

Morrisville Stirrup Iron Creek Greenway Feasibility Study

Morrisville, North Carolina

Town of Morrisville and NCDOT IMD



Town of Morrisville
100 Town Hall Dr
Morrisville, NC, 27560
919.463.6200

NCDOT IMD
1550 Mail Service Center
Raleigh, NC, 27699-1550
919.707.2600

PREPARED BY



VHB Engineering NC, P.C.
940 Main Campus Dr #500,
Raleigh, NC, 27606
919.829.0328

July 2024

Page intentionally left blank.

Table of Contents

1	Introduction.....	1
	Study Overview	1
	Prior Plans Review.....	4
	Existing Conditions Review	5
	Opportunities and Barriers.....	8
	Field Visit Summary.....	20
2	Public and Stakeholder Engagement	21
	2.1 Steering Committee.....	21
	2.2 Property Owner Notification.....	22
	2.3 Stakeholder Meetings with Wake County and the Town of Cary	22
	2.4 Public Meeting.....	24
	2.5 Online Survey Results.....	24
3	Recommendations	26
	3.1 Design Considerations.....	26
	3.2 Design Criteria	27
	3.4 Typical Section	28
	3.4 Greenway Recommendations.....	30
	Greenway Corridor Segments.....	30
	Trailheads / Greenway Access Points	32
	Greenway Alignment Alternatives.....	32
4	Action Plan.....	59
	4.1 Preferred Alternatives and Phasing	59
	4.2 Summary of Cost Estimates.....	61
	4.3 Implementation Action Plan.....	62
	4.4 Funding Opportunities	65
	Federal.....	65
	State.....	65
	State-Continued	66
	Regional.....	66
	Municipal/Local	66
	Private Foundation Grants	66
	4.5 Trail Maintenance	66
	Regular Maintenance	71
5	Appendix A. Prior Plans Review	73
	Morrisville Comprehensive Transportation Plan (2019)	74
	Morrisville Sidewalks and Greenways Map (2021)	74
	Triangle Bikeway Study	74

Capital Area Metropolitan Planning Organization (CAMPO) 2050 MTP	74
CAMPO Comprehensive Transportation Plan (CTP)	75
Wake County Greenway System Plan (2017).....	75
Town of Cary Bike and Hike Map.....	75
I-5700 Interchange Update at I-40 and Airport Boulevard.....	75
EB-5814 Airport Boulevard Sidewalks and Sidepath.....	75
I-5506 Interchange Update at I-40 and Aviation Parkway.....	75
6 Appendix B. Funding Opportunities.....	77
Federal.....	78
State.....	80
Regional.....	84
Municipal/Local	84
Private Foundation Grants	85
7 Appendix C. Public Engagement Survey Results.	87
8 Appendix D. Floodplain and Sewer Utilities Mapping.	101
9 Appendix E. Demographic Analysis Maps.	112

List of Figures and Tables

Figure No.	Description	Page
Figure 1.	Morrisville Stirrup Iron Creek Greenway Area Overview Map	1
Table 1.	Corridor Study Timeline.....	2
Figure 2.	Study Corridor by Segment.....	3
Figure 3.	Existing and Proposed Bicycle and Pedestrian Facilities.....	6
Figure 4.	STIP Projects with Status	7
Figure 5.	Public Transportation Routes and Stops.....	9
Table 2.	Demographic Characteristics.....	11
Figure 6.	Publicly-Owned Parcels and Existing Greenway Easements along the Study Corridor ..	13
Figure 7.	Environmental Screening Map.....	15
Figure 8.	Topography/Contours.....	16
Figure 9.	Floodplains along the Study Corridor.....	17
Table 3.	Steering Committee Members.....	21
Table 4.	Design Criteria.....	27

Figure 11. Typical Shared Use Path Cross-Section through a Wooded Area (Bottom) and Along a Roadway (Top)	28
Figure 12. Typical Bridge Cross-Section (Top) and Boardwalk Cross-Section (Bottom)	29
Figure 13. Example photo of existing conditions (before greenway) and photosimulation of greenway after construction – Segment 3.....	30
Figure 14. Segments and Potential Trail Access Points Near Stirrup Iron Creek Greenway.....	31
Table 5. Summary of Greenway Alternatives by Segment.....	34
Figure 15. Map of Preferred Conceptual Alignment, with Potential Connectors for Stirrup Iron Creek Greenway.....	60
Table 6. Summary of planning level estimates of probable costs for greenway segments by alternative	61
Table 7. Summary of planning level estimates of probable costs for connectors	62
Table 8. Implementation Action Plan	63
Figure 16. Typical Steps when Implementing a Federally-Funded Locally Administered Project (LAPP).....	65
Figure 25. U-5811 Expected Cross-Section for Aviation Parkway. NCDOT Public Meeting Maps (2017).Figure 16. Typical Steps when Implementing a Federally-Funded Locally Administered Project (LAPP).....	65
Figure 17. U-5811 Expected Cross-Section for Aviation Parkway (NCDOT).....	76
Table B1. STI Prioritization Criteria	80

1

Introduction

Study Overview

Morrisville Stirrup Iron Creek Greenway corridor is an approximately 3.5-mile greenway corridor (including the length of greenway spurs) located in the Town of Morrisville in western Wake County, near the border of Durham County. The Morrisville Stirrup Iron Creek Greenway corridor generally parallels Interstate 40 (I-40). It begins just south of Interstate 540 (connecting to the office park off Carrington Mill Boulevard and Sync Street) and ends at Aviation Parkway, near Lake Crabtree. The greenway is expected to cross Airport Boulevard and follow the Stirrup Iron Creek corridor to the east and behind some of the industrial development along McCrimmon Parkway, with an expected terminus near the intersection of Aviation Parkway and Dominion Drive. Lake Crabtree County Park is located southeast of the study corridor and William Umstead State Park is located on the opposite side of I-40, southeast of the study

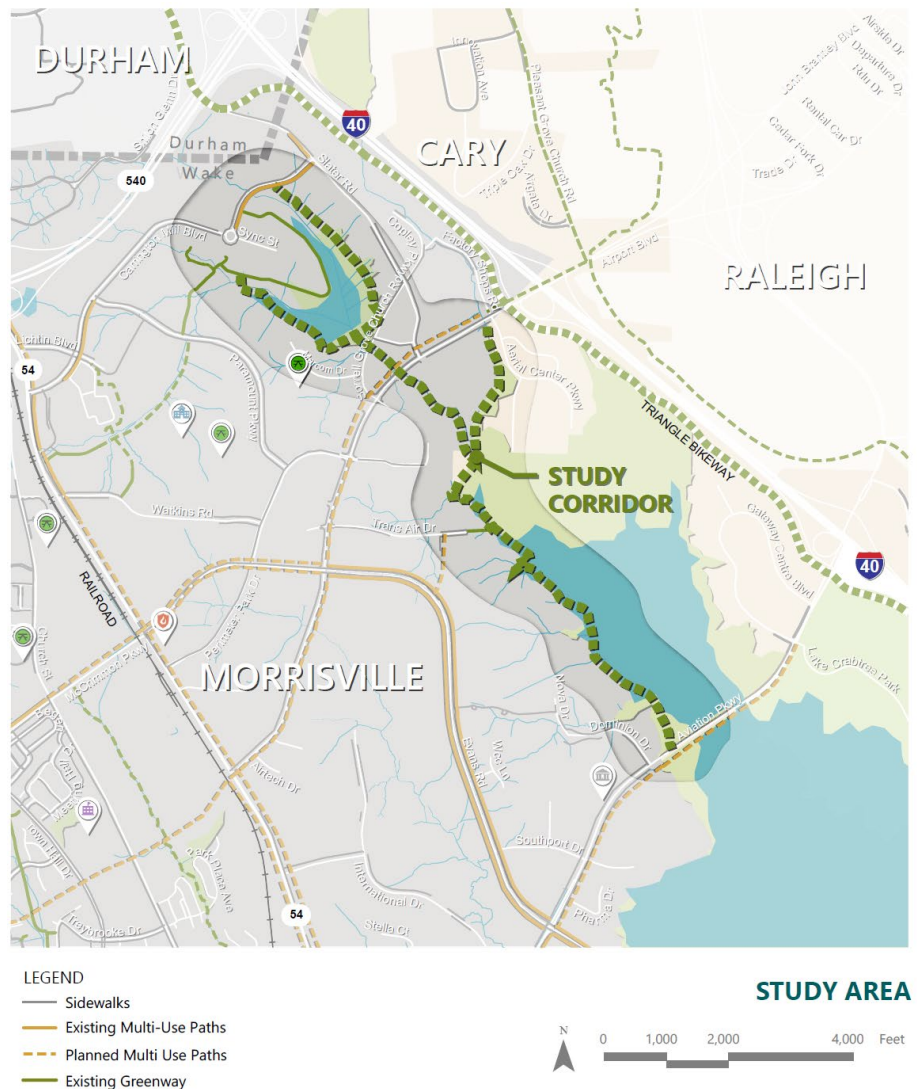


Figure 1. Morrisville Stirrup Iron Creek Greenway Area Overview Map

corridor. The Raleigh-Durham International Airport is a regional destination nearby, located east of I-40 along Airport Boulevard. The Stirrup Iron Creek Greenway is identified as a future greenway in the Town's Comprehensive Transportation Plan.

Figure 1 illustrates the study area and study corridor. The study schedule is detailed in Table 1.

Table 1. Corridor Study Timeline.

Task	Timeline			
	Summer 2023	Fall 2023	Winter 2023	Spring 2024
1. Existing Conditions Analysis				
2. Alternatives Development				
3. Recommendations and Maps				
5. Final Reporting				
5. Public Engagement	<i>Steering Committee</i>	<i>Stakeholder Meetings Steering Committee</i>	<i>Public Engagement Event</i>	<i>Steering Committee</i>

For purposes of the study, the greenway corridor was broken into five segments, numbered from south to north. Those segments are shown in Figure 2 and will be referenced throughout the report.

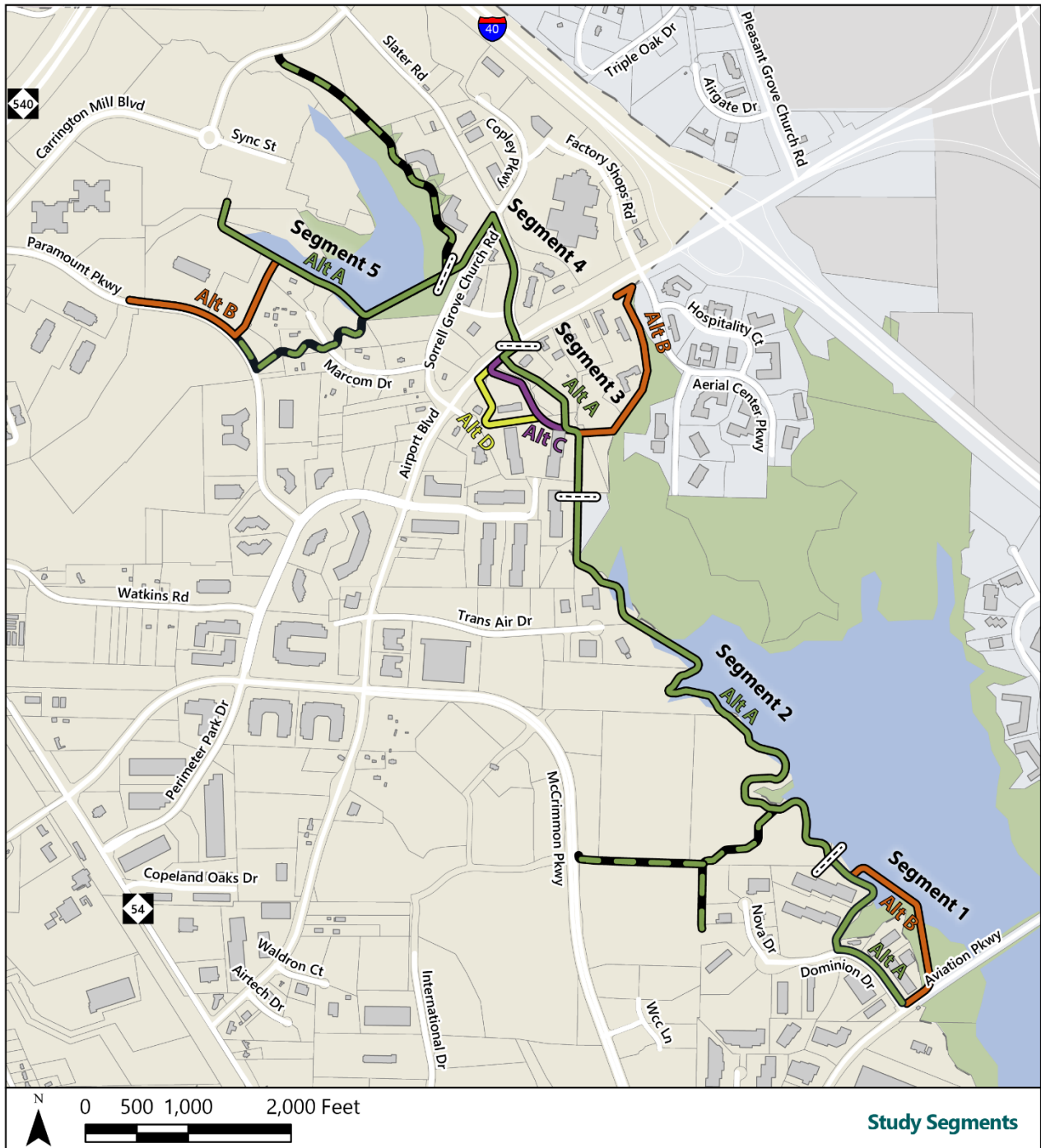


Figure 2. Study Corridor by Segment

The purpose of the feasibility study was to evaluate potential alignment for Stirrup Iron Creek Greenway, solicit public and stakeholder feedback for the potential greenway location, identify the most likely implementable alternative, and prepare planning-level cost estimates by section.

Section 4.4 and Appendix B review the funding opportunities for implementation of the future greenway. The following funding opportunities could be some of the best options to provide funding for a significant portion of the overall greenway corridor:

- Capital Area MPO (CAMPO) Locally Administered Projects Program (LAPP) Call for Projects
- NCDOT STI (SPOT) Prioritization for Funding in the State Transportation Improvement Program (STIP)
- State funding for greenways and trails including North Carolina one-time non-recurring \$25 million trail and greenway funding program called the Great Trails State Program (included in 2023-2025 budget)
- Federal competitive grant programs such as Active Transportation Infrastructure Investment Program (ATIIP)
- Local bond referendum for transportation and parks and recreation projects

Prior Plans Review

To ensure recommendations are complementary to previously identified community goals, the study was informed by preexisting plans, funded projects, and policies. Design considerations are influenced by mandates set at state and local levels.

The plans and previously funded transportation improvement projects consulted are listed below:

- Morrisville Comprehensive Transportation Plan (2019)
- Morrisville Sidewalks and Greenways Map (2021)
- Triangle Bikeway Study
- Capital Area Metropolitan Planning Organization (CAMPO) 2050 Metropolitan Transportation Plan (MTP)
- CAMPO Comprehensive Transportation Plan
- Wake County Greenway System Plan (2017)
- Town of Cary Bike and Hike Map
- I-5700 Interchange Update at I-40 and Airport Boulevard
- EB-5814 Airport Boulevard Sidewalks and Sidepath
- I-5506 Interchange Update at I-40 and Aviation Parkway
- U-5811 Aviation Parkway Widening from NC 54 to I-40

A more detailed summary of prior plans is provided in Appendix A.

Existing Conditions Review

Existing and Proposed Bicycle, Pedestrian and Greenway Facilities

Existing facilities near the study corridor include the existing Mills Spring Greenway to the north of the horseshoe-shaped lake, existing sidewalk and sidepath along Carrington Mill Boulevard, existing sidewalks on Airport Boulevard and Aviation Parkway (with some gaps), existing shared use path facilities and bike lanes on McCrimmon Parkway, and existing sidewalks along Trans Air Drive and Slater Road.

Proposed bicycle and pedestrian facilities include the regionally significant Triangle Bikeway along the I-40 corridor as well as shared use paths along Aviation Parkway, Airport Boulevard, McCrimmon Parkway, and NC-54 (Chapel Hill Rd), greenways north of the I-40 interstate along Raleigh-Durham International Airport property and between Paramount Parkway and NC-54, and bike lanes along McCrimmon Parkway west of Perimeter Park Drive.

Several projects in the State Transportation Improvement Program (STIP) and projects in the Town of Morrisville Capital Improvement Program (CIP) intersect with and connect to the study corridor and will provide additional bicycle and pedestrian connections to the future greenway. These projects are listed below.

- EB-5814 Airport Boulevard Sidewalks (completed)
 - Project improved sidewalk connectivity along Airport Boulevard
- I-5700 I-40 at Airport Boulevard Interchange (under construction)
 - Project will include a shared use path down the median of the new diverging diamond interchange (DDI)
- U-5811 Aviation Parkway (scheduled for 2028 for construction)
 - Sidepath on south side, will connect to Lake Crabtree Park
- U-5828 McCrimmon Parkway Widening (completed)
- Bicycle lanes and sidepaths implemented on both sides
- Morrisville Intersection Improvement Study (2021) included in the Town CIP
 - Slater Road and Sorrell Grove Church Road to be upgraded to a signalized intersection with pedestrian improvements. Project is currently in CIP/planning phase.

Existing and proposed bicycle and pedestrian facilities are displayed in Figure 3. The referenced STIP and CIP projects and project statuses are displayed in Figure 4.

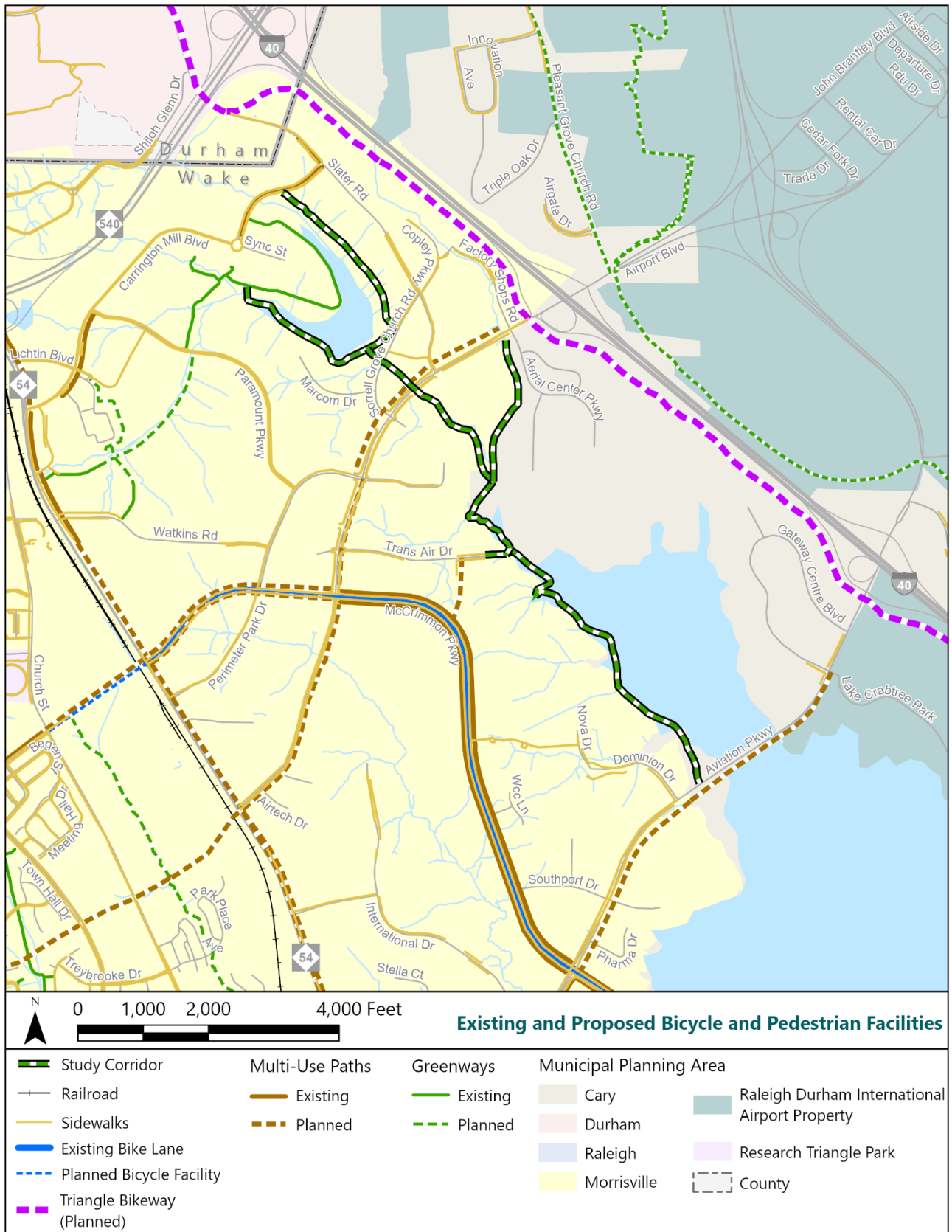


Figure 3. Existing and Proposed Bicycle and Pedestrian Facilities

Note: "2024-2033 STIP" Lines/Points do not represent final alignments and come directly from NCDOT's map

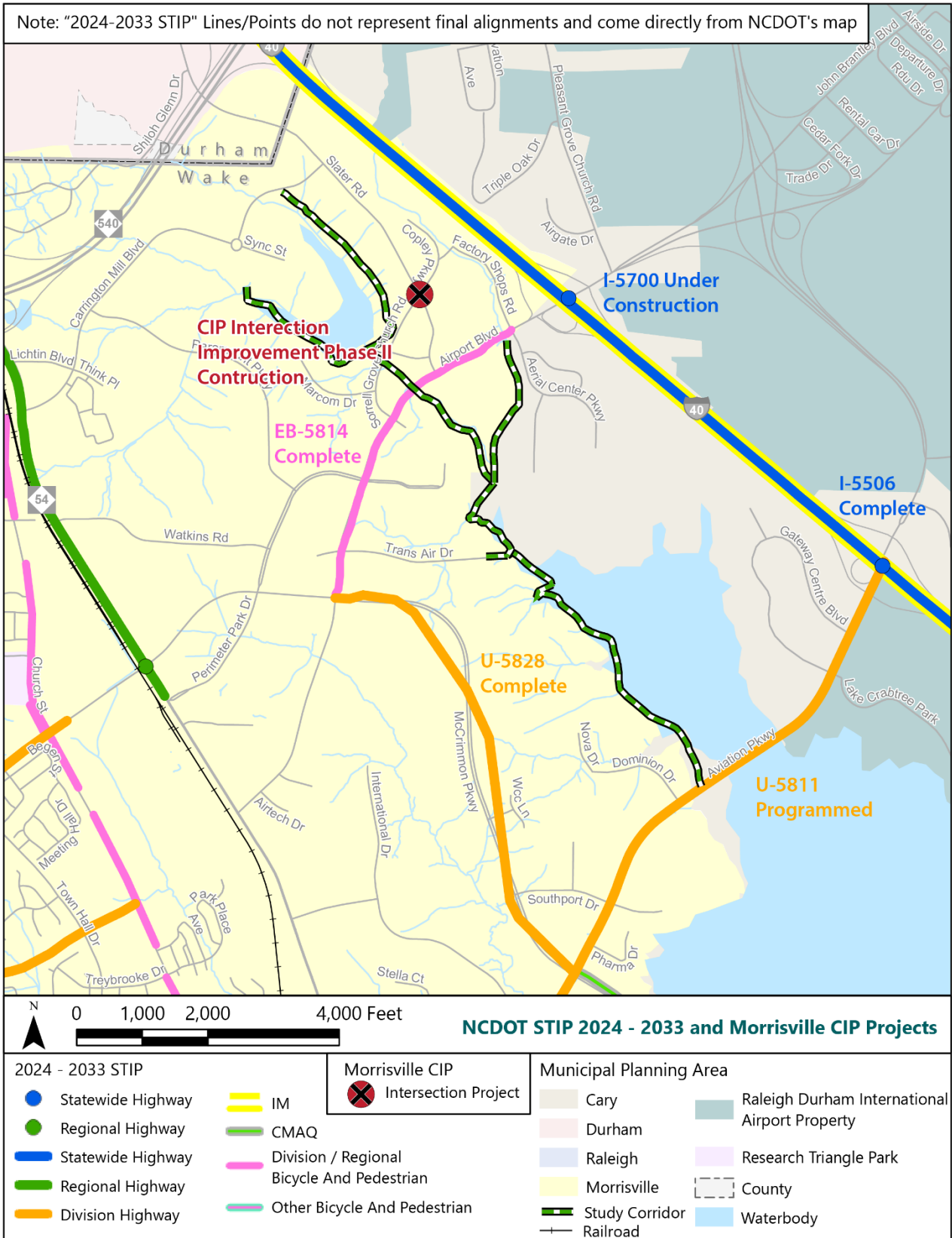


Figure 4. STIP Projects with Status

Opportunities and Barriers

Identifying and comparing potential alignment alternatives is a critical part of greenway feasibility analysis. An opportunities and barrier analysis provides an understanding of the advantages and disadvantages associated with various alternatives by investigating opportunities for greenway community connections and potential barriers to greenway implementation. The opportunities and barriers analysis can identify how the greenway corridor will tie into the larger network of community destinations, parks, and bicycle and pedestrian links in the surrounding community. Additionally, the opportunities and barriers analysis can highlight some of the challenges associated with implementation, including environmental permitting, utility coordination, and potential property owner impacts.

Below are the elements considered as part of the opportunities and barriers analysis:

- Connectivity to destinations and points of interest
- Connectivity to existing and planned bicycle and pedestrian facilities
- Connectivity to transit routes and stops
- Potential economic development opportunities
- Environmental protection
- Impacts to the natural and human environment
- Physical and topographic barriers
- Major road crossings and pedestrian safety
- Constraints associated with the floodplain
- Wake County Conservation Area
- Constraints associated with utilities
- Impacts to landowners

Destinations and Points of Interest, Existing and Planned Bicycle and Pedestrian Facilities

The project corridor provides opportunities to connect to a variety of commercial, residential, and public amenity destinations. From the corridor's southern terminus, future greenway users can connect to Lake Crabtree County Park via a short connection along Aviation Parkway, where a shared use path is proposed; the existing Morrisville Smart Shuttle node (as shown in Figure 5) is another potential connection (near Aviation Parkway and Dominion Drive). Continuing north of Competition Center Drive, adjacent to McCrimmon Parkway, there is a large life science office under construction. Workers could use the greenway for recreation during their lunch hour or for the purposes of commuting via walking or bicycling. Just north of this life science development is a proposed 300(+)-unit multi-family development, where future residents could use the greenway for recreation, as an active transportation thoroughfare to reach goods and services along Aviation Parkway, or to get to the Lake Crabtree County Park. Near Airport Boulevard, greenway users would have access to several restaurants as well as a future parks off Marcom Drive and Paramount Parkway. The northern terminus includes multiple 200-unit multi-family development and additional office space, as well as nearby connections to a new high school on Paramount Parkway.

The greenway corridor would also create additional active recreation and commuting trips through connections to existing and proposed bicycle and pedestrian facilities. The southern terminus will feature a link to a proposed shared use path along Aviation Parkway to connect to Lake Crabtree County Park, the proposed Triangle Bikeway along I-40 to the north, and Evans Road / McCrimmon Parkway corridor to the south that features existing multi-family housing and existing shared use paths (8 feet wide) on each side. Near the terminus of Stirrup Iron Creek at Aviation Parkway, a Town of Cary proposed greenway will follow the western side of Lake Crabtree. Stirrup Iron Creek would provide a future connection into this greenway system. Trans Air Drive, which connects to the middle section of the greenway corridor, will offer sidewalk linkages and proposed shared use path connections to McCrimmon Parkway and Airport Boulevard. At Airport

Boulevard has opportunity for pedestrian connections as well as a connection opportunity to the proposed Triangle Bikeway. At the northern terminus of the greenway corridor, the existing Mills Spring Greenway around the horseshoe-shaped lake and the sidewalks along Carrington Mill Boulevard will provide a beneficial connection.

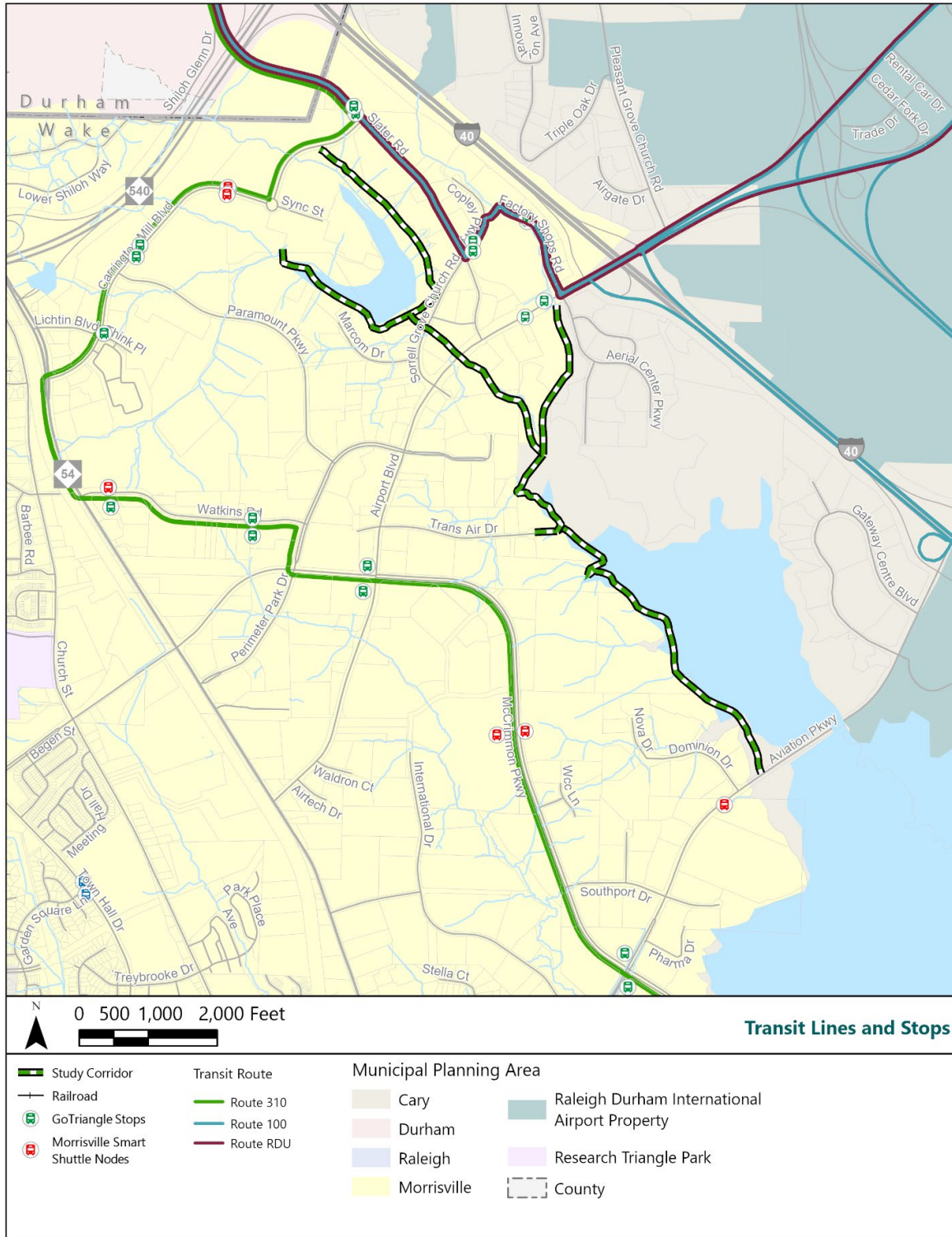


Figure 5. Public Transportation Routes and Stops

Existing public transportation routes in the area can expand the reach of the future planned greenway for transportation purposes and allow for commute alternatives on a rainy day when commuting by foot or on bicycle via a greenway might be less appealing.

The following transit services are currently present in the area (as shown in Figure 5):

- GoTriangle regional express bus routes
- Morrisville Smart Shuttle (on-demand, free microtransit) includes a node near the southern terminus, just south of Aviation Parkway and Dominion Drive, and two other stops on McCrimmon Parkway.



Morrisville Smart Shuttle Vehicle. Image Courtesy of the Town of Morrisville

A future potential Rapid Bus transit corridor (Western Corridor Rapid Bus Extension from downtown Cary to the Research Triangle Park) is being considered, with preferred alignment near the greenway study corridor shown along Evans Road/McCrimmon Parkway¹. This project is currently in the early planning stage.

Existing Demographic Conditions

Active transportation facilities such as greenways, sidewalks, and safe pedestrian crossings can support a healthier lifestyle and reduce the reliance on automobiles for everyday trips, thus reducing a household's transportation costs. Both health benefits and transportation cost savings benefits are of particular importance to transportation-disadvantaged households (for example, low-income, minority and zero vehicle households), which face multiple barriers to accessing key resources in their everyday lives.

Table 2 below summarizes demographic characteristics for the U.S. Census block groups overlapping with the study area as they compare to the Town of Morrisville, Town of Cary, Wake County, and North Carolina overall. The study area residents appear to be slightly younger, on average, than the Town of Morrisville residents (32 vs. 34 years of age) and are slightly more likely than the Town residents to have access to zero vehicles (4.4% vs. 3.0%). The zero vehicle household presence in the study area (4.4%) is lower than North Carolina overall (at 5.4%). The study area residents have a slightly lower Black, Indigenous, People of Color (BIPOC) population presence (at 52.3%) than the Town of Morrisville overall (60.4%); both of those proportions are higher than Wake County BIPOC population (at 37.5%) and North Carolina BIPOC population (at 30.10%). The proportion of the study area's population in poverty is 4.4%, which is slightly higher than the Town of Morrisville overall (at 4.1%) but lower than for Wake County (8.5%) and for North Carolina overall (12.8%).

The neighborhoods of Morrisville that connect to the future Stirrup Iron Creek are currently undergoing significant land use and development changes. New multi-family residential developments are expected to bring additional residents to the area who will benefit from future access to the greenway. The results of this demographic analysis for the study area can be considered as a measurement of the population at one point-in-time, with numerous changes expected in the near future.

¹ NC Capital Area MPO (CAMPO). https://wakebrtextensionsstudy.com/media/jcyp4fb4/rapid-bus_project-profile-western-final.pdf

Table 2. Demographic Characteristics

Geography	Population	Average Household Income	Average Age	BIPOC Population	% of Population Experiencing Poverty	% Limited English Proficiency	% Zero Vehicle Households
Study Area- Stirrup Iron Creek Greenway	6,698	\$79,864	32.1	52.30%	4.40%	6.50%	4.40%
Morrisville	28,824	\$106,891	34.1	60.40%	4.10%	9.10%	3.00%
Cary	171,603	\$113,782	39.1	37.00%	5.70%	6.80%	2.80%
Wake County	1,112,883	\$88,471	36.7	37.50%	8.50%	5.60%	3.90%
North Carolina	10,439,388	\$67,481	39.2	30.10%	12.80%	4.60%	5.40%

**Information for the study area is based on overlapping U.S. Census block groups*

For additional information and maps of demographic parameters for the study area, see Appendix E.

Economic Development Opportunities

The existing development pattern along the greenway corridor includes several industrial, warehouse, and office park land uses. Commercial uses such as restaurants are clustered along Airport Boulevard. Future land use data from the Town of Morrisville’s Government GIS portal indicate that parcels immediately adjacent to the greenway corridor are primarily zoned as Business Activity Center (BAC) and Industrial Management (IM) along the southern portion; a mix of Office (O), Commercial (C), Residential (R) and Institutional (I) along the northern portion; and Park, Greenway, and Open Space (PGO) near Marcom Drive. In addition to life sciences buildings and some additional industrial and warehousing facilities, several multi-family residential developments are planned along the study corridor, as well as additional office buildings. Future multi-family residential complexes are expected to bring residents to the area who can take advantage of the presence of a greenway for outdoor recreation and short trips. Employees at office parks could take a short stroll on the greenway at lunch or consider active transportation commute options if they live nearby. As the area along the greenway study corridor continues to redevelop into more of a mixed-use activity center with a variety of business types as well as additional residential structures, the presence of the greenway is likely to become an appreciated amenity that could support attracting additional future businesses and residents to the general vicinity.

Publicly-owned parcels along the greenway corridor could support alternative route options with potential deviation from the initial proposed alignment, provided the neighboring government entities are in support of the future Stirrup Iron Creek Greenway vision. Greenway easements dedicated as part of pending development will also support a likely location for greenway alignment along some sections of the corridor. Figure 6 details the location of publicly-owned parcels along the study corridor as well as greenway easements set aside by developers as part of development projects. The study corridor closely hugs the lines of Wake County-owned parcels in the southern portions of the proposed greenway, as well as in the sections north of Sorrell Grove Church Road. For latest development updates, please reference the Morrisville site: <https://www.morrisvillenc.gov/government/departments-services/planning/development-information>.

The integration of future residential, office, and greenspace developments along the proposed greenway is likely to bring future residents and workers to the area, increasing the potential utilization and attractiveness of the greenway corridor. Future redevelopment in combination with implementation of a greenway corridor is expected to encourage a more vibrant, interconnected activity center where the Stirrup Iron Creek Greenway corridor can play the role of a green spine for active transportation and recreation.

Landowner Impacts

As reflected in Figure 6, a large portion of planned greenway corridor overlaps with publicly-owned parcels. Four of the publicly-owned parcels belong to Wake County, and one to the Town of Cary. The Town of Morrisville also owns four parcels that exist just outside of the corridor's extent. Further, three parcels with pending developments have a designated greenway easement. Approximately 21 additional private parcels are expected to be impacted by the planned greenway alignment based on the initial planned alignment of Stirrup Iron Creek Greenway corridor.

In the southern portion of the corridor, land use is primarily allocated as Industrial Management (IM) and Business Activity Center (BAC). In the northern portion of the corridor, the land use designation for those parcels is primarily Corridor Commercial (CC) and Regional Activity Center (RAC). Some of those parcels have an existing recorded sewer easement, and the greenway easement could be added in parallel to those sewer easements.

Additional construction easements might be required at several locations along the corridor in order to stage equipment, access the greenway corridor with construction vehicles and deliver structural pieces to the site.

Existing and planned park locations are available at the northern terminus and the southern terminus of the study corridor. A mid-point public access trailhead and parking lot could be considered to provide an additional point of access. This would likely require a purchase of a parcel or multiple parcels, depending on the trailhead amenities and parking lot size preferred.

Major impacts to business operations are not expected based on the likely greenway alignment. Due to the significant presence of freight vehicles accessing industrial and warehouse parcels in the vicinity of study corridor, special consideration will be required for interface between the business driveways and greenway crossing locations to ensure safety for all greenway users. Appropriate signage and pavement markings will need to be considered.

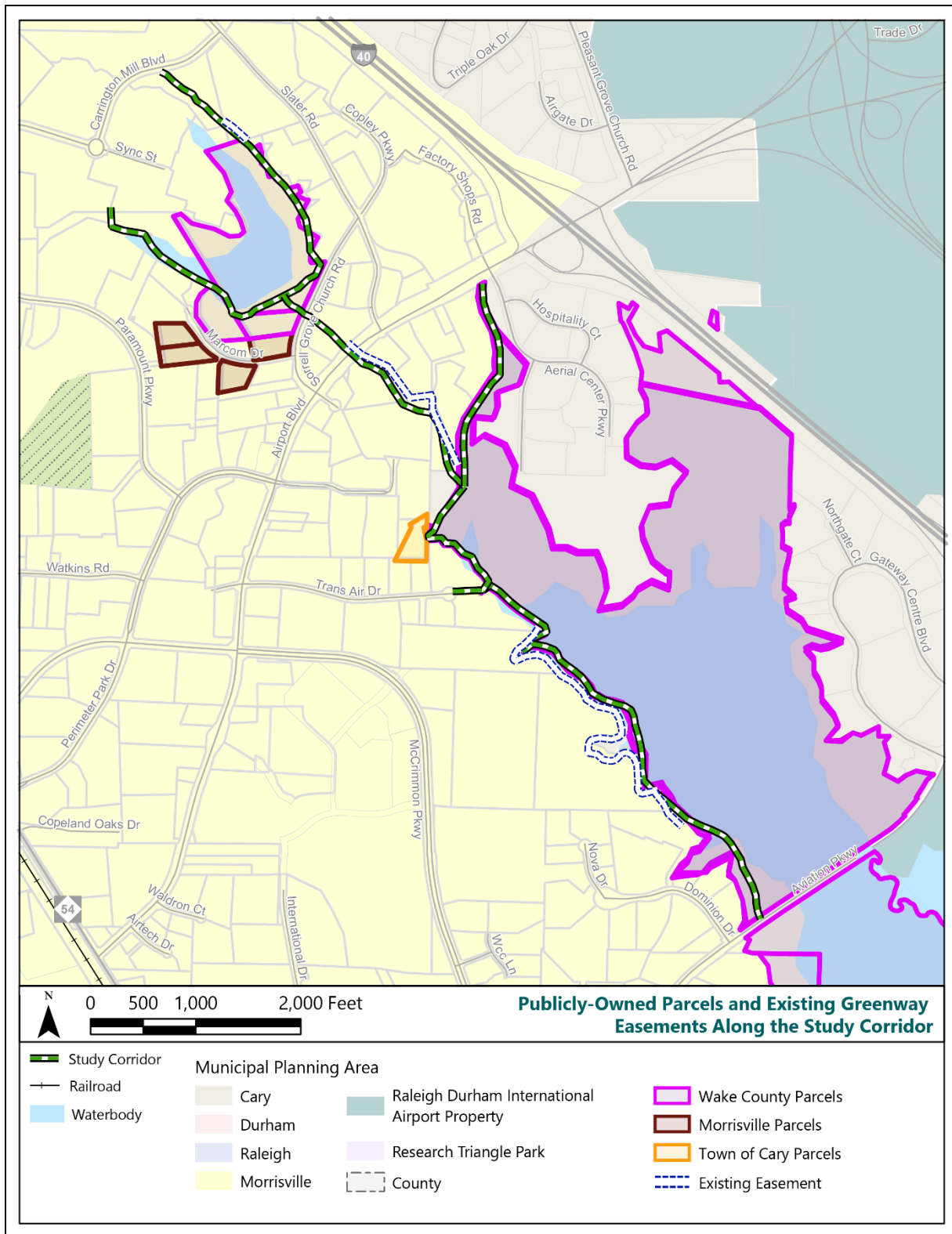


Figure 6. Publicly-Owned Parcels and Existing Greenway Easements along the Study Corridor

Environmental Considerations

A number of environmental considerations will impact the implementation of the future Stirrup Iron Creek Greenway corridor, including the presence of streams and wetlands, riparian buffer rules, floodplain and FEMA

regulations, stormwater regulations, an overlap with Wake County Flood Control Areas (designated as “Managed Areas” in Figure 7), and potential presence of threatened and endangered species. Figure 7 illustrates some of the environmental features in the study corridor.

Floodplain Constraints

Stirrup Iron Creek generally flows from northwest to southeast and outlets into Crabtree Lake outside of the Town of Morrisville limits. The corridor of the greenway study area is located within three Federal Emergency Management Agency (FEMA) special flood hazard areas (SFHA), including regulatory floodways, associated with Stirrup Iron Creek, Basin 18, Stream 13, and Basin 18, Stream 13 Tributary. It is located on Flood Insurance Rate Map (FIRM) 3720075600K, effective July 19, 2022. As a participating municipality in the National Flood Insurance Program (NFIP), Morrisville requires a floodplain development permit for any development within the FEMA-regulated 100-year floodplain (noted as Flood Zone A in Figure 9). If the preferred alignment of the proposed greenway is located within the floodway of the SFHA, a hydraulic analysis must be performed to determine the project impacts. There are several buildings located in the SFHA within the study area, therefore no development will be permitted if the hydraulic analysis shows an adverse impact on water surface elevations in the vicinity of these buildings. The presence of regulated floodplain areas is likely to have an impact on the feasibility of bridge structures across the Stirrup Iron Creek and its tributary.

Wake County Flood Control Areas

A Wake County Flood Control Area takes up a large parcel along the southern portion of the future greenway corridor, near Lake Crabtree. An additional smaller Wake County Flood Control Area is located around the eastern edge of the horseshoe-shaped lake (flood control measure lake) near the northern terminus of the greenway corridor. Stakeholder conversations with Wake County staff included potential restrictions related to greenway development, specifically a “no net fill” requirement that would impact greenway bridge and boardwalk structures in the flood control areas and fill dirt that might be brought in to help create a flatter base for the future greenway. Essentially, a “no net fill” requirement means that the loss of flood storage due to buildings or fill dirt in the floodplain is compensated for by providing an equal volume of storage to replace what is lost through removing dirt elsewhere. This is intended to preserve the ability of the floodplain to store water. For every bucket of dirt (or other materials) that is brought in, the same volume of dirt must come out elsewhere within the flood control area.

There are some portions of the trail, particularly where downward slopes exceed 10 percent on the cross-section towards the wetlands, where topography creates ADA and safety concerns, and additional safety measures, such as guard rails, should be implemented. Topography is mapped in Figure 8. Based on the current corridor alignment, there are some locations that exceed the 1:12 ratio for ADA guidelines, where switchbacks or an elongated route may be required for the accessibility to all users.

Other considerations for environmental impact should include the potential presence of Polychlorinated biphenyls (PCBs) within and around Lake Crabtree, as reported by Wake County. The presence of these chemicals could require additional testing upstream and associated mitigation measures.

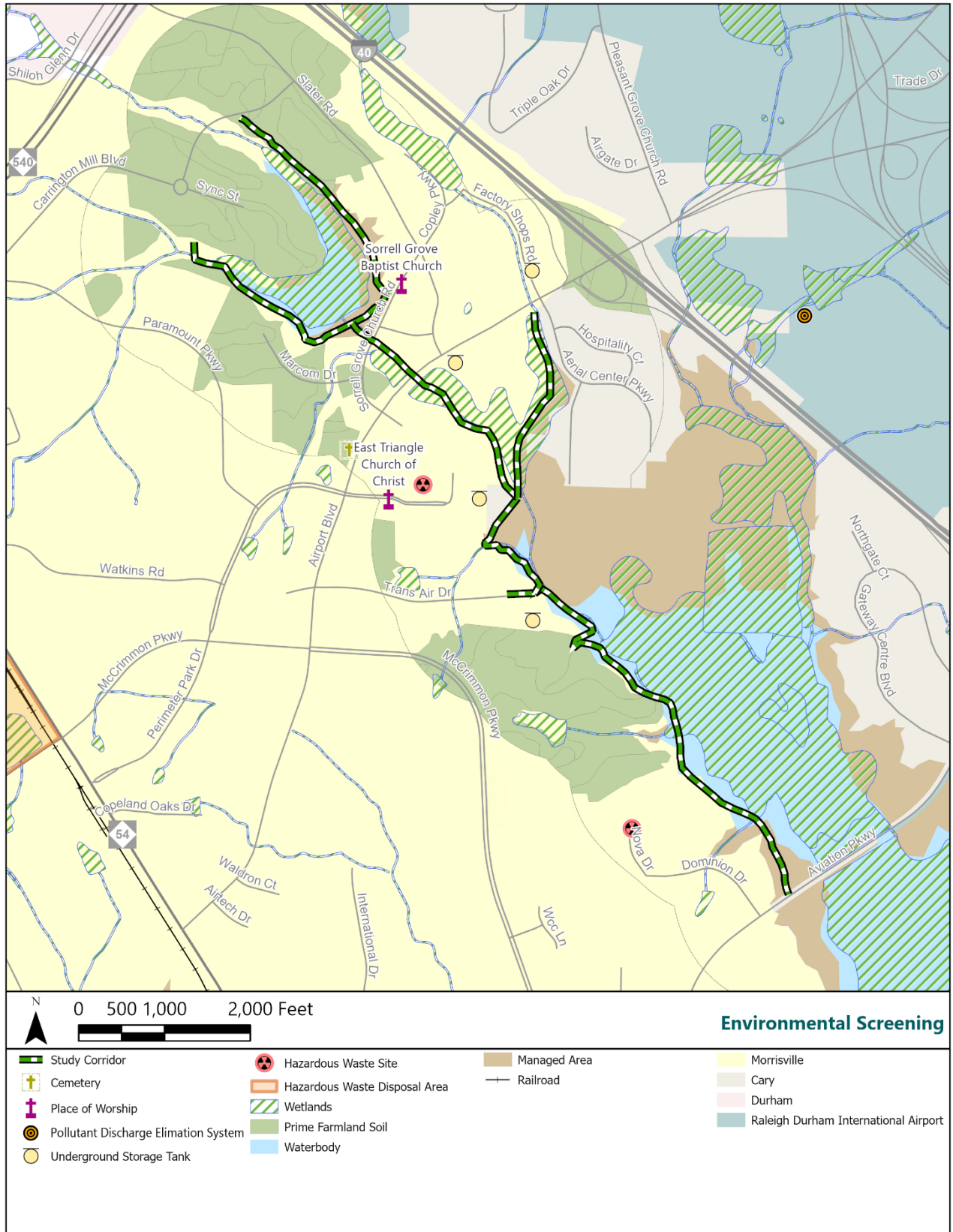


Figure 7. Environmental Screening Map.



Figure 8. Topography/Contours

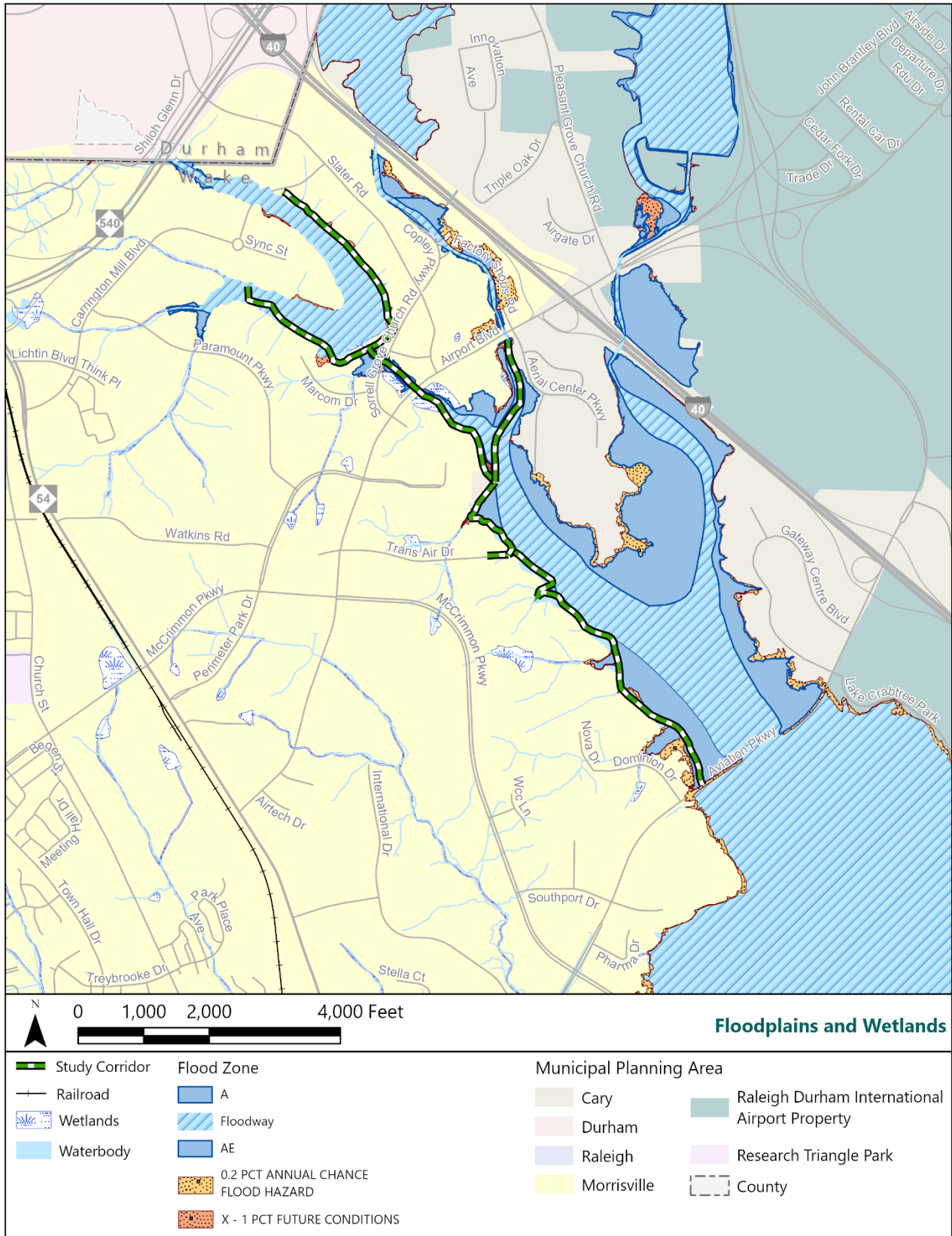


Figure 9. Floodplains along the Study Corridor

Major Roadway Crossings and Pedestrian Safety

Two major roadways that cut across the Stirrup Iron Creek Greenway corridor, Aviation Parkway and Airport Boulevard, carry high volumes of vehicular traffic at relatively high rates of speed. Both roadways have 45 miles per hour posted speed limits. Aviation Parkway, at the greenway corridor's southern terminus, is a 2-lane road; however, south of the corridor, the road is a 4-lane cross-section with the eastbound travel lanes merging into one lane and the westbound expanding into two. Future widening of Aviation Parkway is planned (see *Existing and Proposed Bicycle, Pedestrian and Greenway Facilities* Section). Aviation Parkway carries an annual average daily traffic (AADT) of 27,000 vehicles per day. The greenway crossings at Airport Boulevard will face a 5-lane cross-section with 2 travel lanes on each side and a center turning lane. Airport Boulevard carries approximately 34,000 vehicles per day at the trail crossing locations.

Due to the high vehicle travel speeds and average daily traffic, fully signalized pedestrian crossings are preferred if at-grade trail crossings across Airport Boulevard and Aviation Parkway are selected for preferred alignment. A Pedestrian Hybrid Beacon (PHB), also known as a High-Intensity Activated crosswalk (HAWK) is recommended at mid-block crossing locations.

At the southern terminus of the greenway study corridor, the existing traffic signal at Dominion Drive should be upgraded to include high visibility crosswalks, pedestrian signal heads, and curb ramps for the greenway to cross Aviation Parkway and connect to a future sidepath planned along the southeastern side. At Airport Boulevard, existing signalized crossings at Aerial Center Parkway/Factory Shops Road and at Slater Road could be considered for potential greenway crossing locations.

Sorrell Grove Church Road is an NCDOT-maintained two-lane roadway. Based on a 2014 Traffic Forecast completed for I-5700, I-40 at Airport Boulevard Diverging Diamond Interchange (DDI), 1,300 vehicles per day were traveling along Sorrell Grove Church Road in the vicinity of future greenway corridor; 1,900 vehicles per day were expected to travel along Sorrell Grove Church Road by 2040 in the "build" scenario, with the DDI project implementation.

In reviewing bicycle and pedestrian crashes for the 10-year period between 2012 – 2021, there were seven bicycle and pedestrian crashes recorded in the greenway corridor vicinity. This does not include crashes that occurred along fully access-controlled highways (I-40). Of the crashes considered, two minor injury crashes occurred on Airport Boulevard, one involving a pedestrian and one involving a bicyclist. Aviation Parkway also had two crashes, with one involving possible injuries to a pedestrian and the other involving minor injuries to a bicyclist. Perimeter Park Drive had one bicyclist-involved crash resulting in minor



Photo: Aviation Parkway at Dominion Drive, Looking Southwest



Photo: Sorrell Grove Church Road, Looking North Towards Intersection with Slater Road

injuries. NC 54 had two crashes, with one involving serious injuries with a pedestrian and a fatal crash with a bicyclist.

Utility Constraints

Sewer, water, electric, and communication utilities are present within the greenway study area. No overhead transmission lines were detected within the study area. Overhead power and cable utility lines are present along Aviation Parkway and Airport Boulevard. Underground fiberoptic cable is also present along the major roadway corridors as well as connecting corridors, including Dominion Drive and Aerial Center Parkway. Some utility pole relocation might be required as part of greenway implementation. No natural gas utilities were located within the study area based on a review of parcel records along the study corridor.

The Town of Cary holds sewer easements along Stirrup Iron Creek and Stirrup Iron Creek Tributary. Typical sewer easements along the corridor are 30-40 feet wide. Some overlap with existing Town of Cary water lines is also expected, but to a much lesser extent than the sewer corridors. Appendix D includes maps of sewer corridors by greenway corridor segment.

A Town of Cary sewer pump station is located near the eastern terminus of Perimeter Park Drive; a gravel road to the pump station could serve as a potential construction access point during greenway construction. Additional coordination with the Town of Cary is required to determine the feasibility of using the gravel road for temporary access during construction. A Paramount Pump Station upgrade is listed in the Town of Cary CIP for 2023. This project would be in proximity to the northwestern branch of Stirrup Iron Creek Greenway, along the horseshoe-shaped lake. Additional coordination with the Town of Cary is needed to check if this project adds any additional constraints to the proposed future greenway alignment.

Locating greenways near or along existing sewer corridors would take advantage of existing cleared corridors and may reduce the number of trees that are removed for construction. Impacts to private properties could also be decreased if a future greenway easement is co-located with sewer easements, since those portions of private property are already encumbered and might be less viable for an alternate use or constructing a new structure. While co-locating with sewer corridors may decrease some of the costs by reducing the need for tree removal and increased accessibility, it can result in additional future greenway maintenance costs associated with maintenance accommodations required to access the sewer utility. Some constraints to boardwalk and bridge structure locations are expected where the greenway corridor comes close to or overlaps with sewer pipes, due to access for maintenance concerns. Field surveying and possibly Subsurface Utility Engineering would be needed during design phase to document the location of utility poles and underground utility structures.

Field Visit Summary

Two VHB staff and one staff member from the Town of Morrisville conducted a site visit on August 7, 2023. The team visited a total of 8 sites along the potential alignment. Overall, the team noted that large sections of the potential alignment corridor are not currently accessible from surrounding development. There is a lack of obvious trailheads and access points, especially along the middle section of the greenway corridor. Potential locations for at-grade crossings were noted at Aviation Parkway and Airport Boulevard. A significant overlap exists with the Town of Cary sewer easements and Wake County flood management areas.

The team started the field review at the southernmost portion, near Dominion Drive. Potential crossing opportunities at Aviation Parkway were observed here, noting Wake County's conversation area markers (near the Bald Eagle nesting site), adjacent to the body of water. The team also noted existing infrastructure as part of current development and sewer easements. Traveling north along the potential alignment, the team noted its proximity to future mixed-use development near Trans Air Drive. Continuing further north, industrial use development remains prevalent along the alignment, with the potential to connect into these areas and provide amenities for employees to utilize.

At Airport Boulevard, the team noted the alignment potential along Stirrup Iron Creek and Stirrup Iron Creek Tributary. A potential bridge would be required over the tributary to connect from the southern portion of the greenway corridor to the north, which would require flood modeling to determine feasibility. The eastern bank of Stirrup Iron Creek Tributary and the western bank of Stirrup Iron Creek might provide an easier alignment option due to topography for the two potential branches of the greenway located south of Airport Boulevard. The two branches of the greenway would likely need to cross Airport Boulevard at-grade at the Slater Road, Aerial Center Parkway, and Factory Shops Road existing signalized intersections.

The potential alignment has numerous opportunities for scenic overlooks, connection to places of employment, connection to future residential complexes and connection to existing greenways and shared use paths.



View of the Water and Wetlands along Southern Portion of the Corridor near Dominion Drive/Aviation Parkway



Signage Designating Wake County Conservation Area in Proximity to a Bald Eagle Nest Site

2

Public and Stakeholder Engagement

In the framework of planning, the importance of public engagement and stakeholder meetings cannot be understated. These processes serve as crucial instruments to ensure transparency, inclusivity, and cooperation between all parties involved. Public engagement provides an opportunity for the general public to voice their opinions, thereby ensuring that the planning process is reflective of the community's needs and aspirations. Similarly, stakeholder meetings facilitate open dialogue between key contributors, optimizing collective intelligence and fostering collaboration towards a common goal. In effect, these practices enhance the legitimacy and efficacy of the planning process by incorporating diverse perspectives and fostering a sense of shared ownership over the planning decisions.

2.1 Steering Committee

A Steering Committee was established to help guide the development of the feasibility study. Town of Morrisville staff made up the Steering Committee and met three times during the duration of the study. The Steering Committee members are listed in Table 3.

Table 3. Steering Committee Members

Name	Position
Ben Mills	Stormwater Engineering Manager
Caleb Allred	Planner II - Transportation
Danielle Kittredge	Senior Planner
Jeffrey Brown	Public Works Director
Josh Almond	Lieutenant Police Department
Kyle Cooper	Capital Project Manager
Steven Spruill	Assistant Public Works Director
Tom Dooley	Deputy Fire Chief

The first Steering Committee meeting occurred on August 23, 2023, where a review of existing conditions in the Town was presented. The Steering Committee highlighted the importance of upcoming developments such as residential buildings and office parks, which would serve as key destinations for residents as well as

members of the broader community. Attendees expressed the importance of acquiring appropriate permits for developing along floodplains, wetlands, and managed areas. This input would guide the design process to minimize impacts to regulated resources.

The second Steering Committee meeting was held on November 14, 2023. An initial set of potential alignment alternatives for the greenway was presented at this meeting. The Steering Committee advised shifting Segment 1 out of a wetland complex, avoiding the need for additional structures. A collective review of sewer lines was also conducted, with the resulting recommendation to shift Segment 3 away from existing pipes and manhole access points.

The third Steering Committee meeting took place on February 22, 2024. The VHB Team presented an analysis of survey results and detailed layout options for segment cutsheets. The Steering Committee identified minor changes to trail access points and reinforced the need for potential retaining walls along some portions of the trail.

2.2 Property Owner Notification

The property owners along the study corridor received a mailer with study information from the Town of Morrisville in October 2023. This letter notified the property owners of the greenway feasibility study and shared contact information for Town staff if they had any questions.

2.3 Stakeholder Meetings with Wake County and the Town of Cary

On October 6, 2023, the VHB Team and Town of Morrisville met with Wake County staff to discuss regulations and concerns typically associated with constructing new greenway trails. Staff noted that they do not have an immediate or future park or trail project planned in the greenway area. Wake County stakeholders identified a “no net fill” rule, which prevents the placement of structures in flood control areas, and structures that attempt to do so must prove net-zero fill in review. The County also noted PCB contamination concerns associated with Lake Crabtree and the existing Ward Transformer superfund site upstream, which would impose some constraints at the southern end of the corridor due to restrictions on the removal and transport of contaminated soil, as well as the placement of new soil. Lake Crabtree Park is owned by the Raleigh-Durham International Airport. Wake County’s lease of the land ends in 2026. Monitoring of ownership and future changes should occur.

The proposed alignment detailed a trail that might fall outside of the Town of Morrisville boundaries in some locations and would take advantage of existing Wake County properties. Wake County stakeholders noted that property can be leased to a municipality for construction of recreational resources, but maintenance of leased areas falls entirely upon the municipality. Lease agreements between the Town and County must be codified by contract before land is developed. There is a precedent for similar agreements for the purpose of greenway implementation between Wake County and the Town of Cary.

On October 25, 2023, the VHB Team and Town of Morrisville met with the Town of Cary staff to gather feedback on initial alignment alternatives. Town of Cary recommended that the design team avoid constructing the trail directly on top of sewer corridors, although crossing the sewer corridor with a paved greenway is allowable. When asked about the portions of greenway alignment that cross through Town of Cary owned parcels, Town of Cary indicated that they could ask for an easement from Wake County. While the Town of Cary has wayfinding signage standards, these may not be necessary along the portions of alignment which overlap with Cary parcels. The Extraterritorial Jurisdiction (ETJ) showing the various municipalities

ownership is shown in Figure 10 below. Single ownership of the greenway is desired to avoid complications with maintenance.

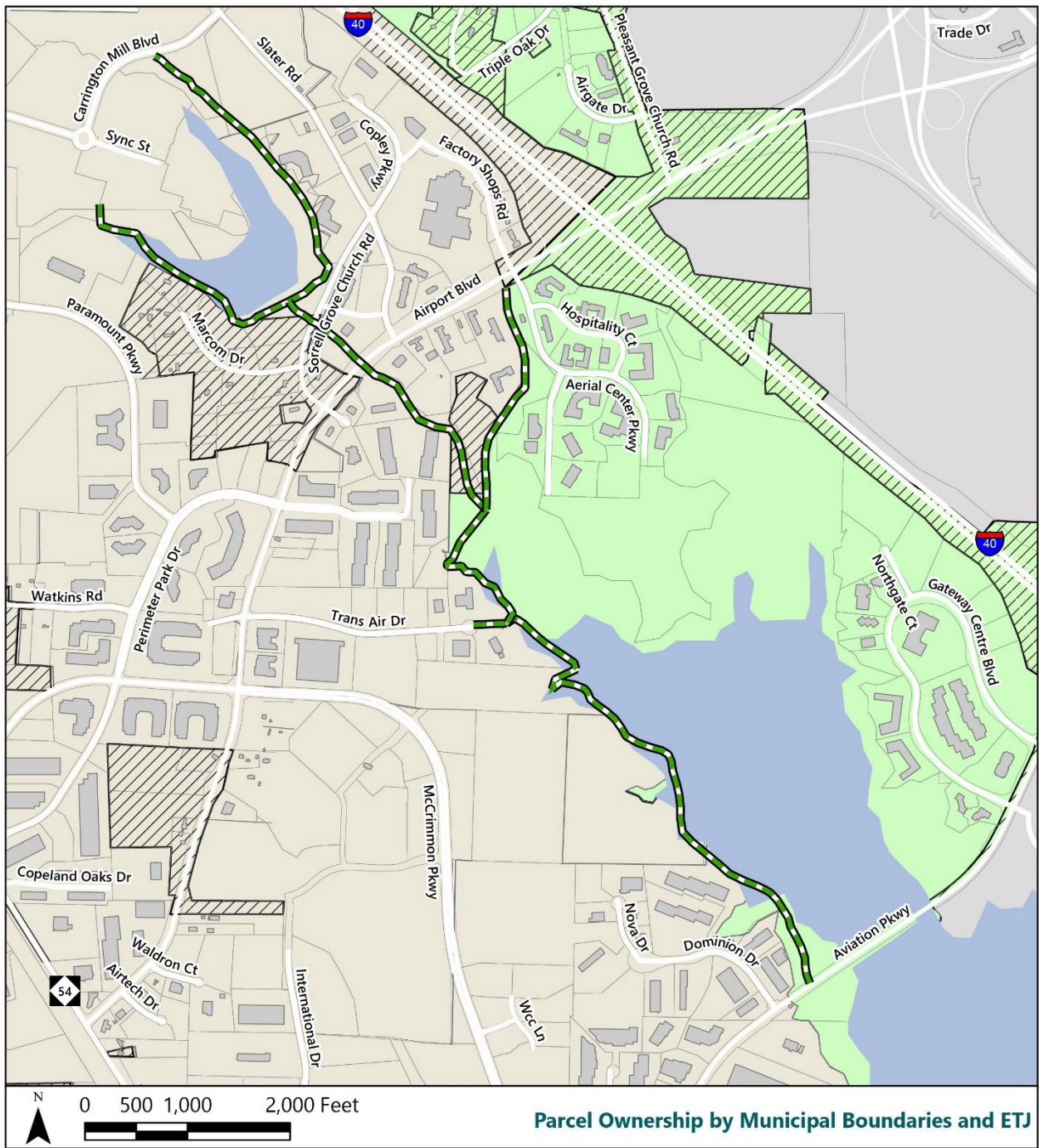


Figure 10: ETJ Boundaries

2.4 Public Meeting

An in-person pop-up public engagement event was held as part of the Tree Lighting celebration in Morrisville on December 2, 2023. Three project team members were able to interact with approximately 125 members of the public at the event and hand out cards with information for participants to fill out an online survey. A map with draft greenway alignment was shared, and opportunity was provided for members of the public to share whether they currently walk or bike on the greenways in Morrisville, and whether they would consider walking and bicycling on Stirrup Iron Creek Greenway in the future once it is built.



Pop Up Public Engagement during the December 2nd Tree Lighting Event.

The public response at the event was overwhelmingly positive, and many Town residents shared that they are active greenway users. Many residents shared that they are not familiar with the existing Mills Spring Greenway, suggesting that there is an opportunity for additional wayfinding and signage, and/or advertising the greenway through the Town social media channels. Many of the comments received during the public engagement focused on connections to other existing greenways and bicycle and pedestrian facilities in Town. The following were some of the recurring themes in the comments received during the engagement:

- Marked interest expressed in the Wake Competition Center greenway connector (to connect to McCrimmon Parkway)
- Requests to connect alignments to Indian Creek and Crabtree Creek Greenways
- Residents expressed a safety concern with greenway crossings at Airport Road and Sorrell Grove Church Road
 - High vehicle speeds, traffic, as well as crime were noted concerns along Segment 4.

2.5 Online Survey Results

An online survey for the greenway feasibility study was posted on the Town of Morrisville's website and open from November 27, 2023 – January 8, 2024. The link to the survey was shared through social media and during the in-person public engagement event. Overall, 63 responses were collected from the online survey. The survey revealed overwhelming support for the proposed trail alternatives, and responses reinforced the need for additional recreation resources. Of the respondents who were in favor of Stirrup Iron Creek Greenway, a variety of intended uses were highlighted by residents with walking and biking leading the list.

Survey respondents detailed a wide variety of destinations they would like the greenway to connect to. Key destinations included places of worship such as Morrisville's BAPS and HSNC temples as well as academic and

professional resources like Pathway Triangle, an upcoming mixed-use life sciences campus. With interest for the proposed greenway being high, it would be equally important to consider how residents plan to access the amenity. While a large percentage of respondents indicated the ability to walk or bike to access the greenway, nearly half of respondents would need to use a motor vehicle. This points to the importance of locating potential trailheads and parking locations along the future greenway corridor. The results to the survey questions can be found in Appendix C.

3

Recommendations

3.1 Design Considerations

The Stirrup Iron Creek Greenway as proposed in this feasibility study will be approximately 3.5 miles in length with various opportunities for additional connector segments and access points. The preliminary high-level design efforts as part of the study were completed to provide the Town of Morrisville with several alternatives for a chosen greenway alignment based on construction costs, future development, and other factors that may impact the best course of action in proposing a greenway facility through this corridor. The greenway alignment for the Stirrup Iron Creek Greenway was split into five (5) segments based on their unique characteristics. These segments are described and presented in Section 3.5 of this report.

The Town of Morrisville provided the design team an initial alignment based on their knowledge of the area and vision of the potential greenway in the Town's Comprehensive Transportation Plan. The VHB design team used this initial alignment to begin their feasibility study and sought to refine their design and add additional alternatives where feasible. There were several design elements considered when proposing alternatives to the Town:

- **Wetlands and low-lying areas:** The land surrounding the Stirrup Iron Creek alignment is located within a FEMA floodplain (see Chapter 1 of this report). Constructing greenways over wetlands were avoided where possible. Boardwalk was assumed to be required within the stream buffered areas.
- **Existing easements:** Alignments for the Stirrup Iron Creek Greenway were proposed within existing easements where available to reduce potential right-of-way costs.
- **Existing terrain and proposed grades:** The proposed alignments for the greenway attempted to remain along ridgelines adjacent to the stream when proposing greenway in new location areas. This will minimize potential earthwork needed to design proposed greenway facilities that are ADA compliant.
- **Proposed structure lengths:** Perpendicular stream crossings were proposed, when possible, to reduce structure lengths and to reduce the likelihood of the stream overtopping the structure during a flood-event.
- **Ensuring future access:** Greenways and connector alignments were proposed to ensure that the public will be able to access the facility at multiple locations throughout the greenway corridor.
- **Avoiding potential utility conflicts:** The design team was advised by the Town of Morrisville and Town of Cary to avoid structures at sewer line crossings to mitigate future maintenance and access issues. Additionally, sidepaths along the roadway sections of the greenway were placed to avoid major overhead utility relocations if possible.

All designs were completed using LIDAR elevation data, aerial imagery, and GIS data collected from various databases. No survey or floodplain mapping was completed as part of the design efforts to complete this

report. Further investigations will be required to ensure that all greenway alignments proposed are feasible as they are currently shown.

3.2 Design Criteria

The design criteria in Table 4 were developed for the project based on the latest national and state guidance.

Table 4. Design Criteria

Design Criteria	Guideline (AASHTO)	Reference (AASHTO)*
Design Speed	20 mph	pg 5-12 to 5-13
Horizontal Curve Radius	60 ft minimum	pg 5-13 to 5-14
Cross Slope	≤2%	pg 5-15 to 5-16
Stopping Sight Distance	Refer to Figure 5-7 or Table 5-4	pg 5-19 to 5-20
Profile Grade	5% maximum; 0.5% minimum	pg 5-16 to 5-17
Length of Vertical Curve	Refer to Table 5-5 or Figure 5-8	pg 5-20 to 5-21
Typical Section		
Pavement Width	12' typical; 10' on neighborhood access connections	pg 5-3
Shoulder Width	2' typical	pg 5-5
Shoulder Cross Slope	2% minimum; 1V:6H maximum	pg 5-5 to 5-7
Clear Zone	2' minimum to obstructions; 5' min. adjacent to water bodies or downward slope of 1V:3H or steeper; 1' min. where safety rail is applied	pg 5-5 and Figure 5-3
Vertical Clearance	10' preferred; 8' minimum	pg 5-6
Lateral Clearance on Horizontal Curves	Refer to Table 5-6 & Figures 5-9 & 5-10*	pg 5-22 to 5-24
Structure Width	14' preferred; 12' minimum	pg 5-26
Crosswalks	High-visibility crosswalk; 12' preferred, 8' minimum	Manual on Uniform Traffic Control Devices (MUTCD), NCDOT Std. 1205.07

*All references are American Association of State Highway Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities, 4th Edition unless otherwise noted.

3.4 Typical Section

A typical section and width for the greenway was selected based on the design criteria, area context, design constraints, and Town preferences. A 12-foot-wide paved shared use path with two-foot clear shoulders on each side is the preferred cross-section for the Stirrup Iron Creek Greenway (Figure 11). Concrete is the preferred paving material in areas of the greenway that are difficult to access for maintenance, and where more frequent water inundation is expected to occur. Asphalt paving material may be used in areas less prone to flooding and more easily accessible with heavy construction equipment.

Where a bridge or a boardwalk structure is expected, an additional clearance is recommended to account for shy distance from vertical barriers; a 14-foot-wide boardwalk or bridge section is recommended (Figure 12). Boardwalk materials may vary based on design, maintenance, or cost constraints. Material options may include timber, concrete, or some combination thereof. If boardwalk sections will be elevated more than



Figure 11. Typical Shared Use Path Cross-Section through a Wooded Area (Bottom) and Along a Roadway (Top)

30 inches from the existing ground, they will require the inclusion of 48-inch minimum height safety rails (54-inch height along high-hazard locations.)



Figure 12. Typical Bridge Cross-Section (Top) and Boardwalk Cross-Section (Bottom)



Figure 13. Example photo of existing conditions (before greenway) and photosimulation of greenway after construction – Segment 3.

3.4 Greenway Recommendations

Up to three conceptual trail alignments and 9 trailheads/potential access points were identified based on the data reviewed and the opportunities and barriers identified along the study corridor.

Greenway Corridor Segments

Figure 14 illustrates the study corridor divided into five segments for further analysis and consideration, with potential greenway access points. Most segments were of similar length, between 2,000-3,000 feet in length.

Segments were numbered from south to north, starting with Segment 1 at Aviation Parkway and Dominion Drive. White stars illustrate the locations of potential future access points.

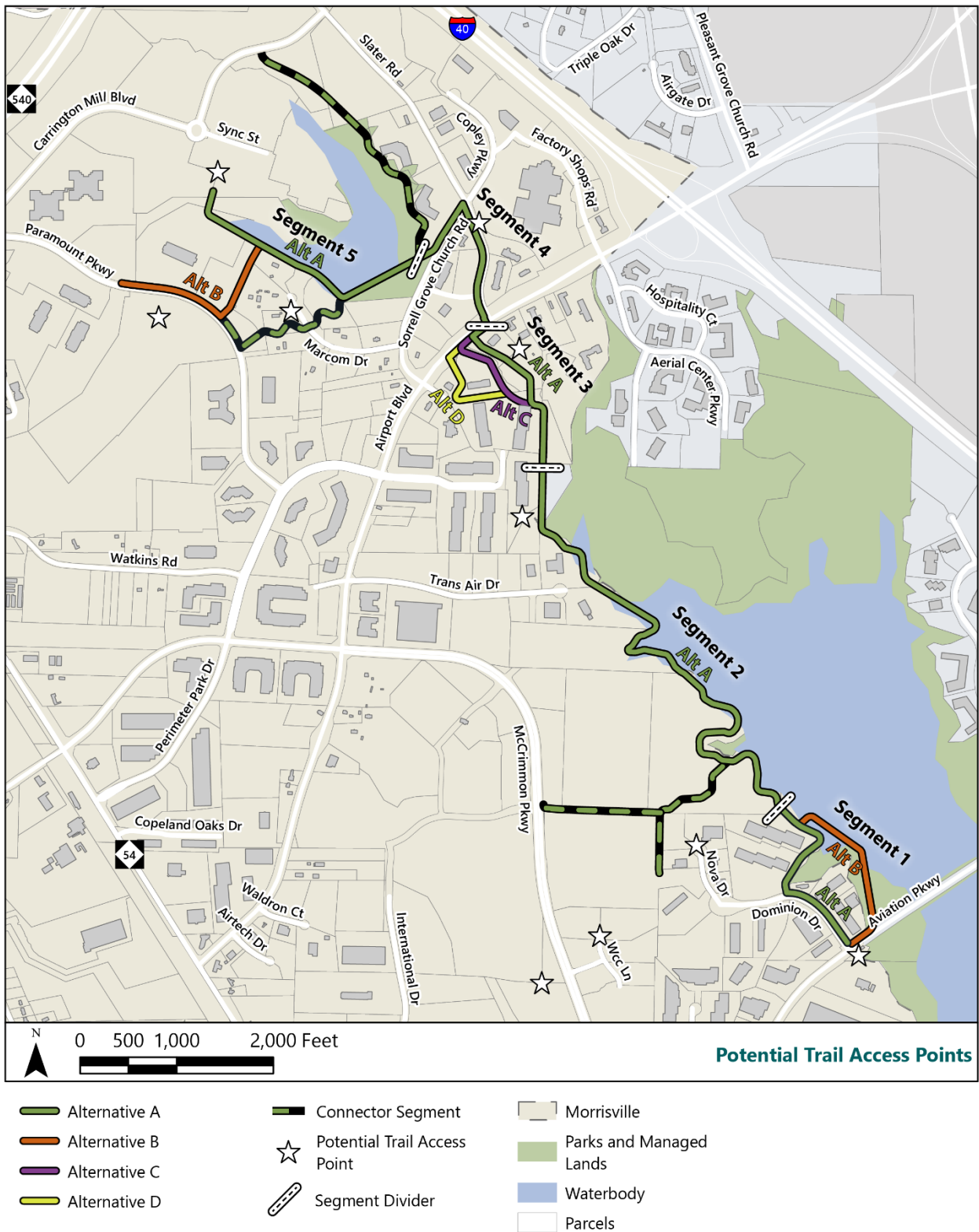


Figure 14. Segments and Potential Trail Access Points Near Stirrup Iron Creek Greenway

Trailheads / Greenway Access Points

The study included a review of potential trailhead parking locations and access opportunities along the future greenway. The northernmost section, Segment 5, presents an opportunity to connect to the existing Mills Spring Greenway, the future Town Park along Marcom Drive, and a future High School across Paramount Parkway. Segments 4 through 1 present a challenge with identifying additional trailhead/parking and access locations. Figure 14 details initial locations that could be considered for future trailhead and greenway access parking opportunities.

Development interest is strong in the areas adjacent to Wake Competition Center; parcels here may become more expensive in the future as a result. The opportunity to partner with developers on future trail access points may assist in alleviating said costs.

One example of a municipality partnering with a developer in North Carolina to install trail parking on the developer's property is the collaboration between the Town of Cary and a residential developer in the area. The Town of Cary has been actively expanding Cary's greenway trail system to promote outdoor recreation and connectivity within the community. As part of this effort, the Town of Cary collaborated with a developer who was constructing a residential community near an existing greenway trail. The developer agreed to set aside a portion of their property for trail parking to accommodate visitors to the greenway. In exchange, the municipality provided incentives such as expedited permitting and other regulatory benefits to the developer. This partnership allowed the developer to enhance the attractiveness of their development by offering easy access to recreational amenities like the greenway trail. By working together, the municipality and the developer were able to achieve their respective goals – Cary expanded its trail infrastructure, while the developer added value to their residential project.

Another example of a partnership with developers to implement trail parking occurred in Boulder, Colorado. In Boulder, there is significant demand for access to outdoor recreational areas, particularly trails for hiking and biking. However, parking availability near these trails is often limited, leading to congestion and inconvenience for residents and visitors alike.

Recognizing this issue, the City of Boulder partnered with a developer who owned land near the popular Mount Sanitas trailhead. The developer agreed to work with the City to construct a parking lot on their property, which would provide much-needed parking spaces for trail users. In return for allowing the city to use their land for parking, the developer may receive various benefits, such as expedited permitting for other development projects or tax incentives.

Such a public-private partnership for trail access and parking benefits both parties involved: the municipality gains additional parking capacity without having to bear the full cost of land acquisition and construction, while the developer can potentially enhance the value of their property and gain favor with the local community and authorities. Such collaborations exemplify how public-private partnerships can effectively address infrastructure needs and improve community access to recreational amenities. Morrisville could negotiate with future developers to instate a similar partnership.

Greenway Alignment Alternatives

Up to four alternatives were identified for the five segments, along with three connector projects. Each alternative and segment are listed below. This section summarizes some of the key features of each segment and alternative. Table 5 provides a summary of each alternative and the following pages includes cutsheets for the individual segments and connectors with additional information regarding constraints, development, and key destinations.

- **Segment 1**
 - Alternative A – begins at the intersection of Aviation Parkway and Dominion Drive, traveling north along Dominion Drive before running between commercial developments and traveling along Stirrup Iron Creek.
 - Alternative B – begins at Aviation Parkway, just north of Dominion Drive traveling northward of Lake Crabtree Wake County flood control area.
- **Segment 2** – continues northward, following along Stirrup Iron Creek.
- **Segment 3**
 - Alternative A – includes a stream crossing, and then parallels the right side of Stirrup Iron Creek, moving north, making connection to Airport Boulevard.
 - Alternative B – Alternative B was completely removed from the study. This alternative traveled northeast at a great distance, connecting up to Airport Boulevard and Factory Shops Road. This alternative did not move forward due to assumed costs. This was a spur originally in the Morrisville Comprehensive Transportation Plan (CTP).
 - Alternative C – travels north on the left side of the stream, running adjacent to the current parcel, and connecting to Airport Boulevard. Alternative C may require the acquisition of parking spots from the Holiday Inn, or additional infrastructure to ensure the greenway can be constructed along the ridgeline.
 - Alternative D – travels east and then north, connecting to Airport Boulevard. Alternative D may require a retaining wall to construct the greenway between the Holiday Inn and the adjacent parcel.
- **Segment 4** – multiuse path along Slater Road and Sorrell Grove Church Road; only one alternative as a sidepath along several roadways was considered for this segment due to the stream corridor being very constrained. Segment 4 also include site visibility constraints crossing over Sorrel Grove Church Road. Concourse Village Drive was considered as a parallel route, but this is a private street.
- **Segment 5**
 - Alternative A – runs parallel to the outer shape of the body of water, connecting to the existing Mills Spring Greenway.
 - Alternative B – runs parallel to the outer shape of the body of water but veers southwest to connect to Paramount Parkway and continues as a sidepath along Paramount Parkway before meeting up with Mills Spring Greenway.
- **Connectors**
 - Paramount Parkway – travels across Marcom Drive and along Paramount Parkway. This connector has the potential to connect to a future Town park. It can also connect into a future greenway south of Paramount Parkway, a greenway shown in the Town’s CTP. The location will be determined during the design process for Morrisville High School.
 - Carrington Mill Boulevard – along the northeast bank of the body of water, travels north up to Carrington Mill Boulevard.
 - Competition Center Drive – connects McCrimmon Parkway to Competition Center Drive and Segment 2.

Table 5. Summary of Greenway Alternatives by Segment

	Segment 1 (A)	Segment 1 (B)	Segment 2	Segment 3 (A)	Segment 3 (C)	Segment 3 (D)	Segment 4	Segment 5 (A)	Segment 5 (B)
At-Grade Crossings, Type Signalized/Unsignalized	1 signalized (Dominion Dr)	1 signalized (Dominion Dr)	0/0	0/0	0/0	0/0	2 total; 1 signalized/1 future signal	0/0	0/0
Bridge Structure / Creek Crossing	0	0	1	1	0	0	0	Potential for a bridge structure-further investigation needed	0
Boardwalk Structures	0	1	1	1	0	0	0	0	0
# Parcels (Public/Private)	0/4	1/1	2/7	0/4	0/3	0/4	1/4	2/5	2/6
Length	2,100 ft	2,100 ft	6,500 ft	1,250 ft	2,100 ft	2,500 ft	2,100 ft	2,700 ft	3,800 ft
Planning-Level Cost Estimate	\$2,463,425	\$4,425,350	\$6,163,021	\$2,538,686	\$1,916,475	\$2,748,800	\$3,033,100	\$2,742,150	\$3,779,925
Additional Considerations	Following Dominion Drive as a sidepath reduces the need for a lengthy boardwalk; opportunity for wildlife observation platform	This segment will likely require boardwalks due the alignment veering into the wetland area; boardwalk structure crossing over a sewer corridor presents additional challenges; opportunity for wildlife observation platform	This segment will primarily follow an existing easement	Opportunity to utilize the stream crossing to implement a “gateway” treatment at the north end of Segments 1-3, which travels along the wetland separated from surrounding development; boardwalk structure crossing over a sewer corridor presents additional challenges	Steep bank along Stirrup Iron Creek Tributary might result in the need for a retaining wall; potential impacts to hotel parking lot and driveway	This alternative for Segment 3 deviates the furthest away from Stirrup Iron Creek Tributary, less scenic; no structures and easier to implement	This segment primarily consists of sidepath sections along Slater Road and Sorrell Grove Church Road; would utilize planned signal at Slater Road and Sorrell Grove Church Road	Potential for scenic views of the lake, connects to Mills Spring Greenway	Potential for scenic views of the lake, connects to Mills Spring Greenway, includes a sidepath along Paramount Parkway



Segment 1 Alternative A

-  Alternative A
-  Other Alternative Sections
-  Potential Trail Access Point
-  Boardwalks
-  Bridges
-  Multi-Use Paths
-  Planned
-  Morrisville
-  Parks and Managed Lands
-  Waterbody
-  Parcels
-  Signalized Pedestrian Crossing

Segment 1 Alternative A starts at the intersection of Dominion Drive and Aviation Parkway, where it would follow along Dominion Drive, then cut through Commonwealth Business Park and shift north to parallel an existing 20-foot-wide sewer easement. No structures are required for this alternative, as the alignment avoids an existing wetland complex north of Dominion Drive and Aviation Parkway. Segment 1 connects north to a Pathway Triangle owned parcel, a corporate campus under construction at this time and would connect to Lake Crabtree Park via a planned sidepath along Aviation Parkway.

Details

At-Grade Crossings: 1 (Dominion Drive and Aviation Parkway, existing signal would need to be upgraded)

Structures: None

Connections:

- Commonwealth Business Park
- Pathway Triangle
- BAPS Hindu Temple (across Aviation Parkway)
- Future sidepath along Aviation Parkway to connect to Lake Crabtree Park
- Town of Cary Crabtree Creek Greenway connection

Facilities:

- 12 ft Shared Use Path
- 12 ft Sidepath

Length: 2100 ft

Parcel Information

- One publicly owned parcel along Lake Crabtree (owned by Wake County).
- Acquisition of right-of-way may be required for the portion of this segment that intersects Commonwealth Business Park.

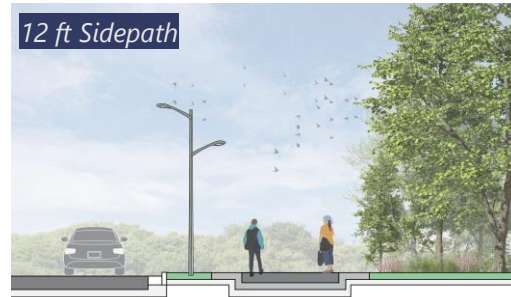
Project Cost

Facility	Segment 1 Alternative A
Trail	\$2,113,425**
Boardwalk	\$0
Bridge	\$0
Ped Crossing	\$350,000
Total	\$2,463,425

*Costs were collected using NCDOT's Protected Linear Pedestrian Facility Tool, which estimates design, construction, utilities, and ROW to provide planning-level estimates using averaged 2019 project costs.

**FHWA NHI notes a 51.5% increase in total costs due to inflation from Q2 of 2019 to Q2 of 2024. This coefficient has been applied to the high-level estimates.

Typical Cross-Section



Environmental Factors and Other Potential Barriers







The publicly-owned parcel this alignment parallels is currently being used for flood management by Wake County.

Potential permitting needs include:

- 401/404
- Erosion control
- Floodplain development
- Bald Eagle nest site in the vicinity
- Additional permitting from Wake County
- Coordination with Town of Cary Utilities required



Segment 1 Alternative B

- | | | | |
|---|---|---|--|
|  Alternative B |  Boardwalks |  Morrisville |  Signaled Pedestrian Crossing |
|  Other Alternative Sections |  Bridges |  Parks and Managed Lands | |
|  Potential Trail Access Point |  Multi-Use Paths |  Waterbody | |
| |  Planned |  Parcels | |

Segment 1 Alternative B starts at the intersection of Dominion Drive and Aviation Parkway, where it follows along Aviation Parkway with a short section of sidepath, then continues northwest along a known wetland. A 14-foot-wide boardwalk, spanning 1530 feet is expected, transitioning to a 12-foot-wide shared use path, connecting to Segment 2. Segment 1 connects north to Pathway Triangle, a corporate campus under construction at this time, and would connect to Lake Crabtree Park via a planned sidepath along Aviation Parkway.

Details

At-Grade Crossings: At-Grade Crossings: 1 (Dominion Drive and Aviation Parkway, existing signal would need to be upgraded)

Structures: 1 Boardwalk, 1530 ft

Connections:

- Commonwealth Business Park
- Pathway Triangle
- BAPS Hindu Temple (across Aviation Parkway)
- Future sidepath along Aviation Parkway to connect to Lake Crabtree Park
- Town of Cary Crabtree Creek Greenway connection

Facilities:

- 12 ft Shared Use Path
- 12 ft Sidepath
- 14 ft Boardwalk

Length: 2100 ft

Parcel Information

- One publicly owned parcel along Lake Crabtree (owned by Wake County)
- One private parcel acquisition of right-of-way may be required for the portion of this segment that intersects Commonwealth Business Park.

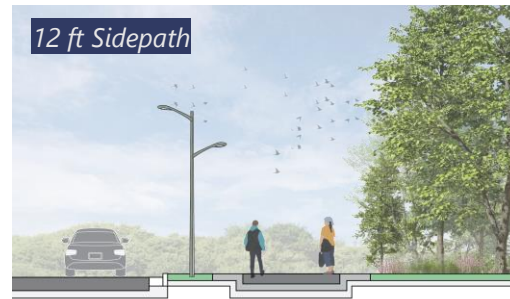
Project Cost

Facility	Segment 1 Alternative B
Trail	\$598,425**
Boardwalk	\$3,476,925**
Bridge	\$0
Ped Crossing	\$350,000
Total	\$4,425,350

*Costs were collected using NCDOT's Protected Linear Pedestrian Facility Tool, which estimates design, construction, utilities, and ROW to provide planning-level estimates using averaged 2019 project costs.

**FHWA NHI notes a 51.5% increase in total costs due to inflation from Q2 of 2019 to Q2 of 2024. This coefficient has been applied to the high-level estimates.

Typical Cross-Section



Environmental Factors and Other Potential Barriers

The publicly-owned parcel this alignment parallels is currently being used for flood management by Wake County.

Potential permitting needs include:

- 401/404
- Erosion control
- Floodplain development
- Bald Eagle nest site in the vicinity
- Additional permitting from Wake County
- Coordination with Town of Cary utilities; a boardwalk structure crossing over Town of Cary sewer pipe would be required.



Segment 2 Alternative A

- | | | | |
|------------------------------|-------------------|--------------------------|-------------------------|
| Alternative A | Boardwalks | Multi-Use Paths Existing | Morrisville |
| Other Alternative Sections | Bridges | Multi-Use Paths Planned | Parks and Managed Lands |
| Potential Trail Access Point | Greenways Planned | | Waterbody |
| | | | Parcels |

Segment 2 Alternative A begins northwest of Commonwealth Business Park, where it generally follows a sewer corridor and the embankment of Lake Crabtree. The alignment will run through two new developments, the Parkway Triangle business campus, and a new multi-family housing complex. A small, existing stream and wetland complex runs through the east-center of the Parkway Triangle, where a 90-foot-long bridge is anticipated. From here, the trail alignment will continue north, past Trans Air Drive, and cross a 175-foot-long boardwalk over an unnamed tributary.

Details

At-Grade Crossings: None

Structures:

- One Boardwalk, 175 ft
- One Bridge, 90 ft

Connections:

- Pathway Triangle business campus
- Morrisville 2.0 multi-family housing
- Bicycle lanes and shared use path facilities along McCrimmon Parkway (via future greenway connector)

Facilities:

- 12 ft Shared Use Path
- 14 ft Boardwalk
- 14 ft Bridge

Length: 6500 ft

Parcel Information

- Two publicly owned parcels along Lake Crabtree (owned by Wake County).
- Seven private parcels, two with existing greenway easements. Acquisition may be necessary for the remaining five parcels.

Environmental Factors and Other Potential Barriers

The publicly-owned parcels this alignment parallels are currently being used for flood management by Wake County.

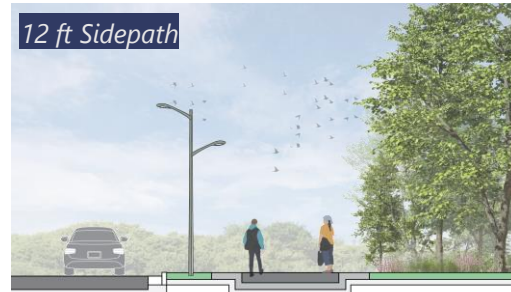
Potential permitting needs include:

- 401/404
- Erosion control
- Floodplain development
- Additional permitting from Wake County
- Coordination with Town of Cary Utilities required

Project Cost

Facility	Segment 2 Alternative A
Trail	\$5,196,450**
Boardwalk	\$397,688**
Bridge	\$568,883**
Total	\$6,163,021

Typical Cross-Section



*Costs were collected using NCDOT's Protected Linear Pedestrian Facility Tool, which estimates design, construction, utilities, and ROW to provide planning-level estimates using averaged 2019 project costs.

**FHWA NHI notes a 51.5% increase in total costs due to inflation from Q2 of 2019 to Q2 of 2024. This coefficient has been applied to the high-level estimates.



Competition Center Drive Connector

- | | | |
|------------------------------|-----------------|-------------------------|
| Competition Ctr Dr Connector | Bridges | Morrisville |
| Other Alternative Sections | Multi-Use Paths | Parks and Managed Lands |
| Potential Trail Access Point | Existing | Waterbody |
| Boardwalks | Planned | Parcels |

Competition Center Drive Connector is an additional, optional segment that would connect McCrimmon Parkway and Wake Competition Center to Segment 2 of the proposed alignment. Connection could provide access to Wake Competition Center, a large sports and sports-health complex off McCrimmon Parkway.

Details

Grade-Separated Crossings: None

At-Grade Crossings: None

Structures: None

Connections:

- Wake Competition Center
- Bicycle lanes and shared use path facilities along McCrimmon Parkway

Facilities:

- 12 ft Shared Use Path

Length: 2900 ft

Parcel Information

- Four private parcels, acquisition of right-of-way may be required to instate additional alignment.

Project Cost

Facility	Competition Center Dr Connector
Trail	\$2,931,525
Boardwalk	\$0
Bridge	\$0
Total	\$2,931,525

Typical Cross-Section

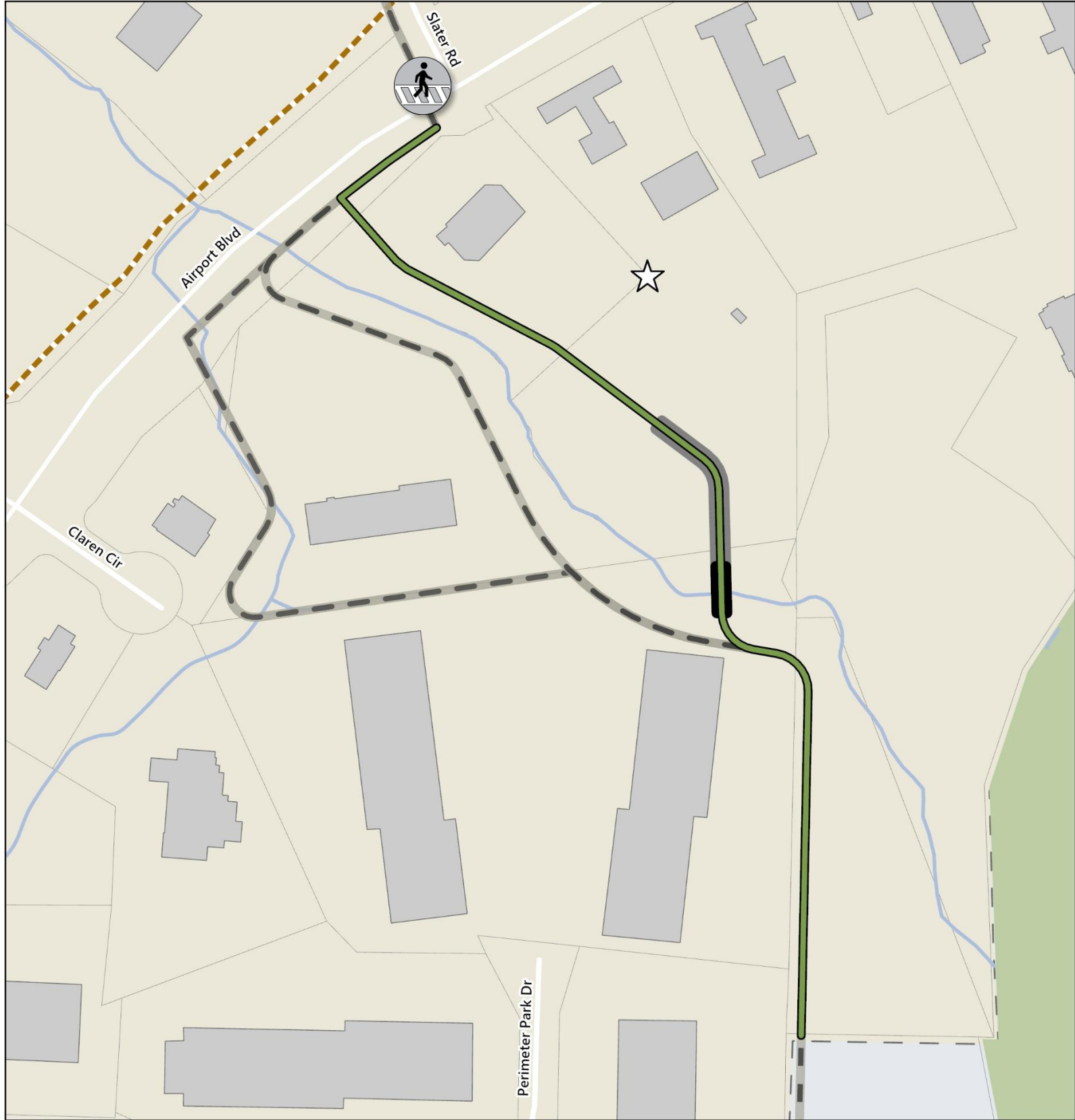


Environmental Factors and Other Potential Barriers

The publicly-owned parcel this alignment parallels is currently being used for flood management by Wake County. Floodplain Development Permitting, Erosion Control Permitting as well as 401/404 permits where the alignment enters the existing wetland may be required. This alternative runs directly through the managed area and may require additional permitting from Wake County as well.

*Costs were collected using NCDOT's Protected Linear Pedestrian Facility Tool, which estimates design, construction, utilities, and ROW to provide planning-level estimates using averaged 2019 project costs.

**FHWA NHI notes a 51.5% increase in total costs due to inflation from Q2 of 2019 to Q2 of 2024. This coefficient has been applied to the high-level estimates.



Segment 3 Alternative A

- | | | | |
|---|---|---|--|
|  Alternative A |  Boardwalks |  Morrisville |  Signalized Pedestrian Crossing |
|  Other Alternative Sections |  Bridges |  Parks and Managed Lands | |
|  Potential Trail Access Point |  Multi-Use Paths |  Parcels | |
| |  Planned |  Waterbody | |

Segment 3 Alternative A crosses over a tributary to the Stirrup Iron Creek with a bridge, and crosses over a large wetland complex. Greenway users would travel over a 70 ft bridge that transitions to a boardwalk, spanning a total of 275 ft. Transitioning to a shared use path, the alignment will follow behind some commercial developments to reach Airport Boulevard, where the alternative joins with Segment 4 at Slater Road.

Details

Grade-Separated Crossings: None

At-Grade Crossings: None

Structures:

- One Boardwalk, 275 ft
- One Bridge, 70 ft

Connections:

- Several hotels and restaurants along Airport Boulevard
- Connection to shared use path planned across I-40 as part of Airport Boulevard Diverging Diamond Interchange
- Future connection to Triangle Bikeway

Facilities:

- 12 ft Shared Use Path
- 12 ft Sidepath
- 14 ft Boardwalk
- 14 ft Bridge

Length: 1250 ft

Parcel Information

- Four privately owned parcels where acquisition of right-of-way may be necessary.

Environmental Factors and Other Potential Barriers

This alternative crosses a stream, crosses over a large wetland complex and would cross Town of Cary sewer corridor with a structure.

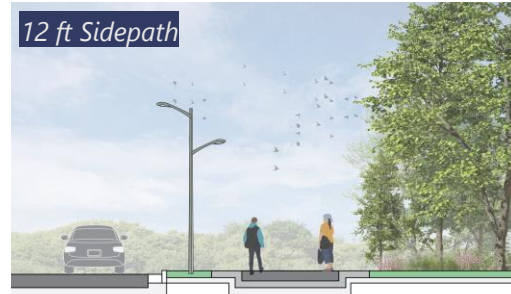
Potential permitting needs include:

- 401/404
- Erosion control
- Floodplain development
- Additional permitting from Wake County
- Coordination with Town of Cary Utilities required; structures crossing over sewer pipe

Project Cost

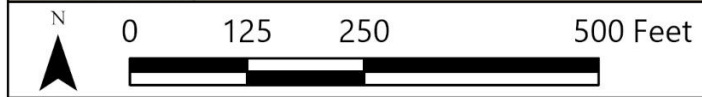
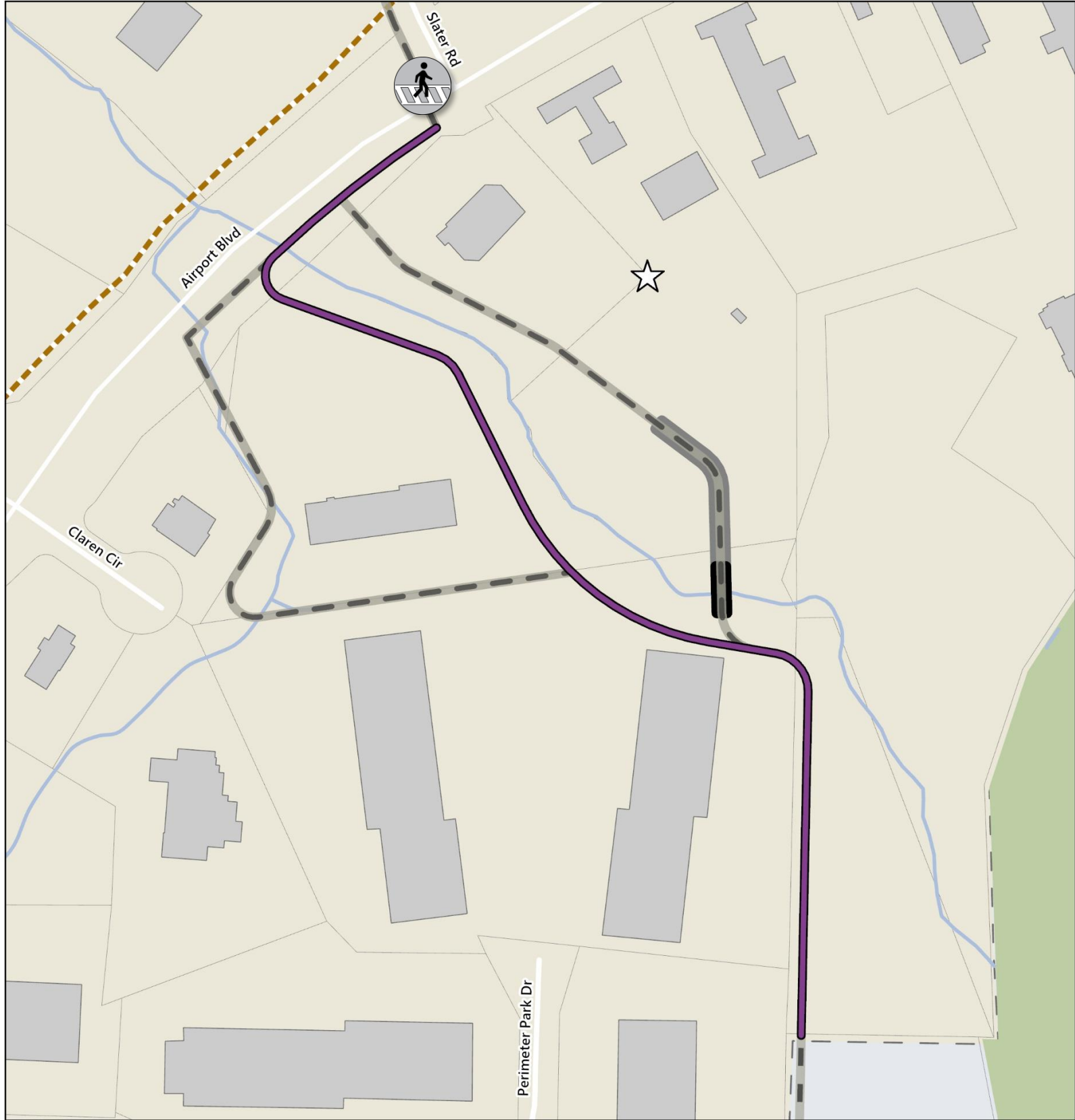
Facility	Segment 3 Alternative A
Trail	\$984,750**
Boardwalk	\$624,938**
Bridge	\$928,998**
Total	\$2,538,686

Typical Cross-Section



*Costs were collected using NCDOT's Protected Linear Pedestrian Facility Tool, which estimates design, construction, utilities, and ROW to provide planning-level estimates using averaged 2019 project costs.

**FHWA NHI notes a 51.5% increase in total costs due to inflation from Q2 of 2019 to Q2 of 2024. This coefficient has been applied to the high-level estimates.



Segment 3 Alternative C

- | | | | |
|------------------------------|-----------------|-------------------------|--------------------------------|
| Alternative C | Boardwalks | Morrisville | Signalized Pedestrian Crossing |
| Other Alternative Sections | Bridges | Parks and Managed Lands | |
| Potential Trail Access Point | Multi-Use Paths | Parcels | |
| | Planned | Waterbody | |

Segment 3 Alternative C follows the steep southwestern bank of Stirrup Iron Creek Tributary, staying along the edge of a hotel parking lot to join Airport Boulevard where it would continue as a sidepath to the intersection with Slater Road. There are no bridge or boardwalk structures required for this alternative, although a retaining wall may be necessary due to steep bank. The alignment spans 2100 ft.

Details

Grade-Separated Crossings: None
 At-Grade Crossings: None
 Structures: None (*a potential retaining wall would need to be explored in future design)

Connections:

- Several hotels and restaurants along Airport Boulevard
- Connection to shared use path planned across I-40 as part of Airport Boulevard Diverging Diamond Interchange
- Future connection to Triangle Bikeway

Facilities:

- 12 ft Shared Use Path
- 12 ft Sidepath

Length: 2100 ft

Parcel Information

- Three privately owned parcels where acquisition of right-of-way may be necessary.

Project Cost

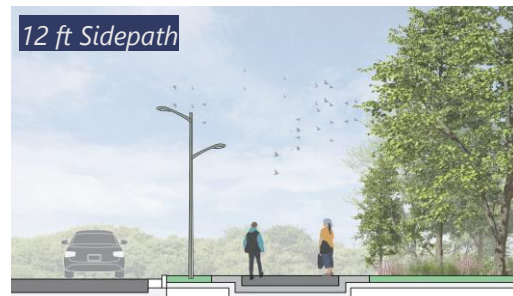
Facility	Segment 3 Alternative C
Trail	\$1,916,475**
Boardwalk	\$0
Bridge	\$0
Total	\$1,916,475

* Possible cost of a retaining wall not included

** Costs were collected using NCDOT's Protected Linear Pedestrian Facility Tool, which estimates design, construction, utilities, and ROW to provide planning-level estimates using averaged 2019 project costs.

***FHWA NHI notes a 51.5% increase in total costs due to inflation from Q2 of 2019 to Q2 of 2024. This coefficient has been applied to the high-level estimates.

Typical Cross-Section

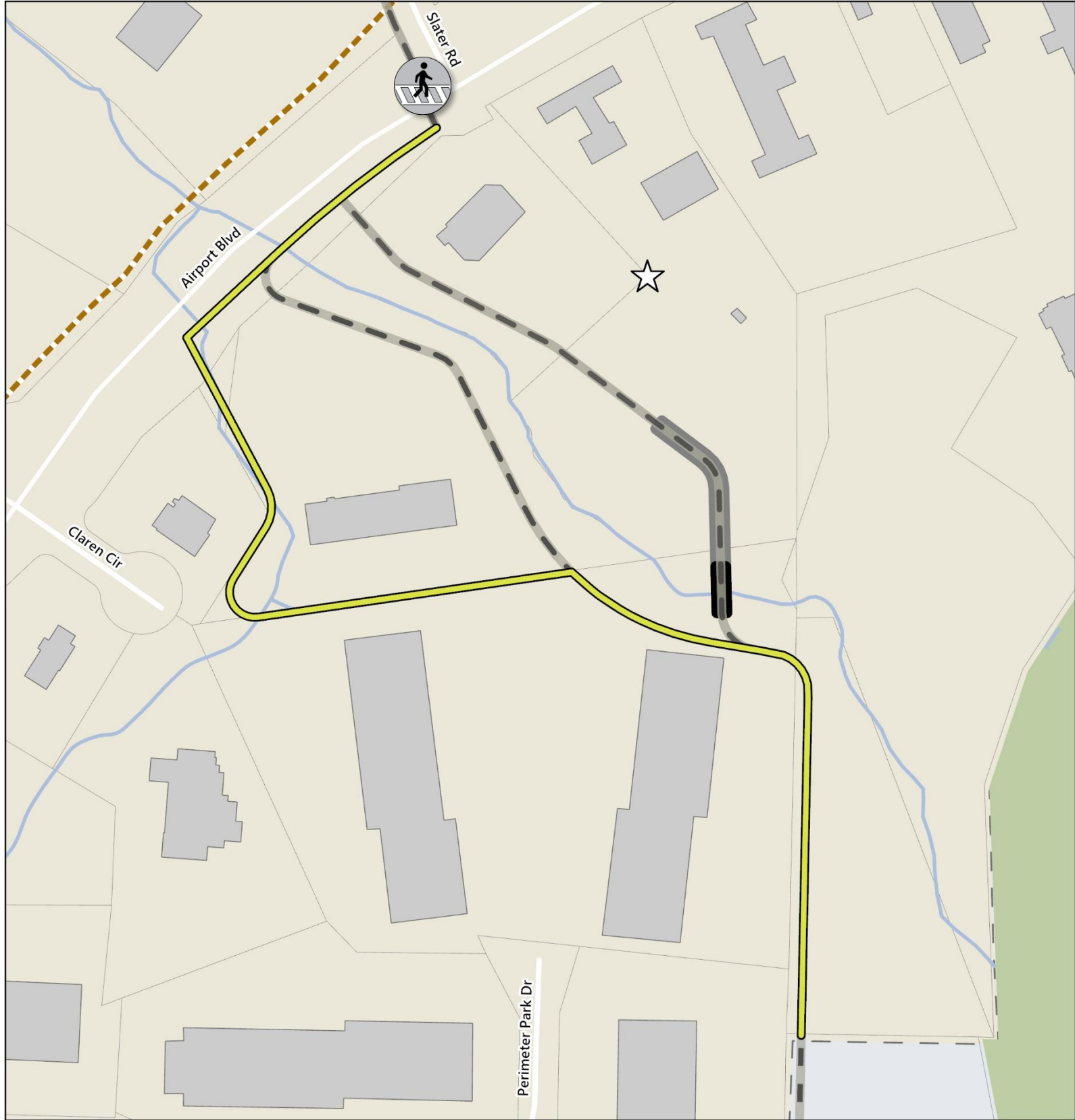


Environmental Factors and Other Potential Barriers

Steep topography along the projected alignment may require the construction of a retaining wall and possible modification to a hotel driveway, which may impact total project cost. This alternative borders a large wetland complex to the east, which may be impacted by this alternative. Consider establishing mitigation strategies to avoid wetland disturbance.

Potential permitting needs include:

- 401/404
- Erosion control
- Floodplain development



Segment 3 Alternative D

-  Alternative D
-  Other Alternative Sections
-  Potential Trail Access Point
-  Boardwalks
-  Bridges
-  Multi-Use Paths
-  Planned
-  Morrisville
-  Parks and Managed Lands
-  Parcels
-  Waterbody
-  Signalized Pedestrian Crossing

Segment 3 Alternative D deviates away from the Stirrup Iron Creek Tributary corridor and follows a path in-between a hotel parking lot and some commercial developments, avoiding wetlands and streams altogether. The alternative then joins Airport Boulevard and continues as a 12-foot-wide sidepath facility to the intersection with Slater Road. This is the longest of the three alternatives for Segment 3, at 2500 feet and less scenic; on the other hand, it would be easier to construct and maintain since no structures are required.

Details

Grade-Separated Crossings: None

At-Grade Crossings: None

Structures: None

Connections:

- Several hotels and restaurants along Airport Boulevard
- Connection to shared use path planned across I-40 as part of Airport Boulevard Diverging Diamond Interchange
- Future connection to Triangle Bikeway

Facilities:

- 12 ft Shared Use Path
- 12 ft Sidepath

Length: 2500 ft

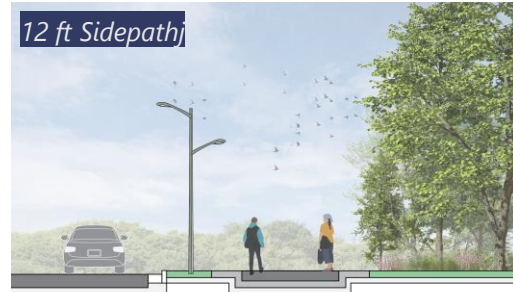
Parcel Information

- Four privately owned parcels where acquisition of right-of-way may be necessary.

Project Cost

Facility	Segment 3 Alternative D
Trail	\$2,530,050**
Boardwalk	\$0
Bridge	\$0
Retaining Wall	\$218,750
Total	\$2,748,800

Typical Cross-Section



Environmental Factors and Other Potential Barriers

Potential permitting needs include:












- Erosion Control
- 401/404

*Costs were collected using NCDOT's Protected Linear Pedestrian Facility Tool, which estimates design, construction, utilities, and ROW to provide planning-level estimates using averaged 2019 project costs.

**FHWA NHI notes a 51.5% increase in total costs due to inflation from Q2 of 2019 to Q2 of 2024. This coefficient has been applied to the high-level estimates.



Segment 4 Alternative A

-  Alternative A
-  Other Alternative Sections
-  Potential Trail Access Point
-  Boardwalks
-  Multi-Use Paths
-  Planned
-  Morrisville
-  Parks and Managed Lands
-  Waterbody
-  Parcels
-  Signalized Pedestrian Crossing

Segment 4 Alternative A begins at Airport Boulevard and Slater Road, crossing Airport Boulevard via an existing at-grade signalized intersection with high-visibility crosswalk markings and pedestrian signals. The alignment will continue as a 12-foot-wide sidepath along the west side of Slater Road. Continuing north across Concourse Village Drive, the greenway alignment would cross Sorrell Grove Sorrell Grove Church Road at the intersection with a planned signal. After traversing the intersection, the alignment continues as a sidepath along Sorrell Grove Church Road before splitting off towards the horseshoe-shaped lake, just across the street from an NC Quick Pass Office.

Details

At-Grade Crossings: 2; One signalized intersection and one future signal

Structures: None

Connections:

- Sorrell Grove Baptist Church
- NC Quick Pass Office
- Transit stops just north of Slater Road and Sorrell Grove Church Road

Facilities:

- 12 ft Sidepath
- 12 ft Shared Use Path

Length: 2100 ft

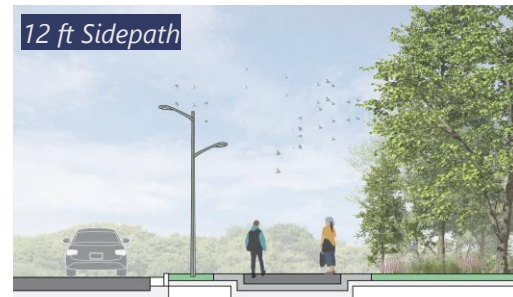
Parcel Information

- One publicly owned parcel along horseshoe-shaped retention pond.
- Follows existing right-of-way along Slater Road and Sorrell Grove Church Road.

Project Cost

Facility	Segment 4 Alternative A
Trail	\$2,333,100**
Boardwalk	\$0
Bridge	\$0
Crossing	\$700,000
Total	\$3,033,100

Typical Cross-Section



Environmental Factors and Other Potential Barriers

This alternative directly bisects a large wetland complex.

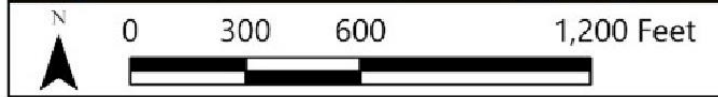
Potential permitting needs include:

- 401/404
- Erosion control
- Floodplain development
- Additional permitting from Wake County may be required

Some overhead utilities relocation may be required

*Costs were collected using NCDOT's Protected Linear Pedestrian Facility Tool, which estimates design, construction, utilities, and ROW to provide planning-level estimates using averaged 2019 project costs.

**FHWA NHI notes a 51.5% increase in total costs due to inflation from Q2 of 2019 to Q2 of 2024. This coefficient has been applied to the high-level estimates.



Segment 5 Alternative A

- | | | | |
|--------------------------------|------------------|-----------------|-------------------------|
| Other Alternative Sections | Greenways | Multi-Use Paths | Morrisville |
| Alternative A | Existing | Existing | Parks and Managed Lands |
| Potential Trail Access Point | Planned | Planned | Waterbody |
| Signalized Pedestrian Crossing | Triangle Bikeway | Parcels | |

Segment 5 Alternative A follows a scenic path along the southern tip of the horseshoe-shaped lake (Wake County flood management feature) via a 12-foot-wide shared use path that spans 2700 ft. This alignment connects directly to Mills Spring Greenway, which wraps along the interior length of the lake.

Details

Grade-Separated Crossings: None

At-Grade Crossings: None

Structures: None

Connections:

- Mills Spring Greenway
- Marcom Drive future park
- Planned high school across Paramount Parkway (via Paramount Parkway connector)
- Businesses along Sync Street

Facilities:

- 12 ft Shared Use Path

Length: 2700 ft

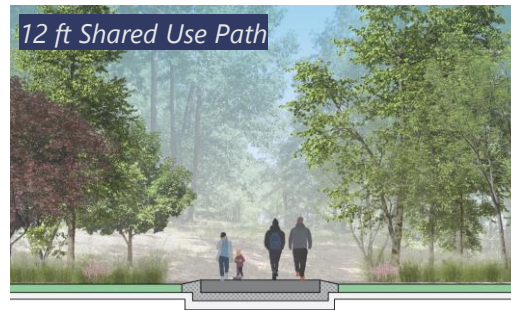
Parcel Information

- Two publicly owned parcels along the horseshoe-shaped lake, both owned by Wake County.
- Four private parcels, acquisition of right-of-way may be required for the portion of this segment that intersects private property south of Sync Street.

Project Cost

Facility	Segment 5 Alternative A
Trail	\$2,742,150**
Boardwalk	\$0
Bridge	\$0
Total	\$2,742,150

Typical Cross-Section



Environmental Factors

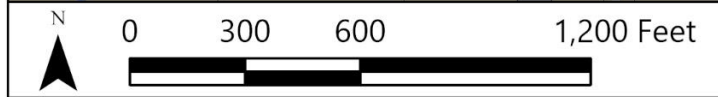
This alignment straddles an existing floodplain management lake structure with steep contours. Additional permitting may be required.

Potential permitting needs include:

- 401/404
- Erosion control
- Floodplain development
- Additional Wake County permitting

*Costs were collected using NCDOT's Protected Linear Pedestrian Facility Tool, which estimates design, construction, utilities, and ROW to provide planning-level estimates using averaged 2019 project costs.

**FHWA NHI notes a 51.5% increase in total costs due to inflation from Q2 of 2019 to Q2 of 2024. This coefficient has been applied to the high-level estimates.



Segment 5 Alternative B

- | | | | |
|--------------------------------|------------------|-----------------|-------------------------|
| Other Alternative Sections | Greenways | Multi-Use Paths | Morrisville |
| Alternative B | Existing | Existing | Parks and Managed Lands |
| Potential Trail Access Point | Planned | Planned | Waterbody |
| Signalized Pedestrian Crossing | Triangle Bikeway | Parcels | |

Segment 5 Alternative B follows along the base of the horseshoe-shaped lake as a 12-foot-wide shared use path. After rounding the base of the lake, the path diverts southwest behind several office buildings, meeting Paramount Parkway. At this point, the shared use path becomes a sidepath, connecting to Mills Spring Greenway to the east. The total length traveled is 3800 ft.

Details

Grade-Separated Crossings: None

At-Grade Crossings: None

Structures: None

Connections:

- Mills Spring Greenway
- Future high school and fire department across Paramount Parkway

Facilities:

- 12 ft Shared Use Path
- 12 ft Sidepath

Length: 3800 ft

Typical Cross-Section



Parcel Information

- Two publicly owned parcels along the horseshoe-shaped lake, both owned by Wake County.
- Six private parcels, acquisition of right-of-way may be required.

Environmental Factors

This alignment straddles an existing an existing floodplain management lake structure with steep contours. Additional permitting may be required.

Potential permitting needs include:

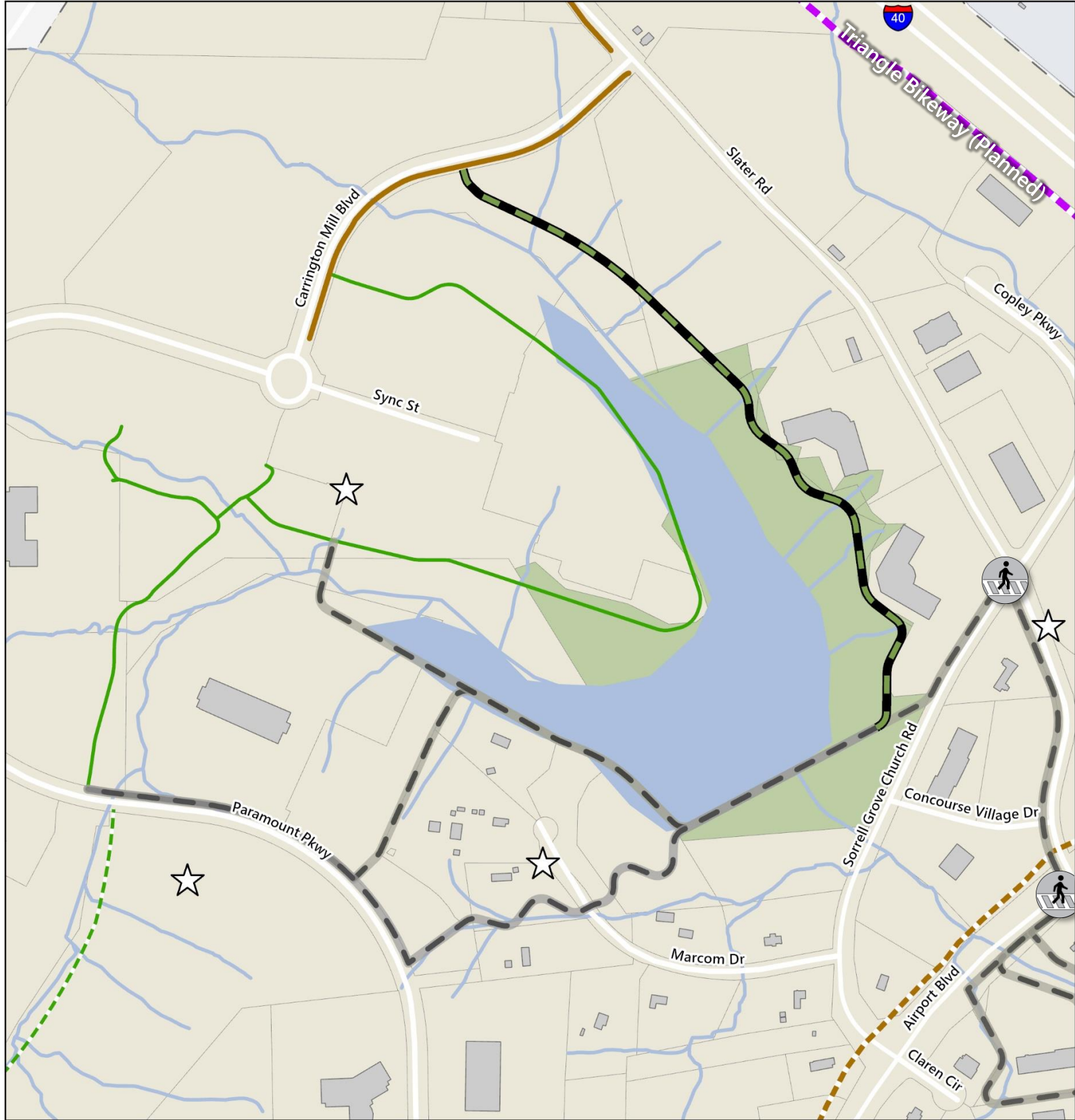
- 401/404
- Erosion control
- Floodplain development

Project Cost

Facility	Segment 5 Alternative B
Trail	\$3,779,925**
Boardwalk	\$0
Bridge	\$0
Total	\$3,779,925

*Costs were collected using NCDOT's Protected Linear Pedestrian Facility Tool, which estimates design, construction, utilities, and ROW to provide planning-level estimates using averaged 2019 project costs.

**FHWA NHI notes a 51.5% increase in total costs due to inflation from Q2 of 2019 to Q2 of 2024. This coefficient has been applied to the high-level estimates.



Carrington Mill Boulevard Connector

- | | | | | | | | |
|--|--------------------------------|--|------------------------------|--|--------------------------|--|-------------------------|
| | Carrington Mill Blvd Connector | | Potential Trail Access Point | | Existing Multi-Use Paths | | Morrisville |
| | Other Alternative Sections | | Existing Greenways | | Planned Multi-Use Paths | | Parks and Managed Lands |
| | Signalized Pedestrian Crossing | | Planned Greenways | | Triangle Bikeway | | Waterbody |
| | | | | | | | Parcels |

Branching off Segment 4 Alternative A, Carrington Mill Boulevard Connector is an optional, additional segment that guides pedestrians around the northern half of the horseshoe-shaped lake via a 12-foot-wide shared use path. This alternative segment connects to an existing shared use path along Carrington Mill Boulevard, which would connect trail users back to Mills Spring Greenway. This connector alignment would follow an existing sewer easement and would provide an opportunity for scenic views of the lake. A portion of this connector segment is outlined in adjacent site plans where greenway easements are present.

Details

At-Grade Crossings: None

Structures: None

Connections:

- Existing shared use path along Carrington Mill Boulevard
- Mills Spring Greenway
- Office and multi-family residential development

Facilities:

- 12 ft Shared Use Path

Length: 3900 ft

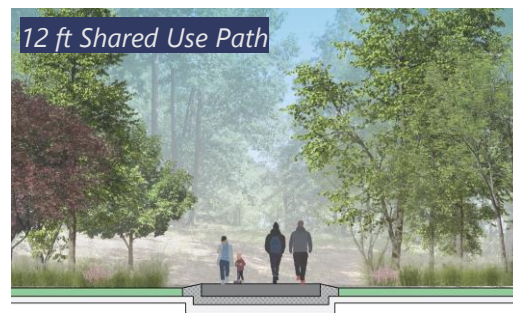
Parcel Information

- Four publicly owned parcel along a stormwater retention pond (owned by Wake County).
- Two private parcels, one of which contains an existing greenway easement. additional acquisition of right-of-way may be required for the portion of this segment that connects to Carrington Mill Boulevard.

Project Cost

Facility	Carrington Mill Blvd Connector
Trail	\$3,742,050**
Boardwalk	\$0
Bridge	\$0
Total	\$3,742,050

Typical Cross-Section



Environmental Factors

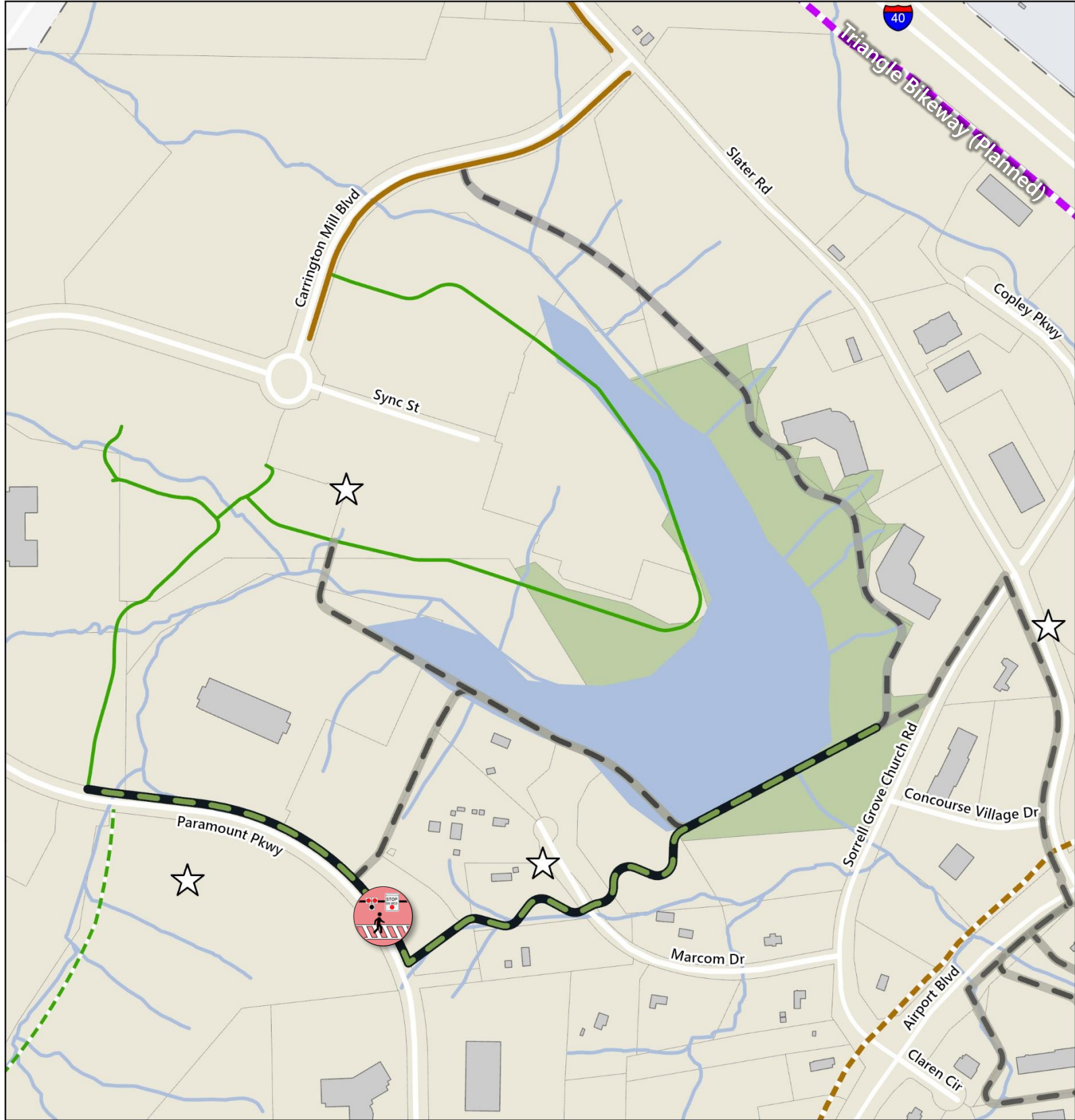
This additional connector alignment straddles an existing floodplain management lake structure with steep contours and runs through portions of a 500-year flood zone. Sewer corridors are present throughout the length of the connector as well. Additional permitting may be required.

Potential permitting needs include:

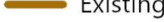
- 401/404
- Erosion Control
- Floodplain Development
- Additional Wake County permitting
- Town of Cary utilities coordination

*Costs were collected using NCDOT's Protected Linear Pedestrian Facility Tool, which estimates design, construction, utilities, and ROW to provide planning-level estimates using averaged 2019 project costs.

**FHWA NHI notes a 51.5% increase in total costs due to inflation from Q2 of 2019 to Q2 of 2024. This coefficient has been applied to the high-level estimates.



Paramount Parkway Connector

- | | | | | | | | |
|--|--------------------------------|---|------------------------------|---|--------------------------|---|-------------------------|
|  | Paramount Parkway Connector |  | Potential Trail Access Point |  | Existing Multi-Use Paths |  | Morrisville |
|  | Other Alternative Sections |  | Existing Greenways |  | Planned Multi-Use Paths |  | Parks and Managed Lands |
|  | Pedestrian Hybrid Beacon (PHB) |  | Planned Greenways |  | Triangle Bikeway |  | Waterbody |
| | | | | | |  | Parcels |

Paramount Parkway Connector is an optional greenway segment that meanders through and across Marcom Drive along parcels that were recently acquired by the Town in planning for a future park. A new high school across Paramount Parkway is planned for development in the next few years, which could become easily accessible from the Stirrup Iron Creek Greenway via one at-grade crossing featuring a pedestrian hybrid beacon (PHB).

Details

Grade-Separated Crossings: None

At-Grade Crossings:

- 1 with a Pedestrian Hybrid Beacon (PHB)

Structures: None

Connections:

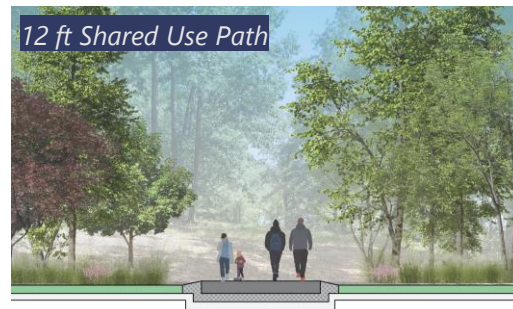
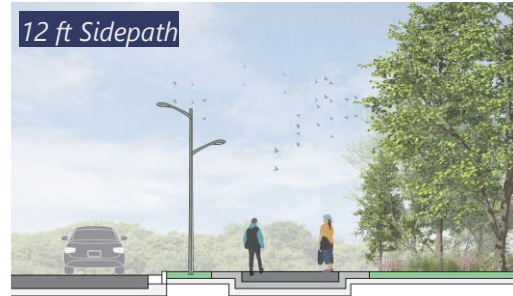
- Future high school off Paramount Parkway
- Future Marcom Drive Park

Facilities:

- 12 ft Shared Use Path
- 12 ft Sidepath

Length: 4400 ft

Typical Cross-Section



Parcel Information

- Three publicly owned parcels along a stormwater retention pond (owned by Wake County).
- One private parcel acquisition of right-of-way may be required for the portion of this segment that connects to Paramount Parkway.

Project Cost

Facility	Paramount Parkway Connector
Trail	\$3,984,450**
Boardwalk	\$0
Bridge	\$0
PHB	\$233,333
Total	\$4,217,783

Environmental Factors

This additional connector alignment starts out at the base of a floodplain management lake structure with steep contours.

Potential permitting needs include:

- 401/404
- Erosion Control
- Floodplain Development
- Wake County additional permitting may be required

*Costs were collected using NCDOT's Protected Linear Pedestrian Facility Tool, which estimates design, construction, utilities, and ROW to provide planning-level estimates using averaged 2019 project costs.

**FHWA NHI notes a 51.5% increase in total costs due to inflation from Q2 of 2019 to Q2 of 2024. This coefficient has been applied to the high-level estimates.

4

Action Plan

4.1 Preferred Alternatives and Phasing

Where multiple alternatives were developed for specific segments, the least expensive alternative based on the planning level estimates of probable costs was selected as the preferred alternative for greenway implementation. This decision was based on discussion with the Steering Committee. Additional data gathering during design phase might require consideration for revisiting other alternatives. Bridge and boardwalk structures would likely require additional permitting and would present additional challenges if there is a need to cross over an existing sewer corridor, due to utility maintenance requirements.

Due to ongoing development, including future school and park construction, implementation is recommended to begin with the northern portion of the greenway corridor. This area will connect to the existing Mills Spring Greenway, future Marcom Drive Park, and future high school and park across Paramount Parkway. As development construction continues, it is recommended to implement portions of the greenway when feasible along with development. Segment 2 is already experiencing those changes. The following alternatives by segment are recommended as the most likely feasible alternatives:

- Segment 1, Alternative A
- Segment 2
- Segment 3, Alternative C
- Segment 4
- Segment 5, Alternative A

Figure 15 illustrates the preferred conceptual alignment, with optional connectors. Segment 3 Alternative C is highlighted as currently preferred alignment; Segment 3 Alternative D might be considered, instead, if Segment 3 Alternative C is determined to be more challenging to implement based on further investigation during design.

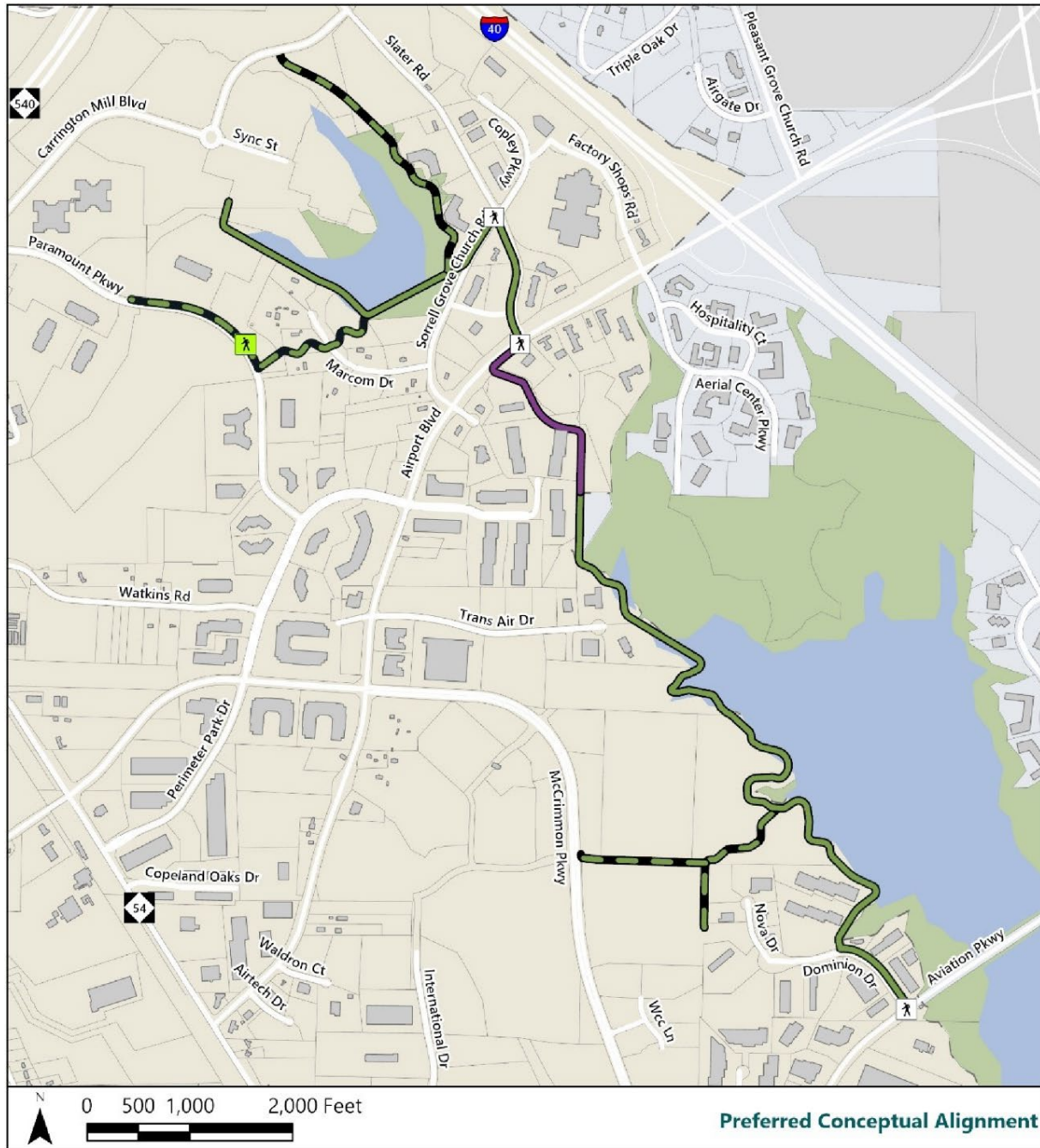


Figure 15. Map of Preferred Conceptual Alignment, with Potential Connectors for Stirrup Iron Creek Greenway

4.2 Summary of Cost Estimates

The planning level estimates of probable costs for each segment are detailed in Table 6 and Table 7. Cost estimates were prepared in 2024 dollar amounts and created utilizing the NCDOT bicycle and pedestrian cost estimating tool.

Additional changes to the likely cost estimates are to be expected as part of future design phases.

Table 6. Summary of planning level estimates of probable costs for greenway segments by alternative

Facility	1A	1B	2	3A	3C	3D	4	5A	5B
Trail	\$2,113,425	\$598,425	\$5,196,450	\$984,750	\$1,916,475	\$2,530,050	\$2,333,100	\$2,742,150	\$3,779,925
Boardwalk	\$0	\$3,476,925	\$397,688	\$624,938	\$0	\$0	\$0	\$0	\$0
Bridge	\$0	\$0	\$568,883	\$928,998	\$0	\$0	\$0	\$0	\$0
Retaining Wall	\$0	\$0	\$0	\$0	\$0	\$218,750	\$0	\$0	\$0
Pedestrian Crossing Upgrades	\$350,000	\$350,000	\$0	\$0	\$0	\$0	\$700,000	\$0	\$0
Total	\$2,463,425	\$4,425,350	\$6,163,021	\$2,538,686	\$1,916,475	\$2,748,800	\$3,033,100	\$2,742,150	\$3,779,925

**Costs were estimated using NCDOT's Protected Linear Pedestrian Facility Tool, which estimates design, construction, utilities, and ROW to provide planning-level estimates using averaged 2019 project costs.*

***FHWA NHI notes a 51.5% increase in total costs due to inflation from Q2 of 2019 to Q2 of 2024. This coefficient has been applied to the planning-level estimates.*

Table 7. Summary of planning level estimates of probable costs for connectors

Facility	Paramount Pkwy Connector	Carrington Mill Blvd Connector
Trail	\$3,984,450	\$3,742,050
Boardwalk	\$0	\$0
Bridge	\$0	\$0
Pedestrian Crossing (PHB)	\$233,333	\$0
Total	\$4,217,783	\$3,742,050

**Competition Center Drive Connector cost estimate is not included due to previously-initiated development.*

For future potential funding options, the following design work cost estimates are high-level planning estimates.

- Feasibility to 30% design: \$275,000 / mile
- 30% to 60% design: \$315,000 / mile
- 60% to final design: \$420,000 / mile

If the entire 3.5-mile greenway project is positioned for design by the Town, the following would be the approximate fee with 20 percent contingency;

- Feasibility to 30% design: \$825,000 (in 2024 dollars)
- 30% to 60% design: \$1,000,000 (in 2026 dollars)
- 60% to final design: \$1,500,000 (in 2030 dollars)
- Total design cost: \$3,325,000

4.3 Implementation Action Plan

Considering the identified preferred segments and phasing for the greenway corridor, an action plan matrix in Table 8 identifies some of the initial supporting policy and funding steps that the Town of Morrisville could undertake, in coordination with partner agencies, to formulate and refine a funding strategy, pursue funding, and implement portions of the Stirrup Iron Creek Greenway corridor in phases.

Coordination with CAMPO, Wake County and the Town of Cary, as well as with the local and regional bicycle and pedestrian groups, would support the momentum to implement the Stirrup Iron Creek Greenway and ensure that the greenway is well-integrated into the regional greenway network.

Table 8. Implementation Action Plan

Action	Lead	Partners	Timeframe	Performance Measures	
1	Adopt the Stirrup Iron Creek Greenway Feasibility Study and reflect the preferred alignment in the Town of Morrisville Transportation Plan. This action would allow the study to become an official planning document for this greenway corridor.	Town of Morrisville		Coordinate with next CTP update (anticipated adoption 2025)	Plan adoption, meeting minutes
2	Work with CAMPO and planning agency partners to update the CAMPO CTP to include study recommendations and preferred alignment.	CAMPO	Town of Morrisville, NCDOT Transportation Planning Division, NCDOT Div. 5, Wake County	Coordinate with next MTP/CTP (anticipated adoption late 2025/early 2026) or during the next MTP/CTP amendment cycle	CAMPO CTP Amendment adoption, meeting minutes
3	Coordinate with the Town of Cary on reflecting preferred alignment for Stirrup Iron Creek Greenway on the Town of Cary greenway plan for ease of future coordination.	Town of Cary	Town of Morrisville	Fall 2024	Plan adoption or amendment
4	Designate an implementation champion (or champions) from the Town of Morrisville (i.e. department or several staff members in key roles).	Town of Morrisville		Ongoing	Meeting agendas and minutes
5	Monitor future and pending developments for opportunities to implement sections of the future Stirrup Iron Creek Greenway corridor.	Town of Morrisville		Ongoing	Easements and dedicated sections of greenway to be set aside as part of future development approval
6	Monitor adjacent and parallel roadway, bicycle and pedestrian, and intersection improvements to ensure that the projects allow and support future Stirrup Iron Creek Greenway implementation (i.e. signalization of intersection at Sorrell Grove Church Road and Slater Road allows for wider trail crossing vs. standard pedestrian crossing).	Town of Morrisville	NCDOT Div. 5	Ongoing	

7	Review opportunities for greenway easement acquisition including potential parcels for greenway access/trailhead parking; develop a cost estimate for several priority parcels and submit for Capital Improvement Program (CIP) review and discussion.	Town of Morrisville		Beginning in 2025; Ongoing	Easement acquisition funding as part of future Town budgets
8	Develop a grant procurement and fundraising plan to identify steps in securing funding to construct sections of the Stirrup Iron Creek Greenway.	Town of Morrisville		Ongoing	
9	Initiate 30% design for a single greenway segment or multiple greenway segments.	Town of Morrisville	CAMPO; NCDOT	Ongoing	RFQ release and Professional Engineering Consultants (PEC) firm selection
10	After further design of the greenway, coordinate with Town of Cary and Wake County on future maintenance and jurisdictional considerations.	Town of Morrisville	Wake County; Town of Cary	Future	Documentation of agreements
11	Gather further public support and input during the design phase.	Town of Morrisville		Ongoing	Summary of public feedback received
12	Update design to 100% with continued public and stakeholder involvement; Coordinate with Wake County and land owners on acquiring easements in this segment; Coordinate with CAMPO and Wake County on funding strategies.	Town of Morrisville	Wake County; CAMPO	Ongoing	Final design plans
13	Participate in the update of Wake County Greenways System Plan and ensure that the updated plan document reflects the preferred Stirrup Iron Creek Greenway alignment.	Wake County	Town of Morrisville	2028	Plan update
14	Development of remaining greenway segments (if greenway corridor is not developed as a single project) - design to 30%; continue design to 100% with continued public and stakeholder involvement; Coordinate with Wake County and land owners on acquiring easements; Coordinate with CAMPO and Wake County on funding strategies.	Town of Morrisville	Wake County; CAMPO	Ongoing	Additional segments design

4.4 Funding Opportunities

The list below provides a description of some of the key funding sources available to support implementation of greenway and other active transportation improvements. This is not meant to be an exhaustive list. More details on each of these funding opportunities can be found in Appendix B. Figure 16 illustrates some of the key steps involved when implementing a federally-funded project.

Federal

- Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Discretionary Grant Program
- Active Transportation Infrastructure Investment Program (ATIIP)
- Surface Transportation Block Grant (STBG)
- Congestion Mitigation and Air Quality (CMAQ)
- Carbon Reduction Program (CRP)

State

- Strategic Transportation Improvements (STI) Prioritization and State Transportation Improvement Program (STIP)
- North Carolina Great Trails State Program
- NCDOT Highway Safety Improvement Program (HSIP) Hazard Elimination
- Governor’s Highway Safety Program Grant
- Eat Smart, Move More NC
- Bicycle Amenities Program
- Non-Infrastructure Transportation Alternatives Program
- NC Parks and Recreation Recreational Trails Grants
- Trust Fund PARTF Program
- Community Development Block Grant Program

Locally Administered Project Delivery Steps*

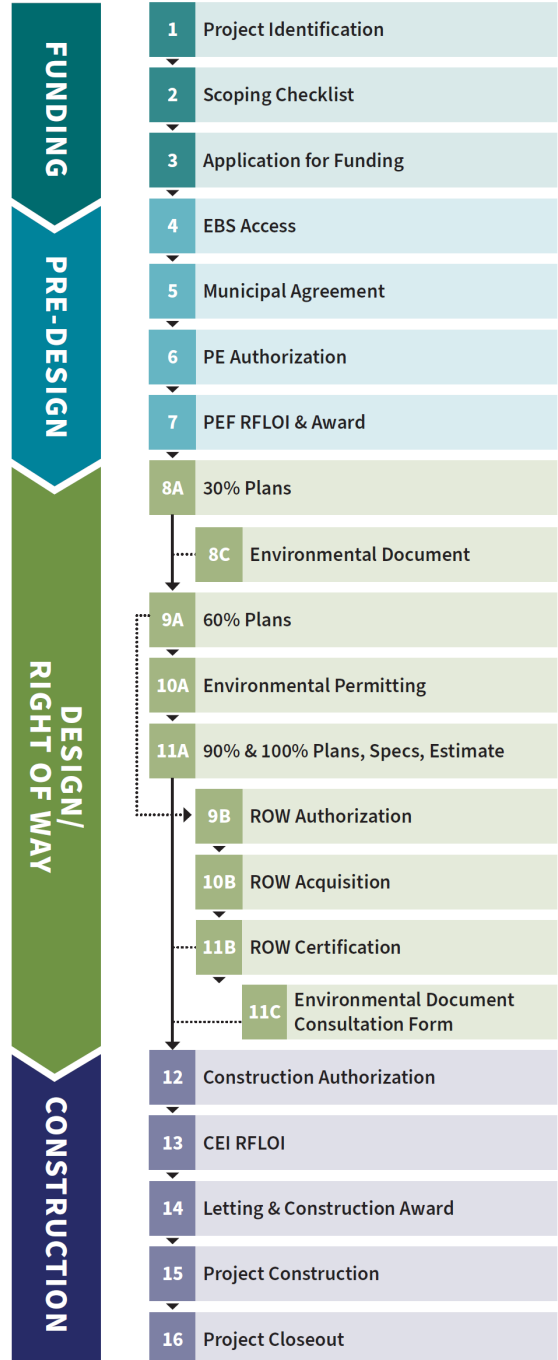


Figure 16. Typical Steps when Implementing a Federally-Funded Locally Administered Project (LAPP).

State-Continued

- Implementation as Part of Roadway Projects Implementation and Complete Streets Improvements
- Implementation as Part of Maintenance Activities
- Clean Water Management Trust Fund

Regional

- CAMPO Call for Locally Administered Projects Program (LAPP)

Municipal/Local

- Implementation as Part of Residential and Commercial Development
- Municipal Property Tax
- Municipal Vehicle Tax for Transportation Improvements
- Powell Bill Funds
- General Obligation Bonds
- Municipal Service Districts (MSDs)

Private Foundation Grants

- AARP Community Challenge Grants
- American Hiking Society's National Trails Fund Grant
- Better Block Foundation Grants
- National Association of Realtors Placemaking Grants

4.5 Design Guidance Resources

This Design Guidance section documents current design guidance and standards resources in support of implementing the Stirrup Iron Creek Greenway. This list of resources has been developed to complement the Stirrup Iron Creek Greenway Feasibility Study and reflects best practices at the state and national level to support bicycle and pedestrian user safety and comfort.

Implementation of the greenway segments identified in the feasibility study will require a more detailed evaluation by a professional engineer prior to implementation, with considerations for physical constraints, floodplain and utilities, rights-of-way, traffic counts and speed and other data to be reviewed at the time of the engineering study.

National Guidance

American Association of State Highway and Transportation Officials' (AASHTO) *Guide for the Planning, Design, and Operation of Pedestrian Facilities.*

The American Association of State Highway and Transportation Officials (AASHTO) is a non-profit organization with the goal of supportive multimodal transportation for the entire United States. The AASHTO *Guide for the Planning, Design, and Operation of Pedestrian Facilities* (2nd Edition, 2021) provides guidance on the planning, design, and application of various types of pedestrian facilities. The project team used this guide to help develop the recommendations in this Plan, and future updates to this Plan should involve consulting the guide. It will also provide specific guidance for design criteria of individual projects during the implementation phase.

American Association of State Highway and Transportation Officials' (AASHTO) *Guide for the Development of Bicycle Facilities*

The AASHTO *Guide for the Development of Bicycle Facilities* (4th Edition, 2012) provides similar types of guidance as the AASHTO Pedestrian Guide, and should be consulted in a similar manner as priority projects are advanced into design and construction. A new guide is anticipated in the near future.

American Association of State Highway and Transportation Officials' (AASHTO) *A Policy on Geometric Design of Highways and Streets.*

A Policy on Geometric Design of Highways and Streets (2018) provides national guidance on the design of highways and streets. The 7th edition of the "The Green Book" offers an updated framework for geometric design that is more flexible, multimodal, and performance based than in previous editions.

Federal Highway Administration (FHWA) Guidance

FHWA provides guidance for accessibility, design, and facility operations for pedestrians and bicyclists, among other modes. Often, these are in the form of standalone publications that target a specific issue in transportation, such as planning in small towns, crossing guidance, and bikeway facility design. Their resources are especially helpful for state and local governments who wish to implement the best practices. Several publications of note are included below:

- ***Bikeway Selection Guide.*** The *Bikeway Selection Guide* (2019) is designed to assist transportation planners and engineers in the selection of roadway design treatments to accommodate bicycles and motor vehicles. This document is a resource to help transportation practitioners consider and make informed decisions about tradeoffs relating to the selection of bikeway types based on the local context, roadway characteristics and planned bicycle network.
- ***Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations.*** The *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations* (2018) is developed to assist State or local transportation or traffic safety departments that are considering developing a policy or guide to support the installation of countermeasures at uncontrolled pedestrian crossing locations. This document provides guidance to agencies, including best practices for each step involved in selecting countermeasures. By focusing on uncontrolled crossing locations, agencies can address a significant national safety problem and improve quality of life for pedestrians of all ages and abilities.

- **Pedestrian Lighting Primer.** The *Pedestrian Lighting Primer* (2022) was developed be a resource for transportation practitioners interested in the safety and security benefits of pedestrian lighting as well as lighting design considerations at locations with existing or future pedestrian activity.
- **Separated Bike Lane Planning and Design Guide.** The *Separated Bike Lane Planning and Design Guide* (2015) is the latest national guidance on the planning and design of separated bike lane facilities released by the Federal Highway Administration (FHWA). The resource documents best practices as demonstrated around the U.S.
- **Small Town and Rural Multimodal Networks Guide.** The *Small Town and Rural Multimodal Networks Guide* (2016) adopts existing street design guidance and facility types for bicycle and pedestrian safety and comfort for the context of smaller towns and rural places not addressed in guides such as the NACTO Street Design Guide and ITE Walkable Urban Thoroughfares report. The guide provides examples of how to interpret and apply design flexibility to improve bicycling and walking conditions.
- **STEP: Improving Visibility at Trail Crossings.** *STEP: Improving Visibility at Trail Crossings* is a resource focused on improving the driver’s visibility of trail users at roadway crossings. The document presents a systemic approach to reviewing existing crossings or planning for improved at-grade trail crossings with engineering countermeasures, such as enhanced signs and traffic controls. This resource discusses ways to make crossings more visible to drivers. The document describes safety issues and countermeasures for several most frequent types of trail crossings and introduces a process for reviewing trail crossing locations for issues and opportunities to reduce the chances of fatal or severe injury crashes.

ITE Designing Walkable Urban Thoroughfares: A Context Sensitive Approach

The Institute of Transportation Engineers’ (ITE) *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach* (2010) was developed as a guide to support the understanding of the flexibility that is inherent in the AASHTO *A Policy on Geometric Design of Highways and Streets*. The chapters emphasize thoroughfares in "walkable communities" - compact, pedestrian-scaled villages, neighborhoods, town centers, urban centers, urban cores and other areas where walking, bicycling and transit are encouraged. It describes the relationship, compatibility and trade-offs that may be appropriate when balancing the needs of all users, adjoining land uses, environment and community interests when making decisions in the project development process.

Manual on Uniform Traffic Control Devices (MUTCD)

The MUTCD provides guidance on the use, design, and application of control devices such as signs, pavement markings, and signals. The MUTCD provides guidance on the use, design, and application of control devices such as signs, pavement markings, and signals. This manual defines the design criteria for specific implementation projects. The current edition of the MUTCD is the 11th Edition, dated December 2023². The project team consulted the MUTCD during preparation of this Plan.

National Association of City Transportation Officials’ (NACTO) Urban Bikeway Design Guide

The NACTO *Urban Bikeway Design Guide* (2011) is based on the experience of cycling cities around the world and in the U.S. and is meant provide cities with state-of-the-practice solutions that can help create complete streets that are safe and enjoyable for bicyclists.. The designs in this document were developed by cities for

² https://mutcd.fhwa.dot.gov/kno_11th_Edition.htm

cities, since unique urban streets require innovative solutions. Most of these treatments are not directly referenced in the current version of the AASHTO Guide to Bikeway Facilities, although most of them are permitted under the Manual on Uniform Traffic Control Devices (MUTCD). Non-compliant traffic control devices may be piloted through the MUTCD experimentation process. That process is described in Section 1A.10 of the MUTCD. The Federal Highway Administration has posted information regarding MUTCD approval status of all the bicycle related treatments (last updated in 2017)³ and has issued a memorandum⁴ in August 2013 officially supporting use of the document.

National Association of City Transportation Officials' (NACTO) *Urban Street Design Guide*

The National Association of City Transportation Officials' (NACTO) *Urban Street Design Guide* (2013) is a collection of nationally recognized street design standards, and offers guidance on the current state of the practice designs. Written by and for cities, NACTO's design guide centers around building streets that safely accommodate all road users, including people traveling on foot, bike, and on transit. This guide includes a toolkit of street design elements with key dimensions and applications.

United States Access Board

The US Access Board provides standards and guidelines for accessibility consistent with ADA. For more information about ADA accessibility requirements, the Town should consult the US Access Board's 1991 *ADA Accessibility Guidelines (ADAAG)* and the 2010 *Standards for Accessible Design* as minimum requirements for new construction or alterations.

The Town should also consult the 2011 *Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way* (proposed PROWAG) for additional best practices for accessibility. PROWAG has been published as a Notice of Proposed Rulemaking but is not standard as of 2022.

North Carolina Guidelines

MUTCD

North Carolina has its own supplement to the MUTCD to provide additional guidance on very specific issues, such as the implementation of speed limit signage. For more general instruction on signage and traffic markings, consult the national MUTCD provided by FHWA.

Roadway Design Manual

This document includes design specific elements and information required to prepare a detailed roadway design. The RDM is also intended to provide the designer with flexibility in the design process while still maintaining reasonable conformity to common NCDOT design practices. Part I, Chapter 4 – Cross Section Elements, describes the desirable and minimum widths for pedestrian and bicycle facilities and related projects.

Pedestrian Crossing Guidelines

This guide is designed to help local communities evaluate the existing conditions at pedestrian crossings in North Carolina. With this evaluation, it may be used to assess potential improvements based on these

³ FHWA (2017). Bicycle Facilities and the Manual on Uniform Traffic Control Devices (table). Retrieved from https://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/mutcd/

⁴ FHWA (2013). Memorandum: Bicycle and Pedestrian Facility Design Flexibility. Retrieved from https://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_flexibility.cfm

conditions. This guide is not designed to prioritize improvements, or assess the connectivity of a local pedestrian network. Additionally, this guide may not apply in special circumstances such as school crossings.

Complete Streets Implementation Guide and Evaluation Methodology

NCDOT describes the process for evaluating and incorporating pedestrian, bicyclist, and transit elements facilities in the Complete Streets Implementation Guide and the Complete Streets Project Evaluation Methodology. These resources are designed to help communities and NCDOT Divisions plan for a variety of transportation modes, including determining cost-share obligations. Through this multimodal approach, communities can become more active, sustainable, and connected.

Traffic Engineering Policies, Practices and Legal Authority (TEPPL)

This comprehensive resource provides a complete authority on federal and state policies and regulations regarding all transportation issues. This resource should be used a library for very intricate details regarding policy issues affecting active transportation.

Useful Web Links by Source

AASHTO

- AASHTO Publications. <https://store.transportation.org/>

FHWA

- Manual on Uniform Traffic Control Devices (2023): https://mutcd.fhwa.dot.gov/kno_11th_Edition.htm
- Bicycle and Pedestrian Program Publications: https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/
- Safe Transportation for Every Pedestrian (STEP) Resources: https://safety.fhwa.dot.gov/ped_bike/step/resources/

ITE

- ITE Transportation Planning Resources <https://www.ite.org/technical-resources/topics/transportation-planning/>

NACTO

- NACTO Guides <https://nacto.org/publications/>

NCDOT

- Active Travel Terminology (2015) <https://connect.ncdot.gov/projects/BikePed/Documents/NC%20Terminology%20for%20Active%20Travel.pdf>
- Bicycle and Pedestrian Project Development and Design Guidance Resources (including Bicycle and Pedestrian Facility Cost Tool; Greenway Construction Standards): <https://connect.ncdot.gov/projects/BikePed/Pages/Guidance.aspx>

- Complete Streets Planning and Design Guidelines: <https://connect.ncdot.gov/projects/BikePed/Pages/Complete-Streets.aspx>
- Local Programs Management Handbook: <https://connect.ncdot.gov/municipalities/Funding/Pages/LPM%20Handbook.aspx>
- Manual of Uniform Traffic Control Devices-North Carolina Supplement (2009): <https://connect.ncdot.gov/resources/safety/Documents/>
- Roadway Design Manual: <https://connect.ncdot.gov/projects/Roadway/Pages/RDM.aspx>
- Pedestrian Crossing Guidance: https://connect.ncdot.gov/resources/safety/Tepp/TEPPL_All_Documents_Library/Pedestrian_Crossing_Guidance.pdf
- Traffic Engineering Policies, Practices, and Legal Authority (TEPPL): <https://connect.ncdot.gov/resources/safety/Tepp/Pages/tepp.aspx>
- WalkBikeNC: <https://www.ncdot.gov/bikeped/walkbikenc/>

4.6 Trail Maintenance

The Town Public Works Department is responsible for the maintenance of Town greenways in addition to the maintenance of parks, grounds, athletic fields, and amenities. Proper maintenance ensures that, once constructed, greenways remain a great amenity for the community. Timely maintenance expands the longevity of the trail infrastructure.

Regular Maintenance

Regular maintenance includes the weekly, monthly, and quarterly schedule of tasks to keep the greenway functional for all users. This includes regular clean up and vegetation control, but also incorporates minor repairs such as filling cracks and replacing mulch. Simpler tasks are included in the weekly and monthly schedule, whereas larger tasks should be addressed and monitored on a quarterly basis. Examples of the different types of managements tasks are below.

- **Weekly Maintenance Tasks:** Trash pickup, debris removal, vegetation management, and pothole repair.
- **Monthly Maintenance Tasks:** Trail sweeping, signage replacement, mulching and edging, safety evaluations, drainage evaluations, fill cracks, and repair eroding edges.
- **Quarterly Maintenance Tasks:** Vegetation replacement, ADA compliance checks, small resurfacing patches, and seasonal maintenance tasks.

Remedial Maintenance

Emergency type of maintenance needs to occur to address specific needs to keep the greenway open. These types of tasks will need to be addressed immediately and are typically in response to major weather events or unforeseen issues such as large debris falling on the greenway, wash out from a major storm, or an eroding greenway edge.

Long Term Maintenance

For the long-term success of the greenway, a plan needs to be developed for the replacement and repair of primary elements along the trail. This includes resurfacing, repairing infrastructure, and adding needed

elements based on usage and observations. Updating the long-term maintenance plan based on observations and usage will help ensure that maintenance is properly planned and adapting to the needs of the site.

Examples of long-term maintenance tasks are:

- Repave/Resurface
- Remove/replace damaged trees
- Re-grading/update drainage
- Add walkways/connections based on usage and access needs
- Realign segments if erosion, tree root, or infrastructure encroaches along edge
- Add culverts, bridges, retaining walls as needed

Appendix A. Prior Plans Review

Morrisville Comprehensive Transportation Plan (2019)

Morrisville Comprehensive Transportation Plan (2019) provides multimodal transportation improvement recommendations for the Town of Morrisville. This plan addresses current and future transportation needs through the year 2040 for the Town of Morrisville. The plan highlights an existing greenway on the opposite side of the horseshoe-shaped lake from the planned Stirrup Iron Creek Greenway corridor (near Sync Street) – this is the existing Mills Spring Greenway. The plan identifies access management along Airport Boulevard from NC 54 to I-40 as a planned transportation improvement overlapping with the study corridor. The Comprehensive Transportation Plan also notes a proposed bike lane and sidepath on McCrimmon Parkway; several sections of those proposed improvements along McCrimmon Parkway have been recently implemented. The plan also recommended a sidepath (10 feet or wider) along Aviation Parkway from NC 54 to the northern Town boundary, to pair with either bicycle lanes or sharrows depending on roadway speeds. Morrisville Comprehensive Transportation Plan includes the proposed Stirrup Iron Creek Greenway corridor. The plan makes a note that as property along McCrimmon Parkway is developed there will be greenway connectors constructed between the sidepath on McCrimmon Parkway and the proposed Stirrup Iron Creek Greenway corridor.

Morrisville Sidewalks and Greenways Map (2021)

Morrisville Sidewalks and Greenways Map (2021) is not a separately adopted local plan; rather this map utilizes some of the Morrisville CTP layers and was developed for general public use, to support navigation around Town on foot and by bicycle. The Sidewalks and Greenways Map identifies existing and recommended greenway and shared use path sections. Mills Spring Greenway is identified as complete on the map, and the Stirrup Iron Creek corridor is identified as planned greenway. Planned shared use paths along Airport Boulevard and Aviation Parkway are also reflected on the map, as well as the shared use path section completed along McCrimmon Parkway.

Triangle Bikeway Study

The Triangle Bikeway Study identifies a regional shared use path corridor running between Chapel Hill and Raleigh along I-40. The study proposes a potential alignment for the future shared use path, which would parallel the planned Stirrup Iron Creek Greenway. A shared use path being constructed with NCDOT I-5700 project provides a potential future connection along the Airport Boulevard between the Triangle Bikeway and the Stirrup Iron Creek Greenway.

Capital Area Metropolitan Planning Organization (CAMPO) 2050 Metropolitan Transportation Plan (MTP)

The CAMPO 2050 MTP is a fiscally-constrained long-range transportation plan for the Capital Area Metropolitan Planning Organization region, with proposed transportation improvements organized by mode, as well as by expected horizon year for each of the funded projects included in the financial plan. Proposed improvements in the general vicinity of Stirrup Iron Creek Greenway consist of roadway projects on I-40, Aviation Parkway, and NC 54. Along the I-40 corridor, the proposed improvements consist of widening (funding horizon 2050), and interchange improvements (funding horizon 2030). Aviation Parkway has several proposed improvements including widening (shown for horizon year 2040). Lastly, NC 54 has two phases of proposed widening, with one section shown in horizon year 2030 and another section shown in horizon year 2040.

CAMPO Comprehensive Transportation Plan (CTP)

The CAMPO Comprehensive Transportation Plan (CTP) is a long-range plan for multimodal transportation improvements in the larger CAMPO region, which extends beyond the MTP time horizon. CAMPO's CTP is composed of proposed projects in Wake County that were not funded in the MTP, as well as adopted CAMPO portions of countywide CTPs for Franklin County, Granville County, Harnett County, and Johnston County. In reviewing bicycle and pedestrian improvements in the CTP, some of the bicycle and pedestrian projects of statewide and regional importance recognized in and near the greenway study corridor include the proposed Triangle Bikeway and wide outside lanes along Airport Boulevard.

Wake County Greenway System Plan (2017)

The Wake County Greenway System Plan (2017) details greenway recommendations for Wake County. The Greenway System Plan shows existing greenway networks, greenways in development (as of 2017), and proposed greenway corridors. Stirrup Iron Creek Greenway corridor was identified as part of Morrisville's CTP in 2019, and thus was not recognized as part of Wake County Greenway System Plan update in 2017.

Town of Cary Bike and Hike Map

The Town of Cary Bike and Hike Map shows existing and proposed greenway trails and on-road bike routes. The map shows existing shared use path facilities along McCrimmon Parkway that begin at the Airport Boulevard intersection and then travel south to connect with Crabtree Creek Greenway. A planned shared use path along Aviation Parkway shown on this map would join just east of Dominion Drive and terminate at Lake Crabtree County Park entrance.

I-5700 Interchange Update at I-40 and Airport Boulevard

NCDOT is constructing interchange improvements at the junction of Airport Boulevard and I-40, with conversion of the interchange design to a Diverging Diamond Interchange (DDI). A shared use path is proposed down the median of the DDI interchange bridge.

EB-5814 Airport Boulevard Sidewalks and Sidepath

EB-5814 consisted of approximately 0.64 miles of sidewalk and sidepath improvements along Airport Boulevard, from McCrimmon Parkway to Slater Road. The project also included signal improvements at Perimeter Park Drive. An 8-foot sidewalk (sidepath) was included on the southeast side of Airport Boulevard from McCrimmon Parkway to Perimeter Park Drive, continuing as a 5-foot sidewalk to connect to the existing sidewalk. An 8-foot sidewalk (sidepath) was included on the northwest side of Airport Boulevard from Perimeter Park Drive to the private drive before Sorrell Grove Church Road, where it continues as a 5-foot sidewalk to connect between Sorrell Grove Church Road and the Iron Stirrup Creek tributary to the existing sidepaths along McCrimmon Parkway. This project was still under construction in the summer of 2023 when the prior plans were being reviewed but is complete as of spring of 2024.

I-5506 Interchange Update at I-40 and Aviation Parkway

I-5506 consists of improvements to interchange of I-40 at SR-1002 (Aviation Parkway) and the construction of an auxiliary lane on I-40 westbound from SR 1002 (Aviation Parkway) to SR-3015 (Airport Boulevard). This project has been completed.

U-5811 Aviation Parkway Widening from NC 54 to I-40

U-5811 consists of improvements to Aviation Parkway from NC 54 (Chapel Hill Road) to I-40 in Morrisville. NCDOT is proposing to widen Aviation Parkway to a 4-lane median-divided roadway with curb and gutter. The project design will accommodate bicyclists and pedestrians through a combination of a shared use path on one side and a sidewalk on the other side. Right of way acquisition is scheduled to begin in 2026, and construction is expected to begin in 2028.

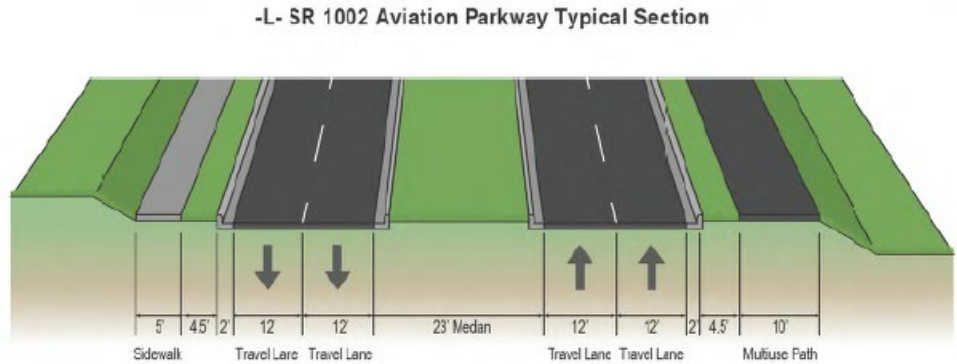


Figure 17. U-5811 Expected Cross-Section for Aviation Parkway (NCDOT)

Appendix B. Funding Opportunities

Federal

Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Discretionary Grant Program

RAISE discretionary grant funding program, previously known as TIGER grants and then later as BUILD grants, includes eligibility for a wide variety of transportation projects planning and implementation. RAISE grants are expected to help communities carry out projects with significant local or regional impact. A competitive grant application process is required. The minimum award amount for planning projects is \$5 million (\$1 million in rural areas), and the maximum amount differs between two funding streams (\$25 million if funded through Bipartisan Infrastructure Bill (BIL) funding and \$45 million if funded through the FY 2022 Appropriations Act funding). A 20% local match is generally required, with a few exceptions in the following cases:

- Rural communities
- Areas of Persistent Poverty
- Historically Disadvantaged Communities are eligible to apply for 100% federal funding

The Town of Chapel Hill recently received \$1 million in federal RAISE grant funding to invest in feasibility studies and the expansion of the Town's greenway system.

Active Transportation Infrastructure Investment Program (ATIIP)

This is a new funding program in the Infrastructure Investment and Jobs Act (IIJA, also known as the Bipartisan Infrastructure Bill (BIL)). Under the Active Transportation Infrastructure Investment Program, local, regional, state, and tribal governments can apply to receive funding for active transportation projects and planning grants that build upon a local, regional, or state network or key network corridors. The infrastructure projects and planning studies funded under this program must account for safety and facilitate more people walking or biking. A 20% match is required for this grant.

Surface Transportation Block Grant (STBG)

STBG provides a flexible funding source to best address State and local transportation needs and covers a wide variety of potential projects including highway, bridge, transit capital and bicycle and pedestrian projects. A minimum of 20% local match is required. The State of North Carolina receives an apportionment on an annual basis based on an established allocation formula. MPOs with over 200,000 in population including the CAMPO also receive pass-through funds as STBG-DA. NCDOT allocates STBG funding that is not designated for larger MPOs through the STI Prioritization process that informs the STIP development every two years.

Congestion Mitigation and Air Quality (CMAQ)

CMAQ funding supports surface transportation projects and other related efforts that contribute to air quality improvements and provide congestion relief. Funds may be used for a transportation project or program that is likely to contribute to the attainment or maintenance of a national ambient air quality standard and is included in an MPO's current transportation plan and TIP (Transportation Improvement Program) or current STIP in areas without an MPO. Funding is apportioned to North Carolina based on the population in nonattainment and maintenance areas of the state and the severity of air quality problem. NC's allocation of CMAQ funding is divided between three funding categories:

- **Statewide CMAQ** funding category: those funds are administered by NCDOT and are awarded to prioritized NCDOT-driven CMAQ eligible projects either on a statewide tier facility or involving a

system wide improvement within nonattainment and maintenance areas. This category accounts for 35% of the total North Carolina CMAQ apportionment and is not subject to regional or subregional allocations or the allocation formula.

- **Subregional CMAQ** funding category: those funds are locally-administered and awarded at the MPO/RPO level to projects within eligible counties. This CMAQ funding category would be most applicable to a bicycle and pedestrian or greenway project. The local project sponsor is responsible for providing the required match and meeting federal funding requirements. This category accounts for 60% of the total North Carolina CMAQ apportionment. See CAMPO Discretionary Projects under Regional Funding for further discussion about the application process in Wake County.
- **Regional CMAQ** funding category: those funds are locally-administered and awarded to projects spanning more than one air quality region that cannot be considered subregional projects. Air quality regions are Catawba, Great Smoky Mountains National Park, Metrolina, Rocky Mount, Triad and Triangle. The local project sponsor is responsible for providing the required match. This category is less frequently used and accounts for 5% of the total North Carolina CMAQ apportionment.

A minimum of 20% local match is required for CMAQ funding application.

Carbon Reduction Program (CRP)

CRP was a new funding category established with the passage of the Bipartisan Infrastructure Law (BIL) in 2021. CRP provides funds for projects designed to reduce transportation emissions, defined as carbon dioxide (CO₂) emissions from on-road highway sources.

Some of the eligible project types include, but are not limited to the following project categories:

- a transportation alternative including, but not limited to, the construction, planning, and design of on-road and off-road trail facilities for pedestrians, bicyclists, and other nonmotorized forms of transportation;
- a project to establish or operate a traffic monitoring, management, and control facility or program, including advanced truck stop electrification systems;
- a public transportation project;
- a project for advanced transportation and congestion management technologies;
- deployment of infrastructure-based intelligent transportation systems capital improvements and the installation of vehicle-to-infrastructure communications equipment;
- a project to replace street lighting and traffic control devices with energy-efficient alternatives;
- a project or strategy designed to support congestion pricing, shifting transportation demand to nonpeak hours or other transportation modes, increasing vehicle occupancy rates, or otherwise reducing demand for roads, including electronic toll collection, and travel demand management strategies and programs;
- efforts to reduce the environmental and community impacts of freight movement; and
- a project that supports deployment of alternative fuel vehicles.

Each State's apportionment of CRP funding is calculated based on a percentage specified in BIL; North Carolina further suballocates the CRP funds based on the following required percentages:

- 65% of a State's CRP apportionment is to be obligated in specific areas in proportion to their relative shares of the State's population:
 - Urbanized areas with an urbanized area population greater than 200,000:
 - Urbanized areas with an urbanized area population of at least 50,000 but no more than 200,000:
 - Urban areas with population at least 5,000 and no more than 49,999.
 - Areas with population of less than 5,000.

- The remaining 35% of the State's CRP apportionment can be obligated in any area of the State

States are required to divide the funding to urbanized areas with a population of at least 50,000 based on the relative population of the areas. CPR funds allocated to the CAMPO region are expected to be awarded to projects through the CAMPO Discretionary Projects application process.

State

STI Prioritization and STIP

NCDOT manages the STI Prioritization process which results in an update to the State Transportation Improvement Program (STIP) every two years. STIP identifies construction funding for transportation projects, funded through a combination of federal and state funding sources. The Town of Morrisville could submit a bicycle or pedestrian project through the Capital Area MPO (CAMPO) process to be considered for STI Prioritization and scoring and inclusion in the STIP. This opportunity is dependent on available funding allocated to NCDOT Division 5, and this process is very competitive. For example, during the STI Prioritization P5.0 process, out of approximately \$7 billion of non-highway projects submitted, only \$1 billion in non-highway projects was funded in the 2020-2029 STIP including aviation, ferry, transit, rail and bicycle and pedestrian projects⁵.

The following requirements apply to bicycle and pedestrian projects, to be eligible for STI Prioritization submittal:

- Minimum total project cost = \$100,000
- Eligible costs include right-of-way, preliminary engineering, and construction
- 20% of total project cost is currently required as non-federal match by local governments
- Project must be included in an adopted plan (adopted bicycle plans, greenway plans, pedestrian plans, Safe Routes to School action plans, comprehensive transportation plans (CTPs), and long range transportation plans

The following scoring criteria in table B1 below are considered for bicycle and pedestrian projects scoring as part of STI Prioritization process:

Table B1. STI Prioritization Criteria

Criteria	Measure	Percentage of score, Division Needs (out of 50%; 50% of the score comes from local input)
Safety	(Number of crashes x 40%) + (Crash severity x 20%) + (Safety risk x 20%) + (Safety benefit x 20%)	20%
Accessibility/ Connectivity	Points of Interest pts + Connections pts + Route pts	15%

⁵ NCDOT, STI Prioritization Training Slides, May 2023.

[https://connect.ncdot.gov/projects/planning/Prioritization%20Data/Prioritization%20Training%20\(May%202023\)/STI%20Training%20-%20May%2031-June%201,%202023.pdf](https://connect.ncdot.gov/projects/planning/Prioritization%20Data/Prioritization%20Training%20(May%202023)/STI%20Training%20-%20May%2031-June%201,%202023.pdf)

Demand/ Density	# of households and employees per square mile near project	10%
Cost Effectiveness	(Safety + Accessibility/Connectivity + Demand/Density) / Cost to NCDOT	5%

For Points of Interest considered as part of Accessibility and Connectivity criteria, the following are automatically measures in SPOT Online using a 1.5 mile buffer for bicycle facilities (0.5 miles for pedestrian facilities):

- Government buildings
- Fire/EMS
- Transit routes
- Schools (K-12, public/private, universities, colleges)
- Parks (national, state, local)
- Tourist destinations (historic districts, major sports)
- Medical (hospitals and public/private clinics)
- Places of worship
- Adult education centers
- Grocery stores, convenience stores
- Pharmacies

The following additional points of interest require a manual entry:

- Employment centers
- Tourist destinations (museums, theaters, historic landmarks, etc.)
- Shelters

Roadway projects that are candidates for STI Prioritization submittal in the CAMPO region have to be first identified in the Metropolitan Transportation Plan.⁶ The Metropolitan Transportation Plan for the region is updated every four years, and the next MTP update for the CAMPO region is expected to be completed in early 2026.

North Carolina Great Trails State Program

The North Carolina 2023-2025 budget included the creation of a new \$25 million Great Trails State Program (\$12.5 million per year for two years) that will offer competitive grants for paved and natural surface trails. The grant program is expected to support both new trail development as well as extension of existing trails, including paved and unpaved trails and greenways for biking, hiking, walking, equestrian use, and paddling. The fund will be administered by the North Carolina Department of Natural and Cultural Resources (NCDNCR). Eligible uses for funds will include planning, design, and related environmental assessment, land and easement acquisition, trail construction, trail structures (e.g. bridges), trail amenities (i.e. trailhead parking, signage), and maintenance, and can be used as matching funds for federal or other non-state grants. The funds will require a minimum of a 25% flexible match, including cash, in-kind services, or donation of assets. Grants awarded will be limited to \$500,000 per project.

⁶ <https://www.campo-nc.us/funding/spot/prioritization-70-spot-7>

NCDOT Highway Safety Improvement Program (HSIP) Hazard Elimination

Safety grant program utilizing federal and state funding to address safety and potential safety issues. Projects are selected based on a cost-benefit ratio with safety benefits being classified in terms of crashes reduced. The program is 90% federally funded and 10% state funded. The cost of these projects generally ranges from \$400,000 to \$1 million. A Safety Oversight Committee (SOC) reviews and submits projects to the Board of Transportation (BOT) for funding. Projects are prioritized on a cost-benefit basis, where selected projects will then make way into the STIP.

Governor's Highway Safety Program Grant

Safety grant program specifically related to preventing crashes on North Carolina roads.

(<https://www.ncdot.gov/initiatives-policies/safety/ghsp/Pages/Grants.aspx>)

Eat Smart, Move More NC

This program provides a variety of links and resources, including potential funding sources for public health initiatives. (<https://www.eatsmartmovemorenc.com/>)

Bicycle Amenities Program

The NC Division of Public Health (DPH) conducts a competitive grant program for funding bicycle racks and repair stations. Once awarded, communities must pick up the racks and fixit stations from the state's distribution facility and transport and install in their community. Contact the DPH Built Environment & Physical Activity Coordinator for more information and funding cycles.

Non-Infrastructure Transportation Alternatives Program

Provides periodic funding for programs and activities that aims to shift community behavior, attitudes, and social norms through education, encouragement, and enforcement strategies to increase the safety and convenience for children to walk and bicycle to school

<https://connect.ncdot.gov/projects/BikePed/Documents/SRTS%20Non-Infrastructure%20Grant%20Guidelines.pdf>

NC Parks and Recreation Recreational Trails Grants

The North Carolina Division of Parks and Recreation manages grant funding under the Recreational Trails Program (RTP). The RTP is a \$1.5-million federal grant program designated to help states provide and maintain trails for motorized and non-motorized recreational trail use; RTP funding is provided on a reimbursement basis where the funds must be spent and reimbursement requested upon completion of the project; a state, federal or local government or qualified nonprofit organization is an eligible entity. Additional information available is at <https://trails.nc.gov/trail-grants>.

Trust Fund PARTF Program

Since 1994, the North Carolina Parks and Recreation Trust Fund (PARTF) has been awarding matching grants to local governments for parks and recreational facilities. Counties, incorporated municipalities, and public authorities, as defined by G.S. 159-7, are eligible applicants. A local government can request a maximum of \$500,000 with each application. The appraised value of land to be donated to the applicant can be used as part of the match. Additional information available at <https://www.ncparks.gov/more-about-us/parks-recreation-trust-fund/applicants>.

Community Development Block Grant Program

State Community Development Block Grant (CDBG) funds are provided by the U.S. Department of Housing and Urban Development (HUD) to the state of North Carolina; smaller communities may apply for assistance for community projects that benefit low to middle income households. Projects are intended to support decent housing and suitable living environments and expanding economic opportunities. All North Carolina small cities are eligible to apply for funds except for 23 entitlement cities that receive funds directly from the U.S. Department of Housing and Urban Development (HUD) (Morrisville does not receive direct funds). Each year, CDBG provides funding to local governments for hundreds of critically-needed community improvement projects throughout the state. CDBG grants can fund infrastructure improvements including reconstruction of streets and sidewalks, drainage improvements, upgrade of water supply and distribution systems, and construction or repair of sewer lines, including infrastructure to housing projects; greenways are not called out as specifically eligible projects but a section of a shared use path along a street could be potentially eligible if there is a linkage to community housing or key community resources. Priority is given to the counties in the top 80 percent ranking based on economic distress. Wake County is currently a Tier 3 (least distressed) County, which makes CDBG grant funding applications from jurisdictions in Wake County less competitive. Additional information is available <https://www.nccommerce.com/grants-incentives/public-infrastructure-funds/infrastructure-state-rural-grants>.

Implementation as Part of Roadway Projects Implementation and Complete Streets Improvements

As part of roadway projects planning and implementation, NCDOT reviews roadway projects for multimodal elements based on the Complete Streets Policy. Pedestrian, bicycling, and transit stop improvements can be included as part of a roadway project, if recommendations for those improvements are reflected in a local or regionally adopted plan. (<https://connect.ncdot.gov/projects/BikePed/Pages/Complete-Streets.aspx>)

Bridge replacement is a special case when it would be particularly important to consider bicycle and pedestrian improvements that can be included. Similarly, overpasses over I-40 in and near Morrisville warrant a specific consideration for bicycle and pedestrian facilities that can be improved, to address the issue of I-40 serving as a barrier to multimodal transportation in and around Morrisville.

Implementation as Part of Maintenance Activities

Municipalities and NCDOT can implement some safety treatments as part of typical maintenance activities. For example, when repaving a secondary road, where sufficient width exists, NCDOT can add reflective shoulder striping as a low cost, high impact safety measure. NCDOT provides five-year plans that include resurfacing schedules. The following website includes a link to an interactive map of corridors scheduled for maintenance in over the current five-year cycle: <https://connect.ncdot.gov/resources/Asset-Management/HMIP/Pages/default.aspx>.

Clean Water Management Trust Fund

The Clean Water Management Trust Fund is available to any state agency, local government, or non-profit whose primary purpose is the conservation, preservation, and restoration of North Carolina's environmental and natural resources. Conservation projects have to address one or multiple of the following target areas:

- enhance or restore degraded waters;
- protect unpolluted waters, and/or contribute toward a network of riparian buffers and greenways for environmental, educational, and recreational benefits
- provide buffers around military bases to protect the military mission;

- acquire land that represents the ecological diversity of North Carolina; and
- acquire land that contributes to the development of a balanced State program of historic properties.

Additional information is available at nclwf.nc.gov/grants.

Regional

NC Capital Area MPO (CAMPO) Locally Administered Projects Program (LAPP)

CAMPO holds a competitive call for discretionary transportation projects funding on a regular basis. This overall funding category and selection process is referred to as Locally Administered Projects Program, or LAPP. LAPP includes STBG-DA funds allocated to the region, Transportation Alternatives Program (TAP-DA) funds as well as Congestion Mitigation and Air Quality Improvement Program (CMAQ) funds and a portion of toll proceeds. Based on training presentation materials from 2023⁷, CAMPO LAPP funding target investment mix included 65% allocation to roadway projects, 27% allocation to bicycle and pedestrian projects (for a total of \$6.75 million per year in recent years) and 8% allocation to transit projects. A local match of at least 20 percent is required and local jurisdictions have to complete a LAPP training in order to be able to apply. For a greenway project to be eligible, it has to be recognized as a statewide, regional or local tier project on the MTP (and currently the Stirrup Iron Creek Greenway corridor is recognized as a bicycle and pedestrian project of local significance, not regional significance, in the regional plans). An annual application cycle is expected.

Municipal/Local

Implementation as Part of Residential and Commercial Development

As required in the Town of Morrisville Unified Development Ordinance Section 5.8.8 (Pedestrian Access and Circulation)⁸, most new development types except individual lot single-family residential developments or manufactured homes on an existing lot are required to incorporate greenway and sidepath improvements identified in the Comprehensive Plan. Construction of the greenway/sidepath, as well as providing an easement is expected. The Town of Morrisville would need to ensure that the preferred alignment of the Stirrup Iron Creek Greenway is included in the Comprehensive Plan, upon completion of the study.

Additional coordination with the Town of Cary would be required for the Town of Cary to consider integrating the preferred Stirrup Iron Creek Greenway alignment as part of the Town of Cary Greenways Master Plan, currently going through an update and expected to be finalized in the spring of 2024. An inclusion in the Town of Cary Greenways Master Plan would provide the opportunity to designate greenway easements as part of future redevelopment on the Town of Cary side, where the greenway corridor might switch back and forth between jurisdictions.

Municipal Property Tax

Municipal property tax proceeds are broadly eligible for transportation projects. Additional funds would require either raising the tax rate or re-allocating funding from other purposes.

⁷ CAMPO. LAPP Application and Guidebook. <https://www.campo-nc.us/funding/locally-administered-projects-program/policies> administration

⁸ <https://user-cjghrlw.cld.bz/Morrisville-Unified-Development-Ordinance-Sept-2023-1/282/v>

Municipal Vehicle Tax for Transportation Improvements

NC statutes authorize the levy of an annual municipal vehicle tax upon vehicles registered in the town/municipality to be used to fund projects on public streets. Municipalities can designate a dedicated line item in the annual budget and Capital Improvement Program for neighborhood traffic calming, intersection and safety improvements. As an example, the Town of Waxhaw, North Carolina sets aside funding for “Small Transportation Project Fund” partially funded with municipal vehicle tax.

(https://www.ncleg.gov/EnactedLegislation/Statutes/PDF/BySection/Chapter_20/GS_20-97.pdf)

Powell Bill Funds

North Carolina municipalities receive financial assistance from the State to help pay for the construction, maintenance, and repair of municipal streets, bikeways, and sidewalks. North Carolina levies motor fuel taxes under a formula that increases taxes when the wholesale price of motor fuels increases. The State appropriates a certain percentage of this revenue, plus an additional percentage of the North Carolina Highway Trust Fund's net proceeds, to eligible municipalities across the State. The legislation that first established this distribution is known as the Powell Bill. The available funds are distributed among eligible municipalities. Powell Bill funds can be used for street, sidewalk, and bikeway maintenance, improvements, and design, among other transportation uses. (<https://connect.ncdot.gov/municipalities/State-Street-Aid/Pages/default.aspx>)

General Obligation Bonds

Long-term bonds may be approved through voter referendum, to be repaid by property taxes. The purpose is established prior to the referendum vote. Transportation projects can be a specified purpose of a bond referendum package.

Municipal Service Districts (MSDs)

Municipalities can designate Municipal Service Districts, where additional property taxes may be assessed to fund projects and services within the districts. Downtown Municipal Service Districts are most common.

Private Foundation Grants

AARP Community Challenge Grants

The AARP Community Challenge grant funding cycle in 2021 awarded \$3.2 million to support 244 quick-action projects across the U.S., funding a variety of improvements in urban, rural and suburban communities to support residents of all ages. Community Challenge grants help improve public spaces, transportation, housing, and civic engagement with an emphasis on the needs of people 50 or older. Some of the transportation improvements funded recently included bikeway and pedestrian improvements. Typically, those grants are under \$20,000 each.⁹

⁹ AARP (July 28, 2021). AARP Community Challenge 2021 Grantees. <https://www.aarp.org/livable-communities/community-challenge/info-2021/2021-grantees.html>

American Hiking Society's National Trails Fund Grant

This organization offers micro-grants (\$500-\$3,000) to active members of the alliance of hiking organizations to improve hiker access or hiker safety. Recipient organization must be a 501(c)(3) non-profit.

(<https://www.aarp.org/livable-communities/community-challenge/info-2023/2023-challenge.html>)

Better Block Foundation Grants

The Better Block Foundation is a 501(c)3 nonprofit that educates, equips, and empowers communities and their leaders to reshape and reactivate built environments to promote the growth of healthy and vibrant neighborhoods. Its services support the reimagining of public spaces to include active transportation like walking and bicycling. (<https://www.betterblock.org/>)

National Association of Realtors Placemaking Grants

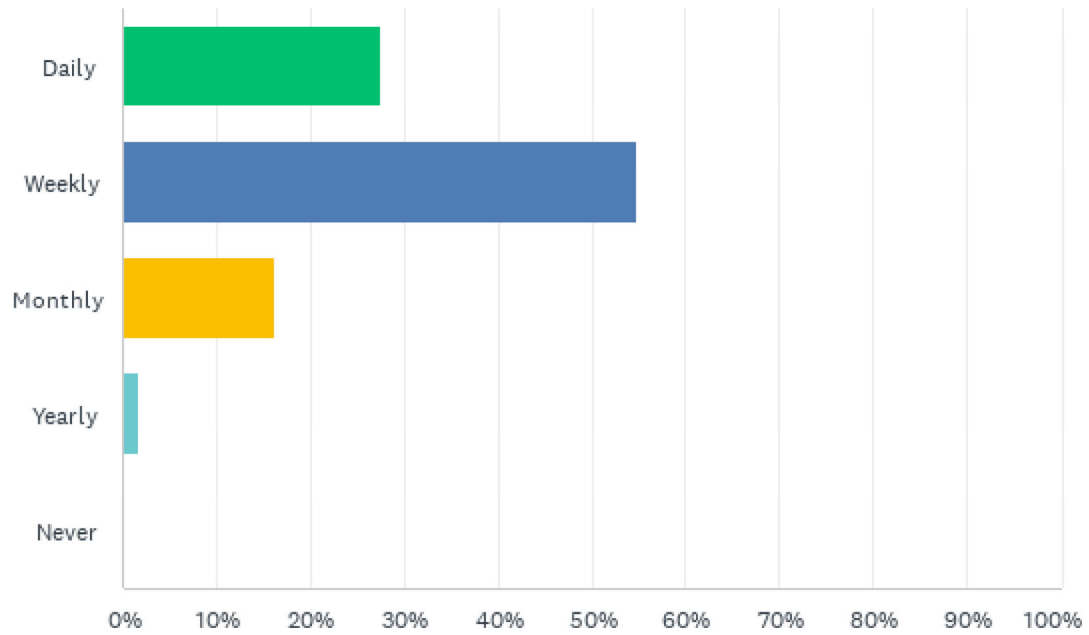
The Placemaking Grant funds the creation of new, outdoor public spaces and destinations in a community, and it is accessible through state and local REALTOR® Associations. Potential funded projects include demonstration projects like parklets, pop-up parks, pedestrian plazas, bike lanes, and amenities like street furniture, paint, signage, materials, landscaping, and murals. (<https://www.nar.realtor/grants/placemaking-grant>).

Appendix C. Public Engagement Survey Results.

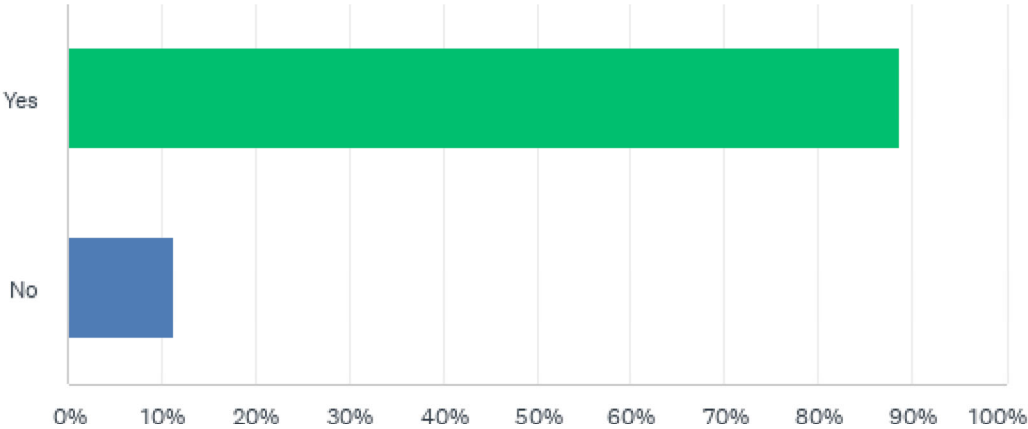
Stirrup Iron Creek Online Survey Results

An online survey for the greenway feasibility study was posted on the town's website and open from November 27, 2023 – January 8, 2024. The link to the survey was shared through social media and during the in-person public engagement event. Overall, 63 responses were collected from the online survey. For more information on the survey and engagement, please refer back to chapter 2 of the full report.

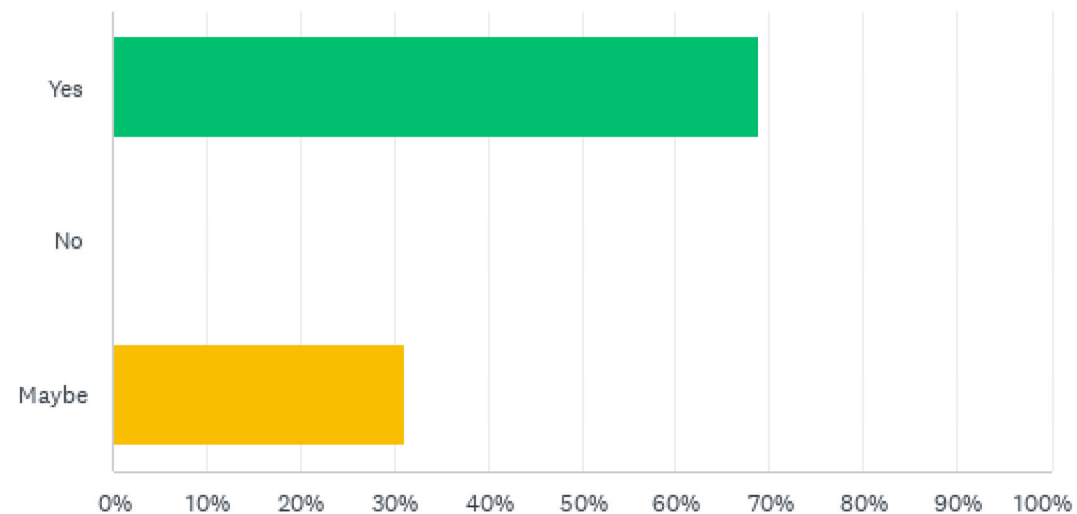
Q1 How often do you utilize greenways?



Q2 Do you visit Wake County's Lake Crabtree Park? If yes, please provide a comment about what activities you enjoy at Lake Crabtree Park



Q3 Based on the map above, is the Stirrup Iron Creek Greenway something you would utilize? If your current answer is "no" or "maybe", please provide potential reasons in the comment field.



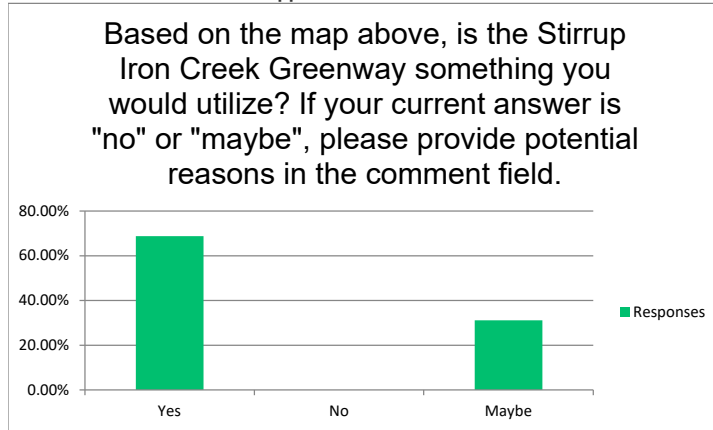
Stirrup Iron Creek Greenway - Town of Morrisville

Based on the map above, is the Stirrup Iron Creek Greenway something you would utilize? If your current answer is "no" or "maybe", please provide potential reasons in the comment field.

Answer Choices	Responses
Yes	68.85% 42
No	0.00% 0
Maybe	31.15% 19
Other (please specify)	

Answered
Skipped

21
61
2



Respondent ID	Response Date	Other (please specify)	Tags
118507626614	Jan 07 2024 09:25 PM	Access/Parking	
118507233983	Jan 06 2024 09:13 PM	Not close to where I live	
118504096234	Jan 02 2024 10:37 AM	I would use the portion closest to the lake mainly for observing wildlife in it's natural environment.	
118503845963	Jan 01 2024 11:01 PM	typically use other greenway but this would be a good 2nd option in the area.	
118503788233	Jan 01 2024 07:05 PM	It's not an area I would go to for destination	
118503777862	Jan 01 2024 06:16 PM	Does not loop around so would need to backtrack	
118503773775	Jan 01 2024 05:55 PM	assigned to the new high school. Any Greenway if well connected with parking/restrooms will be a great addition.	
118503751102	Jan 01 2024 04:07 PM		
118503740378	Jan 01 2024 03:20 PM	If it connects to the Greenway near Church St Park and town hall then I would definitely use it.	
118498902294	Dec 20 2023 07:34 PM	access on foot. botanical arboretum. Game place (play pickleball), light art display or with glow in the dark artwork or just put lights on trees, drink bar with smoothies, boba, beer to share with friends like bottle theory (mini outdoor food hall). I don't work so no use for commute, but I'd used it for fun exercise.	
118498086504	Dec 19 2023 05:56 PM	Realistically would need one or more of the planned multi-use paths to be completed before I could utilize the proposed Stirrup Iron Creek Greenway. Once there is a connection to Morrisville proper then yes, I think I would utilize it some.	
118490523851	Dec 10 2023 08:22 PM	Please make it wide enough to safely accommodate both walkers (including baby carriages and pets) and cyclists.	
118490363246	Dec 10 2023 11:43 AM	Depends on how easy it is to get to	
118486628799	Dec 05 2023 10:51 PM	Location	
118486523063	Dec 05 2023 07:48 PM	Need connection to Church St park, stopping at 54 and not connecting over the railway would severe limit access	
118486318689	Dec 05 2023 03:05 PM	It's pretty far from my home.	
118485968997	Dec 05 2023 09:35 AM	We enjoy biking to Lake Crabtree but this wouldn't be near our usual bike path. We have occasionally parked at the park and taken walks, in which case we might use the proposed greenway.	
118485294643	Dec 04 2023 03:46 PM		

118484401732

Dec 03 2023 04:48 PM

118483987158

Dec 02 2023 03:41 PM

118483986203

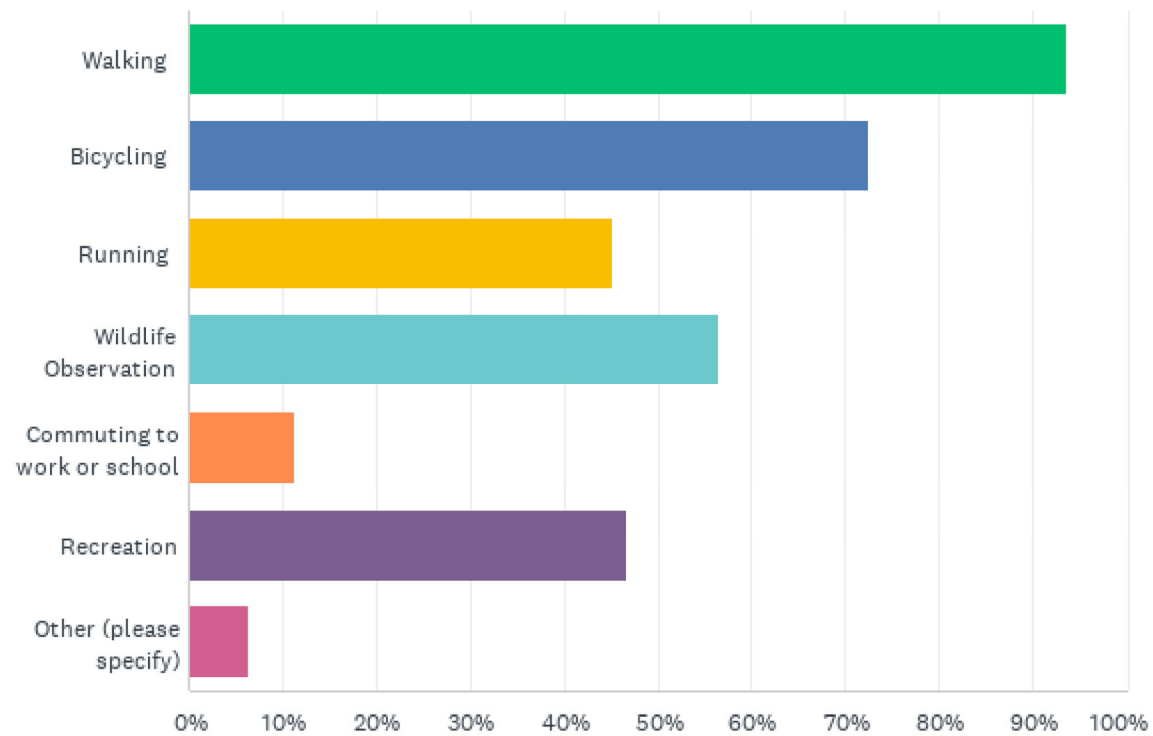
Dec 02 2023 03:38 PM

entertainment/bars (like bottle theory on white oak trail in apex/cary), pickleball courts. That area is changing with the expansion of the airport so I hope to see more entertainment type amenities.

Depends on parking/accessibility to other greenways

It's a little far from my house, I like the idea of walking from my house to a greenway

Q4 What types of activities would you expect to do on the greenway?



Q5 Please let us know what location(s) would be important for you to access near the proposed greenway (nearest intersection or name of business).

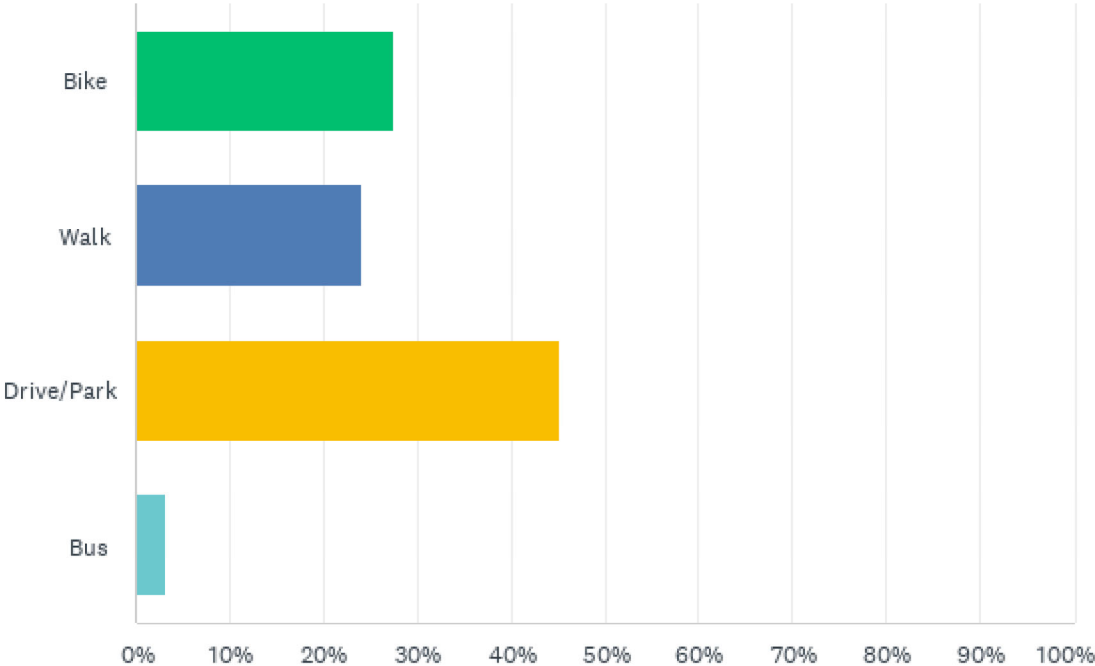
Answered: 34 Skipped: 29

#	RESPONSES	DATE
1	Businesses near 54 like Fount and Koki	1/6/2024 11:21 AM
2	mccrimon	1/3/2024 11:11 PM
3	BAPS temple, HSNC temple, Walmart on 54	1/2/2024 10:35 PM
4	Store, pharmacy and clean restrooms	1/2/2024 8:20 PM
5	Crabtree Creek Greenway, Town Hall Drive and connecting greenways	1/2/2024 8:07 PM
6	Restroom	1/2/2024 12:22 PM
7	Aviation parkway	1/2/2024 12:10 PM
8	my usage would be limited to the section closest to Aviation Parkway.	1/2/2024 10:37 AM
9	do think access to the wake competition center would be good and proposed highschool.	1/1/2024 11:01 PM
10	Crabtree Park	1/1/2024 7:05 PM
11	Across the tracks from The WTCC signal	1/1/2024 5:55 PM
12	Access close to Church Street corridor.	1/1/2024 4:44 PM
13	Prefer not to answer	1/1/2024 4:42 PM
14	Airport Blvd	1/1/2024 4:07 PM
15	Can you please extend this greenway to providence place greenway (the one which ends on church street)	1/1/2024 3:52 PM
16	SGA and Urban Air	1/1/2024 3:20 PM
17	LA Dance on Dominion Drive	12/22/2023 4:45 PM
18	Misc food off of airport blvd and the wake competition center	12/20/2023 7:34 PM
19	Shiloh park if a walking/biking bridge was added from church to nc54	12/19/2023 5:56 PM
20	We mostly get on the Crabtree Creek Greenway that goes to Crabtree Park/Umstead - will it eventually connect to this?	12/19/2023 10:48 AM
21	None in particular - it would be more of a recreational/occasional use option for me personally, unless I got a job at one of the businesses or office parks over off of Paramount Parkway, etc.	12/10/2023 8:22 PM
22	all	12/10/2023 1:20 PM
23	Aviation parkway	12/10/2023 11:43 AM
24	Slater or Paramount Parkway	12/5/2023 10:51 PM
25	WCCC, McCrimmon or Aviation Blvd.	12/5/2023 7:48 PM
26	Church St Park	12/5/2023 3:05 PM
27	Don't know that area well enough to say	12/5/2023 9:35 AM
28	Access from Hatcher creek greenway?	12/5/2023 7:29 AM
29	Lake Crabtree park/existing greenway	12/4/2023 6:39 PM

Stirrup Iron Creek Greenway - Town of Morrisville

30	Chapel hill road, near food lion & dollar tree	12/4/2023 6:10 PM
31	Wake Competition Center	12/4/2023 3:46 PM
32	Perimeter Parkway, Morrisville fire station 2	12/4/2023 3:43 PM
33	wake competition, walmart	12/3/2023 4:48 PM
34	Town Hall Dr	12/2/2023 3:38 PM

Q6 How would you expect to access the future greenway?



Stirrup Iron Creek Greenway - Town of Morrisville

Please provide your home zip code

Answered

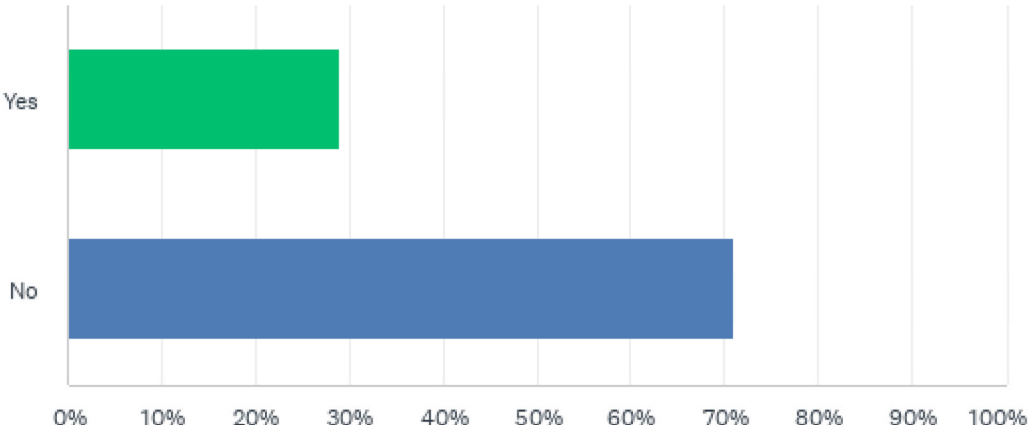
61

Skipped

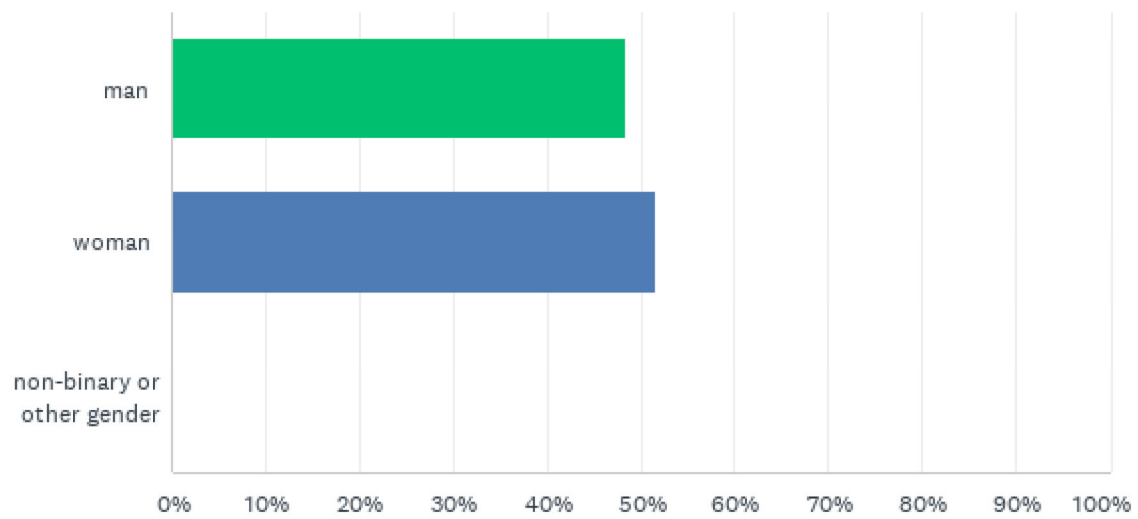
2

Respondent ID	Response Date	Responses	Tags
118507817361	Jan 08 2024 06:41 AM	27560	
118507628249	Jan 07 2024 09:30 PM	27560	
118507626614	Jan 07 2024 09:25 PM	27560	
118507233983	Jan 06 2024 09:13 PM	27560	
118506975891	Jan 06 2024 11:21 AM	27560	
118506656864	Jan 05 2024 06:20 PM	27560	
118506633476	Jan 05 2024 05:27 PM	27560	
118505973973	Jan 04 2024 07:59 PM	27560	
118505266093	Jan 03 2024 11:11 PM	27560	
118504483542	Jan 02 2024 10:35 PM	27519	
118504430863	Jan 02 2024 08:20 PM	27560	
118504425924	Jan 02 2024 08:07 PM	27560	
118504170700	Jan 02 2024 12:22 PM	27560	
118504158301	Jan 02 2024 12:10 PM	27560	
118504096234	Jan 02 2024 10:37 AM	27560	
118503845963	Jan 01 2024 11:01 PM	27560	
118503815228	Jan 01 2024 09:04 PM	27519	
118503795986	Jan 01 2024 07:39 PM	27560	
118503788233	Jan 01 2024 07:05 PM	27614	
118503786018	Jan 01 2024 06:55 PM	27560	
118503782454	Jan 01 2024 06:38 PM	27560	
118503773775	Jan 01 2024 05:55 PM	27560	
118503769774	Jan 01 2024 05:35 PM	27513	
118503764448	Jan 01 2024 05:09 PM	27560	
118503760338	Jan 01 2024 04:49 PM	27560	
118503759168	Jan 01 2024 04:44 PM	27560	
118503758811	Jan 01 2024 04:42 PM	27465	
118503756949	Jan 01 2024 04:33 PM	27560	
118503751908	Jan 01 2024 04:10 PM	27560	
118503751102	Jan 01 2024 04:07 PM	27560	
118503747706	Jan 01 2024 03:52 PM	27560	
118503740378	Jan 01 2024 03:20 PM	27560	
118500090135	Dec 22 2023 04:45 PM	27560	
118498902294	Dec 20 2023 07:34 PM	27560	
118498174699	Dec 19 2023 09:10 PM	27560	
118498086504	Dec 19 2023 05:56 PM	27560	
118497781707	Dec 19 2023 10:48 AM	27560	
118497401879	Dec 18 2023 09:55 PM	27560	
118490523851	Dec 10 2023 08:22 PM	27560	
118490396262	Dec 10 2023 01:20 PM	27560	
118490363246	Dec 10 2023 11:43 AM	27519	
118486628799	Dec 05 2023 10:51 PM	27560	
118486523063	Dec 05 2023 07:48 PM	27560	
118486318689	Dec 05 2023 03:05 PM	27560	
118486055128	Dec 05 2023 10:54 AM	27560	
118486021373	Dec 05 2023 10:23 AM	27560	
118485968997	Dec 05 2023 09:35 AM	27560	
118485911242	Dec 05 2023 08:37 AM	27523	
118485856365	Dec 05 2023 07:29 AM	27519	
118485742670	Dec 05 2023 04:46 AM	27560	
118485468701	Dec 04 2023 07:56 PM	27560	
118485464403	Dec 04 2023 07:48 PM	27560	
118485423634	Dec 04 2023 06:39 PM	27560	
118485405485	Dec 04 2023 06:10 PM	27560	
118485297239	Dec 04 2023 03:49 PM	27519	
118485294643	Dec 04 2023 03:46 PM	27519	
118485291959	Dec 04 2023 03:43 PM	27560	
118484401732	Dec 03 2023 04:48 PM	27560	
118484206192	Dec 03 2023 06:35 AM	27560	
118483987158	Dec 02 2023 03:41 PM	27560	
118483986203	Dec 02 2023 03:38 PM	27560	

Q8 I represent a minority race or 2+ races (African American, Asian, South Asian, American Indian, Alaska Native, Middle Eastern, Pacific Islander)

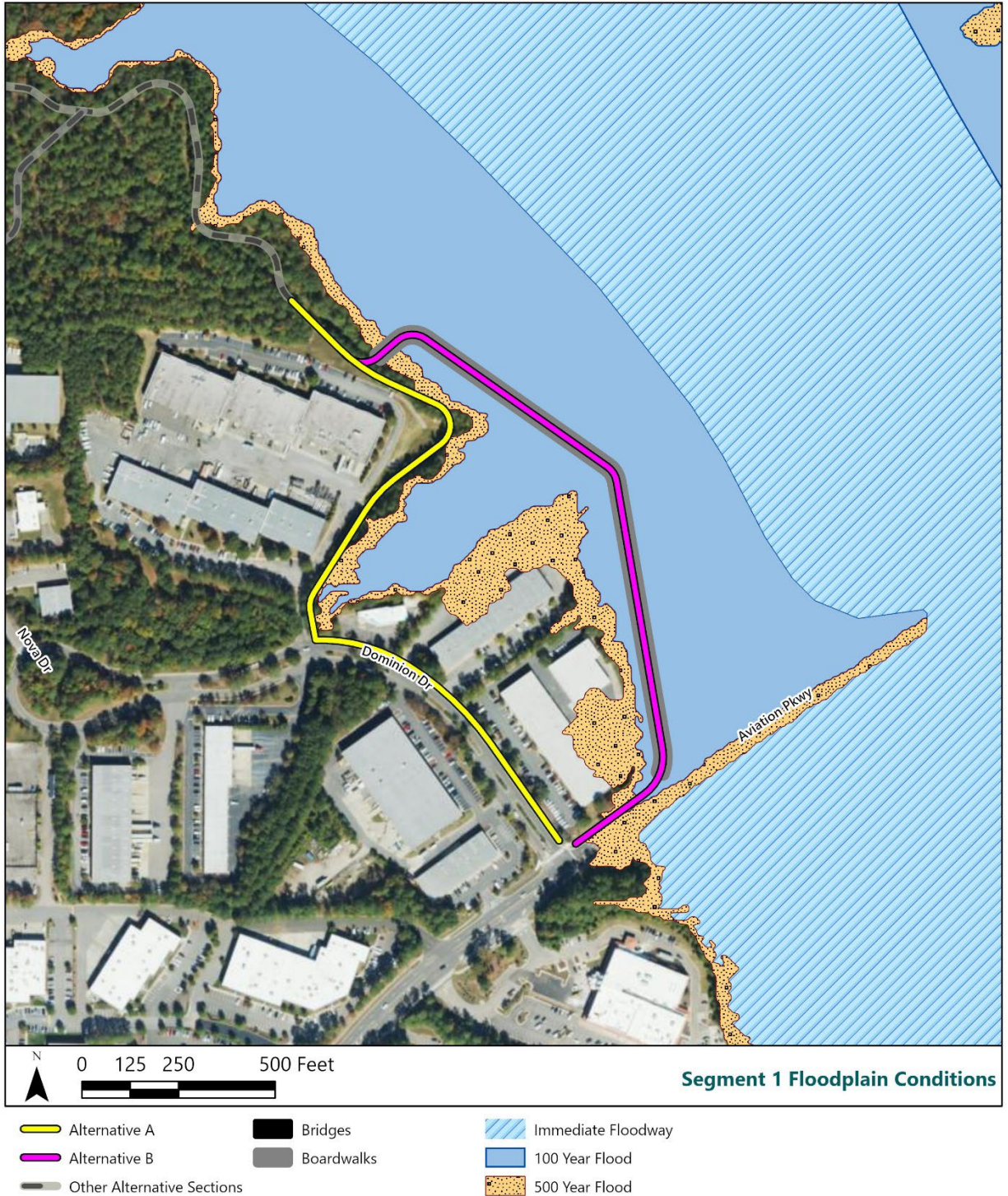


Q9 I identify as

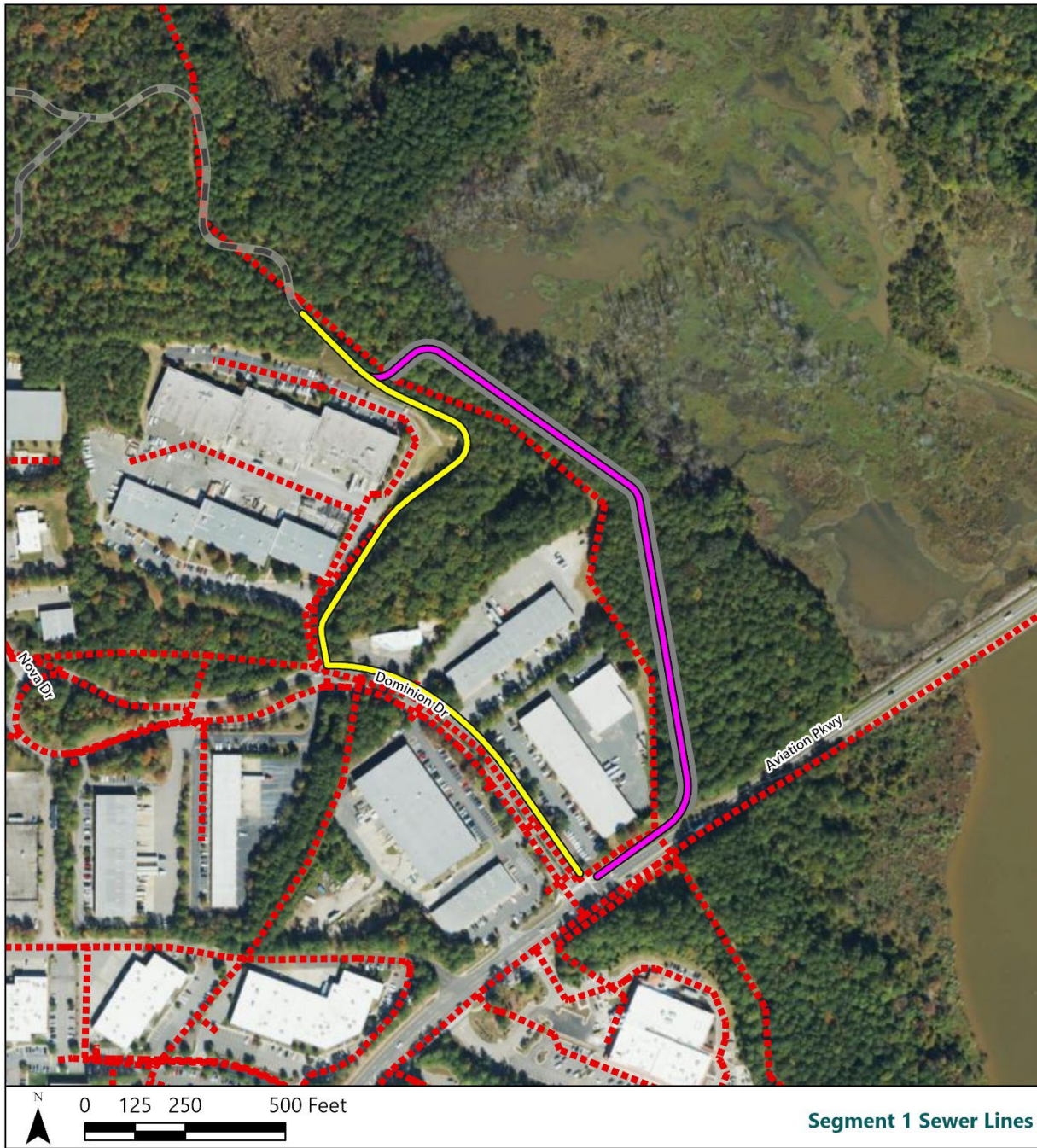


Appendix D. Floodplain and Sewer Utilities Mapping.

Segment 1 Floodplain Map

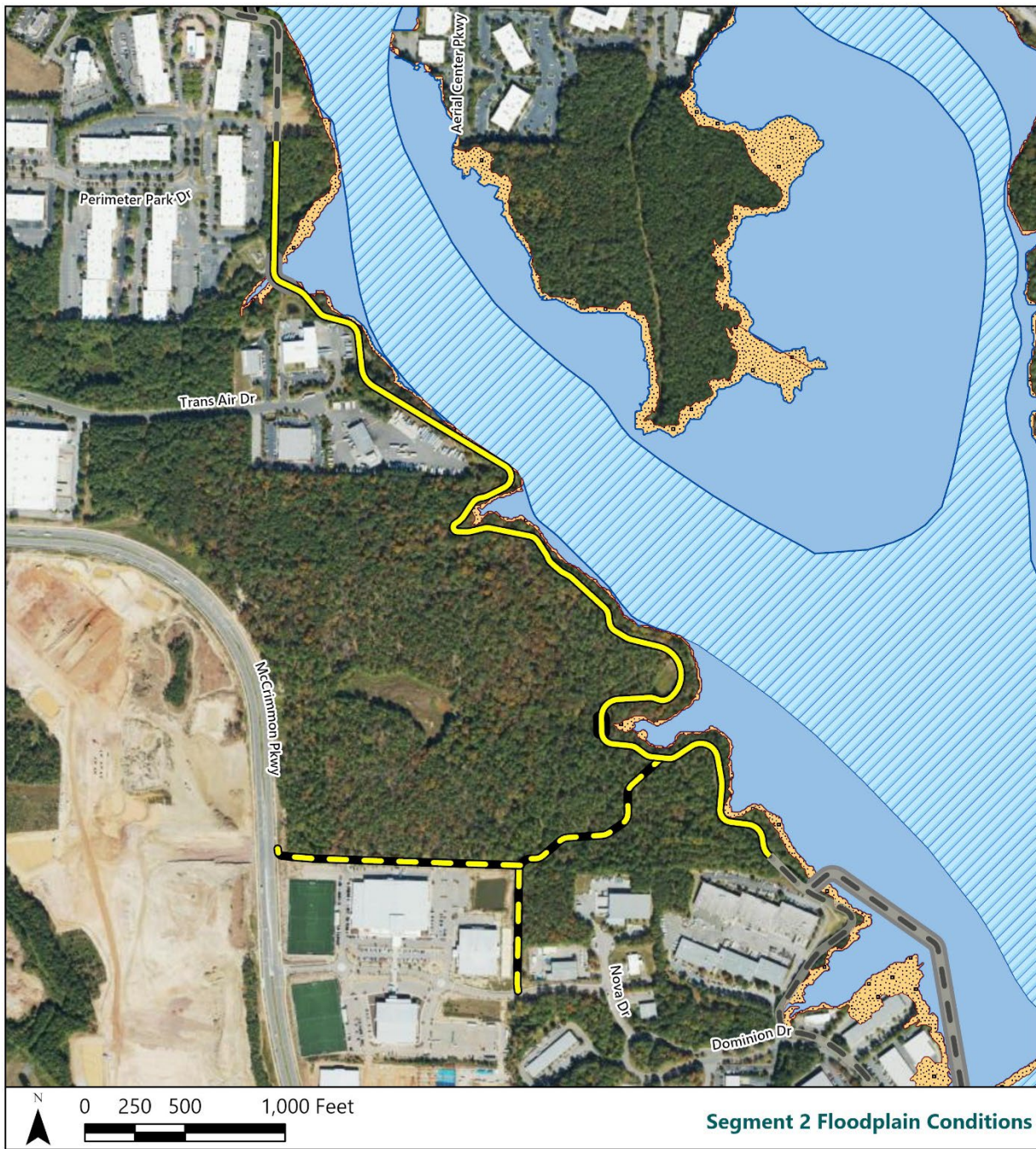


Segment 1 Sewer Lines



- Alternative A
- Alternative B
- Other Alternative Sections
- Bridges
- Boardwalks
- Sewer Line

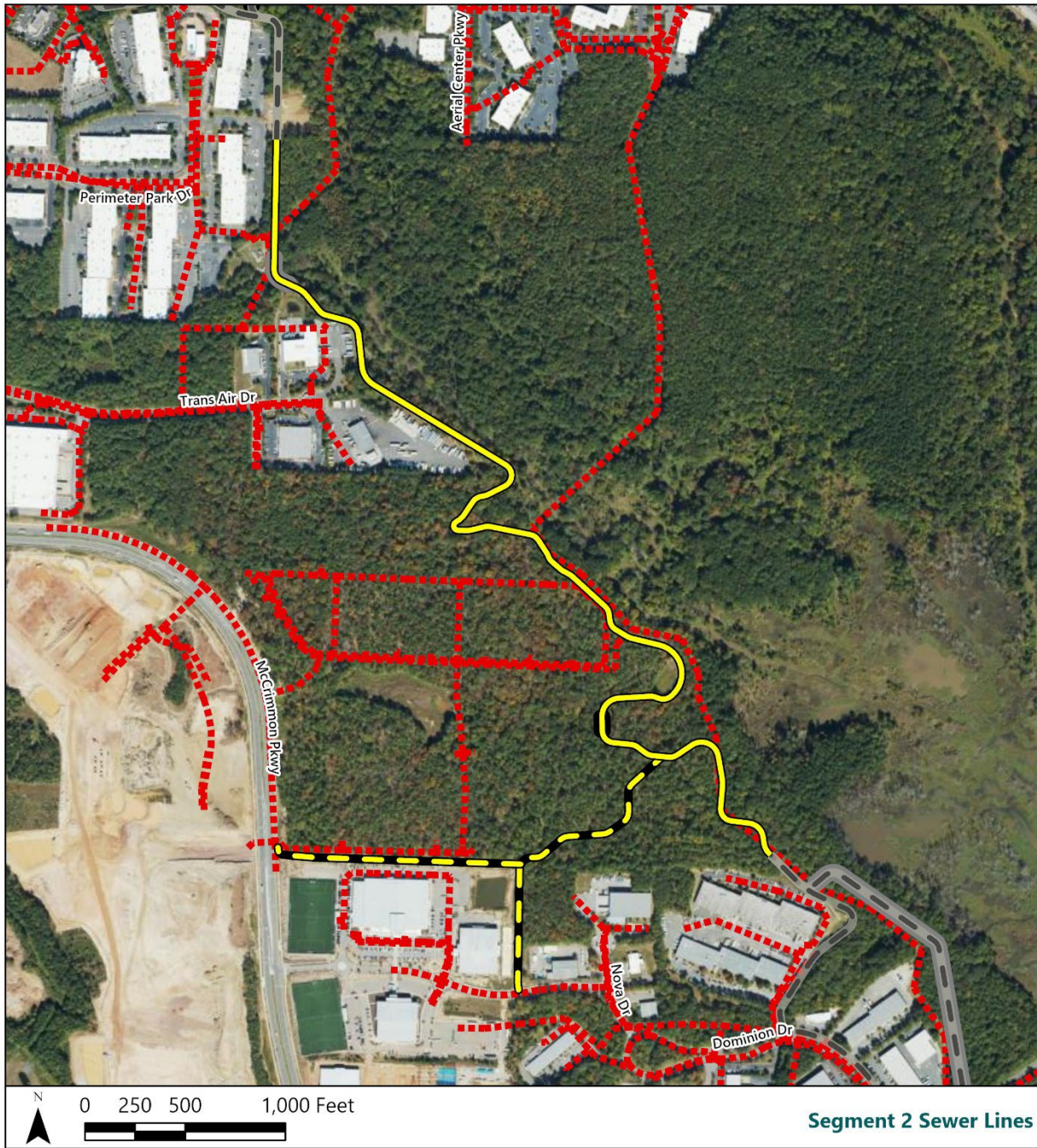
Segment 2 Floodplain Map



Segment 2 Floodplain Conditions

- | | | |
|------------------------------|------------|--------------------|
| Alternative A | Bridges | Immediate Floodway |
| Competition Ctr Dr Connector | Boardwalks | 100 Year Flood |
| Other Alternative Sections | | 500 Year Flood |

Segment 2 Sewer Lines



- Alternative A
- Bridges
- Sewer Line
- Competition Ctr Dr Connector
- Boardwalks
- Other Alternative Sections

Segment 3 Floodplain Map



- Alternative A
- Alternative C
- Alternative D
- Other Alternative Sections
- Bridges
- Boardwalks
- Immediate Floodway
- 100 Year Flood
- 500 Year Flood

Segment 3 Sewer Lines








- Alternative A
- Alternative C
- Alternative D
- Other Alternative Sections
- Bridges
- Boardwalks
- - - Sewer Line

Segment 3 Sewer Lines

Segment 4 Floodplain Map



Segment 4 Floodplain Conditions

-  Alternative A
-  Other Alternative Sections
-  Immediate Floodway
-  100 Year Flood
-  500 Year Flood

Segment 4 Sewer Lines



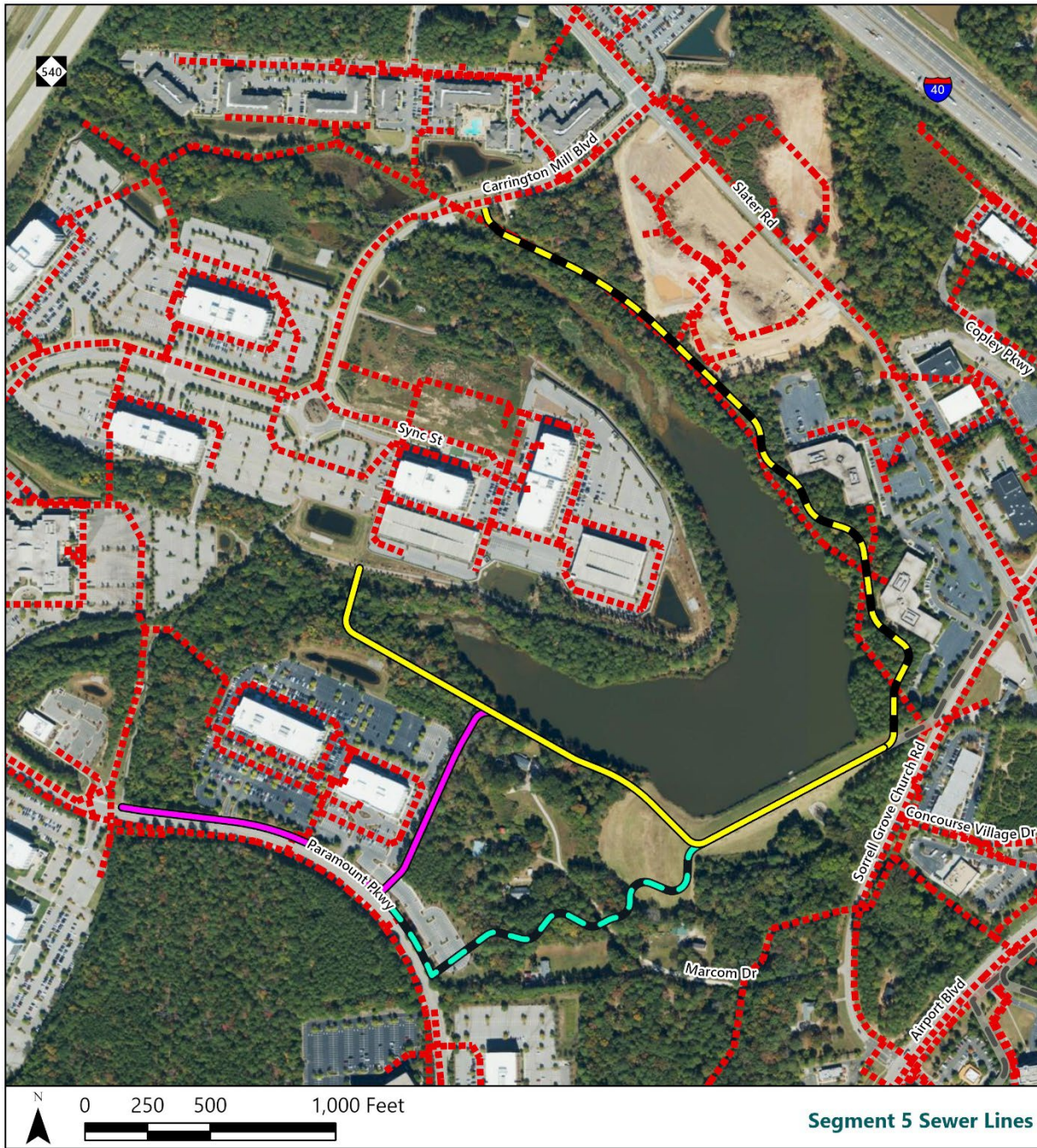
- Alternative A
- Sewer Line
- Other Alternative Sections

Segment 5 Floodplain Map



- Alternative A
- Alternative B
- Paramount Parkway Connector
- Carrington Mill Blvd Connector
- Other Alternative Sections
- Immediate Floodway
- 100 Year Flood
- 500 Year Flood

Segment 5 Sewer Lines



- Alternative A
- Alternative B
- Paramount Parkway Connector
- Carrington Mill Blvd Connector
- Other Alternative Sections
- - - Sewer Line

Appendix E. Demographic Analysis Maps.

Demographic Analysis

Demographic Analysis Approach

Reviewing the demographics of the Town and areas near the future greenway corridor provides insights into the diverse needs, preferences, and challenges of nearby residents. Understanding the characteristics of existing populations along the future greenway can help ensure that the facility is built to be accessible and can serve residents, employees, and visitors to the area.

Targeting the same characteristics that make up NCDOT’s Transportation Disadvantage Index (TDI), the study reviewed a variety of population characteristics for the greenway study area. As part of the demographic analysis, the target demographic characteristics included Black Indigenous and People of Color (BIPOC) populations, persons with one or more disabilities, Limited English Proficiency (LEP), households in poverty, zero vehicle households, and senior/youth populations. The demographic data were reviewed for the U.S. Census block groups overlapping with the half-mile study area around the Stirrup Iron Creek Greenway corridor.

Table E1 below summarizes demographic characteristics for the U.S. Census block groups overlapping with the study area as they compare to the Town of Morrisville, Town of Cary, Wake County, and North Carolina overall.

Table E1. Demographic Characteristics

Geography	Population	Average Household Income	Average Age	BIPOC Population	% of Population Experiencing Poverty	% Limited English Proficiency	% Zero Vehicle Households
Study Area- Stirrup Iron Creek Greenway	6,698	\$79,864	32.1	52.30%	4.40%	6.50%	4.40%
Morrisville	28,824	\$106,891	34.1	60.40%	4.10%	9.10%	3.00%
Cary	171,603	\$113,782	39.1	37.00%	5.70%	6.80%	2.80%
Wake County	1,112,883	\$88,471	36.7	37.50%	8.50%	5.60%	3.90%
North Carolina	10,439,388	\$67,481	39.2	30.10%	12.80%	4.60%	5.40%

Black, Indigenous, and People of Color (BIPOC Population)

The study area residents have a slightly lower Black, Indigenous, People of Color (BIPOC) population presence (at 52.3%) than the Town of Morrisville overall (at 60.4%); both of those

proportions are higher than Wake County BIPOC population (at 37.5%) and North Carolina BIPOC population (at 30.10%). The Town of Morrisville BIPOC populations are mostly concentrated near Church Street, though a high presence of BIPOC populations is also prevalent in block groups along McCrimmon Parkway and NC 540. Figure E1 highlights the location and concentration of BIPOC populations in and near the study area, at a block group level.

Population with One or More Disabilities

The Town of Morrisville has a smaller population with one or more disabilities as compared with Wake County and North Carolina overall. Block groups east of NC 54 within the study area are noted as having a higher presence of residents with one or more disabilities, as seen in Figure E2.

Limited English Proficiency (LEP)

Similar to the geographic concentration of BIPOC communities in the Town, block groups with the highest rates of Limited English Proficiency populations occur east of Church Street as seen in Figure E3. Within the study area, moderate concentrations of Limited English Proficiency population groups are located near the Town's east and northmost boundaries.

Population Aged 65+

Senior population in Morrisville, as a percentage, is lower than in the Town of Cary, Wake County and in North Carolina overall. The block groups overlapping with the study area also tend to skew younger than the Town of Morrisville overall, with a lower concentration of seniors, as illustrated in Figure E4.

Households in Poverty

Population in poverty in the study area, at 4.4%, is at a slightly higher percentage than for the Town of Morrisville overall (at 4.1%) but lower than for Wake County (8.5%) and for North Carolina overall (12.8%).

Poverty is more prevalent in the study area, as seen in Figure E5. Areas outside of Morrisville stretching into Durham County display much lower percentages of populations experiencing poverty.

Youth under the Age of 18

The study area residents appear to be slightly younger, on average, than the Town of Morrisville residents (32 vs. 34 years as the median age). The Town of Morrisville has a higher concentration of youth under the age of 18 in the south and central-west portions of the municipal boundary. This could be due in part to the number of residential neighborhoods in this section of the Town. The study area exhibits a similar presence of youth population which is higher as

compared to statewide averages. Concentrations of youth under the age of 18 populations begin to decrease outside of the study area and in more rural block groups as seen in Figure E6.

Zero Vehicle Households

The study area residents are slightly more likely than the Town of Morrisville residents overall to have access to zero vehicles (4.4% vs. 3.0%). The zero vehicle household presence in the study area, at 4.4%, is lower than for North Carolina overall (5.4%). The concentration of households that do not have a vehicle available for personal use is reflected in Figure E7.

Demographic Analysis Figures

Figures E1 through E7 on the next several pages illustrate the concentration of the target demographic groups in the study area.

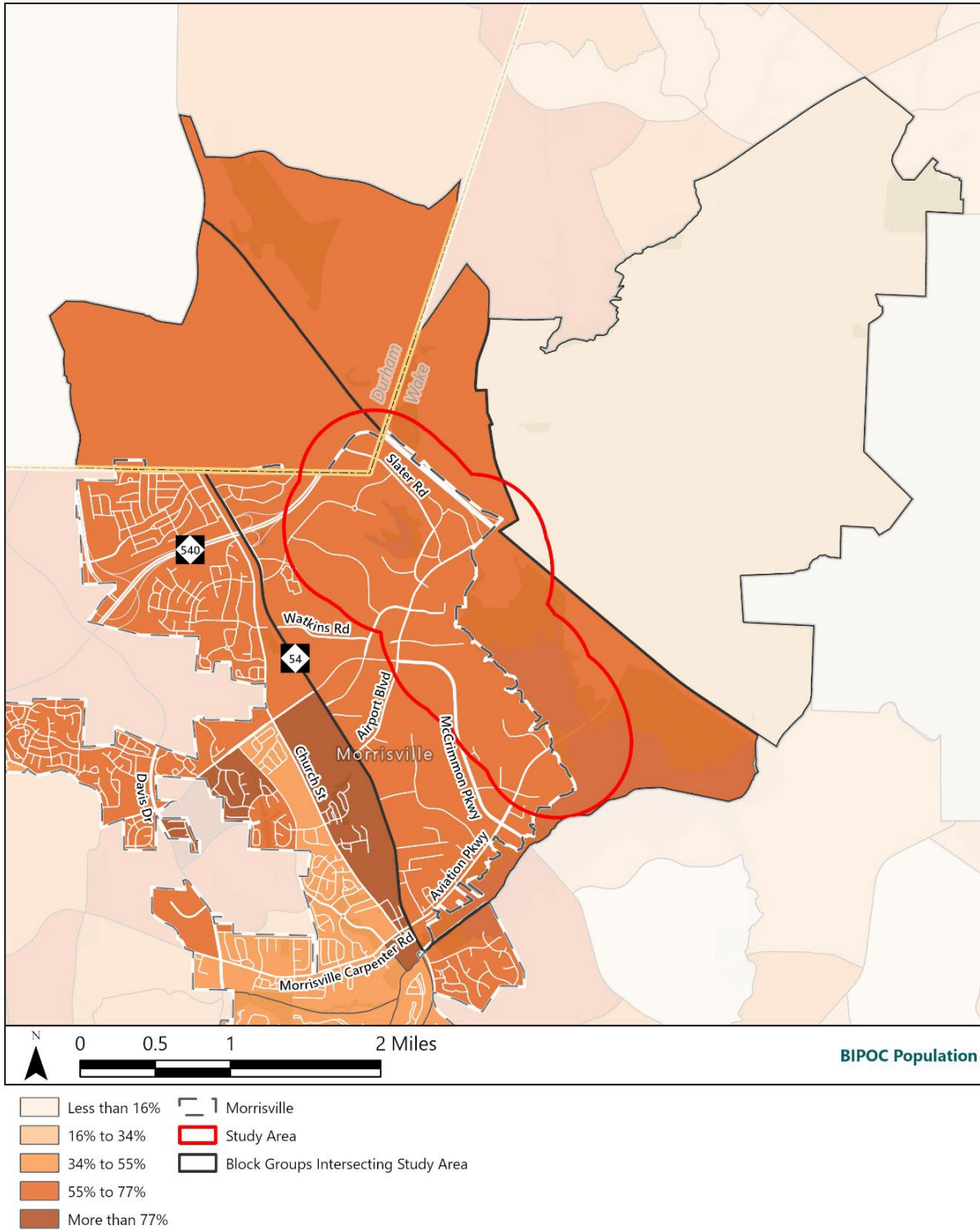


Figure E1. Black, Indigenous, and Persons of Color Populations within the Study Area.

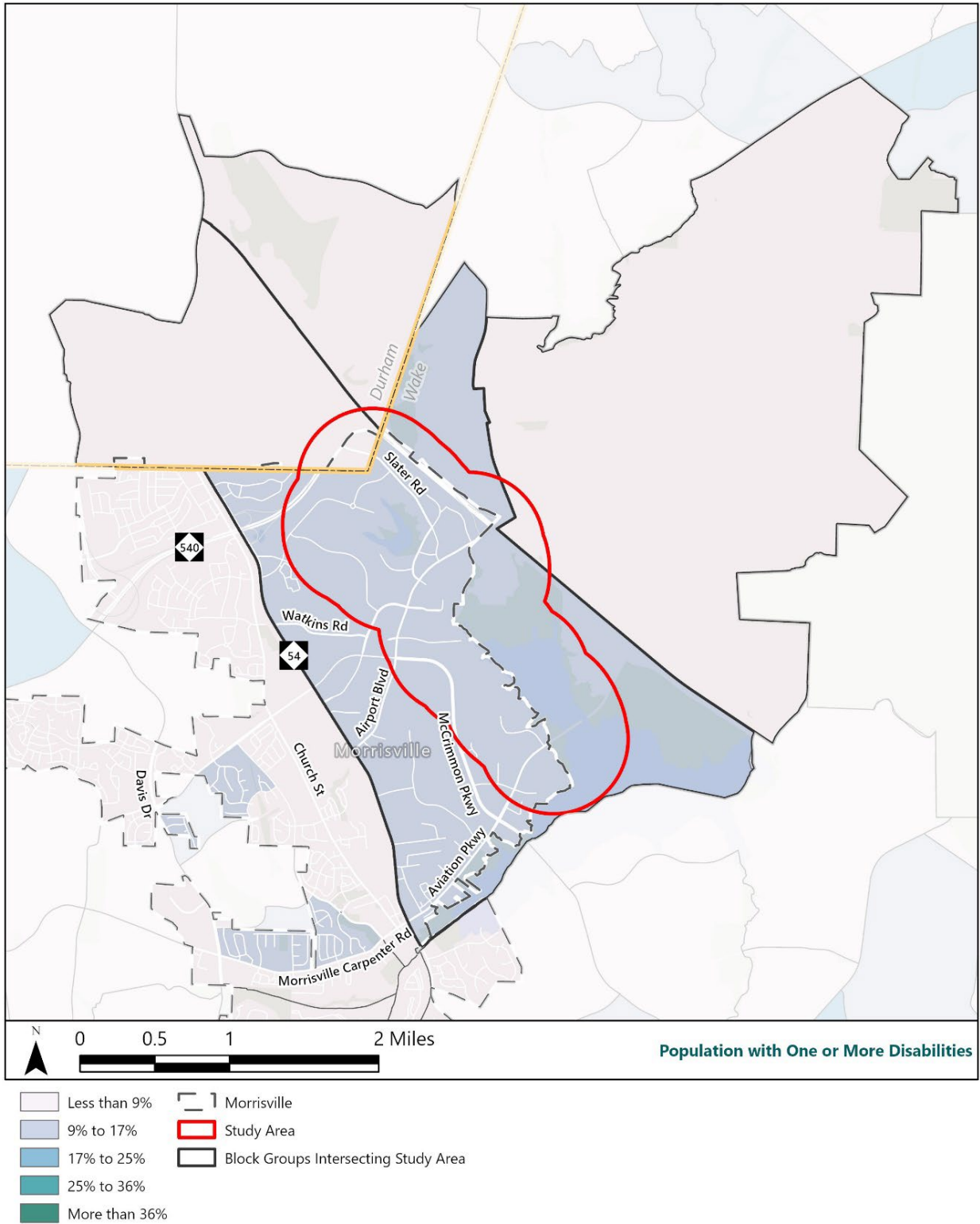


Figure E2. Populations with One or More Disabilities within the Study Area.

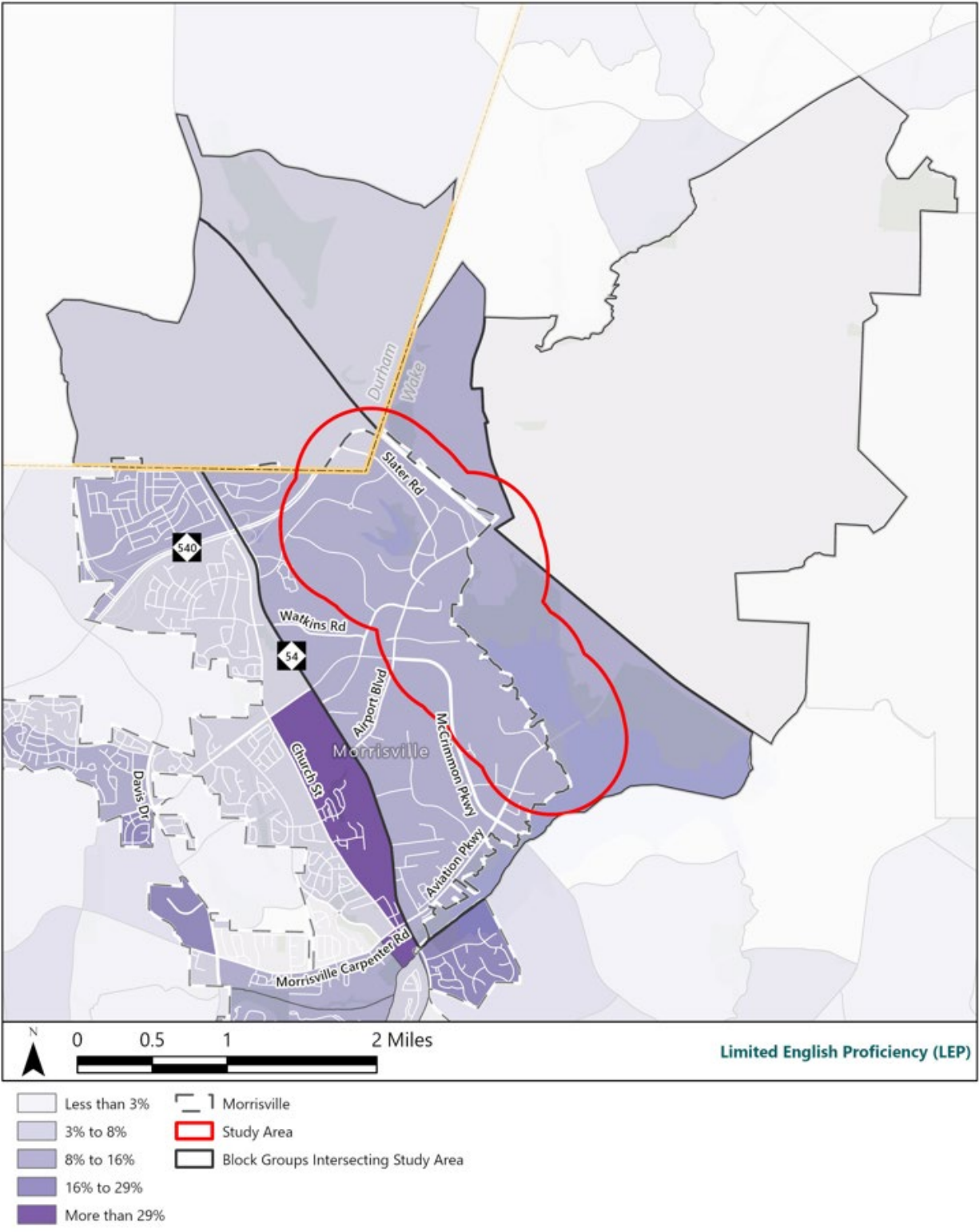


Figure E3. Limited English Proficiency within the Study Area.

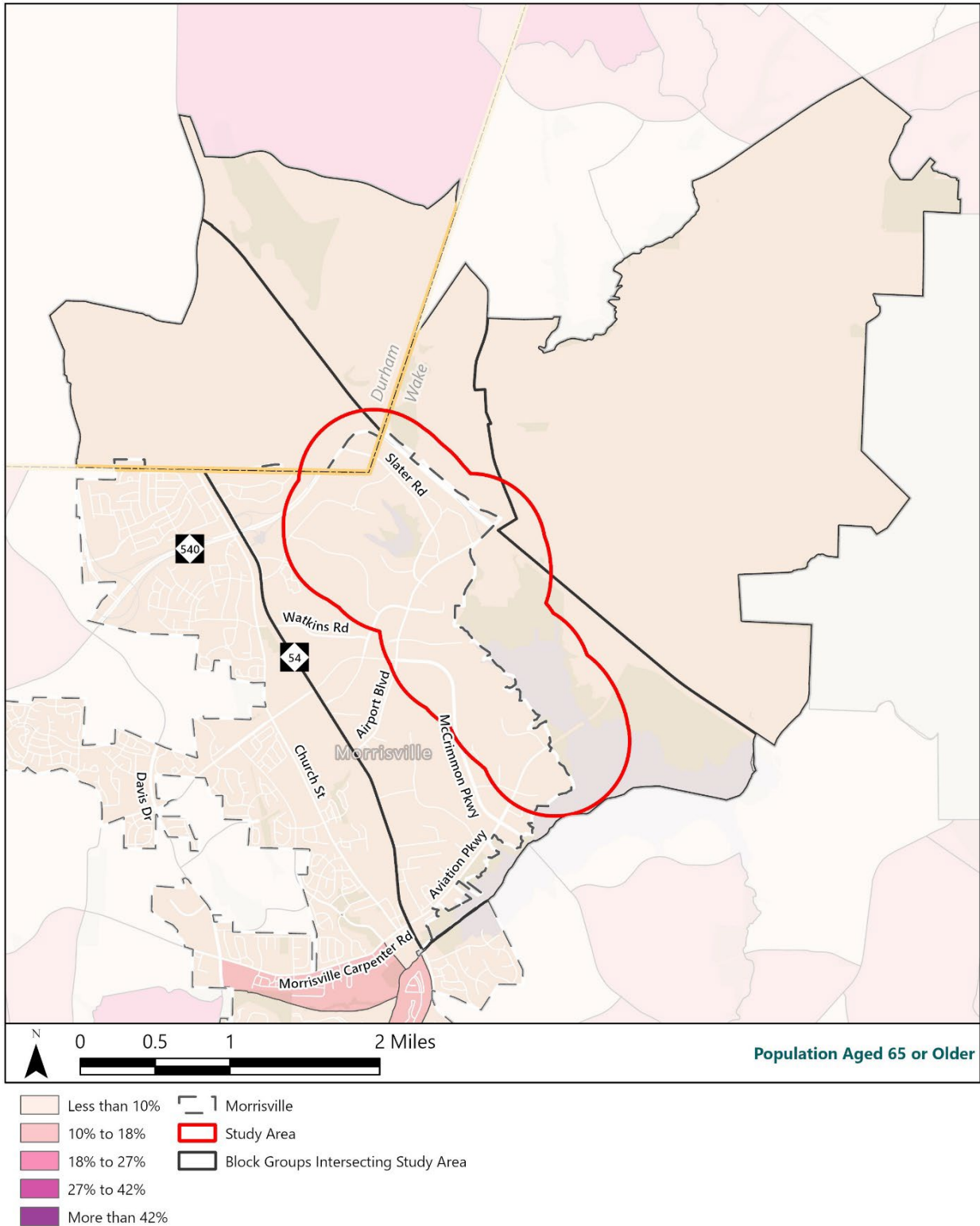


Figure E4. Senior Populations within the Study Area.

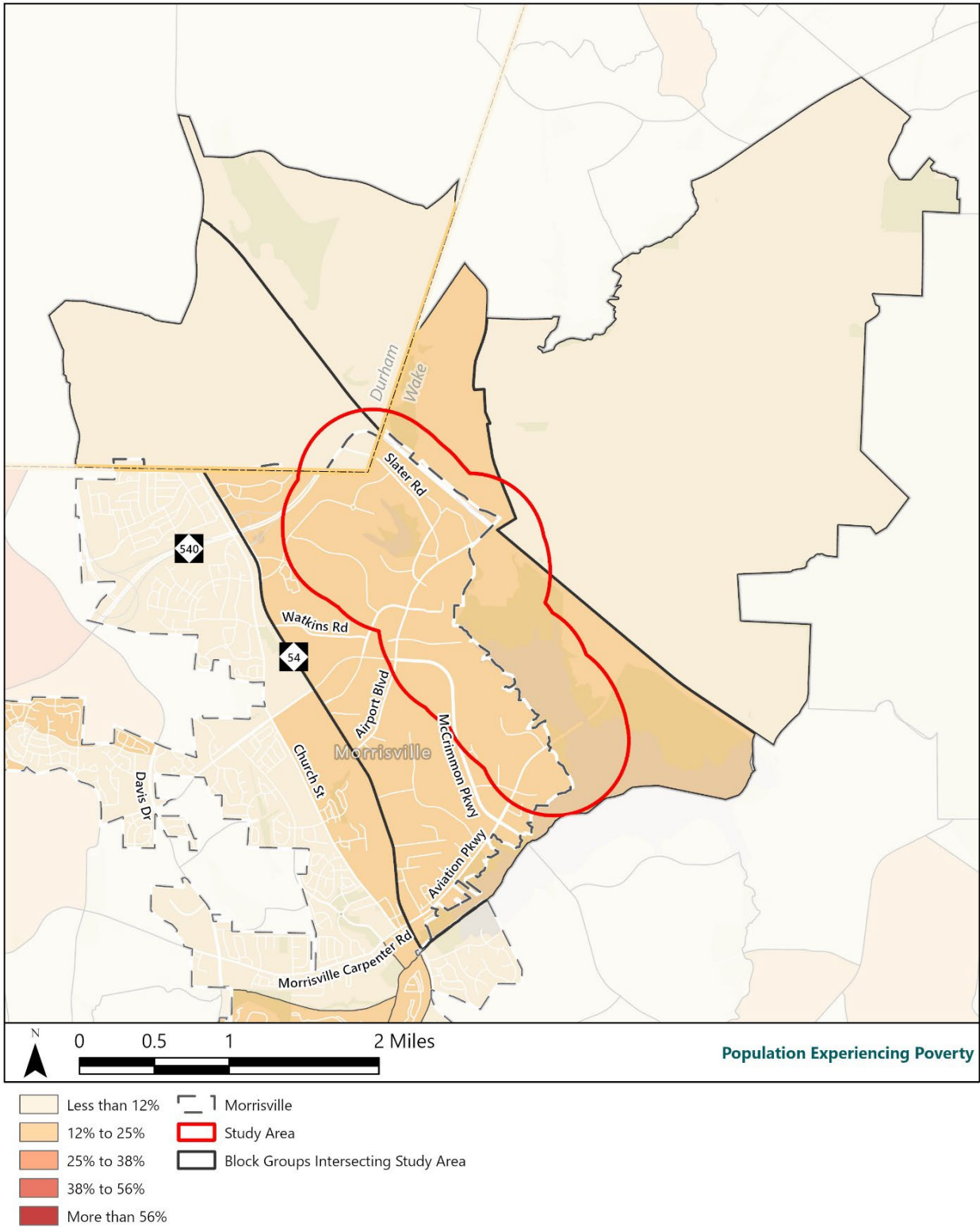


Figure E5. Populations Experiencing Poverty within the Study Area.

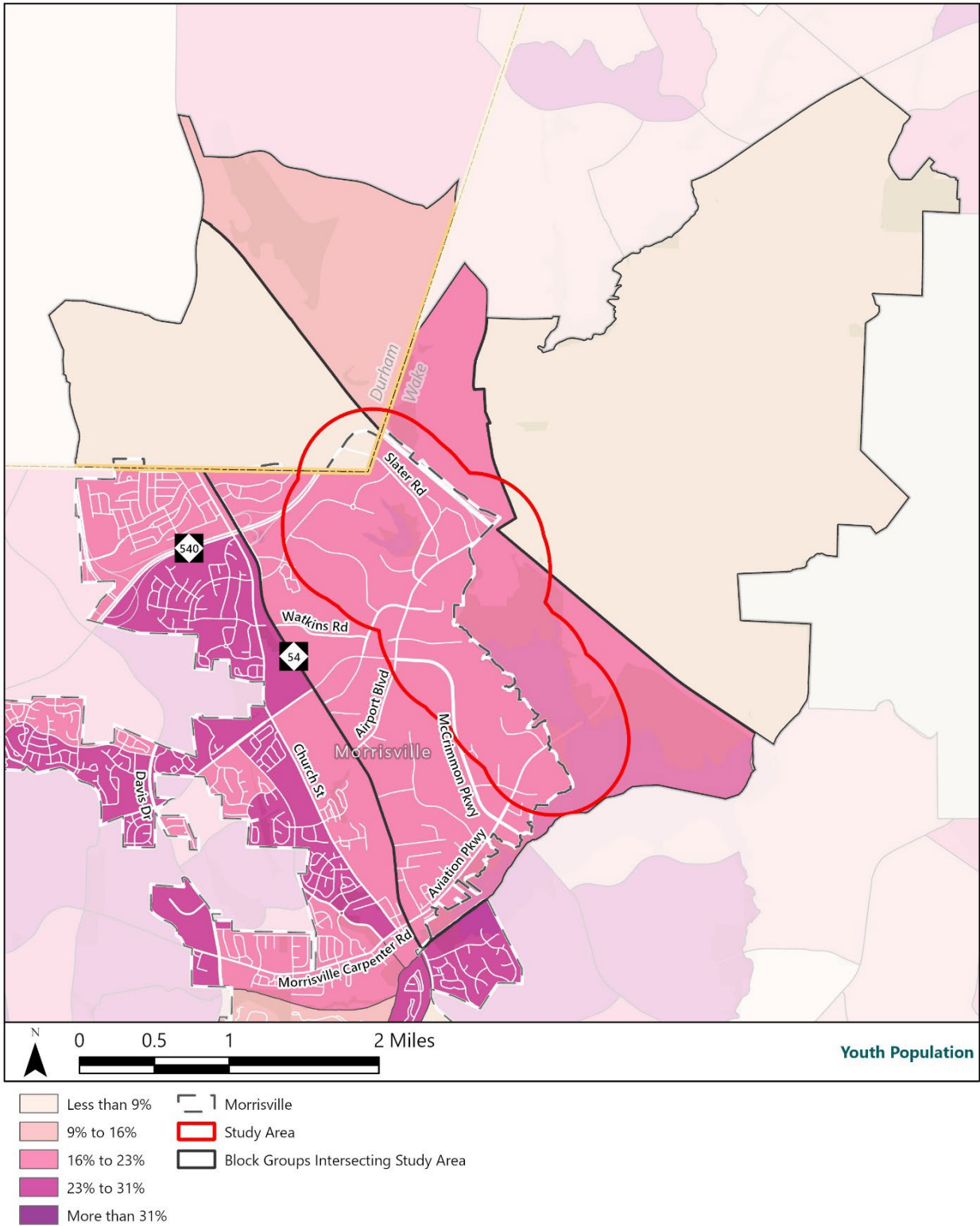


Figure E6. Youth under the Age of 18 within the Study Area

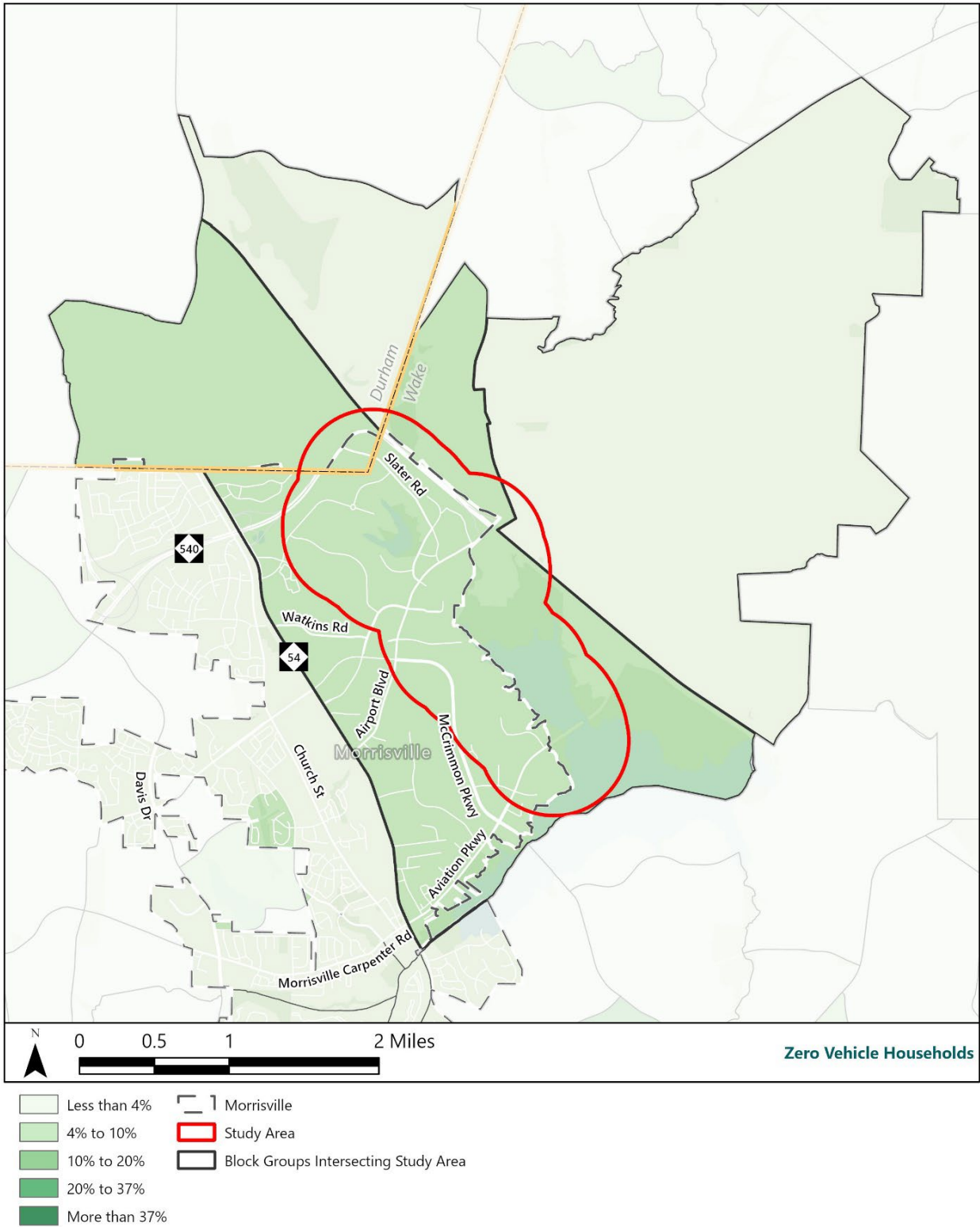


Figure E7. Households Without a Vehicle Available for Personal Use within the Study Area.