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**North Carolina Department of Transportation
Planning and Research Branch
Thoroughfare Planning**


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Bethel Thoroughfare Plan

May, 1988



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BETHEL
THOROUGHFARE PLAN

PREPARED BY:

STATEWIDE PLANNING UNIT
PLANNING AND RESEARCH BRANCH,
DIVISION OF HIGHWAYS,
N. C. DEPARTMENT OF TRANSPORTATION

IN COOPERATION WITH:

TOWN OF BETHEL

APRIL 1988

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INTRODUCTION

A preliminary thoroughfare plan for Bethel was adopted by the Town of Bethel on October 9, 1979, and the North Carolina Board of Transportation on November 9, 1979. The plan was jointly developed by Thoroughfare Planning Section. The Mid-East Commission and the town of Bethel. It is documented in the Statewide Planning Group's files.

In December of 1987, the town of Bethel requested the assistance of the North Carolina Department of Transportation in the review and up-date of the 1979 plan. The town noted that there were some obvious error which needed to be corrected as well as changes that are imminent and probably need addressing in the Thoroughfare Plan.

The purpose of this report is to document the study findings and recommendations. Included are recommendations for thoroughfare cross sections, cost estimates, for recommended improvements, and recommendations for plan implementation.

I. EXISTING CONDITIONS AND PROBLEMS

Bethel is located in the north central part of Pitt County, approximately 12 miles north of Greenville, N. C. Highway service to the town is via US-13,64 and NC-11,30. US-13 and NC-11 are significant north-south regional highways in the area. US-13 serves as a major military corridor between Fort Bragg and the Norfolk-Chesapeake Bay area; while NC-11 along with US-13 serves the corridor from Wilmington to Norfolk, which includes Kinston, N. C. and Greenville, N. C. US-64 is the major east-west corridor from outer banks to Asheville, N. C.

Although Bethel has no heavy industrial base of employment, the employed numbers approximately that of the national average. Being situated in a rural setting, it serves as a market community for farm products; however, it is becoming more diversified and service is becoming very important.

Population within Pitt County increased approximately 21 percent for the thru decade period 1940 to 1970, which was approximately half the rate of the state as a whole. The county population increased by approximately 27 percent for the ten period 1979-1980, which was about 5 percent greater than that of the state. Except for the period 1960-1970, the population of Bethel has approximated that of the state and the county. The forty year growth rate has been 36.9 percent. See Table 1 and Figure 1.

POPULATION TRENDS

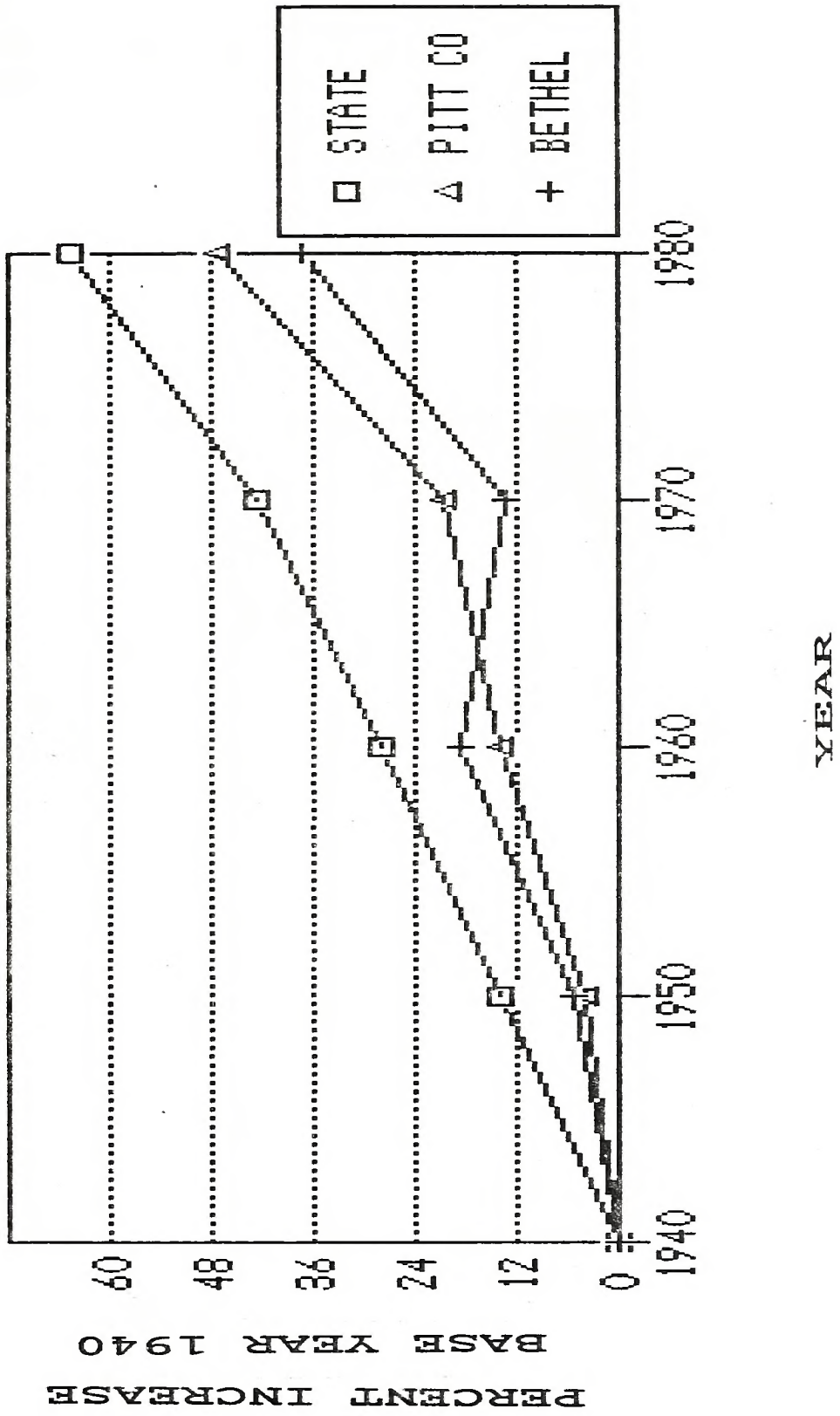


FIGURE 1

TABLE 1
POPULATION DATA

CENSUS YEAR	STATE	PITT COUNTY	BETHEL
1940	371623	61244	1333
1950	4061929	63789	1402
1960	4556155	69942	1578
1970	5082059	73900	1514
1980	5874429	90146	1824
1990	6601815 ^a	101761 ^a	2004 ^a
2000	7262895 ^a	112847 ^a	2196 ^a
2010	7809530 ^a	122050 ^a	2400 ^a

^aESTIMATES

Residential growth is occurring in the west and North area of the town. A community type shopping plaza to be located along US 64-13 east of town.

The thoroughfare plan adopted by the town of Bethel October 9, 1979, with minor revisions, is still adequate to serve the needs of the community for the next 20 years. The primary revision is the realignment of the proposed NC-11 bypass to accommodate the shopping plaza. Other realignments were made to better utilize the property involved.

II. THOROUGHFARE PLANNING PRINCIPLES

The primary objective of thoroughfare planning is to assure that the street and highway option will be processively developed in a manner to adequately serve land use and travel desires. Other objectives include: (1) to reduce travel and transportation costs; (2) to reduce the cost of major street improvements to the public through the coordination of the street system with private action; (3) to enable private interests to plan this action's improvements, and developments with full knowledge of public intent; (4) to minimize disruption and displacement of people and businesses; and (5) to increase travel safety.

Thoroughfare planning objectives are achieved through both improving the operational efficiency of streets and improving system efficiency through better street coordination and layout.

Streets in a thoroughfare plan are classified according to the type function they perform. Major thoroughfare are the primary traffic arteries of an urban area. They may range from a two lane street carrying minor traffic volumes to major expressways with multiply traffic lanes. Elements of a major thoroughfare system includes (1) radial streets which carry traffic to and from the central area; (2)

cross-town streets which carry traffic across the central area; (3) loop thoroughfares which provide for travel between suburban areas; and (4) bypasses which serve primarily through traffic.

Minor thoroughfares are a second classification of streets which supplement the major thoroughfare systems by facilitating minor through movement and collecting traffic from local access streets and carrying it to the major thoroughfare system.

Local access streets provide access to abutting property. Local access streets may be further classified as either residential, commercial, and/or industrial depending on the type load use which they serve.

An Idealized Thoroughfare Plan is shown in Figure 2.

III. LAND USE

The generation of traffic on a particular street is very closely related to the manner in which adjacent land is used. Some types of land uses generate more traffic than others.

Figure 3¹ shows the proposed land use for the Bethel area. An effective transportation system can be developed when it is based on the overall densities and land uses. Acquisition of future rights-of-way can be reserved or dedicated through land developments.

A continant objective of the land use plan is to provide the town of Bethel with guidelines for future zoning ordinance. Since zoning is one of the few tools available to the town for implementing the development plan.

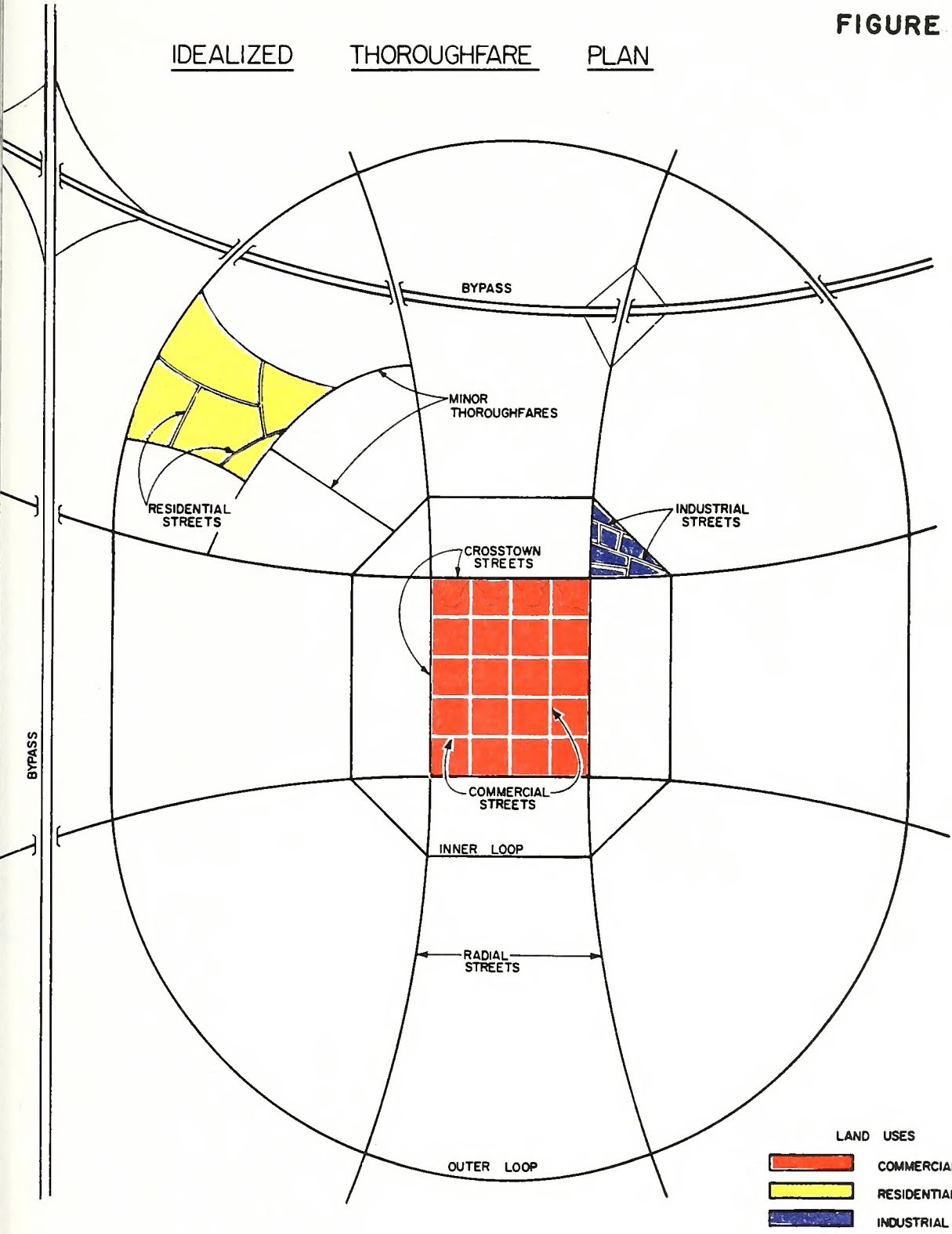
Residential development may use the following criteria for potential expansion:

1. Availability of water
2. Availability of sewage
3. Access to thoroughfare
4. Land values
5. Previous growth rate
6. Access to local service business
7. Previous ordered patterns of growth
8. Topographic conditions
9. Soil conditions
10. Land available

Commercial development is primarily along US-64, US-64-13, NC-11, US-13&11, and South Railroad Street. Although the present traffic values does not indicate any capacity problems; however, the mixing of heavy through trip movement with local trips creates a level of service that is undesirable.

FIGURE 2

IDEALIZED THOROUGHFARE PLAN





EXISTING LAND DEVELOPMENT

TOWN OF BETHEL

WILLIAMS & WORKS
ENGINEERS ARCHITECTS SURVEYORS PLANNERS GEOLOGISTS

FIGURE 3

Legend:

- SINGLE FAMILY
- ⊙ MOBILE HOME
- ▲ PUBLIC, SEMI-PUBLIC
- COMMERCIAL
- ⊠ INDUSTRIAL

IV. TRAVEL PATTERNS

The major highway system in Bethel is in Figure 4 with the 1987 average daily traffic volumes as well as the year 2010 projected volumes. The year 2010 projected volumes are made on the assumption that the US-64 and NC-11 bypasses are not built. The highest volume 6200 is on US-13 & NC-11 between Washington Street and Flat Swamp Road (SR 1500). As mentioned previously, US-13 & NC-11 between Bethel and Greenville serves as an aperture for traffic from the East, Northeast, North, and East of Bethel to the Southeast, South, and Southwest of Greenville.

The projected volumes were on a do-nothing basis; however, when US-64 is relocated to the north of Bethel, the volumes on present US 64 will decrease. These volumes will be shifted to Main Street making the proposed NC-11 bypass more of a necessity. With proper traffic management and minor construction to provide continuity of traffic flow, the rest of the traffic needs can be served.

V. BETHEL THOROUGHFARE PLAN

The 1979 Bethel Thoroughfare Plan was developed to provide the town and state guidance as to how the major street system should be developed in order to meet existing and future travel desires. Other objectives of the plan are: (1) to ensure the development of a coordinated major street system as land development occurs; (2) to reduce travel and transportation cost to the public; (3) to reduce public cost for major street improvement through coordination of the street improvement through coordination of the street systems with project action; (4) to enable private interests to plan their actions, improvements, and development with full knowledge of public interests; (5) minimize disruption and displacement of people and business; (6) to reduce transportation environmental impacts; and (7) to increase travel safety.

The Bethel Thoroughfare Plan is designed to solve both existing and projected traffic movement problems in Bethel and adjacent areas. The 1987 proposed plan is shown in Figure 5. Major and minor thoroughfare recommendations are tabulated in Appendix A and described as follows:

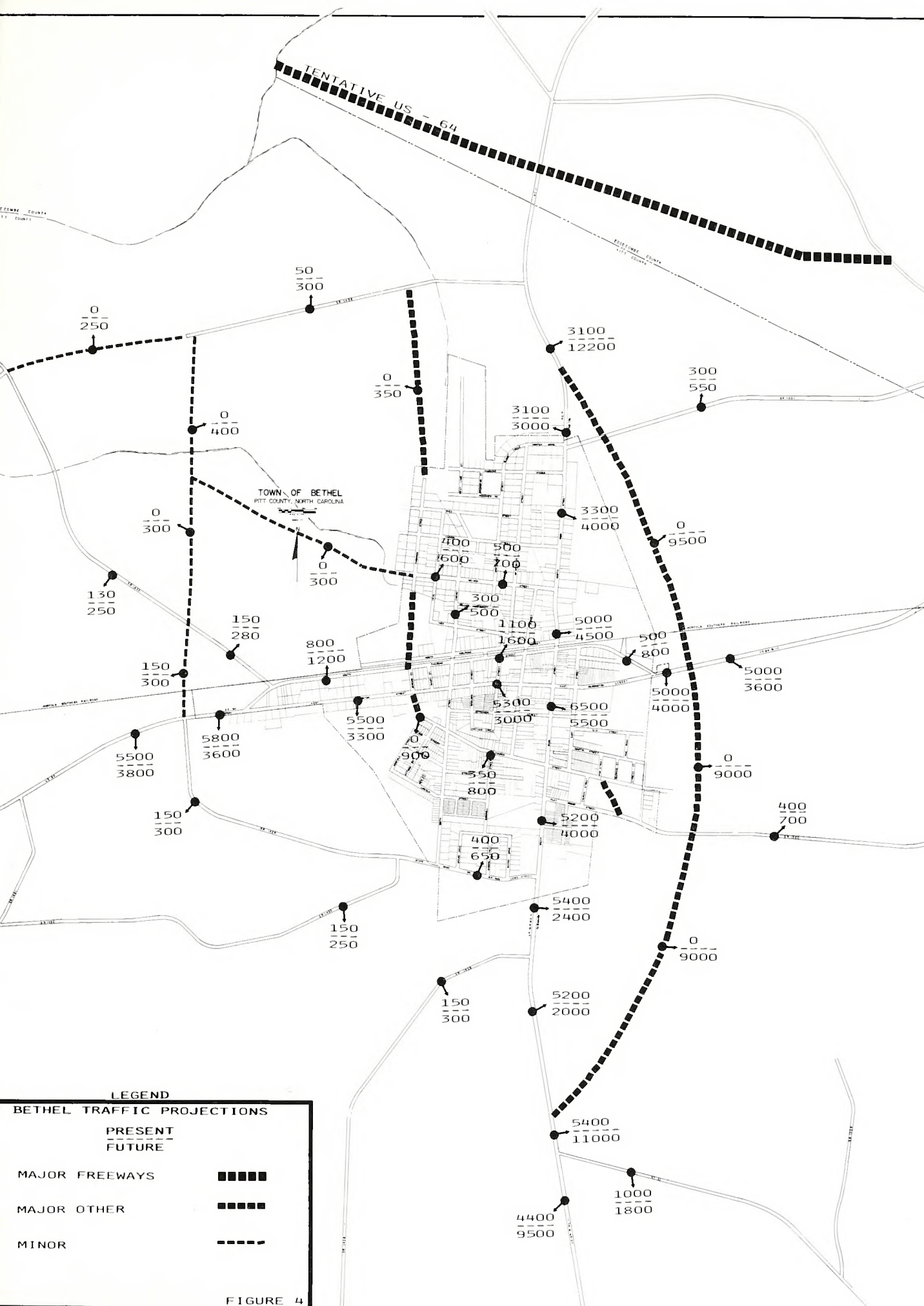
Major Thoroughfare System

The Bethel major thoroughfare system includes US 13, US 64, NC 11, NC 30, Church Street, S. Railroad Street, Robinson Street, and SR's 1433 & 1429.

US 13 - This route was designated as a US route in the early 60's to be a major military route between Fort Bragg and the deep water ports of Norfolk and Baltimore.

US 64 - This route is a major east-west route which transverses the state from the Atlantic Ocean to the Tennessee border. It is the major route connecting the heavily populated piedmont section of the state to the Outer Banks.

NC-11 - As mentioned previously, NC-11 is a major connector between the ports of Wilmington and Norfolk. It is used as a bypass of US 13 from Ahoskie to Bethel.



LEGEND

BETHEL TRAFFIC PROJECTIONS

PRESENT
FUTURE

MAJOR FREEWAYS



MAJOR OTHER



MINOR



FIGURE 4

PROPOSED TENTATIVE US - 64

TIP #R-2111

DECEMBER COUNTY
PITT COUNTY

ROSELAND COUNTY
PITT COUNTY

SR 1436

SR 1501

TOWN OF BETHEL
PITT COUNTY, NORTH CAROLINA

SR 1433

ROBINSON ST.

NORTH MAIN ST.

NELSON ST.

SOUTH RAILROAD ST.

EAST WASHINGTON ST.

US-64 NC-13

WEST WASHINGTON ST.

CHURCH ST.

SR 1429

SR 1500

FLAT SWAMP RD.

SR 1430

LEWIS ST.

SMITH ST.

SOUTH MAIN ST.

SR 1428

NC-11

US-13

NC-30

ADOPTED BY THE TOWN OF BETHEL 7/5/88
RECOMMENDED APPROVAL BY PLANNING
AND RESEARCH BRANCH *J. A. Smith 7/10/88*
ADOPTED BY THE NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION 9/9/88

LEGEND

BETHEL	THOROUGHFARE	PLAN
	EXISTING	PROPOSED
MAJOR FREEWAYS		
MAJOR OTHER		
MINOR		

MAY 2, 1988

NC 30 - This is primarily a bypass connecting US 13 and NC 11 south of Bethel to US 264 east of Greenville. This route lets traffic using US 64 from the west to access the Pamlico Sound area without going through Granville.

SR's 1500 1501 - These routes serve as radials to access the Bethel area to local surrounding population. Under our earlier designation procedure, these would be classified as farm-to-market roads.

Smith & Cherry Streets - These streets together serve as a north-south collector facility.

Nelson Street - This street serves as an east-west collector.

South Railroad Street - This facility functions as a crosstown radial which is both residential and commercial in nature and parallels US 64 (Washington Street).

Typical thoroughfare cross sections are shown in Figure 6.

Local Streets - When new development occurs or improvements are made to the existing thoroughfare plan, the typical cross sections for local streets, as shown in Figure 7 are used.

VI. RECOMMENDED TRAFFIC OPERATIONS AND SAFETY IMPROVEMENTS

Traffic safety is a major consideration when developing a thoroughfare plan. Traffic accidents can be divided into three general types:

1. driver oriented
2. auto oriented
3. highway environmental oriented

Most accidents are predominantly driver oriented although each of these sources are usually a contributing factor. Since most accidents occur at or near intersections, the accident records for the period 1/1/87 thru 12/31/87 were obtained for the Bethel area and the results are shown in Table 2.

Table	Accident Location	No. of Accidents
2	NC-64 & NC-11	
	Washington & Main Street	7
	US 64 & Smith Street	1
	James St. N. of US 64	1
	NC 11 & Church Street	1
	NC-11 & Flat Swamp	1
	Earnhill & Crawford	1
	Carson & Cecil	1
	Church & James	1
	Church & Main	3
	East & Elm	1

James & Railroad	1
James & Washington	3
Jefferson & Main	3
Jefferson & Smith	1
Smith & Railroad	1
Smith & Washington	1

The following policies are suggested as general guidelines to be followed:

- 1) All intersections should have some type of control.
- 2) Four-way stop signs should not be utilized at any intersections.
- 3) Stop and yield signs should be used on local streets in such a manner so as to discourage through traffic.
- 4) Major intersections should have traffic control devices consistent with actual traffic demands according to accepted signalization warrants. Unwarranted use of traffic signals can increase delay and increase traffic accidents.
- 5) Signals at major street instructions should be phased to allow maximum movement through the intersection. The recommended cycle length is 60 seconds.
- 6) Signals along major traffic corridors should be interconnected to facilitate maximum progression at reasonable speeds along said corridors.
- 7) Use of special cycle phases (i.e. exclusive pedestrian movements, left turns, etc.) should be minimized.
- 8) Parking should be prohibited for 30 feet in advance of each intersection and for 20 feet in advance of each crosswalk.
- 9) Stop signs should be placed at all minor street intersections with major streets, where signals are not warranted.
- 10) All traffic control devices should be installed and standardized in accordance with the Manual on Uniform Traffic Control Devices.

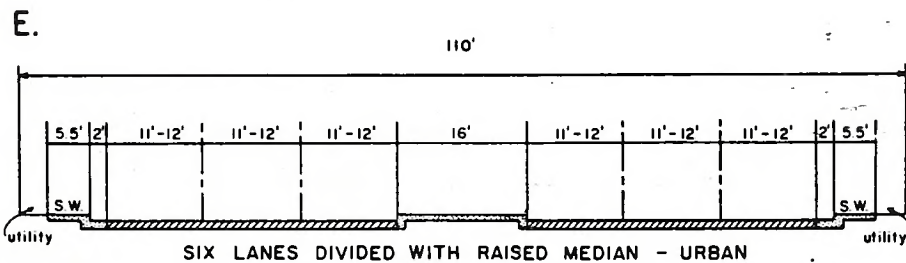
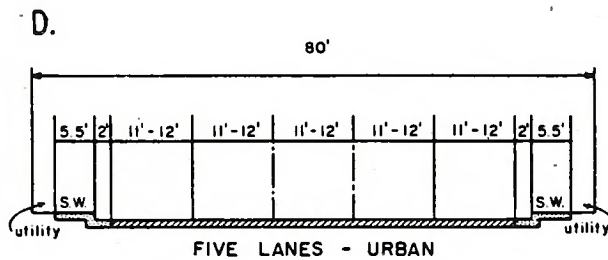
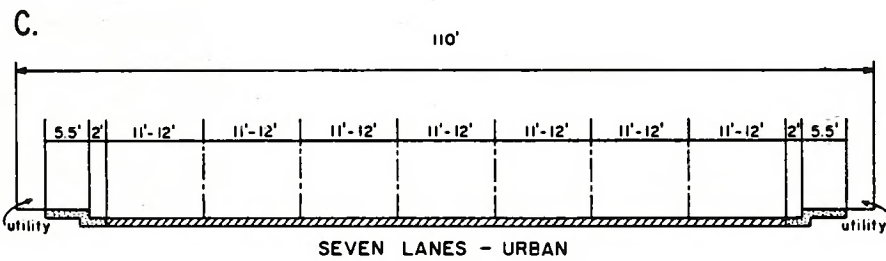
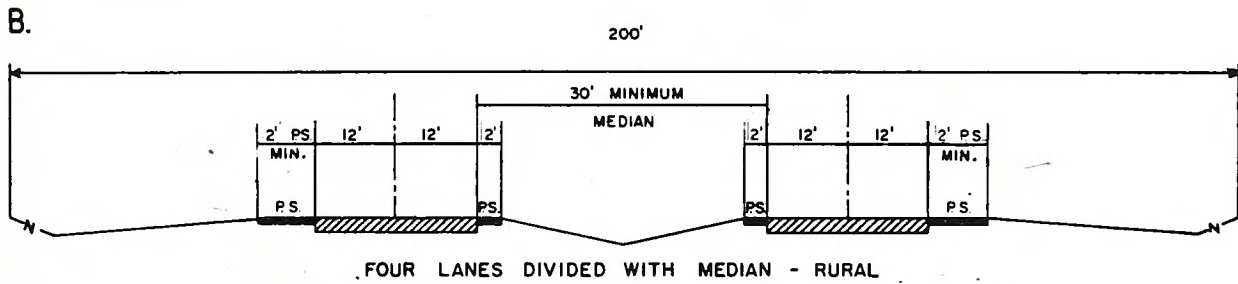
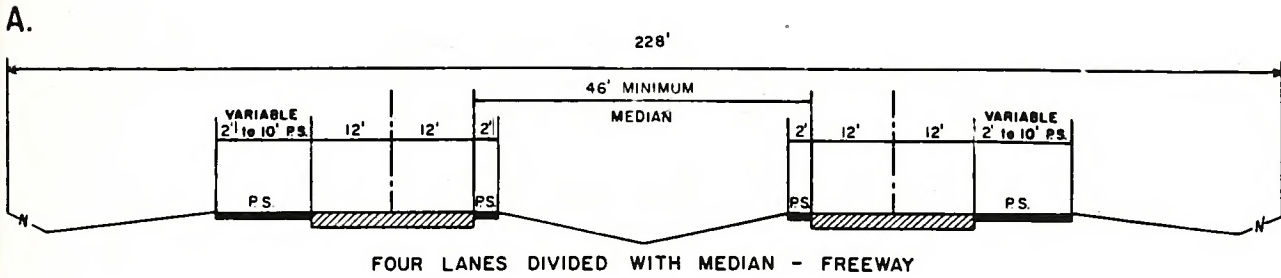
VII. IMPLEMENTATION

There are several tools which are available for implementation of the thoroughfare plan. They are as follows:

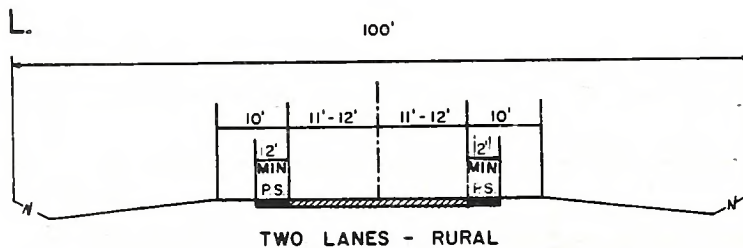
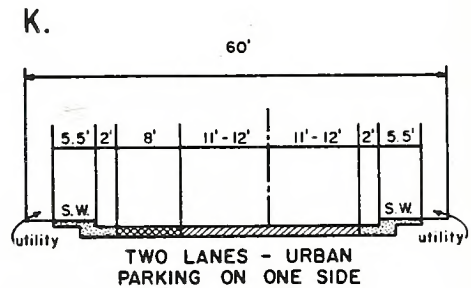
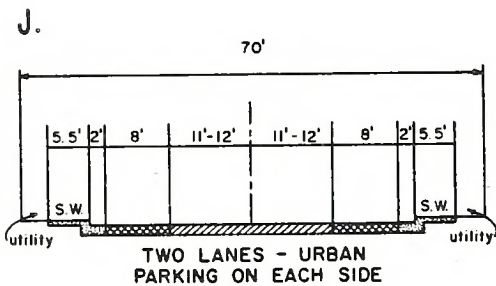
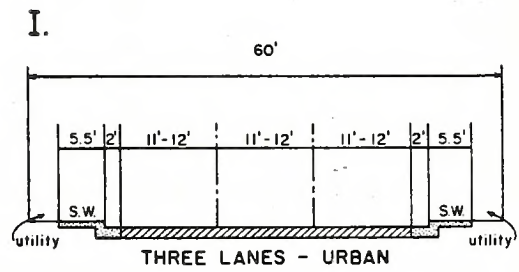
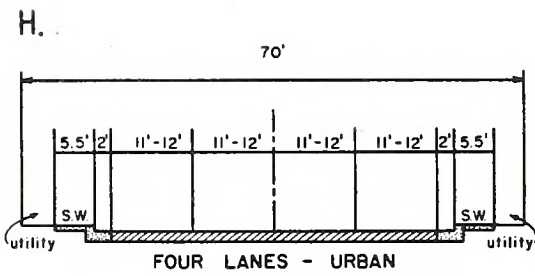
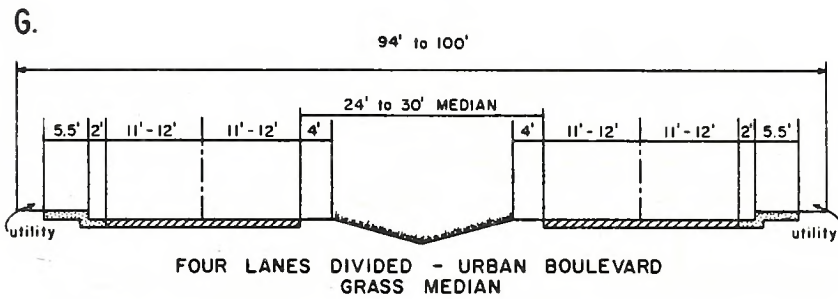
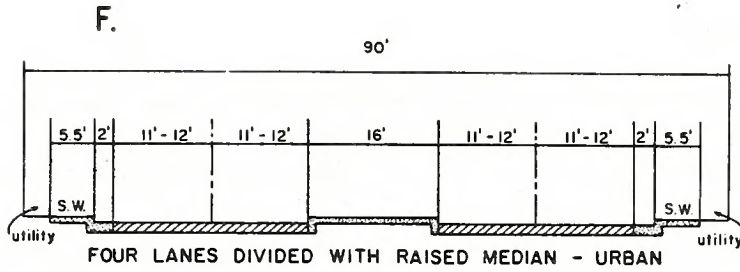
State and Municipal Adoption of Thoroughfare Plan

Chapter 136, Article 3A, Section 136-66.2 of the General Statutes of North Carolina provides that after development of a thoroughfare plan, the plan may be adopted by the government body of the municipality

TYPICAL THOROUGHFARE CROSS SECTIONS



TYPICAL THOROUGHFARE CROSS SECTIONS (CONTINUED)



TYPICAL CROSS SECTION
FOR
LOCAL STREETS

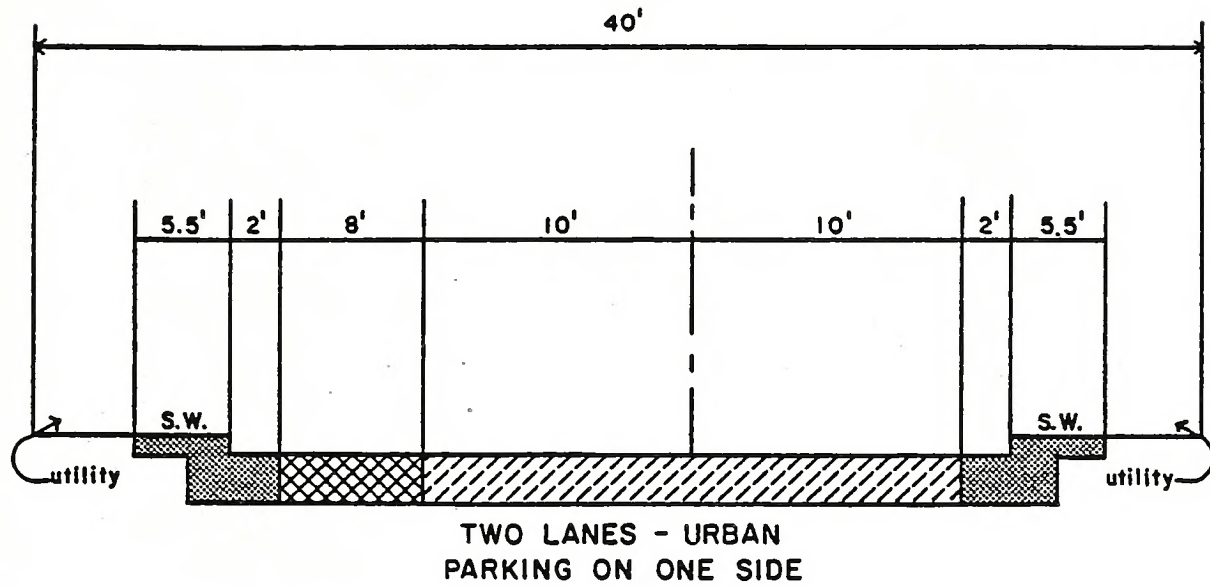


FIGURE 7

and the Board of Transportation as the basis for future street and highway improvements.

Subdivision Control

A subdivision ordinance requires that every subdivider submit to the town a plot of its proposed subdivision. Certain standards must be met by the developer before he can be issued a building permit to construct his development. Through this process, it is possible to reserve or protect the rights of way for projected streets which are a part of the thoroughfare plan and to require street construction in accordance with the plan.

Official Street Map

A municipality map, through special enabling legislation, adopt an official existing and future street lines. No new construction or reconstruction of structures would be permitted within the designated future street lines. This would cover a period of time, reduce the cost of additional right of way along densely developed thoroughfares which will require widening at some future date.

Future street lines should be established to provide for the ultimate rights of way specified in Appendix A.

Zoning

A zoning ordinance can be beneficial to thoroughfare planning in that planned locations of various land uses and planned densities of dwellings can be realized. This provides a degree of stability on which to make future traffic projections and to plan streets and highways.

Other benefits of a good zoning ordinance are:

- (1) the establishment of standards of development which will aid traffic operations on major thoroughfares, and
- (2) the minimization of strip commercial development which creates traffic friction and increases the traffic accident potential.

Urban Renewal

Urban renewal is the term used to describe the removal of slums and allow for corrections to basic problems in the street system layout and design.

To qualify for community development funds or discretionary funds a city must first prepare a community development program. Urban areas throughout the state compete on the basis of demographic points which consider such conditions of percent of substandard housing, people per square foot of housing, dwelling age, etc.

An effort should be made to insure that community development and transportation plans are compatible.

Capital Improvement Program

One of the tools which make it easier to build a planned thoroughfare system is a capital improvement program. This is a long range plan for the spending of money on street improvements, acquisition, of right-of-way, and other capital improvements within the bounds of projected revenues. Municipal funds should be available for construction of street improvements which are a municipal responsibility, right of way cost sharing on facilities designated a Division of Highways responsibility, and advance purchase of right of way where such action is required.

FACILITY AND SECTION	RECOMMENED CROSS SECTION	RECOMMENED RIGHT OF WAY	CONSTRUCTION COST(THOUSANDS)
<u>US 64-13</u> PLANNING BOUNDARY TO N.*RR N. RAILROAD TO MAIN	ADEQUATE ADEQUATE	ADEQUATE ADEQUATE	
<u>US 64</u> *PB TO SR 1429 SR 1429 TO S. RAILROAD ST. S. RR ST. TO CHURCH CONN. *PRO CHURCH *CONN TO SMITH SMITH ST. TO MAIN ST.	ADEQUATE ADEQUATE ADEQUATE ADEQUATE ADEQUATE	ADEQUATE ADEQUATE ADEQUATE ADEQUATE ADEQUATE	
<u>US 13 - NC 11</u> PLANNING BOUNDARY TO NC 30 NC 30 TO PROPOSED NC 11*BP *PRO NC 11 *BP TO SR 1429 SR 1429 TO CHURCH ST. CHURCH ST TO WASHINGTON ST	B* B* ADEQUATE ADEQUATE ADEQUATE	200' 200' ADEQUATE ADEQUATE ADEQUATE	500' 500'
<u>NC 11</u> WASHINGTON ST.TO S.*RR ST. S. *RR ST. TO NELSON ST. NELSON ST. TO SR 1501 SR 1501 TO *B OF NC-11 *BP *B OF NC-11 *BP TO SR 1436 SR 1436 TO TENTATIVE US 64 TENTATIVE US 64 TO *PB	ADEQUATE ADEQUATE ADEQUATE ADEQUATE B* B* ADEQUATE	ADEQUATE ADEQUATE ADEQUATE ADEQUATE 200' 200' ADEQUATE	
<u>NC 30</u> *PB TO US 13 - NC 11	ADEQUATE	ADEQUATE	
<u>SR 1429</u> US 13 - NC 11 TO SMITH ST. SMITH ST. TO US 64	K L	60' 100'	41 63
<u>SR 1433</u> *PB TO SR 1429-1436 *CONN SR 1429-1436*CONN TO S.*RR	L L	100' 100'	23 17
<u>SR 1436</u> NC 11 TO ROBINSON ST.*CONN RBN *CONN TO SR 1429 *CONN	L L	100' 100'	25 50
<u>SR 1500</u> *PB TO PROPOSED NC 11 *BP *PRO NC 11 *BP TO *CH*CONN	L L	100' 100'	54 19
<u>SR 1501</u> *PB TO PROPOSED NC 11 *BP PROPOSED NC 11 *BP TO MAIN	L	100'	54 7
<u>CHERRY ST.</u> NELSON ST. TO S.*RR ST.	K	40'	43
<u>CHURCH ST.</u> US 13 - NC 11 TO SMITH ST.	K	40'	43

*FOOTNOTES PB=PLANNING BOUNDARY RR=RAILROAD ST. CONN=CONNECTOR PRO=PROPOSED
*B=BEGINNING *BP=BYPASS *CH=CHURCH ST. *RBN=ROBINSON ST.

APPENDIX A CONTINUED

FACILITY AND SECTION	RECOMMENED CROSS SECTION	RECOMMENED RIGHT OF WAY	CONSTRUCTION COST(THOUSANDS)
<u>NELSON ST.</u> MAIN ST. TO CHERRY ST. CHERRY ST. TO ROBINSON ST.	K K	40' 40'	159 66
<u>ROBINSON ST.</u> SOUTH END TO NORTH END	K	40'	100
<u>SOUTH RAILROAD ST.</u> US 64 TO SR 1433 SR1433 TO*PRO*CH-*RBN*CONN *RBN-*CH*CONN TO SMITH ST. SMITH ST. TO MAIN ST. MAIN ST. TO US 64 - 13	K K K K K	40' 40' 40' 40' 40'	46 195 52 149 149
<u>PROPOSED NC 11 BYPASS</u> N. MAIN ST. TO SR 1501 SR 1501 TO US 64 - 13 US 64 - 13 TO SR 1500 SR 1500 TO US 13 - NC 11 PROPOSED SR1433-US 64*CONN *PRO SR1500-CHURCH ST*CONN *PRO CHURCH ST.-*RBN *CONN *PRO *RBN ST.-SR 1436*CONN *PRO SR 1429 -SR 1436*CONN PROPOSED NELSON ST. EXIT	B* B* B* B* K K K K L	200' 200' 200' 200' 40' 40' 40' 40' 100'	375 1181 806 1312 33 112 251 364 1250 715

*FOOTNOTES SEE BOTTOM OF LAST PAGE

B* UNDER RECOMMENDED CROSS SECTION = STAGED CONSTRUCTION

The recommendations in Appendix A were made on the assumption that the relocation of US 64 was in place.

APPENDIX B - Recommended Definitions and Design Standards for
Subdivision Ordinances

APPENDIX B

RECOMMENDED DEFINITIONS AND DESIGN STANDARDS
FOR SUBDIVISION ORDINANCES

DEFINITIONS:

I. Streets and Roads:

A. Rural Roads

1. Principal Arterial - A rural link in a network of continuous routes serving corridor movements having trip length and travel density characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of Interstate routes and other routes designated as principal arterials.
2. Minor Arterial - A rural link in a network joining cities and larger towns and providing intrastate and intercounty service at relatively high overall travel speeds with minimum interference to through movement.
3. Major Collector - A road which serves major intracounty travel corridors and traffic generators and provides access to the Arterial system.
4. Minor Collector - A road which provides service to small local communities and links the locally important traffic generators with their rural hinterland.
5. Local Road - A local road that serves primarily to provide access to adjacent land and for travel over relatively short distances.

B. Urban Streets

1. Major Thoroughfares - Major thoroughfares consist of Interstate, other freeway, expressway, or parkway links, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.
2. Minor Thoroughfares - Minor thoroughfares are important streets in the city system and perform the function of collecting traffic from local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating a minor through-traffic movement and may also serve abutting property.

3. Local Street - A local street is any link not on a higher-order urban system and serves primarily to provide direct access to abutting land and access to higher systems.

C. Specific Type Rural or Urban Streets

1. Freeway, expressway, or parkway - Divided multilane roadways designed to carry large volumes of traffic at relatively high speeds. A freeway is a divided highway providing for continuous flow of vehicles with no direct access to abutting property or streets and with access to selected crossroads provided via connecting ramps. An expressway is a divided highway with full or partial control of access and generally with grade separations at major intersections. A parkway is a highway for non-commercial traffic, with full or partial control of access, and usually located within a park or a ribbon of parklike development.
2. Residential Collector Street - A local access street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.
3. Local Residential Street - Cul-de-sacs, loop streets less than 2,500 feet in length, or streets less than one mile in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.
4. Cul-de-sac - A short street having but one end open to traffic and the other end being permanently terminated and a vehicular turnaround provided.
5. Frontage Road - A local street or road that is parallel to a full or partial access controlled facility and functions to provide access to adjacent land.
6. Alley - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

II. Property

- A. Building Setback Line - A line parallel to the street in front of which no structure shall be erected.
- B. Easement - A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

- C. Lot - A portion of a subdivision, or any other parcel of land, intended as a unit for transfer of ownership or for development or both. The word "lot" includes the words "plat" and "parcel".
1. Corner Lot - A lot abutting upon two streets at their intersection.
 2. Double-Frontage Lot - A continuous (through) lot which is accessible from both of the parallel streets upon which it fronts.
 3. Reverse-Frontage Lot - A continuous (through) lot which is accessible from only one of the parallel streets upon which it fronts.

III. Subdivision

- A. Subdivider - Any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.
- B. Subdivision - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, whether immediate or future, of sale or building development, and all divisions of land involving the dedication of a new street or a change in existing streets; provided, however, that the following shall not be included within this definition nor subject to these regulations: (1) the combination or recombination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein; (2) the division of land into parcels greater than ten acres where no street right-of-way dedication is involved, (3) the public acquisition by purchase of strips of land for the widening or opening of streets; (4) the division of a tract in single ownership whose entire area is no greater than two acres into not more than three lots, where no street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.
- C. Dedication - A gift, by the owner, of his property to another party without any consideration being given for the transfer. Since a transfer of property is involved, the dedication is made by written instrument and is completed with an acceptance.
- D. Reservation - A reservation of land does not involve any transfer of property rights. It simply constitutes an obligation to keep property free from development for a stated period of time.

Design Standards

I. Streets and Roads:

The design of all streets and roads within _____ shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway Officials' (AASHO) manuals.

The provision of street rights-of-way shall conform and meet the requirements of the thoroughfare plan for _____ as adopted by the _____ and the North Carolina Department of Transportation.

The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally the proposed streets should be the extension of existing streets if possible.

The urban planning area shall consist of that area within the urban planning boundary as depicted on the mutually adopted _____ Thoroughfare Plan. The rural planning area shall be that area outside the urban planning boundary.

- A. Right-of-Way Widths: Right-of-way widths shall not be less than the following and shall apply except in those cases where right-of-way requirements have been specifically set out in the Thoroughfare Plan.

Min. Right of Way, Ft.

1. Rural

a. Principal Arterial	
Freeways	350
Other	200
b. Minor Arterial	100
c. Major Collector	100
d. Minor Collector	100
e. Local Road	*60

*The desirable minimum right-of-way is 60 feet. If curb and gutter is provided, 50 feet of right-of-way is adequate on local residential streets.

2. Residential Collector

Curb and gutter section 34 feet, face to face of curb

Shoulder Section 20 feet to edge of pavement, 6 foot shoulders

- C. Geometric Characteristics: The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under Right-of-Way shall apply.

1. Design Speed

The design speeds for subdivision type streets shall be:

	Desirable	(Minimum)		
		Level	Rolling Mountainous	
Rural				
Minor Collector Roads	60	(50)	(40)	(30)
Local Roads including Residential Collectors and Local Residential	50	(50)*	(40)*	(30)*
Urban				
Major Thoroughfares Other than Freeway or Expressway	60	(50)	(50)	(50)
Minor Thoroughfares	60	(50)	(40)	(40)
Local Streets	40	(40)**	(30)**	(20)**

*Based on projected annual average daily traffic of 400-750. In cases where road will serve a very limited area and small number of dwelling units, minimum design speeds can be reduced further.

**Based on projected annual average daily traffic of 50-250.

2. Maximum and Minimum Grades

a. The maximum grades in percent shall be:

Design Speed	Level	Rolling	Mountainous
60	3	4	6
50	4	5	7
40	5	6	8
30		9	10
20			12

b. A minimum grade for curbed streets normally should not be less than 0.5%, a grade of 0.35% may be allowed where there is a high type pavement accurately crowned and in areas where special drainage conditions may control.

c. Grades for 100 feet each way from intersections should not exceed 5%.

d. For streets and roads with projected annual average daily traffic less than 250, short grades less than 500 feet long, may be 150% greater.

3. Minimum Sight Distances

In the interest of public safety, no less than the minimum sight distance applicable shall be provided in every instance. Vertical curves that connect each change in grade shall be provided and calculated using the following parameters. (General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case):

<u>Design Speed, MPH</u>	<u>20</u>	<u>30</u>	<u>40</u>	<u>50</u>	<u>60</u>
Stopping Sight Distance					
Min. Distance, Ft.	150	200	275	350	475
Des. Distance, Ft.	150	200	300	450	650
Min. K* Value For:					
Min. Crest Curve	16	28	55	85	160
Des. Crest Curve	16	28	65	145	300
Min. SAG Curve	24	35	55	75	105
Des. SAG Curve	24	35	60	100	155
Passing Sight Distance					
Min. Passing Distance, Feet (2 lane)		1100	1500	1800	2100
Min. K* Value For Crest Vertical Curve		365	686	985	1340

Sight distance provided for stopped vehicles at intersections should be in accordance with, "A Policy on Geometric Design of Highways and Streets, 1984".

- The following table shows the maximum degree of curve and related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is .08. The maximum rate of superelevation for urban streets with curb and gutter is .06 with .04 being desirable.

*K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length in feet of the vertical curve which will provide minimum sight distance.

Design Speed MPH	Maximum e*	Minimum Radius (Rounded) Feet	Maximum Degree of Curve (Rounded) Degrees
20	.04	125	45.0
30	.04	300	19.0
40	.04	560	10.0
50	.04	925	6.0
60	.04	1410	4.0
20	.06	115	50.0
30	.06	275	21.0
40	.06	510	11.5
50	.06	830	7.0
60	.06	1260	4.5
20	.08	110	53.5
30	.08	250	23.0
40	.08	460	12.5
50	.08	760	7.5
60	.08	1140	5.0

*e = rate of roadway superelevation, foot per foot

D. Intersections

1. Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixty (60) degrees.
2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.
3. Off-set intersections are to be avoided unless exception is granted by the Division of Highways for intersections involving the State Highway System, or the Planning Board for intersections involving only the municipal street system. Intersections which cannot be aligned should be separated by a minimum length of 200 feet between survey centerlines.

E. Cul-de-sacs

Cul-de-sacs, unless exception is granted by the local planning board, shall not be more than five hundred (500) feet in length. The distance from the edge of pavement on the vehicular turnaround to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turnaround. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

F. Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provision is made for service access.

Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.

2. The width of an alley shall be at least twenty (20) feet.
3. Deadend alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turnaround facilities at the deadend as may be approved by the Planning Board.
4. Sharp changes in alignment and grade shall be avoided.

G. Permits For Connection To State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the nearest District Engineer of the Division of Highways.

H. Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 30 feet from the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 6 feet from the face of curb.

I. Wheel Chair Ramps

In accordance with Chapter 136, Article 2A, §136-44.14, all street curbs in North Carolina being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason after September 1, 1973, shall provide wheelchair ramps for the physically handicapped at all intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

Wheelchair ramps and depressed curbs shall be constructed in accordance with details contained in the Department of Transportation, Division of Highways, Publication entitled, "Guidelines, Curb Cuts and Ramps for Handicapped Persons".

J. Horizontal Width on Bridge Deck

1. The clear roadway widths for new and reconstructed bridges serving 2 lane, 2 way traffic should be as follows:
 - a. Shoulder Section Approach
 - i. Under 800 ADT Design Year
Minimum 28 feet width face to face of parapets of rails or pavement width plus 10 feet, whichever is greater.
 - ii. 800-2000 ADT Design Year
Minimum 34 feet width face to face of parapets or rails or pavement width plus 12 feet, whichever is greater.
 - iii. Over 2000 ADT Design Year
Minimum 40 feet
Desirable 44 feet width face to face of parapets or rails.
 - b. Curbs and Gutter Approach
 - i. Under 800 ADT Design Year
Minimum 24 feet face to face of curbs.
 - ii. Over 800 ADT Design Year
Width of approach pavement measured face to face of curbs.

Where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face of curbs, and in crown drop. The distance from face of curb to face of parapet or rail shall be 1'6" minimum, or greater if sidewalks are required.

2. The clear roadway widths for new and reconstructed bridges having 4 or more lanes serving undivided two-way traffic should be as follows:
 - a. Shoulder Section Approach - Width of approach pavement plus width of usable shoulders on the approach left and right.
Min. 8'
Des. 10
 - b. Curb and Gutter Approach - Width of approach pavement measured face to face of curbs.

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