

## Considerations for Implementation

To implement the recommendations in this plan, it will be necessary to balance the competing spatial needs of various roadway users and modes. Simple pavement marking retrofits will be the easiest to implement since they do not require property acquisition or pavement reconstruction. Implementation will become more difficult as the project delivery method changes (new construction, reconstruction, resurfacing).

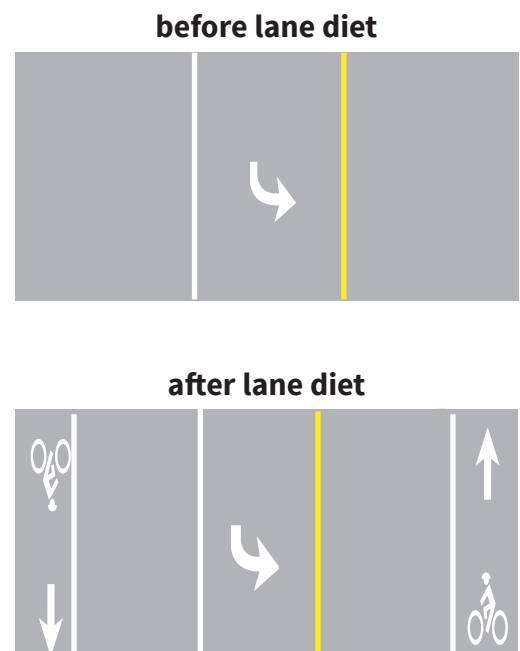
The configuration and width of automobile travel lanes and parking lanes has the largest impact on determining the space available for bike lanes and other bicycle facilities like Shared Use Paths. Therefore, during street reconstruction and resurfacing projects, the Town should consider reallocating street space to better accommodate pedestrians, bicyclists, and transit.

To implement the majority of the Short Term Priority Network projects described in this chapter, two main implementation strategies are recommended, “Lane Diets” and street reconstruction.

## Lane Diets

For bicycle lanes to be retrofitted onto some streets without reconstructing them, existing travel lanes will have to be narrowed. This process of lane narrowing is known as a Lane Diet and lane diets are the primary implementation strategy for the short term network. Road widening (or median narrowing) is reserved only for truly constrained situations where lane narrowing is not feasible or advisable.

The use of narrower travel lanes is consistent with the primary roadway design guidelines used by transportation engineering professionals, the [AASHTO Policy on the Geometric Design of Highways and Streets](#). This book states that “lane widths may vary from 10-12 feet and that lane widths of 10 feet may be used in more constrained areas where truck and bus volumes are low and speeds are less than 35 MPH...and that 11 foot travel lanes are used quite extensively for urban arterial designs.” This is backed up by recent research focused on the safety of travel lane widths varying between 10 and 12 feet for motorists operating on arterial roadways with posted speeds of 45 mph or less. This research found lane width had no impact on safety or capacity under the majority of urban conditions. It should also be noted that wider lane widths may encourage motorist speeding. Adding bike lanes to these streets where there is sufficient right-of-way can reduce speeding and increase safety in residential neighborhoods and near schools. (Appendix A).



## Reconstruction of Streets

Streets that are too narrow already to add bicycle lanes through a lane diet would have to be reconstructed and widened to have in-road bicycle facilities. Street reconstruction projects will likely require property acquisition, utility relocation, drainage improvements, earth moving, inter-agency collaboration and public outreach.

# GENERAL BICYCLE FACILITY RECOMMENDATIONS

These recommendations complement the specific facility recommendations and should be considered when implementing the short term priority network.

## Develop pavement marking plans for the Short Term Priority Network Projects

Having these plans developed ahead of time for the priority network will allow the Town to take advantage of opportunities when they arise.

## Add new bicycle facilities during street repaving when possible.

Ensure that funds are available for spot widening and intersection improvements that can be implemented when a street is being repaved.

## Provide the maximum bicycle quality of service for bicycle facilities.

Maximize the space provided to bicyclists via wider shared travel lanes, shoulders, bicycle lanes, or greenways. (Appendix A)

## Provide a minimum green signal clearance interval for bicyclists at all intersections

Revise signal timing to provide sufficient minimum green time for a bicyclist to safely enter and clear an intersection prior to the onset of the yellow phase. (Appendix A)

## Assess and repair/replace existing facilities

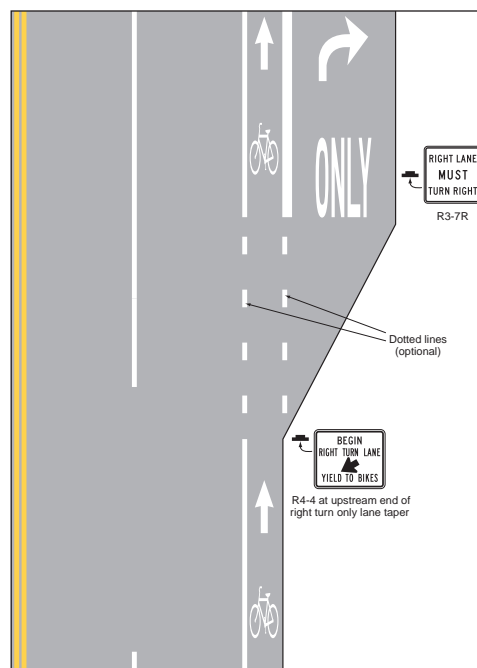


ABOVE: The pavement markings used to delineate this bike lane on the James Taylor Bridge, which have deteriorated over time, need to be replaced

## Alter maintenance schedules/ procedures to keep bike facilities functional

## Retrofit streets with bicycle safe drainage grates

## Continue bike lane markings through auxiliary right turn lanes and intersections.



LEFT: This pavement marking configuration is standard for delineating bicycle lanes from auxiliary right turn lanes.

Source : 2009 Manual on Uniform Traffic Control Devices

## Provide pedestrian-scale lighting to improve roadway and greenway safety

# GENERAL BICYCLE FACILITY RECOMMENDATIONS

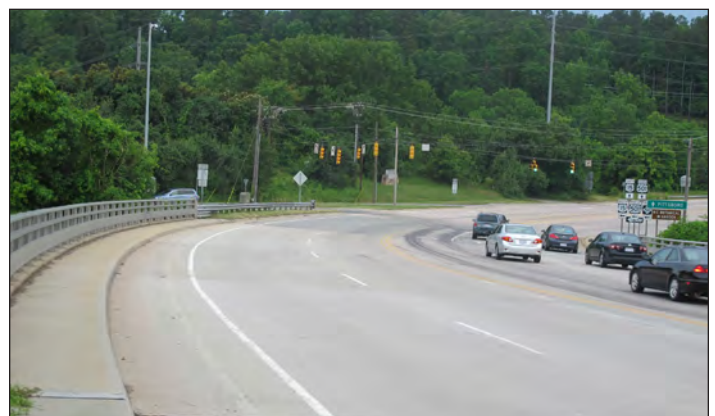
(CON'T)

## Provide bicyclist accommodations on all bridges

All bridge crossings should be upgraded over time to provide a minimum of a 6-8 foot bicycle lane or shoulder on each side of the bridge. Further separation is desirable on bridges to provide a more comfortable facility which vertically separates motorized traffic from non-motorized traffic. At locations where pedestrian volumes are anticipated to be low or infrequent, a shared facility is sufficient. At locations where pedestrians will routinely be present, provision of separate cycle tracks is recommended. For some bridge locations, it may be more feasible or cost-effective to construct a parallel non-motorized crossing than to widen an existing bridge. The following crossings are shown in ranked preference for improvements to the network.

### Town Bridges

Priority	Bridge	ADT	Curb to Curb: Lanes	Bicycle Lane/Shoulder	Sidewalk
Higher	Raleigh Road under Fordham	46,000	35 Feet: 3 Lanes	None	5 Feet
	15/501 over I-40	37,000	112 Feet: 10 Lanes	None	None
	Old Chapel Hill Road over I-40	9,900	26 Feet: 2 Lanes	None	None
	Farrington Road over I-40	9,900	30 Feet: 2 Lanes	None	None
	James Taylor Bridge (S. Columbia over NC54)	32,000	64 Feet: 5 Lanes	4.5 Feet	4 Feet
	Fordham over Raleigh Road (southbound)	14,000*	28 Feet: 2 Lanes	None	None
	MLK over I-40	28,000	60 Feet: 2 Lanes	None	None
	Millhouse Road under I-40	4,999*	20 Feet: 2 Lanes	None	None
	Sunrise Road over I-40	4,999*	20 Feet: 2 Lanes	None	None
	Erwin Road over I-40	7,600	22 Feet: 2 Lanes	None	None
	Fordham over Raleigh Road (northbound)	14,000*	33 Feet: 2 Lanes	8 Feet	None
Lower	E. Franklin over Fordham	20,999*	27 Feet: 1 Lane	None	None

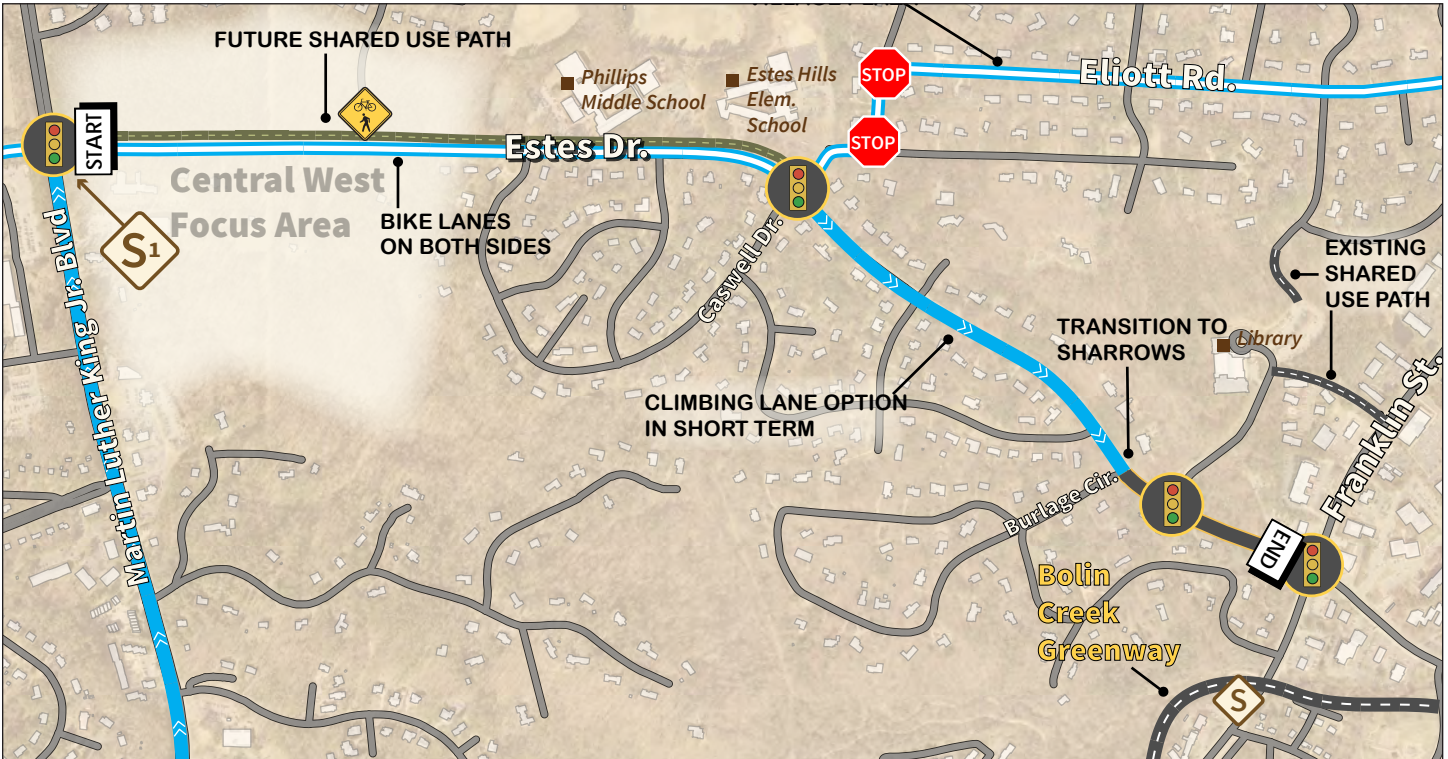


ABOVE: Looking South The James Taylor Bridge

LEFT: Looking west Fordham Blvd. bridge over Raleigh Rd.




**PROJECT** ESTES DR. CONNECTIVITY  
**PRIORITY** 1  
**EST. COST** \$ 2.3 MILLION



### Project Description






Construct a 10'-12' shared use path on the north side of Estes Dr. between Martin Luther King Jr. Blvd. and Caswell Rd.

In the near term, it is recommended that the 22-foot segment of Estes Drive between Martin Luther King Jr. Blvd and Caswell Rd. be widened to allow for the addition of six-foot bike lanes. Between Caswell Rd. and Library Dr., a bicycle climbing lane is recommended. Between Library Dr. and Franklin St, a shared lane marking is recommended.

 = Improve Estes Dr./Martin Luther King Jr. Blvd intersection

### Implementation challenges

Widening the roadway may involve significant grading and filling, utility relocation and tree removal.

FACILITY LEGEND	
EXISTING FACILITIES	PROPOSED FACILITIES
<b>Bike Lanes</b> 	<b>Sharrows</b> 
<b>Greenway/ Shared Use Path</b> 	<b>Bicycle Climbing Lane</b> 
	<b>Bike Lane</b> 
	<b>Buffered Bike Lane</b> 
	<b>Greenway/ Shared Use Path</b> 
	<b>Cycle Track</b> 
	<b>"Spot" Improvement</b> 
<b>INTERSECTIONS</b>	
 <b>Signalized</b>	
 <b>Stop Controlled</b>	
 <b>"Mid-Block" Pedestrian Crossing</b>	
 <b>Bike-Ped Crossing</b>	



**PROJECT** ESTES DR. EXT. -

**PRIORITY** 1 (WITH ESTES DR. CONNECTIVITY PROJECT)

**EST. COST**

## Project Description

- Add Bike Lane Markings

Bike Lane markings should be added in the existing striped shoulder along Estes Dr. Ext to make an official bike lane.

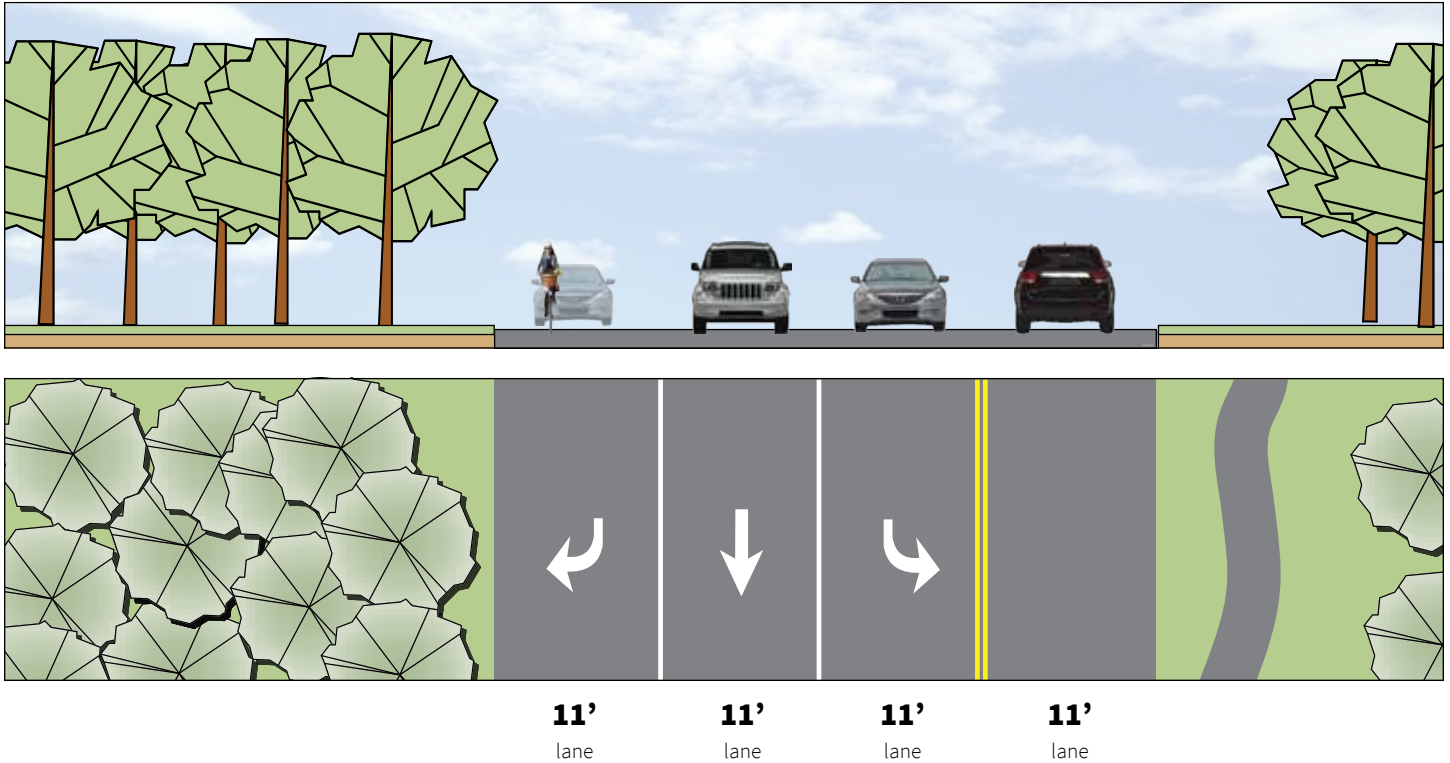
To connect the bike lane to the proposed Estes Dr. bike lanes east of Martin Luther King Jr. Blvd, some spot widening would be necessary at the intersection (See Map to right).



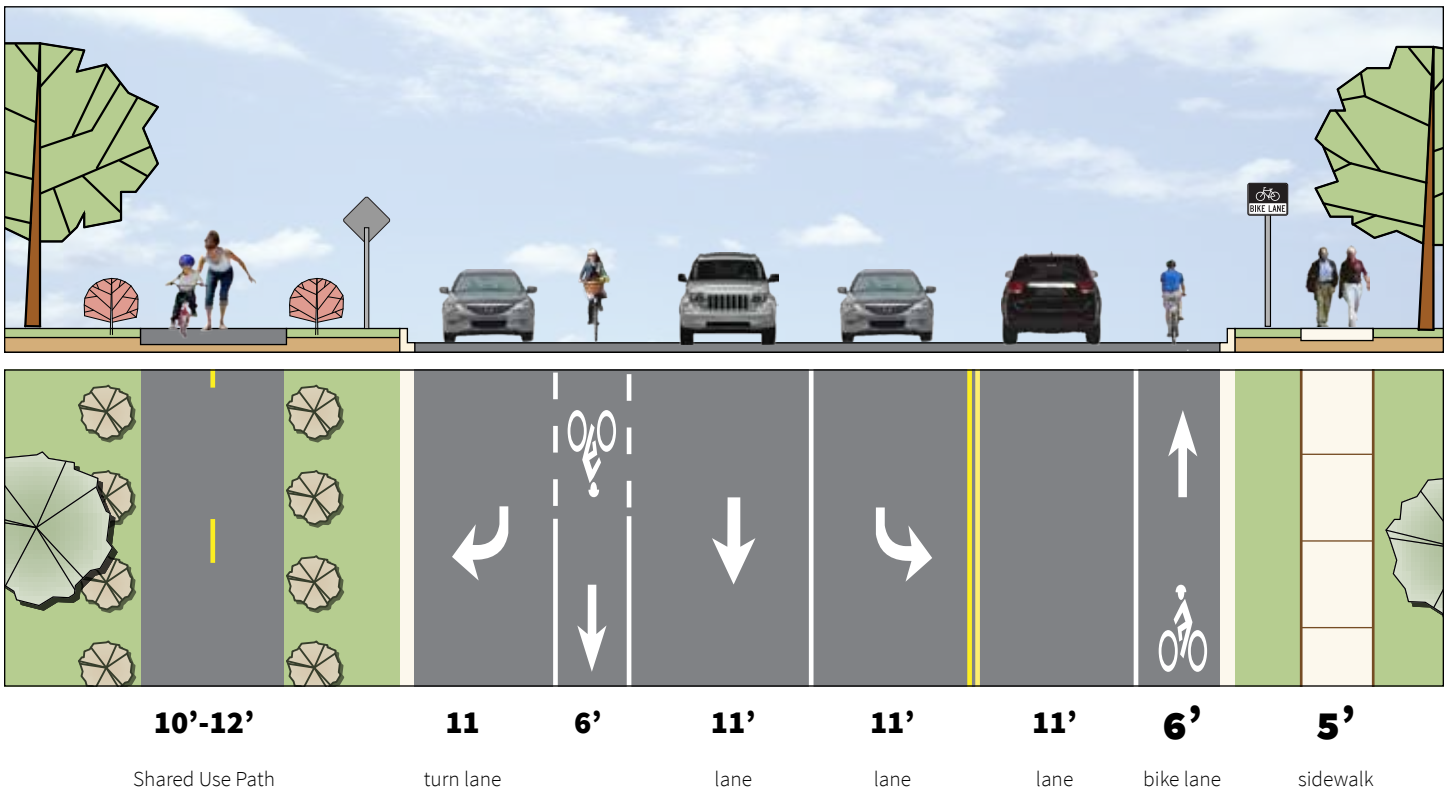
Estes Dr. at Martin Luther King Jr. Blvd. Looking East to Caswell Rd.

# ESTES DR. CONNECTIVITY

**Estes Dr. Existing Cross-Section**  
(From Martin Luther King Jr. Blvd to Caswell Rd.)  
Looking East



**Estes Dr. Short Term Cross-Section**  
(From Martin Luther King Jr. Blvd to Caswell Rd.)  
Looking East

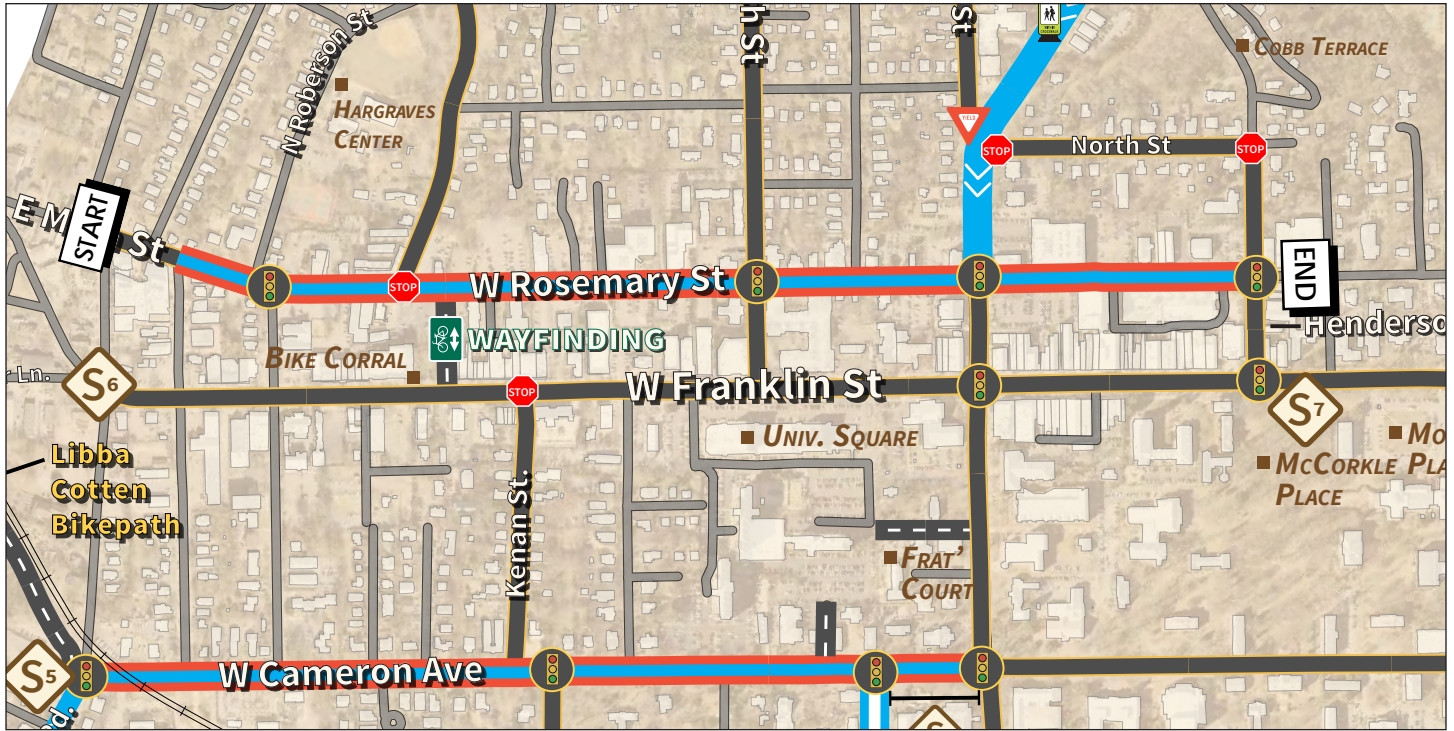








**PROJECT** ROSEMARY ST. BUFFERED BIKE LANES  
**PRIORITY** 2  
**EST. COST** \$70,000 - \$115,000



**Project Description**

- Buffered Bicycle Lanes
- Shared Lanes

In the short term, buffered bicycle lanes are recommended to create more consistent traffic patterns for bicyclists and motor vehicles. The 40-foot roadway allows for buffered bike lanes in each direction which will provide a comfortably separated facility for bicyclists creating a high quality and comfortable alternative to Franklin Street. At intersections requiring left turn lanes, the bicycle lane can be narrowed to 5 feet.

**Implementation challenges**

This design necessitates removal of 8-15 existing on-street parking spaces.

Provisions for large vehicle loading within the bicycle lane or on side streets may be required for some properties

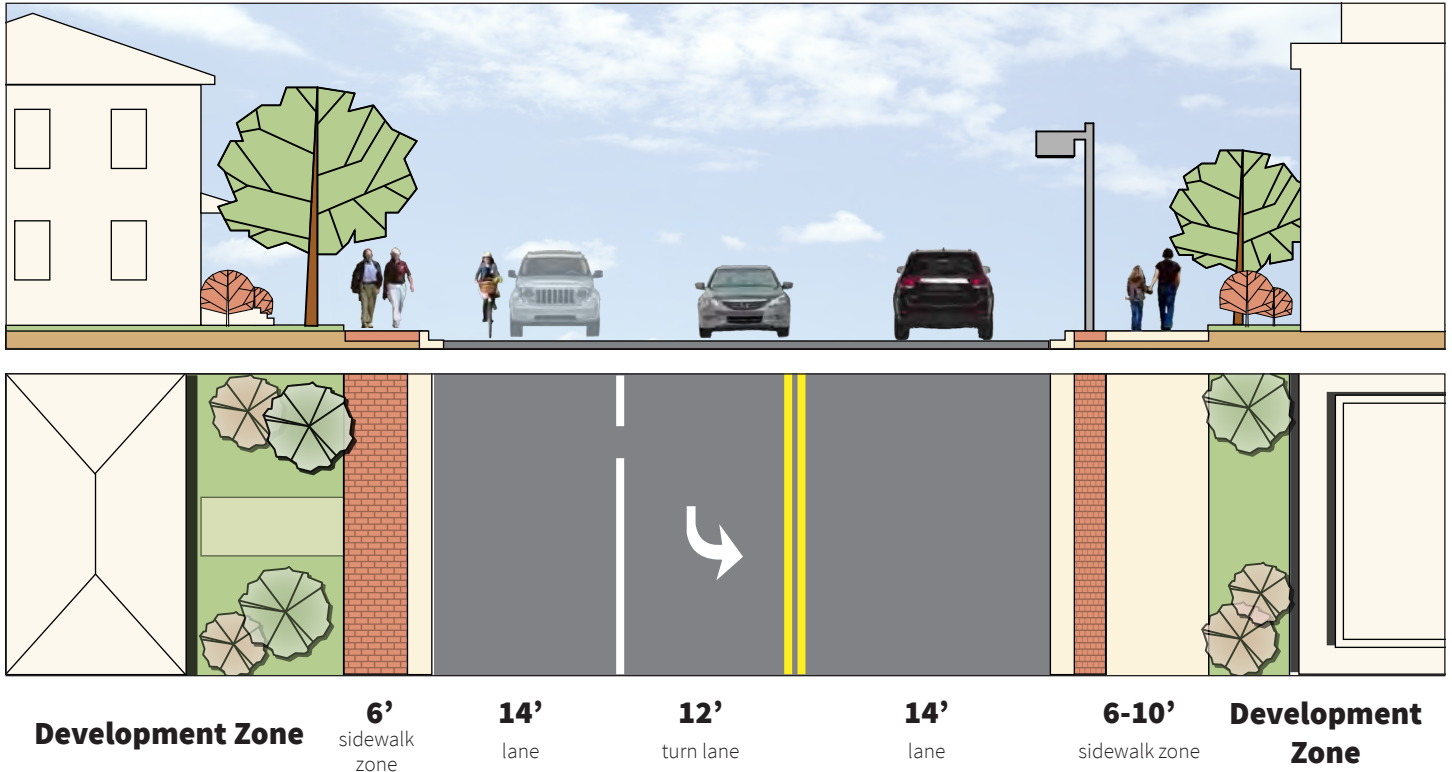
**FACILITY LEGEND**

<i>EXISTING FACILITIES</i>	<i>PROPOSED FACILITIES</i>
<b>Bike Lanes</b> 	<b>Sharrows</b> 
<b>Greenway/ Shared Use Path</b> 	<b>Bicycle Climbing Lane</b> 
<i>INTERSECTIONS</i>	
<b>Signalized</b>	<b>Bike Lane</b> 
<b>Stop Controlled</b>	<b>Buffered Bike Lane</b> 
<b>“Mid-Block” Pedestrian Crossing</b>	<b>Greenway/ Shared Use Path</b> 
<b>Bike-Ped Crossing</b>	<b>Cycle Track</b> 
	<b>“Spot” Improvement</b> 

# ROSEMARY ST. BIKE LANES

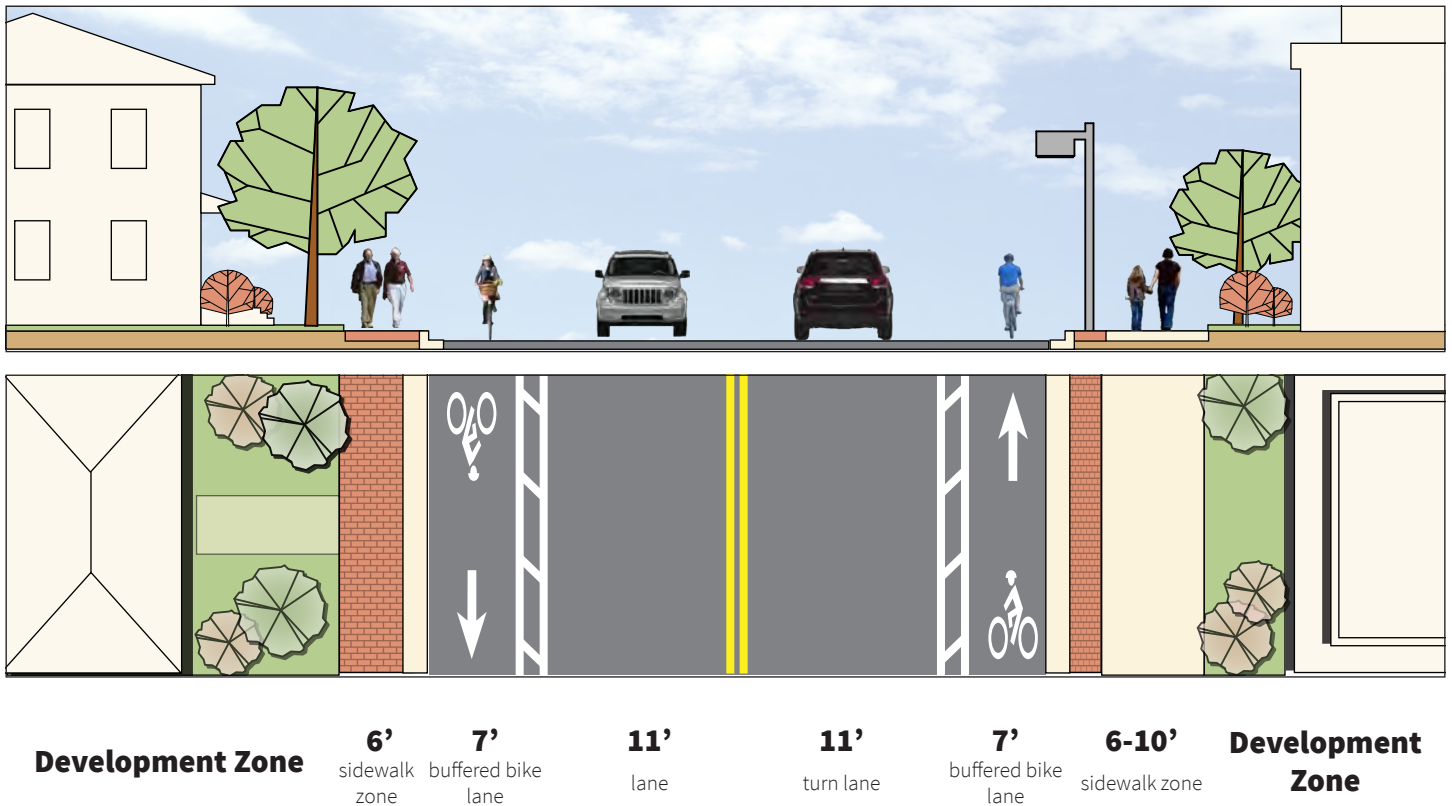
## Rosemary St. Existing Cross-Section

(From Carrboro to N. Columbia St)  
Looking East towards Columbia St.



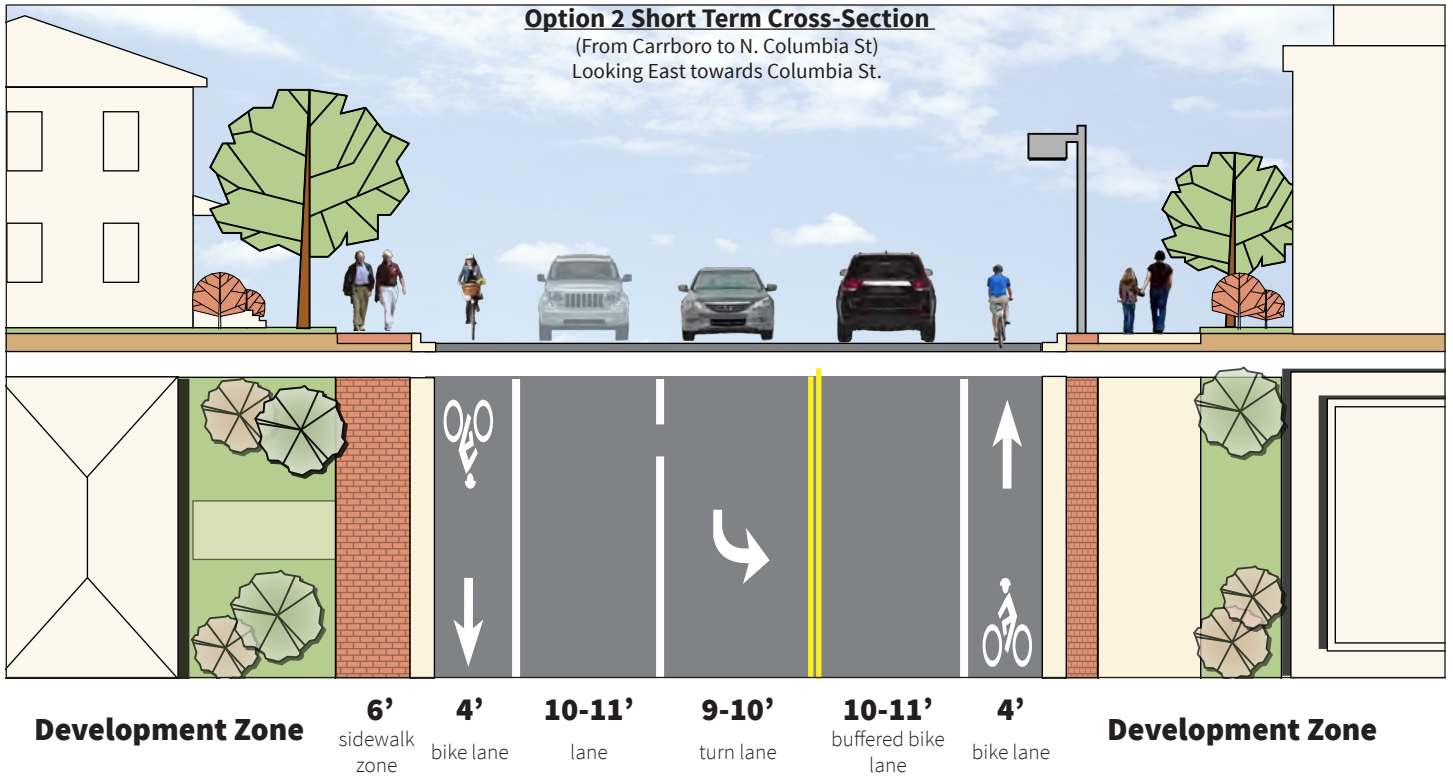
## Option 1 Short Term Cross-Section

(From Carrboro to N. Columbia St)  
Looking East towards Columbia St.





# ROSEMARY ST. BIKE LANES



About Option 2: If a future traffic analysis shows that the left turn lane at Church St. cannot be dropped without significantly reducing motor vehicle capacity at this intersection, then 4 foot bike lanes or sharrow could be used for the length of the left turn lane.






**PROJECT** MARTIN LUTHER KING JR. BLVD

**PRIORITY** 3

**EST. COST** \$275,000

## **Project Description**

- Bicycle Climbing Lanes
- Sidewalk Maintenance

 = Improved Stair Connection to Downtown/Campus

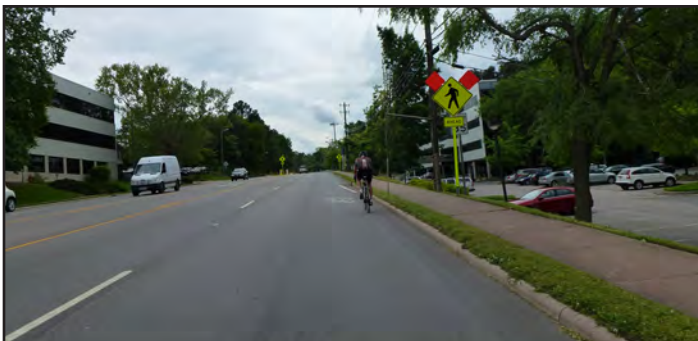
In the short term, it is recommended the roadway be reconfigured to provide a minimum 5 foot climbing bicycle lane in the uphill direction and shared lane markings in the downhill direction. This would be accomplished through a lane diet.

The shared lane marking should be located a minimum of six feet from face of curb to guide faster moving bicyclists away from drainage grates. The existing center turn lane and wide lanes create opportunities to reconfigure the space within the existing curb lines to add the climbing bicycle lanes. The continuous center turn lane provides additional buffering for the 10 foot inside lanes. The travel lanes should taper to 11 feet and the bicycle lanes to 6 feet on either side of the refuge island.

It is also recommended that the existing sidewalks be targeted for spot repair and maintenance to provide a facility for those bicyclists who do not feel comfortable sharing the roadway with motor vehicles. The full width of the sidewalk should be usable, and smooth and overhanging vegetation should be cleared.

### **Implementation challenges**

To achieve 6'foot bike lane and keep 11' motor vehicle travel lanes, it will be necessary to narrow the two mid-block pedestrian refuge islands to 8-9'.



ABOVE: Existing conditions and a conceptual rendering after a Lane Diet



ABOVE: Sidewalk near University Terrace driveway.



# MARTIN LUTHER KING JR. BLVD BICYCLE CLIMBING LANES

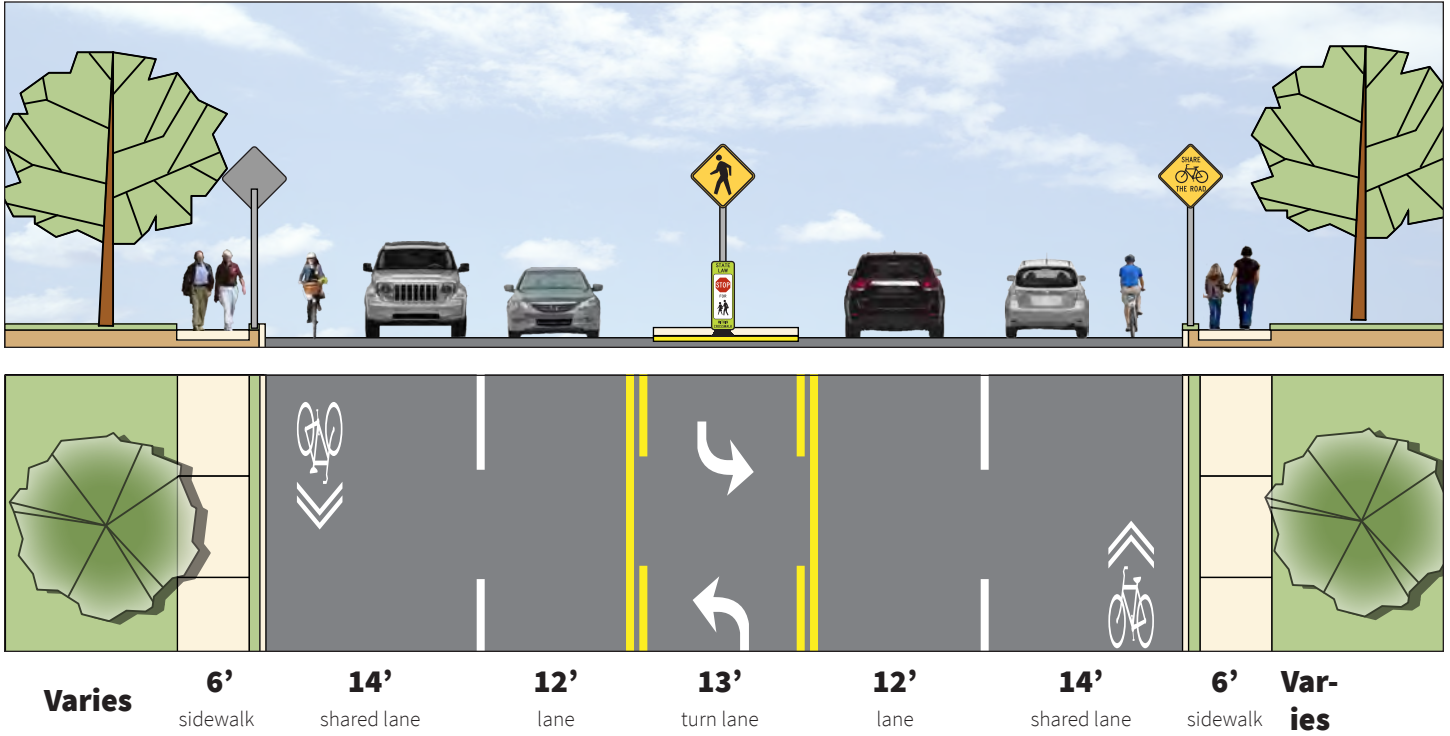




# MARTIN LUTHER KING JR. BLVD

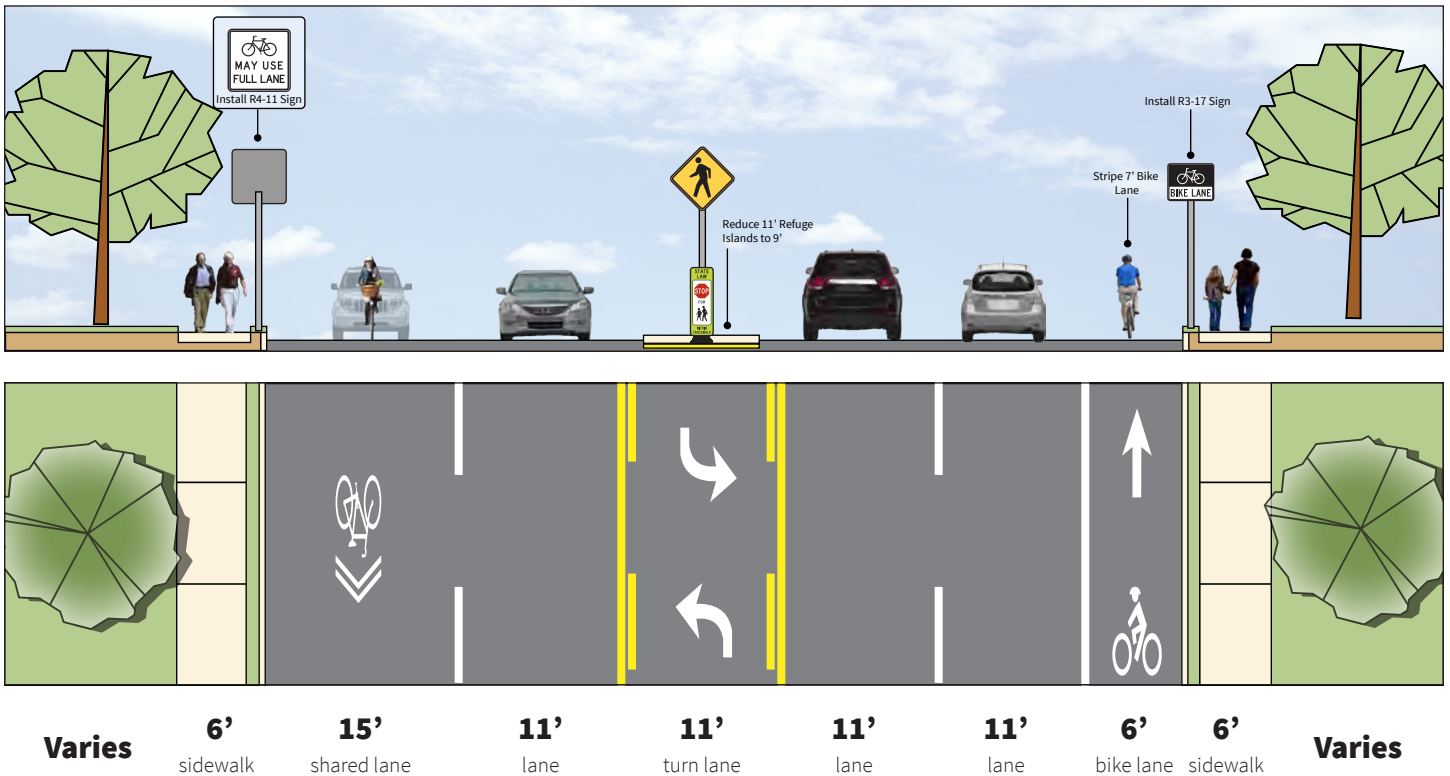
## Existing Cross-Section

(From Estes Dr. to Rosemary St.)  
Looking South towards Downtown at Town Hall



## Short Term Cross-Section

(From Estes Dr. to Rosemary St.)  
Action: Lane Diet  
Looking South towards Downtown at Town Hall





**CONNECTIVITY PROVIDES CONVENIENCE AND VALUE**

Non-motorized transportation connections come in many forms, including greenways and shorter connections between neighborhoods and commercial areas. Even short connections, like a set of stairs, can provide significant benefits. To illustrate the value of non-motorized connectivity, a travel time-benefits analysis was prepared. This analysis considered two possible pedestrian routings that residents of the neighborhood south of Cobb Terrace would use to access the UNC Quad. Based on these routings, the travel time saved and the benefits accrued to pedestrians taking the blue route with the stairs (shown below) instead of the next shortest alternative route (orange) were calculated.

**Providing convenience**

The results in the table below provide insight on how non-motorized connectivity makes walking more convenient. Based on an average walking speed of 2.8 MPH, a pedestrian who uses the blue route instead of the orange alternative would save 11 minutes of travel time daily, and 44 hours annually for a round trip to the Campus Quad (if they used it every weekday).

**Providing value**

To aid in the evaluation of transportation investments and the financial benefits they provide individuals, researchers quantified the monetary value of travel time. On average, the travel time of an individual in the United States is valued at \$12.98 per hour. From the example above, saving 44 hours of travel time yields \$580 in annual individual benefit.

To consider the annual benefit to the whole neighborhood, further assumptions and calculations were made. The area on the map in purple was estimated to have 1,570 residents in 2010. Assuming that only 50% of these residents use the Blue Route like in the example above, the total annual economic benefit of the Cobb Terrace stair connection exceeds \$450,000 dollars annually.



Results of Pedestrian Travel Time-Benefits Analysis for University Commons Stairs								
Route	Length Miles	Roundtrip Individual Time	Annual Individual Travel Time	Value 1 hr. Travel Time	Annual Individual Benefit	Potential Users	Annual Total Neighborhood Travel Time Savings	Annual Total Neighborhood Benefit
Blue	0.48	20 Min.	86 hrs.	\$12.98	\$580	785	35,124 hours	\$455,913
Orange	0.74	31 Min.	131 hrs.	N/A	N/A	N/A	N/A	N/A

**PROJECT** RALEIGH RD. SAFETY IMPROVEMENTS  
**PRIORITY** 4  
**EST. COST** \$900,000

## Project Description

- Bicycle Climbing Lanes
- Sidewalk Maintenance and Repair
- Enhanced Crossings at NC 54/US 15-501 On/Off Ramps
- Complete Interchange Lighting at Intersection of NC 54 and US 15-501

### Bicycle Climbing Lanes

In the near term, it is recommended the roadway be reconfigured to provide a minimum 6 foot climbing bicycle lane with downhill shared lane marked with shared lane markings west of the UNC Spangler Center. The shared lane marking should be located a minimum of six feet from face of curb to guide faster moving bicyclists away from drainage grates.

### Sidewalk Maintenance and Repair

It is also recommended that the existing sidewalks be targeted for spot repair and maintenance to provide a facility for those bicyclists who do not feel comfortable sharing the roadway with motor vehicles. The full width of the sidewalk should be usable, and the surface should be smooth.

**S<sub>3</sub>** = Enhanced Crosswalks at 4 On/Off Ramps

**S<sub>4</sub>** = Complete Interchange Lighting at Interchange at NC 54 and Fordham Blvd.

### Implementation challenges

To maintain 11 foot travel lanes west of the interchange, the continuous median would require narrowing.



Looking east on NC 54 from Fordham Blvd bridge.

The AASHTO Guide to Roadway Lighting recommends complete interchange lighting for interchanges in urban and suburban areas where the daily traffic volume exceeds 10,000 vehicles per day for on/off ramps.



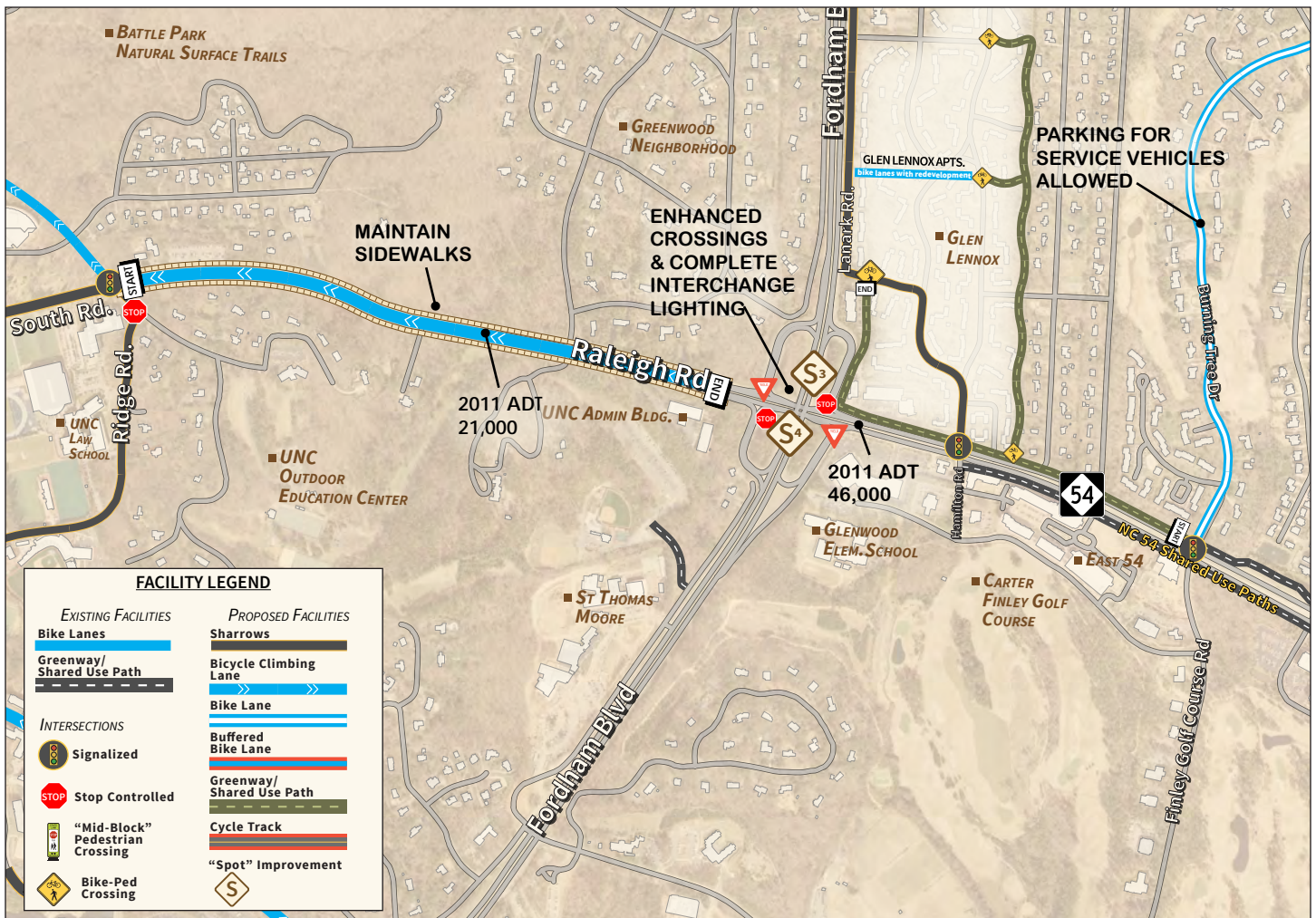
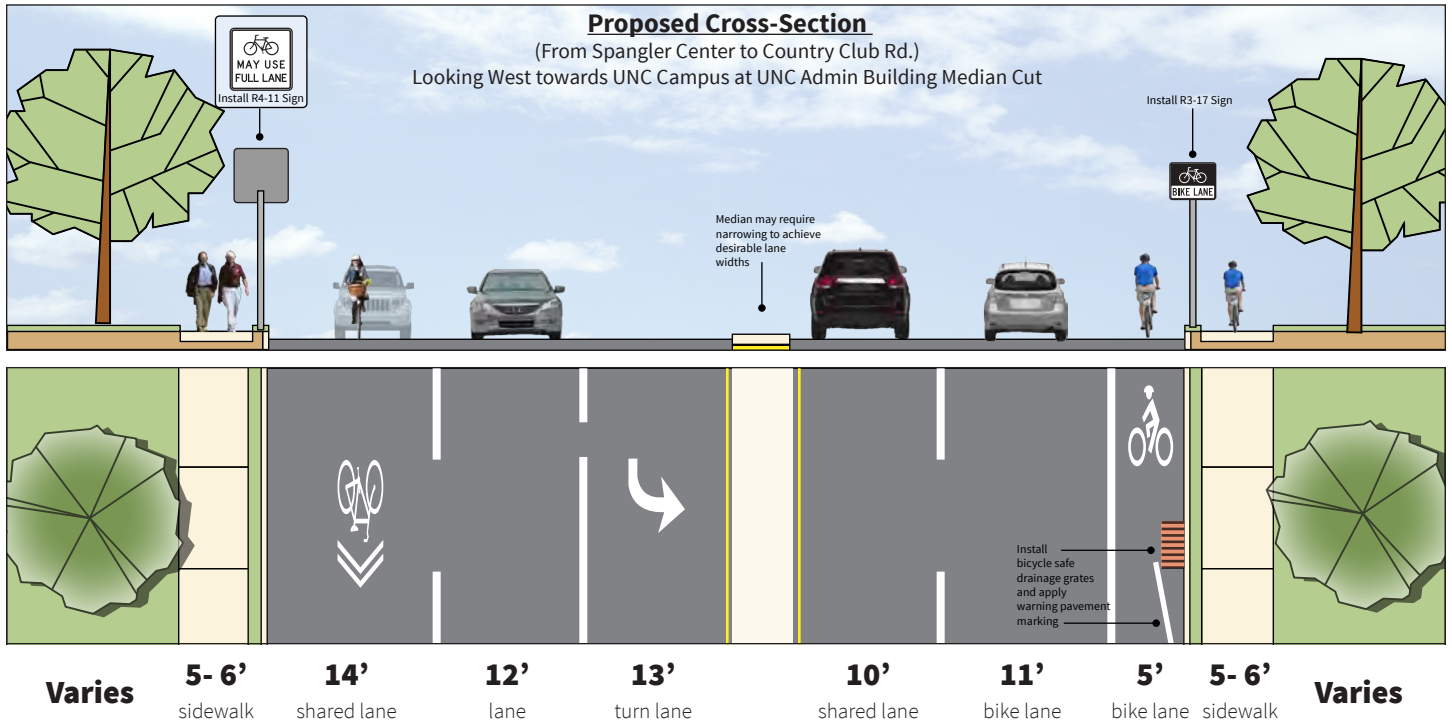
Along with cyclists, pedestrians and transit users would benefit from improved sidewalk conditions at this location along NC 54.



Low-cost improvements such as marked and colored crosswalks can make crossing the 4 ramps at this interchange safer for cyclists and pedestrians using this concrete pedestrian refuge island.



# RALEIGH RD. SAFETY IMPROVEMENTS





<b>PROJECT</b>	S 15-501/JAMES TAYLOR BRIDGE LANE DIET
<b>PRIORITY</b>	5
<b>EST. COST</b>	\$ 300,000

## **Project Description**

- **Bike Lanes; Green Bike Lanes**

Restripe existing 6' bike lanes between Market St. and Mt. Caramel Church with new markings. From Mt. Caramel Church Rd to the S. Columbia St Bike Lanes, add 5' Minimum bike lanes via a lane diet. Then, paint the bike lanes green on 15-501 from Mt. Caramel Church Road to Purefoy Rd. pursuant to the Federal Highway Administration's Interim Approval for Optional Use of Green Colored Pavement for Bike Lanes (IA-14 April 15, 2011). Specific language regarding this approval of green bike lanes is included below. See Appendix A for additional guidance on the use of green colored bike lanes.

## **GREEN BIKE LANES**

### **Background**

A number of experiments have been conducted in the United States and in other countries around the world to determine the value of designating a particular pavement color to communicate to road users that a portion of the roadway has been set aside for exclusive or preferential use by bicyclists and to enhance the conspicuity of a bicycle lane or a bicycle lane extension. In these experiments, green colored pavement is being used as a traffic control device to designate locations where bicyclists are expected to operate, and areas where bicyclists and other roadway traffic might have potentially conflicting weaving or crossing movements. For example, at a location where a bicycle lane crosses an unsignalized freeway on-ramp.



### **Effects of Green Colored Bike Lanes**

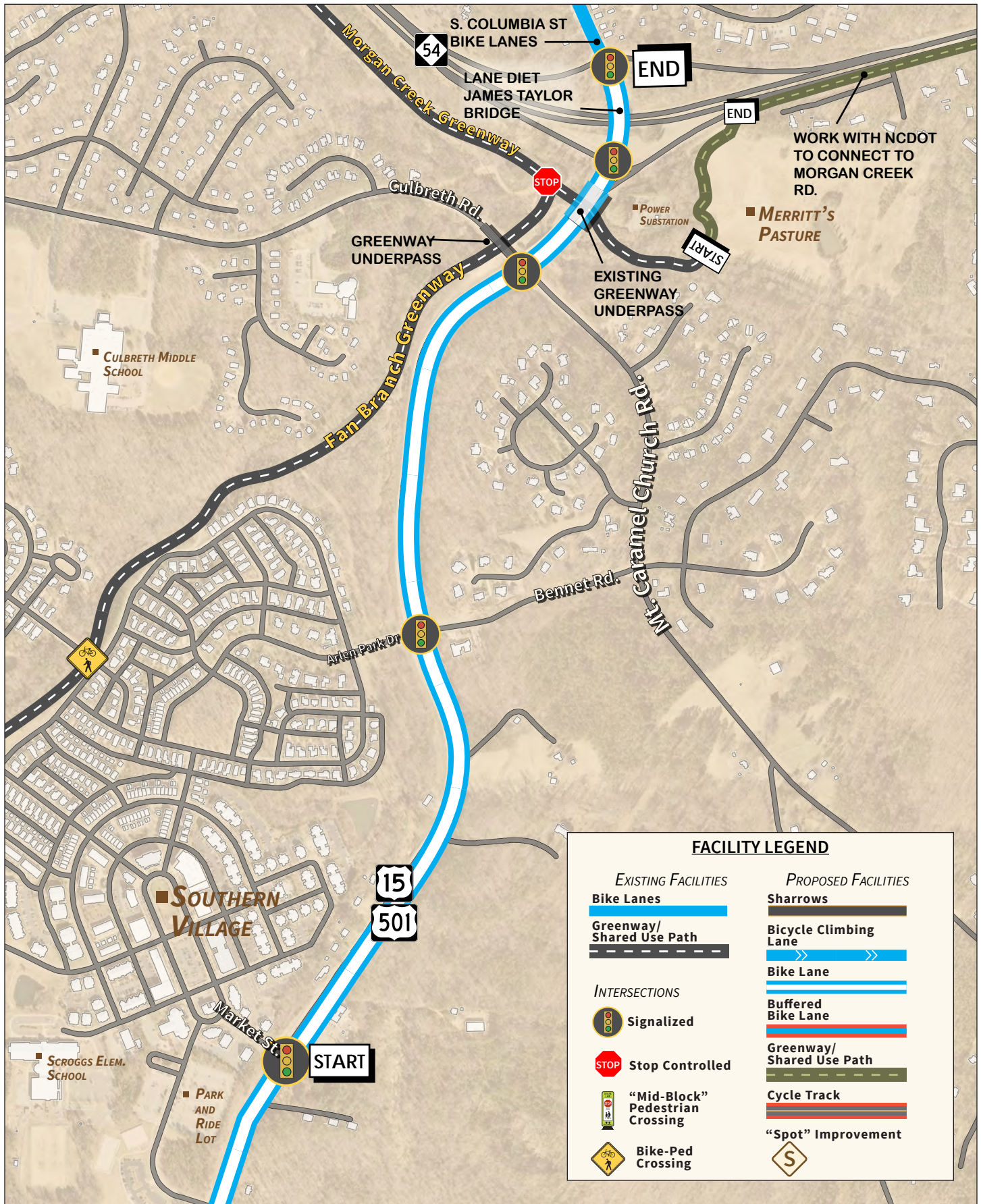
The Federal Highways Administration has reviewed the available data and considers the experimental green colored pavement to be satisfactorily successful for the bicycle applications that were tested. Positive operational effects have been noted in the experiments, such as bicyclists positioning themselves more accurately as they travel across intersections and through conflict areas, and no notable negative operational effects have been observed. The research has also shown that bicyclists and motorists both have a positive impression of the effect of the green colored pavement, with bicyclists saying that they feel safer when the green colored pavement is present, and motorists saying that the green colored pavement gives them an increased awareness that bicyclists might be present and where those bicyclists are likely to be positioned within the traveled way.

### **Conditions of Interim Approval**

The FHWA will grant Interim Approval for the optional use of green colored pavement in marked bicycle lanes and in extensions of bicycle lanes through intersections and traffic conflict areas to any jurisdiction that submits a written request to the Office of Transportation Operations.



# S 15-501/JAMES TAYLOR BRIDGE LANE DIET



FACILITY LEGEND	
<i>EXISTING FACILITIES</i>	<i>PROPOSED FACILITIES</i>
<b>Bike Lanes</b> 	<b>Sharrows</b> 
<b>Greenway/Shared Use Path</b> 	<b>Bicycle Climbing Lane</b> 
	<b>Bike Lane</b> 
	<b>Buffered Bike Lane</b> 
	<b>Greenway/Shared Use Path</b> 
	<b>Cycle Track</b> 
	<b>"Spot" Improvement</b> 
<i>INTERSECTIONS</i>	
<b>Signalized</b>	
<b>Stop Controlled</b>	
<b>"Mid-Block" Pedestrian Crossing</b>	
<b>Bike-Ped Crossing</b>	



# S 15-501/JAMES TAYLOR BRIDGE LANE DIET



ABOVE: James Taylor Bridge on US 15-501 looking south

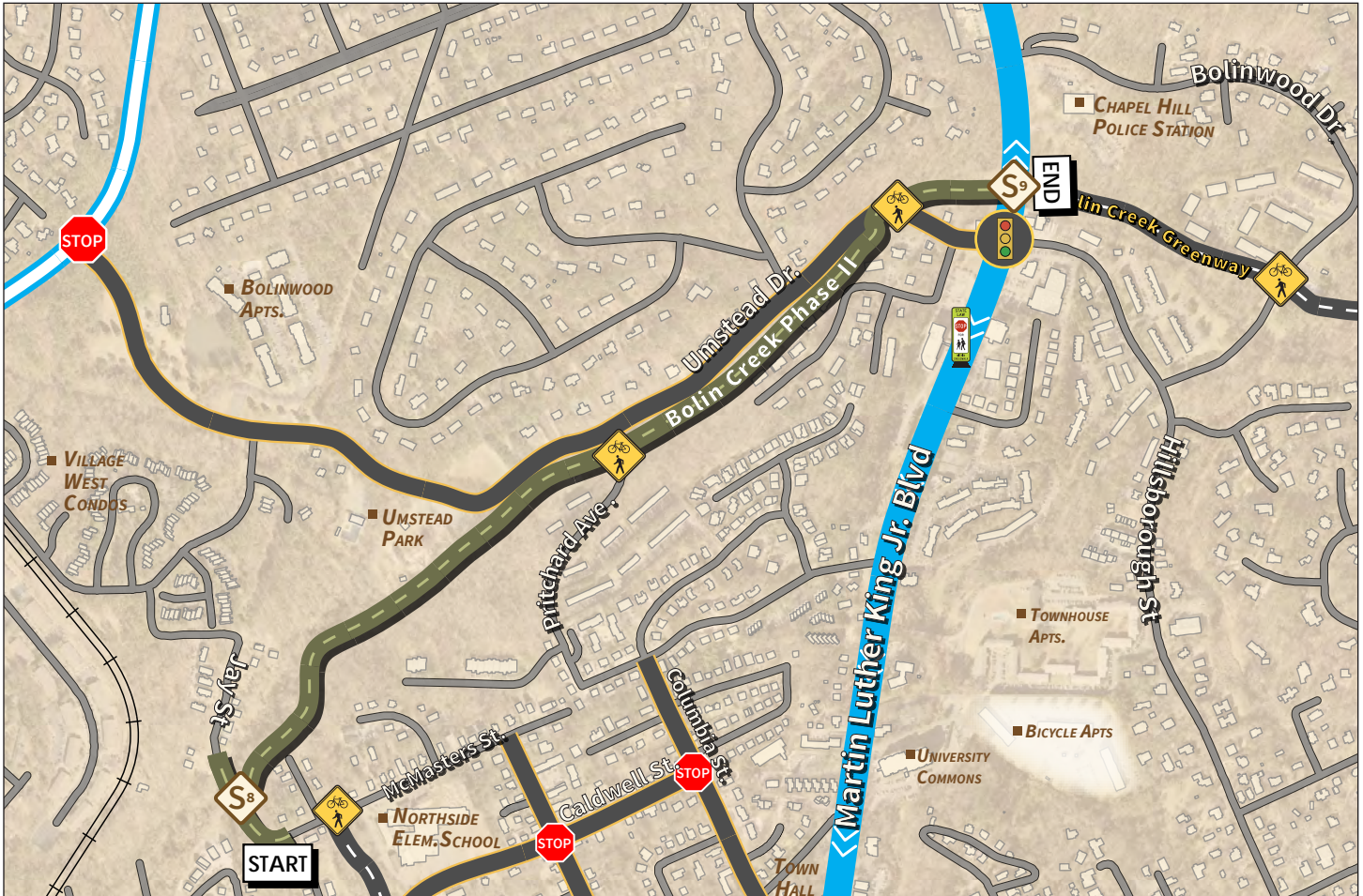


ABOVE: Conceptual rendering of green bike lane treatment through an on-ramp intersection





<b>PROJECT</b>	TANYARD BRANCH AND BOLIN CREEK EXTENSIONS
<b>PRIORITY</b>	6
<b>EST. COST</b>	\$ 3.5 MILLION



## Project Description

The Town controls much of the land from Martin Luther King Jr. Blvd. to Umstead Park, although one small gap in property ownership does exist. This project would likely be the single most difficult greenway section undertaken by the Town due to the significant physical constraints along this section of Bolin Creek. However, it is a vital link if the Town is to merge its trail system with the future trail systems of Carrboro and Orange County.

### Implementation challenges

The physical constraints along Bolin Creek. The construction of two underpass tunnels and a bridge.

**S<sub>8</sub>** = Small Bridge over Tanyard Branch Creek

**S<sub>9</sub>** = Using existing tunnel under Martin Luther King Jr. Blvd, connect Bolin Creek Phase II



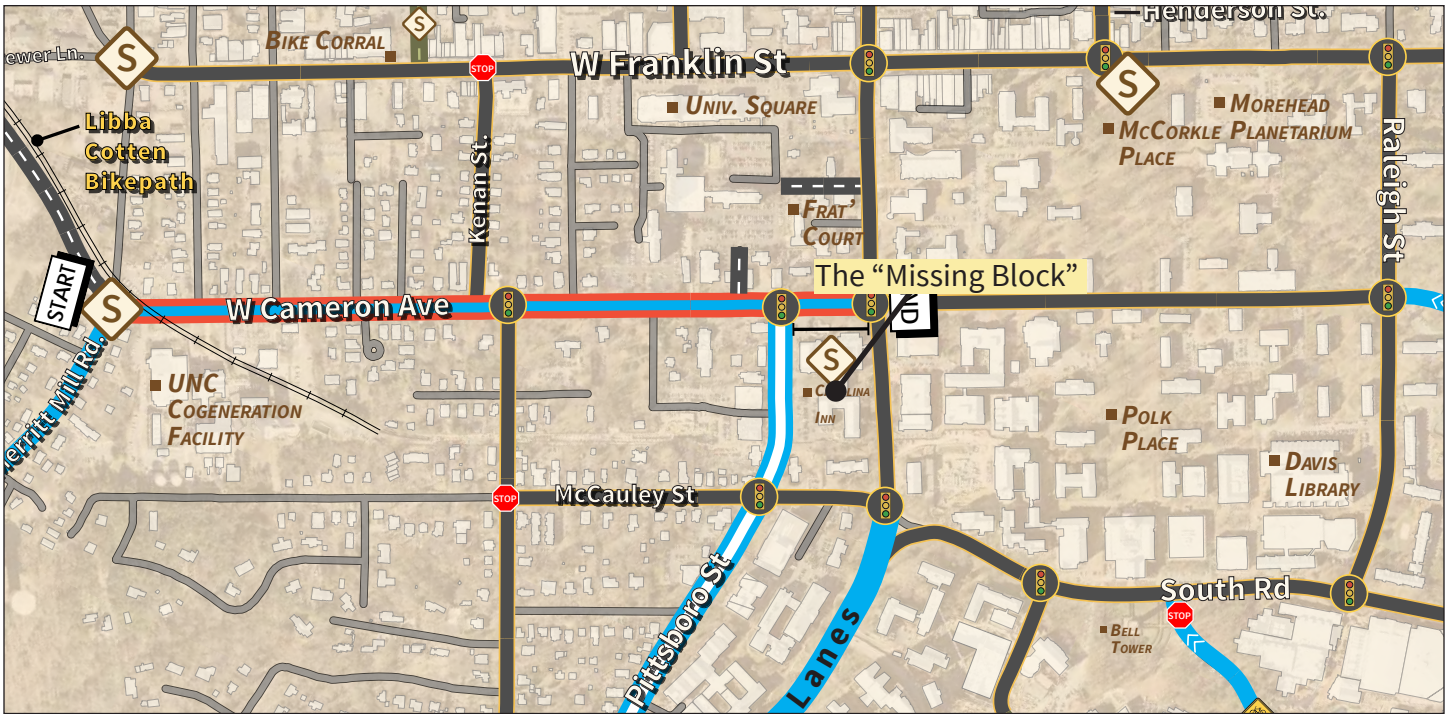
**BOLIN CREEK GREENWAY**



A small bridge would need to be built over the Tanyard Branch Creek as part of this project.



**PROJECT** CAMERON AVE. IMPROVEMENTS  
**PRIORITY** 7  
**EST. COST** \$725,000



**Project Description**

- Buffered Bike Lanes
- Repaving
- Intersection improvements

In the short term, repaving and a lane diet is recommended to allow for buffered bicycle lanes, a more comfortable facility that will better accommodate the high volume of bicycle traffic that travels this corridor daily. With this type of facility, groups of students will be able to ride together more safely two abreast. It is also recommended that the intersection at Merritt Mill Road be redesigned in the short term to facilitate a safe, predictable connection to the Libba Cotton Bikeway.

**Implementation challenges**

Completing the “missing block” between Pittsboro Street and South Columbia Street will require removal of a travel lane, which will require further study.

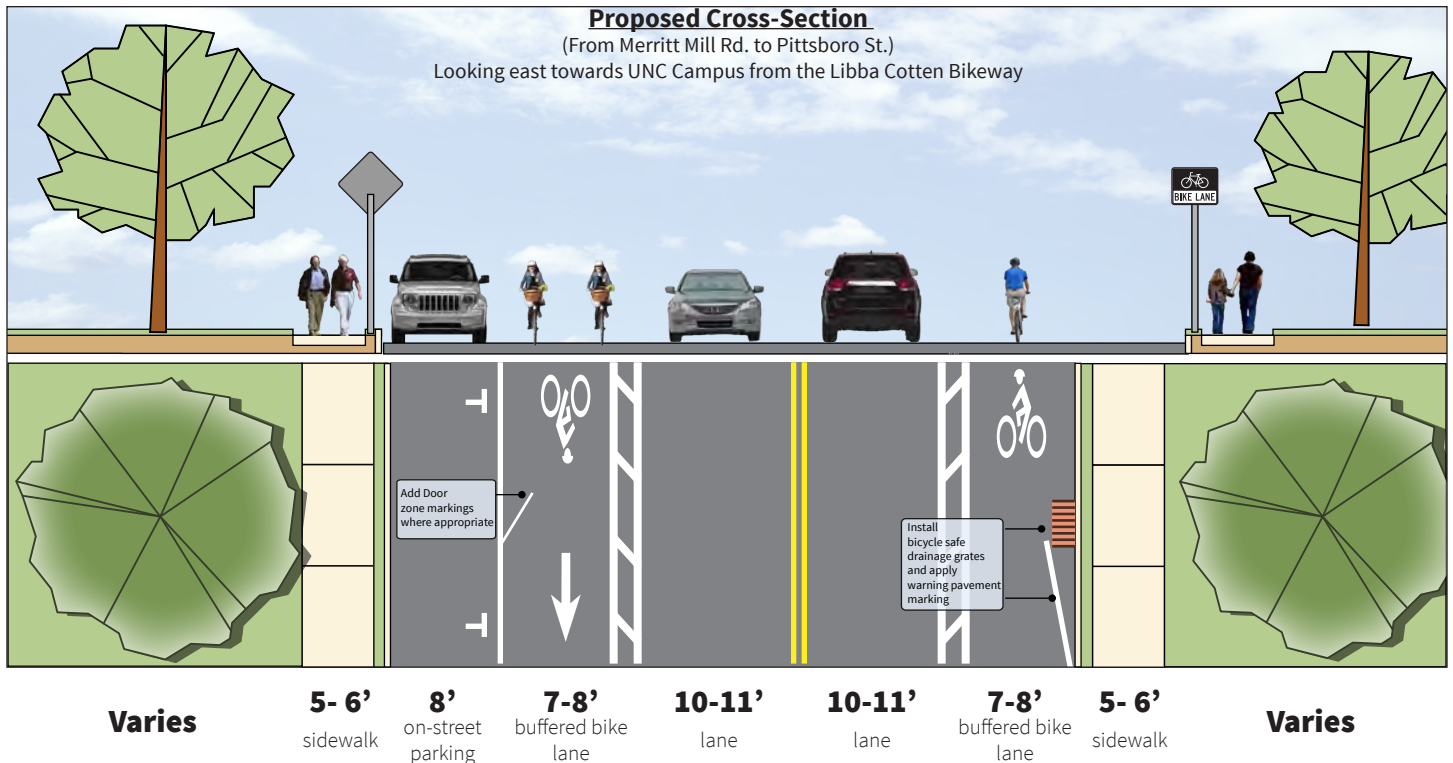
**S<sup>5</sup>** = Spot Improvement at Cameron/Merritt Mill Rd/Libba Cotton Bikeway at NC 54 and Fordham Blvd. Interchange

**FACILITY LEGEND**

<i>EXISTING FACILITIES</i>	<i>PROPOSED FACILITIES</i>
<b>Bike Lanes</b> 	<b>Sharrows</b> 
<b>Greenway/ Shared Use Path</b> 	<b>Bicycle Climbing Lane</b> 
<b>INTERSECTIONS</b>	<b>Bike Lane</b> 
<b>Signalized</b>	<b>Buffered Bike Lane</b> 
<b>Stop Controlled</b>	<b>Greenway/ Shared Use Path</b> 
<b>“Mid-Block” Pedestrian Crossing</b>	<b>Cycle Track</b> 
<b>Bike-Ped Crossing</b>	<b>“Spot” Improvement</b> 



# CAMERON AVE. IMPROVEMENTS



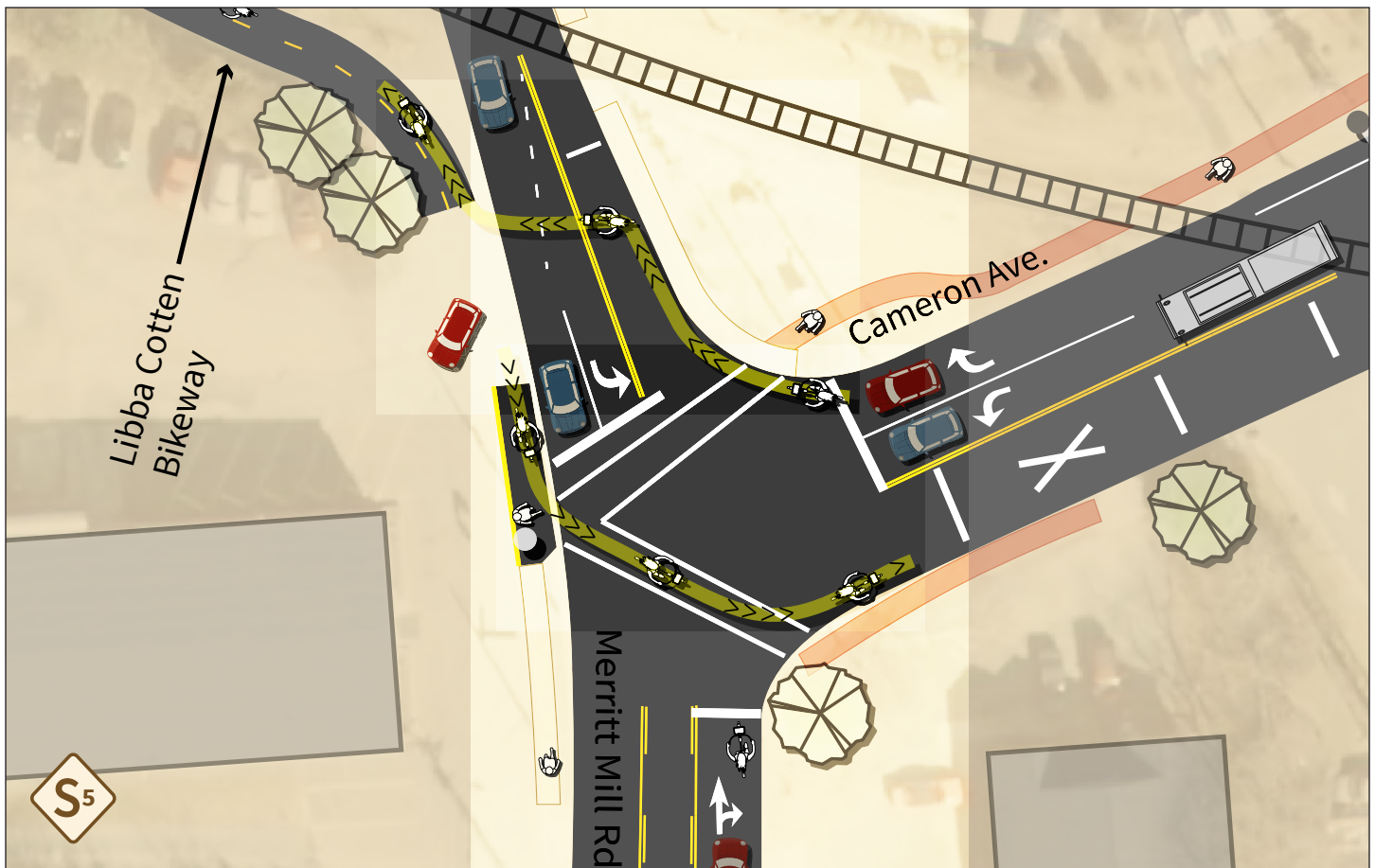
ABOVE: This image shows the beginning of the “missing block” at Cameron Ave. and Pittsboro St. This is where the Cameron Ave. bike lanes currently terminate. To get bike lanes to go all the way to the UNC Campus, a future study of this intersection and this segment of street would be required.



ABOVE: Currently, the on-street parking lane is 10’ wide, the bike lanes are 5’ wide, and the motor vehicle travel lanes are 13’ wide.



Two Common cyclist paths at the Cameron Ave. Libba Cotten Bikeway Intersection





**PROJECT** FRANKLIN ST. SHARED LANES

**PRIORITY** 8

**EST. COST** \$ 80,000



**Project Description**

- Shared Lane

Add shared-lane markings (Sharrows) in center of curb lane between Merritt Mill Rd. and Boundary St.

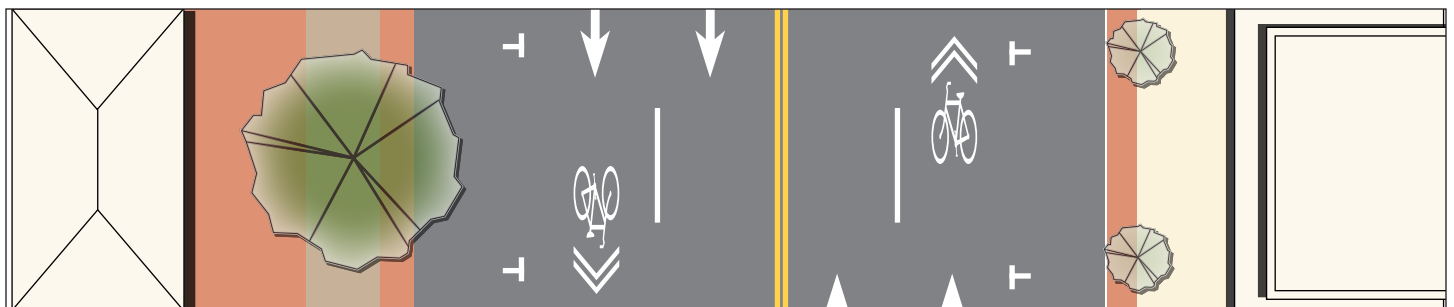
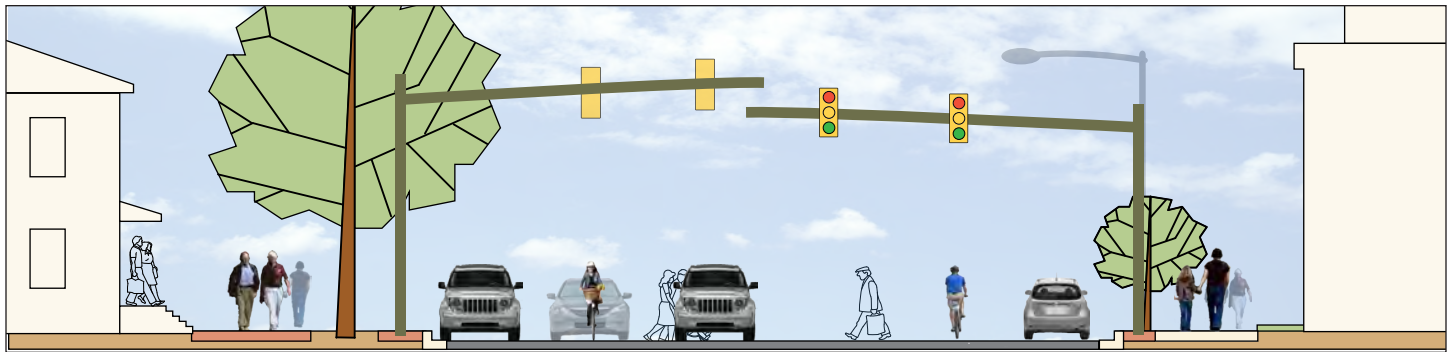
Install BICYCLES MAY USE FULL LANE signs where appropriate.

**S<sub>6</sub>** = Spot Improvement at Franklin/Merritt Mill/Brewer Lane

**S<sub>7</sub>** = Convert steps to Ramp at UNC Campus/Franklin St/Henderson St. Intersection

**Proposed Cross-Section**

Looking east towards 140 West near the mid-block crossing at McDonalds

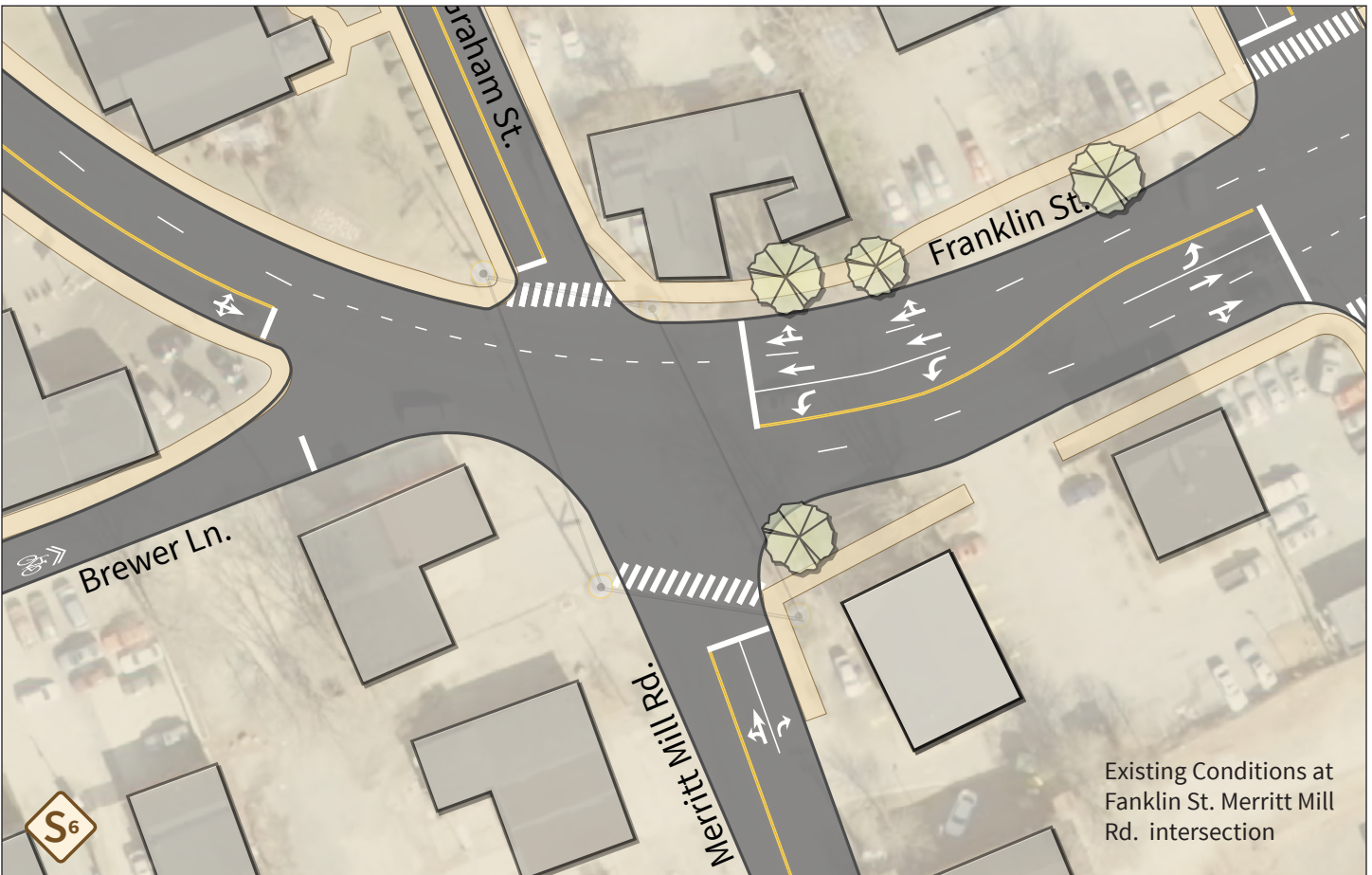


<b>Develop- ment</b>	<b>20'</b> sidewalk/planters	<b>8'</b> on-street parking	<b>10.5'</b> shared lane	<b>10.5'</b> lane	<b>10.5'</b> lane	<b>10.5'</b> shared lane	<b>8'</b> on-street parking	<b>15'</b> sidewalk/ planters	<b>Development</b>
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**FRANKLIN ST.**



Looking west from 140 West Condos



Existing Conditions at Franklin St. Merritt Mill Rd. intersection



**PROJECT** MORGAN CREEK GREENWAY PHASE II

**PRIORITY** 9

**EST. COST** \$ 3.5 MILLION



**Project Description**

- Shared Use Path/Greenway/Bridges

PART 1 : Design and construct the second phase of the Morgan Creek Greenway which will run from the Morgan Creek Greenway Parking Lot to Smith Level Road.

*NOTE: Currently, the final alignment has not been selected and the project has yet to be designed. The total cost of the project could vary depending upon the final alignment and the number of bridges necessary.*

PART II : Design and construct a paved path on the outer edge of Merritt’s Pasture beginning at the current eastern terminus of the Morgan Creek Greenway to the gate at Fordham Blvd. Then work with NCDOT to develop a proper facility to connect this greenway to Morgan Creek Rd along the 54 Bypass.

