North Carolina Department of Transportation
Transportation Planning Branch

Thoroughfare Plan

Study Report for the City of Creedmoor

October 2004

Thoroughfare Plan
Study Report
for the
City of Creedmoor

Prepared by the: Transportation Planning Branch
N.C. Department of Transportation

In Cooperation with: The City of Creedmoor
Kerr-Tar Rural Planning Organization
The Federal Highway Administration
U.S. Department of Transportation

October 2004

Acknowledgments

Persons responsible for this report:

Project Engineer:	Sarah M. Smith, E.I.
Systems Planning Engineer:	Scott Walston, P.E.
Eastern Group Manager:	Travis Marshall, P.E.
Director, Transportation Planning Branch:	Mike Bruff, P.E.
Project Technician:	Jim Neely

Table of Contents

List of Figures

List of Tables

Executive Summary

In January of 2003, the Transportation Planning Branch of the North Carolina Department of Transportation and the city of Creedmoor made a formal agreement to begin an update of the 1993 Creedmoor Thoroughfare Plan. The resulting thoroughfare plan, as shown in the figure at the end of this executive summary, resulted from the implementation of the thoroughfare planning principles.

This report documents the findings of this study, along with the resulting recommendations for improvements. In addition, this report presents transportation cross-section recommendations, cost estimates for the recommended improvements, and environmental features found in the recommended improvement area.

The recommendations for improvement are listed below. A more detailed discussion of these recommendations can be found in **Chapter 2**.

- **Creedmoor Connector**: Proposed four lane divided facility from NC 56 to NC 50 and a two lane divided facility with turn lanes as appropriate on four lane right-of-way from NC 50 to Brassfield Road (SR 1700).

- **I-85**: Widen to a six lane divided facility from the southern study area boundary to the northern study area boundary.

- **US 15**: Widen to a four lane divided facility from the southern study area boundary to the proposed Creedmoor Connector.

- **US 15**: Add turn lanes where necessary from NC 50 to the northern study area boundary.

- **NC 50**: Widen to a four lane divided facility from the Granville/Wake County line to the proposed Creedmoor Connector.

- **NC 56**: Widen to a four lane divided facility from I-85 to the proposed Creedmoor Connector.

- **NC 56**: Add turn lanes where necessary from the proposed Creedmoor Connector to US 15.

- **NC 56**: Realign where it crosses US 15.

- **NC 56**: Widen to three lanes from NC 50 to Hayes Road (SR 1702).

- **NC 56**: Widen to a four lane divided facility from Hayes Road (SR 1702) to the eastern study area boundary.

- **Lyon Station Road (SR 1104)**: Widen to three lanes from Gate 2 Road (SR 1103) to NC 56.

- **Brassfield Road (SR 1700)**: Upgrade to a two lane divided facility with turn lanes as appropriate from the proposed Creedmoor Connector to Hayes Road (SR 1702) with included improvements to the intersection of Brassfield Road (SR 1700) and Hayes Road (SR 1702) to allow for smoother traffic flow.

- **Hayes Road (SR 1702)**: Upgrade to a two lane divided facility with turn lanes as appropriate from Brassfield Road (SR 1700) to NC 56.

After coordination with city officials and several informational meetings with the Council Members and citizens of Creedmoor, the Creedmoor Thoroughfare Plan was adopted by the Creedmoor City Council on July 27, 2004. This plan was adopted by the North Carolina Board of Transportation on September 2, 2004.

Implementation of the plan rests largely with the city and the citizens. Transportation needs throughout the State exceed the available funding; therefore, local areas should aggressively pursue funding for the projects they desire.

N

W E

S

LEGEND

	Existing	Proposed
Major Thoroughfare	———	- - - -
Minor Thoroughfare	———	- - - -
Grade Separation	○	○
Interchange	●	●

ADOPTED BY:

CITY OF CREEDMOOR	July 27, 2004
RECOMMENDED BY TRANSPORTATION PLANNING BRANCH	August 13, 2004
N.C. DEPARTMENT OF TRANSPORTATION	September 2, 2004
COORDINATED WITH KERR-TAR RPO	August 12, 2004
PUBLIC HEARING	June 15, 2004

July 21, 2004

THOROUGHFARE PLAN

CITY OF CREEDMOOR

GRANVILLE COUNTY
NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION PLANNING BRANCH

IN COOPERATION WITH THE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

0 800 1600 3200 4800 6400 Feet

BASE MAP DATE: MAY 2004

I. Introduction

An area's transportation system is its lifeline, contributing to its economic prosperity and social well being. The importance of a safe and efficient transportation infrastructure cannot be overstressed. This system provides a means of transporting people and goods from one place to another quickly, conveniently, and safely. A well-planned system will meet the existing travel demands, as well as keep pace with the growth of the region. The city of Creedmoor recognized the importance of this process of planning for future transportation needs and requested transportation planning assistance from the Transportation Planning Branch of the North Carolina Department of Transportation (NCDOT) in January 2003.

The city of Creedmoor is located in the southern portion of Granville County, just north of the Granville/Wake County line. The city is approximately 25 miles north of Raleigh and approximately 15 miles northeast of Durham. The geographical location is shown in **Figure 1**.

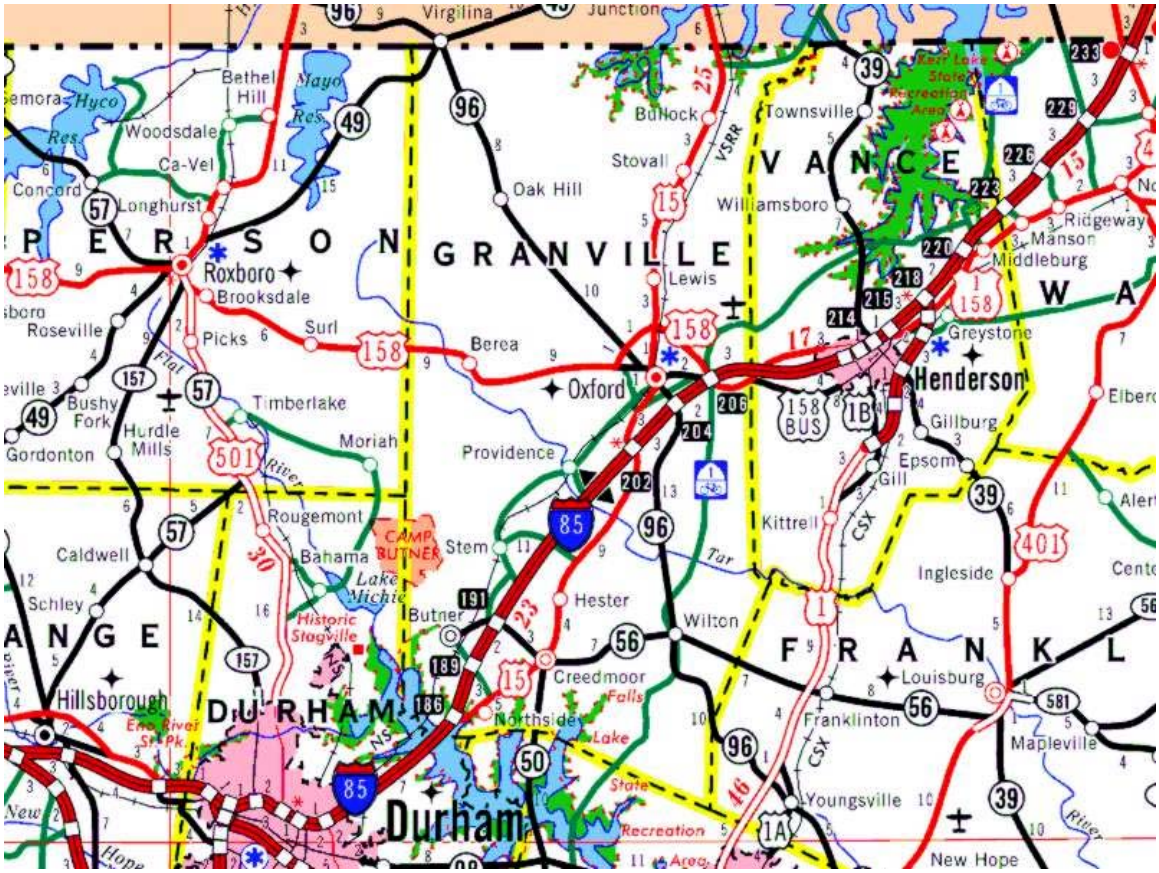


Figure 1: Geographical Location Map

This report documents the development of the 2003 Creedmoor Thoroughfare Plan shown in **Figure 2**, which replaces the 1993 Creedmoor Thoroughfare Plan. In addition, this report presents recommendations for roadway improvements. A thoroughfare plan is developed to ensure that the transportation system will be progressively developed, meeting the needs of the city. It will serve as an official guide to providing a well-coordinated, efficient, and economical roadway system. This document will be utilized by local officials to ensure that planned transportation facilities reflect the needs of the public, while minimizing the disruption to local residents, businesses, and the environment.

The purpose of this study is to examine present and future transportation needs of the area and develop a revised thoroughfare plan to meet these needs. The plan recommends those improvements that are necessary to provide an efficient transportation system within the 2003-2030 planning period. The recommended cross-sections outlined in **Appendix C** for these improvements are based on existing conditions and projected traffic volumes.

The thoroughfare plan is based on the projected growth as forecasted in the Triangle Regional Model. It is possible that actual growth patterns will differ from those logically anticipated. As a result, it may be necessary to accelerate or delay the development of some recommendations found on the plan. Some portions of the plan may require revisions in order to accommodate unexpected changes in urban development.

N

W E

S

LEGEND

	Existing	Proposed
Major Thoroughfare	———	- - - -
Minor Thoroughfare	———	- - - -
Grade Separation	○	○
Interchange	●	●

ADOPTED BY:

CITY OF CREEDMOOR	July 27, 2004
RECOMMENDED BY TRANSPORTATION PLANNING BRANCH	August 13, 2004
N.C. DEPARTMENT OF TRANSPORTATION	September 2, 2004
COORDINATED WITH KERR-TAR RPO	August 12, 2004
PUBLIC HEARING	June 15, 2004

July 21, 2004

FIGURE 2

THOROUGHFARE PLAN

CITY OF CREEDMOOR

GRANVILLE COUNTY
NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION PLANNING BRANCH

IN COOPERATION WITH THE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

0 800 1600 3200 4800 6400 Feet

BASE MAP DATE: MAY 2004

II. Recommendations

This chapter contains recommended improvements based on the ability of the existing roadway system to serve existing and anticipated travel desires as the area continues to grow. The adopted plan represents the highway element of a transportation system that will serve the anticipated traffic and land development needs. The primary objective of this plan is to reduce traffic congestion and improve safety by eliminating both existing and projected deficiencies in the transportation system.

The recommended highway improvements are presented in **Figure 3**. See **Appendix C** for a highway inventory of the recommendations and **Appendix D** for a listing of typical cross-sections used by NCDOT.

The process of determining and evaluating recommendations for the roads in the thoroughfare plan involves many considerations including the goals and objectives of the public in the area, existing roadway conditions, identified roadway deficiencies, environmental impacts and existing and anticipated land development. Consideration of these factors led to the development a mutually adopted plan.

Creedmoor Connector

Project Recommendation: It is recommended that a new control of access facility be constructed on the southwestern and southeastern sides of Creedmoor. This new facility can be divided into two sections, a four lane divided facility from NC 56 on the western side of the planning area south to NC 50, and a two lane facility on four lane right-of-way from NC 50 east to Brassfield Road (SR 1700). The project limits combine for a total of approximately 4.5 miles with an estimated cost of $49 million. A discussion of the alternatives studied for this project can be found in **Appendix A**.

Transportation Demand: The proposed Creedmoor Connector is intended to provide better circulation in and around the planning area. This facility will help reduce congestion in downtown Creedmoor and along NC 56. The western section of the Creedmoor Connector running from NC 56 to NC 50 will provide an alternate route for traffic traveling between Raleigh and I-85 north. The eastern section of the Creedmoor Connector running from NC 50 to Brassfield Road (SR 1700) will help the traffic traveling on the eastern side and in the southern portion of the planning area.

Roadway Capacity and Deficiencies: The 2030 projected average daily traffic volumes along this corridor range from 9,800 vehicles per day (vpd) to 12,000 vpd. An origin and destination study completed for the area in 2000 concluded that the majority of travelers were using NC 56 to travel through Creedmoor. It is

possible that due to this travel pattern, NC 56 could reach capacity in the near future. The level-of-service along other existing roadway facilities will also continue to deteriorate over time if traffic growth continues as expected. The new connector will enable traffic to avoid the downtown area, bypass a large section of NC 56, and relieve some of the expected congestion on the other existing roadways.

Safety Issues: The Creedmoor Connector will remove some of the current and projected traffic from NC 50 in downtown Creedmoor and off of portions of NC 56 thus reducing the potential for crashes. Control of access along the proposed facility will ensure that crossings will only be at locations that can be controlled through signalization or channelization.

Social Demands and Economic Development: It is anticipated that the proposed Creedmoor Connector will bring new growth and economic development to the city. As development occurs it is important that control of access on the facility is implemented to allow for greater capacity through the control of traffic movements. If this proposed facility is not built, then downtown businesses could potentially see a negative impact because shoppers will have difficulty using on street parking due to the projected traffic volumes. Widening NC 50 through downtown is not a viable option due to the limited space for roadway expansion.

System Linkage: The proposed Creedmoor Connector will provide an additional east-west corridor across the city, allowing people to move more efficiently. This facility will allow traffic to bypass the city without having to travel through the downtown area and along the congested portions of NC 56. This facility will also provide an alternative route between I-85 and Raleigh. While other bypass facilities were proposed and studied, this alternative was chosen because it provides a connection between the east and west sides of Creedmoor, minimizes environmental impacts, and was supported by the community and city leaders.

Relationship to Other Plans: The 1993 Creedmoor Thoroughfare Plan identified a need for a bypass around the city. The 1993 plan showed a facility looping the entire city. The northern section of the bypass was dropped from this plan because of environmental constraints and low traffic volume projections. The proposed facility in this plan only runs along the southern portion of the city. The southwestern section of this loop is listed in the 2004-2010 Transportation Improvement Program (TIP) as project R-2542.

Project Staging: As discussed earlier, this project can be divided into two sections, an eastern and western. These sections can be completed at different times. The western section, which connects NC 56 on the west side of Creedmoor to NC 50, should be completed first due to the need of travelers to access I-85 from NC 50. The eastern section that connects NC 50 to Brassfield Road (SR 1700) should be completed after the western section. By staging this

project so that the sections are completed at different times divides the project cost and ensures that the greatest need is met first.

I-85 Widening

Project Recommendation: It is recommended that I-85 be widened to a six lane divided facility from the southern study area boundary to the northern study area boundary. This widening is intended to improve the safety and capacity of the existing roadway.

Transportation Demand: The widening of this route will help improve the north-south travel along I-85 through Granville County. The 2030 traffic on this route is anticipated to be approximately 77,000 vpd.

Roadway Capacity and Deficiencies: I-85 is the only interstate facility in Granville County, and it is the only north-south interstate facility in the central part of North Carolina. It is important that the capacity on this facility be maintained to provide free flow, non-stop travel. Sections of this facility in Granville County will be over capacity by the year 2030 if no improvements are made, and other sections of the facility will quickly be approaching their capacity limits.

Safety Issues: If I-85 is not widened, congestion and delays will occur, as well as increased crashes due to the high number and close proximity of vehicles in the traffic stream.

Social Demands and Economic Development: In conjunction with the other recommendations in this report, the I-85 widening should have a positive impact on economic development, and improve automobile transportation in Granville County.

System Linkage: I-85 provides a north-south interstate connection across the state of North Carolina. This facility extends into Virginia and South Carolina providing for both statewide and national travel.

Relationship to Other Plans: The 1993 Creedmoor Thoroughfare Plan did not identify this section of I-85 for future improvements, therefore the proposed widening is a new recommendation. This recommendation coincides with current improvements being made to I-85 in Durham County where the facility is being widened as TIP project I-306. I-85 is also classified as an interstate on the Federal Functional Classification System.

US 15 Widening

Project Recommendation: It is recommended that US 15 be widened to a four lane divided facility from the southern study area boundary to the proposed Creedmoor Connector. This widening is intended to improve the safety and capacity of the existing roadway.

Transportation Demand: The widening of this route will help improve the north-south travel along US 15 through Creedmoor and Granville County.

Roadway Capacity and Deficiencies: The 2030 traffic on this route is anticipated to be approximately 15,000 vpd. This route is projected to carry 19,000 vpd in the year 2030 with the addition of the Creedmoor Connector. Without any improvements, the level of service by 2030 will deteriorate if traffic growth continues as expected.

Safety Issues: If US 15 is not widened, congestion and delays will occur. US 15 could also provide for an alternate route in the event of a crash on I-85 in Granville County.

Social Demands and Economic Development: In conjunction with the other recommendations in this report, the US 15 widening should have a positive impact on economic development, and improve automobile transportation in the city of Creedmoor and in Granville County.

System Linkage: US 15 provides direct access between the city of Creedmoor and the city of Durham. This route also parallels I-85 through the southern portion of Granville County.

Relationship to Other Plans: The 1997 Granville County Thoroughfare Plan recommended widening the sections of US 15 from I-85 to the southern Creedmoor study area boundary, Bryant Hill Road (SR 1192) to the southern Oxford study area boundary, and the northern Oxford study area boundary to the Virginia State line from two lanes to four lanes. In addition the 1997 Granville County Thoroughfare Plan recommended upgrading US 15 from the Creedmoor northern study area boundary to Bryant Hill Road (SR 1192) to a 24 foot cross section. The 1993 Creedmoor Thoroughfare Plan identified a need to widen US 15. The 1993 plan proposed to widen US 15 to a four lane divided facility for the section south of the loop, a three lane section for the portion of the facility between the loop and Sam Moss Road (SR 1638), and a two lane facility from Sam Moss Road (SR 1638) to Hester Road (SR 1129). This plan only identifies a need to widen US 15 to a four lane divided facility south of the Creedmoor Connector. US 15 is also classified as a major collector on the Federal Functional Classification System.

NC 50 Widening

Project Recommendation: It is recommended that NC 50 be widened to a four lane divided facility from the Granville/Wake County line to the proposed Creedmoor Connector. The project is approximately 2 miles in length. The estimated cost for this project is $9 million.

Transportation Demand: The construction of this project is needed to improve the north-south transportation link between Creedmoor and Raleigh. The growth in Creedmoor, southern Granville County, and northern Wake County will result in increased transportation demands on this two lane facility. The 2003 annual average daily traffic (AADT) for the section of NC 50 that is proposed to be widened ranged from 4,500 vpd to 6,900 vpd.

Roadway Capacity and Deficiencies: NC 50 is a major north-south peak hour commuting route. This heavily traveled two lane route is projected to carry 20,000 vpd by the year 2030. This route is projected to carry 26,000 vpd by the year 2030 with the addition of the Creedmoor Connector. The 2030 projected traffic along NC 50 will result in the facility being over capacity. Without any improvements, the level of service by 2030 will deteriorate if traffic growth continues as expected.

Safety Issues: If no improvements are made to NC 50, the resulting increase in congestion will create the potential for increased crash rates. The widening of NC 50 will provide increased capacity and greater maneuverability resulting in safer driving conditions. The construction of a median will provide safe locations for pedestrians to cross the facility and limited points of conflict for turning vehicles.

Social Demands and Economic Development: The area along NC 50 is primarily residential, with many undeveloped tracts of land. Improvements to this facility will further provide sufficient roadway capacity to handle the increased traffic resulting from new development.

System Linkage: NC 50 is the only major route providing direct access between Creedmoor and Raleigh. In addition, it is expected that many vehicles will use NC 50 to access the proposed Creedmoor Connector, resulting in the need for a widened facility. NC 50 also provides a connection to I-540 in Wake County.

Relationship to Other Plans: The 1993 Creedmoor Thoroughfare Plan did not identify this particular section of NC 50 for future improvements. The 1993 plan identified a need to widen the section of NC 50 between the Creedmoor Loop and Church Street (SR 1700) to three lanes. The 1997 Granville County Thoroughfare Plan recommended widening NC 50 from the southern Creedmoor study area boundary to the Granville/Wake County line from two to four lanes. The Capital Area Metropolitan Planning Organization (CAMPO) has a project identified in their 2030 Long Range Transportation Plan (LRTP) to widen NC 50

in Wake County to four lanes from I-540 to NC 98 by the year 2030. However, CAMPO has not indicated a need to widen NC 50 north of NC 98 to the Granville/Wake County line. NC 50 is also classified as a major collector on the Federal Functional Classification System.

NC 56 Widening

Project Recommendation: It is recommended that NC 56 be widened to a four lane divided facility from I-85 to the proposed Creedmoor Connector, widened to three lanes from NC 50 to Hayes Road (SR 1702) and widened to a four lane divided facility from Hayes Road (SR 1702) to the eastern study area boundary.

Transportation Demand: This route is projected to carry between 7,000 to 22,000 vpd, depending on the location, in the year 2030. Without any improvements, the level of service by 2030 will deteriorate if traffic growth continues as expected.

Roadway Capacity and Deficiencies: NC 56 is the primary east-west route across Creedmoor. An origin and destination study completed for the area in the year 2000 concluded that the majority of travelers were using NC 56 to travel through Creedmoor. Portions of NC 56 will be near or over capacity in the year 2030 if the growth continues as projected.

Safety Issues: If no improvements are made to NC 56, the resulting increase in congestion will create the potential for increased crash rates. The widening of NC 56 will provide increased capacity and greater maneuverability resulting in safer driving conditions.

Social Demands and Economic Development: In conjunction with the other recommendations in this report, the widening of sections of NC 56 should have a positive impact on economic development, and improve automobile transportation in the city of Creedmoor and in Granville County.

System Linkage: NC 56 provides a connection from I-85 to points eastward in both Granville and Franklin Counties.

Relationship to Other Plans: The 1993 Creedmoor Thoroughfare Plan identified a need to improve NC 56. The plan recommended upgrading NC 56 to a five lane facility from I-85 to the Creedmoor Loop, a four lane facility from the Creedmoor Loop to Durham Avenue, a three lane facility from Durham Avenue to the Creedmoor Loop, and a five lane facility from the Creedmoor Loop to Moss Hayes Road (SR 1702). This plan did not make any recommendations to improve NC 56 from the Creedmoor Connector east to US 15. The 1997 Granville County Thoroughfare Plan recommended widening NC 56 from two to four lanes from the eastern Creedmoor study area boundary to NC 96. NC 56 is also classified as a major collector on the Federal Functional Classification System.

Project Staging: The widening of NC 56 can be completed as three different projects. One project is the widening from I-85 to the proposed Creedmoor Connector. Another project is the widening from NC 50 to Hayes Road (SR 1702). The last project is the widening from Hayes Road (SR 1702) to the eastern study area boundary. By staging this project so that the sections are completed at different times divides the project cost and ensures that the greatest need is met first.

Other Recommendations

Widening Projects

- **Lyon Station Road (SR 1104):** To improve safety and capacity, it is recommended to widen Lyon Station Road (SR 1104) to three lanes from Gate 2 Road (SR 1103) to NC 56. This improvement is needed to accommodate the road's growing travel needs. Most of Creedmoor's industrial development is located at the northern end of the road, while new housing developments are being built at the southern end of the road. The three lane section will allow motorist to make left and right turns safely with out impeding the traffic flow. This widening was also identified as a need in the 1993 Creedmoor Thoroughfare Plan.

- **Brassfield Road (SR 1700):** To improve safety, capacity and allow for smoother traffic flow, it is recommended to upgrade Brassfield Road (SR 1700) to a two lane divided facility with turn lanes as appropriate from the proposed Creedmoor Connector to Hayes Road (SR 1702). This recommendation also includes improvements to the intersection of Brassfield Road (SR 1700) and Hayes Road (SR 1702) to allow for smoother traffic flow. These proposed improvements provide an improved route to NC 56 for motorists traveling on the Creedmoor Connector east of NC 50.

- **Hayes Road (SR 1702):** It is recommended to upgrade Hayes Road (SR 1702) to a two lane divided facility with turn lanes as appropriate from Brassfield Road (SR 1700) to NC 56 to improve safety, capacity, and allow for smoother traffic flow. This recommendation connects with the improvements to Brassfield Road (SR 1700) described above to provide an improved route to NC 56 for motorists traveling on the Creedmoor Connector east of NC 50.

Other Projects

- **US 15:** It is recommended to add turn lanes on US 15 where necessary from NC 56 to the northern study area boundary. These improvements are needed to improve traffic flow, safety, and capacity along the existing facility. While a widening project is not warranted on this section of US 15 within the study area at this time, adding turn lanes will allow motorist to make turns without impeding the traffic flow.

- **NC 56:** To improve traffic flow and safety it is recommended to realign NC 56 where it crosses US 15. Existing conditions require that east-west trips on

NC 56 make two turning movements, utilizing part of US 15, in order to travel through Creedmoor. This realignment will reduce turns, thus improving traffic flow, capacity, and safety.

- **NC 56:** It is recommended to add turn lanes where necessary on NC 56 from the proposed Creedmoor Connector on the western side of the city to US 15. These improvements are needed to improve traffic flow, safety, and capacity along the existing facility. With the opening of the Creedmoor Connector traffic volumes are expected to drop along this section of NC 56.

Deletions from 1993 Creedmoor Thoroughfare Plan

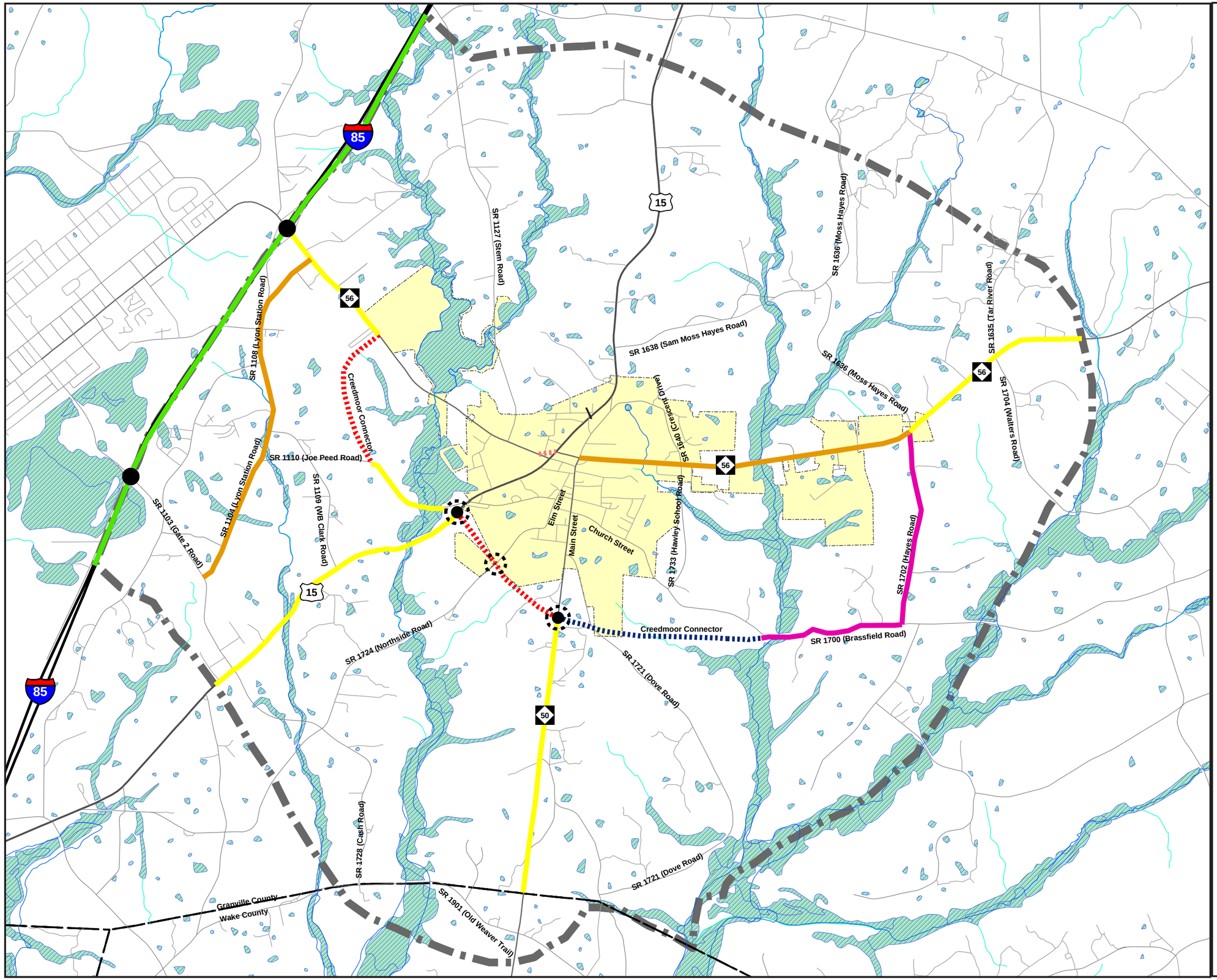
These projects were deleted from the 1993 Creedmoor Thoroughfare Plan.

- **The Creedmoor Loop:** A loop was proposed around the city of Creedmoor to provide better circulation in and around the planning area. Due to the availability of better environmental data and updated traffic projections, the northern section of the loop was dropped from the plan while the southern section of the loop is proposed in a different location, as the Creedmoor Connector.

- **Lake Road (SR 1736) Extension:** An extension of Lake Road across NC 50 to NC 56 was proposed in the 1993 plan as a way to make NC 56 continuous through Creedmoor. This recommendation was deleted and replaced with the NC 56 realignment described earlier in this chapter.

- **Lake Road (SR 1736) Widening:** The 1993 Creedmoor Thoroughfare Plan identified a need to widen Lake Road (SR 1736) to a four lane facility. This plan did not make that recommendation because traffic projections did not indicate a need for making improvements to this facility.

- **Hawley School Road (SR 1733) Widening:** The 1993 plan identified a need to widen Hawley School Road (SR 1733) to a three lane facility. This plan did not make that recommendation because traffic projections did not indicate a need for making improvements to this facility.



N
W E
S

Legend

- EXISTING INTERCHANGE
- PROPOSED GRADE SEPARATION
- PROPOSED INTERCHANGE
- 6 LANE DIVIDED WIDENING
- 4 LANE DIVIDED CONTROL OF ACCESS PROPOSED
- 4 LANE DIVIDED WIDENING
- 3 LANE WIDENING
- 2 LANE DIVIDED ON 4 LANE R/W CONTROL OF ACCESS PROPOSED
- 2 LANE DIVIDED WIDENING
- 2 LANE PROPOSED NC 56 REALIGNMENT
- RIVERS/STREAMS
- WETLAND STREAMS
- WETLANDS
- STUDY AREA
- CREEDMOOR CITY LIMITS

FIGURE 3

RECOMMENDED IMPROVEMENTS

CITY OF

CREEDMOOR

GRANVILLE COUNTY
NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION PLANNING BRANCH

IN COOPERATION WITH
US DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

0 800 1,600 3,200 4,800 6,400
Feet

MAP DATE: SEPTEMBER 2004

III. Population, Land Use, and Traffic

In order to fulfill the objectives of an adequate thirty-year thoroughfare plan, reliable forecasts of future travel patterns must be achieved. Such forecasts depend on careful analysis of the following items: historic and potential population changes; significant economic trends; character and intensity of land development; and the ability of the existing transportation system to meet existing and future travel demand. Secondary items that influence forecasts include the effects of legal controls such as zoning ordinances and subdivision regulations, availability of public utilities and transportation facilities, and topographic and other physical features of the urban area.

Population

Since the volume of traffic on a roadway is related to the size and distribution of the population that it serves, population data is used to aid in the development of the thoroughfare plan. Future population estimates typically rely on the observance of past population trends and counts.

Land Use

Land use refers to the physical patterns of activities and functions within an area. The traffic patterns on a particular road are related to the land uses adjacent to that facility and the intensity of land use. For example, a shopping center generates larger traffic volumes than a residential area. The spatial distribution of varying land uses is the predominant determinant of when, where, and why congestion occurs. The attraction between different land uses and their association with travel varies with the size, type, intensity, and spatial separation of each land use. When dealing with transportation planning, land use is divided into the following classifications:

- Residential – Land is devoted to the housing of people, with the exception of hotels and motels.

- Commercial – Land is devoted to retail trade including consumer and business services and their offices; this may be further stratified into retail and special retail classifications. Special retail would include high-traffic establishments, such as fast-food restaurants and service stations; all other commercial establishments would be considered retail.

- Industrial – Land is devoted to the manufacturing, storage, warehousing, and transportation of products.

- Public – Land is devoted to social, religious, educational, cultural, and political activities; this would include the office and service employment establishments.

The city of Creedmoor has most of their commercial development around the intersection of I-85 and NC 56 on the western side of town. There is also some commercial development along Main Street (NC 50) downtown. Most industrial development is located along Lyon Station Road (SR 1104). Residential and public development is spread throughout the planning area, with the heaviest densities inside the municipal limits.

Traffic Model

In thoroughfare plan studies a traffic model is developed to help analyze the current and future roadway networks. The purpose of the traffic model is to replicate the conditions on the street system by taking into account the population and land use of an area. The traffic projections and deficiencies identified in the thoroughfare plan were developed using the Triangle regional travel demand model. This traffic model covers the entire counties of Durham, Orange, and Wake, and portions of Chatham, Franklin, Granville, and Johnston Counties. The Triangle Regional Model version trm25v5-2001 was used in this study. The Triangle Regional Model was used in this study because the entire study area was included within the modeled area.

The version of the Triangle Regional Model used in this study has a base year of 1995 and future years of 2005, 2015, and 2025. The 2025 model volumes were adjusted and projected up to the year 2030 for the purposes of this study. All population, economic, and land use data were included in this model, therefore a new collection and projection of this data was unnecessary.

The Triangle Regional Model was in the process of being updated with new population, economic and land use data during the course of this study. The updated Triangle Regional Model has a base year of 2002 and future years of 2010, 2020, and 2030. Due to the uncertain completion date of the updated model the city leaders of Creedmoor decided in May 2003 to proceed with the study using the 2025 version of the Triangle Regional Model.

Existing Transportation System

An important stage in the development of a thoroughfare plan is the analysis of the existing roadway system and its ability to serve the area's travel desires. Emphasis is placed not only on detecting the existing deficiencies, but also on understanding the causes of these deficiencies. Capacity deficiencies may result from problems with inadequate pavement width, intersection geometry, or intersection controls. System deficiencies may result from system problems such as the need to construct missing travel links, bypass routes, loop facilities, or additional radial routes.

An analysis of the roadway system looks at both current and future travel patterns and identifies existing and anticipated deficiencies. This is usually accomplished through a traffic crash analysis, roadway capacity deficiency analysis, and a system deficiency analysis. This information is used to analyze

factors that will impact the future system, including population growth, economic development potential, and land use trends.

Traffic Crash Analysis
Traffic crashes are often used as an indicator for locating congestion problems. While often the result of drivers or vehicle performance, crashes may also be a result of the physical characteristics of the roadway. Roadway conditions and obstructions, traffic conditions, and weather may all lead to a crash. While some crashes are the fault of the driver, others may be prevented with physical design changes or traffic control changes such as the installations of stop signs or traffic signals.

Crash data for the period of January 2000 to December 2002 was obtained from the Traffic Engineering Branch of NCDOT and was studied as part of the development for this report. The analysis considered both crash frequency and severity. Crash frequency is the total number of reported crashes, while crash severity is the crash rate based upon injuries and property damage incurred. These two factors helped to determine the high crash locations within the study area that are summarized in **Table 1**.

Locations	Angle	Rear End	Ran Off Road	Left Turn	Right Turn	Other	Total	Severity
I-85/NC 56	4	9	-	1	1	10	25	3.64
US 15/SR 1728	10	1	-	4	-	2	17	11.32

Table 1: Locations with Ten or More Crashes in a Three Year Period

To request a more detailed analysis for any of the locations listed in **Table 1**, or other intersections of concern, the city should contact the Division Traffic Engineer. Contact information for the Division Traffic Engineer is included in **Appendix F**. In 2004 NCDOT installed a new traffic signal at the intersection of US 15 and Cash Road (SR 1728).

Roadway Capacity Deficiencies
Capacity deficiencies occur wherever the travel demand volume of a roadway is close to or more than the capacity of that roadway. Travel demand is the total number of vehicles that use a roadway on a daily basis. The existing travel demand volumes for Creedmoor are based upon traffic count data taken annually by the NCDOT Traffic Survey Unit and are shown in **Figure 4** for the year 2003. The projected 2030 travel demand volumes from the Triangle Regional Model are shown in **Figure 5**. These are the projected traffic volumes without any improvements to the roadways.

Capacity is the maximum number of vehicles that can pass over a given section of roadway during a given time period under prevailing roadway and traffic conditions. Many factors contribute to the capacity of a roadway, including:

- Geometry of the road, including number of lanes, horizontal and vertical alignment, and proximity of perceived obstructions to safe travel along the road;
- Typical users of the road, such as commuters, recreational travelers, and truck traffic;
- Access control, including streets and driveways, or lack thereof, along the roadway;
- Development of the road, including residential, commercial, and industrial developments;
- Number of traffic signals along the route;
- Peaking characteristics of the traffic on the road;
- Characteristics of side-roads feeding into the road; and
- Directional split of traffic or the percentages of vehicles traveling in each direction along a road at any given time.

The relationship of travel demand to roadway capacity determines the level-of-service (LOS) of a roadway. Six distinct levels-of-service are possible, with letter designations ranging from LOS A, which represents the best operating conditions, to LOS F, which represents the worst operating conditions. LOS D indicates "practical capacity" of a roadway, or the capacity at which the public begins to express dissatisfaction. The six levels of service are described below and illustrated in **Figure 6**.

- **LOS A**: Describes primarily free flow conditions. The motorist experiences a high level of physical and psychological comfort. The effects of minor incidents of breakdown are easily absorbed. Even at the maximum density, the average spacing between vehicles is about 528 ft, or 26 car lengths.
- **LOS B**: Represents reasonably free flow conditions. The ability to maneuver within the traffic stream is only slightly restricted. The lowest average spacing between vehicles is about 330 ft, or 18 car lengths.
- **LOS C**: Provides for stable operations, but flows approach the range in which small increases will cause substantial deterioration in service. Freedom to maneuver is noticeably restricted. Minor incidents may still be absorbed, but the local decline in service will be great. Queues may be expected to form behind any significant blockage. Minimum average spacing is in the range of 220 ft, or 11 car lengths.
- **LOS D**: Borders on unstable flow. Density begins to deteriorate somewhat more quickly with increasing flow. Small increases in flow can cause substantial deterioration in service. Freedom to maneuver is severely limited, and the driver experiences drastically reduced comfort levels. Minor incidents can be expected to create substantial queuing. At the limit, vehicles are spaced at about 165 ft, or nine car lengths.
- **LOS E**: Describes operation at capacity. Operations at this level are extremely unstable, because there are virtually no usable gaps in the traffic stream. Any disruption to the traffic stream, such as a vehicle entering from a ramp, or changing lanes, requires the following vehicles to give way to admit

the vehicle. This can establish a disruption wave that propagates through the upstream traffic flow. At capacity, the traffic stream has no ability to dissipate any disruption. Any incident can be expected to produce a serious breakdown with extensive queuing. Vehicles are spaced at approximately six car lengths, leaving little room to maneuver.

- **LOS F**: Describes forced or breakdown flow. Such conditions generally exist within queues forming behind breakdown points.

Design requirements for roadways vary according to the desired capacity and level-of-service. Recommended improvements and overall design of the thoroughfare plan were based upon achieving a minimum LOS D on existing facilities and a LOS C on new facilities.

2003 Traffic Capacity Analysis
The comparison of the 2003 travel demand for the major roadways in Creedmoor to the current practical capacities for these roadways did not identify any deficiencies in the city of Creedmoor.

2030 Traffic Capacity Analysis
The capacity deficiency analysis for the 2030 design year examined the existing street system and determined that several roadways will exceed capacity if improvements are not made. The roadways that will exceed capacity by the design year include portions of US 15, NC 50, and NC 56. These capacity deficiencies are shown in **Figure 5**.

Bridge Conditions

Bridges are an important element of a highway system. Any bridge deficiency will affect the efficiency of the entire transportation system. In addition, bridges present the greatest opportunity of all potential highway failures for disruption of community welfare and loss of life. Therefore, bridges must be constructed to the same, or higher, design standards as the system of which they are a part, and must be inspected regularly to ensure the safety of the traveling public.

The NCDOT Bridge Maintenance Unit inspects all bridges in North Carolina at least once every two years. A sufficiency rating for each bridge is calculated and establishes the eligibility and priority for replacement. Bridges having the highest priority are replaced as federal and state funds become available.

A bridge is considered deficient if it is either structurally deficient or functionally obsolete. A bridge at least ten years old is considered structurally deficient if it is in relatively poor condition or has insufficient load-carry capacity due to either the original design or to deterioration. The bridge is considered to be functionally obsolete if it is narrow, has inadequate clearances, has insufficient load-carrying capacity, is poorly aligned with the roadway, and can no longer adequately serve existing traffic. A bridge must be classified as deficient in order to qualify for federal replacement funds. In addition, the bridge must have a certain sufficiency

rating to qualify for these funds. To qualify for replacement, the sufficiency rating must be less than 50%; for rehabilitation, the sufficiency rating must be less than 80%. Structurally deficient bridges within the study area are given in **Table 2** and functionally obsolete bridges are given in **Table 3**.

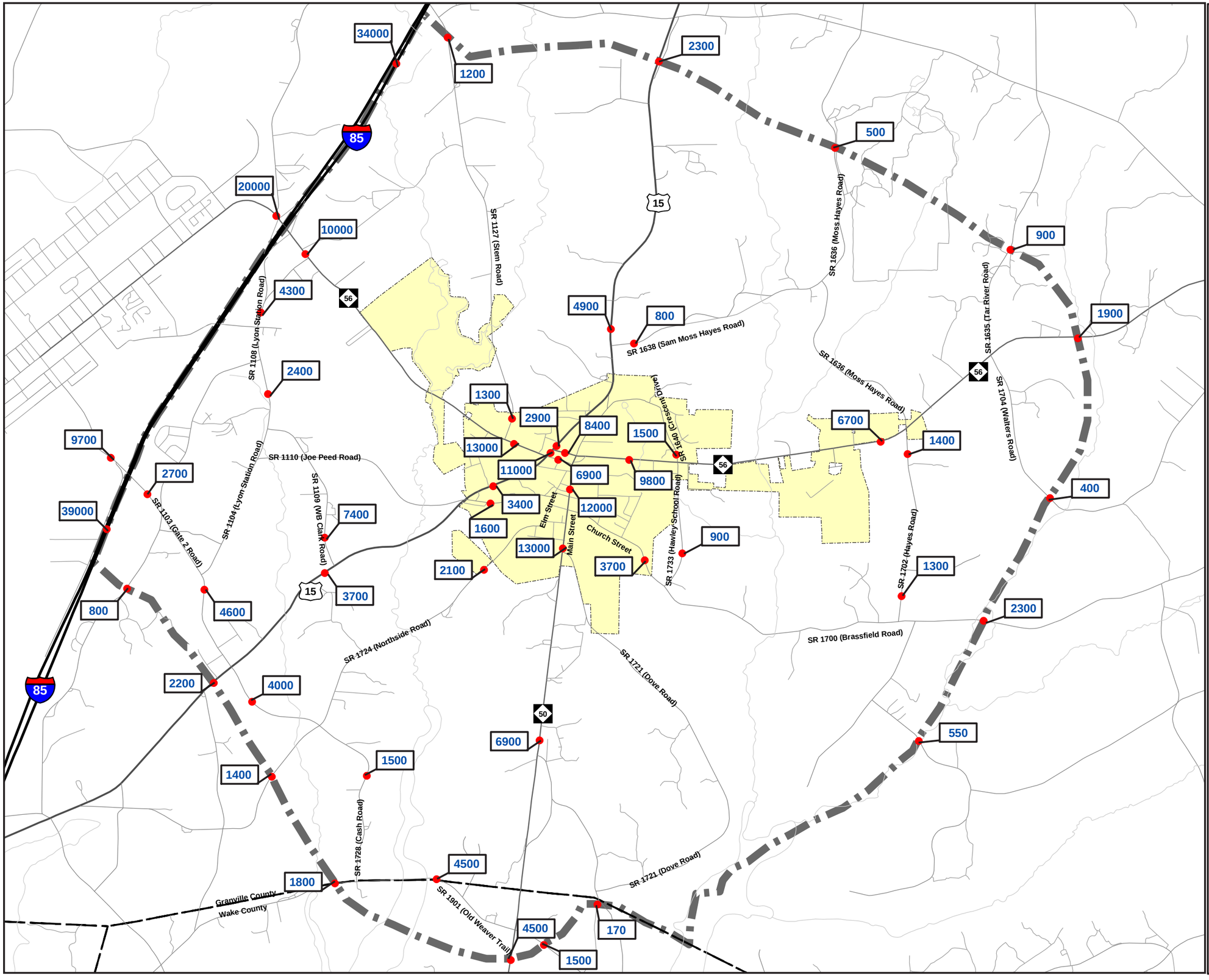
Bridge No.	Facility Carried	Location	Rating
4	US 15	Big Lodge Creek	14.3
42	SR 1724	Ledge Creek	42.8

Table 2: Structurally Deficient Bridges in Creedmoor Planning Area

Bridge No.	Facility Carried	Location	Rating
2	NC 56	Ledge Creek	61.8
23	SR 1700	Beaver Dam Creek	54.4
59	SR 1110	Ledge Creek	86.1

Table 3: Functionally Obsolete Bridges in Creedmoor Planning Area

Of these bridges, one is included in the 2004-2010 Transportation Improvement Program (TIP). TIP project B-2563 replaces bridge number four over Big Lodge Creek. This bridge replacement is currently under construction.



N

W E

S

Legend

- STUDY AREA
- CREEDMOOR CITY LIMITS
- 2003 TRAFFIC COUNT LOCATIONS
- 00000 2003 DAILY TRAFFIC VOLUME

FIGURE 4

2003 TRAFFIC VOLUMES

CITY OF

CREEDMOOR

GRANVILLE COUNTY
NORTH CAROLINA

PREPARED BY THE

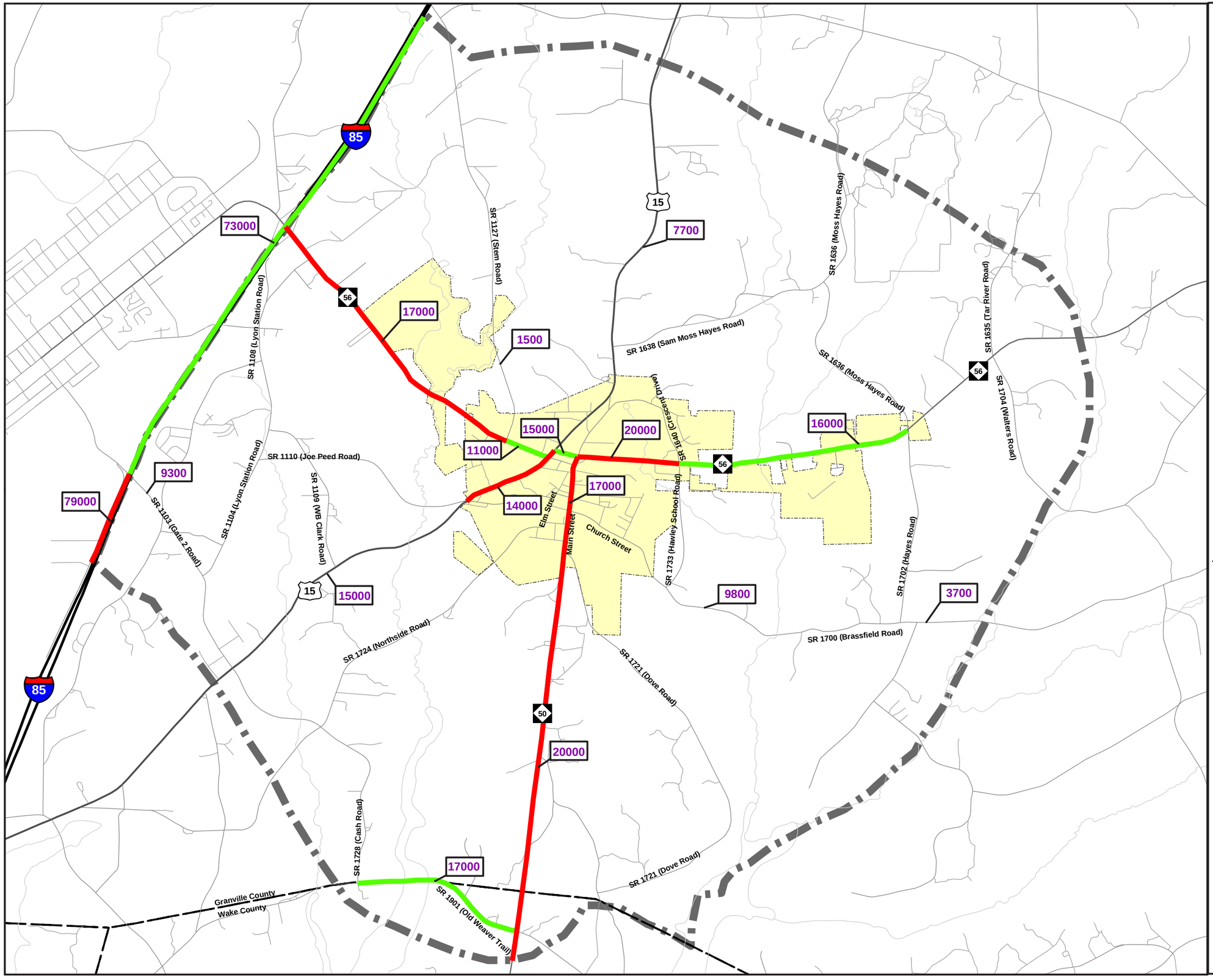
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION PLANNING BRANCH

IN COOPERATION WITH

US DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

0 800 1,600 3,200 4,800 6,400
Feet

MAP DATE: SEPTEMBER 2004



N

W E

S

Legend

- NEAR CAPACITY (V/C = 0.8-1.0)
- AT OR OVER CAPACITY (V/C >= 1.0)
- STUDY AREA
- CREEDMOOR CITY LIMITS
- 00000 PROJECTED 2030 DAILY TRAFFIC VOLUMES

FIGURE 5

PROJECTED 2030 TRAFFIC VOLUMES

CITY OF

CREEDMOOR

GRANVILLE COUNTY
NORTH CAROLINA

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION PLANNING BRANCH

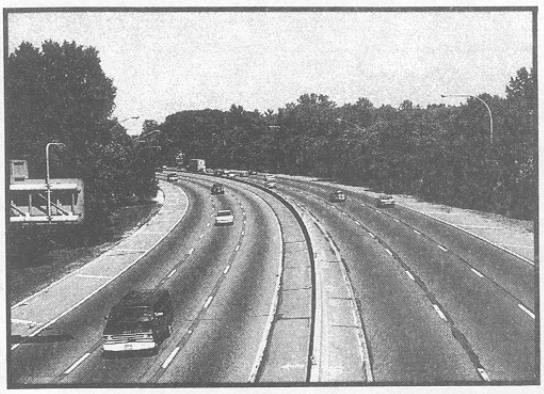
IN COOPERATION WITH

US DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

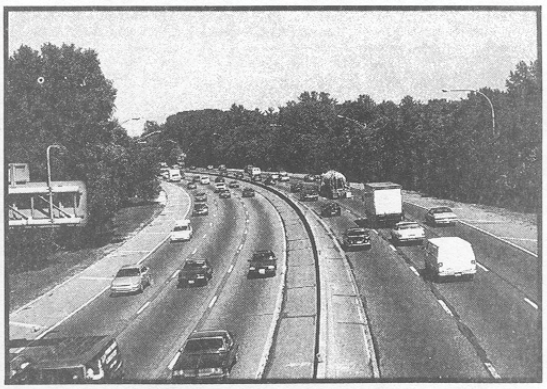
0 800 1,600 3,200 4,800 6,400
Feet

MAP DATE: SEPTEMBER 2004

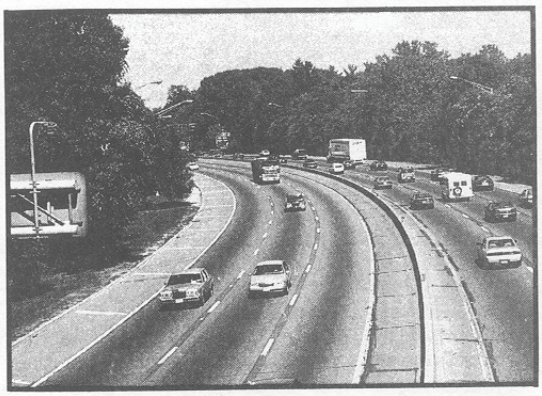
Source: 1994 Highway Capacity Manual



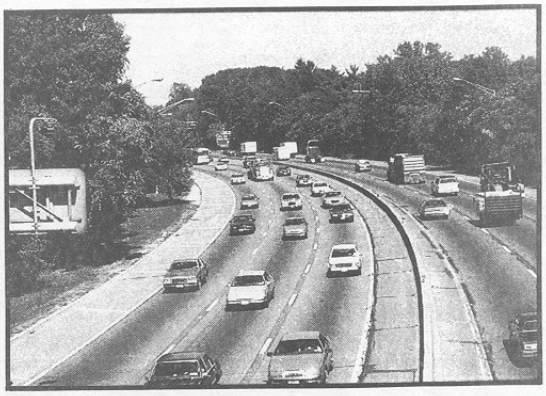
LOS A.



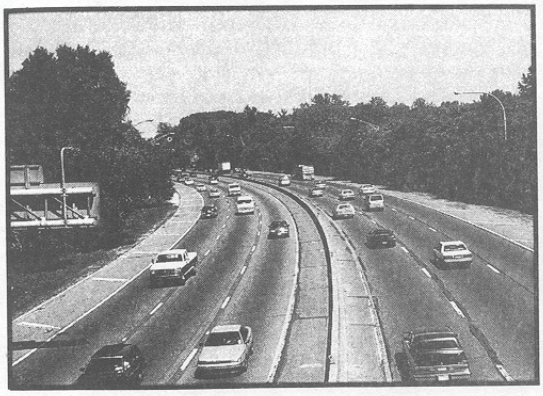
LOS D.



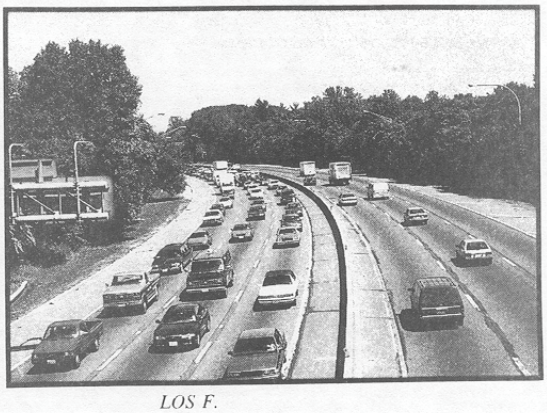
LOS B.



LOS E.



LOS C.



LOS F.

Figure 6: Levels of Service

IV. Environmental Screening

In recent years, the environmental considerations associated with transportation construction have come to the forefront of the planning process. Section 102 of the National Environmental Policy Act (NEPA) requires the completion of an Environmental Impact Statement (EIS) for projects that have a significant impact on the environment. The EIS includes impacts on wetlands, wildlife, water quality, historic properties, and public lands. While this report does not cover the environmental concerns in as much detail as an EIS would, consideration for many of these factors was incorporated into the development of the thoroughfare plan. These factors were also incorporated into the recommended improvements. Environmental features found in the area are shown in **Figure 7**.

Wetlands

Wetlands are those lands where saturation with water is the dominant factor in determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. Wetlands are crucial ecosystems in our environment. They help regulate and maintain the hydrology of our rivers, lakes, and streams by storing and slowly releasing floodwaters. Wetlands help maintain the quality of water by storing nutrients, reducing sediment loads, and reducing erosion. They are also critical to fish and wildlife populations by providing an important habitat for approximately one-third of the plant and animal species that are federally listed as threatened or endangered. The National Wetland Inventory showed several wetlands throughout the study area. Wetland impacts have been avoided or minimized to the greatest extent possible while preserving the integrity of the thoroughfare plan.

Threatened and Endangered Species

The Threatened and Endangered Species Act of 1973 allows the U.S. Fish and Wildlife Service to impose measures on the Department of Transportation to mitigate the environmental impacts of a transportation project on endangered animal and plant species, as well as critical wildlife habitats. Locating any rare species that exist within the study area during this early planning stage will help to avoid or minimize impacts.

A preliminary review of the Federally Listed Threatened and Endangered Species in the study area was completed to determine what effects, if any, the recommended improvements may have on wildlife. Mapping from the N.C. Department of Environment and Natural Resources revealed occurrences of threatened or endangered plant and/or animal species in the study area. No threatened or endangered species are anticipated to be adversely impacted by any of the thoroughfare plan recommendations. However, a detailed field investigation is recommended prior to construction of any highway project in this area.

Historic Sites

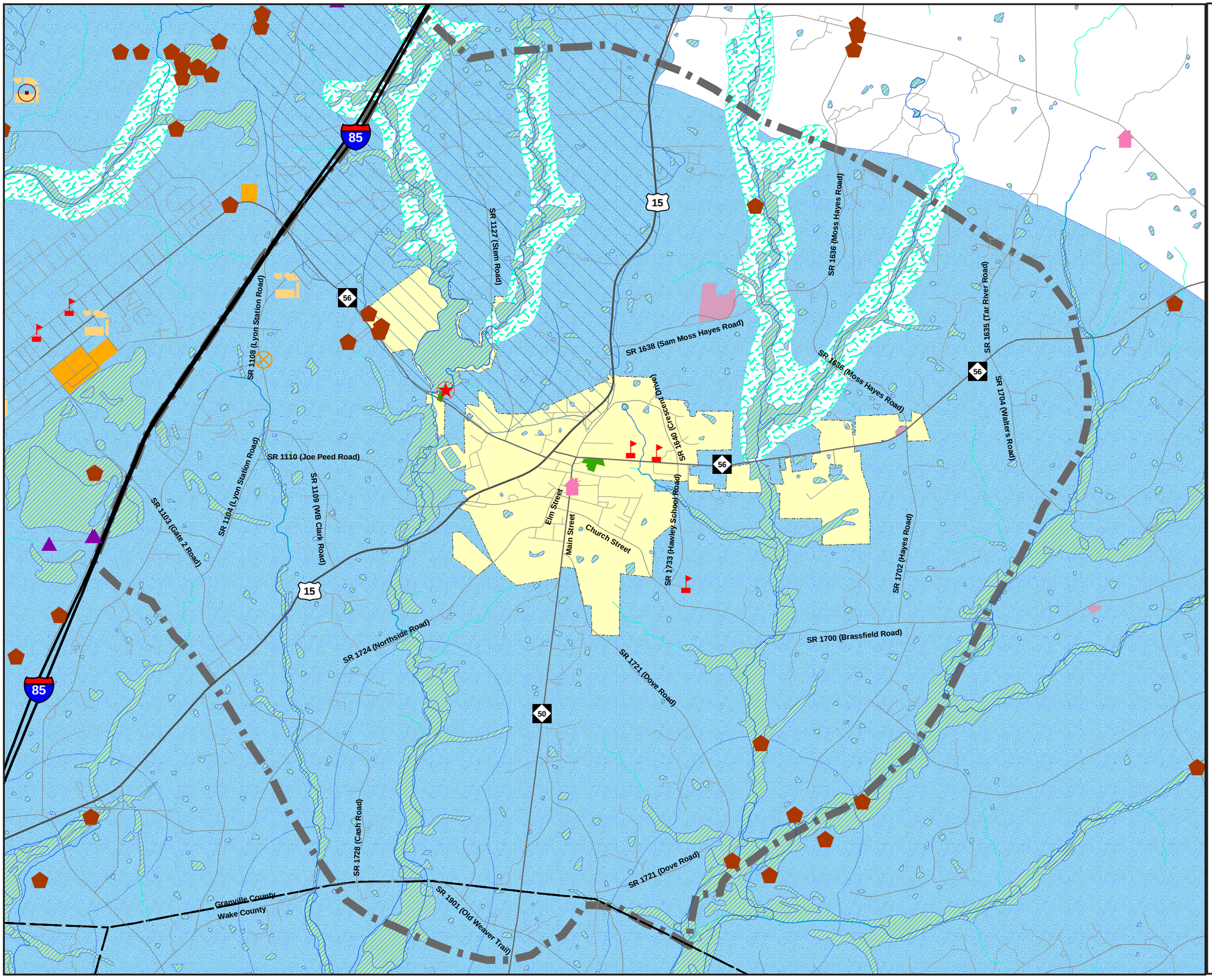
Section 106 of the National Historic Preservation Act requires the Department of Transportation to identify historic properties listed in, as well as eligible for, the National Register of Historic Places (NRHP). The NCDOT must consider the impacts of transportation projects on these properties and consult with the Federal Advisory Council on Historic Preservation.

N.C. General Statute 121-12(a) requires the NCDOT to identify historic properties listed on the National Register, but not necessarily those that are eligible to be listed. The NCDOT must consider the impacts and consult with the State Historic Preservation Office (SHPO), but is not bound by their recommendations.

The location of historic sites within the study area was investigated to determine any possible impacts resulting from the recommended improvements. This investigation identified three historic properties. These properties will not be impacted by any of the recommended improvements.

Educational Facilities

The location of educational facilities in the study area was considered during the development of the thoroughfare plan. The implementation of the thoroughfare plan should result in positive effects on educational facilities in study area by improving the safety and capacity of the roadways around educational facilities and avoiding existing schools.



N

W E

S

Legend

- SOLID WASTE FACILITIES
- AIR QUALITY POLLUTION DISCHARGE POINTS
- PUBLIC SCHOOL LOCATIONS
- HISTORIC NATIONAL REGISTER STRUCTURES
- NATURAL HERITAGE OCCURANCE SITES (ENDANGERED PLANT SPECIES)
- SURFACE WATER INTAKES
- NPDES - NONDISCHARGE SYSTEMS
- HAZARDOUS WASTE FACILITIES
- RIVERS/STREAMS
- WETLAND STREAMS
- HISTORIC NATIONAL REGISTER DISTRICTS
- HAZARDOUS DISPOSAL SITES
- LAND & WATER CONSERVATION FUND AREAS
- WETLANDS
- GROUNDWATER RECHARGE/DISCHARGE AREAS
- HIGH QUALITY WATER ZONES
- WATER SUPPLY WATERSHED
- STUDY AREA
- CREEDMOOR CITY LIMITS

FIGURE 7

ENVIRONMENTAL DATA

CITY OF

CREEDMOOR

GRANVILLE COUNTY
NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION PLANNING BRANCH

IN COOPERATION WITH
US DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

0 800 1,600 3,200 4,800 6,400
Feet

MAP DATE: SEPTEMBER 2004

V. Public Involvement

Overview

Since the passage of the federal Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), the emphasis on public involvement in transportation has taken on a new role. Although public participation has been an element of long range transportation planning in the past, these regulations call for a much more proactive approach. The NCDOT's Transportation Planning Branch has a long history of making public involvement a key element in the development of any long range transportation plan, no matter the size of the city. This chapter is designed to provide an overview of the public involvement elements implemented into the development of the thoroughfare plan for the city of Creedmoor.

Study Initiation

The Creedmoor Thoroughfare Plan update study was requested on January 3, 2003 by way of an email from the city of Creedmoor. The Transportation Planning Branch met with the city officials on February 4, 2003 to identify the primary transportation concerns and to define the scope of the study.

Public Meetings

Public Workshops

Three public workshops were held at Creedmoor City Hall during the development of the thoroughfare plan to discuss proposed recommendations. The first workshop was held on November 18, 2003, the second workshop was held on January 20, 2004, and the third workshop was held on April 6, 2004. Each workshop had approximately twenty attendees. Proposed recommendations and ideas for the proposed Creedmoor Connector were discussed at the workshops.

Public Drop-In Session

A public drop-in session was held on May 17, 2004. Thirty-six citizens attended the drop-in session. The drop-in session allowed citizens to view, ask questions and comment on the proposed recommendations for the thoroughfare plan. The following pages contain a handout that discusses the thoroughfare planning process in Creedmoor and the comment sheet that was available during the drop-in session.

CREEDMOOR THOROUGHFARE PLAN

THOROUGHFARE PLAN PURPOSE:

The goal of thoroughfare planning is to meet the anticipated transportation needs for the City of Creedmoor in the most efficient and least damaging manor as possible. Planning now for future facilities (in this case the year 2030) will minimize impacts to homes, businesses, and environmentally sensitive areas in the future when new roads are needed. Prior to construction of specific projects, a more detailed study will be required to reconsider development trends and to determine specific locations and design requirements. The update of Creedmoor's Thoroughfare Plan has been a cooperative effort between NCDOT and the City of Creedmoor.

RECOMMENDATIONS:

NCDOT and the City of Creedmoor have worked together cooperatively over the past several months to develop a set of proposed transportation improvements. The list below details the proposed recommendations (projects listed in alphabetical order).

- **Creedmoor Connector**: Proposed 4 lane divided facility from NC 56 to Brassfield Road and a 2 lane facility on 4 lane right-of-way from Brassfield Road to NC 56
- **I-85**: Widen to a 6 lane divided facility from the southern study area boundary to the northern study area boundary
- **Lyon Station Road**: Widen to 3 lanes from Gate 2 Road to NC 56
- **NC 50**: Widen from the Granville/Wake County line to the proposed Creedmoor Connector
- **NC 56**: Widen to 3 lanes from NC 50 to the proposed Creedmoor Connector
- **NC 56**: Widen to a 4 lane divided facility from I-85 to the proposed Creedmoor Connector
- **NC 56**: Widen to a 4 lane divided facility from the proposed Creedmoor Connector to the eastern study area boundary
- **NC 56**: Realign where it crosses US 15
- **NC 56**: Add turn lanes where necessary from the proposed Creedmoor Connector to US 15
- **US 15**: Widen to a 4 lane divided facility from the southern study area boundary to the proposed Creedmoor Connector
- **US 15**: Add turn lanes where necessary from NC 50 to the northern study area boundary

PURPOSE OF TODAY'S PUBLIC DROP-IN SESSION:

Today's drop-in session was scheduled to give the public an opportunity to comment on the proposed recommendations for Creedmoor's Thoroughfare Plan, in particular the proposals for the Creedmoor Connector. Many different alternatives have been studied for the location of the Creedmoor Connector, and they have been narrowed down to two alternatives, Connector Alternative 1 and Connector Alternative 2. The following matrix describes the impacts of each alternative.

IMPACTS (ESTIMATES)		
	CONNECTOR ALTERNATIVE 1	CONNECTOR ALTERNATIVE 2
PROJECT FACTORS		
Mainline Length (Miles)[1]	6.77	7.27
Number of Grade Separations (Roadway)	1	1
Number of Intersections	2	2
Railroad Crossings At-grade	0	0
Railroad Crossings Grade Separated	0	0
Estimated Connector Cost (Millions)	64.1	65.7
Estimated NC 56 Improvement Cost (Millions)	19.5	17.3
Estimated Total Cost (Millions)	83.6	83.0
SOCIOECONOMIC FACTORS		
Residential Relocations[2]	11	11
Business Relocations	2	5
Schools Impacted	0	0
Parks Impacted	0	0
Churches Displaced	0	0
CULTURAL RESOURCE FACTORS		
Roads Effecting Historic Properties	1	1
Direct Impacts to Historic Properties	0	0
NATURAL RESOURCE FACTORS		
Stream Crossings	5	4
Total Wetlands Impacted (Acres)[3]	4.81	4.46

Notes: Unless otherwise noted, estimates of impacts are based on a 100 foot corridor (estimated right of way limits).

[1] Lengths are approximate.

[2] Residential relocations are approximate.

[3] Total acres of wetlands impacted are approximate.

NEXT STEPS:

1. Develop final set of recommendations
2. Adoption of Thoroughfare Plan Map by the City of Creedmoor
3. Adoption of Thoroughfare Plan Map by the Board of Transportation
4. Report completion and distribution

QUESTIONS?

Sarah M. Smith
NCDOT- Transportation Planning Branch
919-733-4705
sarahsmith@dot.state.nc.us

City of Creedmoor
Thoroughfare Plan Update
Citizens Informational Workshop

COMMENT SHEET

May 17, 2004

PLEASE PRINT:

NAME: _____

ADDRESS: _____

CITY/TOWN: _____ STATE: _____ ZIP CODE: _____

PHONE NUMBER: _____ E-MAIL: _____

1. Do you prefer Connector Alternative 1 or Connector Alternative 2? Please check one box.

Connector Alternative 1 ☐

Connector Alternative 2 ☐

2. What are your reasons for supporting the alternative you chose in **Question 1**?

_____

_____

_____

I also wish to comment on specific recommendations or inquire about the following aspects of this plan:

_____

_____

_____

Concerning the format of the Citizens Informational Workshop, do you have any positive or negative comments or suggestions for improvements to the way information was presented to the public?

_____

_____

_____

City of Creedmoor
Thoroughfare Plan Update
Citizens Informational Workshop

COMMENT SHEET

May 17, 2004

All suggestions, questions, or comments may be submitted in writing by completing this form and leaving it at this public meeting. You may also mail or call in your comments/questions to the address and phone number provided below by **June 1, 2004**.

Ms. Sarah M. Smith
Transportation Planning Branch
North Carolina Department of Transportation
1554 Mail Service Center
Raleigh, North Carolina 27699-1554

Phone: 919-733-4705

(Fold Here to Mail)

Please Place Stamp Here

Ms. Sarah M. Smith
Transportation Planning Branch
North Carolina Department of Transportation
1554 Mail Service Center
Raleigh, North Carolina 27699-1554

Public Hearing

A public hearing was held at Creedmoor's City Hall on June 15, 2004. The purpose of this meeting was to discuss the plan recommendations and to solicit public input. Eleven citizens voiced their concerns about the thoroughfare plan at this meeting. Comments received included the following:

- There was concern with the uncertainty of when the improvements would take place.
- There was a concern that the proposed location for the Creedmoor Connector did not go far enough south. Many citizens suggested using Gate 2 Road for the connector.
- There was a concern with the proposed NC 56 realignment.

The Creedmoor City Council unanimously adopted the thoroughfare plan on July 27, 2004.

VI. Conclusion

Creedmoor is a growing community that will require improvements to its transportation system over the next thirty years. It is the responsibility of the city to take the initiative for the implementation of the thoroughfare plan. It is imperative that the local area aggressively pursues funding for desired projects. Questions regarding funding, projects, planning, and modes of transportation should be addressed to the appropriate branch within NCDOT. **Appendix F** includes contact information for many of these branches.

Appendix A: Creedmoor Connector Alternatives

Throughout the course of this plan update several alternatives were studied for the location of the Creedmoor Connector. The alternatives were discussed at meetings with Creedmoor's Transportation Committee, at public workshops, and at the public drop-in session. The criteria for helping choose the location of the proposed Creedmoor Connector included:

- The ability to be a control of access facility;
- Reduce traffic in downtown Creedmoor;
- Provide access from NC 50 to I-85;
- Minimize environmental impacts.

The following sections describe the alternatives studied in this plan. Many of these alternatives are perfectly acceptable alternatives for the Creedmoor Connector and meet many of the criteria stated above. These alternatives evolved over time and are largely the result of input by the city leaders and citizens. The alternative that is reflected in the thoroughfare plan is felt to best meet the above criteria while minimizing social and environmental impacts.

Alternative 1

One alternative suggested for the Creedmoor Connector numerous times during the course of this study was the Gate 2 Road (SR 1103) Bypass as shown in **Figure A-1**.

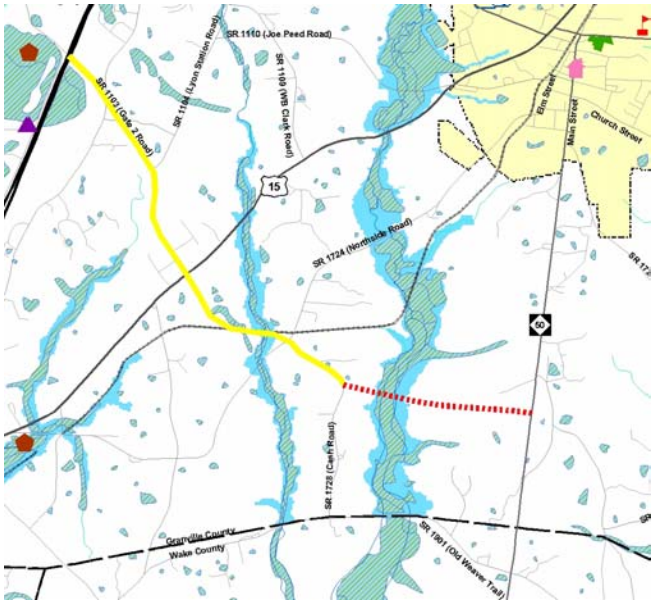


Figure A-1: Gate 2 Road (SR 1103) Bypass Alternative

This alternative is shown as a four lane divided facility. Part of the facility would be on new location from NC 50 to Cash Road (SR 1728) and part of the facility would be upgrading the existing roadway from Cash Road (SR 1728) to I-85. This alternative was eliminated for several reasons. There would be an inability to enforce control of access along the roadway due to the fact that this alternative uses a large section of existing roadway. This alternative also crossed wetlands and Army Corps of Engineer property. The Triangle Regional Model projected the facility would only carry 5,000-8,000 vpd in the year 2030 and that other roadways within the downtown area would still be over capacity with this improvement.

Several other alternatives for the location of the proposed Creedmoor Connector were discussed during this plan update. The following alternatives all provide a connection from NC 56 on the west side of Creedmoor to NC 56 on the east side of Creedmoor.

Alternative 2

Creedmoor Connector Alternative 2 is shown in **Figure A-2**.

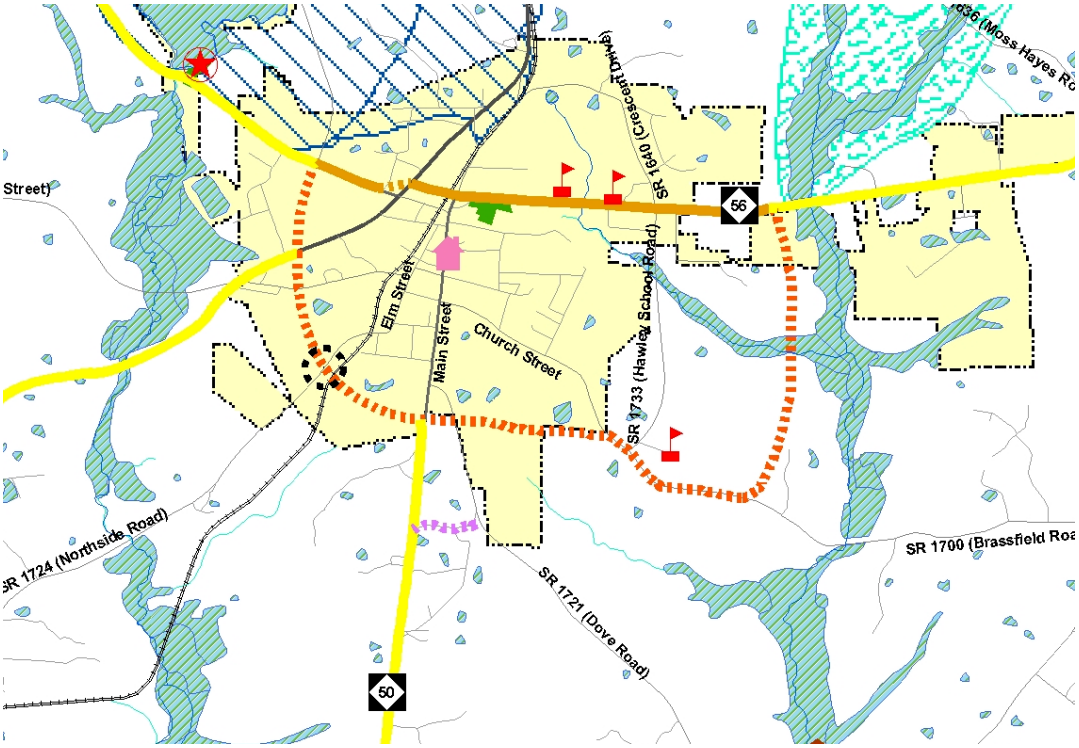


Figure A-2: Creedmoor Connector Alternative 2

This alternative recommends that the entire length of the Creedmoor Connector be a two lane facility on four lanes of right-of-way. This alternative carries the proposed Creedmoor Connector from NC 56 at Stem Road (SR 1127) south across US 15. A grade separation is recommended at Northside Road (SR 1724). The proposed connector then crosses NC 50 and joins with a portion of Brassfield Road (SR 1700) before turning north to meet NC 56. This proposed alternative also utilizes existing reserved right-of-way behind Whitehall Subdivision. The location of this alternative allows the facility to be control of access. This alternative does cross over a wetland area on the eastern side of Creedmoor. This alternative was eliminated for several reasons. It crossed wetlands, thus potentially harming the environment. The citizens of Creedmoor also felt that this alternative was to close to the downtown area, and they opposed the widening of NC 56 on the western side of Creedmoor that would be necessary with the selection of this alternative.

Alternative 3

Creedmoor Connector Alternative 3 is shown in **Figure A-3**.

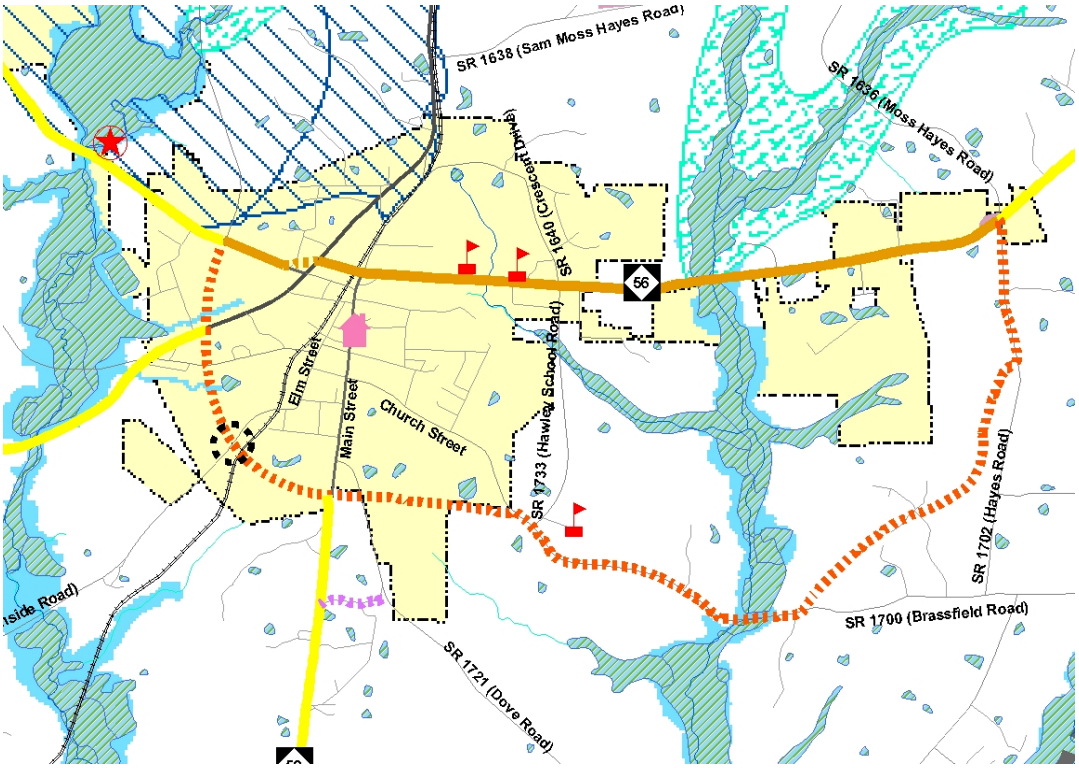


Figure A-3: Creedmoor Connector Alternative 3

This alternative recommends that the entire length of the Creedmoor Connector be a two lane facility on four lanes of right-of-way. This alternative carries the proposed Creedmoor Connector from NC 56 at Stem Road (SR 1127) south across US 15. A grade separation is recommended at Northside Road (SR 1724). The proposed connector then crosses NC 50 and joins with a portion

of Brassfield Road (SR 1700), utilizing an existing bridge crossing, before turning north to meet with Hayes Road (SR 1702). This proposed alternative also utilizes existing reserved right-of-way behind Whitehall Subdivision. The location of this alternative allows the facility to be control of access. This alternative was eliminated due to the lack of community support. The citizens of Creedmoor felt that this alternative was to close to the downtown area, and they opposed the widening of NC 56 on the western side of Creedmoor that would have to be completed with the selection of this alternative.

Alternative 4

Creedmoor Connector Alternative 4 is shown in **Figure A-4**.

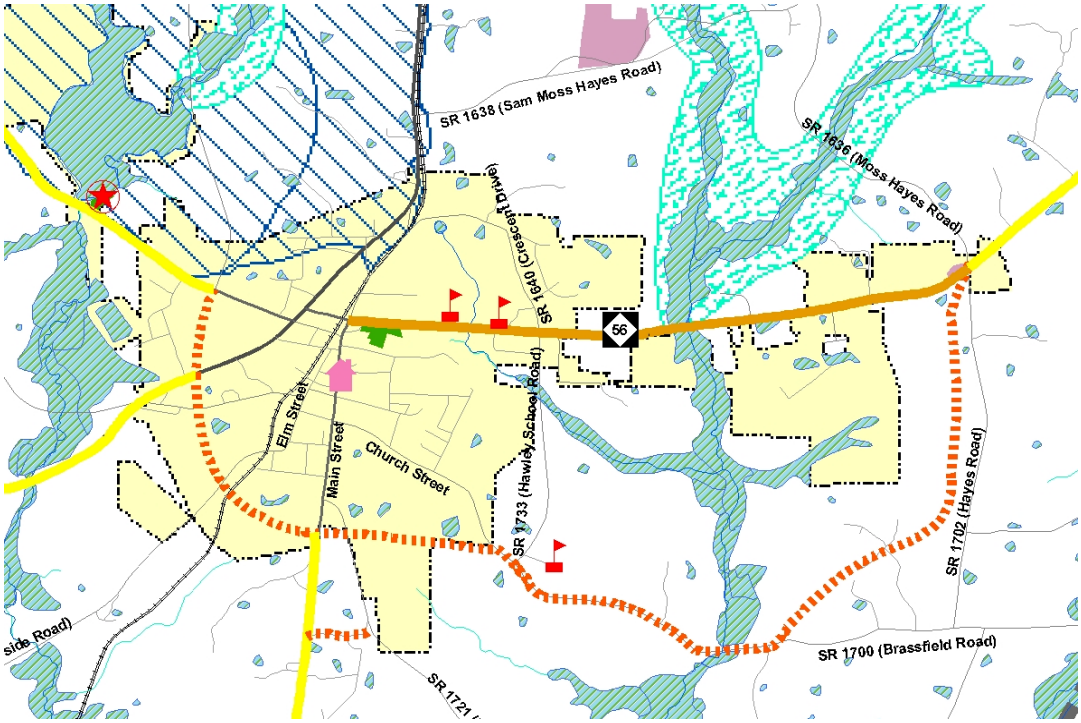


Figure A-4: Creedmoor Connector Alternative 4

This alternative recommends that the entire length of the Creedmoor Connector be a two lane facility on four lanes of right-of-way. This alternative carries the proposed Creedmoor Connector from NC 56 at Stem Road (SR 1127) south across US 15 and then across NC 50. The proposed connector then joins with a portion of Brassfield Road (SR 1700), utilizing an existing bridge crossing, before turning north to run parallel to Hayes Road (SR 1702). This proposed alternative also utilizes existing reserved right-of-way behind Whitehall Subdivision. The location of this alternative allows the facility to be control of access. This alternative was eliminated due to the lack of community support. The citizens of Creedmoor felt that this alternative was to close to the downtown area, and they opposed the widening of NC 56 on the western side of Creedmoor that would be necessary with the selection of this alternative.

Alternative 5

Creedmoor Connector Alternative 5 is shown in **Figure A-5**.

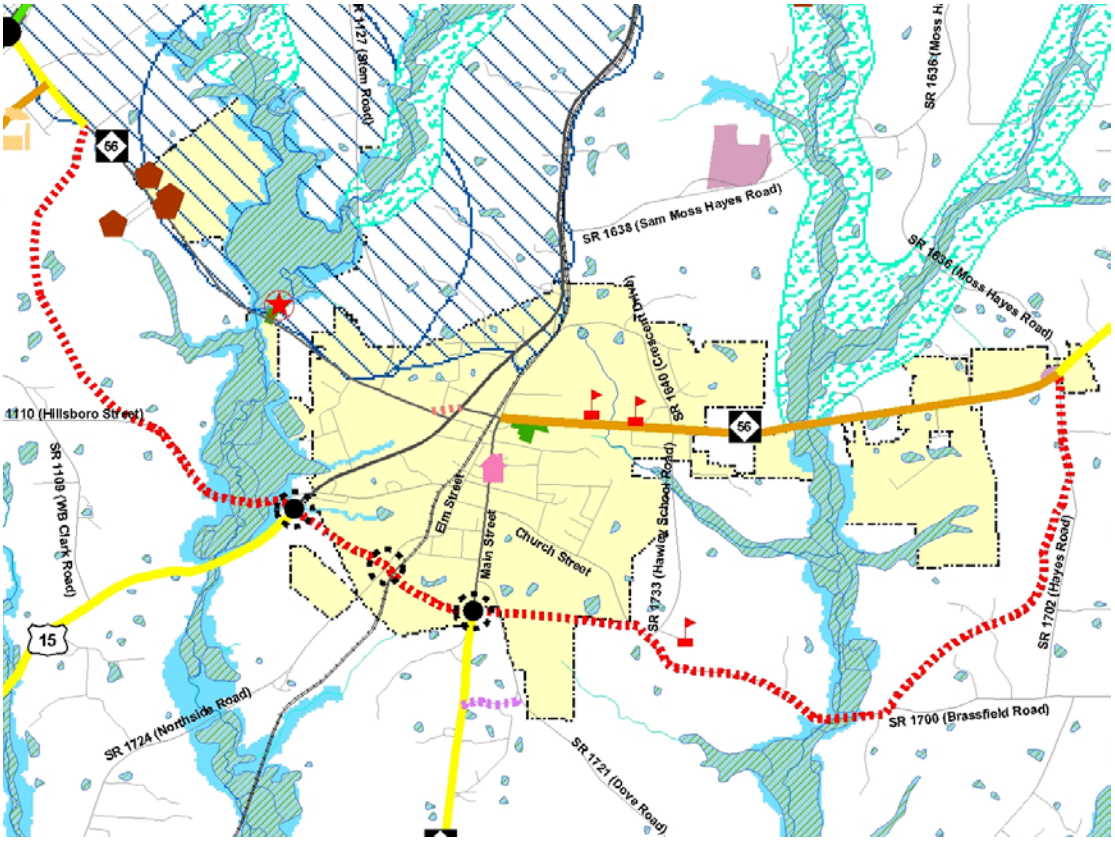


Figure A-5: Creedmoor Connector Alternative 5

This alternative recommends that the entire length of the Creedmoor Connector be a four lane divided control of access facility. This alternative carries the proposed Creedmoor Connector from NC 56 near I-85 south to join with a portion of Joe Peed Road (SR 1110) and utilizes an existing wetlands crossing. The connector crosses US 15 where an interchange is proposed, crosses Northside Road (SR 1724) where a grade separation is proposed, and crosses NC 50 where an interchange is proposed. The proposed connector then joins with a portion of Brassfield Road (SR 1700), utilizing an existing bridge crossing, before turning north to meet Hayes Road (SR 1702). This proposed alternative also utilizes existing reserved right-of-way behind Whitehall Subdivision. This alternative was eliminated because there were possible negative impacts to businesses on the western side of the connector. This alternative was also eliminated because the city leaders felt that the section of the connector between US 15 and NC 50 was to close to the downtown area.

Alternative 6

Creedmoor Connector Alternative 6 is shown in **Figure A-6**.

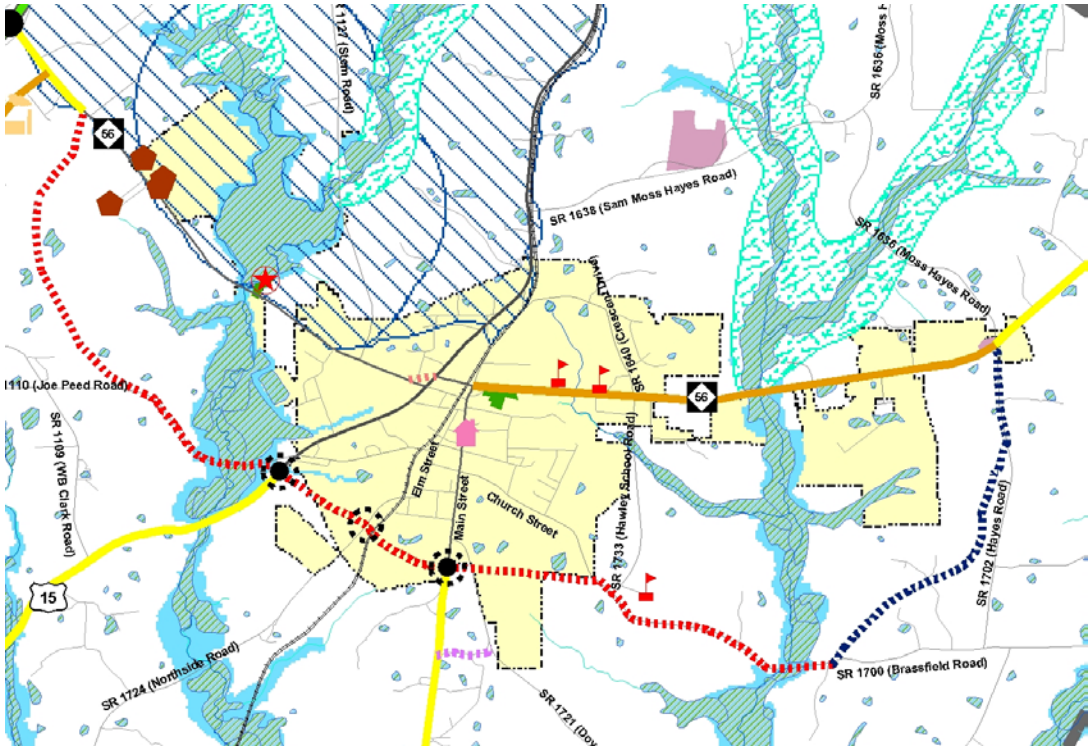


Figure A-6: Creedmoor Connector Alternative 6

This alternative is the same as Alternative 5 described on the previous page, except for the cross section of the roadway. This alternative recommends that the length of the Creedmoor Connector from NC 56 on the west side of Creedmoor to Brassfield Road (SR 1700) be a four lane divided control of access facility. From Brassfield Road (SR 1700) to NC 56 on the east side of Creedmoor this alternative recommends that the Creedmoor Connector be a two lane facility on four lanes of right-of-way. This alternative was eliminated because there were possible negative impacts to businesses on the western side of the connector. This alternative was also eliminated because the city leaders felt that the section of the connector between US 15 and NC 50 was to close to the downtown area.

Alternative 7

Creedmoor Connector Alternative 7 is shown in **Figure A-7**.

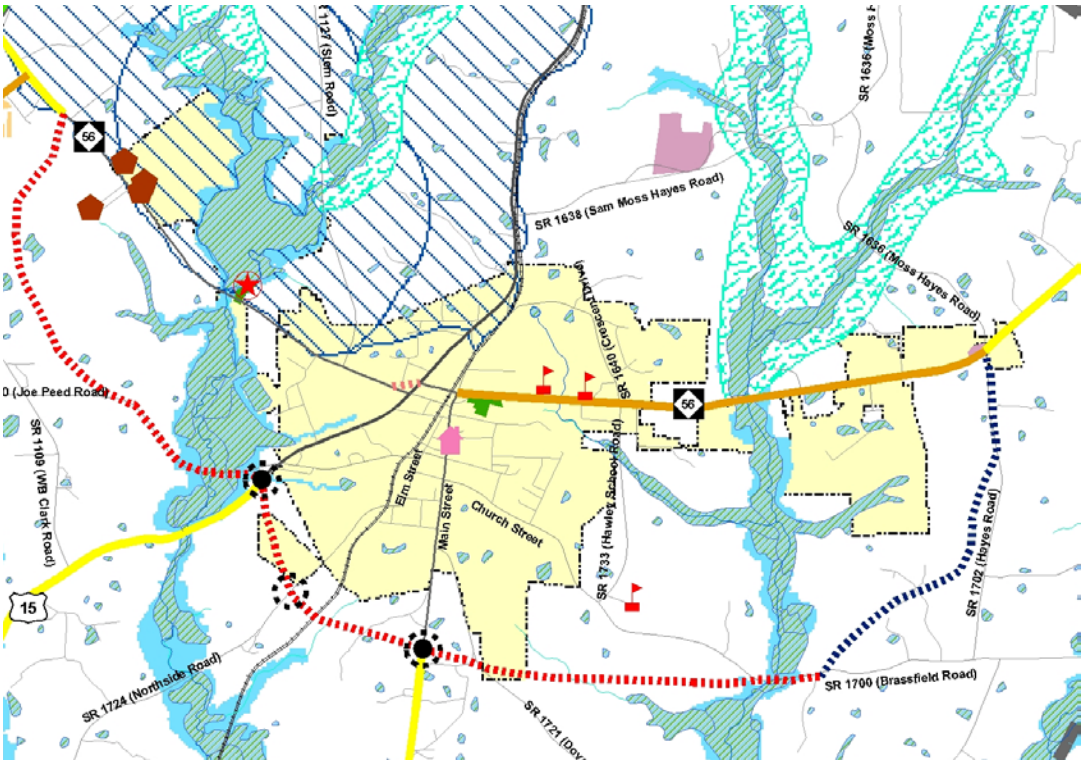


Figure A-7: Creedmoor Connector Alternative 7

This alternative is very similar to Alternative 5 and Alternative 6 described previously, except that the connector goes farther south to cross NC 50 and does not utilize the existing right-of-way behind Whitehall Subdivision. This alternative recommends that the length of the Creedmoor Connector from NC 56 on the west side of Creedmoor to Brassfield Road (SR 1700) be a four lane divided control of access facility. From Brassfield Road (SR 1700) to NC 56 on the east side of Creedmoor this alternative recommends that the Creedmoor Connector be a two lane facility on four lanes of right-of-way. This alternative carries the proposed Creedmoor Connector from NC 56 near I-85 south to join with a portion of Joe Peed Road (SR 1110) and utilizes an existing wetlands crossing. The connector crosses US 15 where an interchange is proposed, crosses Northside Road (SR 1724) where a grade separation is proposed, and crosses NC 50 where an interchange is proposed. The proposed connector then joins with a portion of Brassfield Road (SR 1700), utilizing an existing bridge crossing, before turning north to meet Hayes Road (SR 1702). This alternative was eliminated because there were possible negative impacts to businesses on the western side of the connector.

Alternative 8

Creedmoor Connector Alternative 8 is shown in **Figure A-8.**

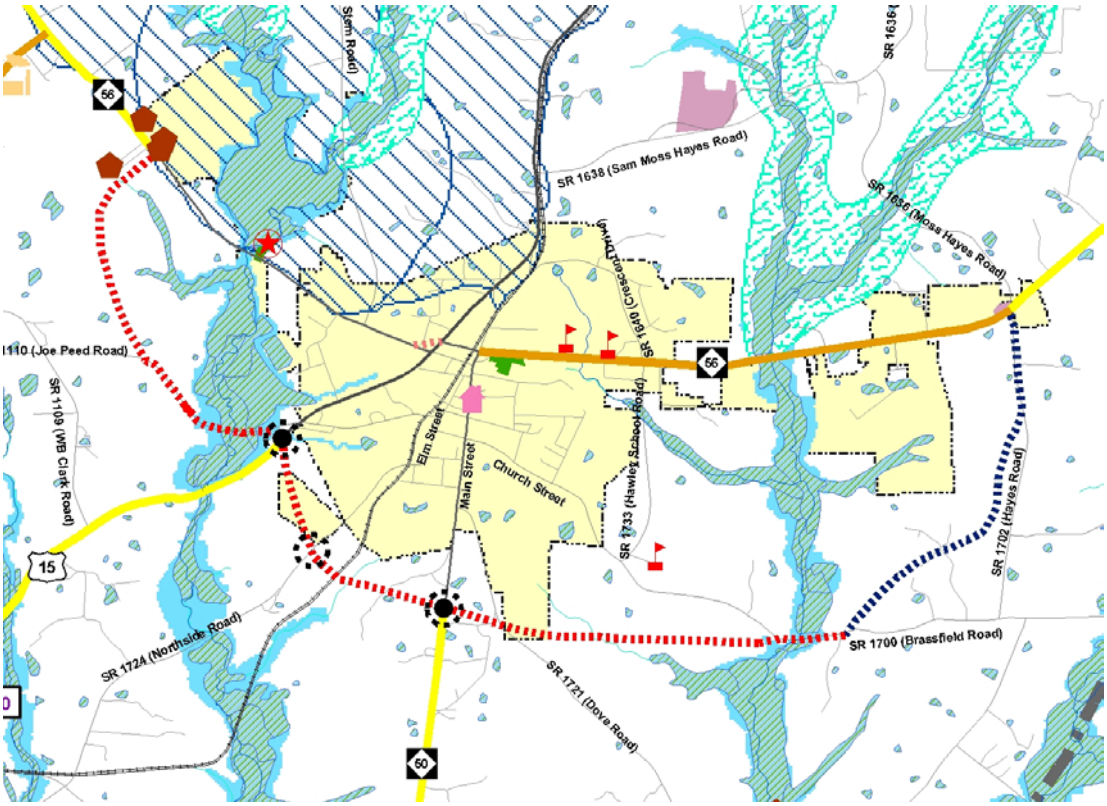


Figure A-8: Creedmoor Connector Alternative 8

This alternative is the same as Alternative 7 described on the previous page, except for the location of the intersection of the proposed Creedmoor Connector with NC 56 on the west side of Creedmoor. This alternative recommends that the Creedmoor Connector begin farther east of I-85. This alternative was selected at the June 15, 2004 public hearing as the preferred alternative for the thoroughfare plan. Due to the citizen input at the public hearing the City Commissioners requested some changes be made to the eastern side of the connector. Many citizens in the Brassfield Road (SR 1700) and Hayes Road (SR 1702) area did not like the uncertainty of when the proposed facility would come through their land, and they felt that a new roadway would destroy the rural nature of the area. The requested changes are reflected in the adopted thoroughfare plan map shown in **Figure 2** and well as the Recommendations Map shown in **Figure 3**.

Appendix B: Thoroughfare Planning Principles

There are many advantages to thoroughfare planning, but the primary mission is to assure that the road system will be progressively developed to serve future travel desires. Thus, the main consideration in thoroughfare planning is to make provisions for street and highway improvements so that, when the need arises, feasible opportunities to make improvements exist.

Benefits of Thoroughfare Planning

There are two major benefits derived from thoroughfare planning. First, each road or highway can be designed to perform a specific function and provide a specific level of service. This permits savings in right-of-way, construction, and maintenance costs. It also protects residential neighborhoods and encourages stability in travel and land use patterns. Second, local officials are informed of future improvements and can incorporate them into planning and policy decisions. This will permit developers to design subdivisions in a non-conflicting manner, direct school and park officials to better locate their facilities, and minimize the damage to property values and community appearance that is sometimes associated with roadway improvements.

Thoroughfare Classification Systems

Streets perform two primary functions, traffic service and land access, which when combined, are basically incompatible. The conflict is not serious if both traffic and land service demands are low. However, when traffic volumes are high, conflicts created by uncontrolled and intensely developed abutting property lead to intolerable traffic flow friction and congestion.

The underlying concept of the thoroughfare plan is that it provides a functional system of streets that permits travel from origins to destinations with directness, ease, and safety. Different streets in this system are designed and called on to perform specific functions, thus minimizing the traffic and land service conflict.

Urban Classification

In the urban thoroughfare plan, such as the city of Creedmoor, elements are classified as major thoroughfares, minor thoroughfares, or local access streets.

Major Thoroughfares

These routes are the primary traffic arteries of the urban area and they accommodate traffic movements within, around, and through the area.

Minor Thoroughfares

Roadways classified under this type collect traffic from the local access streets and carry it to the major thoroughfare system.

Local Access Streets
This classification covers streets that have a primary purpose of providing access to the abutting property. This classification may be further classified as residential, commercial and/or industrial depending upon the type of land use that they serve.

Idealized Major Thoroughfare System

The coordinated system of major thoroughfares that is most adaptable to the desired lines of travel within an urban area and that is reflected in most urban area thoroughfare plans is the radial-loop system. The radial-loop system includes radials, crosstowns, loops, and bypasses as shown in **Figure B-1**.

Radial streets provide for traffic movement between points located on the outskirts of the city and the central area. This is a major traffic movement in most cities, and the economic strength of the central business district depends upon the adequacy of this type of thoroughfare.

If all radial streets crossed in the central area, an intolerable congestion problem would result. To avoid this problem, it is very important to have a system of crosstown streets that form a loop around the central business district. This system allows traffic moving from origins on one side of the central area to destinations on the other side to follow the area's border. It also allows central area traffic to circle and then enter the area near a given destination. The effect of a good crosstown system is to free the central area of crosstown traffic, thus permitting the central area to function more adequately in its role as a business or pedestrian shopping area.

Loop system streets move traffic between suburban areas of the city. Although a loop may completely encircle the city, a typical trip may be from an origin near a radial thoroughfare to a destination near another radial thoroughfare. Loop streets do not necessarily carry heavy volumes of traffic, but they function to help relieve central areas. There may be one or more loops, depending on the size of the urban area. They are generally spaced one-half mile to one mile apart, depending on the intensity of land use.

A bypass is designed to carry traffic through or around the urban area, thus providing relief to the city street system by removing traffic that has no desire to be in the city. Bypasses are usually designed to through-highway standards, with control of access. Occasionally, a bypass with low traffic volume can be designed to function as a portion of an urban loop. The general effect of bypasses is to expedite the movement of through traffic and to improve traffic conditions within the city. By freeing the local streets for use by shopping and home-to-work traffic, bypasses tend to increase the economic vitality of the local area.

Rural Classification

The facilities outside the urban thoroughfare planning boundaries make up the rural system. There are four major systems: principal arterials, minor arterials, major and minor collectors, and local roads.

Rural Principal Arterial System

This system is a connected network of continuous routes that serve corridor movements having substantial statewide or interstate travel characteristics. This will be shown by both the trip lengths and the travel densities. The principal arterial system should serve all urban areas of over 50,000 population and most of those with a population greater than 5,000. The Interstate system constitutes a significant portion of the principal arterial system.

Rural Minor Arterial System

This system forms a network that links cities, larger towns, and other traffic generators such as large resorts. The minor arterial system generally serves intrastate and intercounty travels and travel corridors with trip lengths and travel densities somewhat less than the principal arterial system.

Rural Collector Road System

The rural collector routes generally serve intracounty travel. These routes serve travel whose distances are shorter than on the arterial routes. The rural collector road system is subclassified into major and minor collector roads.

- **Major Collector Roads** - These routes provide service to the larger towns not directly served by the higher systems and to other traffic generators of equivalent intracounty importance, such as consolidated schools, shipping points, county parks, significant mining and agricultural areas, etc. Major collector roads also link these places to routes of higher classification and serve the more important intracounty travel corridors.

- **Minor Collector Roads** - These routes collect traffic from local roads and bring all developed areas within a reasonable distance of a major collector road. They also provide service to the remaining smaller communities and link the locally important traffic generators with the rural outskirts.

Rural Local Road System

The local roads are all roads that are not on a higher system. Local residential subdivision streets and residential collector streets are elements of the local road system. Local residential streets are either cul-de-sacs, loop streets less than 2,500 feet in length, or streets less 1 mile in length. They do not connect thoroughfares or serve major traffic generators and do not collect traffic from more than one hundred dwelling units. Residential collectors serve as the connecting street system between local residential streets and the thoroughfare system.

Objectives of Thoroughfare Planning

Thoroughfare planning is the process public officials use to assure the development of the most appropriate street system that will meet existing and future travel desires within the urban area. The primary aim of a thoroughfare plan is to guide the development of the urban street system in a manner consistent with the changing traffic patterns. A thoroughfare plan will enable street improvements to be made as traffic demands increase, and it helps eliminate unnecessary improvements, so needless expense can be averted. By developing the urban street system to keep pace with increasing traffic demands, a maximum utilization of the system can be attained, requiring a minimum amount of land for street purposes. In addition to providing for traffic needs the thoroughfare plan should embody those details of good urban planning necessary to present a pleasing and efficient urban community. The location of present and future population, commercial and industrial development affect major street and highway locations. Conversely, the location of major streets and highways within the urban area will influence the urban development pattern.

Other objectives of a thoroughfare plan include:

- To provide for the orderly development of an adequate major street system as land development occurs;
- To reduce travel and transportation costs;
- To reduce the cost of major street improvements to the public through the coordination of the street system with private action;
- To enable private interest to plan their actions, improvements, and development with full knowledge of public intent;
- To minimize disruption and displacement of people and businesses through long range advance planning for major street improvements;
- To reduce environmental impacts, such as air pollution, resulting from transportation, and
- To increase travel safety.

These objectives are achieved through improving both the operational efficiency of thoroughfares, and improving the system efficiency through system coordination and layout.

Operational Efficiency

A street's operational efficiency is improved by increasing the capability of the street to carry more vehicular traffic and people. In terms of vehicular traffic, a street's capacity is defined by the maximum number of vehicles that can pass a given point on a roadway during a given time period under prevailing roadway and traffic conditions. The physical features of the roadway, nature of traffic, and weather affect capacity. Physical ways to improve vehicular capacity include:

- **Street widening** - Widening of a street from two to four lanes more than doubles the capacity of the street by providing additional maneuverability for traffic.
- **Intersection improvements** - Increasing the turning radii, adding exclusive turn lanes, and channeling movements can improve the capacity of an existing intersection.
- **Improving vertical and horizontal alignment** - Reduces the congestion caused by slow moving vehicles.
- **Eliminating roadside obstacles** - Reduces side friction and improves a driver's field of sight.

Operational ways to improve street capacity include:

- **Control of access** - A roadway with complete access control can often carry three times the traffic handled by a non-controlled access street with identical lane width and number.
- **Parking removal** - Increases capacity by providing additional street width for traffic flow and reducing friction to flow caused by parking and unparking vehicles.
- **One-way operation** - The capacity of a street can sometimes be increased 20 - 50%, depending upon turning movements and overall street width, by initiating one-way traffic operations. One-way streets can also improve traffic flow by decreasing potential traffic conflicts and simplifying traffic signal coordination.
- **Reversible lane** - Reversible traffic lanes may be used to increase street capacity in situations where heavy directional flows occur during peak periods.
- **Signal phasing and coordination** - Uncoordinated signals and poor signal phasing restrict traffic flow by creating excessive stop-and-go operation.

Altering travel demand is a third way to improve the efficiency of existing streets. Travel demand can be reduced or altered in the following ways:

- **Carpools** - Encourage people to form carpools and vanpools for journeys to work and other trip purposes. This reduces the number of vehicles on the roadway and raises the people carrying capability of the street system.
- **Alternate mode** - Encourage the use of transit and bicycle modes.
- **Work hours** - Encourage industries, businesses, and institutions to stagger work hours or establish variable work hours for employees. This will spread peak travel over a longer time period and thus reduce peak hour demand.
- **Land use** - Plan and encourage land use development or redevelopment in a more travel efficient manner.

System Efficiency

Another means for altering travel demand is the development of a more efficient system of streets that will better serve travel desires. A more efficient system can reduce travel distances, time, and cost to the user. Improvements in system efficiency can be achieved through the concept of functional classification of streets and development of a coordinated major street system.

Application of Thoroughfare Planning Principles

The concepts presented in the discussion of operational efficiency, system efficiency, functional classification, and idealized major thoroughfare system are the conceptual tools available to the transportation planner in developing a thoroughfare plan. In actual practice thoroughfare planning is done for established urban area and is constrained by existing land use and street patterns, existing public attitudes and goals, and current expectations of future land use. Compromises must be made because of these and the many other factors that affect major street locations.

Through the thoroughfare planning process it is necessary from a practical viewpoint that certain basic principles be followed as closely as possible. These principles are listed below:

1. The plan should be derived from a thorough knowledge of today's travel - its component parts, and the factors that contribute to it, limit it, and modify it.
2. Traffic demands must be sufficient to warrant the designation and development of each major street. The thoroughfare plan should be designed to accommodate a large portion of major traffic movements on a few streets.
3. The plan should conform to and provide for the land development plan for the area.
4. Certain considerations must be given to urban development beyond the current planning period. Particularly in outlying or sparsely developed areas that have development potential, it is necessary to designate thoroughfares on a long-range planning basis to protect rights-of-way for future thoroughfare development.
5. While being consistent with the above principles and realistic in terms of travel trends, the plan must be economically feasible.

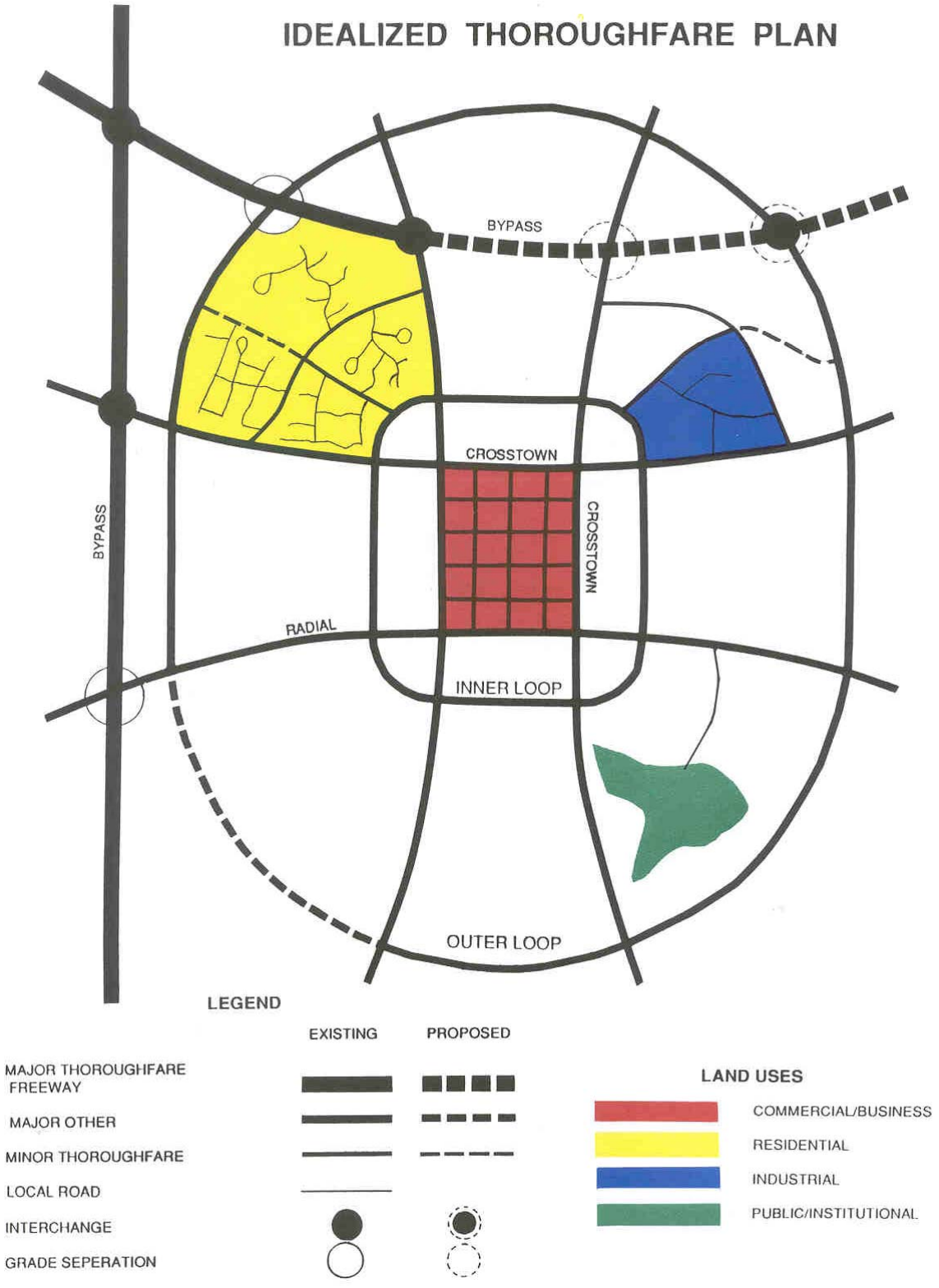


Figure B-1: Idealized Thoroughfare Plan

Appendix C: Thoroughfare Street Tabulation and Recommendations

This appendix includes a detailed tabulation of all streets identified as elements of the city of Creedmoor Thoroughfare Plan. The table includes a description of the roads by sections, as well as the length, cross section, and right-of-way for each section. Also included is the existing and projected average daily traffic volumes, roadway capacity, and the recommended ultimate lane configuration. Due to space constraints, these recommended cross sections are given in the form of an alphabetic code. A detailed description of each of these codes and an illustrative figure for each can be found in **Appendix D**.

The following index of terms may be helpful in interpreting the table:

NCL – Northern Corporate Limits
SCL – Southern Corporate Limits
EPB – Eastern Planning Boundary
NPB – Northern Planning Boundary
SPB – Southern Planning Boundary
WPB – Western Planning Boundary
SR - State Road
N/A - Not Available
RDWY – Roadway
ROW – Right-of-way

FACILITY & SECTION	DIST (MI)	EXISTING CONDITIONS RDWY (FT)	ROW (FT)	NO. OF LANES	CAPACITY (vpd)	NO BUILD ADT 2003 ADT	2030 ADT	RECOMMENDATIONS CROSS SECTION	CAPACITY (VPD)	2030 ADT
Creedmoor Connector										
NC 56 - US 15	1.91	-	-	-	-	-	-	F	37200	9,800
US 15 - NC 50	1.1	-	-	-	-	-	-	F	37200	12,000
NC 50 - SR 1700	1.6	-	-	-	-	-	-	H	18600	12,000
I-85										
SPB - SR 1103	0.43	48	350	4	56,600	39,000	79,000	L	110,000	82,000
SR 1103 - NC 56	2.30	48	350	4	56,600	39,000	73,000	L	110,000	73,000
NC 56 - NPB	1.51	48	400	4	56,600	34,000	73,000	L	110,000	73,000
US 15										
SPB - SR 1109	1.25	21	100	2	17,300	2,200	15,000	F	35,000	19,000
SR 1109 - SCL	1.08	21	100	2	17,300	3,700	15,000	F	35,000	19,000
SCL - NCL	[common to US 15 (Durham Avenue)]									
NCL - NPB	2.45	21	100	2	17,300	4,900	7,700	Adequate	Adequate	7,700
US 15 (Durham Avenue)										
SCL - NC 56	0.77	21	100	2	13,900	3,400	14,000	Adequate	Adequate	15,000
NC 56 - NC 50	0.06	24	90	2	13,900	11,000	14,000	Adequate	Adequate	15,000
NC 50 - NCL	0.76	21	100	2	13,900	2,900	14,000	Adequate	Adequate	6,500
NC 50										
SPB - County Line	0.52	22	60	2	17,300	4,500	20,000	F	35,000	26,000
County Line - SCL	2.40	22	60	2	17,300	6,900	20,000	F	35,000	26,000
SCL - NC 56	[common to NC 50 (South Main Street)]									
NC 56 - US 15	[common to NC 50 (West Wilton Avenue)]									
NC 50 (South Main Street)										
SCL - SR 1700	0.43	21	60	2	13,900	13,000	17,000	Adequate	Adequate	11,000
SR 1700 - NC 56	0.42	38	60	2+parking	13,900	12,000	17,000	Adequate	Adequate	11,000
NC 50 (West Wilton Avenue)										
NC 56 - US 15	0.20	22	60	2	13,900	8,400	15,000	Adequate	Adequate	15,000
NC 56										
WPB - SR 1108	0.41	31	100	3	13,900	10,000	17,000	F	35,000	22,000
SR 1108 - Capital Drive	0.51	31	60	3	13,900	10,000	17,000	F	35,000	22,000
Capital Drive - Pond Drive	0.10	21	60	2	17,300	10,000	17,000	F	35,000	22,000
Pond Drive - Mill Stream Circle	0.10	31	60	3	17,300	10,000	17,000	F	35,000	22,000
Mill Stream Circle - WCL	0.69	21	60	2	17,300	10,000	17,000	Adequate	Adequate	11,000
WCL - US 15	[common to NC 56 (West Lake Road)]									
SR 1736 - NC 50	[common to US 15 (Durham Avenue)]									
US 15 - NC 50	[common to NC 50 (West Wilton Avenue)]									
NC 50 - ECL	[common to NC 56 (East Wilton Avenue)]									
ECL - SR 1636	0.35	22	60	2	17,300	6,700	16,000	H	35,000	7,500
SR 1636 - SR 1635	0.84	22	60	2	17,300	6,700	16,000	F	35,000	7,500
SR 1635 - EPB	0.71	22	60	2	17,300	1,900	16,000	F	35,000	7,500
NC 56 (East Wilton Avenue)										
NC 50 - SR 1640	0.77	22	60	2	13,900	9,800	20,000	H	17,300	18,000
SR 1640 - ECL	1.40	22	60	2	17,300	9,800	16,000	H	17,300	6,300
NC 56 (West Lake Road)										
WCL - SR 1127	0.64	21	60	2	17,300	10,000	17,000	Adequate	Adequate	11,000
SR 1127 - US 15	0.34	21	60	2	13,900	13,000	11,000	Adequate	Adequate	11,000
SR 1103 (Gate 2 Road)										
WPB - SR 1104	1.00	23	60	2	17,300	2,700	9,300	Adequate	Adequate	2,300
SR 1104 - US 15	0.70	21	60	2	17,300	4,600	9,300	Adequate	Adequate	4,300
SR 1104 (East Lyon Station Road)										
SR 1103 - SR 1109	1.20	20	60	2	17,300	2,400	N/A	H	18,600	N/A
SR 1109 - SR 1106	0.50	20	60	2	17,300	2,400	N/A	H	18,600	N/A
SR 1106 - SR 1108	0.20	20	60	2	17,300	2,400	N/A	H	18,600	N/A
SR 1108 (East Lyon Station Road)										
SR 1104 - NC 56	0.65	20	60	2	17,300	4,300	N/A	H	18,600	N/A

Table C-1: Thoroughfare Plan Street Tabulation and Recommendations

FACILITY & SECTION	DIST (MI)	EXISTING CONDITIONS				NO BUILD ADT		RECOMMENDATIONS		
		RDWY (FT)	ROW (FT)	NO. OF LANES	CAPACITY (vpd)	2003 ADT	2030 ADT	CROSS SECTION	CAPACITY (VPD)	2030 ADT
SR 1109 (W.B. Clark Road)										
SR 1104 - US 15	1.30	20	60	2	17,300	7,400	N/A	Adequate	Adequate	N/A
SR 1110 (Hillsboro Street)										
US 15 - Ward Street	0.15	20	60	2	13,900	1,600	N/A	Adequate	Adequate	N/A
Ward Street - SR 1724	0.52	20	60	2	13,900	1,600	N/A			
SR 1127 (Brogden Road)										
NCL - NPB	2.75	20	60	2	17,300	1,200	1,500	Adequate	Adequate	1,200
SR 1127 (Stem Road)										
NC 56 - NCL	0.24	20	60	2	17,300	1,300	1,500	Adequate	Adequate	1,200
SR 1639 (North Main Street)										
NC 56 - US 15	0.62	20	100	2	13,900	2,000	N/A	Adequate	Adequate	N/A
SR 1700 (Brassfield Road)										
Peachtree Street - ECL	0.39	20	60	2	17,300	3,700	9,800	Adequate	Adequate	3,300
ECL - SR 1733	0.13	20	60	2	17,300	3,700	9,800	Adequate	Adequate	3,300
SR 1733 - SR 1702	1.89	20	60	2	17,300	3,700	9,800	H	18,600	12,000
SR 1702 - EPB	0.64	20	60	2	17,300	2,300	3,700	Adequate	Adequate	6,200
SR 1700 (Church Street)										
SR 1724 - NC50	0.13	20	50	2	13,900	3,700	9,800	Adequate	Adequate	3,300
NC 50 - Peachtree Street	0.46	20	60	2	13,900	3,700	9,800	Adequate	Adequate	3,300
SR 1702 (Hayes Road)										
SR 1700 - NC 56	1.46	20	60	2	17,300	900	N/A	H	18,600	6,300
SR 1724 (Elm Street)										
SCL - SR 1110	0.72	18	60	2	13,900	2,100	N/A	Adequate	Adequate	N/A
SR 1110 - Fleming Street	0.23	18	50	2	13,900	2,100	N/A	Adequate	Adequate	N/A
SR 1724 (Northside Road)										
SPB - SR 1728	0.52	19	60	2	17,300	2,100	N/A	Adequate	Adequate	N/A
SR 1728 - Ledge Creek	1.07	19	60	2	17,300	2,100	N/A	Adequate	Adequate	N/A
Ledge Creek - SCL	0.80	19	60	2	17,300	1,400	N/A	Adequate	Adequate	N/A
SR 1728 (Cash Road)										
US 15 - SR 1724	0.90	21	60	2	17,300	4,000	N/A	Adequate	Adequate	1,800
SR 1724 - SR 1901	1.35	21	60	2	17,300	1,500	N/A	Adequate	Adequate	1,800
SR 1733 (Hawley School Road)										
SR 1700 - NC 56	0.99	21	60	2	17,300	900	N/A	Adequate	Adequate	N/A
SR 1736 (Lake Road)										
US 15 - NC 50	0.20	20	30	2	13,900	6900	N/A	Adequate	Adequate	N/A
Fleming Street										
Elm Street - NC 50	0.04	20	40	2	13,900	2,100	N/A	Adequate	Adequate	N/A

Table C-1: Thoroughfare Plan Street Tabulation and Recommendations

Appendix D: Typical Thoroughfare Cross Sections

Cross section requirements for roadways vary according to the capacity and level of service to be provided. Universal standards in the design of roadways are not practical. Each roadway section must be individually analyzed and its cross section determined based on the volume and type of projected traffic, existing capacity, desired level of service, and available right-of-way. The cross sections are typical for facilities on new location and where right-of-way constraints are not critical. For widening projects and urban projects with limited right-of-way, special cross sections should be developed that meet the needs of the project.

On all existing and proposed roadways delineated on the thoroughfare plan, adequate right-of-way should be protected or acquired for the recommended cross sections. In addition to cross section and right-of-way recommendations for improvements, **Appendix C** may recommend ultimate needed right-of-way for the following situations:

- roadways which may require widening after the current planning period,
- roadways which are borderline adequate and accelerated traffic growth could render them deficient, and
- roadways where an urban curb and gutter cross section may be locally desirable because of urban development or redevelopment.

Recommended design standards relating to grades, sight distances, degree of curve, superelevation, and other considerations for thoroughfares are given in **Appendix E**. The typical cross sections are described below.

A: Four Lanes Divided with Median - Freeway
Cross section "A" is typical for four-lane divided highways in rural areas that may have only partial or no control of access. The minimum median width for this cross section is 46 feet, but a wider median is desirable.

B: Seven Lanes - Curb & Gutter
Cross section "B" is typically not recommended for new projects. When the conditions warrant six lanes, cross section “D” should be recommended. Cross section “B” should be used only in special situations such as when widening from a five-lane section where right-of-way is limited. Even in these situations, consideration should be given to converting the center turn lane to a median so that cross section “D” is the final cross section.

C: Five Lanes - Curb & Gutter
Typical for major thoroughfares, cross section "C" is desirable where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

D: Six Lanes Divided with Raised Median - Curb & Gutter
E: Four Lanes Divided with Raised Median - Curb and Gutter
Cross sections "D" and "E" are typically used on major thoroughfares where left turns and intersection streets are not as frequent. Left turns would be restricted to a few selected intersections. The 16-ft median is the minimum recommended for an urban boulevard-type cross section. In most instances, monolithic construction should be utilized due to greater cost effectiveness, ease and speed of placement, and reduced future maintenance requirements. In certain cases, grass or landscaped medians result in greatly increased maintenance costs and an increase danger to maintenance personnel. Non-monolithic medians should only be recommended when the above concerns are addressed.

F: Four Lanes Divided - Boulevard, Grass Median
Cross section "F" is typically recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 24 ft is recommended, with 30 ft being desirable.

G: Four Lanes - Curb and Gutter
Cross section "G" is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would likely be required at major intersections. This cross section should be used only if the above criteria are met. If right-of-way is not restricted, future strip development could take place and the inner lanes could become de facto left turn lanes.

H: Three Lanes - Curb and Gutter
In urban environments, thoroughfares that are proposed to function as one-way traffic carriers would typically require cross section “H”.

I: Two Lanes – Curb and Gutter, Parking both sides
J: Two Lanes – Curb and Gutter, Parking one side
Cross section “I” and “J” are usually recommended for urban minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross-section “I” would be used on those minor thoroughfares where parking on both sides is needed as a result of more intense development.

K: Two Lanes - Paved Shoulder
Cross section "K" is used in rural areas or for staged construction of a wider multilane cross section. On some thoroughfares, projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time. For areas that are growing and future widening will be necessary, the full right-of-way of 100 ft should be required. In some instances, local ordinances may not allow the full 100 ft. In those cases, 70 ft should be

preserved with the understanding that the full 70 ft will be preserved by use of building setbacks and future street line ordinances.

L: Six Lanes Divided with Grass Median - Freeway
Cross section “L” is typical for controlled access freeways. The 46-ft grass median is the minimum desirable width, but variation from this may be permissible depending upon design considerations. Right-of-way requirements are typically 228 ft or greater, depending upon cut and fill requirements.

M: Eight Lanes Divided with Raised Median - Curb and Gutter
Also used for controlled access freeways, cross section "M" may be recommended for freeways going through major urban areas or for routes projected to carry very high volumes of traffic.

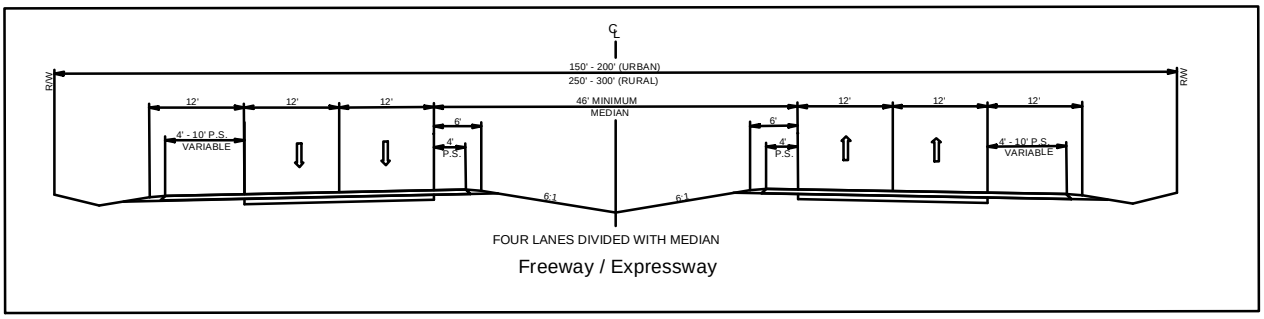
General
The urban curb and gutter cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk farther away from the street to provide additional separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

The right-of-way shown for each typical cross section is the minimum amount required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

D-1

TYPICAL HIGHWAY CROSS SECTIONS

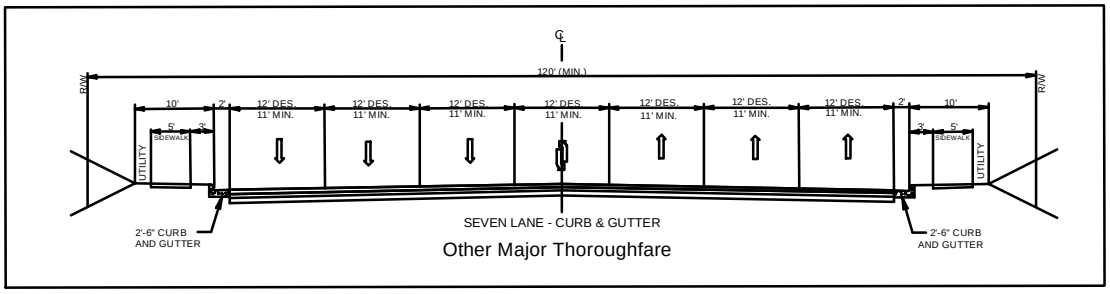
A



FOUR LANES DIVIDED WITH MEDIAN

Freeway / Expressway

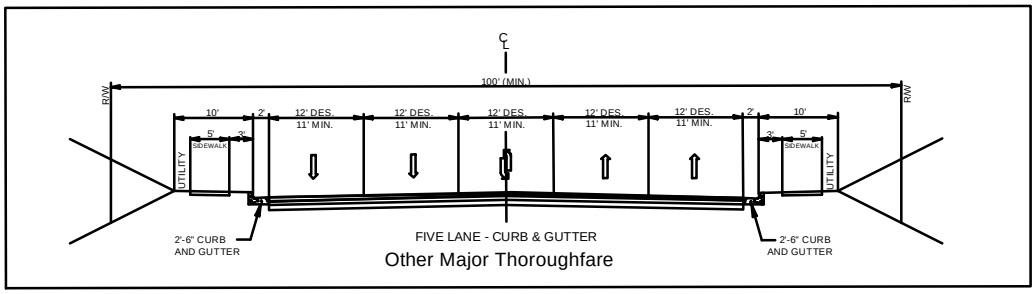
B



SEVEN LANE - CURB & GUTTER

Other Major Thoroughfare

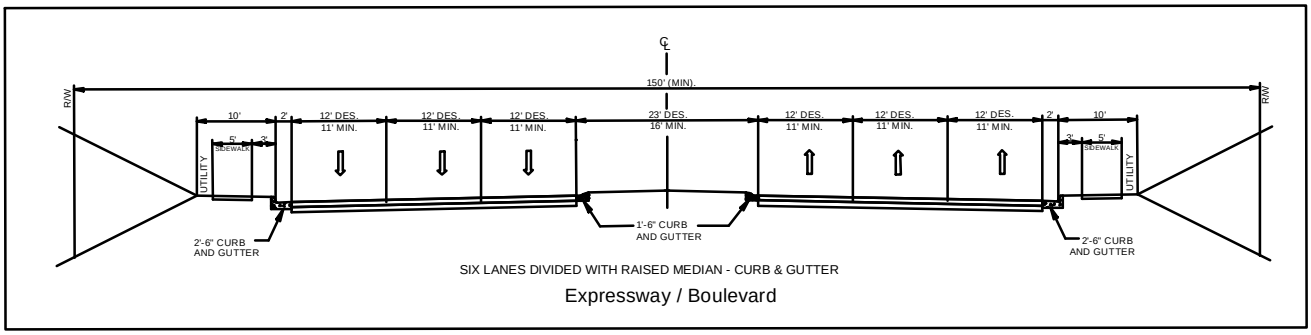
C



FIVE LANE - CURB & GUTTER

Other Major Thoroughfare

D



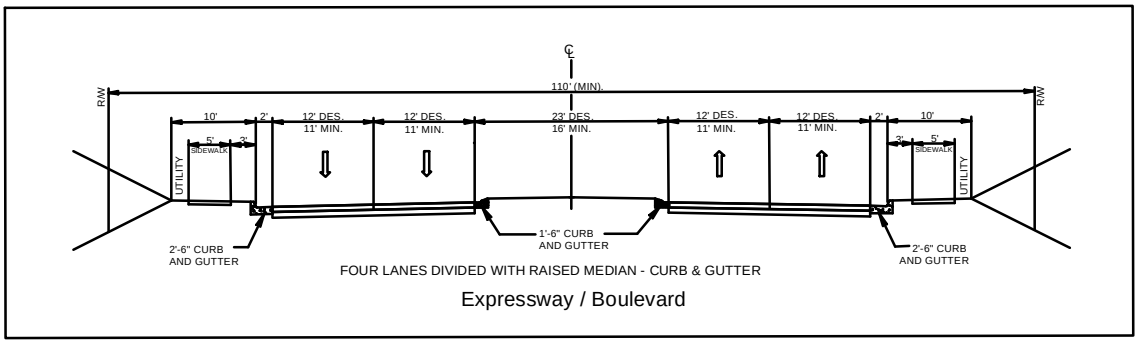
SIX LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

Expressway / Boulevard

revised 04-01-05

TYPICAL HIGHWAY CROSS SECTIONS

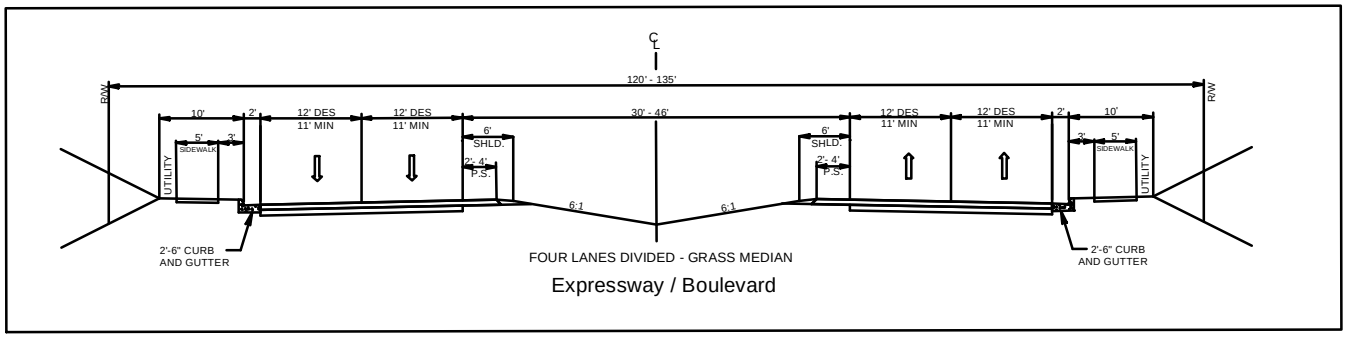
E



FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

Expressway / Boulevard

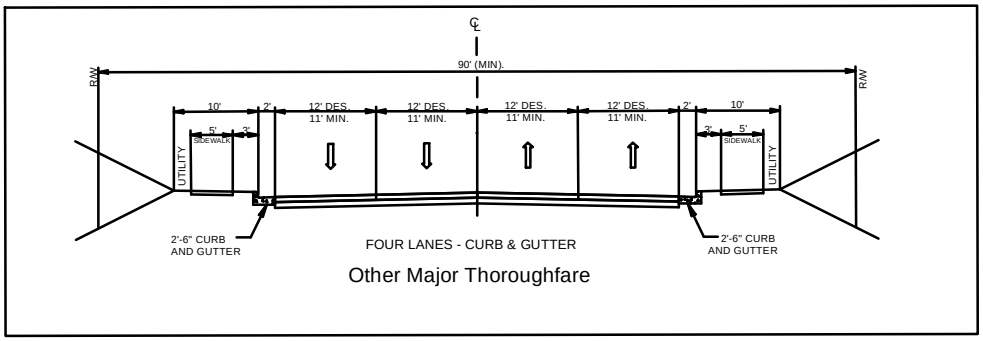
F



FOUR LANES DIVIDED - GRASS MEDIAN

Expressway / Boulevard

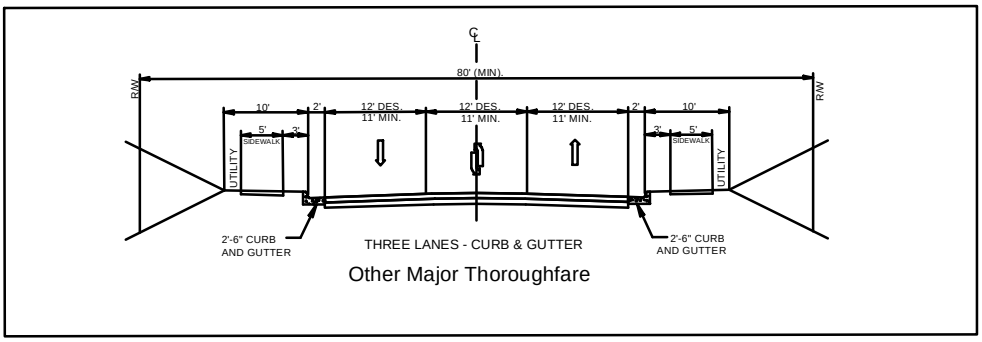
G



FOUR LANES - CURB & GUTTER

Other Major Thoroughfare

H

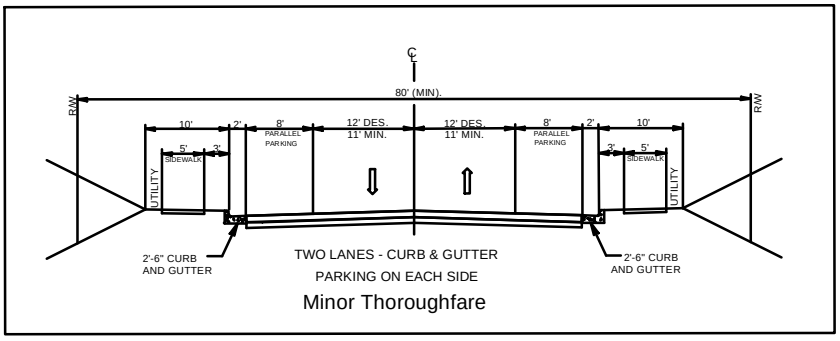


THREE LANES - CURB & GUTTER

Other Major Thoroughfare

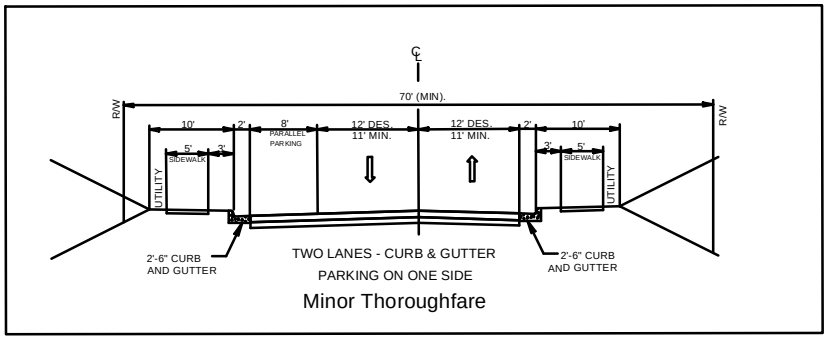
TYPICAL HIGHWAY CROSS SECTIONS

I



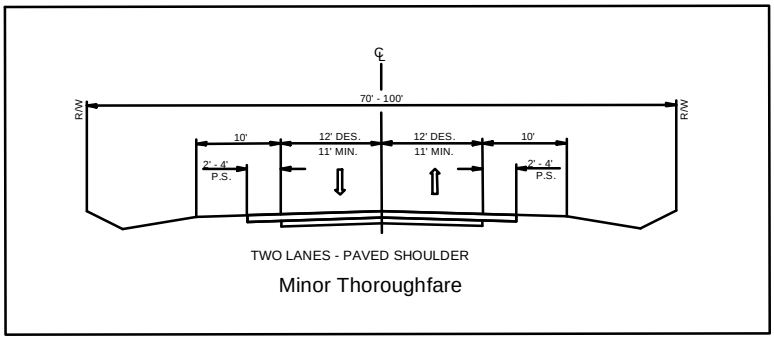
TWO LANES - CURB & GUTTER
PARKING ON EACH SIDE
Minor Thoroughfare

J



TWO LANES - CURB & GUTTER
PARKING ON ONE SIDE
Minor Thoroughfare

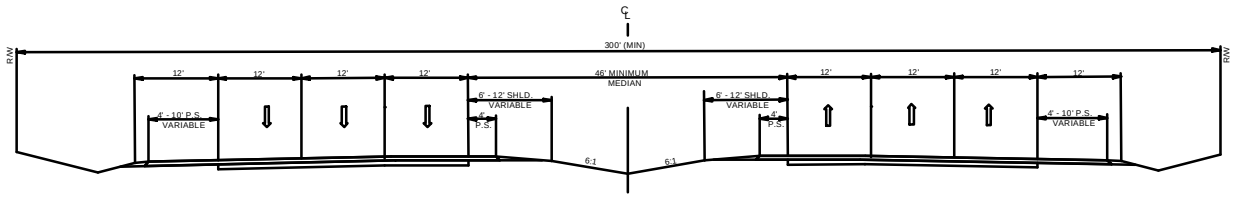
K



TWO LANES - PAVED SHOULDER
Minor Thoroughfare

TYPICAL HIGHWAY CROSS SECTIONS

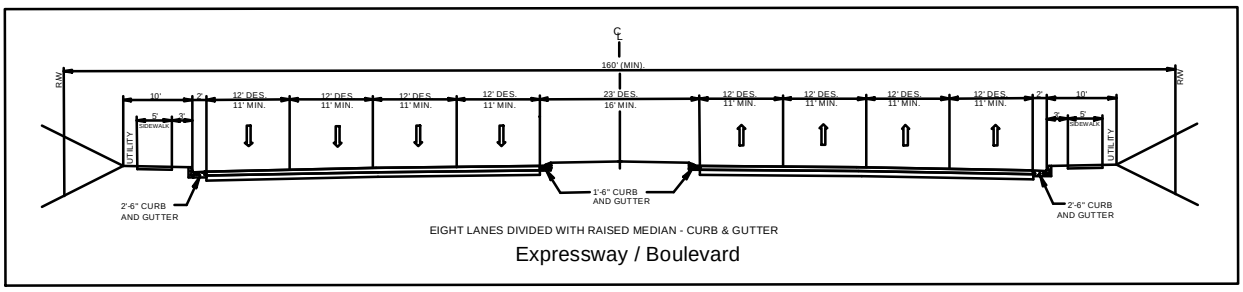
L



SIX LANES DIVIDED WITH GRASS MEDIAN

Freeway / Expressway

M



EIGHT LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

Expressway / Boulevard

Appendix E: Recommended Subdivision Ordinances

Definitions

Rural Roads

- **Principal Arterial** - A rural link in a highway system serving travel, and having 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.
- **Minor Arterial** - A rural roadway joining cities and larger towns and providing intra-state and inter-county service at relatively high overall travel speeds with minimum interference to through movement.
- **Major Collector** - A road that serves major intra-county travel corridors and traffic generators and provides access to the arterial system.
- **Minor Collector** - A road that provides service to small local communities and traffic generators and provides access to the major collector system.
- **Local Road** - A road that serves primarily to provide access to adjacent land over relatively short distances.

Urban Streets

- **Major Thoroughfares** - Major thoroughfares consist of inter-state, other freeway, expressway, or parkway roads, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.
- **Minor Thoroughfares** - Minor thoroughfares 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 minor through traffic movements and may also serve abutting property.
- **Local Street** - A local street is any street not on a higher order urban system and serves primarily to provide direct access to abutting land.

Specific Type Rural or Urban Streets

- **Freeway, expressway, or parkway** - Divided multilane roadways designed to carry large volumes of traffic at high speeds. A *freeway* provides for continuous flow of vehicles with no direct access to abutting property and with access to selected crossroads only by way of interchanges. An *expressway* is a facility with full or partial control of access and generally with grade separations at major intersections. A *parkway* is for non-commercial traffic, with full or partial control of access.
- **Residential Collector Street** - A local 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.

- **Local Residential Street** - Cul-de-sacs, loop streets less than 2,500 feet in length, or streets less than 1.0 mile in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.
- **Cul-de-sac** - A short street having only one end open to traffic and the other end being permanently terminated and a vehicular turn-around provided.
- **Frontage Road** - A road that is parallel to a partial or full access controlled facility and provides access to adjacent land.
- **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.

Property

- **Building Setback Line** - A line parallel to the street in front of which no structure shall be erected.
- **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.
- **Lot** - A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership or for development or both. The word "lot" includes the words "plat" and "parcel".

Subdivision

- **Subdivider** - Any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.
- **Subdivision** - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development and all divisions of land involving the dedication of a new street or change in existing streets. The following shall not be included within this definition nor subject to these regulations:

    - the combination or re-combination 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
    - the division of land into parcels greater than 10 acres where no street right-of-way dedication is involved
    - the public acquisition, by purchase, of strips of land for the widening or the opening of streets
    - the division of a tract in single ownership whose entire area is no greater than 2 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.

- **Dedication** - A gift, by the owner, of his property to another party without any consideration being given for the transfer. The dedication is made by written instrument and is completed with an acceptance.
- **Reservation** - Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

Design Standards

The design of all roads within the Planning Area 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' (AASHTO) manuals.

The provision of street rights-of-way shall conform and meet the recommendations of the thoroughfare plan, as adopted by the municipality. 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.

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.

The subdivider will only be required to dedicate a maximum of 100 feet of right-of-way. In cases where over 100 feet of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 100 feet. On all cases in which right-of-way is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principle and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width right-of-way, not less than 60 feet in width, may be dedicated when adjoining undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is sub-divided, the remainder of the full required right-of-way shall be dedicated. Minimum right-of-way requirements are shown in **Table E-1**.

Area Classification	Functional Classification	Minimum ROW
Rural	Principal Arterial (Freeway)	350 feet
	Principal Arterial (Other)	200 feet
	Minor Arterial	100 feet
	Major Collector	100 feet
	Minor Collector	80 feet
	Local Road (see note #1)	60 feet
Urban	Major Thoroughfare	90 feet
	Minor Thoroughfare	70 feet
	Local Street	60 feet
	Cul-de-sac (see note #2)	variable
1) The desirable minimum right-of-way is 60 feet. If curb and gutter is provided, 50 feet of ROW is adequate on local residential streets.		
2) The ROW dimension will depend on radius used for vehicular turn around. Distance from edge of pavement of turn around to ROW should not be less than distance from edge of pavement to ROW on street approaching turn around.		

Table E-1: Minimum Right-of-way Requirements

Street Widths
Widths for street and road classifications other than local shall be as recommended by the thoroughfare plan. Width of local roads and streets shall be as follows:

- **Local Residential**
  - Curb and Gutter section - 26 feet, face to face curb
  - Shoulder section - 20 feet to edge of pavement, 4 feet for shoulders

- **Residential Collector**
  - Curb and Gutter section - 34 feet, face to face of curb
  - Shoulder section - 20 feet to edge of pavement, 6 feet for shoulders

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.

- **Design Speed** - The design speed for a roadway should be a minimum of 5 mph greater than the posted speed limit. The design speeds for subdivision type streets are shown in **Table E-2**.
- **Minimum Sight Distance** - In the interest of public safety, no less than the minimum sight distance applicable shall be provided. Vertical curves that connect each change in grade shall be provided and calculated using the parameters set forth in **Table E-3**.
- **Superelevation** - **Table E-4** shows the minimum radius and the related maximum superelevation for design speeds. The maximum rate of roadway

superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.

- **Maximum and Minimum Grades** - The maximum grades in percent are shown in **Table E-5**. Minimum grade should not be less than 0.5%. Grades for 100 feet each way from intersections (measured from edge of pavement) should not exceed 5%.

Facility Type		Design Speed (mph)		
		Desirable	Minimum	
			Level	Rolling
Rural	Minor Collector Roads (ADT over 2000)	60	50	40
	Local Roads (ADT over 400)[1]	50	50*	40*
Urban	Major Thoroughfares[2]	60	50	40
	Minor Thoroughfares	40	30	30
	Local Streets	30	30**	20**
[1] Local Roads including Residential Collectors and Local Residential				
[2] Major Thoroughfares other than Freeways and Expressways				
* Based on an ADT of 400 - 750. Where roads serve a limited area and small number of units, can reduce minimum design speed.				
** Based on projected ADT of 50 - 250. (Reference NCDOT Roadway Design Manual page 1-1B)				

Table E-2: Design Speeds

Design Speed	Stopping Sight		Minimum K Values		Passing Sight Distance (feet)
	Desirable	Minimum	Crest Curve	Sag Curve	
30	200	200	30	40	1100
40	325	275	60	60	1500
50	475	400	110	90	1800
60	650	525	190	120	2100
Note: General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case. (Reference: "NCDOT Roadway Design Manual" pg.1-12 T-1)					
[1] K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length of vertical curve which will provide the desired sight distance. Sight distance provided for stopped vehicles at intersections should be in accordan					

Table E-3: Sight Distance

Design Speed	Minimum Radius of Maximum e[1]			Maximum Degree of Curve		
	e = 0.04	e = 0.06	e = 0.08	e = 0.04	e = 0.06	e = 0.08
30	302	273	260	19 00'	21 00'	22 45'
60	573	521	477	10 00'	11 15'	12 15'
80	955	955	819	6 00'	6 45'	7 30'
100	1,637	1,432	1,146	3 45'	4 15'	4 45'
[1] e = rate of superelevation, foot per foot						
Reference: "NCDOT Roadway Design Manual," pg. 1-12 T-6 thru T-8						

Table E-4: Superelevation

Facility Type		Design Speed	Minimum Grade in Percent		
			Flat	Rolling	Mountainous
Rural	Minor Collector Roads*	20	7	10	12
		30	7	9	10
		40	7	8	10
		50	6	7	9
		60	5	6	8
		70	4	5	6
	Local Roads*[1]	20	-	11	16
		30	7	10	14
		40	7	9	12
		50	6	8	10
		60	5	6	-
Urban	Major Thoroughfares[2]	30	8	9	11
		40	7	8	10
		50	6	7	9
		60	5	6	8
	Minor Thoroughfares*	20	9	12	14
		30	9	11	12
		40	9	10	12
		50	7	8	10
		60	6	7	9
		70	5	6	7
	Local Streets*	20	-	11	16
		30	7	10	14
		40	7	9	12
		50	6	8	10
		60	5	6	-
* For streets and roads with projected annual average daily traffic less than 250 or short grades less than 500 feet long, grades may be 2% steeper than the values in the above table. (Reference NCDOT Roadway Metric Design Manual page 1-12 T-3)					
[1] Local Roads including Residential Collectors and Local Residential					
[2] Major Thoroughfares other than Freeways or Expressways					

Table E-5: Maximum Vertical Grade

Intersections

- 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-five (65) degrees.
- 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.
- Off-set intersections are to be avoided. Intersections, which cannot be aligned, should be separated by a minimum length of 200 feet between survey centerlines.

Cul-de-sacs

Cul-de-sacs shall not be more than 500 feet in length. The distance from the edge of pavement on the vehicular turn around 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 turn around. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

Alleys

- 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 provisions are made for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.
- The width of an alley shall be at least 20 feet.
- Dead-end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn around facilities at the dead-end as may be required by the Planning Board.

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 District Engineer of the Division of Highways.

Offsets to Utility Poles

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

Wheel Chair Ramps
All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provide wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

Horizontal Width on Bridge Deck
The clear roadway widths for new and reconstructed bridges serving two lane, two way traffic should be as follows:

- shoulder section approach:
    - under 800 ADT design year - minimum 28 feet width face to face of parapets, rails, or pavement width plus 10 feet, whichever is greater,
    - 800 – 2,000 ADT design year - minimum 34 feet width face to face of parapets, rails, or pavement width plus 12 feet, whichever is greater,
    - over 2,000 ADT design year - minimum width of 40 feet, desirable width of 44 feet width face to face of parapets or rails;

- curb and gutter approach:
    - under 800 ADT design year - minimum 24 feet face to face of curbs,
    - 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 curbs, and in crown drop; the distance from face of curb to face of parapet or rail shall be a minimum of 1.5 feet or greater if sidewalks are required.

The clear roadway widths for new and reconstructed bridges having four or more lanes serving undivided two-way traffic should be as follows:

- shoulder section approach:
    - width of approach pavement plus width of usable shoulders on the approach left and right (shoulder width 8 feet minimum, 10 feet desirable);

- curb and gutter approach:
    - width of approach pavement measured face to face of curbs.

Appendix F: Resources and Contacts

North Carolina Department of Transportation

Customer Service Office
1-877-DOT4YOU
(1-877-368-4968)

Secretary of Transportation
1501 Mail Service Center
Raleigh, NC 27699-1501
(919) 733-2520

Board of Transportation Member
Contact information for the current Board of Transportation Member may be accessed from the NCDOT homepage on the worldwide web *(http://www.ncdot.org/board/)* or by calling 1-877-DOT4YOU.

Highway Division 5

Division Engineer
Contact the Division Engineer with general questions concerning NCDOT activities within Division 5 or information on Small Urban Funds.

2612 N. Duke St.
Durham, NC 27704
(919) 560-6851

Division Construction Engineer
Contact the Division Construction Engineer for information concerning major roadway improvements under construction.

2612 N. Duke St.
Durham, NC 27704
(919) 560-6853

Division Traffic Engineer
Contact the Division Traffic Engineer for information concerning high-collision locations.

2612 N. Duke St.
Durham, NC 27704
(919) 560-6856

District Engineer
Contact the District Engineer for information regarding Driveway Permits, Right of Way Encroachments, and Development Reviews.

1575 Mail Service Center
Raleigh, NC 27699-1575
(919) 733-3213

County Maintenance Engineer
Contact the County Maintenance Engineer regarding any maintenance activities, such as drainage.

1579 Mail Service Center
Raleigh, NC 27699-1579
(919) 733-4768

Centralized Personnel

Transportation Planning Branch

Contact the Transportation Planning Branch with long-range planning questions.

1554 Mail Service Center
Raleigh, NC 27699-1554
(919) 733-4705

Secondary Roads Office

Contact the Secondary Roads Officer for information regarding the Industrial Access Funds Program.

1535 Mail Service Center
Raleigh, NC 27699-1535
(919) 733-3250

Program Development Branch

Contact the Program Development Branch for information concerning Roadway Official Corridor Maps and the Transportation Improvement Program (TIP).

1542 Mail Service Center
Raleigh, NC 27699-1542
(919) 733-2031

Project Development & Environmental Analysis Branch

Contact PDEA for information on environmental studies for projects that are included in the TIP.

1548 Mail Service Center
Raleigh, NC 27699-1548
(919) 733-3141

Traffic Engineering & Safety Systems Branch

Contact the Traffic Engineering & Safety Systems Branch for information regarding Development Reviews.

1561 Mail Service Center
Raleigh, 27699-1561
(919) 733-3915

Highway Design Branch

Contact the Highway Design Branch for information regarding alignments for projects that are included in the TIP.

1584 Mail Service Center
Raleigh, 27699-1584
(919) 250-4001

Bicycle and Pedestrian Division

Contact the Bicycle and Pedestrian Division for information regarding projects in the TIP, funding, and events.

1552 Mail Service Center
Raleigh, 27699-1552
(919) 733-2804

Public Transportation Division

Contact the Public Transportation Division for information regarding planning funding for public transportation.

1550 Mail Service Center
Raleigh, 27699-1550
(919) 733-4713

Railroad Division

Contact the Railroad Division for information regarding engineering and safety, operations, and planning.

1553 Mail Service Center
Raleigh, 27699-1553
(919) 733-7245

Other departments

Contact information for other departments within the NCDOT not listed here are available at the NCDOT homepage on the worldwide web (http://www.ncdot.org/board/) or by calling 1-877-DOT4YOU.