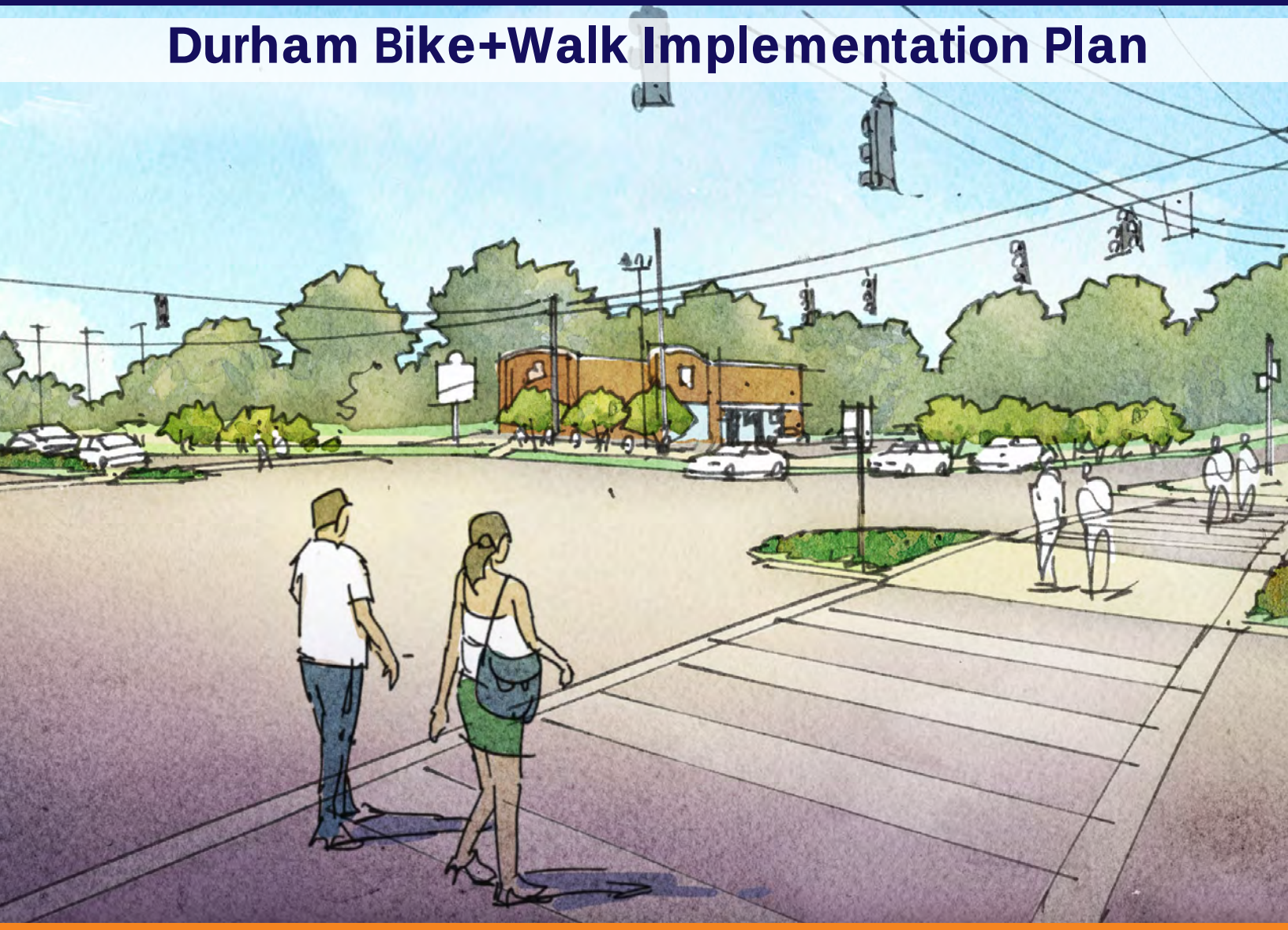
City of Durham

presents

Durham Bike+Walk Implementation Plan



Stantec Consulting Services | Toole Design | Mobycon

05.2017

This report is the **Durham Bike+Walk Implementation Plan**. In it we discuss the context, engagement, and resulting recommendations for projects and practices that the City of Durham and its people will implement to create a better, safer future for walkers and bikers.

durham

project report | 05.2017

Table of contents

I. Existing Conditions & Directions

II. Project Recommendations

III. Topics

A GOOD DAY FOR A WALK

Why Durham has a focus on biking & walking now

Children and adults alike will benefit from the successful implementation of the Durham Bike+Walk Implementation Plan.

In 2006, the City adopted both a bicycle and a pedestrian plan. A lot has changed since then, and the urgency for moving forward with projects has increased.

Those plans adopted over a decade ago have helped facilitate new projects, but more work is to be done. In that era, advocates of more biking and walking infrastructure often had to "sell" the merits of active forms of transportation. Selling is less important now, although the benefits of active transportation to the economy, health, and mobility of communities is worth repeating. Durham, like every city, has many competing needs for its attention and resources, but getting more people walking and biking is a cross-cutting action that improves security with more "eyes on the street," lowers health costs related to sedentary lifestyles, improves education (up to 20% higher on test scores, according to one study), and optimizes transit services while creating reliable alternatives to crowded roadways for short- (walking) and moderate- (biking) length trips. This plan focuses on projects the City can do soon, identifying 75 projects and 11 action topics to make these benefits happen more often for more people.

a brief overview of this report's contents and findings

INTRODUCTION to DURHAM

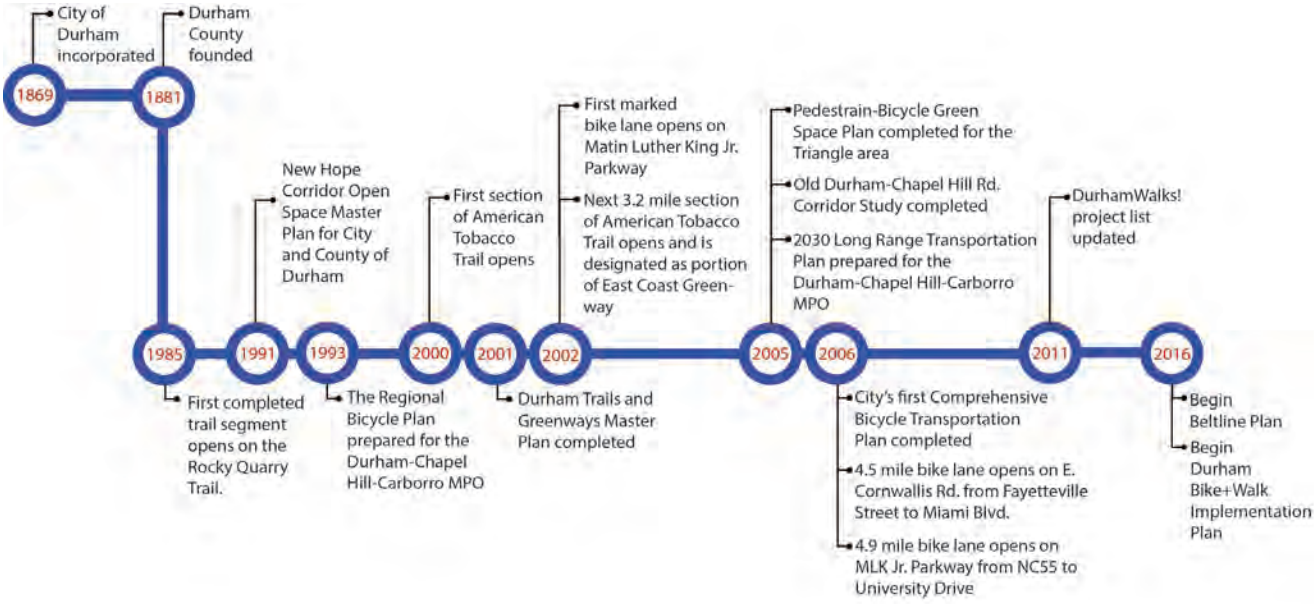
The purpose of the Durham Bike+Walk Implementation Plan (the "Plan") is to update and combine its Comprehensive Bicycle Transportation Plan and DurhamWalks! Pedestrian Plan, both adopted in 2006 with a focus on implementing projects to improve biking and walkability.

Extensive engagement throughout the city provided opportunities for people from all parts of Durham to participate in identifying walking and bicycling priorities. During the past ten years more than 30 miles of bike lanes, 25 miles of publicly constructed sidewalk, and 12 miles of shared use path facilities have been implemented and constructed. While laudable, residents increasingly want to have a more walkable and bikeable community. Durham itself has enjoyed nothing short of a renaissance of redevelopment and energy, particularly in its downtown. With this redevelopment, there has been renewed focus on improving streets throughout the City to install curb ramps, pedestrian sig-

nals, pedestrian lighting, bicycle racks, and signage. These improvements have helped Durham's active transportation mode renaissance, improved safety, and led to increases in the number of people choosing to walk and bike.

The goal of this Plan is to build on that momentum and generate a more livable and healthy city by making more places more accessible to more people. The end result will determine implementable projects that will connect people with safer and better connected bicycle and pedestrian facilities.

timeline



History

Where we're coming from

The City of Durham was founded in 1869 as a rail and tobacco town. The city adopted an electric streetcar network in 1902 that was shortly replaced by a bus system in 1930. People generally walked to reach transit then, much as they do today.

As in most American cities, automobile use grew from the 1950's through the 1990's, accompanied by increased congestion. At the same time, the requirement and desire for sidewalk construction as part of new development ceased. This resulted in sprawled development, isolated neighborhoods, and unsafe streets for those choosing to bike

or walk. Changes to policy and support in the 1990's began to make the city friendlier to cyclists and pedestrians.

The 2006 bicycle and pedestrian plans laid out a future path for the city through visionary planning processes that identified many projects and priorities. In this past condition that those plans operated within, the city often had to sell the idea of adding more bicycle and pedestrian improvements, answering the question of "how come?"

There is broad recognition of the benefits biking and walking can have to human health and safety, supporting economic revitalization efforts, and creating opportunity for residents to be more mobile and participatory in that economy. Now, the question has evolved into "how fast?" can it be built. This plan attempts to develop a blueprint and strategy for the expedited delivery of bicycle and pedestrian facilities.

Elements of the Plan

What's inside

The current Plan was developed through research; spatial data collection and analysis; community outreach and public input; a field inventory; and guidance from a diverse and dedicated steering committee. The Plan includes a demographic summary and overview of existing conditions, followed by a description of the prioritization process of projects, and how those projects were initially identified.

The first section discusses current conditions, issues-based engagement, and the first round of project prioritization. The second section discusses recommendations for the projects identified as top priorities, while the third and final section addresses 11 special topics and actions that can be taken to improve the city's standing as walk- and bike-strong community.

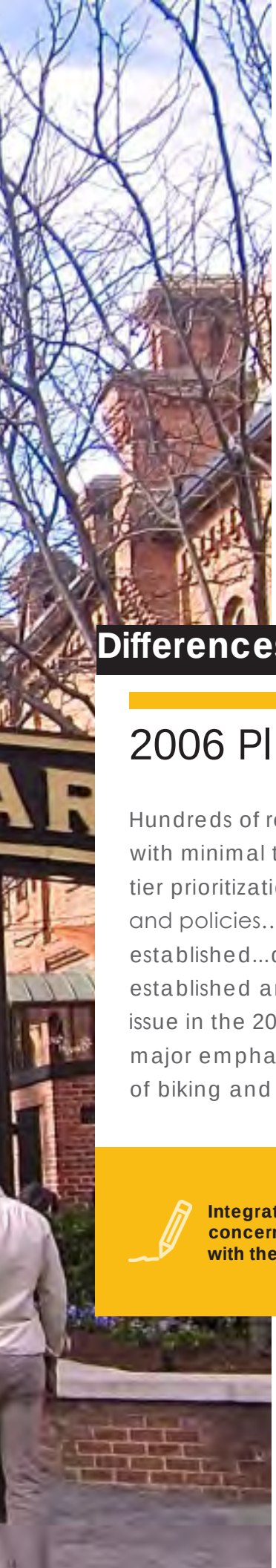
Marlon Wayans

Being successful means that you're working hard and walking your walk every day.

What makes this plan different

A focus on implementation and projects

There are two previous significant planning documents: the 2006 Durham Walks! Plan (updated in 2011 to the extent that the project priorities were modified) and the 2006 Durham Comprehensive Bicycle Transportation Plan. The differences in these plans and the Durham Bike + Walk Implementation Plan are shown at right.



The goal of this Plan is to build on this momentum and generate a more livable and healthy city by making more places more accessible to more people throughout the city.

Differences in this Implementation Plan and the past plans:

2006 Plans

Hundreds of recommended projects with minimal technical analysis...single tier prioritization...focus on programs and policies...financing was hopeful, not established...design practices were less established and therefore more of an issue in the 2006 planning documents... major emphasis on “selling” the concept of biking and walking

Implementation Plan

75 specific projects in three categories... two-tier prioritization, first to identify high priorities, then a second round analyzing constructability and feasibility focus on 11 topic areas that are specific and implementable... better constructability estimates...less emphasis on design practices and more targeted identification of key issues of concern in Durham

Integrating public concerns is shared with the plans

The plans have a scoring system (but not the same)

These plans discuss projects and programs

Project Team

The Project Team was led by the Durham Transportation Department. A consulting team, led by Stantec Consulting Services Inc., provided assistance with analysis, engagement, and document preparation.

CONTACT
Bryan Poole
T: 919-560-4366
E: Bryan.Poole@durhamnc.gov

Steering Committee

Thank you!

Cha'ssem Anderson	North Carolina Central University
Kendra Bridges	Bicycle and Pedestrian Advisory Commission
Max Bushell	Bicycle and Pedestrian Advisory Commission
Alison Carpenter	Duke University
Jennifer Delcourt	Active Routes to School Coordinator
Scott Denton	Durham Public Schools
DeDreana Freeman	Inter-Neighborhood Council
Matt Gladdek	Downtown Durham Inc.
John Goebel	Durham Open Spaces and Trails Commission
Shelly Green	Durham Chamber of Commerce
Adam Haile	Bike Durham
Landis Masnor	Bike Durham
John Hodges-Copple	TJCOG
Aspen Romeyn	TJCOG
Marge Walters-Clemons	Mayor's Committee for Persons with Disabilities
Shep Smith	Community Development
Ellen Beckman	Transportation Department
Terry Bellamy	Transportation Department
Bill Judge	Transportation Department
Phil Loziuk	Transportation Department
Dale McKeel	DCHC/Transportation Department
Pete Nicholas	Transportation Department
Leslie Tracey	Transportation Department
Laura Biedeger	Neighborhood Improvement Services
Jacob Lerner	Neighborhood Improvement Services
Tom Dawson	Parks and Recreation
Lindsay Smart	Parks and Recreation
Jenny Green	GoTriangle
Stephanie Loyka	GoTriangle
Eric Simpson	GoTriangle
Tasha Johnson	Public Works
Clint Blackburn	Public Works
David Kielson	NCDOT Division 5
Brian Massengill	Durham Police Department
Lisa Miller	City/County Planning Department
Marissa Mortiboy	Durham County Public Health

Bryan Poole

Project Manager (Durham)

Bryan has worked on national reports concerning bicycle and pedestrian safety and infrastructure, helped communities across the state develop bicycle and pedestrian plans, and now works for the City to improve conditions for pedestrians and cyclists in his adopted home of Durham. He is also a dad, bike commuter, and weekend-warrior triathlete.

Scott Lane

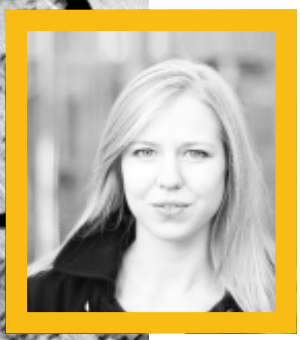
Project Manager (Stantec Consulting)

Scott is a 25-year veteran of many multimodal studies and projects in North Carolina and beyond. He is a League of American Bicyclists' Certified Master Instructor, teaching kids to ride more safely.

Jennifer Toole

Task Leader (Toole Design Group)

Jennifer has over 20 years of experience planning and designing multimodal transportation systems. She is a runner and bicyclist who is a daily user of the extensive trail network near her home in Columbia, MD.



Mary Embry Elbech

Task Leader (Mobycon)

Mary devises solutions that positively influence everyday travel choices. She is skilled at developing relationships with clients, listening closely, and designing creative solutions that work in context.

Mapbook

a look at some of the context that influences movement

The following pages illustrate age, income, and other characteristics that influence the needs and desires for mobility in Durham. The city is a remarkably diverse place, a trait that is an advantage as noted by many food, livability, and business awards. It's also a characteristics that demands a range of considerations about the role of walking and biking in the community.

Durham compared to N.C.

Foreign-Born residents **+6 %**

Language spoken at home other than English **+8 %**

Adults with Bachelors' Degree or higher **+17 %**

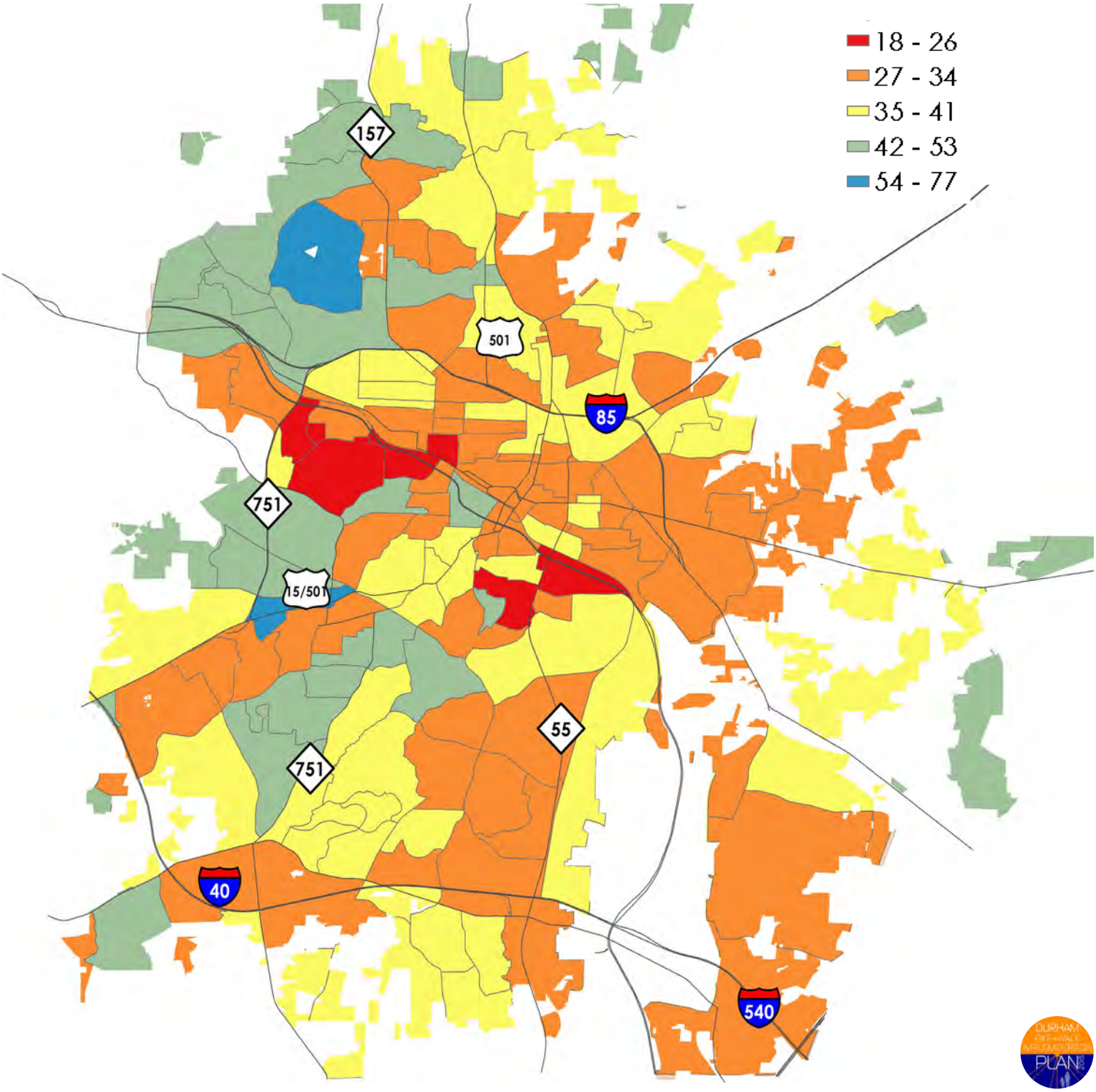
Over 65 years of age **-3 %**

Population that reported as Hispanic **+4 %**

Households with a computer at home **+5 %**

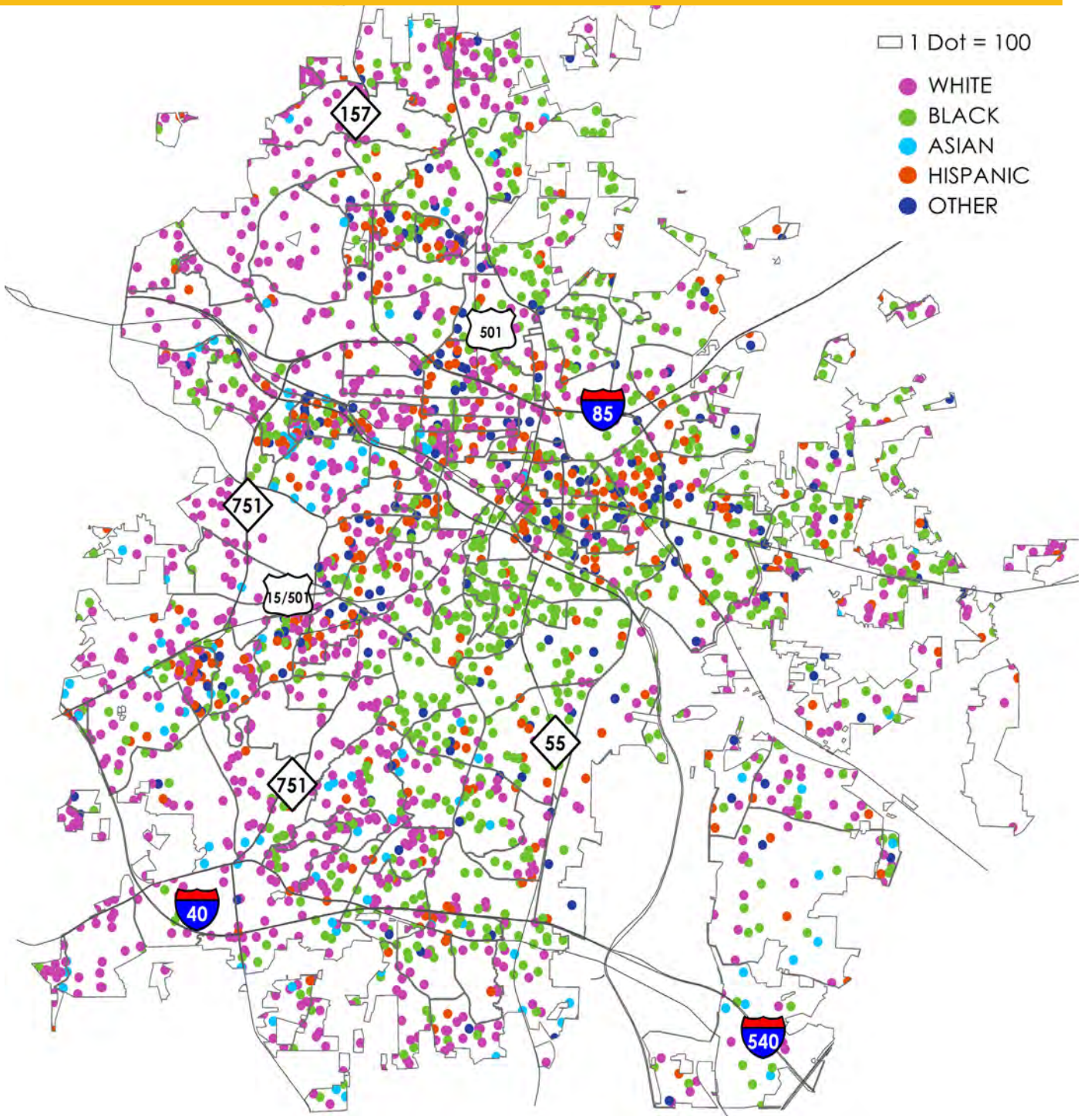
Median Age | a youthful city

The youth of Durham is focused in the east and southwest (Duke and North Carolina Central University campus areas) of the city. More traditional suburbs to the north and west have different age profiles, and likely different experiences with



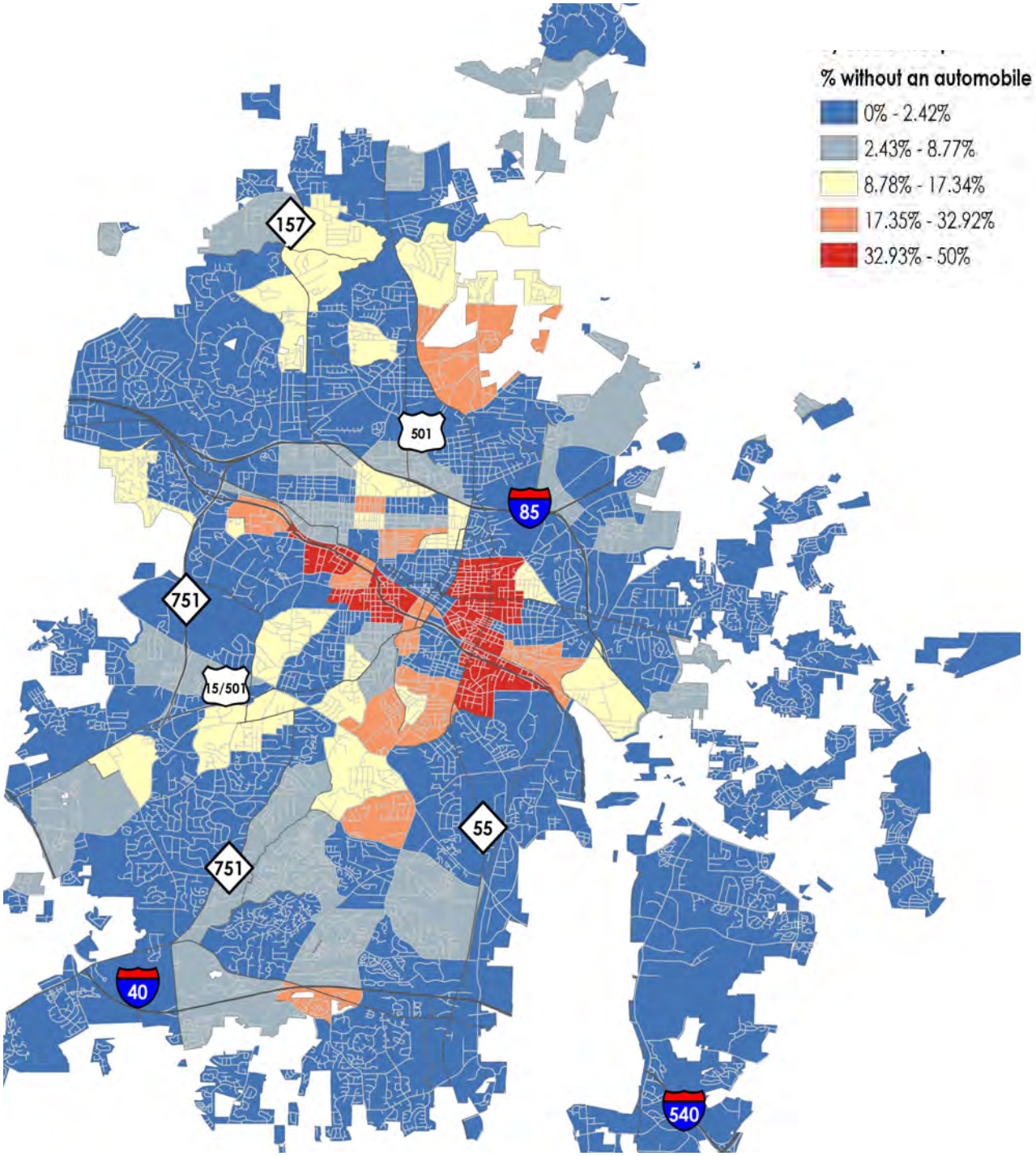
Race and Ethnicity | a diverse city

While a very diverse place compared to North Carolina and many other cities, Durham's racial composition is not evenly distributed, with African-Americans living predominantly in the east, and a concentration of Asian persons living near the Duke campus.



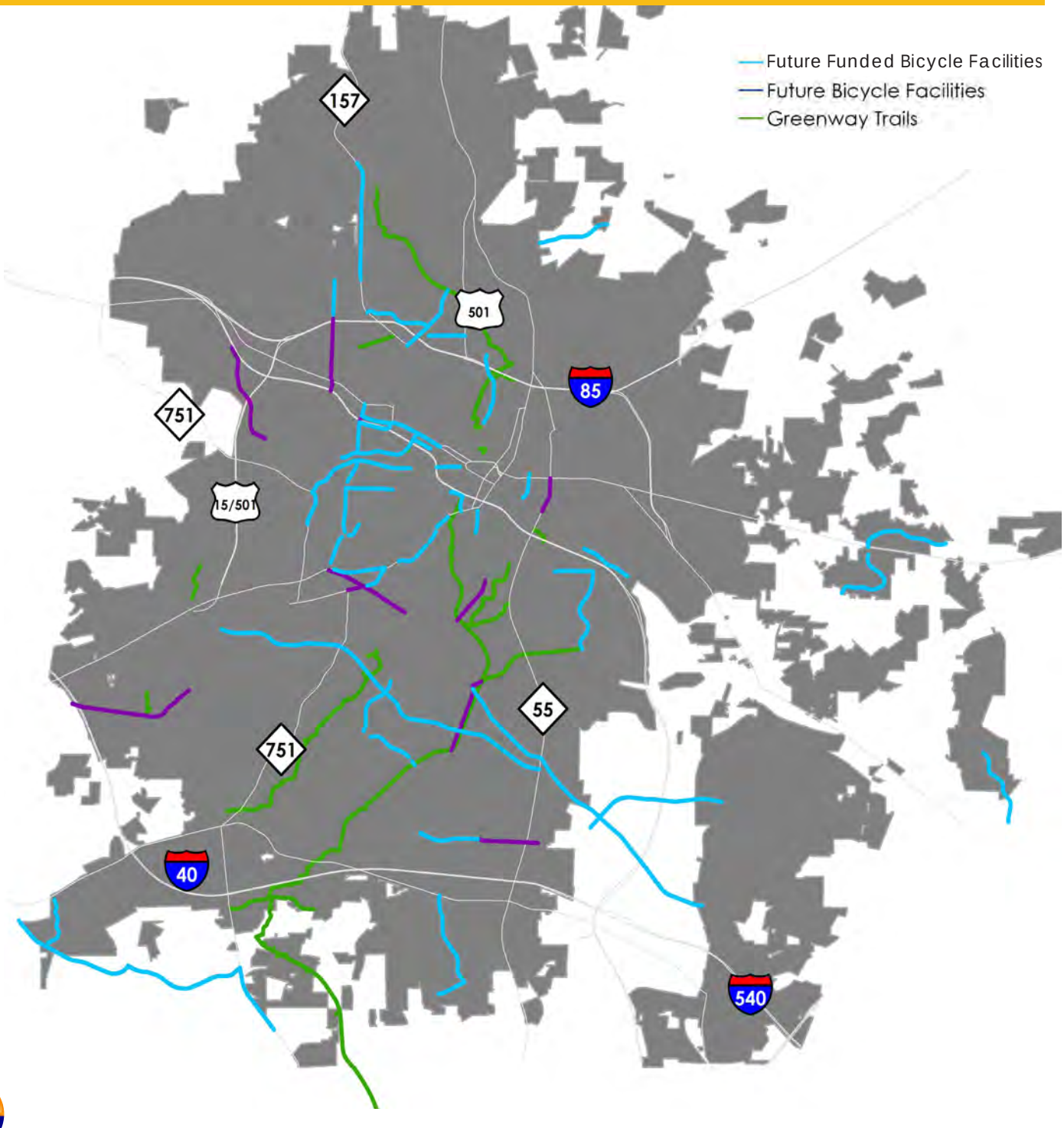
Car Ownership | feet matter, by place

Not surprisingly, car ownership varies greatly and is correlated with student populations, place design / density, and income levels. Walking and bicycling are a matter of necessity in some places, and a matter of health and recreation in others.



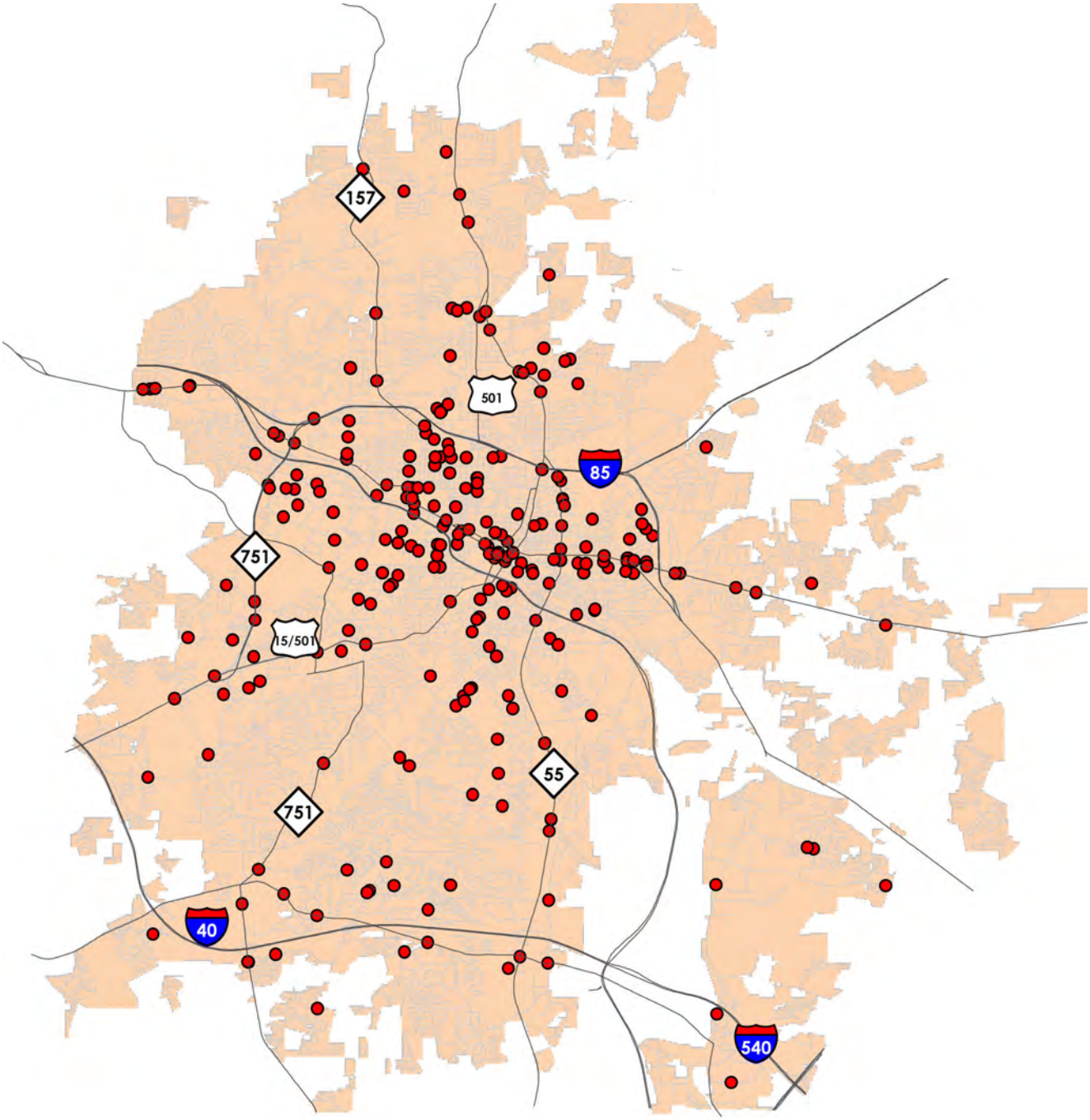
Bicycle Facilities | miles of biking

Durham has 44.3 miles of existing bicycle facilities, and another 39.1 miles of greenways that bicycles and pedestrians use today. By the end of 2017, another 8.9 miles of biking facilities are scheduled to begin construction.



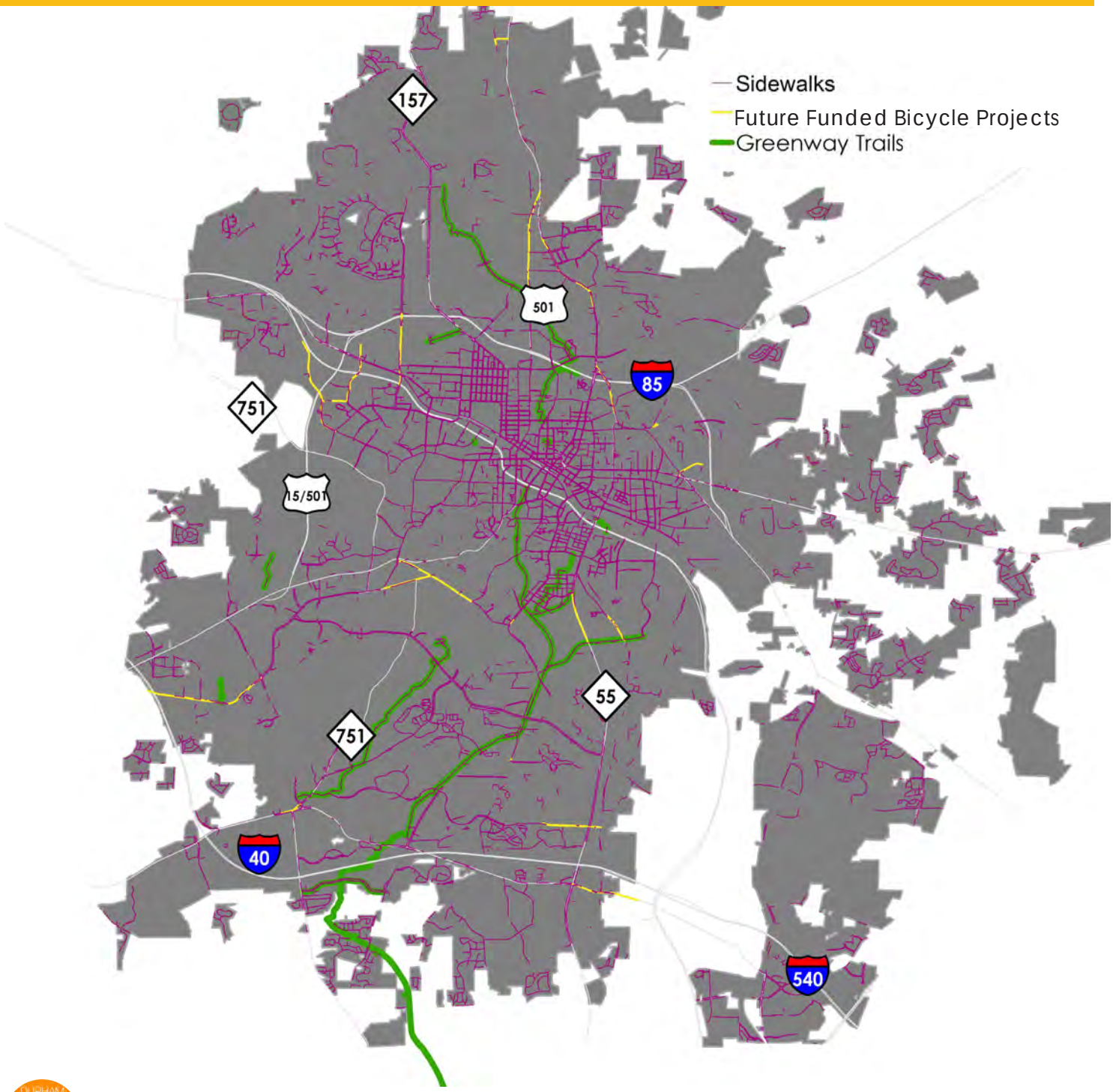
Bicycle Crashes | there are no accidents

A total of 273 reported (and many are not reported) crashes involving a cyclist were reported between 2007 and 2013. Crashes do tend to occur more often were there is more cycling going on, but there are also crashes occurring in neighborhoods throughout the city.



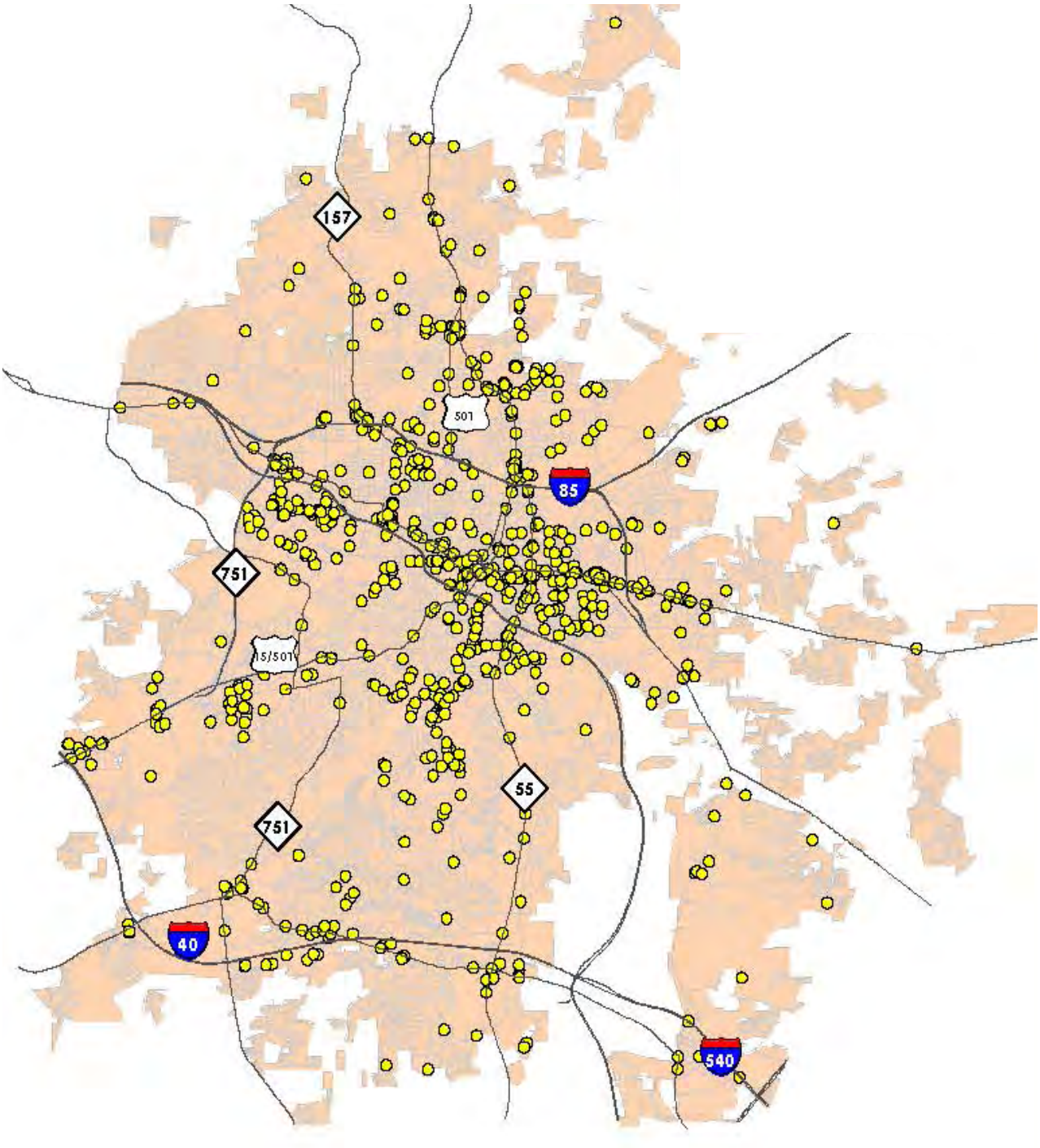
Pedestrian Facilities | a place to walk

As noted previously, there were 39.1 miles of greenway in Durham in 2016. Another 543 miles of sidewalk were also in place, with nearly 16 more miles scheduled to be under construction before the end of 2017.



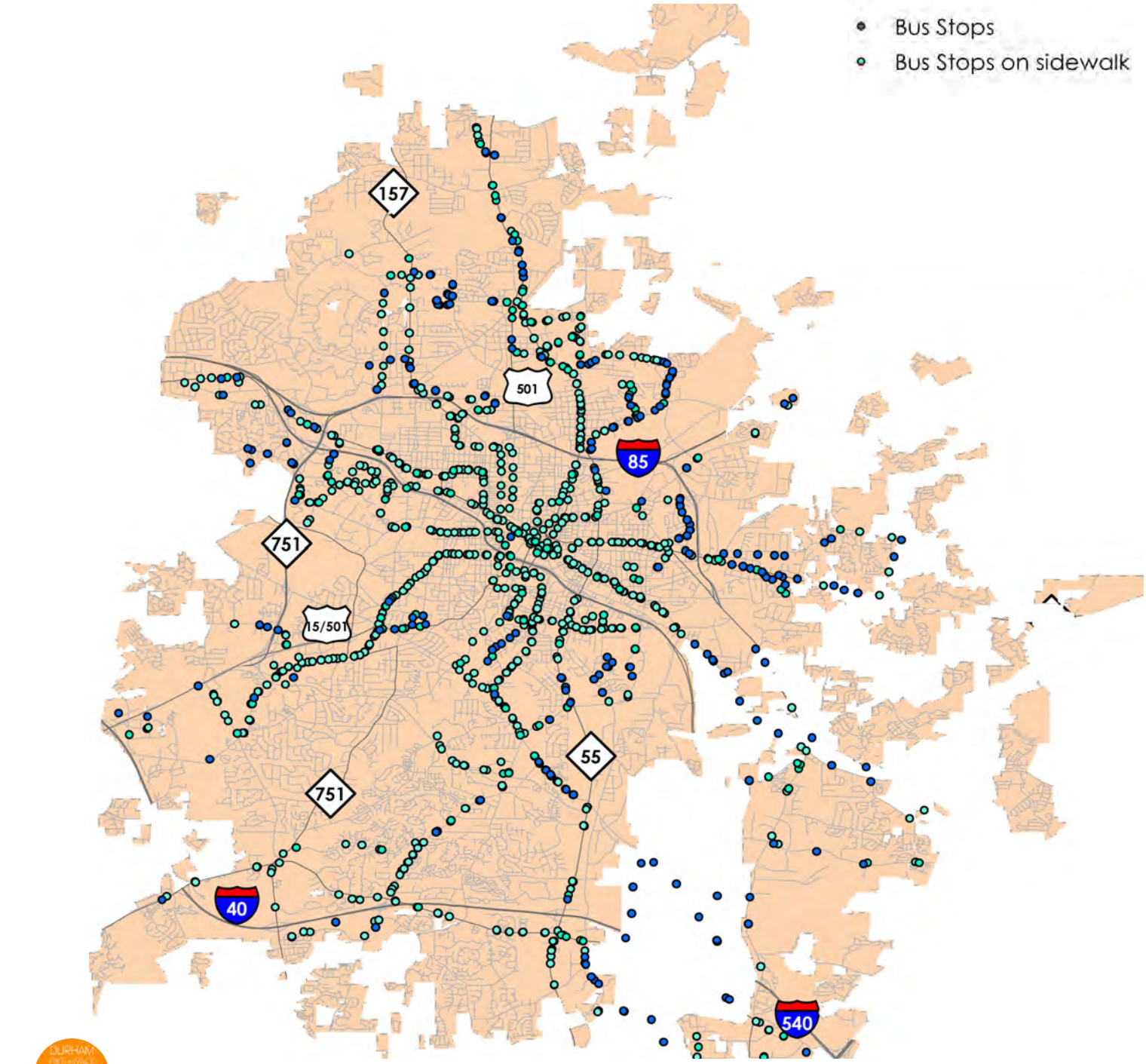
Pedestrian Crashes | crossing a divide

Pedestrian crashes, not all of which are reported to the police, occurred 807 times between 2007 and 2013. Crashes happen disproportionately where there are no safe street crossings, but also occur in locations where there are many potential conflicts with fast-moving automobile traffic.



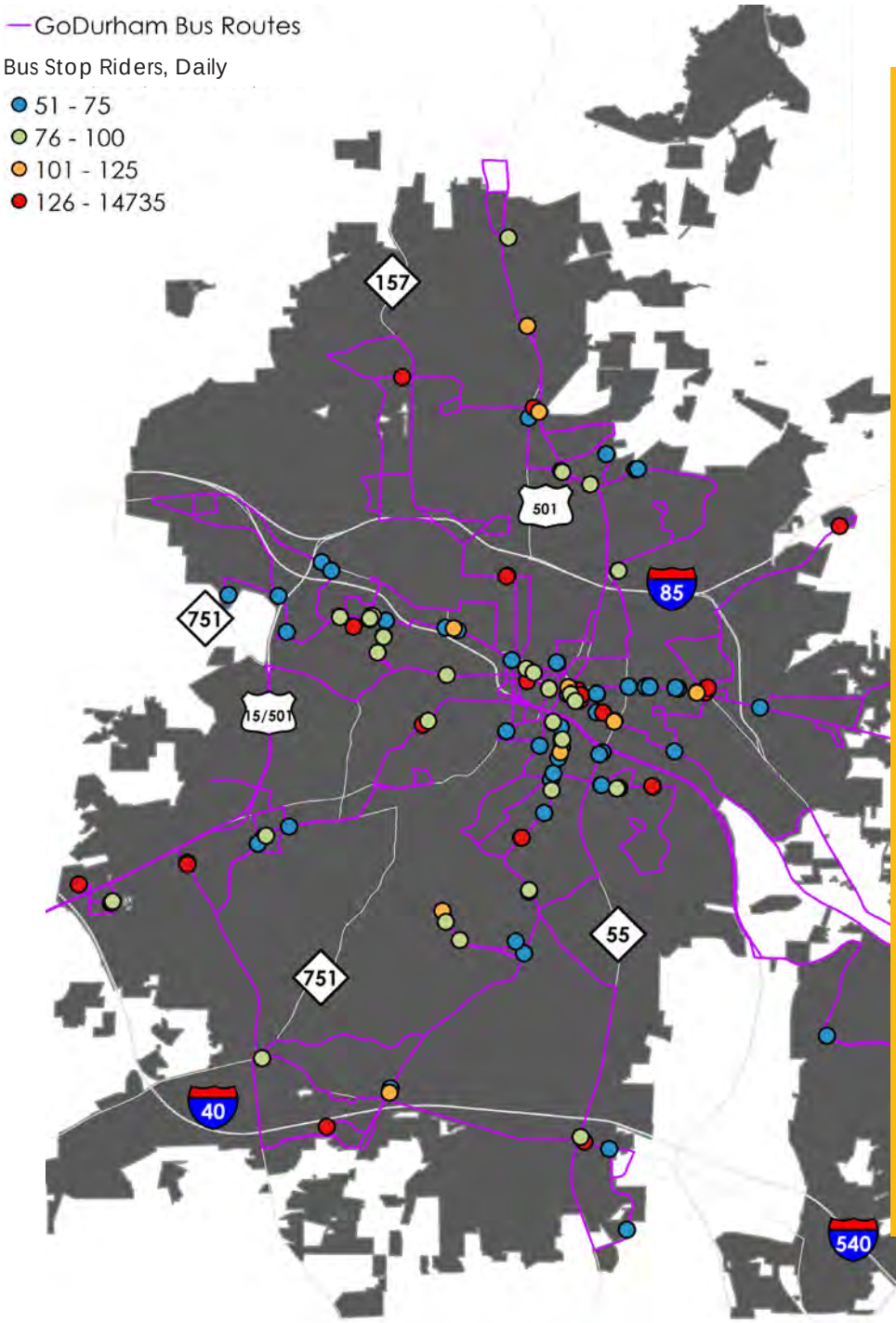
Transit Stops | walking to ride

One of the primary benefits of having great walking and biking environments is the advantage given to transit services with great access. The great majority of GoDurham's bus stops are adjacent to sidewalks, but some are missing and still others have nearby gaps.



Transit Ridership | enjoy the ride

Ridership on public transportation, while dominated by downtown-area stops, nevertheless has more far-flung centers of activity occurring on all sides.



2015 passengers
6.2m

GoDurham | passenger boardings

The GoDurham system saw 6.2 million people board one of its vehicles in 2015. Durham's system is productive, too: 32 boardings per hour compared to 24 per hour for Charlotte.

"To further increase ridership, GoDurham must attract new customers while retaining current customers."

- GoDurham Service Performance Annual Report, FY2015

a description of adopted plans and current programs and how they are relevant

PAST PLANS & EXISTING PROGRAMS

The Durham Bike+Walk Implementation Plan does not begin from a blank slate. Past, adopted policies, plans, and practices play a role in shaping this plan and project recommendations. The following is a brief summary of the most relevant of each of these plans.

DurhamWalks! Plan (Adopted 2006, Revised 2011)

The *DurhamWalks! Plan* was the City of Durham's first dedicated pedestrian plan. The Plan presents four goals: 1) To increase the number of pedestrian facilities and amenities; 2) to improve the quality of existing and future pedestrian facilities; 3) to enhance pedestrian safety; and 4) to incorporate pedestrian considerations into policies and practices into all planning processes. To assess existing conditions, an inventory of all existing sidewalks and paved trails was conducted as part of the planning process. Based on an evaluation of the existing conditions and needs, the Plan recommended several improvement projects, prioritized as corridor, intersection, or maintenance projects. The Plan provided design standards and guidelines for pedestrian facilities, which have been incorporated into the Durham Bike+Walk Implementation Plan as applicable.

With every new and redeveloped property there is an opportunity to create a better, safer, and more extensive pedestrian and bicycle network. Durham works with private developers to fairly apply these standards.

The projects and policies recommended in the DurhamWalks! Plan were considered during the development of the Durham Bike+Walk Implementation Plan.

Durham Comprehensive Bicycle Transportation Plan (2006)

The *Durham Comprehensive Bicycle Transportation Plan* was developed for the City and County of Durham in 2006 with the goal of increasing mode share and safety for cyclists, thereby improving quality of life in Durham. Based on an inventory of existing facilities, extensive public input, and research, the plan proposed a recommended bicycle route network, with 852 miles of bicycle facilities. Of this network, 337 miles were identified as short-term or opportunity-based improvements (e.g., re-striping, signage, shared roads, paved shoulders), and 515 miles were prioritized as medium and long term projects. Additionally, the plan provides design guidelines for bicycle facilities and amenities, such as bicycle-friendly intersections, pavement markings, roadside treatments, signage, shared use paths, greenways, and trails, bicycle parking, and drainage grates. Several of the education, encouragement, and enforcement programs proposed in the plan are aimed at fostering coordination between Duke and Durham bicycle planning, including the development of a connected bicycle network between the University and Durham and the creation of a Bicycle and Transit Wayfinding plan.

a walk in Durham

Durham Trails and Greenways Master Plan (2011)

The *Durham Trails and Greenways Master Plan* is an inventory of existing trails (as of 2011), and a vision for the interconnectivity of approximately 188 miles of future trails to serve community destinations such as parks and schools, and to enhance the region's natural environment. The plan incorporates three different types of trails: natural surface, improved surface, and paved trails or sidewalks.

The plan calls out 12 significant trails and greenways that are within the city and county. These include the Rocky Creek/Pearsontown Greenway, New Hope Creek Greenway, Lick Creek Greenway, Little River Greenway, Crooked Creek Greenway, North/South Greenway, Roxboro Rail-Trail Greenway, Eno River Greenway, Little Lick Creek Greenway, Northeast Creek Greenway, Page Branch Creek Trail, and the American Tobacco Trail Greenway. The 22-mile American Tobacco Trail is the most regionally significant trail/greenway and connects its northern terminus to the Durham city center at the American Tobacco Campus, then south through Chatham and Wake Counties.

Relevant goals of the plan are shown at right.

- **Connectivity:** Plan trails and greenways with origins and destinations, and tie into the city and county's system of sidewalks, on-road bicycle facilities and transit routes to allow the full spectrum of alternate transportation options.
- **Accessibility:** Design and plan paved greenways to be fully accessible to people with disabilities, and unpaved trails to be accessible to a level similar to their surrounding environment.
- **Right-of-Way Preservation:** The city and county of Durham should preserve potential trail and greenway corridor rights-of-way in anticipation of future trail development.
- **Water Quality Protection:** Greenway and trail construction in stream corridors should follow best practices for environmental protection, and will include stream bank enhancement as necessary.
- **Open Space Preservation:** Design trail construction for minimum impact to sensitive plant and wildlife habitats.
- **Community Education:** Take advantage of the Durham Open Space and Trails Commission (DOST) to inform and educate citizens about trails and greenways through interpretive planning and education.
- **Community Involvement:** Encourage all citizens of Durham to become involved in future development of the greenways and trails system through the establishment of community inspired neighborhood connector trails, matching grant program initiatives and citizen adoption of trail sections for assistance and maintenance.

Improvement Type	RURAL	SUBURBAN	URBAN
Public Sidewalk (5' minimum)	NO	YES	YES
Pedestrian Crossing Treatments	NO	YES	YES
Marked Routes in Parking Areas	NO	YES	YES
4' Bike Lanes or 14' Wide Outside Lanes	YES	YES	YES

Street Type*	RURAL	SUBURBAN	URBAN
Major/Minor Thoroughfare	None	Both Sides	Both Sides
Collectors	None	Both Sides	Both Sides
Non-Residential (2,000 or more trips)	None	One Side	One Side
Non-Residential (less than 2,000 trips)	None	One Side	One Side
Residential Street	None	One Side	One Side
Cul-de-Sac (400' or longer)	None	One Side	One Side
Cul-de-Sac (less than 400')	None	None	One Side

**Note: Compact and Downtown areas always require sidewalks on both sides of the street; freeways do not ever require sidewalks.*

where we currently require pedestrian treatments

Infrastructure Matters More Now, but Policy Matters More, Later

Over time, how well a city serves cyclists and pedestrians is determined by how well private spaces and developments are constructed. The tables above, taken from the Unified Development Ordinance, indicate private development requirements in three "tiers" of placetypes. For recommendations on improving the UDO requirements, see page 166.

Other Guiding Documents

Other plans and policies are also relevant to the Durham Bike+Walk Implementation Plan; the following is a brief description of the *Comprehensive Plan, Unified Development Ordinance, and Reference Guide for Development*.

1 Comprehensive Plan

The *Comprehensive Plan* embodies the vision of the citizens and elected officials to create a community in which people want to live and how Durham will look and function into the future. It includes 16 elements, of which the transportation and capital improvements elements are mostly relevant to this Plan. The plan states "How Durham plans for invests in facilities for walking, bicycling and transit will affect future mobility and accessibility. Policies should be put in place to make biking and walking more viable alternatives to driving."

2 Development Ordinance

The guiding purpose of the Unified Development Ordinance is to "promote the health, safety and general welfare of the residents of Durham City and County." The UDO contains regulations designed to "minimize congestion in the streets and reduce reliance on automobiles by providing options for walking, bicycling and transit use" which is defined in Section 12.4 Pedestrian and Bicycle Mobility.

3 Development Guide

The City of Durham prepared the *Reference Guide for Development* (updated, 2016) to provide a reference manual to some of the City of Durham Public Works Department's design standards and design requirements. Design criteria for sidewalk layout and construction require crossing intersections, minimum of 5 - 6 feet in width, and shall be placed so as not to interfere with future widenings.

4 Transportation Plan

The City, in partnership with the Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO) and North Carolina Department of Transportation (NCDOT) have developed a Comprehensive Transportation Plan, a multimodal long-range plan that identifies existing facilities and deficiencies for all transportation modes. This plan identifies the comprehensive inventory of existing facilities and where improvements are needed.

Current Programs

Durham has a number of both long-standing partners and more recently established groups, initiatives, and programs that help the City improve conditions for pedestrians and bicyclists. Some of these are briefly described in the following paragraphs.

Why Partnerships Matter

- Assistance with Funding
- Champions after the Plan is Complete
- Working on Pilot Projects
- Help with Community Engagement
- Implement Programs and Safety Initiatives

Durham Bicycle and Pedestrian Advisory Commission

Durham's Bicycle and Pedestrian Advisory Commission (BPAC) was established in 2001 to advise the City Council and the Board of County Commissioners on bicycle and pedestrian issues. The citizens group consists of 17 voting members with six members appointed by Durham City Council and six appointed by the Durham County Commissioners. The remaining five voting members are liaisons from other commissions (Planning, Open Space and Trails, and Recreation) and from Duke and N.C. Central universities.

The Commission promotes the full integration of bicycling and walking into community transportation policies and practices. The BPAC evaluates incentives, best practices, benefits, and funding for bicycle and pedestrian programs and facilities. In addition to advising the City and County, the Commission is involved in educating the public on bicycle and pedestrian issues and performing special studies and projects as requested by the City and/or County on bicycle and pedestrian questions.

Watch For Me NC

Durham is a partner city in the statewide "Watch for Me NC" program run by the NCDOT which aims to reduce pedestrian and bicycle injuries and deaths through a comprehensive, targeted approach of public education and police enforcement. The program involves two key elements: 1) safety and educational messages directed toward drivers, pedestrians and bicyclists, and 2) enforcement efforts by area police to crack down on some of the violations of traffic safety laws.

Bike Durham

Bike Durham is a bicycle advocacy group that works to improve bicycle friendliness in the area by hosting educational and awareness events. In particular, they host seminars and workshops on commuter cycling and discuss best practices for cycling in traffic, navigating different features in traffic landscapes, interacting with motorists and parked cars, cycling around people on trails, and cycling in different weather conditions. Their annual Bike-a-Bull City event brings together cyclists of all types to celebrate and lobby for better bicycle infrastructure.

Bicycle Friendly Community

The Bicycle Friendly Community (BFC) program was created by the League of American Bicyclists to recognize the current bicycle network and provide recommendations to improve bicycle conditions. The feedback report provided by the League includes recommendations from five categories: engineering, education, encouragement, enforcement, and evaluation and planning.

In 2010, the City of Durham was designated a Bronze Level Bicycle Friendly Community. This designation, renewed in 2014, recognized current efforts to make Durham a safe, comfortable, and convenient place to bicycle and included suggested actions for improving their status by the next application cycle in 2018. Key engineering recommendations included expanding and implementing Durham's Complete Streets Policy, increasing the amount of high quality bike parking, creating development requirements to build bike lanes, expanding the bike network, and reducing traffic speeds.

The education recommendations were to incorporate routine bicycle-safety courses in primary and secondary education, expand public outreach campaigns to promote the share the road message, and offer a greater variety of bicycling skills training opportunities for adults. Encouragement strategies targeted local businesses, agencies, and organization to promote cycling and to seek recognition through the Bicycle Friendly Business Program. Enforcement improvements centered on increasing the actual and perceived safety of the American Tobacco Trail and passing additional ordinances to protect cyclists.

Under the evaluation and planning the League recommended dedicating more staff time to bicycle planning and programming, updating the 2006 bike plan, increasing dedicated funding for the implementation of the plan, and streamlining the process of making roadway improvements to problematic areas.

Bicycle Boulevards Initiative

Another advocacy organization, Durham Bicycle Boulevards, is focused on developing a dedicated bicycle network of low-stress neighborhood streets. Bicycle boulevards are "streets with low motorized traffic volumes and speeds, designated and designed to give bicycle travel priority." (National Association of City Transportation Officials)

Signage, markings, pavement changes, and other measures are constructed to support the bicycle boulevards. The Durham Bicycle Boulevards organization is working on community support and asking the City to move quickly toward implementation.

At right is a graphic representation of the group's conceptual bicycle boulevard network.

Wendell Berry

There comes . . . a longing never to travel again except on foot.

conceptual bicycle boulevard network (Durham Bicycle Boulevards)

Public Engagement

Everyone is a pedestrian sometimes, and many automobile owners use bicycles for transportation as well as recreation. It is therefore important to get ideas from all citizens and receive input from a wide range of stakeholders. The public process methods used in developing this plan aimed to recognize and assess citizen's concerns and patterns of travel; identify problems and gaps in connectivity; and build support for future implementation. Walking and biking are very personal activities, and only the people that travel in these ways every day understand these trips. Thus the public involvement is a key requirement to developing meaningful projects.

The next page describes the variety of engagement tools used by the Project Team, followed by an overview of the public workshop conducted in June of 2016, one of the key elements of the outreach process. This section then follows with key findings from the on-line survey and interactive mapping tools.

Everyone is a pedestrian sometimes.

Digital Outreach

Reaching people the Internet

- Launching a project website (durhambikewalkplan.com)
- An online survey questionnaire
- Wikimap: a web-based crowdsourcing tool
- Paid advertising on Facebook (both geographically and demographically specific)

Place-Based Engagement

Reaching people where they live, work, play, etc.

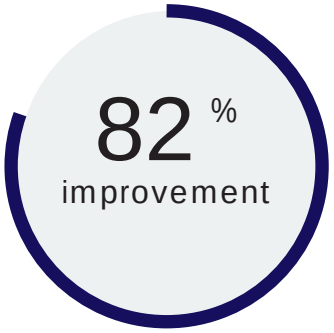
- Public Workshop (June, 2016)
- Presentation to Durham Bicycle and Pedestrian Advisory Committee (BPAC) meetings
- Presentation to the Durham Open Space and Trails Committee (DOST) meetings
- Presentation to the Durham Obesity and Chronic Illness Committee
- Flyers handed out across the city (shops, stores, restaurants, libraries, etc.)
- Tabling at Durham public events: Bull City Open Streets, Tour de Fat, and farmer's markets
- Presentations to community groups like the NE Central Durham Leadership Council and Inter-Neighborhood Council
- Community Walks events involving walking around neighborhoods and discussing issues and conducting surveys
- Cycle Track demonstration project in collaboration with Bike Durham
- Tabling at grocery stores in under-represented areas of the city

Public Workshop

On June 6, 2016 the project team conducted a public workshop to gather public input on key issues

A public open house at the Durham Main Library in June 2016 allowed for face-to-face feedback from citizens about biking and walking in Durham. A total of 86 participants attended the event, which included three presentation sessions for people arriving at different times. Each session included an interactive "polling" presentation, as well as stations set up around the room for people to conduct surveys, have pictures taken of themselves with a placard denoting their biking and walking issues (see pictures at right), and a sketch station so that people could illustrate their issues and our team's design responses.

by the numbers (poll results at the workshop)



We can do better

Over 82% of those polled at the public workshop said that there was lots of room for improvement in the biking and walking environment in Durham.

Safety is paramount

Safety from cars (28%) and personal security (27%) were top answers for why people at the workshop didn't walk more often.

Encouragement

What's the best reason to invest in more biking and walking infrastructure?

Provide alternatives to cars

30 %

Encouragement to bike/walk more

41 %

33%

Working Hard

1 out of 3 respondents at the workshop said that work was where they most wanted to bike or walk (followed by recreation)

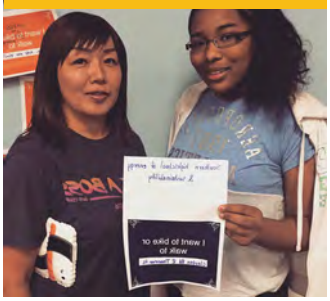
Project Flyer

Shown at left and behind this panel

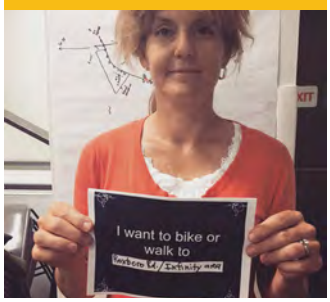
Where do we want to bike or walk?

school and have fun

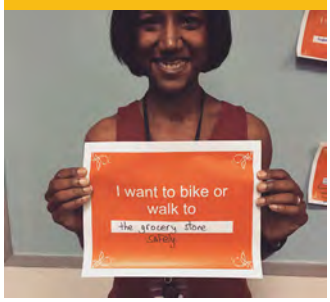
downtown, other Durham 'hoods



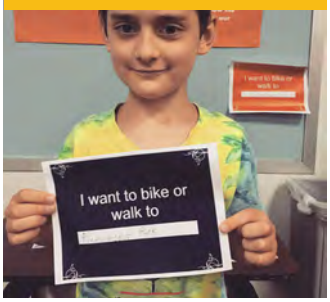
Clayton Road and Freeman Road



Roxboro Road / Infinity Area



the grocery store, safely



Pineywoods Park

.

While people at the workshop saw the need for improvement (82%) in biking and walking conditions, they were very upbeat at the meeting. One-third of the attendees said that they bike to work at least once per week. People that bike or walk love to see other people out doing the same thing: there is a sense of safety as well as community in numbers.

I'd really like to see sidewalks put in/repaired on Elliot Street from Roxboro to Rigsbee. Many people walk down that road, including to and from the farmers market. It feels a little bit dangerous to walk in the street there with a stroller.

Drivers do not yield to pedestrians. More visible signage might be helpful.

Survey comments displayed at the

Penny's bend is a natural area with lots of native Piedmont flora and folks like to fish in the river.

I would like sidewalks and bike lanes on University Drive from Forest Hills Park to Shannon Drive and also the entire length of Kent Street.

There is not even a crosswalk to cross from the SE to NE corner of Trinity and Foster - yet many children and families must cross here every day to get to school/work. I agree that signals and buttons would be helpful, especially since it's near a school.

It's so dark along this street that I start to wonder if I'm in the country.

This intersection has six stop signs! I think it is crying out for a traffic circle.

e public workshop on June 6, 2016

PROJECT WEBSITE AND ON-LINE SURVEY

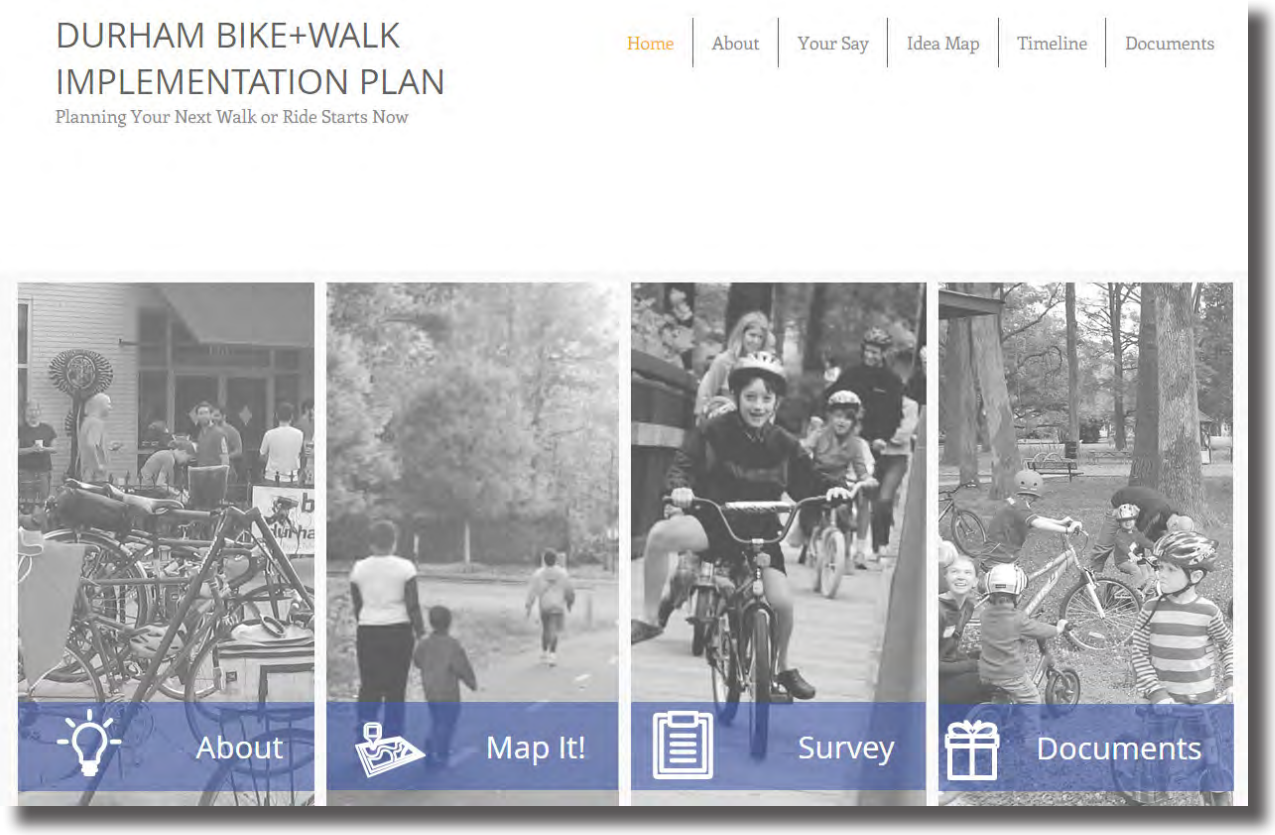
An online survey questionnaire was developed early in the plan development process that asked Durham residents to provide input on their biking and walking habits, preferences, desires, and problems. The survey, which was also distributed in a paper-based version in English and Spanish at events, received more than 1,040 responses. It was promoted on a dedicated project website, the city website, and at various events and meetings.

The following is a summary of the survey results.

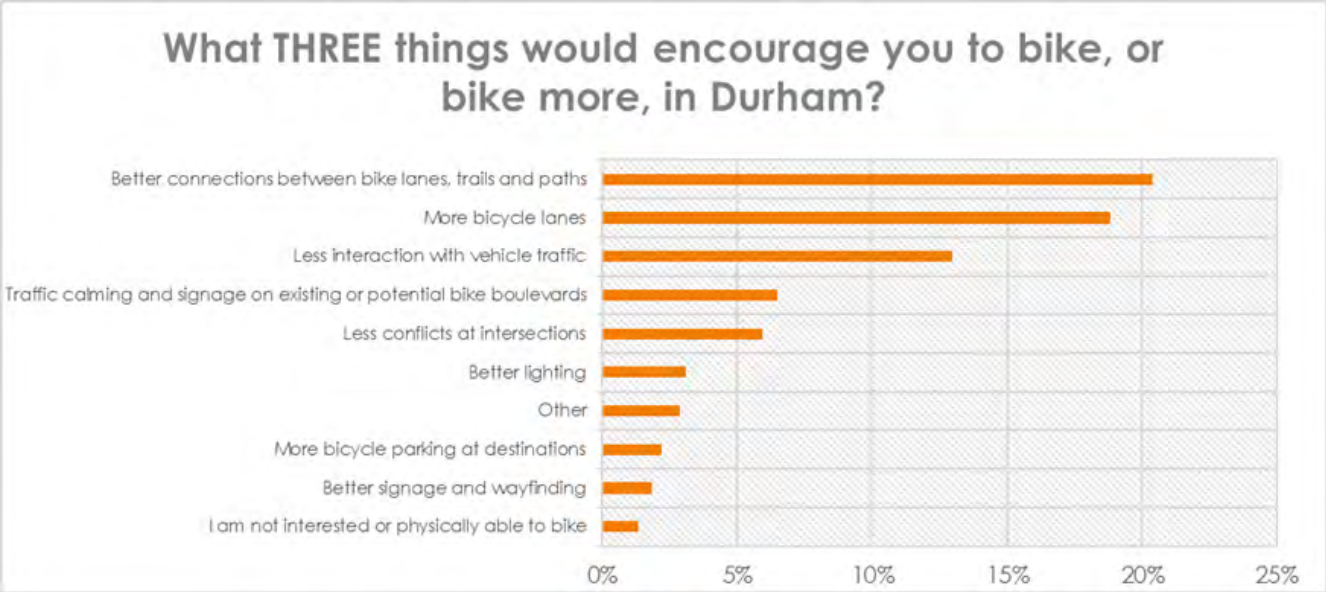
1,040

Survey Respondents

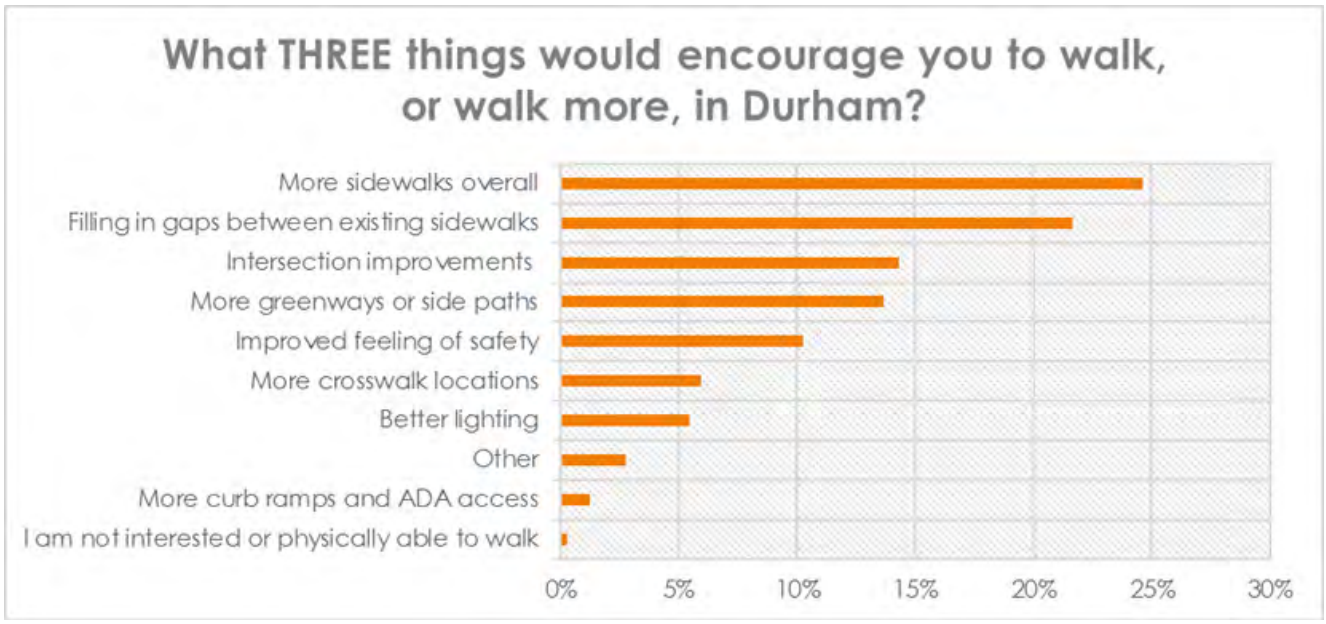
During the three-month period when the survey was on-line, 1,040 people took the survey on-line or on paper.



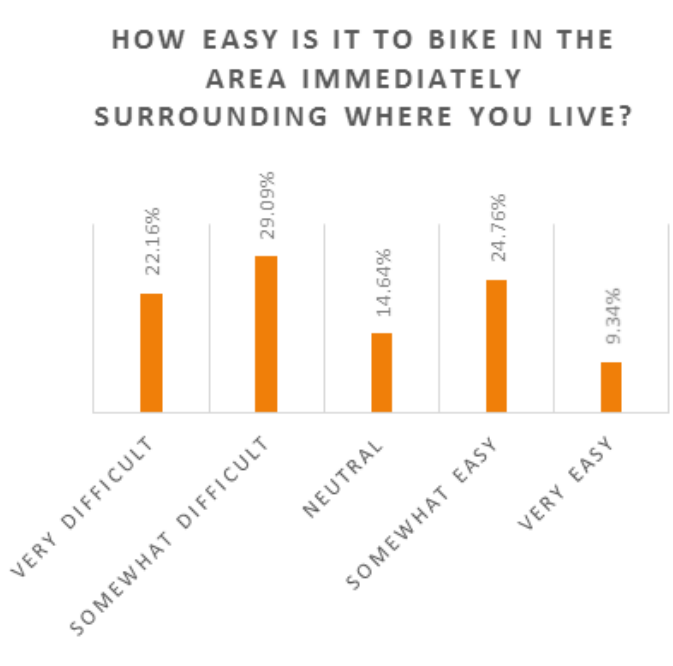
Durham Bike+Walk Implementation Plan website

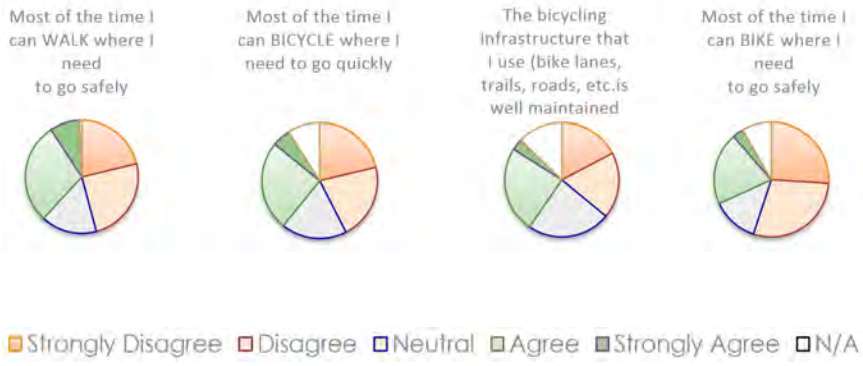


"Other" responses: "Organized social group rides" "Bike lanes are confusing to drivers" "More driver awareness/education on road sharing" "Traffic calming on high volume streets!" "Better facilities for getting cleaned up at my work destination" "Enforce Helmets and lights on bikes" "More security on the Tobacco Trail on morning and afternoon commute" "Quality of surfaces/roads" "Slow down vehicle traffic - lower speed limits in city limits" "Traffic lights that respond to cyclists" "Would consider biking if better off-street bike linkages" "Bike paths separate from car roads" "Bike lanes inadequately marked so cars routinely drive/pass in them"



"Other" responses: "More awareness from drivers" "Repair existing sidewalks" "Undoing the loop around downtown" "More shade trees along sidewalks!" "Better facilities for getting cleaned up at my work destination" "Connecting current greenways & paths" "Improved patrolling of the ATT, especially north of 54" "Closer proximity of destinations" "More things to walk to - neighborhood retail and restaurants" "More traffic calming devices" "Convert downtown Durham into a pedestrian only zone" "Enforcement at existing crosswalks" "We are unable to walk out of our development due to disconnected sidewalks"



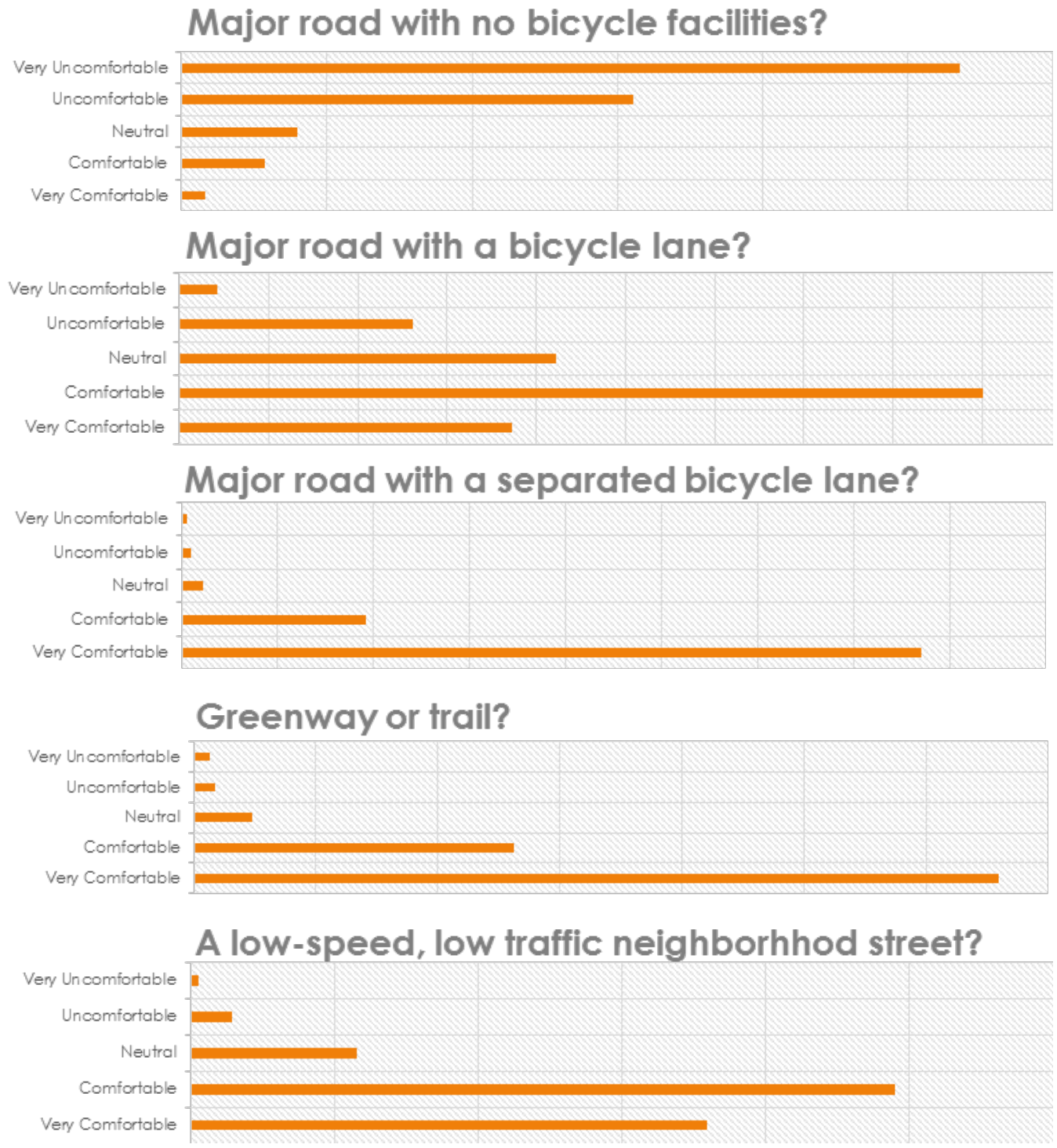


2 of 3

want small projects

Sixty-six percent (66%) of people said that they would prefer many, smaller projects compared to fewer, larger projects.

How comfortable do you feel about bicycling on a…

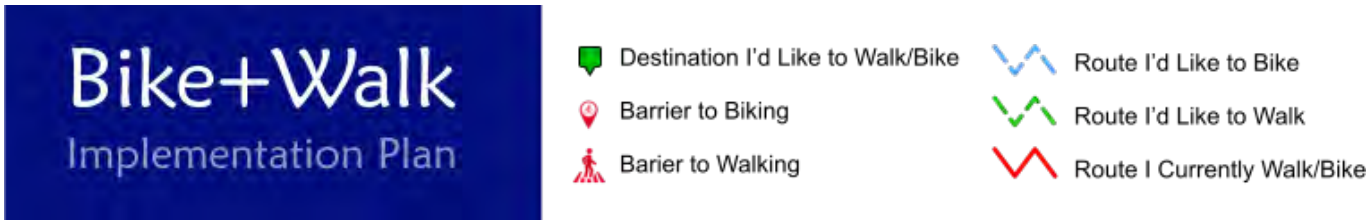


INTERACTIVE ONLINE MAPPING

To complement the electronic survey, a web-based crowdsourcing and mapping tool (Wikimaps) was tailored to the Durham and Duke active mode projects to gather and collaborate public knowledge on bicycle and pedestrian infrastructure, destinations, and barriers. Users accessed the tool through the project website and pinpointed where problem areas and/or desired routes are located. The data received aided the prioritization process and identified places where bicycle and pedestrian improvements were needed. However the team did not rely solely on Internet-based input and a variety of engagement techniques were used to make sure that people without access to the Internet could equally participate in the planning process.

Over 4,000 individual comments were provided by hundreds of people on the Durham / Duke Bike + Walk mapping site. The feedback takes the form of comments on other ideas; point locations or routes traveled (or desired to be traveled) for improving bicycle and pedestrian access and connectivity throughout the City of Durham; or barriers to biking and/or walking. Each point or line type was created with its own question that people could quickly answer to identify more information about the point or line that they were creating.

The figures on the next page illustrate the extent and general locations of the inputs. While inputs are no longer being received, the map can be viewed at www.durhambikewalkplan.com.



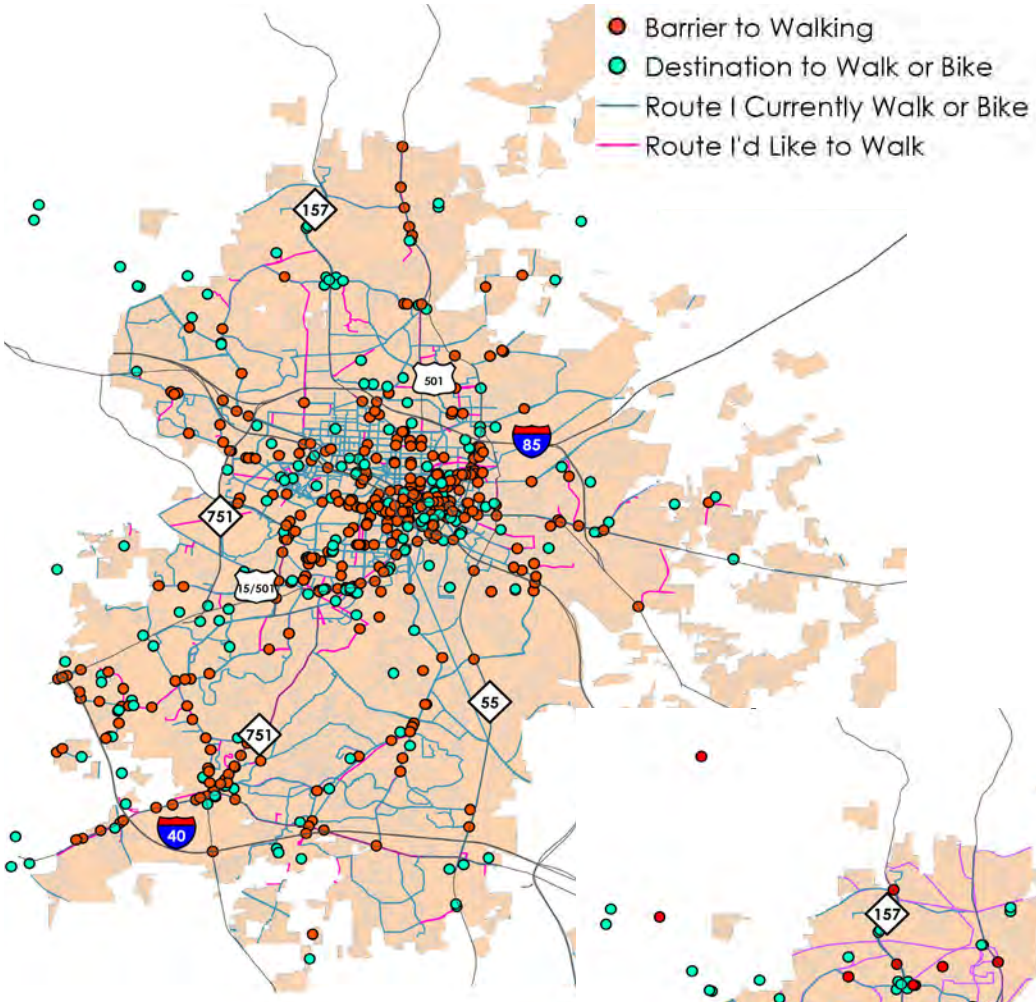
The menu from the Wikimapping (interactive map) site.

4000

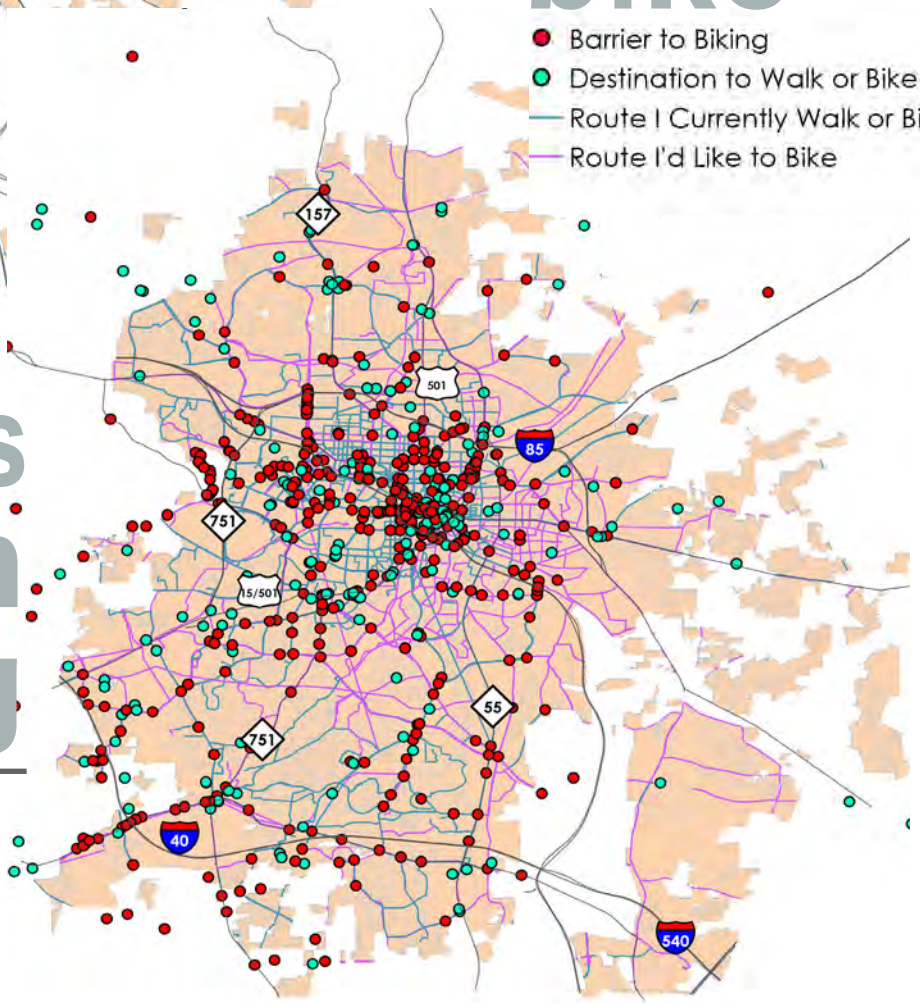
Inputs

Over 4,000 separate pieces of information were provided via the interactive map

walk



bike



Inputs from mapping

Walking & Biking | interactive map ONLY

how the plan determined
which projects to move forward

PRIORITIZATION OF PROJECTS

The focus of the Durham Bike+Walk Implementation Plan was to identify 75 projects that could be promptly constructed. But this required first identifying all the needs of Durham, ranking the projects through a prioritization process, and finally narrowing the list of projects by balancing constructability and need. The following discussion highlights the process undertaken by the Project Team.

Similar to the city's previous bicycle and pedestrian planning efforts, the initial task of this plan identified candidate projects in Durham. This effort was aided by public comments, past plans, and previously suggested projects as well as reviews of gaps between existing sidewalks, greenways, public schools, and transit. These efforts identified 461 miles of roads in need of new/improved bicycle facilities in Durham, 420 miles of sidewalk needs, and 480 intersections in need of improvement or redesign. A map of these facilities can be found on pages 50-53. All of these projects are recognized as needing improvement to better accommodate pedestrians and/or bicyclists. These projects were then prioritized using four factors determined by the Steering Committee with input from the survey results: safety, connectivity, demand, and equity. The current Plan then took the prioritization process a significant step further by narrowing the top ranking projects to 75 locations where rapid improvement is needed and where the city should direct its focus.

Four primary factors were used to determine a short list of projects from hundreds of miles of bike and sidewalk needs and almost 500 intersection needs . Final prioritization also involved reviewing locations and feasibility.

The figure provides a high-level overview of how the four factors were applied to the three kinds of candidate projects; the following pages provide more detail.

Bicycle Gap Candidate Projects

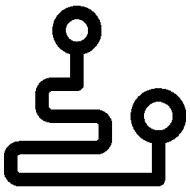
Potential bike projects from public, past plans, and staff inputs

SAFETY: bicycle crashes and vehicular speed

CONNECTIVITY: bicycle facilities crossed

DEMAND: colleges+rail stations+schools within ½-mile (students) + commercial & residential densities

EQUITY: households in poverty w/in ½-mile



Sidewalk Gap Candidate Projects

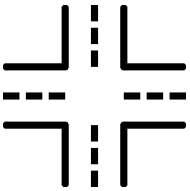
Potential projects involving sidewalks or other pedestrian paths

SAFETY: pedestrian crashes and vehicular speeds

CONNECTIVITY: walk facilities connected

DEMAND: near colleges+rail / bus stations+schools within ½-mile (students) + employment & residential densities+parks/rec facilities

EQUITY: households in poverty w/in ½-mile



Intersection Candidate Projects

Intersections that would benefit from safety improvements

SAFETY: pedestrian & bike crashes

CONNECTIVITY: within 200' of ped/bike facilities

DEMAND: near colleges+rail / bus stations+schools within ½-mile (students) + employment & residential densities+parks/rec facilities

EQUITY: households in poverty w/in ½-mile

PRIORITIZATION METHOD

The first round of prioritization included several steps. First, the consulting team, City staff and stakeholder committee members discussed the existing conditions, as well as what factors that should be used to weight projects. Second, projects were identified as noted above, and were categorized as a bicycle and/or pedestrian project, or an intersection project. Third, the consulting team members and City staff collaborated on key issues to define initial project locations, specifics regarding coding into a geographic information system (GIS) database, and applying the factors using variables and datasets available to the team. Finally, the projects were ranked using the *ActiveTrans Priority Tool*, a nationally regarded method for developing a quantitative ranking of projects. For this first round of prioritization it was necessary to use data that could be operationalized by the priority tool. The final step ensured that projects helped address areas across the city and that the projects were a mixture of actions that could be taken relatively quickly (although longer-term actions are also noted in the recommendations for some project locations).

process

Identify Candidate Projects.

461 miles of bicycle facilities,
394 miles of sidewalk facilities,
26 miles of sidewalk gaps (<500'),
and 480 intersections.

Apply weights.

Prioritization weights were established using input from public surveys and the Steering committee.

ActiveTrans Prioritization model.

All projects were scroed in the ActiveTrans model. High scoring projects undergo additional anysis regarding cost, feasibility, constructability, geographic equity, and project type to develop final list.

FACTORS AND VARIABLES FOR PRIORITIZING BICYCLE NETWORK GAPS

Factor	Variable	How Variable Is Measured
Safety	*Crashes involving bicyclists*	# of crashes involving bicyclists per mile along gap within 200'
	Speed limit	Average speed limit along gap, higher speeds positively influencing score
Connectivity	*Connects to Existing Facilities*	Number of existing bicycle facilities that gap intersects per mile
Demand	*Proximity to Attractors*	# of colleges and universities within 1 mile of gap per mile # of future light rail stations within ½ mile of gap per mile # of schools within ½ mile of gap per mile. Weight schools as follows: all non-public schools and public schools less than 400 enrollment as (x1), public schools with 400-999 enrollment (x2), and schools with 1000 or more (x3) # of employment centers within ½-mile of gap per mile # of parks and recreation facilities within 1/2 mile of gap per mile
(also includes variables related to Access / Convenience)	*Land Use*	Proportion of high-density commercial land uses along gap.
	Population Density	Average population density within ½-mile of gap by Census Block Group
Equity	*Households in Poverty*	Average proportion of households in poverty within ½-mile of gap by Census Block Group

William Bruce Cameron

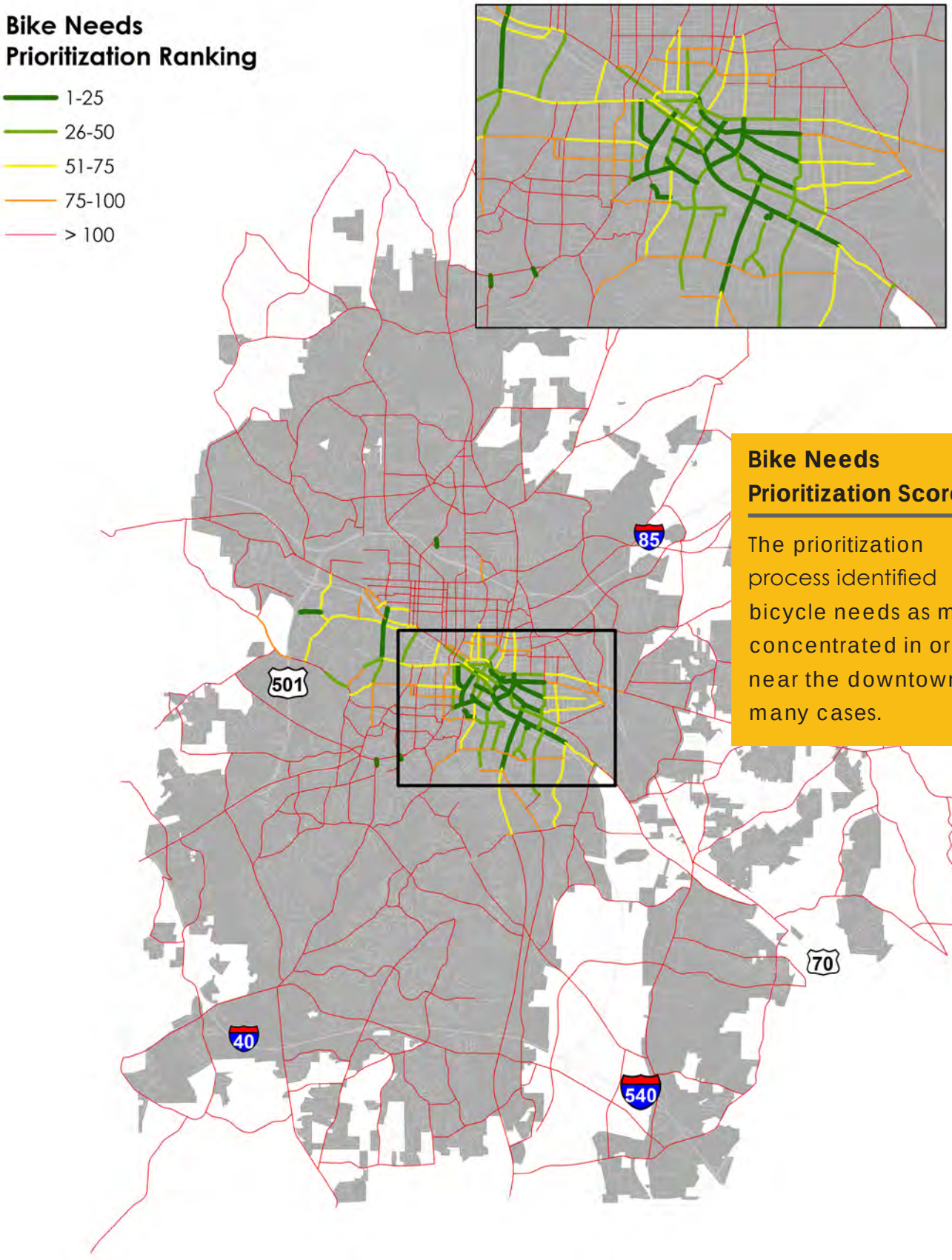
Not everything that can be counted counts.

FACTORS AND VARIABLES FOR PRIORITIZING PEDESTRIAN NETWORK GAPS

Factor	Variable	How Variable Is Measured
Safety	*Crashes involving pedestrians*	# of crashes involving pedestrians per mile along gap within 200'
	Speed limit	Average speed limit along gap, higher speeds positively influencing score
Connectivity	*Connects to Existing Facilities*	Connects to more than one existing facility=10 Connects to existing facility on one end=5 Does not connect to existing facility=0
Demand	*Proximity to Attractors*	# of colleges and universities within 1/2 mile of gap per mile # of future light rail stations within 1/4 mile of gap per mile # of schools within 1/4 mile of gap per mile. Weight schools as follows: all non-public schools and public schools less than 400 enrollment as (x1), public schools with 400-999 enrollment (x2), and schools with 1000 or more (x3) # of employment centers within 1/4 mile of gap per mile. # of parks and recreation facilities within 1/4 mile of gap per mile # of bus stops within ¼ mile of gap (weighted by boardings and alightings)
(also includes variables related to Access / Convenience)	*Land Use*	Proportion of high-density commercial land uses along gap.
	Population Density	Average population density within ½-mile of gap by Census Block Group
Equity	*Households in Poverty*	Average proportion of households in poverty within ½-mile of gap by Census Block Group

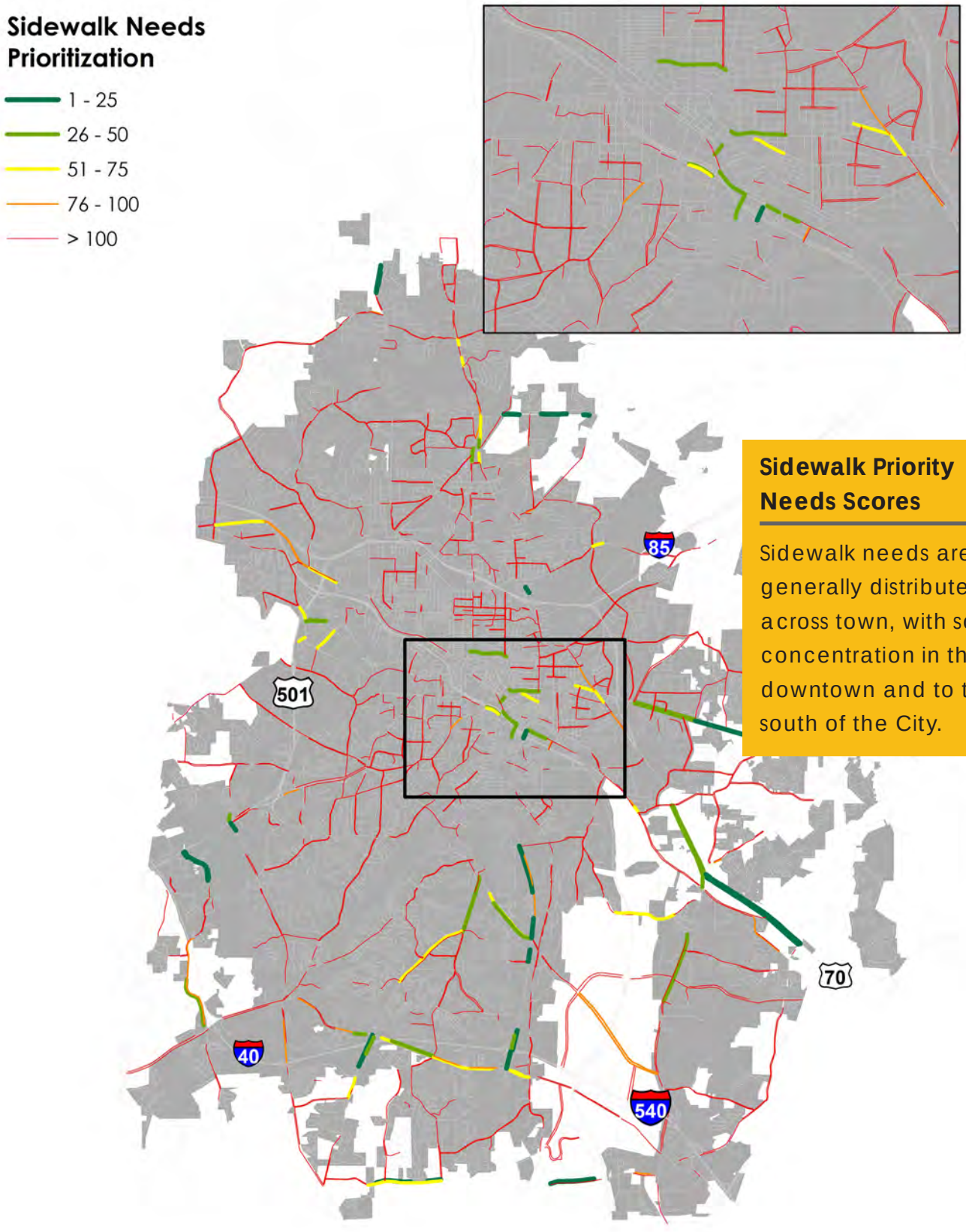
FACTORS AND VARIABLES FOR PRIORITIZING INTERSECTION IMPROVEMENTS

Factor	Variable	How Variable Is Measured
Safety	*Crashes involving pedestrians or bicyclists*	# of crashes within 500 feet of intersection or mid-block crossing centroid
Connectivity	*Connects to Existing Pedestrian or Bicycle Facilities*	Intersection or mid-block crossing centroid is within 200 feet of existing pedestrian and bicycle facilities=10 Intersection or mid-block crossing centroid is not within 200 feet of existing pedestrian and bicycle facilities=0
Demand	*Proximity to Attractors*	# of colleges and universities within 1/2 mile of gap per mile # of future light rail stations within 1/4 mile of gap per mile # of schools within 1/4 mile of gap per mile. Weight schools as follows: all non-public schools and public schools less than 400 enrollment as (x1), public schools with 400-999 enrollment (x2), and schools with 1000 or more (x3) # of employment centers within 1/4 mile of gap per mile. # of parks and recreation facilities within 1/4 mile of gap per mile. # of bus stops within ¼ mile of gap (weighted by boardings and alightings)
	Land Use	Proportion of high-density commercial land use within 1/4-mile of intersection
	Population Density	Average population density within ½-mile of intersection by Census Block Group
Equity	*Households in Poverty*	Average proportion of households in poverty within ½-mile of intersection by Census Block Group



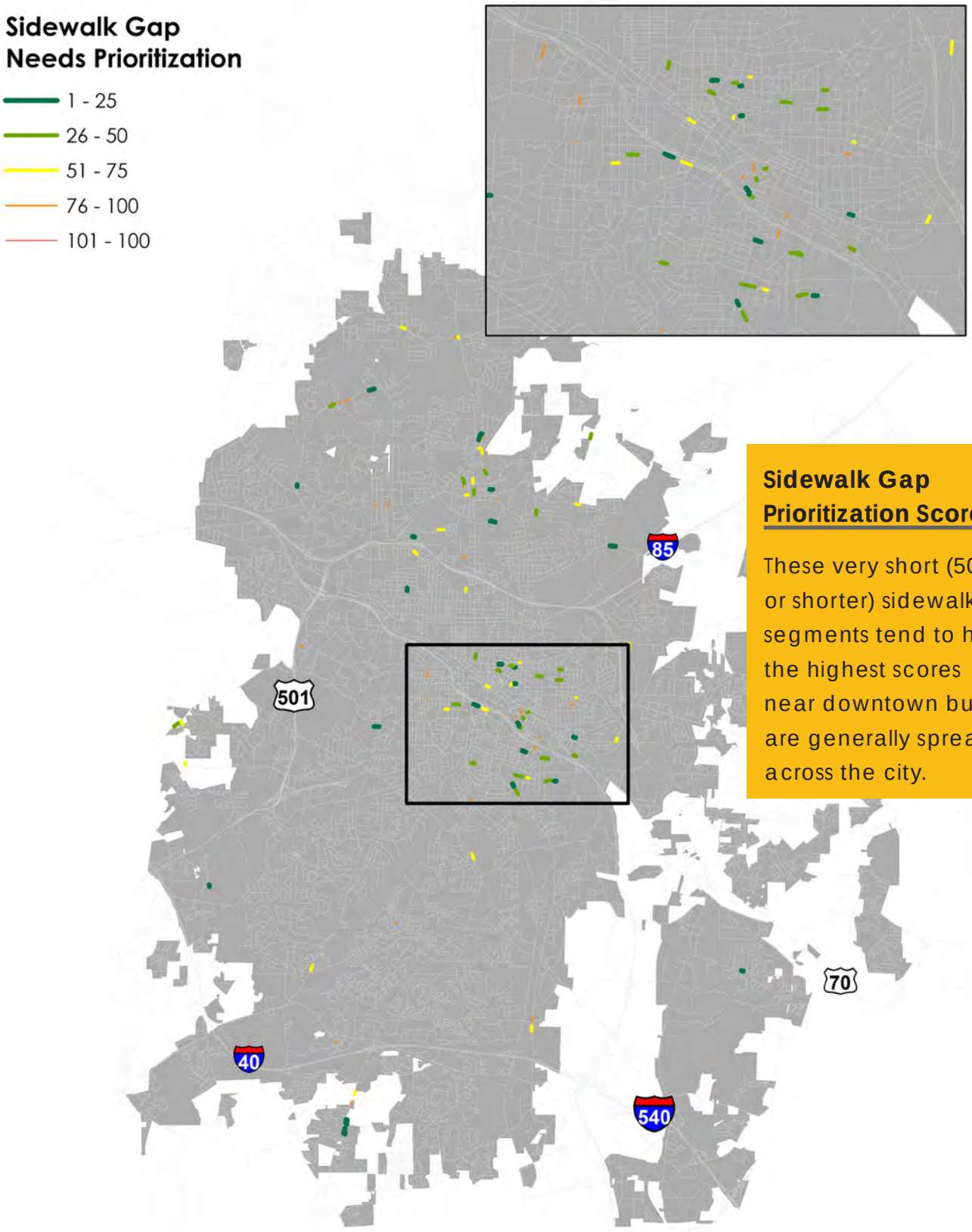
Bike Needs Prioritization Scores

The prioritization process identified bicycle needs as most concentrated in or near the downtown in many cases.



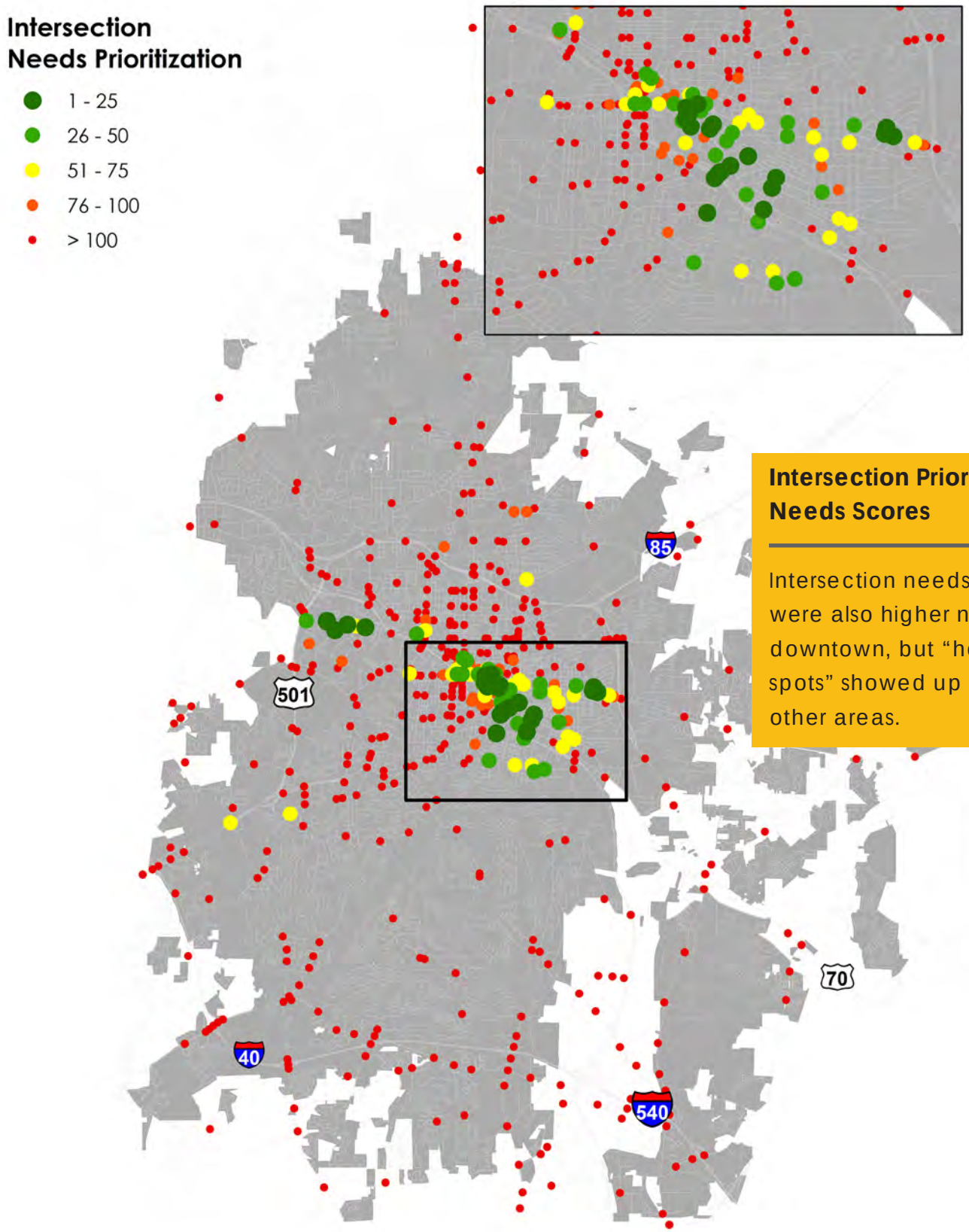
Sidewalk Priority Needs Scores

Sidewalk needs are generally distributed across town, with some concentration in the downtown and to the south of the City.



Sidewalk Gap Prioritization Scores

These very short (500' or shorter) sidewalk segments tend to have the highest scores near downtown but are generally spread across the city.



Intersection Priority Needs Scores

Intersection needs were also higher near downtown, but "hot spots" showed up in other areas.

planning through prioritization

GETTING TO 75

The first round of projects indentified the critical needs in the city using the prioritization method previously described. Next, these needs were analyzed by the project team to ensure that the candidate projects:

- Were not part of a future funded project
- Balanced need and constructability/ feasibility
- Were geographically equitable
- Had the appropriate project origin and termini

From this second round of prioritization, the following project lists were developed. These projects were presented to the public for comment during the month of February 2017. Feedback received from the public, staff, and other stakeholders was incorporated and developed into final project recommendations. The list of final priority projects are described and illustrated on the following pages.

John Lennon

topics

Building Regional Connections
Tactical Urbanism
Fostering Partnerships in Sidewalk Construction
Making the Jump: Innovative Facilities and What's Required
Economics of Biking and Walking
Benchmarking Peer Communities
Education is Key
Safe Routes to School Committee
Maintaining Our Place
Unified Development Ordinance (UDO)
The Final Topic: It's About Every Project

Topics | Creating a great environment that supports safe and effective biking and walking is about more than concrete and paint. These 11 topics identify important actons that the City and its partner can undertake to make active modes a priority. See Section III.

As a kid I had a dream — I wanted to own my own bicycle. When I got the bike I must have been the happiest boy in Liverpool, maybe the world.

Safety is crucial

Repeatedly, the project team heard safety and personal security as key concerns in the minds of residents, so lighting and context-sensitive treatments were important in some of the recommendations. People feel safest when they bike and walk away from car traffic; designs to do this are more expensive than on-road treatments, but separated facilities should be the preferred option when it is feasible to do so, even if it is a longer-term proposition.

There are many potential active mode projects in Durham

The project team and citizens collectively identified literally thousands of candidate gaps, intersections, and longer corridors through this planning process. In total the projects measured 461 miles in bicycle facilities, 395 miles of sidewalk, 25.6 miles of sidewalk gaps and 480 intersections. Continued financing, expedited delivery of projects, and updating this plan are highly recommended actions to begin to address the backlog of great projects.

Prioritization had to integrate a lot of factors

While the prioritization tool used by the Project Team was a good start, final selection required integrating thousands of public comments, prior experiences and plans, and an understanding of the feasibility of a particular project as well as how it relates to other existing, programmed, and planned projects.

Corridor	From	To	Length
Recommended Bicycle-Focused Projects			
Chapel Hill St	Ramseur St	Swift Ave	1.07 miles
Club Blvd	Washington St	Broad St	1.07 miles
Foster St	American Tobacco Trail	Monmouth Ave/Trinity Ave	1.07 miles
Fulton St	Erwin Rd	Durham Freeway	.38 miles
Liberty St	Cleveland St	N Miami Blvd	1.89 miles
Morgan St	Great Jones St	Main St	.49 miles
University Dr	Hope Valley Rd	Garrett Rd	3.94 miles
Watts St	Club Blvd	Morgan St	1.07 miles
Recommended Pedestrian Pedestrian-Focused Projects			
Clayton Rd	Obsidian Way	Chandler Rd	.45 miles
Cornwallis Rd	Industry Ln (Existing Sidwalks)	NC 55	1.13 miles
Corporation St	Mangum St	Duke St	.63 miles
Fayetteville St	Lawson St	Main St	1.15 miles
Hardee St	Cheek Rd	Holloway St	.96 miles
Hillsborough Rd	LaSalle St	Neil Rd (Bus Stop)	.58 miles
Holloway St	Chandler Rd	Junction Rd	1.05 miles
Holloway St	Gary Ave	Guthrie Ave	.36 miles
Horton Rd	Roxboro St	Guess Rd	1.60 miles
Miami Blvd	New Haven Dr	Cornwallis Rd	2.47 miles
N Roxboro St	Fairfield Rd	Milton St	2.73 miles
NC 54	NC 55	Fayetteville Rd	2.29 miles
NC 55	NC 54	Carpenter Fletcher Rd	.91 miles
NC 55	Riddle Rd	Cornwallis Rd	1.57 miles
Old Oxford Rd	Dearborn Dr	Roxboro St	.58 miles
Pettigrew St	Briggs Ave	Alston Ave	.99 miles
SW Durham Dr	Durham Chapel Hill Blvd	Old Chapel Hill Rd	.99 miles

Recommended Intersection Projects			Sidewalk Gap Projects	
Street 1	**Street 2**	**Street 3**	**On Street**	**Length**
Foster St	W Trinity Ave	Washington St	Ashe St	102’
S Mangum St	S Dillard St		North Pointe Dr	245’
Roxboro St	Jackie Robinson Dr	S Service Rd	Hunt St	135’
Blackwell St	Jackie Robinson Dr	S Service Rd	Cooper St	644’
Swift Ave	Caswell Pl	Hwy 147 on/off ramp	Ramseur St	330’
Hollowayy St	N Miami Blvd	Raynor St	Gregson St	197’
Durham-Chapel Hill Blvd	Hope Valley Rd		Lumley Rd	201’
James St	Durham-Chapel Hill Blvd	University Dr	Fayetteville St	498’
Alston Ave	Cornwallis Rd		S Elm St	135’
Tower Blvd	Durham-Chapel Hill Blvd		Stadium Dr	582’
Fayetteville Rd	Herndon Rd		Leon St	428’
Scott King Rd	American Tobacco Trail		S Miami Blvd	400’
Lawson St	Ridgeway Ave		Juliette Dr	214’
Cornwallis Rd	NC 55		Pickett Rd	182’
Mineral Springs Rd	NC 98		Raynor St	292’
Duke University Dr	Academy Rd	Cameron Blvd	Morehead Ave	790’
Durham-Chapel Hill Blvd	Mt. Moriah Rd		Broad St	446’
Club Blvd	Roxboro St		Holt School Rd	432’
Markham Ave	Buchanan Blvd		Green St	158’
Broad St	Markham Ave		Cook Rd	394’
Avondale Dr	N Roxboro St		W Main St	670’
Oakwood Ave	Holloway St		Duke University Rd	992’
			University Dr	132’
			Fayetteville St	53’
			Cheek Rd	863’

[THIS PAGE INTENTIONALLY LEFT BLANK]

Priority Project Recommendations

Recommended Intersection Projects				Sidewalk Gap Projects (begin page 138)	
Street 1	**Street 2**	**Street 3**	**Page**	**On Street**	**Length**
Foster St	W Trinity Ave	Washington St	114	Ashe St	102’
S Mangum St	S Dillard St		115	North Pointe Dr	245’
Roxboro St	Jackie Robinson Dr	S Service Rd	116	Hunt St	135’
Blackwell St	Jackie Robinson Dr	S Service Rd	117	Cooper St	644’
Swift Ave	Caswell Pl	Hwy 147 on/off ramp	118	Ramseur St	330’
Swift Ave	Pettigrew St	Railroad	119		
Holloway St	N Miami Blvd	Raynor St	120	Gregson St	197’
Durham-Chapel Hill Blvd	Hope Valley Rd		121	Lumley Rd	201’
James St	Durham-Chapel Hill Blvd	University Dr	120	Fayetteville St	498’
Alston Ave	Cornwallis Rd		123	S Elm St	135’
Tower Blvd	Durham-Chapel Hill Blvd		124	Stadium Dr	582’
Fayetteville Rd	Herndon Rd		125	Leon St	428’
Scott King Rd	American Tobacco Trail		126	S Miami Blvd	400’
Lawson St	Ridgeway Ave		127	Juliette Dr	214’
Cornwallis Rd	NC 55		128	Pickett Rd	182’
Mineral Springs Rd	NC 98		129	Raynor St	292’
Duke University Dr	Academy Rd	Cameron Blvd	130	Morehead Ave	790’
Durham-Chapel Hill Blvd	Mt. Moriah Rd		131	Broad St	446’
Club Blvd	Roxboro St		132	Holt School Rd	432’
Markham Ave	Buchanan Blvd		133	Green St	158’
Broad St	Markham Ave		134	Cook Rd	394’
Avondale Dr	N Roxboro St		135	W Main St	670’
Oakwood Ave	Holloway St		136	Duke University Rd	992’
				University Dr	132’
				Fayetteville St	53’
				Cheek Rd	863’

DESIGN WITH PRINCIPLE

During the intensive and iterative review that took place to develop these recommendations, a number of design themes appeared consistently to address similar issues. Although not a "design guide" (see text box at right for the preferred guidance), these two pages help introduce the most common situations encountered during the assessment of projects that follow. Seemingly small changes, like more right-turn-on-red restrictions, leading pedestrian intervals, signage, and pavement markings applied correctly can help improve safety.

These are "foundation" types of considerations - there are many unique situations that may call for specialized treatments; but these issues were encountered often in the planning process.

One resource that the project team referenced frequently is the NACTO Urban Bikeway Design Guide (the companion documents for Urban Streets and Transit Streets are also useful) - the first and foremost recommendation is to continue to reference this important national guidance for future planning, design, and construction efforts. AASHTO and FHWA also publish valuable resources that are historically recognized by local and state transportation departments.

GENERAL PRINCIPLES

Bicycle Corridors

- *Mixing: all modes can mix with fewer than 2000 VPD and at 20mph or slower. Minimal infrastructure, with a focus on traffic calming elements*
- *Separate: Speeds and volumes of traffic are two main considerations for when to separate bicyclists and pedestrians from cars (see next page); but there are unique conditions to consider in every design process*
- *One-way streets for cars should remain two-way for bikes, preferably using a contra-flow bicycle lane physically separated from on-coming traffic.*
- *Unless there are strong reasons to do otherwise, one-directional bike facilities are in principle preferred over bi-directional for safety reasons*

Pedestrian and Bicycle Crossings

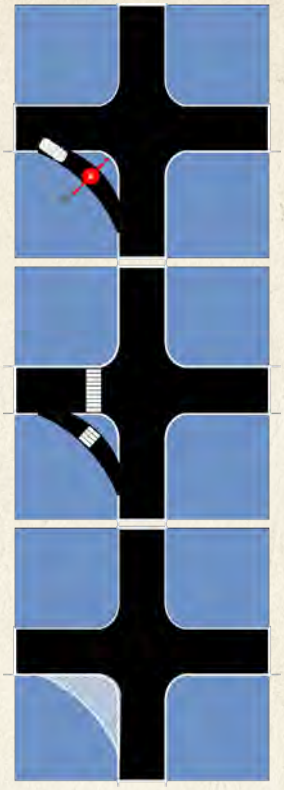
- *Traffic islands: more than two lanes and unsignalized intersections/crossings require traffic island to enable a two-stage turn*
- *Two-phase left turns for cyclists are recommended over advanced stop boxes on left turn pockets*
- *Stop lines: to increase visibility of bicycles, pull stop lines back for cars, move forward for bikes*
- *Green paint on approaches to and through intersections and multi-unit driveways (see at right)*
- *Improve detection of bicycles at signalized intersections*
- *Use elements of protected intersections to guide intersection design: physical barriers that protect cyclists and pedestrians at corners and narrow intersection for cars, tight turn radius, bike lanes/ crosswalks bend out, minimize crossing distances*
- *Remove free-right turns for cars, balancing queuing and safety for all modes of traffic*
- *Weigh the needs of adjacent properties when considering on-street parking removal*

Additional Elements

- *More than four buses/hour = dedicated bus stop, (with bike lane on the right of the stop)*
- *Wayfinding is achieved by paint markings on the ground or with vertical signage*
- *Lighting in areas where people wait for buses, isolated intersections, and to support crime-reduction efforts*

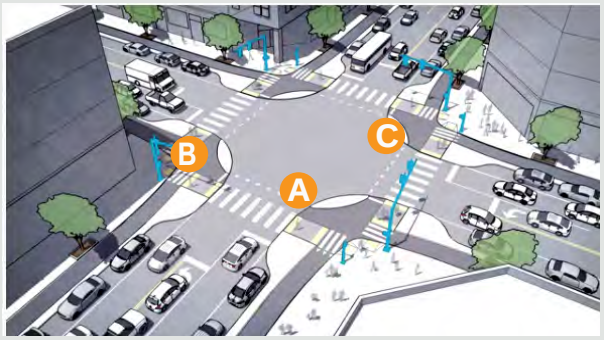
HIGH-SPEED RIGHT TURNS

Cars making speedy turns often neglect to check for pedestrians or cyclists (top). Options include creating a safe refuge (middle) or building out the turning radius to slow turns (bottom). Capacity is reduced on the approach, and more rear-end crashes are likely, warranting caution.



PEDESTRIANS AT INTERSECTIONS

Pedestrian safety can be improved by reducing curb radii and creating "bulb-outs" or constructing curb extensions to reduce crossing distances (A). Additional treatments include leading intervals to allow cyclists and pedestrians to start into the intersection before cars (B) and advance staging areas (C). These treatments are advisable in high pedestrian / cyclist traffic routes, downtown, and near some schools - posted speeds of 25mph or lower, and less than 2,000 cars per day are optimal conditions.

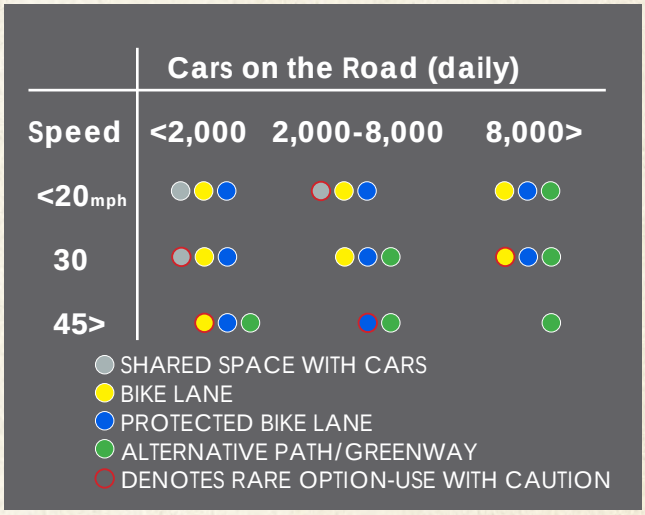


source: ProtectedIntersection.com

WHICH INFRASTRUCTURE TREATMENT TO CONSIDER?

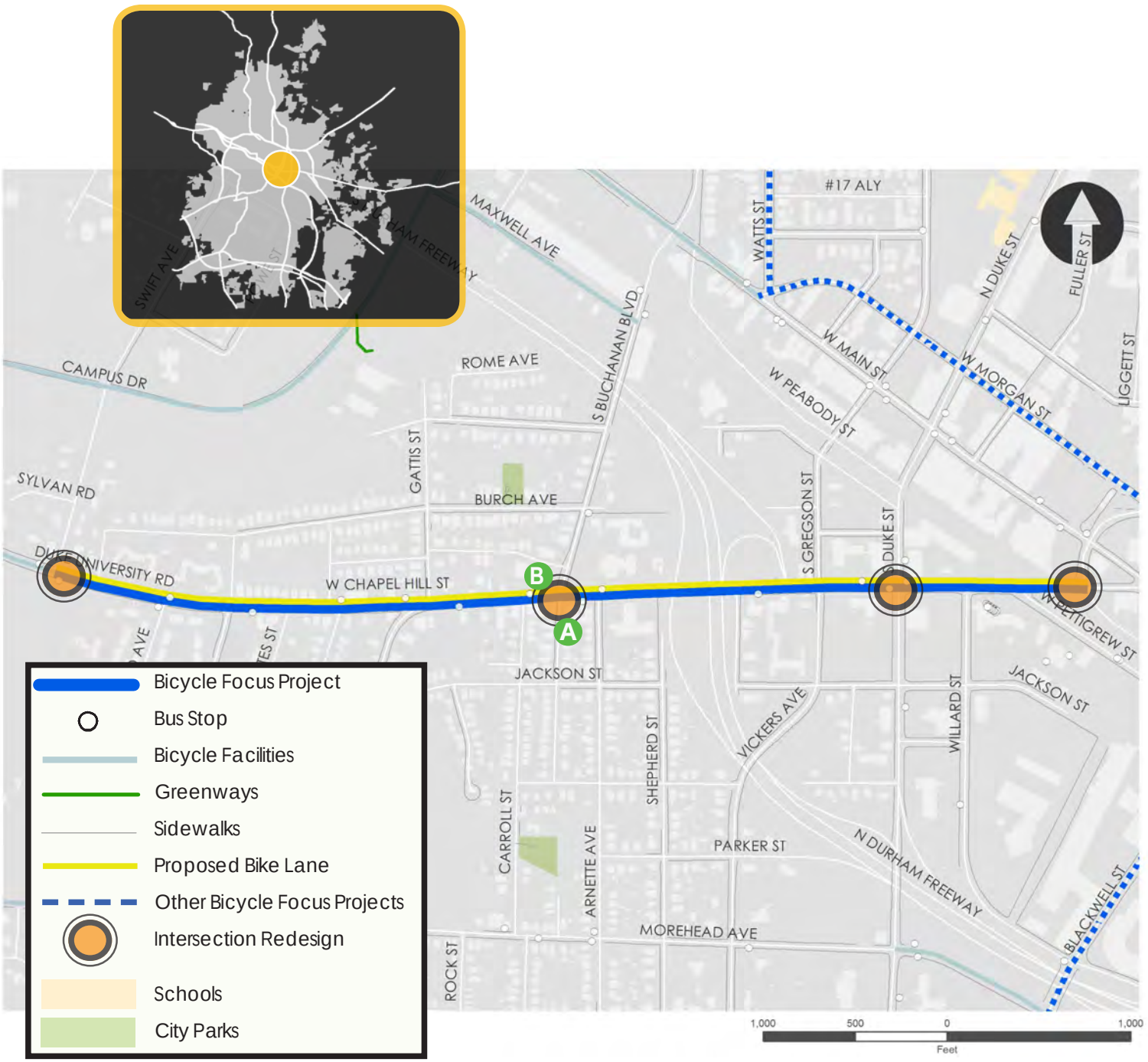
There is no universal rule for selecting infrastructure treatments. See the decision tree at right for basic considerations.Other important rules are fairly steadfast "go-tos" when making this important design decision.

- As speeds approach 45mph, separating the bicycle traffic from cars is crucial. More driveways and more lanes of travel create greater conflicts; the decision matrix at right would need to be adjusted accordingly.
- More people use separated paths (e.g., protected bike lanes) but careful design at intersections become more necessary.
- For pedestrian travel, mid-block crossings may be warranted where greenways cross the road, high foot-traffic locations, demonstrated high-crash areas but generally should be used sparingly.
- Each location is unique, and should be studied and designed carefully.



SPECIFIC ISSUES ENCOUNTERED OFTEN IN DURHAM

COST ESTIMATES ARE PRELIMINARY
OPINIONS OF PROBABLE COST ONLY

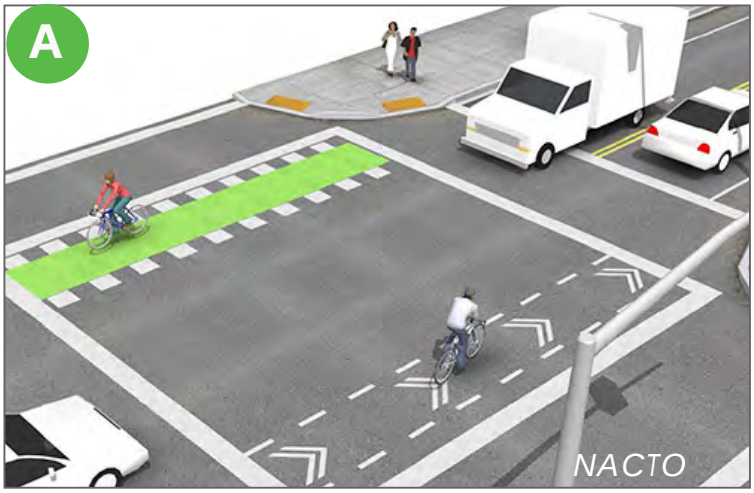


Varying street widths, removal of parking spaces, school drop off area

"Bike lanes are frequently blocked during the week for school drop offs and pickups. Bike lanes are usually blocked on Sundays to parked cars"

Connects to Downtown and Duke University

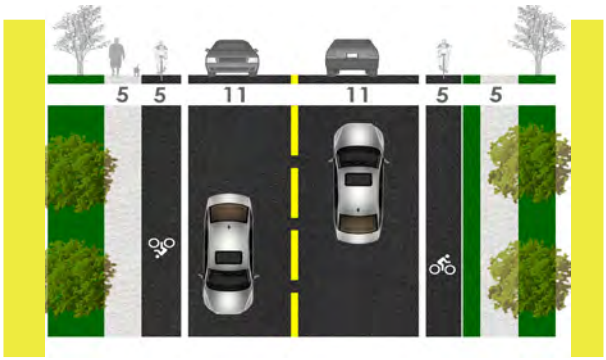
Challenges Public Comment Connectivity

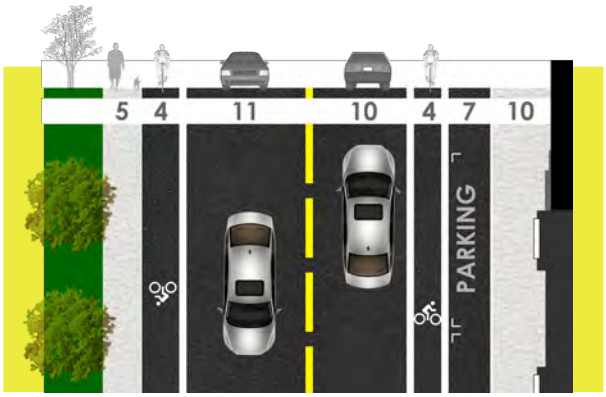


W. CHAPEL HILL ST

FROM: Ramseur Street
TO: Swift Avenue
LENGTH: 1.07 miles

Critical improvements to this corridor include adding green paint at the major conflict points and intersections, narrowing the width of the NC 147 on-ramps, restricting parking in the existing bike lanes, and keeping the bicycle lanes continuous through the corridor (through removal of parking or turn lanes). Other improvements include removing the shared bike-parking lane and making it an enforced bicycle-only lane, and adding pedestrian-scale lighting in commercial areas.



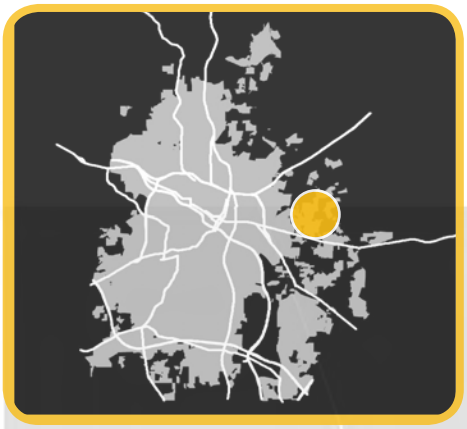


(atypical) Alternate cross-section with on-street parking on one side; use any additional space to offset outside edge of bike lane from parking zone

Key Points

- Serves as a main bike arterial, but many residents commented on the need for improvement.
- Provides connections to Duke, downtown, neighborhoods and existing bicycle facilities.

Construction Cost (Include signage, changing out signal heads, restriping for bike lanes and intersection improvements) **$253,316**



- Pedestrian Focus Project
- Bus Stop
- Sidewalks
- Proposed Sidewalks
- Proposed Bike Lanes
- Intersection Redesign
- Schools
- City Parks

Add crosswalks and slow turns at intersection

Complete the sidewalk network

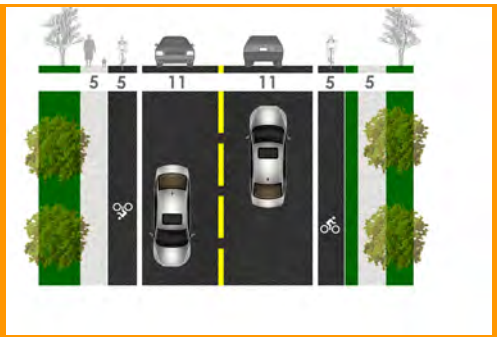
Connectivity Redesign intersection

CLAYTON ROAD

FROM: Obsidian Way
TO: Chandler Road
LENGTH: .45 miles

Clayton/Freeman Road serves primarily low-density, residential neighborhoods with intermittent footpaths. Southern High School near the corner is an attraction for more foot traffic.

To improve traffic safety, critical improvements include connecting sidewalks on two sides from Obsidian Way to Chandler Road, making intersection improvements at the intersection of Clayton and Freeman by extending the curb line and adding crosswalks, and improving lighting at transit stops.

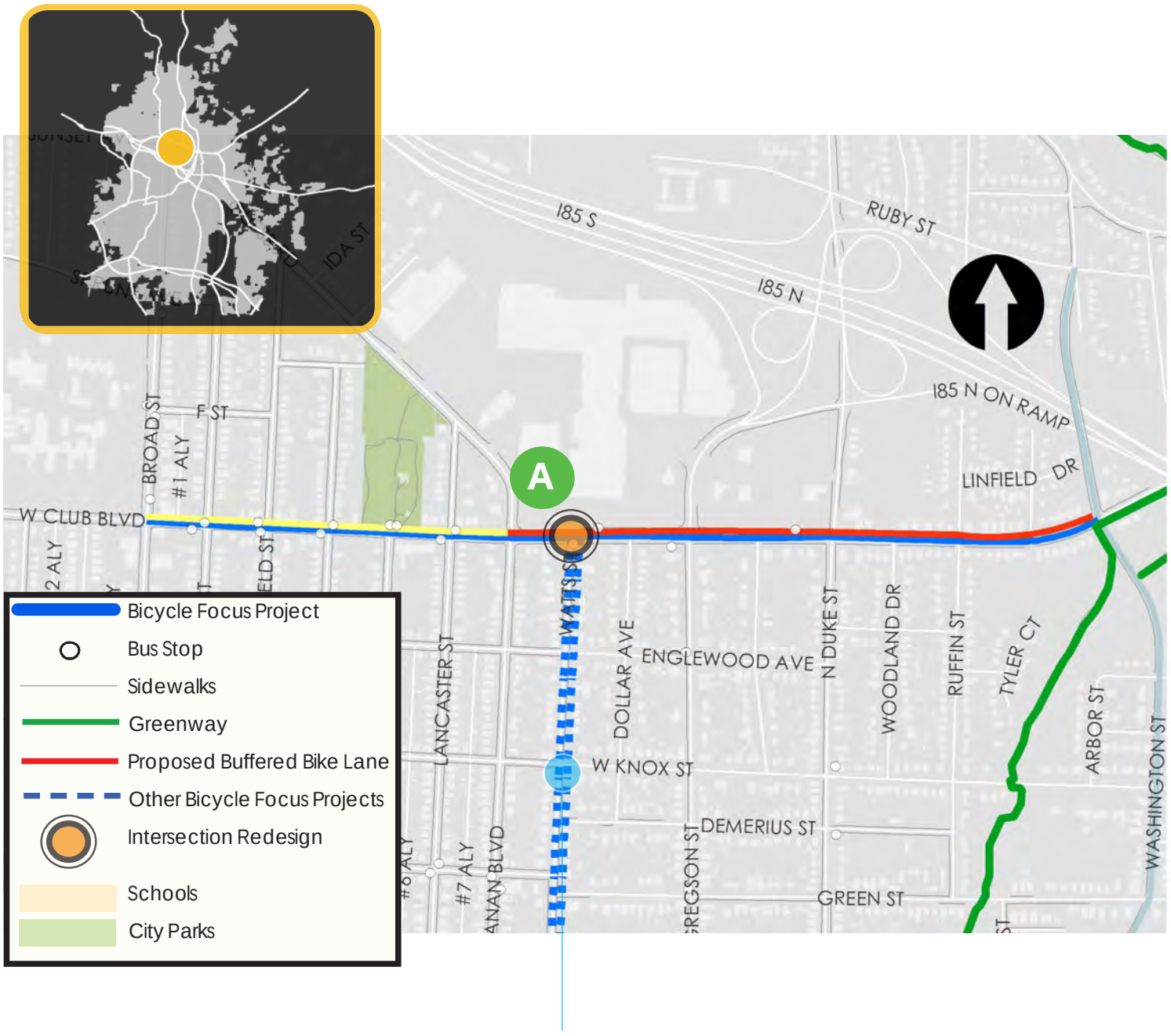


Key Points

- Provides safe area to walk and bike.
- Congested streets with large amount of destinations for pedestrians and cyclists to reach.

Construction Cost: (Intersection improvements, sidewalk construction, right of way acquisition.) $412,386

CLAYTON ROAD



Additional pedestrian-scale lighting needed

Connection to Watts St. and trails, and to other bicycle corridors and downtown area

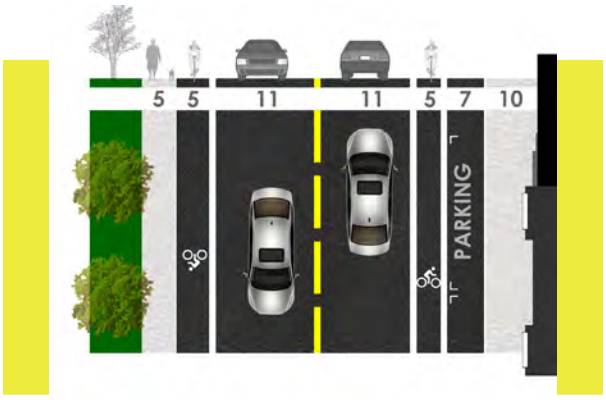
"Adding bicycle lanes would connect much of west central Durham"

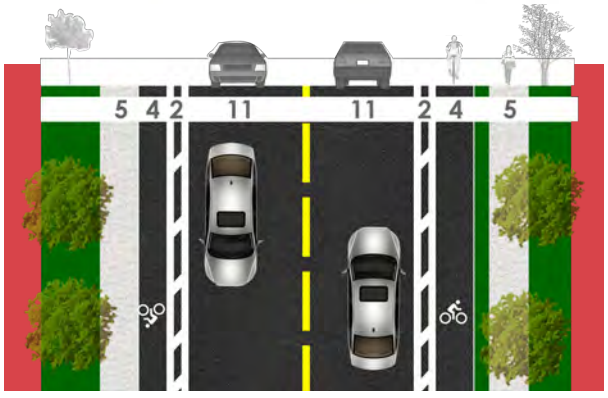
Public Comment Connectivity

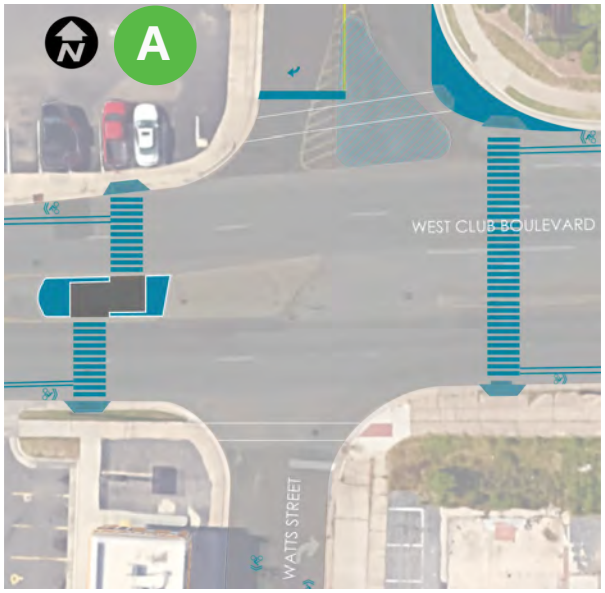
CLUB BOULEVARD

FROM: Washington Street
TO: Broad Street
LENGTH: 1.07 miles

*The eastern section of Club Boulevard is a four-lane arterial, with moderate traffic speeds and volumes (11,000ADT - **a**verage **d**aily **t**raffic), allowing for possible lane reallocation in the four-lane section east of Buchanan. Critical improvements include adding bike lanes from Broad St. to Washington St. and green paint at three critical intersections/conflict points. This project could be done through lane reallocation, and modifications to the existing median. Other improvements involve facilitating pedestrian crossings through intersection improvements, mid-block crossing at Watts Boulevard, and improving lighting at eight transit stops.*





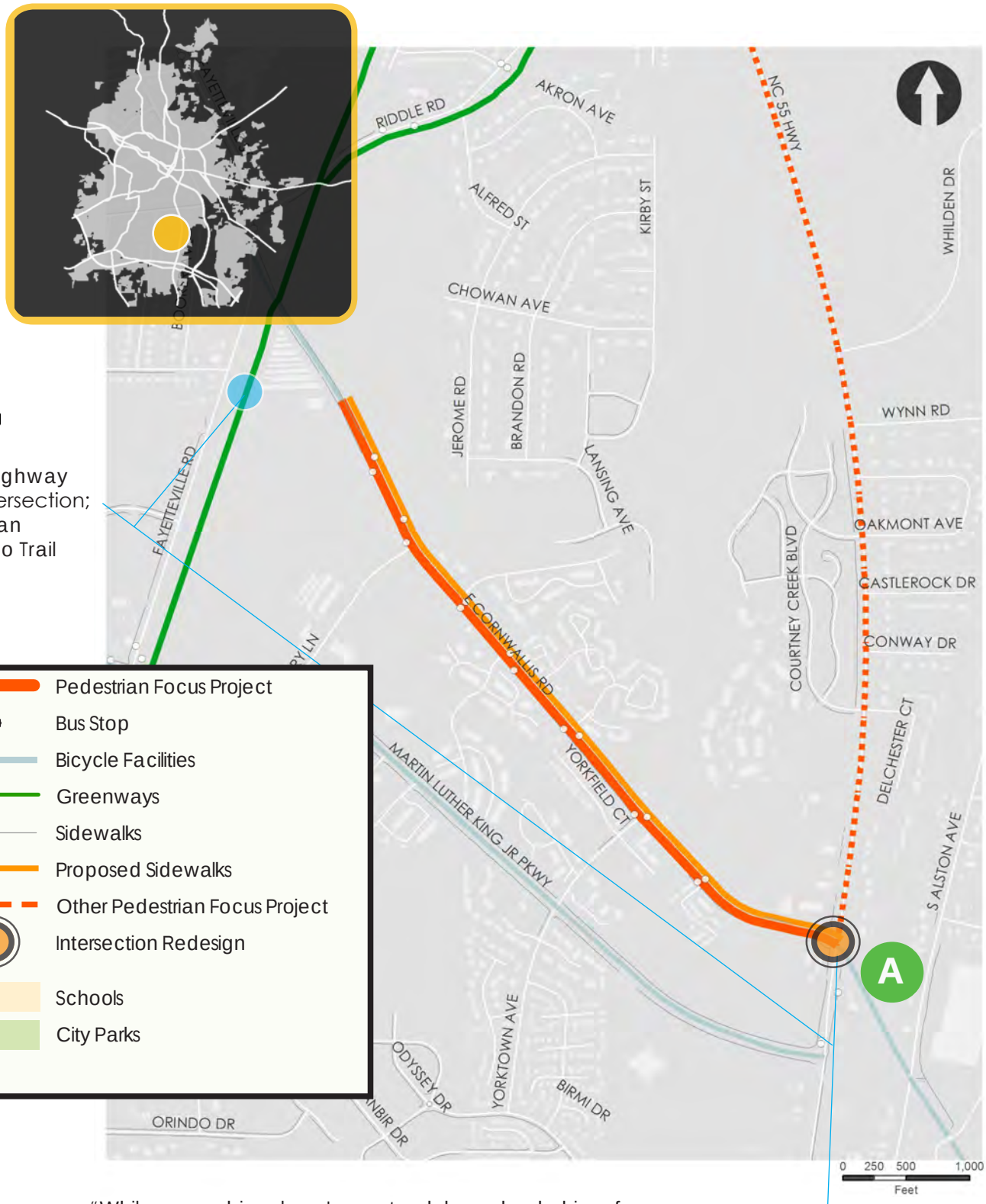


Key Points

- Provides access to key destinations.
- Connects to other bicycle projects, including the Watts Bike Boulevard.

Construction Cost (includes bicyle lane markings, signage, shortening taper at Northgate Mall entrance, and Watts Boulevard pedestrian crossing treatments as shown): **$350,436**

CLUB BOULEVARD



Apex Highway and Intersection; American Tobacco Trail

- Pedestrian Focus Project
- Bus Stop
- Bicycle Facilities
- Greenways
- Sidewalks
- Proposed Sidewalks
- Other Pedestrian Focus Project
- Intersection Redesign
- Schools
- City Parks

"While on my bicycle ... I was struck by a drunk driver from behind who swerved into the bike lane. The physical injuries could have been far worse, but I am dealing with at least a broken leg and back pain. Having biked down this road dozens of times, I frequently encounter pedestrians walking in the bike lanes. I would strongly recommend sidewalk additions and improvements along Cornwallis from Rt 55 to the Tobacco Trail."

Redesign / Improve Intersection with Apex Highway (NC 55)

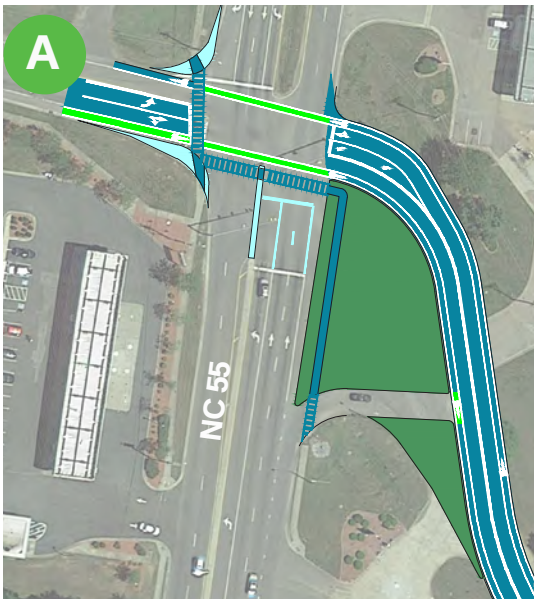
Intersection Redesign Public Comment

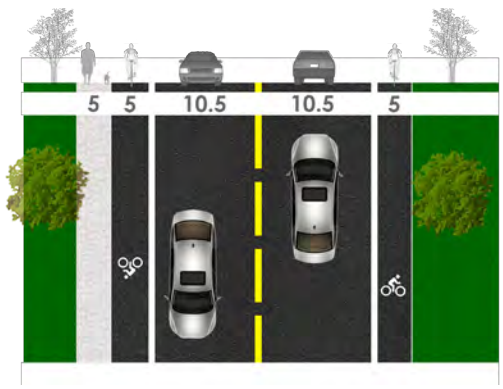
CORNWALLIS ROAD

FROM: Existing sidewalk
TO: NC 55 Highway
LENGTH: 1.13 miles

Pedestrian connectivity would be improved with the completion of the sidewalk along the south side of the roadway. Many college students live in the adjacent apartment complexes, and heavily utilize public transportation and the bus stops that dot the road.

Critical improvements include sidewalks on south side of Cornwallis, improved lighting, seating at and connections to transit stops (and two shelters in front of apartments), as well as intersection improvements at Cornwallis/NC 55 (cost and project described on page 123). Other improvements include adding sidewalk and curb/gutter on both sides of the street and adding buffer between travel lanes and bicycle lanes.



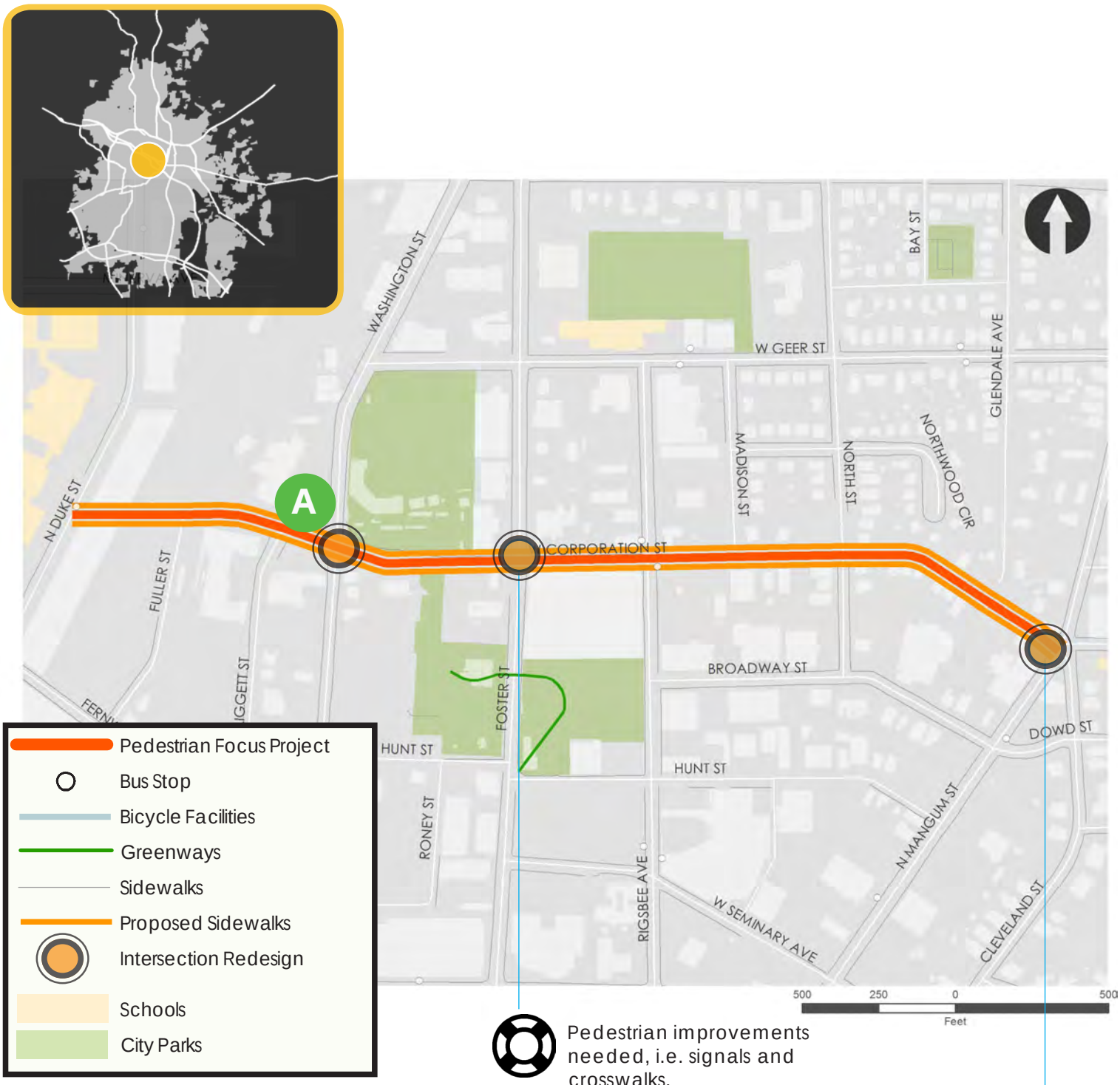


Key Points

- Provides safe area to walk and bike.
- Completes a larger pedestrian network.
- Access to ATT.

Construction Cost (nearly one mile of sidewalk, lighting): $1,465,000

CORNWALLIS ROAD



Pedestrian improvements needed, i.e. signals and crosswalks.

Pedestrian improvements needed, i.e. signals and crosswalks.

"Great idea for the pedestrian corridor here! I'm also supportive of the other comments noting that a bike lane would be great here as well."

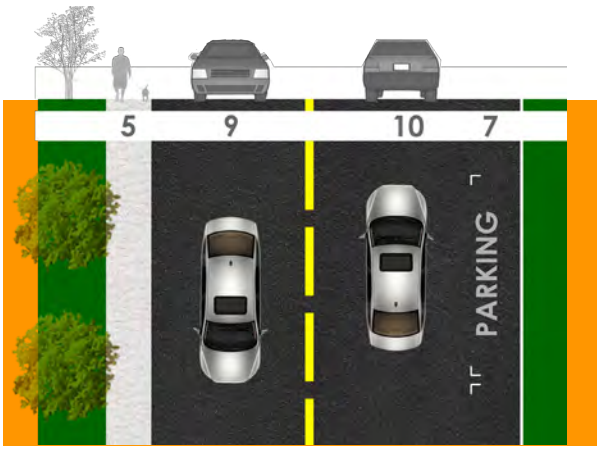
Ties into "Little Five Points" redevelopment efforts

Public Comment Intersection Redesign Connectivity

CORPORATION STREET

FROM: Mangum Street
TO: Duke Street
LENGTH: 0.63 miles

Critical improvements include connecting sidewalk gaps on the south side of the street between Duke Street and Rigsbee Street, adding sidewalk on the north side of the street between Rigsbee St and Mangum St, and adding pedestrian signals at Mangum St/Little Five Points. Other improvements include redesigning the intersection at Morris/Washington/Corporation, adding gateway treatments at Little Five Points, installing sharrow pavement markings, and improving lighting at the crossing at Duke Street to the Durham School for the Arts.



Key Points

- Provides safer pedestrian access from Northeast Central Durham to Central Park.
- Improves pedestrian safety at Little Five Points and the

Construction Cost: Intersection improvements, sidewalk construction, ADA curb ramps, lighting): **$408,291**

CORPORATION STREET

Add full traffic signal to improve access to school and create gaps in traffic

Provides connection for commercial activity and to a local school. Completes a larger pedestrian network in the area

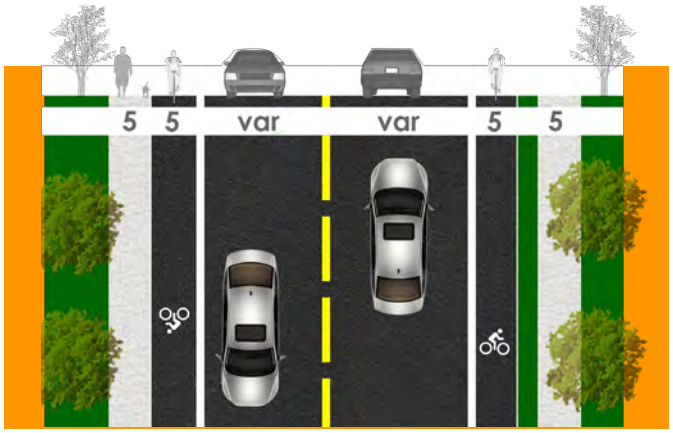
Intersection Redesign Connectivity

SW DURHAM DRIVE

FROM: Durham Chapel Hill Boulevard
TO: Old Chapel Hill Road
LENGTH: 0.99 miles

SW Durham Drive is home to many new residential developments, mostly multi-family apartments. The roadway is short but busy with "cut-through" traffic between higher-level roadways.

Critical improvements include filling sidewalk gaps and improving crossings at the entrance to Sherwood Githens Middle School and at each end of the corridor.

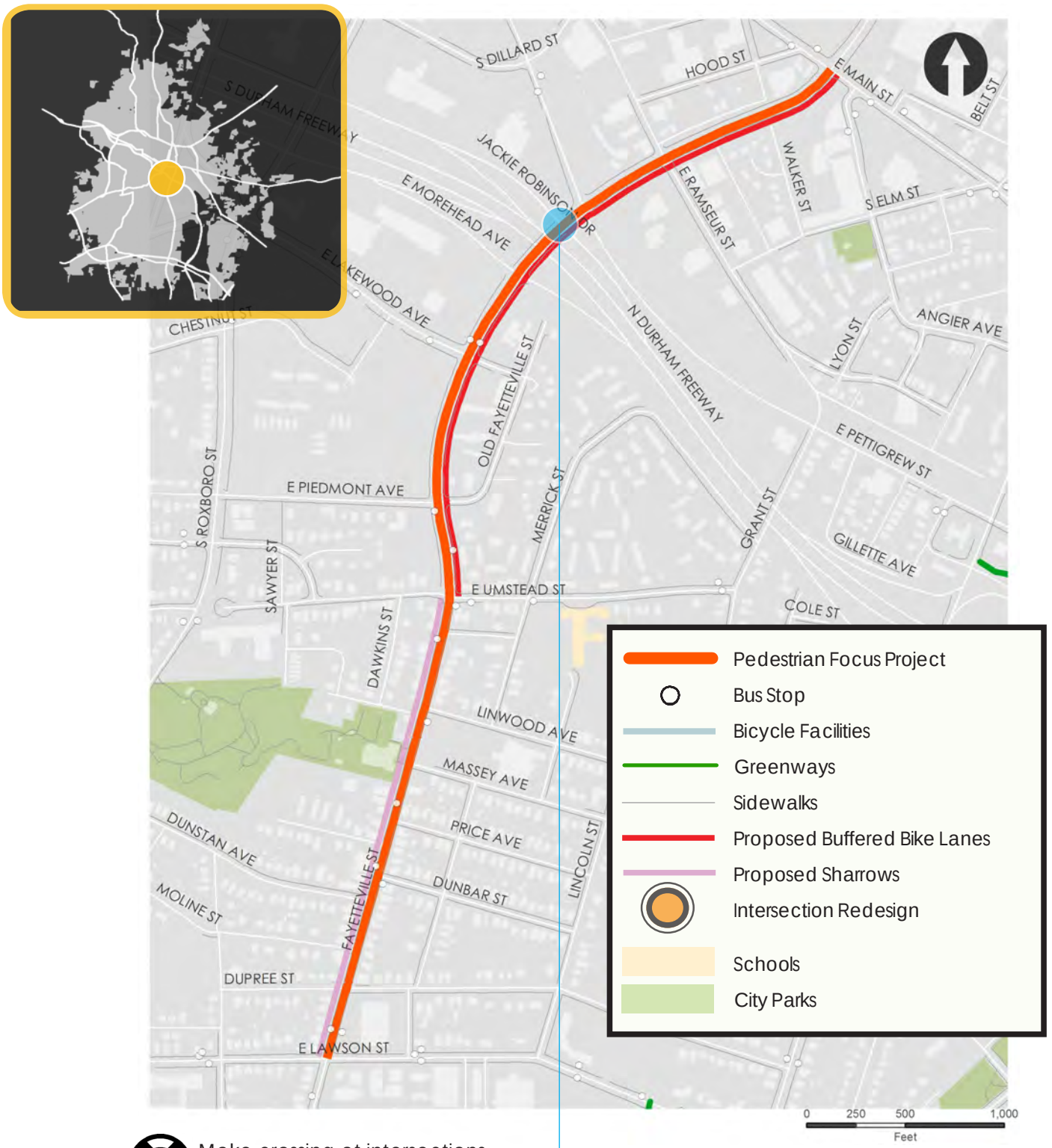


Key Points

- Provides safe area to walk and bike.
- Congested streets with large amount of destinations for pedestrians to reach.

Construction Cost:(Intersection improvements, construction path, right of way acquisition) **$941,515**

SW DURHAM DRIVE



Make crossing at intersections shorter

Add streetscape and maintenance to construction effort to improve appearance and reduce criminal activity

Incorporate wayfinding to other trails

"This project is certainly necessary. Let's not forget about pedestrian treatments on the bridge over 147. I know this is complicated, but it'll be so important to connect the south and north sides of the freeway and to the light rail station."

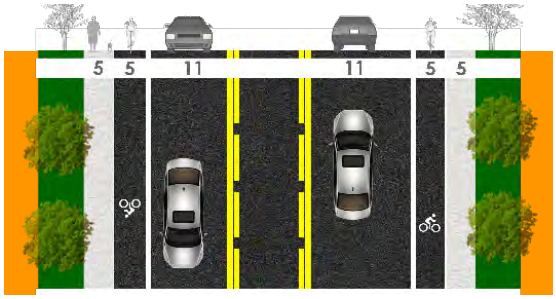
Challenges | Intersection Redesign | Public Comment

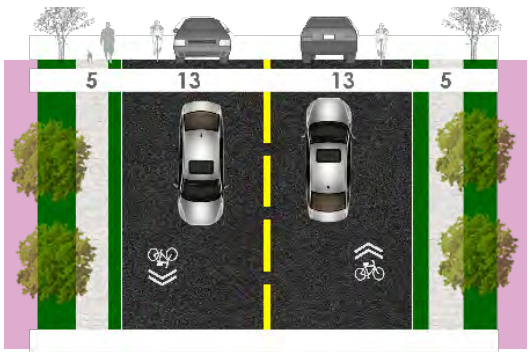
FAYETTEVILLE STREET

FROM: Lawson Street
TO: Main Street
LENGTH: 1.15 miles

Fayetteville Street is popular both with pedestrians and with cyclists. Two types of improvements are recommended.

Critical improvements include adding pedestrian crossing treatments and reallocating lanes from five to three to allow buffered bicycle lanes from Umstead Street to Main Street. Sharrows are recommended from Lawson Street to Umstead Street. Additional improvements include landscaping the median and adding pedestrian-scale lighting at the NC 147 overpass, and numerous pedestrian crosswalks. Per coordination with GoTriangle, crosswalks, pedestrian-scale lighting at transit stops, and sidewalk infrastructure throughout the corridor are recommended for this Transit Emphasis Corridor. Additionally, textured/colored 10' crosswalks would replace the parallel lines at Main Street.



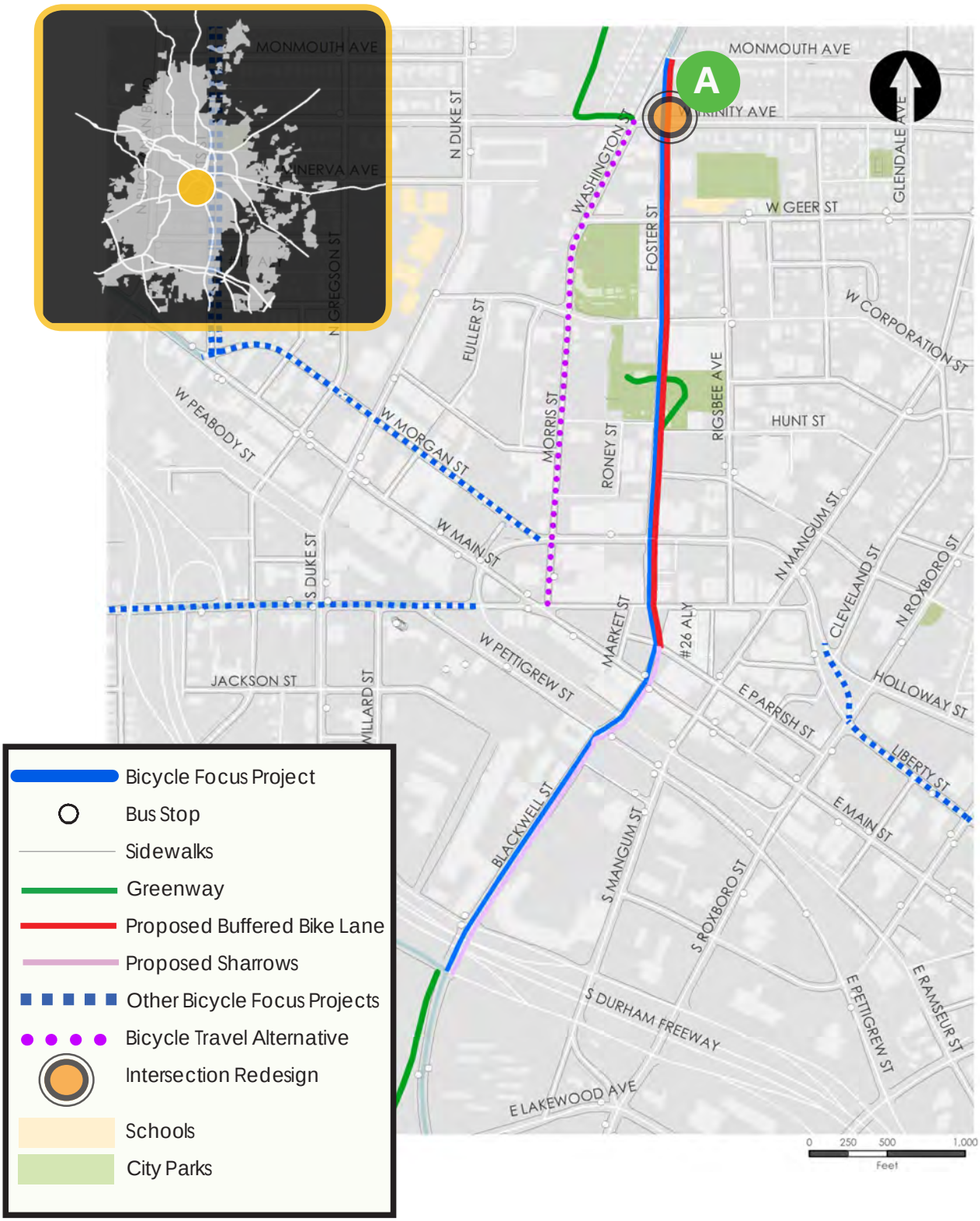


Key Points

- Provides safer area to walk and bike.
- Completes a larger pedestrian network.
- Connects NCCU to Downtown.

Construction Cost: (ntersection improvements, construction path, right of way acquisition) **$267,988**

FAYETTEVILLE STREET

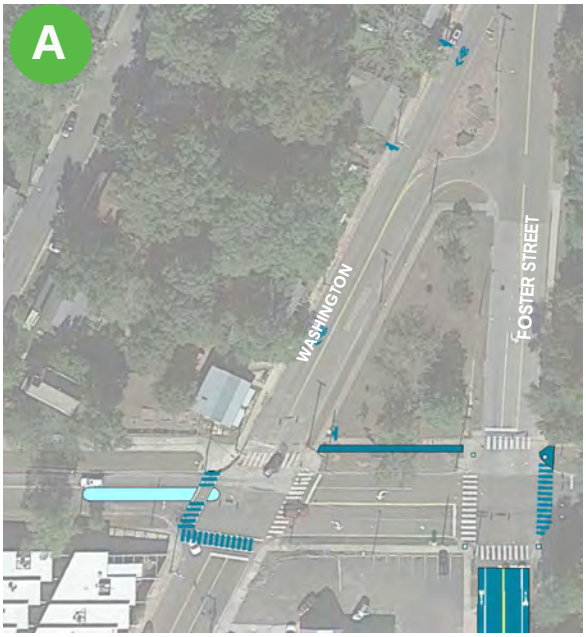


Removal of on-street parking

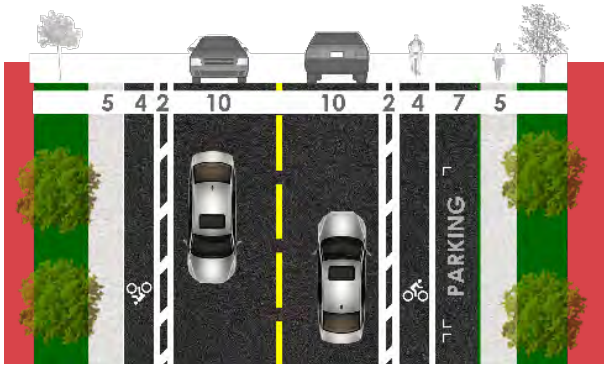
FOSTER STREET

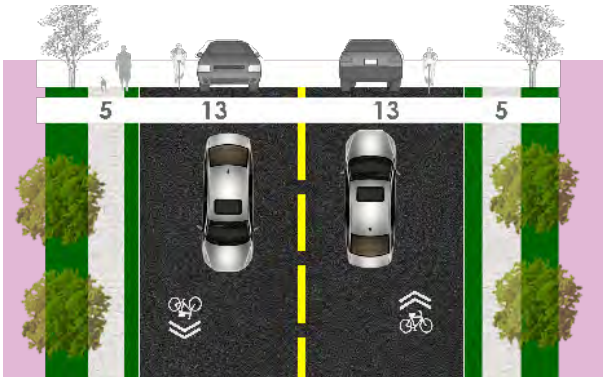
FROM: American Tobacco Trail

TO: Monmouth Ave/Trinity Ave?
LENGTH: 1.07 miles



Critical improvements include bicycle lanes and traffic calming/gateway treatments between Trinity Ave and Morgan St to slow traffic and improve safety. Morris Street is an alternative for bicycle travel. Shared lane pavement markings and signage should be installed south of East Parrish Street where the curb-to-curb width narrows and on-street parking becomes critical. Additional improvements include reconfiguring Blackwell St to add a separated bicycle climbing lane between the American Tobacco Trail and downtown. These improvements will require on-street parking to be removed on one side north of East Parrish.



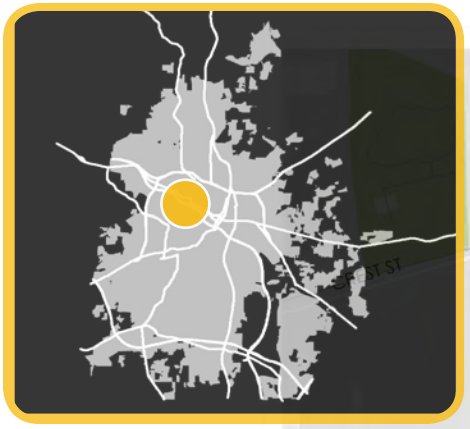


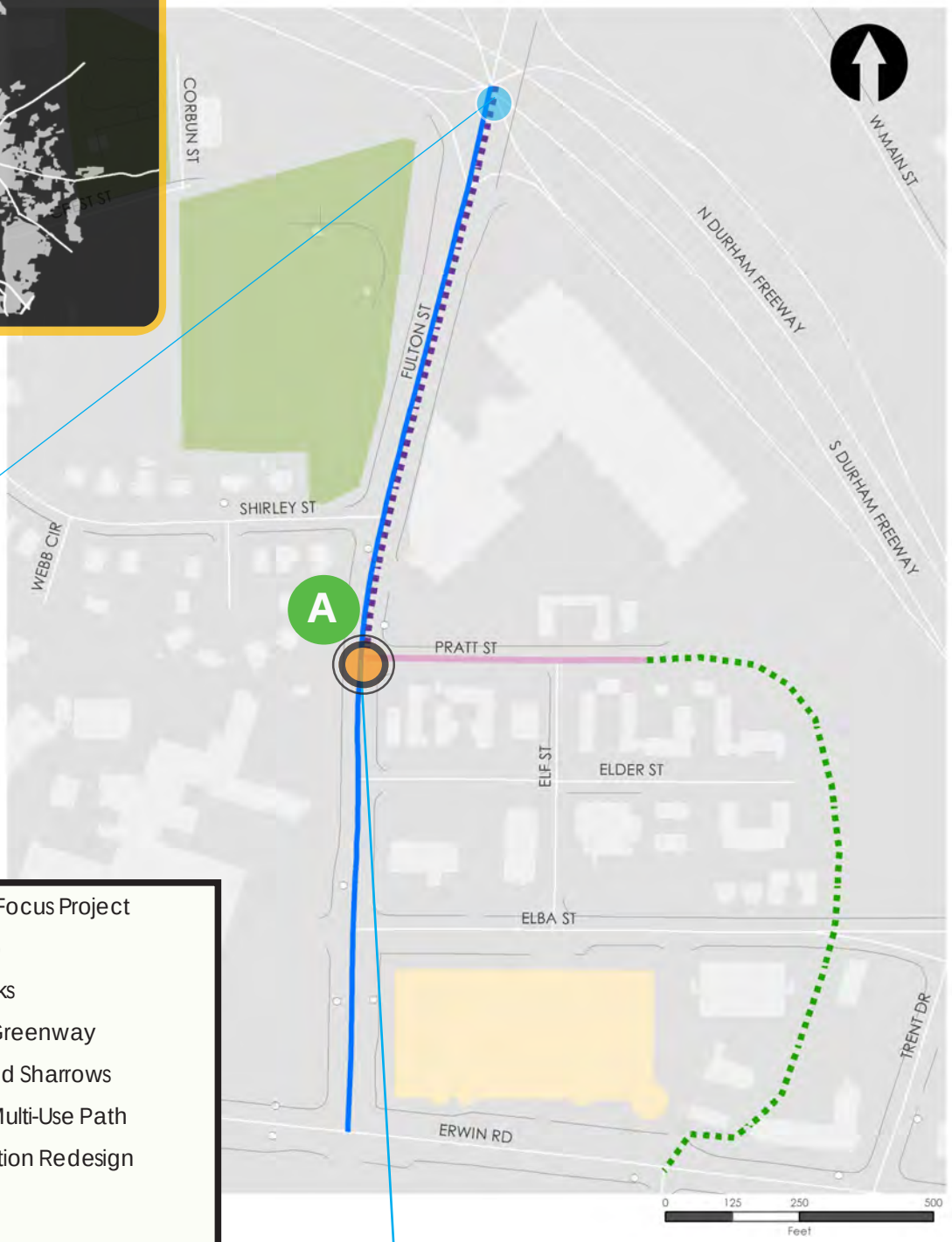
Key Points

- Provides connection to greenway,
- Provides connection to other on-street bicycle facilities,
- Provides access to downtown area.

Construction Cost (Include signage and pavement markings)**: $94,746**

FOSTER STREET





Bike signals and better lighting under 147 bridge to connect to Hillandale Road bicycle project to the north

- Bicycle Focus Project
- Bus Stop
- Sidewalks
- Future Greenway
- Proposed Sharrows
- Future Multi-Use Path
- Intersection Redesign
- Schools
- City Parks

"Sidepath on east side needed and better crossing at Pratt."

Remove on street parking

Wayfinding signage needed along route

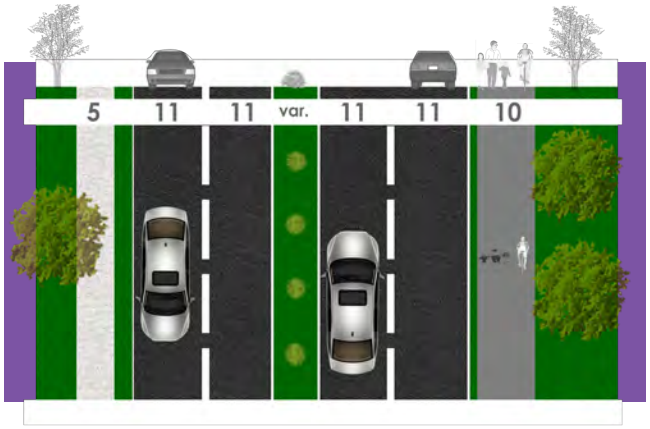
Provides safe connection to hospital area and Duke University

Challenges Public Comment Connectivity

FULTON STREET

FROM: Erwin Road
TO: Durham Freeway
LENGTH: 0.38 miles

Critical improvements include continuing the planned multi-use path on Fulton St to Pratt St, and using markings and signage to show connections to lower volume streets and a future Duke greenway. Other improvements include a traffic signal at Pratt St and Fulton St, and high-visibility crosswalks.

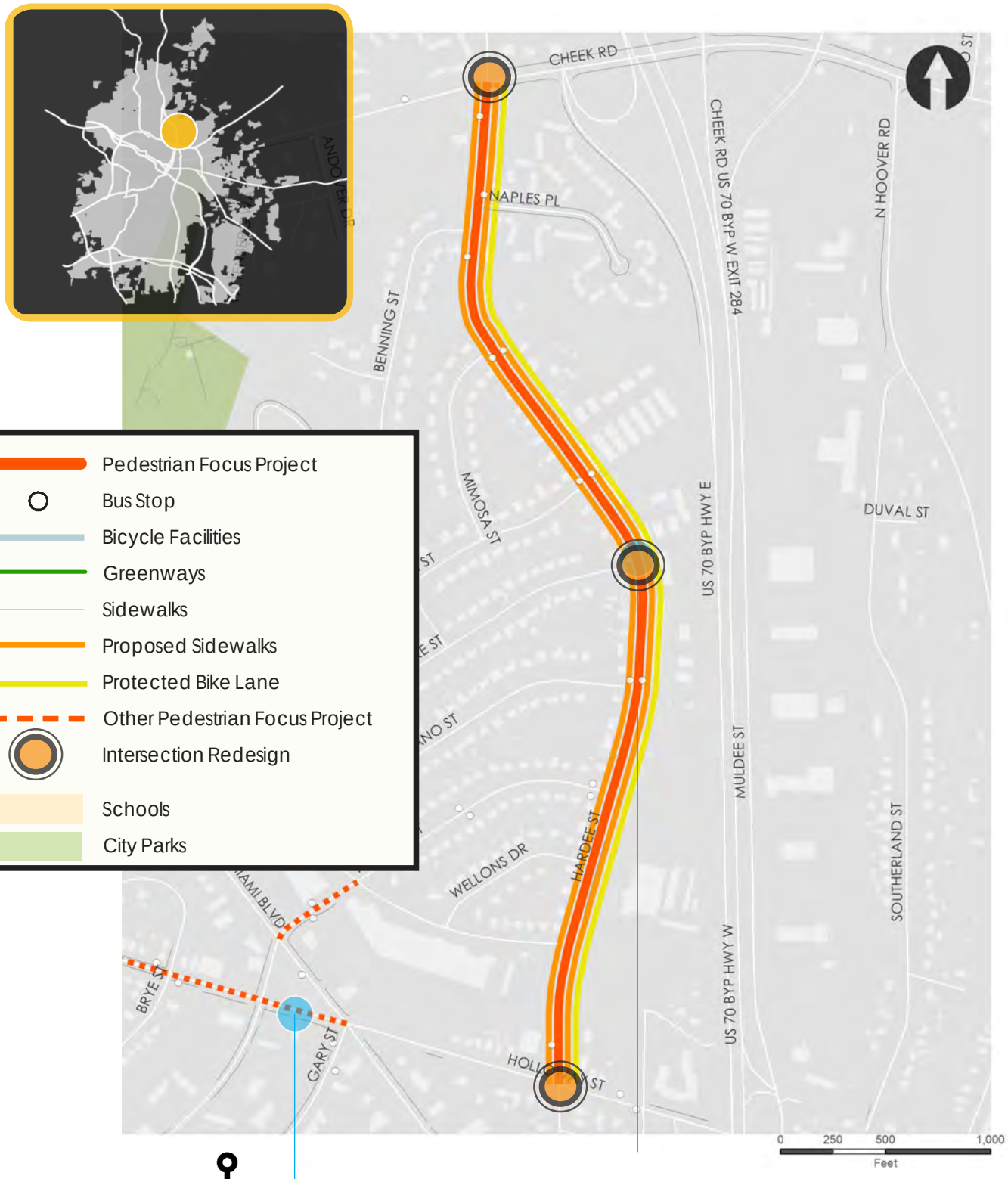


Key Points

- Provides access to hospital area and University
- One of the heaviest traffic corridors in the City
- Provides critical connection between planned bicycle facility and Duke University and Hospital/Erwin Rd

Construction Cost (Include signage, new traffic signal, re-stripping for bike lanes, and intersection improvements) **$534,895**

FULTON STREET



Proposed Holloway Corridor Project (and gap project at north end)

Redesign intersections with smaller turning radii to slow traffic

Intersection Redesign Connectivity

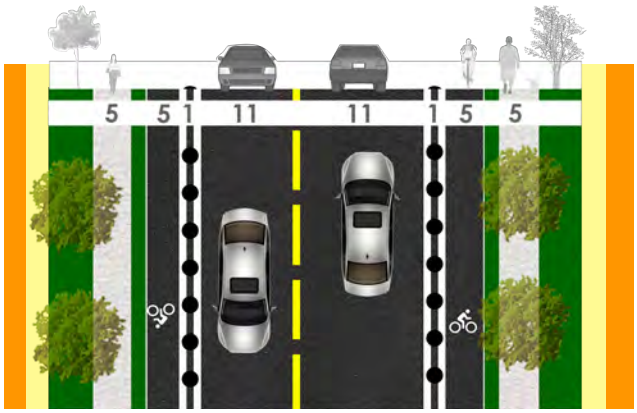
N. HARDEE STREET

FROM: Cheek Road
TO: Holloway Street
LENGTH: 0.96 miles

Hardee St is a low-density, residential collector street. Current high operating speeds suggest the need for traffic calming. Sidewalks on both sides will best serve pedestrians from the adjacent residential neighborhood.

Critical improvements include sidewalks on both sides, as well as crossing improvements at intersections, requiring reconstruction of the edge-of-pavement, new curb-and-gutter, and drainage. Other improvements include improving intersection crossings, improving lighting at four bus stop locations, and adding traffic calming elements to slow traffic speeds.

Worn path (looking north on N. Hardee Street) indicating significant walking traffic.



Key Points

- Provides safe area to walk and bike.
- Transitions street to walk-focused environ-

Construction Cost: (Intersection improvements, construction path) $3,162,036

N. HARDEE STREET

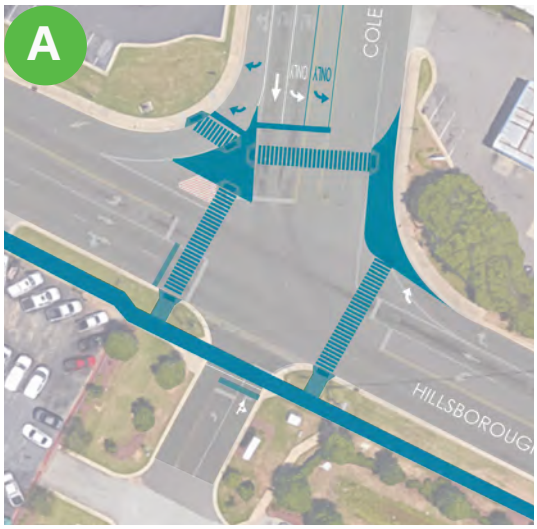
Challenges Redesign intersection

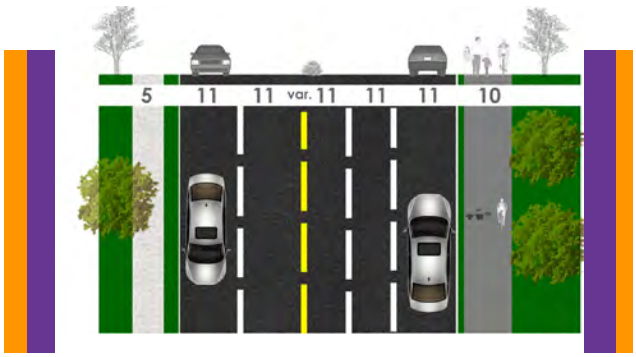
HILLSBOROUGH RD

FROM: LaSalle Street
TO: Bus Stop
LENGTH: .58 miles

Hillsborough Road has sidewalks in places, but some crucial segments are missing. In addition, there is a lack of safe crossing options, which is hazardous, in particular around the freeway junction. This is a recognized transit-focused corridor as well.

Critical improvements include completing sidewalk gaps on the north side, and transit stop access improvements. Additional improvements include intersection improvements at Cole Mill Road to include reducing curb radii, adding crosswalks, pedestrian signals, and a pedestrian refuge median. In the longer term, a multi-use sidepath on the south side is recommended.





Key Points

- Provides safe area to walk and bike.
- Congested streets with large amount of destinations for pedestrians and cyclists to reach.

Construction Cost: (Intersection improvements, sidepath): **$1,330,541**

HILLSBOROUGH ROAD

Crosswalks, signals and ramps needed at intersections.

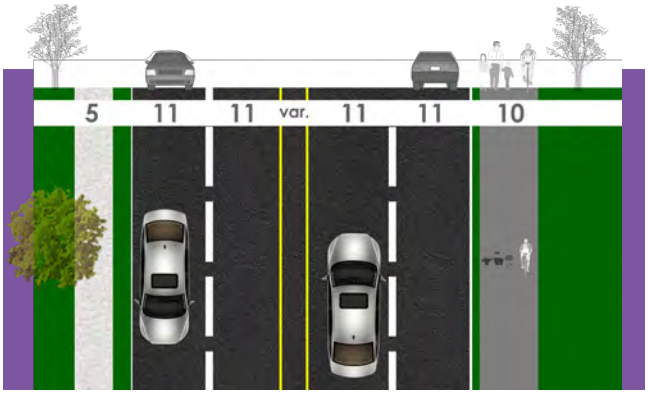
Limited right-of-way and need for tree removal to accomplish the project, significant grading issues. This is a transit-focus corridor as well.

HOLLOWAY STREET/ NC 98

FROM: Chandler Road
TO: Junction Road
LENGTH: 1.05 miles

Holloway Street is a four-lane arterial road connecting the eastern suburbs of Durham. There are no bicycle or pedestrian facilities and car traffic volumes and speeds are high.

Given the nature of the road, critical improvements include complete sidewalks on the north side of the roadway and connections to bus stops on both sides, with appropriate crosswalks at Junction Rd, Adams St, Lynn Rd and Chandler Rd. Longer term improvements include constructing a 10'-12' multi-use side path to facilitate both pedestrian and bicycle travel.



Key Points

- Provides safe area to walk and bike.
- Further enhances existing pedestrian network in the Downtown area.

Construction Cost: (Intersection improvements, multi-use side path): **$1,608,400**

- Pedestrian Focus Project
- Bus Stop
- Bicycle Facilities
- Greenways
- Sidewalks
- Proposed Sidewalks
- Other Pedestrian Focus Project
- Intersection Redesign
- Schools
- City Parks

Improve transit stops in this transi-focus corridor, including easier pedestrian access and lighting, benches, shelters

"I'm glad to see this project on the map. In the afternoons/ evenings, this area is congested with cars and pedestrians and could use relief!"

Near both Liberty Street and Hardee Street Proposed Projects

Challenges Public Comment Connectivity

HOLLOWAY STREET/ NC 98

FROM: Gary Street
TO: Guthrie Avenue
LENGTH: .36 miles

This segment of Holloway St serves mostly low-density housing with a retail/ commercial zone at the end closest to North Miami Blvd.

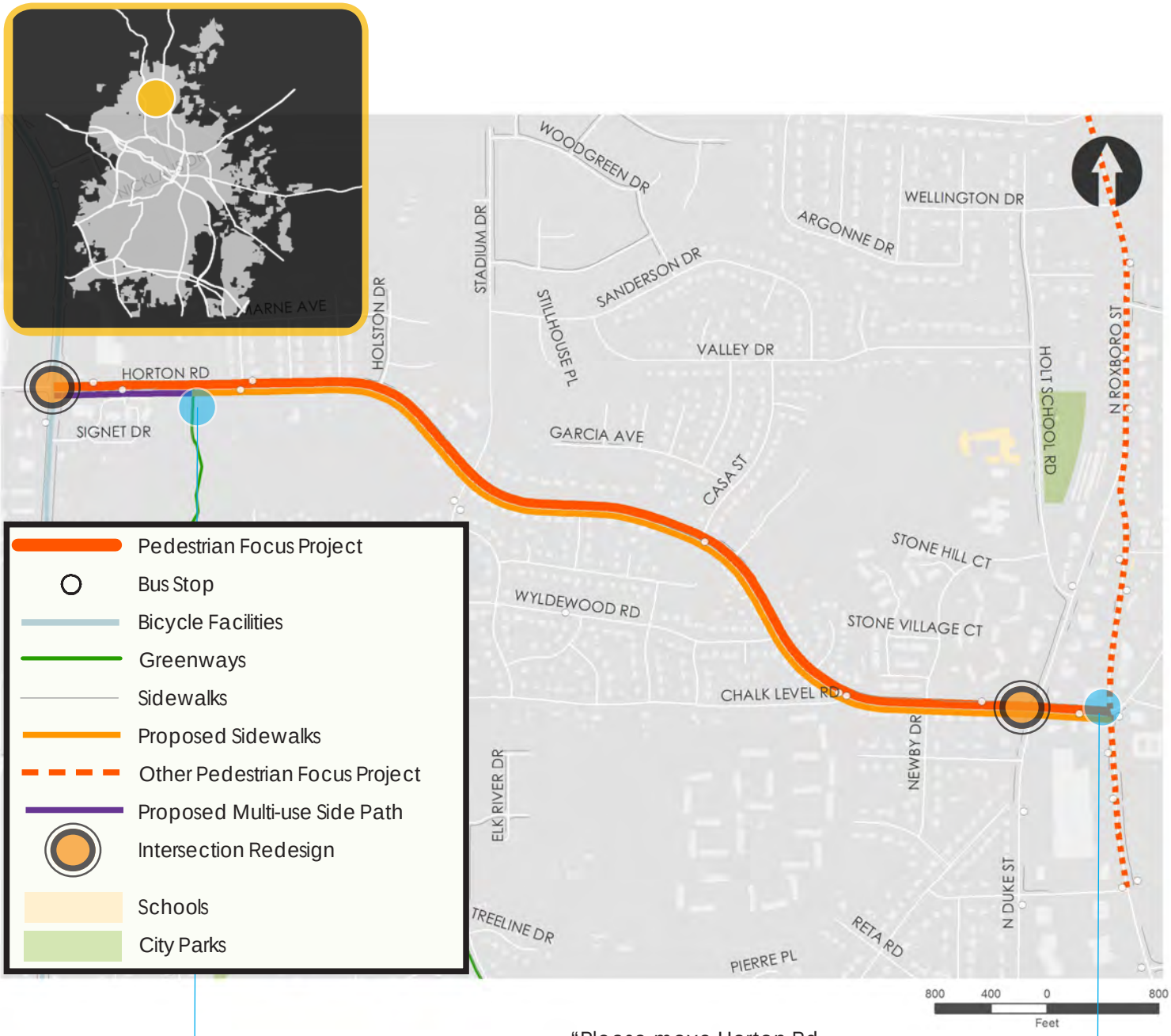
Critical improvements to safety and accessibility includes filling in sidewalk gaps on the north side of Holloway Street, repair existing sidewalks on both sides, construct curb ramps, and increase access to and level of amenity at six transit stops in this transit-focus corridor.

Key Points

- Provides safe area to walk and bike.
- Worn desire paths seen along corridor
- High transit use corridor.

Construction Cost: (Intersection improvements, sidewalks): **$396,131**

HOLLOWAY STREET



"Please move Horton Rd sidewalk up on the priority list. People walking to and from bus stops walk ON (not off to the side) this narrow, curving road at all hours of the day and night. It is dangerous."

Intersects with the Warren Creek Trail

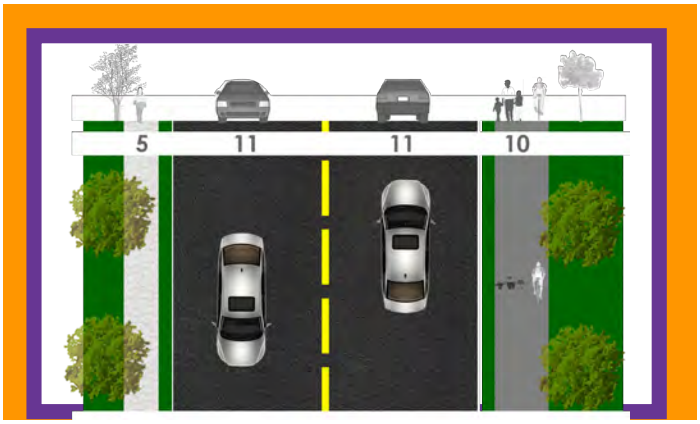
Intersects the North Roxboro Street Proposed Project and Duke St Funded Sidewalk Project

HORTON ROAD

FROM: Roxboro Street
TO: Guess Road
LENGTH: 1.60

This segment of Horton Rd mostly serves low- to moderate-density residential uses with retail-commercial developments at either end.

Critical improvements include providing a shared use path connection from the Warren Creek trail to Guess Road, sidewalks on one side of the street throughout the corridor, and transit improvements. Additional improvements include improvements at the North Duke Street and Guess Road intersections, and adding curb/gutter and bicycle lanes throughout the corridor.

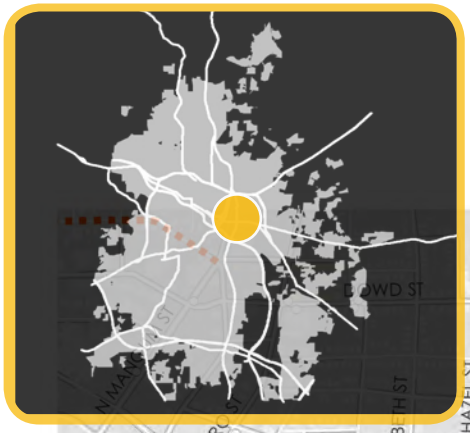


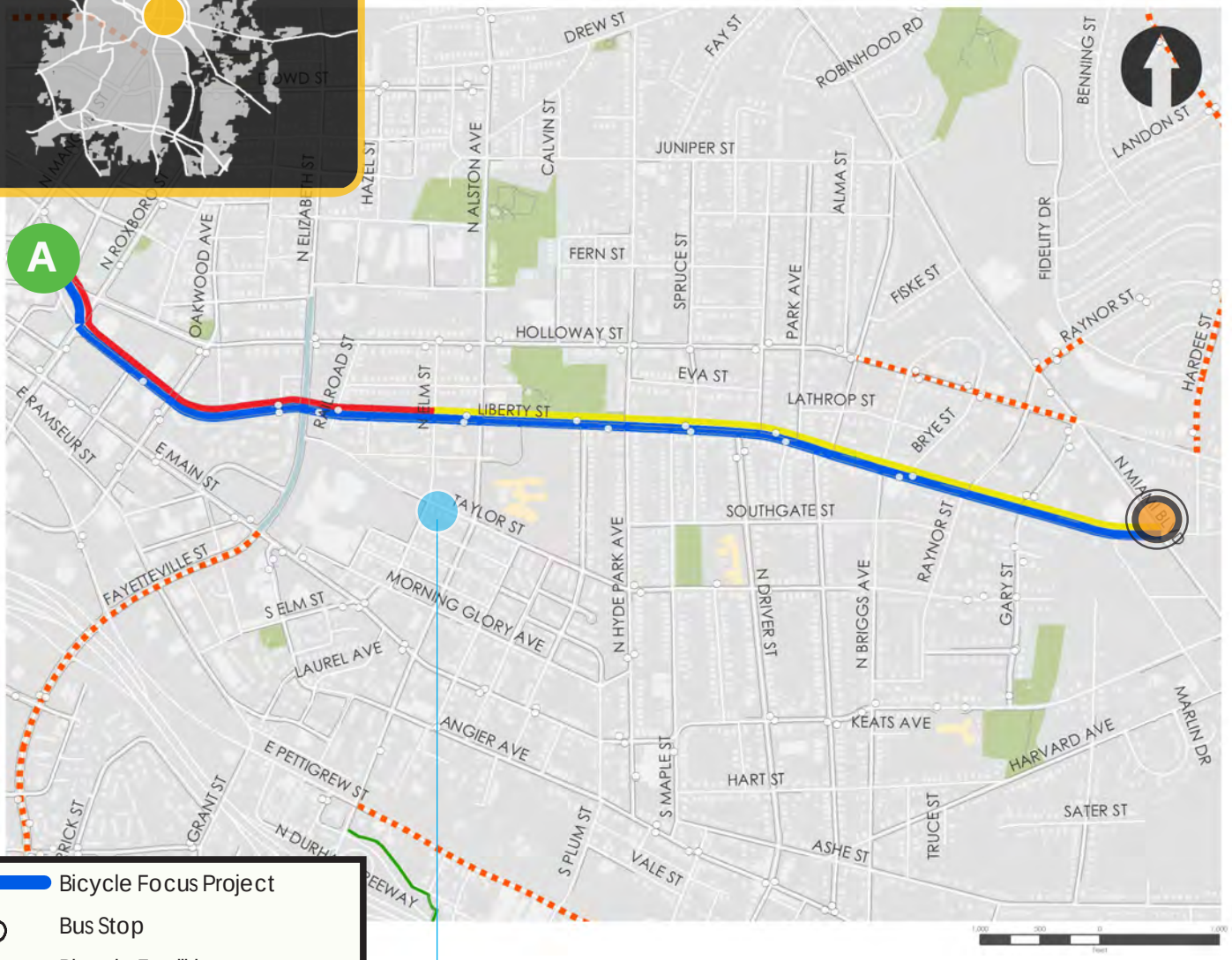
Key Points

- Provides safe area to walk and bike.
- Congested streets with large amount of destinations for pedestrians and cyclists to reach.

Construction Cost:(Intersection improvements, construction path, right of way acquisition) **$2,663,254**

HORTON ROAD





- Bicycle Focus Project
- Bus Stop
- Bicycle Facilities
- Greenways
- Sidewalks
- Proposed Buffered Bike Lane
- Proposed Bike Lane
- Intersection Redesign
- Schools
- City Parks

"Bike boulevard option as secondary route on Taylor"

Connect the Village to Downtown

Varying street widths, removal of parking spaces, school drop off area

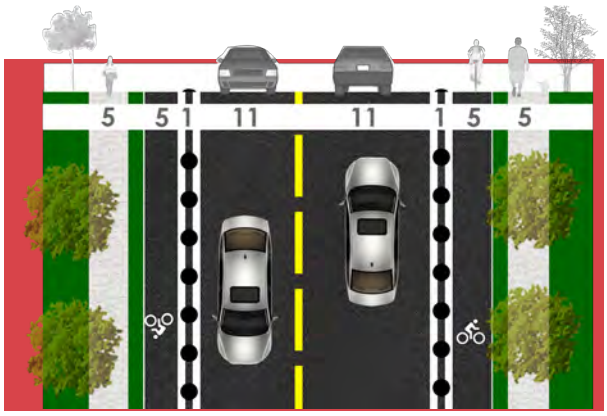
Challenges Public Comment Connectivity

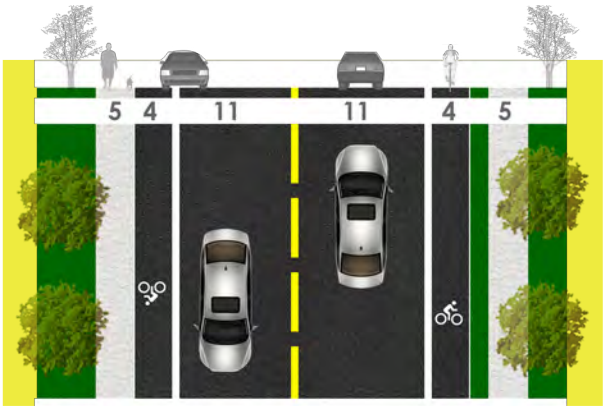
LIBERTY STREET

FROM: Cleveland Street
TO: N. Miami Boulevard
LENGTH: 1.89 miles

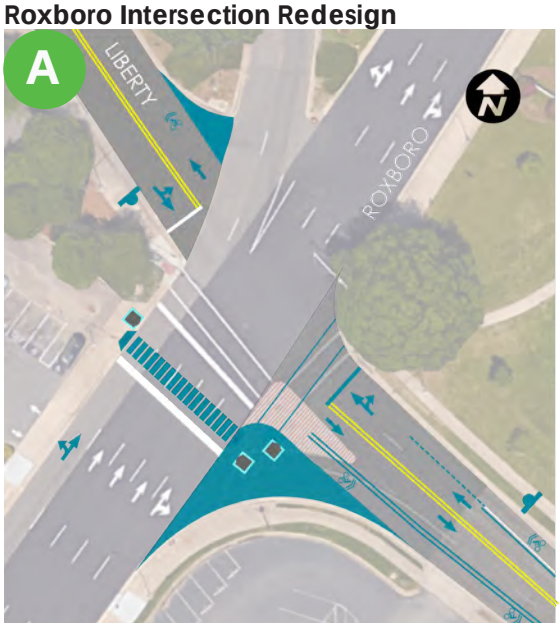
Recommendations for Liberty Street include protected bicycle lanes, where possible, redesign of Liberty St and Roxboro St intersection to include protection for cyclists and conversion of the one way road to two-way for vehicles.

The intersection with Roxboro Road would encourage integration of bicycle and vehicular traffic on the northbound approach, anticipating the rapid narrowing that occurs just north of the intersection (sharrow markings leading to that point).





Roxboro Intersection Redesign

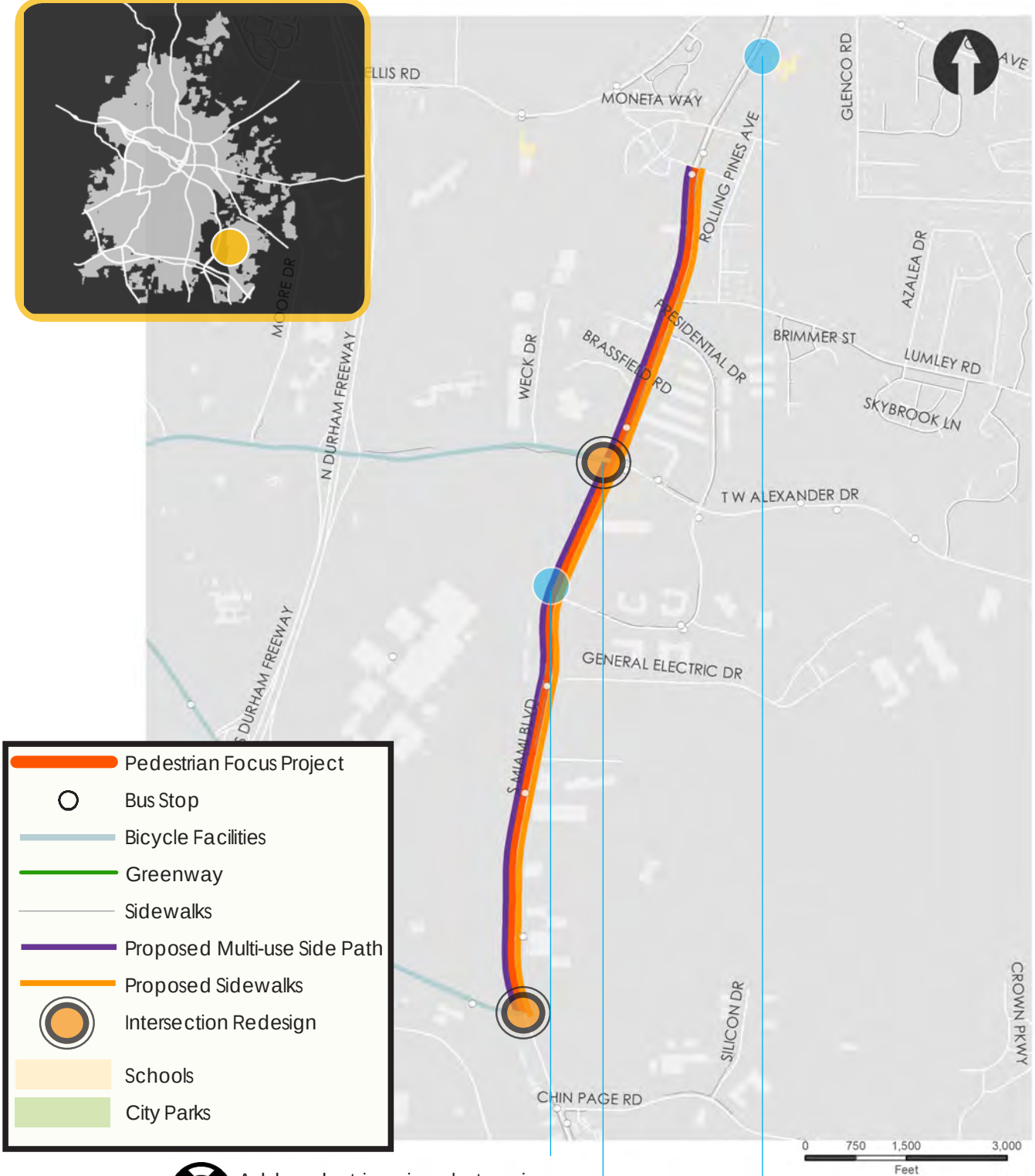


Key Points

- Connects to Downtown Durham to East Durham
- Close proximity to area Greenways
- Takes advantage of low parking utilization
- Improves safety for cyclists

Construction Cost (Include signage, changing out signal heads, re-stripping for bike lanes and intersection improvements) **$2,035,288**

LIBERTY STREET



Add pedestrian signal at major development entrance

Redesign intersection at TW Alexander for safer pedestrian and bicycle crossings

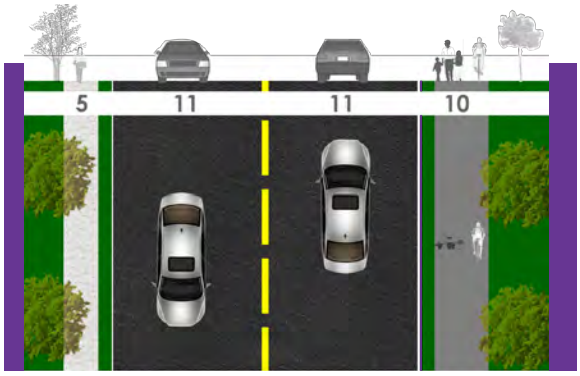
Sidepath exists at Bethesda Elementary School

MIAMI BOULEVARD

FROM: New Haven Drive
TO: Cornwallis Road
LENGTH: 2.47 miles

South Miami Blvd is an arterial road connecting both a major office complex (IBM) and residential developments with very low-density land use.

Critical improvements include a wide (12') multi-use path on the east side of the roadway and adding sidewalk on the opposite side of the street.

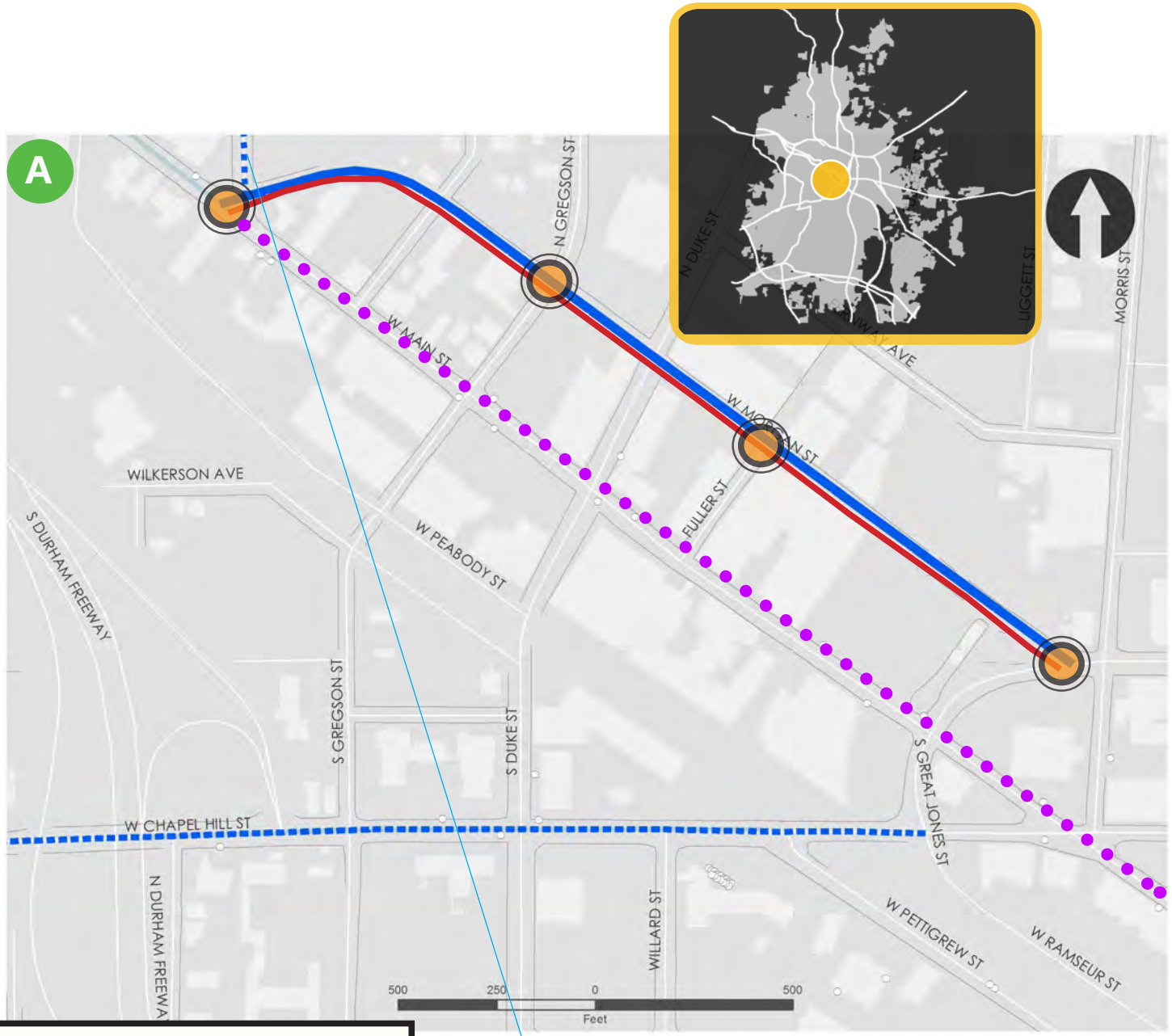


Key Points

- Provides safe area to walk and bike.
- Completes a larger pedestrian network.

Construction Cost:(Intersection improvements, construction path, right of way acquisition) **$6,503,860**

MIAMI BOULEVARD



- Bicycle Focus Project
- Bus Stop
- Sidewalks
- Greenway
- Proposed Protected Bike Lane
- Other Bicycle Focus Projects
- Bicycle Travel Alternative
- Intersection Redesign

Connects to Watts Bicycle Boulevard

Removal of on-street parking, width constraints between Duke St and Gregson St.

Challenges Connectivity

MORGAN STREET

FROM: Great Jones Street
TO: Main Street
LENGTH: .49 miles

Critical improvements are needed to connect the existing Main Street bicycle lanes to downtown. Protected bicycle lanes are recommended along Morgan St. Main Street is an alternative facility, but would require striped bike lanes and removal of on-street parking used by retail establishments that depend on it. Other improvements include intersection improvements (such as Watts/Main/Morgan), pedestrian-scale lighting, and filling in sidewalk gaps.

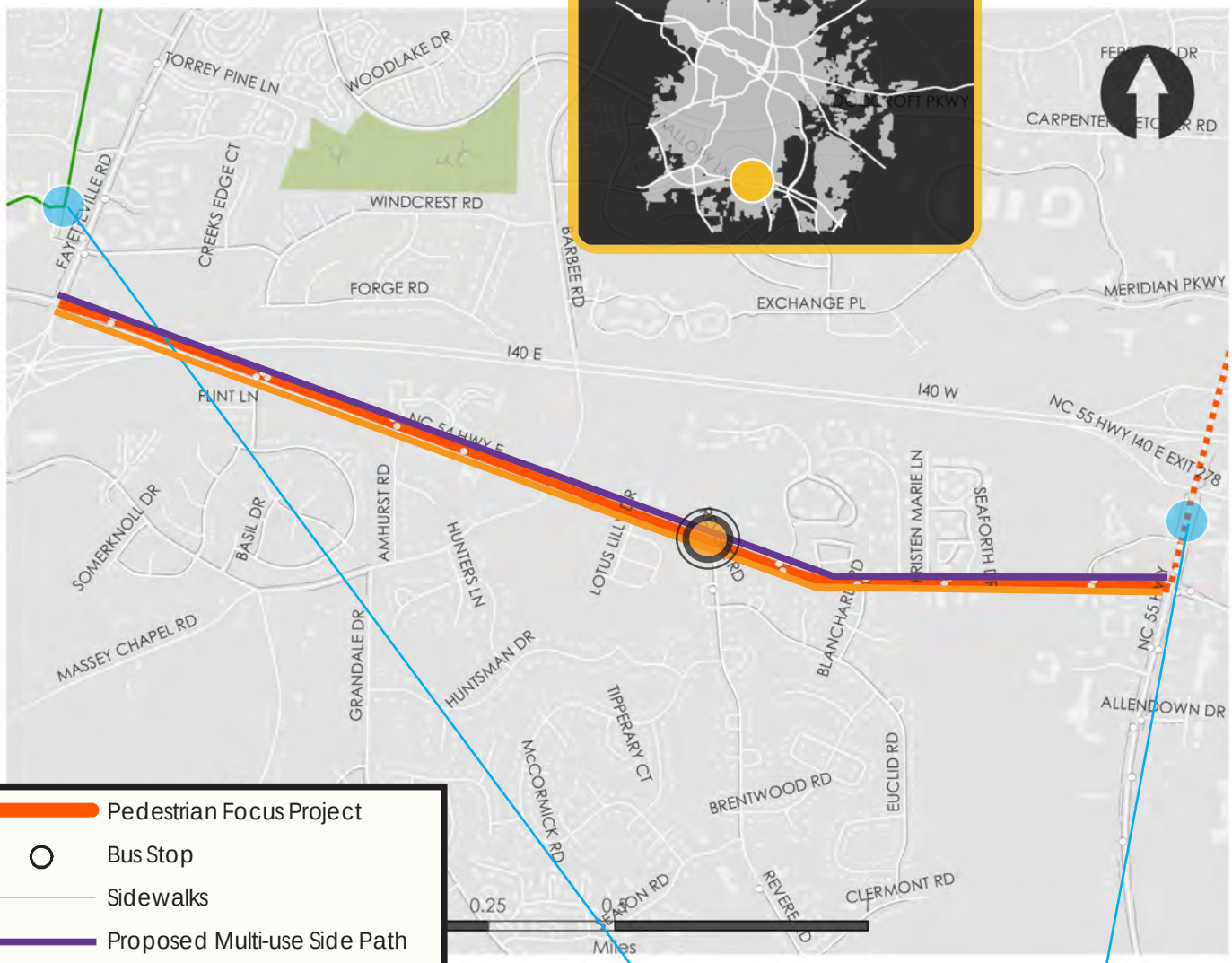
The Watts/W. Morgan/Main intersection calls for new (flush with pavement) textured/colored pavement and crosswalks.

Key Points

- Provides access to key destinations.
- Connects to other bicycle projects.
- Connects to future Duke Belt Line trail.

Construction Cost (Include signage, changing out signal heads, intersection improvements, payment markings) **$220,555**

MORGAN STREET



- Pedestrian Focus Project
- Bus Stop
- Sidewalks
- Proposed Multi-use Side Path
- Proposed Sidewalks
- Other Pedestrian Focus Project
- Intersection Redesign
- City Parks

Link to American Tobacco Trail

Apex Highway (NC 55) Proposed Sidewalk Project

"It would be nice if the ATT branched here and sent a bike trail along 54 to Chapel Hill and hooked up with their trails."

Separated, shared use path

Challenges | Public Comment | Connectivity | Redesign intersection

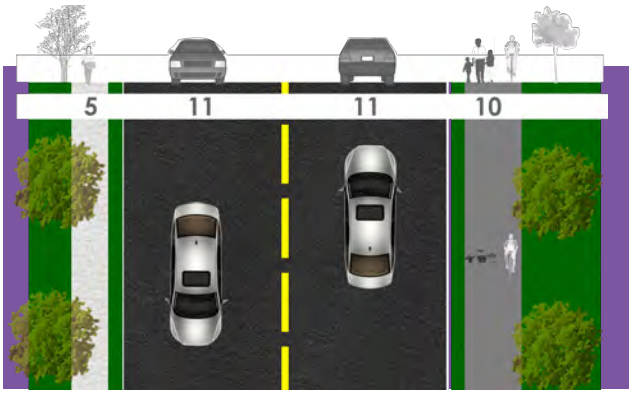
NC 54 HIGHWAY

FROM: NC 55 Highway
TO: Fayetteville Road
LENGTH: 2.29 miles

This section of NC Highway 54 has intermittent footpaths running alongside the road. Worn foot paths are evident along the road as well, expressing the need for additional pedestrian facilities.

Critical improvements include constructing a shared use path on one side of the road to help connect to the American Tobacco Trail and planned improvements on the section of NC 54 to the east. Intersection improvements are needed at Fayetteville Road, Barbee Road, and a full redesign of Revere Road. Additional improvements include adding sidewalk on the opposite side, especially where connecting to bus stops and businesses.

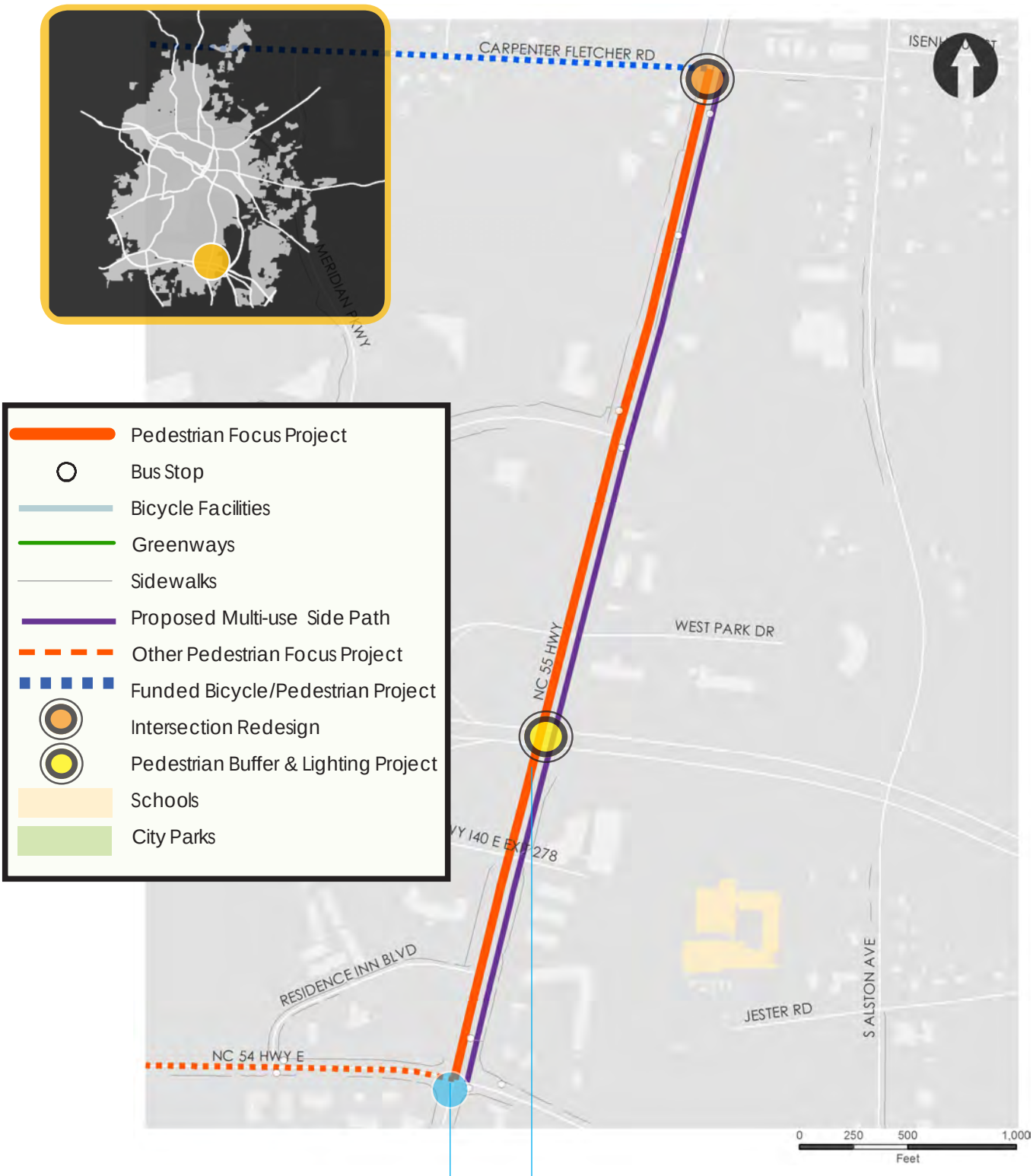
NC 54 HIGHWAY



Key Points

- Provides safe area to walk and bike.
- Improved safety at crossings.
- Provides another east-west connection to the American Tobacco Trail

Construction Cost: (Intersection improvements, construction path, possible right of way acquisition.) **$5,301,699**



Connects to Proposed NC54 Project

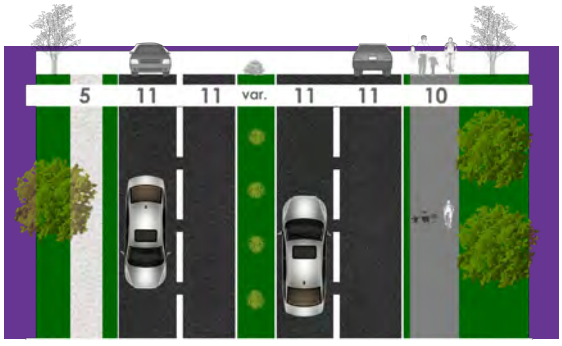
Improve pedestrian buffer under I-40, add better lighting

NC 55 HIGHWAY

FROM: NC 54 Highway
TO: Carpenter Fletcher Road
LENGTH: .91

Critical improvements include connecting sidewalk on the east side of the road, making sidewalk connections to bus stops, intersection improvements at: Carpenter Fletcher Road that include a short median extension to provide a pedestrian refuge and crosswalks; NC 54; Meridian Parkway; and a buffer and lighting under I-40.

Additional improvements include a shared use path on one side of the street, filling in sidewalk gaps on the opposite side of the road, streetscaping, and improved crossing treatments at the I-40 ramp heads.

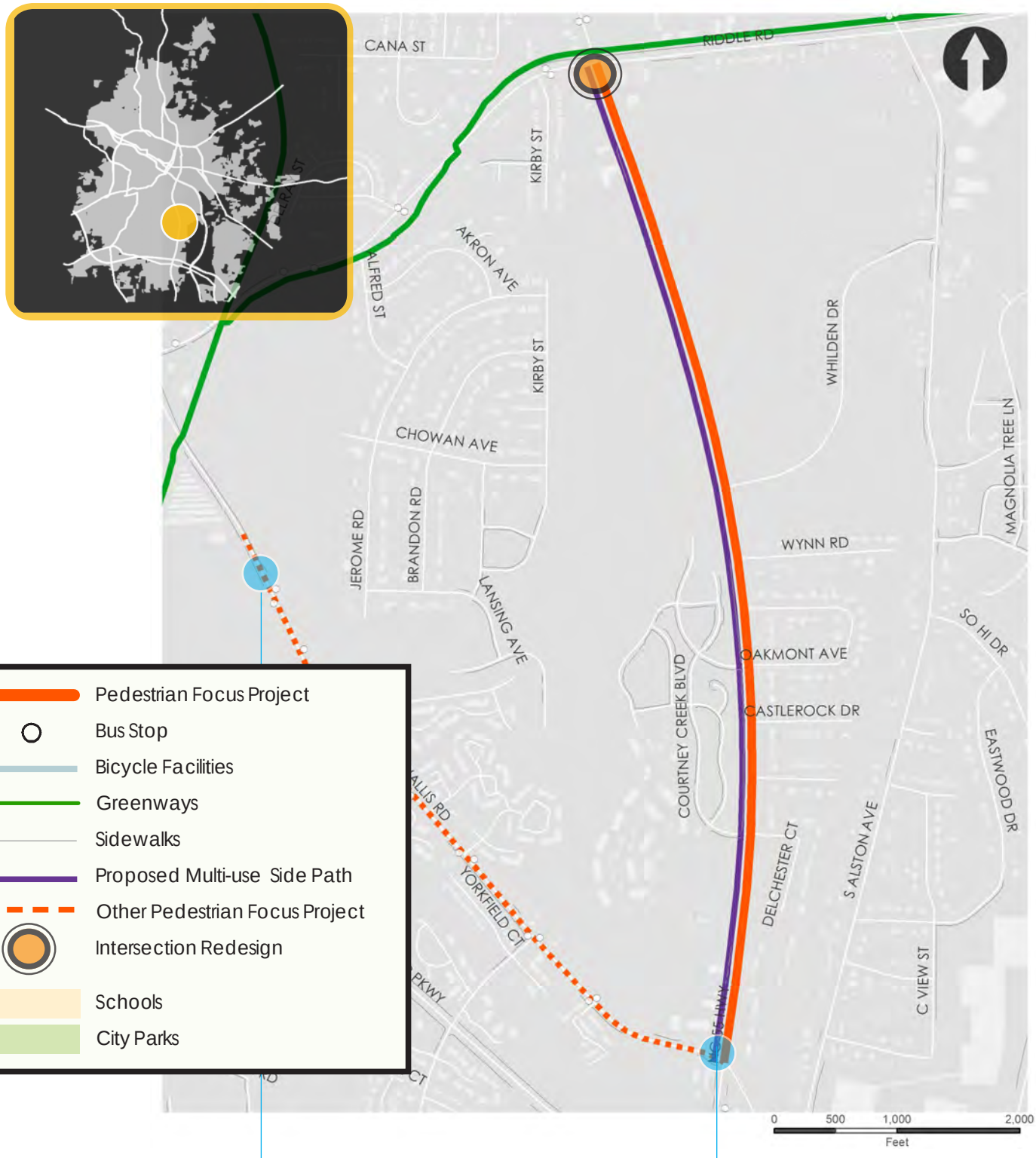


Key Points

- Improve pedestrian buffer under I-40
- Adds better lighting and improved crossing at high-volume Interstate ramps

Construction Cost:(Intersection improvements, construction path, right of way acquisition) **$1,555,927**

NC 55 HIGHWAY



E. Cornwallis Road Proposed Project; Proposed Intersection

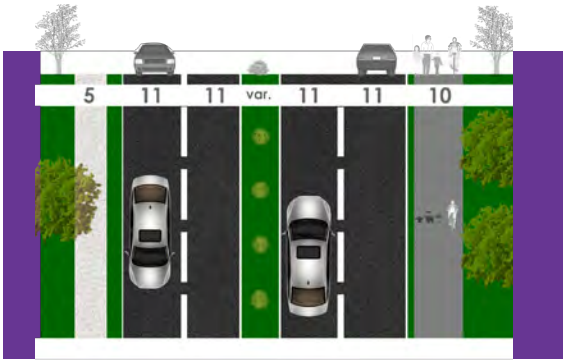
"This is a very dangerous intersection for cyclists, no cross walk, no dedicated light and the bike lane is often used as a turn lane! Please fix this!"

NC 55 HIGHWAY

FROM: Riddle Road
TO: Cornwallis Road
LENGTH: 1.57

While NC 55 is a high-speed route into Research Triangle Park, it also connects residences, a park, the American Tobacco Trail, apartments, and single-family residences.

Critical improvements include a multi-use side path on the west side of the corridor behind the existing ditchline that will connect to existing sidewalk and multiple neighborhoods. Other improvements include intersection improvements at Riddle Road to the American Tobacco Trail and Cornwallis.



Key Points

- Provides connection to ATT.
- Provides safe path for pedestrians and cyclists.

Construction Cost:(Intersection improvements, multi-use side path): **$1,922,127**

NC 55 HIGHWAY

Lack of right of way, costly

"Replace gravel path with sidewalks, desire line at Dearborn into Sidewalk."

Improve crossings at all intersections

Challenges Public Comment Connectivity Redesign intersection

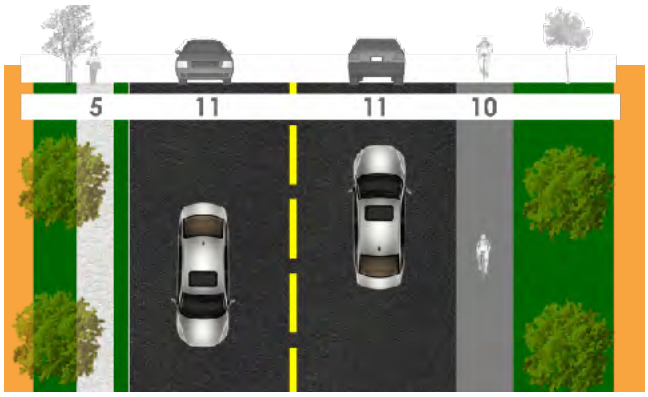
OLD OXFORD RD

FROM: Dearborn Drive
TO: Roxboro Street
LENGTH: .58 miles

Old Oxford Road has a narrow sidewalk on the northern side only. The shopping center and grocery store on the north side, several nearby parks, and a school deserve better pedestrian accommodations.

Critical improvements include sidewalks on the north side of the roadway and crosswalks at Meriwether Drive, Danube Lane, and Dearborn Road.

Later (not costed) improvements include adding sidewalk on the south side of the road, a possible bicycle lane, or a wide / striped shoulder for bicycles that also increases the recovery area for motorists.

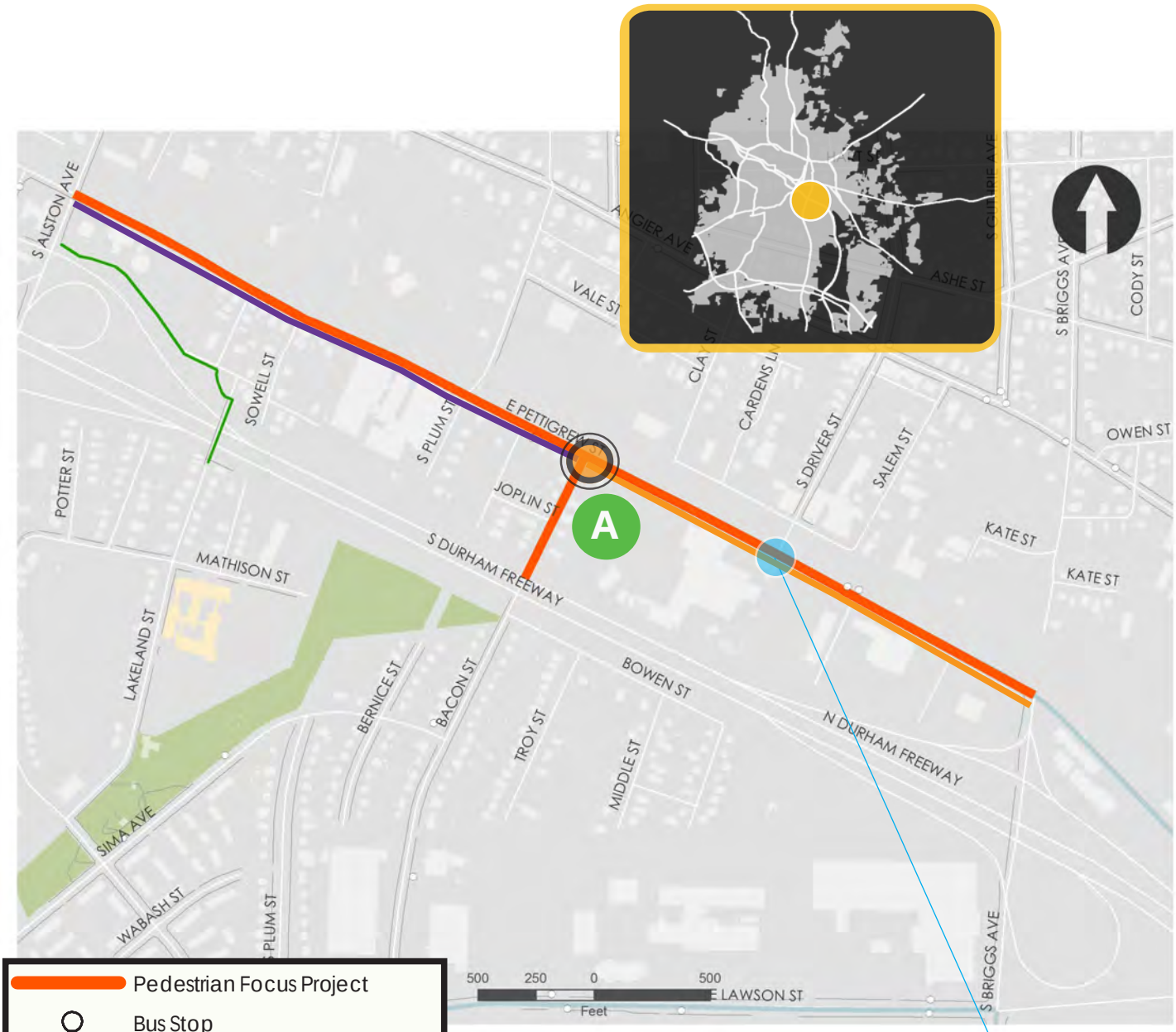


Key Points

- Provides safe area to walk and bike.
- This area is included in the East Coast Greenway. Completion of sidewalks would enhance the connectivity of the network

Construction Cost: (Intersection improvements, sidewalks): **$427,111**

OLD OXFORD ROAD



Improve crossings with pedestrian signals, curb ramps and high quality crosswalks

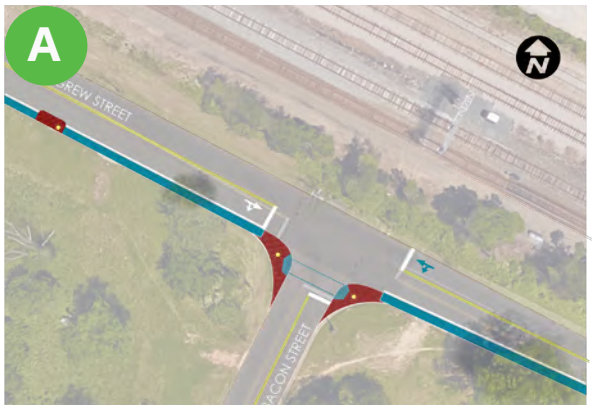
"There needs to be a pedestrian crosswalk from Driver across the tracks to Pettigrew. The cars here are too aggressive."

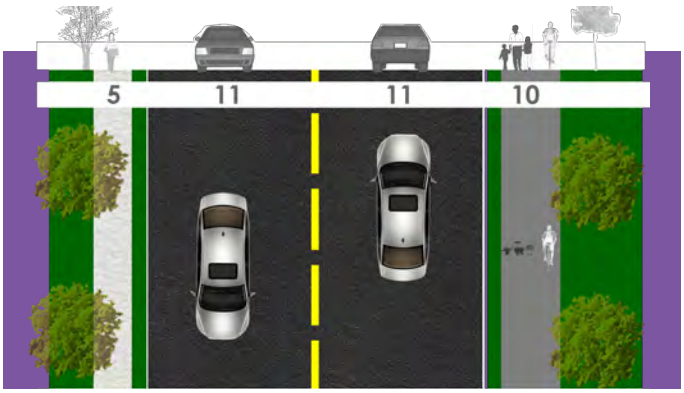
PETTIGREW STREET

FROM: Briggs Avenue
TO: Alston Avenue
LENGTH: .99 miles

East Pettigrew Street runs parallel to the railway line, South-East of Downtown Durham. There are currently no sidewalks along East Pettigrew Street as the railroad and houses close to the roadway restrict the ability to construct sidewalks.

To facilitate biking and walking, critical improvements include striping a buffered shared biking/walking path on the southern side of Pettigrew Street, and constructing sidwalk/ multi-use path off road where possible, installing crosswalks and curb ramps, and doing the same on the east side of Bacon Street from NC 147 to Pettigrew. Additional improvements include adding a raised divider, using textured/stained concrete, pedestrian scale lighting, and wayfinding signage to the Kelly Bryant Bridge.



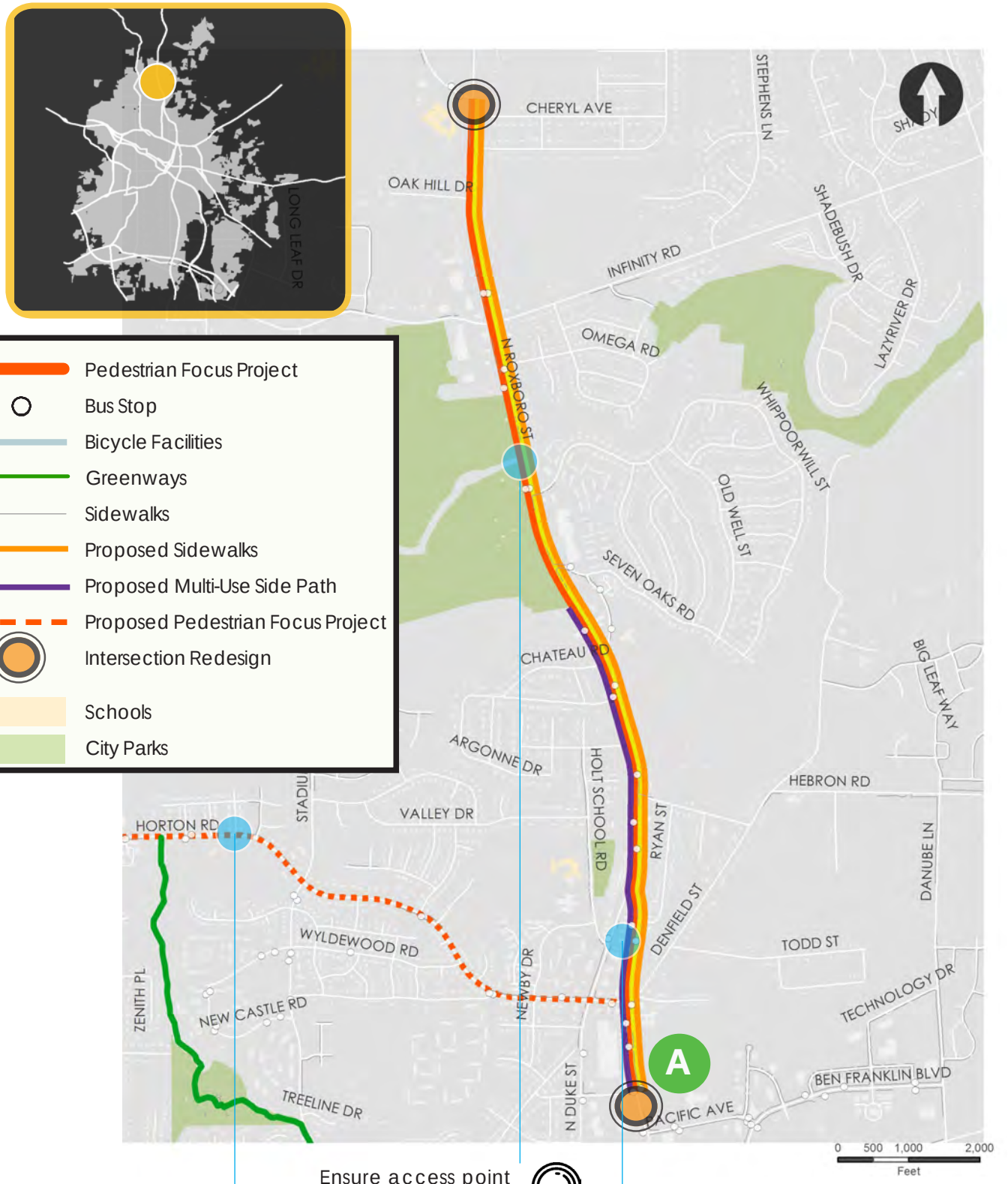


Key Points

- Provides safe area to walk and bike.
- Further enhances existing pedestrian network in the Downtown area.
- Provides safer access to the Kelly Bryant Bridge and planned greenway trails.

Construction Cost: (Intersection improvements, construction path, possible right of way acquisition.) **$187,660**

PETTIGREW STREET

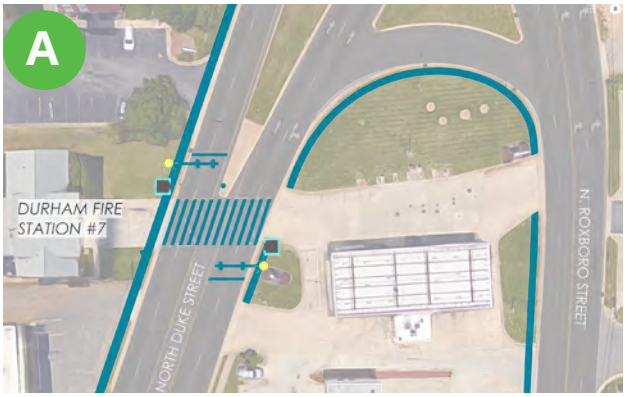


Ensure access point down to Eno River

Improve two-stage crossing at Wellington and Fire Station #7

Intersects with proposed Horton Road Project; near proposed gap project on Holt School Road

Install crosswalks on sidestreets throughout project area

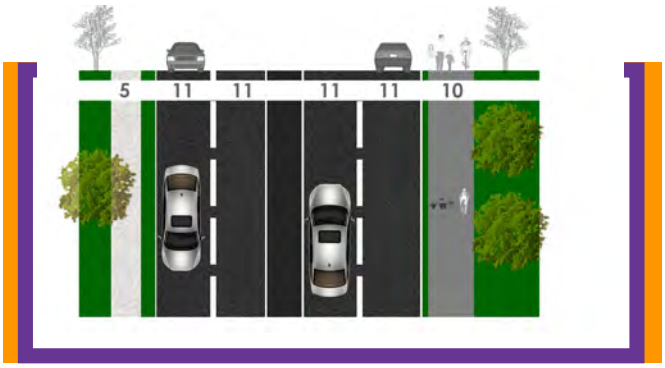


The Roxboro/Duke Street intersection could be fitted with a crosswalk and signal that functions as an emergency signal for the fire station.

N. ROXBORO STREET

FROM: Fairfield Road
TO: Milton Road
LENGTH: 2.73 miles

North Roxboro St is a five-lane arterial road with low-density commercial land use. It connects several adjacent multi-family neighborhoods. Critical improvements include sidewalks on one side of the road, crosswalks at major intersections, and connections to transit stops on both sides of the street. Other improvements include a shared use path on the west side that connects to the West Point on the Eno and facilitates bicycle travel along this corridor.

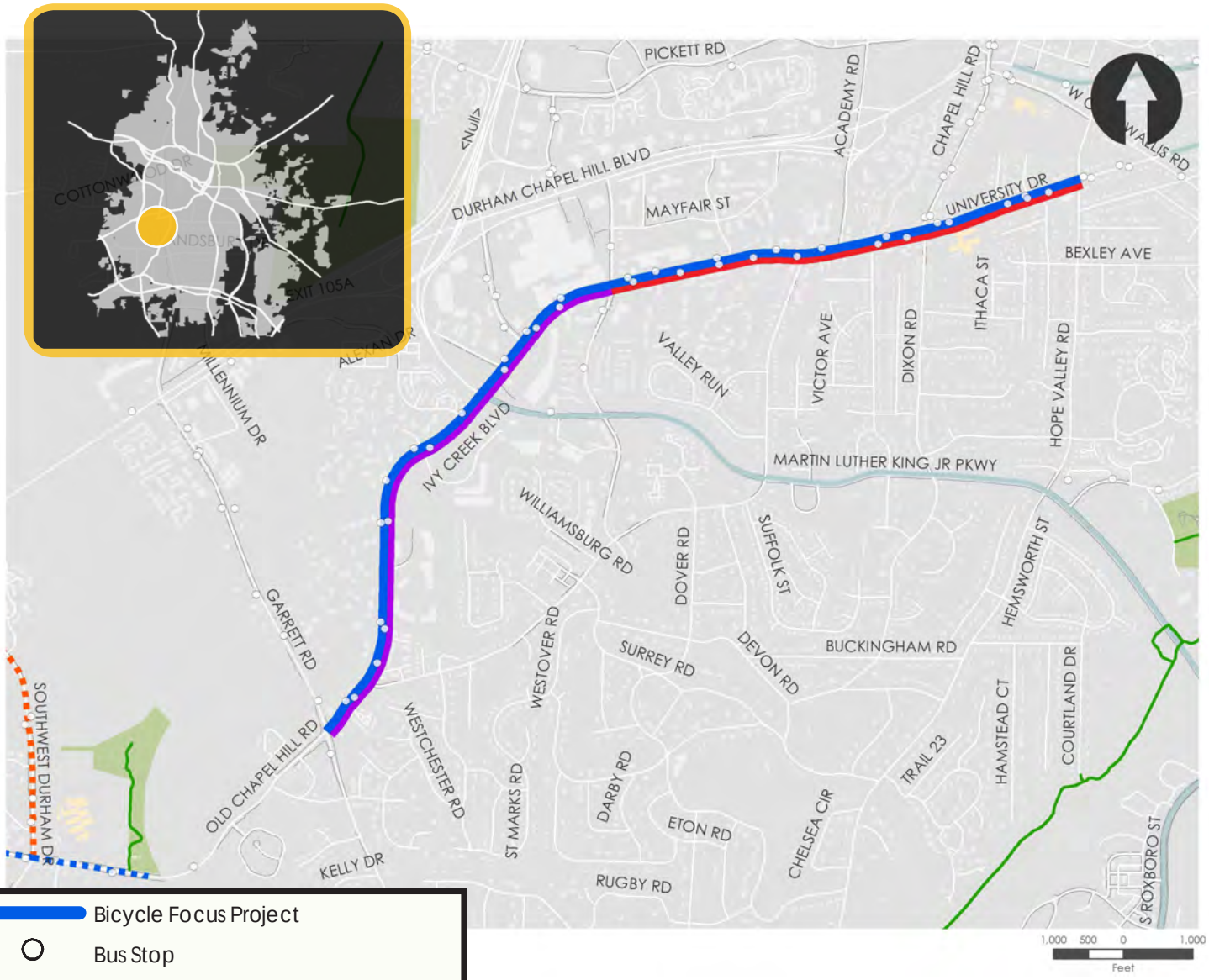


Key Points

- Provides safe area to walk and bike
- Completes a larger pedestrian network
- Connects to West Point on the Eno
- Connects neighborhoods to shopping centers, schools, and library
- High levels of existing pedestrian activity

Construction Cost:(Intersection improvements, construction path, right of way acquisition) **$2,999,343**

N. ROXBORO STREET



- Bicycle Focus Project
- Bus Stop
- Bicycle Facilities
- Greenways
- Sidewalks
- Proposed Buffered Bike Lane
- Proposed Multi-Use Side Path
- Proposed Pedestrian Focus Project
- Funded Bicycle/Pedestrian Project
- Intersection Redesign
- Schools
- City Parks

Median in five-lane sections to enable easier mid-block crossings and slow traffic

Long construction periods, higher costs

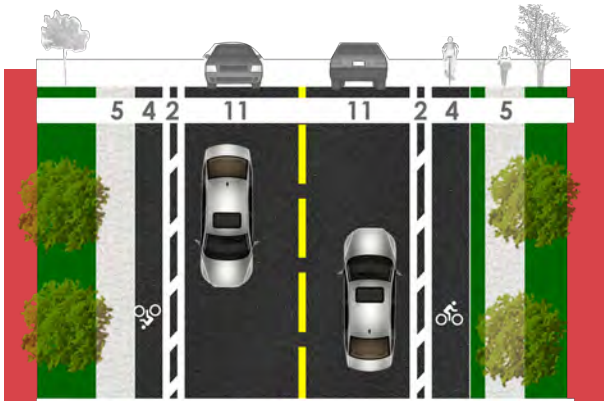
Connections to existing bicycle facilities and future light rail

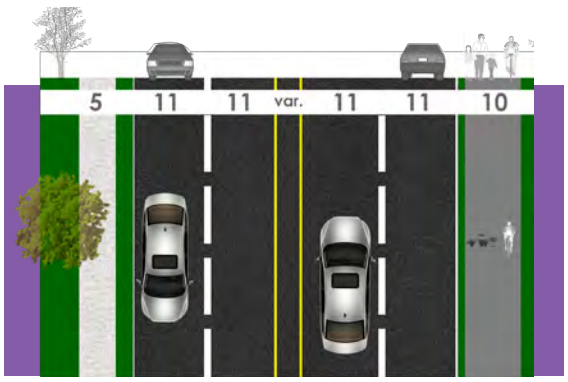
UNIVERSITY DRIVE

FROM: Hope Valley Road
TO: Garrett Road
LENGTH: 2.9 miles

Critical improvements on this bicycle route to Chapel Hill include improved signage, lane reallocation and a multi-use sidepath from South Square to Garrett, and the installation of a buffered bicycle lane east of Shannon Road to Dixon (narrower pavement east of this point would dictate near-term sharrow markings).

Long-term improvements include widening the road from Dixon Road to Hope Valley Road to add bicycle lanes and tying into the plans for the future Durham-Orange light rail corridor. A potential alternate path through the Blue Cross property could also be negotiated.



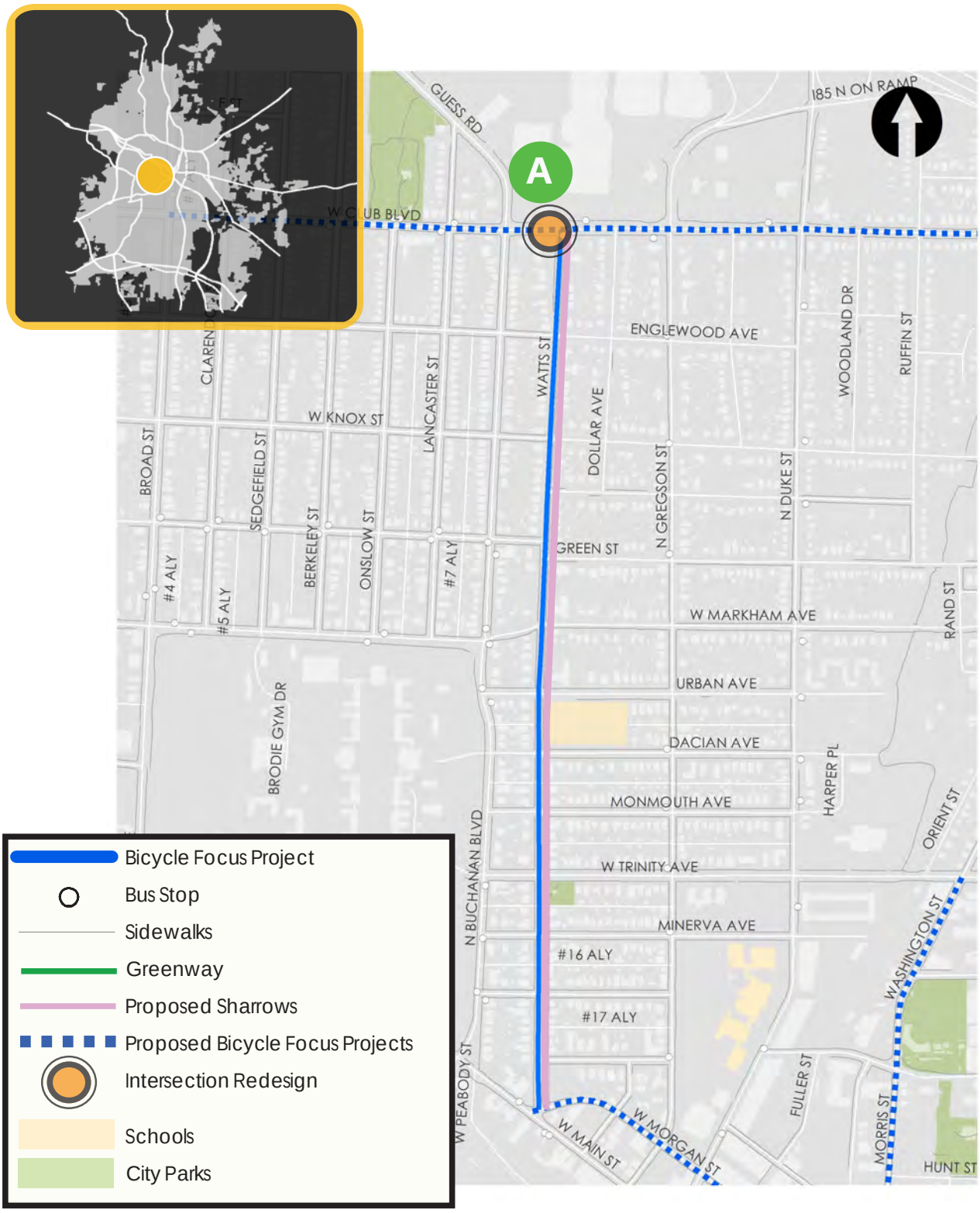


Key Points

- Provides connection to planned bicycle and pedestrian project
- Provides access to future light rail plans

Construction Cost (Include signage, pavement markings, re-striping for bike lanes, sidepath construction, and intersection improvements) **$1,408,381**

UNIVERSITY DRIVE



Links to W. Morgan St. and W. Club Dr.

Noted as a Bicycle Boulevard by Durham Bike Boulevard advocates

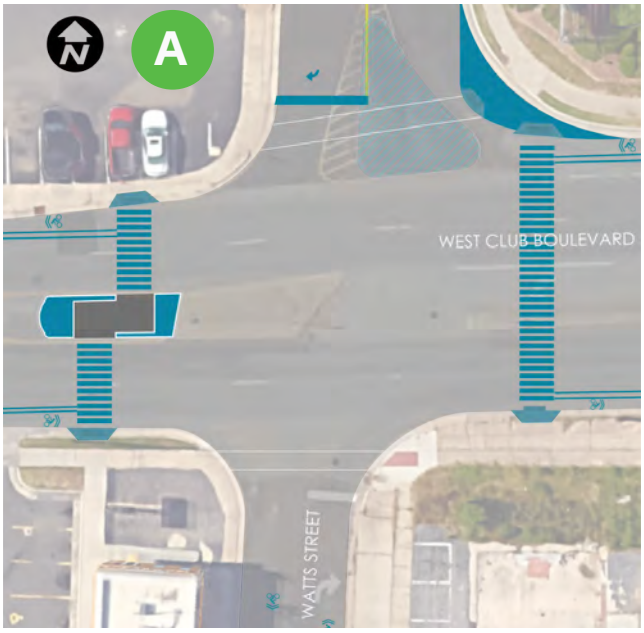
Public Comment Connectivity

WATTS STREET

FROM: Club Boulevard
TO: Morgan Street
LENGTH: 1.07 miles

Watts is a good example of a prototypical "bicycle boulevard" street. Such low-volume, low-speed streets are good candidates for increased signage and markings to help brand the street and improve wayfinding. An improvement is needed at Club Boulevard to facilitate a safer pedestriqn crossing to Northgate Mall.

Developing a broader bicycle boulevard network in Durham will require working with residents to plan the network, determining necessary improvements along the route, and branding the signage and route network.



Watts St/Club Blvd Intersection

Wayfinding signage

Key Points

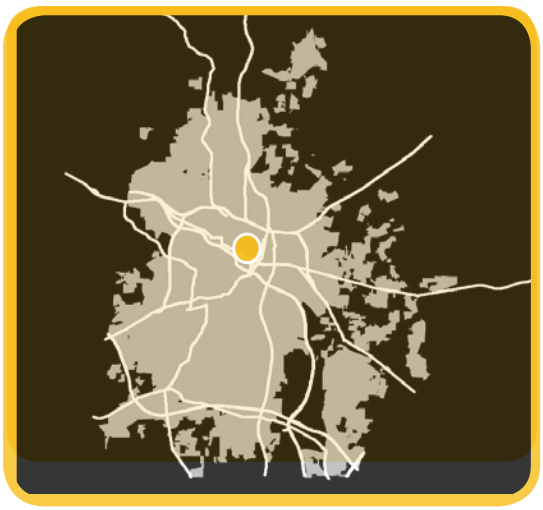
- Low traffic volumes
- Clear and safe navigation
- Bicycle boulevards can range from $10,000-$150,000 per mile depending on the types of improvement

Construction Cost (Include signage, changing out signal heads, intersection improvements, payment markings) **$18,665**

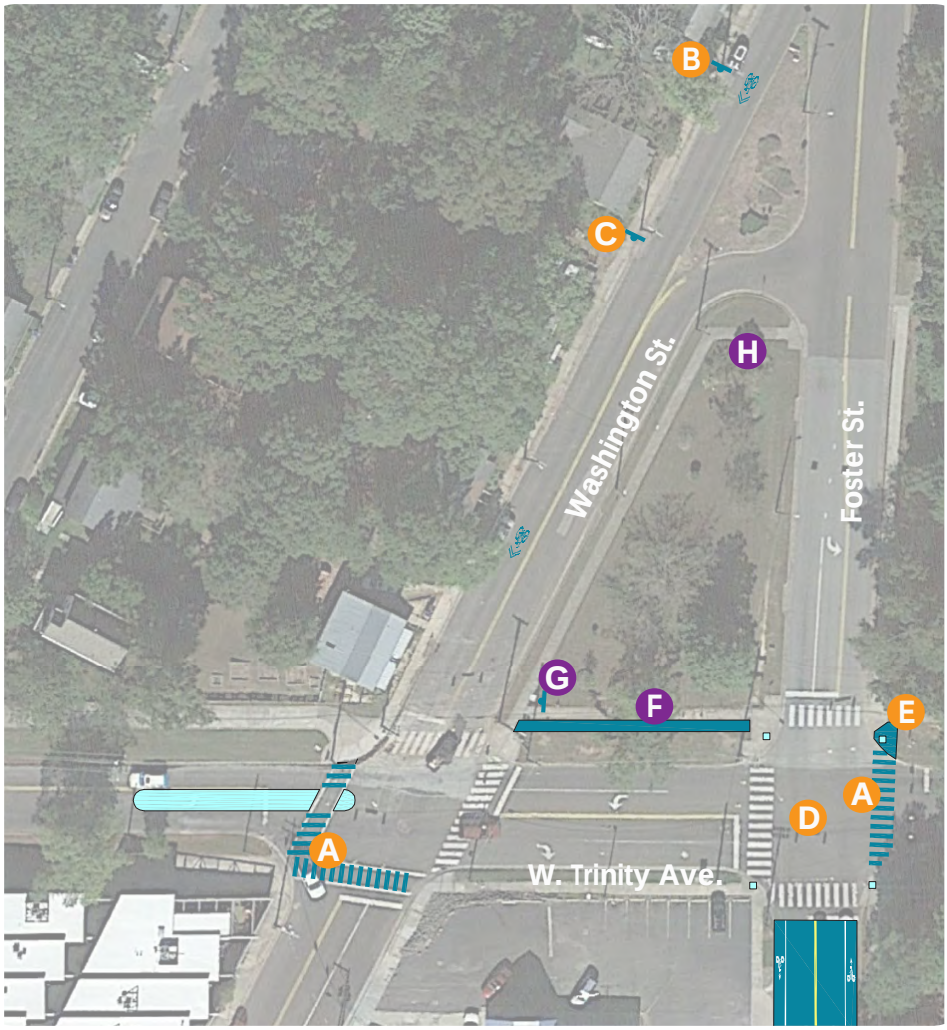
WATTS STREET

Foster / W. Trinity

This section of W. Trinity Ave. has 3,600 ADT, with consistently low congestion for the past 10 years and serves as an important gateway to Duke University's east gate and with direct access to the Ellerbee Creek Greenway. Foster St. serves as a direct route to the downtown core. These crossroads present an opportunity to create a more bicycle and pedestrian friendly gateway, transitioning from residential areas in the north to the urban core in the south.



cost estimate: $56,835



Phase I

A. High visibility crosswalk and pedestrian refuge island

B. Bike lane ends from north; Add MUTCD R3-17 & R3-17b signage

C. Sharrow Markings and add MUTCD R4-11 signage

D. Add pedestrian crossing signals (4)

R3-17

R3-17b

R4-11

Phase II

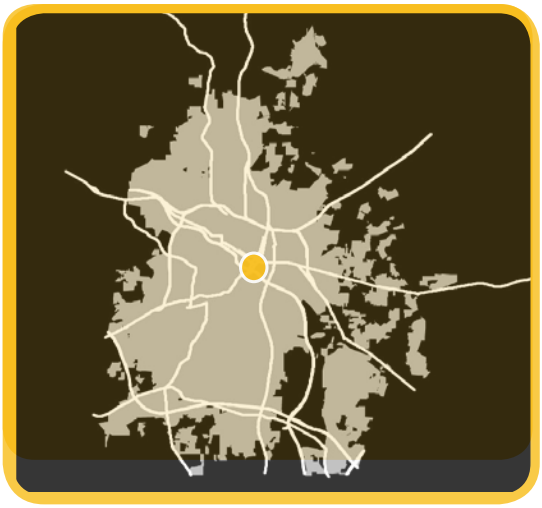
F. Extend Ellerbee Creek Trail to Foster St.

G. South Ellerbee Creek wayfinding sign

H. Bench

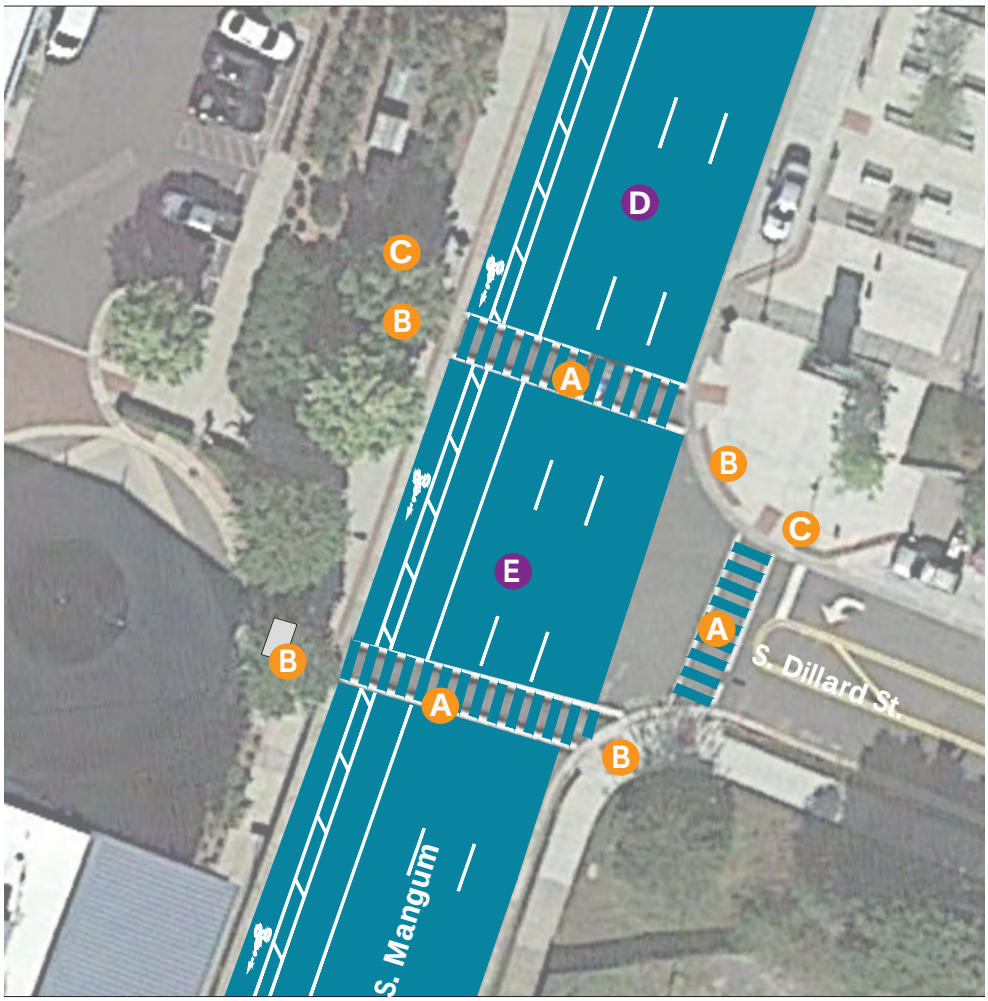
"The addition of bicycle and pedestrian infrastructure here would present a perfect opportunity to activate this park! Art installations? More benches? Food truck site? Pop-up markets? This place could be super cool!"

S. Mangum / Dillard



This intersection is located in the downtown core and is adjacent to some of the more popular destinations in the Durham Bulls Athletic Park, Diamond View Park and the American Tobacco Campus, as well as the Durham County Courthouse and several employment centers. With S. Mangum St. reaching upwards of 12K+ ADT, it is imperative to improve safety and connectivity at this intersection for all modes.

cost estimate: $390,263



Phase I

A. High Visibility Crosswalks
B. Pedestrian push buttons & overhead pedestrian signal
C. Add MUTCD W11-2 signage

W11-2

Phase II

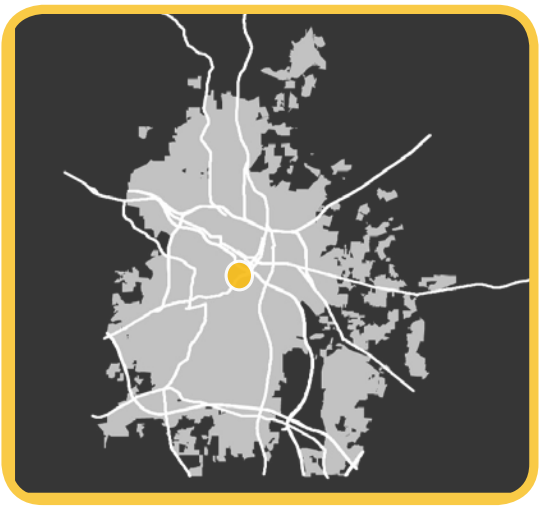
D. Rechannel roadway ROW from Four 12+' travel lanes to Three 11' travel lanes, 8' parking lane, 3' buffer and 5' bike lane.
E. Signalize intersection

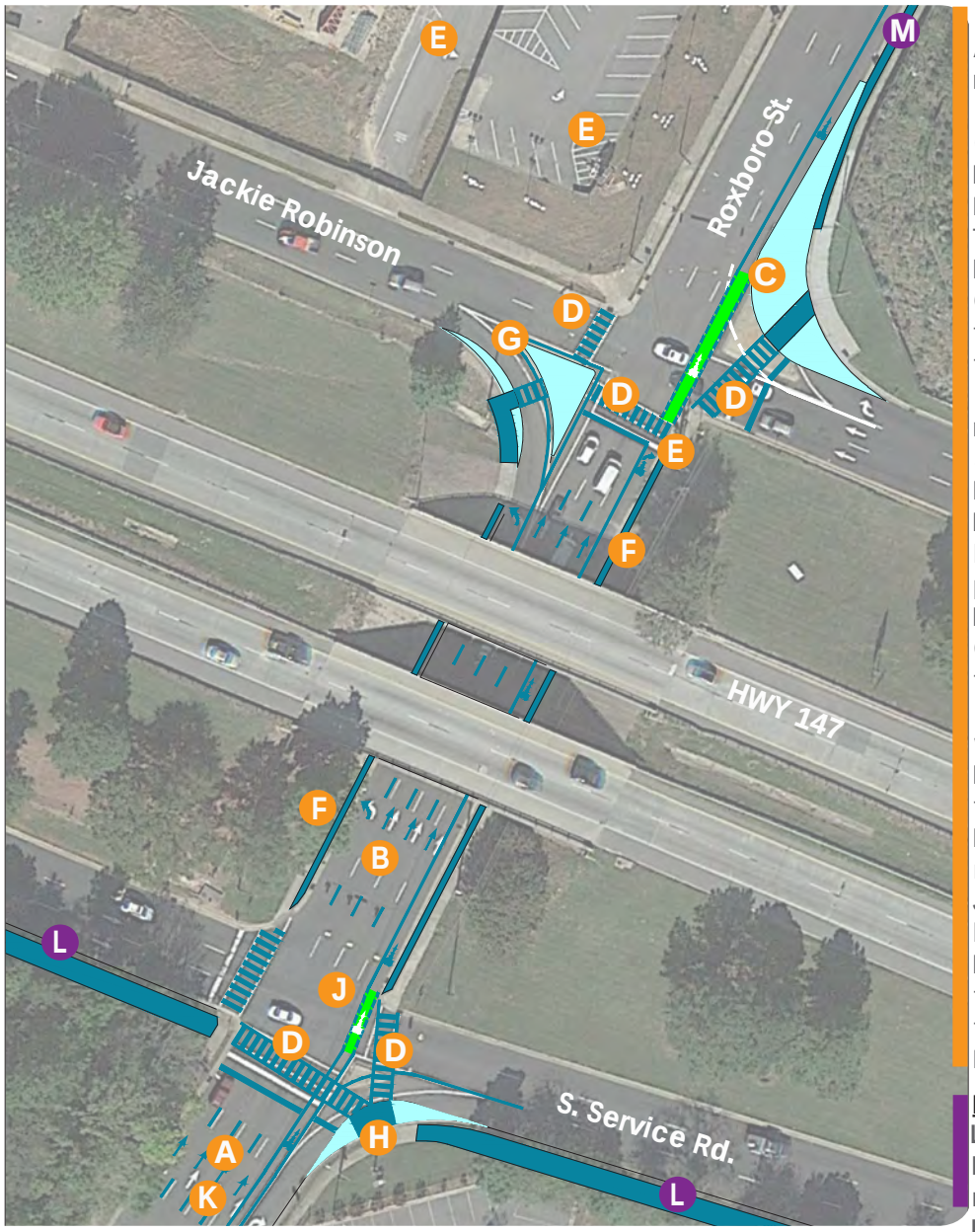
"Rampant speeding and aggressive motorists makes crossing here at the courthouse hairy. I'm an experienced cyclist and I wouldn't ride a bicycle on this street with its current design."

Roxboro / Jackie Robinson

Roxboro St. is another viable gateway into downtown with these two intersections having the potential to filter in more pedestrians and cyclists safely. Providing safer crossings for pedestrians and rechanneling roadway laneage to accommodate an extended bike lane and multi-use side path through this area should start to revitalize this corridor with mult-modal use.

cost estimate: $185,978





Phase I

A. Rechannel lanes from existing 60' roadway ROW: Five 12' travel lanes converted to Five 11' travel lanes and One 5' bike lane

B. Rechannel roadway ROW lanes: Four 12' travel lanes converted to Three 11' travel lanes, One 10' travel lane and One 5' bike lane

C. Reconfigure intersection from free flow right-turn lane to standard right turn, tighten turn radius and create bulb-out, move stop bars back for right-turn and through movements, and add multi-use path

D. High visibility crosswalks

E. Route on-street bike lane to new high viz crosswalk and multi-use side path with wayfinding

F. Widen existing sidewalk to curb

G. Redesign of free flow left-turn for tighter turn radius, shorter pedestrian crossing distance, high-visibility crosswalk and sidewalk extension

H. Redesign of free-flow, right turn for tighter turn radius

I. Add MUTCD W11-2 signage at all crosswalks

W11-2

J. Add green paint along bike lane at conflict points

K. South of here where right-turn lane converges with future bike lane, add MUTCD R4-4 signage

R4-4

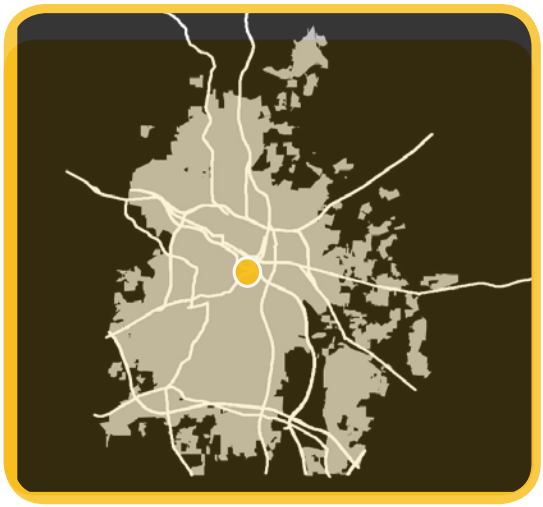
Phase II

L. Sidewalks

M. Widen existing sidewalk to 10' multi-use side path

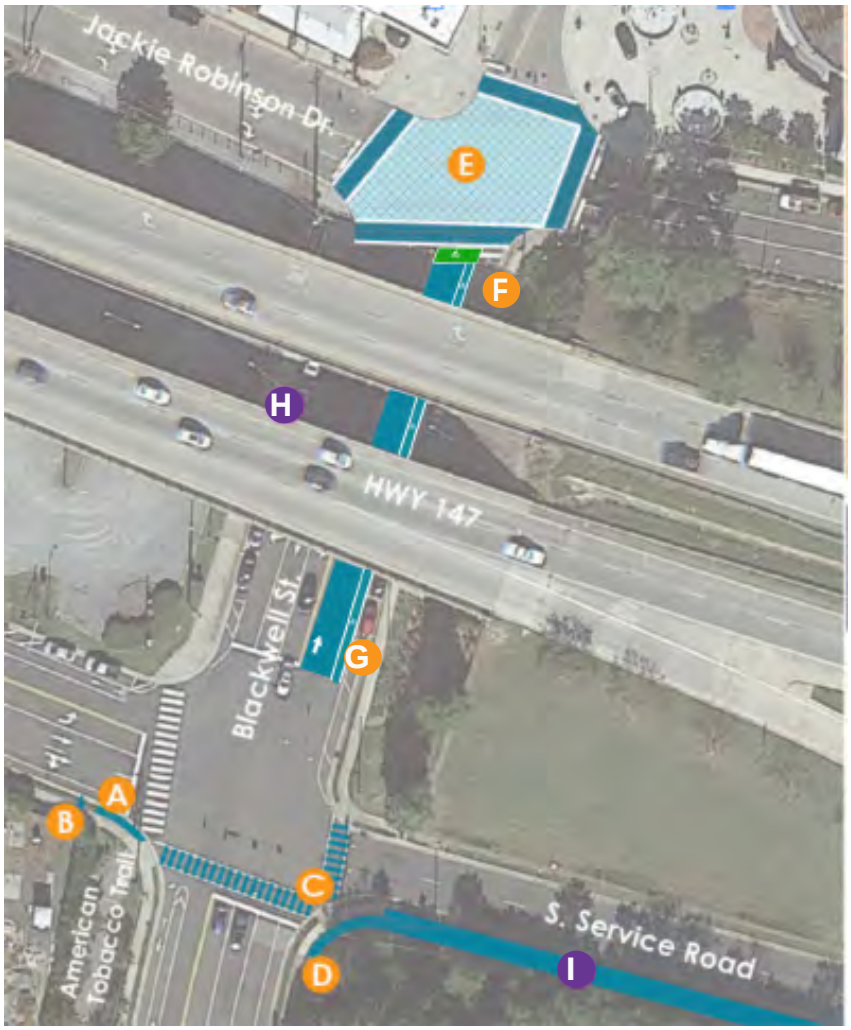
N. Lighting under bridge

Blackwell / Jackie Robinson



These two intersections serve three of the most frequented destinations in the city in the American Tobacco Trail northern trailhead, American Tobacco Campus and Durham Bulls Athletic Park. Creating safer and more visible connections to these destinations will not only benefit visitors and users, but start to create placemaking opportunities.

cost estimate: $202,281



Phase I

A. Extend curb ramp to east to allow cyclists on bike lane to safe refuge at corner accessing ATT

B. Add MUTCD signage W11-15 and W11-15p

W11-15
W11-15p

C. High visibility crosswalks

D. Add MUTCD W11-2 signage at all crosswalks

E. Stamped concrete paver intersection and crosswalks for high visibility at busy pedestrian intersection and intersection design

W11-2

F. Add bike lanes, queue and bike boxes

G. ARemove left turn lane on Blackwell St to Jackie Robinson Dr.

Phase II

H. Add colored, decorative lighting and artwork at underpass

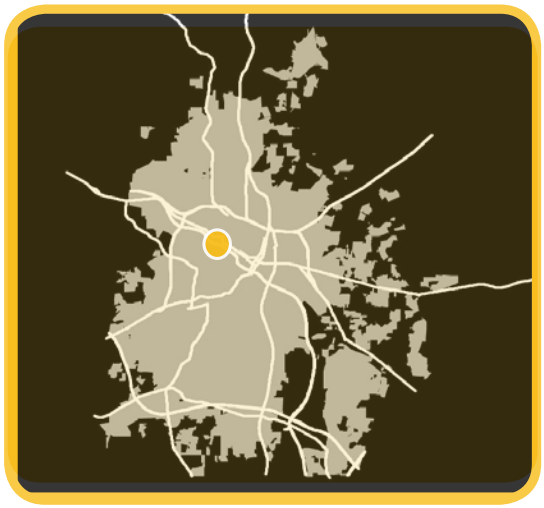
I. Multi-use side path

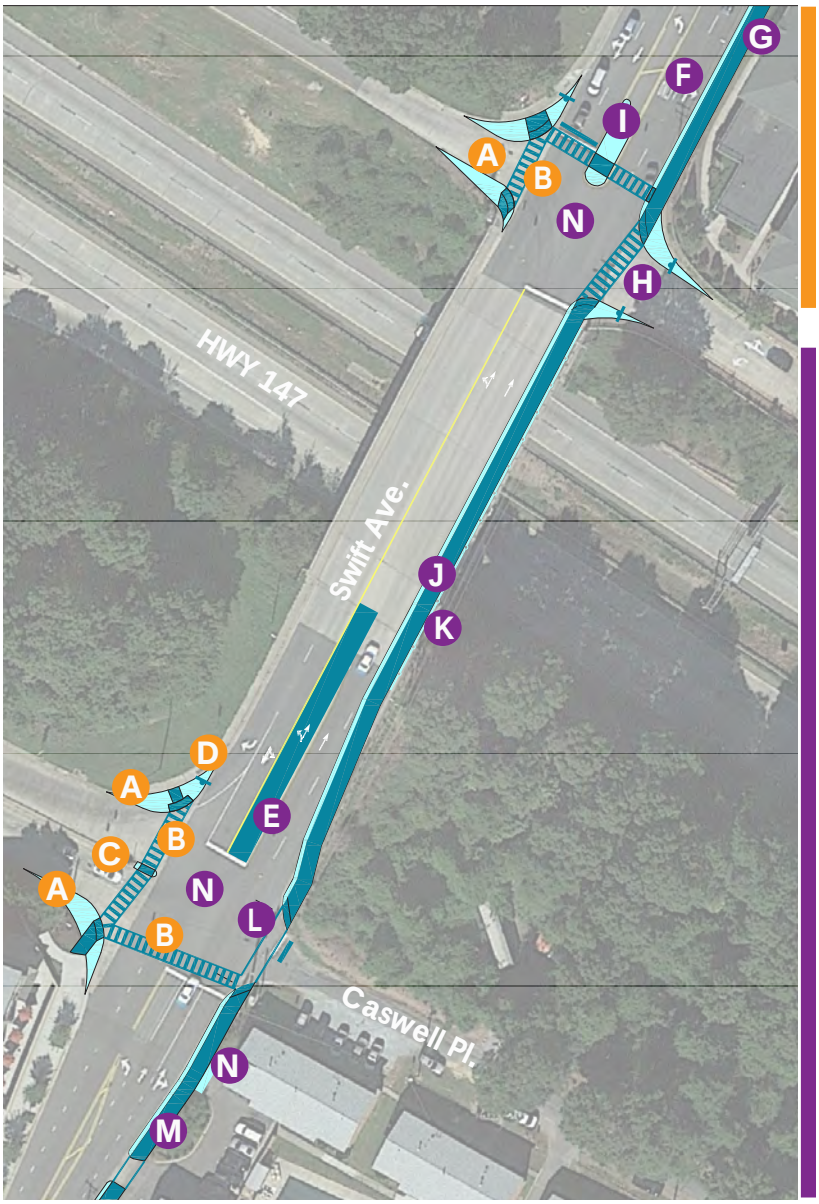
"I hate exiting the ATT when going north into downtown. Surely there has to be a safer & more convenient option for ATT users."

Swift / Caswell

Swift Avenue at this location gets 20K+ ADT, mainly because of NC Highway 147 loading, and traffic relevant to Duke University. It is imperative to make walking through these intersections safer and more desirable in the short term. In the long term there are opportunities to connect this corridor with bicycle facilities.

cost estimate: $351,407





Phase I

A. Create bulb-outs to lessen vehicle turning radius and to make shorter pedestrian crossing; new curb cuts; sidewalk extensions. Restrict right turn movement (no turn on red) for vehicles on the freeway exit ramp).
B. High visibility crosswalks
C. Create small pedestrian refuge
D. Add MUTCD W11-2 signage


W11-2

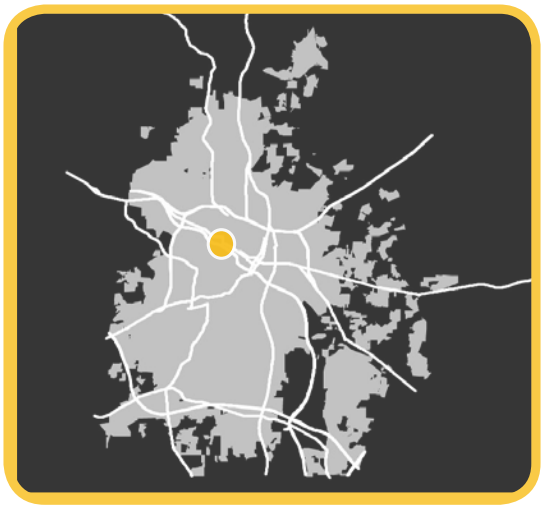
Phase II

E. Eliminate Swift Ave. south bound left only lane (to Caswell Pl.) and combine left turn with south bound through lane.
F. Rechannel existing Two 12' north bound through lanes from 12' to 11' wide
G. Create 8' multi-use side path with 2-3' landscape or hardscape buffer
H. Create bulb-outs to lessen vehicle turning radius and to make shorter pedestrian/bicycle crossing; add high visibility crosswalk: add MUTCD W11-15 signage


W11-15

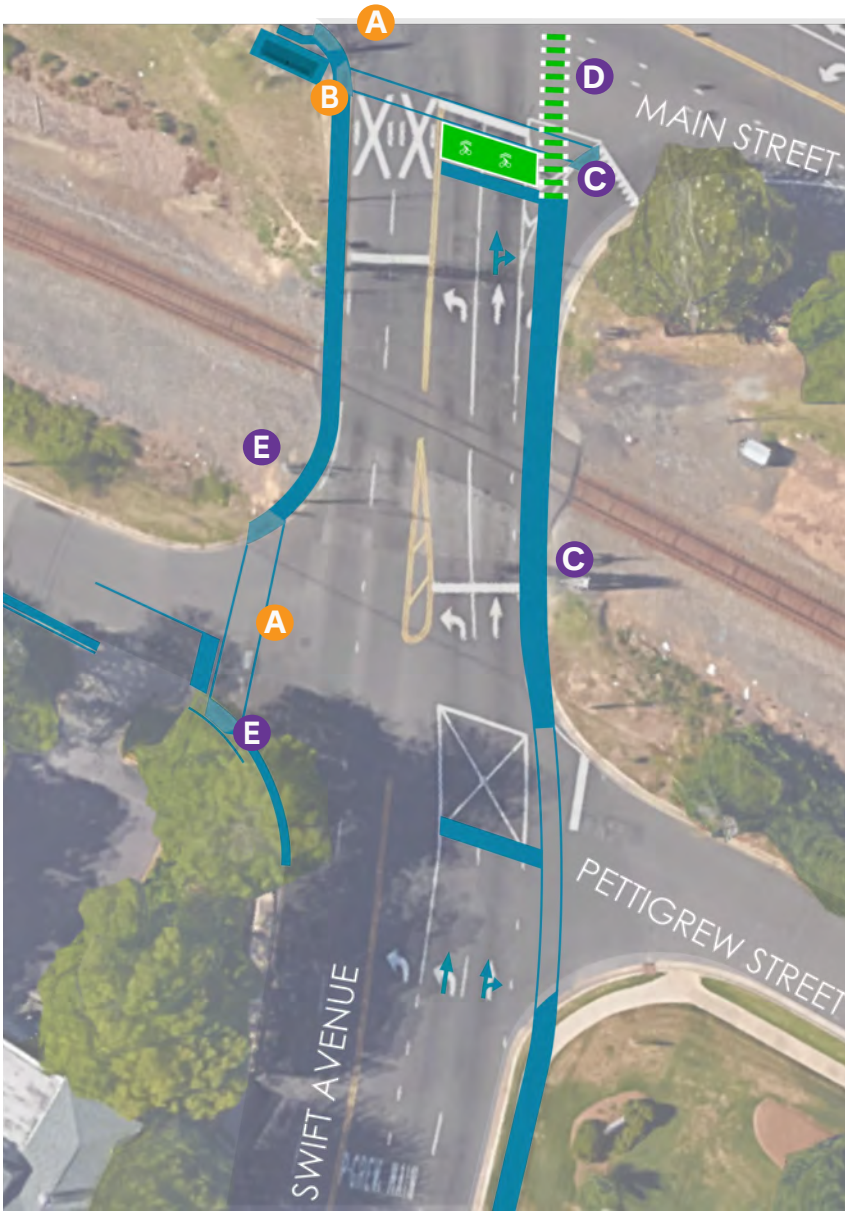
I. Create pedestrian refuge in unused median area; high visibility crosswalk; move stop bar back on Swift Ave south bound
J. Create 8' multi-use side path with 2-3' landscape/hardscape buffer (from lane rechannelization)
K. Bicycle/pedestrian safe railng along Hwy. 147 overpass
L. Transverse crosswalk; move stop bar back on Caswell Pl.
M. Widen existing sidewalk to 8' multi-use side path; 2-3' hardscape/landscape buffer
N. Close driveway

Swift / Pettigrew



The Swift and Pettigrew intersection supports nearby commercial and University travelers, and is part of a critical, if challenging, corridor. The rail line provides both constraints and a potential opportunity for over-hauling this location comprehensively. Improvements to the busy transit stop on Main, sidewalk connections and crosswalks provide short-term change while supporting separation of foot and bike traffic is a longer-term objective.

cost estimate: $210,678



Phase I

A. Construct crosswalks at Pettigrew and Main intersections and curb ramps (3)

B. Improve transit stop (shelter) and construct connecting wide sidewalk to (new) curb ramp per Downtown Design District standards, if feasible with respect to RR right-of-way.

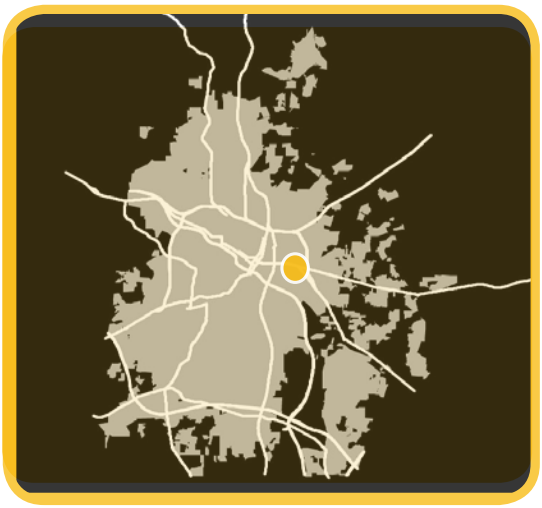
Phase II

C. Extend curb line, construct curb ramp, and reallocate lanes to remove northbound right-turn lane to allow for construction of multi-use path

D. Install green warning crosswalk and bike box at Main Street intersection

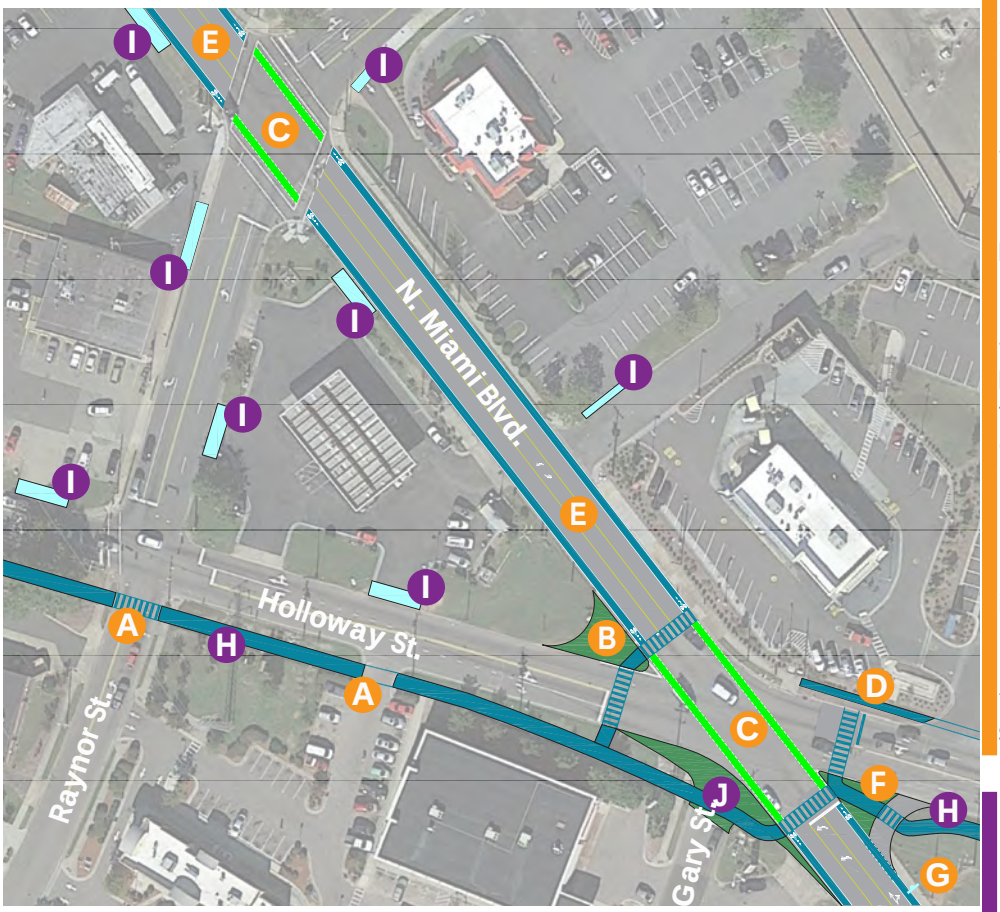
E. Construct new sidewalk and retaining walls (south side of Pettigrew) - NOTE: may require shifting all lanes east to avoid negotiating additional crossing width at railroad)

Holloway / N. Miami



The crossroads of Holloway St. and N. Miami Blvd. is consistently congested with ADT data of 9K+ and 7.5K+ respectfully. Slowing down automobiles with reclaimed hardscape areas as green space and pedestrian refuges, providing safer crossing distances through high visibility crosswalks and pedestrian countdown signals, and re-channeling the roadway for better bicycle access will provide a more inviting environment for pedestrians and cyclists .

cost estimate: $253,613



Phase I

A. High visibility and transverse crosswalks

B. Reclaim hardscape area as green space and pedestrian refuge, close right-turn movements west bound from Miami to Holloway, and provide high visibility crosswalks

C. Improve traffic signal operations for all modes; green painted bike lanes at conflict points

D. Extend sidewalk

E. Rechannel roadway from existing 42' roadway ROW to Two 10.5' travel lanes, One 11' center turn lane and Two 5' bike lanes

F. Redesign intersection to allow for safer crossing for pedestrians and cyclists; expand median refuge island, move right-turn off of Miami to Holloway east bound back, and pull back stop bars to accommodate high visibility crosswalks.

G. Add 'Yield to Bikes' sign or similar MUTCD spec. **Provide MUTCD W11-2 signage at all crosswalks

W11-2

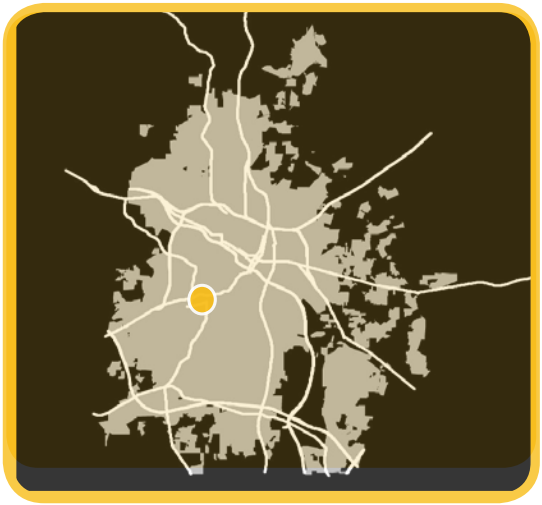
Phase II

H. Multi-use side path

I. Close driveways as redevelopment occurs

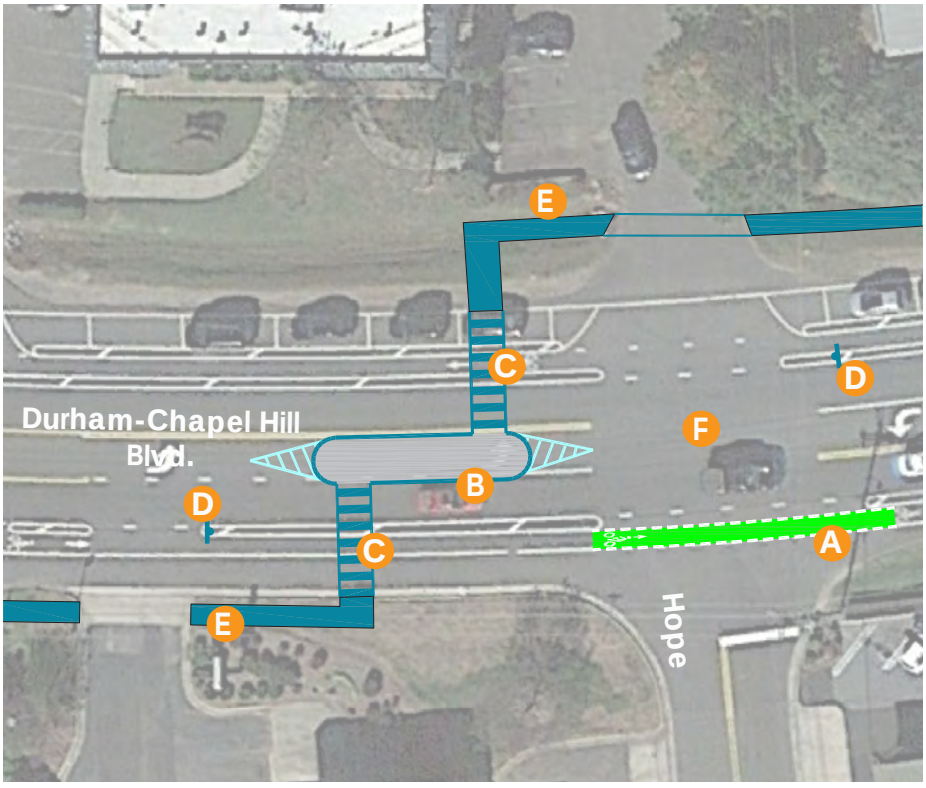
J. Restrict Gary St. access and tighten turning radius with reclaimed green space

Hope Valley / Durham-Chapel Hill



Durham-Chapel Hill Blvd. is a busy road with an upwards of 13K ADT at this location, and has a wide ROW with room to add sidewalks. This corridor is continually adding more restaurants and shopping choices and, as expressed by local citizens, should be more accessible by foot. This increase in walkability would increase patronage to businesses and transit stops, and make for a more inviting and viable corridor.

cost estimate: $399,081



Phase I

A. Green painted bike lane at intersection

B. Barrier protected pedestrian refuge

C. High visibility cross-walks

D. Add MUTCD W11-2 signage

E. New sidewalks to connect to bus stops

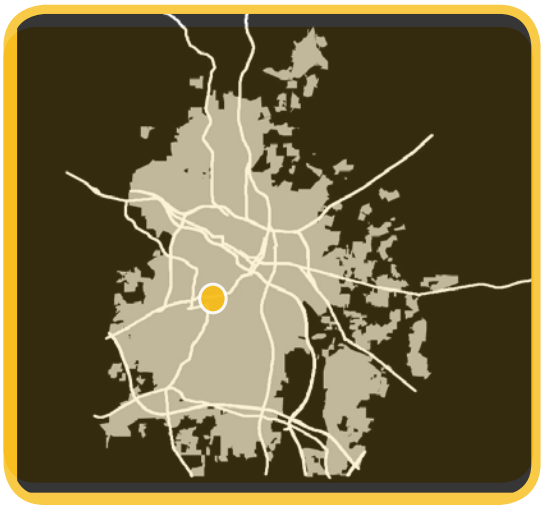
W11-2

Phase II

F. Install Signal

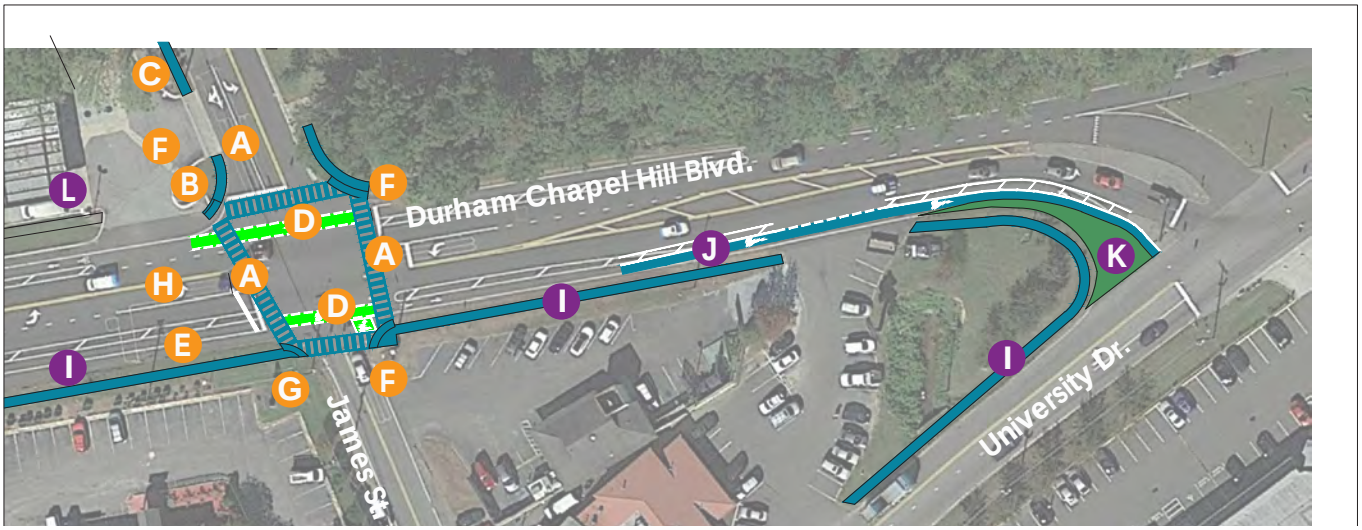
"Really a very necessary intersection in a potentially walkable neighborhood if one could cross the street! I live, walk and bike this neighborhood and would shop more if I could cross the street more easily."

Durham-Chapel Hill/ James



This intersection along a busy Durham-Chapel Hill Blvd is becoming a commercial business and restaurant hub, and is bounded on all sides by residential. It is imperative to provide for better walkability to and from intersection for local residents, as well extending and providing safer and better connectivity for bicycle use.

cost estimate: $241,671



Phase I

A. High visibility crosswalks
B. Pedestrian push buttons & overhead pedestrian signal at all 4 corners
C. Sidewalks (reach bus stop on west side)
D. Painted bike lanes at intersection; Two-stage turn queue box at south leg
E. Add 'Left Turn Box' sign for guiding cyclists
F. MUTCD W11-15 signs (4)
G. Add curb ramps to all 4 corners
H. Move stop bar back

W11-15

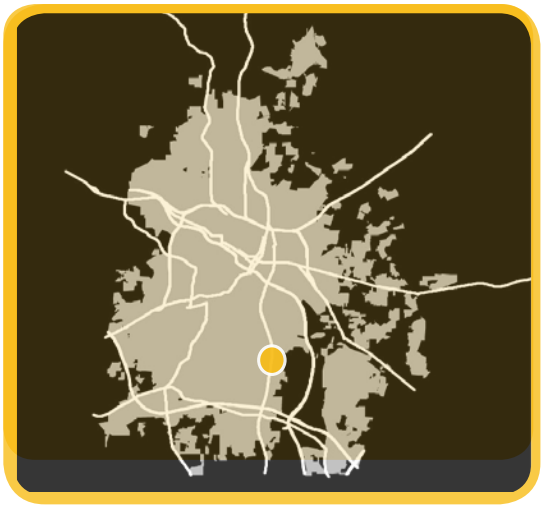
Phase II

I. New sidewalks
J. Extend buffered bike lane to University Dr. intersection
K. Close right-turn only lane and bring bike lane up to intersection; Reclaim as green space
L. Close Driveway

Alston / Cornwallis

Cornwallis Rd. is an important bicycle corridor with on-street bike lanes that connect the southern reaches of the city. However, several intersections are dangerous for bicycle through movement including this one at Alston Ave. Making more visible bicycle crossings with painted bike lanes at conflict points, as well as improving channel islands for better delineation and visibility should increase safety and cycling through this intersection.

cost estimate: $40,194



Phase I

A. Raised and landscaped channel islands

B. Painted bike lane through intersection

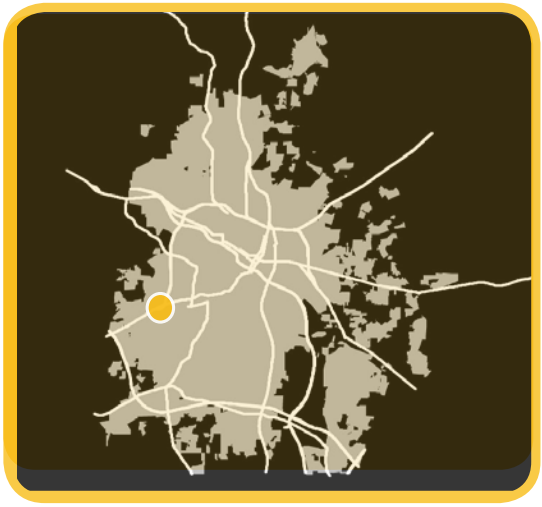
C. Add MUTCD W11-1 signage

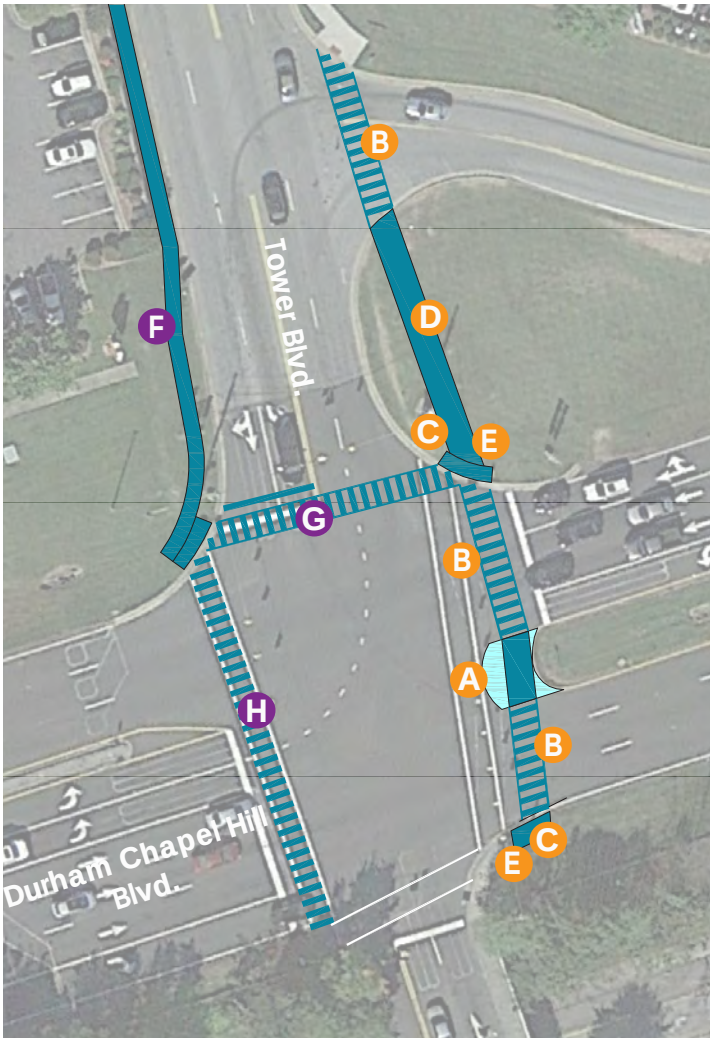
W11-1

Durham Chapel Hill/ Tower

This intersection along Durham-Chapel Hill Blvd. gets an upwards of 18K ADT, and is not inviting at all for crossing pedestrians. With the multitude of businesses that line this corridor, providing for safer, more visible crosswalks and sidewalk connections is important for improving for future walkability.

cost estimate: $77,255





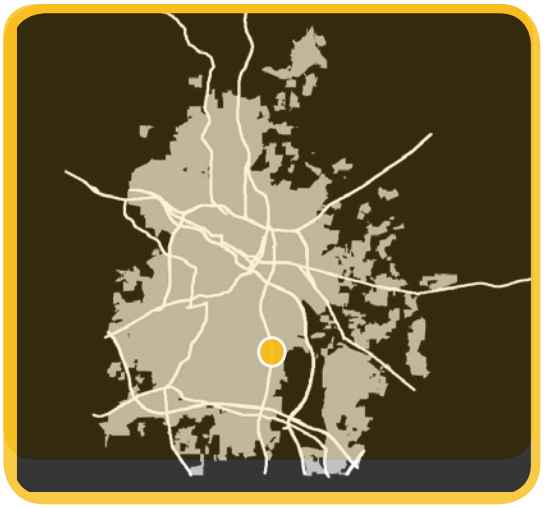
Phase I

A. Extend median and create pedestrian refuge
B. New high visibility crosswalks (replace older transverse crosswalks)
C. New curb ramps
D. New sidewalk
E. Add pedestrian countdown signal

Phase II

F. Add new sidewalk on East side of Tower Blvd.
G. Add new high visibility crosswalk and move stop bar back
H. Add new high visibility crosswalk

Fayetteville / Herndon



Next to an I-40 interchange, Southpoint Mall and Renaissance Shopping Center, Fayetteville Rd., at this intersection, has a very high ADT of 34K. Herndon Rd., to the east connects a plethora of residential developments. Pedestrian friendly elements like curb bulb-outs, high visibility crosswalks and pedestrian refuge will make this popular shopping destination more accessible for pedestrians. In the long term, a safer, more direct route connecting to the American Tobacco Trail at the west side of the mall is important.

cost estimate: $604,816

Phase I

A. Extend median to provide pedestrian refuge
B. Tighten turn radius and extend curb ramps
C. High visibility crosswalks
D. Widen sidewalk to 10' to support multiple uses
E. New extended curb ramp

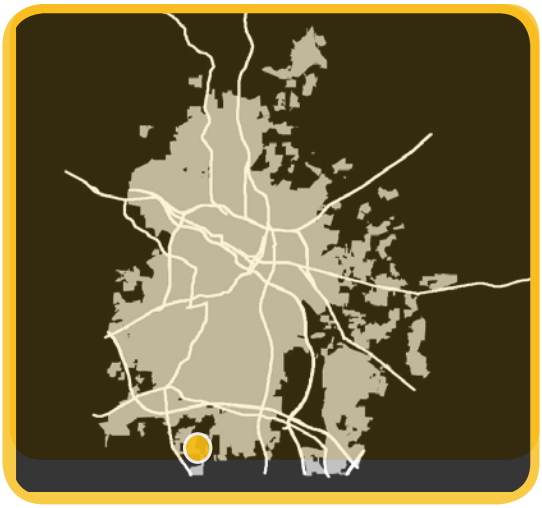
Phase II

F. New curb break, curb ramps and high viz crosswalk to access mall parking lot
G. New sidewalk to access mall (existing worn pedestrian foot path here)
H. New sidewalk around northeast side of mall to connect to American Tobacco Trail

Scott King / ATT

The 23-mile American Tobacco Trail is the region's recreational jewel, connecting the town of Cary to the downtown core of Durham. However, some roadway intersections along the trail are dangerous to cross. Flashing LED beacons warning motorists trail users crossing, along with automobile preventive entry elements will keep the trail safer and more accessible.

cost estimate: $132,940



Phase I

A. Brick column/ marker (2)
B. Large boulders (4) to prevent vehicle entry
C. Solar flashing LED Beacon with motion detectors (2)

Phase II

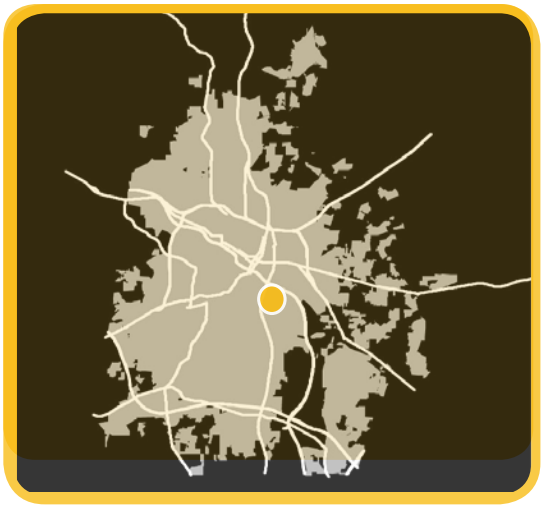
D. Mid-block crossing raised median island

"High speed, poorly lit intersection with pedestrians and bicyclists. Pedestrians are not visible until the last second due to obstructions from vegetation. Suggest pedestrian signs that flash when pedestrians are in the crosswalk."

Lawson / Ridgeway

The Lawson St./Ridgeway Ave. intersection sits between North Carolina Central University and Durham Technical Community College. A half-mile separates the two institutions, that is bounded by sidewalks and residential access. As an increase of students and other citizens walk this corridor, pedestrian friendly improvements like improved crosswalks, new curb ramps and pedestrian scale lighting will improve safety.

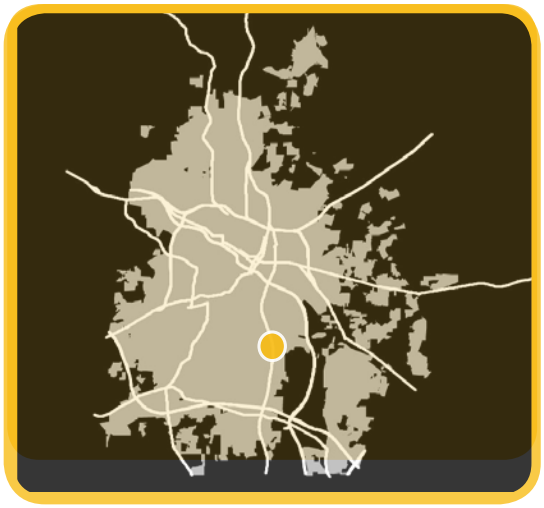
cost estimate: $5,185



Phase I

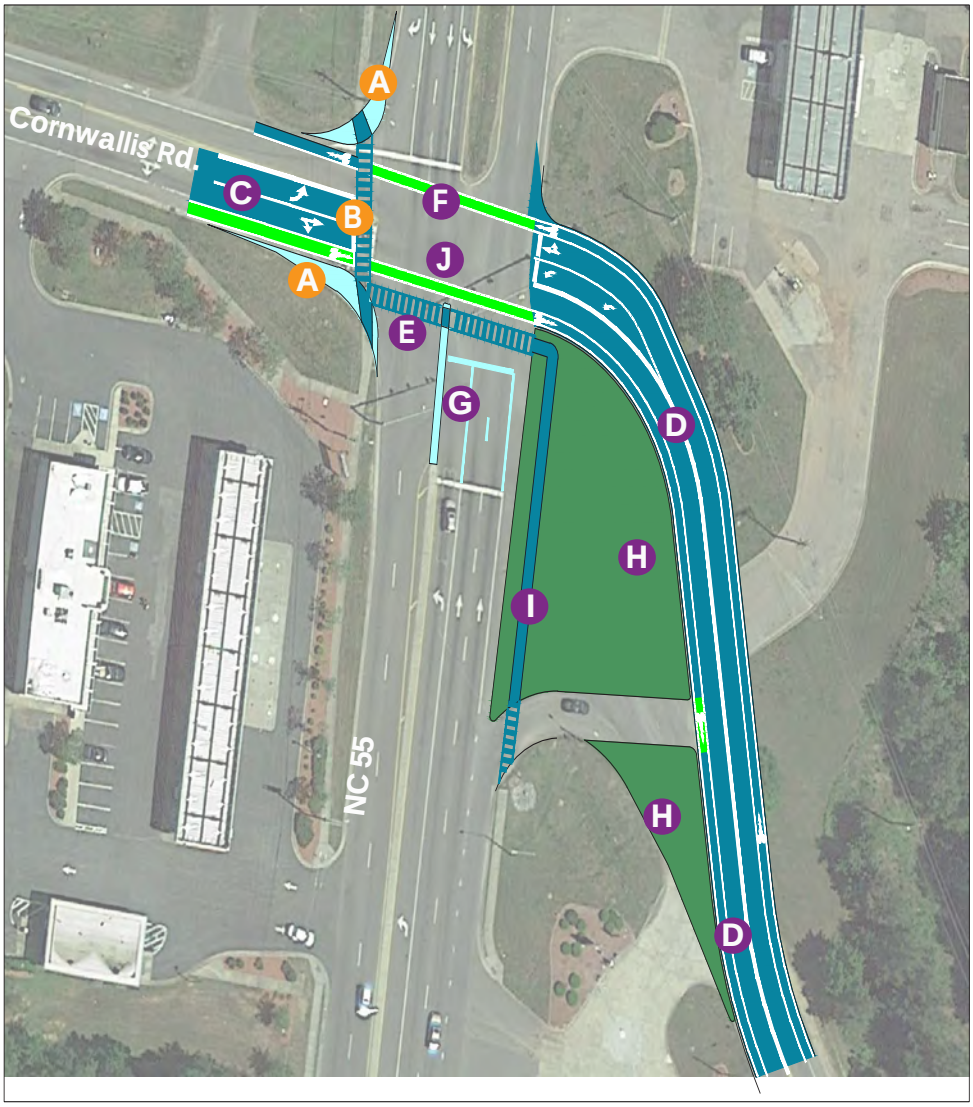
A. New and realigned transverse crosswalks (3)
B. Pedestrian scale lighting at stop
C. Yellow no passing striping to delineate travel lanes
D. New curb ramp and reconnect sidewalk

Cornwallis / NC 55



With an ADT of 26K along NC55 and 12K along Cornwallis Rd. and no pedestrian or bicycle friendly crossing elements present, this intersection direly needs improvements for multi-modal access. A proposed multi-use path project to the north will also benfit from improved access. Short term improvements should include curb bulb-outs and high-visibility crosswalks, while long-term improvements should include a re-routing of Cornwallis to align for safer and shorter crossing for cyclists and pedestrians.

cost estimate: $454,743



Phase I

A. Bulb outs to reduce turning radius and lessen pedestrian crosswalk distance; new curb ramps and sidewalk connections; add pedestrian push button crossing signals (2); add W11-15 signs (2)

W11-15

B. High visibility crosswalk

Phase II

C. Realign lanes, move stop bar back and place bike box for safer bicycle through movements

D. Realign Cornwallis Rd.

E. High visibility crosswalk

F. Painted bike lanes at intersection for bicycle through designation

G. Move stop bars and laneage up to new crosswalk; Extend concrete median up to crosswalk and create pedestrian refuge

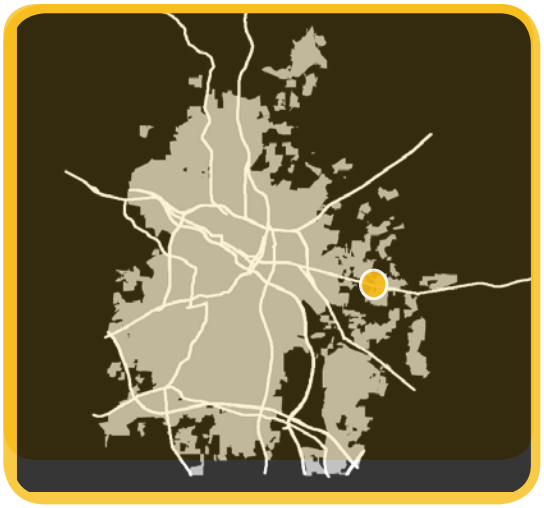
H. Expand median islands and reclaim as ladscape areas

I. New sidewalk connection

J. Improve traffic signal operations for all modes

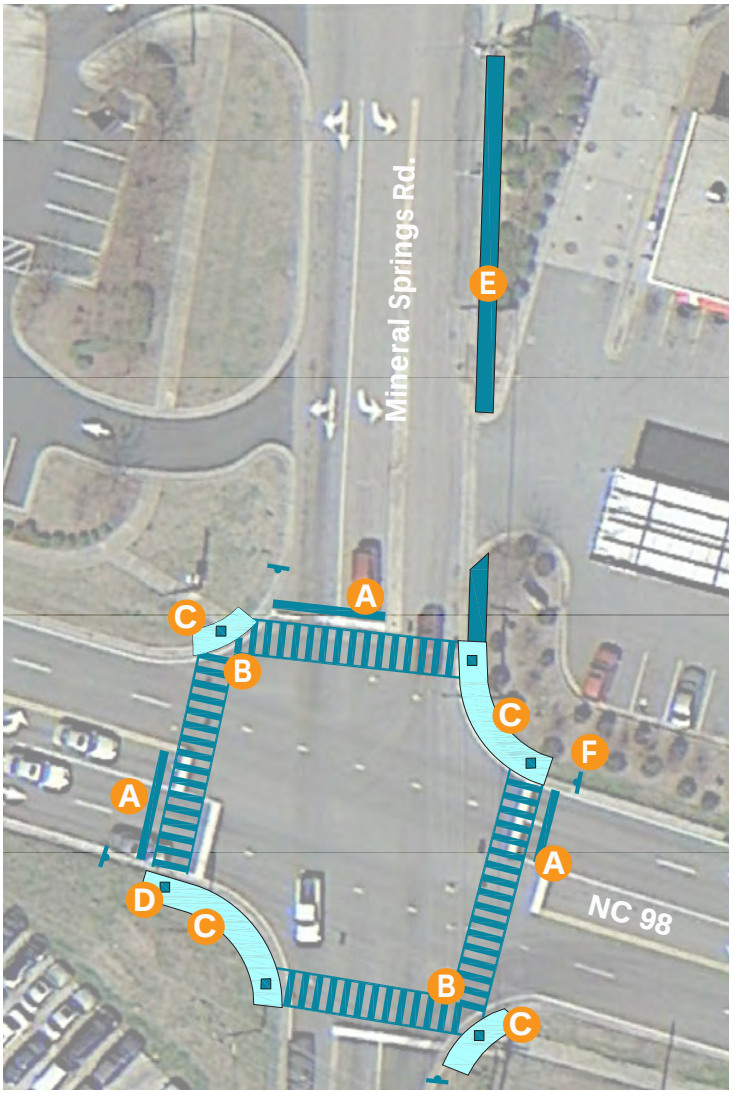
"This is a very dangerous intersection for cyclists, no cross walk, no dedicated light and the bike lane is often used as a turn lane! Please fix this!"

NC 98 / Mineral Springs



This intersection is adjacent to Oak Grove Elementary School, shopping and restaurants and is fairly congested with 18K ADT along NC 55 and 10K along Mineral Springs. To provide better walkability and multi-modal access to these destinations, a new sidewalk connection to the bus stop, high visibility crosswalks, curb ramps and pedestrian push button signals should be implemented.

cost estimate: $54,230

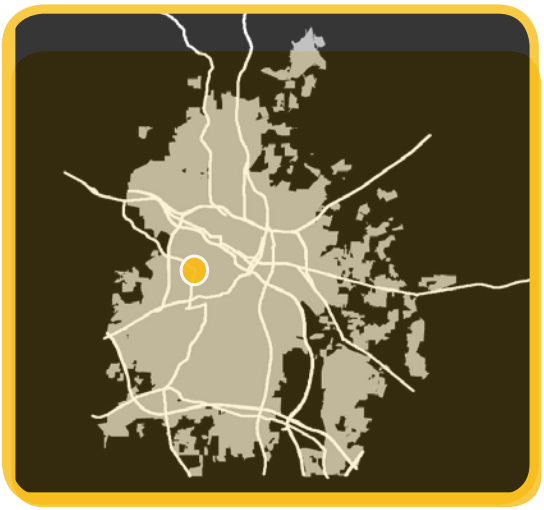


Phase I

A. Relocate stop bars
B. High visibility crosswalks
C. New curb ramps
D. (6) Pedestrian push button signals
E. New sidewalk to bus stop
F. (4) MUTCD W11-2 signs

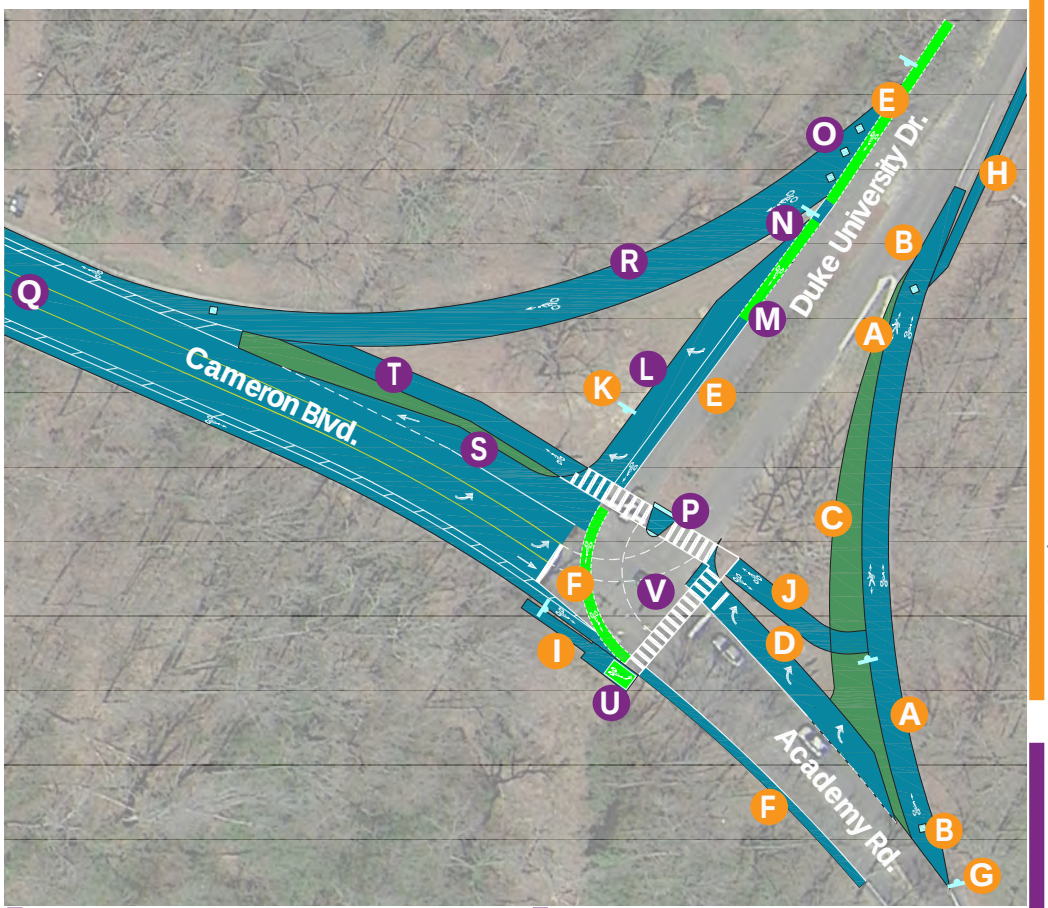
W11-2

Duke U. / Academy



This intersection serves as a southern gateway into Duke University. Cameron Blvd. and Academy Rd. get 10K and 8.5K ADT respectfully, with most traffic coming from off campus commuters and athletic events. The free-flow right turns encourage higher than normal speeds which poses a danger to cyclists and pedestrians navigating this intersection. Closing the free-flow turn and reconfiguring a T-intersection, along with extended and delineated bicycle routes, and extended pedestrian routes will make this intersection more of a multi-modal gateway.

cost estimate: $160,286



Q. Rechannel 44-46' ROW roadway to Two 10' travel lanes, One 10' center turn-lane, Two 4-5' bike lanes, and Two 3' buffer lanes
R. Close free flow right-turn and convert to multi-use trail
S. Add recieving merge lane

T. Add multi-use path connection and landscape buffer
U. Add turn quene box with appropriate leading signage for northbound cyclists
V. Improve traffic signal operations for all modes

Phase I (closing east free-flow right-turn lane only)
A. Close right-turn only travel lane and convert to multi-use trail
B. Bollard to prevent automobile entry
C. Expand left over road space to planted green space
D. Add right-turn lane
E. Continue striped bike lane to intersection; add dashed striping and green paint at conflict area
F. Continue green bike lane turning movement through intersection; join bike lane to existing
G. Add MUTCD R5-3 sign
H. New sidewalk joining with converted multi-use trail

R5-3

I. Extend existing sidewalk east joing new high visibility crosswalk
J. Multi-use path connection
K. MUTCD W11-2 sign and at every crosswalk

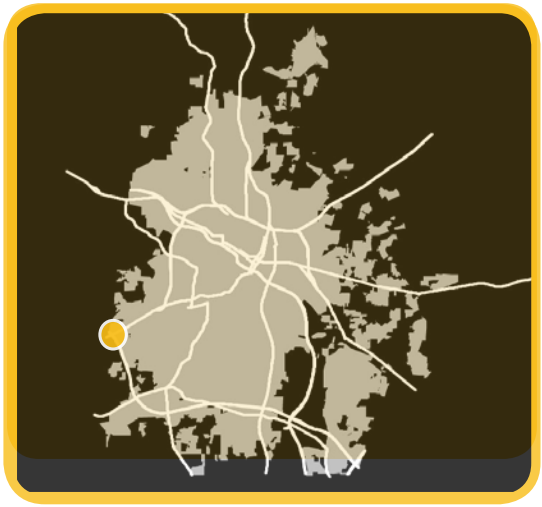

W11-2

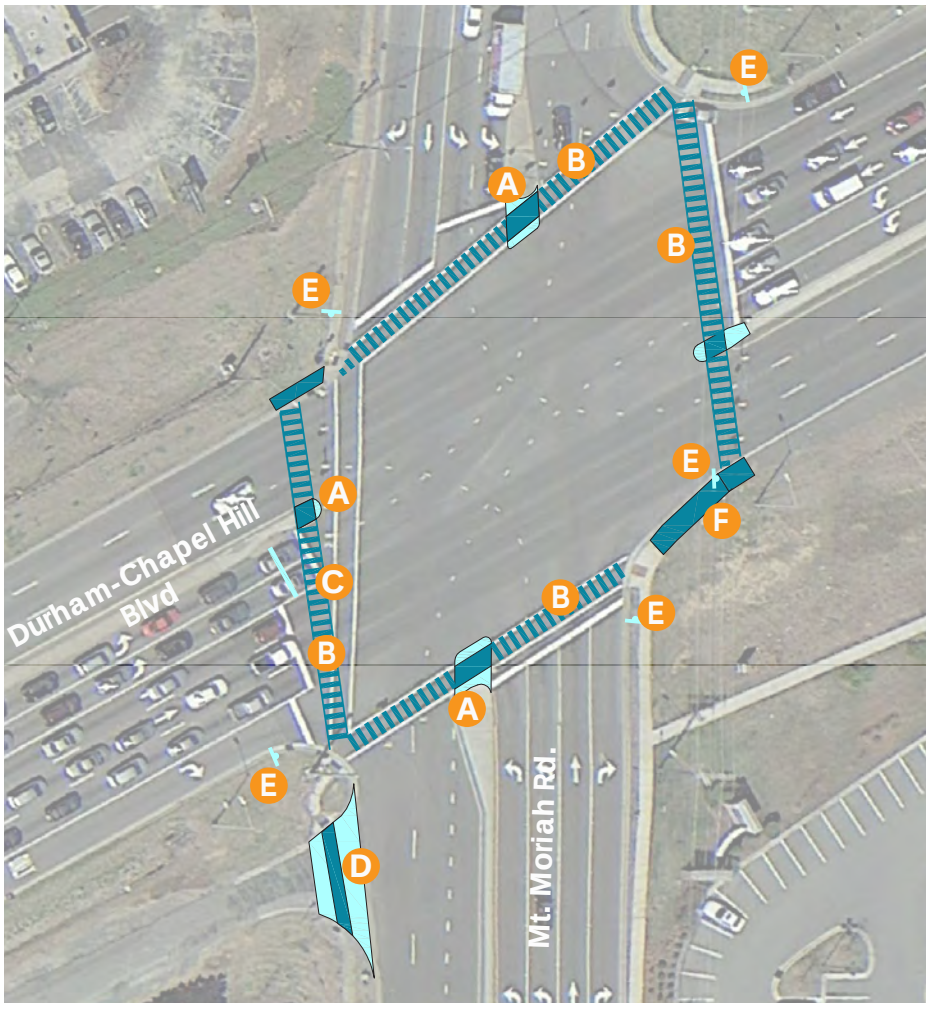
Phase II (closing both free-flow right-turn vehicle lanes)
L. New right-turn only lane
M. Green painted bike lane at conflict area
N. Add 'Yield to Bikes' sign or similar MUTCD spec.
O. Add bollards
P. High viz. crosswalk and pedestrian refuge

Durham-Chapel Hill / Mt. Moriah

Adjacent to an I-40 interchange, this intersection gets a high amount of traffic with 42K ADT making it unsafe for pedestrians to cross to many commercial businesses and restaurants that surround. Improving crosswalks to high visibility ladders, extending medians to provide for pedestrian refuge along the lengthy crossings and improving curb ramps should make this intersection more accessible for pedestrians.

cost estimate: $49,190





Phase I

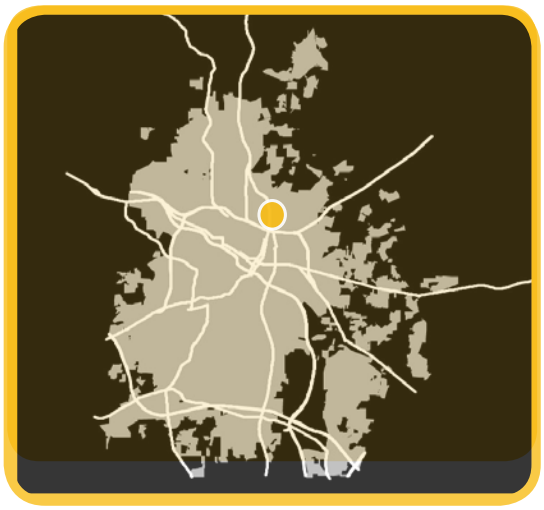
A. Extend median island
B. High visibility crosswalks
C. Realign crosswalk; move right-turn lane stop bar back
D. Close Watkins; add sidewalk and curb and gutter
E. (5) MUTCD W11-2 signs
F. Extend sidewalk to new crosswalk; add new curb ramp

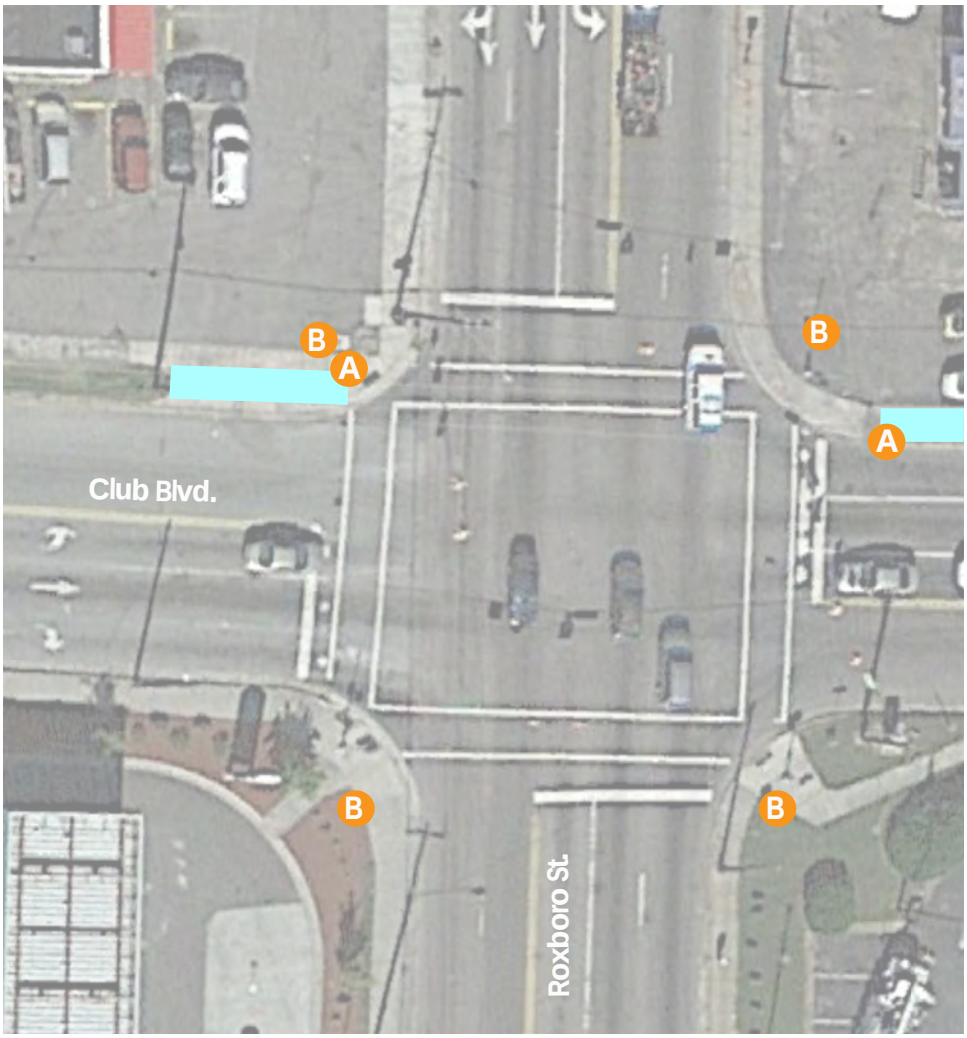
W11-2

Club / Roxboro

There are several adjacent restaurants next to this intersection, along with being close to residential areas and accessible by sidewalks on all sides. Roxboro St. gets a high amount of traffic with 29K ADT. Improvements for better pedestrian circulation include closing driveways for better access management and adding pedestrian scale lighting.

cost estimate: $13,365





Phase I

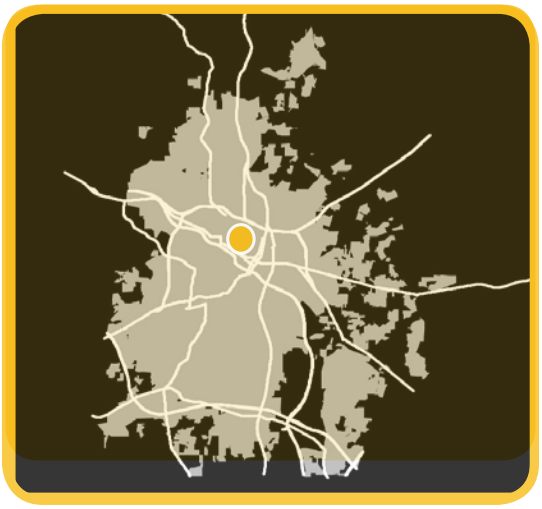
A. Close driveway access points

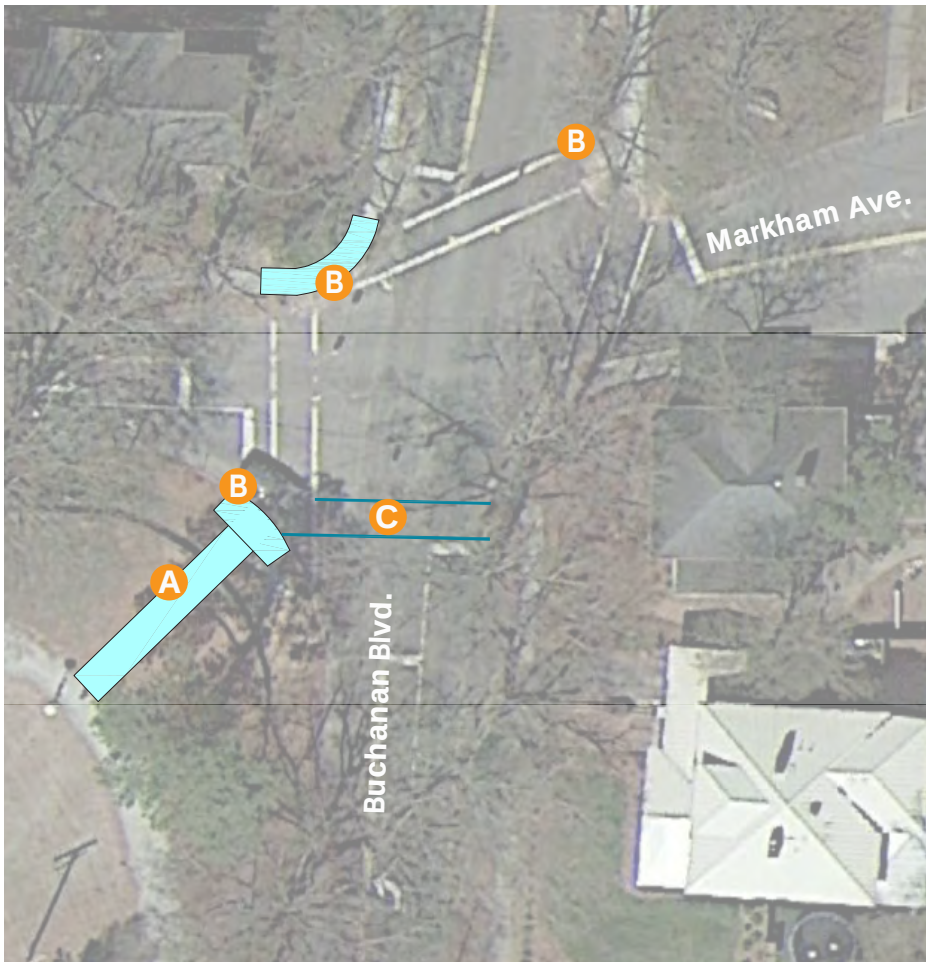
B. Add pedestrian-scale lighting at corners

Markham / Buchanan

This intersection lies at the northeast corner of Duke University's East Campus. An existing multi-use trail goes around the periphery of the campus, but a stone wall separates the trail from the streetscape. An opening in the wall with a sidewalk connection, along with improved curb ramps and crosswalks should improve pedestrian access. The wall modification will be contigent on coordination of Duke University.

cost estimate: $13,236



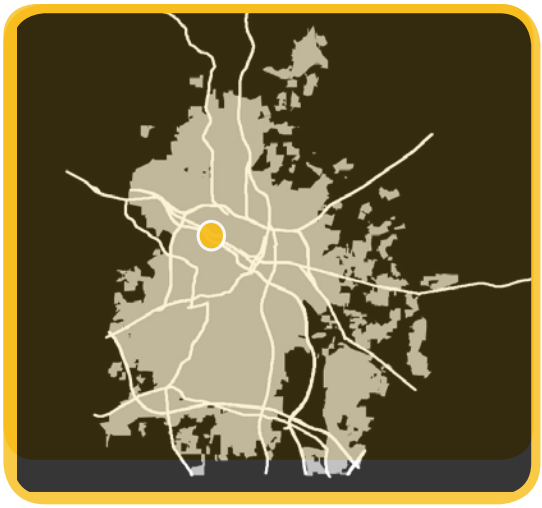


Phase I

A. New sidewalk from corner through new opening in wall
B. Replace curb ramps and make ADA compliant
C. New transverse crosswalk

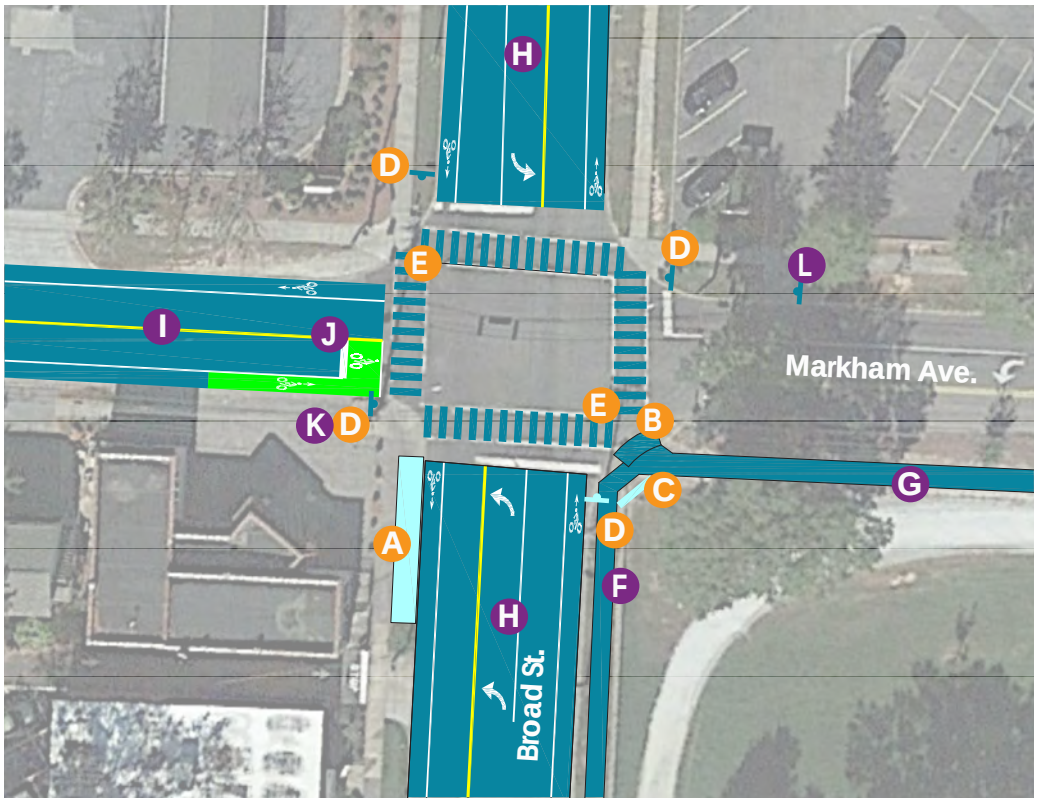
"The intersection needs access at all 4 corners and could the Duke East Wall be opened?"

Broad / Markham



Broad St., with 13K ADT, is a busy local road splitting East Campus and connecting to main campus and shopping areas (Whole Foods) to the south, and North Carolina School of Science and Mathematics to the north, with Markham Ave. bordering the entire northern limits of campus. Foot traffic is heavy here with connections to residential areas, so improved high visibility crosswalks, curb ramps and pedestrian scale lighting is imperative. Longer term improvements should include re-channeling the roadway to accommodate bicycle travel. Wall modification required for a new sidewalk project (Phase I, B and C) will require coordination with Duke University.

cost estimate: $84,057



Phase I

A. Close driveway and landscape
B. New curb ramp
C. Modify stone wall to accomodate new curb ramp and future sidewalks
D. Add MUTCD W11-2 signs at all crosswalks (4)
E. High visibility crosswalks


W11-2

Phase II

F. New sidewalk to Perry St. (worn route exists)
G. New sidewalk (worn route exists)
H. Rechannel roadway from existing 30' roadway ROW (taking out center turn lane) to Two 10.5 travel lanes and Two 4.5' bike lanes
I. Rechannel roadway from existing 43' roadway ROW to Two 11' travel lanes, Two 5' bike lanes
J. Bike Box for safer through movements
K. Add 'Yield to Bikes' sign or similar MUTCD spec.
L. Add MUTCD W11-1 signage

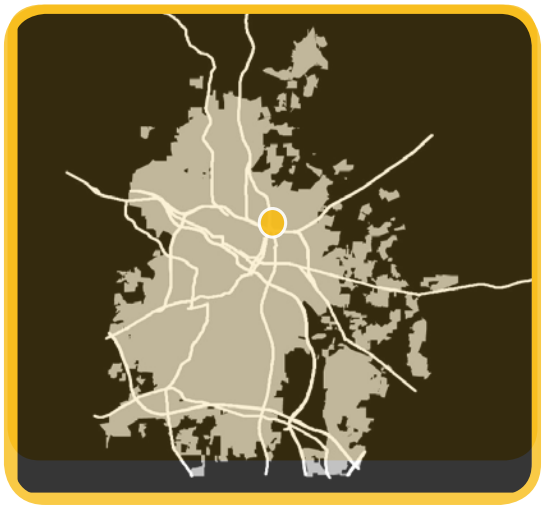


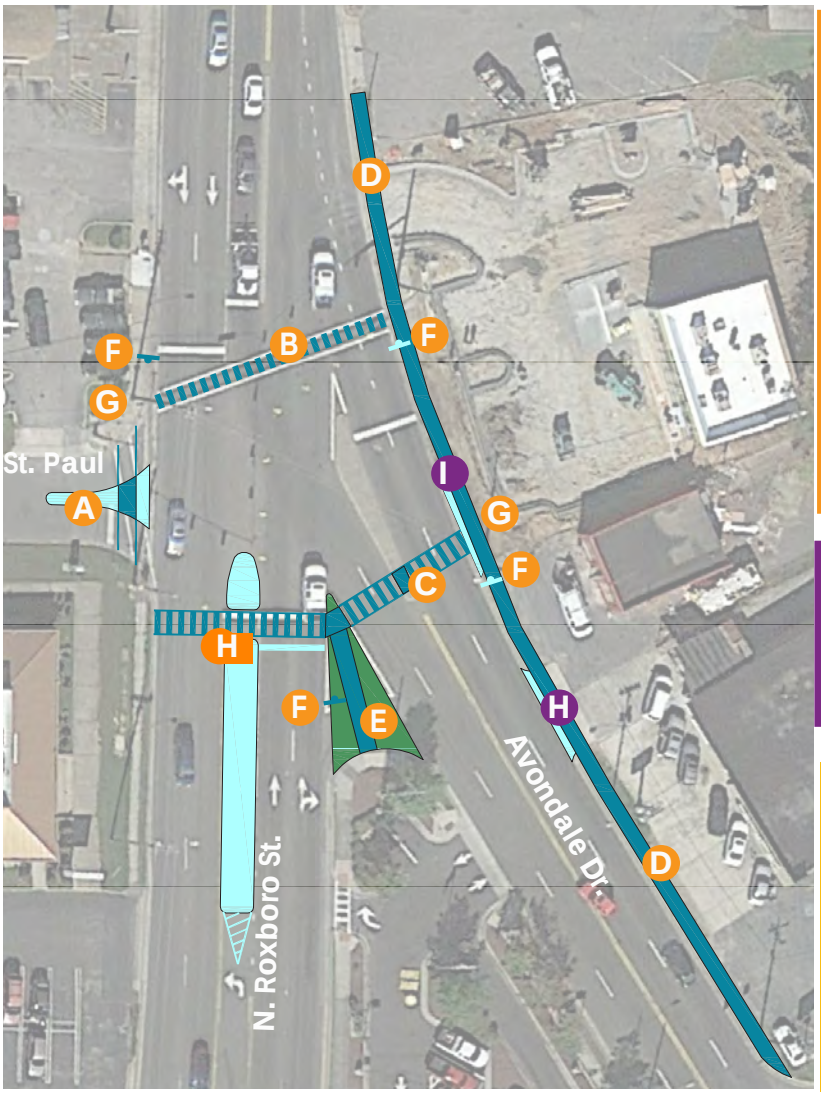
W11-1

Avondale / Roxboro

Adjacent to I-85, this intersection is one of the busiest in northeast Durham with Roxboro St. receiving 29K and Avondale Dr. 23K ADT. The area is under current and future redevelopment, with several restaurants and services already present. To make the area more accessible to pedestrians, improvements should include higher visibility crosswalks and pedestrian crossing signals, and devising pedestrian refuges from roadway reconfigurations.

cost estimate: $144,740





Phase I

A. Restrict St. Paul St. to right-in/right-out; add pedestrian refuge island; realign crosswalk
B. High visibility crosswalk
C. High visibility crosswalk with small pedestrian refuge
D. Add sidewalk and curb ramps
E. Raised median island with landscaping, pedestrian refuge and ped walkway to McDonald's parcel
F. Add MUTCD W11-2 signs (3)
G. Add pedestrian crossing signals at all crosswalks
H. Eliminate left-turn: create raised median island with pedestrian refuge;

W11-2

Phase II

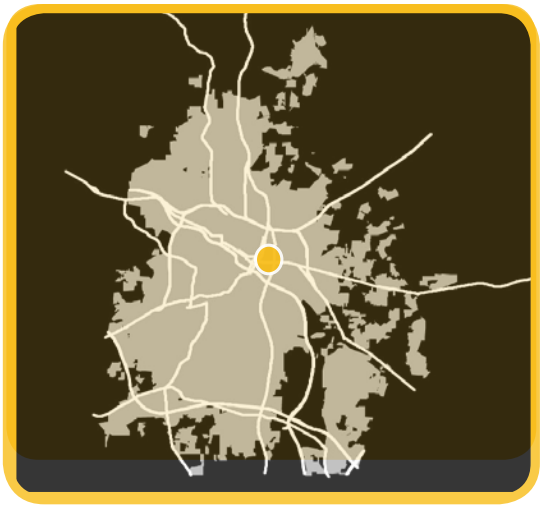
I. Close driveways as redevelopment occurs

"This intersection is very dangerous for pedestrians, and definitely in need of major improvements. This is also the closest commercial area to Duke Park, Old North Durham, and Northgate Park, but most residents drive to the shopping areas because it is simply not safe on foot or

Oakwood / Holloway

This intersection lies adjacent to the eastern downtown periphery, and is connected on all sides by sidewalks. Currently, Holloway St. gets a modest 5.8K ADT, but with the continuous growth of the city, foot traffic should increase in and out of downtown. Pedestrian push button signals are highly recommended at this intersection and, in the long term, a re-channeling of Dillard St. to accommodate bicycle travel would further improve multi-modal access.

cost estimate: $31,386



Phase I

A. (5) Pedestrian crossing push buttons

B. Landscaping opportunity area

Phase II

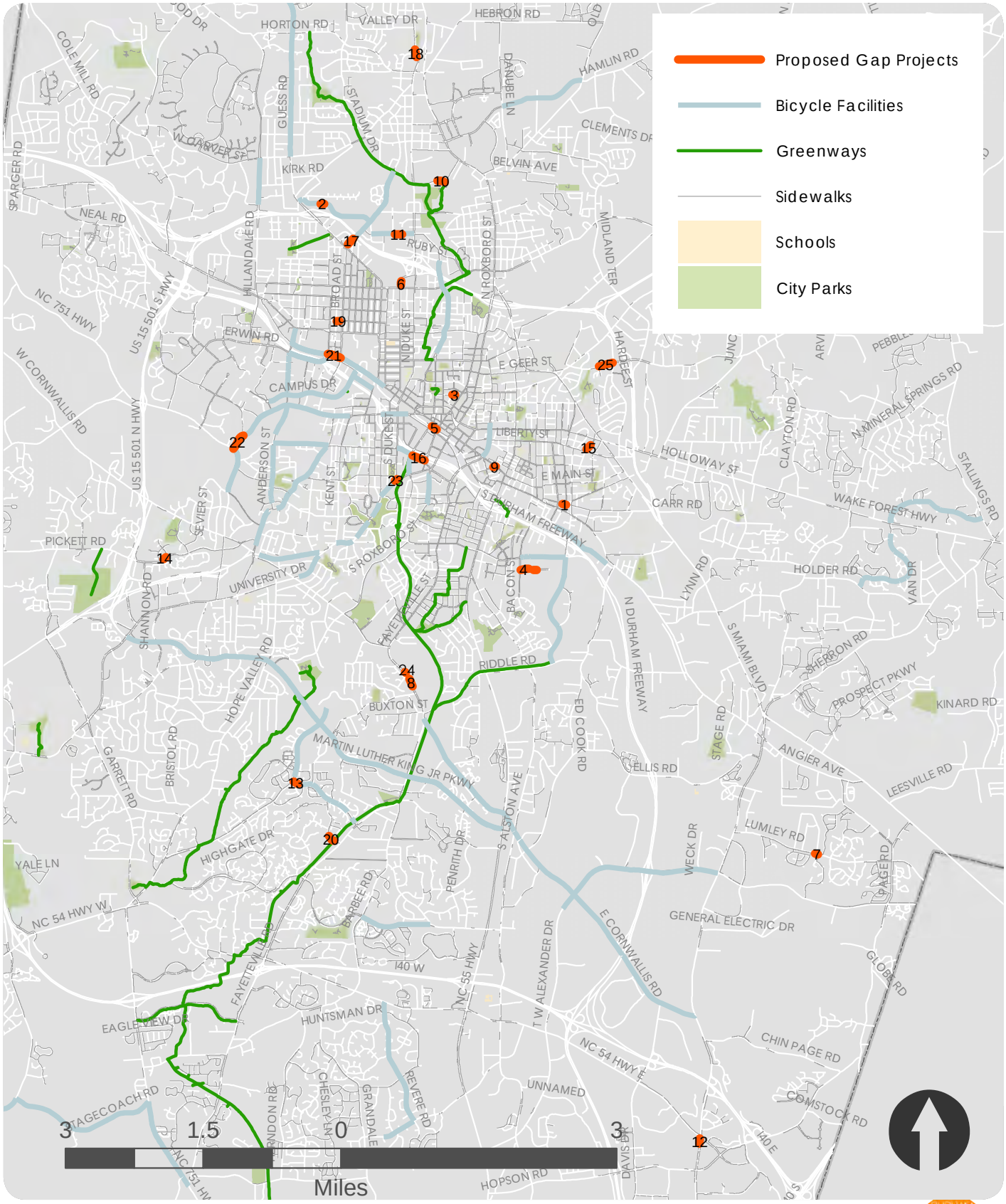
C. Rechannel roadway from Four travel lanes at 44' road ROW: to Two travel lanes, one Two-way center turn-lane, and Two 5' bike lanes

[THIS PAGE INTENTIONALLY LEFT BLANK]

GAP PROJECTS

- *Typically less than 500' in length*
- *Connects to schools, parks, transit*
- *Provides connectivity inside communities*

Map	On Street	From	To	Length	Cost	Connections	Additional Notes
1	Ashe St.	Existing Sidewalk	Existing Sidewalk	102'	$20,273	Existing network	Likely to be privately developed
2	North Pointe Dr.	Existing Sidewalk	Existing Sidewalk	245'	$54,291	Transit	Overhead utilities, 4 curb ramps
3	Hunt St.	Existing Sidewalk	Existing Sidewalk	135'	$26,831	Existing network	Overhead utilities
4	Cooper St.	Bacon St.	Existing Sidewalk	644'	$134,641	School, transit	4 curb ramps, 3 crosswalks
5	Ramseur St.	Corcoran St.	S. Mangum St.	330'	$65,588	Transit	Overhead utilities, regrading
6	Gregson St.	Existing Sidewalk	Northgate Mall	197'	$39,154	Existing network	--
7	Lumley Rd.	Existing Sidewalk	Sagebrush Ln.	201'	$47,703	Existing network	Curb and gutter, stream crossing, overhead utilities
8	Fayetteville St.	Existing Sidewalk	Existing Sidewalk	498'	$98.978	School, transit	--
9	S. Elm St.	Existing Sidewalk	E. Main St.	135'	$28,230	Transit	Overhead utilities, 1 curb ramp
10	Stadium Dr.	Olympic Ave.	N. Duke St.	582'	$121,619	Park, greenway	1 crosswalk, 4 curb ramps
11	Leon St.	Existing Sidewalk	Existing Sidewalk	428'	$90,662	School, transit	4 curb ramps
12	S. Miami Blvd.	Existing Sidewalk	Slater Rd.	400'	$83,698	Transit	3 curb ramps
13	Juliette Dr.	Existing Sidewalk	Roxboro St.	214'	$42,533	School	--
14	Pickett Rd.	Existing Sidewalk	Existing Sidewalk	182'	$48,824	Existing network	Right-of-way
15	Raynor St.	Existing Sidewalk	Existing Sidewalk	292'	$58,035	Existing network	--
16	Morehead Ave.	Blackwell St.	S. Mangum St.	790'	$157,013	Greenway	Overhead utilities
17	Broad St.	Existing Sidewalk	Forest Rd.	446'	$94,939	Transit	4 curb ramps, 2 crosswalks
18	Holt School Rd.	Existing Sidewalk	Existing Sidewalk	432'	$96,233	School, transit	Curb and gutter, 2 curb ramps
19	Green St.	Existing sidewalk	Iredell St.	158'	$33,152	School, transit	Curb ramp, crosswalk
20	Cook Rd.	American Tobacco Trail	Southwest Elementary	394'	$81,456	School, transit, greenway	2 curb ramps, crosswalk
21	W. Main St.	Ninth St.	Swift Ave.	670'	$134,562	Transit	1 curb ramp, overhead utilities
22	Duke University Rd.	Wannamaker Dr.	Cameron Blvd.	992'	$203,456	Existing network	4 curb ramps, 2 crosswalks, trees
23	University Dr.	S. Duke St.	Lakewood Ave.	132'	$27,984	Transit, park	1 curb ramp, 1 crosswalk
24	Fayetteville St.	Existing sidewalk	Existing sidewalk	53'	$34,771	School, transit	Right-of-way, overhead utilities, regrading
25	Cheek Rd.	Andover Dr.	N. Hardee St.	863'	$198,072	Transit	Curb and gutter, overhead utilities, 6 curb ramps, 4 crosswalks


Proposed Gap Projects
Bicycle Facilities
Greenways
Sidewalks
Schools
City Parks
HORTON RD
VALLEY DR
HEBRON RD
HAMLIN RD
CLEMENTS DR
BELVIN AVE
KIRK RD
NEAL RD
W CARVER ST
COLE MILL RD
SPARGER RD
GUESS RD
STADIUM DR
DANBEE LN
HILLANDALE RD
BROAD ST
RUBY ST
N ROXBORO ST
MIDLAND TER
NC 751 HWY
US 15 501 S HWY
ERWIN RD
N DUKE ST
E GEER ST
HARDEE ST
CAMPUS DR
W CORNWALLIS RD
US 15 501 N HWY
LIBERTY ST
S DUKE ST
ANDERSON ST
KENT ST
SEVIER ST
E MAIN ST
HOLLOWAY ST
CLAYTON RD
N MINERAL SPRINGS RD
STALLINGS RD
CARR RD
WAKE FOREST HWY
DURHAM FREEWAY
S ROXBORO ST
PICKETT RD
UNIVERSITY DR
SHANNON RD
FAYETTEVILLE ST
BACON ST
LYNN RD
HOLDER RD
VAN DR
N DURHAM FREEWAY
S MIAMI BLVD
SHERRON RD
PROSPECT PKWY
KINARD RD
RIDDLE RD
BUXTON ST
HOPE VALLEY RD
BRISTOL RD
GARRETT RD
MARTIN LUTHER KING JR PKWY
ED COOK RD
ELLIS RD
STAGE RD
ANGIER AVE
LEESVILLE RD
LUMLEY RD
WECK DR
PAGER RD
HIGHGATE DR
YALE LN
NC 54 HWY W
BARBEE RD
PENRITH DR
ALSTON AVE
GENERAL ELECTRIC DR
E CORNWALLIS RD
GLOBAL RD
I40 W
NC 55 HWY
T W ALEXANDER DR
FAYETTEVILLE RD
EAGLE VIEW DR
HUNTSMAN DR
NC 54 HWY E
CHIN PAGE RD
UNNAMED
COMSTOCK RD
STAGECOACH RD
LONDON RD
CHESLEY LN
GRANDALE
REVERE RD
I40 E
DAVIS DR
HOPSON RD
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
3
1.5
0
3
Miles

[THIS PAGE INTENTIONALLY LEFT BLANK]

Topics

these 10 topics + 1 are special actions including programs and policies that can collectively have a large impact on the quality of biking and walking in Durham

BUILDING REGIONAL CONNECTIONS

Regional transportation connections, which often pass through rural areas, are **important for bicyclists and pedestrians** and **contribute substantially to the economy**.

Bicycle and pedestrian projects expand mobility choice at a very low cost; attract tourists; reduce health care costs; and create more jobs than road construction projects (on a per dollar basis). There is a diverse set of transportation users in the state of NC, including pedestrians, bicyclists, and transit users and an increasing desire among residents to have a multitude of transportation choices. Federal and state spending should reflect this diversity of users.

Regional rural trail projects have significant economic impacts on the surrounding community. The Great Allegheny Passage Trail, through Maryland and Pennsylvania, contributes $40.8 million annually in direct spending with an additional $7.5 million in wages[1]. The rural 20-mile Swamp Rabbit Trail in Greenville, South Carolina has led to an increase in business sales from 30 to 85% and attracts over 100,000 tourists at an estimated economic impact of $6.7 million annually[2].

Biking and walking facilities also have a positive effect on job creation and return on investment. A study of direct, indirect, and induced employment created through the design, construction, and materials procurement of bicycle, pedestrian, and road infrastructure projects found that $1 million dollars invested in bicycle-only projects creates 11.4 jobs; in pedestrian-only projects creates 10 jobs; in multi-use trails creates 9.6 jobs; whereas road-only projects create the least at 7.8 jobs. Including pedestrian and bicycle facilities in road projects increases the jobs created over road-only projects[3].

Investing in bicycling and walking facilities also reduces health care cost and obesity levels. North Carolina has the 22nd highest obesity rate (at 30.1%)[iv] in the country including a high percentage of children. A study by the Centers for Disease Control in Nebraska found that after the construction of a trail, 71% of respondents increased their weekly physically activity.

PRACTICES

There are several ways to accommodate bicyclists and pedestrians along rural roadways, from simple restriping to adjacent trail building.

Roadway restriping during a repaving project is the most cost efficient way of adding bicycle facilities. If motor-vehicle volumes are low, a lane can be removed, or the width of one or more lanes can be reduced through rechannelization. A lane diet from Reston Pkwy to Myrtle Lane was implemented along Soapstone Drive in Reston, Virginia resulting in significant reductions in crashes and speeding while adding new bike lanes.

A new tool is an "Advisory Shoulder[5]" (also called an advisory or dashed bicycle lane) where shoulders, demarcated by striping and paint, are prioritized for bicycles (and pedestrians) and vehicles share a bi-directional center lane 10 to 18-feet in width. These facilities work best on roadways with limited vehicular traffic, lower speeds and clear site lines and require a Request to Experiment from FHWA. Currently they have been successfully installed in Alexandria, Virginia; Hanover, New Hampshire; Bloomington, Indiana; and Minneapolis, Minnesota.

Adding paved shoulders can accommodate bicycle and pedestrian use, and while not possible on all projects (especially where additional right-of-way is required or large drainage ditches are used), they benefit all roadway users by providing a recovery area for errant motor vehicles, lengthening the roadway lifespan by providing pavement structural support, reducing edge deterioration of the travel lanes, significantly decreasing maintenance costs, and improving drainage.

1 The Great Allegheny Passage Economic Impact Study (2007-2008). Progress Fund's Trail Town Program. https: gaptrail.org

2 Trail Impact Study (Year 1, 2, 3). Greenville County Rec and Greenville Health System Swamp Rabbit Trail. http:// greenvillerec.com/studies-surveys/

3 Garret-Peltier, H. Pedestrian and Bicycle Infrastructure: A National Study of Employment Impacts. Political Economy Research Institute. University of Massachusetts, 2011.

4 The State of Obesity. Robert Wood Johnson Foundation. 2016. http://stateofobesity.org/adult-obesity

5 Small Town and Rural Design Guide. U.S. Department of Transportation. 2016. http://ruraldesignguide.com/ mixed-traffic/advisory-shoulder

Example of a paved shoulder creating an area allocated for bicycles.

In some situations, it is more viable to construct an adjacent trail. A trail can be built as an independent project, such as the Lummi Nation Haxton Way Trail in Bellingham, Washington. Or, trails can be built as part of a roadway reconstruction project, at a reduced cost, such as the inclusion of the 50-mile Bitterroot Trail in Montana built during the widening of Route 93; the Custis Trail in Arlington, Virginia built as part of I-66; the Plank Trail in Sheboygan County, Wisconsin, and the Fairfax County Parkway and Route 123 Trails in Virginia.

Funding for bicycle and pedestrian facilities is available at the federal, state and community levels. Information on funding sources is provided by the U.S. Departments of Transportation and the Federal Transit Administration. The Rails-to-Trails Conservancy also provides an abundance of creative funding ideas.

The Way Forward

Regional routes require the most advance planning and most coordination of any project; they are usually more costly and take longer to develop as a result. The following are some actions the City can take to move these projects forward.

1

IDENTIFY ROUTES

Determine the most important routes for bicycle and pedestrian access and focus efforts on those roadways. Proceed with a cursory assessment of the viability of adding paved shoulders or trails along these segments.

2

WORK WITH PARTNERS

Implementation options outside city boundaries sharply constrain regional actions unless Durham collaborates with NCDOT, DCHC MPO, TJCOG, Durham/Orange/Wake County, and others on a regional route system that is jointly planned and funded.

3

EDUCATE THE PUBLIC

Communicate to the public and policy makers the priority routes. Provide information and maps to bicyclists on the existing suitability of rural roadways. Key information includes volume of traffic, posted speeds, and presence of paved shoulders or trails.

4

THINK OUTSIDE THE BOX

Consider a variety of options such as Advisory Shoulders.

5

ADVOCATE FOR FACILITY INCLUSION

Ensure that the public and public officials know the focus routes and are committed to improvements as funding become available.

6

DEVELOP STRATEGIC INVESTMENTS GOALS

Develop a new Strategic Mobility Formula that recognizes that bicycle, pedestrian and trail projects create more jobs, attract more tourists, and reduce health-care costs at a lesser price than roadway projects.

FROM PILOT TO PERMANENT

Pilot projects, sometimes called "tactical urbanism" refers to temporary, low-cost changes to public space that can build support or allow for experimentation prior to more permanent changes.

Pilot projects help members of the public, policy makers, local government staff, and others reimagine how roadways and other public spaces can be used in a relatively quick and cheap manner. As pilot projects test concepts and broaden public engagement, they also encourage collaboration and draw attention to perceived shortcomings. Potential projects include temporary pedestrian or bicycle lanes and crossings, transit improvements, traffic calming measures, and more.

PRACTICES

City of Durham has implemented several pilot projects in recent years. In 2016, the City of Durham collaborated with Bike Durham to create a pop-up two-way cycle track on Washington Street. This daylong event allowed residents to experience a separated bicycle facility and increase public engagement for the Bike+Walk Plan update.

Elsewhere in North Carolina, Greensboro implemented a Better Block in the

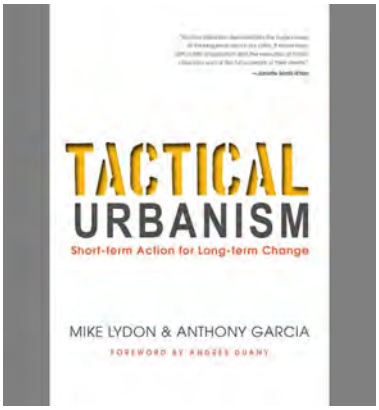


Figure 1: Street Plans has created several resources that include guidance for tactical urbanism projects. In addition to *Tactical Urbanism: Short-term Action, Long-term Change* (shown left), Street Plans has also developed *Tactical Urbanist's Guide to Materials and Design*, and *The Open Streets Guide*.

Hamburger Square area. The experimental streetscape included narrower travel lanes, temporary bicycle lanes, patio furniture, and signage. Artwork and music created an inviting environment for pedestrians and bicyclists. Surveys conducted of participants are informing a phased approach to changes in Hamburger Square.

Outside of North Carolina, cities and counties have begun to institutionalize pilot projects as a function of local government. One example is the Miami-Dade County's Quick Build Program, which provides funding and technical assistance to citizens, nonprofit organizations, municipalities, and others to implement tactical urbanism projects. The program is run by Street Plans and operates through an application and selection process. Awardees receive technical assistance with design, permitting, and construction and funding to pay for materials, equipment rentals, and hired labor. Up to $60,000 will be awarded for multiple projects in 2017. Projects can be for any duration or length, but submissions must be grounded in a previously approved or ongoing planning effort. The Program also includes a series of workshops designed to inform people about tactical urbanism, encourage applicants, and brainstorm ideas.

Setting up the Washington Street two-way cycle track. Photo credit: Bike Durham.

The Way Forward

1

MAKE IT OFFICIAL

Establish an official program or unit within City government that is responsible for facilitating, coordinating, or encouraging tactical urbanism projects citywide.

2

COORDINATE

Establish a mechanism to encourage interdepartmental coordination on tactical urbanism projects.

3

STREAMLINE

Review the Special Event Permit Guidelines to understand how to simplify the permitting process for tactical urbanism projects. Frame tactical urbanism projects likethose addressed by the Neighborhood Matching Grants program, which may involve public art, street furniture, landscaping, and bike racks.

4

CREATE A TOOLKIT

Create a user-friendly community toolkit to provide guidance on tactical urbanism projects, including permitting steps and design standards for different types of projects. Consider hosting workshops to promote the toolkit and inform community organizations about tactical urbanism.

5

DO THE DATA THING

Require collection of data before and after implementation of tactical urbanism projects to enable evaluation.

6

FUND IT

Identify funding to implement designs tested through tactical urbanism when there is a clear consensus on implementation.

FOSTERING PARTNERSHIPS IN SIDEWALK CONSTRUCTION

In order to address issues of prioritization and appropriate allocation of resources, many communities across the U.S. have developed strategic programs for funding sidewalk construction and maintenance.

Cities in North Carolina and throughout the U.S. have implemented sidewalk construction using a variety of funding sources. The City of Davidson has partnered with developers to address sidewalk needs through informal relationships. For example, if a developer has equipment being used for street-related work near a sidewalk project, the City may ask the developer to address the maintenance need.

Between 2009 and 2014, Fayetteville, North Carolina utilized funding from external sources for sidewalk construction. The City used matching and partial funding from Safe Routes to School, North Carolina Department of Transportation, and FAST New Freedom to construct sidewalks downtown and in neighborhoods adjacent to schools. This approach proved successful—in five years, it installed 13 miles of sidewalk.

Who Pays What?

A 2010 survey conducted of 82 cities in 45 states on how municipalities cover the costs of reparing sidewalks.

40% require property owners to pay the full cost

46% share the cost with property owners

13% pay the full cost

There is currently a policy where residents on a street can petition for sidewalks. The cost is based on whether the street was identified in the previous DurhamWalks! Plan, and requires 70% of the legal owners of lots with road frontage to sign the petition, and these signatures to represent at least 70% of the length of the road frontage within the project limits. Other funding sources that have been utilized for both sidewalk construction and maintenance include: bonds, community-wide assessments, homeowners associations, Improvement districts, utility fees, and coordination with other improvements.

In 2011, Boulder, Colorado passed a ballot giving the city authority to leverage existing revenues for a bond of to $49 million to pay for capital investments, including pedestrian enhancements. The ballot item did not raise taxes, since the bond is paid for with existing revenues. The City maintains a public list with photos on its website of completed projects that have addressed missing sidewalk links and pedestrian crossings, and it includes photos of each project site.

The City of San Antonio has a voluntary sidewalk cost-sharing program where owner-occupants and the city share in the cost of replacing sidewalks. The cost share percentage is determined by residential location, with properties located in a Community Development Block Grant (CDBG) area paying less. Something similar could be done in Durham for new sidewalk construction as well as repair.

Another option would be to streamline the permitting and construction process for residents to construct their own sidewalk, while ensuring the finished product is ADA-compliant and becomes the property of the City.

In Austin, Texas, Parking Benefit Districts (PBD) allow residents and business owners to create boundaries extending out from a metered area with City approval. A portion of the meter revenue is dedicated for street and sidewalk improvements within the defined boundaries. The PBD dedicates a portion of the revenues to improvements that promote walking, cycling and transit use. One of the City's first PBDs was in the West Campus area, which is starting to see sidewalk improvements in the meters' vicinity.

A sidewalk on the University of North Carolina Charlotte campus.

The Way Forward

1

ALLOCATE RESOURCES

Set a minimum fiscal allocation for sidewalk projects each year. Ensure there is a consistent and dedicated funding source.

2

IDENTIFY PARTNERSHIPS

Form relationships with developers that allow for consistent design standards, best practices, and an understanding about the economic benefits of sidewalk construction.

3

PRIORITIZE PROJECTS

Establish a transparent system for prioritizing projects based on factors such as severity of sidewalk problem, access to key destinations, and demographics (age, disability, income). Use online tools that allow the public to update issues that require resolving.

4

ESTABLISH PROCEDURES

Incorporate sidewalks into roadway maintenance programs, including assessment and upkeep of existing facilities. Track spending on sidewalks, maintain an inventory of facilities, and monitor their usage.

5

MANAGE LIABILITY

Assess how rules and responsibilities for different parties incentivize potentially liable parties to take, or not take, action.

MAKING THE JUMP: INNOVATIVE FACILITIES AND WHAT'S REQUIRED

Research and best practices regarding bicycle facilities that create safer and more comfortable places for people of all ages and abilities to ride continues to evolve. As Durham strives to be at the forefront of bicycle safety and encouraging more bicycling, it can learn from other cities' research and experimentation to create the best facilities at the lowest cost.

Practices

The most innovative, comfortable and safe bicycle facilities separate bicyclists from vehicular traffic on high speed and high volume roadways. These facilities, known as buffered bike lanes, separated bike lanes, and protected intersections can be implemented at low cost and have resulted in the greatest increase in bicycling when installed.

Buffered Bike Lanes are being successfully installed throughout the U.S. including Durham and use simple pavement markings to create a wider separation between bike lanes and moving vehicles or the door zone of parked cars. They can be implemented during routine roadway repaving projects at almost no cost though they can also be implemented as striping projects at any time.

Separated Bike Lanes enhance safety by adding a physical separation between the bike lane and vehicular traffic. Low cost versions can be easily and cheaply installed by adding flex-posts in a 2 to 3-foot buffer area between the bicycle lane and adjacent travel lanes. Where on-street parking exists, the parked cars can act as the buffer separating the bike lane from the moving vehicular traffic. For added beauty, many cities are using boxes filled with flowering plants which can be maintained by adjacent businesses and residents. Maintenance can be simple if the bike lane width is planned to accommodate the width of Durham's street-sweeping vehicles. The City of Norfolk, Virginia quickly added Separated Bike Lanes to Llewellyn Avenue after

Separation Types	Pros & Cons
Flex-Posts	(+) Removable (+) Inexpensive (-) Low durability; may require frequent replacement
Parking Stops/Raised Oblong Bumps	(+) Removable (+) Durable (-) Low visibility (due to lack of vertical element)
Planter Boxes	(+) Removable (-) Inflexible vertical element may be problematic on high-speed roadways (-) Requires significant maintenance (of plantings)
Rigid Bollards	(-) Usually permanent (-)Relatively expensive (-) Inflexible vertical element may be problematic on high-speed roadways

after the completion of their Strategic Implementation Plan. Along Broad Avenue, residents crowd-funded the completion of a separated bike lane in the Hampline neighborhood to revitalize the area and create a connection to a large park.

Protected Intersections are a new tool to enhance safety for bicyclists at intersections which are particularly dangerous. Protected intersections result in slower turning movements and create better sight lines for motorized vehicles. They can be created using paint and flex-posts, planters or quick-curbs. More information can be found at: www.protectedintersection.com. On roadways with very little vehicular traffic, there are many innovative ideas to enhance safety for bicyclists and create inspiring places.

Shared Streets, Curb-less Streets, and **Slow Zones** are roadways where pedestrians, bicyclists, outdoor cafes, and children playing all share the same space. The first shared street was developed when residents in Delfts, Netherlands placed planters and benches in the roadway to slow vehicular traffic. In residential areas, they can be quickly implemented by painting in-street murals, adding play equipment, flower pots and outdoor furniture in the roadway and supplementing these elements with signage and gateway features. Commercial areas can be retrofitted with plaza-like paving and the removal of curbs to designate that vehicles can use the space, but do not have the right of way. Wall Street in Asheville, North Carolina attracts tourist who come to shop and Main Street in Charlottesville, North Carolina does not allow vehicles except to cross the street. More information can be found in NATO's Shared Streets document.

Advisory Bike Lanes are bike lanes on narrow streets where motorized vehicles must share space with other vehicles and give the right-of-way to bicycles. A typical example allocates 18 feet or less for two-way motorized vehicles who must slow or wait until the bike lane is clear to pass. This innovate facility reallocates low-use streets to better accommodate bicyclists and can be easily implemented with new roadway striping. Implementation of these facilities requires a Request to Experiment from FHWA, but have been successfully implemented across the country including in Alexandria, Virginia.

Bicycle Counts. The best way to gain support for better facilities is to understand how they are being used. The North Carolina Department of Transportation has installed 20 continuous bicycle counters across the state, including four in Durham (two along the American Tobacco Trail and one on Main Street and Cornwallis Road coming in 2017).But to maximize their benefit these counters should be supplemented by short-duration counts to expand the city-wide count program. In addition to monitoring overall bicycle use, short-duration counts can be used to determine before and after counts at new facilities and to establish crash rates.

1. What Are You Counting?

	Technology	Bicyclists Only	Pedestrians Only	Pedestrians & Bicyclist Combined	Pedestrians & Bicyclist Separately	Cost
Permanent	Inductance Loops[1]	●			◐	$$
	Magnetometer[2]	○				$-$$
	Pressure Sensor[2]	○	○	○	○	$$
	Radar Sensor	○	○	○		$-$$
2. How Long?	Seismic Sensor	○	○	○		$$
	Video Imaging: Automated	○	○	○	○	$-$$
	Infrared Sensor (Active or Passive)	○	●	●	◐	$-$$
	Pneumatic Tubes	●			◐	$-$$
	Video Imaging: Manual	○	○	○	●	$-$$$
Temporary/ Short Term	Manual Observers	●	●	●	●	$$-$$$

○ Indicates what is technologically possible.
● Indicates a common practice.
◐ Indicates a common practice, but must be combined with another technology to classify pedestrians and bicyclists separately.
$, $$, $$$: Indicates relative cost per data point.
[1] Typically requires a unique loop configuration separate from motor vehicle loops, especially in a traffic lane shared by bicyclists and motor vehicles.
[2] Permanent installation is typical for asphalt or concrete pavements; temporary installation is possible for unpaved, natural surface trails.
[3] Requires specific mounting configuration to avoid counting cars in main traffic lanes or counting pedestrians on the sidewalk.

From FHWAY Traffic Monitoring Guide.

Short-duration counts are commonly done manually by volunteers or automatically using tubes or other sensing devices such as infrared, inductive loops, piezoelectric strips, and video detection. The continuous counters can be supplemented with a "count totem" which provides real-time counts to the public, a great way to highlight the use of a popular facility. Totems can be funded by hospitals or other foundations and would a make a great addition to the Duke University campus. Detailed information about counts can be found in the 2014, Guidebook on Pedestrian and Bicycle Volume Data Collection (Report 797) from the National Cooperative Highway Research Program and an overview of count programs is in the table below.

Count Method	Description
Manual	• Low cost* • Can be conducted by trained volunteers or city staff • Should be a screenline count and not an intersection • Used for very short duration counts (2 hours, etc.) • Can observe other attributes, such as pedestrians, bicyclists, helmet use, etc.
Inductive Loops and Piezoelectric Sensor	• Moderate cost for equipment, but high installation costs • Consists of loops or strips embedded in pavement creating magnetic fields • (Piezoelectric strips are not used extensively for bicycle counting in the U.S. but technology shows potential) • Used for continuous counting of bicyclists only (not pedestrians)
Tubes	• Moderate cost • Tubes are specially designed to count bicyclists only (not motor vehicles) • Tubes can be freed from their moorings by heavy vehicles • Can be installed in bike lanes, paved shoulders, travel lanes or paths • Used for counts from 2 days to 2 weeks or more
Infrared	• Moderate to high cost • Can be used for counts on sidewalks and paths • Generally does not separate bicyclists from pedestrians • Can detect direction of movement • Used for continuous and short duration counts
Video Detection	• Moderate to high cost (for manual analysis) • New technology for automated detection or manual analysis of video recordings • Used for short duration counts

*Equipment Cost Details: Low cost: typically cost less than $1,500 as of 2016; Moderate cost: typically costs between $1,500 and $4,000 per device; High cost: typically costs more than $4,000 per device. Costs do not include deployment, monitoring or analysis.

The Way Forward

Using innovative facilities will move Durham forward in establishing a safe and comfortable bicycling environment for all cyclists and establish a progressive image for the City. Innovative facilities may also provide the answer to those complicated environments where traditional ideas do not fit. The following are some steps to get started.

1

COORDINATE WITH ROADWAY PLANS

The cheapest way to add innovate facilities is to include them with roadway repaving plans, when the roadway becomes a blank slate where anything is possible. Have a plan ready for high-priority roads.

2

COORDINATE WITH FHWA EXISTING PROJECTS

FHWA Requests to Experiment have already been established for many innovative facilities and create guidelines for Durham's submissions.

3

READY. FIRE. AIM

Don't be afraid to "try out" a treatment using temporary materials to determine the impacts and get quick feedback.

4

FIND PARTNERS

Innovate facilities are often highlighted in the press and create a great opportunity for new funders and partners who rely on positive marketing.

5

LOCATE THE PERFECT PLACE

Not all innovative facilities will work at every location; look for locations where innovative facilities appear to be the perfect answer and try them out with community support.

ECONOMICS OF BIKING & WALKING

Not everyone walks for the majority of their trips, and some people haven't ridden a bicycle for years. However, **everyone can benefit economically from new and improved active mode infrastructure**.

Remaining competitive has become a major source of interest in and justification for investments in walking and cycling. Durham competes with Austin, Seattle, Denver, Cambridge, and Nashville[1] for the best cities to live and advance a career. One common theme among many of these cities: they are able to attract and retain youthful workers - who want to be in a place where they can forego a car (even if they still own one). The economic influences of walking and biking stretch across several perspectives: **job creation/retention; property values; and commercial opportunity**.

The old model of job creation assumed that employees followed the CEO; the new model insists that the employer goes

Better Places (and Higher Rents)

Denser, more walkable neighborhoods tend to generate higher rents than their suburban counterparts. Upside: more tax revenues; downside: keeping places affordable.

Walkable / Bikeable Office 90% Higher

Walkable / Bikeable Retail 71% Higher

Walkable / Bikeable Multifamily Rental 66% Higher

Leinberger and Rodriguez, Foot Traffic Ahead: Ranking Walkable Urbanism in America's Largest Metros 2016, The George Washington University School of Business.

+79%

+85%

Walk on the Sunny Side

85% of people surveyed say that sidewalks are a positive factor when purchasing a home, and 79% place importance on being within easy walking distance of places.

2015 Community and Transportation Preferences Survey, National Association of Realtors

where the employees want to be.[2] Accessible neighborhoods and jobs are more resilient, and can thrive in times where fuel prices are high or in places where few people have cars. Home prices declined half as much in walkable areas during the Great Recession compared to less walkable areas across the country.

1 McMullen and Sreekar, Best Cities for Job Seekers in 2017, December 2016; Forbes Magazine, The Best Places For Business And Careers, website accessed 2-2016.

2 Todd Noell, Noell Consulting Group, presentation, December 13, 2016.

150%

Property values increased by an average of 150% in the vicinity of the Cultural Trail in Indianapolis after its opening in 2008.

Active Transportation and Real Estate: The Next Frontier, ULI, 2016.

The Way Forward

Every city wants to compete well against other, peer cities. Increasing internal demand for biking and walking; cohesive messaging; and working with business partners are important elements to linking active modes to dollars.

1 SAY IT...OFTEN

The Durham Public Affairs Office, working with the Durham Convention & Visitor's Bureau, can advocate / advertise active mode elements into its newsletters, social media, and the City's public TV station.

2 ANALYZE IT

The City, in partnership with a local University, should conduct a city-wide impact analysis of the proposed recommendations in this plan, and speak to biking / walking ROI generally.

3 BE FRIENDLY

Higher ranks on national Bike-Friendly and Walk-Friendly designations have been noted elsewhere; these designations are important to recruiting efforts as well. Support actions that improve the City's, University's, and business rankings.

4 BIKES MEAN BUSINESS

Develop a bike- and walk-friendly business program that offers discounts to customers that arrive by foot or on their bicycles. Check out the Oregon example.

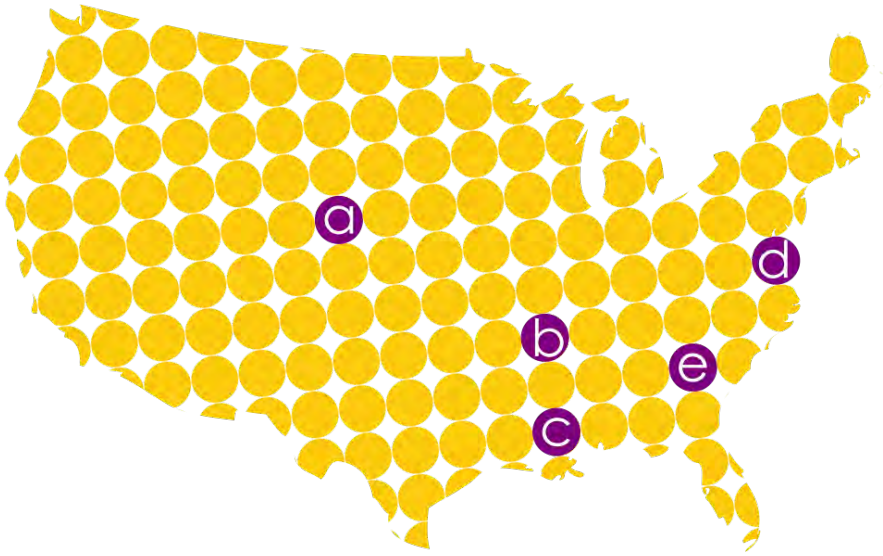
BENCHMARKING PEER COMMUNITIES

Benchmarking, or establishing metrics by which to rate performance, is an important means of evaluating progress towards creating a more bicycle and pedestrian-friendly environment. Metrics should be quantifiable; fit the city's context; and directly support the city's vision for the future. The City of Durham can draw upon many examples as they develop their performance metrics.

Throughout the country, communities are benchmarking their performance related to bicycle and pedestrian facilities and programs. A common benchmarking platform is the League of American Bicyclists' Bicycle Friendly Community rating. The City of Durham has a Bronze-level rating. This allows Durham to compare itself to other Bronze-level communities or strive to reach Silver, Gold or Platinum status. Similarly, a Walk Friendly Community rating system exists. Typical benchmarking goals include the following.

- Zero fatality and crash rate
- Annual increase in the number of trips made by walking
- Annual increase in the number of trips made by bicycling
- Annual increase in the number/ percent of children walking/bicycling to school
- Lane-miles of roadway-appropriate walking/bicycling facilities
- Percent or amount of funding dedicated and spent on bicycling and walking facilities and programs

Leading by Example



a. Boulder, CO

Underachiever (not)

Boulder, Colorado, a Platinum-level community, 10% of trips are taken by bicycle and 10% by walking. Boulder has invested in 58 miles of connected trails; keeps a public website of prioritized missing sidewalks, has 78 bicycle/pedestrian underpasses, and has conducted travel surveys for every school as part of their Safe Routes to School program.

b. Little Rock, AR

Two Percent Rule

Little Rock, Arkansas spends at least 2% of its transportation budget on bicycle projects.

c. Baton Rouge, LA

Complete Streets+Bikeshare

Baton Rouge, Louisiana adopted a Complete Streets Policy and developed a plan for a BikeShare system which, with CMAQ and foundation funding, will be launched in the fall of 2017.

d. Norfolk, VA

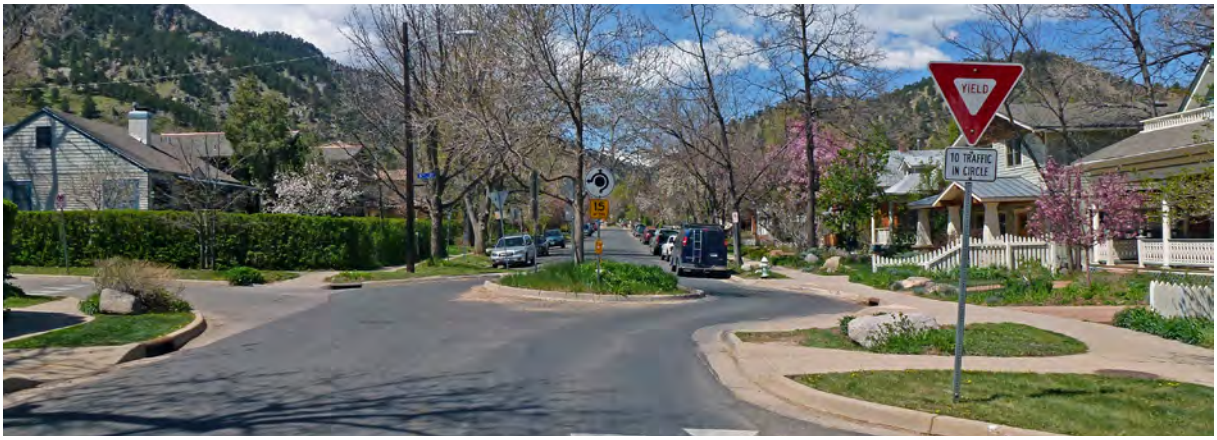
Position: Company Manager/Developer | Experience: 12 years

Norfolk, Virginia engaged their downtown business district in the development of their bike plan to better coordinate bike facilities into redevelopment projects. And, after the completion of their plan, quickly implemented project recommendations – including their first separated bike lane.

e. Greenville, SC

See Swamp Rabbit Run

Greenville, South Carolina, after the completion of their Bicycle Master Plan, invested $2 million in a 1-mile extension of the Swamp Rabbit Trail including a 170-foot trail bridge, launched a bike share program, and conducted a review of bicycle detection at 31 signalized intersections.



Traffic calming and curb extensions in Boulder create a safer and more enjoyable place for bicycling and walking.

The Way Forward

Establishing benchmarks and comparing your progress to cities you aspire to is a great motivator toward creating a bicycle and pedestrian-friendly city. Here are some benchmarks for the City of Durham to consider.

1 VISION: ZERO

Develop Vision Zero Campaign and clear action steps toward elminating all roadway fatalities and severe injuries, setting targets for annual reductions. Use the Vision Zero Network to establish principles like prioritizing life in design decisions.

2 MODE RAISING

Increase the number of trips made by walking and bicycling (to 10% and 5% by 2022) with a focus on ensuring that they represent the ages, races, genders and abilities of city residents.

3 BIKE FOR GOLD

Review the standards for becoming a Gold-level Bicycle Friendly Community and work toward meeting those goals.

4 WALK FOR GOLD

Apply to become a Walk Friendly Community and work toward the goal of achieving Gold-level status.

Imagine 2027

Year that came without a serious or fatal crash in Durham.

EDUCATION IS KEY

Education programs can help improve safety for pedestrians and bicyclists, particularly when combined with robust enforcement of traffic laws and engineering approaches that encourage safe behaviors.

Education programs can help improve safety for pedestrians and bicyclists, particularly when combined with robust enforcement of traffic laws and engineering approaches that encourage safe behaviors. Effective education can help people:

- Develop safe walking and bicycling skills.
- Understand how to safely maneuver a motor vehicle around pedestrians and bicyclists.
- Become more aware of, and compliant with, traffic laws.
- Become more empathetic and understanding of people using other modes.
- Understand the relationship of street design and operation on pedestrian and bicycle safety.

Durham has partnered with the statewide Watch for Me NC safety education campaign since 2014. During that time, Durham has conducted a number of campaign-related traffic safety activities, including distributing bicycle helmets, locks, and lights, posting banners along high-crash corridors, and distributing Watch for Me NC materials at events such as community meetings and walk and bike to school days. In addition, four Durham schools have implemented the Let's Go NC! pedestrian and bicycle safety curriculum.

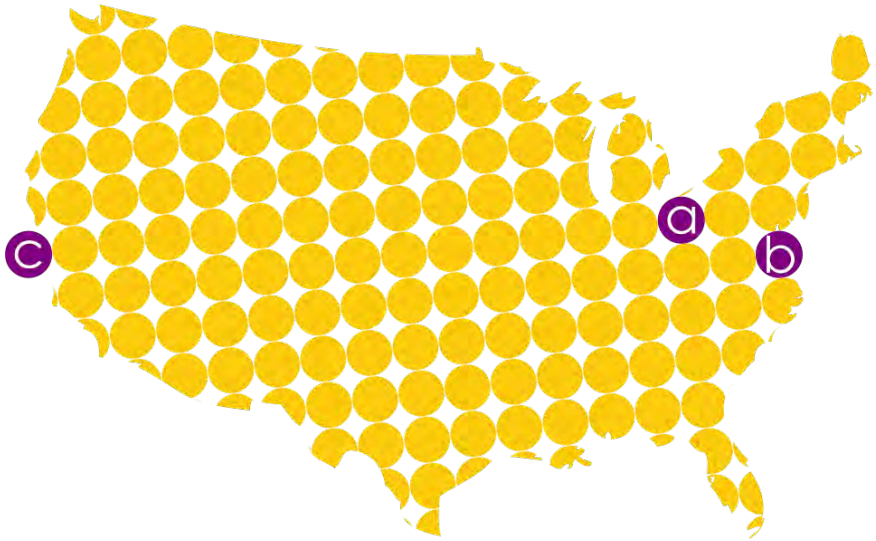
a. Columbus, OH

On-Road Bicycle Education

Yay Bikes!, a Columbus, Ohio non-profit, provides a range of on-road bicycle education opportunities to Columbus-area residents and others across the State of Ohio. These opportunities include the How We Roll program, which teaches participants about bike law and roadway positioning; the Bike Buddies Program, which pairs first-time bike commuters with experienced cyclists who escort them on their first ride; and Professional Development Rides, which gives local government officials experience riding different types of roadways and bicycle facilities.

Leading by Example

b. Montgomery County, MD



You Only Live Once

Montgomery County, Maryland's YOLO (You Only Live Once) campaign is an example of a safety education program that targets teens. The program focuses on reducing distracted walking and driving and relies on teens to develop messages that target their peers.

c. San Jose, CA

Comprehending Change

San Jose, California's Street Smarts program is an example of a comprehensive safety education program. The program is based on an analysis of crash data and includes both mass media and grass roots components. The grass roots element targets schools and neighborhoods through safety presentations, flyers, posters, lawn signs, and other materials. The mass media element includes radio spots at peak drive times, print articles in major publications, and ads on buses and transit shelters. Since developing Street Smarts in 2002, the city has made it available to other jurisdictions, which pay a nominal fee for rebranded materials.

RESOURCES:

Goodwin, A., Thomas, L., Kirley, B., Hall, W., O'Brien, N., & Hill, K. (2015, November). Countermeasures that work: A highway safety countermeasure guide for State highway safety offices, Eighth edition. (Report No. DOT HS 812 202). Washington, DC: National Highway Traffic Safety Administration.

Based on the data, determine the behaviors, locations, and audiences that will be focal points.

Build on existing partnerships and others like the Partnership for a Healthy Durham, Durham County Department of Public Health, Public Schools, Universities, and City departments neighborhoods, fire, etc.)

Use diferent message delivery types like personal communications or at the roadside (such as through variable and mixed message signs, etc.). Use location-specific messaging, like lawn signs and sidewalk graphics.

Enforcement and education work best together. When conducting targeted safety enforcement actions publicize them. Provide traffic safety literature or classes in lieu of tickets for minor or first-time offenses.

HIT THE TARGET | PARTNERING | SPREAD THE WORD | LEVERAGE ENFORCEMENT

2 | 4 | 6 | 8

The Way Forward

Education isn't a one-way street - it's a process that involves many people both external and internal to the City. These are linked strategies to get more people involved in that process.

1 | 3 | 5 | 7

1 ANALYZE THE DATA

Analyze pedestrian and bicycle crash data to determine what types of crashes occur most frequently, where they're located, and who's involved, building on the 2010 *Pedestrian Safety Action Plan.*

3 KEY MESSAGING

Develop key safety messages. by involving members of the target audience in developing and testing the key messages to ensure they resonate.

5 WORK WITH POLICE

Ensure that all officers receive training in bicycle and pedestrian laws. Bike Durham has worked with the Durham Police Department to provide in-service training to officers on bicycle and pedestrian laws.

7 EVALUATE

Periodic evaluation is essential for determining the effectiveness of any safety education strategy and making necessary adjustments.

SAFE ROUTES TO SCHOOL COMMITTEE

A Safe Routes to School (SRTS) committee is a municipal level committee charged with implementing strategies to promote walking, bicycling and other green transportation choices for school travel.

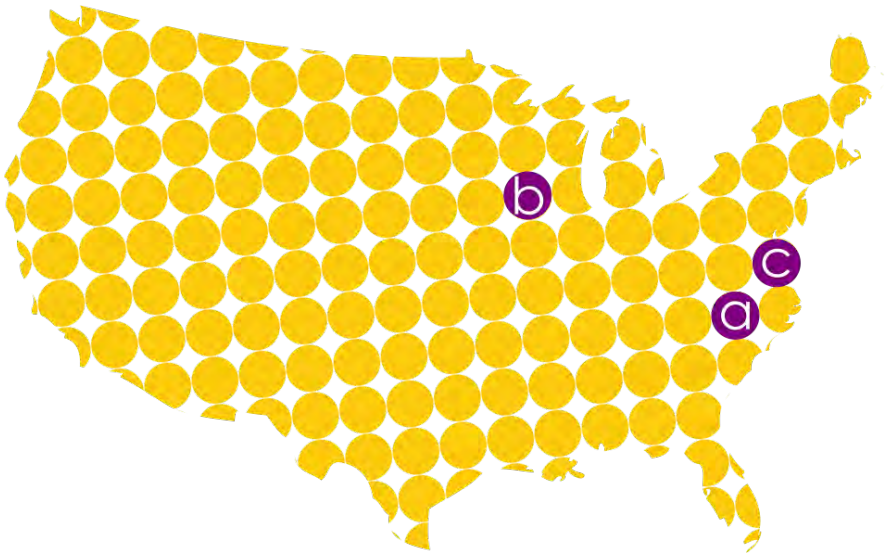
The SRTS Committee can serve a broad range of functions, including:

- Demonstrating a community's interest and long-term commitment to Safe Routes to School
- Prioritizing infrastructure projects near schools
- Responding to safety concerns related to school transportation
- Assessing school arrival and dismissal conditions
- Assisting with grant writing and funding applications
- Helping to coordinate SRTS events
- Developing a SRTS plan

Children riding bikes in Durham.

The committee can operate either as an independent committee or as a subcommittee of an already established group, such as the Bicycle and Pedestrian Advisory Commission (BPAC). The committee should include a mix of representatives from the city, school district, and the community. Potential members include city transportation staff, school district transportation staff, school principals, a BPAC representative, a law enforcement representative, a healthcare sector representative, parents, and students. The required committee membership should have a real interest in SRTS and have experience relevant to the committee's charge.

Leading by Example



a. Carrboro, NC

The Paris Near Us

Just outside Durham, the Town of Carrboro established a SRTS committee in 2015. The committee includes school district representatives, school administrators, a North Carolina Department of Transportation representative, a representative from the town's transportation advisory board, a community representative, a parent, and three students from Carrboro schools. Its duties include recommending projects, policies, and programs, providing guidance and support for implementing the town's SRTS action plan, and providing assistance with funding, event planning, and data collection. The committee has a budget of approximately $250 annually, which it can use at its discretion.

b. Madison, WI

Improvements by Committee

Madison's School Traffic Safety Committee has been operating for more than a decade. It includes the city's pedestrian and bicycle coordinator, school district staff members, crossing guard supervisors, and representatives from the city's traffic engineering department. The committee focuses on developing school traffic safety plans aimed at improving safety during arrival and dismissal times. It has no annual budget; however, the city provides dedicated funding for Safe Routes to School ($79,000 in 2015), which is often spent on improvements identified by the committee.

c. Arlington County, VA

Influenced by Committee

In 2016, Arlington County, Virginia created the Joint Committee on Transportation Choices and the Advisory Committee on Transportation Choices. The Joint Committee on Transportation Choices (JCTC) is made of county and school district staff and is charged with developing plans and strategies to promote green school transportation options for students, parents, and staff members. The Advisory Committee on Transportation Choices (ACTC), includes parents, school staff members, and high school students as well as representatives of the pedestrian, bicycle, and transit advisory committees. The ACTC reviews and provides feedback on the plans and strategies developed by the JCTC. The JCTC and ACTC do not have their own budgets but can influence how county and school district funds are spent.

The Way Forward

Education isn't a one-way street - it's a process that involves many people both external and internal to the City. These are linked strategies to get more people involved in that process.

1 FOUNDATION

The Transportation Department should develop relationships with Durham Public Schools staff and PTA groups, and do targeted outreach on activities and options for improving safety around schools.

2 CHARGE FORWARD

Clearly define the committee's mission and goals: is it reactive, proactive, or both? Can it be more broad, considering school bus safety, for example?

3 MAKE IT OFFICIAL

Pass an ordinance establishing the committee or make it official by other means.

4 CONTROL THE BUDGET

Provide the committee with an annual budget sufficient to perform its duties and implement quick improvements and/or give it the power to influence how dedicated funding is spent.

5 RUNNING START

Hold a kick-off meeting with the North Carolina Safe Routes to School Coordinator to provide attendees with an orientation to Safe Routes to School and brief them on available funding opportunities.

6 MAKE AN ACTION PLAN

Create a plan that identifies actions to promote green transportation choices for school travel. The plan should have fun elements, use the 5 E's framework, and include a timeframe for implementation of each strategy.

7 KEEP GOING

Identify a skilled facilitator as committee chair, establish a participatory approach, and ask committee members to sign a terms of reference agreement providing an overview of tasks, roles, responsibilities, and goals. Establish a meeting time and location that is convenient for the required membership. Consider establishing a committee website for use in promotion activities and to inform the public of the committee's work.

MAINTAINING OUR PLACE

Cities across the U.S. take a number of different approaches to funding and maintaining walking and bicycling facilities due to their different locations in the public right-of-way. Cities such as Durham that place a high emphasis on multimodal transportation systems often develop design guidance, operating plans and funding approaches to ensure that bicycling and walking facilities remain usable and safe.

Durham is one of a number of cities that does not require adjacent property owners to maintain sidewalks. This model of publicly-funded bikeway and sidewalk maintenance is a good one as it ensures equity and consistency. It also necessitates innovation, partnerships and a proactive planning approach. In order to minimize future maintenance needs and costs, many cities begin the process with careful consideration of facility design and selection of materials.

The following pages highlight how some other cities across the country are making maintenance work.

Leading by Example

a. Seattle, WA

A Tree Grows There

Seattle's Tree and Sidewalk Operating Plan lays out various construction details for sidewalks that can better withstand growing trees, which are the major cause of sidewalk damage. (Over 60 other cities such as Santa Monica, California have installed rubberized sidewalk to reduce tree root damage.)

b. Denver, CO; Madison, WI; etc.

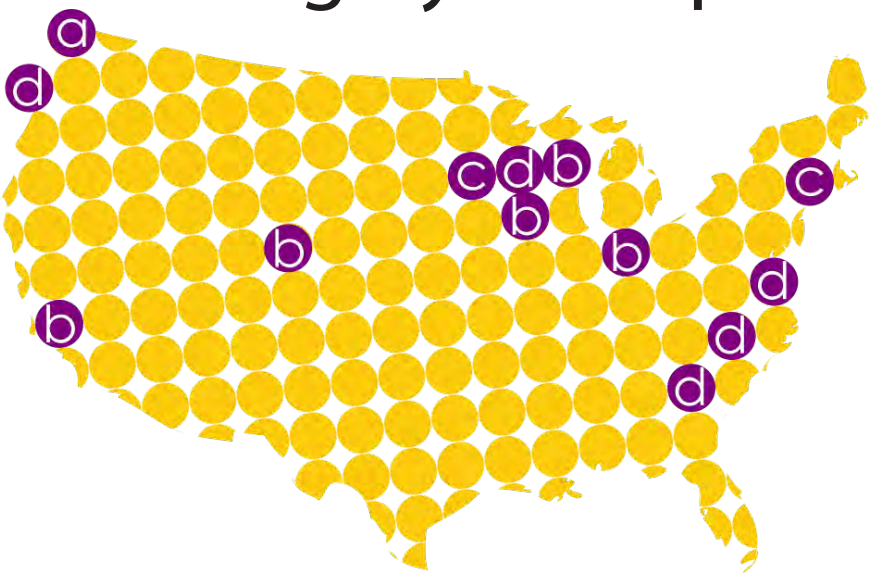
Funding Maintenance and Repair

- Denver, Colorado is currently developing a policy to assume responsibility for building and repairing sidewalks, and plans to establish a dedicated funding source for this purpose. Through their policy development process, Denver found that other cities fund sidewalk maintenance through various sources including a utility bill fee, an opt-in concrete utility fund fee, a mill levy, and an annual maintenance fee.
- In Seattle, voters passed a property tax levy in 2015 to fund sidewalk maintenance. Seattle has also experimented with incentives for private developers to build more and better sidewalks.
- Madison, Wisconsin's 2014 budget includes $500,000 for the bikeways program to fund ongoing bikeway maintenance. The City uses operational efficiencies to cover maintenance costs for new facilities, such as a position shared among agencies to respond to varying seasonal needs.

c. Massachusetts; Cambridge, MA; and Hennepin County, MN

Maintaining Separated Bikeways, Three Ways

- MassDOT's Separated Bike Lane Design Manual considers bikeway width and placement as the first step in developing a maintenance plan that addresses routine maintenance (such as removing debris) and long-term maintenance (such as repairing and replacing vertical elements, pavement surfaces, and traffic controls).
- Cambridge, Massachusetts' report, Cycle Tracks: A Technical Review of Safety, Design, and Research recommends building cycle tracks (also referred to as Separated Bicycle Lanes) for ease in year-round maintenance. Separated Bike Lanes' width, edge treatments, and draining details all need to be designed with maintenance considerations in mind. The city uses existing equipment to maintain 10-foot separated bike lanes, removing flex-posts and bollards where needed. For narrower cycle tracks, the city uses a combination of specialized equipment that can be used in cold and warm months and maintenance agreements.
- Hennepin County, Minnesota's Bikeway Maintenance Study offers guidance on: selecting an appropriate pavement preservation method for bike facilities (surface treatments, crack treatments, pothole and depression repair, and resurfacing) based on surface type and ride quality; and selecting materials based on lifespan and maintenance costs. It also includes Toronto's snow plowing decision matrix for bikeways and can serve as a model for Durham's seasonal maintenance needs.



- The San Luis Obispo County 2005 bikeway plan required a 2.5% set-aside for bicycle and pedestrian facility maintenance from their locally-funded transportation budget for large scale maintenance projects such as curb ramp replacements. Routine maintenance is handled through roadway maintenance funds.
- Cedar Rapids, Idaho spends $150,000 each year for new sidewalks maintenance and installation.
- Seattle, Washington plans for $300,000 per block for new sidewalks, owing to its hills and stringent storm water requirements
- Cincinnati, Ohio funds routine lane sweeping from its storm water management fund at a cost of $55-$62 per curb mile for monthly sweeping plus an additional seasonally-based sweeping during five more months.

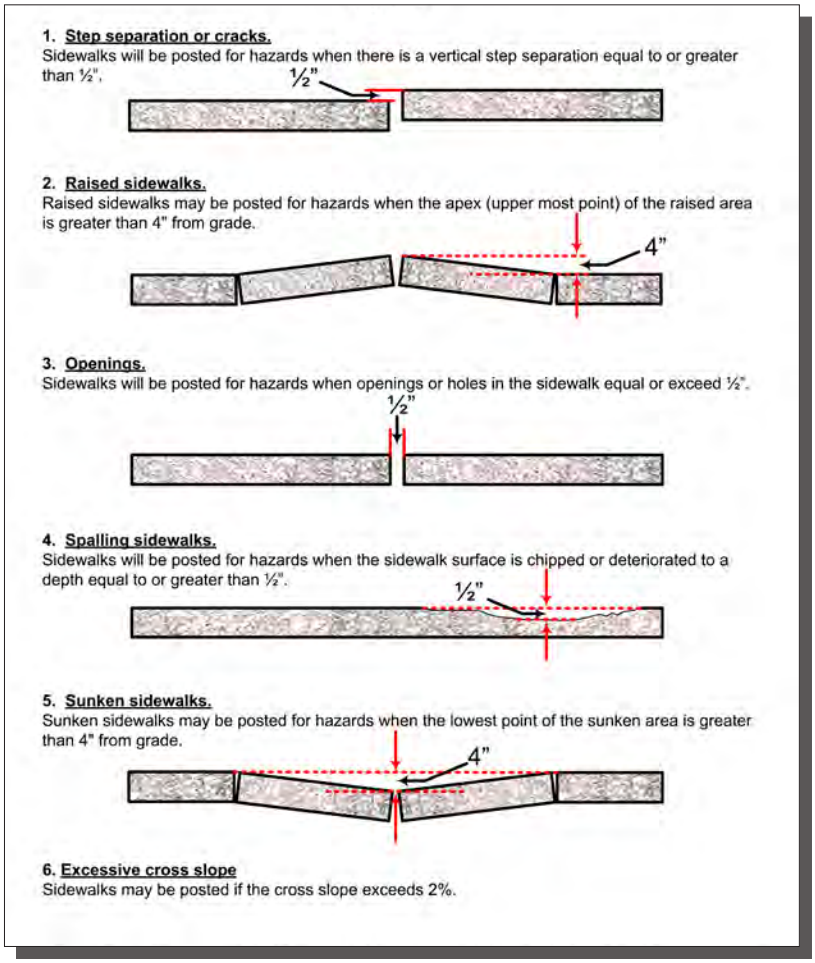
d. Notes from All Over

Frederick Douglass

"It is easier to build strong children than to repair broken men."

Evaluating Conditions

- Evaluating current sidewalk and bikeway conditions for maintenance needs should be done regularly. The Loudoun County (Virginia) Bicycle & Pedestrian Mobility Master Plan recommends an annual inspection of sidewalks and more frequent inspections and maintenance of bikeways.
- A tracking system keeps things organized and transparent. Using a GIS-based system makes it efficient. Minneapolis, Minnesota's inspects sidewalks on a 10-year cycle, showing inspections and repairs in a publicly-available map.
- Georgia Tech has developed a tool called the Automated Sidewalk Quality and Safety Assessment System, which uses the camera of a tablet mounted on a wheelchair to determine sidewalk presence, conditions, and ADA standards compliance, resulting in a Sidewalk Quality Index (SQI). Findings from the assessment can be used to prioritize maintenance needs. Future versions are expected to incorporate repairs costs.
- Formal assessments by city staff can be augmented by the public who can provide valuable information on conditions where they walk or bicycle. Durham's One-Call system takes request for sidewalk repairs. On-line crowd-sourcing systems such as Wikimap provide additional flexibility because of their 24/7 availability.
- Madison, Wisconsin's bikeway maintenance program is named for its goal -- Bikeway Maintenance: Making Bicycling a Viable Mode of Transportation. The document covers all types of maintenance and includes typical failures in bikeways needing repair.
- Portland, Oregon's Sidewalk Maintenance Standards provide clear information on when repairs are needed using diagrams. Because adjacent property owners are responsible for sidewalk maintenance, the City publishes standard drawings and a Sidewalk Repair Manual, which is a comprehensive review of sidewalk deficiencies and repair techniques



City of Portland, Oregon Sidewalk Maintenance Standards.

The Way Forward

Evaluation, funding, and coordination of maintenance efforts are central parts of keeping biking and walking working in Durham. Here are some key pointers.

1

KNOW IT

Complete annual or bi-annual sidewalk assessments. Use GIS-based technology that can help prioritize, such as the Automated Sidewalk Quality and Safety Assessment System developed by Georgia Tech.

2

THE PUBLIC IS THE BEST TEAM PLAYER

Continue to use Durham's One-call system; list sidewalk maintenance as one of the needs handled through One-call. Train residents in each of the Partners Against Crime (PAC) districts to complete an annual sidewalk and bikeway assessment.

3

MAKE PRIORITIES

Establish a prioritization system that includes guidelines for conditions that trigger maintenance activity. Priorities should factor in ADA-compliance needs, severity of condition, and equity.

4

SMALL THINGS MATTER

Establish a quick-response capability for bikeway and sidewalk repairs to immediately reduce the likelihood of a crash. Guidelines for determining quick response maintenance should reflect the crash or fall risk to the bicyclist or pedestrian. Include seasonal maintenance as a quick-response need, i.e., when snow and ice impedes travels. Remember that a little snow and ice affects bicycling and walking more than driving.

5

GET AHEAD OF THE GAME BY DESIGN

Get ahead of the game by designing lower maintenance, high quality pedestrian and bicycle facilities. Review and revise design criteria to reduce future maintenance needs. Evaluate the trade-offs of higher quality and cost materials against life-span maintenance costs.

Unified Development Ordinance (UDO)

A Unified Development Ordinance (UDO) is a local policy document containing traditional zoning and subdivision regulations and other desired city regulations, such as design guidelines, sign regulations, and floodplain and storm water management. A UDO streamlines and coordinates the development process of permits and approvals for development projects by removing inconsistencies and eliminating outdated policies. The required permits, processes, and regulations for the development process are outlined in one place, making it easier for developers, the public, and public entities to understand the requirements.

Adopted in December 2005 and taking effect on January 1, 2006, Durham's UDO supersedes the Zoning and Subdivision Ordinance and is crafted to result in a built environment that meets its Comprehensive Plan goals. UDOs typically begin with and focus on land use development regulations, especially for commercial, industrial, civic and residential uses. Guidance on transportation networks is included as it relates to specific land uses, not necessarily as an independent topic. References to separate modal plans provide more details. As more communities adopt UDOs, some offer a stronger connection between land use and transportation, incorporating, for example, regulations typically included in Complete Streets policies, urban street design guidelines.

Complete Streets

Communities increasingly recognize that transportation and land use are tightly connected and changes in either greatly affect the other. This is particularly true when creating a multimodal community is part of an overall economic development and community viability strategy.

Charlotte's 1994 Growth Framework identifies walkable activity centers and its 2007 Urban Street Design Guidelines support the City's Complete Streets policy. In 2016, Charlotte launched a process to define "Place Types" that will better connect land use and transportation design and that will be ultimately incorporated into the City's UDO update. In addition, Charlotte's draft bicycle plan update recognizes the need for using multiple factors, including land use, to determine the appropriate bicycle facility for a specific location.

Raleigh's Unified Development Ordinance establishes a connection between transportation and land use in its intent and purpose by including an object to, "Promote development patterns that support safe, effective and multimodal transportation options … and therefore minimize vehicle traffic by providing a mixture of land uses, walkability and compact community form." Raleigh's UDO, adopted in 2013, was followed by its Complete Streets policy in 2015. The core of this policy (Policy T 3.1) is to incorporate Complete Streets principles in all transportation projects "…and support mutually-reinforcing land use and transportation decisions." Careful coordination of land development and transportation systems through a Complete Streets policy and other measures usually has multiple benefits. Smart Growth America's 2013 report, Building Better Budgets, includes tax municipal property tax per acre statistics from Raleigh showing that denser, mixed-use, walkable development generates ten times higher property tax yields than more suburban development patterns.

UDO Requirements

Several North Carolina communities have provisions in their UDO that support developer participation in building the bicycle and pedestrian networks.

Brevard, North Carolina's UDO requires all new development to incorporate onsite sidewalks, bike paths, or bike lanes depending on what is most practical and functional. If a property is located on the main corridor and does not have a sidewalk, when the property is developed the owner is responsible for installing a sidewalk or 10-foot-wide asphalt bike path (which is ultimately dedicated to the city for maintenance purposes). If a property includes a portion of the bike path in a city planning document, then the developer is required to install the bike path as part of their construction. The ordinance also requires bike racks for new developments.

Fayetteville, North Carolina's UDO states that "In lieu of a TIA (traffic impact analysis), alternative vehicular and/or pedestrian analyses may be requested by the City Manager which include, but are not limited to, individual intersection peak hour counts, trip generation and/or trip distribution calculations for use by City staff to determine any mitigation measures that may be required by development sites."

In 2003, Greensboro strengthened its sidewalk installation ordinance to further the goals of its Walkability Plan. Changes now require new developments or redevelopments to install sidewalk along their street frontage. The new requirements are referenced in Greensboro's UDO.

Development Agreements

UDOs can provide tools for a city to use in negotiations during the project development stage, such as development agreements that include infrastructure that benefits bicycling and walking networks. The project development stage may be the best time for the city to get agreement about these types of improvements. Some cities use a strong proffering system that results in outcomes that better match both land use and transportation goals. Parking requirement reductions, traffic projections, and programmed projects are some of the triggers that require developers to build or improve pedestrian and bicycle networks, or for the City to negotiate with developers to do so.

Arlington County, Virginia, negotiates off-site improvements as part of the mitigations for a special exception project, where appropriate. The County has a policy to consider off-site improvements in exchange for commercial office parking reductions, including for school sites.

In San Luis Obispo, California, the Multimodal Transportation Impact Study Guidelines include about a dozen conditions where a developer must conduct an impact study. For example, if the project would generate 100+ peak hour motor vehicle trips; if it affects existing problematic areas of concern; if it increases existing or planned crosswalk length or the total number of travel lanes crossed; and if it increases existing or planned vehicle lanes, lane widths, or the number of driveways crossed by bike lanes. Required data includes pedestrian and bicyclist peak hour volumes, which the developer must collect if the City has not done so.

North Carolina law allows local governments to negotiate agreements with developers for on- and off-site improvements, without being bound by the limitations of formally imposing regulatory extractions. While an earlier law limited development agreements to projects with at least 25 developable acres, 2015 revisions to the state code opened the door for negotiating all developments, regardless of size. The law allows agreements to include those needed to secure compliance of the project with the comprehensive plan or to address impacts reasonably anticipated to result from the project. The law does not explicitly address on- and off-site improvements. However, it is not uncommon to have agreements include some nearby offsite improvements, where they can be tied to project impacts and both parties agree to the conditions.

North Carolina jurisdictions that negotiated for provision of off- and on-site transportation network improvements, regardless of size include:

- Catawba County – Crescent Resources/ Key Harbor: The landowners agreed to provide specified off-site highway improvements (based on a Traffic Impact Analysis), install a bike path and sidewalks, and improve a school parking lot.
- Wilmington-Newland Communities: The developer agreed to provide bike paths and sidewalks per city plans, in addition to roadway improvements related to a road relocation.
- Chapel Hill used a development agreement in 2016 when the town leased a small site with a fire station to a developer who is replacing the fire station and building a private office building on the leased land.

About Fee in Lieu

UDOs often include a fee-in-lieu provision that allows developers to avoid building a sidewalk or bicycle facility under certain conditions. Instead, developers pay an amount into a fund that is used for sidewalk construction when future conditions warrant. Too often, the funds do not cover the actual construction costs. Some communities include provisions that reduce the financial risk to the city by either a more accurate way to calculate the fee in lieu payment or simply requiring sidewalks.

Another change to Greensboro's UDO sets a limit on the timeframe for deferring installing sidewalks: developers can pay a fee-in-lieu if installing sidewalks would conflict with a planned or programmed roadway project that will begin within four years. The fee would be used to install sidewalks as part of the planned or programmed project. The fee-in-lieu amount is to be "an amount of the entire estimated cost of completing the installation, based on current contract unit prices, as approved by the City Engineer."

Charlotte, North Carolina, on the other hand, requires sidewalks at the time of development. The city found the cost to construct is much lower and a fee-in-lieu system is inadequate, unless calculated in a way that ensures sufficient funds when it is time to build.

The Way Forward

The following are suggestions that help create a better place for walking, bicycling, and business. **Any changes to the UDO would require additional staff refinement, public review, and follow the normal city process for UDO amendments.**

Strengthen the transportation-land use connection.

Update the UDO's Purpose and Intent section to reflect a stronger connection between land development and the city's transportation network, along with small wording changes and additions throughout will go a long way towards this.

Be Complete; Streets, that is

- Adopt a Complete Streets policy that includes street types with accompanying multimodal design guidance.
- Use as a model the proposed changes to the Design Districts guidelines, section 16.4.4, A,2,3 – street types for new streets. The Comprehensive Plan recommends adoption of a Complete Streets policy (Chapter 8.1.1d)
- Consider bicycling and walking networks to be as essential to land development as water and sewer.
- Require sidewalks adjacent to bridges without sidewalks to connect to the edge of the bridge's shoulder. See the NCDOT Complete Streets Guidelines for more information.

Overlay the Design District

- Build on the work of the Design District updates to establish transportation overlay zones, such as for transit, schools, and neighborhood commercial uses.
- Alexandria, Virginia uses these to ensure streets with special emphasis such as transit, bicycle network streets, and historic streets and alleyways.

Get It Right Before It Goes In

- Current Comprehensive Plan policies and UDO requirements require significant developer contributions to public bicycle and pedestrian infrastructure. The following should be considered to strengthen the developer proffering system and development agreements:
  - A multimodal traffic impact analysis with minimums for walking, bicycling and transit traffic, along with motor vehicles. This is especially critical for projects in the downtown tier, where TIA's are currently exempt. (Current language is UDO section 3.3)
  - Offsite transportation system improvements due to land development impacts based on the multi-modal traffic impact analysis.
  - Connections to adjacent bicycle and pedestrian facilities, with no or minimal exceptions. Do not allow sidewalk frontage gaps in new subdivisions. Require pedestrian connections to development on each street frontage of a site. Negotiate an agreement for the developer to provide access to transit stops and improve the stop to make it ADA accessible both on site and for companion stops off-site when they can be tied to project impacts. When new streets are built, provide bicycle and pedestrian facilities on the entire length of the street even when a portion is off-site.
  - Require personal lockers/showers in office developments to encourage bicycling to work.
- Reassess the fee-in-lieu option, as it places a financial burden on the City to install sidewalks which will most likely cost more than the fee received. (Eliminate exemptions in Section 12.4.2, E). Language may mirror that from the Design Districts guidelines, section 16.4.2, A-8 "Payment in lieu shall not be an option to comply with sidewalk requirements."
- Develop a set of case studies, talking points, infographics, and other materials that show the economic benefits of these connections for the developer. Studies such as those included in a Headwaters Economics report can be used as references.

Go Completely Complete

- Include bicycle and pedestrian facilities on all streets, unless prohibited by law. This means that design guidelines need to include cross-sections showing these facilities.
- Begin with updating the sidewalk requirements shown in the chart in section 12.4.2 to require sidewalks on both sides of the street for nonresidential and residential streets in the Urban and Suburban Tiers. Current standards require a sidewalk on both sides only for the Urban Tier with at least 2,000 daily motor vehicle trips, post-development. Consider requiring sidewalks in the rural tier.
- Clarify when sidewalks are required and remove or reduce exemptions to avoid need for interpretation. Note that sidewalks are required even as part of a change of use or minimum building improvement.
- Update pedestrian and bicycle standards to reflect targeted (or desired) pedestrian and bicycle traffic volumes, especially where these streets are near pedestrian/bicycle generators such as schools, parks, transit, retail or where there is multi-family or compact housing.

Be Clear and Current

- Revise section 12.4.1, General to be more specific about sidewalk and bikeway design guidelines. The current language "Design, location, dimensions, dedications, easements, and reservations shall conform to applicable City and County policies and plans for sidewalks, bicycle routes, and trails" can be strengthened and perhaps include a provision for flexibility in design. Provide clearer standards for bicycle facilities and when an off-street facility is acceptable, and the standards for these improvements. Strengthen requirements to improve conditions for bicyclists when intersections are impacted by development. A Complete Streets policy would ideally include this provision.
- Update the Public Works Department's *Reference Guide for Development* and incorporate into the UDO.
- Update all standards and minimums to reflect current national guidance. Two areas of need are: a 5-6 foot minimum for bicycle lanes instead of four feet; and eliminate the use of a wide outside lane with a shared lane marking instead of a bicycle lane.
- Reference NACTO design guidance documents.

Get Rid of the Stress for Everyone

- Include level of service (incorporating level of stress and comfort) targets for bicycling and walking comparable to those for motor vehicle traffic (Transportation chapter of the comprehensive plan, 8.1.2h).
- Incorporate a reference guide for matching roadways and adjacent land use with bicycle facility type.

Going Forward: It's About Every Project

The Durham Bike+Walk Implementation Plan identified and prioritized more than 450 miles of bicycle facility needs, more than 400 miles of sidewalk needs, and 480 intersection improvement needs. From these needs, 75 projects have been identified based on a data-driven prioritization process that will guide the immediate focus and work plan of the City. However, this does not discount the need for bicycle and pedestrian facilities and improvements on many other streets in Durham. What options are available for these streets?

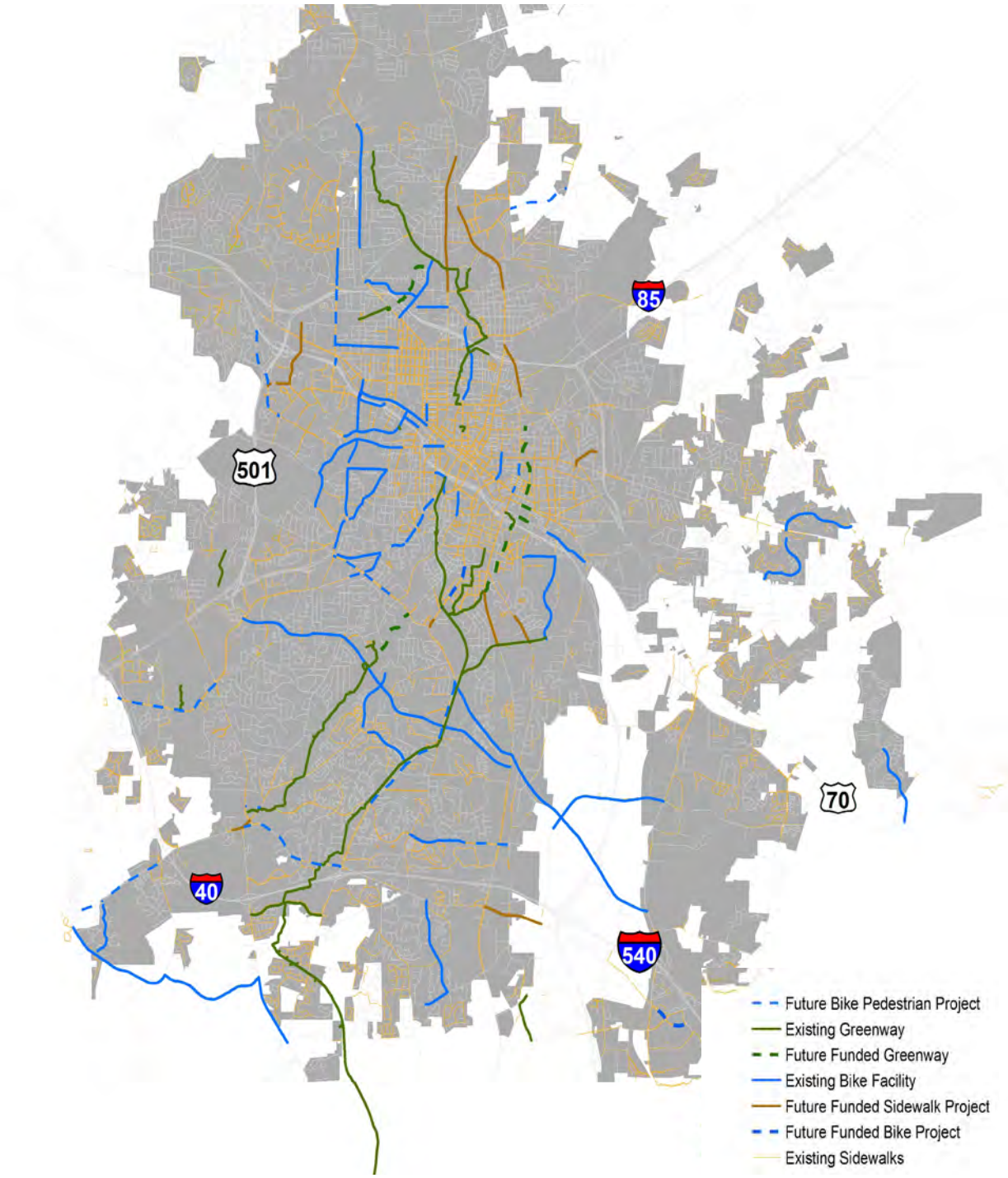
First, these are not the only locations that will see bicycle and pedestrian improvements in upcoming years. A number of bicycle/pedestrian projects are currently funded and in various stages of development. These projects, seen on Map A , came from the previous DurhamWalks! Plan, the 2006 Comprehensive Bicycle Plan, or as part of an NCDOT road project and will add approximately 23 miles of sidewalks and/or bicycle facilities. More information about these projects can be found on the City's website. The City now considers every transportation project a "complete streets" project.

The map on the next page (Map A) shows these pedestrian projects, and more information can be found on the City's website. In addition, there are a number of opportunities for bicycle and pedestrian improvements that are and will continue to be pursued:

- Bicycle lane feasibility during all road resurfacing projects
- Sidewalks required as part of new development
- Coordination with Parks and Recreation on trail construction and improving access to and from trails
- Coordination with GoTriangle on bicycle/pedestrian improvements related to the Durham-Orange Light Rail and other transit projects
- Bicycle/Pedestrian facilities added as part of NCDOT road and intersection projects
- Neighborhood traffic calming efforts
- Safety improvements on a case-by-case basis
- Sidewalk petition program that allows residents to request and share in the cost of sidewalk construction

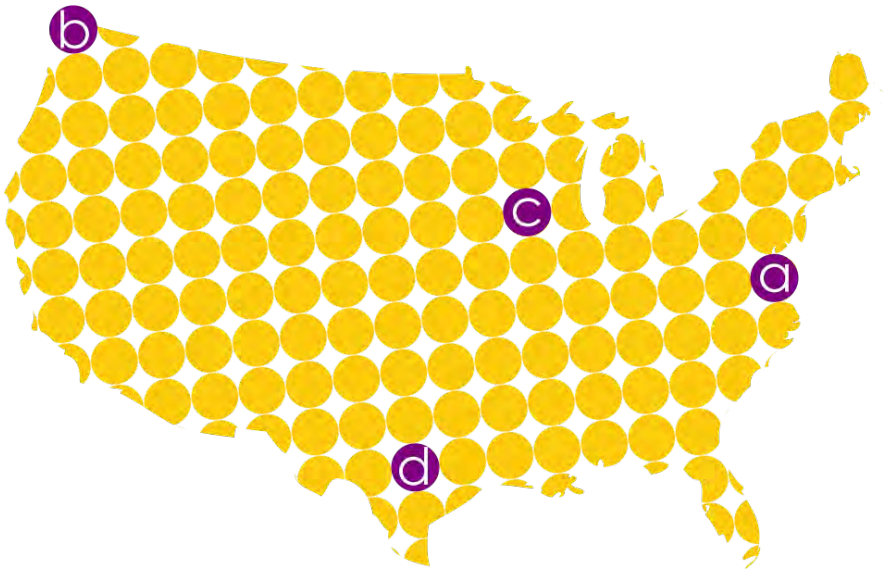
Map A | planned and/or funded bicycle and/or pedestrian projects

The map here shows pedestrian projects planned for the future, and their relationship to current / funded bicycle and pedestrian facilities.



The following are examples of what other municipalities are doing to help stretch limited finding.

Leading by Example



a. Washington, DC

Moving Projects Faster in DC (!)

The District of Columbia has been able to increase the pace of sidewalk construction and reduce costs by hiring contractors who develop sidewalk designs in the field rather than submitting formal drawings. The contractor bases the designs on the city's Public Realm Design Manual, which provides detailed guidance covering most sidewalk situations. D.C. sends notification letters to affected residents, and conducts field visits or meetings to address any resident concerns, sometimes using spray paint to show where sidewalks would go. D.C. also shaves costs by grouping projects together geographically, which enables the contractor to place needed support equipment in a central location.

b. Seattle, WA

Stretching Sidewalk Dollars

The City of Seattle is stretching its sidewalk dollars by substituting low cost sidewalks for traditional concrete sidewalks in some cases. The low-cost sidewalks are constructed using materials such as stamped concrete and stained asphalt or by creating street-level sidewalks separated by curb stops, bioswales, or landscaping. This low-cost approach will enable the City to construct 250 blocks of sidewalks at the cost of 150 blocks of traditional sidewalks.

c. Madison, WI

Hard Ties to Resurfacing

The City of Madison, Wisconsin leverages scheduled roadway resurfacing as an opportunity to add bicycle lanes more inexpensively. Prior to resurfacing any arterial or collector street, the city conducts an evaluation to determine the feasibility of installing bicycle lanes along with resurfacing and proceeds to install them if there is enough space.

d. San Antonio, TX

Everything is Bigger...but the Fees

The City of San Antonio's Sidewalk Cost Sharing Program takes equity into account. Rather than requiring everyone to pay the same share for sidewalk maintenance and construction, the rate is based on where residents live. If the sidewalk is located in a Community Development Block Grant (CDBG) area, the city pays 70% and residents pay 30%. On the other hand, if the property is located outside a CDBG area, the city splits the cost with residents 50-50. This approach is more equitable because CDBG block grant areas typically include a high proportion of low- to moderate-income residents.

As mentioned, while attention is currently on the projects identified as priorities, the goal of the City is to make significant progress on these projects in the coming years. Alternative projects might also be necessary if there are unanticipated challenges with one or more of the identified projects. As necessary, the City will identify replacement projects, using a methodology similar to the first round of projects. This process involves an initial review of the first round prioritization scores to pinpoint high need locations, and then look at other factors (cost, public comments received during this plan process, constructability, geographic equity, source of funding, etc.) to develop future round(s) of projects.

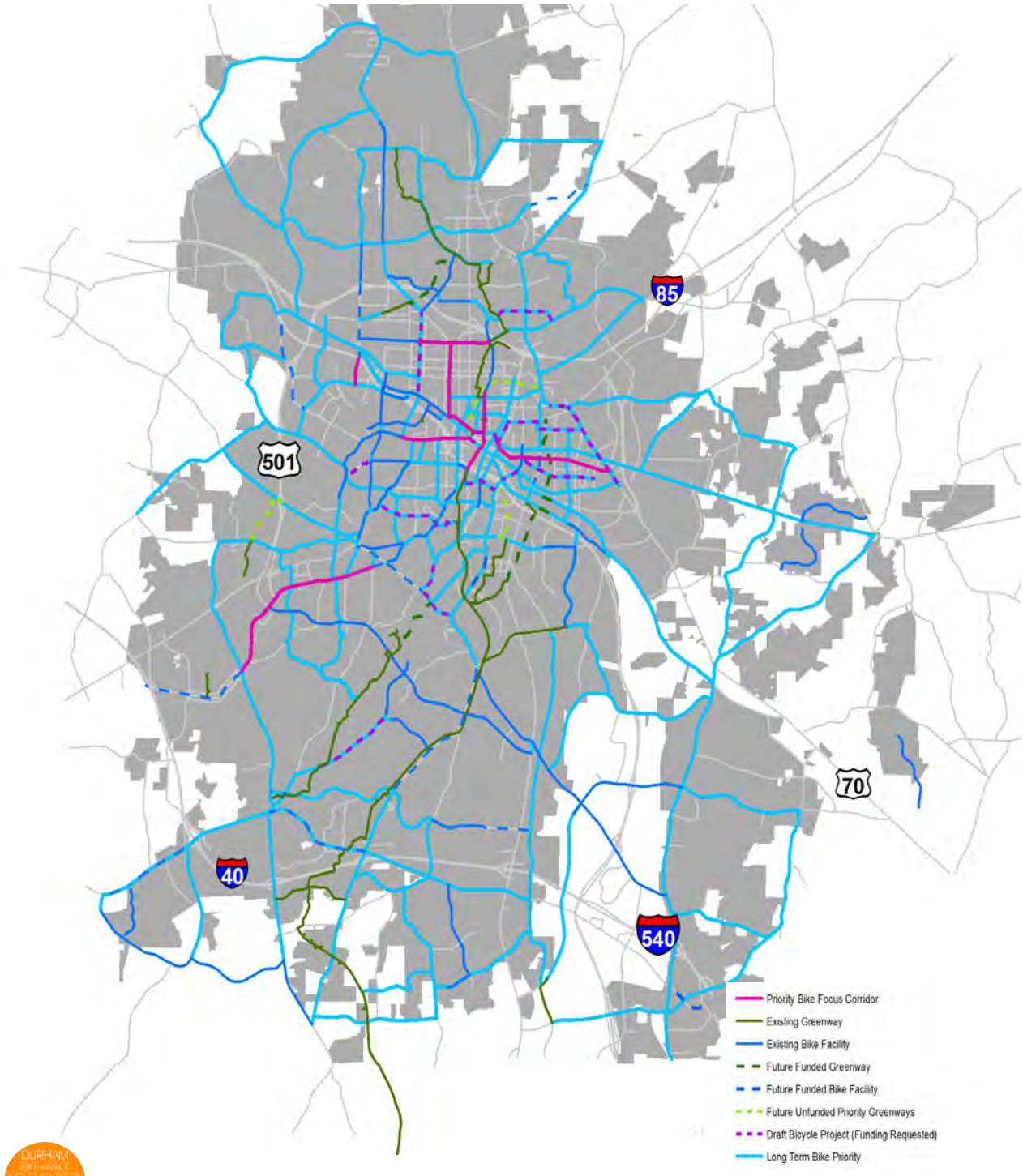
The Need for a Bicycle Network

For bicycle projects, an additional emphasis will be made on developing a low-stress, connected bicycle network. The survey conducted as part of this plan update found more than half of Durham residents found it "very difficult" or "somewhat difficult" to get around by bicycle in the area around where they live. Less than half said they could get to where they want to go safely or quickly by bicycle. In the same survey, there was a clear preference for low-stress facilities. Low-stress facilities can range from multiuse trails, to on-street bicycle lanes with vertical separation (like bollards or curbs) to bicycle boulevards/neighborhood greenways.

In response, a Priority Bicycle Network Map (see Map B on the next page) has been developed that refines the recommendations of the MPO's Comprehensive Transportation Plan (CTP), the previous Durham Comprehensive Bicycle Plan, and the first round of prioritization (see map). This Priority Network map does not replace the CTP, which continues to guide the City's long-term network goals. Rather, this Priority Bicycle Map shows the most critical local and regional connections and will help prioritize both short- and longer-term improvements along these corridors. These routes are recommended for further analysis to determine the most appropriate facility and work to make both short- and longer-term improvements on these corridors. It is also intended to be used by Parks and Recreation, Planning, GoTriangle, and other stakeholders for trail, transit and other planning purposes.

Map B | bicycle network

This map shows how planned, funded and existing projects are helping develop a comprehensive bicycle network.



The Way Forward

The examples shown here are compelling, but recognizing Durham's specific context is important to moving projects faster. Here are a few concepts.

1

STREAMLINE

Potential strategies include removing the requirements for a public hearing and City Council approval, and establishing a public web page where residents can submit sidewalk petitions and track progress.

2

ADD CAPACITY...FOR SIDEWALKS

Consider hiring additional Public Works Department staff and/or on-call contractors to assist with sidewalk construction. Incentivize performance with timing bonuses (contractors) and more maintenance funds (internal staff).

3

FASTER AND LOWER

Accelerate projects by designing less complex sidewalks in the field rather than requiring formal drawings, and construct some sidewalks using lower-cost materials or without traditional curb-and-gutter / piped drainage.

4

LEVERAGE MAINTENANCE ACTIVITIES

Durham has a reputation for working well with NCDOT to align biking and walking priorities to upcoming resurfacing projects. The City can also adopt a policy that all arterial and collector streets be reviewed in advance of resurfacing to determine the feasibility of installing bicycle lanes, and extending the practice to utility (e.g., stormwater) maintenance actions as well.

5

CALM THE NERVES

Encourage residents to utilize the City of Durham's newly revised Traffic Calming Guidelines to slow down motor vehicles on roads without sidewalks and to make walking and bicycling on those roads safer and more comfortable in the absence of formal pedestrian and bicycle facilities.

Walt Whitman
As I Walk These Broad, Majestic Days

As I walk these broad, majestic days of peace,
(For the war, the struggle of blood finish'd, wherein, O terrific Ideal!
Against vast odds, having gloriously won,
Now thou stridest on—yet perhaps in time toward denser wars,
Perhaps to engage in time in still more dreadful contests, dangers,
Longer campaigns and crises, labors beyond all others;)
—As I walk, solitary, unattended,
Around me I hear that eclat of the world—politics, produce,
The announcements of recognized things—science,
The approved growth of cities, and the spread of inventions.

I see the ships (they will last a few years,)
The vast factories, with their foremen and workmen,
And hear the endorsement of all, and do not object to it.

But I too announce solid things;
Science, ships, politics, cities, factories, are not nothing — I watch them,
Like a grand procession, to music of distant bugles, pouring, triumphantly moving—
and grander heaving in sight;
They stand for realities—all is as it should be.

Then my realities;
What else is so real as mine?
Libertad, and the divine average—Freedom to every slave on the face of the earth,
The rapt promises and lumin of seers—the spiritual world—these centuries-lasting songs,
And our visions, the visions of poets, the most solid announcements of any.

For we support all, fuse all,
After the rest is done and gone, we remain;
There is no final reliance but upon us;
Democracy rests finally upon us,
(I, my brethren, begin it,)
And our visions sweep through eternity.

Thank you to everyone that helped create this plan, and will help turn it into reality for our city.