# Introduction

The University of North Carolina at Chapel Hill (UNC-CH) is committed to the development of a sustainable transportation system. UNC-CH has demonstrated this commitment to sustainability with projects such as the establishment of a fare-free bus system, enrichment of the pedestrian pathway system throughout campus, addition of a bike lane on South Columbia street, inclusion of shower facilities for commuters in new buildings, construction of a pedestrian bridge over Manning Drive and the development of educational outreach programs for all modes of travel. In addition to these projects, several campus groups have formed to support bicycle planning and facilities. While these actions demonstrate commitment to sustainable transportation, there remains a need for an overall plan to organize and guide the growth of the bicycling system and culture at UNC-CH. This Bicycle Master Plan (the Plan) was created to fulfill that need.

The Plan analyzes existing conditions, recommends bicycle facilities, gives best practice examples of facilities and programs at peer institutions and offers information about educational programs. The intent of this Plan is to institutionalize bicycling as part of the UNC-CH transportation system. This Plan also recognizes that improving existing bicycle facilities, adding new facilities where needed and providing more educational opportunities to the campus community will improve safety for all modes of travel even as the number of bicyclists increases.

The goals of the Plan cannot be achieved in isolation from other University, Town of Chapel Hill (the Town) and North Carolina Department of Transportation (NCDOT) initiatives. The Plan must be incorporated not only into the UNC-CH transportation system, but also integrated with local and regional transportation systems. To aid in this process, UNC-CH has created a new Associate Director of Transportation position within its Department of Public Safety (DPS). This staff member, along with a new technical transportation planner, will greatly aid in ensuring the success of this Plan.

## PLAN VISION AND GOALS

As part of the planning process, a steering committee was formed to assist with the Plan. The first task of this committee was to create a vision statement and goals for the Plan. The vision and goals are stated below.

Vision:

***Bicycling is an integral part of UNC-CH culture and how the community gets to, through and around campus.***

The thought behind this vision is two-fold. Today, bicycling is an informal part of campus life, but it should be recognized formally as a fundamental component of how UNC-CH functions. Secondly, the vision statement highlights the fact that bicyclists travel within and across campus boundaries, so

*Bicyclist headed across East Franklin Street from Campus. This typical route includes the pathway and staircase (shown) that connect to Town streets.*

careful coordination with the Town and NCDOT must occur to ensure seamless trips in and out of campus.

The vision statement is supported by five goals that seek to improve, increase and integrate bicycling at UNC-CH. The goals create a framework for this Plan and are central to the development of the recommendations it proposes. The Plan goals are:

**1. Increase safety for all campus users including bicyclists, pedestrians, transit users and drivers.** *The large population of students, workers and visitors who access the UNC-CH campus each day can result in congested roads and pathways. Crowded conditions often lead to conflicts among bicyclists, pedestrians and vehicles. Feedback received throughout the Plan process indicated that the campus community wants to improve safety for travelers using all modes.*

**2. Build a culture of bicycling among UNC-CH students, staff and faculty.** *Making bicycling a more visible and attractive transportation choice has many benefits: as more people choose to ride bikes on and near campus, others will be encouraged to do the same. Developing a culture of bicycling will also help UNC-CH achieve designation as a Bicycle Friendly University℠.[1] Other universities have found this designation helps them find funding for bicycle improvements, and advances their reputation as sustainable campuses.*

**3. Use education and enforcement to improve bicycling and safety for all road and pathway users.** *Many students and visitors come to campus from communities where bicycling is not the norm, so the University has a responsibility to educate bicyclists, pedestrians and drivers about how they should interact with other modes of travel. Education, combined with enforcement of applicable policies and laws, will be important for all travelers.*

**4. Create well-known and connected north-south and east-west bicycle routes through campus.** *The creation of well marked, easy to follow routes through campus will make bicycling easier and aid new bicyclists in choosing where to ride. These routes will be created through on-the-ground infrastructure improvements.*

**5. Fund bicycle improvements on campus.** *Bicycle friendly universities tend to have dedicated sources of funding for infrastructure, staff, programs, signage, promotional materials and other elements.*

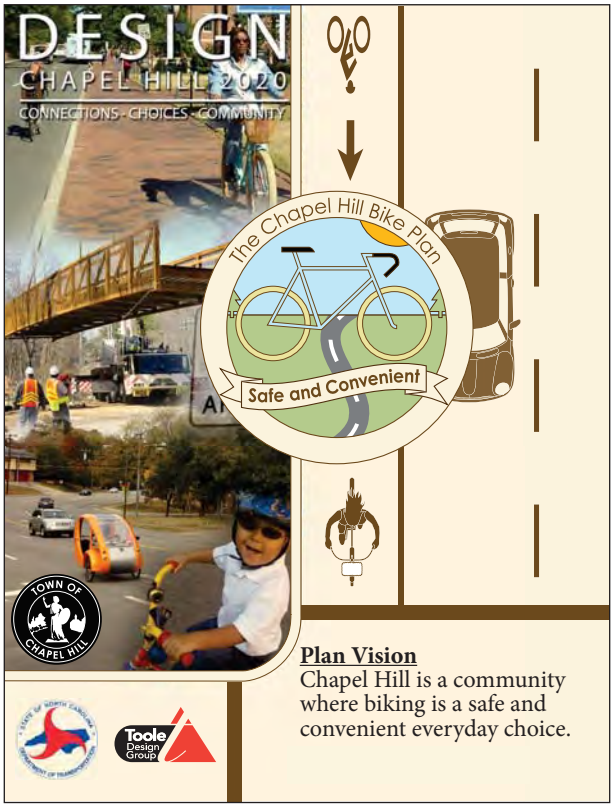
1 The Bicycle Friendly University program is administered by The League of American Bicyclists. The application program ranks universities throughout the country on their bicycle friendliness. Details are available here: http://www.bikeleague.org/content/universities

These goals are interdependent. Increased safety is achieved, in part, through the education of all road users. A strong bicycle culture helps bicycling become an everyday transportation choice. Similarly, all of the programs and infrastructure projects can only be accomplished with funding from the University.

## COORDINATION WITH TOWN OF CHAPEL HILL BICYCLE PLAN

The Town and UNC-CH developed individual bicycle master plans within approximately the same time frame and led by the same consultant: Toole Design Group. This allowed for coordination of the plans. The integration of the UNC-CH plan with the local Town plan is important and will make it easier to align this Plan with regional planning efforts.

Coordination with the Town included presentation of information for both plans at Town and UNC-CH community meetings, sharing of an interactive online "WikiMap" to capture comments on existing conditions and sharing of individual survey results and information between the UNC-CH and Town project managers. The Town plan website can be viewed at: www.townofchapelhill.org/bikeplan.




*The Chapel Hill Bike Plan was adopted on June 9th, 2014.*

## BICYCLE FRIENDLY UNIVERSITY PROGRAM

The national Bicycle Friendly University℠ (BFU) program, created and run by The League of American Bicyclists, recognizes university applicants for improving bicycling conditions on campus. The program scores universities in the following areas:

The Five "E's"

1. Engineering: Creates safe and convenient places to ride and park a bicycle.
2. Education: Gives people of all ages and ability levels the skills and confidence to ride.
3. Encouragement: Creates a strong bike culture that welcomes and celebrates bicycling.
4. Enforcement: Ensures safe roads for all users.
5. Evaluation and Planning: Plans for bicycling as a safe and viable transportation option.[2]

Each of these "E's" is important to bringing about the holistic change that transforms a campus into a BFU. There are currently 75 BFUs across the country. A number of UNC-CH's peer institutions in the UNC system and throughout the Southeast have achieved this designation, including:

- UNC-Greensboro (Bronze)
- UNC-Wilmington (Bronze)
- University of Virginia (Bronze)
- Duke University (Bronze)
- North Carolina State University (Bronze)
- University of Maryland (Silver)

While UNC-CH has not yet applied for BFU status, students and DPS and Facilities Planning staff members have reviewed the program application and begun to coordinate for a 2014 application.

Consequently, the Five "E's" framework was used to assess existing conditions at UNC-CH and to organize the recommendations of this plan document.

2 Definitions from The League of American Bicyclists, http://www.bikeleague.org/content/5-es


*The Bicycle Friendly University program is part of the Bicycle Friendly America program which also rates communities, businesses and states.*

## LEVEL OF TRAFFIC STRESS FOR BICYCLE NETWORKS

Just as the Five "E" framework was employed to organize the Master Plan, a Level of Traffic Stress framework was used to assess the current bicycle network and make infrastructure recommendations.

The Mineta Transportation Institute developed an evaluation methodology in 2012 that rates streets and bike facilities by the amount of stress a cyclist would experience when riding on them. "High-stress" roads are those with higher speeds, a larger amount of daily traffic and minimal bicycle facilities. These roads are considered comfortable for riding by the group of bicyclists who are Strong and Fearless, those with a high tolerance for traffic stress.

"Low-stress" roads are those where bicyclists share the road with lower-speed and lower-volume traffic. Low-stress facilities also include ones that provide greater separation from traffic, such as a buffered bike lane where a striped area of roadway puts motor vehicles farther from bicyclists than the single strip of a traditional bike lane. These types of facilities are comfortable for a wider range of bicyclists who are less tolerant of traffic stress.

*Participants at the On-Campus Information Meeting in September 2013.*

Chapter 1

# Plan Process

Support for the creation of a Plan was built over several years and came from a variety of groups. An environmental studies class project proposed a bicycle plan in 2001. The Campus Pedestrian Safety Committee added bicycle safety to its charge in 2009 and began to outline the requirements of a bicycle plan. Momentum for this plan grew in 2012 when the Carolina Bicycle Coalition, a student advocacy group, was formed, and a student-run pilot bike share program, Tarheel Bikes, was launched. The development of this Plan was managed by the Facilities Planning Department in partnership with the Department of Public Safety (DPS). Planning process details are provided in Appendix A.

## STEERING COMMITTEE

A steering committee of students, faculty and staff was formed to guide development of the Plan. Steering committee members are listed in the acknowledgements section of this document. As described in the Introduction, the first task of the committee was to develop a vision and goals for the plan. The committee also participated in three workshops. A description of each workshop follows.

### Workshop 1

The first meeting focused on ideas for the plan vision and goals. Committee members discussed what the future of bicycling could look like at the University, as well as challenges to improving bicycling on the UNC-CH campus. The committee agreed that the future campus should be a place where:

- Bicycles are recognized as a valued mode of transportation and receive an equal priority in planning and funding on campus.
- Bicycling is a mode that is available to all types of riders in a safe, comfortable and visible network.
- Bicycling is institutionalized and integrated into the culture of the University.
- All road users are educated about bicycling, including drivers, pedestrians and cyclists.
- Conflicts between bicyclists and other modes are reduced.
- On-road infrastructure is improved for bicyclists.
- Non-road facilities are used to create improved connections.
- Connections and routes are widely known and easy to find.
- Town-University bicycle connections are easy.
- Supporting infrastructure for bicyclists is created.
- Supporting programs for bicyclists are created.

Challenges to success were also identified and include:

- Many students come from parts of the state and country where bicycling is not part of the way of life.
- There is currently no money specifically allocated for physical bicycle improvements on campus.
- The topography of campus, especially north-south, poses a physical barrier for bicycling.

The first two challenges are addressed in this plan. The last issue, topography, will continue to be a challenge, but recommendations to mitigate the topographical challenges are included.

### Workshop 2

The second session focused on a discussion of community feedback from the online survey, which included questions about a potential Bicycle Friendly University program, potential program and policy recommendations, and initial network observations. The committee reviewed preliminary results from the online survey at this meeting, as well as results from the survey from the Town Plan. In order to introduce possible programs and best practices from other universities, the consultant team gave a presentation on the Bicycle Friendly University (BFU) program, and noted peer universities' BFU certification status. Last, the consultant team also solicited additional input from the committee on existing conditions for bicycling on campus.

### Workshop 3

The third meeting introduced a draft plan and recommendations, focusing on the physical network of bicycle facilities on campus. The presentation introduced a series

of routes through campus, including both on-road facilities and amendments to the pathway network. An overview of different types of bicycle parking—covered, secure and in parking decks—was presented, and the consultants sought feedback on potential bicycle parking locations.

## STAKEHOLDER INTERVIEWS

In addition to gathering information from the Steering Committee, the consultant team conducted interviews with the following stakeholders in bicycle programming, funding and infrastructure. Feedback and insight from these stakeholders informed the development of Plan recommendations:

- Staff from the DPS
- University administrators from Athletics, Campus Recreation, Parking, Facilities Planning, Real Estate and UNC Healthcare.
- Campus Pedestrian and Bicycle Safety Committee (PBSC)

## COMMUNITY INPUT

### Online Survey

Feedback from the campus community was gathered through an online survey completed by 818 respondents over an eight-week period beginning June 27, 2013. A range of information was gathered, from opinions about existing conditions for bicycling at UNC-CH to suggestions about where bike parking is lacking.

Survey respondents provided valuable feedback that informed the development of Plan recommendations for both physical infrastructure, policies and programs. Overarching results are presented here, and additional survey information is included throughout the Plan to describe existing conditions and support recommendations.

Although the survey results were important to the planning process, it is important to note that the survey sample was not representative of the campus population in two aspects: affiliation and typical commute mode. Figure 1 shows that staff were heavily over-represented in the Plan survey sample. This was likely because the survey was held during summer months while faculty and students were away from campus.[1] Over-representation of bicyclists is common for a bike plan survey because of significant outreach to bicycling communities during the planning process, and because they are more likely to have experience, input and interest in issues related to biking.

About 60% of survey respondents have biked on the UNC-CH campus within the past year. Those who have not biked on campus most often responded that they were deterred by high-stress roads they would need to ride or cross to access campus and that they are not comfortable sharing the roadway with automobile traffic (see survey responses on the following page). It is likely that many of these comments pertain to roads outside of the UNC-CH campus, which are addressed in the Town Bike Plan, but some are located on campus. Infrastructure and education recommendations in this Plan address both safety issues and the perceived fear or discomfort that non-riders feel.

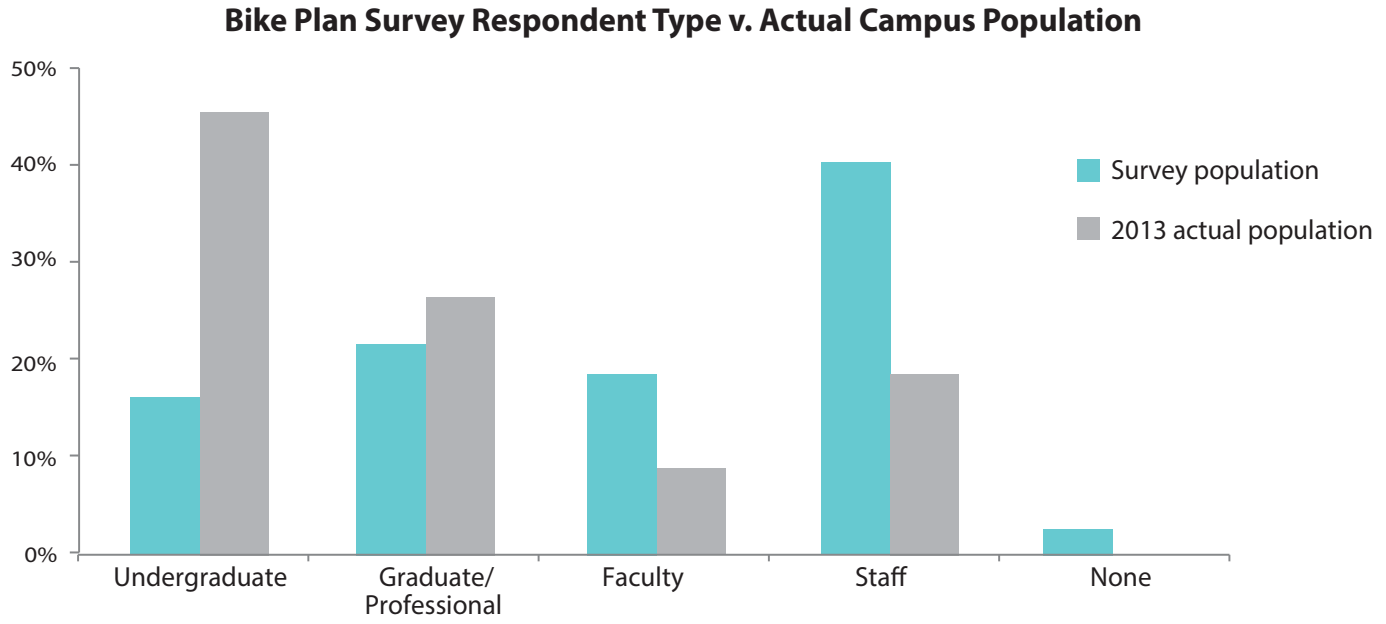



*Figure 1. Bicycle Master Plan Survey Respondent Information*

1 The survey remained open one week after students and faculty returned. But respondents still heavily represented staff members.

| What factors have prevented you from biking on the UNC-CH campus in the past year? | |
|---|---|
| There are too many high-stress roads I would need to ride. | 59.9% |
| I don't feel safe riding a bicycle on roads with cars. | 45.9% |
| There are too many high-stress roads I would need to cross. | 34.4% |
| I don't own a bicycle. | 28.1% |
| It's too hilly. | 22.4% |
| Other | 21.5% |
| There are too many barriers to biking (freeways, stream valleys, lack of street connectivity). | 19.8% |
| It would take me too long to bike to the places I need to go. | 19.5% |
| I own a bicycle but it's not in good riding condition. | 8.0% |
| Family travel needs. | 7.7% |
| There is insufficient bicycle parking at my destination. | 7.2% |
| I am physically limited from riding a bicycle. | 5.2% |

Respondents were also queried about what programs and amenities could influence them to bike more often to or around campus.

| Which of the following improvements would influence you to bike more often to or around campus? (Select up to four) | |
|---|---|
| Education for motorists on how to respectfully share the road | 44.2% |
| Showers and lockers at work | 39.2% |
| Better bicycle parking/storage | 36.3% |
| Improved maintenance (street sweeping/ repair of roads) | 30.9% |
| Increased enforcement of traffic laws | 28.0% |
| Other (please specify) | 26.1% |
| Directional signage for bikes | 23.0% |
| Education for yourself on how to ride with motor vehicle traffic | 18.8% |
| More availability of on-bus bike racks | 17.8% |
| A larger bike sharing program | 16.1% |
| Ability to buy daily parking permits | 11.7% |

Among the 26% of respondents who chose "Other" on the previous question, infrastructure improvements such as bike lanes were the most popular fill-in answer. The question was specifically designed to ask about non-infrastructure improvements, but this pattern of responses speaks to the desire among those surveyed for more on-road bicycle facilities.[2]

Another survey question addressed preferences for bicycle facility types among survey respondents. When asked directly about what infrastructure would encourage them to bike more often, respondents strongly preferred dedicated bicycle facilities (sidepath, sidepath with separation from pedestrians, bike lane) to shared facilities (shared lane marking, wide outside lane).

| Which of the following facility types would encourage to you bike more often to or around campus? (Select all that apply) | |
|---|---|
| Sidepath | 60.7% |
| Sidepath with designated space | 59.7% |
| Bike lane | 59.3% |
| Shared lane marking | 13.8% |
| Wide outside lane | 14.3% |

## Online Interactive Map

Infrastructure recommendations and prioritization of the recommendations were also informed by feedback from an online interactive map, or WikiMap, which collected geographically-specific feedback. The map had 300 registered users who were asked to identify high- and low-stress routes, shortcuts, and potential routes they would like to bike. Problem intersections, destinations and areas that need bike parking were also identified by users.

The same map tool was available for use by both the UNC-CH and Town planning processes, but 72% of users of the map were UNC-CH affiliates, with the largest user group being staff. Many routes and places identified on the map were either on UNC-CH's campus or lead to it, which is not surprising since UNC-CH is a primary destination within the Town.

Routes through campus were marked as high- and low-stress. The high-stress routes tended to be on-road. Generally, comments about high-stress roads focused on the speed of traffic and conflicts with vehicles rather than pedestrians.

The most frequently marked high-stress road was the single block of South Columbia Street from South Road to Cameron Avenue. WikiMap users noted that separated, dedicated

2 An overview of bicycle facility types is provided for reference in Appendix C.

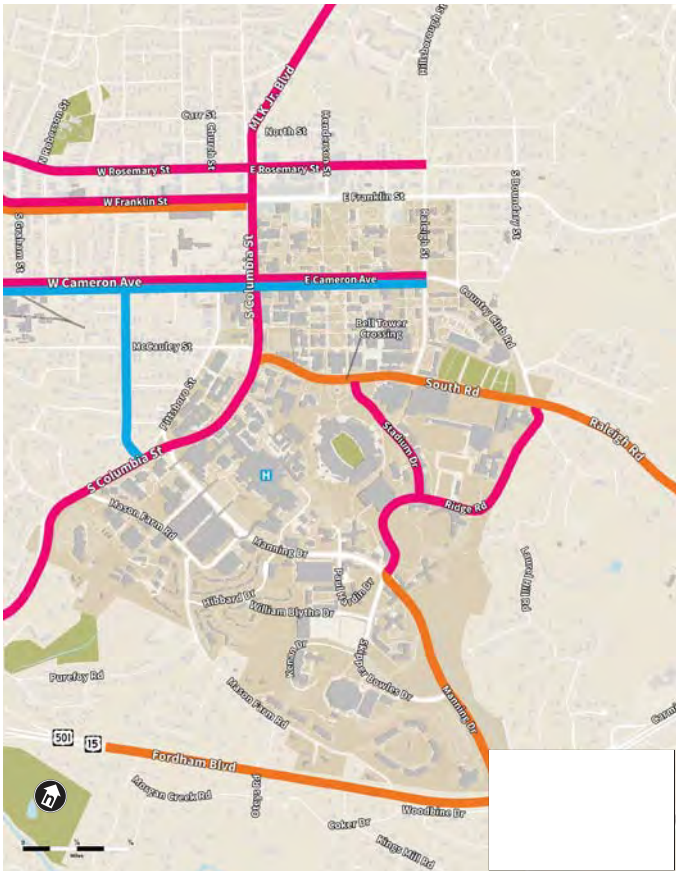



*Figure 2. WikiMap Roadway Input. Cameron Avenue was marked by some map users as high stress and others as low stress. These are likely different types of riders with differing tolerances for adjacent traffic. Desired routes are those where people would like to ride but currently do not owing to any number of personal preference factors.*

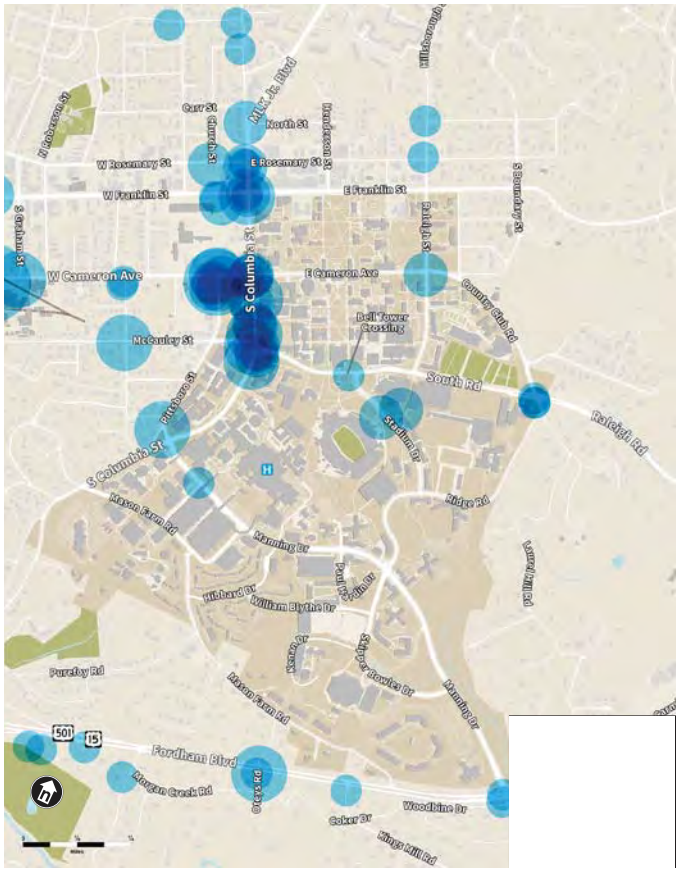



*Figure 3. WikiMap Problem Intersection Input. Intersections with larger circles and greater overlap received more comments.*

space for bicyclists would be desirable in this area, since there is no space for bikes on the road and many pedestrians on the sidewalk. The intersection at South Road and South Columbia Street was also frequently noted as a problem with confusing turning and crossing movements for bicyclists, pedestrians and drivers.

> ***"Buses don't fit in the very narrow lane much less cars. Sidewalk is wide but pedestrian heavy. Unclear if bikes should share the road or share the sidewalk as both are unsafe."***
>
> *- WikiMap comment on South Columbia Street between South Road and Cameron Avenue*

As shown in Figures 2 and 3, roads marked as high-stress tended to also be the location of identified problem intersections.

Manning Drive was also called out as a high-stress road, with comments about the route focusing on the eastern end that accesses Fordham Boulevard. One commenter noted that drivers tend to be impatient when traveling behind bikers riding uphill, causing many bikers to use the sidewalk in the uphill direction. Portions of the sidewalks along this segment are in poor condition. Ridge Road, Stadium Drive and the east end of South Road were also all identified as high-stress roads.

> ***"Disaster area. One of the two worst intersections near campus for bicyclists. Not enough room for cars and bikes. No bike lane, no bike path, no bike share the road markings. Fix please."***
>
> *- WikiMap comment on intersection of South Columbia Street and South Road*

Many routes on campus were marked as low-stress for bicyclists, including both on-road routes and off-road pathways. Cameron Avenue was rated as the least stressful on-campus road. There were no off-road routes identified as stressful. Some users identified off-road to on-road transitions as uncomfortable due to narrow pathways.

Data was also gathered on this WikiMap about bicycle park-

ing needs. This topic will be addressed in Chapter 4.

### On-Campus Information Meeting

An open house to present draft recommendations for the physical infrastructure network, programs and policies was held on October 23, 2013 at the Student Union. Approximately 80 students, faculty and staff attended to give feedback on the draft plan. Participants marked up paper maps and voted on facility options. Voting was also conducted on:

- Bicycle program recommendations
- A suggested policy to restrict bicycles in the core of old campus (bounded by Franklin Street, South Columbia Street, South Road and Raleigh Street)
- Options for funding infrastructure and programs


*Figure 4. This example board from the public meeting shared information on different types of bicycle parking and allowed them to vote on a proposed parking policy.*

### Bike to the Future I and II Open Houses

Two meetings were held as part of the Town Plan development process. The first Town Open House sought input about existing conditions on and near campus as a part of the information gathering process. The second Open House on the proposed Town Plan recommendations also included information on the UNC-CH Plan.

## DRAFT NETWORK DEVELOPMENT AND FIELDWORK

By examining connectivity, existing facilities and routes and intersections identified on the WikiMap, the consultant team developed a "study network" of streets and pathways in need of further examination as part of this Plan. Fieldwork conducted both via car and bicycle by the consultant team during May and July 2013 reviewed this study network. The team measured streets to determine existing space available to accommodate bicycle facilities and noted maintenance issues, sight lines, adjoining land use and other factors. A third fieldwork visit was made in September 2013 to see traffic operations and bicycle movements during the academic year. The consultant team observed driver, bicyclist and pedestrian behavior on streets and off-road facilities, and noted on conflicts and near-conflicts. Bicycle parking utilization was also observed to determine areas that may need increased numbers of bike racks.

## SUMMARY

Input from the Steering Committee, stakeholder interviews, the online survey, WikiMap, Town and UNC-CH open houses, and the fieldwork all contributed to findings and recommendations in subsequent chapters. Once adopted, this Plan will become part of the Campus Master Plan and officially guide the development of the campus environment.


*Bicyclists on the street and sidewalk along South Columbia Street, identified in community feedback as the most stressful area of campus for bicycling.*

Chapter 2

# Existing Conditions

UNC-CH undertook this campus bicycle planning effort at a time when interest in bicycling was rising. Many of the campus' approximately 12,000 employees (not including UNC Hospital) and nearly 30,000 students already bike to and around campus. Plan input indicates that many more University affiliates would bike more often if additional infrastructure, education or supportive programs existed. The University is poised to strengthen the growing bicycle culture in the Triangle region through improvements to existing bicycle infrastructure and programs at UNC-CH.

## TRAVEL MODES

The share of commuters arriving by bicycle to UNC-CH has remained relatively steady since data began being collected via the Campus Commuting Survey in 1997. In 2013, 5.2% of employees and 14.2% of students reported using a bike to access campus at least one day a week. For those residing within two miles of campus, 18.7% of employees and 15.0% of students reported using a bicycle at least once a week to commute. This survey does not include undergraduate or graduate students who reside on campus, and thus may under count the overall bicycle commute mode share of the UNC-CH community.

Mode choice generally has shifted over time with a much higher percentage of both employees and students taking transit today than in 1997. This shift can likely be attributed to the beginning of a fare-free system for Chapel Hill Transit in 2002, and improved and expanded express service and Park & Ride options. This shift also demonstrates that the mode choices of UNC-CH commuters do change with improvements to a specific mode. Details of employee and student mode choice are available in Appendix B.

When evaluating the motivations and barriers that influence how people travel to campus, it is again useful to look at the online Bike Plan survey findings discussed in Chapter One.

The majority of the cyclists who responded to the Bike Plan survey self-identified as riders who are more confident on the road than an average rider. Respondents were asked to place themselves into a category of cyclist. Figure 5 shows that those who bike to campus are more likely to be comfortable on all types of roads than are those who commute

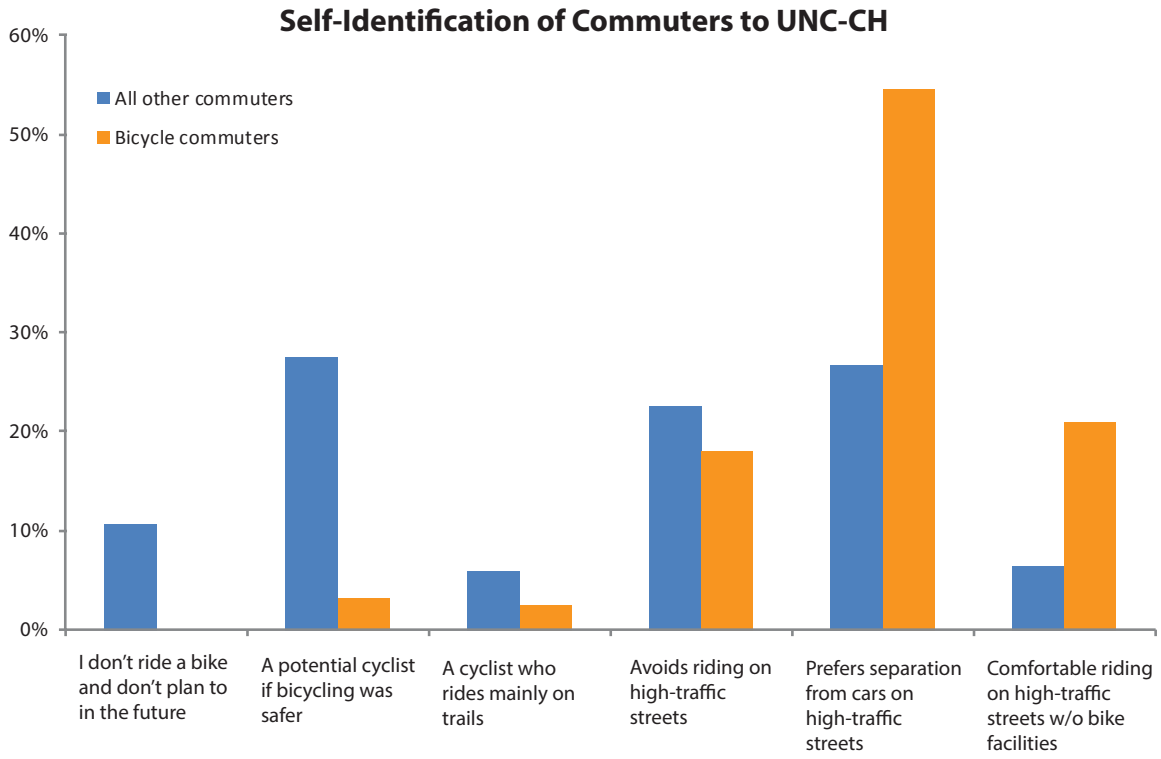



*Figure 5. Plan Survey Respondent Bicyclist Type (Self-Reported)*

by other modes. These results are not surprising given that most of the roads that access campus are high-volume roads, so those who ride today are already comfortable riding in that environment. There is high potential for attracting additional bicycle riders, as 27.5% of respondents who currently access campus/class by other modes responded that they were a potential cyclist if conditions were safer.

Aside from the question of comfort, distance to campus is the greatest challenge for most potential cyclists. According to the 2013 Campus Commuting Survey, students who bike commute typically live close to campus; 91% of students who travel by that mode live within five miles of campus. The Campus Commuting Survey also found that 63.4% of students and 29.7% of employees who drive alone live within five miles of campus. Five miles is generally considered to be a reasonable distance for a daily bicycle trip, so this group represents a target market for bicycle commuting.

Among employees, a number of Bike Plan survey respondents commented that housing in Chapel Hill is too expensive, causing them to live farther away from campus. Staff who live farther away are less likely to become regular bicycle commuters. However, the 2013 Campus Commuting Survey shows that a higher percentage of University employees live in Chapel Hill and Carrboro (39.3%) compared to any time since 2001. This means that the potential for staff to become bicycle commuters could increase. In its comprehensive plan, the Town has a stated goal of increasing workforce housing, so it is possible that in the future there will be more opportunities for employees to commute by bicycle.

As noted previously, the Campus Commuting Survey considers employees and students who live off campus. Some of the bicycle infrastructure factors that may influence commuters' decision to bike are outside the jurisdiction of UNC-CH and are addressed in the Town Plan. Though non-campus infrastructure is beyond the University's purview, the bicycling behavior of the UNC-CH community could certainly be influenced by new University educational information and programming. On-campus travel, whether by resident students or commuters, will be influenced by University investment in on-campus bicycle infrastructure and programs.

## Automobile Parking

Student, employee and visitor decisions about whether to drive to campus or take other modes are often dictated by the availability of parking. The past decade has brought many changes to the parking environment at UNC-CH. Many surface parking lots were removed and replaced with buildings and open space. Parking was consolidated in new decks. Overall, there was a net loss of north campus parking and a net gain of parking on south campus (see Figure 6 for campus region reference).

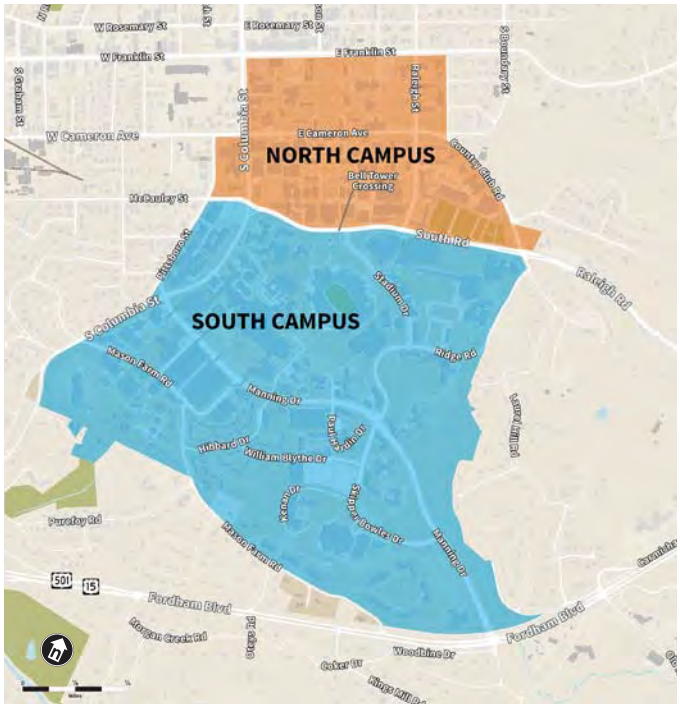



*Figure 6. Campus Regions. These regions will be referred to throughout the Plan document.*

Current parking availability does not satisfy overall demand. This gap between availability and demand is anticipated to remain and drives the demand for transit, bicycle and pedestrian transportation options.

Parking at UNC-CH is governed by the 2013 Traffic and Parking Ordinance, which details locations, permits, fee structures and fines for automobile parking. Off-street parking is available in surface lots and decks on campus for employees, students and visitors. There are also limited, on-street metered spaces for visitors on South Road and Country Club Drive. Parking permits are sold to employees and students on an academic year basis, though freshmen and students residing within a two-mile radius of the Bell Tower cannot purchase a permit. Non-freshmen student residents of UNC-CH Housing have parking available in storage lots on campus through a lottery basis.

Annual permits are also sold for UNC-CH and Town Park & Ride lots from which students and employees may ride fare-free Chapel Hill Transit buses to campus. Temporary one-day and one-week permits are also available for these lots. Charging for use of Park & Ride lots began in August of 2013.

## Transit System

Travelers living farther from campus have the option of combining bicycling with bus trips on Chapel Hill Transit, which


*Figure 7. Chapel Hill Transit Routes and Park & Ride Lots*

serves Chapel Hill and Carrboro, or Triangle Transit, which serves the wider region. Chapel Hill Transit buses are fare-free as they are funded by UNC-CH and the Towns of Chapel Hill and Carrboro. Buses attract high ridership, including those UNC-CH affiliates mentioned previously who use the Park & Ride lots when bus lines do not extend to the start or end of their trip. Chapel Hill Transit routes and Park & Ride locations are shown on Figure 7.

Chapel Hill Transit and Triangle Transit buses are all equipped with front racks that hold two bicycles. According to anecdotal community feedback gathered, these racks are often full on certain routes during the peak commute. Some Park & Ride lots are also equipped with bicycle racks where riders may lock bikes for storage while they use the transit system.

## LAND USE AND GEOGRAPHIC CONTEXT

To better understand why the campus community travels by bicycle, it is important to understand the land use and geographic features within and surrounding UNC-CH.

UNC-CH's main campus features rolling topography typical of the North Carolina Piedmont. The historic core of the campus abuts downtown to the north and is bordered by residential neighborhoods on the east and west. The southern part of campus is separated from neighborhoods farther south by Mason Farm Road and Fordham Boulevard is a four-lane, divided roadway and presents a significant physical barrier to bicycle travel. Major routes into campus, including Raleigh Road, Manning Drive, East Franklin Street and Martin Luther King, Jr. Boulevard, are currently not comfortable for most bicyclists. All of these roads are included in the Town bike plan, and if the recommended improvements are implemented, conditions for bicycling will improve in future years.

Another major route to campus is West Cameron Avenue which has the most heavily used bike lanes in town. The bike lane facilities on West Cameron Avenue make it safer to travel, but significant challenges at the intersections with both Pittsboro Street and South Columbia Street make travel more difficult and less safe. The Town Plan addresses both of these intersections.

On campus, academic undergraduate buildings are concentrated in the northern, historic part of campus mostly north of South Road and stretching west to Pittsboro Street. UNC Hospitals and the medical-related research and academic buildings are located from South Road to the Mason Farm Road area around the west end of Manning Drive. These buildings have the highest number of daily campus visitors. Athletic and recreation facilities are generally in the central and eastern part of campus. These facilities are located south of South Road and extend though the South Campus Recreation Complex and Dean Smith Center area in the southern part of campus off of Manning Drive.

Although there are undergraduate residential halls on the historic campus, the majority of students live on south campus. The number of residential halls on south campus has increased over the past ten years, due to the development of Baity Hill, Rams Village, Koury, Hardin, Craige North and Horton Halls along Manning Drive. Due to the distance from these residential areas to the center of campus, the students in these new residence halls represent a large group of potential bicyclists. Residences such as Baity Hill, Rams Village, and Taylor Residence Hall are all farther than a student is likely to walk to class.

While these residences and many other campus destinations may be within a comfortable biking distance from each other, topography creates challenges to bicycle movement throughout campus. The general downslope from north to south on campus is particularly evident when traveling northbound along Stadium Drive, Skipper Bowles Drive, Ridge Road and South Columbia Street. Only South Columbia Street is equipped with bike lanes to provide separation from faster moving automobile traffic. There are also small, steep grade changes on campus in some locations, such as the area between William Blythe Drive and the S-11 parking lot to its south, which create barriers to bicycle travel.

In the Rams Head Center area, a previously steep grade change has been effectively eliminated for bicyclists and pedestrians through the construction of the Rams Head Center. Cyclists and pedestrians now encounter a gradual grade change from the east side of Kenan Stadium to the north side of Morrison Residence Hall. In other areas, pedestrian and bicycle bridges have been proposed in the campus master plan for Manning Drive and South Road to eliminate steep grade changes and also to decrease conflicts between transportation modes. Completion of a bridge crossing Manning Drive between Dental Sciences and Thurston Bowles has improved pedestrian crossing safety across this busy roadway.

Steep grade changes also have resulted in many stairways on campus that are barriers for bicyclists (see Figure 8 for locations). Many people are not strong enough or comfortable carrying a bicycle on stairs. On campus it is common to suddenly come upon a staircase while biking and need to alter one's route to reach a destination. For example, traveling south from the main academic area of the historic quads, there is only one pathway (between Wilson Library and the Undergraduate Library) that does not terminate in a staircase at South Road. This effectively funnels all bicycle travel onto this pathway.

## EXISTING BICYCLE CIRCULATION NETWORK

### Streets

While bicycle travel is permitted on the limited number of streets that penetrate campus, pathways and parking lots on the UNC-CH main campus are also used as an informal bicycle network. The street network consists of NCDOT-maintained streets, Town-maintained streets and a few University-maintained streets (see Figure 9). The entities who maintain the streets review and approve all changes to the streets that they maintain. There is a complex, formal process for approval of proposed roadway changes, with changes to NCDOT roads having the most stringent requirements. Ownership of the road rights-of-way extends to the property lines of UNC-CH parcels, so any changes required beyond the existing roadway also necessitate approval from the University. Most often, coordination between all three entities is required. There is a good working relationship between representatives of NCDOT, the Town and UNC-CH. Cooperation between these partners will be essential to meeting UNC-CH's transportation needs and keeping the roadway system safe and consistent despite the different ownership/maintenance entities.

Pedestrian safety improvements have been made on most of the roads within and around the campus area in the last decade. Some of these improvements, including raised crosswalks and intersections, were constructed to reduce vehicle speeds in certain parts of campus. These traffic calming measures also benefit bicyclists by bringing automobile speeds closer to those of the bicyclists with whom they share the road.

The speed limit on all campus roads is 25 mph, and this speed limit is enforced by UNC-CH DPS officers. Many of the roads that enter campus are high-volume, higher-speed (35 mph) streets. Drivers often appear to come onto campus

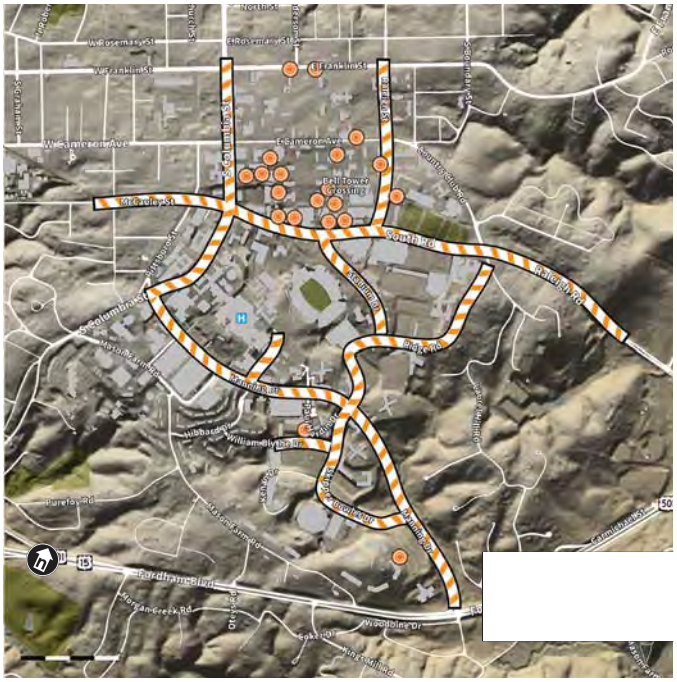



*Figure 8. Man-made (traffic + staircase) and Natural (topographical) Barriers*

*Figure 9. Roadway Maintenance*


*Figure 10. Existing On-Road Bicycle Facilities*

roads traveling faster than the posted speed. In general, it has been observed that few drivers use the cross-campus streets as through routes, and most vehicles on the roads that cross through campus likely have a destination within campus.

There are few campus streets with bicycle facilities (see Figure 10). Bike lanes exist on both sides of South Columbia Street between Fordham Boulevard and Manning Drive. At Manning Drive, where South Columbia Street becomes one way northbound, a bike lane exists on the east side of the road between Manning Drive and just south of North Medical Drive. This bike lane then transitions to shared lane markings which end at South Road. Additionally, there is a single southbound bike lane on the west side of Pittsboro Street that extends from Cameron Avenue to University Drive.

## Pathways

There are no explicit restrictions prohibiting bicycles from any pathways on campus. Bicycles are prohibited from some Town sidewalks, however, including two that border campus: Franklin Street from Robertson Lane to the Carrboro border, and South Columbia Street from Rosemary Street to Franklin Street.[1]

The pathway network was developed to create direct connections for pedestrians between buildings, with the oldest pathways of Polk and McCorkle Places dating back to early in the University's history. These pathways run parallel to and diagonally between buildings in the historic quads. In many locations the paths are interrupted by short sets of stairs such as those to the Lower Quad located on Raleigh Street.


*Narrow pathways, such as this one off Raleigh Street, provide connectivity for bicyclists but may be more likely sites of conflict with pedestrians in tight quarters.*

*Increased pedestrian traffic has led some campus pathways to be widened over time. They can easily accommodate bicyclists at most times but become congested during class changes.*

1 Sidewalk riding restrictions are located in Town code Chapter 21, Section 21-3.

Pathways range anywhere from five to sixteen feet in width, though the interior quad paths are mostly between six and ten feet wide. Newer pathways such as those over Rams Head Parking Deck and through the Rams Village residences north of William Blythe Drive tend to be on the wider end of the range.

Since these pathways are formalized pedestrian shortcuts, it makes sense that bicyclists with the same destinations would also want to take them. During the academic year and especially during class changes, hundreds of pedestrians and bicyclists share the pathway network, putting it at maximum capacity and creating conflicts between users.

Currently, bicyclists approach this congestion either by biking slowly at the pace of pedestrians or by walking their bicycles. Interactions between bicyclists and pedestrians were generally observed to be courteous, but online feedback from some campus community members pointed out that there are on-going issues with "near-misses" and pedestrian discomfort when bicyclists ride too close or too fast in crowded areas. Additionally, 23.3% of respondents to the bike plan survey who reported that they had been involved in a crash on campus said it involved a pedestrian.

### Parking Lots

The 2001 Campus Master Plan altered the previous bicycle circulation system by placing buildings, parking decks or open green space on surface parking lots. However, there are still many parking lots on campus, and they serve an important connectivity function for bicyclists. For example, Stadium Drive serves a dual function as a road and also a linear parking lot, with perpendicular parking spaces lining both sides of most of the street. Road users must carefully watch for vehicles pulling into or out of the perpendicular parking spaces which line both sides of the road. This roadway is also a bus route and has major pedestrian crossing flows, making travel through the area even more complex.

*Stadium Drive functions as both a parking lot and a roadway.*

There are other smaller parking lots that serve as connections such as the lot adjacent to Bynum Hall, the linear lot south of Alumni Hall, linear lots along Emerson Drive and lots associated with most of the south campus residence halls. The complex nature of automobile traffic in all of these lots can lead to unexpected conflicts for drivers and bicyclists that must be a consideration when routing bicyclists through these areas.

## PLANNING CONTEXT

### Departments and Organizations

There are a number of entities involved with the support and planning for bicycles, and they include the following departments and organizations.

Campus master planning is facilitated through the Facilities Planning Department. In the case of bicycle planning, efforts are currently shared by Facilities Planning and the DPS. These positions will enable DPS to expand its planning capabilities for all modes of campus travel and will oversee the completion of the Development Plan Transportation Impact Analysis on a biennial basis. These analyses are coordinated with Facilities Planning.

DPS is responsible for the Commuter Alternative Program (CAP) which targets employees and commuting students to reduce single-occupancy vehicle trips.

Some student groups are directly involved in promoting bicycling, and there are others whose missions are supportive of bicycling. A full description of campus bicycle programs operated by University staff and student groups is in Chapter 5.

Additionally, there are academic departments and research centers whose work includes bicycle planning. The Department of City and Regional Planning includes some of the premier American academic researchers on active transportation. The Highway Safety Research Center is a nationally respected research group on bicycle and pedestrian issues. Also, research at the School of Public Health and the Sociology Department relates to or addresses bicycling.

There are a number of official University committees whose decisions directly influence the bicycling environment on campus. The Pedestrian and Bicycle Safety Committee is a chancellor-appointed committee consisting of students, faculty and staff, whose purpose is to advise the Chancellor on resolving conflicts among pedestrians, bicyclists and motor vehicles drivers. The group makes recommendations to the campus administration on standards for infrastructure, policies and other matters relating to the safety of these travel modes on campus.

The Chancellor's Buildings and Grounds Committee is a chancellor-appointed committee consisting of faculty, students and staff that review and approve all changes to the campus physical environment. This includes review of the long-range physical development of the campus, the siting and exterior design of new and renovated buildings, major landscaping changes, the selection of architects and the location of monuments and memorials.

The Advisory Committee on Transportation (ACT) is housed within DPS and oversees all campus transportation matters. Specifically, the ACT is expected to advise on "strategies for convenient, easy to use, and safe transportation access to the campus; and to respond to the changing access needs of faculty, students, staff, patients and visitors to the University and UNC Hospitals on a continuous year-round basis." This 11-member committee is chaired by the Director of DPS and includes student and staff representatives from departments throughout campus. The committee also provides an annual report and briefing to the Vice Chancellor for Finance and Administration. Historically, this committee has focused mostly on campus transit, parking and fees, though its charge is broad and covers all modes used by the campus community.

Each of the above entities has developed policies or created programs that make up the context for the current bicycle planning effort. No overall structure coordinates the bicycle-related efforts of these groups. It would be helpful to clarify the relationships between these groups and coordinate their work in order to make transportation planning more efficient and effective.

## Existing Plans

### *Campus Master Plan*

The guiding document for growth and transportation at UNC-CH is the 2007 Campus Master Plan Update, which includes planning for car and bus transportation, open space, the pedestrian network and utilities. Bicycle transportation is not explicitly addressed in the 2007 plan and has been incorporated informally into the campus environment in past years.

The Campus Master Plan goals for transportation were originally developed by the 1998 Parking and Transit Task Force for the original 2001 Campus Master Plan. They included the following:

- Encourage a campus and Town environment that is supportive of pedestrians and other alternative modes of transportation.
- Offer affordable, flexible and convenient transportation options that will serve the diverse lifestyles of the campus community.
- Reduce the demand for parking on Main Campus while maintaining an adequate supply for visitors.
- Develop an efficient comprehensive transportation system to better serve the entire University community.

Each of these objectives can be addressed, in part, by increasing bicycling on campus.

The 2001 Campus Master Plan was informed by an ad hoc bicycle advisory group who developed the following campus bicycling mission statement, which is largely reflected in the vision and goals of this Bicycle Master Plan:

> *To design efficient bicycle transit routes which are safe for bicyclists and pedestrians; to develop adequate bicycle parking facilities, educational programs, and enforcement; to implement policies and incentives to support transportation by bicycle; and to develop architectural guidelines for buildings which include attention to showers and clothing storage for bicycle commuters.*

To date, implementation of this mission has not been pursued by the University in a targeted way. However, the completion and incorporation of this Bicycle Master Plan into the Campus Master Plan will take steps toward achieving this mission. This Bicycle Plan will provide the guidance necessary to routinely incorporate bicycle infrastructure into campus planning decisions.

### *Development Plan/Transportation Impact Analysis*

The campus Development Plan, the University's agreement with the Town as to how it develops the Main Campus, is updated biennially with a Transportation Impact Analysis (TIA). The TIA updates the progress of construction and its impact on transportation to and from campus estimating how traffic will alter as parking availability, destinations on campus, and transportation modes change. The 2013 TIA includes a number of suggestions relating to bicycle infrastructure and programs, with the goal to increase bicycling as a transportation mode. Increasing bicycle transportation will help to mitigate potential increases in automobile traffic as the campus population continues to grow.

*Bicyclist on the newly repaved East Cameron Avenue.*

Chapter 3

# Engineering Recommendations: Bicycle Network

As discussed in Chapter 2, there are a number of challenges for bicyclists traveling to and through campus. This chapter provides an overview of the proposed UNC-CH bicycle network. The proposed UNC-CH bicycle network will consist of a series of easily identifiable primary and secondary bicycle routes that are seamlessly connected to the Town bicycle network. The routes are intended to be designated on maps and with wayfinding signs.

Each route follows various combinations of individual roadway, pathway and parking lot segments that presently exist or are proposed as future projects. To promote safety and use of these routes, this plan recommends physical changes to portions of each route to mitigate common challenges bicyclists experience where appropriate. Improvements are categorized as short term or long term depending upon the degree of complexity and potential construction cost. For many long term recommendations, there are multiple options which will require further evaluation before a preferred option is selected. Appendix C defines the engineering treatments proposed to improve the routes and provides reference to applicable design guidelines and standards governing the installation and operation of those treatments. Appendix D provides detailed descriptions of the existing conditions, short and long term recommendations, implementation challenges and improvement costs for individual segments which comprise each bicycle route.

## APPROACH TO PROPOSED BICYCLE NETWORK

### Coordination with Town Plan and NCDOT

This Plan was developed concurrently with the Town Of Chapel Hill Bicycle Master Plan, and the bicycle facility recommendations are coordinated between the two plans. The improvements described within this chapter are limited to those improvements which are within the boundaries or immediately adjacent to the UNC-CH campus. Streets outside the boundaries of UNC-CH, while critical to support bicycle trips to and through campus, are discussed within the Town Plan. Discussion of those improvements is not included in this plan. Combined, the two plans will result in the development of a robust bicycle network that is connected, convenient and safe, serving bicyclists as they move within and through the campus, as well as to and from campus from points around town.

Implementation of this plan will require cooperation and coordination between the University, the Town and NCDOT. Many of the streets and proposed routes within the UNC-CH campus are primarily maintained by the Town or NCDOT, thus changes to those streets will require their support. Additional flexibility may be available for recommendations which may require relocation of curbs or reconstruction of sidewalks where the adjacent property is owned by UNC-CH, but there are instances where the property is privately held or owned by either the Town or NCDOT. Within Campus, UNC-CH has sole authority to implement changes proposed on Stadium Drive, Hibbard Drvie, William Blythe Drive, Kenan Drive, and Skipper Bowles Drive. Strategies necessary to implement and fund these projects are included in Chapter 6.

### Development of Bicycle Routes

This plan proposes a series of bicycle routes to service internal and external trips to and through the UNC-CH campus. These routes will be identified with wayfinding signs at key intersections and decision points as well as denoted on campus maps. Initially these routes would utilize existing infrastructure such as streets, campus parking lots and shared use paths. To improve bicyclist safety and comfort, physical changes are recommended on individual segments of these routes ranging from the placement of pavement markings such as sharrows or complete reconstruction of a street to install a shared use path or bicycle lane. The timing of the improvements from near term to long term depends on the type of improvement and the ownership of the route segment. Prior to the identification and development of bicycle routes, an assessment of existing bicycle circulation through and within North Campus was required, including the assessment of a potential dismount zone.

## NORTH CAMPUS INTERNAL CIRCULATION ASSESSMENT

Within North Campus the close proximity of academic buildings results in high volumes of pedestrians and bicyclists throughout the day on the existing sidewalks and pathways. During class change periods, a majority of the sidewalks are operating near capacity with limited freedom to maneuver on the sidewalk. However, unlike South Campus, the dense network of sidewalks creates multiple routing alternatives for bicyclists and pedestrians, alleviating some of the tensions that might otherwise arise from crowded conditions. Options studied for North Campus included application of a dismount zone or identification of a primary bicycle route through North Campus.

To manage conflicts between pedestrians and bicyclists, other universities have implemented bicycle dismount zones with varying degrees of success for all or part of the day. Examples include:

| Institution | Hours of Restriction | Location | Enforcement |
|---|---|---|---|
| **University of Washington** | 24 hours | Core | $25 ticket |
| **University of California - Berkeley** | 8am-6pm | Select crossings | Citation |
| **University of Oregon** | 24 hours | Core | $30 ticket |

Based on discussions with staff and observations of dismount zones at universities with this policy, the effectiveness of a bicycle dismount zone (or walk zone) varies from campus to campus based on a number of factors including: enforcement, size of zone, availability and proximity of alternative routes, bicycle parking, security and time of day. Last and not least, the overall campus culture plays a major role. Feedback through the UNC-CH bike plan public process indicates there is concern with conflicts between pedestrians and bicyclists on north campus, but there is not support from the biking community for a mandatory dismount zone.

### Dismount Zone Recommendations

It is not recommended the University implement a dismount zone in the short term. It is recommended the University undertake the following three actions:

1. Provide additional bicycle parking around the perimeter of North Campus (see Chapter 4).
2. Track pedestrian/bicycle conflicts within North Campus.
3. Implement education and enforcement strategies to change behavior (see Chapter 5).

If after these recommendations are implemented and pedestrian/bicycle conflicts are documented to occur on a regular basis, it may be necessary to reconsider the dismount zone. If pursued, limit the dismount zone to the area where safety issues persist during peak periods of pedestrian activity.

The development of the primary and secondary bicycle route network is based on the recommendation to not pursue a dismount zone. Additionally, given the density of sidewalk and alley options on North Campus combined with the diverse origins and destinations of bicyclists, bicycle routes will not be designated or signed within the boundaries of North Campus. Bicyclists will enjoy full access to all of the sidewalks, parking lots and streets within North Campus.

## ESTABLISHMENT OF PRIMARY ROUTE SYSTEM

The primary routes are intended to connect key external destinations as directly as possible (see Figure 11). Routes located outside of campus are recommended by the Town and will be implemented by the Town. Within campus, there are four primary north-south routes proposed to connect South Campus to North Campus that are viable given the existing terrain and street/pathway connectivity challenges. Two additional routes are proposed by the Town to facilitate connectivity between major off campus student housing complexes and North Campus. Between South Columbia Street and Raleigh Street, South Road is a large barrier to bicyclists traveling north-south due to a significant grade change. There is only one path which does not require bicyclists to dismount to navigate stairs: the Bell Tower crossing. This plan recommends additional options to cross South Road to increase connectivity between North Campus and South Campus. The retrofit of staircases with bicycle rails and future replacement of the staircases with bridges to enhance connectivity are also discussed later in this chapter.

### External Campus Trips

There are large numbers of students, faculty, visitors and staff who originate off-campus and desire bicycle friendly routes to the UNC-CH and UNC Hospital. Some of these key external destinations which generate bicycle traffic to and from campus include the Glen Lennox Apartments and Meadowmont communities to the east, Bicycle Apartments to the north, Town of Carrboro to the west and Southern Village to the south. The Town Plan recommends development of signed bicycle routes between these connections and UNC-CH as well as short and long term physical improvements along these routes. The Town Plan routes and connections to UNC-CH are illustrated on the proposed bicycle routes map and identified as primary routes (see Figure 11).

# Primary and Secondary Bicycle Routes

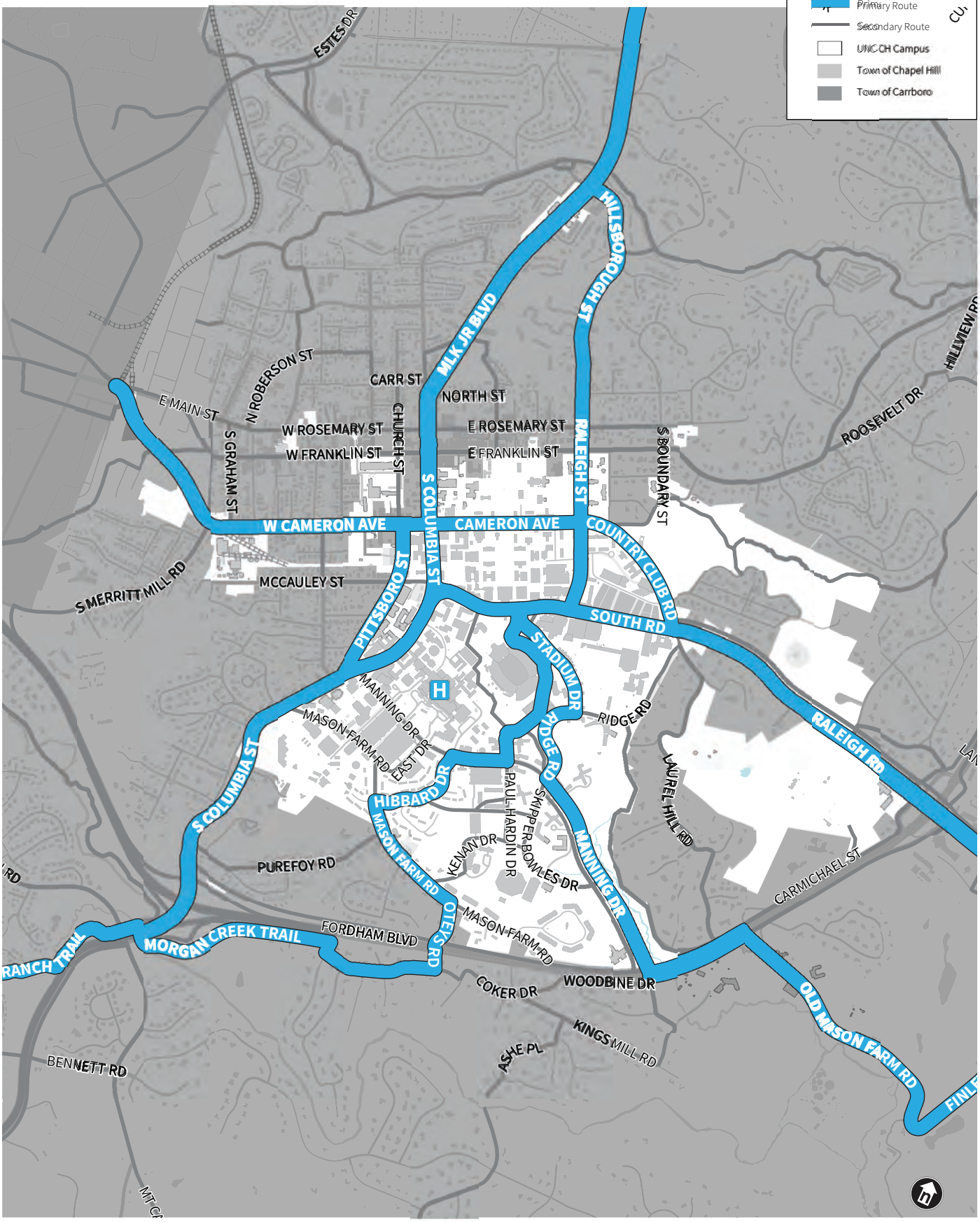



*Figure 11. Proposed North-South and East-West Bicycle Routes*

### Internal Campus Trips

Within campus, a primary function of the bicycle network is to provide north-south connectivity for students residing on South Campus who need to travel to North Campus classrooms and recreation destinations. The UNC-CH campus houses significant numbers of students in the southeast (residential/athletics) portion of campus who desire bicycle-friendly routes to North Campus (academic campus) and into Town. Residence halls are also located within the southwest (medical campus) portion of campus. Future campus redevelopment is envisioned in the southwest quadrant of campus which may add additional classrooms and residence halls. Connections to these key destinations are illustrated on the proposed bicycle routes map and identified as a combination of primary and secondary routes.

## SHORT TERM RECOMMENDATIONS

In the short term, improvements are generally limited to those that are achievable with fairly low costs.This is achieved by limiting recommendations to those that can be implemented within the existing street cross section to avoid major street reconstruction. Within the campus sidewalk system, the improvements are limited to staircase modifications and curb ramp improvements. The locations for the improvements described below are depicted on the short term map (see Figure 12) and in Appendix D with additional detail.

### Route Wayfinding

It is recommended wayfinding signs be installed on all primary and secondary routes. The design and installation of the wayfinding signs should be coordinated with the Town to ensure a uniform approach is developed to guide sign design and installation across jurisdictional boundaries. To simplify coordination, the use of a combination of MUTCD[1] D1 and D11 series signs is recommended. Customized graphics could be developed for use on the D11 sign. At a minimum, the signs should provide destination information with confirmation arrows. Supplemental signs directing bicyclists to locations with bicycle parking can be valuable where the parking is not readily visible such as in parking decks.  M1 series signs may supplement the D series signs to identify the United States Bicycle Route 1 route which traverses Cameron Avenue and Country Club Road.


1 The Manual on Uniform Traffic Control Devices (MUTCD) is the national standard for roadway and pathway signage and markings.

### Bicycle Lanes, Climbing Lanes and Marked Shared  Lanes

In the short term, it is recommended that a combination of bicycle lanes, climbing lanes and marked shared lanes be added to the existing roadway network.

The improvement used will be determined mostly by the existing road width. Bicycle lanes, which create a separate space for the bicyclists to travel on both sides of a roadway are preferred. However, where there is not room for separate bike lanes in both directions and there are steep slopes, a climbing lane is recommended. The climbing lane is a separate bike lane only on the uphill side of a roadway. This separated lane allows bicycles to travel safely uphill without impeding vehicular traffic lanes. Where there is no room for either bike lanes, or a climbing lane, marked shared lanes can be used. The marking of the lane as a shared use lane consists of a symbol placed in the center of the lane to indicate that this roadway is a shared use facility for both vehicles and bicycles. The symbol is repeated at regular intervals. The shared lane markings primarily are used as a tool to raise awareness that both bicycles and vehicles should share the road.

Shared Lane Marking

Climbing Lane

# Short Term Bicycle Plan

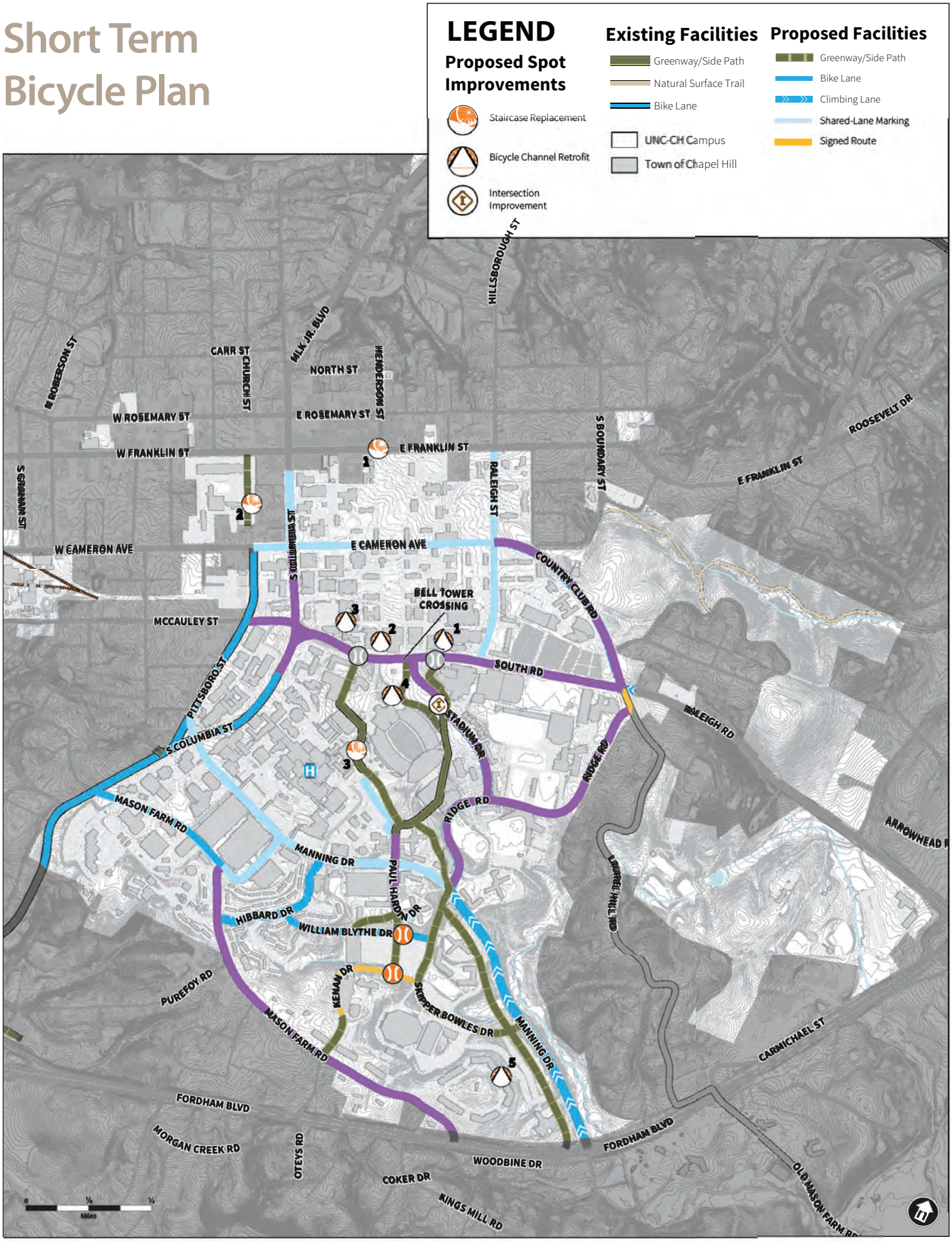



*Figure 12. Short Term Bicycle Network Recommendations*

## Staircase Bicycle Channel Retrofits

There are numerous staircases throughout the path and sidewalk network on the UNC-CH campus. At staircases, bicyclists must dismount and carry their bicycles up or down the stairs. This can be a serious impediment for some bicyclists, especially if the bicycle is carrying loaded bags. Stairs inconvenience or limit route options for bicyclists within the campus. To improve bicyclist circulation throughout campus, it is recommended five staircases be retrofitted with bicycle channels to allow bicyclists to more easily navigate staircases. The bicycle channel is typically a V-shaped or U-shaped channel that runs parallel to the stairs and it is designed to allow bicycle wheels to roll up or down the staircase. The channel should be mounted close to the stair and the design of the channel should allow the bicycle to navigate the staircase without catching a handlebar on a wall or railing. Five locations are proposed:

1. West side of Graham Student Union
2. East side of Caudill Labs
3. East Side of Kenan Labs
4. North side of Kenan Stadium
5. Baity Hill Student Family Housing

*The staircase between the Student Union and UNC Student Stores is a major barrier to north-south travel on campus and is a high priority for retrofit with a stair channel.*


*This stair channel includes a non-slip surface and instructional signage to aid bicyclists.*

## Staircase Replacements

There are three additional locations where relatively short staircases impede bicycle travel through campus on priority bicycle routes. It is recommended these staircases be replaced with American with Disabilities Act (ADA) compliant accessible ramps. The location of these ramps are at key transitions between the campus and the staircases at the following locations:

1. Staircase approaching the eastern eastern Franklin Street crosswalk at Henderson Street from McCorkle Place
2. Staircase connecting Fraternity Court to University Square
3. Staircase adjacent to Campus Health Services.

In the event it is determined that the staircases cannot be replaced with ADA accessible ramps, consideration should be given to constructing bicycle ramps adjacent to the existing staircases. A bicycle ramp creates a barrier free route intended only for bicycle travel and thus does not have to be constructed to the maximum slopes required to meet ADA guidelines. It can thus be constructed at a steeper slope to fit into the existing terrain adjacent to the staircase. As able bodied pedestrians are likely to use this ramp, it is recommended not to exceed a maximum ramp slope of ten percent.

*The staircase adjacent to Campus Health has an existing gravel path that bicyclists use. A bicycle ramp could replace the gravel path.*

*The use of stairs with three-inch vertical risers minimizes the effort required to maintain control of bicycles at locations where stair channels are provided. At locations requiring stairs, where ramps cannot be provided, consideration should be given to the provision of staircases with three-inch vertical risers and bicycle channels. Photo location is Rotterdam Station, Rotterdam, Netherlands.*

## LONG TERM RECOMMENDATIONS

The long-term bicycle network was developed to guide the implementation of the campus master plan, which envisions new campus buildings, roadways and paths, as well as redevelopment of some existing buildings. The long term recommendations are expected to be higher cost and will require reconstruction of roadways, installation of new paths and reconfiguration of parking. The locations for the improvements described below are depicted on the long term map (see Figure 13) and in Appendix D with additional detail.

### Bicycle Lanes and Greenways

In the long term, Hibbard Drive and Mason Farm Road between Hibbard Drive and South Columbia Road are recommended to have bicycle lanes on both sides of the roadway to replace climbing lanes and shared lane treatments. Additional greenway or sidepath construction is also recommended to extend the internal pathway system and to provide a separated bicycle facility for motorized traffic. Examples include sidepaths along Raleigh Road, the lower part of Manning Drive and Skipper Bowles Drive.

### Further Study Needed

The long term bicycle network also identifies those segments which will require further analysis and coordination with partner agencies. Implementation of these projects will require collaboration between UNC-CH, the Town and in some cases the NCDOT. In many cases there are multiple options proposed for the bicycle accommodation. Additional information will be required to choose a preferred design treatment for some locations. The selection of a preferred treatment will require a careful evaluation of bicyclist needs and volumes, pedestrian volumes and traffic operations within the context of available space and budget to implement an improvement. The recommendation is to provide the highest quality bicycle facility to maximize separation from motorized traffic and pedestrian traffic. In many cases this is a cycle track as envisioned in the Town Plan or a sidepath or bicycle lane. As long term projects are implemented, it will be equally important to consider facility type continuity along the route for the bicyclist. Appendix D provides additional information for each primary corridor critical to the long term network, including an overview of existing conditions, purpose and need for improvements, long term recommendation options, implementation challenges and potential cost.

### Example Facility Types: Long Term


Cycle Track

Bike Lane

Greenway

# Long Term Bicycle Plan

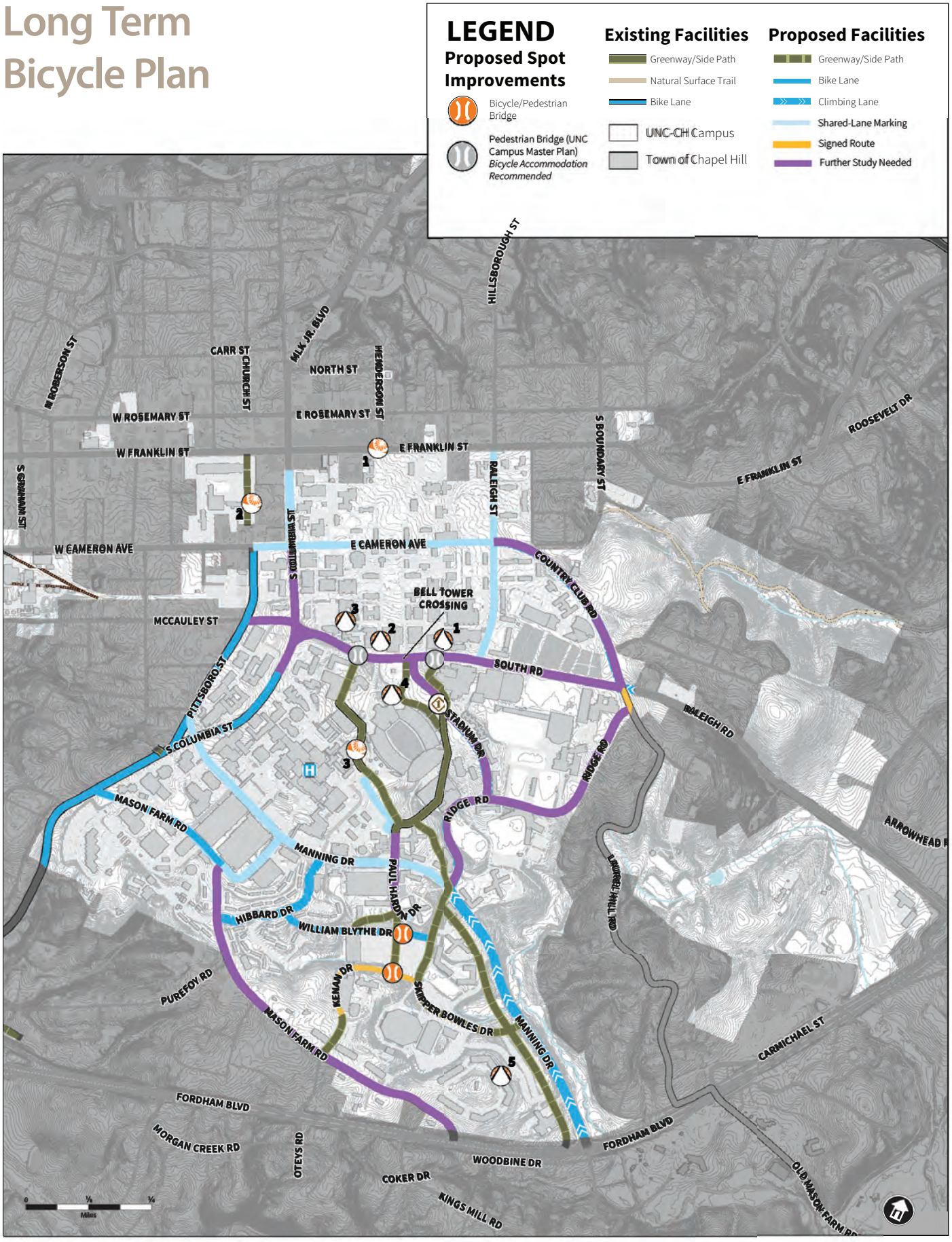



*Figure 13. Long-Term Bicycle Network Recommendations*

## Additional South Road Crossings

To reduce bicyclists and pedestrian volumes at the Bell Tower crosswalk of South Road, this plan supports UNC-CH Master Plan recommendations to construct new non-motorized bridge crossings over South Road near Caudill Labs (Bell Tower Drive Bridge) and the Pit area (Pit Bridge). These new bridges have the potential to greatly improve north-south connectivity between south and north campus. These new connections will provide low stress and safe crossings and will reduce volumes at the Bell Tower crosswalk.

## Intersection Improvements

Intersection improvements will require additional study to determine the preferred improvement. A number of intersections were identified in this plan for improvement. Intersection improvements can enhance cyclist safety by eliminating or raising awareness of potential areas of conflict between motorists and cyclists, or between cyclists and pedestrians. The following intersection improvements are proposed for UNC-CH:

- **Provision of additional crossing time** (walk time or green time) where no conflicting movements occur or time can be reallocated from a lower demand movement (example Cameron Avenue at South Columbia Street).
- **Provision of leading bicycle/pedestrian interval** to reduce conflicts with turning traffic at signalized intersections (example Raleigh Street at Franklin). This would require bicycle signals at locations where the bicyclists are traveling in the roadway.
- **Reductions of curb radii to slow turning traffic** (example Raleigh Road at South Road).
- **Widening of curb ramps on paths and sidewalks** (example South Road at South Cameron Street).
- **Provision of actuated warning signs** such as a Rapid Flashing Beacon (example Stadium Drive at East Kenan Connector Path).
- **Provision of automatic recall walk signals** will result in the walk signal being triggered each cycle change of the traffic signal. This will ensure adequate crossing time is provided to pedestrians and bicyclists who operate on sidewalks and would not normally push the button (example Raleigh Street at Franklin).
- **Provision of pedestrian signals** for all directions crosswalks should be located to ensure adequate information is provided to pedestrians and bicyclists who travel on sidewalks (example Fordham Boulevard at Manning Drive).

## Stadium Concourse

Future improvement plans for Kenan Memorial Stadium include the provision of a wide pedestrian concourse that completely encircles the stadium. Once complete, it will be open to bicycle and pedestrian travel except during major stadium events. This will result in the creation of a more level route between the Campus Health lawn and South Road along the west side of the Stadium similar to Rams Head Center.

## Long Term Cycle Track Alternative

The Town Plan recommended consideration of a cycle track network as an alternative type of bicycle accommodation for a number of roadways within the center of Town. These roadways included South Road, a portion of South Columbia Street and McCauley Street within the UNC-CH Campus. The cycle track network is proposed to separate bicyclists from pedestrians on roadways which have high volumes of pedestrians and bicyclists. The cycle track network proposed would complement the greenway network connecting the Town of Carrboro, UNC-CH, and Town of Chapel Hill business community, and major off-campus residences for UNC-CH students. A map of the proposed cycle track network is attached in Appendix D. Project descriptions provide additional details and considerations for a potential cycle track network for individual street segments as appropriate within the long term recommendations description.

## Universal Accommodations Policy

All streets, roads, paths, parking lots, intersections, and crossings are important for bicycle travel on campus. Locations not identified with specific action in this plan or included as a primary or secondary route should be considered for improvement as projects develop. Opportunities to provide improved bicycle infrastructure that is consistent with the policies and goals of this plan should be considered for all projects.

*This is an example cycle track located in Amsterdam, Netherlands. It provides a high quality of service for pedestrians and bicyclists by separating the two user types. The Town Plan proposes a cycle track network as a long term alternative. A map of the Town proposed network is included in Appendix D.*


*Bicycle parking placement at Kenan Labs takes advantage of a breezeway to provide cover from precipitation.*

Chapter 4

# Engineering Recommendations: Bicycle Parking and Support Facilities

Biking should be a convenient and reliable choice, from the beginning to the end of the trip. This depends in part on the availability of bicycle support facilities such as parking, repair and maintenance resources, showers and, for some, storage facilities. The Bike Plan's online survey revealed that many non-cyclists do not cycle because they do not want to arrive at work looking unprofessional or sweaty. Bicycle support facilities can help address that issue.

This chapter focuses on existing and proposed parking and support facilities and the policies and programs recommended to enable them.

## TYPES OF BICYCLE PARKING

Examples of bicycle parking typically found on university campuses are described below. The appropriate type of parking for each location varies based on the space available and how long people plan to leave a bicycle parked there.

### Basic Bicycle Parking

At minimum, bicycle parking consists of an immovable, anchored object that a bike can be locked to using any type of lock. Basic bicycle parking should be designed for the purpose of parking bikes and must hold the bike up through at least two points of contact. On college campuses, basic bicycle parking usually consists of metal racks. A recommended list of racks is available from the Association of Pedestrian and Bicycle Professionals (APBP), the only national group that produces bicycle rack design guidance.[1] Bicycle racks should be installed such that they are fully accessible from all sides, not next to walls or too close to driveways. Basic bicycle parking is best suited for short-term use.

### Covered Bicycle Parking

Covered bicycle parking consists of racks with some type of covering to prevent precipitation from landing on bicycles. Most often, this is a simple roof or canopy, either a separate structure constructed to cover the racks, or part of a building's structure, such as the covered bicycle parking at Kenan Labs pictured on the previous page. Covered parking can also be located inside a parking deck. Covered parking helps prolong the life of bicycles and keeps them safer for riding by reducing their deterioration due to exposure to natural elements. Covered bicycle parking is ideal for short-term use and adequate for long-term storage.

*Covered bicycle parking at Drexel University*

### Secure Bicycle Parking

Secure, outdoor bicycle parking can come in a number of forms. Freestanding bicycle cages can be constructed to completely enclose a set of racks. These cages are only accessible to those with a key, card or combination. Cages may also be placed inside parking decks, providing both security and cover for bicycles. Generally, this type of parking is for all-day use by daily campus visitors who will not use their bikes for travel within campus during the day. Secure outdoor parking is recommended for visible, central locations accessible to a wide variety of bicyclists. A visible location will increase awareness of available secure bicycle parking, encourage greater use of the racks and increase bicyclists' safety as they come and go. Secure bicycle parking is well suited for long-term bicycle storage, especially if it is also situated to protect bicycles from precipitation.

1 *Bicycle Parking Guidelines 2nd Edition* is available for purchase at http://www.apbp.org/?page=publications

## Indoor Bicycle Parking

Indoor parking is the most secure and protected form of bike parking. Indoor parking can occur in a separate room dedicated to this purpose or in a shared public space. Wall-mounted hooks can be placed in a wide hallway, room or closet allowing users to hang bikes for storage. This method requires compliance with fire and accessibility egress requirements in the area. Indoor bicycle parking is ideal for long-term bicycle storage.

*Michigan State University (MSU) and the University of California at Berkeley are two campuses with good examples of secure bicycle parking in parking decks. MSU installed a 50-bike secure parking cage (below) and a 23-bike parking room in two of their parking decks in 2013. The cage is accessed with a university ID card and one also contains a self-service repair stand. At UC Berkeley, three secure parking areas are spread throughout campus and are accessed using a personal access code. These facilities are available only to university affiliates who have registered their bicycles.*


*MSU's larger bike parking cage in a campus garage*

# EXISTING CAMPUS CONDITIONS

## Bicycle Parking Installation

The University regulates the type and installation of racks in the campus design guidelines under "Site Appurtenances." These guidelines state that bicycle parking should be included in projects where appropriate and that racks should be located "as close as possible to the perceived destination of the bicyclist." Guidelines additionally specify that racks should be installed on paved surfaces, with brick paving being the preferred surface.

These guidelines also govern the placement of racks with respect to other objects such as buildings, walls or tree wells. Generally, these guidelines are followed and racks are installed correctly. One example where parking was sited well is the Genome Sciences Building, where it was integrated into the courtyard design to take advantage of a covered area. There are a few exceptions where racks that are placed too close to parallel building walls do not leave sufficient space to lock a bicycle.

In some locations, racks are also located farther from the door than is desirable and not on the most direct pathway to the main entrance. Poorly planned parking leads to parking on stair and ramp railings at the building, which makes the ramps and steps less safe for use by pedestrians.

There is no secure outdoor or indoor bicycle parking on campus, though some riders keep bicycles indoors in an ad hoc manner. Providing designated indoor bicycle parking is feasible at UNC-CH since there is no prohibition on taking bicycles into buildings as long as fire and accessibility codes are not violated. Another UNC system school, UNC Wilmington, provides indoor bike parking in all new construction as part of that university's requirement for buildings to be LEED (Leadership in Energy and Environmental Design) certified.

*This rack at Greenlaw is placed an adequate distance from the wall for bicyclists to park correctly.*

*This rack at the Law School is positioned too close to the adjacent wall, necessitating turning a bike's handlebars to lock the frame to the rack and only allowing for locking the front wheel or frame, rather than the back wheel.*

## Bicycle Parking Location

Most locations on campus have ample basic bike parking to meet daily demand. Respondents to the online survey and users of the online interactive map had the opportunity to give feedback about parking on campus, and 75.6% of respondents to the online survey indicated that they can always find bike parking at their campus destinations. However, responses on both the survey and online map about locations where parking is typically difficult did cluster around a few locations, mostly near the Pit, as can be seen in Figure 14. Locations around the Pit with a shortage of bicycle parking included the Undergraduate Library, Lenoir Dining Hall and Davis Library. The FedEx Global Education Center, UNC Hospitals and the courtyard shared by the schools of Social Work, Pharmacy and Public Health were also noted by respondents as locations that have a shortage of bicycle parking.

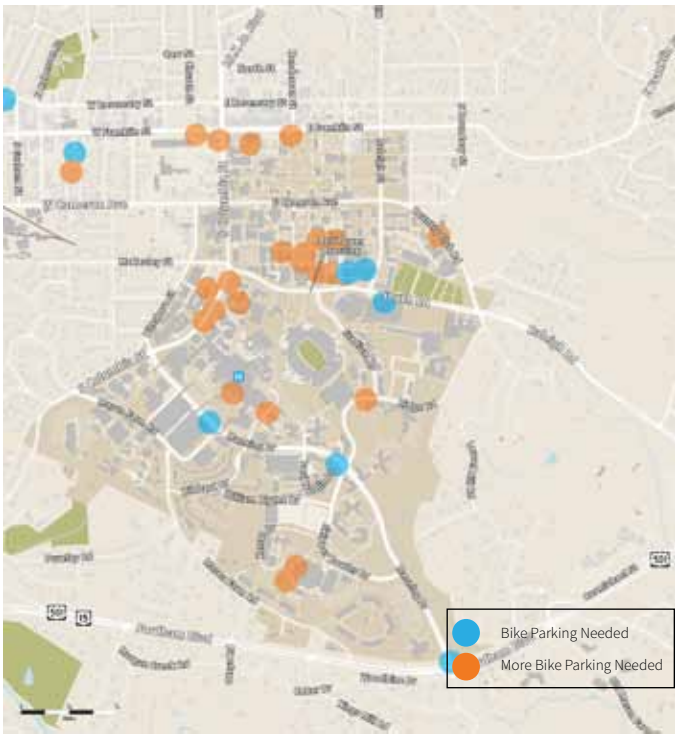



*Figure 14. WikiMap Parking Input.*

Racks near the Pit were observed to be near or at 100% capacity at midday on a weekday. Occupancy was less in the evenings. Bicycles were also locked to railings and benches in this area, encroaching into pedestrian space and preventing the use of outdoor furniture. Racks at academic buildings on and near McCorkle and Polk Places were at less than 100% occupancy on weekdays, and there were fewer bikes locked to non-rack objects in these areas.

*Bikes locked to trees, railings and benches are typical in the heavily trafficked area near the Pit.*

## Bicycle Parking Equipment

The campus standard style of rack on the UNC-CH campus is the wave rack. Bicycles are parked perpendicular to wave racks. Because there is only one point of contact between the bicycle and the rack, bicycles often fall over. This causes damage to bicycles and takes up space, preventing other bicyclists from accessing the rack. The following photograph is a good example of this problem.

*This rack near Carmichael and Teague Residence Halls shows a frequent result of locking to a wave rack: fallen, damaged bikes.*

## Bicycle Impoundment

Abandoned and/or damaged bicycles tend to accumulate on University bicycle racks throughout the academic year. As stated in the current DPS Traffic and Parking Ordinance (Ordinance), these bicycles are removed once a year if they are not claimed within 30 days of the end of a semester or the summer term. Bicycles may not be parked or stored in the following locations:

"(a) inside a University building, where an unsafe or hazardous condition is created for building occupants;

(b) against or attached to any tree, bush, plant or foliage;

(c) against or attached to any electrical fixture, sign post, railing, public seating fixture or emergency safety device; or

(d) in any other area where parking is prohibited specifically by this Ordinance."

Bicycles parked in these locations are removed as they are noticed by DPS. A $10 impoundment fee may be charged to the owner to recover the bicycle. The Ordinance also specifies that it is the right of the University to impound a bicycle considered "junked, abandoned, lost/stolen, parked/stored or operated in violation of this Ordinance, or state or local fire safety regulations."

Impounded bicycles are kept for 30 days by DPS before deemed University property. Letters are sent to owners of registered bicycles informing them of impoundment, and when an owner is unknown, notice is posted at DPS. Bicycles that become University property are auctioned annually as-is in a fundraiser for the Alpha Phi Omega service fraternity's charity work.

### Theft

Over the 4.5 year period between the beginning of 2008 and August 2013, there were 336 bicycle thefts reported to the DPS. Thefts have been increasing with 101 reported in 2011 and 90 in 2012, up from a average of 38 in the previous three years. The theft of a bicycle has a major impact on a bicyclist's lifestyle, particularly if it is the owner's only or best means of transportation. DPS helps students keep bikes safe from theft by providing 50% off coupons for U-locks with campus bicycle registration. Over-crowded racks can lead bicyclists to lock with cable locks which can have a longer reach, but are less secure than U-locks. The use of cable locks was observed regularly in over-crowded campus bicycle parking on wave racks. Crowded wave racks can also lead bicyclists to lock only a wheel to the rack, leaving the rest of the bicycle vulnerable to theft by removing the wheel.

## BICYCLE PARKING RECOMMENDATIONS

In order to create a supportive environment for cyclists and to encourage more bicycle use, the following approach to bicycle parking is recommended for UNC-CH.

### Enact Bicycle Parking Policy

It is recommended that the adopted University bicycle parking policy address the following topics:

#### *Parking Supply*

- Assess the need for additional racks through an annual survey of bicycle parking capacity. Support from volunteers or interns can help offset the resources needed for this survey.
    - Conduct the survey in late September on a non-rainy weekday.
    - Areas where parking exceeds 80% occupancy should be targeted for addition of new racks where space permits.
- Aim for parking supply according to the standards enumerated below. These figures are based on the goal of a modest increase in bicycle mode share. Results of the recommended annual parking survey should override guidance below.
    - Residence halls and other University-owned student residences: Supply parking at a rate of 1 space per 7 building occupants. This is based on national standards and policies in comparable settings. Support from University Housing could be sought for this recommendation.
        - For example: A 250-bed residence hall would be built with 36 bicycle spaces.
    - Classroom buildings: Supply parking at a rate of 1 space per 15 seats. This is based on a 75% seat occupancy at any class time and an estimated 20% of class attendees arriving by bicycle.
        - For example: A 1000-seat classroom building would be built with 150 bicycle parking spaces.
    - Office buildings: Supply parking at a rate of 1 space per 10 employees. This is based on an estimated 10% of employees arriving by bicycle.
    - Racks associated with a particular building should be located within 50 feet of its doorway(s) or inside the building itself.

#### *Parking Type*

- Prioritize covered parking at residence halls as student bicycles are most likely to be parked on racks for extended periods of time.
- Provide academic and office buildings with short-term outdoor parking at a minimum and seek opportunities for other types of longer-term parking as described in this chapter.

*U racks are also available in a series of attached racks that can aid with proper spacing and lessen the number of attachment points needed.*

### *Equipment Specifications*[2]

- Revise University design guidelines to specify the inverted U rack as the preferred type. Its strength, economy, ease of installation, ease of use and versatility in placement are major advantages over the wave rack. A single U rack accommodates two bicycles.
- Install racks according to the APBP Guidelines, and train staff on proper placement and installation techniques.

### *Parking in New Construction*

- Require new construction on campus to provide appropriate bike parking based upon the building use per the supply guidelines above.
- Incorporate indoor bike parking into building design whenever possible. Indoor parking must be close to entrances for ease of use and to reduce conflicts with other building occupants. Underutilized spaces such as under stairways can be considered for parking, and separate bike rooms should also be considered as part of building design.
- It was observed that more parking could potentially occur under roof overhangs that afford some protection.

### *Retrofitting Parking*

- Over time, retrofit all existing wave style racks on campus and replace with inverted U racks. The replacements will occur as funding is available and as renovation and new projects occur. Retrofitting with inverted U racks should be prioritized based on location, as measured in the annual bike parking capacity survey.
- Retrofitting existing racks is a lower priority, generally, than providing an adequate number of spaces at prioritized locations.

## Prioritize New Bicycle Parking Near the Pit

It is critical to add bike parking so bicyclists do not lock their bikes to non-rack objects. The existing stock of racks that DPS has should be installed where space is available. Possible priority locations are the west side of Lenoir Dining Hall and along the north side of Davis Library.

## Survey Indoor Bicycle Parking Opportunities

It is recommended that the University conduct a comprehensive survey of buildings to assess space availability for designated indoor bicycle parking. Building managers and/or departmental parking coordinators could work with student interns to complete the survey. The interns should be trained to identify spaces that could fit vertical or horizontal bike parking and to estimate how many bikes could be accommodated. This survey will be a resource when funding is identified to add new parking. Buildings where existing bike commuters have offices should be prioritized for indoor parking. A one- or two-building pilot project may be conducted to gauge interest and usage.

## Assess Opportunities in Parking Decks

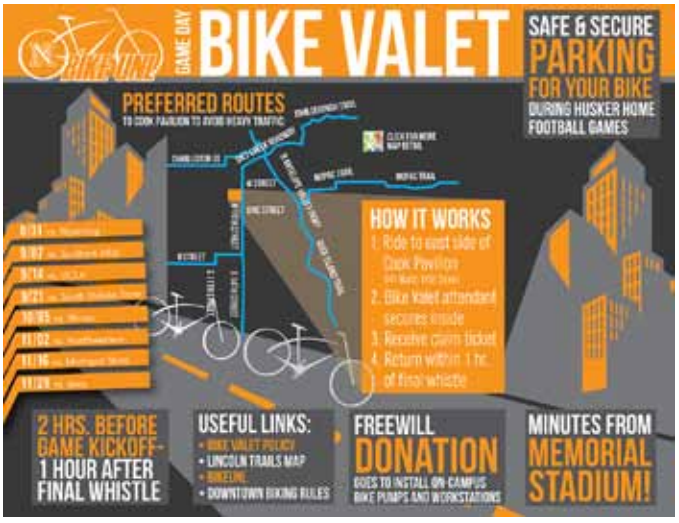
Survey all campus parking decks to determine where opportunities for installing basic bike parking and secure bicycle cages exist. Prioritize decks that are centrally located, such as Bell Tower, Rams Head and Cobb. Cages should only be available to users who have registered their bicycles with DPS in order to increase compliance with the bicycle registration policy. Coordination with DPS will be required.

*This open space in Bell Tower Deck is one of the potential locations for bicycle parking.*

2 Guidance on rack spacing and placement is given in Appendix C. It is also available in the APBP guidelines.

## Offer Valet Bicycle Parking at Events

Offer valet bike parking at large events such as concerts and athletic events, in order to make arrival by bicycle more convenient and to reduce event-related traffic congestion. Minimal equipment is needed for the service, and a few paid student staff can act as attendants. Pilots can be conducted to gauge interest and the service advertised through campus and community bicycle groups. Bike valet at University of Nebraska football games has become very popular, with hundreds of bicyclists using the service at every event.




*The University of Nebraska bike valet is available at all home football games.*

## Revise Abandoned Bicycle Policy and Procedures

The existing bicycle impoundment policy does not keep bicycle racks clear of abandoned bicycles. Abandoned bikes take up space that could otherwise be used for bike storage. This is especially problematic on wave racks, where neglected bicycles often tip over and block multiple spaces.

It is recommended that UNC-CH adopt an enforceable policy that keeps bike racks clear and usable. It is most important to clear bike racks near academic, office and hospital buildings, because these see the most frequent turnover.

Other campuses follow a procedure that clears bikes in high-traffic areas at least every other month during the academic year and clears abandoned bicycles from *all* campus racks at the end of semesters. This can be done on a rolling basis for individual sectors of campus. Abandoned bicycles can be defined as those that are not rideable (flat tires, bent wheels and missing seats, etc.) or those that have not been moved from a rack for 14 days. The following procedure is an example from Harvard University:

1. Attach a tag to each bike stating that it has been deemed abandoned. Allow two weeks for the owner to move or repair the bicycle.

2. Revisit racks two weeks later to impound remaining abandoned bicycles.

3. Contact owners if bicycles are registered with DPS. Allow owners two weeks to claim their bicycle.

4. Hold all bicycles for 30 days total after which they become University property.

This tagging and removal could be coordinated by DPS staff, and may be less costly if performed by student employees. Other universities with on-campus bike shops partner with shop staff to tag and remove bicycles. The shop also takes care of recycling bicycle parts and, in some cases, refurbishing bicycles for sale.

# SUPPORTIVE FACILITIES AND SERVICES RECOMMENDATIONS

In addition to supplying adequate levels and types of parking, UNC-CH can provide other supportive bicycle facilities and services such as the ones described below. Other bicycle friendly universities offer facilities and services like these, as part of their effort to make bicycling as convenient and attractive a choice as possible.

## Provide Shower Access

It is recommended that the University provide additional shower access to commuting faculty, staff and students. The most convenient situation for bicyclists is a shower at their destination building. Recognizing that this is infeasible for every building, an alternative is to provide registered bicycle commuters access to showers at campus recreational facilities for no charge before 9 o'clock each morning. OneCards could be programmed with this commuter designation and coded to allow access during these restricted hours. Coordination with Campus Recreation will be required to implement this program. Duke University has experienced success with a similar program for their bicycle commuters.

In addition to implementing the recreational facility shower program described above, it is recommended that the University study current shower facility use by bicycle commuters. New shower facilities were recently installed at the Genome Sciences building, and their use could be reviewed through a web survey whose link is posted at the facility. This will help determine whether showers like this should be considered for other buildings in the future. For future new buildings, the decision to provide commuter showers should be based on the proximity of that building to other shower facilities that are available to commuters.

## Evaluate On-campus Maintenance and Repair Options

It is recommended that UNC-CH work with student bicycle groups to determine whether there is sufficient demand and potential for a campus bike shop. Most bicycle friendly universities have an on-campus bike repair facility that sometimes also serves as a hub of bicycle activity on campus. There are a variety of approaches to providing on-campus maintenance and repair, from a freestanding repair stand that provides tools and a pump, to a full-service bike shop operated by the university. Several different approaches are explored below. UNC-CH has taken a step in this direction by providing an air compressor pump at the Graham Student Union.

It may be that more than one maintenance and repair option can be implemented. Whatever approach UNC-CH decides to take, student involvement in the development and implementation of the concept will be critical. Several different maintenance and repair options are described next.

### *Do-It-Yourself (DIY) Repair Stations*

Unstaffed bicycle repair stations are typically installed outdoors and include a small kit of bicycle tools suitable for basic repairs, a tire pump and a means for hanging the bicycle while it is repaired. UNC-Asheville has installed this type of repair station. They held a ribbon cutting for their fix-it station in fall 2013 and used its installation to launch an effort to improve bicycling on campus. The stations are a relatively low-cost but high-impact way to increase the visibility of bicycling and empower community members to do their own repairs.[3]

*DIY repair stations are often placed near bicycle parking and areas with high student traffic, such as this one at Cal Tech.*

3 Two examples of public repair stations are from Bike Fixtation http://www.bikefixtation.com/products/public-work-stand and Dero http://www.dero.com/products/fixit/

It is recommended that at least one repair station be installed on campus in the short-term. Investment in one of these stations and placement in a high-visibility location like the Pit, would send a strong message that UNC-CH supports bicyclists. A staff member or department would need to be assigned responsibility for regularly checking the station to ensure that it is in good working condition.

### *Mobile Repair Shop Visits*

Some campuses enter into agreements with local bicycle shops to periodically visit campus and set up temporary locations for repairs. Eastern Mennonite University in Harrisonburg, Virginia works with a local mobile bicycle shop that visits campus weekly to provide repairs to students' and employees' bicycles. UNC-CH could contract with a vendor to provide minor bicycle repairs at no cost to students and staff and potentially arrange discounts for more significant repairs. If a bicycle is in need of major repair, the owner could take it to the vendor's shop, possibly also for a University-arranged discount.

Additionally, the University could work with a vendor to provide a seasonal program whereby the bike shop transports bicycles to and from campus in the spring or fall, in order to perform full tune ups in preparation for the semester.

### *Student-run Mobile Shop*

This type of shop is largely dependent upon student interest. University of Colorado-Boulder and UNC-Greensboro both operate successful mobile mechanic programs. UNC-Greensboro pays student interns to serve as bike mechanics on an on-call basis to make small repairs.[4] The advantages of the mobile set-ups is that there is minimal physical space required, students can take ownership of program operations and competition with local shops is minimal. A student-run shop presumes that there are students with mechanic skills who can perform the repairs, and that consideration is given to competition with local bike repair shops.

A student-run shop will only work if there is strong interest from a group of students who can shepherd the project through its initial stages. Tar Heel Bikes, through its bike share program, is demonstrating that this kind of student-led initiative is possible at UNC-CH.

4 The repair program is available to affiliates with registered bicycles only and is overseen by Parking Operations & Campus Access Management.

### *Student-operated permanent shop*

Some campuses have dedicated shop space where the operations are either wholly or mostly run by students. This option is only available if the university does not have prohibitions on competing with local businesses. For example, UNC Asheville's student-operated shop offers only minimal repairs and accessories for sale, so as not to compete with local shops.[5]

Permanent campus bicycle repair shops often become a hub of bicycle activity, and include an educational component in addition to performing bicycle repairs. The repair shop can also teach owners about how their bicycle operates and how they might fix it themselves in the future. Some student shops have a university staff manager who is a paid employee, most often from an outdoor recreation department. Both shops managed by students and those managed by staff depend upon the professionalism and dedication of student workers. The advantage of a permanent shop is that it can perform more extensive repairs, stock more parts for repair and possibly sell new and used bicycles.

As mentioned earlier, some campus shops also repair and sell bikes that were abandoned on campus. They may work with campus police departments to assess, recycle and repair abandoned bicycles and their parts. They may also operate the tagging and impounding programs for the departments. This is an important function, as the resale of abandoned bikes creates a revenue stream and the police are relieved from spending their time clearing bicycle racks of abandoned bikes.


*University of Colorado Boulder's mobile mechanic program is popular with the campus community.*

5 Information about UNC-Asheville's shop is available here http://recreation.unca.edu/bike-shop

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Chapter 5

# Education, Encouragement and Enforcement Recommendations

This chapter outlines the non-infrastructure program and policy recommendations that will play a critical role in institutionalizing a supportive environment for bicycling. Education and encouragement programs, which include outreach and events, create a more knowledgeable community that is excited to try or continue bicycling. Enforcement programs and policies help ensure legal, predictable bicyclist behavior that leads to a safer traffic environment for bicyclists, pedestrians and drivers. Existing campus programs and policies are presented below, followed by recommendations.

## EXISTING EDUCATION AND ENCOURAGEMENT PROGRAMS

UNC-CH offers a number of education and encouragement programs on campus that help lay a foundation for improving the bicycling environment in the future. Programs are managed and executed primarily by the DPS and by student groups.

### University-led Programs

#### *Commuter Alternative Program*

Most bicycle programming is housed in DPS's Commuter Alternative Program (CAP). This program focuses on helping employees and commuter students decrease the number of single-occupancy automobile trips to campus. Annual benefits of the program available to bicyclists include:

- Access to twelve 1-day parking permits for permanent employees, two 1-day parking permits for students
- Access to Emergency Ride Back (shuttle service within Chapel Hill and Carrboro)
- Discounted annual fee ($10) for Zipcar, the University's carsharing program
- Entry in drawings for prizes donated by local merchants
- Annual GoPass for fare-free transit on Triangle Transit routes for employees and students living outside the Chapel Hill Transit service area
- Discounts at local restaurants and shops

The program has also offered bicycle skills classes in the past and sponsors Bike to Work Week on campus every May. CAP staff attend various events throughout the year to distribute bike safety information, bike maps, lights, tire levers, patch kits and other useful items.

#### *Cyclicious*

This annual event for students, staff and faculty began as an initiative by epidemiology students in partnership with UNC -CH Student Wellness, DPS, The Bicycle Chain (a local bike shop) and the ReCYCLEry (a local bike nonprofit). These partners sponsor the promotional event each year, offering free bike checks and repairs, bicycle registration and safety information.

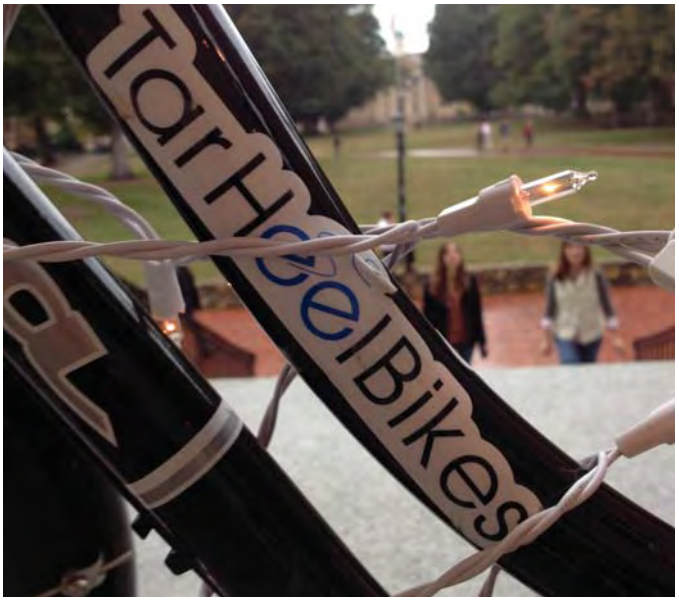
*Cyclicious is held in the Pit and attracts bicyclists and passersby to learn about safe cycling and bike resources.*

### Student-led Programs

#### *Tar Heel Bikes*

This a student-led two-year bike share pilot program launched in 2012. The funding is from multiple sources: the Residence Hall Association, New Student and Carolina Parent Programs, the ReCYCLEry NC, Housing and Residential Education, the Strowd Roses Foundation and the Renewable Energy Special Projects Committee. The program consists

of a 30-bike fleet available for free rentals to approximately 3,000 residents of Craige, Ehringhaus, Hinton James and Morrison Residence Halls. Bikes are checked out from the front office of each residence hall and must be returned there before the office closes. The bikes are maintained by volunteer mechanics from The ReCYCLEry who perform repairs and bi-weekly maintenance.




*Tar Heel Bikes are branded with the program logo.*

At the conclusion of the pilot phase, the student organizers hope to expand the bike sharing program to more campus residences within three years. Considerations for potential expansion are detailed in Appendix G.

When asked about the bike share system on this plan's online survey, 36.4% of undergraduates were aware of the bike share program, and 8.3% have used the bikes. Awareness of the program was lower among non-residential members of the University community who are not the target audience.

### *The Carolina Bicycle Coalition and Carolina Cycling*

UNC-CH currently has two other bicycle student organizations, the Carolina Bicycle Coalition and Carolina Cycling. Formed in 2012, the Carolina Bicycle Coalition's primary goal is to advocate for improved bicycle infrastructure on campus. They also promote bicycle safety and education. Founded in 1996, Carolina Cycling is a bicycle racing club that competes in all types of bicycling events and organizes training rides for students.

There are other student groups whose work relates to bicycling, though they do not provide specific programs. These groups, such as the Sierra Student Coalition, could advocate for implementing bicycle infrastructure and programs on campus.

## EXISTING ENFORCEMENT PROGRAMS

### Bicycle Permits

The current Traffic and Parking Ordinance incorporates all of the 2005 Bicycle Policy governing bicycle registration and parking. All employees and students are required to display a bicycle permit when bringing a bicycle to campus. Permits are available free of charge and are not transferrable between bicycles as specific information about the bicycle (model, color and serial number) is tied to the permit. Permits are valid for five years from issuance date. The ordinance states that violators of this requirement are first warned, then fined $5 on their second violation and $10 for third and subsequent violations.[1]


*Bicycle registration stickers are unique to the bicycle and owner.*

### Traffic Enforcement Strategies

Campus Police enforce state and local traffic laws for all modes on campus. For the past two years, DPS has participated in Watch for Me NC, an NCDOT enforcement program. This program promotes bicycle and pedestrian safety to the public and trains officers to reinforce their understanding of traffic laws that pertain to the interactions of drivers, bicyclists and pedestrians. Targeted Watch for Me NC outreach in October 2013 informed the campus community that moving violations on a bicycle incur the same fines as moving violations in an automobile. UNC-CH Sergeant Megan Howard noted a reduction in offenses directly after this enforcement action.

Campus Police distribute enforcement and safety messages through social media. As available, Police also distribute safety accessories such as bicycle lights and helmets.

1 The full Traffic and Parking Ordinance is available here: http://www.dps.unc.edu/brochures/ordinance.pdf

## EDUCATION AND ENCOURAGEMENT RECOMMENDATIONS

Below are recommendations for new programs to educate the community about bicycling.

### Create Marketing Campaign to Promote Respect

Campaigns to promote understanding and respect may help decrease conflicts amongst all modes on campus. People do not necessarily have an inherent understanding of the motivations, needs and behaviors of those traveling by other modes of transportation. For example, a driver may not understand the importance of using a turn signal to notify a bicyclist of an upcoming turn. A bicyclist may not appreciate how their travel speed impacts the comfort of pedestrians on shared pathways, and a pedestrian may not understand how important it is to make eye contact with a driver or bicyclist when crossing the street. Developing mutual respect and good communication amongst all transportation system users is central to creating a strong, multimodal transportation network.


*The San Francisco Municipal Transportation Authority partnered with a bicycle advocacy group to sponsor this ad series targeted at all modes.*

A set of campaign materials with a recognizable graphic identity should be developed. Materials can include messaging on the campus bicycling website, light pole banners, sandwich boards and posters in dining halls and campus restaurants. The theme of respect should be integrated into other education materials as well. This program is likely best accomplished by DPS working with Housing and the existing student bicycle groups.

### Launch Bicycle Ambassadors Program

Bicycle Ambassador programs have proven successful in a number of cities throughout the United States and are also beginning to be implemented on campuses such as Virginia Tech and the University of Illinois Urbana-Champaign.[2] Bicycle ambassadors perform outreach at all types of events on campus and organize stand-alone events, such as bike light giveaways when daylight savings time ends. Ambassadors are expected to act as model bicyclists by following traffic laws and riding courteously to help spread good behavior among the growing numbers of cyclists. At Virginia Tech, six ambassadors are trained about campus, local and state laws regarding bicyclist rights, responsibilities and other aspects of bicycle culture.


*Campus Bicycle Ambassador programs are modeled on successful municipal programs like that in Washington, DC.*

A student-staffed program like Virginia Tech's could be strengthened through inclusion of faculty and staff. Faculty and staff ambassadors may be more successful than students at forming connections and encouraging bicycling amongst their peers. This program could be initiated through coordination with the Carolina Bicycle Coalition and existing off-campus bicycle groups (Carrboro Bicycle Coalition and Carolina Tarwheels bicycle club) which may have UNC-CH staff or faculty members. The program will need to be coordinated by a staff member, potentially in CAP or elsewhere in DPS.

### Offer Bicycle Education Classes

Offering a regular schedule of bicycle education classes, perhaps two per semester, will help institutionalize safe bicycle practices in the community. These classes should be available to the entire campus community. These classes may be offered through Campus Recreation, since they already provide physical activity skills classes at UNC-CH and are often the provider of this type of programming at other universities.

2 Further information about Virginia Tech's program is available here: http://www.tcs.vt.edu/alternative/bkAmbass.asp, and information about the University of Illinois' program is here: https://icap.sustainability.illinois.edu/project/bicycle-ambassador-program

Instructors should be trained bicycle educators. A number of League of American Bicyclist Instructors live in and near Chapel Hill and have offered to teach classes for Town residents.[3] These professionals are also available to teach courses at UNC-CH. Education about the rules of the road, what to expect when riding in traffic, safe bicycle operations and emergency maneuvers will help bicyclists ride and interact safely with other modes. In order to tailor the national curriculum to the UNC-CH context, additional messaging about respectfully sharing pathways could be added to the classes.

The University may also explore adding a cycling skills class to the Lifetime Fitness curriculum where an indoor cycling course already exists.

Discounted or free bike safety accessories such as lights, locks and helmets may encourage UNC-CH community members to take part in these classes. Yale University has seen an increase in cycling skills class enrollment since beginning to refund membership fees in the campus bike share program for participants.

## Include Bicycle Safety in New Student Orientations

New students, both undergraduate and graduate, come to campus from many different biking cultures, so it is important to educate them about applicable rights and responsibilities for bicyclists in Chapel Hill. During new student orientation, information is given about many aspects of personal safety on campus, and it is recommended that bicycle safety messages be included. Although CAP and DPS distribute bike safety flyers at the information fairs, it would be beneficial to also include a formal presentation to all incoming students and their parents.

Graduate students should also receive bicycle safety materials and messages during their orientations. Student groups can help DPS, Housing and Campus Health with both of these efforts.

## Develop Educational Resources on Bicycle Safety at UNC-CH

Campus-specific safety resources, such as brochures or fact sheets, can help the UNC-CH community interpret and internalize messages about traffic safety. This information will supplement materials that new employees receive in the current New Hire Packet, which includes information about transportation options and the Commuter Alternative Program (CAP). Materials may also be distributed at events where CAP or bicycle student groups table and can be adapted to appear on the recommended UNC-CH bicycling website discussed under "Encouragement." This resource should cover:

- Summary of Chapel Hill laws regarding bicycling, including sidewalk riding prohibitions
- Summary of North Carolina laws regarding bicycling [4]
- How-to's for various bicycle facilities: bike lane, sharrow, pathways and shared roads
- Safety tips for traffic interactions at intersections and highways on/off-ramps[5]
- Campus policies regarding safe bicycle operations and traffic laws
- Safety equipment recommendations (helmet, lights and reflective/bright clothing) and list of local sources
- Bike locking best practices

*How We Roll at OSU*

*The Ohio State University partnered with a local bicycle nonprofit to create a bicycle safety campaign in 2011. Because the campus area was identified as one of the state's high-crash zones, the state departments of transportation and public safety funded the program. Mass media, grassroots outreach and educational bike tours formed the foundation of the campaign. Tours were led by trained peer educators (students and recent graduates) who used the 12-mile rides through Columbus' neighborhoods to conduct on-bike, in-traffic education about safe cycling skills. Campaign outcomes were positive: Tour participants reported a statistically significant increase in their levels of confidence, and over 700 bikes were outfitted with new lights.[6]*


3 League of American Bicyclists instructors teach a "Smart Cycling" curriculum that consists of classroom and on-bike instruction. Information about the program is available here: http://www.bikeleague.org/ridesmart

4 The NCDOT maintains a publication on state bicycle laws which may be summarized for a UNC-CH guide: http://www.ncdot.gov/bikeped/download/bikeped_laws_Guidebook-Full.pdf

5 The League of American Bicyclists' Smart Cycling Tips are a good starting point for this resource: http://www.bikeleague.org/content/smart-cycling-tips-0

6 A full report on the program is available at: http://yaybikes.com/wp-content/uploads/2011/12/HWR-PILOT-FINAL-REPORT.pdf

## Distribute Safety Resources as part of Bicycle Registration Process

Registration is required for all campus bicycles, and any employee or student registering their bike should receive information about bicyclists' rights and responsibilities on roads and pathways. DPS should develop materials for all registrants that include information about "do's and don'ts" for bike parking. The University will explore ways to improve the bike registration process, including advertising and incentives.

## Educate Campus Planning Staff about Bicycle Accommodation

Staff in DPS should receive regular training on all modes of travel and be familiar with the Campus Master Plan, which includes the Bicycle Master Plan. This training should include education about and knowledge of best practices in bicycle planning and design. Examples of educational opportunities include the ProWalk ProBike conference, an educational opportunity sponsored by the National Center for Bicycling and Walking and the Association of Pedestrian and Bicycle Professionals, which offers resources about the field, including webinars.

Staff in the Facilities Planning Department should be aware of bicycling as a form of transportation that will be considered, as are pedestrians and automobiles, in all master planning and capital projects. They should also be familiar with the Campus Master Plan, which includes the Bicycle Master Plan. The University Architect, the Facilities Planning landscape architect and senior management in particular should receive regular training on general bicycle planning and practices. This will enable them to act as an information source within the Facilities Planning Department and to effectively liaise with DPS, campus bicycling advocacy groups, and the Town of Chapel Hill on bicycle planning and design projects.

Educational opportunities for both DPS and Facilities Planning can be local, regional or national and incorporated as a part of the licensing required by these professions. Staff should also be encouraged to attend campus and local bicycling educational events.

## Provide Multimodal Safety Training to Drivers of Vehicles on Campus

It is recommended that the University investigate methods and opportunities to educate drivers on campus about multimodal interactions and rules of the road. This population consists of drivers of UNC-owned vehicles, delivery drivers and students, faculty and staff who drive to campus.

One potential option that has been implemented at Georgia Tech University is to educate the campus population at the time of parking permit purchase. Each buyer must click through a series of educational slides which are followed by a short quiz about rules of the road and safety related to all road users. This quiz reaches a broad population of drivers, but the approach may need to be modified for implementation in UNC-CH's current parking permit purchase system.

## Develop Comprehensive Webpage for UNC-CH Bicycling Resources

DPS is currently redesigning their website, which will provide a better format for information about bicycling. Other universities' commuter websites can serve as models for the type and level of information that should be available to the campus community about bicycling. The pages of UC-Irvine and Yale are particularly good examples.[7] Having a single, comprehensive web resource will make bicycling an easier choice for the campus community and help amass information to demonstrate the extent of bicycling's presence at UNC-CH. Basic categories of information that should be included are:

- Maps: campus, Chapel Hill, Carrboro and region
- Bike Registration: online application
- Safety: bicycle class schedule, and links to safety videos
- Security: locking how-to and best lock to use
- Bikes-on-Buses: tips for using bike racks on buses
- Resources: Student groups like Tar Heel Bikes, Carolina Bicycle Coalition, and Carolina Cycling; local advocacy groups; advisory boards; email listservs
- Bike Plan: upcoming programs, policies and infrastructure around UNC-CH

## Produce a Campus Bicycle Map

Engineering Information Services should update the existing map located at http://gismaps.unc.edu/bike to include the following elements:

- On-road bicycle facilities
- Recommended off-road through routes
- All campus stairways
- Bike rack locations and type: basic, covered and secure
- Bike tire pump locations
- Shower locations

7 These pages are at http://bike.uci.edu/ and http://to.yale.edu/bike

The map should be available in a printable format and linked to the DPS bicycle website. This map should be updated on a regular basis as new bicycle facilities are added on campus and throughout Chapel Hill and Carrboro.

### Hold Annual Fall Bike Ride for Students

This event, in addition to spring Bike to Work week, can become a focus of the bicycling community at UNC-CH and could bring the campus together for a fun, shared activity. The event could also be a safe way to orient new students to bicycling conditions in Chapel Hill. The ride will enable students to get out on the road in a supported environment and will provide resources for students who want additional education about how to safely ride in traffic. The ride should include common routes that students may take to off-campus destinations as well as on-campus routes for getting from residences to academic and recreation buildings. This ride should be organized with support from campus/Town police, so that riders stay together and interact in a courteous and safe way with other traffic.

The annual fall bike ride should be held in coordination with Cyclicious, which is already held in the fall and is also designed to build excitement about bicycling.

### Include Bicycle Routes in Campus Wayfinding

As campus wayfinding is studied and new systems implemented, bicycle routes and destinations should be included in new maps and directional signage. Clearly marked routes displayed in prominent locations will help students and staff navigate campus and will remind anyone using the campus wayfinding system that bicycling is an important part of Carolina culture.

### Apply for Bicycle Friendly University Designation

It is recommended that UNC-CH apply to the League of American Bicyclists for designation as a Bicycle Friendly University (BFU). The completion of the BFU application can continue to bring together parties who coordinated to write this Plan. Continued coordination will help solidify connections that will ease implementation of other Plan recommendations. Additionally, UNC-CH may use its BFU status as a promotional point for prospective students, faculty and employees and to keep up interest on campus for further bicycle improvements.

### Evaluate Feasibility of a Joint Town-Campus Bike Share System

The feasibility of a bike share system that covers both the University campus and the Town should be jointly studied by the Town and UNC-CH. Conducting a feasibility study and exploring possible business models and partnerships will lay important groundwork for a future bike share system. These systems are increasingly popular on campuses throughout the United States and are a way to visibly demonstrate University support for bicycling. In its first year of a two-year pilot, Tar Heel Bikes, a student-led program, had 4,700 rides taken on its fleet of the 30 bikes available to resident undergraduate students living on South Campus. As noted earlier, organizers hope to expand this program throughout campus and into Town.

Raleigh is currently undertaking a feasibility study of bike share. Though it is unlikely that campus affiliates would ride a bike share bicycle from Chapel Hill to Raleigh, the two systems could potentially be run by the same operator and integrated such that members can use systems in both jurisdictions. Conversations about a regional approach to bike share should be included in any feasibility study. A full explanation of considerations for bike share on campus and in Town is available in Appendix G.

*The Massachusetts Institute of Technology and Harvard University have partnered with Hubway, the Boston region's bike share system, to sponsor stations near their campuses.*

## ENFORCEMENT RECOMMENDATIONS

### Consider Campus Policies and Fines Related to Unsafe Cycling

All bicyclists in the roadway must obey North Carolina traffic law, and violators incur the same fines as an automobile driver. Other universities have developed supplemental or parallel policies that govern bike riding behavior not covered under state law. For instance, Colorado State University (CSU) policy states "When riding on a bicycle path or other area shared with pedestrians, a bicyclist or skateboarder will not exceed a speed that is reasonable and prudent with respect to visibility, traffic, weather, and surface conditions,

but in any case will be less than the speed allowed on campus streets and parking lots." Violation of this or any other regulation may result in the issuance of a bicycle violation notice. Certain safety violations incur fines, including riding without lighting equipment, wrong-way riding and failure to signal. Furthermore, multiple violations can be cited at a time. These fines are $25, and it is at the officer's discretion whether to apply the CSU fine structure or the Fort Collins/Colorado fine structure.[8]

## Develop a Diversion Program for Bicycle Violations

It is recommended that UNC-CH develop a new program, modeled on the UC Davis Bicycle Enforcement and Education Program (BEEP). Through BEEP, bicyclists who violate traffic laws have the opportunity to take an online course and quiz following their first infraction. By completing the quiz, bicyclists are able to lower the fine associated with their violation. This program is designed to leverage traffic violations as an opportunity to increase education amongst bicycle riders.[9]

## Continue Enforcement Actions of *Watch for Me NC* Campaign

This campaign reportedly was successful in fall 2013 in reducing bicyclist infractions. Continuing consistent enforcement of state and local traffic laws for bicyclists will help develop a culture of lawful behavior and will create a safer environment for all modes using roadways throughout campus. As enforcement occurs, word will spread quickly through student networks and social media, so a limited number of fines each semester may have a far-reaching effect.

## Ensure Maintenance of Safe Bicycle Routes During Construction

As building and road construction projects occur on campus, it is important to ensure that bicyclists have safe passage during periods of construction. It is recommended that all construction plans be reviewed by the transportation planner to ensure that bicyclists (and pedestrians) are safely accommodated if a facility will be blocked by construction equipment or barricades. For example, if construction results in a blocked bike lane or a narrowed roadway, an interim solution can consist of shared roadway warning signage and temporary shared lane markings.


*The City of San Francisco signs locations for bicyclists and pedestrians while a bike lane is blocked during construction.*

8 Full Colorado State University policies available at: http://bicycle.colostate.edu/policies-and-procedures

9 The online course and quiz are available at: https://secure.taps.ucdavis.edu/beep/


*Midday class change traffic on South Road includes many different modes.*

Chapter 6

# Implementation Strategies

The value of the recommendations presented in previous chapters hinges on the University's ability to coordinate staff and resources to implement this Plan. Improving the culture of bicycling at UNC-CH cannot be accomplished by one staff person or through a one-time initiative, it will require coordinated and sustained support from a range of staff, University administrators, students and the broader community. UNC-CH has already taken steps to improve bicycle conditions and programs on campus. This chapter provides a framework that will enable the University to keep the progress going and to intensify its efforts.

The framework presented here focuses on the staffing and oversight that is needed to accomplish the physical, program and policy recommendations of this Plan. It also includes recommendations related to data collection, which will help UNC-CH track progress toward Plan implementation and changes in bicycling behavior. This type of evaluation will help UNC-CH understand what infrastructure, programs and policies have the most positive impact on the bicycling environment and help guide future investments. Finally, it provides a series of examples of how peer universities have funded their bicycling initiatives.

Cost estimates, priorities, the level of difficulty and parties responsible for implementation of all of the recommendations in this Plan are included in tables in Appendix F.

## ORGANIZATIONAL STRATEGIES

### Integrate Bicycles into all Routine Campus Planning Efforts

In order to achieve the vision and goals of this Plan, bicycling must be fully integrated into University planning efforts in the same way that pedestrian and motor vehicle planning has been in the past. This includes all aspects of planning: master planning, evaluation of project scopes and project review.

### Designate a Bicycle Coordinator

The role of a bicycle coordinator is to coordinate efforts from throughout the institution to create a more bicycle friendly environment on campus. This coordinating role is critical to the implementation of this Plan, because there is no central coordination of efforts on campus bicycling. The top bicycle friendly universities in the country—Stanford, UC Davis, UC Santa Barbara and Portland State—all have a full-time bicycle coordinator on staff. Many other universities designate a portion of a staff member's time to bicycle planning, often someone who shares responsibility for pedestrian planning. This position is sometimes the Transportation Demand Management (TDM) coordinator or another staff member in a university's transportation office. Bicycle programming and monitoring the implementation of bicycle infrastructure are written into that person's job description and usually requires anywhere from 25 to 50 percent of their time.

It is recommended that UNC-CH designate one or multiple staff members who will be responsible for the implementation of this Plan and the coordination of staff across multiple departments. This position(s) may be part- or full-time and should be reevaluated over time to ensure that the staffing approach matches needs.

It is likely that the planning and project management functions will be the responsibility of a staff member in Facilities Planning. The long range planner and technical planner within the DPS should continue to perform project review with an understanding of the need to incorporate bicycle accommodations. Programs relating to encouragement, enforcement and education will likely be managed through of the CAP and other parts of DPS. Having a TDM assistant as CAP did in summer 2013 could be very helpful for this strategy.

### Continue Work of the Campus Pedestrian and Bicycle Safety Committee

Successful bicycle friendly universities have a bicycle advisory committee that meets to discuss bike issues on campus. It is recommended that the Pedestrian and Bicycle Safety Committee be the official advisory body that oversees implementation of this Bike Plan, taking the place of the bicycle steering committee that served during plan development. The PBSC should continue to serve an advisory role, track progress over time and address high-level issues that may arise.

### Convene Staff Working Group on Bicycle Plan Implementation

The implementation of the Plan can be led by a bicycle coordinator, but support from staff throughout the University will also be essential. It is recommended that UNC-CH form a working group or committee consisting of university administrators, or their representatives, who are involved in decision-making for the type of physical, policy or programmatic changes recommended in this Plan. This group should meet regularly to receive updates on the progress of the Plan and to facilitate coordination between various staff and departments. While the PBSC (discussed above) would play an advisory role in plan implementation, this staff working group would be designed to problem solve and collaborate on any specific challenges that come up over time.

## EVALUATION STRATEGIES

### Include Bicycle Plan Implementation Progress in Biannual *Campus Sustainability Report*

This biannual report will detail progress in implementing the infrastructure, policies and programs recommended in this plan. It should be presented to applicable campus committees and stakeholders (Advisory Committee on Transportation, PBSC, staff working group and student bicycle organizations) and also posted on the UNC-CH bicycle website. The report can help keep up momentum for the University in moving toward a greater level of bicycle friendliness.

### Conduct and Publicize Annual Bicycle Counts

Counts are already conducted biennially for the Town-required Development Plan Transportation Impact Analysis, but a yearly count and report can help more closely track bicycle traffic trends. Counts should be conducted according to the guidelines of the National Pedestrian and Bicycle Documentation Project.[1] This recommendation creates the opportunity to involve student volunteers from applicable academic departments such as City and Regional Planning, Geography, Sociology and Public Health.

1 Information on count methods and timing can be found here: http://bikepeddocumentation.org/

## FUNDING STRATEGIES

In order to implement the recommendations in this Plan, the University will need to evaluate and establish funding for bicycle programs and infrastructure. Current University-led bicycle programs and bicycle parking infrastructure at UNC-CH are funded by the DPS, with some support from Student Wellness for the Cyclicious event and a variety of sources that fund Tar Heel Bikes' operations. Funding for bicycle parking also comes from individual new building and building renovation projects and departmental funding.

Discussion is needed to identify funding sources for bicycle infrastructure or programs. A list of examples from peer universities is provided below.

### Peer University Funding Examples

**UNC-Greensboro** uses a portion of their student transportation fee to fund bike programming, ride share and fare-free transit options. They also receive funding in the university budget allocation. There is no standard amount set aside annually, but Parking Operations & Campus Access Management Department maintains a "wish list" of capital projects. They receive $5,000 to $50,000 annually and report having had greater success with funding since being designated a Bicycle Friendly University in 2010.[2]

**UNC-Asheville** (UNC-A) uses a portion of the student campus recreation fee to fund operations of its on-campus bike shop. The Assistant Director for Outdoor Programs oversees shop operations.[3] The shop has some income through bike rentals, but maintenance is provided to UNC-A affiliates for free.

**University of Montana** (UM) funds bicycle programs—parking installation, education, light giveaways and four Bicycle Ambassadors—through a student-initiated transportation fee of $33.50 per semester.[4] Students voted in this fee and created the Associated Students of UM Office of Transportation to help decrease daily visitor automobile trips. Bicycle programs cost $21,000 in FY 2012 and represented 2% of total spending by the Office of Transportation.

The **University of Oregon** has funded a bike share program through the Student Affairs budget and a grant from the Associated Students of the University of Oregon, the campus student government.[5]

2 Correspondence with Suzanne Williams, Associate Director for Campus Access Management, 1 July 2013.

3 http://recreation.unca.edu/bike-shop

4 http://life.umt.edu/asum/asum_agencies/Transportation/default.php

5 http://outdoorprogram.uoregon.edu/bikes/share

Students at the **University of California Santa Barbara** formed a bicycle coalition in 1998 that currently has an annual budget of roughly $100,000.[6] The coalition successfully campaigned for a student fee of $1.25 per quarter which is matched by the University. Of this funding, $5,000 is allocated annually for public awareness activities with the balance allocated exclusively to capital improvements.

Other campuses in the **University of California** (UC) system mostly fund bicycle programs and infrastructure through parking and transportation revenues. **UC Berkeley**'s Campus Bicycle Committee is allocated $10,000 annually in the Parking and Transportation budget to be spent on any program or infrastructure. Parking and Transportation departments in the UC system are self-funded departments.

## UNC-CH Funding Options

There are a variety of possibilities for University funding of bicycle improvements. The planning staff in the DPS should work to identify potential funding sources and maintain a prioritized list of bicycle improvements and their associated cost estimates. This will position the staff to propose improvements as either "stand-alone" projects or ones that can be made as a part of a larger project, such as the development of a new campus building.

Additionally, there are a number of student fees that may be able to be utilized for infrastructure or programs: the Student Transit Fee, Safety & Security Fee, Campus Recreation Services Fee, or an expanded Renewable Energy Fee to cover a range of projects to improve environmental sustainability. Attendees of the October Bike Plan open house were asked to vote on these various fee options, and the most popular option was using a portion of the Student Transit Fee, garnering 75% of votes.[7]

Unlike the UC system, UNC campuses do not have the option of allocating any parking or traffic fine revenues to bicycle infrastructure or programming. These monies are statutorily obligated to fund public schools in North Carolina through the Civil Penalty and Forfeiture Fund as outlined in Article IX, Sec. 7 of the North Carolina Constitution.[8] Parking permit revenues are not similarly restricted.

## Continued Partnership with Town and NCDOT

The Town of Chapel Hill and NCDOT are likely partners to fund bicycle infrastructure as most roads on campus are maintained by them. The Town applies for infrastructure funding to the Durham-Chapel Hill-Carrboro Metropolitan Planning Organization and to NCDOT. Federal funding for bicycle infrastructure would be accessed through applications in partnership with the Town.

NCDOT, the Town and the University coordinate road maintenance projects on a regular basis. Coordination of these maintenance projects may offer opportunities to implement some projects included with the Plan.

6 http://bikes.as.ucsb.edu/

7 Full results of the open house voting are available in Appendix A.

8 http://www.ncleg.net/fiscalresearch/fiscal_briefs/Fiscal_Briefs_PDFs/Fines_and_Forfeitures%20Brief_2010.pdf

Appendix A

# Public Engagement

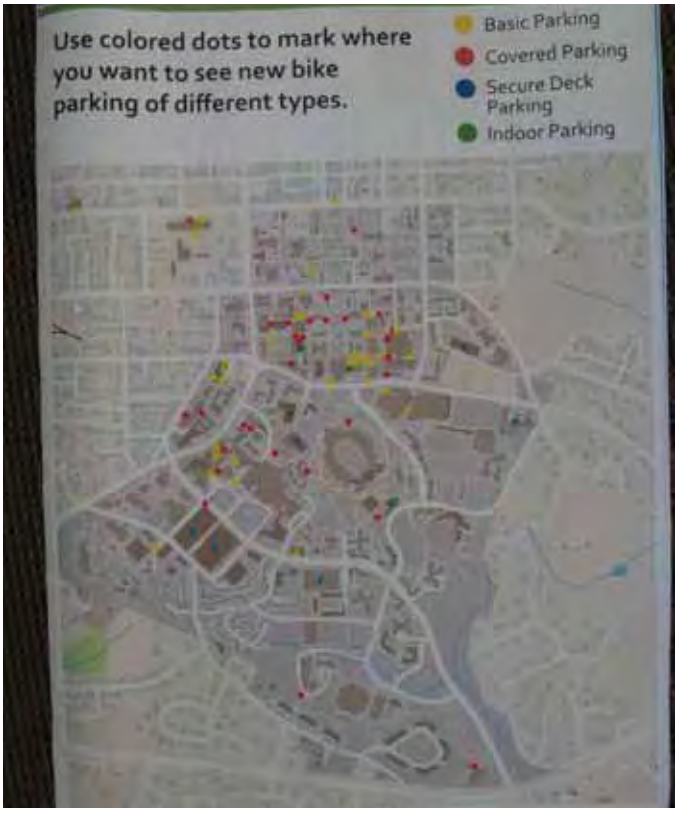
## IN-PERSON OUTREACH

### Steering Committee

### Stakeholder Interviews

### Public Open House

| | | | | |
|---|---|---|---|---|
| **South Road** | Sharrow | Wide sidewalks | Cycle track or raised bike lanes | Wide shared-use path |
| **Ridge Road** | Sharrow | Climbing lane | Bike lanes | Wide shared-use path |
| **South Columbia Street** | Sharrow | Wide sidewalk | Two way cycle track | |
| **Country Club Road** | Sharrow | Climbing lane | Wide shared-use path | |





| Would you support a policy that requires people to park their bike and walk instead to desintations in the Old Campus? | |
|---|---|
| **Yes** | **No** |
| **5** | **24** |

| Program or Policy | Votes |
|---|---|
| Integrate bikes into all routine campus planning efforts | **38** |
| Produce a campus bicycle map with suggested routes, parking + shower locations | **35** |
| Include bicycle safety info in new student orientations | **27** |
| Support on-campus bike shop/hub | **19** |
| Educate cyclists about their rights and responsibilities | **15** |
| Designate a campus bicycle coordinator | **15** |
| Develop webpage for UNC bike resources | **13** |
| Study bike share feasibility | **11** |
| Ensure inclusion of bike routes and destinations in campus wayfinding project | **11** |
| Hold an annual fall bike ride | **10** |
| Consistently enforce traffic laws for all modes | **9** |
| Create "respect" marketing campaign | **8** |
| Offer bicycle education classes on regular basis | **8** |
| Include bicycle safety info in new employee packets | **8** |
| Create enforceable policies with associated fines that restrict unsafe riding | **4** |
| Build bicycle ambassadors program | **3** |
| Continue and grow Cyclicious; pair with spring event | **3** |
| Develop educational videos about biking topics in UNC context | **1** |

| What do you think is the best way to fund bicycling improvements at UNC? | Votes |
|---|---|
| Allocate percentage of existing transportation fee | 24 |
| Expand renewable energy fee to be sustainability fee | 6 |
| Allocate portion of student recreation fee to bike classes and/or campus bike shop | 1 |
| New student fee for bike infrastructre and programming | 1 |

## ONLINE OUTREACH

### Website

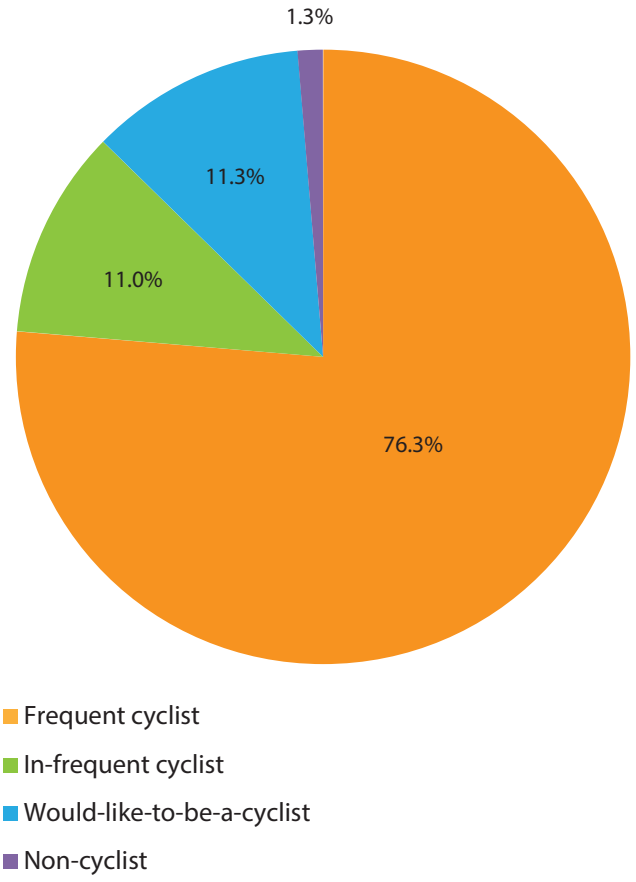
## Comments received through Plan website

| Date | Comment/Question |
|---|---|
| 10/15/2013 | In North Carolina, bicycles are expected to obey traffic laws. Bicycle safety on this campus and in Chapel Hill could be greatly enhanced if only the police would start to enforce these state regulations. I can't begin to recall how many times I've watched bikes run stop lights and traffic signs, go the wrong way on one way streets, ride on sidewalks, again including the wrong way on one way streets, zoom through crosswalks, and weave in and out of traffic with no thought to signalling. I have seen all of these actions and more, some right in front of manned University and Chapel Hill police cruisers, in the over 30 years I have lived here and I have never, ever once seen an officer even try to correct this kind of behavior. If you want a bicycle-safe town start expecting safe bicyclist behavior. |
| 10/15/2013 | I manage the building infrastructure for Computer Science in Sitterson and Brooks. We created an internal bikeroom and it is a great feature. There's a strong need for covered bike storage. I used to commute by bicycle, and having to deal with a wet bike is painful. There's a patio space of sorts off the north west corner of Sitterson, where the bus stop used to be. That area would be an ideal location for covered bike racks. Likewise, there are some nice open space just south of Chapman. |
| 10/15/2013 | Hi - I don't ride a bike on campus personally, but I do work here and thus walk along the sidewalks every work day. I think it's great that people are riding bikes, but there is a problem that I fear greatly. The coasting speeds reached on sidewalks by cyclists are often very fast as they come down slopes. For instance, I park my car in the Undergraduate parking lot each day. I walk up/down the hill via the brick walkway between the Undergrad and Wilson libraries. MANY times I have not heard a bike speeding down the walkway and whizzing past me till it has come and gone - I only hear a whoosh in my ear. There is no way for a cyclist to predict what the pedestrians in front of him will do. I fear that one day I will step to the left or right and get slammed to the ground by one of these bikes. I'm 63 years old, and I would definitely end up in the hospital. The speed on other (of the many) sloping sidewalks is similar. If there could be some sort of regulation or plan to prevent such an accident it would be much appreciated. Thank you! |
| 9/20/2013 | please add me to email update list |
| 7/29/2013 | 1. Campus "Wave" style bike racks are a "Not Recommended" design in the APBP's Guidelines. That is why bicycles are falling all over campus. 2. The bike lane on northbound So. Columbia is a hazard that creates manufactured conflicts. Here is the landing page for a paper I wrote describing the problems: http://bicyclingmatters.wordpress.com/local/bike-lane-on-so-columbia/ |
| 7/1/2013 | I would like a parking lot in Carrboro (?Carrboro Plaza?) devoted to commuting by bicycle to campus. I live in Saxapahaw, so I'd like to drive to Carrboro, leave my car, then fetch my bike from a secure & covered space, and wheel into campus. Ideally, this car/bike parking area would also be accessible via bus in case of bad weather. |
| 6/27/2013 | Just took the survey--didn't see an opportunity for feedback, so doing it here. I'm an avid cyclist and have used my bike as my sole form of transportation for many years. But I think bikes need to be restricted from riding all over campus. I've had many near misses--mostly as a pedestrian. It would also be useful for me, as a cyclist, to have a dedicated route where I can reasonably expect not to find a ton of pedestrians. University of Minnesota did a good job--just painted dedicated routes, no other investment. |

| | |
|---|---|
| 6/27/2013 | I have observed that the vast majority of bicyclists follow absolutely no rules. They run red lights, speed through pedestrian crossings, and weave in and out of pedestrians on side walks. I've been grazed by passing bicyclists while I was walking on sidewalks. I think that biking rules need to be enforced and riders educated about the rules. They are presently a nuisance. However, biking decreases automobile traffic so it is necessary to encourage this type of transportation. Education about riding etticate and providing safe bike lanes is imperative for the master plan. |
| 6/27/2013 | I think what you are trying to do is a good thing but every day I see students and others weaving in and out of traffic. I see them pass you on the right as you have to stop for something and get in front of you, then creep along. I see them blow through red lights and completely ignore traffic laws. They do this in plain sight of officers and I have never seen a biker stopped. Never. It is my opinion that this is no more than a game to the bikers and many of them could care less about the traffic laws they are supposed to obey. Until UNC and Chapel Hill police crack down on some of these people how can anyone expect the problem to get better? I do everything I can everyday to be a safe and responsible driver on this campus. I hope whatever plans you come up with helps keep everyone safe. The biggest and most productive thing that can be done IMO is enforce the existing traffic laws and make the bikers follow them too. |
| 6/27/2013 | What's the deal with bikes riden on the sidewalk? If it's not against the law it ought to be... just sayin'.... |
| 6/27/2013 | I think it's great that you're encouaging more bike riding on campus and trying to determine possible alternatives for them when riding. However, I'm writing to you from a different angle i.e. as a pedestrian, walking on sidewalks, concerned for my safety. If you're going to make the campus more biker friendly, you need to educate the bikers to becoming more pedestrian friendly as well. Please, please, please consider providing information/training to the bike riders about the care they need to take while riding and the consideration they need to give to pedestrians, especially when using the sidewalks that are intended for walking. Rules of the road/sidewalk, so-to-speak. I've literally almost been run over by bikers on a sidewalk more times than I can count. Bikers ride on sidewalks and walkers cannot hear them coming from behind. What if the walker stumbled to or started walking on the other side of the sidewalk and there was a bike coming from behind? The walker would be hit. It's a sidewalk, the walker is not thinking that a bike might be coming from behind. It would be so easy if the bikers gave a proper warning with a yell-out of "passing on the left" as they pass a pedestrian on the same sidewalk. The majority of bikers do not know to do this and have never heard of doing it. Many times there's even a bike lane on the road and the bikers still choose to use the sidewalk. The "call-out" is not only common courtesy since the bikers are infringing on the walkers' sidewalk, but it's a bigger matter of safey. There should be signs posted to reflect riding rules, information should be given to the bikers on their responsibility to ride safely, just as there are rules and safety standards for drivers of cars. Thank you! |
| 6/27/2013 | A comment: I think a huge integral part of this master bike plan is to have markings on sidewalks for bikes within campus (such as the quad or what not). It would prevent a lot of potential accidents of a 20mph bike vs pedestrian. |

## Online Interactive Map (WikiMap)

| Routes | Total Added |
|---|---|
| Route I ride (low-stress) | 178 |
| Shortcut I use, not trail/road | 54 |
| Problem intersection | 223 |
| Need bike parking | 22 |




## Online Survey

**Appendix B**

# UNC Chapel Hill Commuter Mode Data, 1997 - 2013

| Employee Home To Work Travel Modes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2013 Data | | 2011 Data | 2009 Data | 2007 Data | 2004 Data | 2001 Data | 1997 Data |
| **Mode** | **Total** | **Percent of Total Respondents** | | | | | | |
| Drive Alone (not park & ride) | 1051 | 65.6% | 67.9% | 61.6% | 68.7% | 69.9% | 78.3% | 76.9% |
| Park & Ride | 301 | 18.8% | 20.3% | 20.5% | 17.4% | 17.4% | 7.8% | 5.6% |
| Carpool | 85 | 5.3% | 5.0% | 6.4% | 6.2% | 4.7% | 7.5% | 8.2% |
| Vanpool | 22 | 1.4% | 1.1% | 1.8% | 1.1% | 3.4% | Less than 1% | Less than 1% |
| Bus | 287 | 17.9% | 11.5% | 16.2% | 11.0% | 10.1% | 9.4% | 4.9% |
| Motorcycle/Moped | 17 | 1.1% | 1.2% | 1.0% | 1.1% | 1.0% | Less than 1% | Less than 1% |
| Walk | 55 | 3.4% | 2.0% | 3.8% | 3.5% | 2.7% | 4.1% | 2.9% |
| Bicycle | 84 | 5.2% | 2.8% | 5.0% | 4.5% | 2.9% | 4.8% | 3.7% |
| Dropped off by Friend/Spouse | 71 | 4.4% | 4.3% | 4.4% | 3.7% | 6.1% | 10.4% | 5.5% |
| Telework from Home | 116 | 7.2% | 2.3% | 4.1% | 3.2% | n/a | n/a | n/a |
| Other | 24 | 1.5% | 1.6% | 2.3% | 2.0% | 3.4% | Less than 1% | Less than 1% |

| Student Home To Work Travel Modes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2013 Data | | 2011 Data | 2009 Data | 2007 Data | 2004 Data | 2001 Data | 1997 Data |
| **Mode** | **Total** | **Percent of Total Respondents** | | | | | | |
| Drive Alone (not park & ride) | 408 | 47.2% | 50.8% | 52.2% | 54.9% | 44.1% | 56.4% | 41.3% |
| Park & Ride | 187 | 21.6% | 19.8% | 19.8% | 15.5% | 20.0% | 16.6% | 10.1% |
| Carpool | 73 | 8.4% | 4.8% | 7.3% | 13.9% | 10.5% | 13.1% | 8.6% |
| Vanpool | 26 | 3.0% | 1.0% | 1.0% | 1.5% | 1.0% | 0.6% | 0.3% |
| Bus | 434 | 50.2% | 55.0% | 53.0% | 47.8% | 41.8% | 27.9% | 26.1% |
| Motorcycle/Moped | 31 | 3.6% | 1.4% | 1.6% | 2.0% | Less than 1% | 1.2% | 1.0% |
| Walk | 206 | 23.8% | 16.3% | 17.3% | 19.7% | 19.4% | 20.5% | 27.1% |
| Bicycle | 123 | 14.2% | 12.8% | 16.1% | 11.2% | 7.0% | 11.6% | 16.5% |
| Dropped off by Friend/ Spouse | 82 | 9.5% | 7.6% | 10.5% | 11.0% | 12.2% | 13.4% | 9.1% |
| Telework from Home | 50 | 5.8% | 4.5% | 6.2% | 2.8% | n/a | n/a | n/a |
| Other | 23 | 2.7% | 1.0% | 1.2% | 1.9% | 1.9% | 1.2% | Less than 1% |

Appendix C

# UNC-Chapel Hill Bicycle Facility Design Approach

## C.1 National Guidelines and Standards

## C.2 State Guidelines and Standards

## C.3 Local Guidelines and Standards

## C.4 Design Strategies for Achieving High-Quality Facilities for Vulnerable Roadway Users

## C.5 Bicycle Facility Treatments


DO NOT
ENTER


Kenton
0.7 MI.
4 MIN.
University of Portland
2.1 MI.
13 MIN.
St. Johns
4.1 MI.
25 MIN.

## C.6 Intersection and Roadway Crossing Treatments


DC LAW
STOP FOR
IN CROSSWALKS


STOP
HERE
ON
RED

$$BMG \quad BCT_{standing} - Y - R_{clear}$$

$$BMG \quad PRT + \frac{V}{2a} + \frac{(W+L)}{V} - Y - R_{clear}$$

where:

| | | |
|---|---|---|
| BMG | = | bicycle minimum green time (s) |
| $BCT_{standing}$ | = | bicycle crossing time (s) |
| Y | = | yellow change interval (s) |
| $R_{clear}$ | = | all-red (s) |
| W | = | intersection width (ft) |
| L | = | typical bicycle length = 6 ft (see chapter 3 for other design users) |
| V | = | bicycle speed crossing an intersection (ft/s) |
| PRT | = | perception reaction time = 1 s |
| a | = | bicycle acceleration (1.5 ft/s $^2$) |

## AppendixD

# Project Descriptions

The project descriptions and network maps in this appendix are intended to serve as stand-alone summaries of the bicycle infrastructure projects proposed in the Bicycle Plan. They were developed to assist in the implementation process by providing additional detail for proposed short and long term projects on the major streets within campus. The project descriptions are organized by street in alphabetical order to aide in navigation of the Appendix. Path segments around Kenan Stadium, the Business School and Dean Smith Center have been given names to enable discussion of proposed improvements. A project sheet for William Blythe Drive was not developed as the recommendation is limited to the provision of a bicycle lane within the existing cross section in the short term.

### REFERENCE MAPS

The following maps are provided for your reference:

- The Short term bicycle network recommendation map (from Chapter 3) is provided.
- Long term bicycle network recommendation map (from Chapter 3) is provided.
- The Primary and Secondary bicycle Route Map (from the Town's plan) is an overview map to show the continuity between the Town and University Plans.
- The Cycle Track Alternative map – (adapted from the Town's plan) shows an alternative proposal for a network of cycle tracks on both Town and University roads.

An additional map is provided from the Town's Bicycle Master Plan which depicts the vision for a limited cycle track network within the Town to connect Greenways and priority destinations such as the UNC-CH campus. The Cycle Track Alternative map has been reproduced from the Town Plan. It is included for reference as the Town Plan recommends consideration of cycle tracks on portions of South Columbia Street, South Road, Cameron Avenue, Pittsboro Street and McCauley Street as an option. The Town, NCDOT and UNC-CH will coordinate planning efforts if all or portions of this network are pursued. UNC-CH is not committing to implementing the cycle track network as the roadways proposed for its inclusion are largely under the control of the Town or NCDOT.

A copy of the primary and secondary route map is included for reference. Implementation of physical improvements shown on the short, long and cycle track alternative maps and described in these project descriptions is independent from providing wayfinding along the primary and secondary routes. All primary and secondary routes are recommended for wayfinding in the short term however they are not included in these project descriptions.

### OVERVIEW OF SHORT AND LONG TERM RECOMMENDATION APPROACHES

In the short term, it is recommended that a combination of bicycle lanes, climbing lanes and marked shared lanes be added to the existing roadway network. The improvement used will be determined mostly by the existing road width. Bicycle lanes, which create a separate space for the bicyclists to travel on both sides of a roadway are preferred. However, where there is not room for separate bike lanes in both directions and there are steep slopes, a climbing lane is recommended. The climbing lane is a separate bike lane only on the uphill side of a roadway. This separated lane allows bicycles to travel safely uphill without impeding vehicular traffic lanes. Where there is no room for either bike lanes or a climbing lane, marked shared lanes, can be used. The marking of the lane as a shared use lane consists of a bicycle symbol placed in the center of the lane with directional chevrons to indicate that this roadway is a shared use facility for both vehicles and bicycles. The symbol is repeated at regular intervals. The shared lane markings primarily are used as a tool to raise awareness that both bicycles and vehicles should share the road.

In the long term, it is recommended to reconfigure or reconstruct roadways and paths to provide additional space for bicycle lanes, climbing lanes, paths or cycle tracks.

The long-term bicycle network was developed to guide the implementation of the campus master plan, which envi¬sions new campus buildings, roadways and paths, as well as redevelopment of some existing buildings. The long-term recommendations are expected to be higher cost and will require reconstruction of roadways, installation of new paths and reconfiguration of parking. Implementation of these projects will require collaboration between UNC-CH, the Town and in some cases the NCDOT.

The long term bicycle network identifies those segments which will require further analysis and coordination with partner agencies. In many cases there are multiple op¬tions proposed for the bicycle accommodation. Additional infor-

mation will be required to choose a preferred design treatment for some locations. The selection of a preferred treatment will require a careful evaluation of bicyclist needs and volumes, pedestrian volumes and traffic operations within the context of available space and budget to imple¬ment an improvement. The preference is to provide the highest quality bicycle facility which maximizes separation from both motorized traffic and pedestrian traffic. As long-term projects are implemented, it will be equally important to consider facility type continuity along the route for the bicyclist.

## PROJECT DESCRIPTIONS

The project description sheets for each major street and path are structured to provide the following information to guide project implementation:

***Project Location***

Street or path name

Start and end point limits for improvement

***Project Location Map***

Project limits are highlighted in red on a zoomed in view of the primary and secondary route map

***Purpose of Improvements***

Short description of value of improvement for each segment

Existing Conditions

Approximate curb-to-curb width of the affected road¬way or path

Reference to existing plans for roadway

Considerations of topography, destinations served, route connectivity and public input

***Short Term Recommendations***

Presentation of options if applicable

Primary implementation challenges

Probable construction costs (See Appendix E for further information)

***Long Term Recommendations***

Presentation of options if applicable

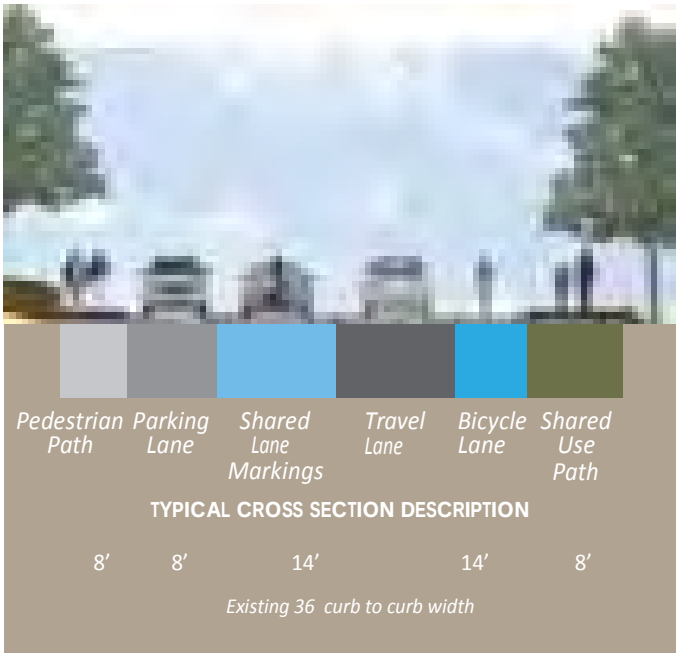
Primary implementation challenges

Probable construction costs (See Appendix E for further information)

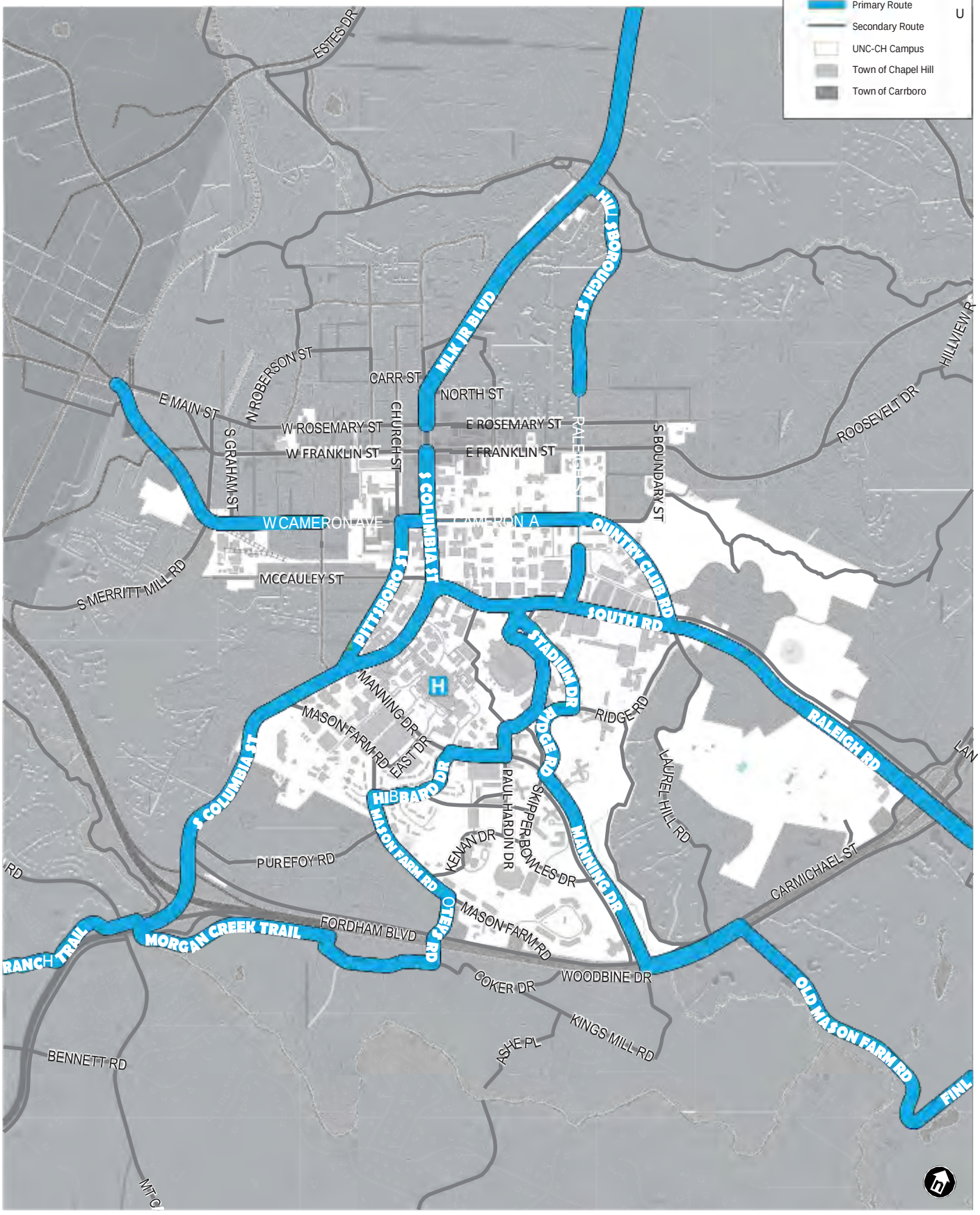
***Example Recommended Cross Section***

A number of project descriptions provide a cross section to assist the reader in visualizing a recommended short or long term cross section. The cross section is labeled to match to the short or long term recommendation description title.

The following cross section is an example to illustrate the information the cross section is a depicting. The color codes represent the type of use (e.g. bicycle only = dark blue labeled bicycle lane) and its proposed width. The dimension line below corresponds to the existing use of the space. The solid black line below the existing cross section represents the curb to curb width. The existing and proposed cross section are equally scaled to allow the reader to evaluate potential curb relocation impacts.



# Primary and Secondary Bicycle Routes



# Short Term Bicycle Plan

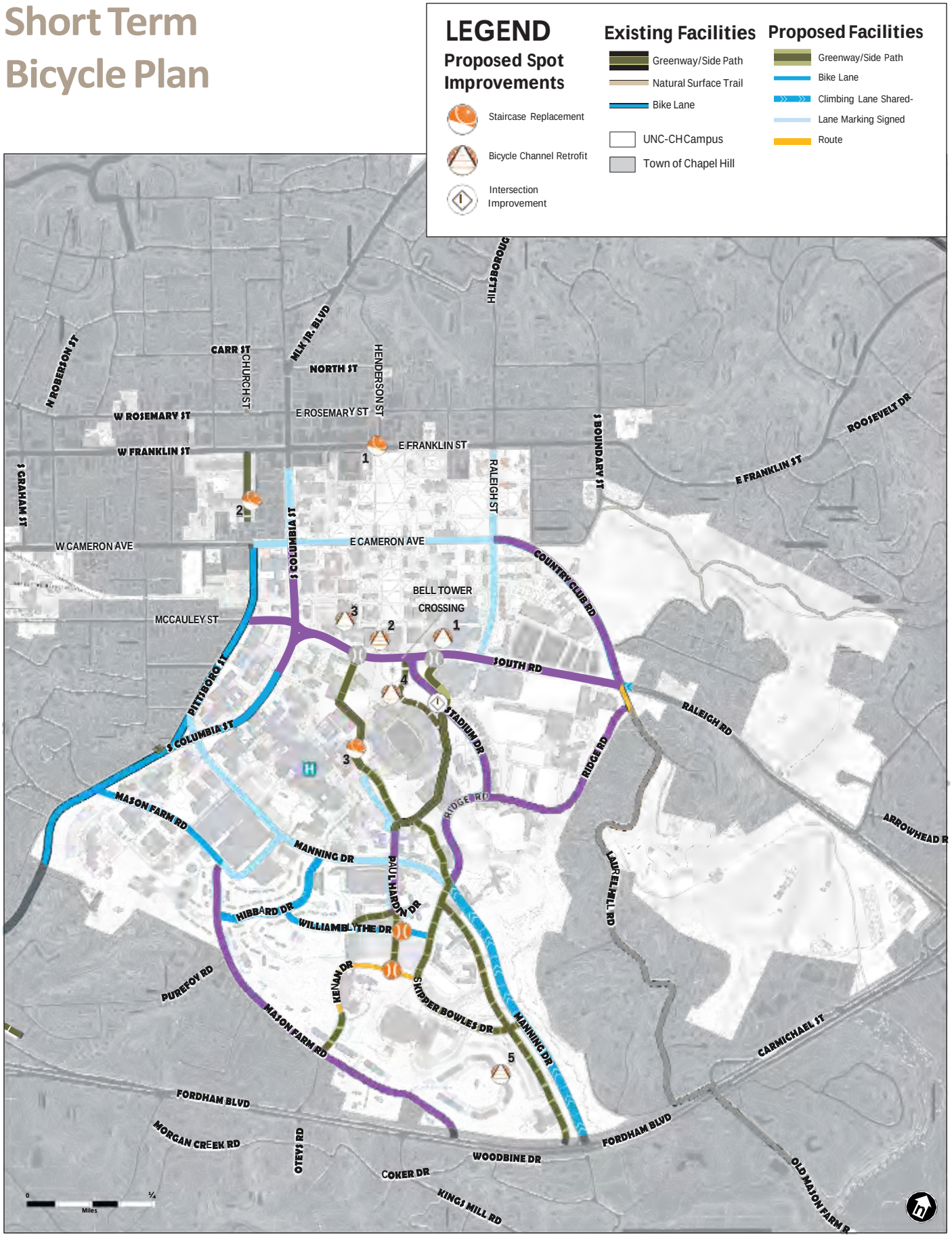



*Figure 12. Short Term Bicycle Network Recommendations*

# Long Term Bicycle Plan

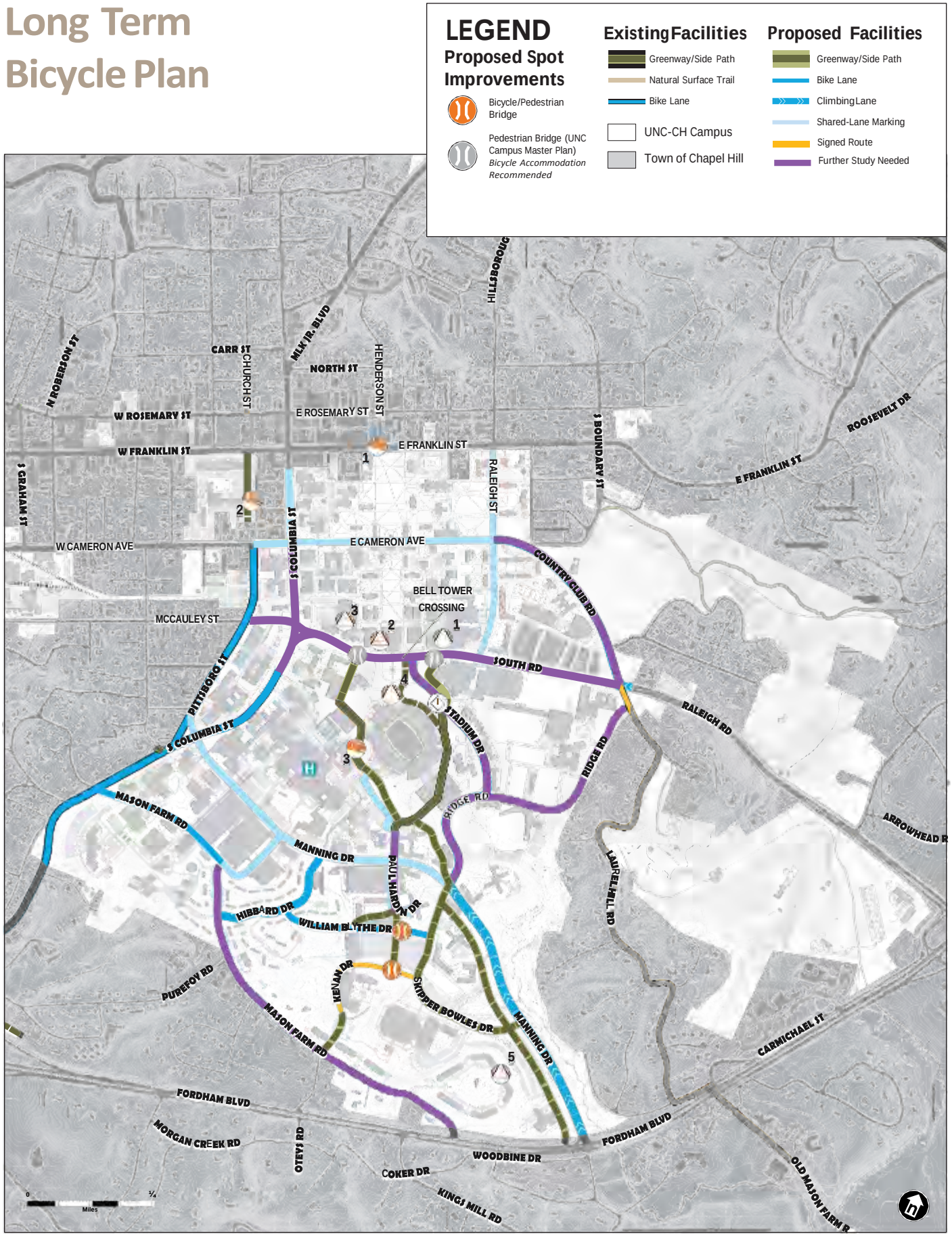
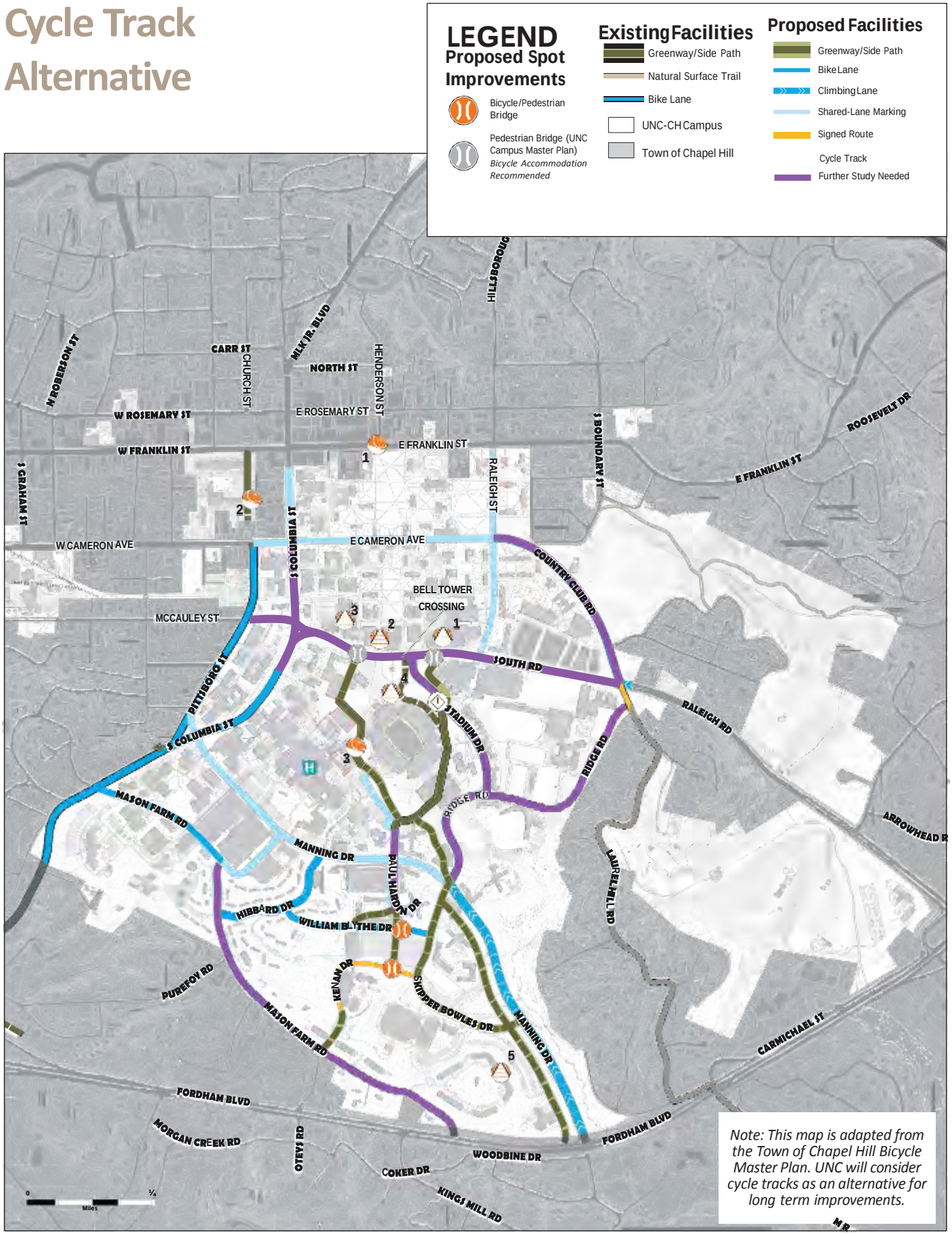



*Figure 13. Long-Term Bicycle Network Recommendations*

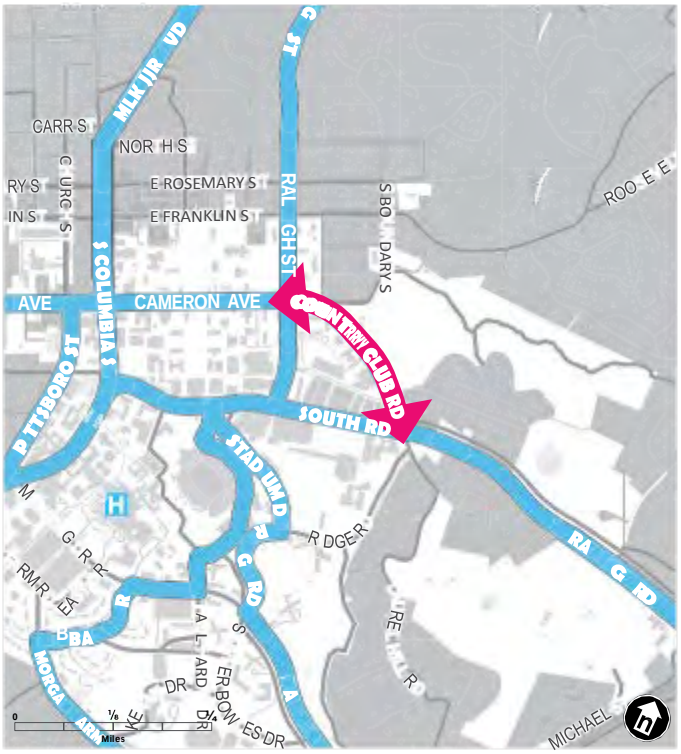
# Cycle Track Alternative




*Note: This map is adapted from the Town of Chapel Hill Bicycle Master Plan. UNC will consider cycle tracks as an alternative for long term improvements.*

# Country Club Road

## Limits: South Road/Raleigh Road to Raleigh Street




## PURPOSE OF IMPROVEMENTS

This connection would improve east-west connectivity between UNC-CH, the Town and the NC-54 Corridor/Glenn Lennox Apartment Community.

## EXISTING CONDITIONS

There is an approximate 36-foot curb to curb width.

There are approximately 12,000 vehicles on Country Club Road per day at a 25 mph speed limit.

No existing bicycle accommodations result in a high stress shared environment.

There is an 8-foot sidewalk on the west side.

There is a natural surface walking path on the east side.

There is a steady uphill grade from Cameron Avenue to Paul Green Theater Drive.

Country Club Road provides an alternative route between South Columbia Street/Downtown Chapel Hill and Raleigh Road allowing traffic to avoid South Road.

There are approximately 40 on-street parking spaces along the west side of the road.

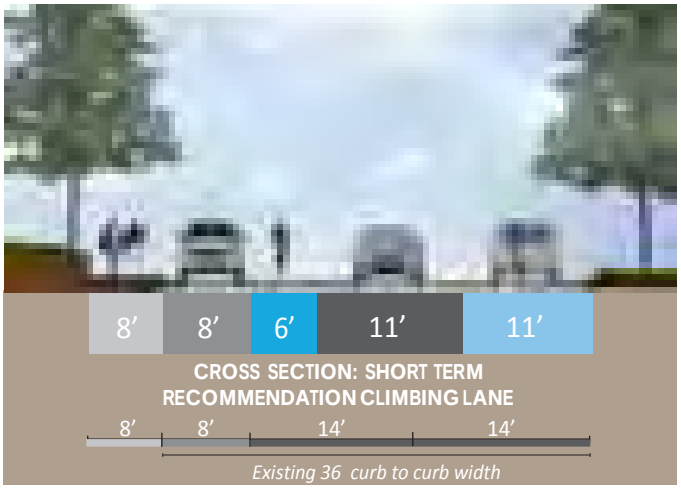
This roadway is maintained by the Town.

## SHORT TERM RECOMMENDATION

**CLIMBING LANE:** Stripe a 6-foot wide southbound bicycle climbing lane by narrowing travel lanes to 10 or 11 feet. Place shared lane markings in the center of the northbound curb lane with BICYCLES MAY USE FULL LANE signs.

***Primary Implementation Challenges:*** narrowing travel lanes, coordination with the Town

***Probable Construction Cost:*** $52,920



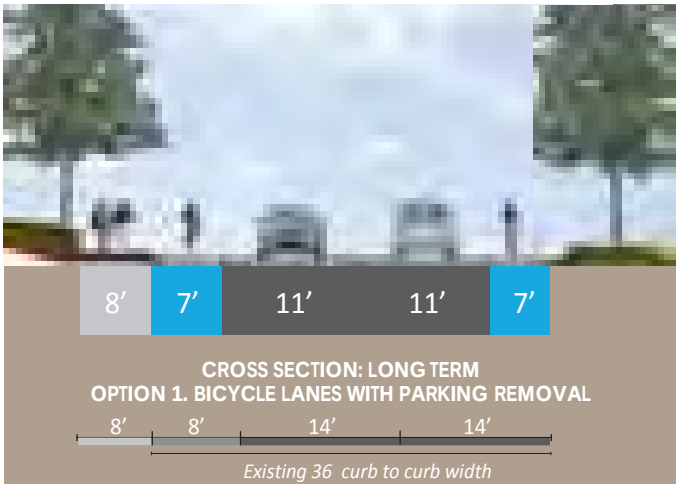

## LONG TERM RECOMMENDATION OPTIONS

Further study will be required to select one of the following options.

**1. BICYCLE LANES WITH PARKING REMOVAL:** The removal of approximately 40 on-street parking spaces located on the west side would create space for bicycle lanes in both directions.

***Primary Implementation Challenge:*** The removal of parking on the west side, grading and tree removal on the east side, with constraints at Forest Theatre limiting sidewalk width

***Probable Construction Cost:*** $62,680



# Country Club Road, continued

## Limits: South Road/Raleigh Road to Raleigh Street

**2. BICYCLE LANES WITH ROAD WIDENING:** As part of a roadway reconstruction project, widen roadway to the east replacing existing natural surface walkway with a 6 foot sidewalk. This will require removal of some trees and grading. A brief section of constrained sidewalk will be required adjacent to Forest Theater. Implementation of this option will allow parking to remain.

***Primary Implementation Challenges:*** Battle Park tree removal, slope into Battle Park

***Probable Construction Cost:*** $1,596,040

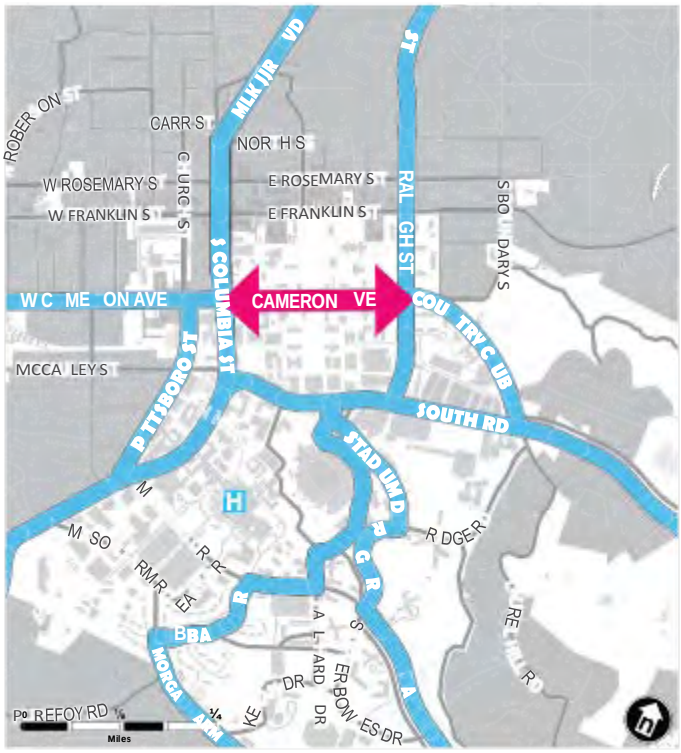
**3. CLIMBING LANE AND SHARED USE PATH:** Maintain climbing lane from short term option and construct new 14-foot shared-use path along the east curb maintaining existing east curb in place. The climbing lane will remain to provide eastbound bicyclists comfortable riding on the roadway a convenient and direct route to Raleigh Road.

***Primary Implementation Challenges:*** Battle Park tree removal, slope into Battle Park

***Probable Construction Cost:*** $550,840

# East Cameron Avenue

**Limits: South Columbia Street to Raleigh Street**




## PURPOSE OF IMPROVEMENTS

The improvements to East Cameron Avenue will further improve east-west connectivity for bicycle travel into and through the campus.

## EXISTING CONDITIONS

There is an approximate 24-foot curb to curb width.

Approximately 6,000 vehicles use East Cameron Avenue per day at a 25 mph speed limit.

There are no existing bicycle accommodations.

There are 6- to 10-foot sidewalks on both sides

Frequent pedestrian crossings result in slow speed traffic.

Wikimap users called this segment both a high- and low-stress route.

The roadway is maintained by the Town.

## SHORT TERM RECOMMENDATION

**NONE.**

## LONG TERM RECOMMENDATION

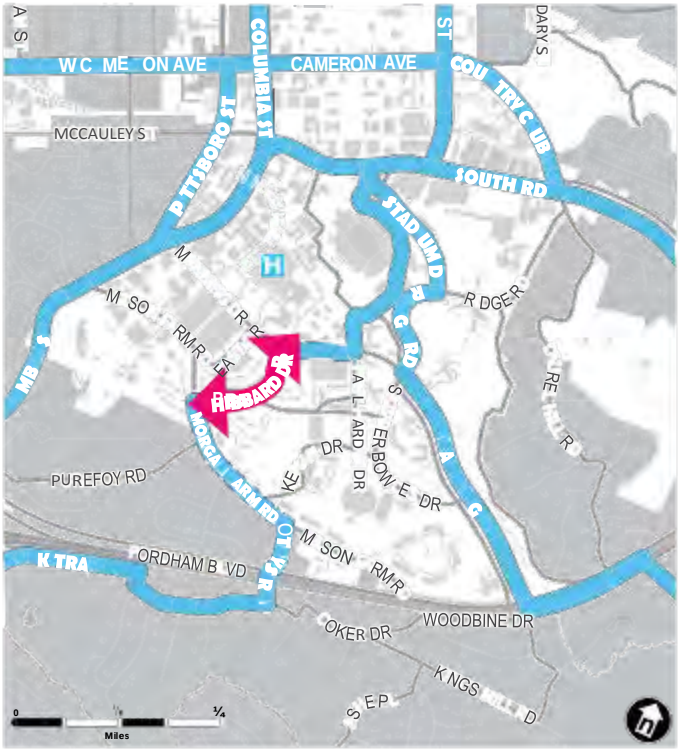
**SHARED LANE MARKINGS:** Add shared lane markings in the center of the outside lanes with a single BICYCLES MAY USE FULL LANE sign posted on the east and west end approaches to the segment to minimize sign clutter.

***Primary Implementation Challenge:*** none

***Probable Construction Cost:*** $7,720

# Hibbard Drive

## Limits: Mason Farm Road to Manning Drive




## PURPOSE OF IMPROVEMENTS

This connection would improve north-south connectivity along the east edge of the Hospital Campus.

## EXISTING CONDITIONS

There is approximately a 26-foot curb to curb width.

There are no existing bicycle accommodations.

A 6-foot sidewalk alternates sides

20-foot perpendicular parking alternate sides of the road.

The steep grade is a significant barrier for bicyclists.

This roadway is maintained by UNC-CH.

## SHORT TERM RECOMMENDATION

**CLIMBING LANE:** Stripe a 6-foot wide northbound bicycle climbing lane by narrowing travel lanes to 10 or 10.5 feet. Place shared lane markings in the center of the southbound curb lane with BICYCLES MAY USE FULL LANE signs.

***Primary Implementation Challenges:*** narrowing travel lanes, coordination with the Town

***Probable Construction Cost:*** $39,690

## LONG TERM RECOMMENDATION

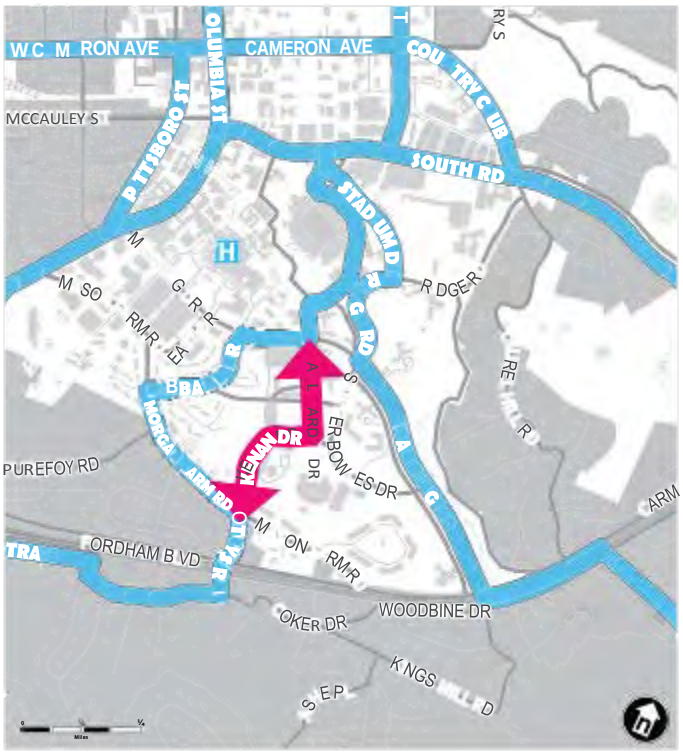
**BICYCLE LANES WITH ROAD WIDENING:** As part of a roadway reconstruction project and/or future campus redevelopment in this area, widen roadway to provide bicycle lanes in both directions with continuous sidewalks.

***Primary Implementation Challenges:*** narrowing travel lanes, coordination with the Town

***Probable Construction Cost:*** $1,197,030

# Kenan-Flagler Business School to Dean Smith Center Connector

**Limits: Manning Drive to Mason Farm Road**




## PURPOSE OF IMPROVEMENTS

This connection would create a new north-south non-motorized route between the Paul Hardin Drive/Morrison Residence Hall and the Smith Center and Business School reducing the need to navigate the severe grade change along Skipper Bowles Drive.

## EXISTING CONDITIONS

Paul Hardin Drive terminates at a large staircase which leads to William Blythe Drive.

Bicyclists must use Ram Village sidewalks to reach William Blythe Drive to avoid staircase. Once on Blythe Drive, bicyclists must route to Skipper Bowles Drive to access Kenan Drive.

The grade change between Blythe Drive , Skipper Bowles Drive and the Skipper Bowles parking lot is significant.

The pathway is maintained by UNC-CH.

## SHORT TERM RECOMMENDATION

**NONE.**

## LONG TERM RECOMMENDATION

**SHARED-USE BRIDGE:** The Campus Master Plan shows development on the existing Skipper Bowles Parking Lot located adjacent to the Business School Parking Deck. When that development occurs, it is recommended that a 20-foot wide shared-use path on top of or through the building to provide connection to Kenan Drive and potentially to the Dean Smith Center and directly to Paul Hardin Drive. This shared-use path would be similar the path that crosses Rams Head Center. This project could also potentially result in a bridge over Blythe Drive at the Ram Village dorm. Construction of this shared-use path would create a route from South Road through the center of campus that minimizes grade changes and interactions with motor vehicles for pedestrians and bicyclists. Refer to the aerial photograph on following page for segment locations.

Segment A: Bridge over Blythe Drive starting from top of stairs at the end of Paul Hardin Drive.

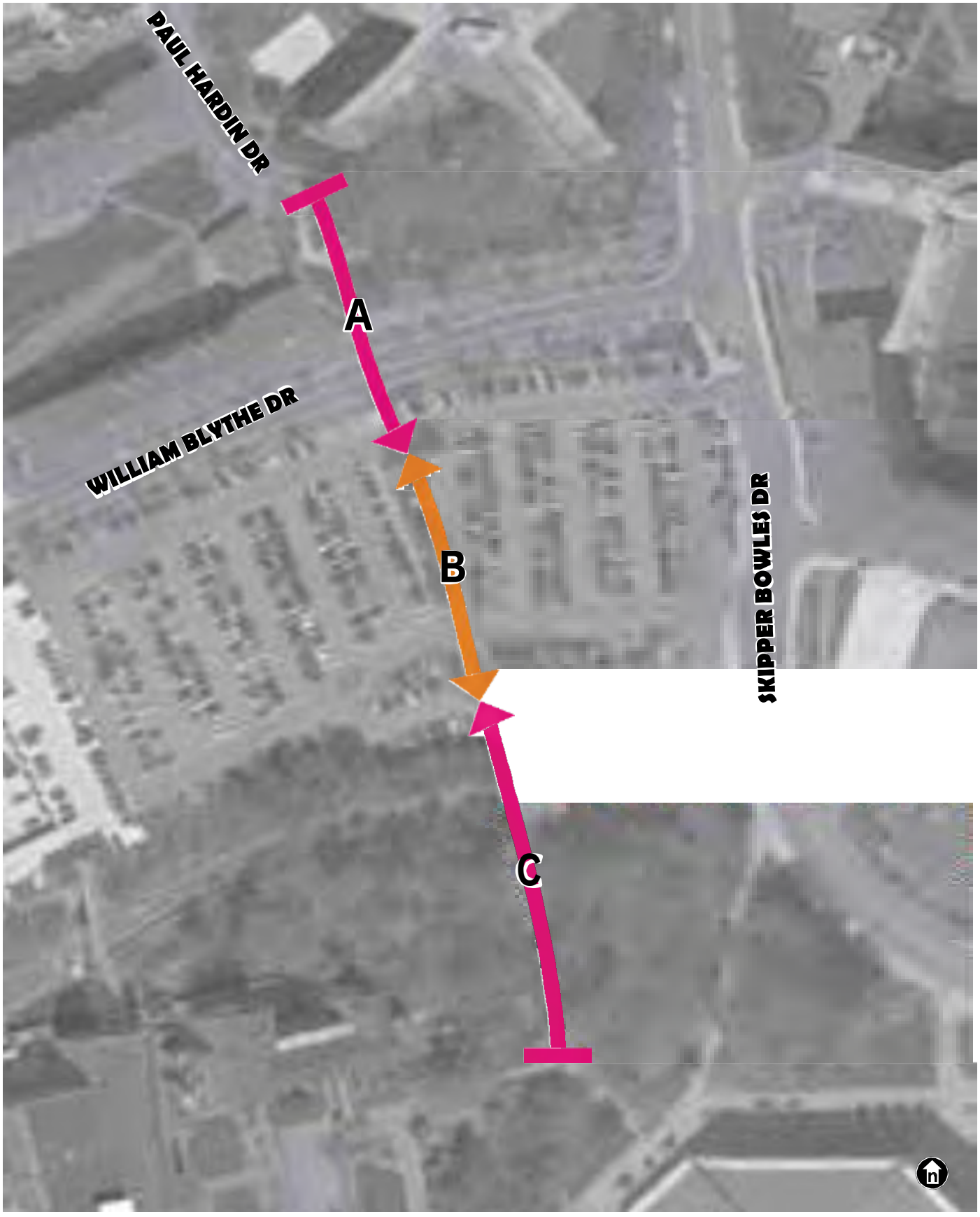
Segment B: Path on top of future building replacing Skipper Bowles Lot.

Segment C: Bridge over Kenan Drive to connect to the Business School Path.

Refer to the graphic on the following page to see where these segments are located.

***Primary Implementation Challenges:*** Coordination with architectural design of future building, identifying a suitable route to Dean Smith Center and determining feasibility of direct bridge connection to staircase at end of Paul Hardin Drive.

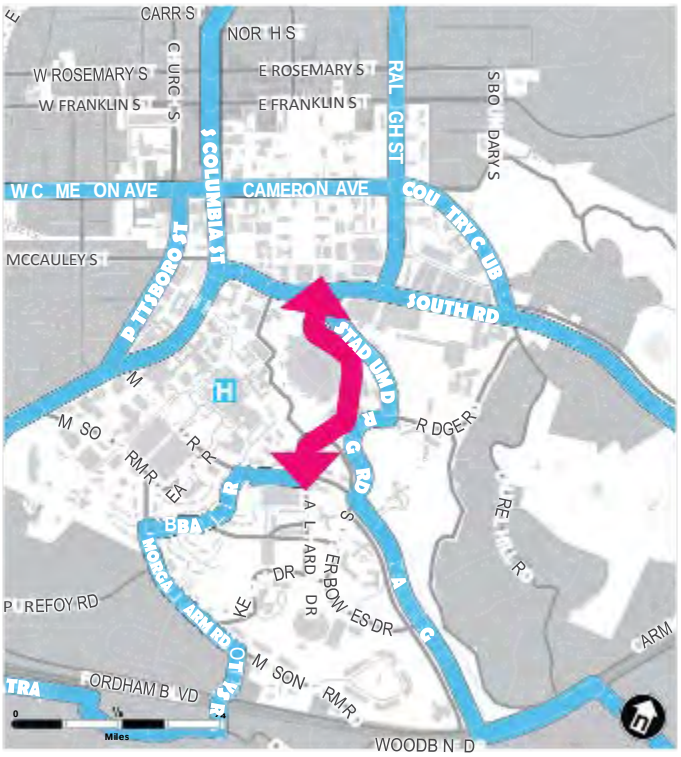
***Probable Construction Cost:*** $10,500,000




*Proposed path segments connecting Paul Hardin Drive to the Business School Path*

# Kenan Stadium East Path Connector

**Limits: South Road to Manning Drive**




## PURPOSE OF IMPROVEMENTS

This connection will complete an important north-south shared use path system between Manning Drive and South Road.

## EXISTING CONDITIONS

The existing 16-foot wide shared use path across Rams Head Center serves as a primary route for pedestrians and bicyclists between Morrison Hall and South Road. It presently ends at the north side entrance to Kenan Stadium in a small parking lot.

There are inadequate pedestrian and bicycle connections between the north side of Kenan Stadium and South Road.

This pathway is maintained by UNC-CH.

## SHORT TERM RECOMMENDATION

**INTERSECTION RECONSTRUCTION:** The intersection of Stadium Drive/Kessing parking lot is dangerous for pedestrians, bicyclists and vehicular traffic and has been identified for improvements. Improvements may include removal of parking to aid visibility, and stop signs to slow vehicular traffic in the area.

***Primary Implementation Challenges:*** parking loss, intersection reconstruction, coordination with future Stadium Drive recommendations

***Probable Construction Cost:*** $50,000

## LONG TERM RECOMMENDATION

**SHARED-USE PATH:** Complete the path from the north side parking lot of Kenan Stadium to the Bell Tower/South Road crossing. The path should be constructed to a width of 14 to 20 feet due to the need to accommodate high volumes of pedestrians and cyclists. This would likely require removal of some parking and construction of the path along the perimeter of Kenan Stadium up to the new emergency vehicle lane on the northeast side of the stadium. Connect the path to Pit Bridge over South Road at the intersection with Stadium Drive/Kessing parking lot. There are multiple alignment options to complete this path:

**1.** Alignment along the stadium and connecting to the existing fire road would require some tree removal, or

**2.** Alignment along the west side of Stadium Drive and widening of the existing sidewalk could be accomplished by:

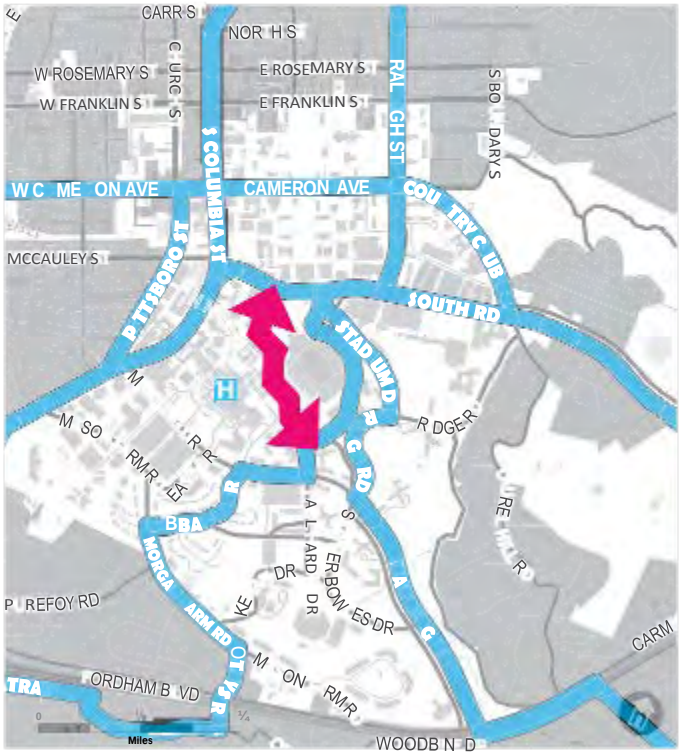
- Widening sidewalk west into the wooded area to preserve Stadium Drive
- Widening the sidewalk east into Stadium Drive by narrowing Stadium Drive access aisle or reconfiguring parking to parallel style parking

***Primary Implementation Challenges:*** reconstruction of Bell Tower landscaping to create direct access to existing crosswalk, restriction of parking, tree removal, coordination with future Stadium Drive recommendations and future Pit Bridge over South Road

***Probable Construction Cost:*** $598,515

# Kenan Stadium West Path Connector

**Limits: South Road to Paul Hardin Drive**




## PURPOSE OF IMPROVEMENTS

This connection will complete a missing link in the Kenan Stadium west side shared use path system through the central part of campus.

## EXISTING CONDITIONS

There is an emerging shared-use path system on the west side of Kenan Stadium between the Bell Tower Parking Deck and Bell Tower Drive.

There is an existing network of narrow footpaths (6 to 8 feet in width) between Morrison Hall and Taylor Campus Health through Kenan Woods. These paths are too narrow for high volumes of pedestrians and bicyclists to share comfortably, causing some people to bicycle through the DPS parking lot.

The paths end at a staircase adjacent to Taylor Campus Health, resulting in bicyclists riding on a gravel path around the existing stairs to get to Bell Tower Drive (see photo on page 28).

There is a recently completed path along the north side of Bell Tower Deck, which terminates near Bell Tower Road.

A large staircase hinders bicycle access between the Stone Center and the Bell Tower along the Kenan Stadium Perimeter walkway.

This pathway is maintained by UNC-CH.

## SHORT TERM RECOMMENDATION

**SHARED LANE MARKINGS AND NEW BICYCLE RAMP:** Add shared lane markings through the DPS parking lot to identify an alternative route to Campus Health paths at the south side Kenan Stadium entrance. Construct a bicycle bypass ramp to the Bell Tower Deck access road. This route would ultimately connect to the Bell Tower Drive Bridge over South Road.

***Primary Implementation Challenges:*** Routing bicyclists through a parking lot.

***Probable Construction Cost:*** $13,860

## LONG TERM RECOMMENDATION

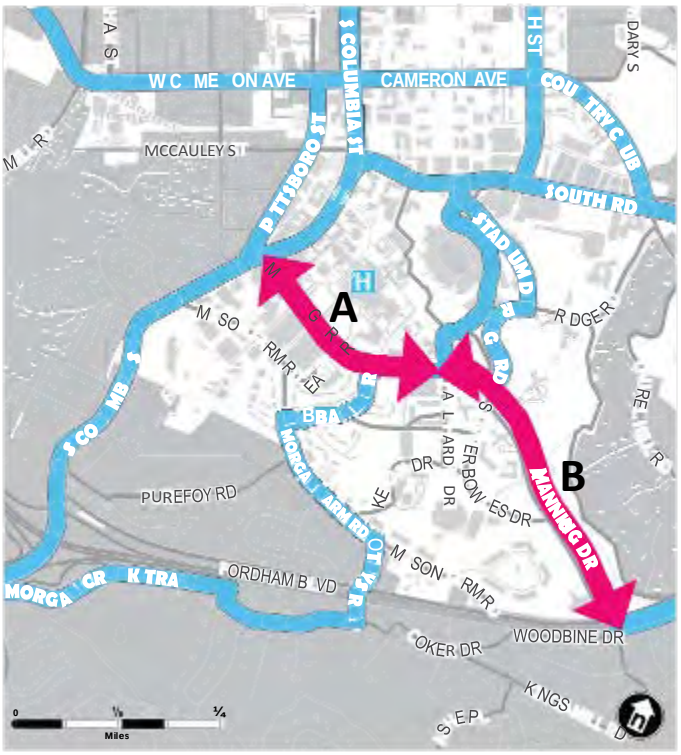
**SHARED USE PATH:** Once the Kenan Stadium promenade is completed around the stadium, direct bicyclists to the promenade connection to Bell Tower. Widen path through Kenan Woods to 10 to 14 feet wide or construct a new path on the north side of the Taylor Health Campus parking lot to connect to the new Kenan Stadium entrance and promenade.

***Primary Implementation Challenges:*** Potential impacts to the sensitive natural resource area of Kenan Woods, steep slopes within Kenan Woods requiring retaining walls or grading

***Probable Construction Cost:*** $115,340

# Manning Drive

### Limits: South Columbia Street to Fordham Boulevard




## PURPOSE OF IMPROVEMENTS

This connection would improve north-south connectivity between Rodham Boulevard and Ridge Road.

## EXISTING CONDITIONS

Manning Drive consists of two distinct cross sections:

Segment A is approximately 55 feet wide curb to curb from S. Columbia to Ridge Road.

Segment B is approximately 48-foot wide curb to curb from Ridge Road to Fordham Blvd.

Approximately 15,000 vehicles per day use this roadway. It has a 25 mph speed limit.

The roadway's lack of existing bicycle accommodations results in a high-stress shared environment.

There are 6- to 10-foot sidewalks on both sides of the roadway between South Columbia and Ridge Road.

The roadway has a 6-foot sidewalk on its west side between Ridge Road and Fordham Boulevard.

The steep grade between Fordham Boulevard and Ridge Road is a significant barrier for bicyclists traveling north.

This section is a critical gap in providing access to campus from the south.

Survey and Wikimap users identified Manning Drive as a high-stress route. The lower, uphill section is especially uncomfortable for bicyclists where commenters noted that drivers are impatient with slow-moving cyclists and often travel at high speeds.

This roadway is maintained by NCDOT.

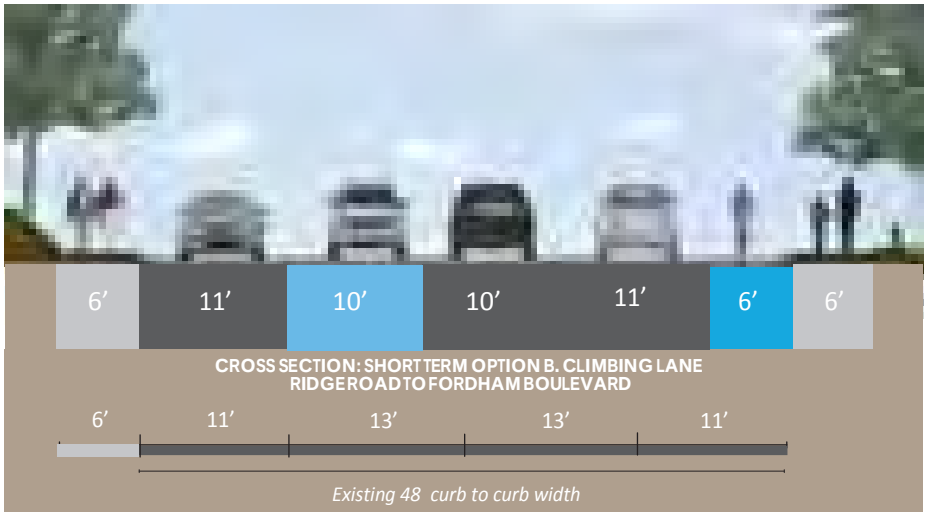
## SHORT TERM RECOMMENDATION OPTIONS

Further study will be required to select one of the following options.

**1. SHARED-LANE MARKINGS (SEGMENT A):** Add shared-lane markings from South Columbia Street to Ridge Road in the center of the outside lanes with BICYCLES MAY USE FULL LANE signs.

***Primary Implementation Challenges:*** *coordination with NCDOT*

***Probable Construction Cost:*** $11,580



# Manning Drive, continued

## Limits: South Columbia Street to Fordham Boulevard

### SHORT TERM RECOMMENDATION OPTIONS (CONT.)

**2. CLIMBING LANES (SEGMENT B):** Stripe a 6-foot wide northbound bicycle climbing lane by narrowing inside travel lanes to 10 or 11 feet from Ridge Road to Fordham Boulevard. Place shared-lane markings in the center of the southbound curb lane with BICYCLES MAY USE FULL LANE signs.

***Primary Implementation Challenges:*** coordination with NCDOT, approval for narrow lanes

***Probable Construction Cost:*** $79,380

### LONG TERM RECOMMENDATION OPTIONS

Further study will be required to select one of the following options.

**1. SHARED-USE PATH (PORTION OF SEGMENT A):** Reconstruct existing 6-foot sidewalk with a 12- to 14-foot wide shared-use path on either the south or north side of the roadway from Hibbard Drive to Paul Hardin Drive. This shared-use path would connect the Hibbard Drive climbing lane to the Paul Hardin Drive and Ridge Road connections. (Portion of Segment A)

***Primary Implementation Challenge:*** reconstruction of the roadway, drainage design.

***Probable Construction Cost:*** $206,565

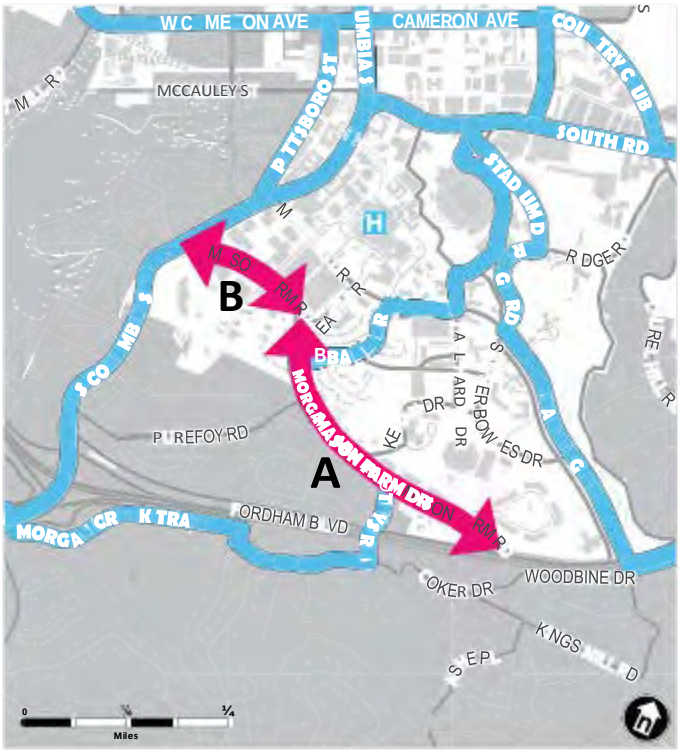
**2. SHARED-USE PATH (ONE SIDE, SEGMENT B):** As part of a roadway reconstruction or through redevelopment of adjacent properties, replace existing sidewalk with 12- to 14-foot-wide shared-use path from Ridge Road to Fordham Boulevard. The shared-use path would be constrained as it approaches and passes by the Horton Residence Hall. (Segment B)

***Primary Implementation Challenge:*** reconstruction of the roadway, drainage design.

***Probable Construction Cost:*** $826,260

# Mason Farm Road

## Limits: Fordham Boulevard to South Columbia Street




## PURPOSE OF IMPROVEMENTS

This connection would improve north-south connectivity through the middle of campus. This connection should be improved through planned redevelopment and/or light rail construction. This would also create an important east-west connection between the Arboretum Trail and the UNC Hospital.

## EXISTING CONDITIONS

Mason Farm Road consists of two distinct cross sections:

Segment A: There is a 20- to 22-foot roadway with speed humps between Fordham Boulevard and East Drive

Segment B: There is a 34- to 48-foot roadway with some on-street parking between South Columbia Street and East Drive.

Provides a less steep alternative route into North Campus to South Columbia Street and Manning Drive.

The Campus Master Plan proposes the roadway be widened to 4 travel lanes, but does not recommend separate bicycle accommodations.

A future light rail alignment is envisioned parallel to Mason Farm Road on the north side with a station stop near the intersection of Mason Farm Road and East Drive.

This section provides a connection from the student residences located on Mason Farm Road to North Campus.

The Campus Master Plan shows a relocated Mason Farm Road on its northern end.

This roadway is maintained by the Town of Chapel Hill.

## SHORT TERM RECOMMENDATION

**SHARED LANE MARKINGS:** Add shared lane markings in the center of the outside lanes with BICYCLES MAY USE FULL LANE signs.

***Primary Implementation Challenges:*** none

***Probable Construction Cost:*** $15,440

## LONG TERM RECOMMENDATION OPTIONS

Further study will be required to select one of the following options.

**1. CYCLE TRACK:** As part of a roadway widening or reconstruction project, add a two-way cycle track to the north side of the roadway.

***Primary Implementation Challenges:*** Coordination with light rail and future roadway reconstruction project

***Probable Construction Cost:*** $1,527,280

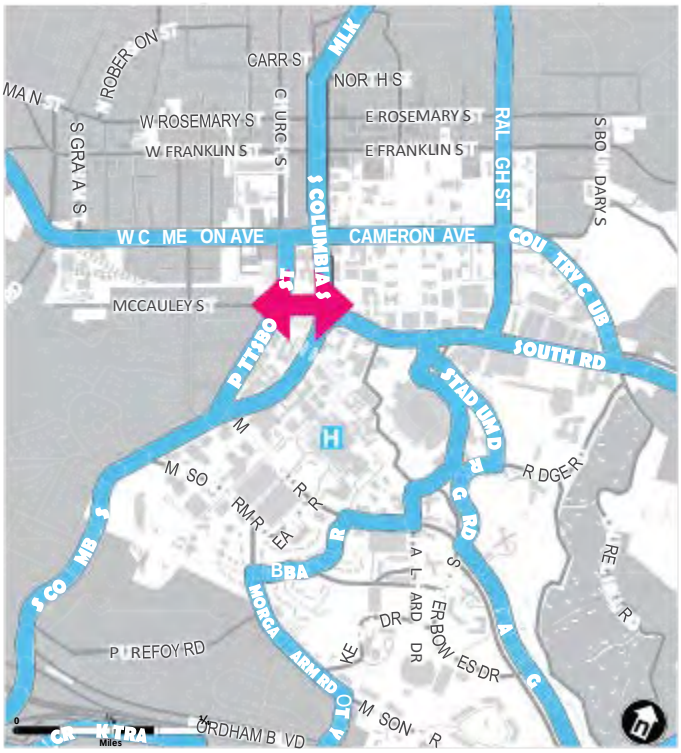
**2. BICYCLE LANES:** As part of a roadway widening or reconstruction project, add 6 foot bicycle lanes to both sides of the roadway.

***Primary Implementation Challenges:*** Coordination with light rail and future roadway reconstruction project

***Probable Construction Cost:*** $1,648,800

# McCauley Street

**Limits: South Columbia Street to Pittsboro Street**




## PURPOSE OF IMPROVEMENTS

This connection would complete the bicycle network and improve east-west connectivity between Pittsboro Street and South Road.

## EXISTING CONDITIONS

There is approximately 33 feet between the curbs.

Approximately 8,000 vehicles use this street daily, at 25 miles per hour speed limit.

There are no existing bicycle accommodations.

There are 10-foot wide sidewalks on both sides with a high volume of pedestrian use.

Steep roadway grade westbound presents a significant barrier for bicyclists.

This roadway is maintained by the Town of Chapel Hill.

## SHORT TERM RECOMMENDATION

**SHARED LANE MARKINGS:** Add shared lane markings in the center of the outside lanes with BICYCLES MAY USE FULL LANE signs.

***Primary Implementation Challenges:*** none

***Probable Construction Cost:*** $1,930

## LONG TERM RECOMMENDATION OPTIONS

Further study will be required to select one of the following options.

**1. CYCLE TRACK:** As part of a roadway widening or reconstruction project, add a two-way cycle track to the north side of the roadway.

***Primary Implementation Challenges:*** requires relocation of retaining wall and construction outside of existing right-of-way on UNC-CH Property. Should only be pursued if cycle tracks are developed on South Road and South Columbia Road.

***Probable Construction Cost:*** $190,910

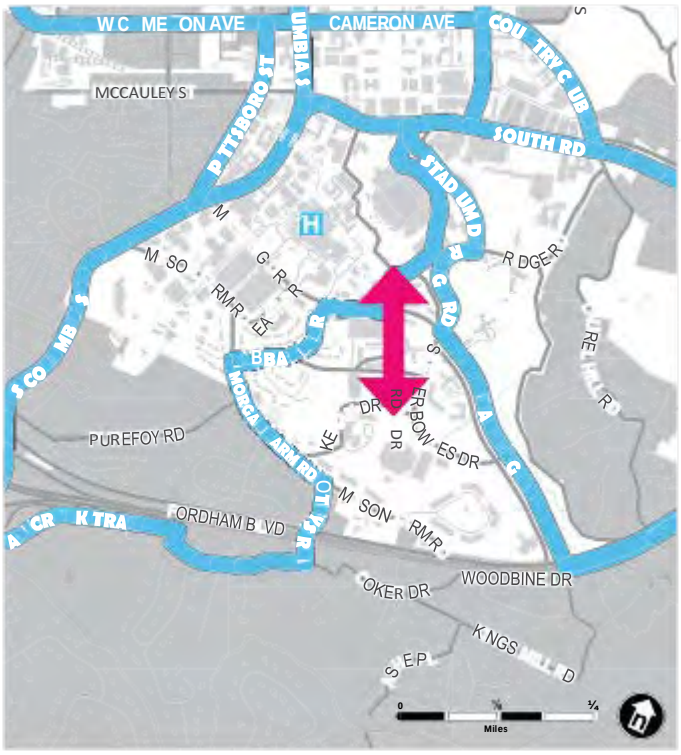
**2. BICYCLE LANES:** As part of a roadway widening or reconstruction project, add 6-foot bicycle lanes to both sides of the roadway.

***Primary Implementation Challenges:*** requires relocation of retaining wall and construction outside of existing right-of-way on UNC-CH Property.

***Probable Construction Cost:*** $399,010

# Paul Hardin Drive

**Limits: William Blythe Drive to Kenan Stadium East and West Path Connectors**




## PURPOSE OF IMPROVEMENTS

This connection would improve north-south connectivity between residence halls and the Kenan Stadium East and West Path system.

## EXISTING CONDITIONS

Road width varies from 20-foot lanes (2 lanes) to 36-foot lanes (3 lanes).

There are no existing bicycle accommodations.

There are 5 to 10-foot wide sidewalks on both sides.

The steep grade northbound is a significant barrier for bicyclists.

The roadway is maintained by UNC-CH.

## SHORT TERM RECOMMENDATION

**SHARED-LANE MARKINGS:** Add shared-lane markings in the center of the outside lanes with BICYCLES MAY USE FULL LANE signs.

***Primary Implementation Challenges:*** none

***Probable Construction Cost:*** $2,895

## LONG TERM RECOMMENDATION OPTIONS

Further study will be required to select one of the following options.

**1. SHARED-USE PATH:** When the DPS Building site is redeveloped, construct a 12-16 foot wide shared use path along the east side of Paul Hardin Drive to connect Rams Village, Kenan Stadium East and West Paths.

***Primary Implementation Challenges:*** west side of Paul Hardin Drive along the Craige Deck is constrained by existing retaining walls and steep slopes. May require relocation or construction of retaining walls.

***Probable Construction Cost:*** $206,565

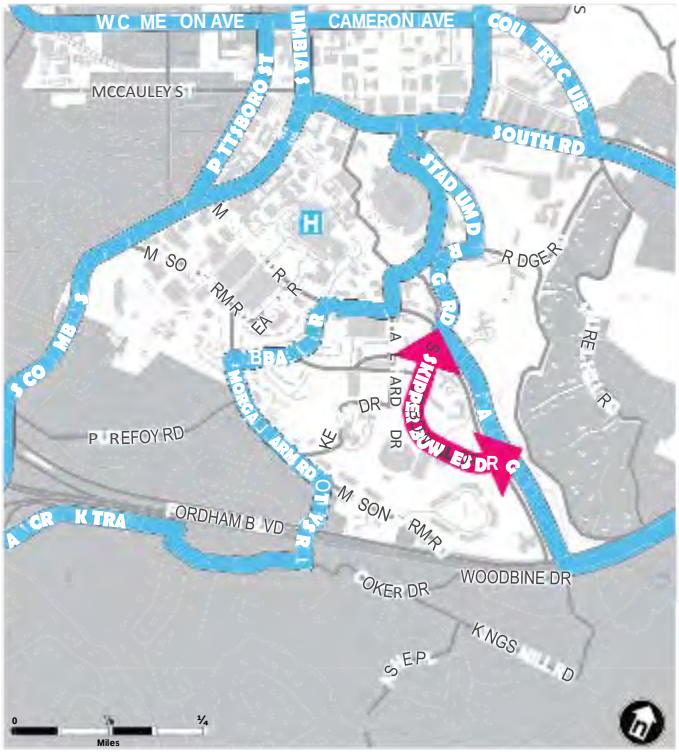
**2. BICYCLE LANES:** As part of a roadway widening or reconstruction project, add 6-foot bicycle lanes to both sides of the roadway.

***Primary Implementation Challenges:*** West side of Paul Hardin Drive along the Craige Deck is constrained by existing retaining walls and steep slopes. May require relocation or construction of retaining walls.

***Probable Construction Cost:*** $598,515

# Skipper Bowles Drive

### Limits: Manning Drive to Manning Drive




## SHORT TERM RECOMMENDATION

**SHARED-LANE MARKINGS:** Add shared lane markings in the center of the outside lanes with a single BICYCLES MAY USE FULL LANE signs.

***Primary Implementation Challenges:*** none

***Probable Consturction Cost:*** $9,650

## LONG TERM RECOMMENDATION

**SHARED-USE PATH:** As part of a roadway reconstruction or through redevelopment of adjacent properties, replace existing sidewalks with 14-20 foot wide shared use paths on the west and south side of the roadway. Wider paths are recommended along Dean Smith Center.

***Primary Implementation Challenges:*** May require relocation or construction of retaining walls, as well as existing storm-water treatment facilities.

***Probable Construction Cost:*** $688,550

## PURPOSE OF IMPROVEMENTS

This route has potential to provide an internal north-south route between athletic facilities and the academic campus. Improvements to the section between Kenan Drive and Manning Drive are a critical link to the East Kenan Route.

## EXISTING CONDITIONS

There are no existing bicycle accommodations.

There are 6- to 10-foot sidewalks on both sides north of Kenan Drive.

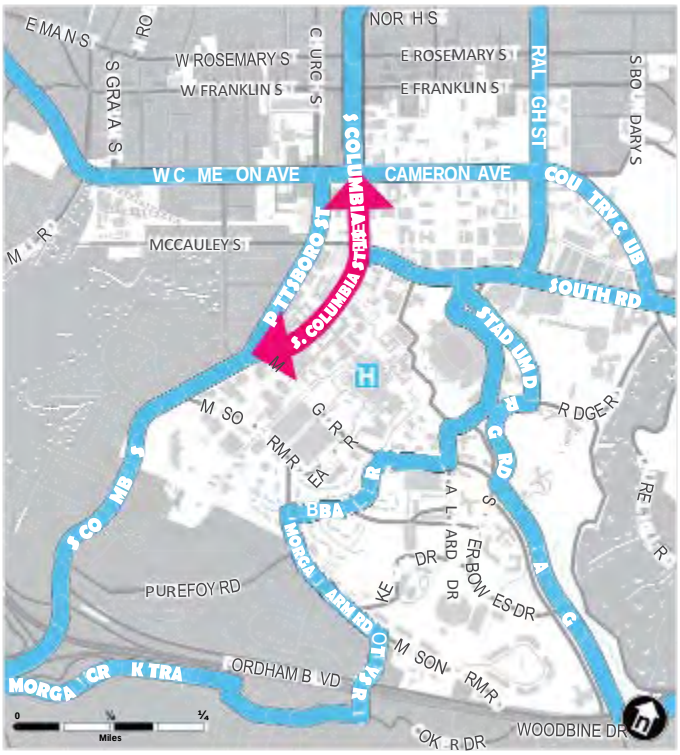
There are 6- to 16-foot sidewalks on the south side of road south of Kenan Drive.

The steep grade is a significant barrier for northbound bicyclists.

The roadway is maintained by UNC-CH.

# South Columbia Street

### Limits: Manning Drive to Cameron Avenue




## PURPOSE OF IMPROVEMENTS

This is a high priority connection to mitigate conflicts between pedestrians and bicyclists and to create safe conditions for two-way bicycle traffic.

## EXISTING CONDITIONS

There are bicycle lanes and transit lanes between Fordham Boulevard and North Medical Drive.

South Columbia Street is one-way northbound between Pittsboro Street and Cameron Avenue.

Approaching North Medical Drive (at School of Nursing), the transit lane and bike lane terminate to a 17-foot-wide outside lane with shared lane markings centered 4 feet from the curb.

North of South Road, the roadway narrows to 29 feet, with three 9- to 10-foot travel lanes with a 5-foot sidewalk on the west and an 8-foot sidewalk on the east side.

Bicyclists currently operate two-way with pedestrians on the 8-foot, east side sidewalk and on the roadway.

This section was identified by many Wikimap users as the highest-stress part of their bicycle route. Commenters noted they had to choose between sharing the right lane with heavy bus traffic or the sidewalk with heavy pedestrian traffic. The bicyclists would prefer their own space through this area.

This roadway is maintained by NCDOT.

## SHORT TERM RECOMMENDATION OPTIONS

Further study will be required to select one of the following options. The termination of the existing bicycle lane into a wide shared lane at North Medical Drive leaves ambiguity for bicyclists and motorists. The shared lane marking is located too far to the right to control the travel lane, yet sufficient space remains to mark a bicycle lane. One of the following options is recommended.

**1. SHARED-LANE MARKINGS:** Relocate shared-lane marking from right hand edge of the existing travel lane to the center of the travel lane between North Medical Drive and South Road. Add shared-lane markings in center of curb lane between South Road and Cameron Avenue. Add BICYCLES MAY USE FULL LANE signs.

***Primary Implementation Challenges:*** coordination and approval of Town and NCDOT.

***Probable Construction Cost:*** $5,790

**2. BICYCLE LANE:** Reconfigure the curb lane from a 17-foot shared through/right/bike lane to an 11-foot right-turn-only lane onto Medical Drive and South Road with a separate 6-foot bicycle lane to the left of the right-turn lane. North of Medical Drive, add shared-lane markings in the center of the curb lane to Cameron Street with BICYCLES MAY USE FULL LANE signs.

***Primary Implementation Challenges:*** may degrade motor vehicle mobility during peak periods of use. Coordination and approval of Town and NCDOT.

***Potential Construction Cost:*** $47,010

## LONG TERM RECOMMENDATION OPTIONS

Further study will be required to select one of the following options.

**1. CYCLETRACK:** Transition from a bike lane to a one-way cycle track approaching the School of Nursing and continue the cycle track to South Road. At South Road, transition to potential future one-way pair of bicycle lanes or cycle tracks

# South Columbia Street, continued

## Limits: Manning Drive to Cameron Avenue

on South Road and to a two-way cycle track for the remainder of South Columbia Street up to Cameron Avenue on the east side of roadway. The two-way cycle track between South Road and Cameron Avenue can be developed by either:

**1A.** Removing one travel lane on South Columbia Street, developing pull-out bus stops and reconstructing portions of the eastern curbline

***Primary Implementation Challenges:*** may degrade motor vehicle mobility during peak periods of use. Coordination and approval of Town and NCDOT.

***Probable Construction Cost:*** $572,730

**1B.** Reconstructing the east side of South Columbia Street between the existing curb line and buildings

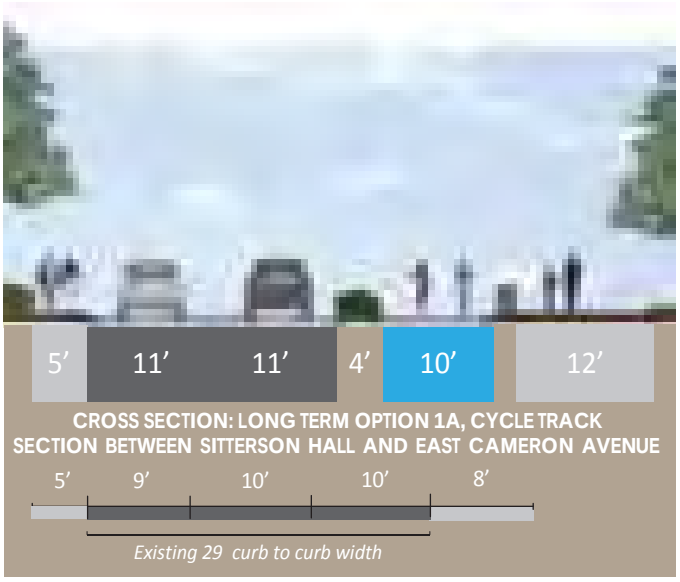
***Primary Implementation Challenges:*** May require relocation or construction of retaining walls, utility relocations and tree removal. Coordination and approval of Town and NCDOT.

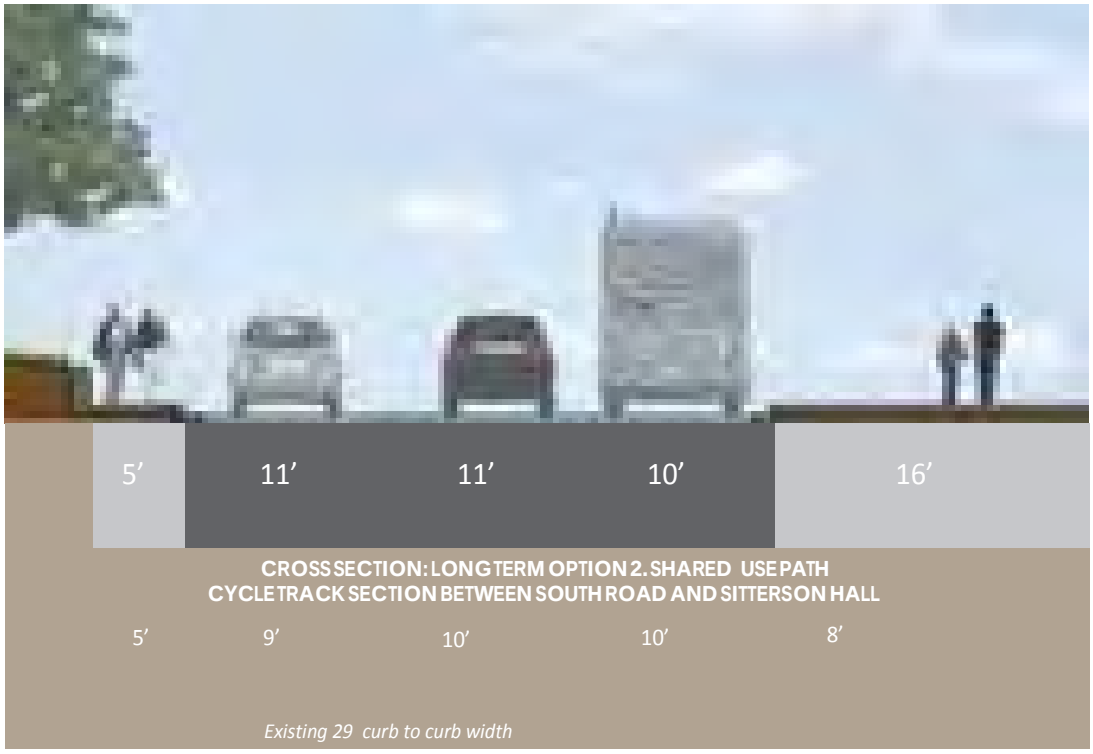
***Probable Construction Cost:*** $1,197,030

**2. SHARED USE PATH:** The existing sidewalk could also be widened to provide a high level of service shared-use path. Similar to the cycle track, the sidewalk could be widened by removing a travel lane or reconstructing the space between the curb line and the buildings.

***Primary Implementation Challenges:*** May require relocation or construction of retaining walls, utility relocations and tree removal. Coordination and approval of Town and NCDOT.

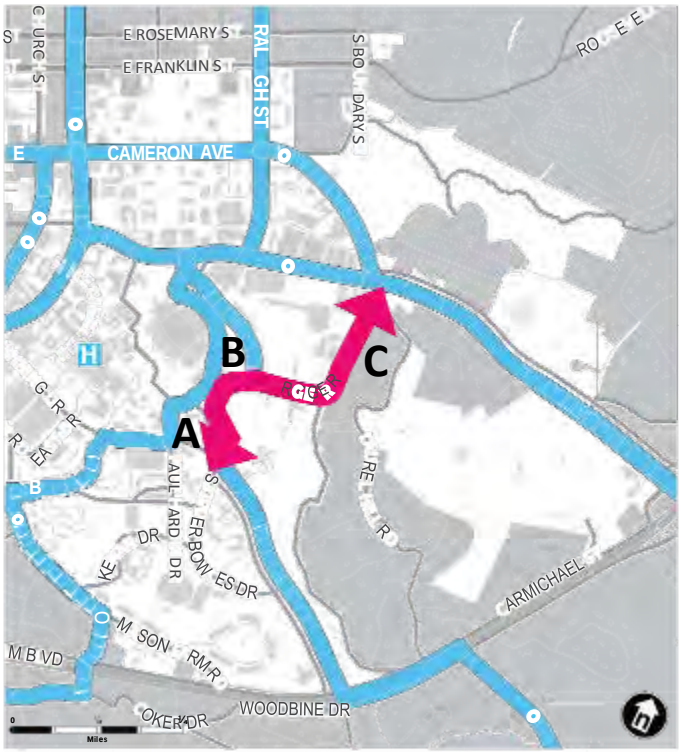
***Probable Construction Cost:*** $413,130



# Ridge Road

## Limits: Manning Drive to Country Club Road




## PURPOSE OF IMPROVEMENTS

The segment between Manning Drive and Stadium Drive is a high priority connection to create an alternative north-south route to the internal Kenan Path network.

## EXISTING CONDITIONS

Ridge Road consists of three distinct cross sections:

Segment A: Manning Drive to Rams Head Parking Deck: 34-foot wide street with on street parking and 13-foot travel lanes transitioning to no parking with a left turn lane at the Rams Head Parking Deck.

Segment B: Rams Head Parking Deck to Boshamer Baseball Stadium: 28 feet in width with two 14-foot wide travel lanes.

Segment C: North of Boshamer Baseball Stadium, the roadway narrows again to 20 feet.

Minimum six-foot wide sidewalks are present continuously on the north and west sides of the roadway.

Sidewalks are discontinuous on the south and east sides of the road.

Wikimap users noted that pavement quality on Ridge Road is poor and sightlines along the winding portion do not allow drivers to easily see bicyclists on the road.

The roadway is maintained by UNC-CH.

## SHORT TERM RECOMMENDATION OPTIONS

Further study will be required to select one of the following options.

**1. CLIMBING LANE (A & B):** Stripe a 5-foot wide northbound bicycle climbing lane by narrowing inside travel lanes to 10 or 11 feet from Manning Drive to Stadium Drive. Place shared lane markings in the center of the southbound curb lane with BICYCLES MAY USE FULL LANE signs.

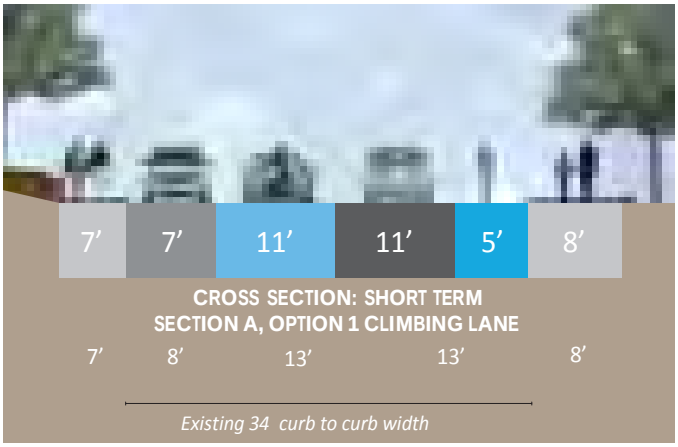
***Primary Implementation Challenges:*** coordination and approval of narrow lanes with Town.

***Probable Construction Cost:*** $39,690

**2. SHARED-LANE MARKINGS (A & B):** In the event narrow travel lanes are not feasible, add shared-lane markings in the center of the outside lanes with BICYCLES MAY USE FULL LANE signs from Stadium Drive to South Road.

***Primary Implementation Challenges:*** coordination with Town

***Probable Construction Cost:*** $7,720




## LONG TERM RECOMMENDATION OPTIONS

Further study will be required to select one of the following options.

### SECTION A: MANNING DRIVE TO RAMS HEAD DECK (34 FEET CURB-TO-CURB WIDTH)

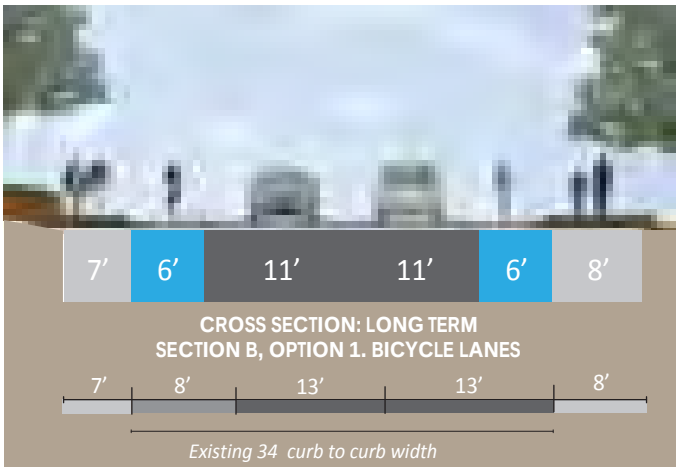
**A1. BICYCLE LANES:** Remove parking and remove center turn lane to add 6 foot bicycle lanes.

***Primary Implementation Challenges:*** removal of parking and turn lane.

***Probable Construction Cost:*** $32,800

# Ridge Road, continued

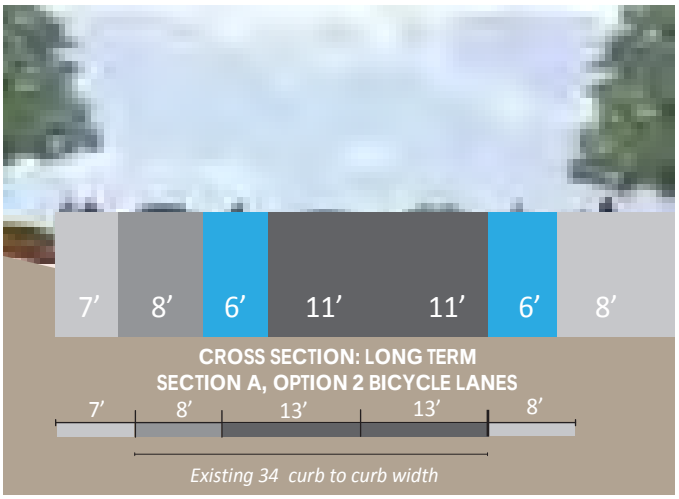
## Limits: Manning Drive to Country Club Road




**A2. BICYCLE LANES:** Maintain parking and left turn lane and widen roadway on the east side to add 6-foot bicycle lanes.

***Primary Implementation Challenges:*** grading, potential retaining walls and drainage changes associated with road widening.

***Probable Construction Cost:*** $798,020




**A3. SHARED-USE PATH:** Maintain parking and left turn lane and reconstruct sidewalk on east side to a 16 foot wide shared use path.

***Primary Implementation Challenges:*** grading, potential retaining walls, and drainage changes

***Probable Construction Cost:*** $275,420

### SECTION B: RAMS HEAD DECK TO STADIUM DRIVE (28 FEET CURB-TO-CURB WIDTH)

**B1. BICYCLE LANES:** Widen roadway 6 feet to add 6-foot bicycle lanes.

***Primary Implementation Challenges:*** grading, potential retaining walls and drainage changes associated with road widening.

***Probable Construction Cost:*** $399,010

**B2. SHARED USE PATH:** Maintain climbing lane and reconstruct sidewalk on south side to a 16-foot wide shared use path.

***Primary Implementation Challenges:*** grading, potential retaining walls and drainage changes associated with road widening.

***Probable Construction Cost:*** $137,710

### SECTION C: STADIUM DRIVE TO COUNTRY CLUB ROAD (20 FEET CURB TO CURB WIDTH)

**C1. CLIMBING LANES:** Widen roadway 6 feet to add a 6-foot climbing lane.

***Primary Implementation Challenges:*** grading, potential retaining walls and drainage changes associated with road widening.

***Probable Construction Cost:*** $802,560

**C2. BICYCLE LANES:** Widen roadway 12 feet to add 6-foot bicycle lanes.

***Primary Implementation Challenges:*** grading, potential retaining walls and drainage changes associated with road widening.

***Probable Construction Cost:*** $1,596,040

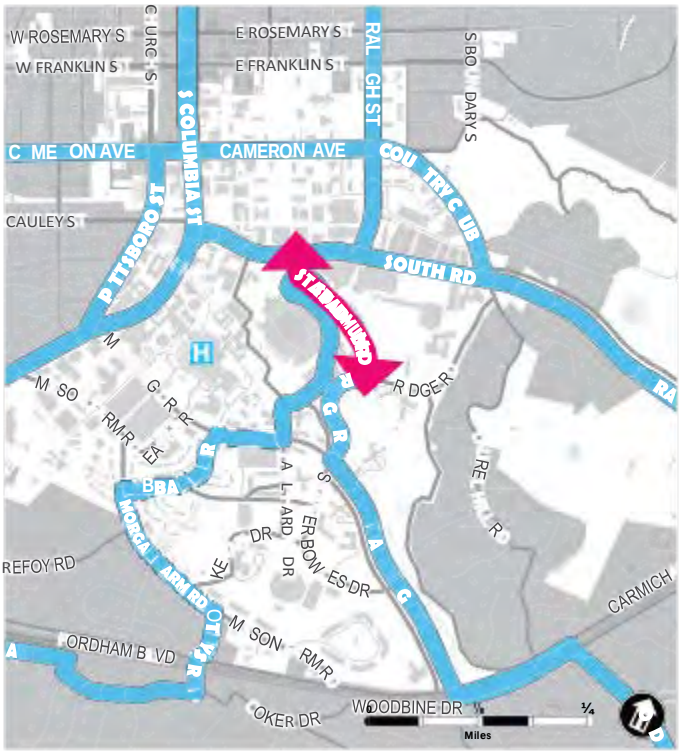
**C3. SHARED USE PATH:** Reconstruct the west sidewalk into 16-foot-wide shared-use path.

***Primary Implementation Challenges:*** grading, potential retaining walls and drainage changes associated with road widening.

***Probable Construction Cost:*** $550,840

# Stadium Drive

## Limits: South Road to Ridge Road




## PURPOSE OF IMPROVEMENTS

This is a high priority connection to create an alternative north-south route to the internal Kenan Path network.

## EXISTING CONDITIONS

This roadway is a combination roadway and parking lot with speed humps.

There are continuous sidewalks, but they are narrow and not always in the most direct line of travel for use by pedestrians or bicyclists.

There are no bicycle accommodations.

The roadway is maintained by UNC-CH.

## SHORT TERM RECOMMENDATION OPTIONS

Further study will be required to select one of the following options.

**1. CLIMBING LANE:** Stripe a 6-foot wide northbound bicycle climbing lane within the existing 26- to 28-foot drive aisle of the roadway. Add centerline markings, creating two 11 foot travel lanes, and place shared lane markings in the center of the southbound curb lane with BICYCLES MAY USE FULL LANE signs. Reconfigure parking to require reverse-angle parking marked at 60-90 degree angle to roadway to improve sight lines and safety.

***Primary Implementation Challenges:*** none

***Probable Construction Cost:*** $52,920

**2. BICYCLE LANES:** Stripe bicycle lanes in both directions by modifying the 90 degree angle parking to 60 degree angle parking to create space for the bicycle lanes.

***Primary Implementation Challenges:*** Changing to and enforcement of reverse-angle parking.

***Probable Construction Cost:*** $65,600

## LONG TERM RECOMMENDATION OPTIONS

Further study will be required to select one of the following options:

**1. CYCLETRACK (TWO-WAY):** Construct a 12-foot-wide two-way cycle track on the west side of the roadway by converting both sides of angle parking to parallel parking.

***Primary Implementation Challenges:*** removal of parking required to convert from angle to parallel.

***Probable Construction Cost:*** $763,640

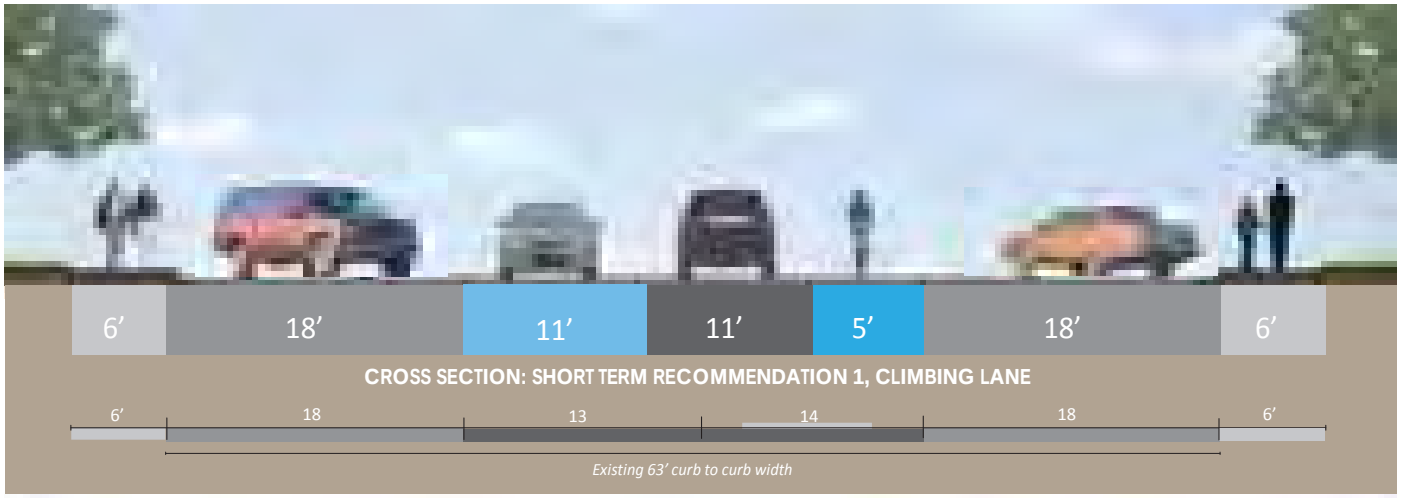
**2. SHARED USE PATH:** Construct a 16-foot-wide shared-use path on the east or west side of the roadway by converting one side of angle parking to parallel parking and reconstructing existing sidewalk.

***Primary Implementation Challenges:*** removal of parking required to convert from angle to parallel

***Probable Consrtuction Cost:*** $550,840

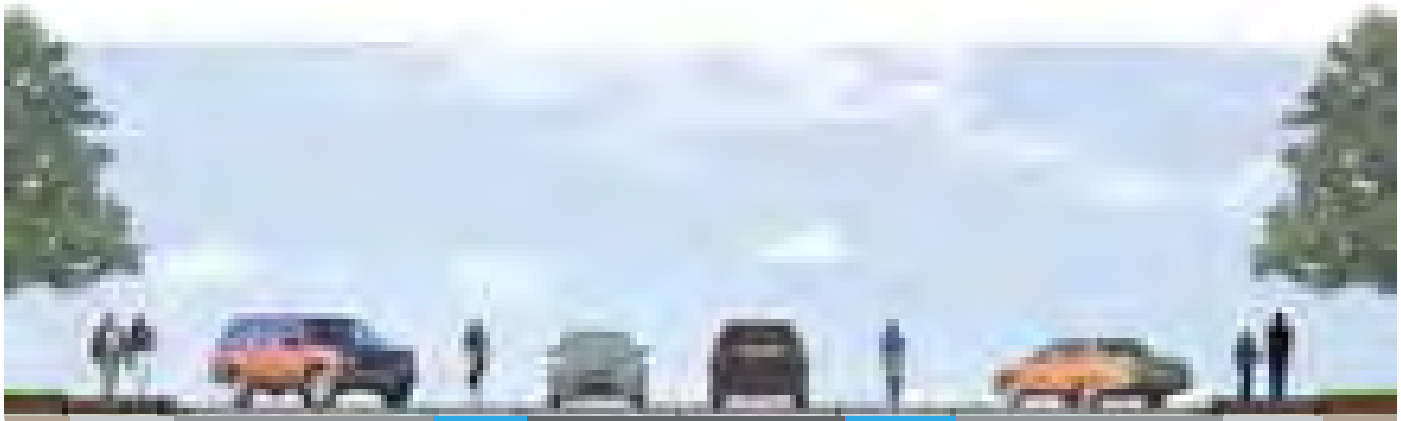
# Stadium Drive, continued

## Limits: South Road to Ridge Road




CROSS SECTION: SHORT TERM RECOMMENDATION 1, CLIMBING LANE



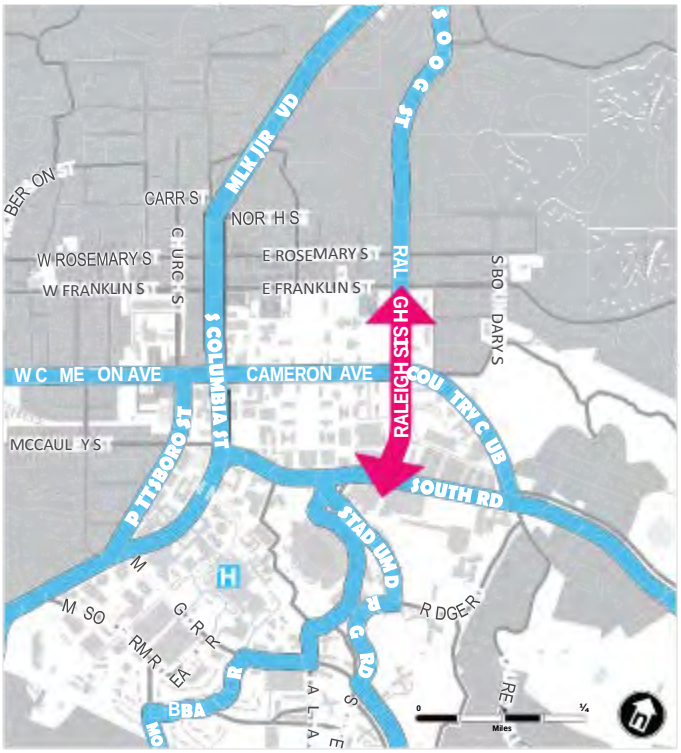

CROSS SECTION: SHORT TERM OPTION 2. BICYCLE LANES



CROSS SECTION: LONG TERM OPTION 1. CYCLE TRACK (TWO WAY)

# Raleigh Street

## Limits: East Franklin Street to South Road




## PURPOSE OF IMPROVEMENTS

This connection would improve north-south connectivity along the east side of campus.

## EXISTING CONDITIONS

This road is approximately 31 feet wide, with frequent pedestrian crossings between South Road and Cameron Street.

North of Cameron Street, the street narrows to 30 feet with on street parking on the east side.

Approaching Franklin Street from the south, the street narrows to 20 feet to pass between retaining walls.

There are no bicycle accommodations.

Traffic frequently queues at northbound Franklin Street approach due to the lack of a left turn lane.

Bicyclists were observed to regularly ride on the sidewalks between Cameron Street and Franklin Street.

The roadway is maintained by the Town.

## SHORT TERM RECOMMENDATION

**SHARED-LANE MARKINGS:** Add shared-lane markings in the center of the outside lanes with BICYCLES MAY USE FULL LANE signs.

**TURN RESTRICTION:** Restrict northbound left turns at Franklin Street, allowing left turns to redirect to Cameron Street or Rosemary Street to improve traffic flow for north-bound Raleigh Street at the Franklin Street intersection. Improvements to traffic flow may encourage more bicyclists to operate on the roadway versus on the adjacent narrow sidewalks.

***Primary Implementation Challenges:*** Restriction of north-bound left turns at Franklin Street will require traffic to turn left onto Rosemary Street.

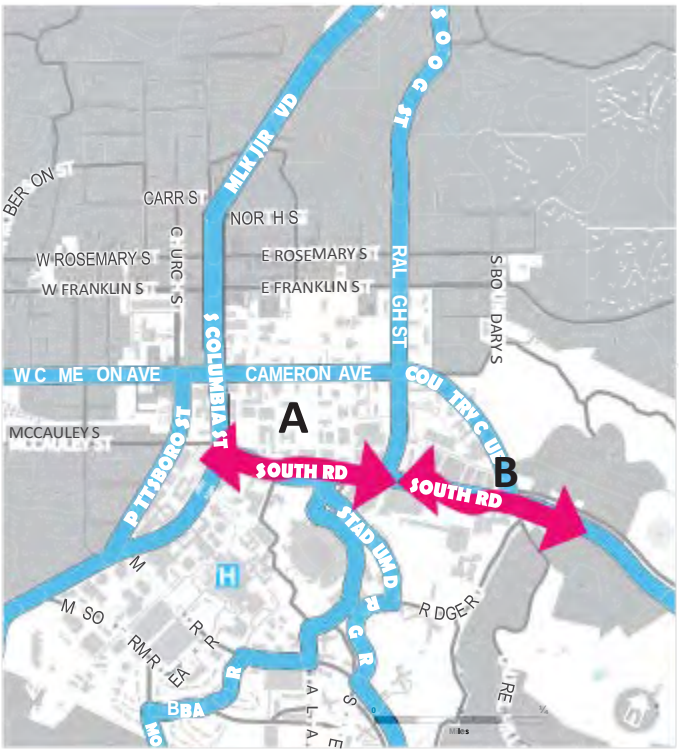
***Probable Construction Cost:*** $7,720

## LONG TERM RECOMMENDATION OPTIONS

**NONE.**

# South Road

**Limits: South Columbia Street to Country Club Road**




## PURPOSE OF IMPROVEMENTS

Creating separate space for bicyclists, pedestrians and motorists during periods of heavy use will improve the comfort and safety of travel through this corridor for all modes.

## EXISTING CONDITIONS

The street consists of two distinct cross sections:

Section A: South Columbia Street to Raleigh Street is 39 feet in width with no parking. A left turn lane is present between Bell Tower Drive and Raleigh Street.

Section B: Raleigh Street to Country Club Road is 34 feet in width with parking on both sides.

No existing bicycle accommodations.

Steep grade is a barrier for westbound bicyclists west of Bell Tower Drive.

Sidewalks are continuous on both sides of the roadway and are generally 8 feet in width with high volumes of pedestrians during class change periods.

There are major bus stops on both sides of South Rd at the Student Union, bus operations with altered lane configurations should be addressed.

The roadway is maintained by NCDOT.

## SHORT TERM RECOMMENDATION

**SHARED LANE MARKINGS:** Add shared lane markings in the center of the outside lanes with BICYCLES MAY USE FULL LANE signs. in sections A and B.

***Primary Implementation Challenges:*** None

***Probable Construction Cost:*** $12,545

## LONG TERM RECOMMENDATION OPTIONS

Further study will be required to select one of the following options.

**1. BICYCLE LANES:** Within section A, remove center turn lane and narrow travel lanes to provide 7-foot bicycle lanes. Within section B, narrow travel lanes and remove parking to provide 7-foot bicycle lanes.

***Primary Implementation Challenges:*** removal of turn lane, allowing parking in bicycle lane during special events.

***Probable Construction Cost:*** $78,370 total

***Section A:*** $57,400

***Section B:*** $20,970

**2. RAISED BICYCLE LANES:** Within section A, remove center turn lane and narrow travel lanes to provide 7-foot raised bicycle lanes. Within section B, narrow travel lanes and remove parking to provide 7-foot raised bicycle lanes.

***Primary Implementation Challenges:*** removal of turn lane, reconstruction of roadway edge to maintain clear separation between pedestrians and bicyclists, design for high volume bus traffic with stops at Student Union and drainage redesign.

***Probable Construction Cost:*** $895,115 total

***Section A:*** $481,985

***Section B:*** $413,130

# South Road

## Limits: South Columbia Street to Country Club Road

**3. CYCLE TRACKS (ONE-WAY):** Maintain center turn lane and narrow lanes to add 7-foot raised cycle track in section A. If a rolled curb is utilized, parking could be allowed for special events in the cycle track. This will require some spot roadway widening or realignment between Bell Tower Drive and Raleigh Street. Can maintain either option 1 or option 2 in section B.

***Primary Implementation Challenges:*** reconstruction of roadway edge to maintain clear separation between pedestrians and bicyclists, design for high volume bus traffic with stops at Student Union and drainage redesign.

***Probable Construction Cost:*** $856,415

*One way cycle track- Utrecht, Netherlands.*

Appendix E

# Cost Estimates + Backup

## PROJECT COST ESTIMATES

| Location/Description | Recommendation | Action | Length (Mile) | Cost/Mile | Item Cost |
|---|---|---|---|---|---|
| **1 Country Club Road** | | | | | |
| | Short Term Climbing Lane | Lane Diet, LD | 0.4 | $ 132,300 | $ 52,920 |
| | LT Option 1 Bicycle Lanes | Lane Diet, LD + Parking Removal | 0.4 | $ 156,700 | $ 62,680 |
| | LT Option 2 Bicycle Lanes | Widen Roadway Closed, WRC | 0.4 | $ 3,990,100 | $ 1,596,040 |
| | LT Option 3 Shared Use Path | Sidepath, ReConstruct Sidewalk | 0.4 | $ 1,377,100 | $ 550,840 |
| **2 East Cameron Avenue** | | | | | |
| | Short Term None | n/a | n/a | n/a | n/a |
| | LT Option 1 Shared Lane Markings | Add Markings, AM | 0.4 | $ 19,300 | $ 7,720 |
| **3 Hibbard Drive** | | | | | |
| | Short Term Climbing Lane | Lane Diet, LD | 0.3 | $ 132,300 | $ 39,690 |
| | LT Option 1 Bicycle Lanes | Widen Roadway Closed, WRC | 0.3 | $ 3,990,100 | $ 1,197,030 |
| **4 Kenan-Flagler Connector** | | | | | |
| | Short Term None | n/a | n/a | n/a | n/a |
| | LT Option 1 Bridge | Two 300 foot bridges | 600 | $ 17,500 | $ 10,500,000 |
| **5 Kenan Stadium East Path Connnector** | | | | | |
| | Short Term Reconstruct Intersection | Reconstruct Intersection | 1 | $ 50,000 | $ 50,000 |
| | LT Option 1 Shared Use Path | Widen Roadway Closed, WRC | 0.15 | $ 3,990,100 | $ 598,515 |
| **6 Kenan Stadium West Path Connnector** | | | | | |
| | Short Term Shared Lane Markings | Add Markings, AM | 0.2 | $ 19,300 | $ 3,860 |
| | Short Term Bicycle Ramp | Bicycle Ramp | 1 | $ 10,000 | $ 10,000 |
| | LT Option 1 Shared Use Path | Greenway, Construct | 0.2 | $ 576,700 | $ 115,340 |
| **7 Manning Drive** | | | | | |
| | Short Term Shared Lane Markings | Add Markings, AM | 0.6 | $ 19,300 | $ 11,580 |
| | Short Term Climbing Lane | Lane Diet, LD | 0.6 | $ 132,300 | $ 79,380 |
| | LT Option 1 Shared Use Path 1 side | Sidepath, ReConstruct Sidewalk | 0.6 | $ 1,377,100 | $ 826,260 |
| | LT Option 2 Shared Use Path Section | Sidepath, ReConstruct Sidewalk | 0.15 | $ 1,377,100 | $ 206,565 |
| **8 Mason Farm Road** | | | | | |
| | Short Term Shared Lane Markings | Add Markings, AM | 0.8 | $ 19,300 | $ 15,440 |
| | LT Option 1 2 Way Cycle Track | Widen Roadway Closed, WRC | 0.8 | $ 1,909,100 | $ 1,527,280 |
| | LT Option 2 Bicycle Lanes | Widen Roadway Closed, WRO | 0.8 | $ 2,061,000 | $ 1,648,800 |
| **9 McCauley Street** | | | | | |
| | Short Term Shared Lane Markings | Add Markings, AM | 0.1 | $ 19,300 | $ 1,930 |
| | LT Option 1 2 Way Cycle Track | Widen Roadway Closed, WRC | 0.1 | $ 1,909,100 | $ 190,910 |
| | LT Option 2 Bicycle Lanes | Widen Roadway Closed, WRC | 0.1 | $ 3,990,100 | $ 399,010 |
| **10 Paul Hardin Drive** | | | | | |
| | Short Term Shared Lane Markings | Add Markings, AM | 0.15 | $ 19,300 | $ 2,895 |
| | LT Option 1 Shared Use Path | Sidepath, ReConstruct Sidewalk | 0.15 | $ 1,377,100 | $ 206,565 |
| | LT Option 2 Bicycle Lanes | Widen Roadway Closed, WRC | 0.15 | $ 3,990,100 | $ 598,515 |
| **11 Skipper Bowles Drive** | | | | | |
| | Short Term Shared Lane Markings | Add Markings, AM | 0.5 | $ 19,300 | $ 9,650 |
| | LT Option 1 Shared Use Path | Reconstruct Sidewalk | 0.5 | $ 1,377,100 | $ 688,550 |
| **12 South Columbia Street** | | | | | |
| | ST Option 1 Shared Lane Markings | Add Markings, AM | 0.3 | $ 19,300 | $ 5,790 |
| | ST Option 2 Bicycle Lane | Lane Diet, LD | 0.3 | $ 156,700 | $ 47,010 |
| | LT Option 1(a) 2 Way Cycle Track | 2 Way Cycle Track | 0.3 | $ 1,909,100 | $ 572,730 |
| | LT Option 1(b) 2 Way Cycle Track | Widen Roadway Closed, WRC | 0.3 | $ 3,990,100 | $ 1,197,030 |
| | LT Option 2 Shared Use Path | Sidepath, ReConstruct Sidewalk | 0.3 | $ 1,377,100 | $ 413,130 |
| **13 Ridge Road** | | | | | |
| | Short Term A1, B1 Climbing Lane | Lane Diet, LD | 0.3 | $ 132,300 | $ 39,690 |
| | Short Term A1, B2 Shared Lane Markings | Add Markings, AM | 0.4 | $ 19,300 | $ 7,720 |
| | LT Option A1 Bicycle Lanes | Road Diet, RD | 0.2 | $ 164,000 | $ 32,800 |
| | LT Option A2 Bicycle Lanes | Widen Roadway Closed, WRC | 0.2 | $ 3,990,100 | $ 798,020 |
| | LT Option A3 Shared Use Path | Sidepath, ReConstruct Sidewalk | 0.2 | $ 1,377,100 | $ 275,420 |
| | LT Option B1 Bicycle Lanes | Widen Roadway Closed, WRC | 0.1 | $ 3,990,100 | $ 399,010 |
| | LT Option B2 Shared Use Path | Sidepath, ReConstruct Sidewalk | 0.1 | $ 1,377,100 | $ 137,710 |
| | LT Option C1 Climbing Lane | Widen Roadway Closed, WRC | 0.4 | $ 2,006,400 | $ 802,560 |
| | LT Option C2 Bicycle Lanes | Widen Roadway Closed, WRC | 0.4 | $ 3,990,100 | $ 1,596,040 |
| | LT Option C3 Shared Use Path | Sidepath, ReConstruct Sidewalk | 0.4 | $ 1,377,100 | $ 550,840 |

| Location/Description | Recommendation | Action | Length (Mile) | Cost/Mile | Item Cost |
|---|---|---|---|---|---|
| **14 Stadium Drive** | | | | | |
| ST Option 1 | Climbing Lane | Lane Diet, LD | 0.4 | $ 132,300 | $ 52,920 |
| ST Option 2 | Bicycle Lanes | Road Diet | 0.4 | $ 164,000 | $ 65,600 |
| LT Option 2 | 2 Way Cycle Track | 2 Way Cycle Track | 0.4 | $ 1,909,100 | $ 763,640 |
| LT Option 3 | Shared Use Path | Sidepath, ReConstruct Sidewalk | 0.4 | $ 1,377,100 | $ 550,840 |
| **15 Raleigh Street** | | | | | |
| Short Term | Shared Lane Markings | Add Markings, AM | 0.4 | $ 19,300 | $ 7,720 |
| Long Term | None | n/a | n/a | n/a | n/a |
| **16 South Road** | | | | | |
| Short Term | Shared Lane Markings | Add Markings, AM | 0.65 | $ 19,300 | $ 12,545 |
| LT Option 1A | Bicycle Lanes | Road Diet | 0.35 | $ 164,000 | $ 57,400 |
| LT Option 1B | Bicycle Lanes | Add Markings | 0.3 | $ 69,900 | $ 20,970 |
| LT Option 2A | Raised Bicycle Lanes | Sidepath, ReConstruct Sidewalk | 0.35 | $ 1,377,100 | $ 481,985 |
| LT Option 2B | Raised Bicycle Lanes | Sidepath, ReConstruct Sidewalk | 0.3 | $ 1,377,100 | $ 413,130 |
| LT Option 3 | One Way Cycle Tracks (A) | One Way Cycle Track | 0.35 | $ 2,446,900 | $ 856,415 |
| **Other Projects** | | | | | |
| William Blythe Drive | Bicycle Lanes | Add Markings, AM | 0.3 | $ 69,900 | $ 20,970 |
| See short term map | Bicycle Stair Channel | Retrofit | 6 | $ 5,000 | $ 30,000 |
| See short term map | Bicycle Ramps | Retrofit | 3 | $ 5,000 | $ 15,000 |
| See short term map | Intersection Study | Study of 25 intersections | 1 | $ 50,000 | $ 50,000 |
| See route map | Signed Routes | Add Signs | 15.0 | $ 6,000 | $ 90,000 |

# UNC CHAPEL HILL -- FACILITY BASE 2013 COSTS (PER MILE)

**Signed Route, SR (Add Signs, SR)**

*Includes: sign and post.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500' , each side of road |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Maintenance of Traffic (Fixed) | LS | 1.00 | $500.00 | $500 | |
| | | | **Subtotal** | **$5,420** | |
| | | | | | |
| | | | 10% Contingency | $542 | |
| | | | **Total Estimated Cost** | **$6,000** | → $1.14 Per Foot |

**Sharrows, SH (Add Markings, AM)**

*Includes: shared lane pavement marking. No markings on existing roadway require removal.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Thermoplastic Pavement Marking Symbol | EA | 40 | $275.00 | $11,000 | 1 Symbol every 250' , each side of road |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500' , each side of road |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Maintenance of Traffic (10%) | LS | 1.00 | $1,592.00 | $1,592 | |
| | | | **Subtotal** | **$17,512** | |
| | | | | | |
| | | | 10% Contingency | $1,751 | |
| | | | **Total Estimated Cost** | **$19,300** | → $3.66 Per Foot |

**Bike Lanes, BL (Add Markings, AM)**

*Includes: bicycle lane markings in both directions with bicycle lane signs. No markings on existing roadway require removal.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Thermoplastic Pavement Marking Lines (4" to 6") | LF | 21,120 | $1.75 | $36,960 | 4 solid lines entire length |
| Thermoplastic Pavement Marking Symbol | EA | 40 | $275.00 | $11,000 | 1 Symbol every 250' , each side of road |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500' , each side of road |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Maintenance of Traffic (10%) | LS | 1.00 | $5,288.00 | $5,288 | |
| | | | **Subtotal** | **$58,168** | |
| | | | | | |
| | | | 20% Contingency | $11,634 | |
| | | | **Total Estimated Cost** | **$69,900** | → $13.24 Per Foot |

**Bike Lanes, BL (Lane Diet, LD)**

*Includes: bicycle lane markings in both directions with bicycle lane signs. Up to 4 traffic lane lines removed.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Thermoplastic Pavement Marking Lines (4" to 6") | LF | 31,680 | $1.75 | $55,440 | 6 solid lines entire length |
| Thermoplastic Pavement Marking Symbol | EA | 40 | $275.00 | $11,000 | 1 Symbol every 250' each side of road |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500' , each side of road |
| Eradication | LF | 21,120 | $2.24 | $47,309 | eradicate 4 solid lane lines |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Maintenance of Traffic (10%) | LS | 1.00 | $11,867.00 | $11,867 | |
| | | | **Subtotal** | **$130,536** | |
| | | | | | |
| | | | 20% Contingency | $26,107 | |
| | | | **Total Estimated Cost** | **$156,700** | → $29.68 Per Foot |

**Bike Lanes, BL (Road Diet, RD)**

*Includes: bicycle lane markings in both directions with bicycle lane signs. Up to 4 traffic lane lines removed.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Thermoplastic Pavement Marking Lines (4" to 6") | LF | 31,680 | $1.75 | $55,440 | 6 solid lines entire length (4-3 road diet) |
| Thermoplastic Pavement Marking Bike Lane Symbo | EA | 40 | $275.00 | $11,000 | 1 Bike Symbol every 250' each side of road |
| Thermoplastic Pavement Marking Arrow Symbol | EA | 20 | $275.00 | $5,500 | 1 Turn Arrows every 500' each side of road |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500' , each side of road |
| Eradication | LF | 21,120 | $2.24 | $47,309 | 4 solid lines entire length |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Maintenance of Traffic (10%) | LS | 1.00 | $12,417.00 | $12,417 | |
| | | | **Subtotal** | **$136,586** | |
| | | | | | |
| | | | 20% Contingency | $27,317 | |
| | | | **Total Estimated Cost** | **$164,000** | → **$31.06** **Per Foot** |

**Bike Lanes, BL (Widen Open Section Roadway, WRO)**

*Includes: bicycle lane markings in both directions with bicycle lane signs. Requires road widening up to 7' each side, 14' total, with 2" pavement overlay of existing roadway. Major grading required with no curb and gutter. Natural ditch drainage provided.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Earthwork, Excavation, Grading | CY | 21,902 | $17.00 | $372,338 | 7' width and 2' depth, each side of road |
| Aggregate Base Course for Pavement | CY | 2,738 | $56.00 | $153,316 | 7' width and 1' depth, each side of road |
| Milling | SY | 12,907 | $7.00 | $90,347 | 22' width |
| Asphalt Base Course | TON | 2,779 | $67.00 | $186,189 | 14' width and 0.5' depth, 13.3 CF in a TON |
| Asphalt Surface Course | TON | 1,786 | $67.00 | $119,693 | 36' width and 0.125' depth, 13.3 CF in a TON |
| Thermoplastic Pavement Marking Lines (4" to 6") | LF | 21,120 | $1.75 | $36,960 | 4 solid lines entire length |
| Thermoplastic Pavement Marking Symbol | EA | 40 | $275.00 | $11,000 | 1 Symbol every 250' each side of road (bike lane) |
| Crosswalk | EA | 4 | $1,000.00 | $4,000 | 4 Crosswalks per mile, 36' x 10' High Visibility |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500' , each side of road |
| Retaining Wall (up to 6' height) | LF | 528 | $500.00 | $264,000 | 10% of length |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Landscaping (5%) | LS | 1.00 | $48,938.00 | $48,938 | |
| Drainage and E&S (10%) | LS | 1.00 | $97,876.00 | $97,876 | |
| Maintenance of Traffic (10%) | LS | 1.00 | $97,876.00 | $97,876 | |
| Utility Adjustments (10%) | LS | 1.00 | $97,876.00 | $97,876 | |
| | | | **Subtotal** | **$1,585,329** | |
| | | | | | |
| | | | 30% Contingency | $475,599 | |
| | | | **Total Estimated Cost** | **$2,061,000** | → **$390.34** **Per Foot** |

**Bike Lanes (Widen Closed Section Roadway, WRC)**

*Includes: bicycle lane markings in both directions with bicycle lane signs. Requires road widening up to 14' on one side, 14' total, with 2" pavement overlay of existing roadway. Major grading required with retaining walls. Curb and gutter relocation and drainage*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Earthwork, Fill, Excavation, Grading | CY | 31,289 | $17.00 | $531,911 | 20' width up to 8' depth |
| Aggregate Base Course for Pavement | CY | 2,738 | $56.00 | $153,316 | 7' width and 1' depth, each side of road |
| Milling | SY | 12,907 | $7.00 | $90,347 | 22' width |
| Asphalt Base Course | TON | 2,779 | $67.00 | $186,189 | 14' width and 0.5' depth, 13.3 CF in a TON |
| Asphalt Surface Course | TON | 1,786 | $67.00 | $119,693 | 36' width and 0.125' depth, 13.3 CF in a TON |
| Remove Curb and Gutter | LF | 5,280 | $7.00 | $36,960 | both sides |
| Remove 4' sidewalk | SY | 4,693 | $4.00 | $18,773 | both sides |
| Curb and Gutter | LF | 10,560 | $20.00 | $211,200 | both sides |
| Construct 5' sidewalk | SY | 5,867 | $58.00 | $340,267 | both sides |
| Thermoplastic Pavement Marking Lines (4" to 6") | LF | 21,120 | $1.75 | $36,960 | 4 solid lines entire length |
| Thermoplastic Pavement Marking Symbol | EA | 40 | $275.00 | $11,000 | 1 Symbol every 250' each side of road (bike lane) |
| Crosswalk | EA | 4 | $1,000.00 | $4,000 | 4 Crosswalks per mile, 36' x 10', High Visibility |
| Retaining Wall (up to 6' height) | LF | 1,056 | $500.00 | $528,000 | 10% of length |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500' , each side of road |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Landscaping (5%) | LS | 1.00 | $113,677.00 | $113,677 | |
| Drainage and E&S (10%) | LS | 1.00 | $227,354.00 | $227,354 | |
| Maintenance of Traffic (10%) | LS | 1.00 | $227,354.00 | $227,354 | |
| Utility Adjustments (10%) | LS | 1.00 | $227,354.00 | $227,354 | |
| | | | **Subtotal** | **$3,069,275** | |
| | | | | | |
| | | | 30% Contingency | $920,783 | |
| | | | **Total Estimated Cost** | **$3,990,100** | → **$755.70** **Per Foot** |

**Climbing Lane, CL (Add Markings, AM)**

*Includes: bicycle lane marking in uphill direction with shared lanes markings in downhill direction with signs. No markings on existing roadway require removal.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Thermoplastic Pavement Marking Lines (4" to 6") | LF | 5,280 | $1.75 | $9,240 | 1 solid lines entire length |
| Thermoplastic Pavement Marking Symbol | EA | 40 | $275.00 | $11,000 | 1 Symbol every 250' each side of road |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500' , each side of road |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Maintenance of Traffic (10%) | LS | 1.00 | $2,516.00 | $2,516 | |
| | | | **Subtotal** | **$27,676** | |
| | | | | | |
| | | | 20% Contingency | $5,535 | |
| | | | **Total Estimated Cost** | **$33,300** | → **$6.31** Per Foot |

**Climbing Lane, CL (Lane Diet, LD)**

*Includes: bicycle lane marking in uphill direction with shared lanes markings in downhill direction with signs. Up to 4 traffic lane lines removed.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Thermoplastic Pavement Marking Lines (4" to 6") | LF | 21,120 | $1.75 | $36,960 | 4 solid lines entire length |
| Thermoplastic Pavement Marking Symbol | EA | 40 | $275.00 | $11,000 | 1 Symbol every 250' each side of road |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500' , each side of road |
| | | | | | |
| Eradication | LF | 21,120 | $2.24 | $47,309 | 4 solid lines entire length |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Maintenance of Traffic (10%) | LS | 1.00 | $10,019.00 | $10,019 | |
| | | | **Subtotal** | **$110,208** | |
| | | | | | |
| | | | 20% Contingency | $22,042 | |
| | | | **Total Estimated Cost** | **$132,300** | → **$25.06** Per Foot |

**Climbing Lanes, CL (Widen Open Section Roadway - One Side, WRO)**

*Includes: bicycle lane marking in uphill direction with shared lanes markings in downhill direction with signs. Up to 4 traffic lane lines removed. Requires road widening up to 7' on one side, 7' total, with 22 pavement overlay of existing roadway. Major grading required with retaining walls. Open ditch drainage*

major grading - 7' one side,full overlay 22' of existing roadway)

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Earthwork, Fill, Excavation, Grading | CY | 10,951 | $17.00 | $186,169 | 10' width up to 8' depth, one side of road |
| Aggregate Base Course | CY | 1,369 | $25.00 | $34,222 | 7' width and 1' depth, one side of road |
| Milling | SY | 12,907 | $7.00 | $90,347 | 22' width |
| Asphalt Base Course | TON | 1,389 | $67.00 | $93,095 | 14' width and 0.5' depth, 13.3 CF in a TON |
| Asphalt Surface Course | TON | 1,439 | $67.00 | $96,420 | 29' width and 0.125' depth, 13.3 CF in a TON |
| Curb and Gutter | LF | 0 | $20.00 | $0 | none provided |
| Construct 5' sidewalk | SY | 0 | $58.00 | $0 | none provided |
| Thermoplastic Pavement Marking Lines (4" to 6") | LF | 21,120 | $1.75 | $36,960 | 4 solid lines entire length |
| Thermoplastic Pavement Marking Symbol | EA | 40 | $275.00 | $11,000 | 1 Symbol every 250' each side of road (bike lane) |
| Crosswalk | EA | 4 | $1,000.00 | $4,000 | 4 Crosswalks per mile, 36' x 10', High Visibility |
| Retaining Wall (up to 6' height) | LF | 528 | $500.00 | $264,000 | 10% of length |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500' , each side of road |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Landscaping (5%) | LS | 1.00 | $41,057.00 | $41,057 | |
| Drainage and E&S (10%) | LS | 1.00 | $82,113.00 | $82,113 | |
| Maintenance of Traffic (10%) | LS | 1.00 | $82,113.00 | $82,113 | |
| Utility Adjustments (10%) | LS | 1.00 | $82,113.00 | $82,113 | |
| | | | **Subtotal** | **$1,108,528** | |
| | | | | | |
| | | | 30% Contingency | $332,558 | |
| | | | **Total Estimated Cost** | **$1,441,100** | → **$272.94** Per Foot |

**Climbing Lanes, CL (Widen Closed Section Roadway - One Side, WRC)**

*Includes: bicycle lane marking in uphill direction with shared lanes markings in downhill direction with signs. Up to 4 traffic lane lines removed. Requires road widening up to 7' on one side, 7' total, with 22 pavement overlay of existing roadway. Major grading required with retaining walls. Curb and gutter relocation and drainage reconnections.*

major grading - 7' one side,full overlay 22' of existing roadway)

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Earthwork, Fill, Excavation, Grading | CY | 10,951 | $17.00 | $186,169 | 10' width up to 8' depth, one side of road |
| Aggregate Base Course | CY | 1,369 | $25.00 | $34,222 | 7' width and 1' depth, one side of road |
| Milling | SY | 12,907 | $7.00 | $90,347 | 22' width |
| Asphalt Base Course | TON | 1,389 | $67.00 | $93,095 | 14' width and 0.5' depth, 13.3 CF in a TON |
| Asphalt Surface Course | TON | 1,439 | $67.00 | $96,420 | 29' width and 0.125' depth, 13.3 CF in a TON |
| Remove Curb and Gutter | LF | 5,280 | $7.00 | $36,960 | one side |
| Remove 4' sidewalk | SY | 2,347 | $4.00 | $9,387 | one side |
| Curb and Gutter | LF | 5,280 | $20.00 | $105,600 | one side |
| Construct 5' sidewalk | SY | 2,933 | $58.00 | $170,133 | one side |
| Thermoplastic Pavement Marking Lines (4" to 6") | LF | 21,120 | $1.75 | $36,960 | 4 solid lines entire length |
| Thermoplastic Pavement Marking Symbol | EA | 40 | $275.00 | $11,000 | 1 Symbol every 250' each side of road (bike lane) |
| Crosswalk | EA | 4 | $1,000.00 | $4,000 | 4 Crosswalks per mile, 36' x 10' , High Visibility |
| Retaining Wall (up to 6' height) | LF | 528 | $500.00 | $264,000 | 10% of length |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500' , each side of road |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Landscaping (5%) | LS | 1.00 | $57,161.00 | $57,161 | |
| Drainage and E&S (10%) | LS | 1.00 | $114,321.00 | $114,321 | |
| Maintenance of Traffic (10%) | LS | 1.00 | $114,321.00 | $114,321 | |
| Utility Adjustments (10%) | LS | 1.00 | $114,321.00 | $114,321 | |
| | | | **Subtotal** | **$1,543,336** | |
| | | | | | |
| | | | 30% Contingency | $463,001 | |
| | | | **Total Estimated Cost** | **$2,006,400** | → **$380.00** **Per Foot** |

**Buffered Bike Lane, BBL - (Add Markings, AM)**

*Includes: buffered bicycle lane markings in both directions with bicycle lane signs. No markings on existing roadway require removal.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Thermoplastic Pavement Marking Lines (4" to 6") | LF | 31,680 | $1.75 | $55,440 | 6 solid lines entire length |
| Thermoplastic Pavement Marking Symbol | EA | 40 | $275.00 | $11,000 | 1 Symbol every 250' each side of road |
| Crosswalk | EA | 4 | $1,000.00 | $4,000 | 4 Crosswalks per mile, 36' x 10' , High Visibility |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500' , each side of road |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Maintenance of Traffic (10%) | LS | 1.00 | $7,536.00 | $7,536 | |
| | | | **Subtotal** | **$82,896** | |
| | | | | | |
| | | | 20% Contingency | $16,579 | |
| | | | **Total Estimated Cost** | **$99,500** | → **$18.84** **Per Foot** |

**Buffered Bike Lane, BBL - (Lane Diet, LD)**

*Includes: buffered bicycle lane markings in both directions with bicycle lane signs. Up to 4 traffic lane lines removed.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Thermoplastic Pavement Marking Lines (4" to 6") | LF | 31,680 | $1.75 | $55,440 | 6 solid lines entire length |
| Thermoplastic Pavement Marking Symbol | EA | 40 | $275.00 | $11,000 | 1 Symbol every 250' each side of road |
| Crosswalk | EA | 4 | $1,000.00 | $4,000 | 4 Crosswalks per mile, 36' x 10' , High Visibility |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500' , each side of road |
| Eradication | LF | 21,120 | $2.24 | $47,309 | 4 solid lines entire length |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Maintenance of Traffic (10%) | LS | 1.00 | $12,267.00 | $12,267 | |
| | | | **Subtotal** | **$134,936** | |
| | | | | | |
| | | | 20% Contingency | $26,987 | |
| | | | **Total Estimated Cost** | **$162,000** | → **$30.68** **Per Foot** |

**Repair Concrete Sidewalk (4" Thickness)**

*Includes: removal and replacment of existing sidewalk including driveway ramps and curb ramps.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Repair Concrete Sidewalk (4" Thickness) | SY | 1,760 | $58.00 | $102,080 | Assume 25% of existing sidewalk, both sides |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Landscaping (5%) | LS | 1.00 | $5,104.00 | $5,104 | |
| Drainage and E&S (5%) | LS | 1.00 | $5,104.00 | $5,104 | |
| Maintenance of Traffic (10%) | LS | 1.00 | $10,208.00 | $10,208 | |
| Utility Adjustments (5%) | LS | 1.00 | $5,104.00 | $5,104 | |
| | | | **Subtotal** | **$127,600** | |
| | | | | | |
| | | | 30% Contingency | $38,280 | |
| | | | **Total Estimated Cost** | **$165,900** → | **$31.42** Per Foot |
| | | | | **$82,950** → | Per Side |

**Sidewalk With Bikes Permitted, SWBP (Widen Sidewalk, WS)**

*Includes: removal of existing sidewalk. Widening of sidewalk to 8' minimum where feasible, minimal grading to avoid property acquistion, retaining wall relocation or construction.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Earthwork, Fill, Excavation, Grading | CY | 3,129 | $17.00 | $53,191 | 4' width, up to 2' depth, two sides |
| Aggregate Base Course | CY | 1,564 | $25.00 | $39,111 | 4' width and 1' depth, both sides |
| Widen Concrete Sidewalk (4" Thickness) | SY | 4,693 | $58.00 | $272,213 | Assume 4', both sides |
| Repair Concrete Sidewalk (4" Thickness) | SY | 1,760 | $58.00 | $102,080 | Assume 25% of existing sidewalk, both sides |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500', each side of road |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Landscaping (5%) | LS | 1.00 | $23,576.00 | $23,576 | |
| Drainage and E&S (5%) | LS | 1.00 | $23,576.00 | $23,576 | |
| Maintenance of Traffic (10%) | LS | 1.00 | $47,152.00 | $47,152 | |
| Utility Adjustments (5%) | LS | 1.00 | $23,576.00 | $23,576 | |
| | | | **Subtotal** | **$589,396** | |
| | | | | | |
| | | | 30% Contingency | $176,819 | |
| | | | **Total Estimated Cost** | **$766,300** → | **$145.13** Per Foot |
| | | | | **$383,150** → | Per Side |

**Greenway, GWY (Construct) - no curb work**

*Includes: construction of new 10' minimum greenway through open land or sewer easement with minimal grading.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Earthwork, Excavation, Grading, Fill | CY | 8,800 | $17.00 | $149,600 | 15' width and 3' depth |
| Aggregate Base Course | CY | 1,956 | $25.00 | $48,889 | 10' width and 1' depth |
| Asphalt Surface Course | TON | 496 | $67.00 | $33,248 | 10' width and 0.125' depth, 13.3 CF in a TON |
| Asphalt Base Course | TON | 1,985 | $67.00 | $132,992 | 10' width and 0.5' depth, 13.3 CF in a TON |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500', each side of greenway |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Landscaping (5%) | LS | 1.00 | $18,482.00 | $18,482 | |
| Drainage and E&S (10%) | LS | 1.00 | $36,965.00 | $36,965 | |
| Maintenance of Traffic (5%) | LS | 1.00 | $18,482.00 | $18,482 | |
| Utility Adjustments (10%) | LS | 1.00 | $36,965.00 | $36,965 | |
| | | | **Subtotal** | **$480,543** | |
| | | | | | |
| | | | 30% Contingency | $96,109 | |
| | | | **Total Estimated Cost** | **$576,700** → | **$109.22** Per Foot |

**Sidepath, SidePath (Repair) - no curb work**

*Includes: replacement of existing 6' concrete sidewalk with new 10' minimum shared use path alongside a roadway. Require minimal grading.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Earthwork, Excavation, Grading, Fill | CY | 1,173 | $17.00 | $19,947 | 30%, 10' width and 2' depth |
| Aggregate Base Course | CY | 587 | $25.00 | $14,667 | 30%, 10' width and 1' depth |
| Asphalt Surface Course | TON | 496 | $67.00 | $33,248 | 100%, 10' width and 0.125' depth, 13.3 CF in a TON |
| Asphalt Base Course | TON | 595 | $67.00 | $39,898 | 30%, 10' width and 0.5' depth, 13.3 CF in a TON |
| Milling | SY | 4,107 | $7.00 | $28,747 | assume 70% requires milling at 10' width |
| Remove existing 10' asphalt path | SY | 1,760 | $4.00 | $7,040 | assume 30% requires removal at 10' width |
| Thermoplastic Pavement Marking Symbol | EA | 40 | $275.00 | $11,000 | 1 symbol every 250' (bike lanes) |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500', each side of road |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Landscaping (5%) | LS | 1.00 | $7,973.00 | $7,973 | |
| Drainage and E&S (10%) | LS | 1.00 | $15,947.00 | $15,947 | |
| Maintenance of Traffic (5%) | LS | 1.00 | $7,973.00 | $7,973 | |
| Utility Adjustments (5%) | LS | 1.00 | $7,973.00 | $7,973 | |
| | | | **Subtotal** | **$199,332** | |
| | | | | | |
| | | | 30% Contingency | $59,800 | |
| | | | **Total Estimated Cost** | **$259,200** | → **$49.09** **Per Foot** |

**Sidepath, SUP (ReConstruct) - curb work**

*Includes: replacement of existing 6' concrete sidewalk with new 10' minimum shared use path alongside a roadway. Requires major grading with some retaining walls along with removal and replacement of existing curb and gutter.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Earthwork, Excavation, Grading, Fill | CY | 7,822 | $17.00 | $132,978 | 20' disturbance one side and 2' depth |
| Aggregate Base Course | CY | 1,956 | $25.00 | $48,889 | 10' width, 1' depth |
| Asphalt Surface Course | TON | 496 | $67.00 | $33,248 | 10' width and 0.125' depth, 13.3 CF in a TON |
| Asphalt Base Course | TON | 1,985 | $67.00 | $132,992 | 10' width and 0.5' depth, 13.3 CF in a TON |
| Remove Curb and Gutter | LF | 5,280 | $7.00 | $36,960 | both sides |
| Remove 6' sidewalk | SY | 3,520 | $4.00 | $14,080 | both sides |
| Curb and Gutter | LF | 5,280 | $20.00 | $105,600 | both sides |
| Thermoplastic Pavement Marking Symbol | EA | 40 | $275.00 | $11,000 | 1 symbol every 250' (cycle track) |
| Retaining Wall (up to 6' height) | LF | 528 | $500.00 | $264,000 | 10% of length |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500', each side of road |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Landscaping (5%) | LS | 1.00 | $39,233.00 | $39,233 | |
| Drainage and E&S (10%) | LS | 1.00 | $78,467.00 | $78,467 | |
| Maintenance of Traffic (10%) | LS | 1.00 | $78,467.00 | $78,467 | |
| Utility Adjustments (10%) | LS | 1.00 | $78,467.00 | $78,467 | |
| | | | **Subtotal** | **$1,059,301** | |
| | | | | | |
| | | | 30% Contingency | $317,790 | |
| | | | **Total Estimated Cost** | **$1,377,100** | → **$260.81** **Per Foot** |

**One Way Cycletrack (Construct New - 7' asphalt w/ curb & gutter & median) - both sides**

*Includes: relocation of existing 6' concrete sidewalk with new 7' minimum cycle track alongside a roadway. Requires major grading with some retaining walls along with removal and replacement of existing curb and gutter.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Earthwork, Excavation, Grading, Fill | CY | 9,387 | $17.00 | $159,573 | 12' disturbance each side and 2' depth |
| Aggregate Base Course | CY | 2,738 | $25.00 | $68,444 | 7' width each side and 1' depth |
| Asphalt Surface Course | TON | 695 | $67.00 | $46,547 | 7' width and 0.125' depth, 13.3 CF in a TON each side |
| Asphalt Base Course | TON | 2,779 | $67.00 | $186,189 | 7' width and 0.5' depth, 13.3 CF in a TON each side |
| Retaining Wall (up to 6' height) | LF | 528 | $500.00 | $264,000 | 10% of length |
| Remove Curb and Gutter | LF | 10,560 | $7.00 | $73,920 | both sides |
| Remove 6' sidewalk | SY | 7,040 | $4.00 | $28,160 | both sides |
| Curb and Gutter | LF | 10,560 | $20.00 | $211,200 | both sides |
| Construct Concrete Sidewalk (4" Thickness) | SY | 5,867 | $58.00 | $340,267 | both sides |
| Thermoplastic Pavement Marking Symbol | EA | 40 | $275.00 | $11,000 | 1 symbol every 250' (cycle track) |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500', each side of road |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Landscaping (5%) | LS | 1.00 | $69,711.00 | $69,711 | |
| Drainage and E&S (10%) | LS | 1.00 | $139,422.00 | $139,422 | |
| Maintenance of Traffic (10%) | LS | 1.00 | $139,422.00 | $139,422 | |
| Utility Adjustments (10%) | LS | 1.00 | $139,422.00 | $139,422 | |
| | | | **Subtotal** | **$1,882,198** | |
| | | | | | |
| | | | 30% Contingency | $564,659 | |
| | | | **Total Estimated Cost** | **$2,446,900** | → **$463.43** Per Foot |

**Two Way Cycletrack (2 Way Cycle Track), one side**

*Includes: relocation of existing 6' concrete sidewalk with new 7' minimum cycle track alongside a roadway. Requires major grading with some retaining walls along with removal and replacement of existing curb and gutter.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Earthwork, Excavation, Grading, Fill | CY | 15,644 | $17.00 | $265,956 | 20' disturbance one side and 2' depth |
| Aggregate Base Course | CY | 1,956 | $25.00 | $48,889 | 10' width, 1' depth |
| Asphalt Surface Course | TON | 496 | $67.00 | $33,248 | 10' width and 0.125' depth, 13.3 CF in a TON |
| Asphalt Base Course | TON | 1,985 | $67.00 | $132,992 | 10' width and 0.5' depth, 13.3 CF in a TON |
| Retaining Wall (up to 6' height) | LF | 528 | $500.00 | $264,000 | 10% of length |
| Remove Curb and Gutter | LF | 5,280 | $7.00 | $36,960 | one side |
| Remove 6' sidewalk | SY | 3,520 | $4.00 | $14,080 | one side |
| Curb and Gutter | LF | 5,280 | $20.00 | $105,600 | one side |
| Construct Concrete Sidewalk (4" Thickness) | SY | 2,933 | $58.00 | $170,133 | one side |
| Thermoplastic Pavement Marking Symbol | EA | 40 | $275.00 | $11,000 | 1 symbol every 250' (cycle track) |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500', each side of road |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Landscaping (5%) | LS | 1.00 | $54,389.00 | $54,389 | |
| Drainage and E&S (10%) | LS | 1.00 | $108,778.00 | $108,778 | |
| Maintenance of Traffic (10%) | LS | 1.00 | $108,778.00 | $108,778 | |
| Utility Adjustments (10%) | LS | 1.00 | $108,778.00 | $108,778 | |
| | | | **Subtotal** | **$1,468,501** | |
| | | | | | |
| | | | 30% Contingency | $440,550 | |
| | | | **Total Estimated Cost** | **$1,909,100** | → **$361.57** Per Foot |

**Shared Use Path Bridge (14')**

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Basic Prefab Bridge (200' span) | SF | 2,800 | $250.00 | $700,000 | |
| Public Art Bridge (200' span) | SF | 2,800 | $1,000.00 | $2,800,000 | |
| | | | | | |
| | | | Total Estimated Cost | $3,500,000 | → $17,500.00 Per Foot |

**Priority Shared Lane Marking Treatment (no color)**

*Includes: shared lane pavement marking at 125' spacing with dotted white lines bracketing symbol. No markings on existing roadway require removal.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Thermoplastic Pavement Marking Lines (4" to 6") | LF | 2,400 | $1.75 | $4,200 | 4 dotted lines, 30' length either side of symbol |
| Thermoplastic Pavement Marking Symbol | EA | 80 | $275.00 | $22,000 | 1 Symbol every 125' per side of the road |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500', each side of road |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Maintenance of Traffic (10%) | LS | 1.00 | $0.00 | $0 | |
| | | | **Subtotal** | **$31,120** | |
| | | | 20% Contingency | $6,224 | |
| | | | Total Estimated Cost | $37,400 | → $7.08 Per Foot |

**Priority Shared Lane Marking Treatment with 4' color)**

*Includes: shared lane pavement marking at 125' spacing with dotted white lines bracketing symbol filled with green color. No markings on existing roadway require removal.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Thermoplastic Pavement Marking Lines (4" to 6") | LF | 2,400 | $1.75 | $4,200 | 4 dotted lines, 30' length either side of symbol |
| Thermoplastic Pavement Marking Symbol | EA | 80 | $275.00 | $22,000 | 1 Symbol every 125' per side of the road |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500', each side of road |
| Green coloring within sharrow space | SF | 9,600 | $6.00 | $57,600 | 4' wide color, 30' length either side of symbol |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Maintenance of Traffic (10%) | LS | 1.00 | $0.00 | $0 | |
| | | | **Subtotal** | **$88,720** | |
| | | | 20% Contingency | $17,744 | |
| | | | Total Estimated Cost | $106,500 | → $20.17 Per Foot |

**STRIPED SHOULDER, SS (Add Markings, AM)**

*Includes: shoulder lane line markings in both directions with parking regulation signs. No markings on existing roadway require removal.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Thermoplastic Pavement Marking Lines (4" to 6") | LF | 10,560 | $1.75 | $18,480 | 2 solid lines entire length |
| Thermoplastic Pavement Marking Symbol | EA | 0 | $275.00 | $0 | no symbols |
| New Sign | EA | 20 | $246.00 | $4,920 | 1 Sign every 500', each side of road |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Maintenance of Traffic (10%) | LS | 1.00 | $2,340.00 | $2,340 | |
| | | | **Subtotal** | **$25,740** | |
| | | | 20% Contingency | $5,148 | |
| | | | Total Estimated Cost | $30,900 | → $5.85 Per Foot |

**Add Pedestrian Scale Lighting, AL (FSWAL)**
**60' spacing, along SUP or one side of roadway**

*Includes: installation of pedestrian scale poles (20') with decorative lamp spaced at 60' intervals.*

| Item | Unit | Quantity | Unit Cost | Total Cost | Assumptions |
|---|---|---|---|---|---|
| Street Light Pedestal | EA | 88 | $1,000.00 | $88,000 | new pedestrian poles, lights, one side, 60' spacing |
| Pedestrian Scale Lighting | EA | 88 | $8,500.00 | $748,000 | |
| Power Hookup | EA | 1 | $50,000.00 | $50,000 | |
| | | | | | |
| **Lump Sum Items** | | | | | |
| Landscaping (5%) | LS | 1.00 | $44,300.00 | $44,300 | |
| Drainage and E&S (10%) | LS | 1.00 | $88,600.00 | $88,600 | |
| Maintenance of Traffic (10%) | LS | 1.00 | $88,600.00 | $88,600 | |
| Utility Adjustments (10%) | LS | 1.00 | $88,600.00 | $88,600 | |
| | | | **Subtotal** | **$1,196,100** | |
| | | | 30% Contingency | $358,830 | |
| | | | Total Estimated Cost | $1,555,000 | → $294.51 Per Foot |
| | | | | $3,110,000 | → Two Sides of Road |

Appendix F

# Program, Policy and Implementation Recommendations

## PARKING STRATEGIES

## SUPPORT FACILITY STRATEGIES

## EDUCATION STRATEGIES

## EDUCATION STRATEGIES, CONTINUED

## ENCOURAGEMENT STRATEGIES

## ENFORCEMENT STRATEGIES

## IMPLEMENTATION STRATEGIES

## IMPLEMENTATION STRATEGIES, CONTINUED

Appendix G

# Bike Share

## ABOUT BIKE SHARE

*Geography, climate and land use*

*Demographics and employment*

*Bicycle infrastructure*

*Public transit*

*Policies, plans and regulations*

*System branding*

*Safety*

*Social equity*

*Technology*

*Station siting and permitting issues*