characteristics along Route 31 indicate an essentially balanced distribution of the flows throughout the day with heavier concentrations of traffic during the commuter periods. Two background cycles, both programmed for balanced flows, are recommended: a 90-second cycle during weekday morning and evening peak periods (7:00 to 9:00 A.M. and 4:00 to 6:00 P.M.) and a 70-second cycle at all other times.

System C: N. J. Route 31, Parkside Avenue to Parkway Avenue

As indicated heretofore, the progressive movement of traffic along Route 31 (Pennington Road), south of North Olden Avenue, is accomplished through synchronous noninterconnected coordination. However, only the signal at the Parkside Avenue intersection lies within Report Area II; others to the south lie beyond the study area. The TOPICS study for the City of Trenton has recommended that the signals along Parkway Avenue (including the installation at Pennington Road) be incorporated into a signal system. Accordingly, it is proposed to interconnect the Pennington Road/Parkside Avenue installation with the City system.

Figure B13



Legend

- EXISTING TRAFFIC SIGNAL (36)
- ⊙ PROPOSED TRAFFIC SIGNAL (6)
- PROPOSED SIGNAL SYSTEM

AREAWIDE TOPICS STUDY
 Mercer County, N.J.
 Report Area II
 TRAFFIC SIGNALS AND
 SIGNAL SYSTEMS

System D: Parkway Avenue, North Olden Avenue and Princeton Avenue

Traffic operations on Parkway Avenue, North Olden Avenue, and Princeton Avenue were examined and found to have similarities in several respects. All three arterials are heavily traveled during the morning and evening commuter periods and accommodate lesser, but substantial, volumes at other times of the day. For the most part, the directional distribution of traffic flows is not a pronounced characteristic. In addition, turning movements at the intersections suggest multiphase signal operation be provided at most locations as is recommended elsewhere in the report. Thus, a system operating with a 90-second background cycle and providing offsets for balanced flows is proposed.

It is noted that the data analysis indicated some variation in the directional distribution of traffic flows along Parkway Avenue. These variations, however, were found to be generally of short duration and, in some instances, undergo a reversal in direction within a short period of time. Undoubtedly, the fluctuating patterns are related to traffic movements generated by the General Motors plant and offices of the New Jersey Department of Transportation, as well as the commuter traffic flows that are oriented to Trenton. Whereas traffic originating or destined for Trenton reflects a relatively stable situation, traffic oriented to the two aforementioned generators are subject to variation based on changes in shift starting times, length of work day, or number

of employees engaged at any particular time. Accordingly, it is recommended that the coordinating units used for the Parkway Avenue, North Olden Avenue, and Princeton Avenue systems be capable of providing three offsets. Then, directional preferences can be programmed into the system should pronounced directional flow characteristics become apparent in the future.

System E: Parkside Avenue

An examination of traffic count data on Parkside Avenue indicates two significant patterns, a directional southbound flow during the morning commuter period and essentially balanced flows at other times. Typical traffic volume increases were also noted during the morning and evening peak travel periods, with lighter flows at other times.

Accordingly, it is recommended that four methods of operation be provided: a 90-second background cycle during weekday mornings (7:00 to 9:00 A.M.) with directional offsets favoring southbound traffic, a 90-second cycle with offsets for balanced flow for weekday evenings (4:00 to 6:00 P.M.), and a 70-second cycle with offsets for balanced flow at all other times. Free operation is proposed during the period from midnight to 7:00 A.M.

Benefit

The benefits that will accrue to motorists will largely depend on the proportion of the signal "green" time or the "through band width" that can be designed for the progressive movement of traffic for each of the proposed programs of the respective signal systems. While reductions in travel delays are anticipated, benefits in terms of safety will also result through minimizing the stopping of traffic, thereby reducing the potential for same direction accidents.

Cost Estimate

The following estimates include the cost for equipment, engineering, and estimated annual costs for a pair of leased telephone lines for each of the interconnected signal systems. Since systems A, B and C are on State highways, no estimates have been prepared for equipping or operating them.

	<u>Initial Cost (Equipment)</u>	<u>Annual Cost (Leased Lines)</u>
System D	\$12,500.00	\$170.00
System E	<u>3,500.00</u>	<u>40.00</u>
Subtotal	\$16,000.00	\$210.00
Engineering	<u>2,000.00</u>	<u>-</u>
TOTAL	\$18,000.00	\$210.00



TRAFFIC OPERATIONS

This section of the report deals, in a general manner, with those sections of the TOPICS study network that were found to have capacity limitations, or other operational deficiencies, including those observed at large traffic generators. In some instances, the proposed intersection improvements, presented elsewhere in this report, will serve as a partial answer to the problem. In other instances, substantial relief will only be realized when major roadway improvements, beyond the scope of the TOPICS program, are undertaken.

Whereas a summary of critical elements of the study network is presented herein, this section of the report also capsulizes pertinent studies that have been completed and proposals that are underway by State, County, and municipal agencies. Several improvements, generally of a minor nature, are discussed since they are considered appropriate in the context of the TOPICS study.

Operational Evaluation

U.S. Route 1 (Brunswick Pike)

U.S. Route 1 serves a major arterial between the City of Trenton and points to the north. It is one of the most heavily traveled highways in Mercer County, carrying daily volumes in excess of 35,000 vehicles north of the Brunswick Circle.

North of Lake Drive, the highway is constructed as an expressway with four operating lanes and a median barrier which prevents vehicles from crossing the highway except at controlled locations. All cross movements are accommodated at signalized jughandle intersections, and traffic signal coordination permits the progressive movement of traffic at speeds of 50 to 55 mph.

The southerly portion of the highway traverses a more urbanized area. Speeds are lower and a median island replaces the barrier with openings which, for the most part, permit crossing maneuvers. North of Whitehead Road, the Department of Transportation has closed the median openings with rubber stanchions which permit penetration only by emergency vehicles.

Within the limit of the study area, several Route 1 locations with traffic capacity deficiencies and notable accident histories have been identified. The principal problem locations are the intersections of the highway with Benjamin Franklin Road, Province Line Road, and the Brunswick Circle (U.S. Route 1/U.S. Route 206/U.S. Route 1 Alternate). Some relief for the Brunswick Circle may be forthcoming in the not-too-distant future by virtue of the diversion of some traffic from Route 1 when the construction of the extension of the Trenton Freeway (N.J. Route 174) is completed. Major relief of the Circle, however, will only be realized when the N.J. Route 31 Freeway is constructed and east-west traffic at the Circle is grade separated from north-south movements.

The completion of a regional shopping center (presently in the planning stage) in the southeast quadrant of the intersection of Route 1 and Province Line Road will impose substantially greater volumes on that location; present traffic levels exceed the intersection capacity. The Department of Transportation, however, presently has the intersection under study.

The relatively recent jughandle improvement at the intersection of Route 1 and Whitehead Road has resulted from the Department's effort to continually appraise traffic operations on the highway. Periodic maintenance of the signal system on Route 1 is also given high priority by the Department. Ultimately, however, it is anticipated that the completion of Interstate Routes 95 and 295 will reduce traffic on Route 1 to acceptable levels. In view of the Department of Transportation's ongoing spot improvement projects and proposed Interstate freeway programs, no improvements are proposed herein for Route 1.

Lawrence Shopping Center

The Lawrence Shopping Center, located south of Texas Avenue between Route 1 and Princeton Pike, can accommodate approximately 1300 parked cars. Access facilities on both the State highway and the Pike adequately serve the center and permit safe and efficient traffic operations on the public roadways.

U.S. Route 206, Lawrenceville Road

Route 206 serves as the principal arterial highway between Princeton and the municipalities of Ewing, Lawrence, and portions of Trenton. The facility is limited in capacity by its two-lane width, which has been constructed with various cross section configurations throughout its length. South of Benjamin Franklin Road, a shoulder approximately 10 feet wide extends along the east side of the roadway; in the Lawrenceville area, the roadway is curbed, and to the north, narrow shoulders flank both sides of the highway.

More than 20,000 vehicles a day utilize that portion of the highway between Eggert Crossing Road and Benjamin Franklin Road, volumes which exceed the capacity of the roadway. At several of the intersections along the highway, the shoulder has been converted to an operating lane, thereby easing the capacity restraints at these locations. Approximately 18 years ago, the Department of Transportation proposed the widening of Route 206 to a four-lane facility in the Township of Lawrence, but the plan was dropped from further consideration after residents of the Township voiced their objection to the project.

Several retail shops and businesses are clustered along the highway in the vicinity of Phillips Avenue in Lawrenceville. Although parking is prohibited throughout most of the length of the highway, it is permitted on both sides of the roadway within this commercial area. Traffic operations are necessarily impeded as the roadway is approximately 35 feet in width. Accordingly, it is recommended that parking be prohibited along the east side of the highway, eliminating approximately five parking spaces.

Currently, the Department of Transportation is undertaking studies of the highway between Darrah Lane and Interstate Route 295. It is anticipated that the widening of Route 206 and intersection improvements will be completed along this section of the highway and will include the construction of a jughandle at Benjamin Franklin Road. Signalization of the intersection of the highway with Carter Road has also been programmed.

It is anticipated that the aforementioned 10-foot wide shoulder will be reduced or eliminated as a result of reconstruction of the highway in certain locations. Where the shoulder is to remain, it is proposed to paint 12-inch wide white diagonal lines. It is suggested that the diagonal pavement markings extend from the longitudinal edge line of the outside edge of shoulder, and that NO STOPPING EXCEPT ON SHOULDER signs also be erected. The accident record at the Route 206/Princeton Avenue intersection suggests that improvements at that location would be beneficial. Accordingly, widening of the highway at Princeton Avenue is also suggested.

Rider College

Rider College is a private institution located on the west side of Route 206, approximately midway between Eggert Crossing Road and Benjamin Franklin Road. The college has a student body of approximately 3500, many of whom live on campus. Two driveways connecting to Route 206 serve as access to the campus. The aforementioned proposed improvements to Route 206 include that portion of the highway along the frontage of the college.

Squibb Pharmaceutical Company

The Squibb Pharmaceutical Company has recently opened a research center on the west side of Route 206, south of Province Line Road. The center will ultimately accommodate some 2000 employees. Access to the site has been provided from both of the aforementioned roadways, as well as from Carter Road, and includes channelization improvements at the driveways. No traffic operating difficulties are anticipated as a result of full operation of the facility.

N. J. Route 31, Pennington Road

Route 31 extends from the City of Trenton north through Ewing and Hopewell Townships and beyond. Some 18,000 vehicles a day use this arterial highway; the southern section can be characterized as an urban facility (with curbs and sidewalks), while the northern section is constructed as a rural roadway. Throughout the study area, Route 31 accommodates four traffic lanes which are operationally enhanced by the No Stopping or Standing regulations currently in effect.

Traffic operating problems on Route 31 principally relate to the accident histories at several intersections and, to a lesser degree, the traffic capacity of some of the same intersections. Improvements are proposed at the Route 31/North Olden Avenue Extension intersection and are discussed elsewhere in the report.

The right angle accident history at Green Lane-Theresa Street suggests the possible need for traffic signal control at these two closely spaced intersections. The Department of Transportation is presently studying the need for traffic signals, but any action relative to signalization may not be considered necessary until Trenton State College completes the construction of new access facilities between the campus and Green Lane.

The Department is also studying the Route 31/Parkside Avenue intersection because of its poor accident history. The study may result in changes to the traffic signal operation, with possible modest geometric improvements.

Several other locations on Route 31 have also been investigated as part of the TOPICS study. These are the intersections at Central Avenue, Ewingville Road-Upper Ferry Road, and the Pennington Circle (Route 31 and Washington Crossing Pennington Road-Lawrenceville Pennington Road).

At Central Avenue, a median left turn lane for northbound Route 31 traffic would relieve the potential for left turn and same direction type accidents which have been predominant in the accident history of the intersection. A similar accident history has prevailed at the Ewingville Road-Upper Ferry Road intersection. Accordingly, a median left turn lane on Route 31 would also be beneficial at this location. In addition, the Ewingville Road-Upper Ferry Road intersection has experienced 11 right angle accidents. Introduction of an all-red interval in the traffic

signal timing following each of the two signal phases would potentially relieve this condition. At the Pennington Circle, right angle type and same direction type accidents have been notable. Reconstruction, involving elimination of the traffic rotary, and the installation of traffic signal control are seen as a possible solution.

Geometric improvements of the type described above at Central Avenue, Ewingville Road-Upper Ferry Road, and the Pennington Circle are beyond the scope of the TOPICS program as set forth in the New Jersey Department of Transportation guidelines. Furthermore, such projects, which would require significant capital funding, must be weighed against the possibility of establishing an early scheduling of the construction of the Route 31 Freeway. A new highway would divert traffic from Pennington Road, reducing the urgency for undertaking major relief measures on the older facility.

Trenton State College

One major traffic generator is located on Route 31: Trenton State College located east of the highway, north of Green Lane. Enrollment at the institution is approximately 4000 students, some of whom reside on campus. Access to the campus is from Route 31 with one of the driveways, opposite Carlton Avenue, under traffic signal control. While no notable external traffic operating problems have been observed or reported, the college is planning to provide access to the campus from Green Lane.

Parkway Avenue

As an extension of West Upper Ferry Road, Parkway Avenue continues in an easterly direction to the City of Trenton, functioning as a principal collector roadway that services a variety of abutting developments including residences, office buildings, industrial plants, and neighborhood type shopping centers. The roadway is generally 48 feet in width and curbed; a speed limit of 40 mph is posted. Parking on Parkway Avenue is prohibited throughout most of its length.

Traffic operating problems primarily relate to deficiencies at principal intersections. Accordingly, improvements have been proposed at three Parkway Avenue locations: Scotch Road, Lower Ferry Road, and North Olden Avenue Extension, with traffic signal control proposed for Early Implementation at Scotch Road.

Proposed improvements at the Lower Ferry Road and North Olden Avenue Extension intersections include modifications to the existing signal operation as well as geometric changes. These improvements are discussed elsewhere in the report.

General Motors Corporation

At the westerly terminus of Parkway Avenue, General Motors Corporation operates a manufacturing plant which accommodates approximately 1000 employees on its principal shift (7:00 A.M. to 3:30 P.M.). The surges of traffic that occur on Parkway Avenue at the plant driveways during shift changes do not seriously disrupt traffic operations.

In part, this can be attributed to the times of arrival and departure of most General Motors employees which occur from one to two hours before most other commuter trips are made. The traffic pattern created by employee trips is another favorable factor relative to Parkway Avenue traffic operations. Many trips to the plant are outbound from Trenton in the morning and inbound in the afternoon when much of the other commuter traffic flow is in the opposite direction.

New Jersey Department of Transportation

The other traffic generator of notable significance on Parkway Avenue is the office building that serves as headquarters for the New Jersey Department of Transportation located on Parkway Avenue at Lower Ferry Road. It is estimated that, for the some 1500 employees working at the site, approximately half that number of passenger cars are used, with buses and car pools serving to supplement employee transportation. It is also of interest to note that, depending upon their classification, some employees work an eight-hour day (8:30 A.M. to 5:00 P.M.), while others report for only seven hours (9:00 A.M. to 4:30 P.M.), a factor which favorably influences traffic patterns at the site by spreading the morning inbound and evening outbound movements over an extended period of time. During peak periods of operation, however, traffic volumes exceed capacity limitations at the Parkway Avenue/Lower Ferry Road intersection. A traffic officer has been observed operating the traffic signal to provide an extended "green" to Lower Ferry Road traffic, thereby minimizing delays to traffic on the south approach. The proposed improvements to the Parkway Avenue/Lower Ferry Road intersection (discussed elsewhere in the report) are offered as a means of substantially reducing the capacity and safety deficiencies at the intersection.

Princeton Avenue-Princeton Pike

Princeton Avenue and its extension to the north, known as Princeton Pike, vary in usage and function at different locations. Between North Olden Avenue Extension and the Brunswick Circle Extension, Princeton Avenue is a heavily traveled urban facility designated as U.S. Route 1 Alternate. This half-mile section of roadway is approximately 44 feet in width and serves a mixture of commercial and residential land use. It also functions as a major connector between U.S. Route 1 and other roadways to the south and west. In addition to deficiencies in intersection capacity at Spruce Street and North Olden Avenue Extension, Princeton Avenue in this area suffers from a poor accident record primarily attributable to conflicting movements between through traffic and traffic oriented to the roadside development. Accordingly, a detailed investigation of this portion of Princeton Avenue has been made and is considered separately in another section of the report.

North of the Brunswick Circle Extension, Princeton Avenue is less heavily traveled, its function reduced to that of a secondary arterial roadway and roadside development changed to a more suburban character. No notable traffic operating problems were found in this section

of Princeton Avenue. The County of Mercer, however, is undertaking the reconstruction of Princeton Avenue from the Brunswick Circle Extension to U.S. Route 206. The improvement principally will involve widening the roadway to 48 feet and will include the construction of curbs and sidewalks.

North of U.S. Route 206, Princeton Pike is under the jurisdiction of the Township of Lawrence. Development remains suburban in character and thins out in the northerly part of the Township. The pavement width narrows from 44 feet in the south to 22 feet in the northerly section. The municipality has obtained authorization to install traffic signal control at the intersection of the Pike with Darrah Lane. Currently the Township is preparing contract plans and specifications and is proposing to complete the improvement outside the TOPICS program. In addition, the County of Mercer will be upgrading the signal hardware and modifying signal operation at the intersection of County Road 546 (Benjamin Franklin Road) and Princeton Pike.

SPEED LIMITS

Realistic Speed Limits

Speed limits are posted to guide drivers in their operation of motor vehicles. If the limit is too high, the dangerous driver is unchecked in his pursuit of speed to the detriment of others. If the limit is too low, drivers will ignore it, and the value of the posted limit as a guide to safe travel will be undermined. Only with realistic speed zoning can the demands of safety, speed, and comfort be merged into a working balance.

Realistic limits are a reflection of certain constants which make up the physical characteristics of a roadway. These include alignment of the roadway, pavement and lane width, presence of shoulders, curbs and sidewalks, roadside development and distance to vertical obstructions. Obviously, the influence of each of these on travel speeds cannot be measured separately. But the speed that a safe driver chooses at any location is a reflection of all these conditions combined.

Realistic speed limits, therefore, will allow the typical safe driver to travel at his accustomed speed while excluding the few unsafe drivers, who, as violators, can then be subject to apprehension and the penalties prescribed by law. Speed limits are not a tool for effecting substantial changes in the pattern of speeds along a roadway, since the speed of most vehicles will remain unchanged. Proper limits, however, do tend to lower the highest speeds and raise the lowest ones, resulting in more uniform traffic flows and safer driving conditions.

Three roadways in Report Area II were selected for survey and analysis: Buttonwood Drive, Somerset Street, and Reed Road-Lower Ferry Road. No speed limits are presently posted on these roadways, and the statutory speed limits applicable to them appear to be unrealistic.

The Survey

The survey was conducted under the best available weather conditions and involved three distinct procedures. Along stretches of roadway where motorists can travel relatively unrestricted, spot speed checks were taken with radar from a vehicle parked inconspicuously on the side. These observations were limited to off-peak hours when traffic was free-flowing. The 85th percentile speed was then computed for each study location and posted on a map for analysis in conjunction with the speed check results at other locations on the same road. The final proposed speed limit for the roadway was then determined on the basis of a comprehensive review of all the posted data.

The second procedure involved determination of the safe travel speed along the curved sections of the study roadways. With the aid of a ball bank indicator, a driver and a recorder traversed each location several times to determine the comfortable and safe travel speed at which each of the curves could be negotiated. Independent ball bank surveys were made in each direction of travel.

After the initial engineering analysis was completed and tentative speed limit and warning signs were selected, a field check was made to determine the exact location of the proposed signs. A field run(s) in each direction was then made to determine the necessity for complementary devices such as School Advance and School Crossing signs.

Proposed Improvements

As a result of the engineering surveys and analyses described above, it is recommended that new speed limits be ordained on Buttonwood Drive, Somerset Street, and Reed Road-Lower Ferry Road. It is also proposed to erect appropriate speed limit and warning signs along the study roadways in accordance with the following sign schedules. Advisory Speed signs are proposed for use with the warning signs where appropriate. Each listing describes the proposed sign legend and location, and its designation as shown in the current "Manual on Uniform Traffic Control Devices for Streets and Highways." The replacement of existing signs - such as school signs - that do not conform to the Manual is proposed.

Benefit

Realistic speed limits will tend to be observed voluntarily since they coincide with the speeds assumed by the majority of drivers. Proper posting of realistic speed limits will also tend to reduce the higher speeds, resulting in more uniform traffic flows and safer operating conditions. Finally, the advance warning signs and advisory speeds will provide additional guides for motorists at hazardous locations, affording further aids toward safer operation.

Cost Estimate

Construction	\$6,200.00
Engineering	<u>800.00</u>
Total	\$7,000.00

BUTTONWOOD DRIVE

Study Section Characteristics

Limits: Somerset Street to Prospect Street

Length: 0.8 mile

Assumed Direction: West-East

Roadway Geometrics and Controls:

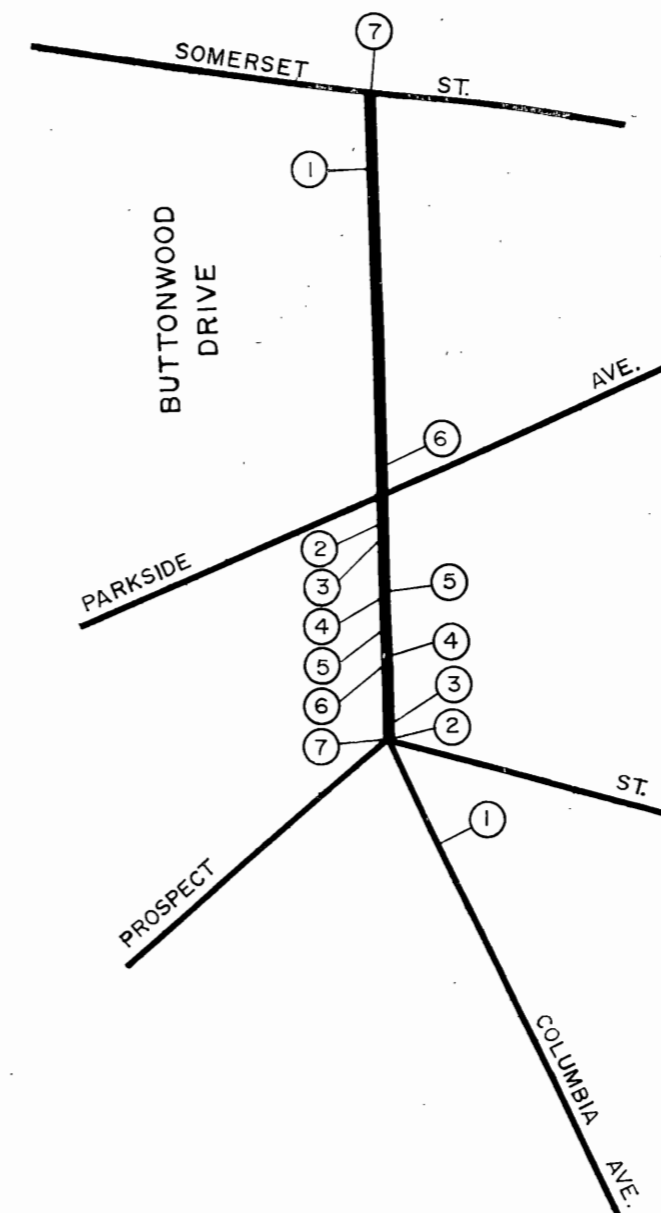
Width	Somerset Street-Parkside Avenue, 45 feet Parkside Avenue-Prospect Street, 36 feet
Alignment	Straight
Controls	STOP sign control at Ardsley Avenue and Prospect Street. Buttonwood Drive is STOP sign controlled at Parkside Avenue and YIELD sign controlled at Somerset Street.
Speed Limit	Statutory 25 mph and 50 mph

Land Use: Residential and Park

School: Alfred Reed School located between Prospect Street and Twelfth Street. Statutory school zone speed in existence. Mid-block crosswalk in front of school. Crossing guard on duty when children are present.

Recommended Speed Limit

Somerset Street to Prospect Street: 40 mph
School: 25 mph when children are present



SIGN
LOCATIONS

BUTTONWOOD DRIVE

Sign Schedule: Eastbound Direction

<u>Sign</u>	<u>Type</u>	<u>Location</u>
1) SPEED LIMIT 40	R2-1	58' east of Ormond Avenue (40' east of Pole 61727EW)
2) SPEED LIMIT 40	R2-1	235' east of Parkside Avenue (20' west of Pole PS1558EW)
3) School Advance	S1-1	290' east of Parkside Avenue (35' east of Pole PS1558EW)
4) SCHOOL SPEED LIMIT 25 WHEN CHILDREN ARE PRESENT (Assembly)	S4-3 R2-1 S4-2	115' west of Twelfth Street, replace existing SCHOOL ZONE sign
5) Cross Road	W2-1	478' west of north approach of Prospect Street (4' west of Pole PS1829EW)
6) School Crossing	S2-1	25' west of Pole PS1534EW
7) School Crossing	S2-1	60' east of Pole PS1826EW

Sign Schedule: Westbound Direction

<u>Sign</u>	<u>Type</u>	<u>Location</u>
1) School Advance	S1-1	230' east of Prospect Street (20' east of Pole 64708EW) on Columbia Avenue
2) School Crossing	S2-1	40' east of Pole W63-SPA-4-35 in place of existing NO PARKING ANYTIME sign
3) SCHOOL SPEED LIMIT 25 WHEN CHILDREN ARE PRESENT (Assembly)	S4-3 R2-1 S4-2	replace existing SCHOOL ZONE sign
4) School Crossing	S2-1	50' east of Pole 57
5) SPEED LIMIT 40	R2-1	20' east of Pole BT311-60 on opposite side
6) SPEED LIMIT 40	R2-1	250' west of Parkside Avenue (20' east of Pole E62302EW)
7) Double Arrow	W1-7	Opposite Buttonwood Drive centerline on the west side of Somerset Street (38' north of Pole E60972EW)

SOMERSET STREET

Study Section Characteristics

Limits: Gould Street to Pennington Road

Length: 0.7 mile

Assumed Direction: North-South

Roadway Geometrics and Controls:

Width 30 feet

Alignment Straight

Controls Signal control at Pennington Road. Southbound STOP sign controlled at Buttonwood Drive.

Speed Limit Statutory 25 mph throughout

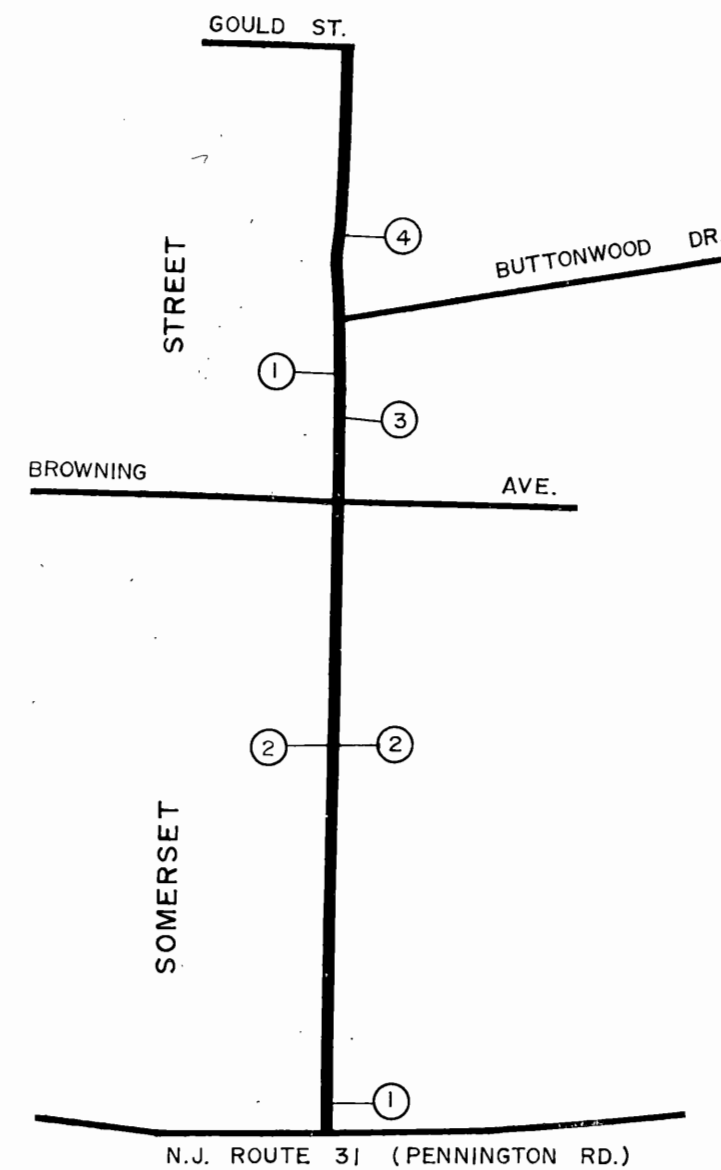
Land Use: Residential

School: None

Recommended Speed Limit

Gould Street to Buttonwood Drive: 25 mph

Buttonwood Drive to Pennington Road: 35 mph



SIGN LOCATIONS

SOMERSET STREET

Sign Schedule: Southbound Direction

<u>Sign</u>	<u>Type</u>	<u>Location</u>
1) SPEED LIMIT 35	R2-1	200' south of Buttonwood Drive (65' south of Pole E60973EW)
2) SPEED LIMIT 35	R2-1	50' south of Georgia Avenue (44' south of Pole 61365EW)

Sign Schedule: Northbound Direction

<u>Sign</u>	<u>Type</u>	<u>Location</u>
1) SPEED LIMIT 35	R2-1	155' north of Pennington Road (15' south of Pole PS5286EW)
2) SPEED LIMIT 35	R2-1	50' south of Georgia Avenue
3) a) Turn sign modified to show the northerly leg of Somerset Street	W1-1	120' south of Loring Avenue (6' south of McCullough RFD)
b) 10 mph Advisory Speed plate	W13-1	Mounted beneath sign 3.a.
4) SPEED LIMIT 25	R2-1	50' north of Carnine Avenue

REED ROAD-LOWER FERRY ROAD

Study Section Characteristics

Limits: Washington Crossing Pennington Road to Route 29

Length: 5.4 miles

Assumed Direction: North-South

Roadway Geometrics and Controls:

Width Reed Road, 16 to 20 feet
Lower Ferry Road, 22 to 26 feet

Alignment Several curves, bump at Reading Railroad crossing

Controls Signal control at Route 29 and Parkway Avenue.
STOP signs at all other intersections. Lower Ferry Road STOP controlled at Upper Ferry Road.

Speed Limit Statutory 25 mph throughout

Land Use: Residential north of Sullivan Way. South of Sullivan Way, undeveloped. Reed Road is light industrial and rural.

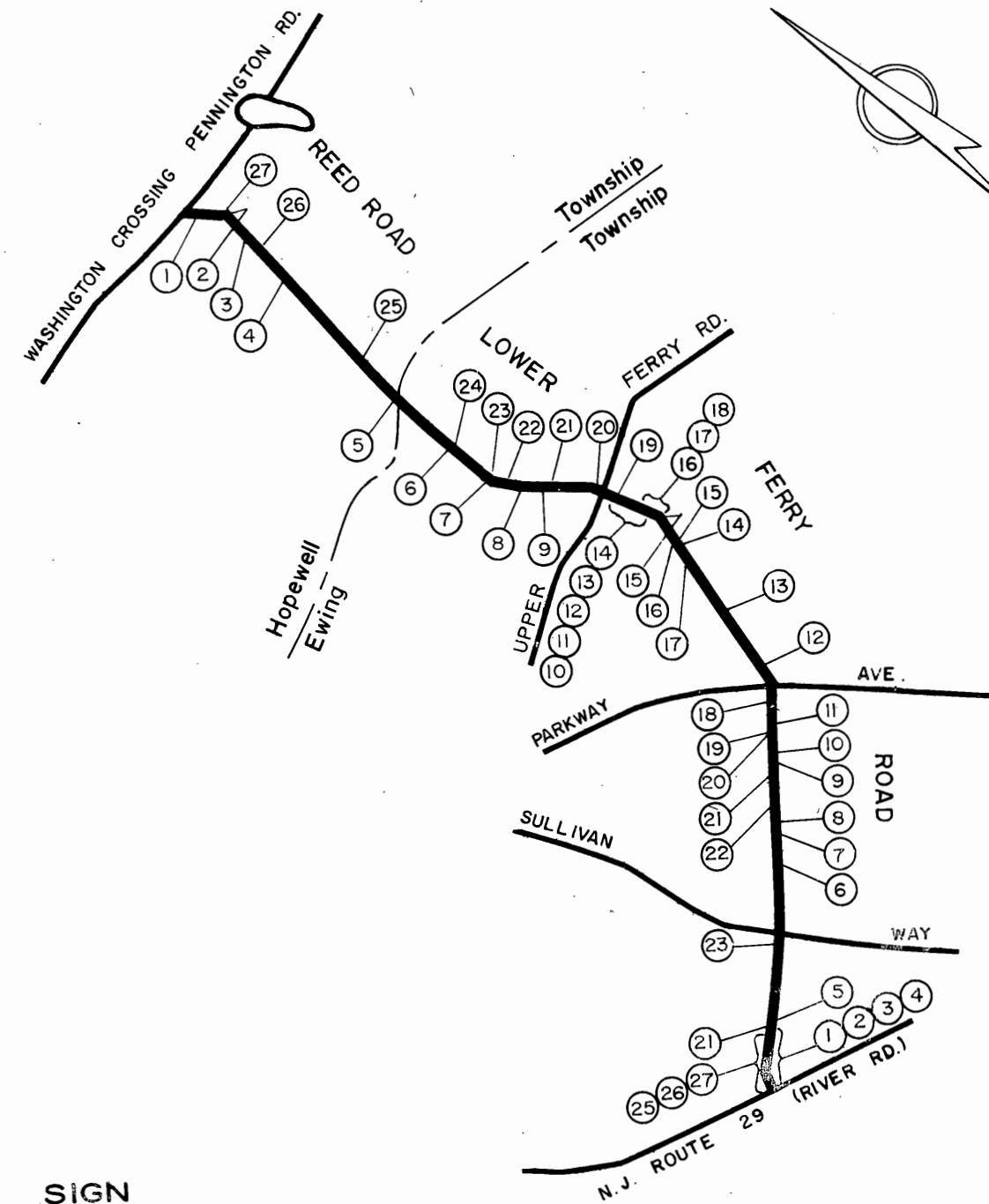
School: Fisher Elementary Junior High School located on west side of Lower Ferry Road between Hillside Avenue and Hickory Hill Drive. Statutory school zone speed in existence. Mid-block crosswalk in front of school.

Recommended Speed Limit

Washington Crossing Pennington Road to Hillside Avenue: 35 mph

Hillside Avenue to Route 29: 40 mph

School: 25 mph when children are present



SIGN
LOCATIONS

REED ROAD-LOWER FERRY ROAD

Sign Schedule: Northbound Direction

<u>Sign</u>	<u>Type</u>	<u>Location</u>
1) a) Right Reverse Turn	W1-3	10' south of Pole 63068EW on opposite side (in place of existing DANGEROUS CURVE sign)
b) 20 mph Advisory Speed plate	W13-1	Mounted beneath sign 1.a.
2) Right Arrow	W1-6	25' south of Pole 63068EW
3) Left Arrow	W1-6	75' north of Pole 64161EW
4) SPEED LIMIT 40	R2-1	1250' north of River Road (34' north of Pole 62332EW)
5) SPEED LIMIT 40	R2-1	2200' north of River Road (40' south of Pole PS4872EW)
6) SPEED LIMIT 40	R2-1	420' north of Stuyvesant Avenue (34' north of Pole 60587EW)
7) a) Left Curve	W1-2	450' south of Stuyvesant Avenue (15' south of Pole 61864EW)
b) 30 mph Advisory Speed plate	W13-1	Mounted beneath sign 7.a.
8) Left Arrow	W1-6	15' north of Pole 60571EW
9) Railroad Advance Warning	W10-1	500' south of the Reading Railroad crossing (30' north of Pole 60551EW)

Sign Schedule: Northbound Direction (continued)

<u>Sign</u>	<u>Type</u>	<u>Location</u>
10) a) BUMP	W8-1	390' south of the Reading Railroad crossing (15' north of Pole 60550EW)
b) 30 mph Advisory Speed plate	W13-1	Mounted beneath sign 10.a.
11) SPEED LIMIT 40	R2-1	185' north of the Reading Railroad crossing (16' south of Pole 60544EW)
12) SPEED LIMIT 40	R2-1	225' north of Parkway Avenue (139' north of Pole PS4159EW)
13) SPEED LIMIT 40	R2-1	188' north of Theresa Street (opposite Pole EM60871EW79)
14) a) Left Curve	W1-2	470' south of Hillside Avenue (50' south of Pole PS2168EW)
b) 30 mph Advisory Speed plate	W13-1	Mounted beneath sign 14.a.
15) School Advance	S1-1	Replace existing SCHOOL CROSSING sign
16) Left Arrow	W1-6	100' south of Pole PS1018EW
17) SCHOOL SPEED LIMIT 25 WHEN CHILDREN ARE PRESENT (Assembly)	S4-3 R2-1 S4-2	20' north of Pole 65497EW (south of school driveway)
18) School Crossing	S2-1	20' south of Pole 1021EW

REED ROAD-LOWER FERRY ROAD

Sign Schedule: Northbound Direction (continued)

<u>Sign</u>	<u>Type</u>	<u>Location</u>
19) SPEED LIMIT 35	R2-1	Opposite existing SCHOOL CROSSING sign
20) a) Left Curve	W1-2	153' north of Upper Ferry Road (25' north of Pole A65479EW)
b) 30 mph Advisory Speed plate	W13-1	Mounted beneath sign 20. a.
21) a) Right Curve	W1-2	50' south of Pole A66507EW
b) 30 mph Advisory Speed plate	W13-1	Mounted beneath sign 21. a.
22) a) Right Turn	W1-1	25' south of Pole A66518EW, PS122EW
b) 20 mph Advisory Speed plate	W13-1	Mounted beneath sign 22. a.
23) Right Arrow	W1-6	20' south of Pole T65780EW on west side
24) SPEED LIMIT 35	R2-1	25' south of Pole PS125EW
25) SPEED LIMIT 35	R2-1	1300' south of Diverty Road (100' south of Pole PS1625HW)
26) a) Left Turn	W1-1	20' south of Pole PS1318HW
b) 20 mph Advisory Speed plate	W13-1	Mounted beneath sign 26. a.
27) Left Arrow	W1-6	90' north of Pole 190S

Sign Schedule: Southbound Direction

<u>Sign</u>	<u>Type</u>	<u>Location</u>
1) a) Right Curve	W1-2	106' north of Pole 194
b) 25 mph Advisory Speed plate	W13-1	Mounted beneath sign 1. a.
2) Right Arrow	W1-6	25' north of Pole 190S
3) SPEED LIMIT 35	R2-1	25' north of Pole 188
4) SPEED LIMIT 35	R2-1	30' north of Pole BT9-180
5) SPEED LIMIT 35	R2-1	25' north of Pole T64095HW
6) a) Left Turn	W1-1	180' north of Pole 134
b) 20 mph Advisory Speed plate	W13-1	Mounted beneath sign 6. a.
7) Left Arrow	W1-6	20' south of Pole E65779EW
8) a) Left Curve	W1-2	74' north of Pole 1291-2
b) 30 mph Advisory Speed plate	W13-1	Mounted beneath sign 8. a.
9) SPEED LIMIT 35	R2-1	25' north of Pole BT9-125
10) SPEED LIMIT 35	R2-1	125' south of Upper Ferry Road (20' north of Pole 66025EW)
11) School Advance	S1-1	35' north of Pole E65775EW

REED ROAD-LOWER FERRY ROAD

Sign Schedule: Southbound Direction (continued)

Sign	Type	Location
12) SCHOOL SPEED LIMIT 25 WHEN CHILDREN ARE PRESENT (Assembly)	S4-3 R2-1 S4-2	Replace existing SCHOOL CROSSING sign
13) School Crossing	S2-1	45' north of Pole BT9-104
14) a) Right Curve	W1-2	30' north of Pole BT9-104
b) 30 mph Advisory Speed plate	W13-1	Mounted beneath sign 14.a.
15) Right Arrow	W1-6	On east side of road, 25' north of Pole 65498EW
16) SPEED LIMIT 40	R2-1	50' north of Pole C65771EW
17) SPEED LIMIT 40	R2-1	75' south of Central Avenue (65' south of Pole 60883EW)
18) SPEED LIMIT 40	R2-1	250' south of Parkway Avenue (77' north of Pole PS4154EW)
19) Railroad Advance Warning	W10-1	500' north of the Reading Railroad crossing (144' north of Pole PS4150EW)

Sign Schedule: Southbound Direction (continued)

Sign	Type	Location
20) a) BUMP	W6-1	400' north of the Reading Rail- road crossing (44' north of Pole PS4150EW)
b) 30 mph Advisory Speed plate	W13-1	Mounted beneath sign 20.a.
21) a) Left Curve	W1-2	200' south of the Reading Rail- road crossing
b) 35 mph Advisory Speed plate	W13-1	Mounted beneath sign 21.a.
22) SPEED LIMIT 40	R2-1	700' south of Langford Lane (20' south of Pole 60560EW on the opposite side)
23) SPEED LIMIT 40	R2-1	200' south of Sullivan Way (25' south of Pole PS4894EW)
24) 20 mph Advisory Speed plate	W13-1	Mounted beneath the existing Reverse Turn sign
25) Right Arrow	W1-6	450' south of the Reading Rail- road bridge on the east side (20' north of Pole 6416EW)
26) Left Arrow	W1-6	30' south of Pole 6306EW
27) Signal Ahead	W3-3	20' south of Pole 6309EW

PUBLIC TRANSIT

Existing Conditions

Mercer Metro, the principal bus operator in Mercer County, assigns a total of eight routes in Report Area II, all of which extend from the City of Trenton. In relation to population distribution and corridor development, the existing bus routes provide good coverage. Three bus routes operate in Lawrence Township along Route 1, Route 206, and Princeton Pike. Two of these terminate within the Township and the third extends into Princeton Borough. Six bus routes serve Ewing Township, one of which extends into Hopewell.

For the most part, bus stops in the Township are not identified by signs or other markings. Hence, bus drivers stop in response to patron demand. Where bus stops are identified, the signing is generally old and illegible, and, typically, existing bus stops are too short, or not located to the best advantage relative to overall traffic operating considerations.

Proposed Improvements

The following improvements are recommended relative to the proposed bus stops listed in Table C of the Appendix:

- . Establish all proposed bus stops by local ordinance, and by State regulation on State highways.
- . Provide bus stops of the following minimum dimensions:*.
 - Corner, Near Side - 105 feet
 - Corner, Far Side - 100 feet
 - Mid-Block - 135 feet
- . Provide bus stops 40 feet longer than the above minimum standards in certain locations as indicated in Table C.
- . Provide a NO PARKING BUS STOP sign at each end of all proposed bus stops.

*New Jersey Department of Transportation standards.

Benefit

Providing bus stops of the lengths proposed will permit the easy maneuvering of buses, thereby encouraging their proper use. The extended bus stop dimensions proposed for selected locations will permit two buses to stop simultaneously, thus accommodating the concentrated activity of buses and other traffic that presently operate on these roadways. The use of far side bus stops wherever practical will minimize conflicts between buses and crossing pedestrians, as well as conflicts between buses and right turning vehicles. It is also anticipated that the proposed signing will readily identify the bus stops to patrons and parking motorists.

Cost Estimate

Construction	\$6,500.00
Engineering	<u>800.00</u>
Total	\$7,300.00

EXISTING ORDINANCES

All existing traffic and parking ordinances on the study roadways in Ewing, Hopewell, and Lawrence Townships were reviewed relative to their legal authority. Those found to be unapproved were examined with respect to their need for maintaining the full potential of the street network in relation to the demands of traffic. Appropriate recommendations were then formulated toward repealing or seeking the approval of these ordinances.

The benefits to be derived in obtaining approval of the ordinances discussed herein are not immediately obvious. They relate, however, to the desirability of providing uniformly credible traffic regulation that will be enforced on the one hand and respected on the other, a necessary condition in providing the safe and orderly movement of traffic.

Through Street (Ewing Township)

It is recommended that the following Through Street ordinance be submitted to the New Jersey Department of Transportation for approval:

- . Glen Clair Drive-Central Avenue, between Glen Mawr Drive and Pennington Road.

Truck Gross Weight Limit (Ewing Township)

It is recommended that the following ordinance relative to Truck Gross Weight Limit of 15 Tons be submitted to the New Jersey Department of Transportation for approval:

- . Parkside Avenue from North Olden Avenue Extension to Parkway Avenue.

It is recommended that the following ordinance relative to Truck Gross Weight Limit of 15 Tons be repealed:

- . Upper Ferry Road from Pennington Road to Scotch Road.

It is recommended that a Truck Gross Weight Limit of Eight Tons be ordained and submitted to the New Jersey Department of Transportation for approval to comply with existing signing as follows:

- . Upper Ferry Road from Lower Ferry Road to Scotch Road.

Parking (Lawrence Township)

It is recommended that the following ordained Parking regulation be submitted to the New Jersey Department of Transportation for approval:

- . Stopping and standing be prohibited at any time on Princeton Pike, east side, from the south curb line of Harding Avenue to a point 500 feet south thereof.

<u>Table</u>	<u>Description</u>	<u>No. Pages</u>
A	Accident History At Intersections 1968-1970	2
B	Traffic Signal Locations	2
C	Proposed Bus Stops	9

TABLE A

ACCIDENT HISTORY AT INTERSECTIONS 1968-1970

Intersection	Number of Accidents				Intersection	Number of Accidents			
	PD	PI	F	Total		PD	PI	F	Total
U.S. Rte. 1/U.S. Rte. 206	165	23		188	U.S. Rte. 206/Princeton Ave.	16	7		23
U.S. Rte. 1/Whitehead Rd. Ext.	42	17	1	61	Trenton Freeway Exit/Whitehead Rd. Ext.	17	6		23
N. Olden Ave. Ext./Princeton Ave.	44	16		60	U.S. Rte. 1/Texas Ave.	15	7		22
N. Olden Ave. Ext./Prospect St.	36	20		56	N. J. Rte. 31/Central Ave.	15	6	1	22
N. Olden Ave. Ext./Parkside Ave.	36	19		55	Princeton Ave./Pine St.	19	2		21
N. Olden Ave. Ext./N. J. Rte. 31	35	15		50	U.S. Rte. 1/Lake Dr. Jughandle	14	6		20
Parkway Ave./Lower Ferry Rd.	34	13		47	U.S. Rte. 1/Cherry Tree La.	14	5		19
Princeton Ave./Myrtle St.	34	12		46	U.S. Rte. 1/Motor Vehicle Jughandle	10	7	2	19
Princeton Ave./Spruce St.	35	5		40	U.S. Rte. 206/Carter Rd.	14	5		19
Parkway Ave./N. Olden Ave. Ext.	34	5		39	Parkside Ave./Buttonwood Dr.	10	9		19
N. J. Rte. 31/Ewingville Rd. -Upper Ferry Rd.	26	9	1	36	N. J. Rte. 31/Green La.	16	2		18
U.S. Rte. 1/Benjamin Franklin Rd. - Lawrence Station Rd.	28	7		35	Artic Parkway/Spruce St.	16	2		18
N. Olden Ave. Ext./Artic Parkway	23	9		32	N. Olden Ave. Ext./Sixth St.	11	6		17
Pennington Traffic Circle	24	8		32	Parkway Ave./Scotch Rd.	13	4		17
U.S. Rte. 206/Benjamin Franklin Rd.	25	6		31	Princeton Ave./Vermont St.	10	5		15
N. J. Rte. 29/Washington Crossing Pennington Rd.	20	11		31	Princeton Pike/Benjamin Franklin Rd.	11	4		15
Lower Ferry Rd./Sullivan Way	19	9		28	N. J. Rte. 31/Thurston Ave.	10	4		14
Parkside Ave./Spruce St. Ext.	22	6		28	N. J. Rte. 31/Carlton Ave.	9	5		14
Princeton Ave./Mulberry St.	24	4		28	Prospect St./Spruce St.	9	5		14
Parkway Ave./Farrell Ave.	16	11		27	U.S. Rte. 1/Slack Ave.	6	6	1	13
N. J. Rte. 31/Parkside Ave.	17	7		24	U.S. Rte. 1/E. Darrah La.	5	8		13
					N. J. Rte. 29/Lower Ferry Rd.	9	4		13
					Ewingville Rd./Eggert Crossing Rd.	10	3		13

PD: Property Damage

PI: Personal Injury

F: Fatal

TABLE A (Continued)

ACCIDENT HISTORY AT INTERSECTIONS 1968-1970

Intersection	Number of Accidents				Intersection	Number of Accidents			
	PD	PI	F	Total		PD	PI	F	Total
Ewingville Rd. /Federal City Rd.	10	3		13	N. J. Rte. 31/Brae Burn Dr.	7	2		9
U.S. Rte. 1/Bunker Hill Ave.	8	4		12	N. J. Rte. 31/Theresa St.	6	3		9
U.S. Rte. 206/Mulberry St.	9	3		12	Princeton Pike/Darrah La.	2	7		9
U.S. Rte. 206/Darrah La.	9	3		12	Princeton Pike/Province Line Rd.	7	2		9
N. J. Rte. 29/N. J. Rte. 175	10	2		12	Interstate Rte. 95/Bear Tavern Rd.	4	4		8
N. J. Rte. 31/Somerset Ave.	8	4		12	U.S. Rte. 1/Putnam Ave.	5	3		8
N. Olden Ave. Ext. /Fifth St.	5	7		12	U.S. Rte. 206/Spruce St.	8			8
U.S. Rte. 1/Carnegie Rd.	5	6		11	U.S. Rte. 206/Eggert Crossing Rd.	3	5		8
Buttonwood Dr. /Somerset St.	8	3		11	N. J. Rte. 31/Weber Ave.	7	1		8
Ewingville Rd. /Lynwood Ave.	10	1		11	N. J. Rte. 31/Penwood Dr.	6	2		8
Washington Crossing Pennington Rd. /Trenton Harbourton Rd.	6	5		11	U.S. Rte. 1/Valley Forge Ave.	7			7
W. Upper Ferry Rd. /Grand Ave.	11			11	Ewingville Rd. /Green La.	6	1		7
Lawrenceville Pennington Rd. /Blackwell Rd.	6	4		10	Lower Ferry Rd. /Upper Ferry Rd.	4	3		7
Princeton Ave. /Brunswick Circle Ext.	10			10	N. Olden Ave. Ext. /Glen Mawr Dr.	3	4		7
Princeton Pike/Texas Ave.	8	2		10	Princeton Ave. /Lanning Ave.	7			7
Princeton Pike/Fackler Rd.	8	2		10	Washington Crossing Pennington Rd. /Scotch Rd.	4	3		7
Whitehead Rd. Ext. /Lakedale Dr.	7	3		10	U.S. Rte. 1/Pilgrim Ave.	4	2		6
U.S. Rte. 1/Haveson Ave.	7	2		9	U.S. Rte. 206/Gordon Ave.	4	2		6
U.S. Rte. 1/Graf Ave.	7	2		9	N. J. Rte. 31/Carolina Ave.	4	2		6
U.S. Rte. 1/President Ave.	4	5		9	N. J. Rte. 31/Main Blvd.	5	1		6
U.S. Rte. 206/Province Line Rd.	6	3		9	N. J. Rte. 31/Brandon Rd.	2	4		6
					Lower Ferry Rd. /Carlton Ave.	4	2		6

TABLE B
TRAFFIC SIGNAL LOCATIONS

INTERSECTION	STATUS	IMPROVEMENT	DESIGN DRAWING
<u>Existing Signals</u>			
U.S. Route 1/Slack Avenue-Cherry Tree Lane	Approved	None	
U.S. Route 1/Whitehead Road Extension	Approved	None	
U.S. Route 1/Lake Drive	Approved	None	
U.S. Route 1/Texas Avenue	Approved	None	
U.S. Route 1/Jughandle south of East Darrah Lane	Approved	None	
U.S. Route 1/East Darrah Lane Jughandle	Approved	None	
U.S. Route 1/Carnegie Avenue	Approved	None	
U.S. Route 1/Franklin Corner Road-Lawrence Station Road	Approved	None	
U.S. Route 1/Inspection Station Access Drive	Approved	None	
U.S. Route 1/Province Line Road	Approved	None	
U.S. Route 206/Princeton Avenue-Princeton Pike	Approved	Proposed	
U.S. Route 206/Eggert Crossing Road	Approved	None	
U.S. Route 206/Benjamin Franklin Road	Approved	None	
U.S. Route 206/Phillips Avenue	Approved	None	
N. J. Route 29/Washington Crossing Pennington Road	Approved	None	
N. J. Route 29/West Upper Ferry Road	Approved	None	
N. J. Route 29/Lower Ferry Road	Approved	None	
N. J. Route 31/Parkside Avenue	Approved	None	
N. J. Route 31/North Olden Avenue Extension	Approved	Proposed	B2
N. J. Route 31/Central Avenue	Approved	None	
N. J. Route 31/Somerset Street	Approved	None	
N. J. Route 31/Carlton Avenue	Approved	None	
N. J. Route 31/Ewingville Road-Upper Ferry Road	Approved	Proposed	

TABLE B (Continued)

TRAFFIC SIGNAL LOCATIONS

INTERSECTION	STATUS	IMPROVEMENT	DESIGN DRAWING
<u>Existing Signals</u> (continued)			
North Olden Avenue/Parkside Avenue	Authorized/Unapproved	Proposed	B2
North Olden Avenue/Prospect Street	Approved	Proposed	B3
North Olden Avenue/E. J. Korvette Entrance	Authorized/Unapproved	None	
North Olden Avenue/Princeton Avenue	Authorized/Unapproved	Proposed	B8
Parkside Avenue/Buttwood Drive	Authorized/Unapproved	None	
Parkway Avenue/General Motors Crosswalk	Authorized/Unapproved	None	
Parkway Avenue/Lower Ferry Road	Approved	Proposed	B10
Parkway Avenue/Farrell Avenue	Approved	None	
Parkway Avenue/North Olden Avenue Extension	Authorized/Unapproved	Proposed	B11
Princeton Avenue/Spruce Street Extension	Authorized/Unapproved	Proposed	B8
Princeton Pike/Benjamin Franklin Road	Authorized/Unapproved	None	
Sullivan Way/Lower Ferry Road	Authorized/Unapproved	None	
West Upper Ferry Road/Grand Avenue-Bear Tavern Road	Approved	None	
<u>Proposed Signals</u>			
Ewingville Road/Eggert Crossing Road	Authorized	Proposed	B5
North Olden Avenue/Artic Parkway		Proposed	B4
Parkside Avenue/Spruce Street Extension		Proposed	B12
Parkway Avenue/Scotch Road	Authorized	Proposed	B6
Princeton Avenue/Brunswick Circle Extension		Proposed	B9
Washington Crossing Pennington Road/Scotch Road	Authorized	Proposed	B7

TABLE C

PROPOSED BUS STOPS

	<u>Bus Stop Type</u>		<u>Bus Stop Type</u>
<u>ROUTE K</u> <u>Brunswick Avenue, East Side</u>		<u>ROUTE K</u> <u>Brunswick Avenue, West Side</u>	
Spruce Street	Far Side	Plum Street	Mid Block (75' South)
Pine Street	Near Side	Lanning Avenue	Far Side
Mulberry Street	Far Side	Mulberry Street	Far Side
Plum Street	Far Side	Pine Street	Far Side
Cherry Street	Far Side		
<u>ROUTE K</u> <u>U.S. Route 1 (Brunswick Pike), East Side</u>		<u>ROUTE P</u> <u>U.S. Route 206 (Lawrenceville Road), East Side</u>	
Pear Street	Far Side	Princeton Pike	Far Side
Puritan Avenue	Far Side	Fairfield Avenue	Mid Block (725' South)
Putnam Avenue	Far Side	Fairfield Avenue	Far Side
Trumbull Avenue	Far Side	Devon Avenue	Far Side
Cherry Tree Lane	Far Side	Brearly Avenue	Far Side
Whitehead Road Extension	Far Side	Roxboro Road	Far Side
Bunker Hill Road	Far Side	Gainsboro Road	Far Side
Lake Drive	Far Side	Wilson Avenue	Far Side
Colonial Lake Drive	Mid Block (650' South)	Millerick Avenue	Far Side
		Berwyn Place	Far Side
		Eggert Crossing Road	Far Side
		Oaklyn Terrace	Far Side
		Darrahan Lane	Far Side
		Skillman Avenue	Far Side
		Vander Veer Drive	Far Side
		West Long Road	Far Side
		West Church Road	Far Side
		Benjamin Franklin Road	Far Side
		Green Avenue	Far Side
		Titus Avenue	Far Side
		Craven Lane	Far Side
		Phillips Avenue	Far Side
		Cold Soil Road	Far Side
<u>ROUTE K</u> <u>U.S. Route 1 (Brunswick Pike), West Side</u>			
Lake Drive	Mid Block (225' North)		
President Avenue	Far Side		
Graf Avenue	Far Side		
Slack Avenue	Far Side		
Trumbull Avenue	Far Side		
Haveson Avenue	Far Side		
Maplewood Avenue	Far Side		

TABLE C (Continued)

PROPOSED BUS STOPS

	<u>Bus Stop Type</u>		<u>Bus Stop Type</u>
<u>ROUTE P</u> <u>U.S. Route 206 (Lawrenceville Road),</u> <u>East Side (continued)</u>		<u>ROUTE P</u> <u>U.S. Route 206 (Lawrenceville Road),</u> <u>West Side (continued)</u>	
Greenwood Avenue	Far Side	Lawn Park Avenue	Far Side
Carter Road	Far Side	Meadowbrook Avenue	Far Side
Carter Road	Mid Block (300' North)	Fernwood Avenue	Far Side
Squibb Company Driveway	Far Side	Fairfield Avenue	Far Side
Province Line Road	Far Side	Fairfield Avenue	Mid Block (825' South)
<u>ROUTE P</u> <u>U.S. Route 206 (Lawrenceville Road),</u> <u>West Side</u>		<u>ROUTE H</u> <u>N. J. Route 31 (Pennington Road),</u> <u>East Side</u>	
Province Line Road	Far Side	Parkway Avenue	Far Side
Squibb Company Driveway	Far Side	Clover Avenue	Far Side
Carter Road	Mid Block (450' North)	Homecrest Avenue	Far Side
Carter Road	Far Side	Parkside Avenue	Far Side
Greenwood Avenue	Far Side	Bradway Avenue	Mid Block (130' North)
Cold Soil Road	Far Side	North Olden Avenue Extension	Far Side
Manning Lane	Far Side	Pennroad Avenue	Far Side
Phillips Avenue	Far Side	Woodland Avenue	Far Side
Titus Avenue	Far Side	Central Avenue	Far Side
Green Avenue	Far Side	Sussex Avenue	Far Side
Benjamin Franklin Road	Far Side	Green Lane	Far Side
West Church Road	Far Side	Lanning Street	Far Side
West Long Road	Far Side	Campus Court	Far Side
Vander Veer Drive	Far Side	Trenton State College	Far Side
Skillman Avenue	Far Side	Carlton Avenue	Near Side
Darrah Lane	Far Side	Lake Boulevard	Far Side
Oaklyn Terrace	Far Side	Ewingville Road	Far Side
Eggert Crossing Road	Far Side	Brighton Road	Far Side
Berwyn Place	Far Side	Crown Road	Far Side
Forest Avenue	Far Side	Rockleigh Drive	Far Side
Eldridge Avenue	Far Side	Bull Run Road	Near Side

TABLE C (Continued)

PROPOSED BUS STOPS

<u>Bus Stop Type</u>		<u>Bus Stop Type</u>	
<p>ROUTE H <u>N. J. Route 31 (Pennington Road), East Side (continued)</u></p>		<p>ROUTE P, S <u>Princeton Avenue, East Side</u></p>	
Brandon Avenue	Far Side	Spruce Street	Far Side
Orchard Avenue	Far Side	Pine Street	Far Side
Diverty Road	Far Side	Mulberry Street	Far Side
Washington Crossing Pennington Road	Far Side	Betts Avenue	Far Side
<p>ROUTE H <u>N. J. Route 31 (Pennington Road), West Side</u></p>		<p>ROUTE S <u>Princeton Pike, East Side</u></p>	
Shop Rite Store	Mid Block (between driveways)	U.S. Route 206 (Lawrenceville Road)	Far Side
Diverty Road	Far Side	Carr Avenue	Far Side
Orchard Avenue	Far Side	Harmony Avenue	Far Side
Brandon Avenue	Far Side	Fairfield Avenue	Far Side
Bull Run Road	Far Side	Smithfield Avenue	Far Side
Rockleigh Drive	Far Side	Harding Avenue	Far Side
Crown Road	Far Side	Hughes Avenue	Far Side
Hilltop Road	Far Side	Lawnside Drive	Far Side
Upper Ferry Road	Far Side	Darrah Lane	Far Side
Old Forge Road	Far Side	Allen Lane	Far Side
Carlton Avenue	Far Side	Rita Road	Far Side
Trenton State College	Mid Block (opposite driveway)	Cresthill Avenue	Mid Block (335' North)
Main Boulevard	Far Side	Benjamin Franklin Road	Far Side
Lanning Street	Far Side	<p>ROUTE S <u>Princeton Pike, West Side</u></p>	
Green Lane	Far Side	Benjamin Franklin Road	Far Side
Carolina Avenue	Far Side	Cresthill Avenue	Mid Block (470' North)
Central Avenue	Far Side	Pine Knoll Road	Far Side
Thurston Avenue	Far Side	Barnett Road	Far Side
Pennroad Avenue	Far Side	Darrah Lane	Far Side
North Olden Avenue Extension	Far Side	Lawnside Drive	Mid Block (100' South)
Bradway Avenue	Near Side	Hoover Avenue	Far Side
Parkside Avenue	Far Side	Gedney Road	Far Side
Greenwald Avenue	Far Side		
McCarthy Drive	Far Side		

TABLE C (Continued)

PROPOSED BUS STOPS

	<u>Bus Stop Type</u>		<u>Bus Stop Type</u>
<u>ROUTE S</u> <u>Princeton Pike, West Side (continued)</u>		<u>ROUTE S</u> <u>Grand Avenue, North Side</u>	
Smithfield Avenue	Far Side	Railroad Avenue	Far Side
Irwin Place	Far Side	Trenton Avenue	Far Side
Harmony Avenue	Far Side	Summit Avenue	Far Side
Carr Avenue	Far Side		
Mabel Avenue	Far Side		
<u>ROUTE P, S</u> <u>Princeton Avenue, West Side</u>		<u>ROUTE S</u> <u>Grand Avenue, South Side</u>	
Betts Avenue	Far Side	West Upper Ferry Road	Far Side
Mulberry Street	Far Side	Summit Avenue	Far Side
Pine Street	Far Side	Trenton Avenue	Far Side
		Railroad Avenue	Near Side
<u>ROUTE S</u> <u>Sullivan Way, North Side</u>		<u>ROUTE S</u> <u>West Upper Ferry Road, West Side</u>	
Palmer Lane	Far Side	Grand Avenue	Far Side
Lower Ferry Road	Mid Block (1000' West)	Hinkle Terrace	Far Side
Lower Ferry Road	Mid Block (1330' West)	Washington Avenue	Far Side
Railroad Tracks	Mid Block (750' East)	Manor Drive	Far Side
<u>ROUTE S</u> <u>Sullivan Way, South Side</u>		<u>ROUTE S</u> <u>West Upper Ferry Road, East Side</u>	
Railroad Tracks	Mid Block (615' East)	Manor Drive	Far Side
Lower Ferry Road	Mid Block (1585' West)	Wilburtha Road	Far Side
Lower Ferry Road	Mid Block (1205' West)	Washington Avenue	Far Side
Palmer Lane	Far Side		

TABLE C (Continued)

PROPOSED BUS STOPS

<u>Bus Stop Type</u>		<u>Bus Stop Type</u>	
<p>ROUTE S <u>Diane Drive, South Side</u></p>		<p>ROUTE X <u>North Olden Avenue Extension, South Side (continued)</u></p>	
West Upper Ferry Road	Far Side	N. J. Route 31 (Pennington Road)	Far Side
Cul de Sac	Near Side	Parkside Avenue	Far Side
Wilburtha Road	Near Side	Prospect Street	Far Side
		Artic Avenue	Far Side
		E. J. Korvette Driveway	Far Side
<p>ROUTE S <u>Manor Drive, North Side</u></p>		<p>ROUTE Q <u>Parkway Avenue, North Side</u></p>	
Wilburtha Road	Far Side	N. J. Route 31 (Pennington Road)	Far Side
		Brinton Avenue	Far Side
		Parkside Avenue	Far Side
		Gardner Avenue	Far Side
		Berwyn Avenue	Far Side
		Concord Avenue	Far Side
		Greenway Avenue	Far Side
		Southerland Road	Far Side
<p>ROUTE X <u>North Olden Avenue Extension, North Side</u></p>		<p>ROUTE Q, X <u>Parkway Avenue, North Side</u></p>	
Princeton Avenue	Far Side	North Olden Avenue Extension	Far Side
E. J. Korvette Driveway	Far Side	Ewing High School Driveway	Far Side
Artic Avenue	Far Side	Farrell Avenue	Far Side
Prospect Street	Far Side	Rutledge Avenue	Far Side, Q Route Only (140' long)
Parkside Avenue	Far Side	Stratford Avenue	Far Side, X Route Only (140' long)
N. J. Route 31 (Pennington Road)	Far Side	Gold Avenue	Far Side
Southerland Road	Mid Block (485' East)	Gold Avenue	Mid Block (500' West)
Southerland Road	Far Side	Scotch Road	Far Side
Highgate Drive	Far Side		
<p>ROUTE X <u>North Olden Avenue Extension, South Side</u></p>			
Parkway Avenue	Far Side		
Highgate Drive	Far Side		
Weston Drive	Far Side		
Southerland Road	Mid Block (350' East)		

TABLE C (Continued)

PROPOSED BUS STOPS

	<u>Bus Stop Type</u>		<u>Bus Stop Type</u>
<u>ROUTE Q, X</u> <u>Parkway Avenue, South Side</u>		<u>ROUTE Q</u> <u>Fireside Avenue, South Side</u>	
Scotch Road	Far Side	Lower Ferry Road	Far Side
Walter Avenue	Far Side	Stratford Road	Far Side
Gold Avenue	Far Side		
Stratford Avenue	Near Side, X Route Only (145' long)	<u>ROUTE Q</u> <u>Fireside Avenue, North Side</u>	
Rutledge Avenue	Near Side, Q Route Only (145' long)	Dunmore Avenue	Far Side
Farrell Avenue	Far Side	Stratford Road	Far Side
Saratoga Avenue	Far Side		
<u>ROUTE Q</u> <u>Parkway Avenue, South Side</u>		<u>ROUTE Q</u> <u>Glen Mawr Drive, South Side</u>	
Lexington Avenue	Far Side	Dunmore Avenue	Far Side
Ranchwood Drive	Mid Block (650' West)		
Ranchwood Drive	Far Side	<u>ROUTE Q</u> <u>Glen Mawr Drive, North Side</u>	
Greenway Avenue	Far Side	Farrell Avenue	Far Side
Berwyn Avenue	Far Side		
Gardner Avenue	Far Side	<u>ROUTE Q</u> <u>Farrell Avenue, West Side</u>	
<u>ROUTE Q</u> <u>Lower Ferry Road, East Side</u>		Glen Mawr Drive	Far Side
Parkway Avenue	Far Side		
<u>ROUTE Q</u> <u>Lower Ferry Road, West Side</u>		<u>ROUTE Q</u> <u>Farrell Avenue, East Side</u>	
Fireside Avenue	Far Side	Parkway Avenue	Far Side

TABLE C (Continued)

PROPOSED BUS STOPS

<u>Bus Stop Type</u>		<u>Bus Stop Type</u>	
<u>ROUTE G</u> <u>Prospect Street, East Side</u>		<u>ROUTE G</u> <u>Spruce Street Extension, South Side</u>	
Parkway Avenue	Far Side	Stoneham Road	Near Side
Dover Avenue	Near Side	Sigmond Avenue	Far Side
Weber Avenue	Far Side		
Troy Avenue	Near Side	<u>ROUTE G</u> <u>Parkside Avenue, West Side</u>	
North Olden Avenue Extension	Far Side	Poland Avenue	Far Side
Madison Avenue	Far Side	East Gate Apartments Driveway	Far Side
Buttonwood Drive	Far Side		
Eighth Avenue	Far Side	<u>ROUTE G</u> <u>Parkside Avenue, East Side</u>	
		Buttonwood Drive	Far Side
<u>ROUTE G</u> <u>Prospect Street, West Side</u>		East Gate Apartments Driveway	Far Side
Spruce Street	Far Side		
Eighth Avenue	Far Side	<u>ROUTE G</u> <u>Buttonwood Drive, North Side</u>	
Buttonwood Drive	Far Side	Parkside Avenue	Far Side
Madison Avenue	Far Side	Allison Avenue	Far Side
North Olden Avenue Extension	Far Side	East Ardsley Avenue	Far Side
Rosedale Avenue	Far Side		
Weber Avenue	Far Side	<u>ROUTE G</u> <u>Buttonwood Drive, South Side</u>	
Clover Avenue	Far Side	Somerset Avenue	Far Side
Parkway Avenue	Far Side	Ardsley Avenue	Far Side
		Hillman Avenue	Far Side
<u>ROUTE G</u> <u>Spruce Street Extension, North Side</u>			
Prospect Street	Far Side		
Sigmond Avenue	Far Side		
Dawes Avenue	Far Side		

TABLE C (Continued)

PROPOSED BUS STOPS

Bus Stop Type		Bus Stop Type	
ROUTE G <u>Somerset Avenue, West Side</u>		ROUTE G <u>Green Lane, West Side</u>	
Buttonwood Drive	Far Side	Ewingville Road	Far Side
		Spring Valley Road	Far Side
		Running Brook Road	Far Side
		Hollow Brook Road	Far Side
ROUTE G <u>Somerset Avenue, East Side</u>		ROUTE G <u>Ewingville Road, North Side</u>	
Browning Avenue	Far Side	Green Lane	Far Side
		Bakun Avenue	Far Side
		Alexander Drive	Far Side
		Clement Avenue	Near Side
ROUTE G <u>Browning Avenue, North Side</u>		ROUTE G <u>Ewingville Road, South Side</u>	
Somerset Avenue	Far Side	N. J. Route 31 (Pennington Road)	Far Side
Crescent Avenue	Far Side	Alexander Drive	Far Side
		Bakun Avenue	Far Side
ROUTE G <u>Browning Avenue, South Side</u>		ROUTE G <u>Upper Ferry Road, North Side</u>	
Green Lane	Far Side	N. J. Route 31 (Pennington Road)	Far Side
Crescent Avenue	Far Side		
ROUTE G <u>Green Lane, East Side</u>			
Browning Avenue	Far Side		
Hollow Brook Road	Far Side		
Running Brook Road	Far Side		
Spring Valley Road	Far Side		

TABLE C (Continued)

PROPOSED BUS STOPS

	<u>Bus Stop Type</u>		<u>Bus Stop Type</u>
<u>ROUTE G</u> <u>Hilltop Road, South Side</u>		<u>ROUTE T</u> <u>Lower Ferry Road, East Side</u>	
N. J. Route 31 (Pennington Road)	Near Side	Stuyvesant Avenue	Far Side
		Ashley Avenue	Far Side
<u>ROUTE T</u> <u>Stuyvesant Avenue, North Side</u>		Langford Road	Far Side
Preston Avenue	Far Side	Railroad Tracks	Mid Block (100' North)
Esther Avenue	Far Side	<u>ROUTE T</u> <u>Lower Ferry Road, West Side</u>	
<u>ROUTE T</u> <u>Stuyvesant Avenue, South Side</u>		Railroad Tracks	Mid Block (150' North)
Lower Ferry Road	Far Side	Langford Road	Far Side
Preston Avenue	Far Side	Ashley Avenue	Far Side

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