Acknowledgments

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Table of Contents

Figures and Tables

Chapter 1

Chapter 2

Chapter 3

Chapter 4

Chapter 5

Chapter 1 – Introduction

Vision Statement

Located off of US 70 near I-40 and I-95, Clayton is the second largest town in Johnston County. The downtown of Clayton is a thriving area, with a variety of businesses and restaurants. The adopted goals for the Town of Clayton include being "the safest, healthiest town in the Triangle area" as well as "a place for family fun and leisure." Both of these goals address the desire of the community's leadership to improve the town's quality of life, including in the area of bicycle transportation.

Clayton Goals 2000-2010

Safest, Healthiest Town in Triangle Area

Downtown: The Community Hub

Regional Service Center

A Place for Family Fun and Leisure

Business Community: Diverse and Profitable

Value for Taxes and Public Fees

Yet bicycle access, mobility, and safety continue to be compromised by manufactured barriers such as the North Carolina Railroad, US 70 corridors, and the focus on moving cars.

As the community leadership works to establish a diverse and profitable business community and make Clayton a regional service center, it is clear that Clayton is a growing community. With the growth in population comes changes in the needs for transportation, which will begin to show significant impacts on Clayton in the coming years. The community will need an integrated multimodal transportation system to support its vision for the future. As people seek ways to enjoy more of their communities and travel more efficiently, it is valuable to consider the bicycle as an important component in meeting those needs.

This bicycle plan balances several responsibilities. It identifies the specific needs in the community, a vision for the future, the investment opportunities and financial realities, and a disciplined investment strategy.

The Town of Clayton's vision for a *Comprehensive Bicycle Plan* includes providing its citizens with safe, convenient, and more complete bicycle travel facilities within the community. This project is intended to create bike friendly environments, evaluate current biking trends, develop a viable bike transportation system, enhance the safety and health of users, and promote livability.

Vision

This project is intended to create bike friendly environments, evaluate current biking trends, develop a viable bike transportation system, enhance the safety and health of users, and promote livability.

History

Benefits of Bicycling

Today, bicycling as a primary means of transportation is widely popular in densely populated cities around the world. Sometimes commuters find cycling more efficient, affordable, and convenient than traveling by automobile on congested urban streets. Although most people choose to travel by cars and trucks in the United States, bicycling is still the first — and sometimes the only — choice for some people.

Bicycling is recognized to be an appealing alternative to traveling by car because of the benefits it offers, including:

- ***It is environmentally-friendly.*** Cyclists power the machines themselves and do not use fossil fuels. Since bicycles do not release polluting emissions into the air and run on gears versus engine power, both air and noise qualities are improved.
- ***Bicycling promotes good health practices.*** The United States Surgeon General advises Americans to get 30-60 minutes of exercise 4 to 6 times each week. Bicycling is a low-impact way to exercise and can improve a person's health by lowering blood pressure, strengthening muscles, lowering stress levels, increasing the size, strength, and efficiency of the heart and cardiovascular system, burning fat, and increasing metabolism.
- ***It represents the "livability" of a place.*** Being able to reach a destination via bicycle gives people another alternative for choosing a travel mode. It combines the functionality of actually getting there with the benefits of exercise and recreation. In places where residents are regularly seen outside walking or bicycling, visitors feel a sense of community and safety there. A town with great "livability" constantly attracts new residents and businesses.
- ***The economics of bicycling make sense.*** According to a study by the Boston Foundation, in 2003, typical American households spent an average of $7,125 on transportation costs, including insurance, repair, maintenance, fuel costs, taxes, and other fees — a significant annual investment. The average cyclist spends only $120 per year on bicycle costs. Choosing to ride a bicycle versus the bus or personal automobile could save one person thousands of dollars in a single year.
- ***Bicyclists can generally avoid traffic congestion.*** Since a bicycle only takes up about a quarter of the physical space that the average car does, cyclists can maneuver more easily through traffic in urban areas. Often, cyclists can use dedicated bicycle lanes or greenways, which allow for an even more efficient trip.

- ***It is easy.*** According to a 1995 National Personal Transportation Survey, analysts found that approximately 40 percent of all trips made are less than 2 miles in distance from origin to destination. Most bicyclists can make that level of trip in approximately ten minutes.

The Bicycle's Role in Clayton: Plans, Projects, Involved Agencies, and Citizen Initiatives

Incorporated in 1869 but first settled around 1770, the Town of Clayton has always revolved around transportation. The community served as a depot for the North Carolina Railroad, and fostered a transportation network to support its tobacco, cotton, and lumber industries. Clayton is now located near two interstate highways and is the fastest growing town in Johnston County.

The Town of Clayton has conducted a variety of efforts that all take bicycle planning into consideration. Clayton recently updated their Comprehensive Parks and Recreation Master Plan which proposes additions to the mountain bike trail and greenway system in the town. The Town of Clayton is also in the process of updating its long-range transportation plan in collaboration with NCDOT. In addition, the Clayton Strategic Growth Plan performed in 2000 outlines strategies to enhance and expand the town's open spaces and to provide improved services for its citizens. These plans set a precedent for where the Town of Clayton hopes to go with their bicycle planning efforts.

One of the top priority projects for the 2002 to 2004 Work Plan for the Town of Clayton specifically identified the development of a mountain biking trail. This measurable goal was successfully realized when the 6-mile bicycle path connecting to Legend Park was designed and constructed under the supervision of the Clayton Parks and Recreation Department. This is really only one step of many that have been taken to make Clayton the kind of community where people feel comfortable riding bikes and encourage others to join them on bikeway facilities.

In addition to the Clayton Parks and Recreation and Planning Departments' involvement in promoting biking through the development of trails, citizens have been involved in Clayton's bike development as well. The Triangle Off-Road Cyclists (TORC) was instrumental in designing and building multi-use trails in the town's Legend Park. This group has expressed interest in helping the Town develop programs to increase the cycling and passive recreational opportunities in Clayton.

Current Trends and Initiatives

Bicycle education programs have been in place in Clayton for several years now. Since 1996, bicycle safety programs have included classroom and road training. For completing the program, children were given helmets, which reinforced the message that safety

is critical to being a responsible bicyclist.

Local corporate sponsors have validated the importance of this program by lending support, including Bayer and Caterpillar of Clayton. The Clayton Police Department has worked with the Parks and Recreation Department to reach children with this program during the summer.

Community Support

When the town applied to the North Carolina Department of Transportation's Bicycle Planning Grant, letters of support from the community were included with the grant application. The Town of Clayton Planning Board, Clayton Recreation Advisory Committee, the Clayton Chamber of Commerce, the Town Council, and the Upper Coastal Plain Area Rural Planning Organization all adopted resolutions in support of the Town's efforts to provide safe, convenient, and more complete bicycle travel facilities within the community. Many people have been committed to making Clayton a community where bicyclists feel safe and can be active.

Goals and Objectives

Through regular meetings with an advisory committee and a charrette process, the public expressed their interests in the bicycle plan's goals and objectives. The advisory committee participated in a "King or Queen" survey that addressed the desires of the committee to improve engineering, education, enforcement, and encouragement measures in Clayton.

When asked where they would most like to see safety improved for bicyclists, the committee frequently mentioned Covered Bridge Road, US 70, and the downtown area (including specific facilities such as Main Street and Front Street). The two most important education initiatives expressed by the committee were those of bike safety (through schools, forums, etc.) and sharing the road. Members of the committee felt that the support of greenways and parks is an important encouragement initiative.

Demonstrations of the economic and environmental benefits of bicycling, advertisement of the bicycle planning results, and reiteration of proper bicycle safety practices were also considered desirable encouragement practices. The law that the advisory committee felt most needed enhanced enforcement is that of wearing a helmet. Riding with traffic and speed enforcement in general and around schools were two additional enforcement measures mentioned frequently by committee members.

Survey results from the long-range transportation plan update were also considered for this study. The Town of Clayton/Western Johnston County Transportation Goals and Objectives Survey was conducted by the Town of Clayton and NCDOT in order to obtain information about all modes of travel. There were many bicycle-oriented comments received from this survey, of which the most frequent are listed here:

- Improved crossings of and facilities on US 70
- Provide bicycle facilities and enforce speed limits around schools
- Widen shoulders or outside lanes and incorporate bicycle lanes
- Provide bicycle and pedestrian connections between neighborhoods
- Get through traffic out of downtown to make it more bicycle-friendly

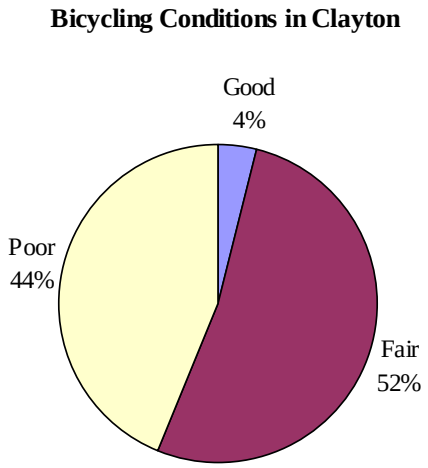
In addition to these tools, the *Clayton Bicycle Planning Survey* was conducted in conjunction with this plan. Using this survey, participants indicated their bicycling preferences and tendencies. 64% of the respondents considered themselves advanced riders, while the rest considered themselves basic riders. This statistic is not representative of the true makeup of the bicycle population; rather, it reflects the types of individuals attending meetings and participating in the planning process.

The survey participants identified concerns with several bicycle-related issues, with the most frequently mentioned including:

- Roads too narrow to accommodate both cars and bicycles
- Cars ignoring or crowding bicycles along the roadside
- Cars turning or stopping in front of bicycles
- Traffic volume

Survey respondents were also asked to rate bicycling conditions in Clayton. Out of all participants, only one felt that bicycling conditions in Clayton are good. Over half of respondents considered conditions to be fair, while almost 45% felt that conditions were poor, as shown in **Figure 1.1**. This indicates that measures should be implemented in an attempt to make the bicycling environment more suitable for users.

Figure 1.1 Bicycling Conditions in Clayton Survey Response



This plan will seek to address these issues through its recommendations and implementation strategies.

In order to make Clayton's bicycle system more user-friendly, the concerns presented in these surveys were taken into consideration to develop a set of short- and long-range goals.

Short-Range:

- Increase the number of people who regularly bicycle
- Organize periodic events that encourage new riders and promote safety
- Pursue funds to construct high priority facilities

Long-Range:

- Increase public awareness of bicycling as a viable mode of travel
- Promote rights and responsibilities of bicyclists, pedestrians and motorists in a shared transportation network while improving safety and enforcement
- Ensure bicycle accommodations are considered in the Plan in a balanced approach with education and enforcement programs
- Provide solutions for safe crossing opportunities of major natural and manufactured barriers, in particular US 70
- Create additional physical activity opportunities in Clayton, increasing physical and mental wellness, as well as improving air quality
- Provide improved opportunity and access for bicycling to all residents
- Encourage the design, finance, and construction of transportation facilities that provide safe, secure, and efficient linkages for bicyclists throughout the Town
- Provide safe and efficient bicycle connectivity between neighborhoods, businesses, and recreation areas
- Encourage safe riding practices on roads and trails
- Promote the development of seamless transitions for all bicycle facilities crossing over the town limits

Scope and Purpose of Plan

Scope

The *Clayton Comprehensive Bicycle Plan* does not exist in a vacuum. As a result, significant consideration was given to several influential factors.

The plan focuses on both on-road and off-road facilities within the study area — the extra-territorial jurisdiction limits of Clayton.

As mentioned previously, this plan addresses several issues. It considers the plans already developed that would impact bicycling in the community, the expectations of current members of the community along with federal and state regulations, and financial constraints and opportunities. It is intended to serve as a master plan for investments of local, state, and federal monies.

Purpose

The purpose of this planning effort is to increase bicycling trips, improve bicycle access and transportation options, assess current conditions, initiatives, and opportunities in the area, and understand and meet the needs of the public.

To do this, the plan looked at bicycling trip characteristics, transportation priorities, safety considerations barriers to bicycling, and the needs of special populations. This plan identifies long- and short-range project and program priorities by integrating the plan with other state, regional and local planning initiatives, implementing existing local, state, and federal policies and guidelines, identifying high-priority transportation improvement projects, and enhancing the interface with other transportation modes.

The plan provides standards and guidelines for the development for bicycle facilities and outlines strategies for raising community awareness of bicycle needs and issues. In addition, the comprehensive bicycle plan includes an action plan that identifies tasks and involves state, regional, and local agencies, elected officials, advocacy groups, and public/private partnerships. It includes implementation strategies, including recommendations for projects, policies, funding, staffing/committees, local ordinances, and program initiatives.

The vision of a connected, financially feasible bicycle plan for Clayton can become a reality. This *Clayton Comprehensive Bicycle Plan* is intended to serve as a tool, guiding the future success of implementing the Town of Clayton's bicycle facilities.

This plan includes descriptions of the development of several key plan components. These components, critical to making a plan successful in terms of being able to be implemented, are addressed within the following chapters:

- Evaluating Current Conditions and Existing Plans, Programs, and Policies
- Developing Bicycle System Plan, Facility Standards and Guidelines, and Ancillary Facilities and Programs
- Project Development, Recommendations, and Implementation Plan

Chapter 2 – Existing Conditions

With its gently rolling hills, proximity to many rivers and streams, and situation as a bedroom community to the Triangle area on the busy US 70 corridor, Clayton is a very desirable area for bicycle travel. This chapter will outline the existing conditions for bicycling in and around Clayton, the existing statutes and ordinances, the current and planned bicycle programs and initiatives, and major barriers to bicycle travel.

Existing Bicycle Facilities

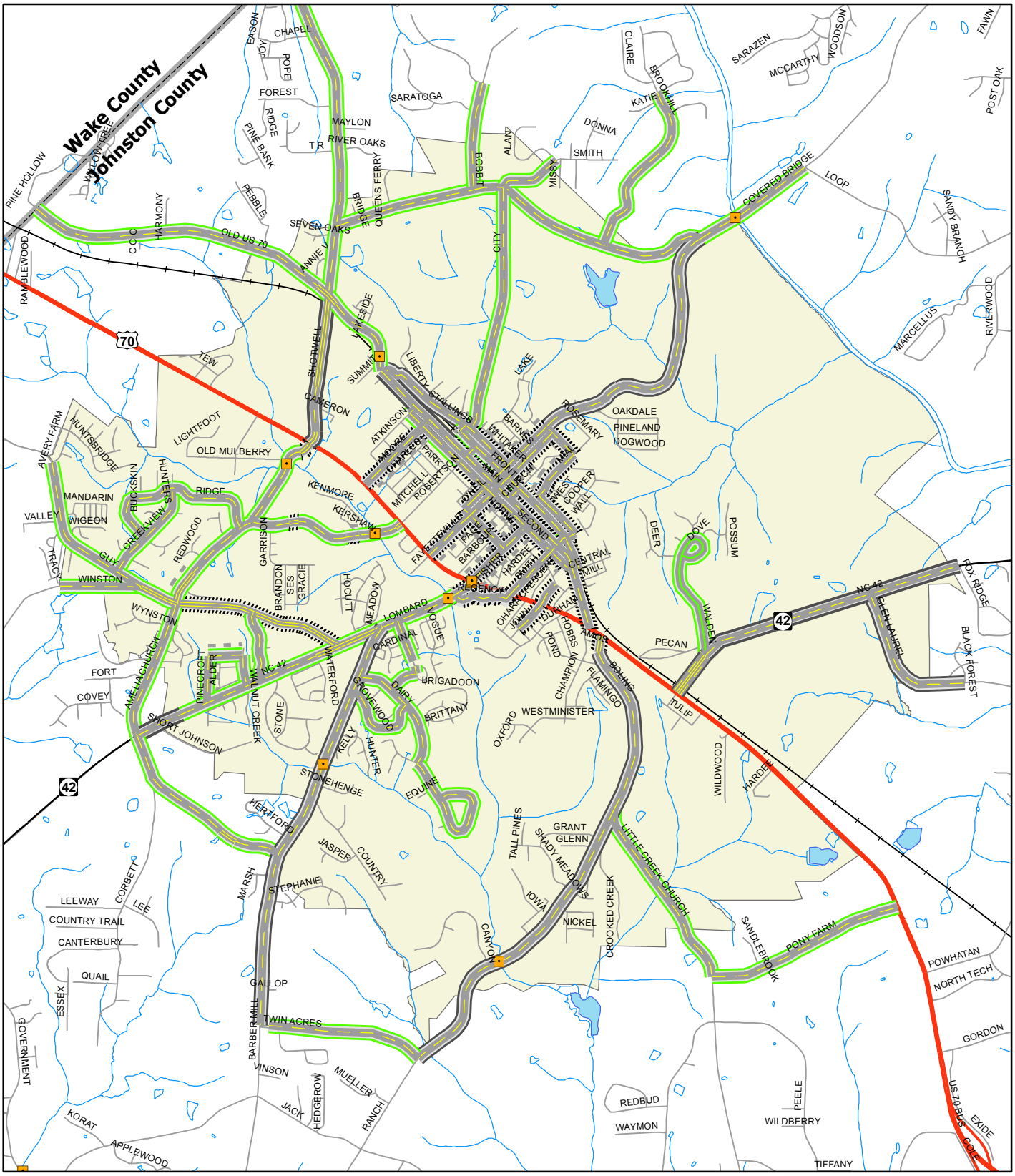
At this time, there are no designated on-road bicycle facilities in Clayton. Legend Park boasts an 8-mile long mountain bike trail. While this facility is ideal for those individuals who enjoy riding on a natural trail, it is not an option for road bikes and is not a connected part of the transportation network due to its lack of additional connections.

As a part of the bicycle planning process, an extensive data collection effort was undertaken in Clayton. Once an inventory of existing information had been assessed, the data collection effort identified a core network of interconnected roads. Information such as the number of lanes, presence of sidewalks, curb of gutter, and shoulder were then obtained through a field review. If a shoulder was identified, the type (such as paved or grass) and the width were also determined. This information is shown in **Figure 2.1**. Ultimately, the data collected through this process is utilized to determine the most appropriate and cost-effective facility types for the recommended bicycle routes.

Bicycle Statutes and Ordinances

There are currently no bicycle or pedestrian in existence for the Town of Clayton. However, there is an existing greenway plan embodied in the recreation and parks master plan that provides suggested standard facilities. The Clayton street design guidelines are outlined in the Town's Unified Development Code. Major and minor thoroughfares, collector streets, residential collector streets, commercial streets, frontage roads, residential streets, and alleys are all defined. Roadway and right-of-way widths have been stipulated in the ordinances and are shown in **Table 2.1**.

These widths are also accompanied by a set of cross-sections depicting the various street types. Each cross-section depicts a standard sidewalk width; however, none of the cross-sections make special provisions for bicycles. Section 72.01 of the code prohibits bicycles riding on all public sidewalks. It is recommended that this policy be revised to allow bicycles on sidewalks in certain areas or along high traffic roads where they may not feel comfortable riding with traffic.



Clayton Bicycle Plan

Figure 2.1 - Existing Conditions

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- Clayton ETJ
- County Boundary
- Bodies of Water
- Railroads
- Bridges
- Sidewalk One Side
- Sidewalk Both Sides
- 1 Foot Paved Shoulder
- 2 Foot Paved Shoulder
- Combination Curb/Gutter and Grass
- Curb and Gutter
- Grass Shoulder
- Two Lanes with Left Turn Lane
- Two Lanes
- Two Lanes with Planted Median
- Four Lanes with Two Way Left Turn Lane

N W E S

0 0.125 0.25 0.5 0.75 1 Miles

Table 2.1 Street and Right-of-Way Widths

Street Type	Street Widths (B/C to B/C) (feet)	Minimum Right-of-Way Widths (feet)
Major Thoroughfare	41-77	70-100
Minor Thoroughfare	35-45	70-80
Collector Street	41*	60
Residential Collector Street	31*	50
Commercial Street	41	60
Frontage Road	27	40
Residential Street	27**	50
Alley	20	20

**May be reduced to 24 feet if no curb and gutter is required to be used.*
***May be reduced to 20 feet if no curb and gutter is required to be used.*

These widths are also accompanied by a set of cross-sections depicting the various street types. Each cross-section depicts a standard sidewalk width; however, none of the cross-sections make special provisions for bicycles. Section 72.01 of the code prohibits bicycles riding on all public sidewalks. It is recommended that this policy be revised to allow bicycles on sidewalks in certain areas or along high traffic roads where they may not feel comfortable riding with traffic.

When examining the pavement widths provided in the Unified Development Code, it can be seen that for a two-lane residential collector with eleven-foot lanes and allowing one foot total for the curb section, there is adequate room to install two four-foot bike lanes. The section provided for residential streets, however, only allows for two 13-foot lanes. If this section was widened two additional feet on each side, there would be adequate room for striped bicycle lanes on these types of facilities. Without the presence of curb and gutter, two ten-foot lanes are allowed. Three or four feet on either side should be considered to allow for wide lanes or striped bicycle lanes. While striped bicycle lanes or wide outside lanes are not always the preferred option on every road, these modified street section would provide a viable option for on-street bicycle accommodations.

Current Programs and Initiatives

Clayton has some bicycle programs in place that help to promote awareness in the community. The police force conducts bicycle rodeos at schools on a by-request basis. In addition, the police force has recently hired an expert from the city of Chicago who will train bicycle officers for Clayton.

The Town of Clayton is also striving to improve its bicycle facilities. The Town is currently working with NCDOT to determine an alignment for a section of the Mountains to Sea Trail along the Neuse River. This will ultimately connect Clayton to a statewide route, bringing new bicycle traffic to the area.

Barriers for Bicycling in Clayton

NC 42 at Little Creek

The NC 42 bridge crossing at Little Creek is two lanes with a two-foot shoulder on one side and a one-foot shoulder on the other side. In addition to

this vehicle bridge, there is a separate six-foot wide bridge to accommodate pedestrian traffic. This bridge connects with a sidewalk but appears to be in poor condition, with pitted pavement and a bent, overgrown fence. Bicycling conditions in this area are poor, with high speeds and narrow lanes posing a danger on the road with multiple utility poles crowding the narrow sidewalks.

Recommendation:

- Little Creek is the proposed site for a future greenway (10-foot multi-use path) connection. As a result, it is recommended that the section of NC 42 between the proposed greenway and the downtown area be improved to a 10-foot multi-use path. A multi-use path in this location would allow bicyclists of all skill levels to stay off of the narrow roadway while also allowing beginner and intermediate bicyclists an opportunity to connect to the proposed greenway from the downtown area. It may be difficult to construct a 10-foot multi-use path in this area due to constrained right-of-way. As a result, an 8-foot multi-use path may be more appropriate. The path should be widened to 10 feet when it reaches a feasible location.
- NC 42 from the proposed greenway back towards the elementary school and on to Amelia Church Road currently has 2 feet of shoulders on each side. These shoulders should be widened to four feet on each side of the road. This will allow bicyclists a refuge area that will be especially helpful on the steep hill by the West Clayton Elementary School. A mid-block crossing should be installed before reaching the bridge to allow bicyclists on the road an opportunity to cross onto the multi-use path.
- If a new bridge cannot be built to accommodate the proposed multi-use path, the existing pedestrian bridge should be rehabilitated with a new fence and new pavement.
- When NC 42 is widened, accommodations should be made for wide shoulders over the length of the road and on the bridge. This would give advanced riders an opportunity to travel more comfortably on the road.

US 70 Underpass at Lombard Street/NC 42

As Lombard Street heads downtown and meets with the US 70 bridge, the sidewalk slopes steeply upwards until reaching a flight of stairs that lead to intersection level. The steep terrain could make street level sidewalks tight, especially with a verge. Under the bridge, the sidewalk continues on the

northwest side. The other side of the underpass does not include sidewalks, instead using the space for drainage facilities.

The Lombard Street lanes are approximately 13 to 14 feet wide leading up to the bridge, a width that indicates wide curb lanes but prohibits the construction of bike lanes. After the bridge, the downtown side of Lombard Street widens to a cross-section suitable for bike lanes.

This is a key crossing of US 70 since there is a grade separation at this location.

Recommendation:

- The existing sidewalk leading up to the underpass should be removed and the slope of the hill reworked to provide room for a 10-foot multi-use path and a 2-foot verge. The sidewalk under the underpass is currently wide enough to support this and would simply need to be resurfaced. Crosswalks would need to be created to get across the US 70 exit ramps, with a refuge area in the island. The creation of a multi-use path here would not only accommodate bicyclists but also provide a more user-friendly facility for pedestrians and create an ADA-accessible environment. The multi-use path should extend to Hamby Street to keep bicycle traffic off-road until all traffic has exited for US 70. In addition, it should connect with the recommended multi-use path across Little Creek.
- After the multi-use path ends at Hamby Street, it is recommended that Lombard Street be restriped to include bike lanes. These lanes should extend through the downtown area and would allow bicyclists not comfortable with riding in traffic a dedicated space.

- The section of Lombard Street/NC 42 without bike lanes should be marked with “Share the Road” signs to indicate that bicyclists may be present in the vehicle lanes.

Amelia Church Road at Little Creek

Amelia Church Road crosses Little Creek with a box culvert and wide grass shoulders on both sides. There is a sidewalk on the west side of the road starting by the apartment complex. However, this facility ends before the bridge and does not continue to US 70.

Recommendations:

- The wide grass shoulders on either side of the bridge should be paved to create three-foot shoulders. This would give the cyclist a refuge area on the bridge and should be extended to the intersection with US 70 if possible.
- A removable bridge should be placed next to the existing bridge to accommodate a multi-use path. This path will ultimately continue along Amelia Church Road from Little Creek to the future community center and the Clayton Community Park. In addition, there will be a connection at this point to the proposed Little Creek greenway.

Shotwell Road at Little Creek

The bridge over Little Creek at Shotwell Road is narrow, with approximately 26 feet total between the guard rails. Little Creek itself is relatively narrow at this point, measuring about 10 to 12 feet wide. There is ample grass shoulder on either end of the bridge on the east side of the roadway.

Recommendations:

- It is recommended that a 10-foot multi-use path be constructed along the east side of Shotwell Road from the shopping center near US 70 to Amelia Church Road. This path would entail the use of a removable bridge installed to the side of the vehicle bridge across Shotwell. The recommended multi-use path would also connect with the proposed greenway along Little Creek at this point.
- "Share the Road" signs should be posted along Shotwell Road to alert drivers of the possible presence of bicyclists on the roadway. This will help more advanced riders who prefer riding on the road rather than on a multi-use path.

US 70 Crossings

US 70 poses a major barrier for residents of Clayton. The photo below shows an intrepid bicyclist preparing to cross US 70 at Amelia Church Road/Robertson Street. As shown in the photo, the refuge area where the bicyclist is waiting is filled with debris. If the bicyclist were to wait in the queue with the automobiles, it would be difficult to clear the intersection in the time allotted. This scenario is echoed at the crossing with Shotwell Road and needs to be addressed with the realignment with Main Street, Champion Street, and Boling Street.

Recommendations:

- US 70 at Amelia Church Road
  - Install a bicycle detector in the "porkchop" of Amelia Church Road. This will allow bicycles to trigger the light when there are not vehicles present. If the current signal length is too short for bicycles to cross comfortably, the bicycle detector could trigger a longer phase. Also, improve maintenance of this road by cleaning the "porkchop" area of this road more frequently.
  - Pave the existing grass shoulders on Robertson Street to create bicycle lanes in each direction. This will give the bicyclist a dedicated space to cross when coming to or from Amelia Church Road. A bicycle detector should be placed in the bicycle lane on the southbound approach. Also, sign the Amelia Church and Robertson sections as bike routes.
  - Stripe crosswalks and install push-button pedestrian crossing signals with countdown clocks. These are helpful for pedestrians at the intersection and also for bicyclists uncomfortable riding with traffic.
- US 70 at Shotwell Road
  - We do not recommend a crossing at this location. This intersection appears to be the most dangerous crossing for bicycles. The bicyclist can utilize the proposed Little Creek greenway to access the Amelia Church intersection from here.
- US 70 at Main Street/Champion Street/Boling Street
  - This intersection is currently being improved with a realignment project. When this is completed, provisions such as striped crosswalks, pushbutton pedestrian signals and

countdown clocks should be implemented at the intersection.

- Champion Street should be striped to include 4-foot bike lanes on either side. A bicycle detector should be placed in the northbound bicycle lane at the intersection. Main Street is wide enough to support wide outside lanes. Placement of a bicycle detector should be explored on this approach.

Chapter 3 – Facility Opportunities and Guidelines

Chapter 3 seeks to build on the existing conditions outlined in Chapter 2 by identifying options for the future bicycle system. This section discusses bicycle opportunities and focus areas, facility planning and design guidelines, and ancillary facilities and projects.

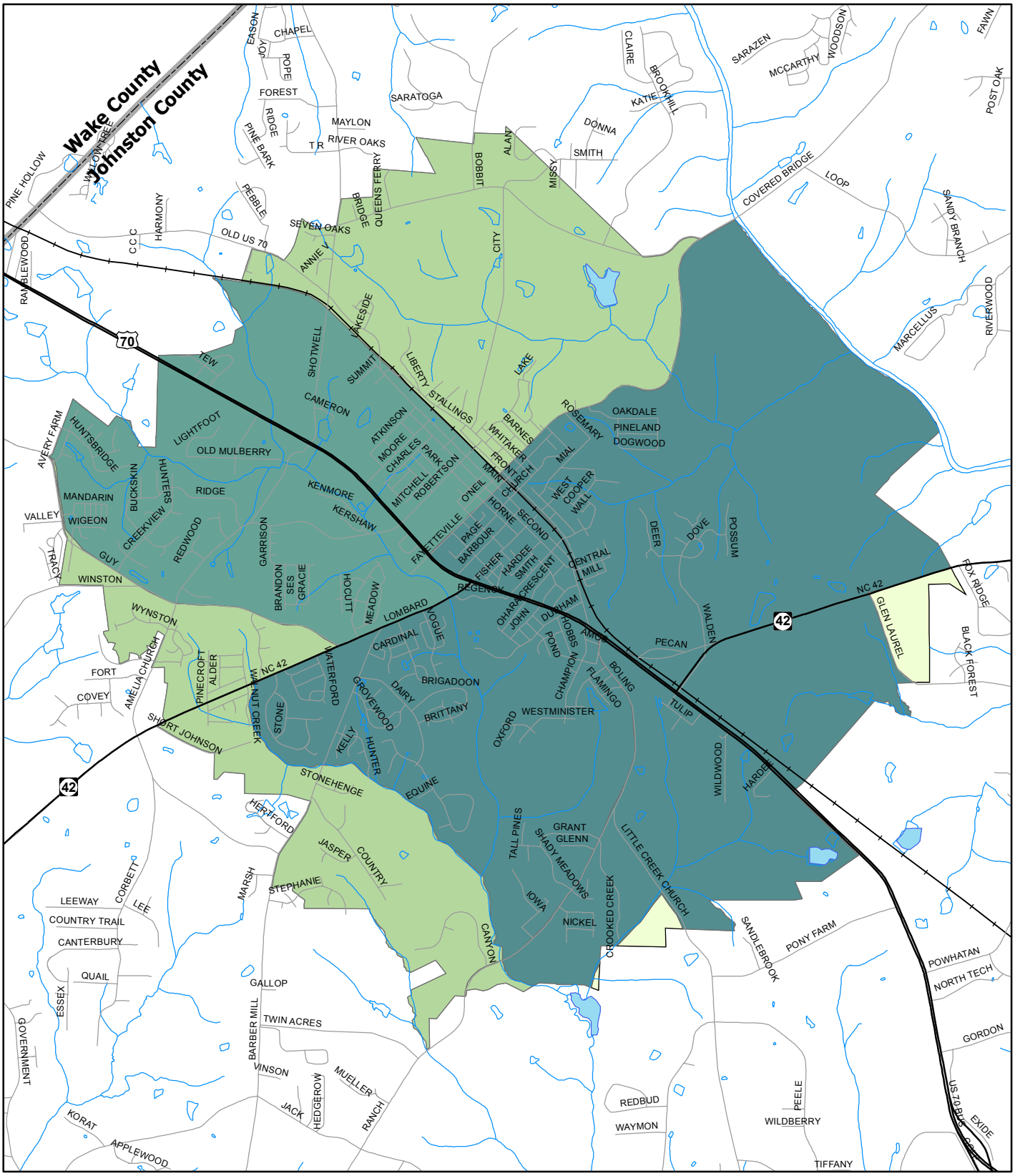
Bicycle Focus Areas

A bicycle focus area is a location where the addition of bicycling facilities and amenities could potentially provide benefits for the greatest number of users. These types of areas can include those underserved by automobiles or linking major destination points.

One objective of this plan is to fulfill the needs of special segments of the population that require bicycling for more than just recreational activity. Captive riders are those who have few transportation options and often turn to modes such as biking or walking for utilitarian purposes. Using U.S. Census 2000 data, the percentage of households owning one vehicle or no vehicle at all was examined within Clayton's extraterritorial jurisdiction. This information is shown in **Figure 3.1**. The Census reports that in a representative sample of Town residents, 10% of the households had no vehicle available to them, and just over 31% of the households have access to only one vehicle. Members of these households in many cases must turn to other modes of travel to complete errands and commute to work or school. As a result, an improved bicycle infrastructure would be beneficial to people with limited access to cars.

This plan considers connections with shopping areas, municipal buildings, libraries, parks and community centers, and schools—the major destinations in and around Clayton. A map of these locations is shown in **Figure 3.2**. The development of a bicycle route system heavily favors the connection of these facilities so that the bicycle routes link citizens and tourists with places they want to ride.

Trip origins and destinations were investigated as a part of the *Clayton Bicycle Planning Survey*. Many of the connections that respondents desired included natural destination points such as those shown in **Figure 3.2**. Downtown Clayton, the town parks, schools, and major neighborhoods and subdivisions were all identified as areas that survey respondents would like connected by bicycle routes. A smaller but significant number of participants emphasized longer-distance cross-town or out-of-town connections.



Clayton Bicycle Plan

Figure 3.1 - Vehicle Ownership

Kimley-Horn and Associates, Inc.

Clayton ETJ

County Boundary

Bodies of Water

Railroads

% of Households with No or One Vehicle

Less than 20%

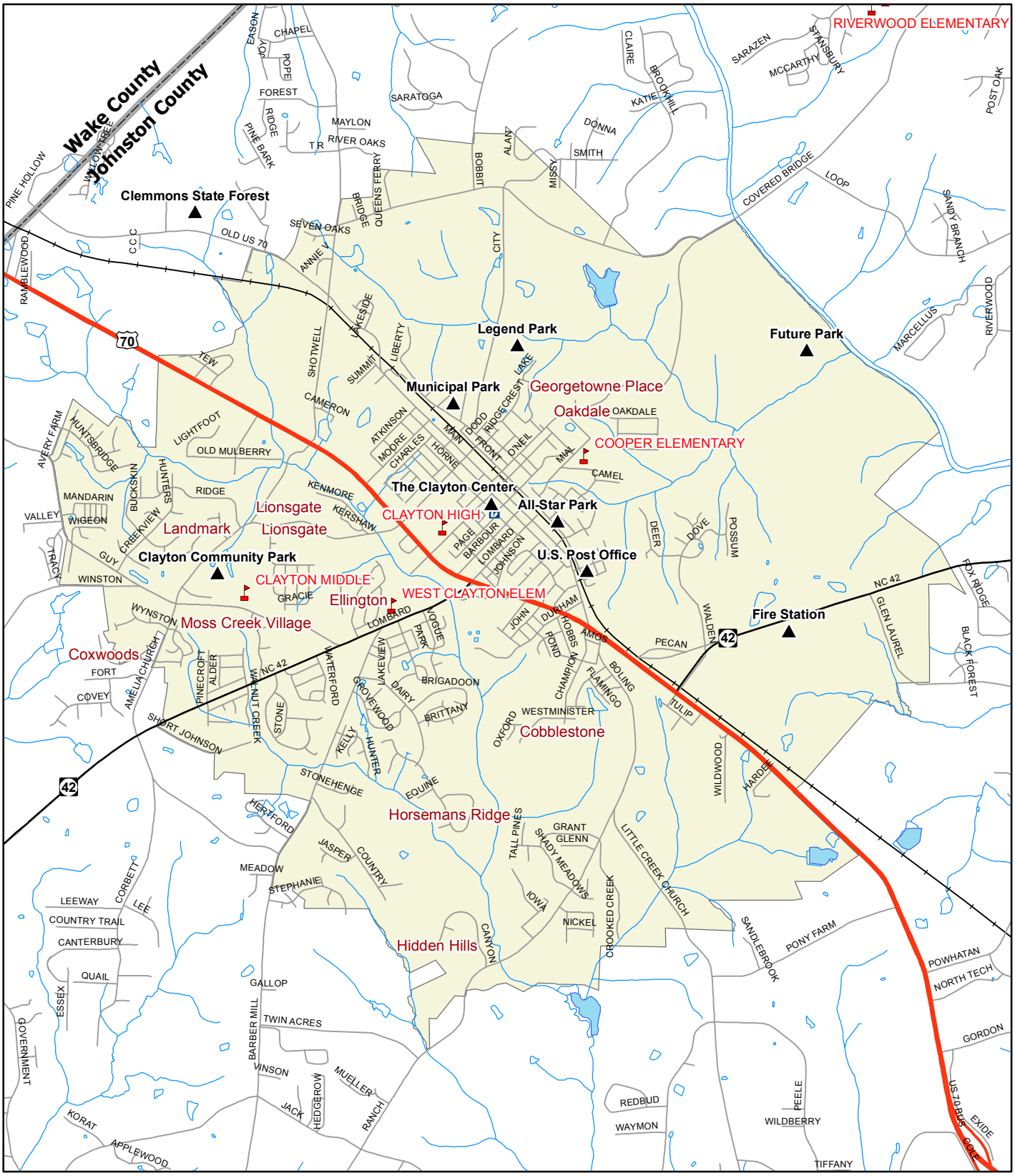
20% to 30%

30% to 40%

More than 40%

N W E S

0 0.125 0.25 0.5 0.75 1 Miles



Clayton Bicycle Plan

Figure 3.2 - Destinations and Attractions

Kimley-Horn and Associates, Inc.

Clayton ETJ
County Boundary
Bodies of Water
US Highways
State Highways
Railroads
Library
Destinations
Schools

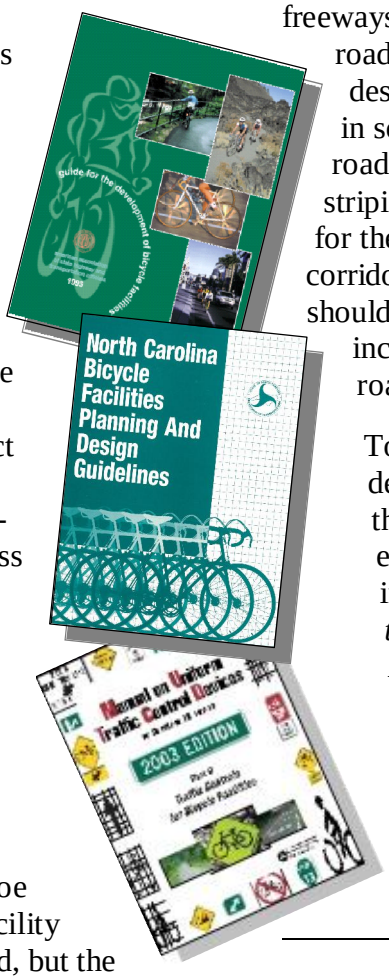
N W E S

0 0.125 0.25 0.5 0.75 1 Miles

Bicycling Opportunities

Current and Planned Roadway Projects

Currently, two hazard elimination projects are under construction at intersections in Clayton. Project W-4409 recommends improvements along US 70 between Shotwell Road and NC 42, while project W-4703 recommends improvements along US 70 with the realignment and other intersection improvements of Boling Street, Main Street, John Street, and Moore Street.



Two other major projects are scheduled to be partially or fully funded in the 2006-2012 TIP. Project R-2552 is the Clayton Bypass, which runs from I-40 to US 70/US 70 Business and is fully funded during the 2012 planning period. This facility will be a freeway on new location and as a result will not accommodate bicycles. There is also an NC 42 widening project (R-3825) between US 70 and Buffaloe Road. A portion of this facility has already been completed, but the remainder of the project is expected to have funding in 2006, 2008 and beyond the 2012 TIP planning schedule.

There is also a study currently underway examining the extension of Front Street. Ultimately, this extension will connect the existing section of Front Street with NC 42. As this project is still in its planning stages, no funding is allocated for right-of-way or construction in the TIP.

Bicycle Facility Design Guidelines

With the exception of interstates and freeways, all new and reconstructed roadways in Clayton should be designed to accommodate bicycles in some manner. While each roadway construction, paving, or striping project must be appropriate for the topography and land use of the corridor, the guidelines in this section should be utilized as a blueprint for incorporating bicycle facilities in roadway corridors.

To develop recommended bicycle design standards for the Clayton, the Study Team reviewed several existing documents. The review included the *AASHTO Guide for the Development of Bicycle Facilities*,[1] the *North Carolina Bicycle Facilities Planning and Design Guidelines*,[2] and the *Manual on Uniform Traffic Control Devices*.[3]

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[1] American Association of State Highway and Transportation Officials (AASHTO), *AASHTO Guide for the Development of Bicycle Facilities*, Washington, DC, 1999.
[2] North Carolina Department of Transportation (NCDOT), *North Carolina Bicycle Facilities Planning and Design Guidelines*, Raleigh, NC, 1994.
[3] Federal Highway Adminstration (FHWA), *Manual on Uniform Traffic Control Devices*, Washington, DC, 2003.

Existing Design Guideline Documents

The section below summarizes the three main bicycle design guideline documents that were reviewed for this plan.

AASHTO Guide for the Development of Bicycle Facilities

Referred to as the *Bicycle Guide*, this is a federal document which sets forth the current design practices accepted by FHWA. This document discusses planning, design, operations, and maintenance issues associated with bicycle facilities. With respect to design, it addresses width dimensions, grades, cross slopes, radii, acceleration rates, deceleration rates and sight distances. The *Bicycle Guide* is not intended to establish strict standards. It provides "sound guidelines that are valuable in attaining good design sensitive to the needs of both bicyclists and other highway users".[4]

FHWA Manual on Uniform Traffic Control Devices (MUTCD)

Unlike the AASHTO *Bicycle Guide*¸ the *MUTCD* does constitute a standard. Failure to comply with the *MUTCD* can result in being denied federal funds and opens up non-compliant jurisdictions to additional liability in the event of a crash. The *MUTCD* addresses standards for signing, striping, markings, signals, islands, and traffic work zone devices (e.g., cones and barricades). It provides information on what symbols may be used on signs and when sign text can vary from the signs provided. The color, width, types, and applications of striping are defined in detail. It also provides dimensions and shapes of pavement markings and pavement lettering.

North Carolina Bicycle Facility Planning and Design Guidelines

Design standards and guidelines for bicycle planning in North Carolina are provided in this manual produced by the NCDOT. This document seeks to clarify specific aspects of standards that should be used when designing bicycle facilities.

Designing Roadways for Bicyclists

It is important for roadway designers to understand how roadway and traffic characteristics affect bicyclists. Several research studies have suggested factors that influence bicyclist safety and comfort when riding on a roadway segment.[5,6,7,8] These factors include:

[4] AASHTO, p.2.

[5] Landis, Bruce W., "The Bicycle Interaction Hazard Score: A Theoretical Model." *Transportation Research Record 1438*, Transportation Research Board, Washington, DC, 1994.
[6] Sorton, Alex. "Bicycle Stress Level as a Tool to Evaluate Urban and Suburban Bicycle Compatibility." *Transportation Research Record 1438*, TRB, Washington, DC, 1994.
[7] Epperson, Bruce. "Evaluating Suitability of Roadways for Bicycle Use: Toward a Cycling Level-of-Service Standard." *Transportation Research Record 1438*, TRB, Washington, D.C. 1994.

- Effective width of the roadway, which includes the width of the outside lane and paved shoulder/bike lane space
- Presence of a bike lane or paved shoulder
- Motor vehicle traffic volumes on the roadway
- Traffic from intersecting roadways/driveways
- Speed of the traffic on the roadway
- Percent heavy vehicles on the roadway
- On-street parking
- Pavement surface condition

In the late 1990s, groundbreaking research was performed to quantify the influence of each of these factors on the perceptions of bicyclists. One research study had bicyclists rate the characteristics of roadways in the field;[9] another had cyclists rate roadway segments from video clips.[10] The former study resulted in the Bicycle Level of Service Model, and the latter resulted in the Bicycle Compatibility Index. All of the factors listed above were found to influence bicyclist comfort.

Both studies identified lateral separation between bicyclists and motor vehicles as one of the most significant factors influencing bicyclist comfort levels. The studies found that bicyclists preferred having wider pavement space to ride on. Further, both studies found that most bicyclists prefer having a shoulder or bike lane stripe provided on roadway segments when compared to the same pavement width without a stripe. In addition, a third study found that motorists give bicyclists more lateral space when bike lanes are striped.[11] These are particularly important findings because bicycle lanes and shoulders can be incorporated during roadway design.

These studies provide the background behind the recommendations to provide bicycle lanes and paved shoulders as preferred bicycle facilities in Clayton.

Guidelines for Specific Facilities

This section describes the types of bicycle facilities that should be incorporated into roadway projects in the Clayton.

Bicycle Lanes

A bike lane is a portion of the roadway that has been designated by striping, signing, and pavement markings for the preferential or exclusive use of bicyclists. Bike lanes are always located

[8] Davis, Jeff. *Bicycle Safety Evaluation*. Auburn University, 1987.
[9] Landis, Bruce W., et al. "Real-Time Human Perceptions: Towards a Bicycle Level of Service," *Transportation Research Record 1578*, TRB, Washington, DC, 1996.
[10] Harkey, D.L., et al. "Development of the Bicycle Compatibility Index: A Level of Service Concept: Final Report," Report No. FHWA-RD-98-072, FHWA, Washington, DC, August 1998.
[11] Hunter, William W., et al. "A Comparative Analysis of Bicycle Lanes Versus Wide Curb Lanes: Final Report," FHWA, FHWA-RD-99-034, December 1999.

on both sides of the road (except one-way streets), and carry bicyclists in the same direction as adjacent motor vehicle traffic. The minimum width for a bicycle lane is 4 feet; 5- and 6-foot bike lanes are typical for collector and thoroughfare roads. Increasing the width of bike lanes provides greater comfort for bicyclists.

The AASHTO *Bicycle Guide* states, "[Bike lanes may be provided] by reducing the width of vehicular lanes or prohibiting parking…" (p. 8). The *North Carolina Bicycle Planning and Design Guidelines* (adapted from the AASHTO *Bicycle Guide*), specifies widths for bike lanes. This graphic is provided on the following page.

NCDOT recommends that bicycle lanes be considered for a roadway based on the demand, connectivity of origin and destination points, surrounding land uses, traffic and geometric conditions, and presence of other route alternatives.

Paved Shoulders

Paved shoulder space improves the safety and comfort of bicyclists. There is no minimum width for paved shoulders; however, a width of 4 feet is preferred. Even wider shoulders provide greater levels of bicyclist safety and comfort. On many roadways, motor vehicle travel lanes can be narrowed to provide more shoulder space. According to the AASHTO *Bicycle Guide*, "where 4-foot widths cannot be achieved, any additional shoulder width is better than none at all." Paved shoulders also improve safety for motor vehicles, prevent pavement damage to travel lanes, and provide space for pedestrians.

While paved shoulders are generally acceptable for roadway sections without frequent intersections, on those where intersections are frequent, appropriate bike lane striping should be applied.[12]

Wide Curb Lanes

Wide curb lanes (typically 14 feet wide) have been used to provide extra space for bicyclists. While wide curb lanes are an effective way to encourage motorists to give cyclists adequate clearance when passing, they are largely unrecognized by casual cyclists as bike facilities. As noted in the research studies above, having a striped bike lane greatly improves cyclists' feelings of safety and comfort. In communities like Clayton that want to significantly increase the number of people riding bicycles, it is recommended that a program to create striped bike lanes be adopted in areas that may attract a large number of riders, such as in the downtown area. However, each roadway should be evaluated individually to determine what treatment is most appropriate for the surroundings and conditions.

[12] In addition, AASHTO's *Guide for Achieving Flexibility in Highway Design* (2004) states, "Paving part or all of the shoulder…helps reduce crash rates…and helps to facilitate use of the road by bicyclists. Shoulder paving also reduces maintenance requirements….Where a 'full width' shoulder cannot be achieved, the designer should strive to provide as wide a shoulder as possible that meets functional requirements" (p. 66).

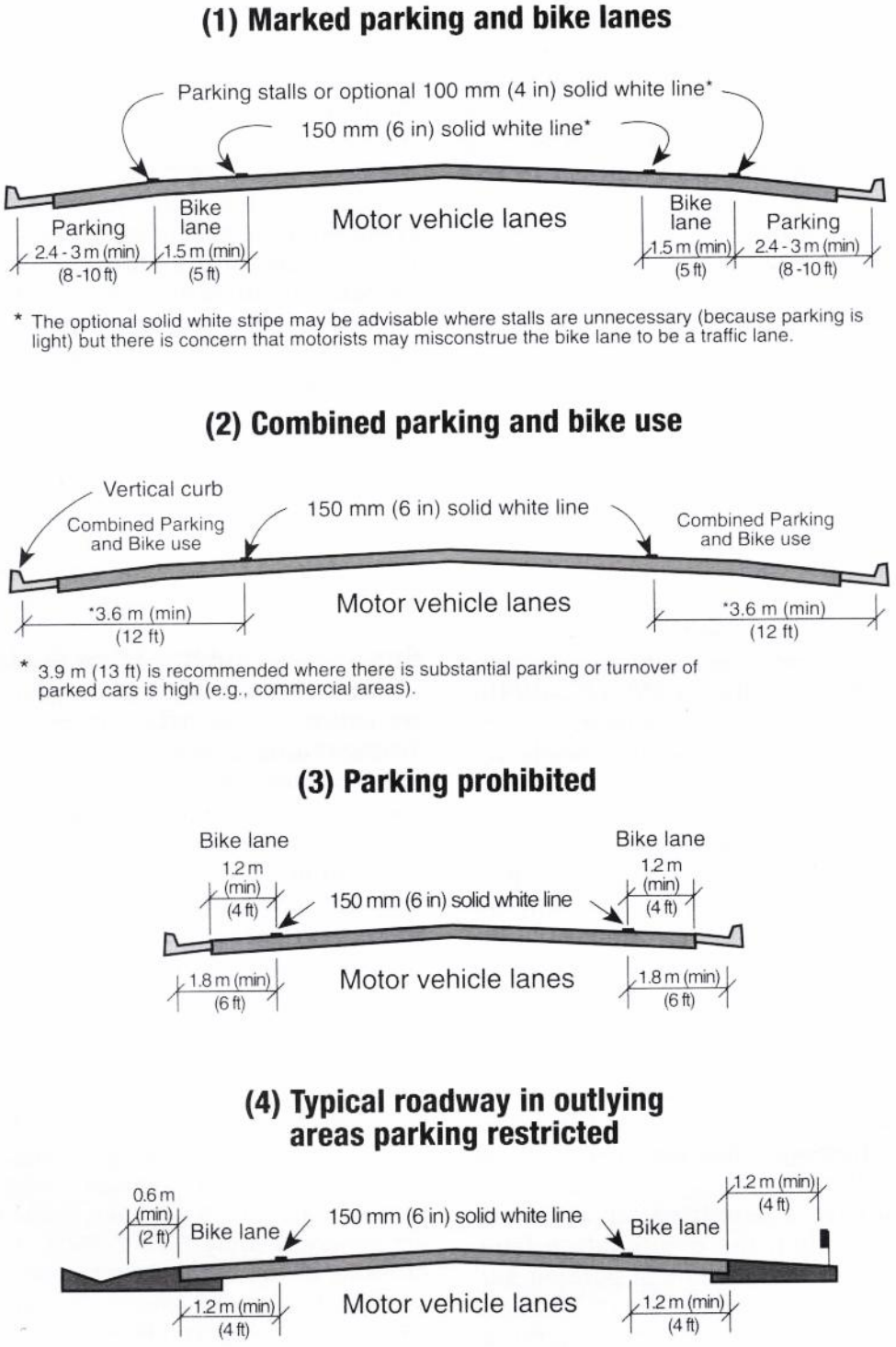


Figure 3.3 Typical bike lane cross sections on two-lane or multi-lane highways

(Source: *North Carolina Bicycle Planning and Design Guidelines*, 1994)

Shared Roadways

Shared roadways are streets and roads where bicyclists can be served by sharing the travel lanes with motor vehicles. Usually, these are streets with low traffic volumes and/or low speeds, which do not need special bicycle accommodations in order to be bicycle-friendly.

Multi-Use Paths on Independent Alignments

Multi-use paths (or shared use trails) are becoming quite popular, not only with bicyclists, but with many non-motorized transportation device users across the country. They can provide a high-quality bicycling experience in an environment that is protected from motor traffic because they are constructed in their own corridor, often within open-space area. Multi-use paths can be paved and should be a minimum of 10-feet wide. Their width may be reduced to eight feet if there are physical or right-of-way constraints. Additional width should be considered for areas with difficult terrain or heavy traffic.

Multi-use paths are, in effect, little roads and should be designed as such. This means there are clearance requirements, minimum radii, stopping sight distance requirements and other criteria just as there are for roadways. High standards should be observed when designing these paths, especially considering that there is typically little federal and state money available for their maintenance. Designers must comply with the *MUTCD* and AASHTO *Bicycle Guide* when designing these facilities.

Though paths should be thought of as roadways for geometric and operational design purposes, they require much more consideration of amenities than do roadways. Shade and rest areas with benches and water sources should be designed along multi-use paths. Where possible, vistas should be preserved. Way finding signs (how far to the library or the next rest area or directions to restrooms) are important for non-motorized users. These types of design considerations can help make a multi-use path more attractive to potential users.

Sidepaths/Wide Sidewalks

A sidepath is essentially a multi-use path that is oriented alongside a road. The AASHTO *Bike Guide* and *North Carolina Design Guidelines* strongly caution those contemplating a sidepath (or wide sidewalk) facility to investigate various elements of the roadway corridor environment and right-of-way before making a decision. AASHTO provides

nine cautions/criteria for designing sidepaths.[13]

In addition to the AASHTO cautions, research from the US and abroad confirm that bicycle/ motor vehicle crash rates are higher for bicyclists riding on a sidepath than on a roadway.[14,15,16,17,18] Consequently, designers are advised to be very careful when choosing to design sidepaths.

There are some high-volume, high-speed roadways where sidepaths are the only bicycle facility that can be provided without very costly changes to the roadway corridor. In these cases, a sidepath may be the preferred alternative. This decision must consider the magnitude of intersecting driveway and roadway conflicts. If possible, sidepaths should be provided on both sides of the roadway to encourage bicyclists to ride in the same direction as adjacent traffic. Finally, the long-term strategy on these roadways should be to widen the road or narrow the lanes to provide additional space for bicyclists in on-road bike lanes or shoulders.

One recently completed research study suggests that there may be ways to mitigate some of the safety risks associated with sidepaths.[19] This research effort found that crashes occur less often when the speed of the trail user is reduced. This means some sort of "traffic calming" treatment for the trail may be appropriate at intersections. At signalized intersections, it is best to treat the path roadway crossings as crosswalks, bringing the pathway close to the adjacent roadway so its signals can be incorporated into the overall signalization plan. Additional treatments to the typical pedestrian heads may be desirable at these intersections. The most significant of these supplemental treatments is the blank-out sign. NO RIGHT ON RED or YIELD TO PEDS IN CROSSWALK signage may increase motorist awareness of individuals riding (or walking) in the crosswalks.

At unsignalized intersections it is best to move the sidepath out of the area of the

[13] AASHTO, pp. 34-35.
[14] Kaplan, J. "Characteristics of the Regular Adult Bicycle User." FHWA, U.S. Department of Transportation, 1975.
[15] Moritz, W. "Adult Bicyclists in the United States - Characteristics and Riding Experience in 1996." Transportation *Research Record 1636*, TRB, Washington, DC, 1998
[16] Wachtel, A. and D. Lewiston. "Risk Factors for Bicycle-Motor Vehicle Collisions at Intersections." *ITE Journal*, September, 1994.
[17] Räsänen, M. "How to decrease the number of bicycle accidents? A research based on accidents studied by road accident investigation teams and planning guides of four cities." Finnish Motor Insurer's Centre, Traffic Safety Committee of Insurance Companies. VALT. Finland, 1995.
[18] Summala, H., E. Pasanen, M. Räsänen, and J. Sievänen, J. "Bicycle Accidents and Drivers' Visual Search at Left and Right Turns." *Accident Analysis and Prevention*. Elsevier Science Ltd., 1996/03, 28(2), pp.147-53, 1996.

[19] Petritsch, Landis, Huang, Challa. "Sidepath Safety Model - Bicycle Sidepath Design Factors Affecting Crash Rates," submitted to TRB for publication, July 2005.

side street intersection with the adjacent roadway. This allows motorists to deal with one intersection at a time. Additionally, bicyclists are only required to scan in two directions.

Signed Bicycle Routes

Signed routes will be an integral part of the bicycling network in Clayton. These facilities are an inexpensive way to guide riders to more bicycle-friendly roads. They can be used with any of the facilities listed above, including roads with bicycle lanes, shared roadways, and shared use paths. The traffic and geometry of a road are important considerations when determining the location of a signed route. In addition, the functionality of the route for the purpose it was intended (e.g. scenic route or utilitarian connector) is a necessary component in the decision-making process.

SHARE THE ROAD signs (*MUTCD* W11-1 warning sign with W28-1 subplate) can be used to alert drivers to the presence of bicyclists. They are typically considered when one or more of the following criteria are met:

- Safety problems exist and the roadway cannot be improved with bicycle lanes
- Bicycling volumes are high
- A conflict or obvious courtesy problem exists between motor vehicle and bicycle traffic sharing the road

BIKE ROUTE signing (*MUTCD* D11-1 sign with D1-1b subplate) is another treatment which can be implemented to improve conditions for bicyclists. BIKE ROUTE signs help guide bicyclists to preferred routes – roads with lower motor vehicle traffic speeds, fewer trucks, or lower volumes. Typically they are supplemented with destination and distance signing.

Special signs should be designed to guide bicyclists along the recommended Town Center Route. These signs should incorporate their own colors and logo so that they can be recognized easily and help advertise the route to potential bicyclists.

Other Bicycle Facilities and Amenities

The *North Carolina Bicycle Facility Planning and Design Guidelines* also provide design considerations and recommendations for other types of ancillary bicycle facilities and amenities. These items, such as bike racks, bikes on buses, and bike-friendly drainage grates and railroad crossings help to complete the bicycle system by eliminating barriers and providing security. In addition, the guidelines also discuss the maintenance of bicycle facilities, which is essential for the continued safe travel of bicyclists. Ancillary bicycle facilities and amenities are discussed in a subsequent section.

Recommendations for Incorporating Bicycle Facilities

When feasible, all new collector and thoroughfare roadways in Clayton should include bicycle lanes when they are constructed. New construction is the easiest and most cost-effective opportunity to include bicycle facilities because they can be integrated as a part of a larger roadway project.

When collector and throughfare roadways are resurfaced or reconstructed, the Town of Clayton should evaluate the roadway cross-sections to identify opportunities for bicycle facilities. This evaluation should consider how much motor vehicle travel lane width can be re-allocated and used for bike lanes or shoulders, given the lane configuration, traffic volumes, and traffic composition of the roadway. Two types of modifications should be considered to provide additional pavement width for bicycling: striping narrower lanes and/or removing travel lanes on roads with excess capacity. Reconfiguring a roadway during a reconstruction project is also more cost-effective than adding shoulders or restriping lanes as an independent retrofit project.

Neighborhood streets and rural roadways with low traffic volumes may be suitable for bicycling as shared roadways (i.e., special bicycle facilities are not needed).

Recommended Changes to Clayton Development Codes

Land development and redevelopment projects are excellent opportunities to improve conditions for bicycling in Clayton. The Town can ensure that bicycle facilities are provided as a part of development projects by updating its zoning and subdivision codes. This plan recommends several revisions to the Clayton municipal code.

§ 153.41: Streets

- Require bicycle lanes or wide outside shoulders to be provided on all roadways classified as thoroughfares
- Require bicycle lanes to be provided on all roadways classified as collectors

§ 153.46: Public Facilities

- Add bicycle lanes to public recreation and open space areas in which developer/subdivider must dedicate land or payment-in-lieu of dedication with similar suitability criteria

§ 153.59: Required Improvements

- Require sidewalks to be provided on both sides of all thoroughfare and collector streets (this reduces the need for pedestrians to make unnecessary street crossings and provides greater opportunity for bicyclists who choose to use the sidewalk to ride in the same direction as traffic)

§ 153, Appendix C: Street Specifications

- Revise typical thoroughfare right-of-way specifications by replacing note requiring 8' sidewalks for shared bicycle and pedestrian facility with 4' bicycle lane or wide outside shoulder in each direction as part of the roadway cross-section (design should encourage construction of bike lanes on appropriate streets and discourage bicycle use on shared use path)
- Revise typical collector street right-of-way specifications by replacing note requiring 8' sidewalks for shared bicycle and pedestrian facility with 4' bicycle lane in each direction as part of the roadway cross-section
- Provide note that if bike lanes not feasible, design should include 10' shared/multiuse path with maximum separation for the travel lanes

§ 155.065: Off-Street Parking

Add minimum bicycle parking space requirements for different types of office, institutional, and commercial land uses.

Minimum Required Bicycle Parking:

- Nonresidential uses with an off-street parking requirement for motorized vehicles of at least 15 spaces and not more than 40 spaces should provide a minimum of two bicycle parking spaces.
- Nonresidential uses with an off-street parking requirement greater than 40 spaces should provide bicycle parking spaces equal to 5% of the total number of spaces required up to 50 spaces.

Conversion of Motorized Spaces to Bicycle Parking:

- During the site plan approval process, the development review approval board may allow a new or pre-existing development to convert up to 5% of its motorized vehicle spaces to additional bicycle parking, as long as the spaces are conveniently located near a building entrance. Converted parking spaces should yield at least six bicycle parking spaces per motorized vehicle space.

Sample Cross-Sections

A set of sample cross-sections has been developed to reflect road treatments for specific bicycle recommendations. These cross-sections can be adapted to correspond to different road conditions and attributes as necessary. **Figure 3.4** corresponds to a cross-section with striped bike lanes. **Figure 3.5** corresponds to a cross-section with striped bike lanes and parking. **Figure 3.6** denotes a cross-section that has used differential striping to obtain wide outside lanes. **Figure 3.7** shows a cross-section containing a multi-use path on one side of the road.

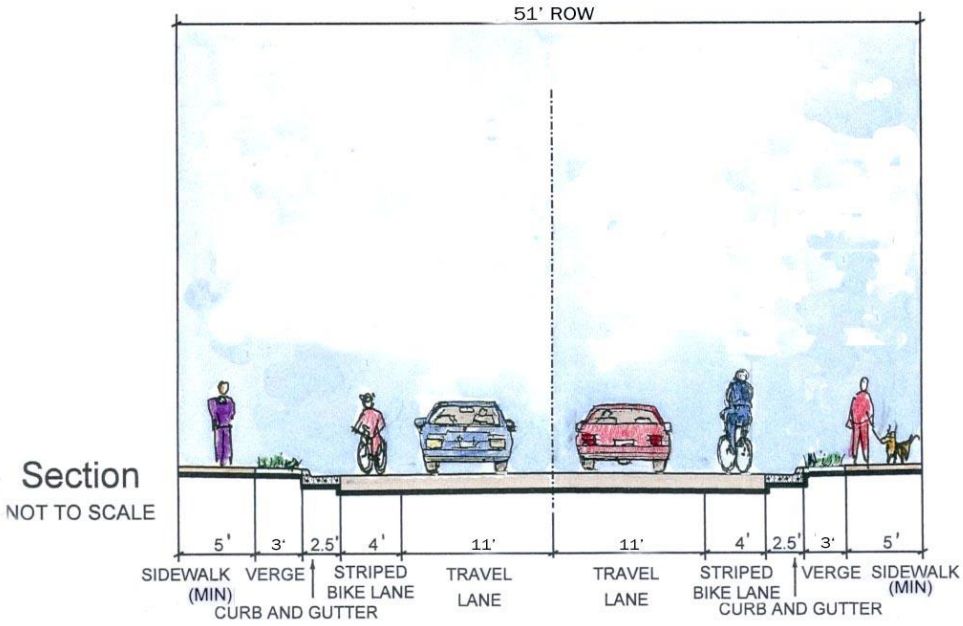


Figure 3.4 Striped Bike Lanes Cross-Section

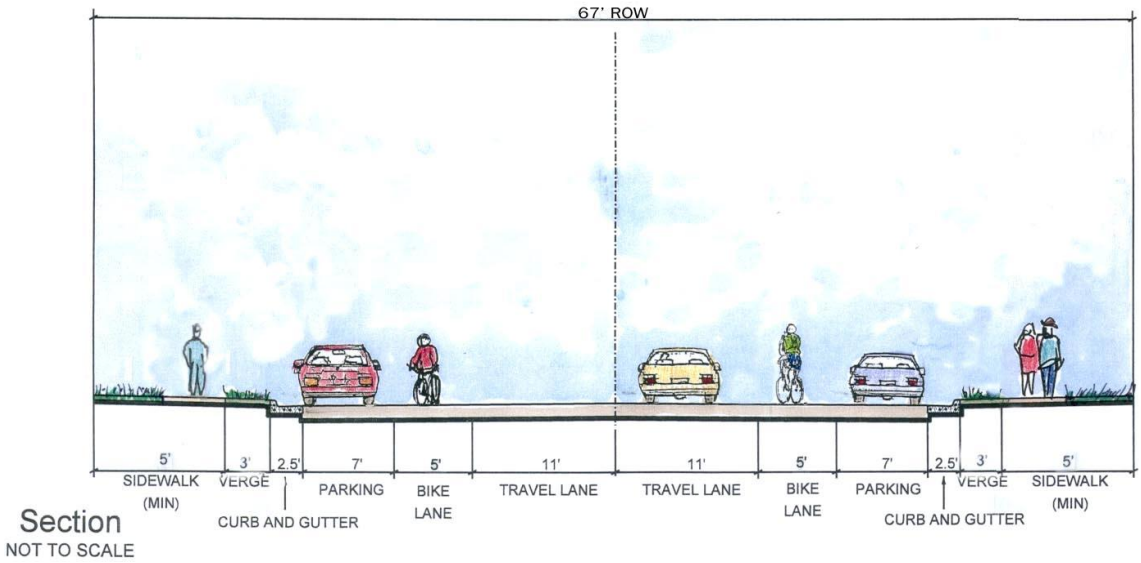


Figure 3.5 Striped Bike Lanes and Parking Cross-Section

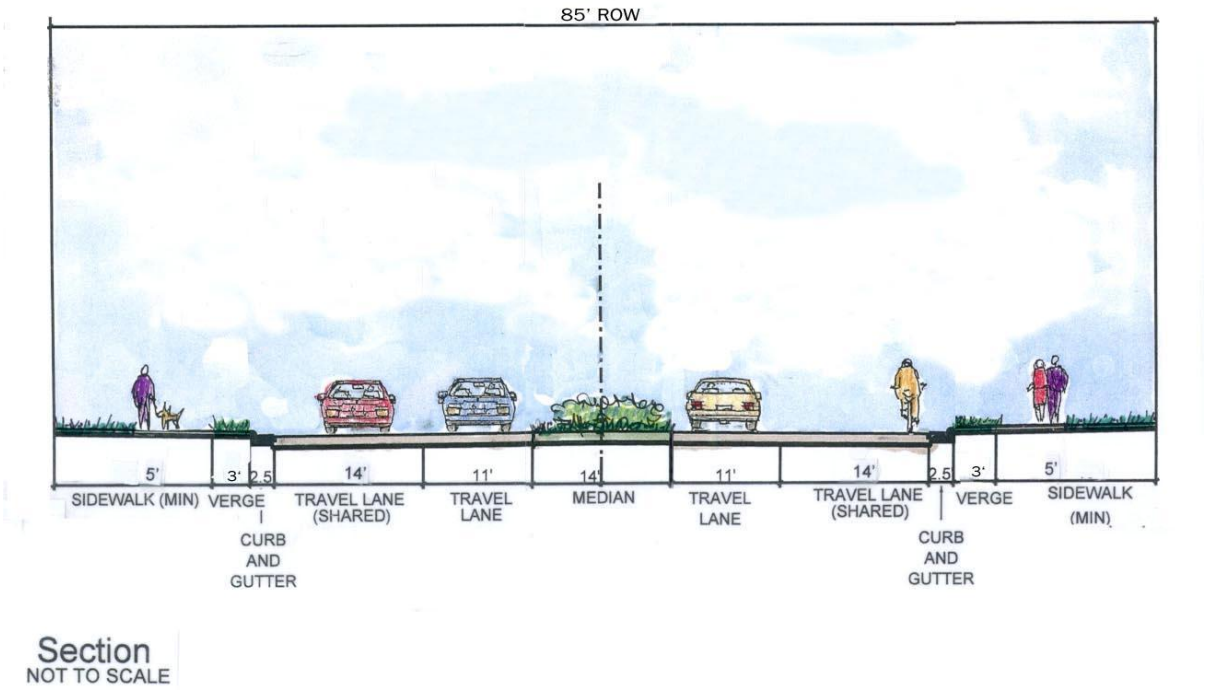


Figure 3.6 Wide Outside Lanes Cross-Section

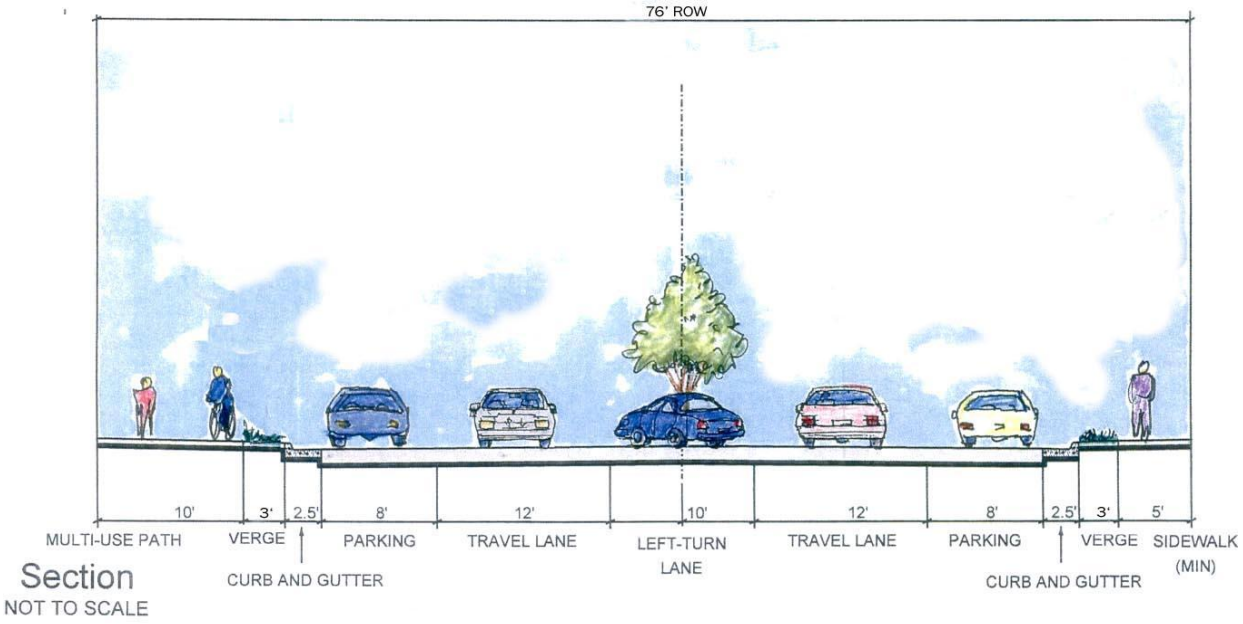


Figure 3.7 Multi-Use Path Cross-Section

Roadway Intersections

Intersections should be designed with a balanced level of accommodation for all modes, including pedestrians, bicyclists, motor vehicle traffic, and public transit. Narrow intersections decrease crossing distances for all users, including bicyclists. Narrower intersections can have a shorter traffic signal cycle length than wide intersections (when the intersection is signalized) and are safer for pedestrians and bicyclists in general.

Special care must be given to bike lane design at intersections. Since intersections represent significant conflict points for bicyclists, appropriate striping, marking, and signing is critical to help ensure the proper behavior of cyclists and motorists.

When designing bike lanes at intersections, the Town of Clayton should follow examples in the Pedestrian and Bicycle Information Center's *Bike Lane Design Guide*, which can be downloaded at www.bicyclinginfo.org/de/bikelaneguide.htm. This document is a summary of the *Chicago Bike Lane Design Guide*. Three example intersection striping treatments and a typical signing plan for an intersection from the Chicago manual are provided at the end of this subsection (**Figures 3.9 – 3.12**).

Signal Loops. Bicyclists frequently have trouble being detected at traffic signals. They often believe the signals are non-responsive and consequently run red lights. However, most traffic signal loops designed for motorists can detect cyclists if the cyclists know where to place their bicycle. One effective way to address this problem is to mark the location on the pavement where a cyclist would have to stop the bike to be detected by a traffic signal. The sign pictured here and the symbol it shows have been tested for cyclist understanding and are being considered for future updates to *MUTCD*. To implement them before they are included in the *MUTCD* would require a request to experiment be filed with FHWA.

Specific signal loops for bike lanes (or shared use paths) can also serve to improve cycling conditions. A typical treatment is a quadrapole loop with overall dimensions of 2 feet by 20 feet.

Roundabouts. Bicycles fare well at urban compact roundabouts. With low design speeds, minimized conflict areas, and yield upon entry traffic control, well-designed urban compact roundabouts are convenient and safe for bicyclists. The approaches to roundabouts should be treated just as any other unsignalized intersection: the bike lanes should be terminated prior to the roundabout, and cyclists should be allowed to claim the lane in the circulating roadway. At more complex roundabouts such as the one at right and on the following page, designs can provide bicyclists with a choice to either claim the lane and ride through the circulating roadway, or to dismount, move to a widened sidewalk, and traverse the roundabout as pedestrians. An example drawing and illustration of this treatment, from the *Kansas Roundabout Guide*[20] is shown below in **Figure 3.8**

It should be noted that the MUTCD states, "Bicycle lanes shall not be provided on the circular roadway of a roundabout intersection." This statement is given as a STANDARD and is thus not to be violated.

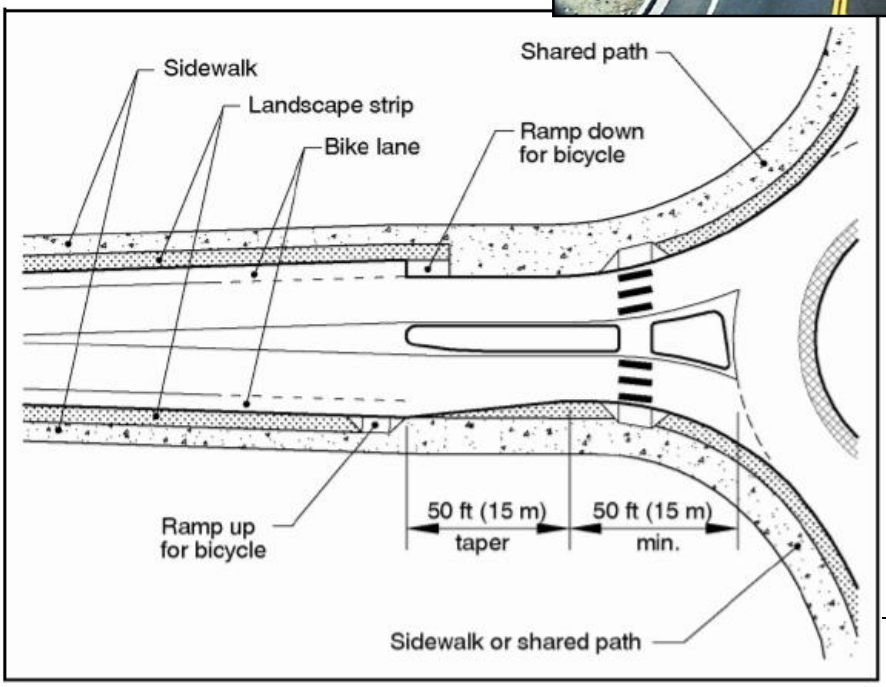


Figure 3.8 Bike lane transitions at roundabouts for on- and off-street cyclists

(Source: *Kansas Roundabout Guide*, Kansas DOT, 2003)

[20] Kansas Department of Transportation. *Kansas Roundabout Guide.* Topeka, KS. October 2003.


Bicyclists May Continue On The Road Into The Roundabout,
Or Use This Slip Ramp Onto The Sidewalk

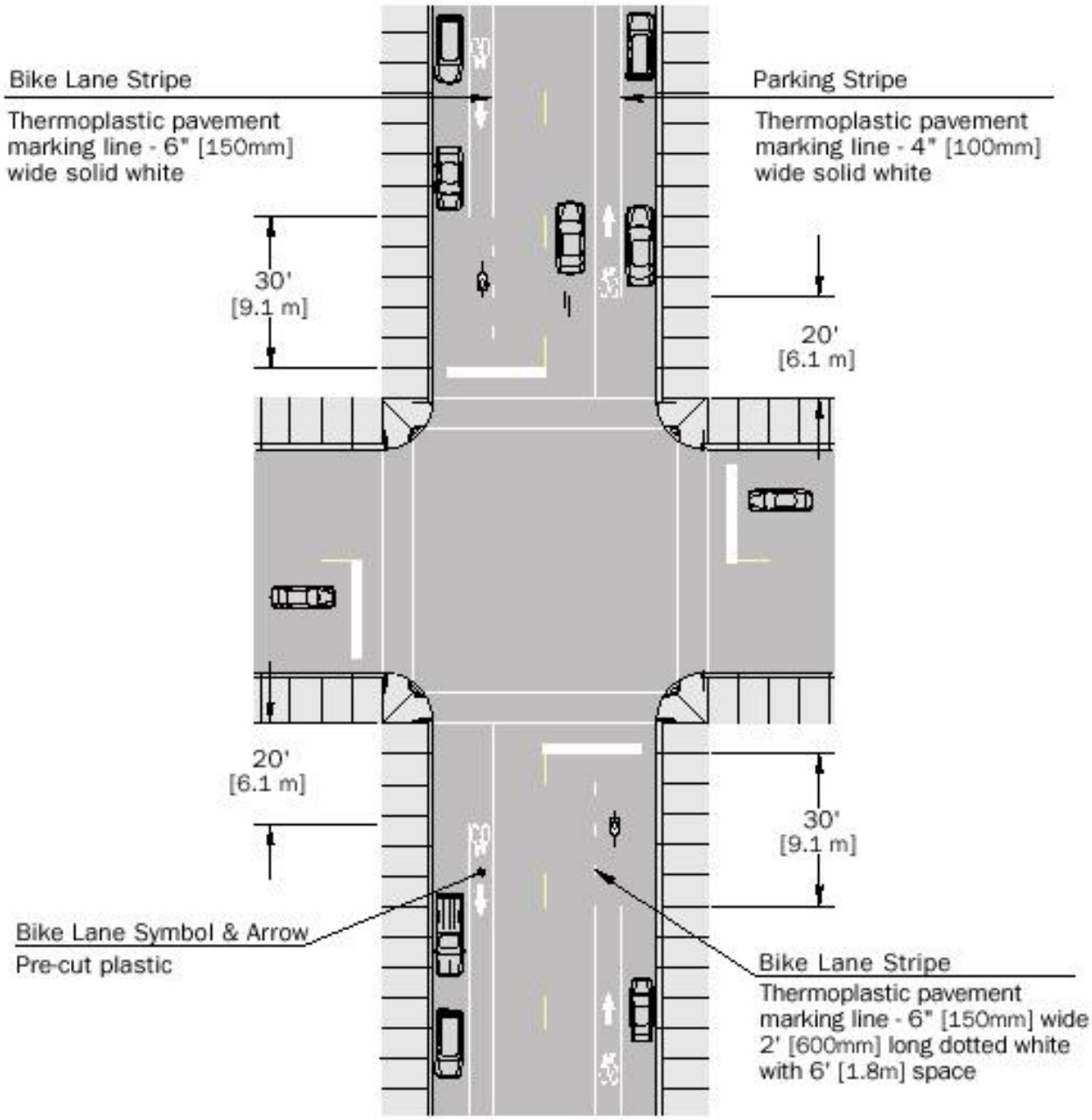


Figure 3.9 Striping for bike lane with parking at intersection with two-lane arterial

(Source: *Chicago Bike Lane Design Guide*, Chicago DOT, 2002)

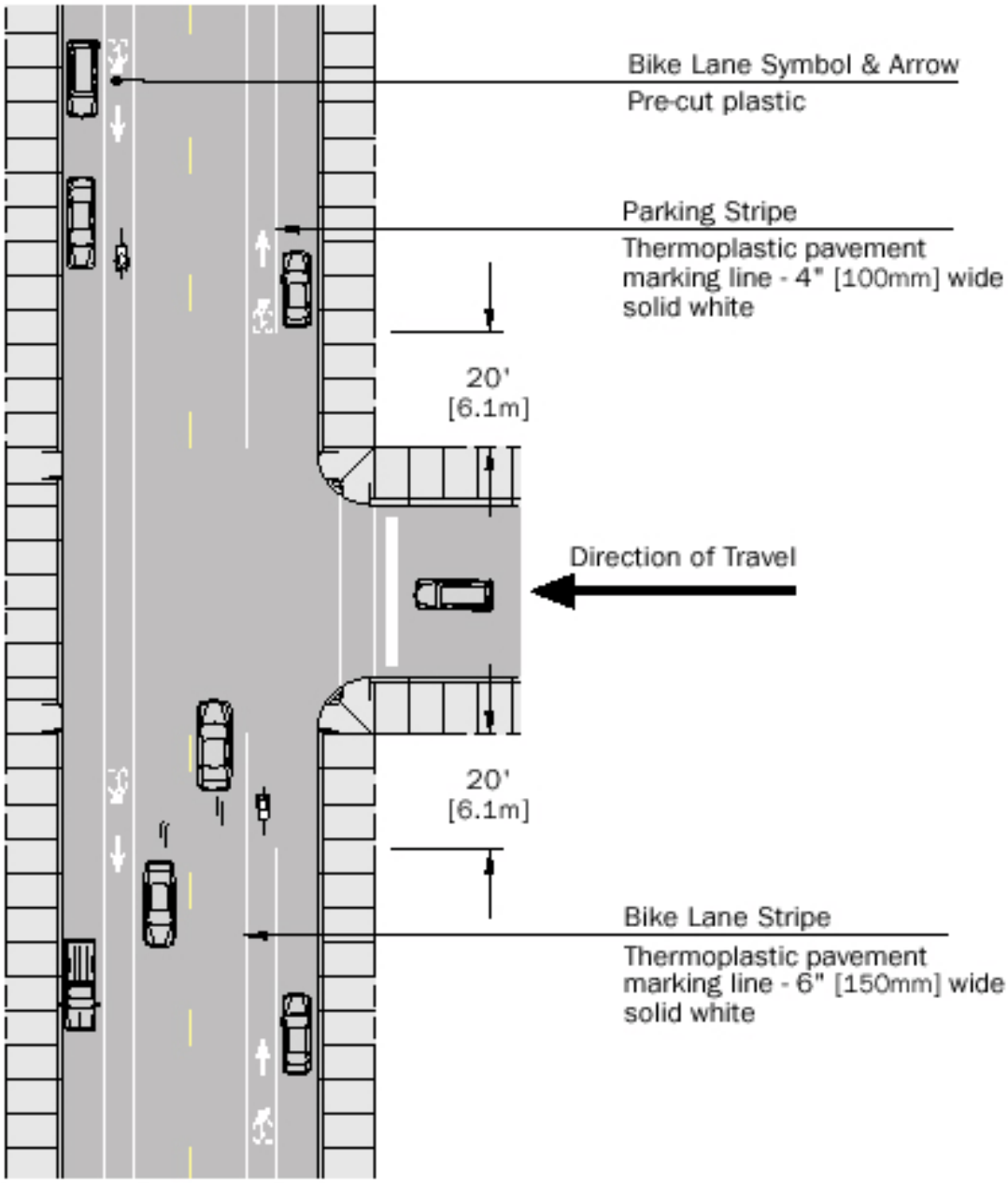


Figure 3.10 Striping for bike lane with parking at T-intersection with one-way local street

(Source: *Chicago Bike Lane Design Guide*, Chicago DOT, 2002)

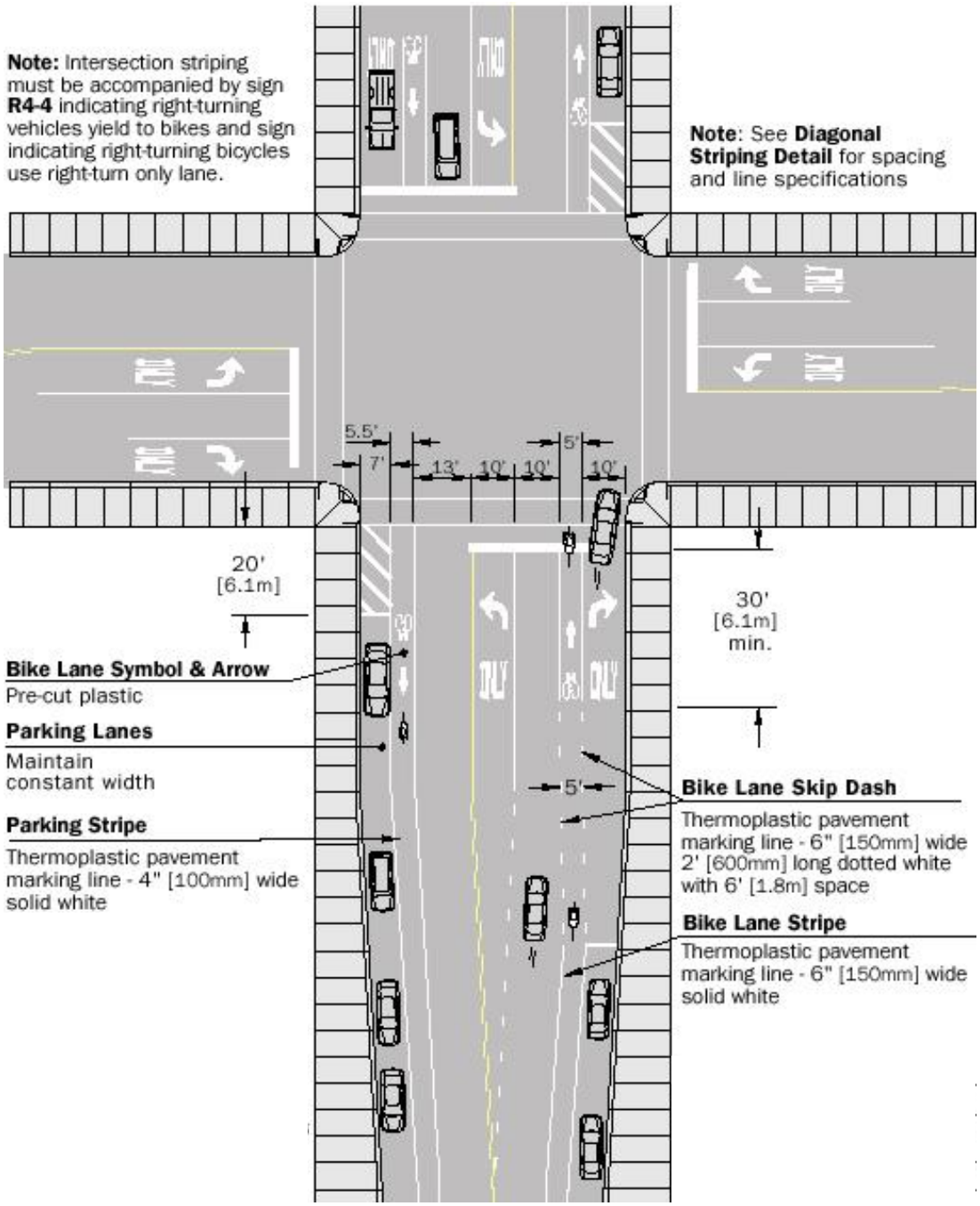


Figure 3.11 Striping for bike lane at 60' wide intersection with left- and right-turn bays

(Source: *Chicago Bike Lane Design Guide*, Chicago DOT, 2002)

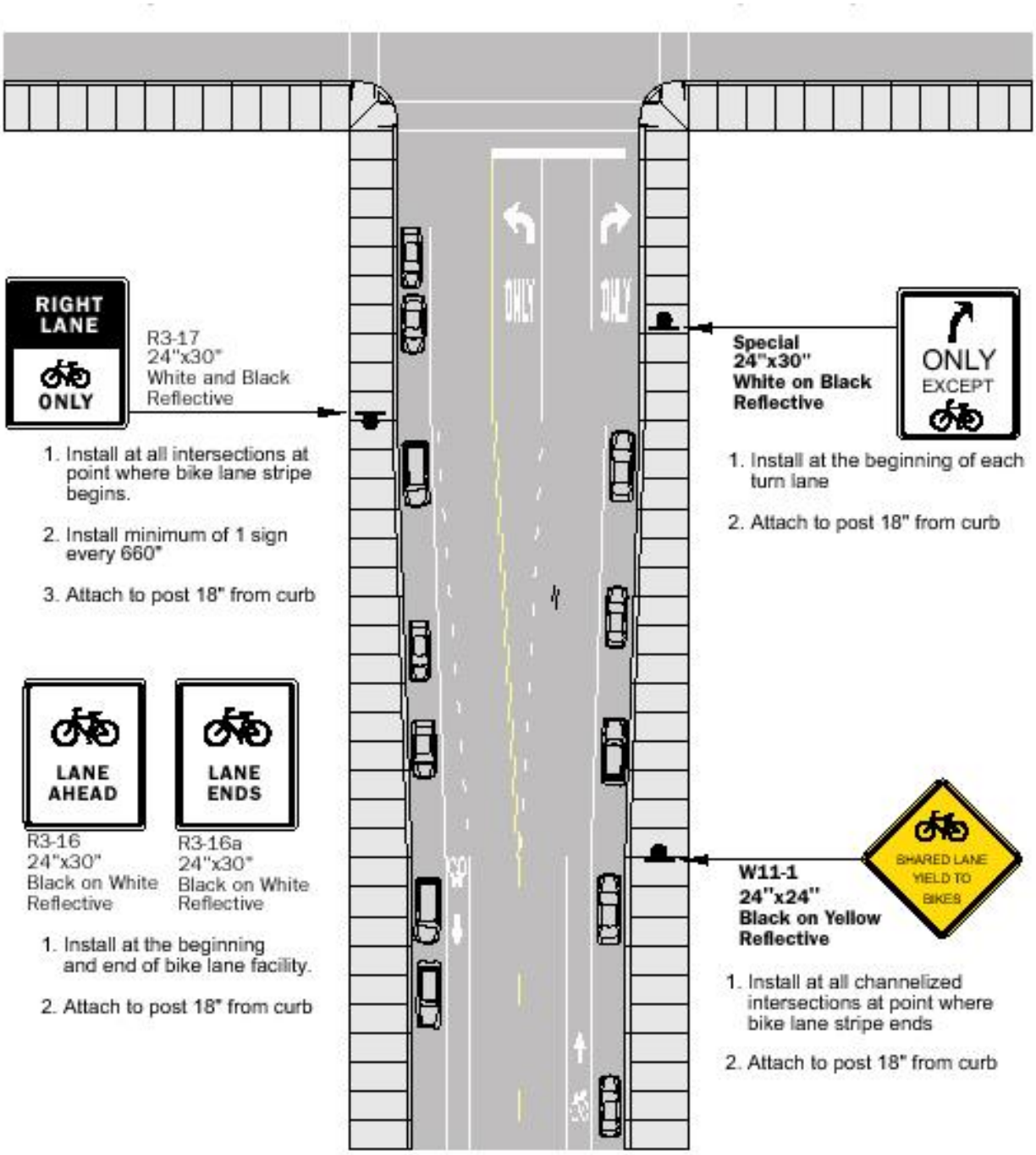


Figure 3.12 Typical Bike Lane Signage at intersection

(Source: *Chicago Bike Lane Design Guide*, Chicago DOT, 2002)

Sample Cost Estimates

To accommodate the bicycle facilities being considered, a set of sample construction cost estimates were developed. These cost estimates were derived based on unit costs for similar facilities in other areas as well as by referencing the NCDOT cost estimation spreadsheet. Each unit cost is included below, along with a description of how it was obtained. The construction costs do not include right-of-way acquisition or mitigation. All estimates are provided in 2006 dollars. A twenty percent contingency cost has been added to these estimates in order to account for fluctuations in construction costs.

Multi-Use Path
$360,000 to $600,000 per mile

This estimate assumes a 10 foot wide asphalt surface and does not include other potential mitigation such as building a structure over a wetland area.

Wide Paved Shoulder
$360,000 to $480,000 per mile

This figure assumes a 4 foot wide paved shoulder being built where there was currently a grass shoulder. Other factors such as extensive ditch work are not considered.

Signed Route
$300 per sign or $1200 per mile

This estimate accounts for four signs to be placed in a mile section, with two signs in each direction. Many bicycle routes in urban and suburban areas require more than four signs per mile.

Striped Bike Lanes
$18,000 per mile

The estimate for striped bike lanes accounts for striping lanes (thermoplastic) in each direction and signing the route. Also, painting the bike lane with a more visible color may be desired at a cost of $30,000 per mile. This will help to calm traffic by creating a sense of enclosure. These lanes are often created in conjunction with resurfacing projects; however, the cost of resurfacing is not included here.

Wide Outside Lanes
$18,000 per mile

Wide outside lanes are used here when differential striping can be applied to a roadway. As a result, no additional widening is necessary. The estimate accounts for the cost of restriping and signing the route. When additional pavement is necessary, an estimate of $440,000 per mile is more appropriate.

Signed Route with Striped Parking
$18,000 per mile

These routes are again the result of working within the existing cross-section to create a new facility type. This estimate accounts for striping and signing costs.

Neighborhood Connector
$60,000 to $102,000 for a prefabricated or removable bridge

This estimate assumes that the neighborhood connector would consist of a prefabricated bridge run for a short section over a stream or other barrier.

Ancillary Facilities and Programs

According to the *Clayton Bicycle Planning Survey*, there is a large demand for many different types of ancillary facilities in the Clayton area. Bicycle route signage, clean road surfaces, maps of bicycle routes, drainage grates flush with pavement surface, and bicycle racks at destination points were all considered to be important to survey respondents. This section outlines several different types of ancillary facilities and their potential benefits to the community.

Mapping and Signing Projects

Comprehensive Route Systems

The recommendations shown in **Chapter 4** have been set forth in order to create a comprehensive route system for the Clayton linking commercial, recreational, and residential areas. Over the next twenty years, the implementation of these routes will ultimately result in an interconnected set of facilities. To accommodate these facilities, the proposed area-wide Bike Route System should be mapped and signed with bicycle route signs. Potential improvements are identified in this chapter. These recommendations encompass issues from maintenance to design and include but are not limited to:

- Provision of bike lanes on local streets where space is available and on-street parking is not an issue

- Exploration of the use of the shared lane symbol under restricted conditions
- Marking and signing signal loops (and possibly repairing them) for bicyclists
- Repairing utility lids within the bicyclists' line of travel
- Marking railroad crossings to improve safety
- Route signage

While the first five items listed above are important for the bicyclist who has decided to use a specific route, the last — route signage — is critical to helping cyclists determine which route to use. Route signage should provide useful information to the bicyclists. When creating a route system signing plan, the destinations being served and the best roadways (or facilities) to access those destinations must be considered. Signing should include information on the direction and distance to destination points, as well as intermittent confirmation that the bicyclist is still on the correct route.

Facilities that can be used to create a comprehensive route system include multi-use paths, bike lanes, shoulders, and wide outside curb lanes.

State/Regional Routes

Any route system implemented by Clayton should consider the existing state routes that run through the Triangle region and those that have been developed in the City of Raleigh and the Town of Cary nearby. Development of a bike route or system in the northeast section of Clayton may provide opportunities for a spur or route leading to the US Bike Route 1, NC Bike Route 5, and the various municipal bike routes near Raleigh. The bicycle routes recommended in **Chapter 4** will discuss these potential connections in greater detail.

Share the Road Signing Initiative

North Carolina has been installing "Share the Road" signage since 1987. Although it was not part of the *Manual on Uniform Traffic Control Devices* (*MUTCD*) at that time, the sign has since been standardized and included in that manual. This sign serves to make motorists more aware of the possibility of bicyclists on high-use roads with potentially hazardous conditions. When this sign is placed along a bicycle route, it typically denotes a major roadway connecting with less frequently traveled roads. These signs serve as important and cost-effective safety and education tools. In fact, the visibility and impact of these signs has recently been acknowledged by the state by the issuing of a "Share the Road" license plate. The additional funds received through the sale of this license plate will be used to promote bicycle education and safety initiatives statewide.

Suitability Rating System

The bicycle level of service (LOS) methodology allows planners and designers to select a level of accommodation rather than a required

specific design treatment to provide for bicyclists along a bike route. What the bicycle LOS methodology does not do is dictate what level of service is appropriate for a given community or user. This means that a community can decide that for one type of bike route system, such as a neighborhood route system, a LOS A or B may be required. Conversely, LOS C may be acceptable for the routes serving cross-town commuter cyclists. In addition to being widely accepted by state DOTs and local jurisdictions, the bicycle LOS method is also being considered as the basis for a national LOS model to be included the *Highway Capacity Manual (HCM)*. Chapter 19 of the current version of the HCM outlines LOS criteria for exclusive off-street bicycle paths, multi-use off-street paths, on-street bicycle lanes on urban streets, and for bike lanes at signalized and unsignalized intersections.[21]

A bicycle level of service analysis was not conducted as a part of this study. However, it is recommended that the Town works with Johnston County to perform a level of service analysis with a corresponding map component. Ultimately this exercise also could serve as a benchmark for the road system in Clayton during future re-evaluations of the system.

[21] Transportation Research Board, *Highway Capacity Manual 2000*, Washington, DC, 2000.

Spot Improvement/ Maintenance Programs

General Considerations

All non-controlled access roadways should be maintained so they are safe for bicyclists to use. The surface should be free of debris. Longitudinal cracks should be patched and drainage grates with longitudinal slots should be replaced. Utility covers should be flush with the roadway surface. Paved shoulders should be installed where rutting is occurring on the side of non-curb and gutter roadways. These items should be addressed through the normal roadway maintenance and Powell Bill program.

The alignment of drainage grates and gutter pans with existing pavement is also an area of concern in Clayton. Over repeated repavings, the pavement level on streets with curb and gutter can become significantly higher than the gutter pan. This poses a safety hazard for bicyclists and cars by creating a dangerous edge of pavement. This situation can be avoided by milling down the pavement so that a repaving will be flush with the gutter pan or by raising the drainage grates and paving all the way to the curb.

Bicycle facilities, including trails, require an additional level of effort to provide acceptable maintenance. These maintenance issues occur most frequently on the right side of the pavement, where the cyclists is likely to be riding. Consequently, a more frequent maintenance cycle to address these defects should be provided for bicycle

routes. Areas such as bridges where excessive debris tends to build up and bicyclists have limited refuge options should be maintained even more frequently.

Signal Clearance

Traffic signal timing and loops along bicycle facilities require extra attention. According to the MUTCD,[22]

> *"At installations where visibility-limited signal faces are used, signal faces shall be adjusted so bicyclists for whom the indications are intended can see the signal indications. If the visibility-limited signal faces cannot be aimed to serve the bicyclist, then separate signal faces shall be provided for the bicyclist.*
>
> *"On bikeways, signal timing and actuation shall be reviewed and adjusted to consider the needs of bicyclists."*

While the former can be easily evaluated, the latter concern (that of signal timing) is a little harder to address. The AASHTO *Bike Guide* provides information of clearance intervals and minimum green times for bicyclists.[23] At wide intersections, the clearance interval equation can result in some excessively long yellow-plus-all red periods for signals. If the facility consists of a shared use path or a bike lane, a signal loop can be placed in the bike lane or on the path in advance of the intersection. When a cyclist passes over the loop, the signal will extend the green time for the intersection approach to accommodate the crossing cyclists. This treatment is in common use for motorist and has been applied in various locations for bikes. The design of the loop is critical; the wrong loop in a bike lane will detect cars in the adjacent lane. An effective loop design for detecting bikes in bike lanes is a quadrapole 2 feet wide and 20 feet long (approximately half the size of a normal 40-foot roadway loop). Such a loop readily detects cyclists, but will not detect a car six inches to the side.

Roadway Symbol Buildup

Thermoplastic buildup is another concern of bicyclists. Bike lane symbols, lane use (directional) symbols, even crosswalks can all build up with repeated application and cause handling problems for bicyclists. More than two layers of thermoplastic (one marking) should not be allowed on bicycle facilities.

The slipperiness of thermoplastic and paints is another concern of bicyclists. One way to mitigate this concern is to add sharp silica sand to the glass spheres when it is being applied to the wet thermoplastic or paint. This increases the roughness of the markings' surface, reducing the potential for bicyclists to slip on the thermoplastic.

[22] FHWA, *MUTCD*, pg. 9D-1.
[23] AASHTO, p.65

Safety Railings along Bicycle Facilities

Bridge railing heights have been the subject of recent revisions to the AASHTO *Bike Guide* and ongoing debates among bicycle facility design professionals. The current guide states that railing heights should be at least 42 inches to prevent bicyclists who hit the railing from tipping over the top. However, the current AASHTO Bridge Specifications require a 54-inch railing. In practice, designers have been using the 54-inch railing when a structure is being built to the AASHTO specifications and a 42-inch railing along non-structural locations, such as when protecting bicyclists from embankments.

Bicycle Parking Facilities

Just as motorists need a place to park their cars when they arrive at destinations, bicyclists also need a place to park their bicycles. Consequently, when creating a transportation system to accommodate bicycling, parking must be included in that system. Bicycle parking is critical in areas where there are frequent bicycle riders such as shopping areas, schools, and other recreational areas. Bicycle parking should also be considered in Downtown Clayton and near businesses where bicyclists may frequent.

Typically, when parking is installed for bicyclists, the primary consideration is simply the accessibility or the convenience of the parking. While these are significant concerns for bicyclists, they are not the only issues. Bicyclists must also consider the security of the parking and the protection afforded to the bicycle.

The security concerns of bicycle parking can be addressed in several ways. High visibility of the parking rack can improve security. By locating parking near storefronts, or in high pedestrian use zones, the potential for theft or vandalism is reduced. Well-lit areas can improve the security in areas where bicycles are parked after dark. Providing racks that support the frame instead of the wheel make it easier to lock a bike without damaging it. Locking bike lockers also provide good security for bicycles.

The protection required for a bicycle varies with respect to the purpose of the bicycle trip. For short duration trips, such as to the grocery store or the library, U-shaped bicycle racks on a concrete pad in front of the building may be acceptable. At a park and ride lot, or in front of an office building where the parking is for commuters, bike lockers or covered parking is more appropriate.

There are four basic elements to bicycle rack design. First, the bicycle should be supported upright by its frame in at least two places. Second, the rack should enable the frame and one wheel to be locked. Third, the rack should be anchored so that it cannot be stolen with bikes on it. Fourth, the rack should be placed as

close to the building it serves as possible.

Bicycle racks can be tailored to reflect the culture or character of an area, or as a form of public art. Bike racks such as the one shown to the right make a statement about the area in which they serve as well as providing parking facilities for bicyclists.

For additional information on bike rack designs, the Association of Pedestrian and Bicycle Professionals (APBP) has produced a guidance document on good bicycle parking design. [24] The guidelines outlined in the reference covers rack design, rack placement, and specifics for appropriate layout of the rack area in dimensions and relation to the surrounding land uses.

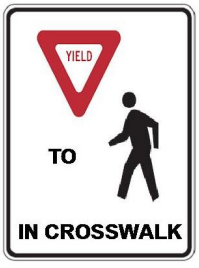
Safety Initiatives to Reduce Bicycle Motor Vehicle Crashes in Clayton

An analysis of bicycle crashes through the Division of Bicycle and Pedestrian Transportation database showed that between 1997 and 2004, there were only two bicycle crashes reported, with neither resulting in a serious injury. However, this low number may be a reflection of the number of crashes reported rather than the number of crashes that actually occurred. The next step for further study could include an analysis of the bicycle crashes in the area with mitigation measures provided at each problem site.

Engineering/Traffic Calming Countermeasures

Intersection Signage

Static signs such as NO TURN ON RED when Pedestrians Present or the Left Turning Vehicles Yield to Pedestrians have been found to reduce the incidence of pedestrian conflicts at intersections. Consequently, it is reasonable to expect that these signs would also reduce the conflicts between motorists and bicyclists riding on the sidewalk or on a sidepath. However, they should be used sparingly and only where a problem has been documented and relatively constant pedestrian/bicycle use of the intersection exists. The overuse of signs or the use of the signs where pedestrians or bicyclists are not using the crosswalks dilute the ability of the signs to command the attention of motorists. Eventually this results in the signs being just background visual clutter. Because they are real time traffic control devices, blank out signs like the one pictured to the right can continue to be effective at intersections

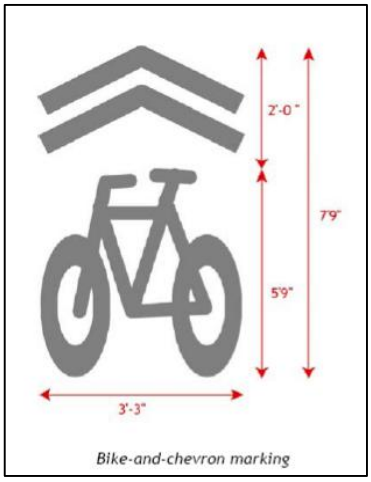


[24] Available at http://www.bicyclinginfo.org/pdf/bikepark.pdf.

because they are only activated when there is a potential conflict. If motorists see a YIELD TO PEDS sign next to a permissive left turn signal, the motorists will know a pedestrian is crossing the conflicting crosswalk at that time. This "real-time" aspect of blank out signs allows for them to be placed at locations where conflicts are not frequent or constant enough to make a static sign appropriate.

Shared Lane Symbol

The Shared Lane Symbol, or "sharrow," has the potential to reduce several different types of crashes and is being used in jurisdictions across the country. Because cyclists tend to center over the symbol, it may be useful for reducing door crashes (where a parked motorist opens a door into the path of a cyclist). Additionally, a similar treatment has been found to reduce wrong way riding and riding on the sidewalk, and to improve bicyclists' position in the travel lanes.



Bike-and-chevron marking

Consequently this treatment may actually reduce the incidence of motorist failure to yield to the bicyclist crashes and overtaking crashes. Despite the potential for these collateral improvements, this treatment is recommended only in very selective areas, such as adjacent to on-street parking, or completing a link in a bicycle route.

This treatment is experimental and has not been approved by FHWA, so it would require filing a Request to Experiment with FHWA prior to implementation. An evaluation plan must accompany this Request to Experiment and this must include measures of effectiveness. The following measures of effectiveness are suggested for Clayton:

- Separation between parked cars and bicyclists
- Percent of bicyclists riding on the sidewalk
- Percent of bicyclists riding against traffic
- Motorists' understanding of the symbol
- Bicyclists' understanding of the symbol

Transit Interface

At this time, no bicycle amenities are included in the transit services that service the Clayton area. The town does have subscription and dial-a-ride paratransit to certain authorized citizens provided by Coordinated Transportation Systems Inc. The Triangle Transit Authority (TTA) offers bus- and vanpool services to commuters likewise.

TTA regional buses are equipped with bicycle racks. However, this service is not currently available in Clayton. Bike racks on these vehicles help eliminate a barriers presented to those individuals who need their bicycle for supplemental

transportation after they deboard. Amenities for bikes on TTA or other future bus services should be considered as a way to enhance the multimodal riding experience for users by extending the catchment area for the transit service, giving bicyclists more options, and potentially increasing transit ridership.

Another amenity that should be considered to more fully integrate bicycle use and the transit system is the installation of bike racks near heavily used bus stops and destination points in town. With features such as bike racks, benches, and shelters, bus stops become more user-friendly environments.

Public Amenities

In addition to bicycle parking and provisions for bikes on buses, other amenities should be considered for implementation in order to create a more user-friendly bicycle system. Benches, water fountains, public restrooms, and changing areas provide riders with valuable services. These amenities are especially helpful in high traffic areas such as downtown and by major destination points such as shopping areas and schools.

Chapter 4 – Recommendations

After considering the bicycle focus areas and opportunities in Clayton, the next step in developing a comprehensive bicycle plan is to recommend a set of routes and facility types. A set of 6 named bicycle loops and connectors is recommended along with proposed greenway system improvements as shown in **Figure 4.1**. These loops and connectors can be studied from the perspective of individual routes or as an overall interconnected system. The facility types recommended for the segments of these routes are shown in **Figure 4.2**. This chapter describes the attributes of these 6 routes and 3 greenways in detail and provides a corresponding cost estimate for each. Cost estimates have been developed for each route based on the unit costs outlined in **Chapter 3** and on specific project attributes.

Proposed Bicycle Routes

Community Park Loop (Figure 4.3)

The **Community Park Loop** is a 7.3-mile route that connects the Clayton Community Park and future community center with two schools and several neighborhoods. In addition, this loop connects with the Little Creek Loop, the Legend Park Loop, and the Little Creek Greenway.

The recommendations for this facility consist of both on- and off-road improvements. Paved shoulders and wide outside lanes are recommended for the majority of the route, providing access to both schools in the loop. A series of multi-use paths is recommended for the remainder of this route. Part of the route will follow the Little Creek Greenway, and then split off to utilize a sidepath near the Lionsgate neighborhood. This will ultimately connect the Little Creek Greenway with the Community Park and the future community center. The Community Park Loop also provides a connector along Amelia Church Road across US 70. After this point, striped bicycle lanes are recommended to continue along Robertson Street as a part of the Legend Park Loop.

The estimated construction cost for this loop and associated connectors including the section running concurrently with the Little Creek Greenway is $3.4 million. Without the Little Creek Greenway section, the total estimated construction cost is $2.6 million.

Legend Park Loop (Figure 4.4)

The 5.5-mile **Legend Park Loop** connects downtown Clayton to Legend Park. As a part of the connection to Legend Park this loop will also link users to the 8-mile mountain bike trail within the park. This loop also connects to the Neuse River Loop, the Town Center Loop, the Municipal Park Loop, the

Community Park Loop, and the Park Greenway.

Except for sections of O'Neil and Robertson Streets in the downtown area, all of the roads used for the Legend Park Loop are recommended to have paved shoulders and wide outside lanes constructed. This will provide bicyclists with a refuge area while on the road, particularly important on a street such as Covered Bridge Road with its steep hills. Stallings Street currently has the width necessary to stripe wide outside lanes, and N O'Neil Street will have curb and gutter installed as new development comes into the area, thus making it an ideal candidate for wide outside lanes. There will be two connections to the Park Greenway from this route, with one on O'Neil Street and one on City Road.

The cost estimated for the construction of the Legend Park Loop is $2.2 million.

Little Creek Loop (Figure 4.5)

Little Creek Loop is an 8.4-mile route linking many different neighborhoods and downtown Clayton. In addition, the Little Creek Loop connects with the Community Park Loop, the Town Center Loop, and the Little Creek Greenway. The alignment for the future Clayton Bypass also passes through the Little Creek Loop.

The Little Creek Loop employs a variety of facility types over its length. Paved shoulders are recommended on Ranch Road since there is an interchange proposed for the Clayton Bypass (currently under construction) on that road. This will accommodate a higher volume of motorized traffic while still providing a space for bicycles. However, due to the low traffic volumes and rural character of the area around Barber Mill Road, it is recommended that this road be signed as a bicycle route. The Little Creek Loop crosses US 70 at two locations, both of which are discussed in the barrier analysis in Chapter 2. There will also be two connection points to the Little Creek Greenway on this route.

The total construction cost estimated for the Little Creek Loop is $2 million.

Municipal Park Loop (Figure 4.6)

The **Municipal Park Loop** is a 4.8-mile route that connects the Municipal Park with Legend Park and the Clemmons State Forest. This loop also connects with the Legend Park Loop and the Park Greenway.

The Municipal Park Loop recommends paved shoulders over its entire length, with a connector to the State Forest along Old US 70 recommended as a signed route. There will be two connections to the Park Greenway along the Municipal Park Loop, with one on Shotwell Road and one on City Road near Legend Park.

The total estimated construction cost for this route is $1.7 million.

Neuse River Loop (Figure 4.7)

The **Neuse River Loop** is a nearly 16-mile loop that connects downtown Clayton with Riverwood and the communities off of NC 42. The Town Center Loop, the Legend Park Loop, the Park Greenway, and the Neuse River Greenway all connect to this route. There are two connections to the Neuse River Greenway and four connections to the Park Greenway along the Neuse River Loop.

Wide outside lanes are recommended for O'Neil Street and paved shoulders are recommended for NC 42 and Covered Bridge Road until reaching the Riverwood area due to the high traffic levels and terrain on these roads. The remainder of Covered Bridge Road, as well as Loop Road and Castleberry Road are recommended to be signed due to their more rural character and their location well outside of the ETJ. The portion of the Neuse River Loop that runs along the Front Street extension and onto NC 42 up to the location of the future fire station runs concurrently with the Park Greenway and as such is recommended to be a multi-use path, functioning as a sidepath along the roads until reaching the existing Front Street. A signed bicycle route is recommended along Front Street to accompany the proposed street improvements in that area.

The estimated total construction cost for the Neuse River Loop is $3.3 million. Without the portion running concurrent with the Park Greenway, the total construction cost is $2.6 million.

Town Center Loop (Figure 4.8)

The **Town Center Loop** is a 3.2-mile facility that provides a route around the heart of downtown Clayton and links features such as the Clayton Center, the library, Cooper Elementary, and All-Star Park. This loop also connects with the Legend Park Loop, the Neuse River Loop, the Little Creek Loop, and the Park Greenway.

O'Neil Street and Lombard Street have widths amenable to accommodating striped bicycle lanes. The remainder of this route is recommended to be signed due to the low speeds and low volumes on the roads.

Due to the fact that no additional pavement has to be laid to create the facilities in this route, the construction cost of the Town Center Loop is estimated to be $75,000.

Little Creek Greenway (Figure 4.9)

The **Little Creek Greenway** is a 4.7-mile multi-use path that runs from near the Buckingham and Hunts Bridge neighborhoods to its terminus at Ranch Road. The greenway will follow the alignment of Little Creek and will provide a sort of parallel route for bicyclists and pedestrians to US 70.

The total construction cost estimated for this facility is $2.8 million.

Neuse River Greenway (Figure 4.10)

The **Neuse River Greenway** runs along the river bearing its name. This multi-use path will serve as the re-routed location for the Mountains to Sea Trail, connecting Clayton with Raleigh and Smithfield, and ultimately the entire state.

The Neuse River Greenway will connect to a future park, and will also intersect with the Park Greenway and the Neuse River Loop.

The cost for this greenway was estimated from Castleberry Road to the County Line in order to account for the area in or near the Clayton ETJ, resulting in a distance of 5.2 miles. This estimated construction cost is $3.1 million.

Park Greenway (Figure 4.11)

The **Park Greenway** is multi-use path running 8.8 miles primarily along small creeks in the area. This combined greenway, consisting of the Sam's Branch Greenway and the East Clayton Greenway, connects Legend Park, the future park by the Neuse River, downtown, and the neighborhoods in East Clayton. This multi-use path also connects the Municipal Park Loop, the Legend Park Loop, the Neuse River Loop, the Town Center Loop, and the Neuse River Greenway.

The Park Greenway runs concurrently with the Neuse River Loop for a portion of Front Street and NC 42. Along these areas the greenway will function as a sidepath. Elsewhere the easements along the small creeks are already owned by the Town, thereby eliminating purchasing or negotiating use of the right-of-way. A portion of the greenway south of NC 42 will be constructed by a developer in the area.

The total estimated construction cost for the Park Greenway is $5.3 million.

Construction Cost Estimates

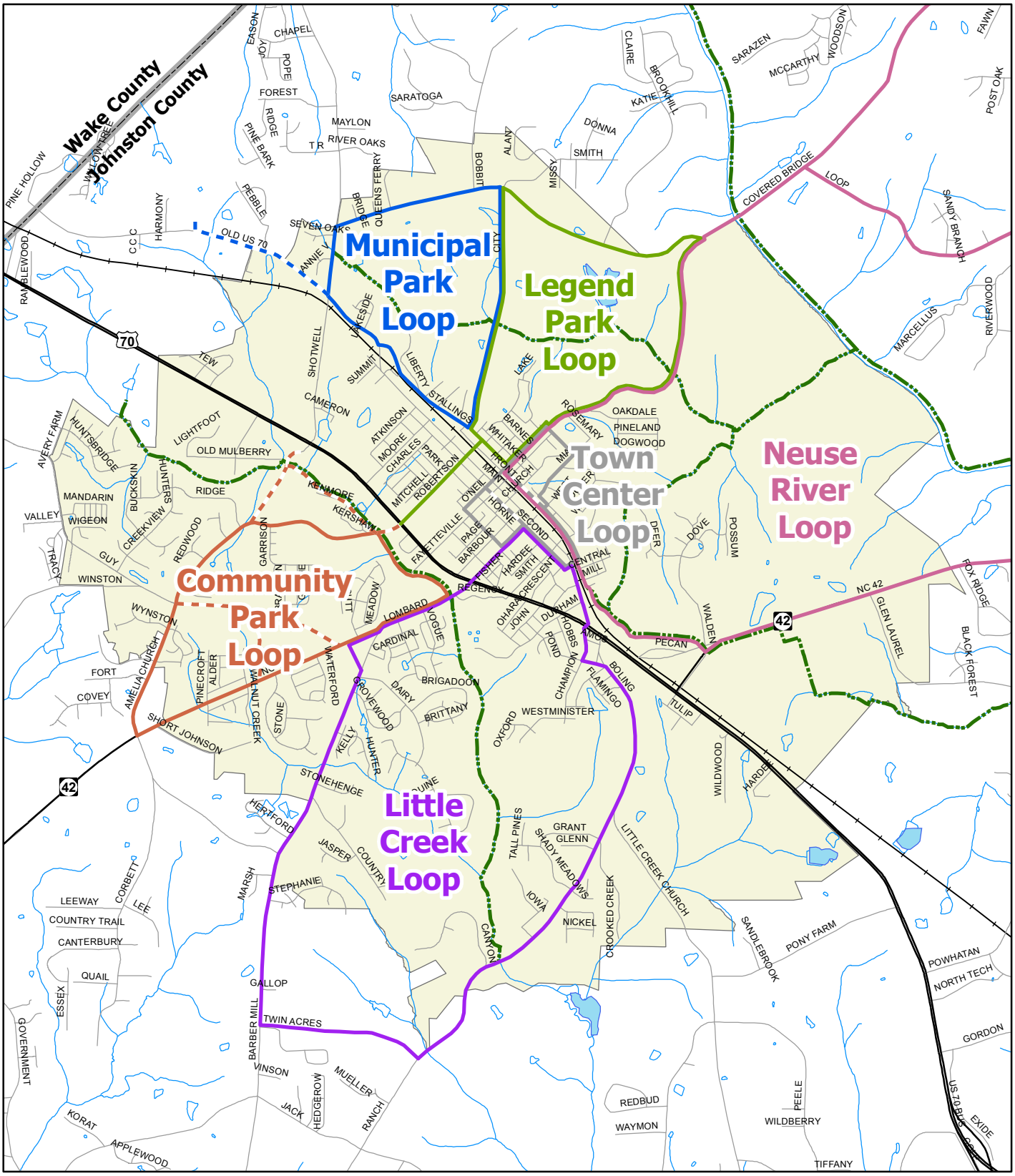
Table 4.1 provides a synopsis of the bicycle routes recommended in the Clayton Bicycle Plan. Each route is listed along with the presence of the various facility types within that route.

The lengths and estimated construction costs for the individual loops are also shown. These values assume that there are no existing facilities that will be shared, so that the cost can be considered for each route as a stand-alone value. In addition to this information, **Table 4.1** provides the total mileage of each facility type estimated as a part of the network, the overall length of all facilities in the network, and the total estimated construction cost for the entire network. This overall cost accounts for overlapping in the network so no facility is considered more than once.

From this table, it is shown that the total estimated construction cost for the proposed 55 miles of bicycle facilities is 21 million dollars. Additional cost estimate information can be found in the Appendix.

Table 4.1 Route and Network Characteristics

Routes	Signed Route	Striped Bike Lane	Wide Outside Lane	Paved Shoulder	Multi-Use Path	Length (miles)	Cost
Community Park Loop		✓	✓	✓	✓	7.3	$3,400,000
Legend Park Loop		✓	✓	✓		5.5	$2,200,000
Little Creek Loop	✓	✓	✓	✓	✓	8.4	$2,000,000
Municipal Park Loop	✓		✓	✓		4.8	$1,700,000
Neuse River Loop	✓	✓	✓	✓	✓	15.6	$3,300,000
Town Center Loop	✓	✓				3.2	$75,000
Little Creek Greenway					✓	4.7	$2,800,000
Neuse River Greenway					✓	5.2	$3,100,000
Park Greenway					✓	8.8	$5,300,000
Total (length in miles)	14.6	1.7	3.9	14.2	20.6	55.0	$21,000,000



Clayton Bicycle Plan

Figure 4.1 - Recommended Bicycle Routes

Kimley-Horn and Associates, Inc.

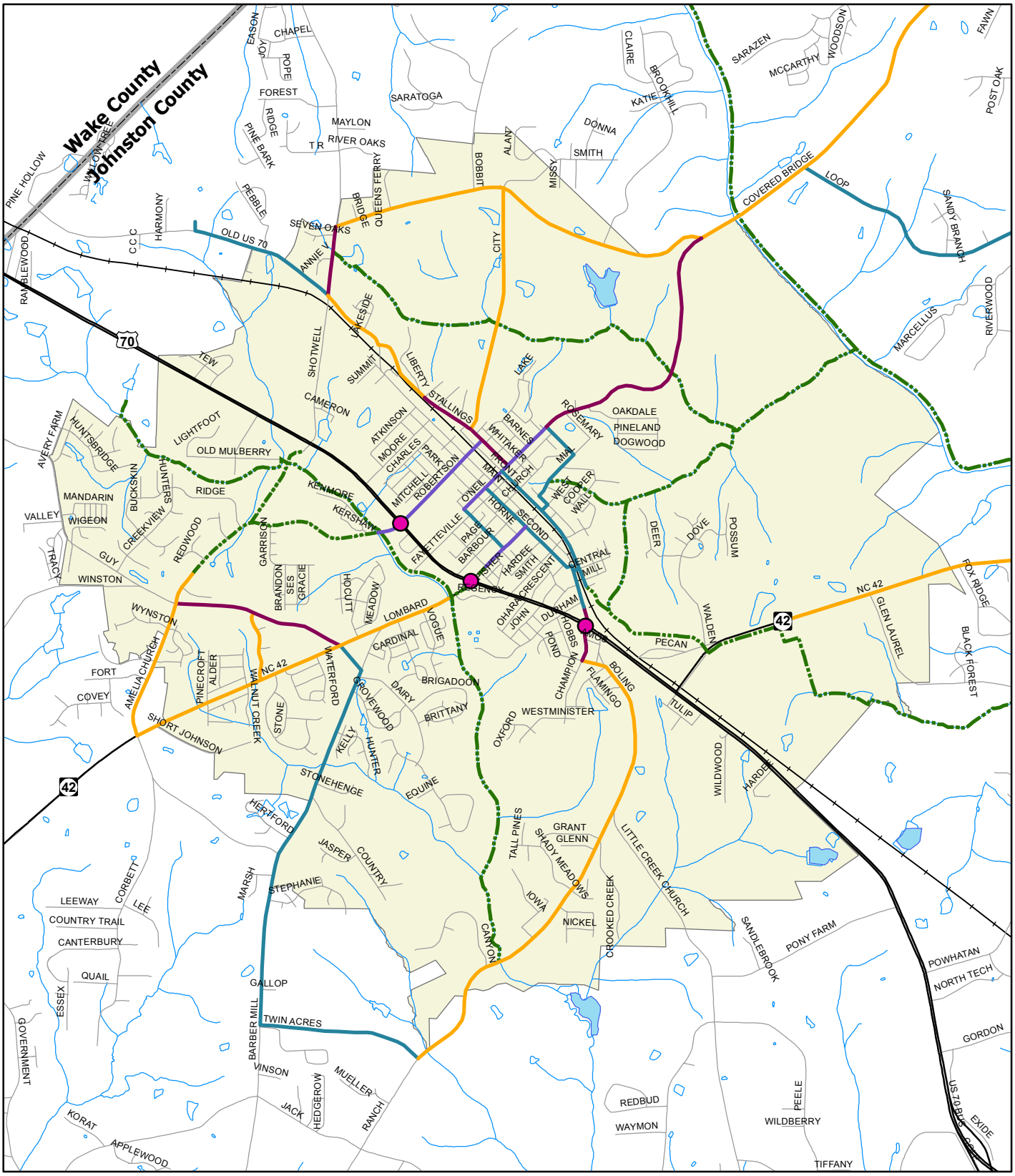
Clayton ETJ
County Boundary
Bodies of Water
Railroads

Recommended Bicycle Routes

Neuse River Loop
Municipal Park Loop
Legend Park Loop
Town Center Loop
Little Creek Loop
Community Park Loop
Municipal Park Connector
Town Center Connector
Community Park Connector
Proposed Greenways

N
W
E
S

0 0.125 0.25 0.5 0.75 1 Miles



Clayton Bicycle Plan

Figure 4.2 - Recommended Bicycle Facilities

Kimley-Horn and Associates, Inc.

Clayton ETJ

County Boundary

Bodies of Water

Railroads

Recommended Facility Types

Bike Lane

Multi-Use Path

Paved Shoulder

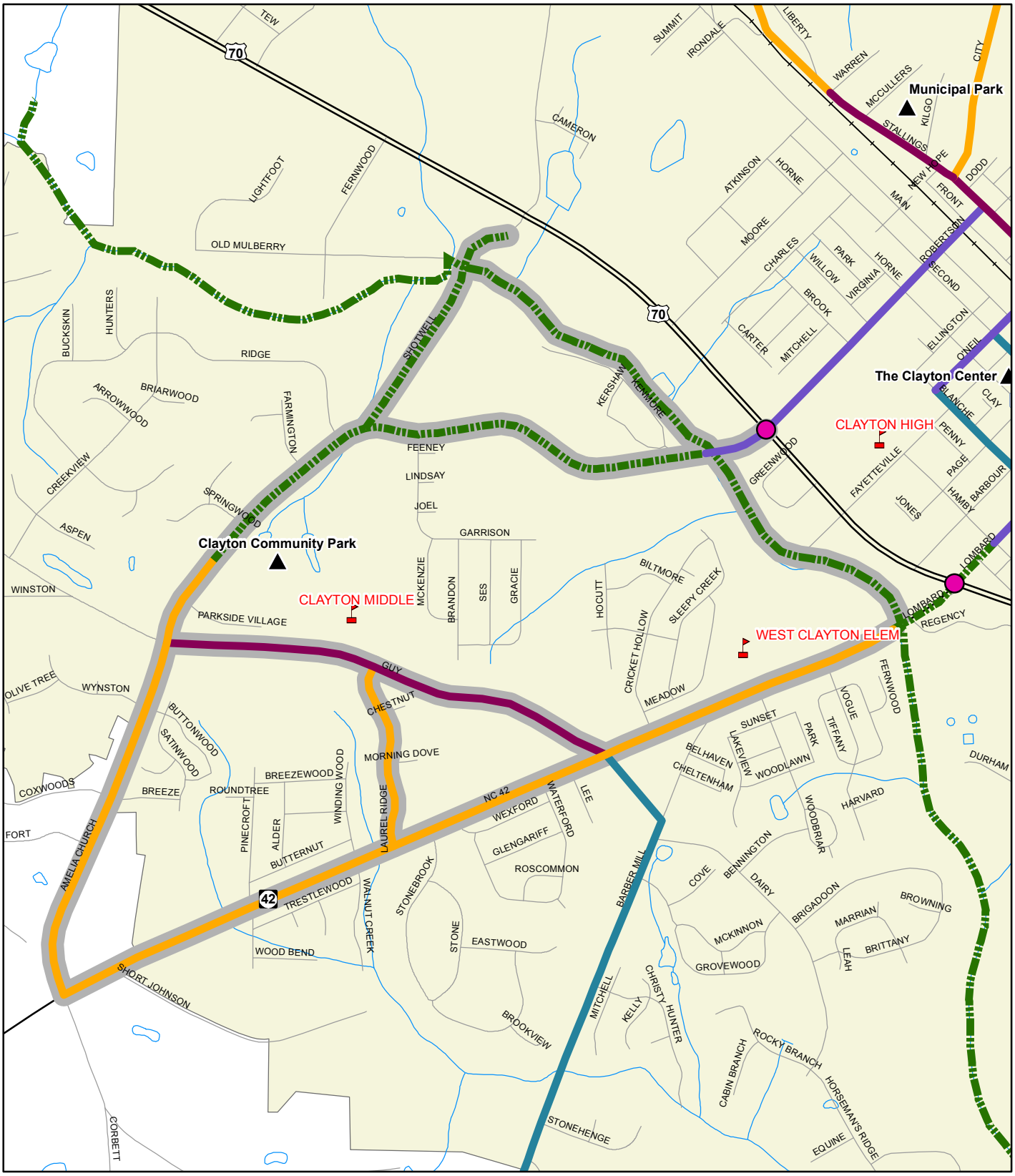
Signed Route

Wide Outside Lanes

Intersection Improvements

N W E S

0 0.125 0.25 0.5 0.75 1 Miles



Clayton Bicycle Plan

Figure 4.3 - Community Park Loop

Kimley-Horn and Associates, Inc.

Clayton ETJ

Bodies of Water

Railroads

TIP R-2552

Recommended Facility Types

Bike Lane

Multi-Use Path

Paved Shoulder

Signed Route

Wide Outside Lanes

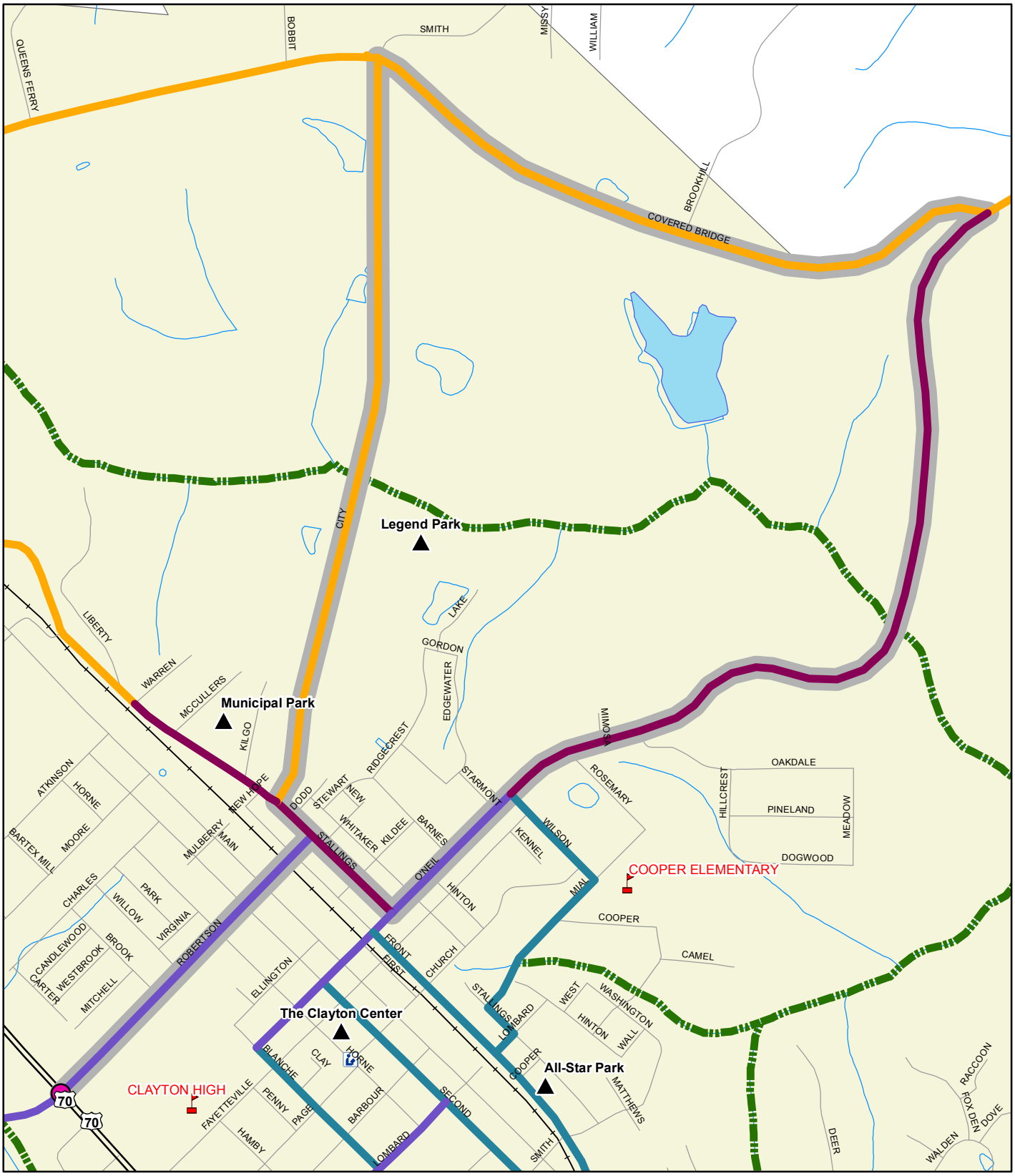
Community Park Loop

Intersection Improvements

Library

Destinations

Schools



Clayton Bicycle Plan

Figure 4.4 - Legend Park Loop

Kimley-Horn and Associates, Inc.

Clayton ETJ
Bodies of Water
Railroads
TIP R-2552

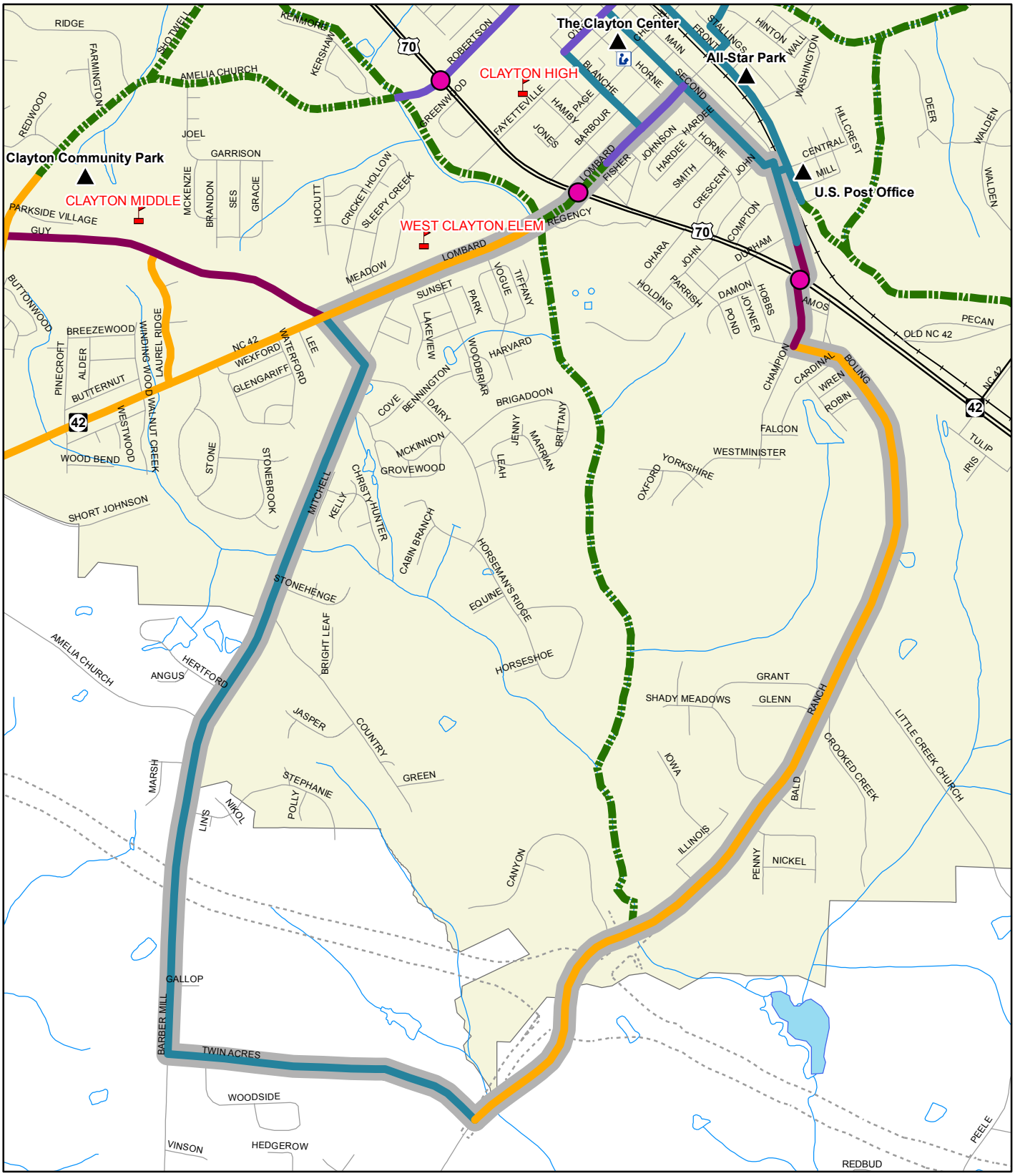
Recommended Facility Types

Bike Lane
Multi-Use Path
Paved Shoulder
Signed Route
Wide Outside Lanes
Legend Park Loop

Intersection Improvements
Library
Destinations
Schools

N
W
E
S

0 0.1 0.2 0.3 0.4 0.5 Miles



Clayton Bicycle Plan

Figure 4.5 - Little Creek Loop

Kimley-Horn and Associates, Inc.

Clayton ETJ
Bodies of Water
Railroads
TIP R-2552

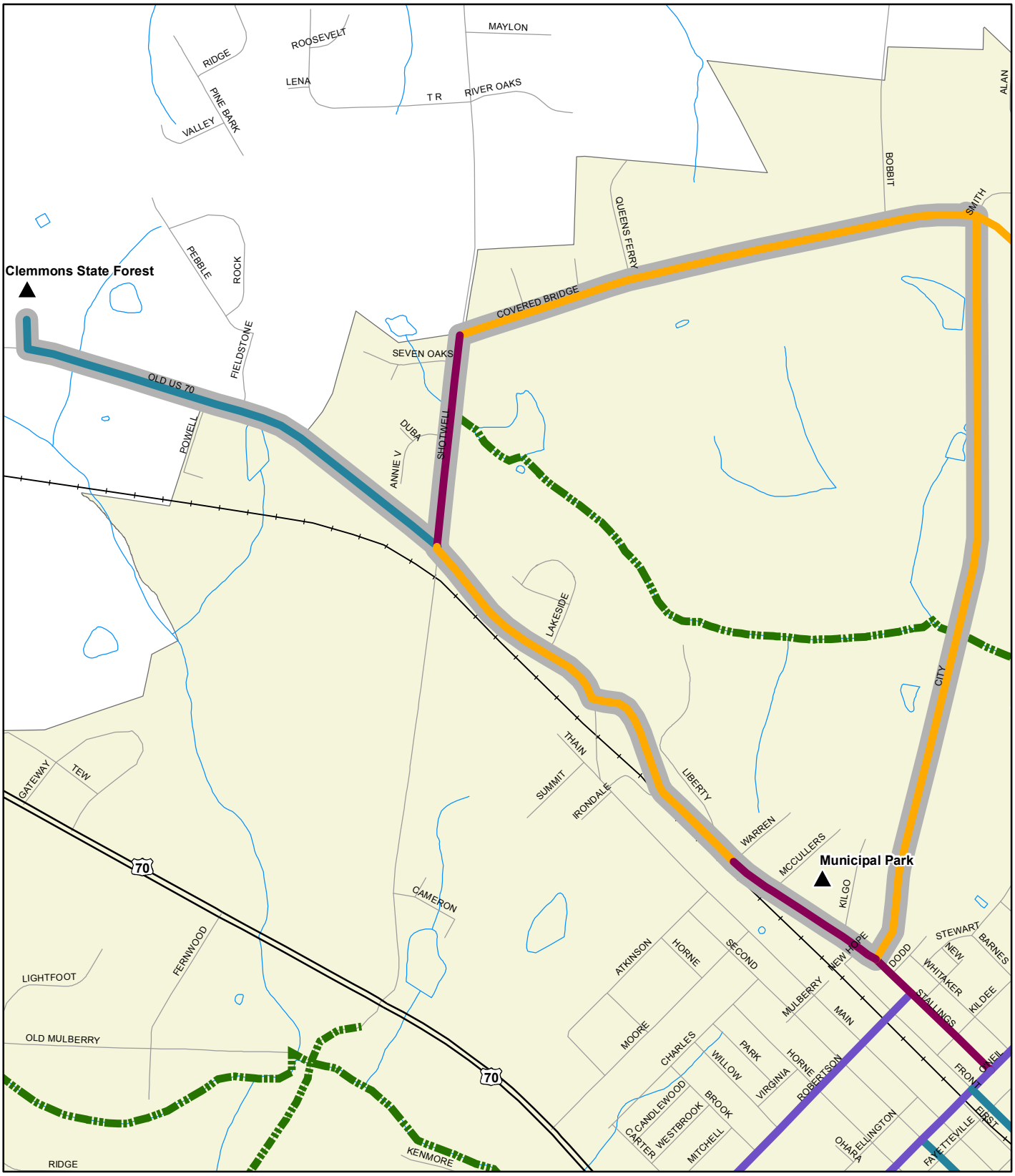
Recommended Facility Types

Bike Lane
Multi-Use Path
Paved Shoulder
Signed Route
Wide Outside Lanes
Little Creek Loop

Intersection Improvements
Library
Destinations
Schools

N
W
E
S

0 0.1 0.2 0.3 0.4 0.5 Miles



Clayton Bicycle Plan

Figure 4.6 - Municipal Park Loop

Kimley-Horn and Associates, Inc.

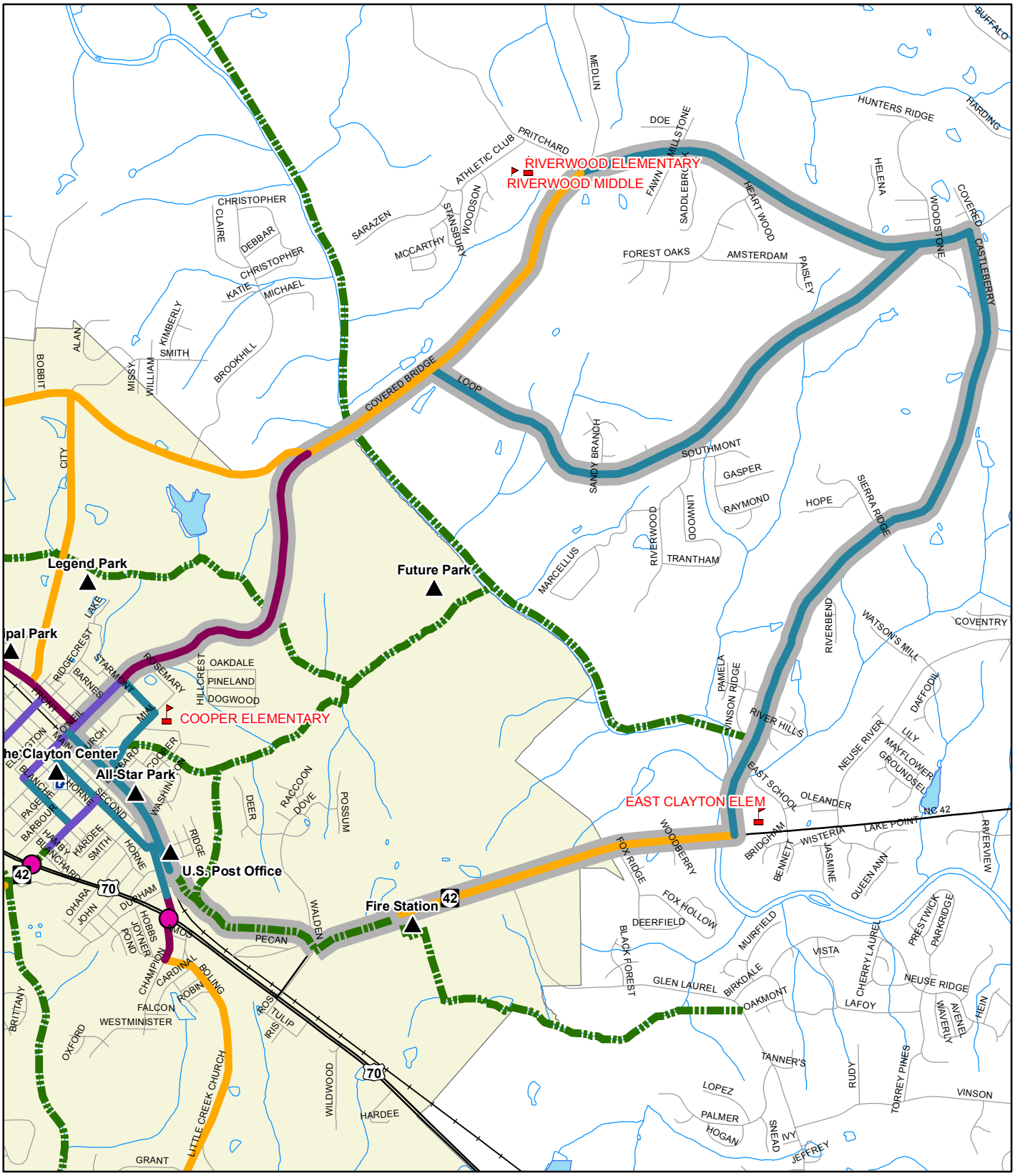
- Clayton ETJ
- Bodies of Water
- Railroads
- TIP R-2552

Recommended Facility Types

- Bike Lane
- Multi-Use Path
- Paved Shoulder
- Signed Route
- Wide Outside Lanes
- Municipal Park Loop
- Intersection Improvements
- Library
- Destinations
- Schools

N W E S

0 0.1 0.2 0.3 0.4 0.5 Miles



Clayton Bicycle Plan

Figure 4.7 - Neuse River Loop

Kimley-Horn and Associates, Inc.

Clayton ETJ

Bodies of Water

Railroads

TIP R-2552

Recommended Facility Types

Bike Lane

Multi-Use Path

Paved Shoulder

Signed Route

Wide Outside Lanes

Neuse River Loop

Intersection Improvements

Library

Destinations

Schools

N W E S

0 0.2 0.4 0.6 0.8 1 Miles

Clayton Bicycle Plan

Figure 4.8 - Town Center Loop

Kimley-Horn and Associates, Inc.

Clayton ETJ

Bodies of Water

Railroads

TIP R-2552

Recommended Facility Types

Bike Lane

Multi-Use Path

Paved Shoulder

Signed Route

Wide Outside Lanes

Town Center Loop

Intersection Improvements

Library

Destinations

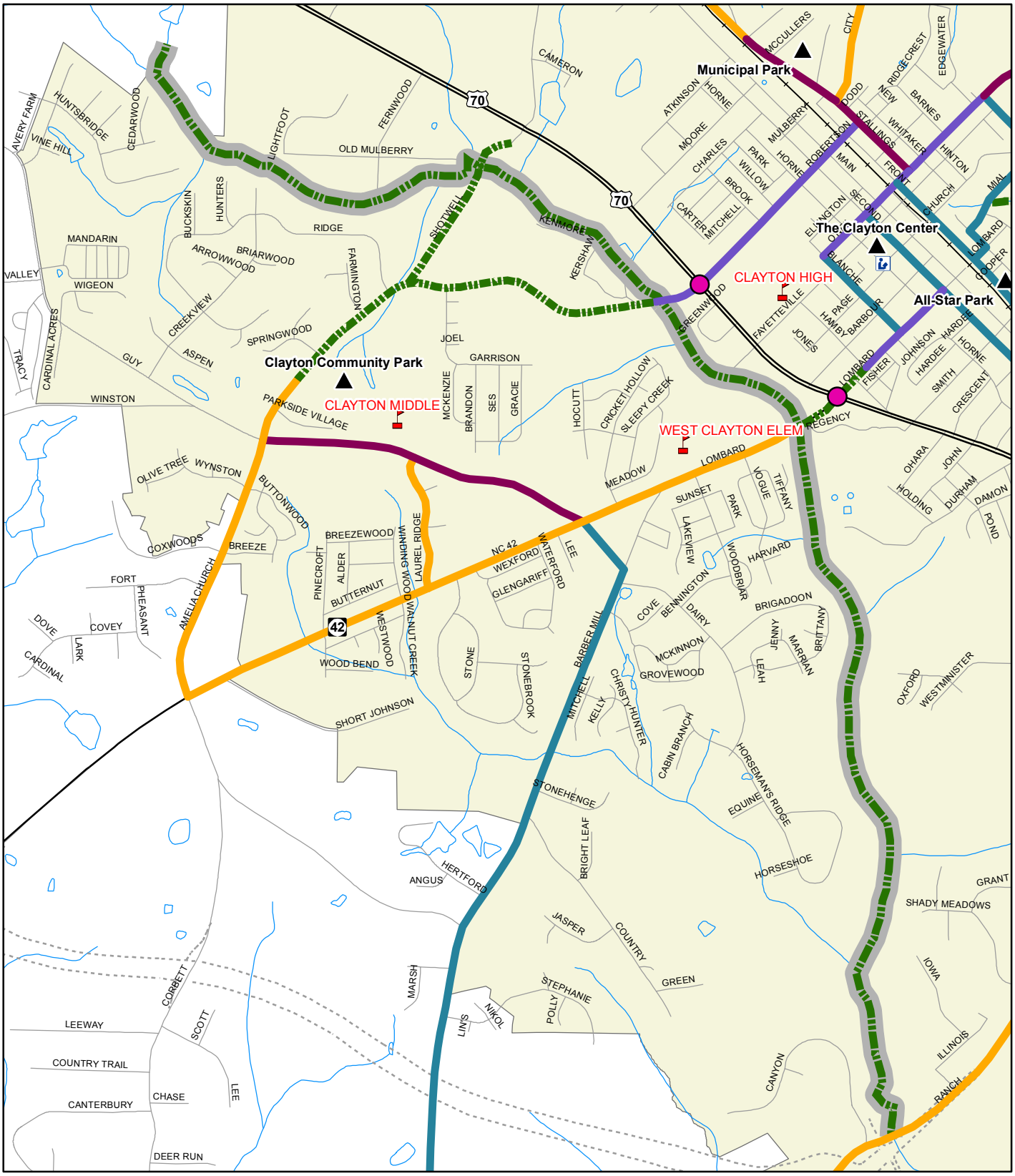
Schools

N

W E

S

0 0.05 0.1 0.15 0.2 0.25 Miles



Clayton Bicycle Plan

Figure 4.9 - Little Creek Greenway

Kimley-Horn and Associates, Inc.

Clayton ETJ
Bodies of Water
Railroads
TIP R-2552

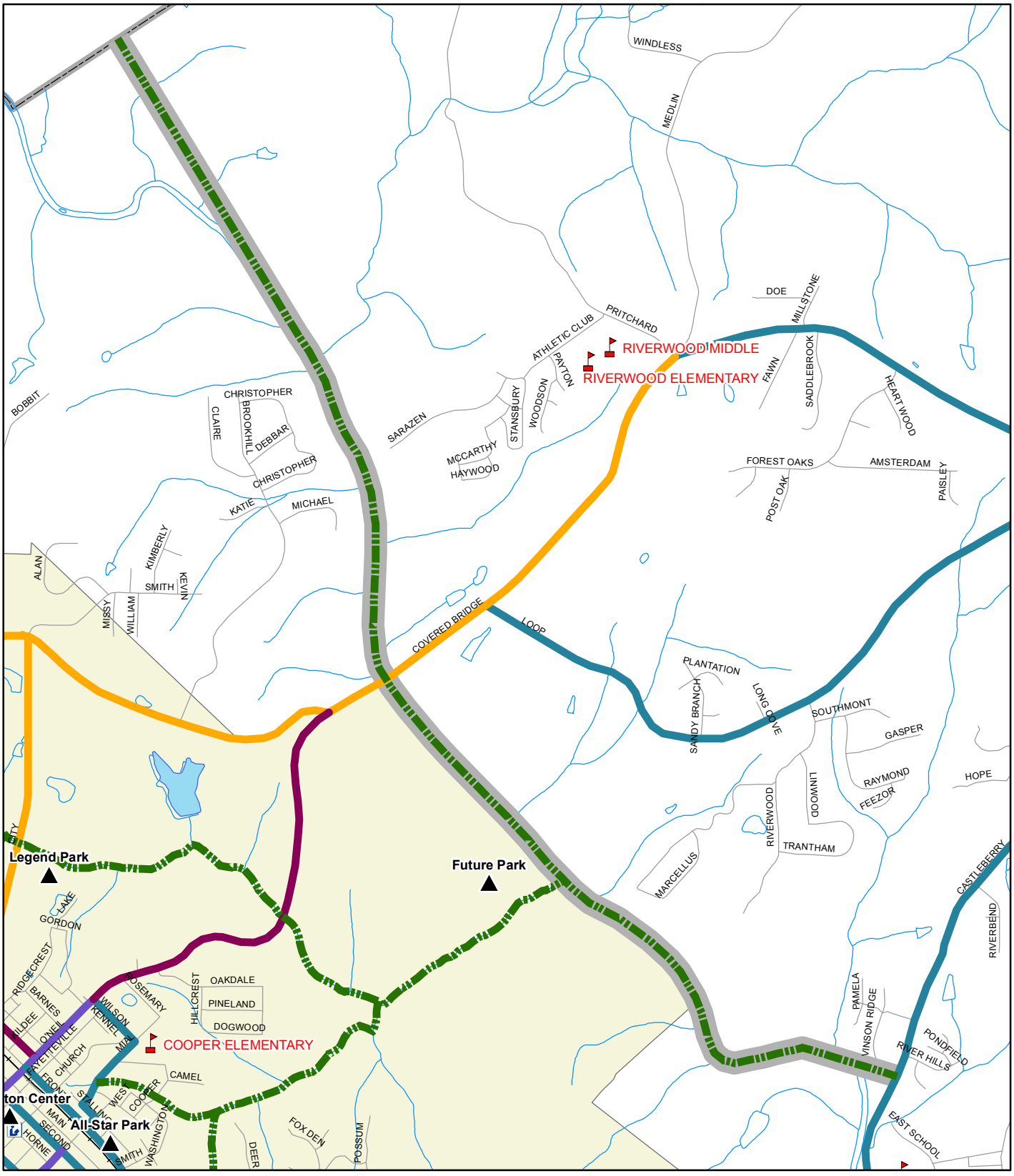
Recommended Facility Types

Bike Lane
Multi-Use Path
Paved Shoulder
Signed Route
Wide Outside Lanes
Little Creek Greenway

Intersection Improvements
Library
Destinations
Schools

N
W
E
S

0 0.2 0.4 0.6 0.8 1 Miles



Clayton Bicycle Plan

Figure 4.10 - Neuse River Greenway

Kimley-Horn and Associates, Inc.

- Clayton ETJ
- Bodies of Water
- Railroads
- TIP R-2552

Recommended Facility Types

- Bike Lane
- Multi-Use Path
- Paved Shoulder
- Signed Route
- Wide Outside Lanes
- Neuse River Greenway
- Intersection Improvements
- Library
- Destinations
- Schools

N W E S

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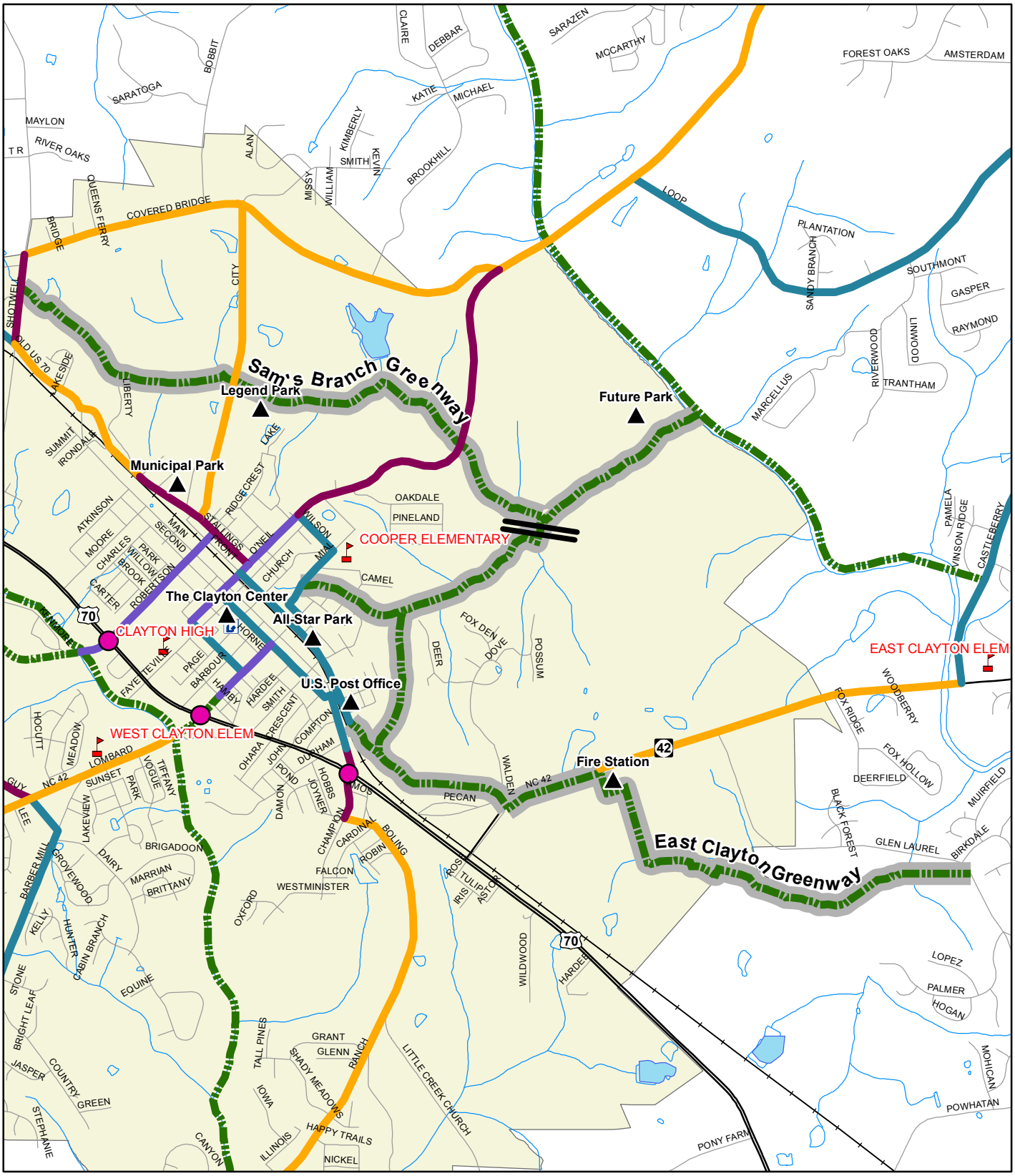


Clayton Bicycle Plan

Figure 4.11 - Park Greenway

Kimley-Horn and Associates, Inc.

Clayton ETJ

Bodies of Water

Railroads

TIP R-2552

Recommended Facility Types

Bike Lane

Multi-Use Path

Paved Shoulder

Signed Route

Wide Outside Lanes

Park Greenway

Intersection Improvements

Library

Destinations

Schools

N W E S

0 0.2 0.4 0.6 0.8 1 Miles

Education, Enforcement, and Encouragement Program Recommendations

The network of bicycle facilities recommended in Clayton should be complemented by education, enforcement, and encouragement programs. As new shoulders, bike lanes, and pathways are constructed, it will be important for bicyclists of all skill levels to be educated about safe ways to use these facilities. Bicycle safety is not the sole responsibility of bicyclists, however. To provide a comfortable and approachable environment for bicycles, motorists must treat bicyclists as legitimate users of the road. Both motorists and bicyclists have a responsibility to use roadways in a safe manner. If they behave unsafely, their actions should be discouraged through police enforcement.

And while discouraging inappropriate and unsafe behavior is important, it is equally as important to encourage appropriate behavior. Below are some recommendations for ways to promote safe use of Clayton's network of bicycle facilities.

As a part of the public outreach effort, local citizens and the BAC were asked to rank several bicycle educational and encouragement programs for their community. The results indicated that the following programs ranked the highest:

- Public Service Announcements (i.e., Share the Road")
- Safe Routes to School
- Public Bicycle Map

Education Programs

The community itself often provides valuable resources in developing and promoting bicycle programs. Law enforcement officials, local bicycle shops, local bicycle advocacy groups, educators, church organizations, public health professionals, local media, and other community groups can all offer resources to the Town as it strives to establish a broad-based bicycle safety education campaign.

Incorporating the diverse community groups listed above in education programs allow people of all ages and bicycling abilities to become more informed about bicycle safety. Because these programs can help drivers operate more safely around bicyclists, they should address both bicyclists and drivers.

- Avoid riding on sidewalks. If it is necessary to ride on a sidewalk, be aware of risks at intersections.

For motorists:

- Obey speed limits. Higher speeds result in greater injuries to cyclists and pedestrians.

Rules of the Road

Conveying the proper way to operate on roadways is a cornerstone of any bicycle safety education campaign. A summary of these "rules of the road" is provided below.

For cyclists:

- Always wear a properly fitting helmet.
- Be visible. If riding at night, use lights, reflectors, and bright clothing.
- Ride predictably and defensively. Use hand signals before turning.
- Follow the same laws that apply to motorists, obeying all traffic signals, signs, and lane markings. Always yield to pedestrians.
- Ride on the right side of the road with the flow of traffic — never against it.

- Obey signs, signals, and markings. Never run red lights.
- Yield to cyclists. Always look for bicyclists when turning.
- Pass cyclists with care. Slow down and provide enough space when passing.
- Do not honk your horn close to cyclists.
- Look for cyclists when opening car doors.
- Watch for children.
- Watch for bicyclists riding at night.

Other Critical Safety Issues

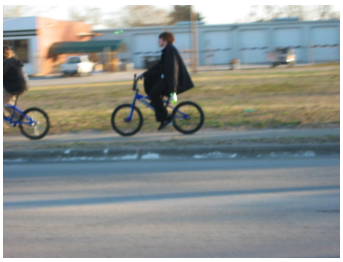
In addition to the rules of the road, other critical safety issues that should be addressed by the Clayton bicycle safety campaign include:

- Riding against traffic
- Riding on sidewalks

- Riding at night

These three behaviors can increase the risk of bicycle-motor vehicle crashes.

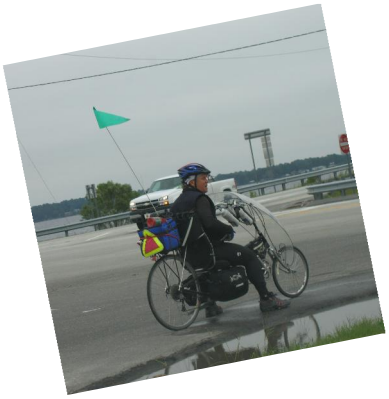
Riding Against Traffic — A common practice in the Clayton area is riding against traffic, which increases the risk of being involved in crashes at driveways or intersections. Most right-turning drivers only look left before they turn, which means they can miss seeing bicyclists approaching from the opposite direction. Graphics like the one below can be used by the Town to educate bicyclists about the risks associate with this behavior.



Riding on Sidewalks — When asked why they ride on sidewalks rather than on roads, bicyclists often say they feel more comfortable being on a facility that is separated from motor vehicles. They are not as safe, however, as they might think. Similar to the hazards faced by riding against traffic, bicyclists riding on sidewalks do not approach intersections from the same areas as motor vehicles, making it difficult for drivers to see them and making them more susceptible to crashes.

When forced to ride on the sidewalk because no other choice would be reasonable, bicyclists should try to ride in the same direction as vehicles in the adjacent roadway lanes. Even so, an education program should inform bicyclists who chose to ride on the sidewalk about the potential dangers they face with this behavior.

Riding at Night — Riding at night can be dangerous for bicyclists, when road hazards can be hidden in the dark and motorists don't have as much sight distance as in the day. Bicyclists who must travel at night need to ride with lights in order to increase their visibility to drivers. Yet even bicycles properly fitted with reflectors and lights can be overlooked by motorists until it is too late for the driver to react.



Bicyclists need to be educated about the dangerous impacts of a dark environment. The Town should distribute posters or fliers that show sight distances for various colors of clothing and illustrate the limitations of reflectors.

The educational campaign should help inform bicyclists about various safety issues. However, motorists also need to be informed so they can be made aware of bicycle crash risks. The Town's education program should instruct

motorists to look in both directions for bicyclists when turning at intersections, drive more slowly, and be aware the potential for bicyclists to be riding at night.

Elements of the Safety Education Campaign

To be truly effective, the Town should implement a broad-based education campaign. Bike rodeos, bicycle safety education programs in schools, public service announcements, and documents, such as posters, brochures, and websites can all be valuable tools in creating a bike-friendly environment.

Bike Rodeos

Clayton police currently offer bicycle rodeos by request only to teach basic bicycling skills and rules of the road. The Town of Clayton should partner with local law enforcement and volunteer bicyclists to offer bicycle rodeos several times during the year. These rodeos could be the initial stages in developing a more comprehensive safety education program for local schools.

School-Based Bicycle Safety Education

The current school curriculum does not spend much time on bicycle safety. Now

is the perfect opportunity to work with local elementary schools to develop a pedestrian and bicycle safety education program. Pedestrian and bicycle safety could be incorporated into the regular physical education classes. While children in Kindergarten and Grades 1 and 2 could be taught about pedestrian safety, Grades 3, 4, and 5 could be given hands-on bicycle safety lessons about wearing helmets, following the rules of the road, and turning and signaling. NCDOT's *Basics of Bicycling Curriculum* could serve as the basis for Clayton's classroom efforts. The Town also could enlist the support of local bicyclists and law enforcement officers for bike lessons.

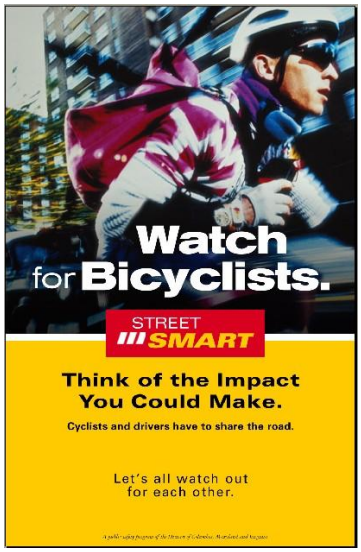
To make the most of the education program, Clayton should target one or two schools during its first year, then expand it to all elementary schools in the Town.

One potential source of funding could be the Governor's Highway Safety Program 402 Funds or the new state Safe Routes to School program. Building partnerships with local public and private schools could also lead to additional financial support.

Public Service Announcements

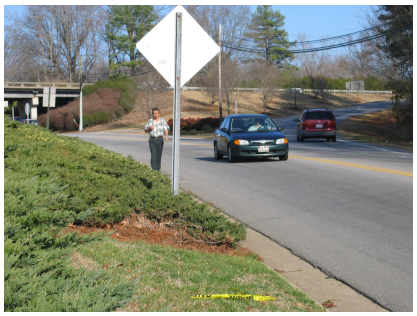
One method of informing the public about safe bicycle riding and driver

courtesy is through public announcements on television and radio. By developing and broadcasting public service messages about bicycle safety, the Town of Clayton will be able to reach additional community members.



Other Educational Materials

In addition to announcements and hands-on programs, the Town should develop written material and images to distribute throughout the community. Brochures, posters, and web pages all will help increase awareness of potentially dangerous situations. The print materials can be provided at local businesses, schools, and public buildings.



State Support for Bicycle Education

A significant amount of information regarding bicycle safety already has been developed by the NCDOT Department of Bicycle and Pedestrian Transportation. Educational materials for children to learn the basics of bicycling, safety, and how to follow the law are available, and posters, pamphlets and brochures, and educational videos can be ordered online or by calling the Department.

In addition to offering educational programs, the NCDOT Bicycle Policy also supports the development of bicycle programs in Clayton:

- State, county, and local law enforcement agencies are encouraged to provide special training for law enforcement personnel with regard to bicycling.
- Education of both motorists and bicyclists on bicycle rights and responsibilities shall be an integral part of the NCDOT Bicycle Program.
- School systems are encouraged to conduct bicycle safety education programs as a part of and in addition to the driver's education program, to the maximum extent practicable.
- The Division of Motor Vehicles is urged to include bicycle safety and user information in its motor vehicle safety publications.

Enforcement Programs

When it comes to bicycle safety, education is important, but so is enforcement. The Town of Clayton should work with Johnston County and the North Carolina State police to establish a well-publicized countywide, coordinated bicycle enforcement campaign. Through this enforcement effort, bicycle safety will be shown as a shared responsibility between bicyclists and motorists. To enforce the laws regarding bicycle safety, it is important to understand what they are and what they mean.

State Bicycle Statutes

Some of the North Carolina statute bicycle-related laws are identified below:

Laws Addressing Bicyclists

- In North Carolina, the bicycle has the legal status of a vehicle. Bicyclists have full rights and responsibilities on the roadway and are subject to the regulations governing the operation of a motor vehicle.
- Bicyclists are required to use both a front lamp and rear reflector when riding at night.
- All bicyclists under the age of 16 must wear a bicycle helmet on public roads, paths, and rights-of-way.
- Bicycles traveling under the posted speed limit must ride in the right-hand lane or as close as practicable to the right-hand curb or edge of the highway, except when overtaking and passing another vehicle or when preparing for a left turn.

Laws Addressing Drivers

- A vehicle overtaking a bicyclist must pass at least two feet to the left of the bicyclist, and is not allowed to drive to the right side of the roadway until safely clear of the bicyclist.
- Motorists must not follow a bicyclist more closely than is reasonable, showing appropriate respect for the speed of such vehicles and conditions of traffic and pavement on the highway.

Targeted Behaviors

Behaviors that go against the laws in North Carolina concerning bicycles should be targeted for enforcement, including the following:

Bicycle Behaviors

- Violating traffic signals
- Riding against traffic on the roadway
- Riding at night without lights

Driver Behaviors

- Not allowing enough space when passing cyclists
- Not yielding to bicyclists when turning
- Speeding

Bicycle Licensing Program

A bicycle licensing program is one method of enforcing bicycle safety that the Town of Clayton should also consider. By requiring bicyclists to register and affix a license tag to their bicycles, the program could help identify bicyclists who might be unresponsive after an accident. This could help rescue personnel quickly establish an accident victim's identity, leading to improved decision-making for emergency medical treatment. Another benefit of a bicycle licensing program is deterring bicycle theft and increasing the opportunity for stolen bicycles to be returned to their proper owners.

Encouragement Programs

Several sets of programs can be established to encourage residents to use the new bicycle facilities.

Safe Routes to School

The implementation of a Safe Routes to School program has helped communities across the nation promote pedestrian and bicyclist safety. Funding is available for this program, and the Town of Clayton should work with local schools and bicycle advocacy groups to apply for state funding. The program should be designed increase the number of students walking and bicycling to school through improved facilities and encouragement. For additional information about this program, please see the website www.saferoutestoschools.org.

Two pilot schools should be selected to be the first in Clayton to implement the Safe Routes to Schools program. The program can then be expanded to additional schools in the future. In terms of funding, the 2005 SAFETEA-LU federal transportation bill has allocated $2.36 million in funding for Safe Routes to Schools Programs in North Carolina in Fiscal Year 2006. This year, NCDOT will identify a new NCDOT Safe Routes to School Program Coordinator who can provide advice and help guide the program in Clayton.

Walk and Bicycle to School Day

In the past decade, many North Carolina schools have identified "walk and bicycle to school" days. Through these programs, schools are able to increase awareness of bicycling and walking as fun, healthy transportation choices. This

kind of encouragement also brings the added benefit of reducing automobile congestion and pollution near schools.

Other School-Based Programs

Other activities that could encourage bicycling include organizing a "bicycling school bus" where students meet and bicycle to school as a group, establishing a "frequent rider" club through which students could earn points and prizes, and giving away bicycle helmets to classes that have the highest number of students bicycling to school. Local bicycle groups should be contacted to see if they can sponsor these programs.

Public Bicycle Map

A public bicycle map for the Clayton area can be an effective means of spreading information regarding bicycle routes and education measures. Identifying safe bicycle paths and making the public aware of the bicycle amenities available to them is the cornerstone of an effective bicycle education program.

Bike Mentor Program

One way to encourage bicyclists is by taking advantage of the people who are already bicycling. Clayton should consider establishing a bike mentor program to match adults who would like to learn more about commuting by bicycle with an experienced volunteer. This gives bicyclist the opportunity to share optimal commuting routes as well as cover important safety basics, such as how to bicycle in traffic, in the dark, or in the rain. This is an effective way to make new bicyclists more comfortable with the idea of bicycling for transportation purposes.

Bike to Work Week

Another idea for promoting bicycling is identifying and publicizing a "Bike to Work" week. Local employers might compete to see which can have the greatest percentage of employees bicycle at least one day during the week, or give away bicycles or bicycle helmets.

Clayton should consider sponsoring a bicycle rally downtown. May is typically considered Bicycle Month in the U.S., so Clayton could select a week to

encouraging bicycling to work. In fact, May 2006 marks the 50th Annual National Bike Month™ designated by the League of American Bicyclists.

Bicycle Rideabout

A bicycle rideabout can be a great way to promote interest in bicycling in Clayton. A rideabout typically consists of a short (three to five mile) ride around bicycle-friendly roads in the community. The Town of Clayton Police Department should also get involved with the ride in order to provide this opportunity to inexperienced riders who may want to participate as well as to help direct traffic at key intersections along the route. Bicycle groups in the area can use a rideabout as a recruiting opportunity or just a fun exercise. This also allows citizens to speak with town staff and learn about the bicycle planning projects that are ongoing in the community. A bicycle rideabout is suitable as a stand-alone event, as a part of a larger festival or event, or as an event kicking off/opening a new bicycle facility or program.

Bicycle Friendly Community

Administered by the League of American Bicyclists, the Bicycle Friendly Communities Campaign identifies communities that provide safe accommodations for bicyclists while also encouraging bicycling for transportation and recreation. Clayton should apply for the Bicycle Friendly Community designation within five years of developing the Comprehensive Bicycle Plan. Cary and Carrboro are two cities in the region that have been awarded this honor previously.

Chapter 5 – Implementation

Introduction

Plan, design, and implementation are all critical components of a successful plan. Bicyclists and walkers within the community desire the facilities that will allow them to commute, exercise and enjoy the "small town" character and natural environment that gives Clayton its charm. However, waiting on public funds to build needed bicycle amenities can be frustrating and time-consuming. In addition, the planning, design, and construction of publicly-funded bicycle projects and greenways can be a multi-year commitment. With this in mind, now is the time to think about how public policy can benefit from partnering with the state and local development community to help expedite the implementation of bicycle improvements.

Bicyclists and walkers within the community desire the facilities that will allow them to commute, exercise and enjoy the "small town" character and natural environment that gives Clayton its charm.

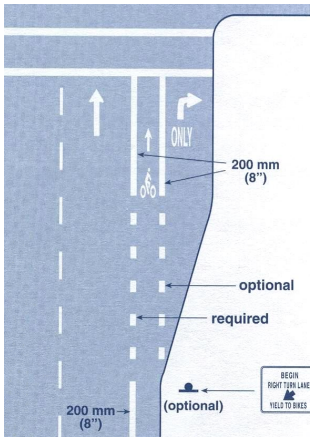
This chapter provides general policy recommendations and an action plan to assist local decision-makers and planning staff in the implementation of the *Clayton Comprehensive Bicycle Plan*. As shown in previous chapters of this report, an interconnected network of bicycle loops supported by ancillary facilities such as bike parking, water fountains, bathrooms, and bike route kiosks can further the Town's goal of developing a safe and convenient bicycle-friendly community. Specifically, this chapter attempts to identify short-, mid- and long-term implementation strategies for bicycle policy measures, education and encouragement program initiatives as well as infrastructure improvements. Ultimately, the "action plan" will be used by local planning staff and elected officials to implement improvements and programs on a continual and timely basis – building on the momentum of this study.

Action Plan

To firmly establish *Comprehensive Bicycle Plan* principles into the normal course of business in Clayton, several amendments to current policies and programs are recommended, including the following:

1. *Clayton Comprehensive Bicycle Plan* — the Town of Clayton should adopt the *Comprehensive Bicycle Plan* (map) as a part of the Comprehensive Plan and state-maintained Comprehensive Transportation Plan (CTP) map. The State will serve as the lead transportation agency to

implement bike planning activities within other areas of the region, while the Town will control the areas within Clayton itself. These will use all available strategies to obtain rights-of-way, ensure connectivity, approve requested variations, and secure funding agreements.



2. Clayton and Johnston County should update the Street Design Standards to include general street design requirements (pages 3-5 through 3-13) and recommended cross-sections (pages 3-14 and 3-15).

3. Considering the success of the recent Rodeo/Rideabout held on June 11, 2006, the Town can carry that momentum forward and implement annual public events to celebrate bicycling in Clayton. With this in mind, the Town should conduct two annual sponsored bicycle events – possibly spring and fall activities. The events could include a Bike Rodeo or Rideabout to encourage more riders as well as educate cyclists on proper "rules of the road".

4. Development Review Process — The Town should require new development projects to incorporate bicycle provisions in their proposed projects. At a minimum, all new collector streets with posted speeds of 35 mph or less should include two four-foot bike lanes. Also, the Town should update the Unified Development Code to include bicycle parking and sidewalk requirements on new development projects.

5. Performance Measures – Clayton should work with the BAC to establish performance measures to benchmark progress in achieving the goals of this plan. These performance measures should be stated in an official report after the plan is completed. The performance measures should address the following aspects of bicycle transportation in Clayton:

Establish performance measures to benchmark progress

- Usage — Measures that document how many people are bicycling
- Safety — Measures of bicycle crashes or injuries
- Facilities — Measures of how many bicycle facilities are available or the suitability of bicycling on roadways
- Education/Enforcement — Measures of the number of people educated or number of

people ticketed as a part of a bicycle safety campaign

- Institutionalization — Measures of the total budget spent on bicycle projects and programs or the number of Town employees receiving bicycle facility design training

The Town should set performance measures that:

- Are related to the goals of the plan
- Provide a description of the data that need to be collected
- Utilize data that can be collected cost-effectively
- Are quantifiable and time-constrained (e.g., construct 2 miles of bike lanes by 2008)
- Can be reported at regular intervals, such as in an annual bicycle performance measures report

6. Incidental Bicycle Projects - As a result of Transportation Improvement Program or Public-Private funds, certain sections of some of the bicycle routes may be implemented earlier than the routes of which they are a part. These sections are listed below.

   - Amelia Church Road – Town staff is currently working with a private developer to pursue a multiuse path along Amelia Church Road connecting Little Creek Greenway to the Community Park. This would require a 10 foot removable bridge across Little Creek.
   - O'Neil Street, Lombard Street, Robertson Street – As local streets are programmed for resurfacing, it will be important to include bicycle provisions in the improvements. O'Neil Street, Lombard Street and Robertson Street are all wide enough to accommodate bike lanes. Local planning staff officials should work closely with the Public Utilities Department to incorporate a new cross section along these roadways to including 5 foot bike lanes.

7. Public Amenities - In addition to bicycle parking and provisions for bikes on buses, other amenities should be considered for implementation in order to create a more user-friendly bicycle system. Benches, water

fountains, public restrooms, and changing areas provide riders with valuable services and were frequently requested during this plan's public involvement process. These amenities are especially helpful in high traffic areas such as Main Street or Lombard Street and by major destination points such as Legend Park and schools. Bicycle rentals,

especially within the downtown and near the future Community Park, can also be a great amenity for visitors and residents alike. This service could be provided through a private entity or administered by the parks and recreation department. The Town should partner with local agencies, schools and shopping areas to establish an annual budget ($20,000) toward the implementation of public amenities.

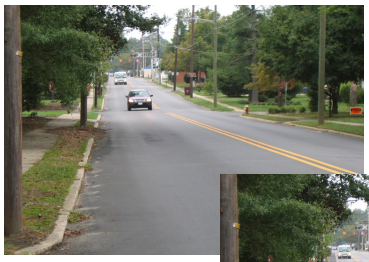
Project Prioritization

Based on input received during the public workshops as well as information provided by the BAC, a set of project and program priorities were developed. These priorities were developed in an attempt to provide an equitable distribution of projects that would benefit a range of geographical areas as well as user groups in the community. Specific projects represent on-road as well as off-road facilities. Bicycling initiatives and program priorities were developed based on their ease of implementation (including set-up costs), connectivity to existing routes and benefit received by the largest contingency of population.

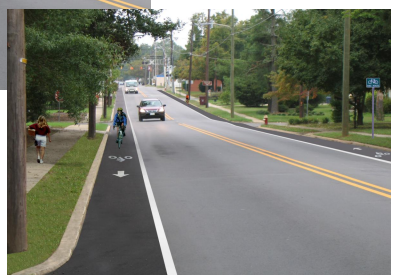
Six independent bicycle route loops were developed as a part of this plan connecting neighborhood communities, commercial areas and public institutions/facilities in Clayton. The intent of developing the bicycle loops was to provide bicycle facilities to a greater percentage of population. If this plan is implemented, over 95% of the local population would have access to bicycle facilities, representing all three levels of bicycle users.

Route Priorities

Three levels are used to classify the priority level of each route: short-term, mid-term, and long-term improvements.



O'Neil Street "Before"



O'Neil Street "After"

The total probable construction cost of the bicycle projects for the plan is $21,000,000 representing over 55 miles of bikeways. Short-term improvements are those projects that are recommended for or can be completed within a 5-year period. The total probable construction cost for the short-term projects is $600,000 (average $120,000 per year). Granted, this may be a significant amount of capital investment. However, a large portion of the multi-use path (i.e., Amelia Church Road and Little Creek) implementation can be facilitated through right-of-way reservation, donation and "in-kind" services and contributions. Mid-term improvements are expected to occur between 5 and 10 years into the future for which $2,765,000 in projects is recommended (average $553,000 per year). Long-term improvements are those projects that fall outside of a 10-year horizon for which a total of $18.6 million in projects is presented (this would take 20 years spending almost $1 million each year). Note that all figures are presented in year 2006 dollars, thus not accounting for inflation or escalation of construction costs. In order to accommodate route segments that can be accomplished more easily in different time frames, some of the routes were split between priority levels. Each route has been classified into one of these priority levels, as shown in **Figure 5.1** and described below.

Short-Term:

- Crosswalks/ enhanced signage at US 70/Robertson Street ($10,000)
- Restripe bike lanes through resurfacing program: O'Neil Street, Lombard Street, Robertson Street ($65,000)[1]
- Little Creek from Lombard Street to Amelia Church multi-use path/bridge (removable) – ($290,000)[2] - Dedicated right-of-way exists
- Amelia Church Road from Lions Gate Greenway to Community Center, 10' multi-use path ($215,000)[2]
- Town Center Loop signage ($10,000)
- Lions Gate multi-use path - under construction (privately funded)[3]
- Bike racks at key destinations – Municipal/Legend Parks, Clayton High School, Middle School, Shopping Centers, Town Hall Center ($12,000)

Mid-Term:

- Lombard Street multi-use path connection ($500,000)[3]

- Amelia Church Road striped bike lanes and signal improvements (i.e. pedestrian signal, crosswalks, pedestrian lighting, bike loop detection) ($20,000)[4]
- Town Center Loop enhancements ($45,000)[5]
- Legend Park Loop ($2,200,000)

Long-Term:

- Community Park Loop ($2,300,000)
- Little Creek Loop ($1,800,000)
- Municipal Park Loop ($1,100,000)
- Neuse River Loop ($2,500,000)
- Little Creek Greenway ($2,500,000)
- Neuse River Greenway ($3,100,000)
- Park Greenway ($5,300,000)

[1] Paint paved shoulders (non-slip), signage and bike symbols. Partial improvements of Legend Park Loop, Town Center Loop and Little Creek Loop

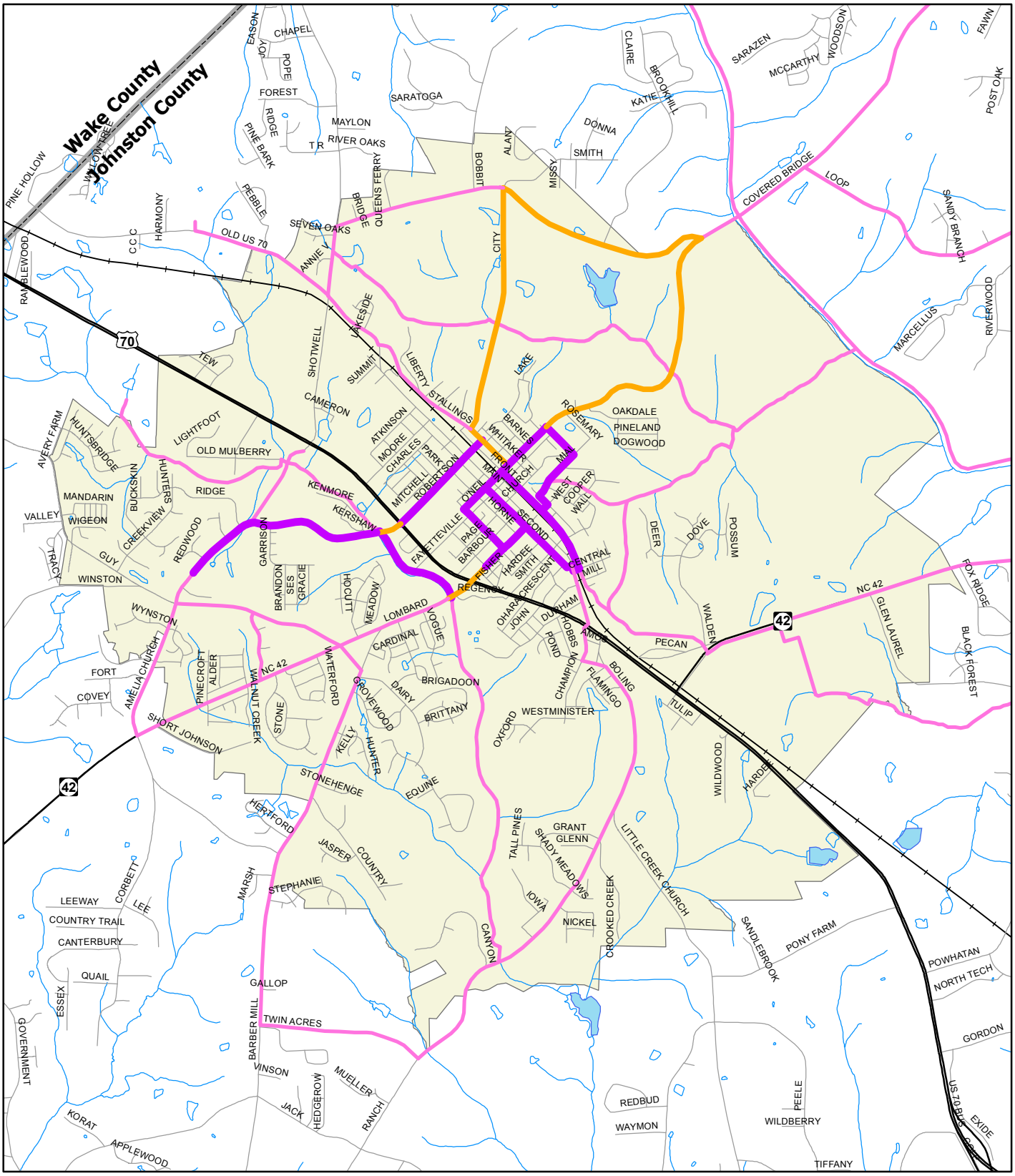
[2] Partial improvement of Community Park Loop

[3] Partial improvement of Little Creek Loop

[4] Partial improvement of Community Park Connector

[5] Enhanced crosswalks, signage and actuated signal at major locations along Main Street

Project implementation will be a shared responsibility between multiple agencies. Additional detail on agency participation is provided in the funding section of this chapter.



Clayton Bicycle Plan

Figure 5.1 - Proposed Route Priorities

Kimley-Horn and Associates, Inc.

Clayton ETJ

County Boundary

Bodies of Water

Railroads

Proposed Route Priorities

Short Term

Mid Term

Long Term

N W E S

0 0.125 0.25 0.5 0.75 1 Miles

Policy and Program Priorities

There are very few existing bicycle-related policies or program initiatives for the Town. However, the following initiatives should be pursued in Clayton during the next 2-4 years to ensure adequate education, encouragement and enforcement of bicycle awareness for its citizenry. The following items were identified as the highest priority bicycle programs as voted on by the BAC and town staff.

- Bicycle Advisory Committee (BAC): One of the most important groups advocating bicycling in Clayton is the BAC. It is though their efforts that the voice of the community is heard. Their knowledge of the Plan as well as influence with key decision-makers is key component to good implementation. With this in mind, the BAC should continue committee activity to promote implementation.

- Bicycle Summary Poster: Within one year of the adoption of this Plan, the Town should produce a quality bicycle summary poster for local and visitor distribution. The poster should include a map of the bicycle routes as well as provide education, enforcement and encouragement information. The bicycle plan and map could also be advertised or discussed in the local newspaper (i.e., The Clayton Star-News) or magazines (i.e., The Triangle Journal).

- Public Service Announcements:

Another program initiative that was highly supported by the BAC was the need for enhanced public service announcements. These educational and encouragement announcements could be geared towards cyclists as well as motorist (as discussed in Cpt. 4). The announcements could cover issues like “Rules of the Road” or upcoming events like a Bike Rodeo, Rideabout or the Clayton Road Race.

- Bicycle Events: Special community events that reach out to its citizens have always been a huge success for a number of NC communities. However, there are no active “ongoing” bike programs in the Town. The Town staff should organize and

advocate the following bicycle events on an annual basis: Bike Rodeos for elementary and middle schools (through actively soliciting school participation) and Rideabouts (at different geographical locations). These events can be conducted on their own or in conjunction with local festivals such as Clayton Road Race (May) or Riverwood Festival (April).

- Safe Routes to School Program: One way to stimulate the educational programs would be to introduce a Safe Routes to School program to the Town of Clayton. The Town should work closely with the State Safe Routes to School coordinator to apply for funding as the program is established in Clayton schools. Safe Routes to Schools funds do not require a local match. The program should be offered at two pilot schools in the first year after this plan is adopted and expand to additional schools in the future. Note that the SAFETEA-LU federal transportation bill has apportioned $2.36 million in funding for Safe Routes to Schools Programs in North Carolina in Fiscal Year 2006. See the website: http://www.saferoutestoschools.org/

- Route Signage Program: The Town should work cooperatively with NCDOT to develop a route signing plan to improve bicycle awareness and information. Signing should include information on the direction and distance to destination points, as well as intermittent confirmation that the bicyclist is still on the correct route (see Ancillary Facilities and Programs – Cpt 3). Route maps placed on kiosks at destination points or along heavily traveled portions of the routes (such as downtown and Legend Park) can also help to publicize the interconnected route system.

- Traffic Calming Program: As a part of the Town's ongoing traffic calming efforts, bicycle facilities such as striped and painted bike lanes should be incorporated into the program as a viable option for calming traffic.

- Spot Improvements and Maintenance Programs: The Town receives Powell Bill funds for street maintenance and dedicates grant-matching funding

through their CIP funds for street improvement projects. If the Town is truly interested in becoming a bicycle friendly community, there must be dedicated funding towards bike improvements and maintenance. As a bold initiative, the Town should consider creating a set-aside for spot improvements and maintenance of bicycle facilities. It is recommended that adequate funding be allocated to this program on an annual basis. These monies can be used towards small projects like improved signing, drainage grates, intersection crosswalks, shoulder repair debris removal, railroad flangeway repairs and repairing edge of pavement seams (see Ancillary Facilities and Programs – Cpt 3).

- Safety Education Programs: Safety education programs need to be initiated within the next two years targeted to specific audiences and specific road user problems and combined with enforcement activities that are coordinated with the appropriate law enforcement agencies. Education programs at churches, schools, and the Clayton Community Center will allow all age levels to become more informed about bicycle safety. Coordination with the Clayton Police Department will allow for this program to be spread throughout the Town and to target areas that need it most. Public services announcements on the radio and television should be an integral part of this program.

Funding and Phasing Concepts

One of the primary purposes of the Clayton Comprehensive Bicycle Plan is to communicate the framework for the future bikeway network and ancillary facilities. This plan conveys a concept of a system of bikeways that work together to provide for an interconnected network. Only through the adoption of local policies and programs, State programs, and private contributions can the incremental construction of bikeway facilities effectively occur. With this in mind, it will be important for the Town of Clayton to identify funding sources to implement the recommendations of this plan. While some projects and programs will be funded by the Town, many other ways are available to provide financial support for improving local bicycling conditions.

Bicycle Facility Funding

Bicycle facility projects can be divided into two types: independent and incidental projects. Independent projects are those that are independent of scheduled highway projects, while incidental projects are bicycle accommodations that are created as a part of a highway project. Both types of projects should be funded to create a well-connected and user-friendly network in Clayton.

Clayton should take advantage of cost-effective opportunities to include bicycle

facilities in incidental roadway improvements, such as repaving and reconstruction projects. The Town administers a number of resurfacing projects throughout the Town on an annual basis. Most recently, the Town has completed projects for areas such as Wilson Street and Center Street. The Planning Department should coordinate regularly with the Town Utilities Director and state transportation planners to make sure that upcoming projects in the Clayton area include bicycle facilities.

Bicycle Program Funding

While the Town may be able to fund some program activities, it should seek to build partnerships as a cost-effective way to offer comprehensive programs.

For example, the Town should partner with Johnston County and state law enforcement departments to implement the bicycle safety enforcement campaign. In addition, having local co-sponsors of events such as Walk and Bike to School Day and Bike to Work Week can help fund events and build relationships with other groups that believe bicycling is important in the community. Therefore, the Town should build partnerships with local bicycle shops, bicycle advocacy groups (i.e., TORC), church groups, health professionals, and educators to develop bicycle programs.

Build partnerships with local bicycle shops, bicycle advocacy groups, church groups, health professionals, and educators to develop bicycle programs

State Funding Support

Many of the roadways where bicycle facilities are needed in Clayton are owned and maintained by NCDOT. Therefore, the Town should take advantage of strong state support for funding bicycle projects and programs. To obtain state funding, the Town should take the following actions:

- Send the recommendations of this plan to the NCDOT Bicycle and Pedestrian Program and to the NCDOT Division 4 Engineer immediately after the plan is adopted. This will improve the likelihood that bicycle accommodations will be included during incidental construction and paving projects.
- Check the State Transportation Improvement Program (STIP) on a regular basis to identify opportunities to include bicycle facilities as a part of STIP projects in Clayton. For projects where bicycle facilities are possible, the Town bicycle and pedestrian coordinator (i.e., Parks and Recreation) should notify both the NCDOT Division 4 Engineer and the NCDOT Bicycle and Pedestrian Program to make sure that bicycle facilities are included during the scoping,

design, and construction phases of the project.

- Submit one or two of the plan's Top Priority projects to NCDOT during the first year after the plan is adopted so that they can be considered for the Bicycle/Pedestrian Program section of the State Transportation Improvement Program (STIP). Typically, the total cost of construction should not exceed $500,000. Continue to submit one or two additional projects for consideration each year in the future. Projects that do not require the Town to purchase additional right-of-way are the best candidates for this funding source. The Bicycle/Pedestrian TIP can include incidental and independent projects. Currently, $6 million is available per year for the entire state through this funding source, and it does not require local matching funds.
- Apply for Transportation Enhancement Program funding for an important bicycle project. Bicycle facilities are one of several types of projects that are eligible to be funded by this program. This funding source requires a 20% local match. For more information on the Enhancement Grant Program see the following web page link:

  www.ncdot.org/planning/development/Enhancement/enhancement/enhancement.htm

- Submit spot improvement projects to NCDOT Division 4 so that they can be fixed with Division Discretionary Funds. Through the course of this study, three dangerous intersections were identified as priority "spot safety" projects. These intersections are:
  - US 70/Amelia Church Road – heavily congested area, no bicycle or pedestrian provisions exist today, vehicular sight distance problems associated with approach grades
  - US 70/Shotwell – high volume, high speed, inadequate crosswalks, lighting, and lack of actuated pedestrian signal
  - US 70 Ramps/Lombard Street – high volume, vehicular sight distance problems, school related pedestrian activity, no bicycle or pedestrian provision exist today.
- Using Discretionary Funds will allow the improvement requests to go through an abbreviated TIP process so that they are funded and implemented within one to two years rather than six. Spot improvement projects include short road sections that need shoulders, drainage grate replacements, and improvements to minor intersections.

- Apply for grants from the Governor's Highway Safety Program (GHSP) to fund education, enforcement, and encouragement campaigns. These federal Section 402 Highway Safety funds can be used for bicycle programs.

- Consider applying for state grants to purchase bicycle helmets for low- and moderate-income children so that they can participate in the new Pedestrian and Bicycle Safety Education Program. NCDOT may have funds available for this purpose through its "Share the Road" license plate campaign.

Apply for state grants to purchase bicycle helmets for low- and moderate-income children

- Take advantage of state planning grant funding to update this plan in five years. In addition, seek state planning grant funding to implement a pedestrian plan. Typically, improving conditions for pedestrians also makes it safer and more convenient to bicycle. In fact, this plan was funded in part by a grant from the Division of Bicycle and Pedestrian Transportation of NCDOT.

- Take advantage of programs similar to N.C. Moving Ahead!, which provided $5 million for bicycle and pedestrian improvements (out of $70 million total for multimodal transportation). If a similar program is established in the future, the Town should actively pursue having several bicycle projects funded through this source.

Local Funding Programs

Alternative Funding Measures

It is evident that Powell Bill and general fund revenues alone will not be sufficient to fund a systematic program of constructing bicycle facilities within the Town. Alternative funding measures that other jurisdictions use for bike system improvements include:

- Transportation/Recreational Bonds
- Impact Fees
- Oversize Agreements

Transportation/Recreational Bonds

Transportation and recreational bonds have been instrumental in the strategic implementation of local roadways, bicycle and pedestrian facilities throughout North Carolina. Voters in communities both large and small regularly approve the use of bonds in

order to improve their transportation system. Projects that have historically been funded include sidewalk projects, bikeways, greenways, new road construction, and streetscape enhancements.

- As Clayton continues to grow, the Town should incorporate bicycle facility improvements into future local bond initiatives. Incorporating a pilot bicycle project into a bond package would be an effective way to secure short-term bicycle funding.
- Powell Bill or other road maintenance funds can be utilized to create incidental bicycle projects through repaving and restriping roads.

Impact Fees

The Town Administration is currently working well with the development community to look beyond the bare necessities of the development. Developers are being asked to incorporate more pedestrian and bicycle amenities into their site plans. Developer impact fees and system development charges are another funding option for communities looking for ways to pay for bicycle facilities and associated infrastructure. They are most commonly used for water and wastewater system connections or police and fire protection services but they have recently been used to fund school systems and pay for bicycle and pedestrian connections. Impact fees place the costs of new development directly on developers and indirectly on those who buy property in the new developments. Impact fees free other taxpayers from the obligation to fund costly new public services that do not directly benefit them. Only a handful of communities in North Carolina have legislative approval to use impact fees (e.g., Cary). The use of impact fees requires special authorization by the North Carolina General Assembly.

Oversize Agreements

This is an agreement between the Town and a developer to identify cost sharing to compensate a developer for constructing a collector street with bicycle and pedestrian facilities instead of a local street with no provisions for bicyclists. For example, instead of a developer constructing a 30-foot back-to-back local street, additional funding would be provided by the Town to upgrade the particular cross section to a 33-foot back-to-back cross section (including bike lanes).

Appendices