

2024



City of Hendersonville

Above the Mud Greenway

Feasibility Study



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Executive Summary



EXECUTIVE SUMMARY

The Above the Mud Greenway Feasibility Study evaluates the possibility of completing a greenway connection between the Oklawaha Greenway in Jackson Park with the Ecusta Trail. This project will complete a key connection in Hendersonville's local greenway network and the regional Hellbender system. It is called Above the Mud in reference to its proximity to Mud Creek. The project will also provide greenway access to downtown Hendersonville and the 7th Avenue Historic District.

Study Area

The study area has many constraints, which include flood hazard zones and railroad corridors. **Map 10 – Rail Corridors** (on page 45) illustrates the study area and its active and inactive rail corridors, which are owned and operated by Watco, except the Ecusta Trail line. As the City proceeds with implementing this plan, the rail lines present an unknown degree of opportunity or challenge depending on Watco's willingness to allow trail use in their right-of-way or openness to selling a portion of the right-of-way. Three potential outcomes to railroad negotiations are described below and have implications for routing:

- 1. Rail-to-Trail Option Allowed:** In this option Hendersonville would use the rail banking process to remove the rail infrastructure to repurpose the corridor with a paved greenway, similar to the Ecusta Trail.
- 2. Rail-with-Trail Option Allowed:** This option would leave the existing rail infrastructure in place. Hendersonville would construct a greenway in the rail right-of-way that is offset from the rail line and is separated by a fence.
- 3. No Encroachment Allowed:** If Watco is unwilling to allow a greenway encroachment or divest of the rail line right-of-way, Hendersonville would need to pursue options that do not use rail corridors.

Coordination with Watco will take time and their sentiment may change over time depending on future operational plans and safety

Figure 1. Survey Response Quotes



concerns. As such, alignments and greenway cross sections were developed in a manner to allow flexibility during implementation to respond to future Watco coordination outcomes.

Alternative Development

The Above the Mud Greenway Feasibility Study developed the greenway alternatives and implementation plan through the following steps:

Step 1. Review of study area conditions: Through a detailed evaluation of opportunities and constraints, the team identified numerous potential greenway segments.

Step 2. Greenway segment analysis: This step vetted the route segments identified in Step 1. This included an analysis of potential railroad responses and identified constructibility challenges. This work resulted in a short list of the most viable connections to carry forward into Step 3.

Step 3. Alternatives development and evaluation: In this step, the team combined viable segments (from Step 2) into route alternatives, established design standards, and estimated costs. Each alignment was evaluated based on criteria developed to identify the preferred alternative(s).

Step 4. Community engagement: The team obtained feedback from the study steering committee, held discussions with key stakeholders, and solicited broad community input using an online survey.

Step 5. Implementation + final study: This step identified and developed an implementation plan and funding options for the preferred alternative(s).

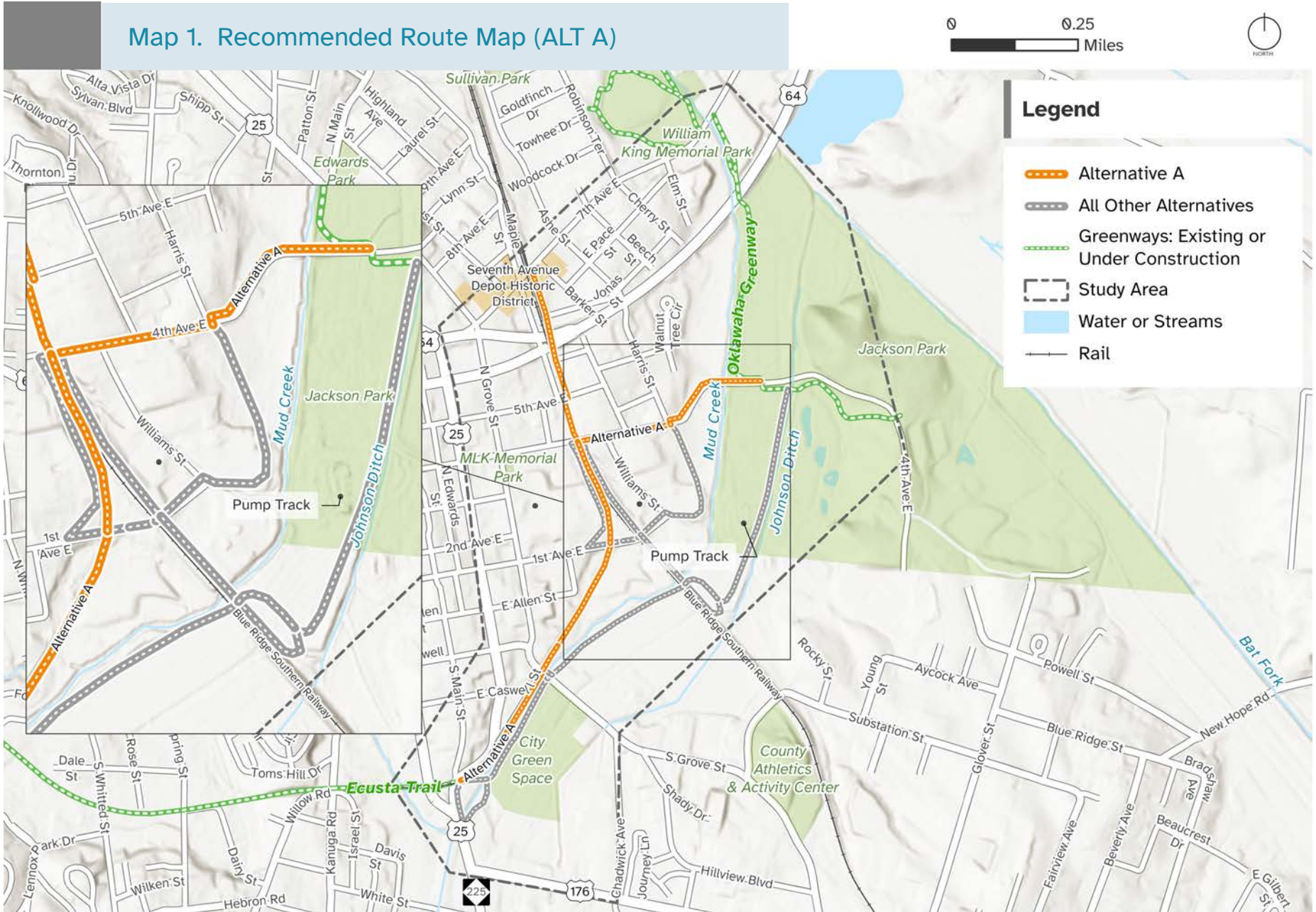
The alternatives that were developed are as follows:

- **Alternative A:** This alternative assumes the City of Hendersonville *can* acquire the remaining active Ecusta Line (owned by Watco) that extends from the Ecusta Trail north to 4th Avenue East. Alternative A would convert the remaining rail line to a paved shared use path extending to a point just north of 4th Avenue East to form an extension of the Ecusta Trail. From the end of the Ecusta Line, a sidepath along 4th Avenue East would continue east into Jackson Park to connect with the existing Oklawaha Greenway. A rail-with-trail segment is also included between 4th Avenue East and 7th Avenue East along the active Zirconia Line (owned by Watco) to the 7th Avenue Historic District.
- **Alternative B:** This alternative assumes that it is *not* feasible to convert the remaining active Ecusta Line to a greenway. From the Ecusta Trail section (under construction), Alternative B would depart from the rail bed at a point just east of South King Street and turn south to cross Mud Creek via a proposed pedestrian bridge. On the south side of Mud Creek, it would continue to the east on City-owned land, crossing South Grove Street and then following a proposed sewer easement to connect to Jackson Park as it passes under a railroad bridge. This alternative would connect to the existing Oklawaha Greenway in Jackson Park and then continue west towards downtown as a sidepath along 4th Avenue East. This alternative also includes a greenway spur between 4th Avenue East and 7th Avenue East along the Watco rail right-of-way to the 7th Avenue Historic District.

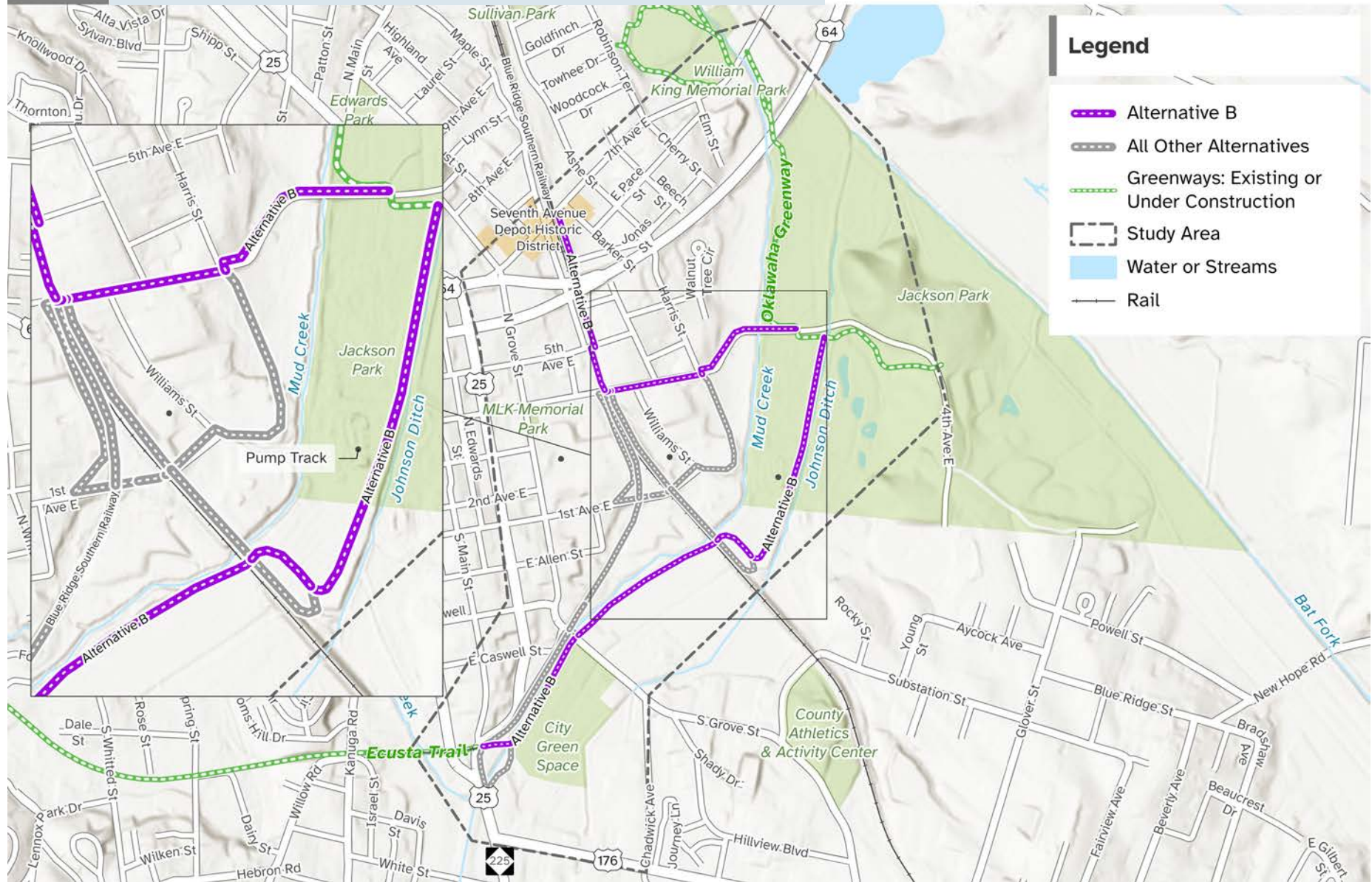
Preferred Alternative

To determine the preferred alignment(s), the team developed evaluation criteria, and gave each viable alternative a score for each of the criteria. The evaluation criteria encompassed eleven factors ranging from “aligning with community goals” to “quality of user experience”. Both Alternative A and Alternative B ranked highly and accomplish the project goals while providing slightly varied connections and user experiences. Both alternatives are recommended for advancement to implementation.

Map 1. Recommended Route Map (ALT A)



Map 2. Recommended Route Map (ALT B)



IMPLEMENTATION

Several early action implementation recommendations were identified based on the following understanding:

- Implementation of Alternative A and B will require early coordination with other partners and planned projects.
- Alternative B has elements that make it more time sensitive to build upon synergies with other projects in progress.
- Alternative A will require more time to reach an agreement with the railroad. Therefore, coordination should begin as soon as possible.

Early Action Implementation Recommendations

1. Begin coordination with Watco to negotiate railroad right-of-way purchase and/or easements as needed.
2. Work with Henderson County Parks and Recreation to develop a unified approach to the greenway sections in Jackson Park. This approach may address items such as who will fund, maintain and design the greenway in the park. This conversation may also include items such as the exact alignment of the greenway, design standards, funding and ownership/maintenance decisions.
3. Apply for design and construction funding grants and reimbursement programs (see funding section).
 Prioritization recommendations are as follows:
 - Prioritize funding for the Mud Creek Bridge: The City is conducting a floodplain restoration for the City-owned green space on South Grove Street which requires floodway modeling and permitting. A bridge over Mud Creek on this property should be incorporated into the floodway permitting and final grading for the site. As such, funding and design for a greenway bridge at this location is a high priority. If this connection is not integrated with the project, floodway permits may be challenging to acquire as a standalone project.

- Incorporate the Alternative B segment from South Main Street to Jackson Park with other City projects.
- Prioritize, or phase, remaining sections of the preferred alignments together or as smaller stand-alone projects as funding opportunities and partnerships become available.

Sections that will function as stand-alone facilities are as follows:

- **Alternative A:** Rail-to-trail conversion of remaining section of the active Ecusta Line between South Main Street and 4th Avenue.
- **Alternative A and B:** Rail-with-trail connection between 4th Avenue and 7th Avenue.
- **Alternative A and B:** 4th Avenue sidepath from the northern end of the Ecusta Line to the Oklawaha Greenway in Jackson Park.

This approach to prioritization is intended to be nimble allowing the City and greenway partners to pivot based on funding opportunities and partnerships as they arise.

Image 1. Typical Greenway Cross-Section



The greenway width should be 12 feet wide with 3 foot shoulders and a 5 foot buffer if adjacent to a roadway. In constrained locations, the greenway may be reduced to the minimum width of 10 feet wide.

Project Partnerships

Project partners will vary during implementation and may include community stakeholders, property owners along the corridor (such as Watco), the French Broad River MPO, NCDOT, Henderson County, advocacy groups, private partners, and community members. Together, these partners can collaborate on the many tasks involved in funding, designing, permitting, building, and maintaining this paved greenway.

In the end, the goal of this plan is to implement a greenway connection that is in line with Hendersonville’s City Council fiscal year 2025 goals which include a focus on strong infrastructure, investing in parks, enhancing city sustainability, and transportation planning. When completed, this project will expand the City’s multimodal transportation network, recreation opportunities, and connections to adjacent greenways and parks. In addition, it will fill a current gap in the regional greenway network, bringing the region one step closer to a complete Hellbender Trail system.

Figure 2. Key Implementation Partners





01 Introduction



OVERVIEW & STUDY GOALS

At the core of the Above the Mud (ATM) project is the goal to add to Hendersonville’s multimodal network connecting parks, neighborhoods, and other places in between as well as linking the Ecusta Trail with the Oklawaha Greenway. As part of the Great Trails State vision, this project strengthens the regional active transportation network, connecting people to key destinations and catering to the recreational needs of both residents and visitors. The City of Hendersonville and NCDOT’s Integrated Mobility Division (IMD) have funded and spearheaded this project, in collaboration with Henderson County, key stakeholders, and the community.

Figure 3 - Project Goals illustrates the four key project goals: enhance safety; expand mobility and transportation choices; elevate equity; and alleviate traffic congestion.

The Above the Mud greenway will connect Hendersonville and Henderson County’s growing and extensive network of miles-long greenways, positioning Hendersonville as a prime destination for individuals seeking active transportation and recreational pursuits. The city is on the verge of transforming into a thriving hub for multimodal infrastructure, thanks to the foresight of local government and community leaders.

Figure 3. Project Goals

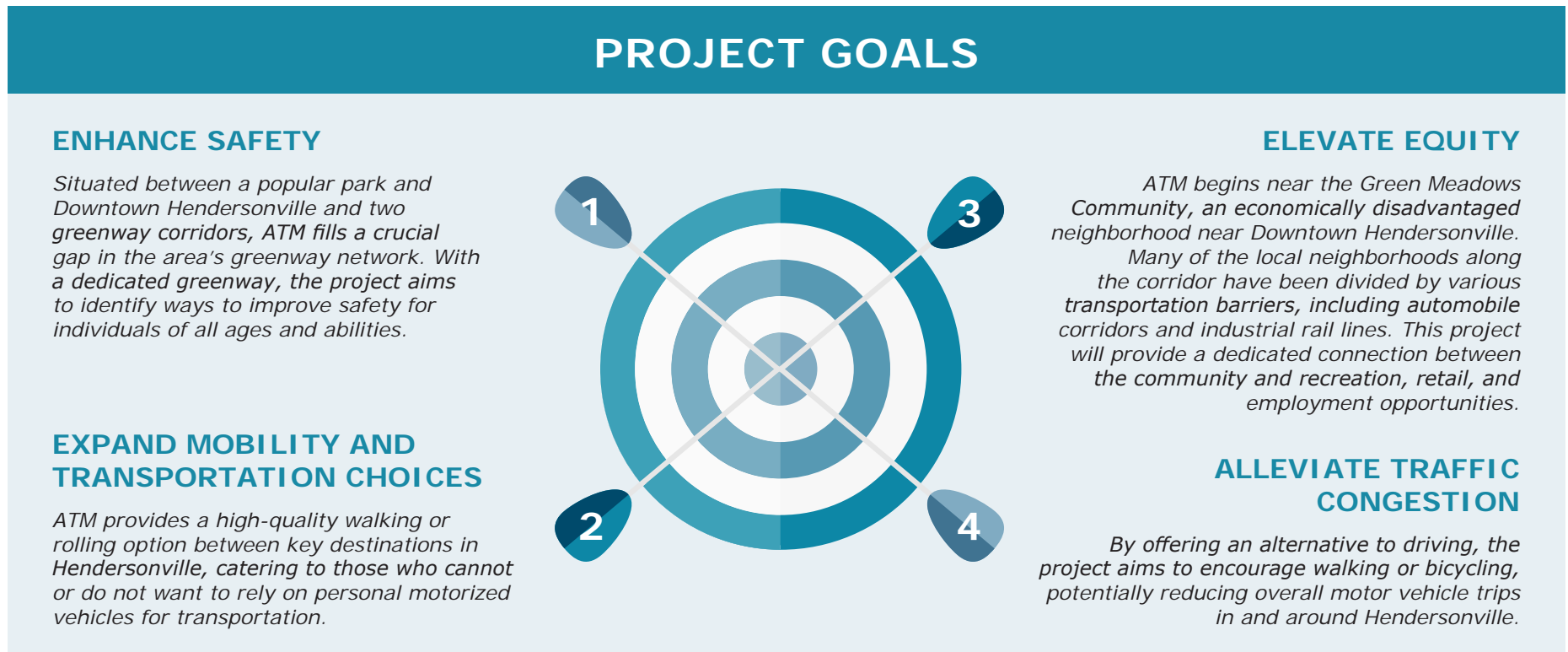
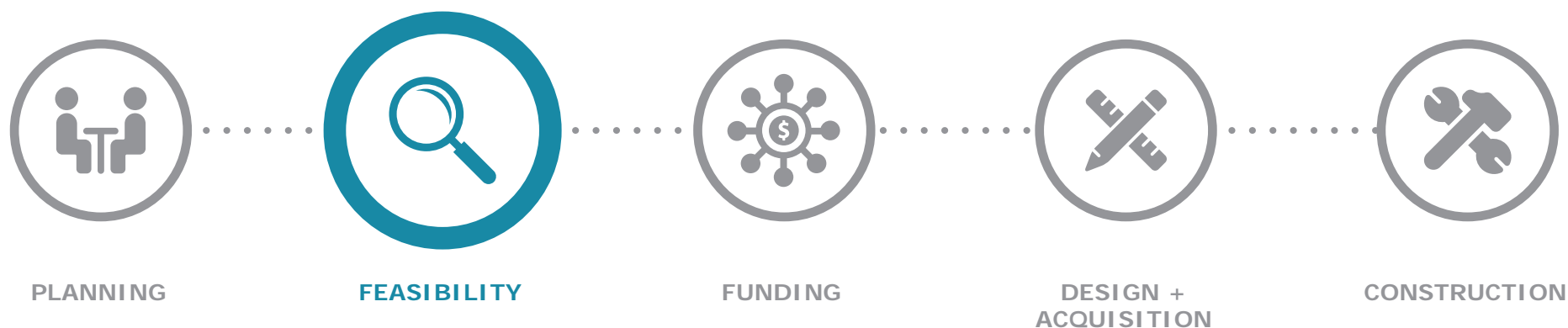


Figure 4. What Is A Feasibility Study?



WHAT IS A FEASIBILITY STUDY?

A feasibility study is a technical investigation of physical and environmental constraints that may impact the ability and/or cost to construct a new multimodal facility or upgrade existing facilities. It is a step in the process to build infrastructure that identifies key project risks that may need additional investigation before the scope and cost can be defined. Feasibility studies bridge the gap between high-level planning studies and prioritization, programming, and design.

Once completed, this feasibility study will equip the City and its partners to identify funding and work with willing property owners to determine the final design and path towards construction.

Feasibility studies include items such as:

- Input from local stakeholders and community members
- Environmental features (e.g. wetlands, threatened and endangered species, waterways)
- Physical constraints (e.g. steep slopes, buildings, and private property impacts)
- Right-of-way availability (property ownership or the ability to acquire property for facilities)
- Utilities and railroad lines

OUTCOMES

A feasibility study yields several specific outcomes, including:

Assess Possible Route Alternatives: By analyzing site conditions, the study identifies opportunities and constraints to develop various route alternatives for this new bicycle and pedestrian connection.

Identify Key Stakeholders: Engagement with project stakeholders helps shape study recommendations and establishes ongoing relationships for the project's progression into the design phase.

Estimate Project Costs: Through thorough analysis, the study calculates anticipated costs associated with designing and constructing the recommended facility, facilitating the development of a project funding plan and future programming.

Plan of Action: Based on informed assessments, the study provides recommendations for preferred route alternatives and outlines a range of potential implementation scenarios and funding sources to guide the project's progression.

BACKGROUND & SITE HISTORY

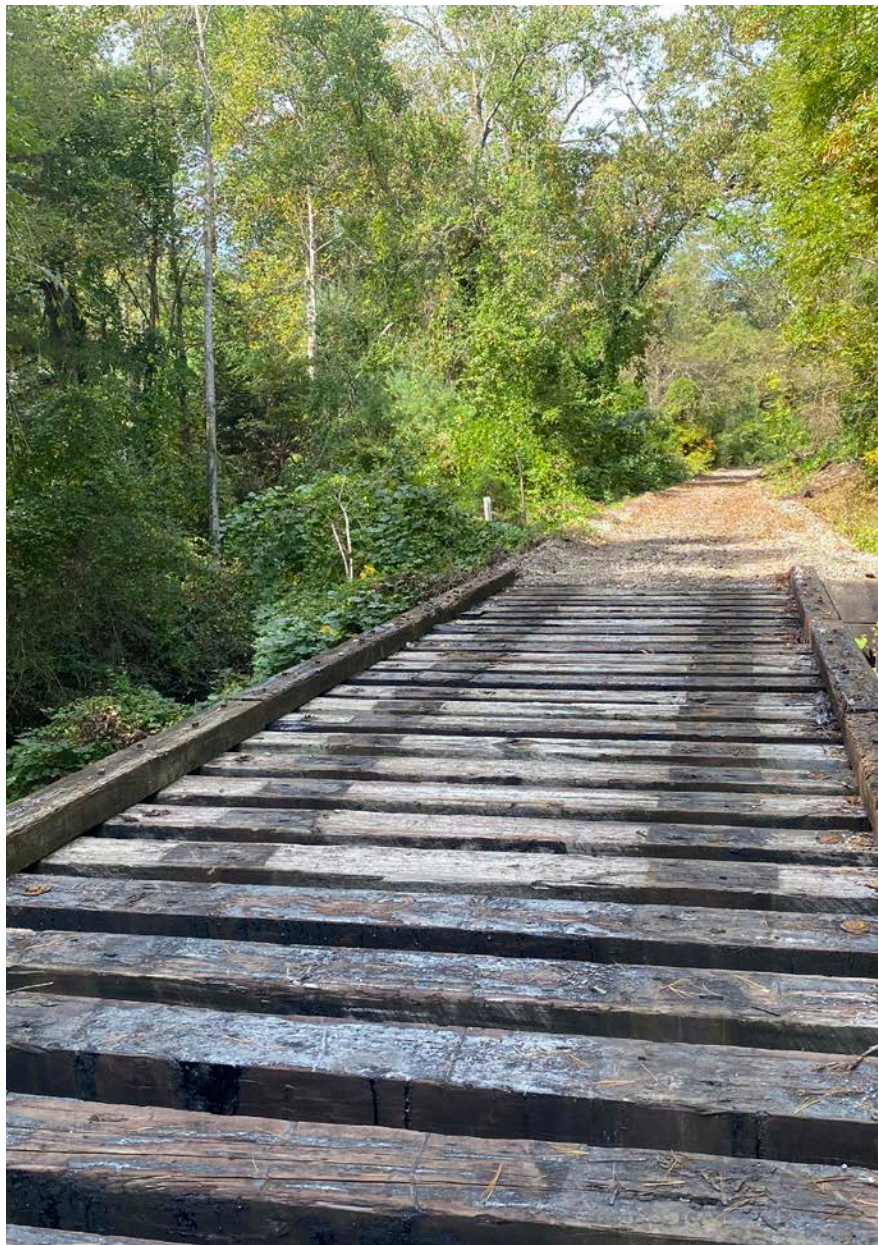
The Oklawaha Greenway is a 3.7-mile bicycle and pedestrian facility that runs north-south between the recreational facilities of Jackson Park and historic Berkeley Mills Ball Field and is one of the longest contiguous greenways in the region. The City of Hendersonville is currently designing and will soon construct the Clear Creek Greenway, a 1.3-mile extension to the northern end of the Oklawaha Greenway. The Ecusta Trail is a nearly 20-mile rail-to-trail project that, once completed, will connect the cities of Hendersonville and Brevard. It is expected to be one of the largest infrastructure projects in Henderson County history and is currently under construction. The Ecusta Trail will terminate at South Main Street in downtown Hendersonville, leaving nearly a mile gap between it and the Oklawaha Greenway.

Image 2. Oklawaha Greenway



Source: TPD

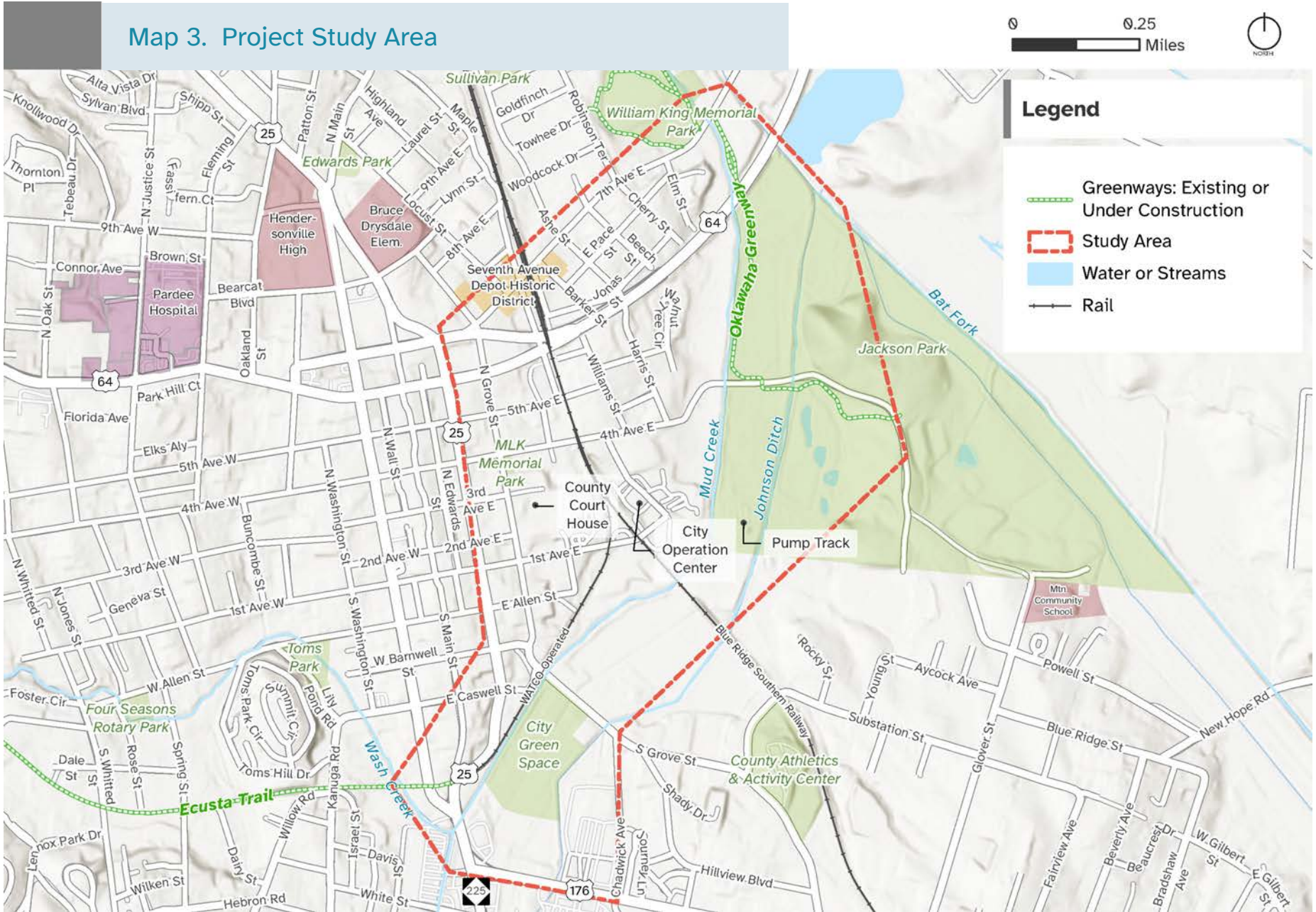
Image 3. Ecusta Trail Prior to Construction



The Above the Mud greenway feasibility study came about once efforts to develop the new Ecusta Trail rail-to-trail project intensified. It became clear that there was a need to seamlessly connect the Ecusta Trail with the Oklawaha Greenway to maximize the benefit of these greenway systems. Above the Mud is primarily a unifying link in Hendersonville's active transportation network and will simultaneously create a cross-municipality transportation and recreational space for residents and visitors. The system is a key connection in the French Broad River Metropolitan Planning Organization's Hellbender Trail Plan and NCDOT State Great Trails Plan. The study area, showing the gap between the Oklawaha and Ecusta Trails, is visually represented in **Map 3 – Project Study Area**.

Source: TPD

Map 3. Project Study Area



PROCESS & SCHEDULE

The development of recommendations within this study benefits from the guidance of a locally appointed steering committee, ensuring that the collective vision aligns with the needs and aspirations of the community. Input from diverse sources, including community members, landowners, and various interested parties, has played a role in shaping these recommendations.

The study began in June of 2023 and concluded in June 2024. The City of Hendersonville identified a project steering committee to guide the process with their local knowledge and provide input for key decisions.

There are four primary phases of the study, as illustrated in **Figure 5 - Project Process & Schedule**.

STUDY CONDITIONS

Data collection, site visit and field work, and mapping exploration and analyses.

ROUTE ANALYSIS

Identification of route alternatives, route selection criteria and decision matrix, and stakeholder meetings.

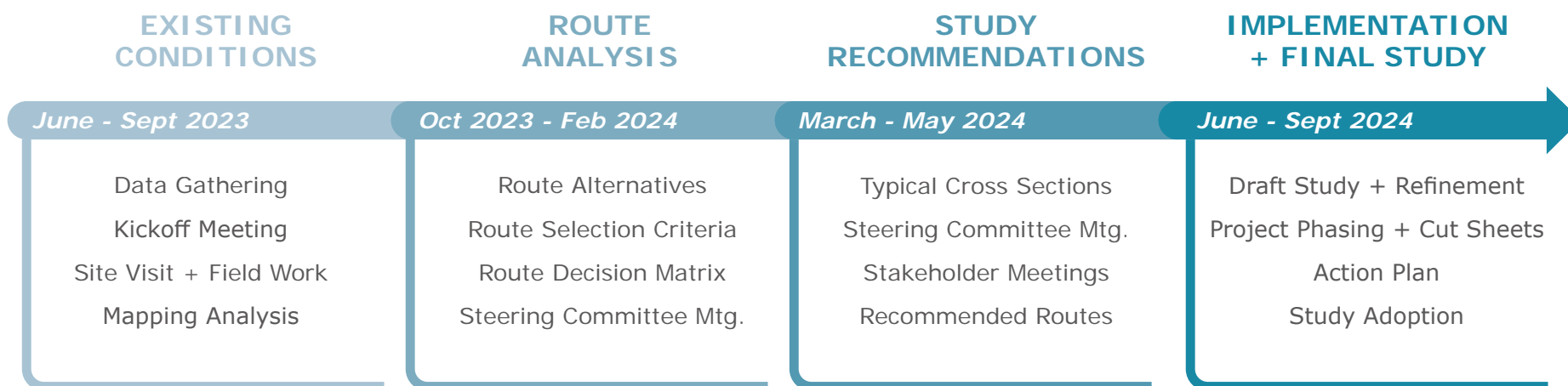
STUDY RECOMMENDATIONS

Identification of recommended routes, design considerations, and continued stakeholder meetings.

FINAL STUDY & IMPLEMENTATION

Creation of project phasing and cutsheets, draft study and refinement, action plan and study adoption.

Figure 5. Project Process & Schedule



PREVIOUS PLANS & EXISTING POLICIES REVIEW

Reviewing previously adopted plan documents in a community is helpful to understand desires and project ideas. The Appendix provides the full review of relevant plans. The plans reviewed include:

- FBRMPO 2024-2033 Transportation Improvement Plan (2024)
- Gen H 2045 Comprehensive Plan (2024)
- Walk Hendo Pedestrian Plan (2023)
- NCDOT Roadway Design Manual (2023)
- Ecusta Trail 100% Designs (2023)
- Above the Mud Greenway Project (2022)
- Mud Creek Greenway Feasibility Study (2021)
- FBRMPO The Hellbender Trail Plan (2020)
- Henderson County Oklawaha Greenway Extension (2019)
- NCDOT Complete Streets Policy (2019)
- Henderson County Greenway Master Plan (2019)
- Hendersonville Bicycle Plan (2018)
- FBRMPO Blue Ridge Bike Plan (2013)
- Ecusta Rail Trail Planning Study & Economic Analysis (2012)
- Park and Greenspace Master Plan (2011)

The City of Hendersonville, Henderson County, and regional partners have a strong legacy of multimodal planning as evidenced by the number of plan documents that relate to multimodal topics in the city, all of which are described below. These plan documents offer a foundation on which to develop the Above the Mud Greenway.

Frequent themes throughout the plan documents are connecting parks, neighborhoods, and destinations; expansion of existing greenway systems; and connecting to a regional system of greenways. The Above the Mud Greenway was identified in the Mud Creek Greenway Feasibility Study, the City's

Image 4. Existing Plan Cover Pages



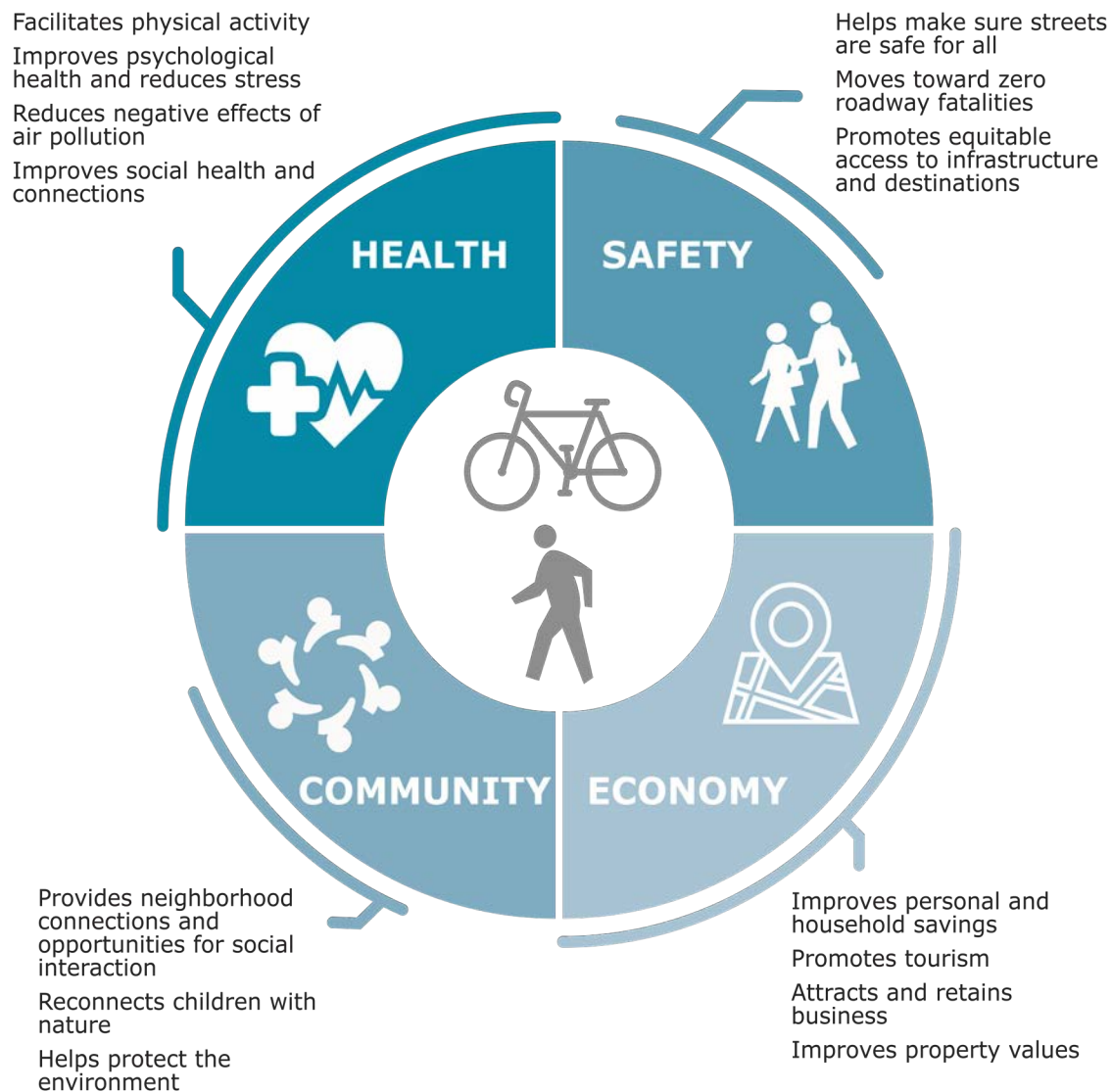
Comprehensive Plan, the 2012 Ecusta study, the City's 2022 RAISE grant proposal, and in the Hellbender Trail Plan. Since the Ecusta Trail does not connect directly to the Oklawaha Greenway as part of that project's rail-to-trail development, a gap in connectivity remains. The Above the Mud feasibility study is needed to examine all possible alignments to produce the most effective means to connect the two greenways and complete the Great Trails State network within Henderson County.

PROJECT BENEFITS

Linking two core greenways in the city – the Ecusta and Oklawaha – will enhance mobility, transportation choice, and recreation in the city and region.

Creating a greenway system in this way can benefit the safety and health of the community. The following describes how walking and biking infrastructure, like greenways, benefits our safety, health, economy, and community.

Figure 6. The Many Benefits of Bicycle & Pedestrian Infrastructure



The positive impact of WALKING & BIKING



Estimated 60,000 pedestrians were injured nationwide in 2021.¹



More than 7,388 people (an average of nearly 21 per day) nationwide were struck and killed while walking in 2021.¹



Approximately 17% of all traffic fatalities in the U.S. in 2021 were pedestrians, a rate that has been increasing over time (up from 14% in 2012).²



Hendersonville rated #1 (highest rate) for pedestrian fatalities and severe injuries.*

*Based on crash data from 2010-2019 and including pedestrians killed or severely injured in cities with populations between 10,000 and 25,000 in North Carolina. *This is the highest rate per capita in the state.*³

265

people killed while walking in North Carolina in 2022 (a 3% increase from 2021).³

Despite the disruptions caused by the COVID-19 pandemic to various facets of daily life, one persistent trend remained unchanged: the rise in pedestrian fatalities. Despite a decrease in driving during 2020 due to the pandemic, pedestrian deaths increased by 4.7% compared to the previous year.

While walking and bicycling comprises a smaller portion of total trips compared to other modes of transportation, people who walk and bike disproportionately bear the burden of traffic fatalities. Referred to as vulnerable users of our streets, pedestrians and bicyclists face a heightened risk of severe injury when involved in collisions with automobiles. Often lacking dedicated infrastructure, they are forced to navigate in unsafe conditions, such as alongside shoulders or roads shared with much faster vehicles. These conditions can make walking and bicycling intimidating or hazardous, leading to decreased levels of active transportation and a greater reliance on private vehicles among those who can drive, or increased vulnerability, isolation and unmet needs for those who cannot.

Investing in dedicated infrastructure and promoting road safety education are steps communities can take to mitigate their risks pedestrians and bicyclists face. Everyone benefits when a community designs transportation systems that prioritize the safety of the most vulnerable users.⁴ Investments in sidewalk, bike lane, and greenway infrastructure yield positive safety outcomes for all roadway users by establishing separate spaces for different modes of travel, thereby minimizing speed differentials and conflicts.

The positive impact of WALKING & BIKING

+ HEALTH

5

Reasons to Walk & Bike

Walking or bicycling for as little as 20 minutes a day has been found to show significant improvements in your overall health, including:



Improving cardiovascular health



Strengthening muscles & bones



Increasing focus, mood & memory



Boosting immune system function



Preventing & managing common health problems

Developing a walkable environment, as Hendersonville is endeavoring to do, can encourage incremental increases in physical activity, such as walking to school or substituting short driving trips with walking. These small changes can yield significant public health benefits, particularly for individuals who are currently inactive.

According to the Centers for Disease Control and Prevention (CDC), adults can derive substantial health benefits from as little as 20-25 minutes of physical activity per day, with even greater benefits achieved with 40-45 minutes of daily activity.⁵ Despite these recommendations, only half of adults in the US currently meet the recommended levels of physical activity.⁶ For children, the target should be around 60 minutes of physical activity per day. Walking and bicycling have been proven to yield numerous health benefits for the brain, heart, and overall physical health, including a reduction in chronic diseases such as heart disease and certain cancers.⁷

Increased physical activity has been demonstrated to slow down the aging process in the elderly, reduce the risk of falls, prevent osteoporosis, and delay the onset of cognitive decline. In children, physical activity has been linked to improved attention, memory, enhanced learning capacity, reduced risk of depression, and improved bone health.⁷ Whether for transportation or recreation, walking and bicycling contribute to active lifestyles that foster these health outcomes.

The positive impact of
WALKING & BIKING

 **ECONOMY**



Greenway users' annual expenditures supported an additional **43 jobs, \$1.3 million in employee compensation, and \$4.9 million** in gross business revenues.¹²



A recent study estimated that **every \$1.00 invested** in greenway construction resulted in approximately **\$1.72 in annual benefits**, including local business revenue, sales tax revenue, and health and transportation-related benefits.

**1.5X
to 3X
MORE**

economic benefit

generated for a dollar spent at an independent business compared to spending that same dollar at a retail chain.¹³

13:1

13:1 benefits vs costs

Recent studies on the economic benefits of walking interventions show an average benefit-to-cost ratio of 13:1.¹⁴

Several studies conducted in North Carolina have underscored the significant economic benefits associated with investments in bicycle and pedestrian infrastructure. For example, research conducted by the Institute for Transportation Research and Education (ITRE) highlighted the economic benefits of greenways, including enhanced property values and increased spending on recreational activities such as dining, equipment purchases, and accommodations.⁸

Research has indicated that well-designed non-motorized transportation enhancements can stimulate local business activity.⁹ Pedestrians tend to notice storefront displays, explore multiple shops, and spend more time in areas with pedestrian-friendly infrastructure, leading to potential increases in sales. Studies have shown that the availability of outdoor recreation, including greenways, is a key factor for businesses when deciding where to locate. For example, a study by the Urban Land Institute noted that businesses are drawn to places with strong recreational amenities as they help attract and retain top talent. By prioritizing and promoting walkable and bikeable communities, we create an environment conducive to the success of independent businesses, thereby bolstering economic growth and strengthening the local economy.¹⁰

Furthermore, robust active transportation networks have the potential to attract tourists seeking outdoor recreational opportunities and walkable downtown areas. Investments in greenways not only improve the quality of life for residents but also contribute to job creation, higher wages, and increased business output for outdoor recreation-related industries and nearby establishments. Thus, investing in bicycle and pedestrian infrastructure not only promotes healthier and more sustainable modes of transportation but also yields tangible economic benefits for communities.¹¹

The positive impact of WALKING & BIKING

COMMUNITY



+3.1 friends per person

Residents of a street with 2,000 vehicles per day have three times as many friends as one with 16,000 vehicles.¹⁶



Residents of highly walkable, mixed use neighborhoods exhibited at least **80% greater levels of four indicators of social capital** (knowing neighbors, sociability, trust and political participation) than those in less walkable neighborhoods.¹⁷

“If you plan cities for cars and traffic, you get cars and traffic. If you plan for people and places, you get people and places.”

- Fred Kent, Project for Public Spaces

Improving walking and biking infrastructure within communities not only enhances quality of life but also ensures equitable access to essential services and opportunities for all individuals, regardless of their circumstances or preferences. By prioritizing and supporting a diverse range of transportation options, we empower individuals to choose how they navigate their surroundings, fostering a vibrant and inclusive place where everyone can thrive.

Research also suggests that individuals living in walkable and bikeable communities tend to exhibit higher levels of trust in their neighbors, actively participate in community initiatives, and volunteer more frequently compared to those in less walkable and bikeable areas.¹⁵

Furthermore, transitioning more trips from motor vehicles to walking or biking helps alleviate traffic and parking congestion in communities. As traffic diminishes, conditions for walking and biking improve, making these modes of transportation more appealing and accessible.

Greenways play a role in supporting the natural environment. They contribute to enhancing air quality by effectively reducing harmful pollutants such as ozone, sulfur dioxide, carbon monoxide, and airborne heavy metal particles. Additionally, greenways can aid in improving water quality by serving as natural buffer zones, protecting streams, rivers, and lakes from pollutants, preventing soil erosion, and filtering out contamination resulting from agricultural and road runoff. Moreover, greenways serve as a protective barrier against natural disasters like flooding by protected open space.

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ENDNOTES

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- 17 *Making the case for investment in the walking environment: A review of the evidence, by Danielle Sinnett, Katie Williams, Kiron Chatterjee and Nick Cavill. 2011*



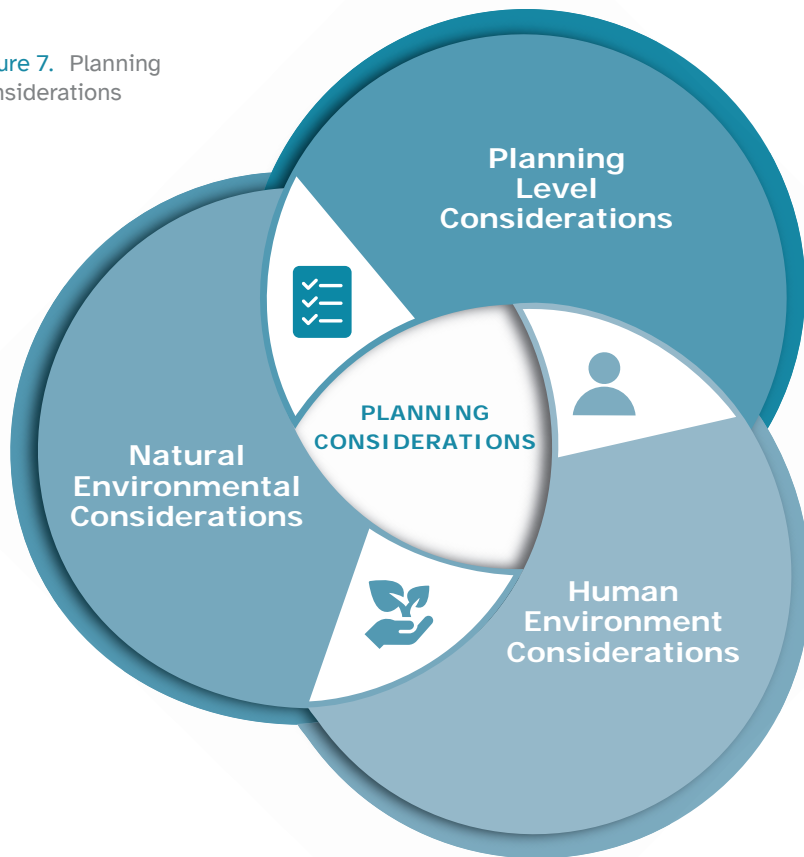
02 Study Considerations + Alternatives Development



INTRODUCTION

The focus of this chapter is on the natural environment, human environment, and planning considerations that define the study area. The natural environment includes water bodies (such as streams and floodplains) and land features (like topography), while the human environment encompasses human-made settings like urban areas and rail. Planning considerations entail the specifics that characterize the community and its people (such as age and race). Understanding this framework is important because each consideration shapes this study's project approach and recommendations.

Figure 7. Planning Considerations



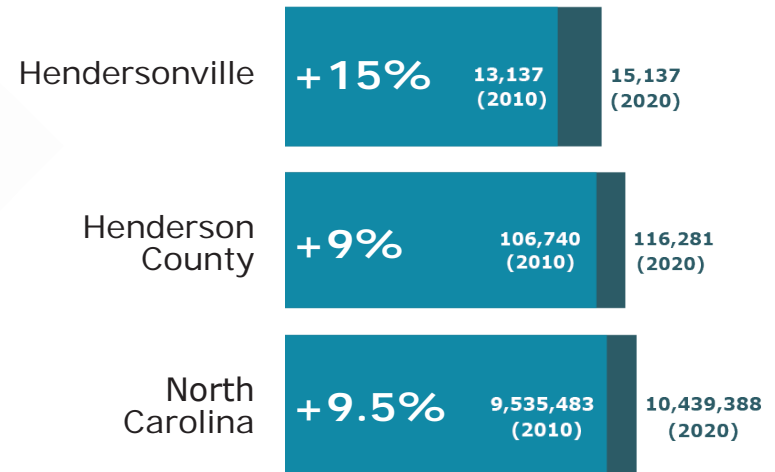
PLANNING LEVEL CONSIDERATIONS

To understand the current community profile, the project team used data from the U.S. Census Bureau's 2020 Decennial Census and the 2018-2022 American Community Survey for the City of Hendersonville, Henderson County, and North Carolina. In certain instances, comparing data from the study area with that of the county and state can be insightful. These findings played a role in shaping the project's focal points and criteria for evaluating route alternatives. Planning level considerations can be found in the following narratives, figures, and maps.

Population

Between 2010 and 2020, the population in the city increased by 15%; this change was greater than that of the county (9% growth) and the state (9.5% growth). This indicates that the city is growing at a relatively fast rate.

Figure 8. Population Growth



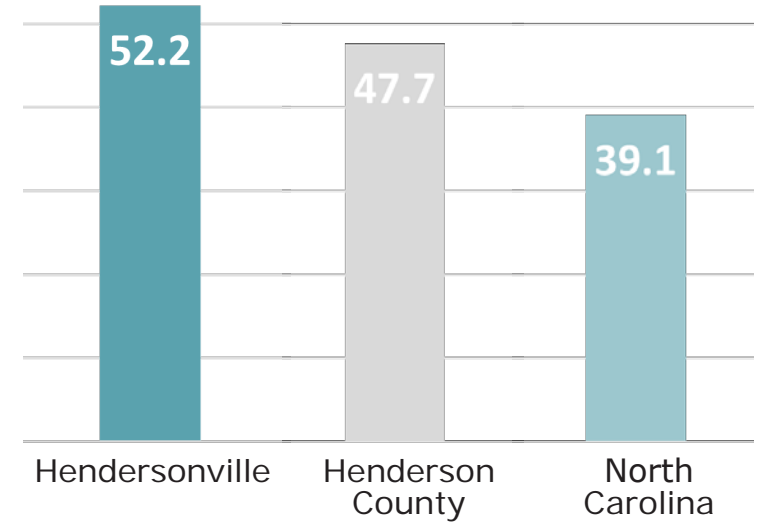
Data Source: U.S. Census 2020 Decennial Census

Age Groups

There are clear age differences between the city and county when compared to the state. The median age in Hendersonville is 52 whereas the median age in North Carolina is 39. Relative to the state, both Hendersonville and Henderson County have a smaller population of residents under the age of 49. In the 50–54 age group, the spread in ages levels out, where this age group represents just over 6% of the population in the city, county, and state. From ages 55 and over, the trend reverses and the city and county has more population in these older ages than the state. This gap is significant in the 70–75 age group where the population in the city is 7.5% while the state is 3%.

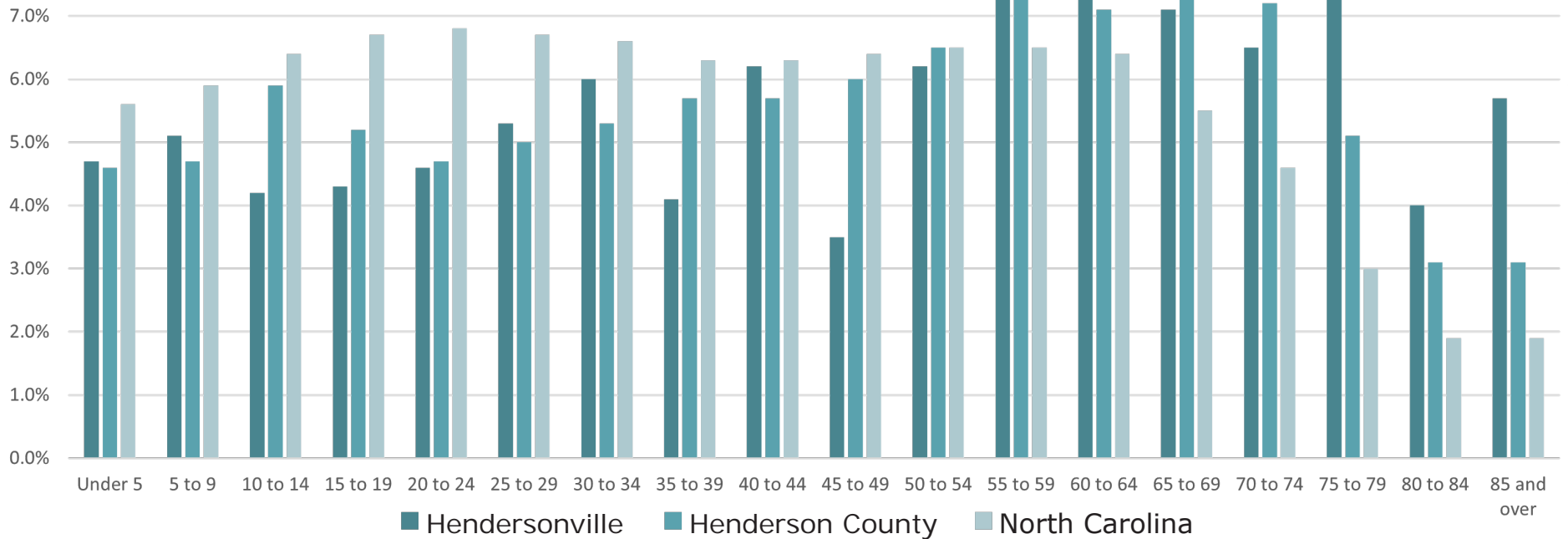
Understanding these age disparities is essential for tailoring transportation and pedestrian infrastructure to meet the mobility needs of different age groups, especially older adults.

Figure 9. Median Age



Data Source: U.S. Census 2018-2022 American Community Survey 5-Year Estimates

Figure 10. Total Population by Age



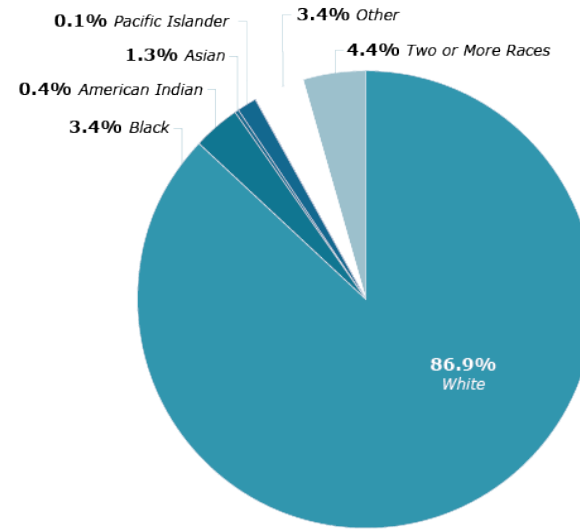
Data Source: U.S. Census 2018-2022 American Community Survey 5-Year Estimates

Diversity

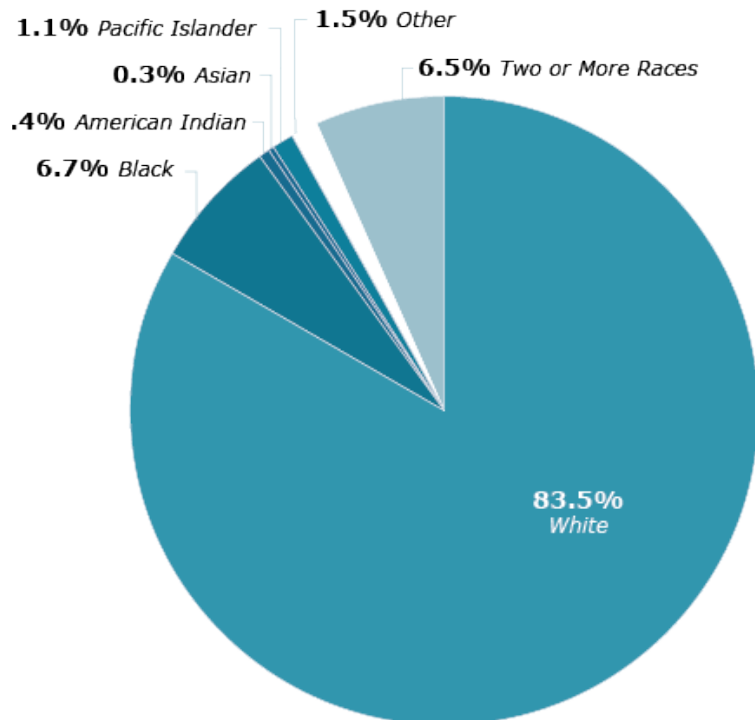
The ethnic and racial diversity in the city area is slightly more than the County, but less diverse than the state. The city area has a population that is 16.5% non-white, compared to 13.1% people who consider themselves non-white in the county and 35% people who are non-white in the state. Fifteen percent (15%) of people identified as Hispanic or Latino in the city of Hendersonville.

Figure 11. Racial Composition

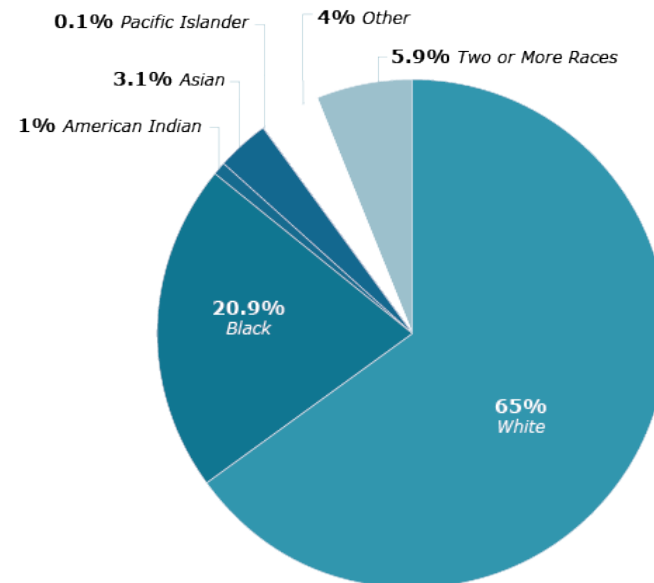
Data Source: U.S. Census 2020 Decennial Census



Henderson County



Hendersonville

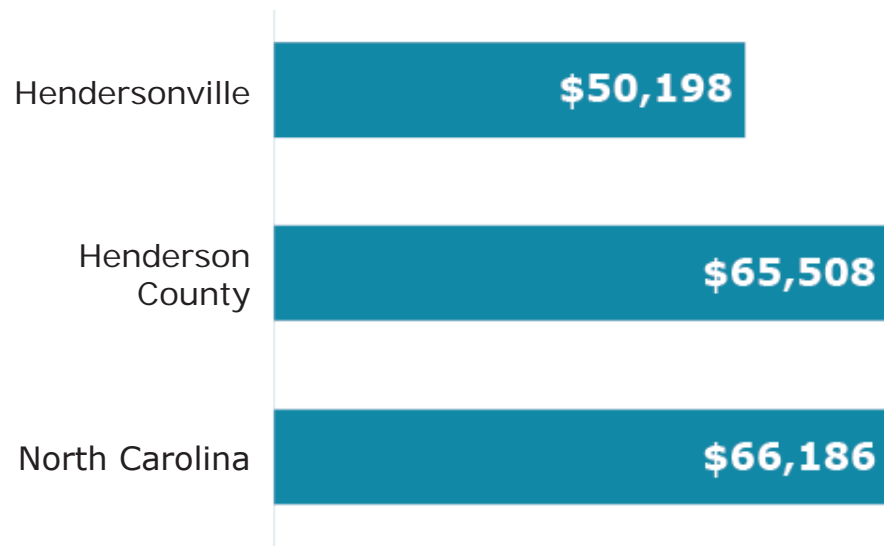


North Carolina

Household Income & Poverty

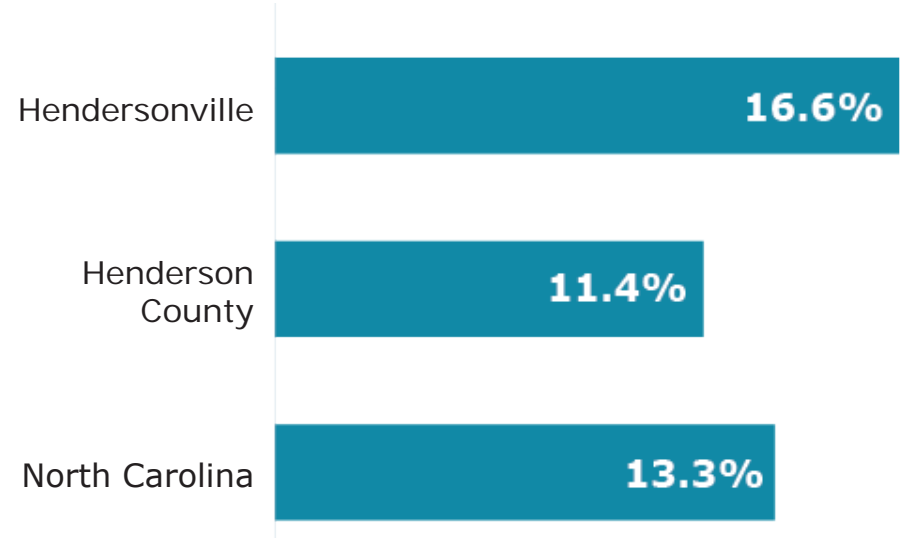
With a median household income of \$50,198, the city has less wealth than the county (\$65,508) and the state (\$66,186). The population of households with income below the poverty line is highest in the city when compared to the other geographies: 16.6% of city households live below the poverty line compared to 11.4% in the county and 13.3% in the state. Connected, high-quality multimodal transportation networks such as the Above the Mud Greenway can help households offset the burden of transportation and housing costs which can consume more than half of monthly incomes.

Figure 12. Median Household Income



Data Source: U.S. Census 2018-2022 American Community Survey 5-Year Estimates

Figure 13. Households Below the Poverty Level

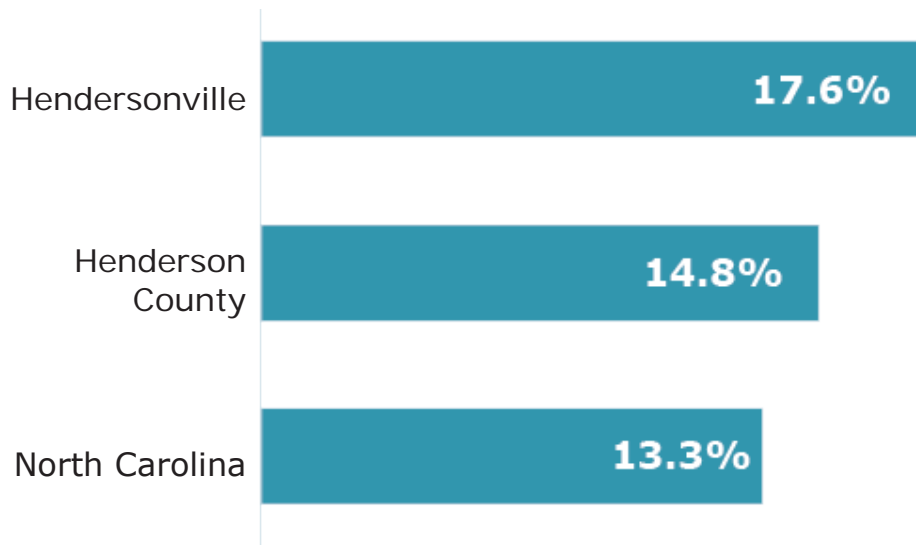


Data Source: U.S. Census 2018-2022 American Community Survey 5-Year Estimates

Disability Status

The percentage of people in the city with a disability (15.5%) is higher than the county (14.1%) and the state (13.7%). The higher percentage of individuals with disabilities in the city suggests a greater demand for accessible transportation infrastructure. This includes sidewalks, curb ramps, crosswalks, and other pedestrian facilities designed to accommodate individuals with varying mobility needs.

Figure 14. Disability Status

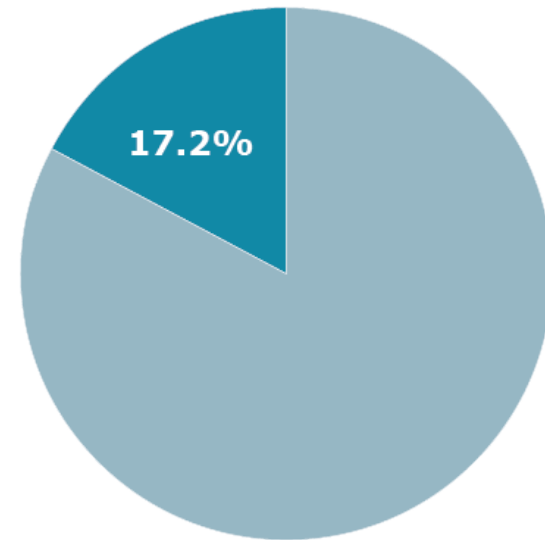


Data Source: U.S. Census 2018-2022 American Community Survey 5-Year Estimates

Households with Children

Just over seventeen percent (17.2%) of households in the city have children under the age of 18. Pedestrian and multiuse path improvements become important for enabling children to walk and bike to school, and to recreate and experience the outdoors.

Figure 15. Hendersonville Households with Children



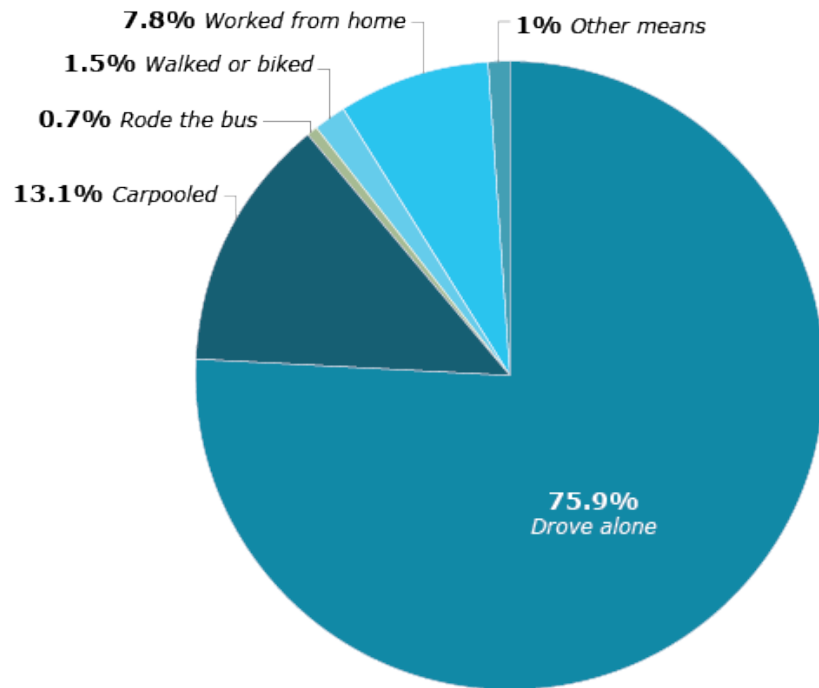
Data Source: U.S. Census 2018-2022 American Community Survey 5-Year Estimates

Commuting & Access to Vehicles

In the city, 89% of the population drove to work, with the majority – 75.9% – of those driving alone. A small percentage, 0.7%, rode the bus; 1.5% walked or biked; and 7.8% worked from home.

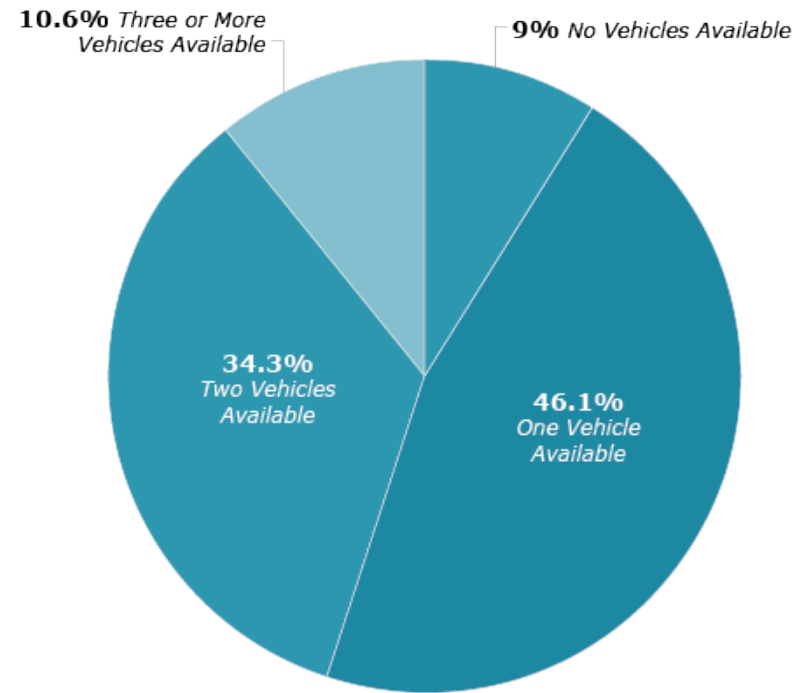
In the city, 34.3% of households have access to two or more vehicles and 9.0% of households are without vehicles entirely. These vehicle-less households may benefit from a new option to get around without a car.

Figure 16. Hendersonville Means of Transportation to Work



Data Source: U.S. Census 2018-2022 American Community Survey 5-Year Estimates

Figure 17. Hendersonville Access to Personal Motor Vehicles



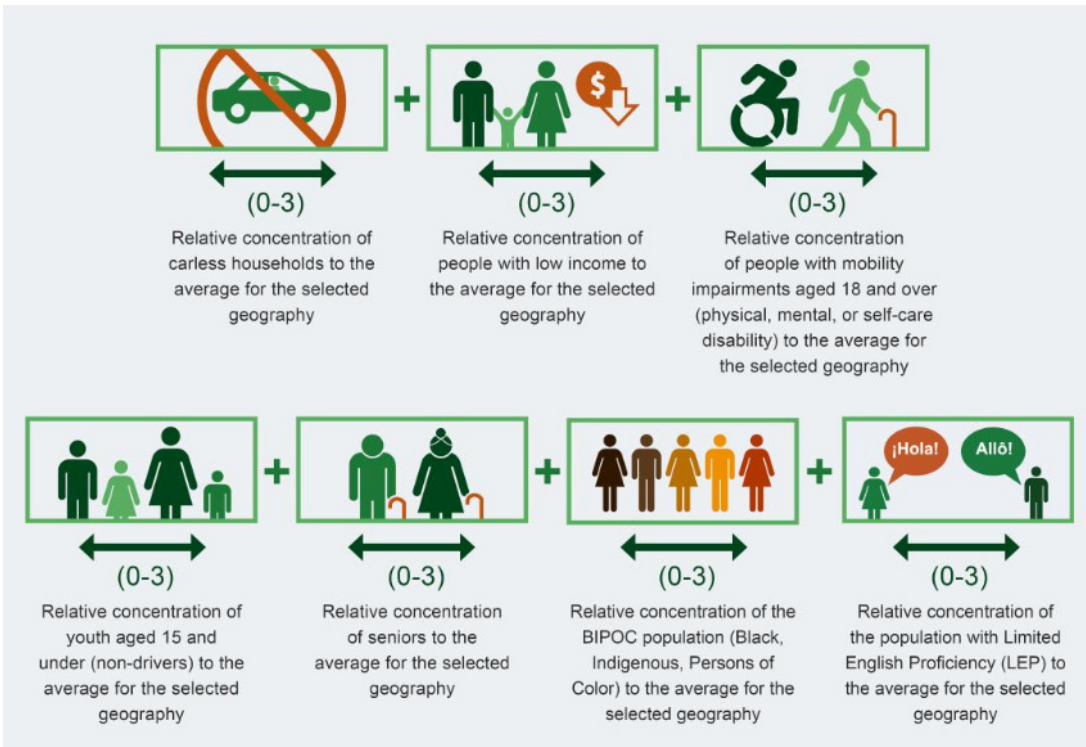
Data Source: U.S. Census 2018-2022 American Community Survey 5-Year Estimates

Special Populations & User Groups

Addressing equity in transportation requires consideration of special populations and user groups. Interpreting census data at a broad geographic scale can be challenging and may lead to inaccuracies and limited insights into relative equity needs. Engaging with local stakeholders provides insights into areas that have experienced under-investment or disinvestment in pedestrian and bicycle infrastructure and can help make the case for one greenway route alternative over another.

To measure equity, the Project Team used NCDOT’s statewide environmental justice map, known as the Transportation Disadvantage Index (TDI). Using the scores from the TDI, the Project Team assigned equity scores ranging from 1 to 5 points based on a relative comparison of an area’s TDI score. The team then adjusted (increased) project scores in some areas based on local knowledge of equity need. **Map 4 - NCDOT Transportation Disadvantage Index (TDI)** shows the TDI scoring for this project’s study area. A higher score indicates an area of greater relative disadvantage.

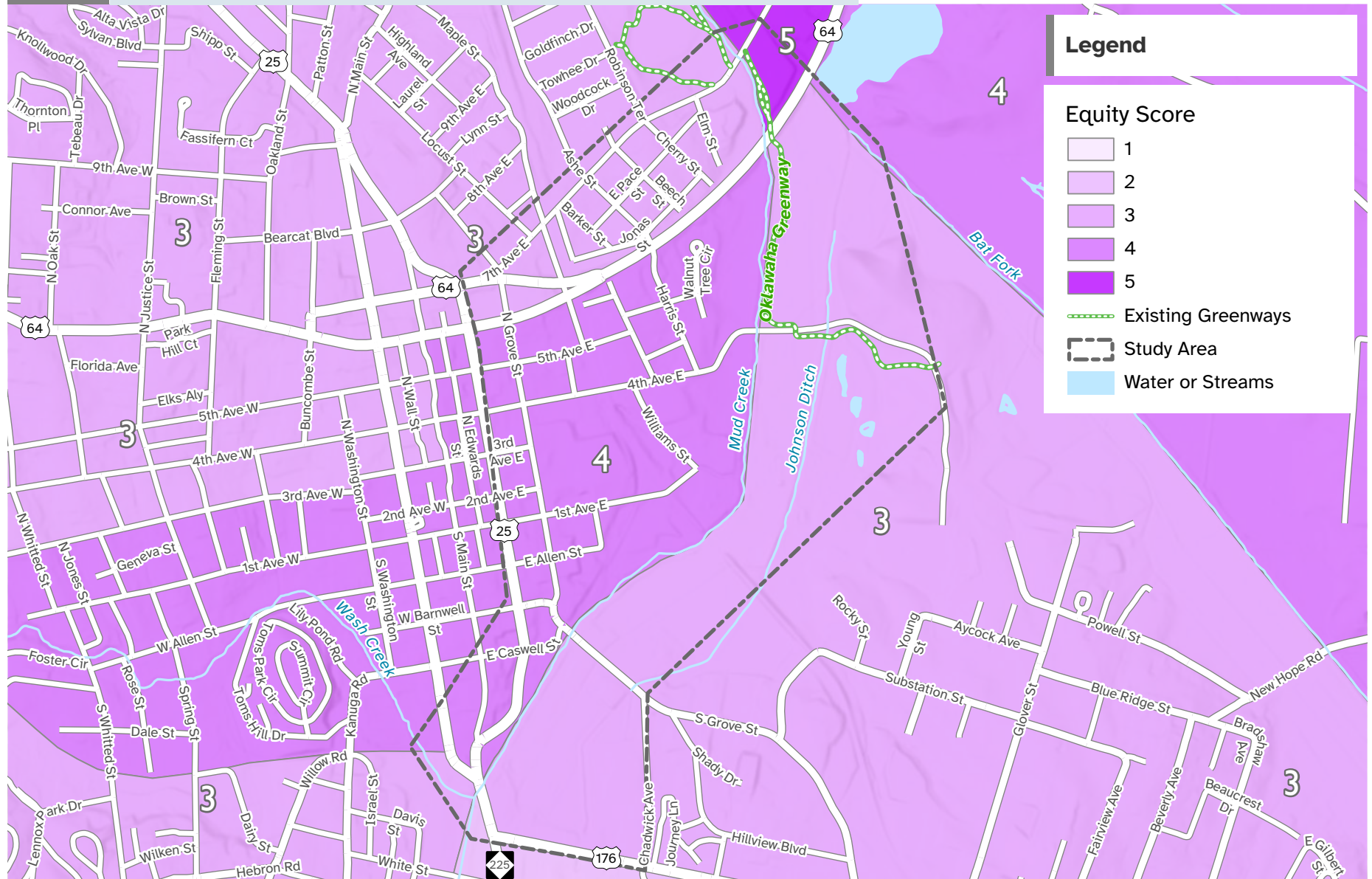
Image 5. NCDOT Transportation Disadvantage Index (TDI) Scoring Metrics



Source: NCDOT

NCDOT uses a range of factors in its Transportation Disadvantage Index (TDI) scoring that together help indicate areas with a higher relative concentration of people who might face mobility challenges and could benefit from improved transportation options.

Map 4. NCDOT Transportation Disadvantage Index (TDI)



Data Source: NC One Map

Employment Information

The U.S. Census Bureau's web-based mapping and reporting application, OnTheMap, was used to retrieve 2021 employment information for a two-mile radius from the study area. **Map 5 - Employment Density & Inflow/Outflow Analysis** illustrates both employment density as points and inflow/outflow analysis, which indicates how people are moving about to get to their job. The employment density points show the greater density of employment around downtown and the hospital, as well as outlying commercial areas. This data is further expanded in the inflow/outflow analysis: more people travel to the study area to work than those that live in the study area. In total 11,272 people are employed in the study area but live outside. The greenway's proximity to employers offers benefits such as the need for fewer employee parking locations.

Image 6. Downtown Hendersonville



Source: Visit Hendersonville

Hendersonville's downtown is a thriving business sector with numerous local businesses and employment opportunities.

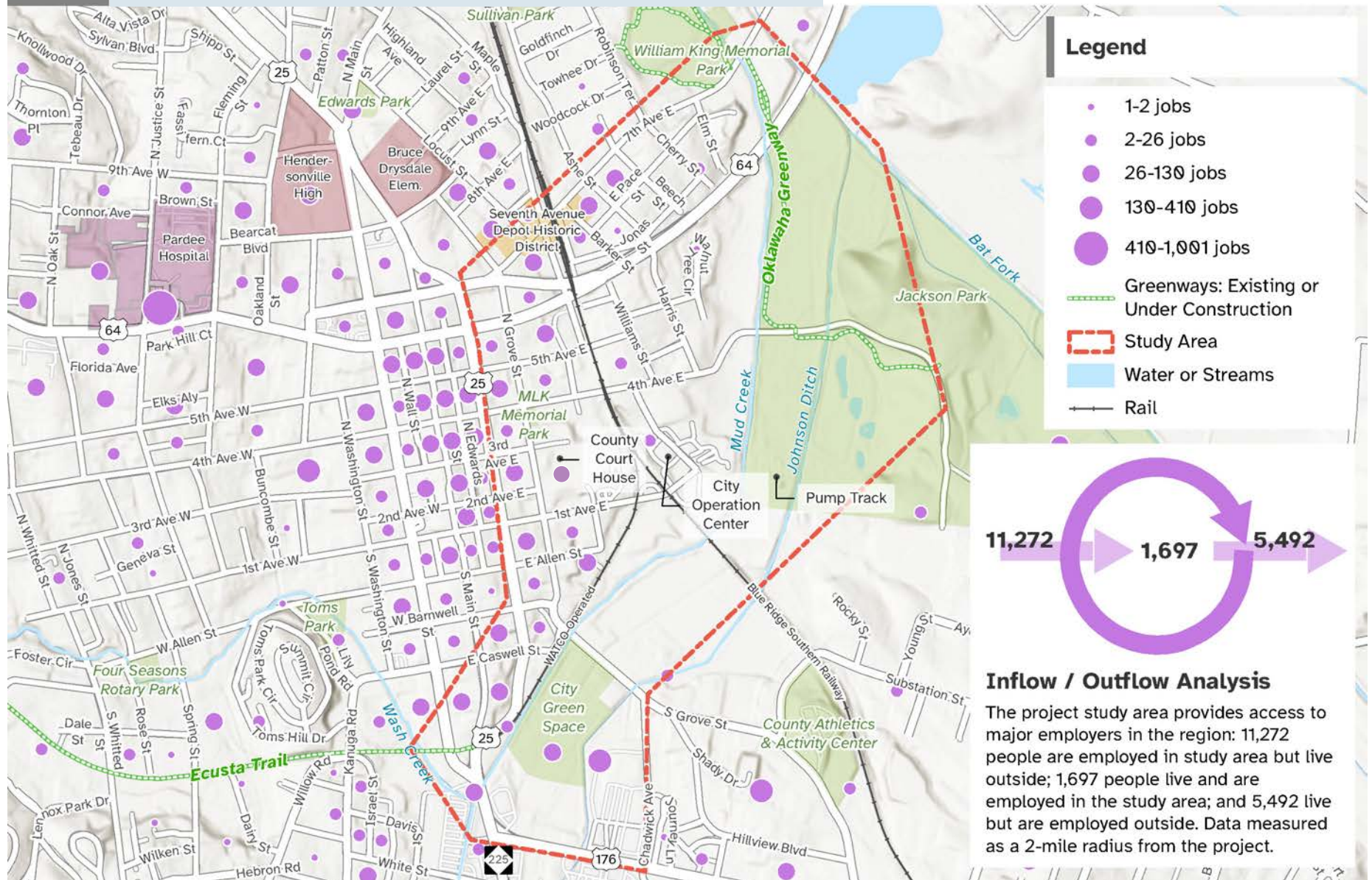
Image 7. Henderson County Courthouse and Sheriff's Department



Source: William Crumpler

The nearby Henderson County Courthouse, Sheriff's Department, and Detention Center are major employers in the area. This greenway connection would directly affect people who work here, giving people new opportunities to commute on foot or by bicycle.

Map 5. Employment Density & Inflow/Outflow Analysis



NATURAL ENVIRONMENT CONSIDERATIONS

Much of the natural land encompassed by this project study area has been shaped by humans – hillsides and slopes have been graded, streams piped and relocated, and rail and roads built. As this project looks to further shape the natural environment, it is important to consider the following factors.

Flooding

Map 6 - Flood Map illustrates the Federal Emergency Management Agency (FEMA) designated regulatory floodway, 100-year floodplain, and 500-year floodplain in the study area:

- The regulatory floodway is the area adjoining a waterway that will allow floodwaters to pass without increasing the water surface elevation by more than one foot. This is the first land to flood during heavy rains.
- The 100-year floodplain is also known as the 1% chance of annual flood, meaning that the land has a 1% chance of being flooded in any given year during a 100-year storm.
- The 500-year floodplain designation means that the land has a 0.2% chance of being flooded in any given year during a 500-year storm.

Almost half of the study area is within the floodway and floodplain, including a few roads, structures, Jackson Park, and the Oklawaha Greenway. When water flows over the banks of the Mud Creek and Johnson Ditch, these areas are periodically inundated by flood waters. Any development, even recreational greenways, can impact the ability of the floodplain to store and slow floods, so it will be critical to design a greenway (and any amenities) with stormwater best management practices and to anticipate regular maintenance to ensure long-term function of the greenway infrastructure. The City is leading a floodplain restoration project for portions of Mud Creek and Johnson's Ditch. The project is aimed at allowing flood storage on key parcels. The consultant team developing the flood model worked in close coordination with the Above the Mud Greenway Feasibility Study team to ensure a greenway could be built on the high ground on these City-owned parcels.

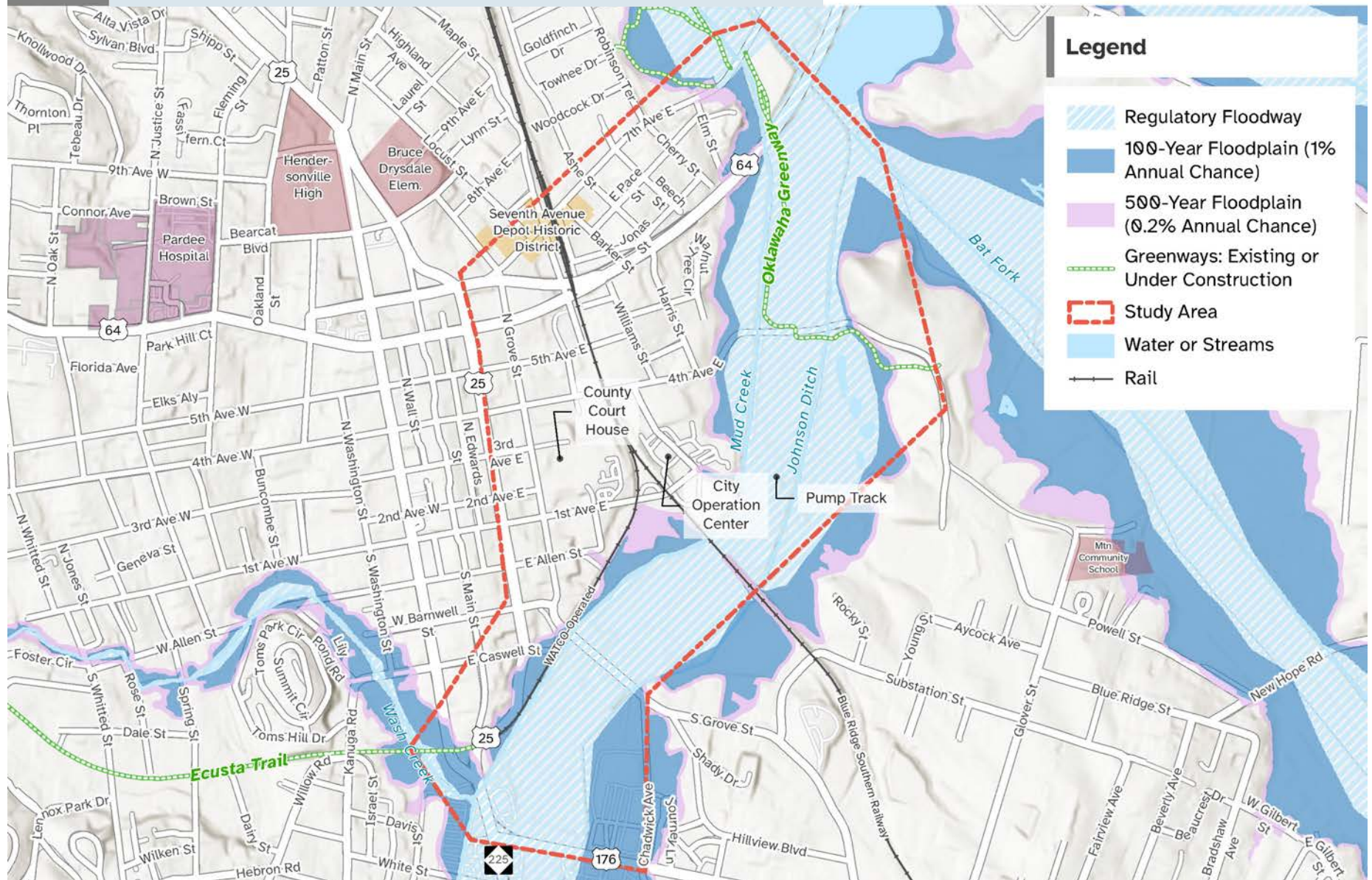
Image 8. Mud Creek



Source: TPD

Since portions of the greenway will be in the floodway to connect to Jackson Park, the greenway will need to be designed to handle periodic flooding.

Map 6. Flood Map

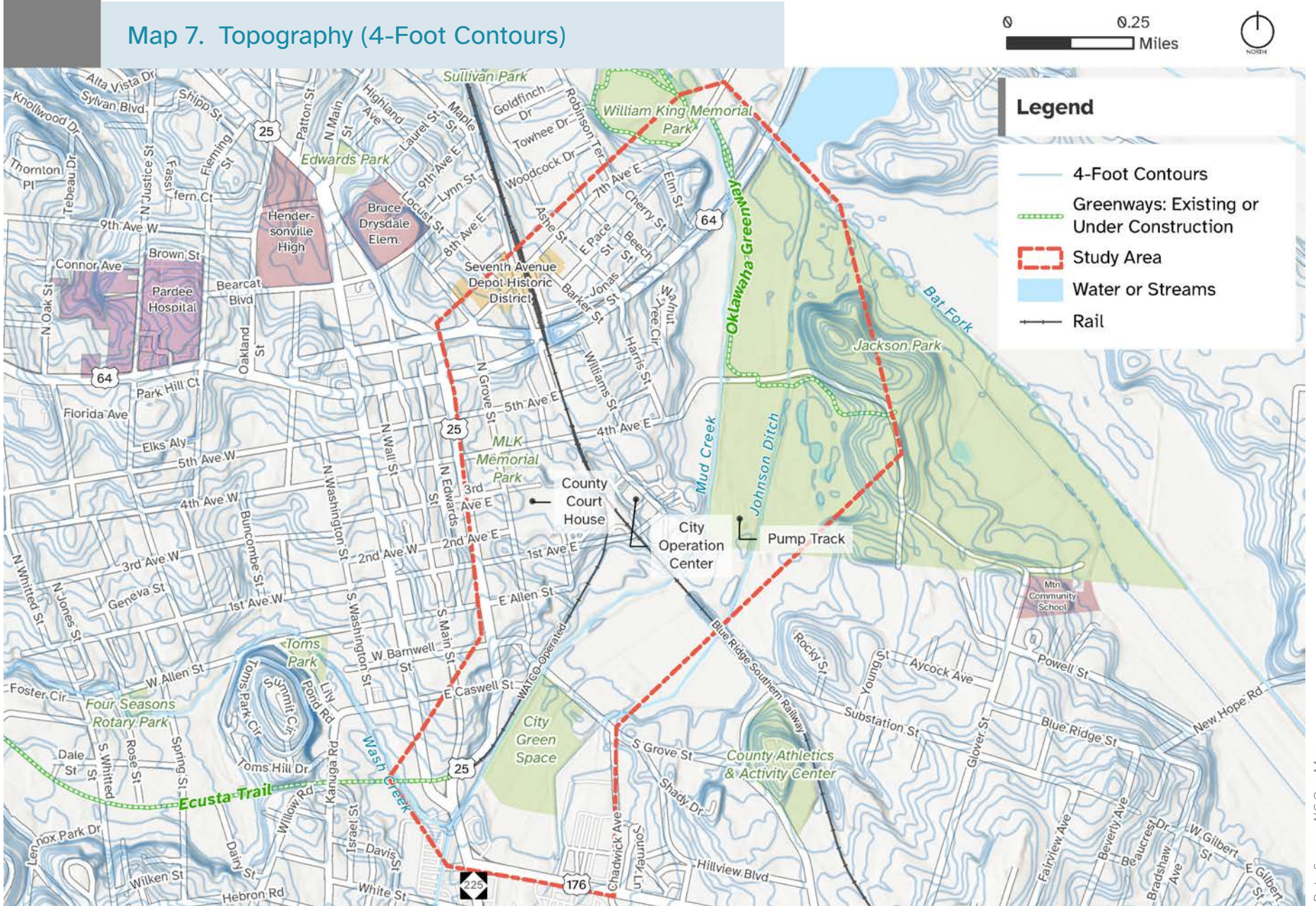


Legend

- Regulatory Floodway
- 100-Year Floodplain (1% Annual Chance)
- 500-Year Floodplain (0.2% Annual Chance)
- Greenways: Existing or Under Construction
- Study Area
- Water or Streams
- Rail

Data Source: NC One Map

Map 7. Topography (4-Foot Contours)



Data Source: NC One Map

Topography

NC One Map data was consulted for 4-foot contour data for the study area, as shown in **Map 7 - Topography (4-Foot Contours)**. Where these elevation lines are spaced far apart, it is clear where the floodplain and waterways exist; where the lines are close together, the land outside of the floodplain is elevated with slopes. Additionally, the rail structures and roadways are elevated as are some buildings (e.g., County Courthouse). Working within the constraints of the topography will require planning and engineering to ensure a direct and accessible greenway connection.

Image 9. Study Area Flat Floodplain



Source: TPD

Threatened or Endangered Species

The project team researched rare and endangered species data for the study area from NCDOT’s ATLAS, a GIS-model that contains data that could impact project development. From this analysis, only one known occurrence of a rare or endangered species was found in the study area: the Rusty-Patched Bumble Bee (*bombus affinis*), which is considered endangered.

Image 10. The Rusty-Patched Bumble Bee



Source: Heather Holm

The 2021 Mud Creek Interceptor (a City-led sewer project) Habitat Review lists 10 threatened or endangered species as potentially occurring in the study area of the proposed sewer project. Some of the species identified in the interceptor study may also apply to this project’s study area, which is smaller. The report concluded that the installation of the Mud Creek Sewer Interceptor is not likely to adversely affect protected species listed as potentially occurring within the boundary. Further investigation of species and habitat may be needed during the design and construction phase of this project.

Image 11. 2021 Mud Creek Interceptor Habitat Review Species List

Common Name	Scientific Name	Status
Appalachian elktoe	<i>Alasmidonta raveneliana</i>	Endangered
Bald Eagle	<i>Haliaeetus leucocephalus</i>	BGPA ¹
Bog turtle	<i>Glyptemys muhlenbergii</i>	Threatened (S/A) ²
Bunched arrowhead	<i>Sagittaria fasciculata</i>	Endangered
Gray bat	<i>Myotis grisescens</i>	Endangered
Mountain sweet pitcherplant	<i>Sarracenia rubra ssp. jonesii</i>	Endangered
Northern long-eared bat	<i>Myotis septentrionalis</i>	Threatened
Small whorled pogonia	<i>Isotria medeoloides</i>	Threatened
Swamp pink	<i>Helonia bullata</i>	Threatened
White irisette	<i>Sisyrinchium dichotomum</i>	Endangered

¹ Protected by the Bald and Golden Eagle Protection Act.

² Threatened due to similar appearance; not subject to Section 7 consultation.

Source: City of Hendersonville

HUMAN ENVIRONMENT CONSIDERATIONS

The study area is in downtown Hendersonville where the human footprint is pronounced. The following aspects explore considerations of the human environment:

- Land parcel ownership
- Existing and planned transportation network
- Points of interest
- Historic resources
- Brownfields
- Annual Average Daily Traffic (AADT)
- Posted speed limit
- Pedestrian crash history and corridor safety scores

Land Parcel Ownership

Henderson County parcel data provides a record of land ownership, which is helpful to consider as the greenway will traverse through publicly- and privately-owned property.

Map 8 - Parcel Ownership illustrates the land that is either City- or County-owned, which is much of the land found in the gap between where the Ecusta Trail ends and the Oklawaha Greenway begins. Having these large, publicly owned parcels is favorable towards the development of a greenway.

Existing Network

Being in downtown Hendersonville, the study area contains an existing network of sidewalks, traffic signals, bus routes, and bus stops as illustrated in **Map 9 - Existing Sidewalks, Greenways, & Traffic Signals** and **Map 10 - Apple Country Public Transit Bus Routes & Stops**.

- The existing sidewalks are on both NCDOT- and City-maintained streets, and while the sidewalk network in downtown and west of the study area is more comprehensive, the sidewalks become sparser in the Above the Mud study area.

- The traffic signals are clustered around downtown streets where traffic volume is higher; the traffic control at most intersections in the study area is either non-signalized or the road is grade-separated and does not require a traffic signal.
- The transit system, Apple Country Transit, is operated by Henderson County and the study area includes three routes and various bus stops.

Image 12. Lack of Sidewalk on South King Street



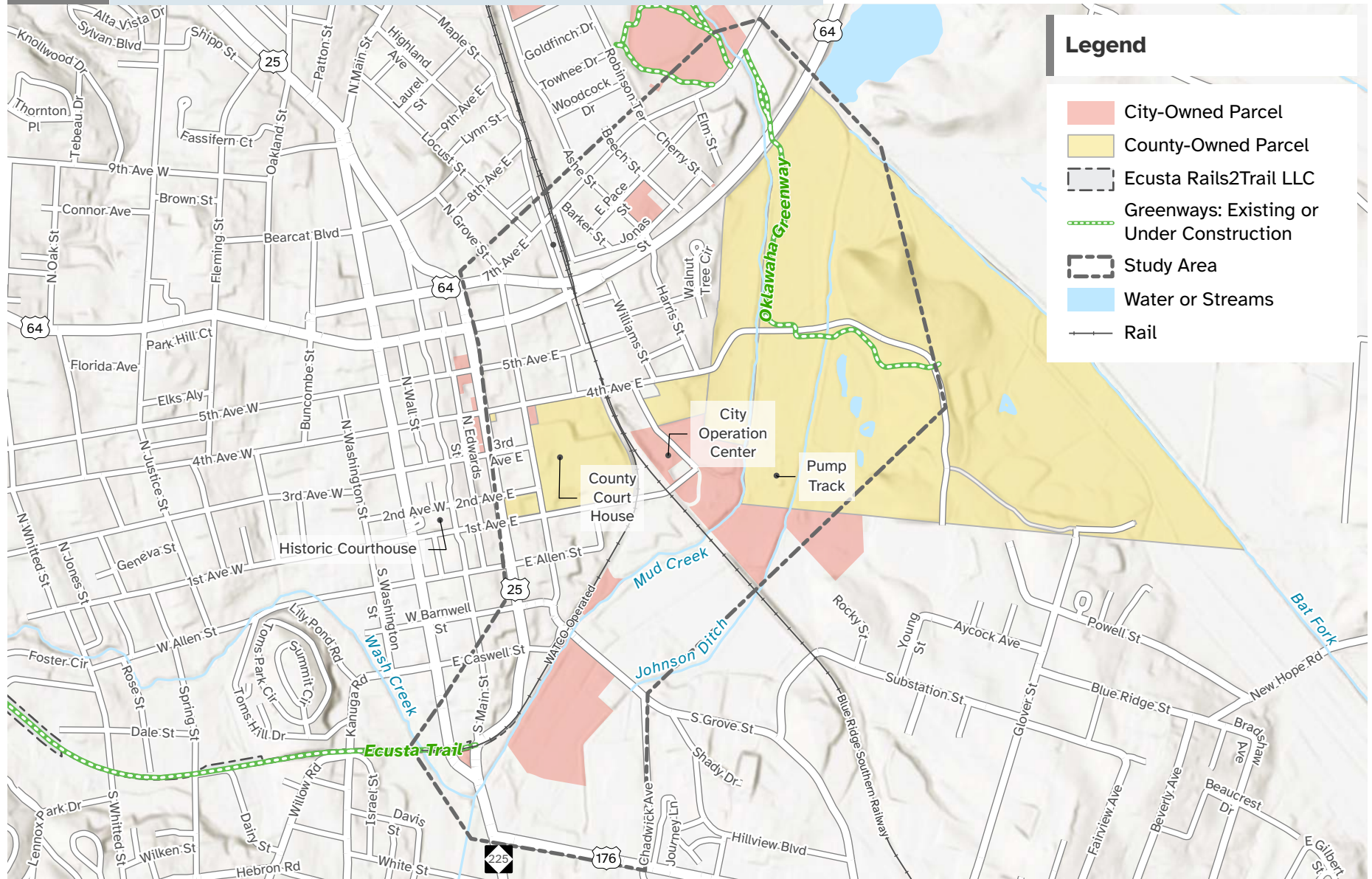
Source: TPD

Image 13. 4th Avenue Shared Lane Markings



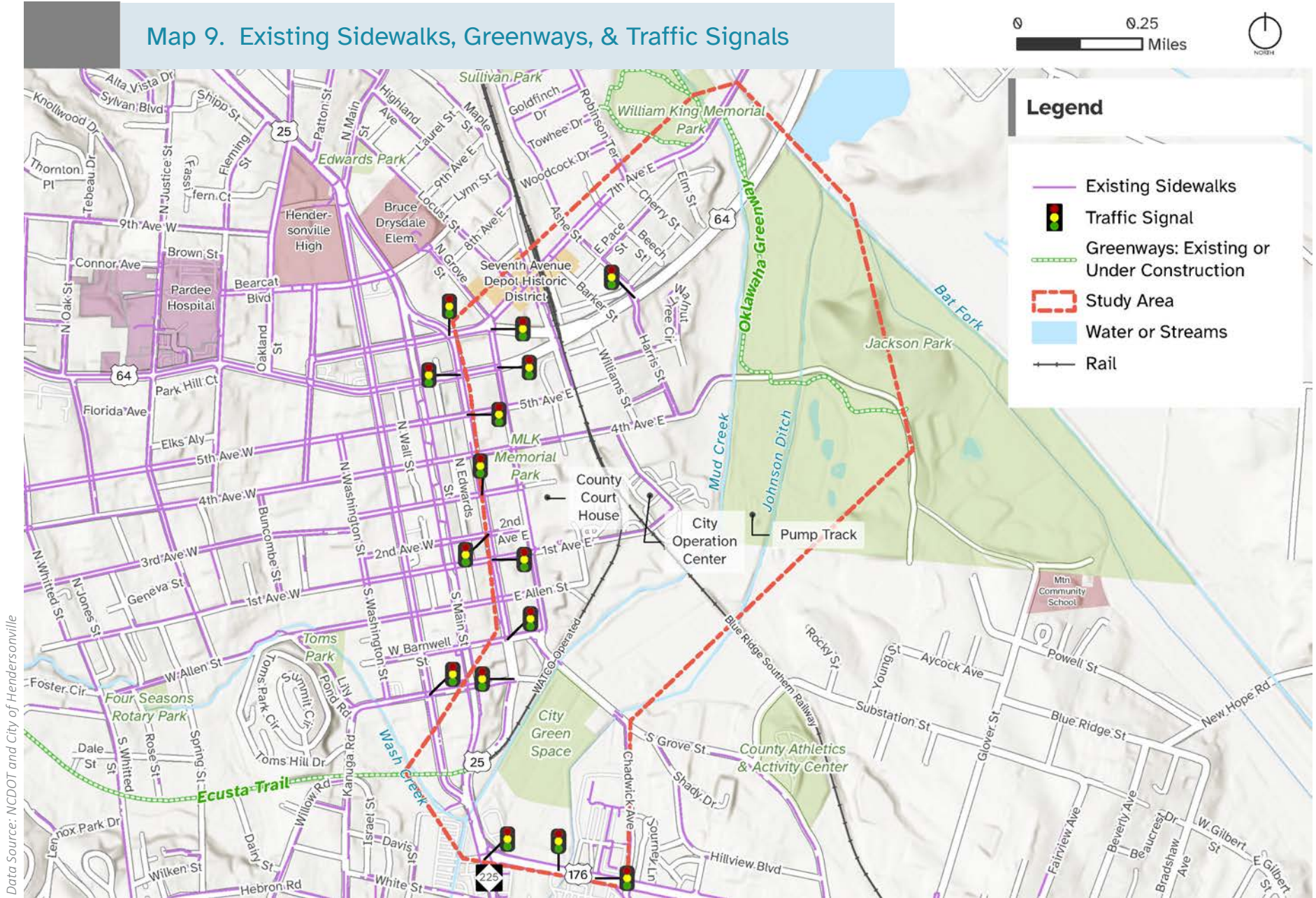
Source: TPD

Map 8. Parcel Ownership



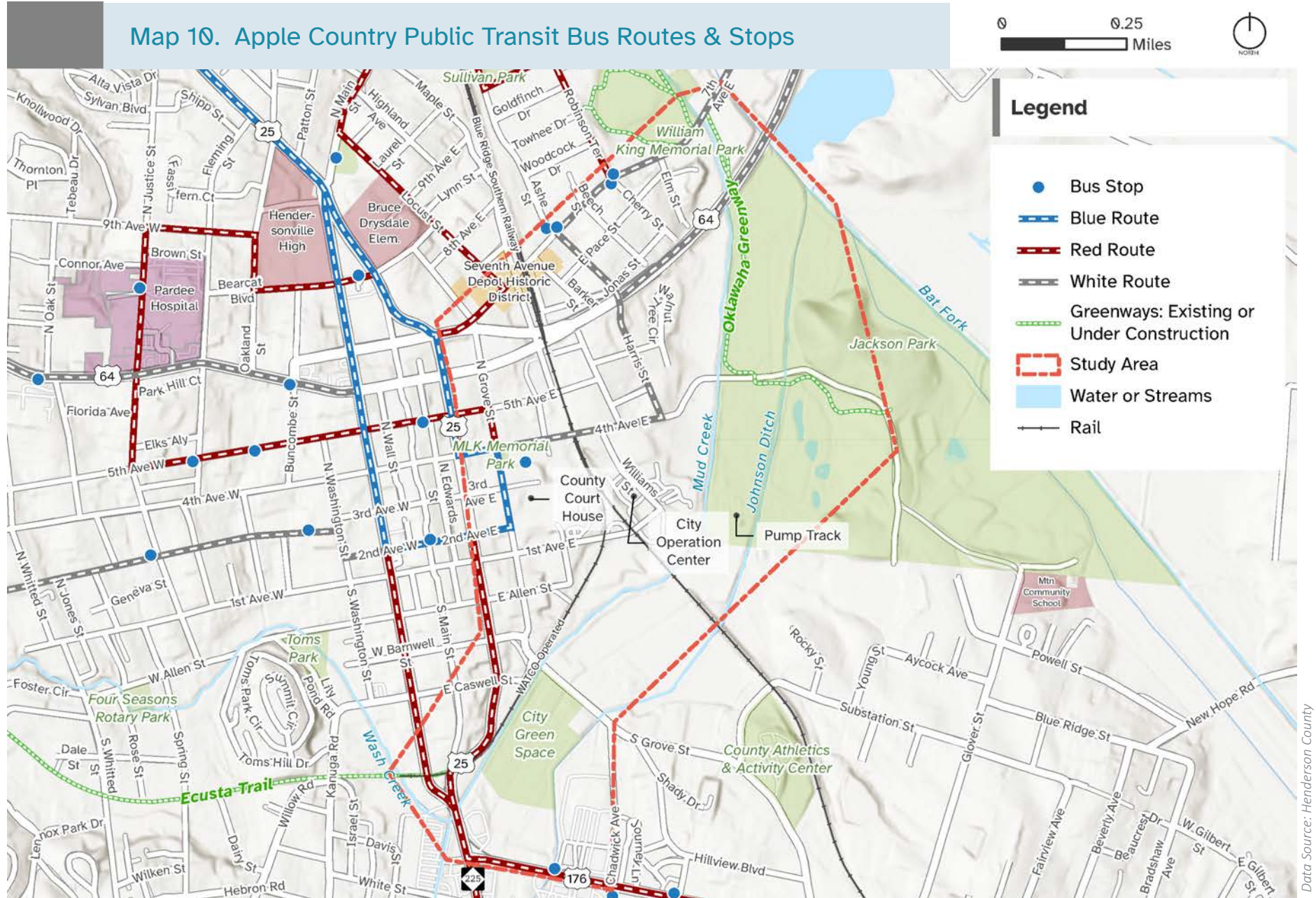
Data Source: City of Hendersonville

Map 9. Existing Sidewalks, Greenways, & Traffic Signals



Data Source: NCDOT and City of Hendersonville

Map 10. Apple Country Public Transit Bus Routes & Stops



Data Source: Henderson County

Railroad Corridors

The Above the Mud study area has rail corridors that present both opportunities and challenges for greenway development. The ownership and current operational status (active or inactive) of the rail lines are integral to alignment evaluation. To aid in understanding the multiple rail lines that traverse the study area, and how the proposed alignments interact with the rail lines, these have been given informal names for the purposes of this project.

Map 11 - Rail Corridors illustrates these rail lines and their informal names, which are used throughout this document.

Image 14. The Ecusta Trail (Under Construction)

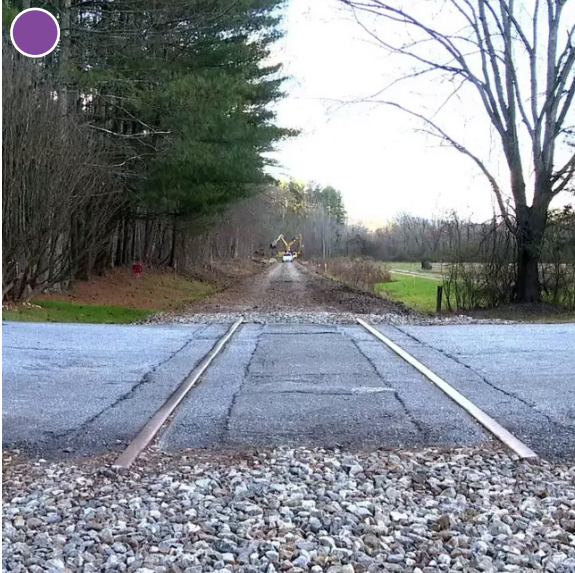


Image 15. The Ecusta Line

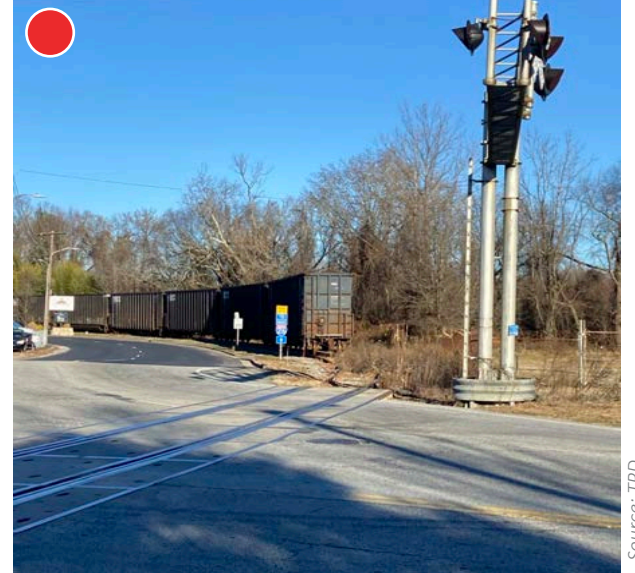


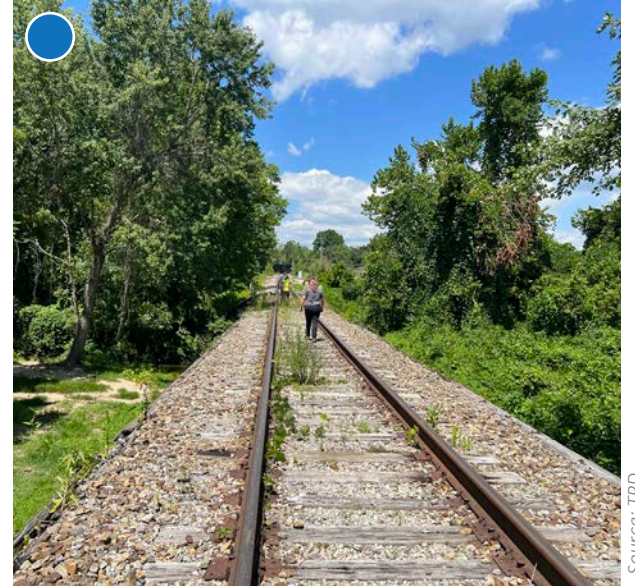
Image 16. The Ecusta Line Joining The Zirconia Line



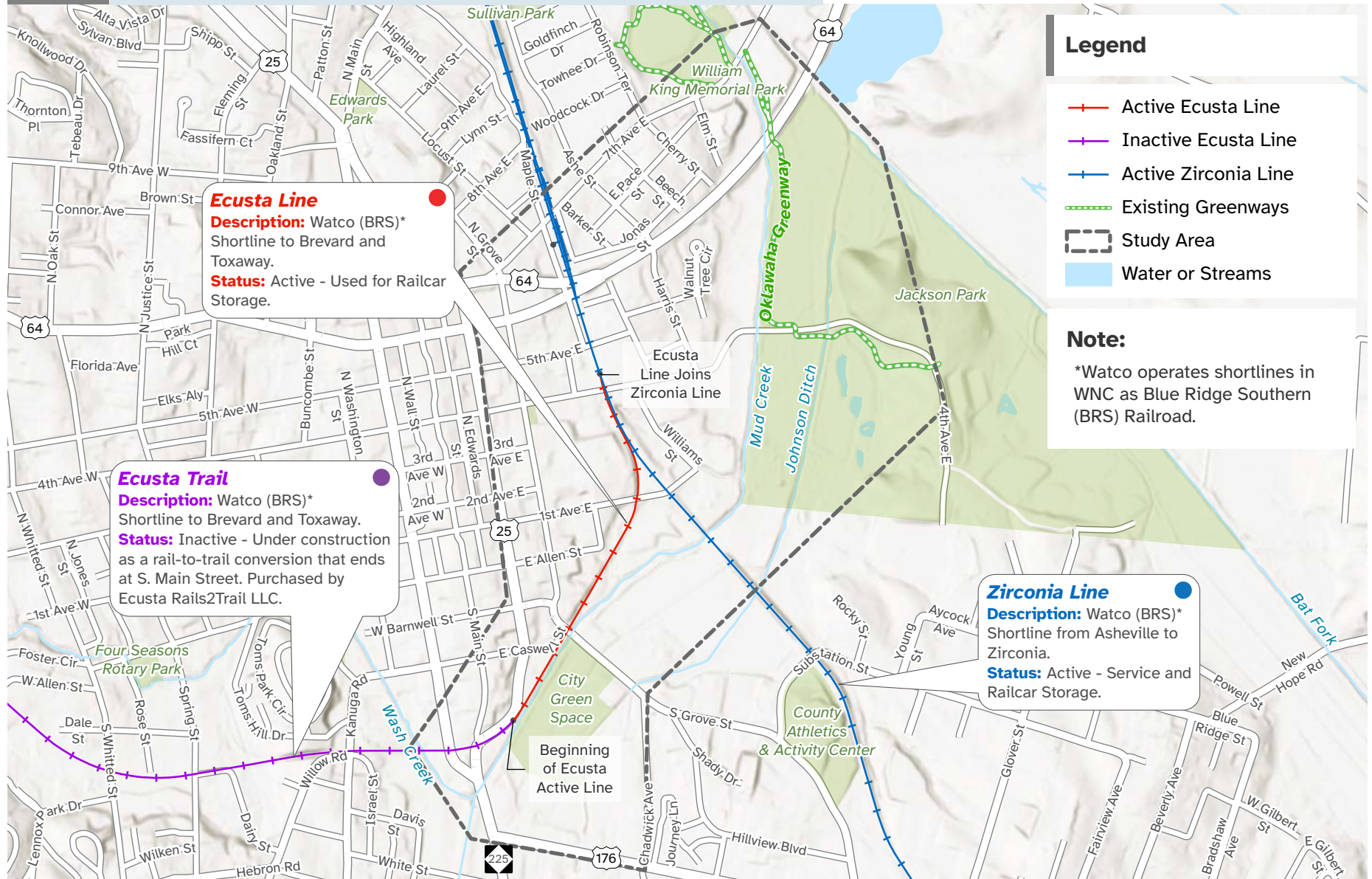
Image 17. The Zirconia Line (North of 5th Avenue)



Image 18. The Zirconia Line (Near the Dog Park)



Map 11. Rail Corridors



Data Source: City of Hendersonville

Planned & Programmed Projects

The previous chapter and Appendix describe the many planning projects that have come before this study. A successful plan incorporates institutional knowledge and avoids duplicating previous project and planning efforts. Many of the projects that came before this planning effort are illustrated in both **Map 12 - Planned Projects (Walk Hendo Pedestrian Plan)** and **Map 13 - Planned Projects (NCDOT HMIP & STIP)**, which together illustrate the linear projects from the State Transportation Improvement Program (STIP), the State Highway Maintenance Improvement Program (HMIP), and the 2023 *Walk Hendo* (WH) Pedestrian Plan.

Within the study area, the STIP projects include:

- Sidewalks on Grove Street from Barnwell Street to US 176 (EB-5963)
- South Main Street widening from US 176 to South King Street (U-6049)
- Realignment and extension of White Street (U-5886)
- North Grove Street and 7th Avenue upgrades (HS-2014N)

The HMIP is the state's plan for resurfacing and rehabilitating pavement. The most recent publicly available data for the HMIP is for 2022-2026. Coordinating with this plan offers opportunities to upgrade pedestrian and bicycle facilities. Within the study area, the HMIP indicates that South King Street will undergo resurfacing soon. The City is also leading a streetscape project along 7th Avenue, which began construction in February 2024. The project includes investment in pedestrian, water, sewer and stormwater infrastructure, lighting, and landscaping. The project is anticipated to finish in the fall of 2024.

Finally, while the *Walk Hendo* plan focused solely on sidewalk improvements and corridor upgrades. The plan recommends several sidewalk segments that will connect the study area to downtown and nearby destinations. The *Walk Hendo* priority projects within the study area include North/South King Street sidewalks and South Main Street sidewalks.

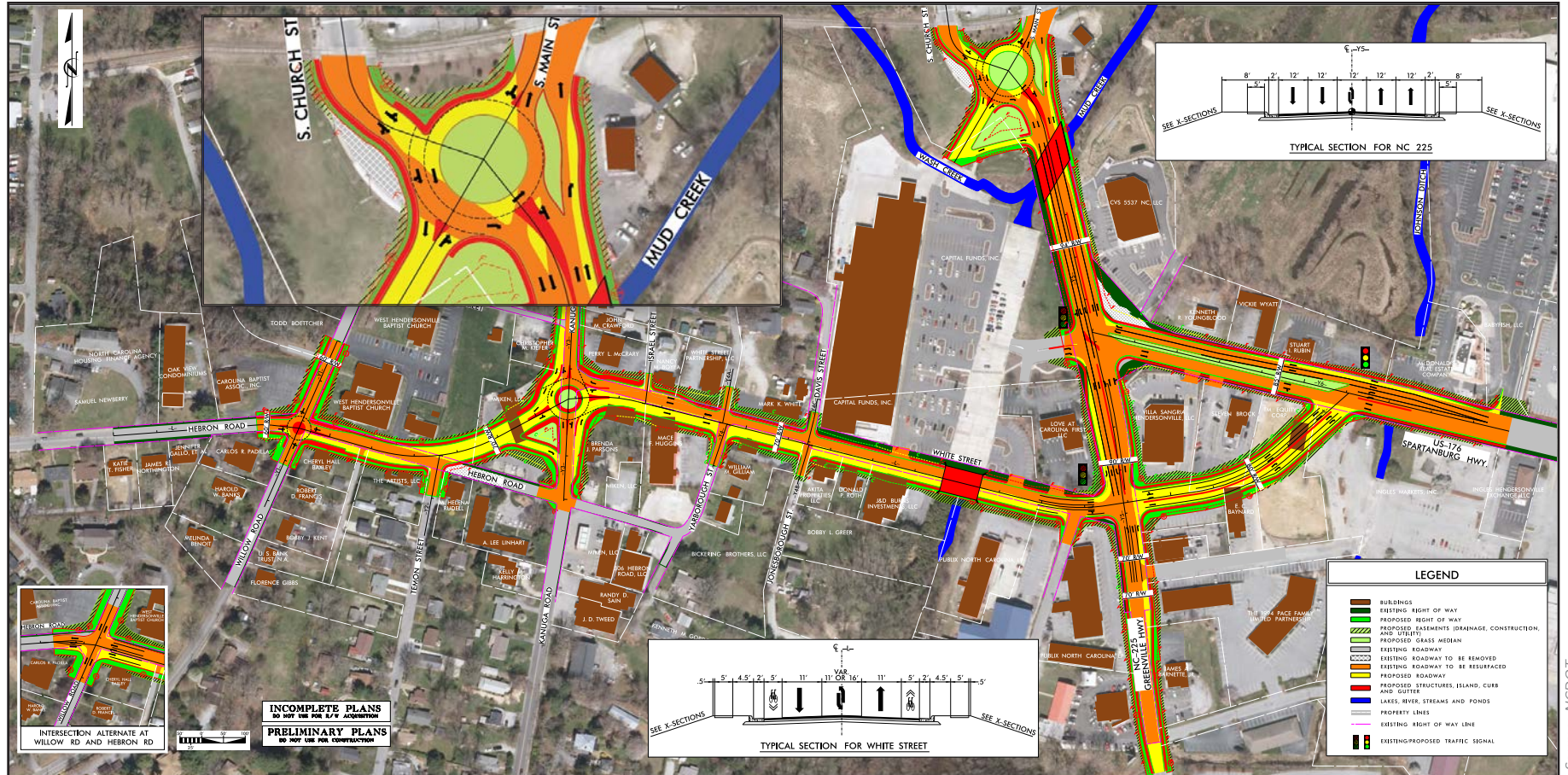
Image 19. 7th Avenue Streetscape Rendering



Source: City of Hendersonville

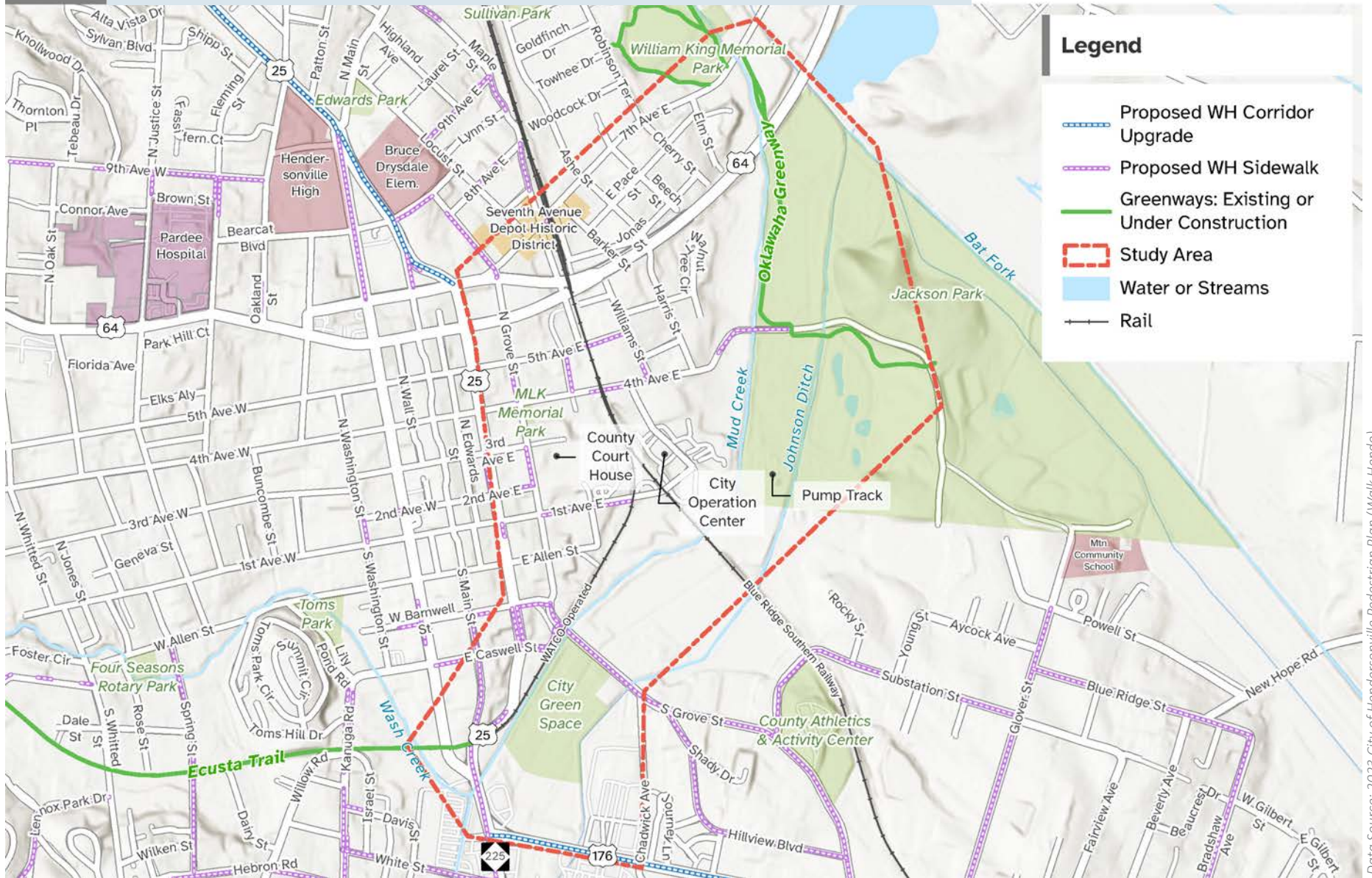
The 7th Ave Historic District is becoming more of a destination as new businesses locate in the area. Walkability is important for its continued success, and having a greenway connection will further improve access for residents and visitors. This rendering by Watermark Landscape Architecture shows enhanced crossings.

Image 20. Preliminary Map for NCDOT STIP Project U-6049



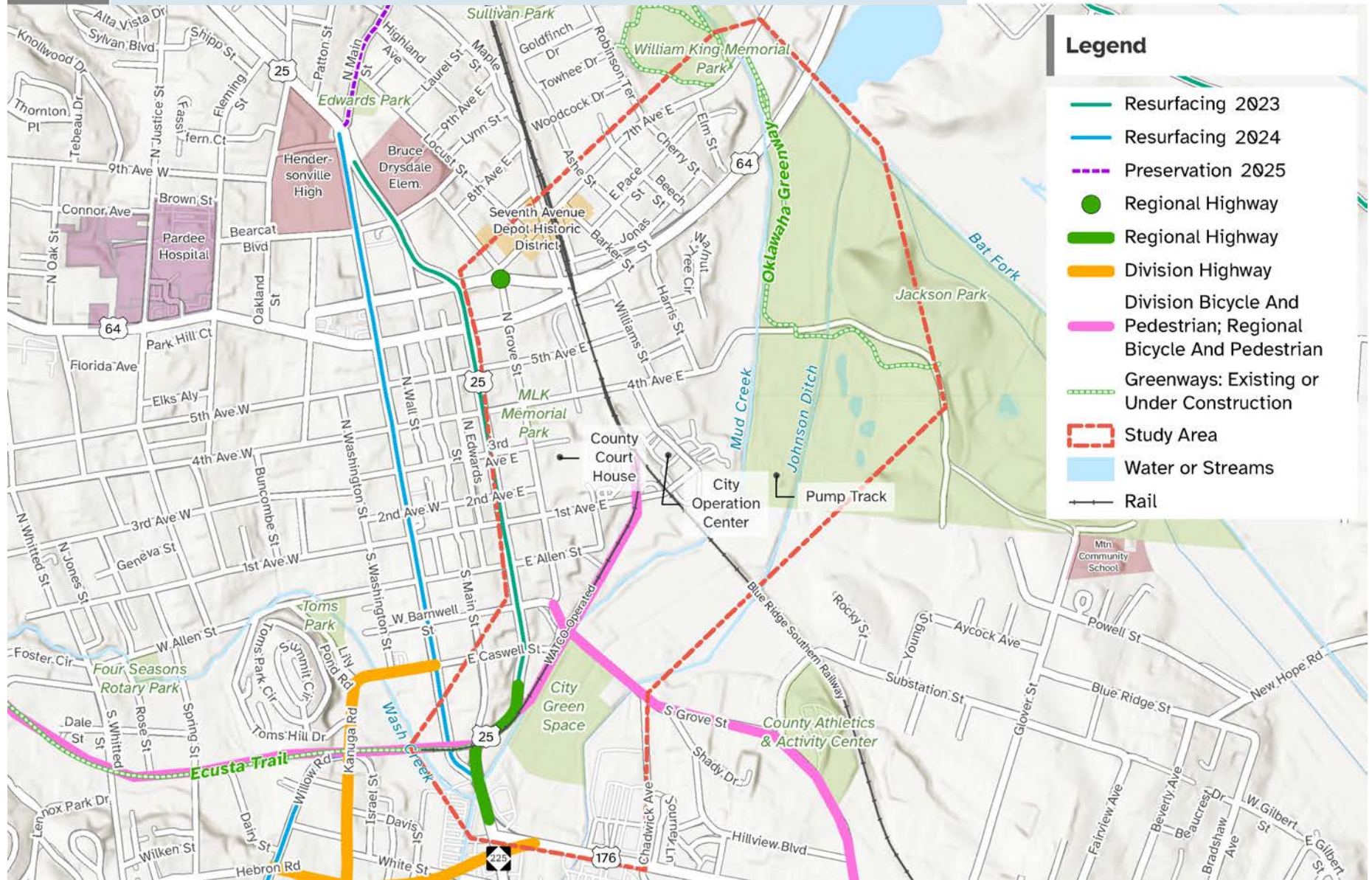
The North Carolina Department of Transportation (NCDOT) is implementing projects U-6049 and U-5886 to reconfigure several streets in the area south of downtown. These plans include adding roundabouts, sidewalks, and modifying lanes and intersections. Such projects will affect mobility in this area, influencing access to the Ecusta Trail and Above the Mud Greenway. For instance, the planned roundabout at the intersection of South Main Street, South Church Street, and South King Street could enhance access to nearby greenways and overall bicycle/pedestrian mobility by reducing vehicle speeds and creating safer crossing points. Compared to traditional intersections, roundabouts can decrease the likelihood and severity of accidents, potentially providing a more secure environment for pedestrians and cyclists.

Map 12. Planned Projects (Walk Hendo Pedestrian Plan)



Data Source: 2023 City of Hendersonville Pedestrian Plan (Walk Hendo)

Map 13. Planned Projects (NCDOT HMIP & STIP)



Data Source: NCDOT

Image 21. South Main Street Before & After Rendering (Walk Hendo)

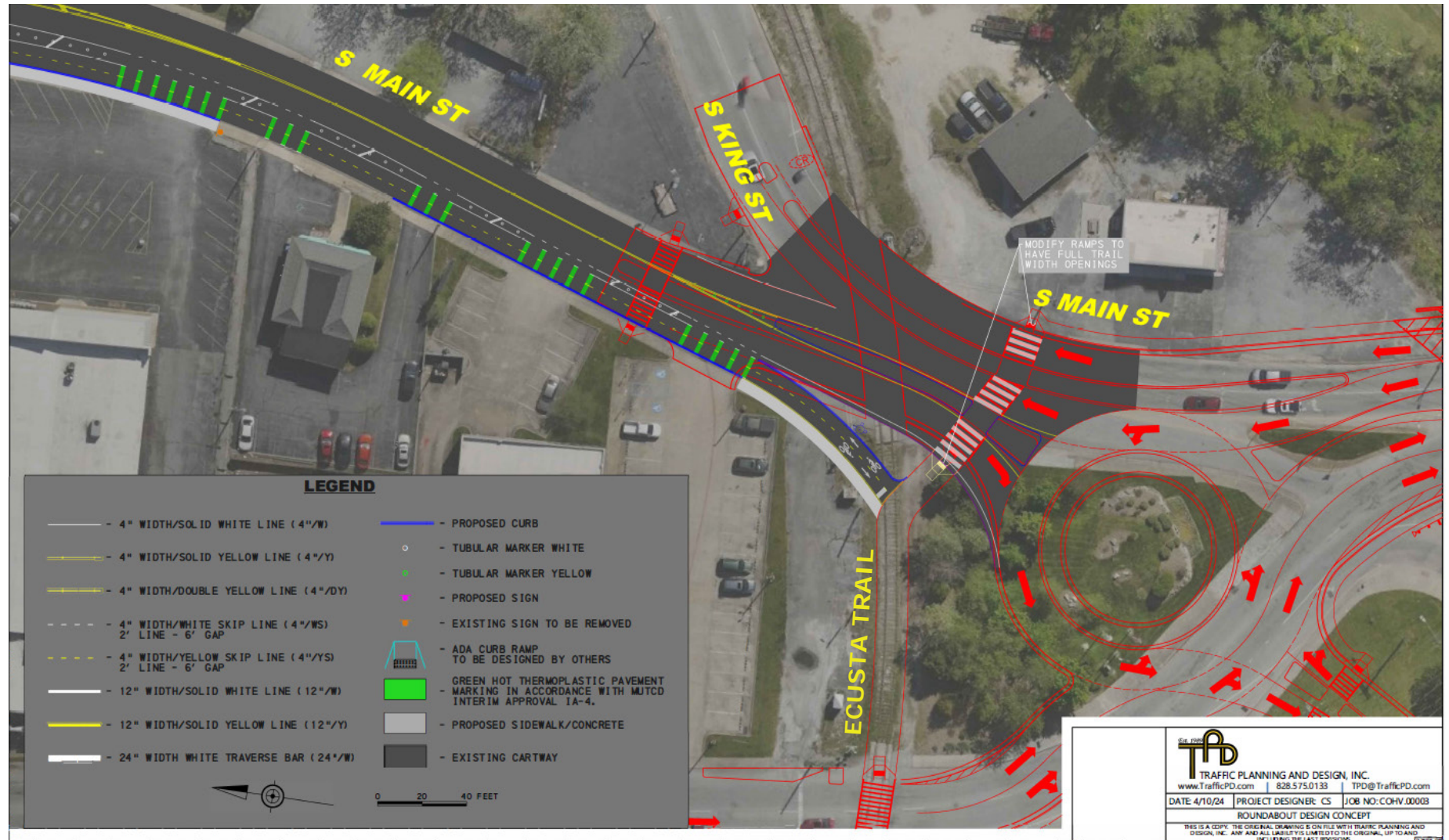


The City's pedestrian plan, Walk Hendo, included recommendations specifically to connect people to the Ecusta Trail. The plan makes the case that new greenway developments are good for residents' day-to-day life, while also helping to support local businesses and spur recreational tourism.



Source: City of Hendersonville

Image 22. South Main Street Bicycle Lane Ecusta Connection (Preliminary Concept)



Source: City of Hendersonville

The City is moving forward with a plan to re-stripe South Main Street with new bicycle lanes and reconfigured parking. The project will be completed in conjunction with paving improvements to provide a safer experience for Ecusta Trail users to access downtown and the Henderson County Visitor Center. This highlights the City's intent to make sure that people can access these greenways using a dedicated facility and that they are viable transportation corridors for the community. The final design will be incorporated with NCDOT roundabout design.

Points of Interest

The study area is located adjacent to downtown; as such, points of interest are abundant. Within the study area, destinations are largely defined by government services and parks as shown in **Map 14 - Points of Interest**. Jackson Park is a popular point of interest with ballfields, a bicycle pump track, the Oklawaha Greenway, a dog park, and more. The Seventh Avenue Historic District, with the Railroad Depot, is also within the study area. Government service buildings include the Sheriff's Office, City Operation Center, County Court House, and Henderson County Offices. Harris Street Housing Authority offers affordable housing, and the Latino Advocacy Coalition is a community center by and for the Latinx community. Public and private schools are in or near the study area including Hendersonville High School, the Mountain Community School, Bruce Drysdale Elementary School, and Faith-Covenant Christian Academy. These destinations would all be well-served by a greenway nearby, where people may be able to walk to go shopping, to go to school, to receive services, or to go to work.

Image 23. Seventh Avenue Historic District Farmers Market



Source: City of Hendersonville

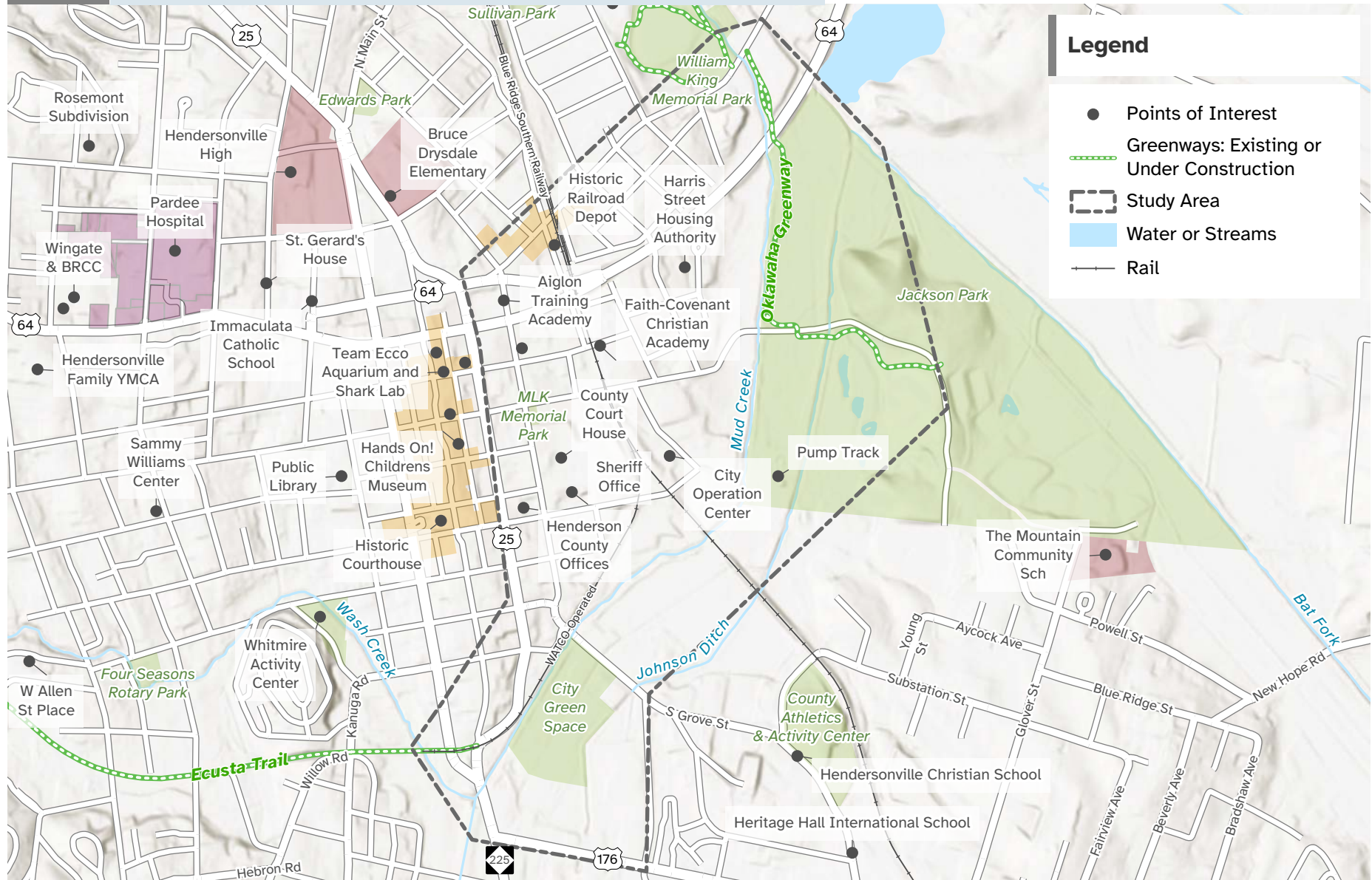
Image 24. Jackson Park Sign



Source: TPD

Not only will the Above the Mud Greenway connect two key greenway systems, it will also link community destinations.

Map 14. Points of Interest



Legend

- Points of Interest
- Greenways: Existing or Under Construction
- Study Area
- Water or Streams
- Rail

Data Source: NC One Map

Historic Resources

The North Carolina State Historic Preservation Office (SHPO) houses research reports, National Register nominations, and other materials related to the statewide survey of historically significant sites, buildings, and districts. By cataloging a wide spectrum of structures and places, SHPO creates a comprehensive inventory that reflects North Carolina's diverse history and development. **Map 15 - Historic Resources** displays a variety of historic properties and buildings in the study area, including some, like the Seventh Avenue Depot Historic District and the Grey Hosiery Mill, that are on the National Register of Historic Places. Other properties in the study area are determined eligible for National Register status, including the Railroad Depot, which was registered by the North Carolina Historical Society as a Historical Landmark.

Listing a property in the National Register imposes no obligations or restrictions on a private owner using their own resources to maintain or alter the property. Over the years, various federal incentives have been introduced to support private preservation efforts. A private owner of a National Register property is required to adhere to federal preservation standards only if federal funding or licensing is used for work on the property, or if the owner seeks and receives a special benefit from the National Register designation, such as a grant or tax credit.

Greenway projects are certainly compatible with historic areas, but must balance providing a public recreational amenity with respect for the historical significance of the area. By integrating interpretive signage, markers, and public art, greenway projects can offer visitors a meaningful experience that celebrates both the natural beauty and the rich history of the area, fostering a deeper appreciation for the community and its heritage.

Image 25. The Historic Railroad Depot



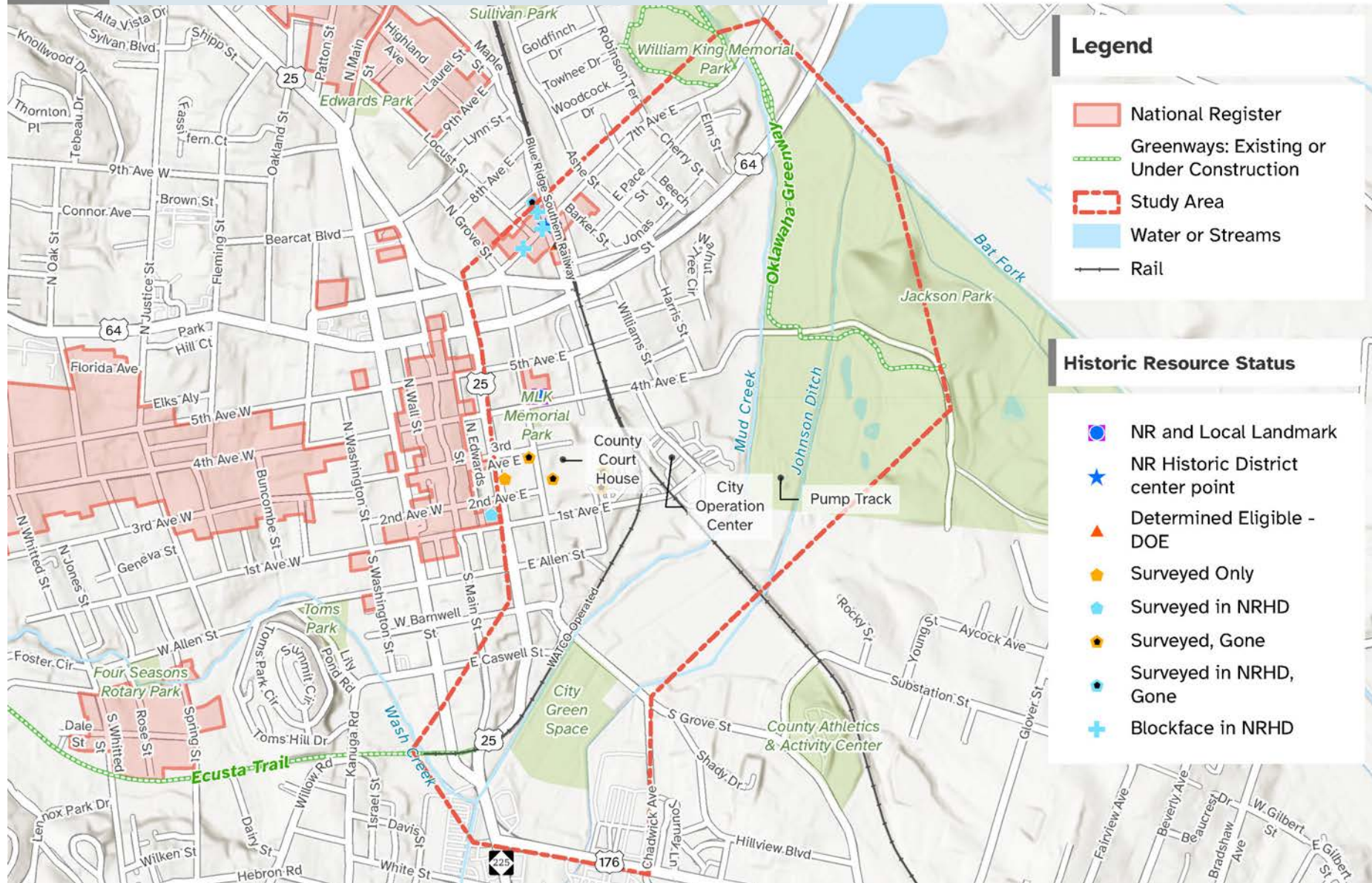
Source: City of Hendersonville

Image 26. The Historic Grey Hosiery Mill in 1921



Source: Henderson County Genealogical & Historical Society

Map 15. Historic Resources



Data Source: NCHPO

Brownfields

Planning a greenway near a brownfield or existing industrial site requires addressing several potential pitfalls to ensure the success and safety of the project. These sites may retain hazardous materials or pollutants from past activities, posing environmental risks to both users and the surrounding area. The lasting ecological impacts stemming from years of polluting land uses within the study area may include soil contamination, water pollution, habitat degradation, and negative effects on local biodiversity. **Map 16 - Brownfields** illustrates several brownfield sites in the study area, which include:

- Robinson Terrace (location of former dump and coal yard)
- Grey Hosiery Mill (former textile/hosiery mill)
- Auto Undertakers (former used auto parts store)
- Baxter Oil (former oil distribution facility)

Despite these challenges, repurposing these areas into open spaces like greenways offers communities the opportunity to reclaim degraded land, mitigate environmental hazards, and foster sustainable development while providing accessible recreational spaces. For instance, the Grey Hosiery Mill has successfully been redeveloped into affordable apartments. Thoughtful planning preserved much of the material and lines of the original architecture, including coursed stone foundations, exposed heavy timbers, steel beams, weathered brick, wood floors, beaded-board ceilings and clerestory windows.

Through careful planning and cooperation between environmental agencies, local communities, and greenway developers, several strategies can be employed to make the sites compatible with a greenway. This could involve remediation efforts to clean up contaminated soil and water, restoration projects to enhance habitat quality and biodiversity, and implementing sustainable design practices to minimize ongoing ecological impacts.

Image 27. Auto Undertakers Site



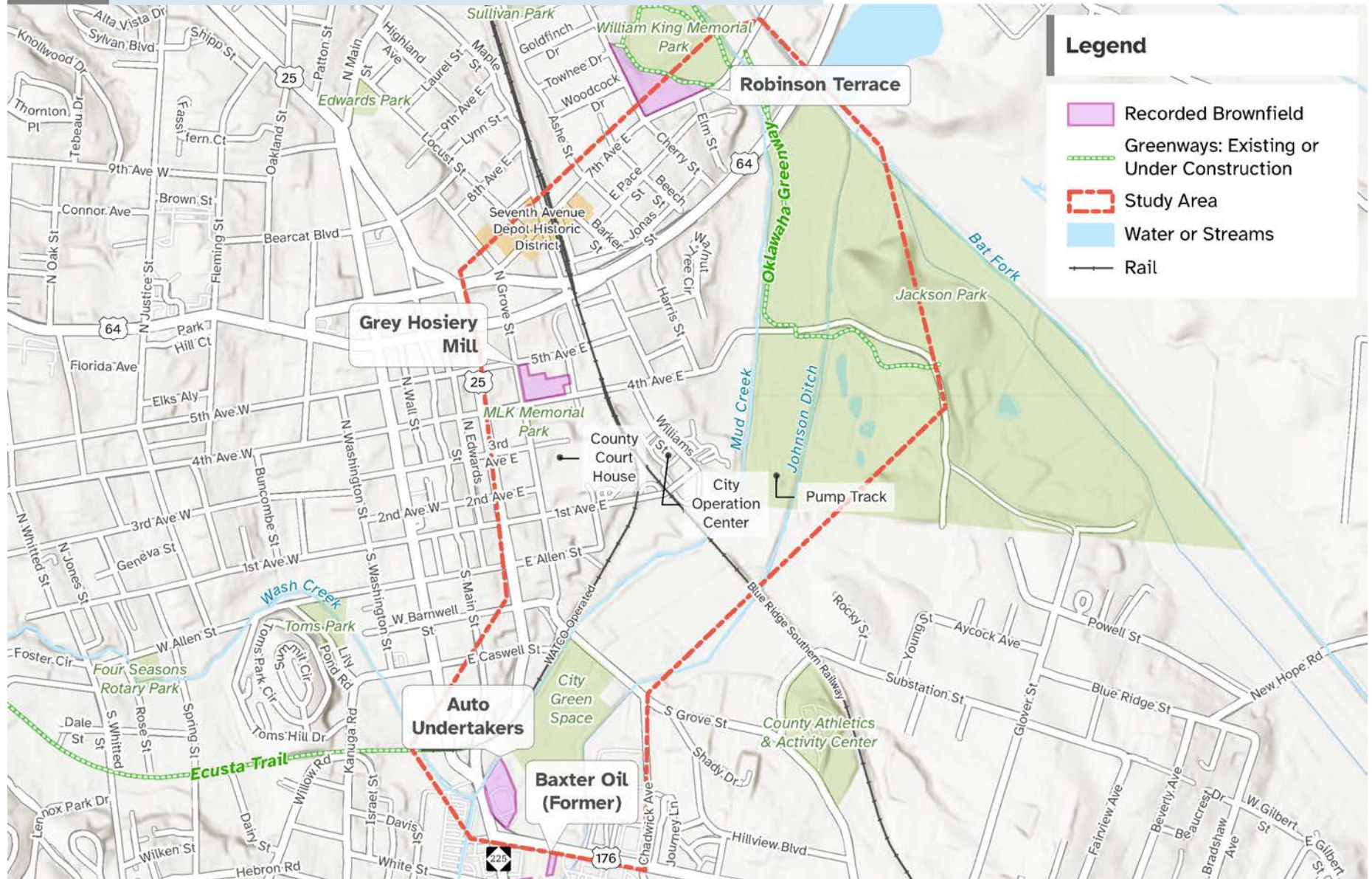
Source: Google

Image 28. Grey Mill Apartments



Source: ForRent.com

Map 16. Brownfields



Legend

- Recorded Brownfield
- Greenways: Existing or Under Construction
- Study Area
- Water or Streams
- Rail

Data Source: NCDEQ

Traffic Volumes

Leveraging data from NCDOT (2021), we can understand the traffic volume on key corridors influencing the study area. **Map 17 - Annual Average Daily Traffic (AADT)** illustrates traffic volume on streets that are maintained by NCDOT. The study area is bounded on three sides by high volume roads, including US 176, US 64, and NC 225. US 176 and US 64 carry volumes over 20,000 vehicles per day (vpd). The one-way north-south couplet streets of South Church Street and South King Street also carry high volumes, in the range of 10,500 vpd – 14,000 vpd. Many of these roads are designed to serve high volumes of traffic into and out of the city. Lower-volume streets exist but within or serving residential areas.

While a greenway, such as Above the Mud, is separated from traffic, portions must cross at roadway-grade and people must travel along roadways to arrive on foot or bicycle. As such, it is important to consider how traffic volume may impact the greenway experience and ultimate alignment

Image 29. Traffic on Spartanburg Highway



Source: TPD

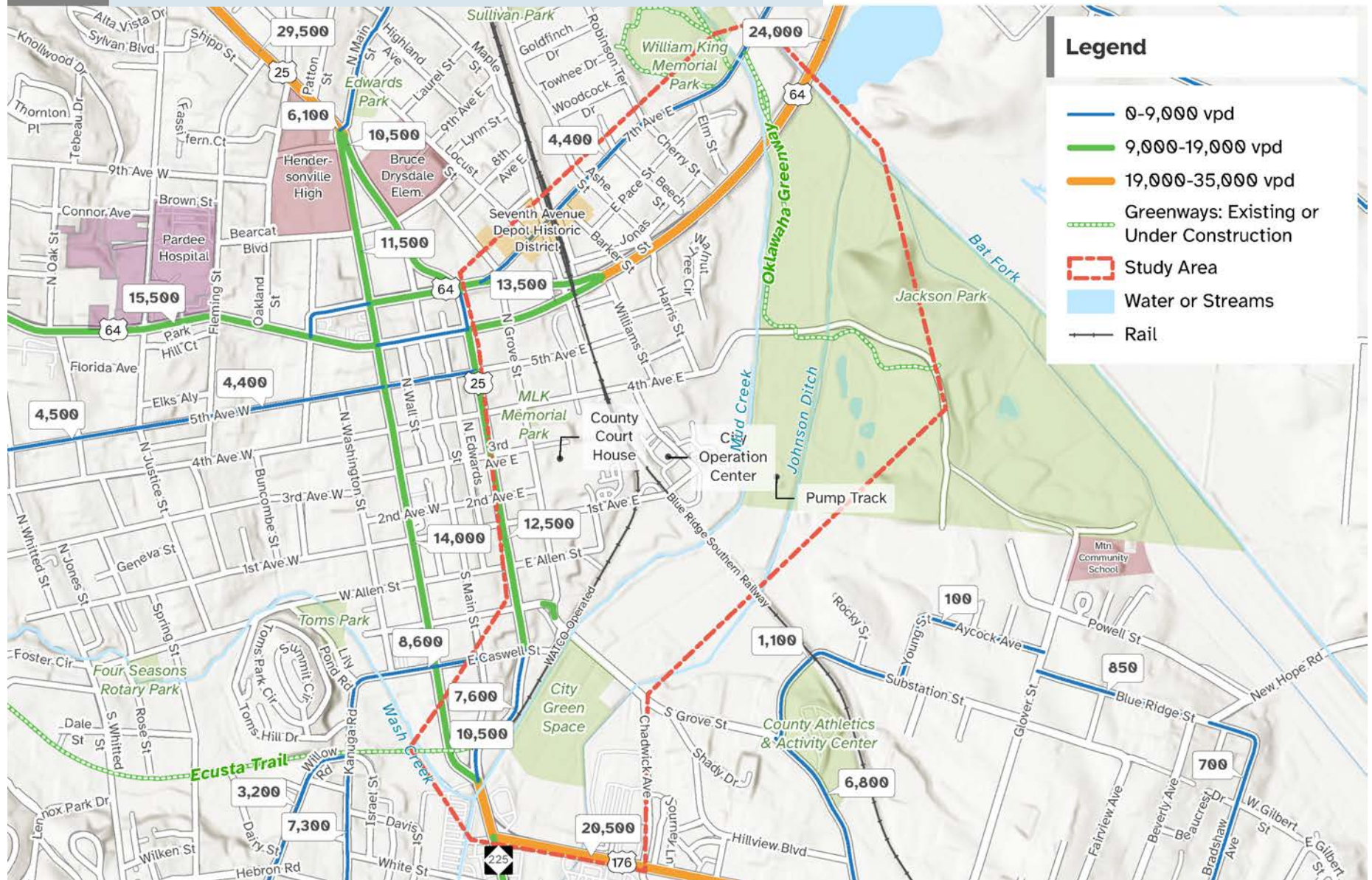
Image 30. Traffic on US 64



Source: TPD

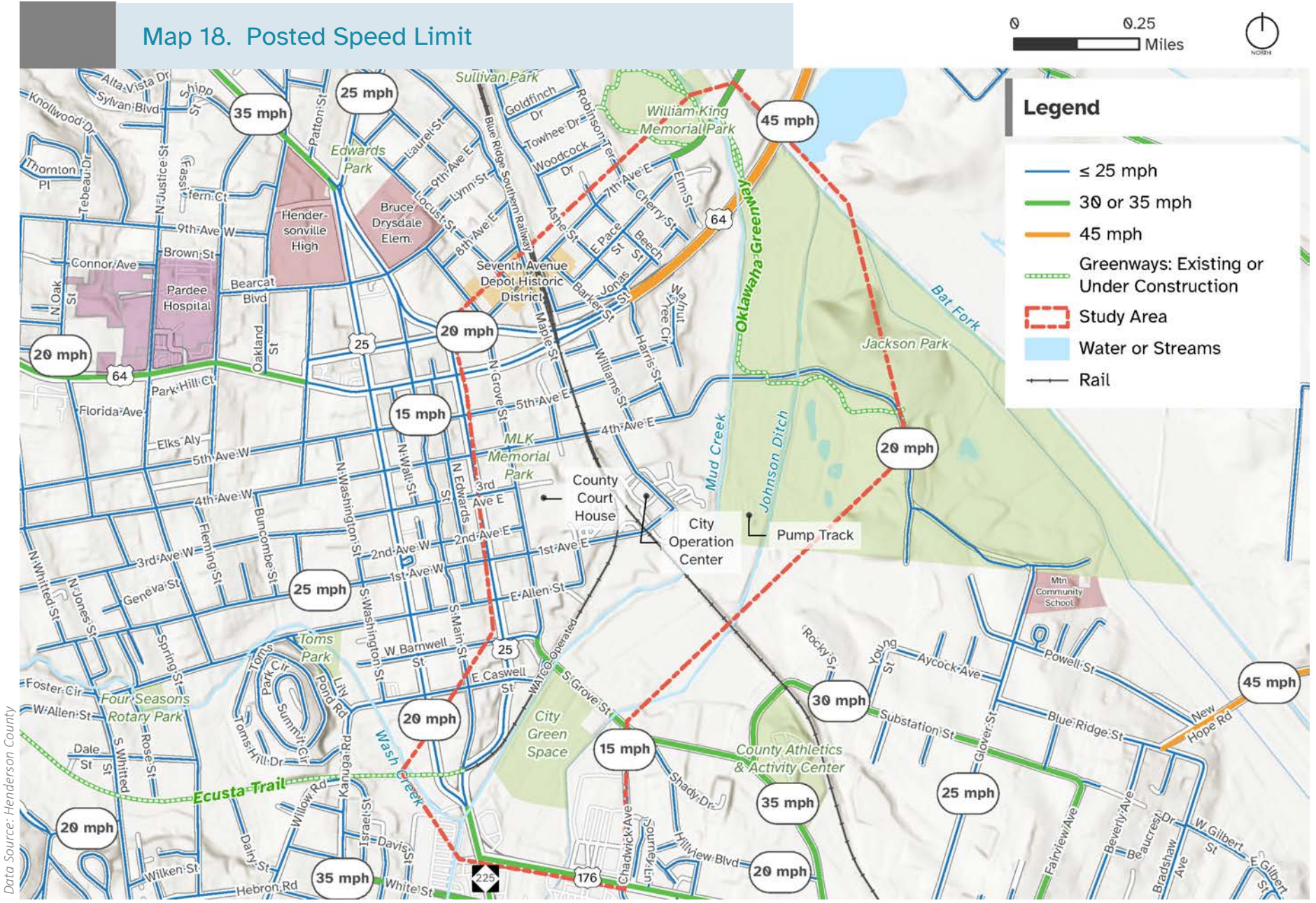
The Above the Mud Greenway will offer an alternative route away from high-traffic roadways, providing a protected pathway for people of all ages and abilities.

Map 17. Annual Average Daily Traffic (AADT)



Data Source: NCDOT (2021)

Map 18. Posted Speed Limit



Data Source: Henderson County

Posted Speed Limit

Tapping into roadway data from the County, **Map 18 - Posted Speed Limit** illustrates the varying posted speed limits on segments throughout the study area. This includes both state-maintained and non-state-maintained roads. Except for US 64, US 176, South Main Street, and South Grove Street, all the roads in the study area are posted at a speed of 25 mph or less. As speed is an important predictor of safety, these low posted speed limits are important for protecting people walking and bicycling.

Pedestrian Crash History and Corridor Section Safety Scores

Map 19 - Crash History & Corridor Safety Scores illustrates the reported pedestrian- and bicycle-involved crashes (2017-2021) and the NCDOT Corridor Section Safety Scores within the study area. There was a total of seven crashes in this time frame: two crashes involved a person bicycling; five crashes involved a person walking; and two of the five pedestrian-involved crashes resulted in a pedestrian death. Although no crash is acceptable, it is important to acknowledge that crashes can be unique events so in addition to understanding crash frequency, it is important to study other indicators of safety. Number of travel lanes, AADT, and posted speed limits provide a better understanding of crash risk and perception of safety for people walking and bicycling. These higher volume and higher-speed roadways are addressed earlier in this chapter.

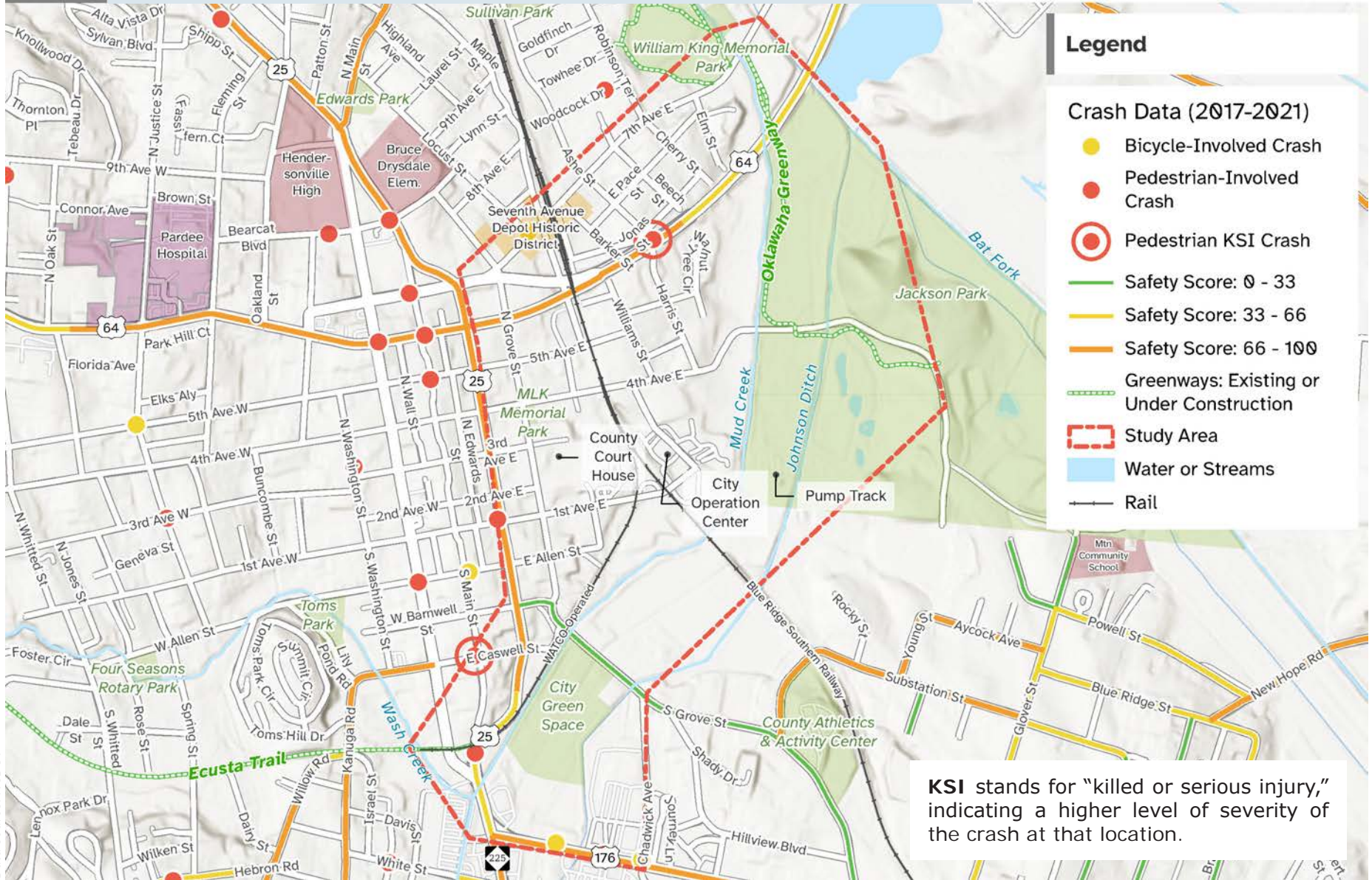
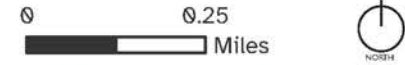
The NCDOT Section Safety Scores provide summarized crash and safety data by intersections or sections of road. The data is intended to be used for high-level prioritization and network programming. Points are assigned to the road segments based on three areas: 1) density of crashes in the study area versus the average crash density of similar facilities; 2) crash severity index; and 3) the actual crash rate for the study area versus the critical crash rate. Segments with a higher score are more problematic and include US 64, US 25, and US 176.

Image 31. Speed Limit Sign on South King Street



Source: TPD

Map 19. Crash History & Corridor Safety Scores



Data Source: NCDOT

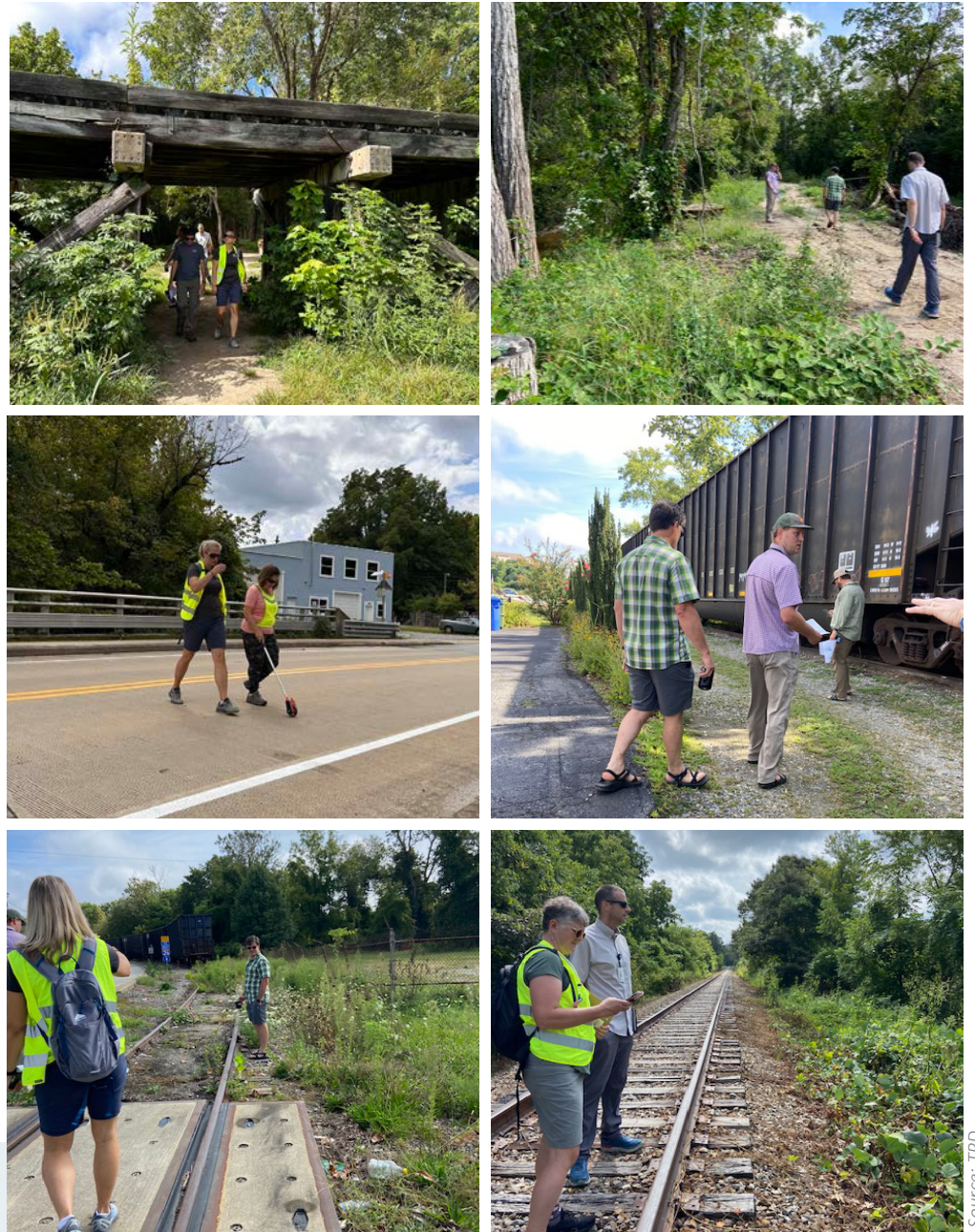
FIELD OBSERVATIONS

To fully understand a project, it is necessary to visit the site and record photographs, measurements, and observations of the natural/human environment. On September 8, 2023, the project team visited the study area to fully understand the opportunities and constraints related to a greenway connection. The team paid close attention to the following considerations, which strongly shaped the identification of the preferred alignments.

- Publicly owned parcels
- Rights-of-way, private property impacts, and building setbacks
- Topography
- Floodplains and water bodies
- Structures (rail, bridges)
- Roadway environment (AADT, posted speed, traffic control, guardrail, sidewalks, crossings, parking)
- Existing greenways and sidewalk connections
- Land uses and new developments
- Driveways and access
- Natural environment (invasive vegetation, erodible soils)
- Utilities
- Drainage

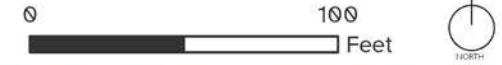
These opportunity and constraint considerations are illustrated in the following maps and photographs, which are grouped geographically throughout the study area. Photograph numbers are allocated based on area and type, so may not appear sequentially on the map.

The team conducting fieldwork for the project.



Source: TPD

Map 20. Opportunities: South Main Street & South King Street



NOTE: Numbers are allocated based on area and type, so may not appear sequentially on the map.

OPPORTUNITIES: SOUTH MAIN STREET & SOUTH KING STREET



1

The intersection of South Main Street and South Church Street is a gateway into the City. NCDOT has plans to construct a roundabout at this intersection.



2

This study begins at the terminus of the future Ecusta Trail, which will be located in proximity to South Church Street.



4

The right-of-way purchased for the Ecusta Trail extends beyond South Main Street for a short section, creating an opportunity to transition to a paved greenway.



5

This underutilized property could provide a connection across Mud Creek to City-owned land.

Map 21. Constraints: South Main Street & South King Street



NOTE: Numbers are allocated based on area and type, so may not appear sequentially on the map.

CONSTRAINTS: SOUTH MAIN STREET & SOUTH KING STREET



3

The crossing where the Above the Mud greenway would traverse South Main Street is currently unsafe for pedestrians.



7

A pedestrian bridge would be required over Mud Creek to access City-owned land.



6

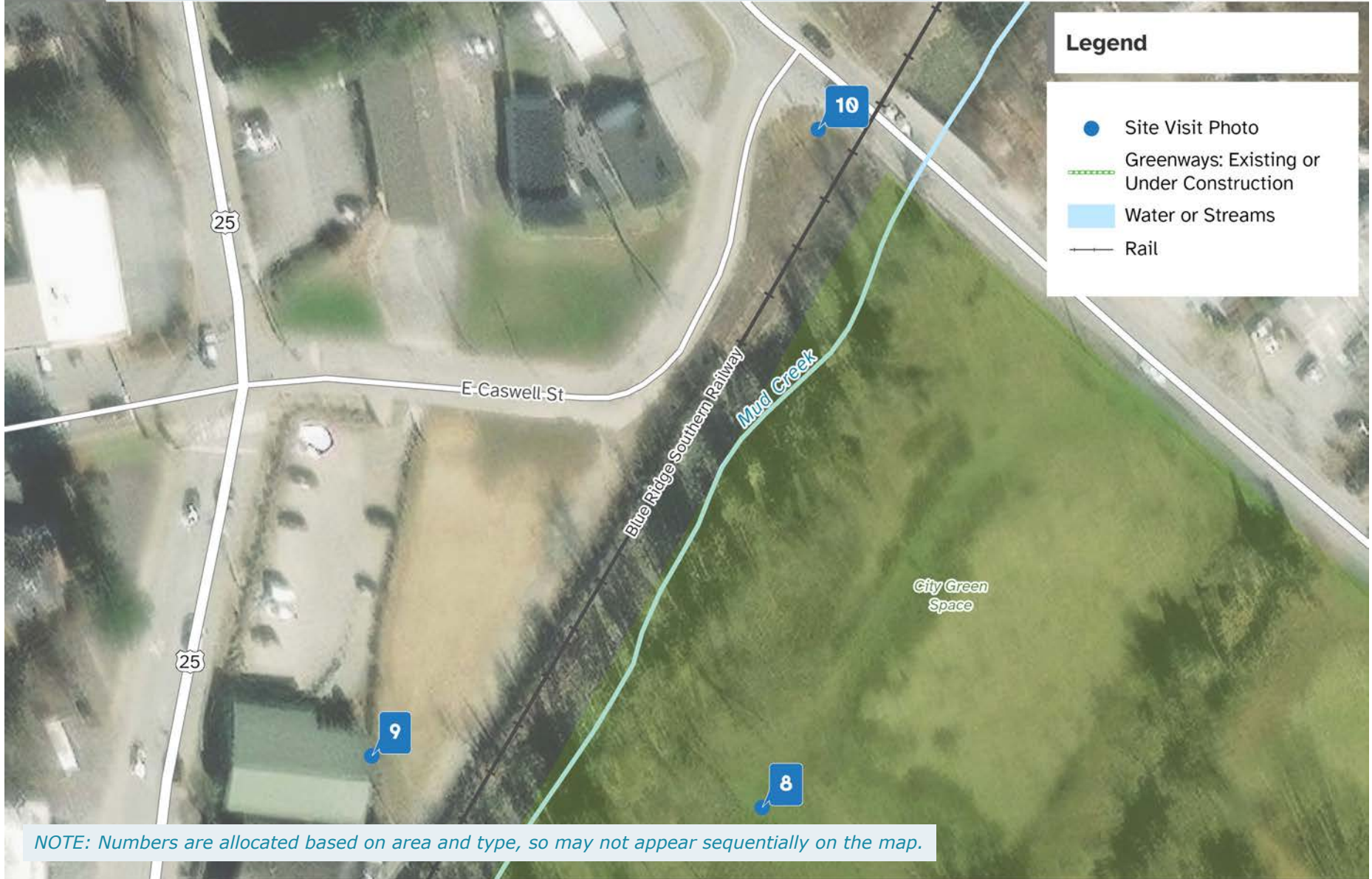
The proximity of the rail lines along South King Street would make a rail-with-trail more difficult as modifications to US 25 would be required.

Map 22. Opportunities: South King Street & East Caswell Street



Legend

- Site Visit Photo
- Greenways: Existing or Under Construction
- Water or Streams
- +— Rail



NOTE: Numbers are allocated based on area and type, so may not appear sequentially on the map.

OPPORTUNITIES: SOUTH KING STREET & EAST CASWELL STREET



8

This City-owned land is part of a flood restoration project and provides an opportunity for a paved greenway parallel to Mud Creek.



9

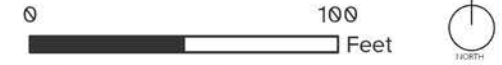
Open land between commercial buildings on South King Street and the rail line offers an opportunity for a greenway.



10

East Caswell Street is a low traffic volume street that has potential to accommodate a greenway if reconfigured.

Map 23. Constraints: South King Street & East Caswell Street



Legend

- Site Visit Photo
- Greenways: Existing or Under Construction
- Water or Streams
- +— Rail



NOTE: Numbers are allocated based on area and type, so may not appear sequentially on the map.

CONSTRAINTS: SOUTH KING STREET & EAST CASWELL STREET



The rail line northeast of South Grove Street is covered with invasive vegetation. The constraints here make a rail-with-trail unlikely. This alignment may only be feasible if the line was converted from rail-to-trail.

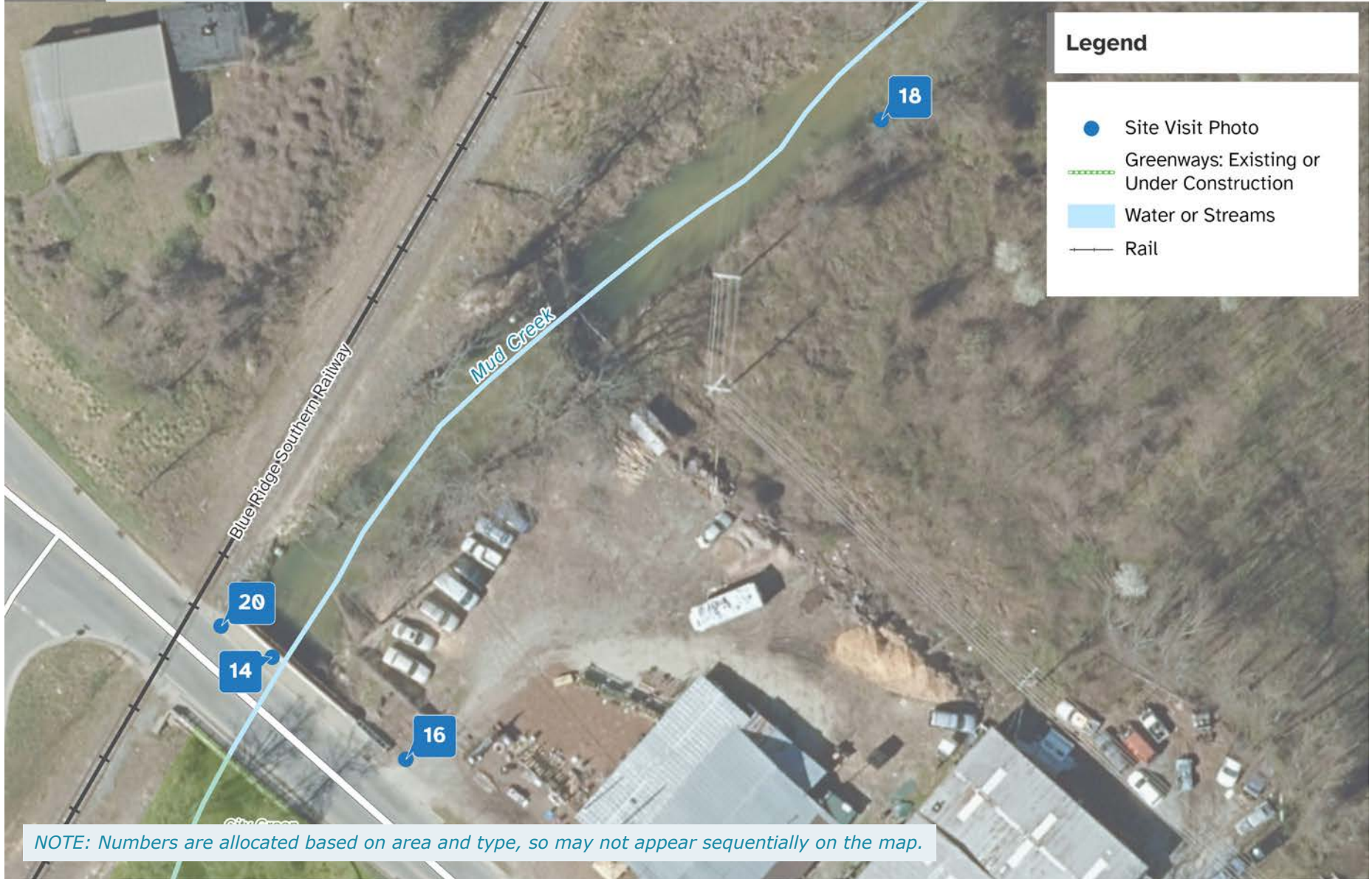
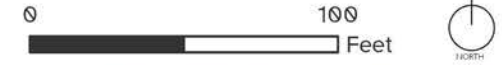


There is very little room for a paved greenway between the rail line and Mud Creek in this location.



This unnamed tributary runs between several buildings, which limits a greenway connection between South Grove Street and parcels to the east.

Map 24. Opportunities: South Grove Street



OPPORTUNITIES: SOUTH GROVE STREET



14

The South Grove Street vehicle bridge over Mud Creek has 5' sidewalks on both sides, providing an opportunity for pedestrian connection but not wide enough for a multiuse path. This connection could be possible if an additional bridge is constructed or if the existing bridge is replaced.



18

This commercial property off of South Grove Street parallels Mud Creek. An easement on private property would be needed for a greenway here.



16

Sidewalks are planned for South Grove Street, a key connection for residents from the south side to the north side of town.

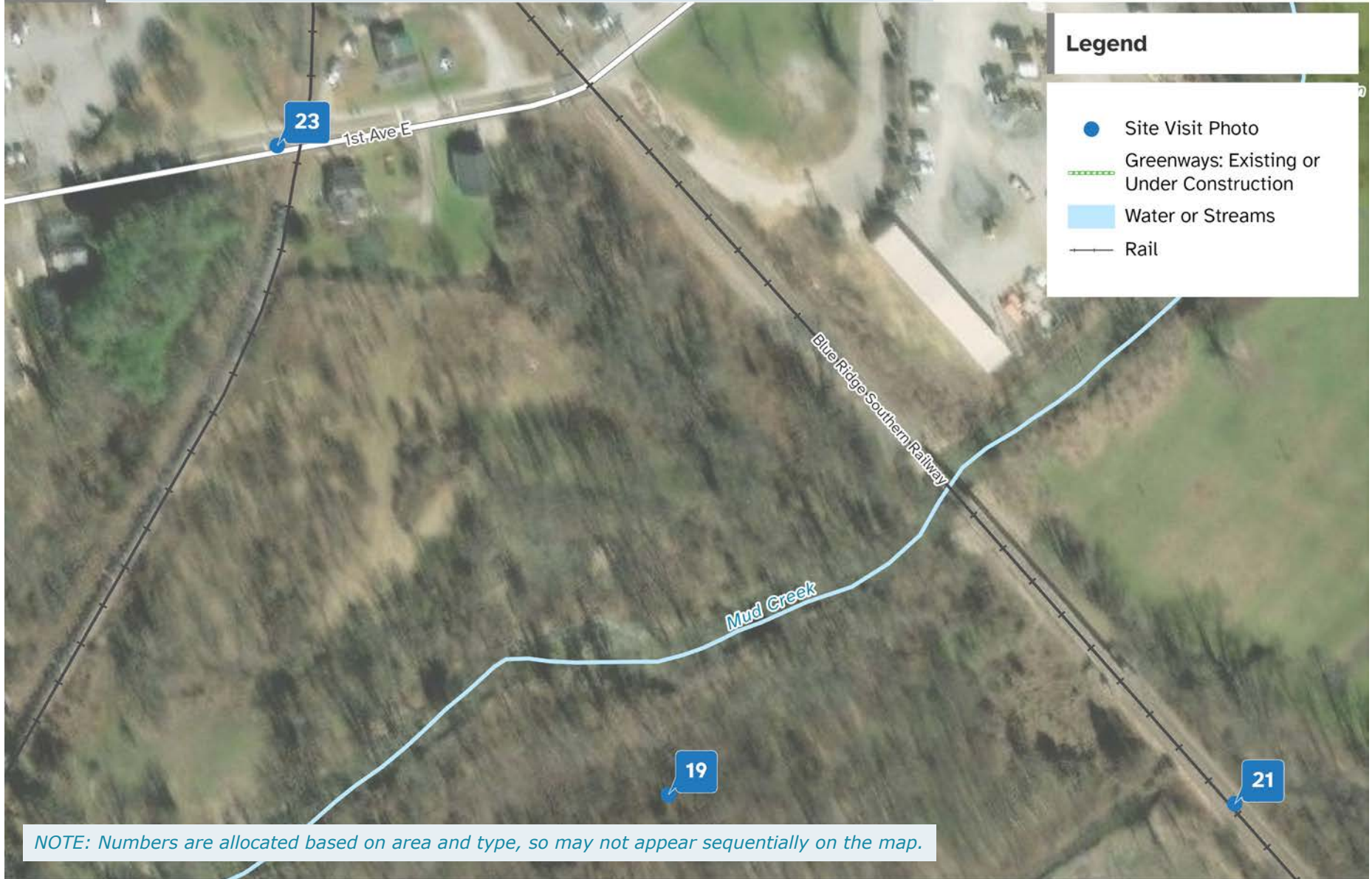


20

This City-owned property is planned for flood restoration and a passive park. A paved greenway could parallel Mud Creek here.

Map 25. Constraints: South Grove Street

0 100 Feet



NOTE: Numbers are allocated based on area and type, so may not appear sequentially on the map.

CONSTRAINTS: SOUTH GROVE STREET



19

This section of Mud Creek is popular with dog owners. The soils in this area are erodible, making this section difficult for greenway construction.



21

Currently, the Watco line is not available for a rail-to-trail conversion. If this section becomes available, it could be used to connect areas north (e.g. 7th Avenue and the City Operations Center area) to Jackson Park and areas south of Mud Creek, including a future Saluda Grade Trail connection. Alternatively, an additional greenway bridge to the west could be added to make this connection.



23

The rail line operated by Watco is being used for storing cars. There is a steep slope west of the tracks.

Map 26. Opportunities: Fourth Avenue Area

0 100 Feet



OPPORTUNITIES: FOURTH AVENUE AREA



22

The rail trestle bridge has piers that are wide enough apart to accommodate a greenway underneath.



25

Fourth Avenue East was recommended as an important multimodal link in past studies. Connecting to this location via the rail line would create a connection to downtown.



24

The open land between the rail tracks and the Henderson County facility provides an opportunity for a greenway alongside the tracks.



26

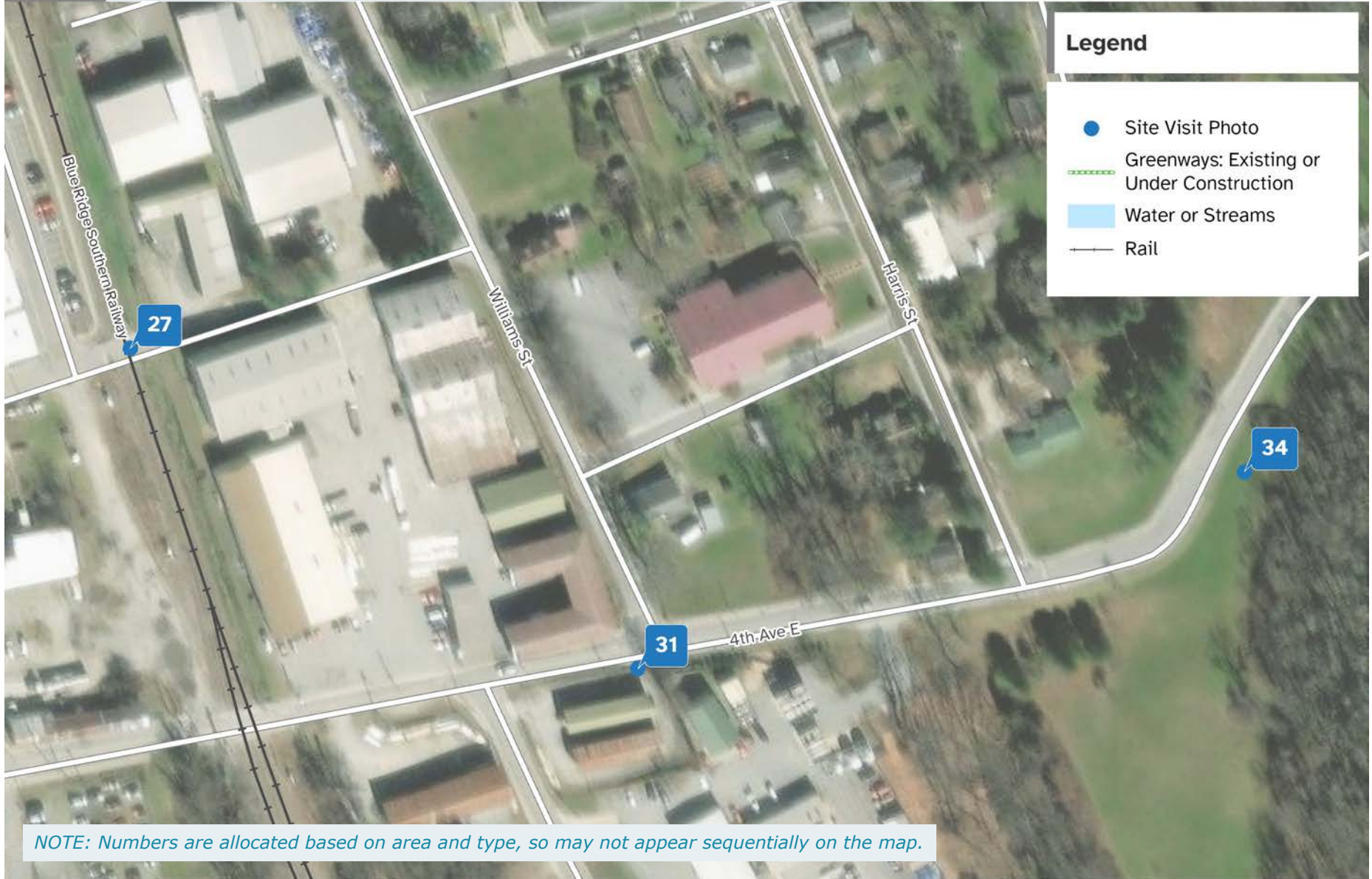
Adjacent to the rail line, north of 4th Avenue, there is currently a wide, undeveloped area on the west side of the rail line and provides an opportunity to connect to the commercial district north of 5th Avenue.

Map 27. Constraints: Fourth Avenue Area



Legend

- Site Visit Photo
- Greenways: Existing or Under Construction
- Water or Streams
- +— Rail



NOTE: Numbers are allocated based on area and type, so may not appear sequentially on the map.

CONSTRAINTS: FOURTH AVENUE AREA



Fourth Avenue to the east (towards Jackson Park) currently has a sidewalk and shared bicycle facility on road. Additional right of way is needed to provide for a greenway connection (sidepath) along this section.

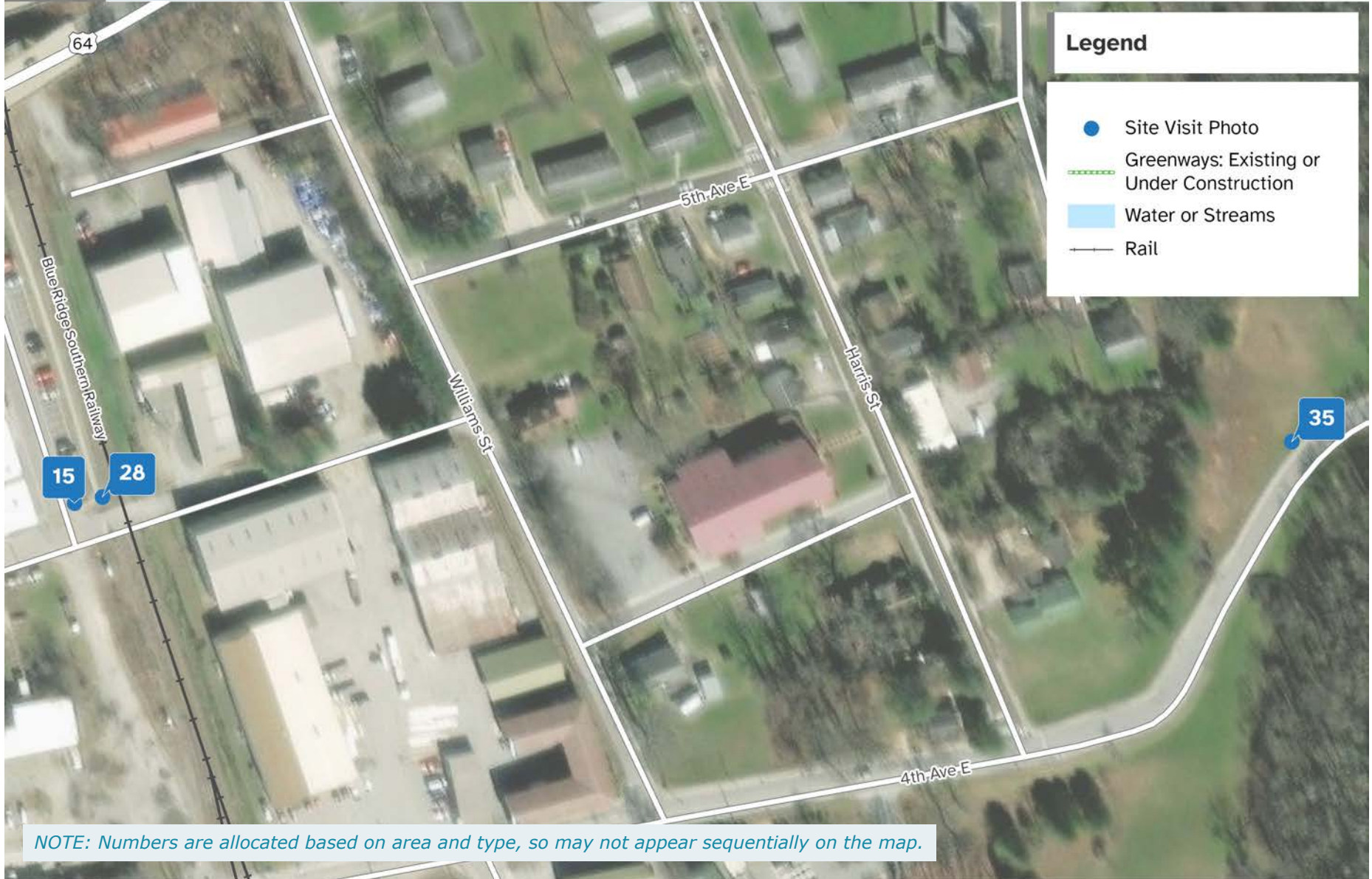


A ditch between the building supply and the rail line is a possible constraint.



The entry road into Jackson Park from 4th Avenue has a significant slope to traverse. Since this is in a floodway, flood impacts would need to be assessed for any modifications.

Map 28. Opportunities: Fifth Avenue Area



OPPORTUNITIES: FIFTH AVENUE AREA



Where the rail line intersects with 5th Avenue East, the "beeline" walk is on the west side, providing a pedestrian connection.

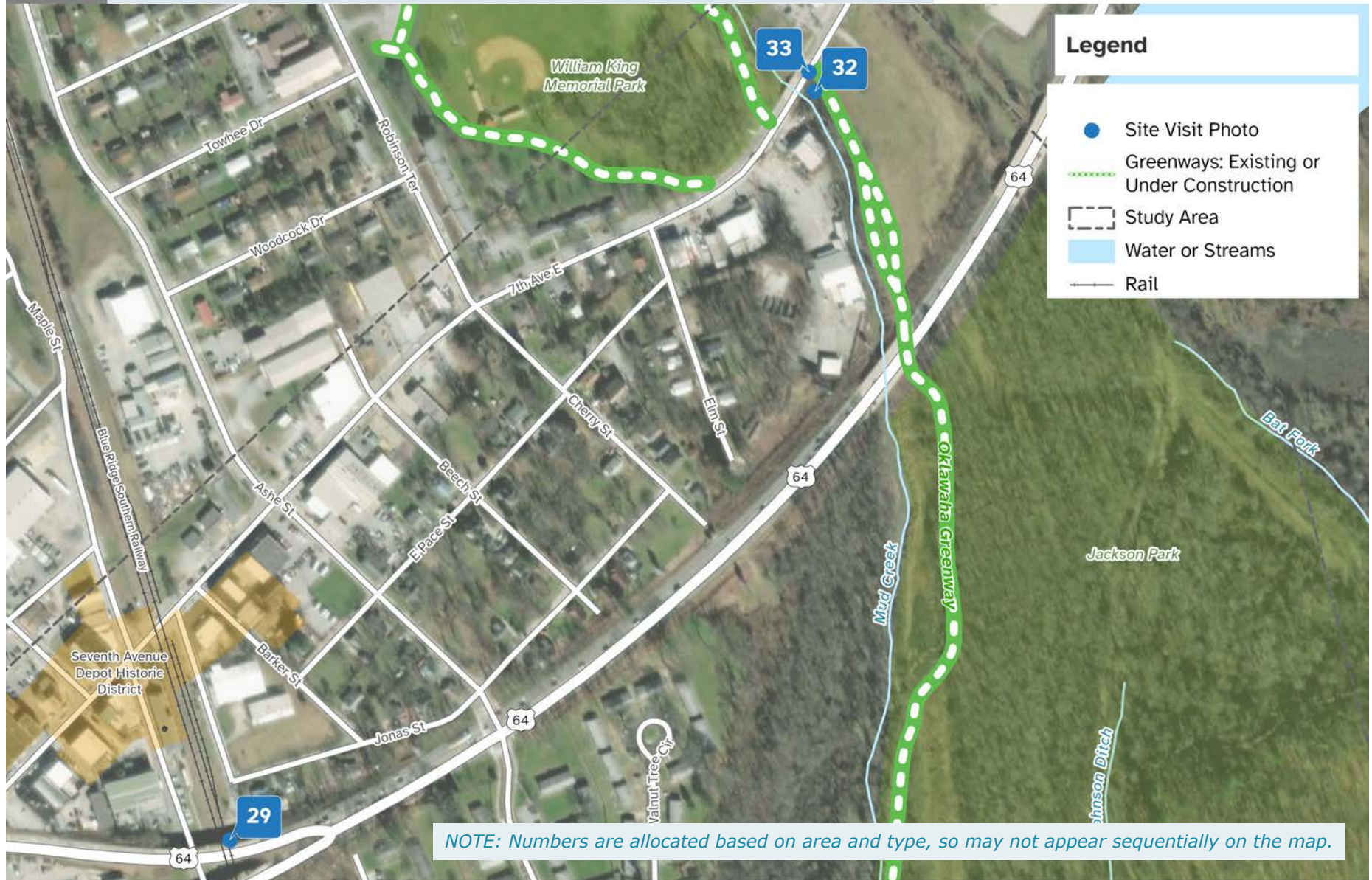


The east side of the tracks between 5th Avenue and 6th Avenue has a wide, underutilized space along the right-of-way.



The entry road to Jackson Park has a wide green space making it possible for a greenway to connect to the existing Oklawaha Greenway on the opposite side of the vehicle bridge. Where this route crosses Mud Creek, floodway analysis will be required for any modifications.

Map 29. Constraints: Seventh Avenue Area



CONSTRAINTS: SEVENTH AVENUE AREA



29

Boxcar Street, a gravel street, is very close to the rail line under US 64. Coordination with local businesses and the railroad will be necessary.



32

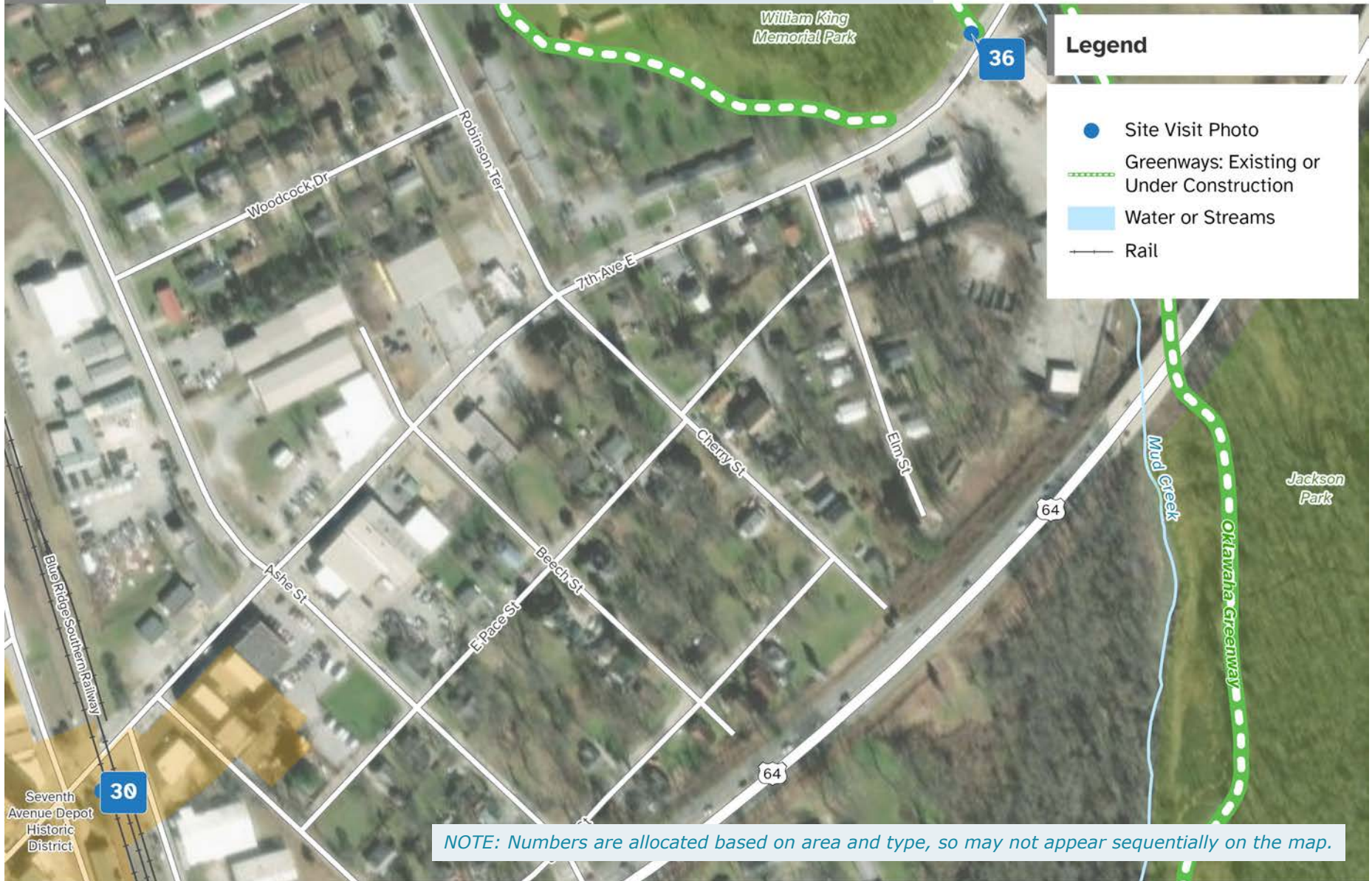
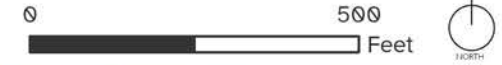
The Oklawaha Greenway crossing at 7th Avenue has some challenges for users.



33

The vehicle bridge over Mud Creek on 7th Avenue includes sidewalks on both sides, but they are narrow.

Map 30. Opportunities: Seventh Avenue Area

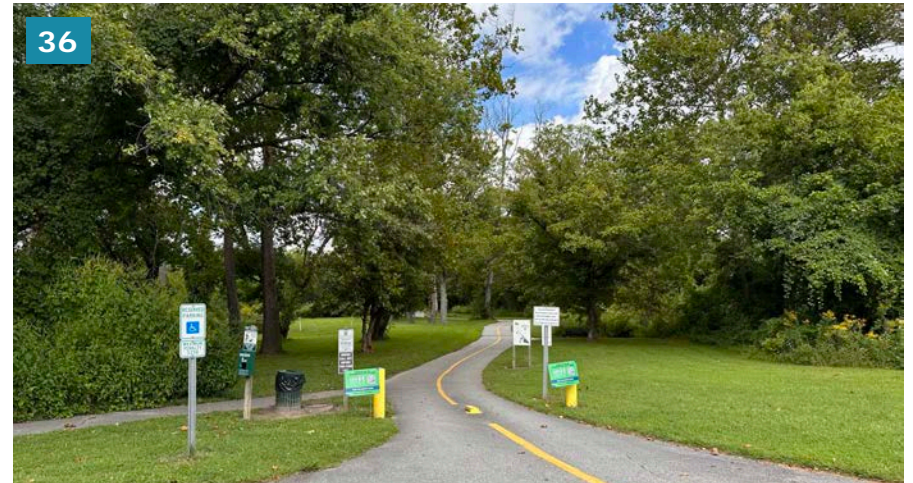


OPPORTUNITIES: SEVENTH AVENUE AREA



30

The commercial district on 7th Avenue East will be a destination for future greenway users.



36

The goal of the project is to connect the Oklawaha Greenway to the future Ecusta Trail.

ALTERNATIVES DEVELOPMENT

Design Parameters

Design parameters are a set of guidelines that steer a project towards the outcomes that are consistent with community goals. Based on project team and steering committee feedback, this project seeks to achieve the following for the Above the Mud greenway:

- **Pedestrian- and Bicycle-Focused Design Solution:** This entails creating a pathway that caters to the needs of people who walk and bike, with features such as wide paths, separation from motor vehicle traffic, and vehicle and pedestrian oriented signage and pavement markings to enhance safety and navigation.
- **Physical Separation from Traffic:** Achieving physical separation from vehicular traffic involves employing barriers, buffers, or other infrastructure to create a safe and protected space for greenway users, minimizing the risk of crashes or conflicts with vehicles.
- **Accessibility for All Ages and Abilities:** Designing the greenway to be accessible to people of all ages and abilities necessitates features such as gentle gradients, smooth surfaces, ample seating areas, and amenities like restrooms and water fountains placed at convenient intervals along the greenway.
- **Resilience to Flood Events:** Given the likelihood of flood events, the greenway's design should incorporate measures designed to withstand flood damage. Examples include elevated pathways, drainage systems, and the use of flood resistant materials. The goal is to design a greenway that is easy to maintain, is resilient to damage during flood events, and facilitates quick recovery post-flooding.
- **Adherence to Standards and Best Practices:** Designing the greenway to comply with guidelines and regulations governing greenway design, construction, and accessibility to deliver a high-quality facility using national guidance to the maximum extent feasible.

- **Minimization of Property Impact:** Minimizing the impact on private property and maximizing the use of publicly owned land requires careful planning, negotiation, and collaboration with property owners, as well as innovative design solutions to mitigate any potential adverse effects on adjacent properties.
- **Phased Implementation:** Identifying phases for greenway development provides project delivery flexibility that can adjust to conditions such as resource and funding availability or changing priorities while ensuring continuity throughout the project development process.

For the Above the Mud greenway to connect the Ecusta Trail to the Oklawaha Greenway, it must cross roadways. While grade-separated crossings are preferred, they are not always possible. When the greenway crosses a roadway at-grade, the primary design feature to consider is how to reduce the exposure to, and increase the visibility of, when people who walk and bike mix with vehicular traffic. Crossings should be high visibility at a minimum, and other treatments (advanced warning signage, signals, pavement markings, etc.) may be considered based on-site conditions. Chapter 4 and the Appendix offer design resources for crossing considerations.

Segment Alternatives

The project team investigated the study area to identify opportunities for greenway connections. Each opportunity (or potential greenway segment) was reviewed to evaluate constructibility factors such as right of way needs, topography, impacts to adjacent properties, environmental and permitting needs, directness of connection, etc. A summary of findings is presented in **Table 1 - Preliminary Segment Investigations**. **Map 31 - Preliminary Segment Investigations** shows the greenway segments that were investigated within the study area.

By evaluating all possible routes and eliminating those that are not practical or feasible, the team identified the most viable alignment between the Ecusta Trail and the Oklawaha Greenway, while also providing access to downtown.

Map 31. Preliminary Segment Investigations

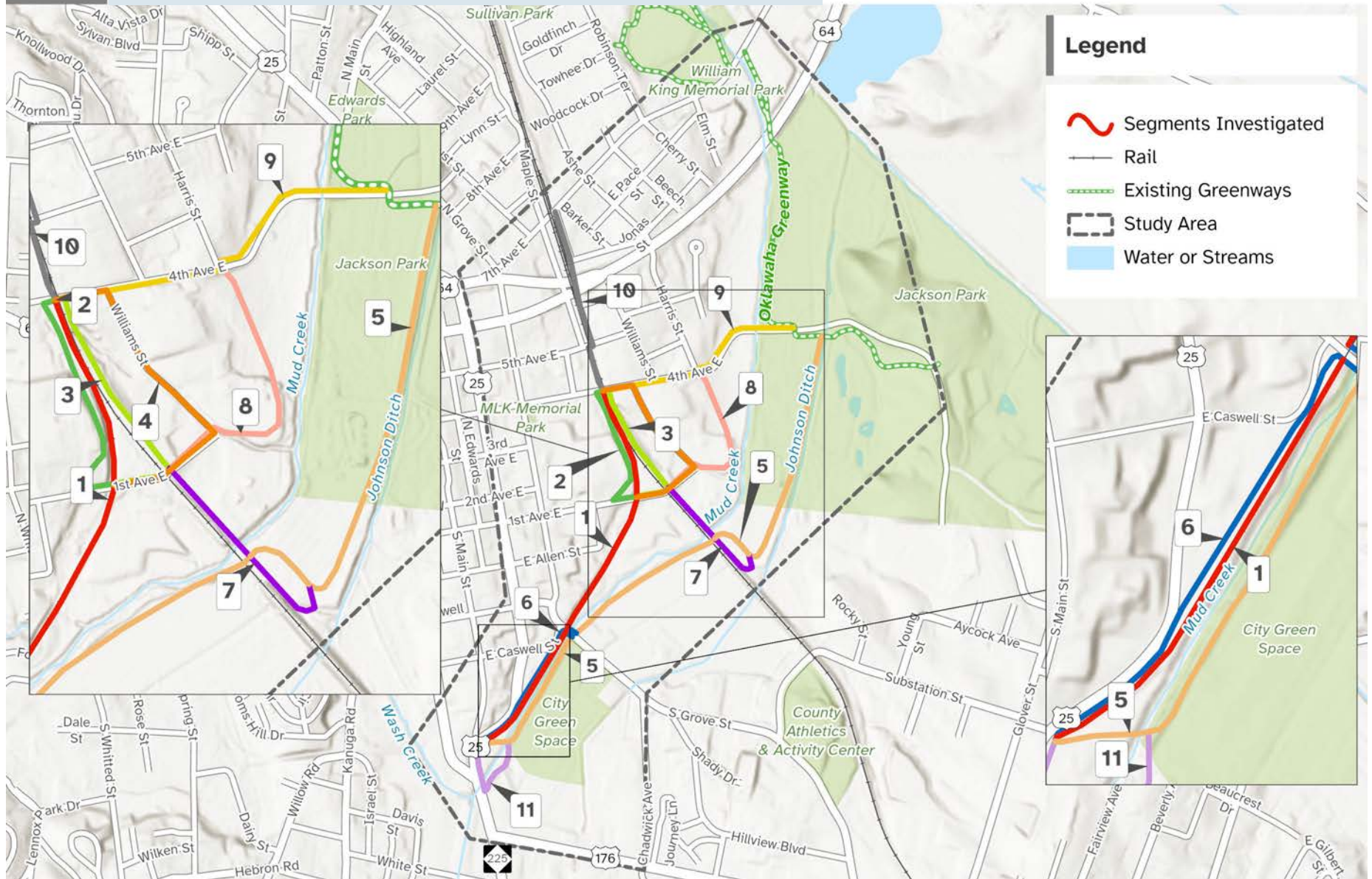
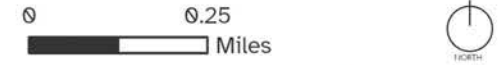


Table 1. Preliminary Segment Investigations

ID	Segment Description	Opportunity	Challenges/Constraints	Status
1	Rail-to-trail conversion for the remaining section of the active Ecusta Line between South King Street and 4th Avenue East.	Extends Ecusta Trail with the most direct connection on same alignment.	Requires approval from rail owner/operator. Construction cost relatively low; however, ROW acquisition will be required.	Under consideration, pending railroad coordination.
2	Rail-with-trail following the west side of the Ecusta Line along County property between 1st Avenue East and 4th Avenue East.	Wide grass buffer between County Detention Center and the Ecusta Line could be graded with retaining walls to make space for a greenway along the edge of County parcels.	Security issues with County Detention Center. Retaining walls would be needed driving up costs. County has plans to expand on site which eliminates the ability to accommodate a greenway on this site.	Eliminated due to ROW constraints.
3	Rail-with-trail following the east side of the Ecusta Line along City property between 1st Avenue East and 4th Avenue East.	Wide grass buffer between City buildings and the Zirconia Line could be graded and use retaining walls to make space for a greenway along the edge of City parcels.	Approval from rail owner/ operator for greenway in ROW. Retaining walls would be needed driving up costs. May not be constructible, more engineering would be required to determine feasibility.	Eliminated due to high cost and City property impacts with constructibility challenges.
4	Sidepath connecting the Ecusta Line where it intersects 1st Avenue East to 4th Avenue East. Parallels portions of 1st Avenue East, Williams Street, and 4th Avenue East.	With retaining walls and parking lot adjustments, a sidepath could be possible along the east side of Williams Street.	Indirect route; requires retaining walls and easements with site modifications for a number of properties. May have utility conflicts.	Eliminated due to poor quality of connection with constructibility challenges.
5	Crosses Mud Creek on a new bridge from the Ecusta Line near South King Street onto planned City floodplain restoration parcels. Parallels Mud Creek north into Jackson Park along a planned sewer easement and additional floodplain restoration properties.	Underutilized parcels and lots can be used to make a high quality connection to expand the urban context between 4th Avenue East and 7th Avenue East.	Requires pedestrian bridge over Mud Creek.	Under consideration. Needed connection independent of this project.

Table 1. Preliminary Segment Investigations (Continued)

ID	Segment Description	Opportunity	Challenges/Constraints	Status
6	Follows Ecusta Line from King Street to South Grove Street. Crosses Mud Creek on a new bridge to connect to planned City floodplain restoration parcels.	Opportunity to utilize extra pavement width along South King Street on the north side of the Ecusta Line, pass along one existing building and then utilize a vacant parcel near South Grove Street.	Requires approval from rail owner/operator; South Grove Street bridge is too narrow for sidepath. Challenges may arise with proposing to narrow South King Street. Pinch point between rail line and private building structure.	Eliminated due to pinch point between private building and railroad line.
7	From Dog Park and Jackson Park, ramps up to cross Mud Creek on a new bridge that runs parallel to the Zirconia Line and connects to 1st Avenue East through City property on the north side of Mud Creek. Follows 1st Avenue East as a sidepath to connect to greenway.	Opportunity to build a new greenway bridge over Mud Creek running parallel to the Zirconia Line bridge and connect to City parcels from Jackson Park.	Indirect connection to Oklawaha Greenway. Permitting a new pedestrian bridge at this location could be challenging due to floodway and floodplain constraints and the need to elevate a greenway ramp to a structure.	Eliminated, indirect route with permitting challenges.
8	Greenway connection through City property that provides an alternate route between Williams Street and 4th Avenue East sidepath into Jackson Park.	Properties owned by City present an opportunity to connect to Jackson Park on the north side of Mud Creek.	Combined with Segment 7. Permitting a new pedestrian bridge at this location could be challenging due to floodway and floodplain constraints and the need to elevate a greenway ramp to a structure. Less direct connection.	Eliminated, indirect route with permitting challenges.
9	Sidepath on 4th Avenue East running from Jackson Park to Ecusta and Zirconia Line rights of way.	This connection is independently needed to connect downtown to Jackson Park and would utilize fields and some wider industrial parcel frontages.	Planned route between Main Street and Jackson Park. Connects to wide sidewalks along County Courthouse site. Requires retaining walls and easements with site modifications for a number of properties. May have utility conflicts.	Under consideration. Needed connection independent of this project.

Table 1. Preliminary Segment Investigations (Continued)

ID	Segment Description	Opportunity	Challenges/Constraints	Status
10	Rail-with-trail along the Zirconia Line between 4th Avenue East and 7th Avenue East. Parallels rail line on the west side between 4th and 5th Avenue East before crossing the railroad and running north to 7th Avenue East on the east side of the rail corridor.	Underutilized parcels and lots can be used to make a high quality connection to 7th Avenue East to expand the urban context	Requires approval from rail owner/operator. Construction cost relatively low; however, ROW acquisition will be required.	Under consideration, pending railroad coordination. Needed connection independent of this project.
11	From Ecusta Trail terminus at South Main Street, connects to planned City floodplain restoration project via a sidepath along the east side of South Main Street, a new pedestrian bridge and a new greenway connection along the northern edge of the CVS property near the stormwater basin.	New greenway bridge over Mud Creek would be adjacent to the S. Main Street bridge which may help with floodway permits.	Indirect connection; permitting challenges with Mud Creek bridge, CVS storm basin impacts and potential brownfield.	Eliminated, indirect route with permitting challenges.

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facilitate double-sided printing.*



03 **Community Engagement**



OVERVIEW

Community participation offers valuable perspectives on local observations, concerns, and hopes, thereby enhancing project designs and decisionmaking. Additionally, engagement opportunities allow the project team to communicate project objectives, manage expectations, and share results. This section summarizes the community engagement efforts for the Above the Mud project and input collected from stakeholders, such as residents, agencies, and nonprofit organizations, all of whom have played a role in shaping the feasibility study for the Above the Mud Greenway feasibility study.

PREVIOUS ENGAGEMENT EFFORTS

This Above the Mud study builds upon previous engagement initiatives that provide insight into the needs, preferences, and concerns of stakeholders, residents, advocacy groups, local businesses, and governmental organizations. The results from the previous engagement efforts are summarized below.

Above the Mud Public Input Meeting

In order to gauge interest and hear concerns as well as improve the chances of winning competitive grants (including a USDOT RAISE grant - Rebuilding American Infrastructure with Sustainability and Equity) for the Above the Mud project, the City of Hendersonville hosted a preliminary public input meeting on Tuesday, March 29, 2022. This drop-in meeting (with a virtual participation option) was designed as a catch-all meeting to capture input on Mud Creek greenway considerations, Oklawaha Greenway flood remediation strategies, and 7th Ave streetscape improvements. The meeting provided grant proposal project information, allowing participants to provide feedback and show their local support for improving bicycle and pedestrian infrastructure.

Image 32. Public Input Meeting Advertisement (2022)

Source: City of Hendersonville

COMMUNITY ENGAGEMENT PLAN

At the beginning of the feasibility project, the project team developed a Community Engagement Plan to outline upcoming outreach endeavors and help ensure equitable public engagement throughout the project’s progression. Serving as a flexible document over the project’s lifespan, it was designed to:

- Offer a retrospective analysis of prior community involvement and planning initiatives.
- Evaluate public interest in the planning procedure and explore avenues for stakeholder contribution.
- Identify areas where the community wants to see multimodal connections.
- Determine strategies for segmenting and prioritizing project components for future investment and advancement.

Figure 18. Above the Mud Greenway Engagement by the Numbers



SUMMARY OF PROJECT MEETINGS

Kickoff Meeting

This meeting was held virtually on July 21, 2023, to launch the project and begin discussing important tasks, milestones, and goals. The team shared a ConceptBoard map set to add comments to points of interest or challenges in the study area.

KEY FINDINGS:

- A major stakeholder is Watco, as well as Conserving Carolina.
- This study has many other concurrent projects to consider (NCDOT U-5886 roundabout, Mud Creek riparian restoration, Oklawaha Greenway extension plans, 7th Avenue streetscape, Ecusta Trail construction updates, new City sewer line project, and a Reconnecting Communities Grant).
- The City is moving forward with a Parks & Recreation Master Plan. The dog park has been identified as something to keep.
- The feasibility study may result in a “working” document that identifies multiple greenway alignments, leaving the final pursuit strategy up to landowner amenability.

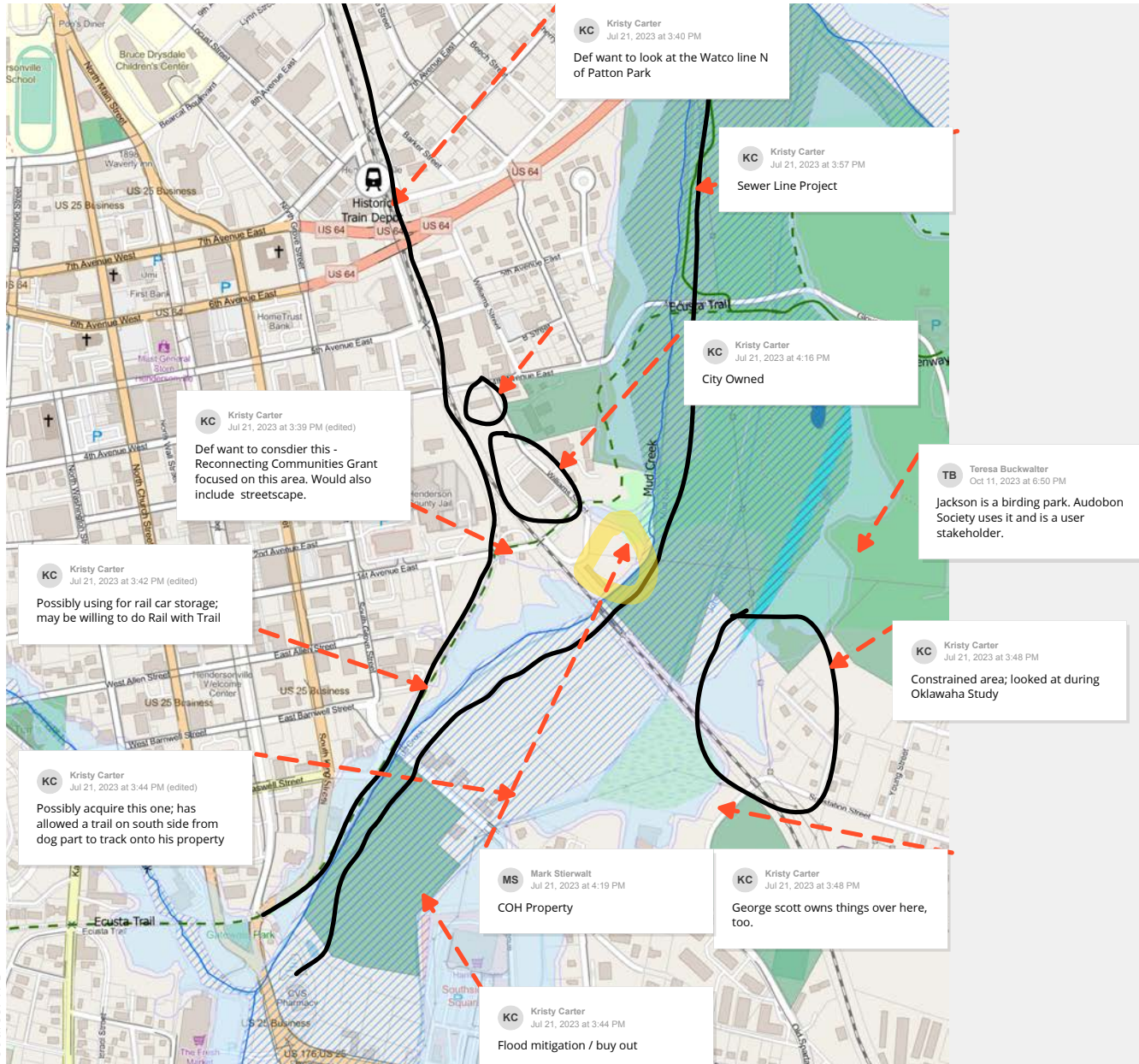
Image 33. Ecusta and Saluda Grade Connection Meeting



Stakeholder groups, including municipal and county leaders, nonprofit agencies, NCDOT, and railroad owners, continue to strategize about key connections. One big regional connection is filling the gap between the Ecusta Trail and the Saluda Grade Trail, with Above the Mud providing a crucial link.

Source: TFD

Image 34. Kickoff Meeting ConceptBoard Screenshot



Initial routing options, notes on important connections, and challenges and opportunities were considered during the project kickoff. These elements were crucial in shaping the development of the greenway alignment alternatives.

Source: TPD

Saluda Grade Trail to Ecusta Trail Connection Meeting

The Saluda Grade Trail project is under development, with three nonprofit partner organization spearheading the study. This 31-mile rail-to-trail project will link Henderson County (Zirconia) to Inman, SC through a purchase and conversion of an inactive Norfolk Southern rail line. A meeting was held on October 4, 2023 with the nonprofit partners and City of Hendersonville staff to discuss a potential connection between the Ecusta Trail and the Saluda Grade Trail. Making this connection would solidify Hendersonville as a greenway “hub” and have huge recreation, economic development, and local connectivity implications.

KEY FINDINGS:

- The rail line is not currently for sale so other routes to connect Hendersonville to the future Saluda Grade Trail will need to be identified.
- Historically, the Village of Flat Rock has not been amenable to greenway connections through the community.
- Following Bat Fork Creek would provide connections to Blue Ridge Community College, East Henderson High School, and access from nearby I-26.

Steering Committee Meeting #1 (Presentation)

The first meeting of the Steering Committee was held on January 22, 2024. It was a virtual meeting and included a comprehensive presentation covering project progress, scheduling updates, preliminary route evaluation criteria, key stakeholder analysis, and observations from site visits. Furthermore, The Team presented all potential route options, highlighting considerations for each, such as existing utility easements, flood zones, existing greenway connections, and railroad rights-of-way.

KEY FINDINGS:

- Routing will depend on final outcome of Watco rail line availability (for purchase or rail-with-trail).
- The CVS drainage basin on South Main Street might be a constraint (soil/water contaminants).

STEERING COMMITTEE

The steering committee was comprised of key local government staff, with representation from the French Broad River Metropolitan Planning Organization (MPO), City of Hendersonville, and NCDOT's Integrated Mobility Division. Meeting three times during the project, the committee provided guidance by examining and giving feedback on relevant data, community engagement efforts, alternate route proposals, and implementation plans.

MEMBERS

- Brent Detwiler, City of Hendersonville
- Mark Stierwalt, City of Hendersonville
- Tom Wooten, City of Hendersonville
- Lew Holloway, City of Hendersonville
- Matt Manley, City of Hendersonville
- Darcy Downs, NCDOT Integrated Mobility Division

- City-led Brevard Church flood restoration project could be integrated with the greenway and new pedestrian bridge.
- Watco may not be receptive to a short parallel bridge over Mud Creek, so other land would need to be identified.
- Some potential conflicts with security for County jail.
- Several preliminary alignments may not be feasible - alternatives are developed under different assumptions regarding rail line options.
- Stakeholder analysis includes a range of organizations, with varied levels of anticipated cooperation and project impact.

Steering Committee Meeting #2 (Check-in)

The group gathered for a check-in meeting on January 30, 2024 to discuss stakeholder engagement. This included a review of communication between elected officials at the state level, Watco rail line, and outreach to Henderson County.

KEY COMMUNICATION POINTS:

- The Above the Mud routing needs to be specific about rail segments and what each alignment needs.
- Clarify with Watco if rail-with-trail would be an option (rather than rail-to-trail conversion).
- Update on the County Courthouse expansion project (limits, scale, etc.)
- Slope constraints/opportunities for collaboration.
- Detention Center separation rules regarding adjacent greenway alignments.
- Henderson County Comprehensive Plan proposed future land use changes in the project area.
- NCDOT thoughts on removing a turning lane on North King Street to better accommodate the greenway.

Stakeholder Engagement

The project team provided guidance to the City of Hendersonville so that they could confer with key stakeholders and communicate effectively about the Above the Mud considerations. The City met with representatives from Watco, Henderson County, and NCDOT Division 14.

City staff led these discussions in early February 2024, which helped narrow the possible route options and clarify feasibility obstacles and specific needs for the project's success.

KEY FINDINGS:

- Watco is not currently pursuing rail line sales for conversion to greenways, but would entertain an excursion line. They are depending on rail car storage revenue since Pactiv Evergreen's paper mill closure in Canton has affected their revenue.

In addition to Watco, Henderson County and NCDOT are key stakeholders in the project study area.

City staff met with Henderson County staff in February 2024 to discuss potential alignments as several possibilities would be on Henderson County property.

KEY FINDINGS:

- The County was favorable to a direct connection to Jackson Park. The challenge is the existence of an unfenced dog park that needs to be considered in any alignment and design.
- The County identified continued flooding of the existing trails in Jackson Park, making them temporarily unusable during flooding events. Further flood studies are ongoing.
- The County is expanding the courthouse campus and is proposed significant grading onto the railroad ROW which would complicate any trail projects in the same area.
- There is a desire to separate the jail from trail use where the general public would be in close proximity.

The project team also met with Steve Williams, Corridor Development Engineer for NCDOT Division 14. The team shared the content of the first steering committee meeting, including potential alignments that would encroach in NCDOT rights-of-way. There were no significant issues with the alignments shared.

ONLINE SURVEY

The project team launched an online survey to gauge public opinions on three distinct route options and general usage of the greenway, including concerns and suggestions. The survey remained open for just over 30 days in early 2024. This method holds significant value in shaping the final route selection and recommendations for several reasons.

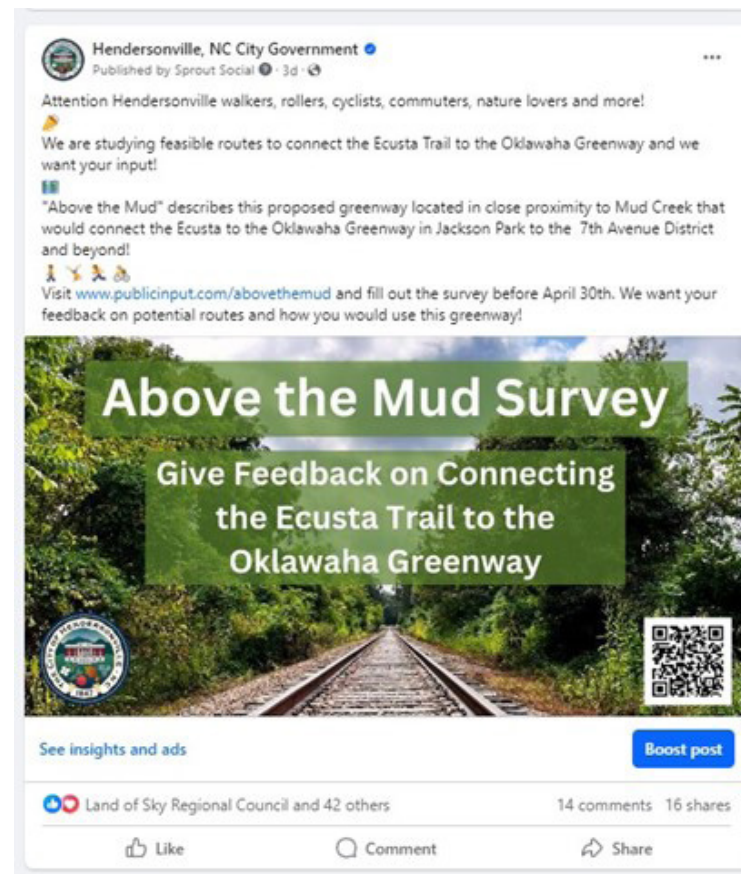
First, by directly engaging with the community, the study can ensure that the chosen route resonates with the public. Second, understanding public perceptions about greenway usage in general provides insight into potential demand and usage patterns. Moreover, by inviting input through an online survey, a wider and more diverse range of voices can be captured, ensuring that the final design and development decisions encompass the perspectives of various stakeholders.

Survey Promotion

The City took steps to promote the online survey in March and April 2024:

- A press release was sent to local media outlets.
- Social media copy and graphics (in both English and Spanish) were shared with various committees and community stakeholders.
- A news item was posted to the City of Hendersonville website, with a link to the survey on the City's public engagement hub and project webpage.
- The survey was advertised on Instagram, Facebook, and Nextdoor.
- Information about the project and survey was provided to the local high school to incorporate into lesson plans.
- The local newspaper ran a story and the radio broadcast an interview with City staff about the project.
- Information about the project and a link to the survey was included in both the Friends of the Ecusta Trail and Friends of the Oklawaha April newsletters.

Image 35. Online Survey Promotion (Facebook)



Source: City of Hendersonville

The survey was promoted across platforms, with information available on social media, City websites, radio, newspapers, newsletters, and more. It was also promoted in Spanish (and the survey itself had a "translate" option) in order to reach as many people as possible.

Image 36. Online Survey Promotion (Twitter/X)



Image 37. Spanish Online Survey Promotion (Facebook)



Image 38. Online Survey Promotion (Agency Newsletter)



Image 39. Online Survey Promotion (Newspaper Article)



Survey Results

A total of 732 people took the survey. About 3/4 of respondents currently walk or bike through the study area, and 92% say they would use this greenway if it is implemented.

There was not much of a change in stated current greenway use versus future use. People indicated that they would use the future Above the Mud greenway in the same ways they use the city's other greenways. Sixty-two percent of respondents use greenways for bicycling, 80% for walking/running, 53% to enjoy nature and relaxation, 37% for dog-walking, 19% for bird-watching, and 16% for taking the kids out for the day.

The percentage of people who said they would use the greenway to commute jumped from 8% who currently commute to 20% who would use it for commuting once this connection was constructed. This reflects how important this link is for the overall network to be successful, showing a demand for greenways as transportation corridors. While the Oklawaha Greenway follows Mud Creek between various recreation amenities, the Ecusta Trail creates new links to residential neighborhoods, commercial districts, and other municipalities.

732
ONLINE SURVEY
PARTICIPANTS

92%
OF SURVEY
RESPONDENTS SAID
THEY WOULD USE
THIS GREENWAY
CONNECTION

The Above the Mud connection means that people will be able to reach more destinations, including downtown and the 7th Avenue historic district, access the greenway from their neighborhood, and get to work on foot or by bike. People want this be a greenway they can use in day-to-day life, not just for a weekend workout. It needs to be easily accessible and connect to various destinations.

Overall, most respondents value connectivity - making sure the greenway connects to the 7th Avenue district and seamlessly links the Ecusta Trail and

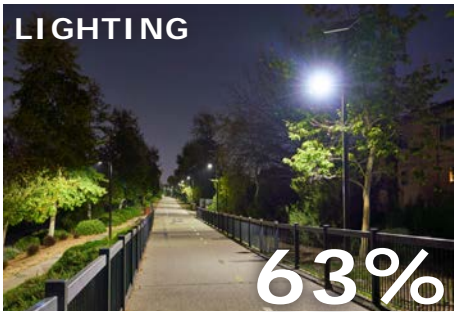
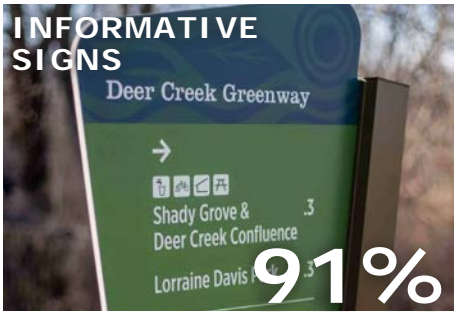
Oklawaha Greenway. People expressed a desire to reach nearby destinations, including coffee shops and beer gardens downtown, nearby grocery stores, the bus transfer station, and the farmer's market.

Some concerns included safety on the greenway as a critical consideration, particularly regarding issues related to crime and visibility through adequate lighting. Some survey respondents also suggested that greenways are luxury amenities and that resources allocated to greenway projects could be better spent addressing more pressing issues such as affordable housing, public safety, and infrastructure needs. Balancing investment in greenways with addressing critical urban challenges remains a key consideration for city planners and policymakers.

There was not a clear preference for either alternative, with comments about the various challenges associated with Alternative A (railroad collaboration) and B (flooding). Some suggested that having both options would be beneficial and equally useful to the community. Respondents expressed enthusiasm for the greenway project and were optimistic about whichever alternative is chosen for implementation. As one respondent said, *"Generally prefer Option A, but will be happy with whichever puts greenway pavement on the ground first!"* The prospect of having safe options for bicycling and walking in the area is a source of hope for many.

Many people would like to see wayfinding signs, lighting, and bathrooms on the greenway. There is a strong desire for access, with demand for parking and trailheads. While some stated that this greenway segment needs to be a greenway and nothing more, most people want to be able to get on the greenway from various points. As this greenway system expands, having wayfinding signage and trailheads will become more important; but in the short-term getting it constructed is the main priority.

Also important is sustainability, with many people hoping to preserve mature trees, incorporate native landscaping, and keep the greenway Above the Mud by ensuring it is sensitive to flooding through elevation and stormwater best management practices.



Survey respondents are clear about the importance of having trailheads with parking and informative signs guiding users along the trail. People also indicate a desire for comfort on this greenway, with shade trees and bathrooms seen as important amenities.

Figure 19. Survey Response Quotes

“ Access from neighborhoods as well as trailhead parking. ”

“ Connecting the trail through 7th Avenue by the farmer's market and downtown 7th Avenue as proposed would be an absolute dream. ”

“ This trail would be wonderful for walking to work and lunch and dinner to visiting friends and shopping. ”

“ Wayfinding to connect to businesses. Coordinated directions for multiple access points with parking. ”

“ It would be nice to have a greenway that goes through downtown. ”

“ Accessibility from downtown corridors, complete sidewalk routes to trailheads, ADA accessibility. ”

“ Please save as many trees as possible. Habitat is being lost at a rapid pace. ”

“ Make sure it really is above the mud and doesn't flood. ”

“ Please make the connection to the Saluda Grade Trail! ”

“ As a connector between two trails and a large park it will be successful...just build it. ”

“ I would recommend Option B now and maybe acquire the other option later. ”

“ We need bicycle parking areas, so we can stop and get out and walk downtown or the park. ”

“ Love the idea of making as many trails connected as possible and connecting downtown areas to the trails ”

“ [This trail] would be amazing because I could then I would be able to take greenways almost all the way to work. ”



04 Evaluation + Recommendations



ALTERNATIVE A

Ecusta Line Extension Alignment

Route Description

This alternative assumes the City of Hendersonville *can* acquire the remaining active Ecusta Line (owned by Watco) that extends from the Ecusta Trail (under construction) north to 4th Avenue East. Alternative A would convert the remaining rail line to a paved shared use path that would extend to a point just north of 4th Avenue East to form an extension of the Ecusta Trail. From the end of the Ecusta Line, a sidepath along 4th Avenue East would continue east into Jackson Park to connect with the existing Oklawaha Greenway. An optional rail-with-trail segment is also included between 4th Avenue East and 7th Avenue East. This rail-with-trail is along the active Zirconia Line (owned by Watco) and connects the 7th Avenue Historic District.

Length

~6,240 linear feet (1.2 miles)

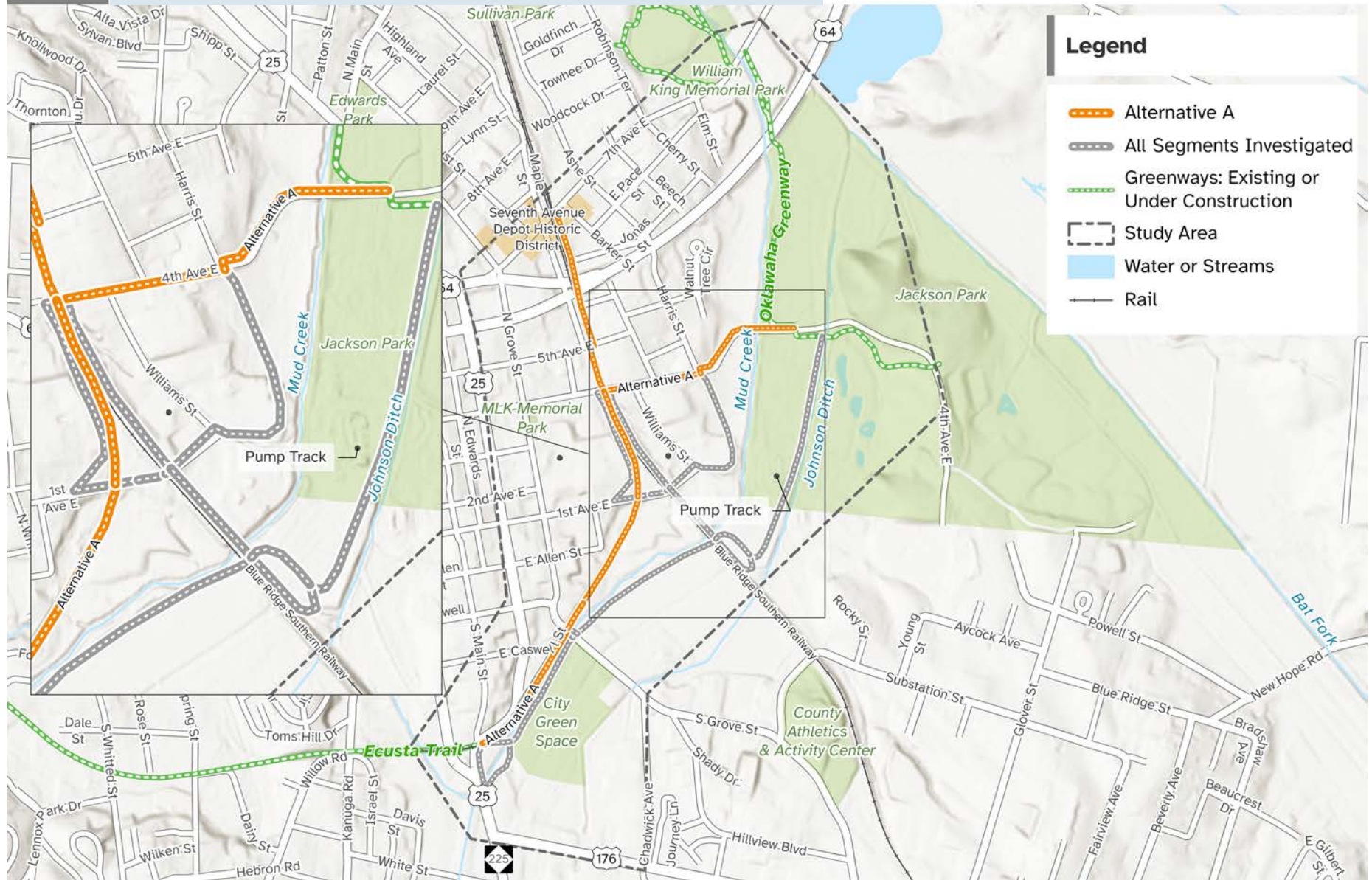
Alternative A Pros

- Most direct route to downtown and 7th Avenue.
- Provides access to neighborhoods that could use the greenway for transportation.
- Mostly off-road alignment would separate users from vehicular traffic.
- Avoids many floodway and environmental constraints.
- Provides a variety of user experiences.

Alternative A Cons

- Less direct connection to the Oklawaha Greenway and Hellbender Trail system.
- The connection to the Oklawaha Greenway and the Hellbender System will require a new sidepath along 4th Avenue East and a new bridge over Mud Creek.
- Would need to receive NCDOT approval to travel under the US 64 elevated structure.
- Requires right of way purchase from Watco.
- The segment between 4th Avenue East and 7th Avenue East will require Watco rail-with-trail approval. If that is not feasible, this segment will need to be removed from Alternative A.
- Crossing on South Grove Street has some sight line limitations and would require installation of a Rectangular Rapid Flashing Beacon (RRFB).

Map 32. Alternative A



ALTERNATIVE B

Floodplain Restoration Projects Alignment

Route Description

This alternative assumes that it is *not* feasible to convert the remaining active Ecusta Line to a greenway. From the Ecusta Trail section that is under construction, Alternative B would depart from the rail bed at a point just east of South King Street and turn south to cross Mud Creek via a proposed pedestrian bridge. On the south side of Mud Creek, it would continue to the east on City-owned land. It would cross South Grove Street and then follow a proposed sewer easement to connect to Jackson Park as it passes under a railroad bridge. This alternative would connect to the existing Oklawaha Greenway in Jackson Park and then continue west towards downtown as a sidepath along 4th Avenue East. This alternative also includes an optional* greenway spur between 4th Avenue East and 7th Avenue East, generally following the Watco rail right-of-way, connecting to the 7th Avenue Historic District. This alternative will require modifications to the existing dog park layout and fencing in order to separate the greenway.

**In the event that Watco will not allow the segment between 4th Ave and 7th Ave, this spur trail to 7th Ave will need to be removed from Alternative B.*

Length

~8,045 linear feet (1.5 miles)

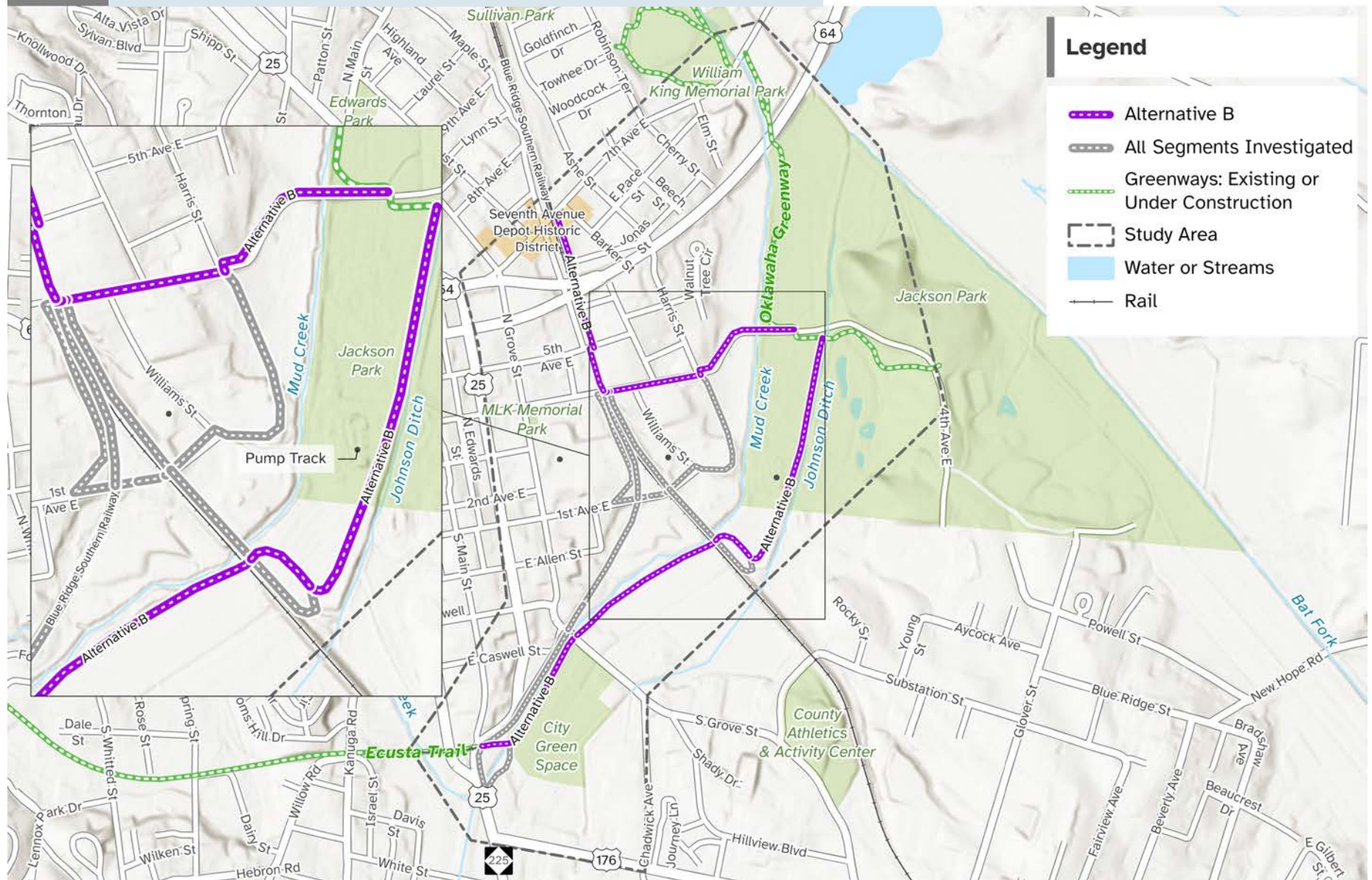
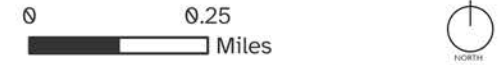
Alternative B Pros

- Provides a more direct connection to Jackson Park, the Oklawaha Greenway, and the Hellbender Trail system.
- High quality user experience along Mud Creek.
- A mostly off-road route that separates greenway users from vehicular traffic.
- Much of the greenway can be designed, permitted, and constructed with other City projects that are already underway.

Alternative B Cons

- Would require a pedestrian bridge over Mud Creek.
- Less direct route to downtown and 7th Avenue than Alternative A.
- The connection to downtown from the Oklawaha Greenway and the Hellbender System, will require a new sidepath along 4th Avenue and a new bridge over Mud Creek.
- Much of this route is in the Mud Creek floodway and will be prone to flooding. Regular maintenance will be required after flooding events.

Map 33. Alternative B



EVALUATION CRITERIA

By considering all possible segments that could comprise a greenway connection, the project team could then determine the preferred alignments. To arrive at those preferred alignments, a prioritization strategy was necessary.

Evaluation criteria aid this decision-making process by assigning a value to each criterion and alignment. The evaluation criteria considered for the Above the Mud Greenway include those in **Table 2 - Evaluation Criteria**.

Table 2. Evaluation Criteria







ABOVE THE MUD GREENWAY EVALUATION CRITERIA	
	<p>DIRECTNESS OF CONNECTION Based on a comparison of alternatives, how direct is this route for users to access Jackson Park, the Oklawaha Greenway (Hellbender Trail system), downtown, and the 7th Avenue Depot Historic District?</p>
	<p>ABILITY TO ACQUIRE ENVIRONMENTAL PERMITS Based on known natural and human environmental impacts (e.g. flood zones), how likely is it that this option can be permitted?</p>
	<p>QUALITY OF USER EXPERIENCE What level of user experience does this route alternative offer in terms of visual surroundings, separation from hazards, personal safety, and connection to nature and topography (including accessible grades)?</p>
	<p>AVAILABILITY OF RIGHT-OF-WAY/ANTICIPATED PROPERTY OWNER COOPERATION To what degree is right of way available or held by cooperative property owners?</p>
	<p>SECONDARY BENEFITS Beyond the primary project goal, how well does this project provide opportunity for secondary benefits such as access to under-served populations (equity), economic development, connections to community resources, sense of place, etc.?</p>
	<p>SEPARATION FROM MOTORIZED TRAFFIC CONFLICTS How well does this alternative separate users from motorized traffic conflicts to provide higher levels of comfort and to limit traffic impacts?</p>

Table 2. Evaluation Criteria (Continued)

ABOVE THE MUD GREENWAY EVALUATION CRITERIA	
	<p>ABILITY TO CONSTRUCT Based on an investigation of physical obstacles and constraints (e.g. roads, utilities, topography, buildings, waterways, etc.), how likely is it that this alternative can be built?</p>
	<p>ALIGNMENT WITH COMMUNITY GOALS Based on community leadership, public feedback, adopted planning efforts and stated local goals and objectives, what is the anticipated level of community support for this alternative?</p>
	<p>COST EFFECTIVENESS Based on a comparison of alternatives, what is the cost effectiveness of this alternative?</p>
	<p>POTENTIAL FOR FUNDING Compared to other alignments, how likely is this route to qualify for known grant and funding opportunities?</p>
	<p>POTENTIAL FOR TIMELY IMPLEMENTATION How likely will this project be able to be funded, designed, permitted, and constructed as compared to other alternatives?</p>

DECISION MATRIX & SCORING

The project team developed a systematic scoring methodology to assist in identifying preferred alignments that will contribute to the overall goals of the project and to meet stated evaluation criteria. Based on a comparison of alternatives, the two primary alternatives (and their respective sub-alternatives) were assigned a ranking based on how it meets the criteria:

- 1 – Below Average
- 2 – Average
- 3 – Above Average
- 4 – Highest

The outcome of this scoring is illustrated in **Table 3 - Evaluation Criteria Scoring**. After the ranking was completed, the alignments were presented to the committee and stakeholders. After this feedback was gathered, the highest ranked alignments were studied for cost estimating purposes.

Table 3. Evaluation Criteria Scoring

CRITERIA	ALTERNATIVE/ SCORE	
	ALT A	ALT B
Directness of connection to Jackson Park, Oklawaha Greenway (Hellbender Trail system), downtown and 7th Avenue Historic District	4	4
Ability to acquire environmental permits	4	3
Quality of user experience	4	4
Availability of right-of-way (anticipated property owner cooperation)	2	4
Secondary benefits	4	4
Separation from motorized vehicle conflicts	4	4
Ability to construct	4	4
Alignment with community goals	4	4
Cost effectiveness	4	3
Potential for funding	4	4
Potential for timely implementation	3	4
TOTAL	41	42

RECOMMENDATIONS

The evaluation criteria scoring resulted in two highest scoring alternatives for the Above the Mud greenway: Alternative A and B, both scoring 40.

Both alignments ranked the highest (a value of 4) for directness of connection, quality of user experience, secondary benefits, separation from motorized vehicle conflicts, and alignment with community goals.

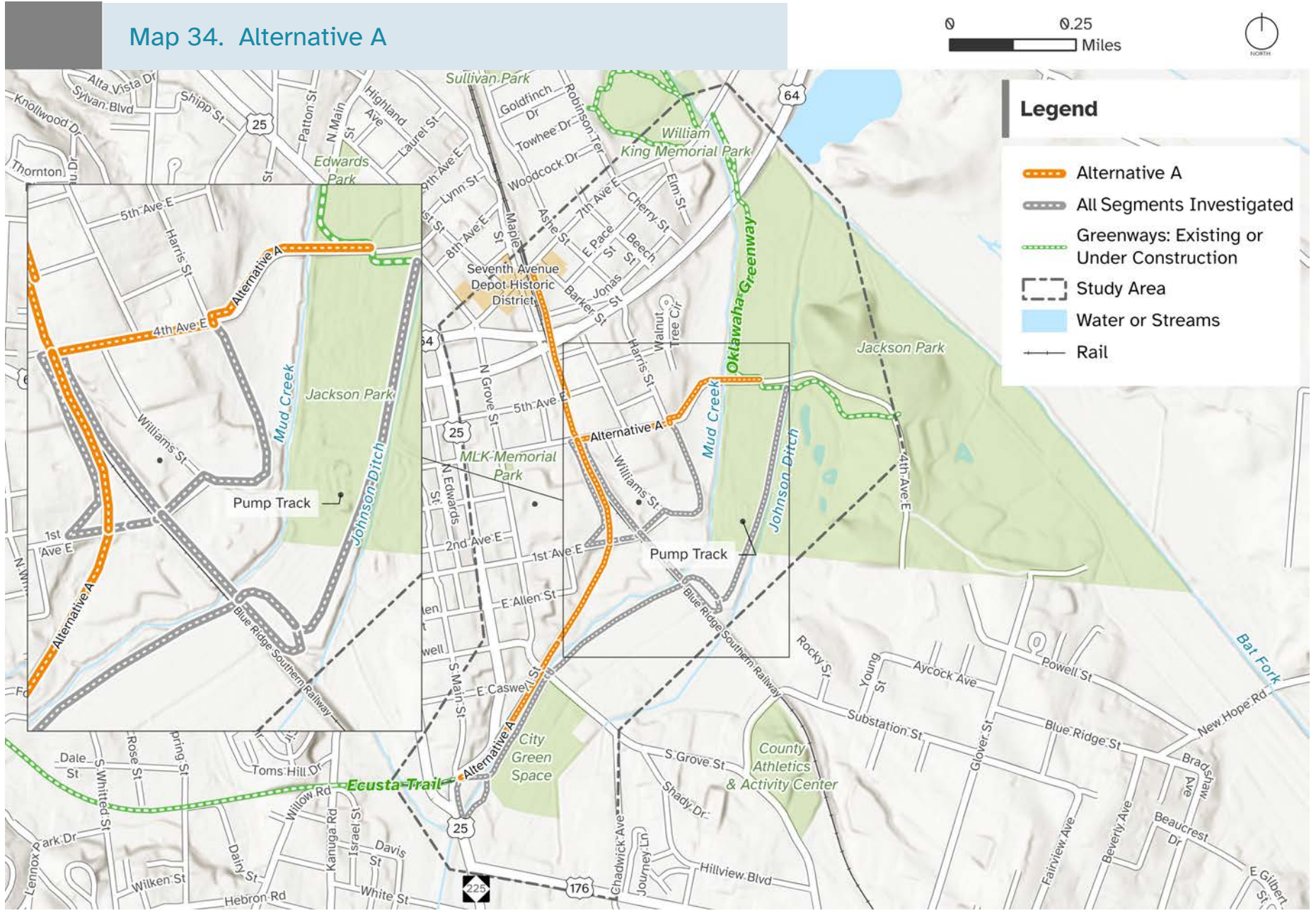
Alternative A ranked higher for ability to acquire environmental permits, cost effectiveness, and potential funding. Alternative B ranked higher for ability to acquire right-of-way, ability to construct, and potential for timely implementation. This suggests that while Alternative A provides some cost-effectiveness, the implementation schedule of Alternative A may be more than Alternative B.

Given the high scores of both projects and how each provides a benefit that is unique from the other, both alternatives are recommended as a part of this study.

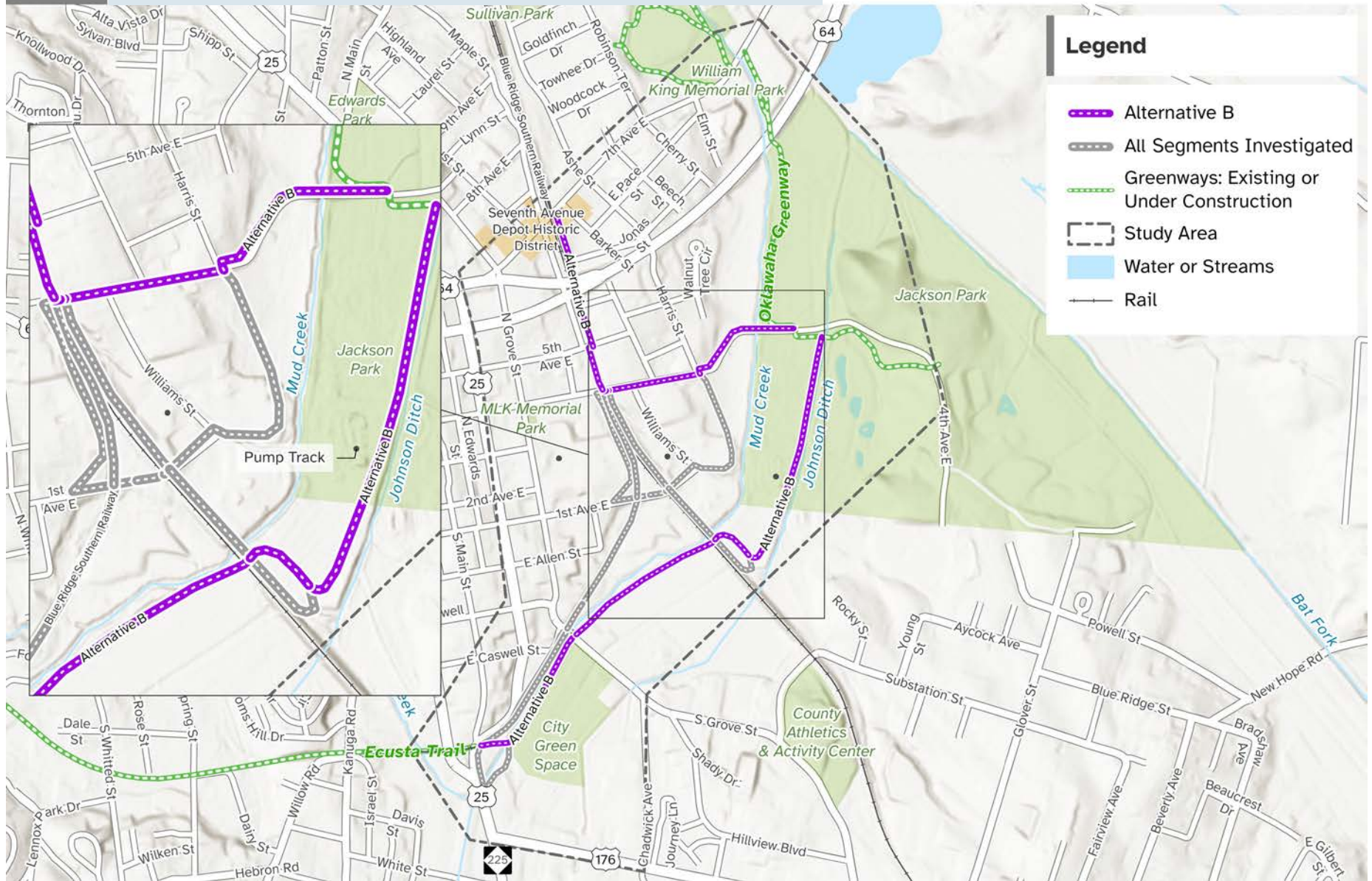
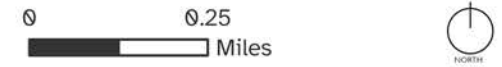
Chapter 5 presents a phasing strategy that will enable both to be implemented as funding becomes available. Individually, Alternative A or B would provide a much-needed connection. Together, they will create a truly comprehensive network for people walking and biking.



Map 34. Alternative A



Map 35. Alternative B



DESIGN CONSIDERATIONS

Design considerations for greenways are crucial to their success and sustainability. Thoughtful design ensures that greenways are safe, accessible, and welcoming for all users, incorporating elements like adequate lighting, clear signage, and connectivity to key community areas. These considerations include:

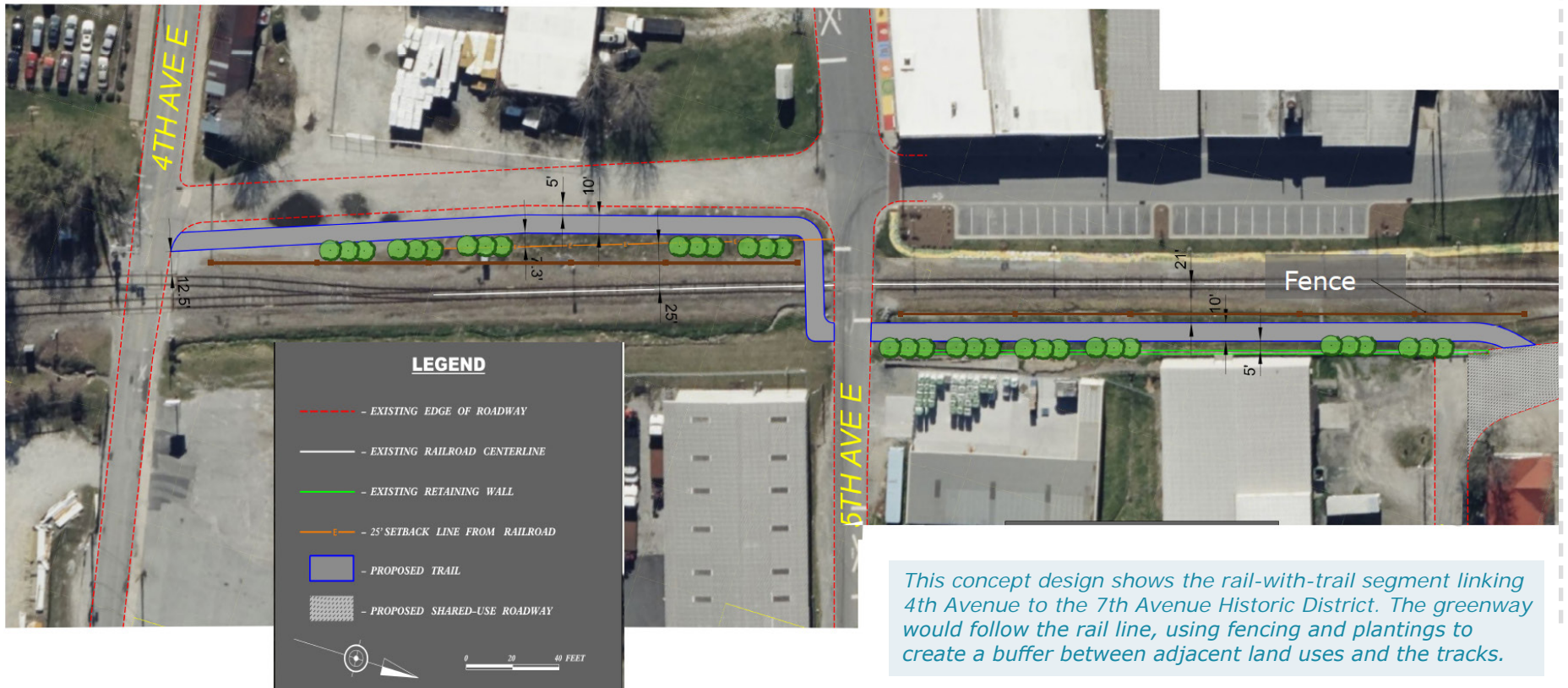
- Greenways in active rail corridors
- Materials selection
- Trailhead/parking
- Greenway amenities

- Wayfinding and branding
- Retaining walls
- Greenway crossing design

Greenways in Active Rail Corridors

When planning for greenway corridors in active rail corridors, safety for the trail users, rail line operators, and general public is paramount. Numerous challenges, including limited right-of-way width, insufficient space for setbacks, concerns about trespassing, and the need for multiple crossings can significantly

Image 40. Rail-with-Trail Concept Design Section 1



This concept design shows the rail-with-trail segment linking 4th Avenue to the 7th Avenue Historic District. The greenway would follow the rail line, using fencing and plantings to create a buffer between adjacent land uses and the tracks.

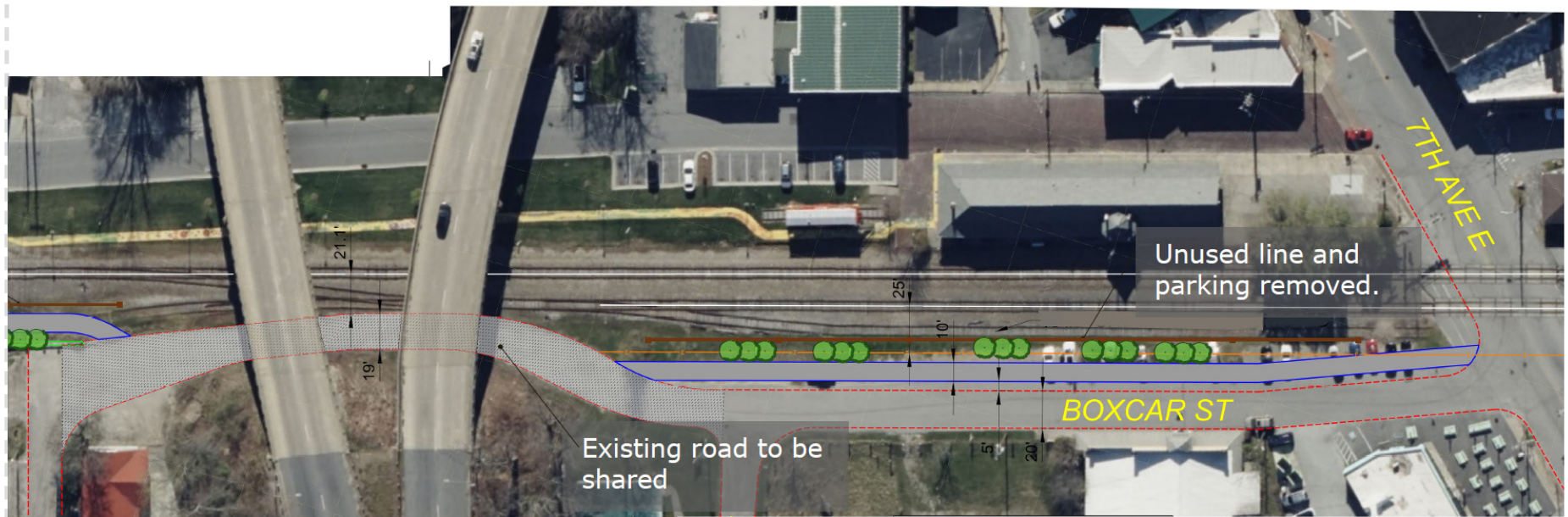
impact project feasibility. Moreover, there may be a need to allocate space for potential future freight or commuter rail service expansion. These considerations must be addressed during the planning and design phases to effectively navigate constraints and challenges and align with Watco standards to gain formal approval.

In many cases, the installation of fencing will be essential to delineate greenway usage. Many standards indicate that fencing should be at least 5 feet tall. Setbacks from active rail lines will vary based on factors such as train speed, frequency, and available right-of-way, all in alignment with safety standards

and regulatory guidelines. Whenever possible, wider paths and enhanced landscaping should be incorporated for added safety and aesthetic appeal.

The concept design illustrated in **Image 40 - Rail-with-Trail Concept Design Section 1** and **Image 41 - Rail-with-Trail Concept Design Section 2** shows the rail-with-trail alignment between 4th and 7th Avenues. The concept calls out the existing edge of roadway, railroad centerline, existing retaining wall, and the 25' setback from the rail line.

Image 41. Rail-with-Trail Concept Design Section 2



This concept design shows how the greenway will utilize an existing (low volume) street for a constrained segment under the US 64 bridges and connect directly to the 7th Avenue Historic

MATERIALS & AMENITIES CONSIDERATIONS

Various factors should be considered when deciding on what surface material a greenway or sidepath should comprise. Considerations include user type (e.g., bicycle or horseback), user demographics (e.g., age which could be an indication of ability level), environmental factors (e.g., topography), cost, maintenance, and funding requirements. Options for surfaces include:

Paved Surfaces

For paved surfaces, asphalt and concrete are common options. Asphalt is popular due to its cost-effectiveness and suitability for various trail types. On the other hand, concrete offers greater durability but comes with a higher initial cost. Concrete surfaces are often preferred for urban settings or areas prone to heavy flooding, where resilience to high volumes of users and water damage is essential.

Image 42. Asphalt Greenway Example



Source: Martin Johnson

Image 43. Concrete Greenway Example



Source: High Line Network

Natural Surfaces

Natural surface options include compacted aggregates and compacted native soil. Compacted aggregates, typically using granite fines, offer a durable and affordable alternative to paved greenways. However, proper compaction and drainage management are needed to prevent erosion and maintain accessibility. Compacted native soil is another economical choice but requires careful compaction and drainage control to maintain trail integrity and accessibility requirements. Both options necessitate annual maintenance, including re-compaction and potential soil additions in erosion-prone areas.

Image 44. Aggregate Trail Example



Source: Vermont Rail Trails

Image 45. Native Soil Trail Example



Source: Green Circle Trail

Retaining Wall Considerations

In areas with topography such as Hendersonville, constructing a greenway will likely require a retaining wall to achieve accessible grades - The Americans with Disabilities Act (ADA) requires a greenway to have a 5% or less longitudinal slope. Retaining wall design offers a multitude of approaches and a variety of retaining systems, each tailored for specific applications in soil retention and slope stability. When future retaining walls are designed and constructed, careful attention should be given to the intricacies of each design approach, including construction methods and the conditions under which they are used.

Image 46. Retaining Wall Example (Purple Martin Trail)



Source: Town of Rutherfordton, NC

In greenway design, retaining walls may be necessary to address slopes or elevation changes along the greenway route. These walls provide stability and prevent soil erosion while ensuring the safety and accessibility of the pathway for users.

Maintenance Considerations

Proper maintenance is critical to ensure that the infrastructure we build can be safely accessed well into the future. Shared use paths should be kept clear of debris and damage so that their surfaces are traversable and curb ramps should be ADA accessible. As much of the study area is in a floodway, it is important to install stormwater mitigation elements and make sure to address maintenance issues after heavy rains and flooding. The following includes maintenance considerations for the long-term viability of this pedestrian connector project:

- Developing an inventory of facilities and assets (signs, bridges, pavement, etc), which will allow the City to understand routine vs. substantial maintenance needs.
- Estimate of baseline maintenance based on City and County costs on other systems.
- Consider available technologies to monitor maintenance, including Esri systems.
- Acquire the final ADA inspection checklist from the contractor prior to project acceptance.
- Establish a maintenance plan and funding resources for repairs to sidewalks, greenways, and curb ramps. More details on development of a maintenance plan are provided in the FHWA 2013 publication, *A Guide for Maintaining Pedestrian Facilities for Enhanced Safety*.

Greenways in Floodplains

Areas along creeks and rivers are prime for greenway development, however, these corridors are also susceptible to flooding - people in Hendersonville experience this conflict every time the Oklawaha Greenway closes after a flood event. Following are some of the materials to consider when developing greenways in flood prone areas, with a focus on the durability of surfaces:

- Crushed rock is prone to erosion, asphalt can be damaged by running water, and while concrete may withstand submersion, severe stream bank erosion can still pose a threat.
- Concrete with transverse saw cuts offers resilience in flood-prone regions, but at a significant cost.
- Alternatively, asphalt provides a smoother and more cost-effective option, though it requires more frequent repairs and can retain heat. Reinforcing asphalt paths with a deep base and strategic stone placement can enhance their durability during floods.

Designing greenway facilities with flooding in mind can safeguard habitats and riparian zones. Implementing erosion control measures like vegetative buffers and stormwater retention devices can prevent soil erosion and protect water quality.

For the Above the Mud greenway, materials resistant to water, corrosion, and erosion—such as concrete, steel, or composite materials—are recommended for bridges and other infrastructure. While these areas are prime for greenway development, it is crucial to weigh the maintenance costs, particularly when they face sediment inundation during floods.

Image 47. Flooding on the Oklawaha Greenway (2024)



Source: Dean Hensley (Hendersonville Times-News)

Mud Creek is prone to flooding following heavy rainfall, leading to temporary closures of greenways like the Oklawaha Greenway. Post-flooding maintenance is needed to ensure these greenways remain open and functional. Tasks include clearing debris, addressing silt buildup, and repairing any damaged amenities.

Image 48. Concept Design for City-owned Greenspace on South Grove Street



Source: City of Hendersonville



The City of Hendersonville is conducting extensive floodplain restoration. The design team collaborated on that project to identify a location for a future greenway to be used for the "Above the Mud" connector. This concept for the City green space on S. Grove Street shows a greenway trail running parallel to Mud Creek. The trail will be elevated higher than the rest of the property so that when floods occur, the trail will be less impacted.

Trailhead/Parking

Jackson Park is a gateway to recreation, outdoor activities, and multimodal transportation. Connecting the Above the Mud greenway to Jackson Park will bolster the park’s amenities and offer people a way to arrive at the park on foot and bike. Jackson Park currently offers parking and a trailhead to the Oklawaha Trail. For the Above the Mud project, the park will also serve as a trailhead, parking, and greenway access point.

The City of Hendersonville is working on a flood restoration project on City-owned property (shown on maps in Chapter 2). As a part of this project, parking and a trailhead are recommended. **Image 48 - Concept Design for City-owned Greenspace on South Grove Street** illustrates the site concept for this project.

This project incorporates the City’s previous design efforts for a trailhead at the Ecusta Trail terminus, at the intersection of South Main Street, South Church Street, and South King Street. This concept, shown in **Image 49 - Trailhead Concept at Ecusta Trail Roundabout**, integrates NCDOT’s plans to build a roundabout at the Ecusta Trail terminus. It provides a vision for a gateway to downtown, with the Ecusta and Above the Mud Greenways front and center.

Image 49. Trailhead Concept at Ecusta Trail Roundabout



This early concept provided by Kimley-Horn consultants shows how multiple projects can work in tandem to result in the best possible outcome for the community. This effort takes ongoing communication and coordination across various agencies and decision points.

Source: Kimley-Horn

Greenway Amenities

Greenways such as the Above the Mud can offer a range of amenities to enhance the user experience. These amenities include benches, trash receptacles, restrooms, dog waste stations, entrance signs, and wayfinding signage, such as those currently offered in Jackson Park and along the Oklawaha Greenway. The City is exploring opportunities for additional restrooms on City-owned property within the Above the Mud greenway study area.

Lighting is important in high-traffic areas, intersections with roads, and areas with low visibility such as beneath bridges or overpasses. To ensure that Above the Mud operates well as a transportation option, lighting will be an important consideration to foster a sense of safety.

Centerline striping on the greenway is recommended in areas with high user volumes, tight or blind corners, intersections, or under bridges. Lane markings can help separate traffic flow, reduce conflicts, and enhance user experience. This feature is beneficial in extensive greenway networks, such as the future 30+ mile system comprised of the Above the Mud, Ecusta, and Oklawaha greenways.

Image 50. Jackson Park Picnic Shelter



Source: Henderson County

Places of respite, with shade and seating, are important for parks and can be useful at trailheads and along the length of a greenway.

Image 51. Center Line Striping on the Oklawaha Greenway



Source: Friends of the Oklawaha Greenway

Wayfinding & Branding

Users of greenways generally are unconcerned about municipal boundaries or what agency owns a particular facility. What matters more to a user is that the facility is intuitive, accessible, and gets them where they need to go. As the Above the Mud greenway will be a part of a network of City- and County-maintained facilities crossing through public and private land, it is important that partners collaborate on a branded wayfinding system that is consistent across all segments of the trail network. These planning efforts are currently underway with the Ecusta Trail partners and will ensure that users have the information they need to make decisions about their trip.

Signs for nearby parks are located along the Oklawaha Greenway. This type of wayfinding is helpful for visitors and will be especially important once the Ecusta Trail connection is made and there are more crossings and access points.

Image 52. Wayfinding Signs on the Oklawaha Greenway



Source: Dean Hensley (Hendersonville times-News)

Image 53. Ecusta Trail Logo



Source: Friends of the Ecusta Trail

The Ecusta Trail has its own branding and logo. Since Above the Mud is a short segment, it likely will not have its own branding.

Source: FHWA



Rectangular Rapid Flashing Beacons (RRFB)

Pedestrian and bicyclist visibility enhancement at a midblock crossing that accompanies a warning sign and consists of two rectangular yellow indicators each with an LED light that flash with an alternating high frequency.

Source: Portland Bureau of Transportation



Crosswalks

Designated areas where pedestrians should cross the street. A crosswalk can be marked or un-marked at an intersection, or can be marked as a mid-block crossing. They may feature signage, pavement markings, and traffic control measures such as stop signs, traffic lights, or flashing devices.

Source: City of San Francisco



Curb Ramps

Sloped surfaces that facilitate the transition between the greenway and the street. When designed in compliance with ADA regulations, ramps enable individuals using mobility devices to easily access and leave the greenway to cross a street or get to a parking facility.

Source: New York Post; Maricopa Association of Governments



Pedestrian Signal Heads & Push Buttons

Installed at signalized intersections, these allow people to activate the walk/don't walk pedestrian signal, indicating whether it is safe to cross the street. A countdown timer is helpful for people to gauge remaining time to cross.

Greenway Crossing Design

At-grade roadway crossings present potential conflicts between greenway users and motorists. However, with well-designed crossings, many operational issues can be mitigated, enhancing safety and comfort for all users. Each crossing should be studied and designed to meet state and national standards for crossings. These standards indicate various safety countermeasures that can be applied based on location specific factors and engineering judgment. In busier urban crossing scenarios, additional safety measures such as physical mid-crossing protection, user-activated signals, and proactive traffic calming treatments may be necessary. Several key assumptions apply to all crossings:

Vehicular Scale Signage: Signage alerting motorists to the presence of the greenway should be placed near the crossing, adhering to Manual on Uniform Traffic Control Devices (MUTCD) standards. If the greenway runs parallel to the street, signage should be installed beforehand to notify motorists in advance.

High Visibility Design: Crossings should be designed for high visibility, using lane markings and signage in compliance with MUTCD standards.

Surface Material: Where the greenway intersects with sidewalks, a concrete surface should be applied for durability and accessibility.

Pedestrian Activated Signals: Mid-block crossings of major streets should feature pedestrian-activated traffic signals.

ADA Compliance: All crossings must comply with Americans with Disabilities Act (ADA) and/or Public Right-of-Way Accessibility Guidelines (PROWAG) guidelines, incorporating detectable warnings and other ADA components according to the latest standards and local regulations.

Stormwater Management: Opportunities to integrate stormwater management elements and pervious surfaces should be considered to establish the greenway corridor as a resilient amenity.

The following resources represent some of the best practices and should be considered in the planning and design of pedestrian crossings for the Above the Mud greenway. Hendersonville's pedestrian plan, *Walk Hendo*, is another helpful resource.

North Carolina Pedestrian Crossing Guidelines (2018) provides guidance on when to consider marking crosswalks at uncontrolled approaches for pedestrians, when to install pedestrian signal heads at existing signalized intersections, and when to provide supplemental treatments at a crossing location. More information can be found [HERE](#).

FHWA's Proven Safety Countermeasures Initiative is the culmination of over 15 years of safety work available in an online tool that can be used to address a variety of areas that impact pedestrian crossing safety including:

- Crosswalk visibility enhancements and lighting.
- Leading pedestrian intervals.
- Medians and pedestrian refuge islands.

- Rectangular Rapid Flashing Beacons (RRFBs).
- Pedestrian Hybrid Beacons (PHBs).

More information can be found [HERE](#).

FHWA's Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations provides guidance for uncontrolled crossings to help local and state agencies "improve quality of life for pedestrians of all ages and abilities." The guide includes a process for evaluating crossings and determining appropriate countermeasures for specific crossing conditions based on engineering which includes data collection, site condition analysis and crash history review. More information can be found [HERE](#).

FHWA's Improving Visibility at Trail Crossings 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. More information can be found [HERE](#).

Image 54. Midblock Crossing (Oklawaha Greenway)



Source: Google Streetview

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facilitate double-sided printing.*



05 **Implementation**



OVERVIEW

The findings presented in this report offer an implementation plan for multimodal investments that will connect the Ecusta Trail with the Oklawaha Greenway. This chapter presents project cutsheets, which provide a concise project snapshot to enable the City and its partners to advance these projects. The cutsheets are standalone details that provide route alternative descriptions, phasing options, cross-sections, maps, visual representations, and planning-level cost estimates.

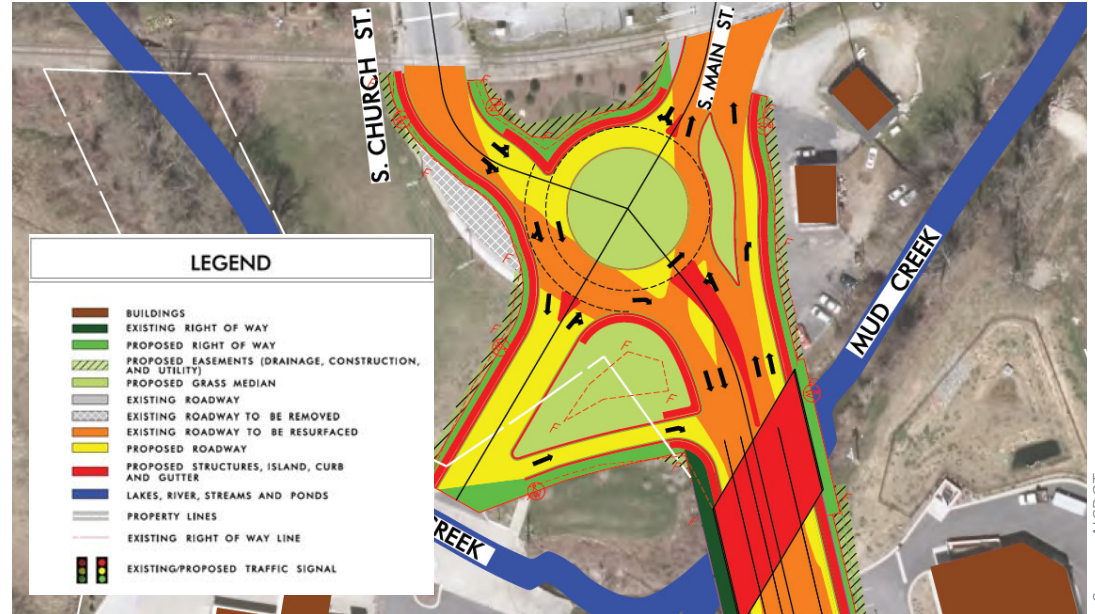
Also essential to project advancement are key local and regional partnerships, which are outlined in this chapter. Finally, this chapter contains an action plan, delineating tasks, designating lead agencies and primary partners, establishing an implementation timeline, and defining metrics for gauging success.

PHASING STRATEGIES

When developing an implementation and phasing plan, certain factors are reviewed that may impact the timing of project implementation. During this analysis, we often split projects into phases based on the following factors:

- Availability of right-of-way and property ownership.
- Permitting challenges including NCDOT coordination, flood impacts, environmental impacts, etc.
- Project needs, such as a segments with a known safety and crash history that is constructed first to prioritize for safety improvements.
- Project cost.
- Potential funding and matching funds.
- Project partnerships.

Image 55. U-6049 Preliminary Design Concept



Source: NCDOT

Coordination and communication between NCDOT and the City of Hendersonville can help make sure that final designs reflect recommendations for the Above the Mud greenway connection.

For example, NCDOT’s South Main Street bridge replacement and intersection improvement project (U-6049) is still in the preliminary design stage. This presents an opportunity to coordinate design efforts of the Ecusta Trail and the Above the Mud connection into the final engineering plans. By aligning these projects early on, there is flexibility for revisions and the introduction of new ideas as NCDOT progresses with the project. This proactive approach may prevent redundancies and potentially save costs during the design and construction phases.

Note that the lower ranked route alternatives are also potentially viable and should not be wholly ruled out. If future opportunities and constraints arise that change the dynamic of the final outcome, the City should adapt.

When developing an implementation and phasing plan, certain factors are reviewed that may impact the timing of project implementation. For the implementation phasing analysis, we often split projects into phases based on the following factors:

- Availability of right-of-way and property ownership (including railroads)
- Permitting challenges including NCDOT coordination, flood impacts, environmental impacts, and the like.
- Project needs such as segments with a known safety and crash history or key network gaps may be prioritized for implementation sooner.
- Project cost
- Potential funding sources and the availability of matching funds.
- Project partnerships

The phasing and prioritization strategies are relatively simple for this project since there are two recommended alternatives (Alternative A and B) that can be advanced immediately. These alternatives serve different connections yet work together for a more complete greenway network.

Several early action implementation recommendations were identified based on the following understanding:

- Implementation of Alternative A and B will require early coordination with other partners and planned projects.
- Alternative B has elements that make it more time sensitive to build upon synergies with other projects in progress.
- Alternative A will require more time to reach an agreement with the railroad. Therefore, coordination should begin as soon as possible.

Early Action Implementation Recommendations

1. Begin coordination with Watco to negotiate railroad right-of-way purchase and/or easements as needed.
2. Work with Henderson County Parks and Recreation to develop a unified approach to the greenway sections in Jackson Park. This approach may address items such as who will fund, maintain and design the greenway in the park. This conversation may also include items such as the exact alignment of the greenway, design standards, funding and ownership/maintenance decisions. Note that community members have indicated the importance of maintaining access to the creek from the dog park. This alternative will require modifications to the existing dog park layout and fencing in order to separate the greenway.
3. Apply for design and construction funding grants and reimbursement programs (see funding section).
Prioritization recommendations are as follows:
 - Prioritize funding for the Mud Creek Bridge: The City of Hendersonville is currently working on a design and permitting for the Brevard Church Site, just south of Mud Creek where a new greenway bridge would need to be incorporated into the floodway permitting and final grading plans for the site. As such, funding and design for a greenway bridge at this location is a high priority. If this connection is not integrated with the project, floodway permits may be challenging to acquire as a standalone project.
 - Incorporate the Alternative B segment from South Main Street to Jackson Park with other City projects.
 - City of Hendersonville "Brevard Church" Site: This funded project is a floodplain restoration project that is currently in the design stage. The project will include design and construction of the portion of Alternative B that runs through the site. Given site constraints and complex floodway modeling that is underway, the future Mud Creek Bridge should be advanced quickly in order to ensure that floodway impacts can

be minimized and that engineering efforts can work together to achieve the floodplain restoration and greenway connectivity goals.

- City of Hendersonville Sewer Project (“Interceptor”): The City is working on a sewer extension project that could include a trail easement allowing for Alternative B to be constructed between South Grove Street and the Scott Site Floodplain Restoration Project.
- City of Hendersonville “Scott Site” Floodplain Restoration Project: This floodplain restoration project is in the early planning stages and funding is pending. Similar to the Brevard Church Site, this project would include the design and construction of the Alternative B greenway through the site and complete the connection to the Watco Zirconia Line railroad underpass into Henderson County property which connects to Jackson Park.
- Prioritize, or phase, remaining greenway segments together or as smaller stand-alone projects as funding opportunities and partnerships become available. Sections that will function as stand-alone facilities are as follows:
 - Alternative A Segment: Rail-to-trail conversion of remaining section of the active Ecusta Line between South Main Street and 4th Avenue.
 - Alternative A and B Segment: Rail-with-trail connection between 4th Avenue and 7th Avenue.
 - Alternative A and B Segment: 4th Avenue sidepath from the northern end of the Ecusta Line to the Oklawaha Greenway in Jackson Park.

This approach to prioritization is intended to be nimble allowing the City and greenway partners to pivot based on funding opportunities and partnerships that may arise.

PREFERRED ALTERNATIVE CUTSHEETS

In order to evaluate phasing strategies, project cut sheets were developed for both Alternative A and B, presented on the following pages. They include implementation details such as:

- Project map and description of improvements
- Right-of-way availability and property acquisition needs
- Permitting needs
- Cost estimates for survey, design and construction

Explanation of Cost Estimate Items

It should be noted that cost estimates are not based on actual survey and design. As such, these planning level costs should be revisited as the project details and preliminary design investigations are completed.

Baseline Construction

This value reflects an opinion of the probable cost for a contractor to construct the described improvements during the current calendar year and is based on recent bid prices for similar projects. These detailed estimates for various project elements are included in the Appendix.

Survey / Design Services

This value reflects an opinion of the cost for consulting firms to obtain survey, design the project for permitting and approvals, and provide construction documents to be used in bidding the project for construction. Various funding sources can impact the necessary approvals, design formats/standards, and permitting requirements. In addition, certain environmental items identified during preliminary design can escalate costs. As such, this cost should be revisited as funding is identified, with completion of design work in stages and an evaluation of project cost and permitting needs to be revisited after preliminary design.

Right-Of-Way (ROW) Acquisition

Many projects have impacts on properties that are outside of the public right-of-way (ROW). Before construction can begin, there are various ROW tasks that must be completed, ranging from purchasing property to obtaining permanent or temporary

easements for the facility and related construction impacts. Depending on the type of ROW task, there is a cost associated with property purchase and/or easements as well as the cost for legal work and right-of-way survey and exhibits. If federal funds are used for the project, the ROW negotiations must be in line with the Federal Relocation Assistance and Real Property Acquisition Policies Act of 1970 (aka Uniform Act). Accurate ROW costs require current market research and appraisals; as such, a special ROW firm may need to be hired to navigate the process. Any ROW costs should be calculated at a later date after additional investigation, as individual segments of the preferred route move into design and implementation.

Escalated Construction

The baseline construction estimate is based on current year costs. Given that it will take time to get a project through funding, ROW, design and permitting stages, there is a need to escalate costs to account for inflation that will occur between now and the estimated year of construction.

Construction Engineering + Inspection Services

Depending on the funding source, varying levels of construction engineering and inspection (CEI) services are expected. CEI services are typically a percentage of the estimated construction cost based on the project size and elements of construction. This study assumes 7.5% for preliminary engineering and another 7.5% for final engineering.

Total Budget Estimates

At the planning level or project cost estimating, there are always detailed items that may be necessary that are unforeseen at the planning stage. As such, a project contingency is assumed to help address these unknown and unforeseen costs. Contingency percentages can vary depending on how advanced the design of the project is and the likelihood of unknowns. At the planning level, a higher contingency is often used to ensure that the project is not underfunded. A 20% contingency was assumed for this project given that no actual design has been completed. The final budget for the project is based on the sum of the above items. The values were rounded to the nearest dollar.

ALTERNATIVE A

Ecusta Line Extension Alignment

This alternative assumes the City of Hendersonville can acquire the remaining active Ecusta Line (owned by Watco) that extends from the Ecusta Trail (under construction) north to 4th Avenue East. Alternative A would convert the remaining rail line to a paved shared use path that would extend to a point just north of 4th Avenue East to form an extension of the Ecusta Trail. From the end of the Ecusta Line, a sidepath along 4th Avenue East would continue east into Jackson Park to connect with the existing Oklawaha Greenway. An optional rail-with-trail segment is also included between 4th Avenue East and 7th Avenue East. This rail-with-trail is along the active Zirconia Line (owned by Watco) and connects the 7th Avenue Historic District.

PROJECT SNAPSHOT

Location: Extends the Ecusta Trail from the terminus at South Main Street up to 4th Avenue East and connects to Jackson Park along 4th Avenue East. Optional spur (pending Watco approval): Extension north to 7th Avenue East.

Facility Type(s): Conversion of rail line to paved greenway; Paved sidepath along 4th Avenue East; Optional spur (pending Watco approval): Paved greenway extension to 7th Avenue East.

Total Length: ~6,240 linear feet

Structures: One (1) greenway bridge over Mud Creek at 4th Avenue East

At-Grade Road Crossings: Five (5)

Greenway Connections: Oklawaha Greenway (Hellbender Trail system); Ecusta Trail

Destinations Served:

- Jackson Park
- City Operations Center
- 7th Avenue Historic Depot and commercial district

POTENTIAL REAL ESTATE ACQUISITION NEEDS

- Railroad right-of-way

POTENTIAL PERMITTING NEEDS

- Erosion and sedimentation control permit
- NCDOT encroachment agreement
- Optional 7th Avenue East extension requires Watco encroachment permit
- Floodway permits for Mud Creek crossings

COST ESTIMATE

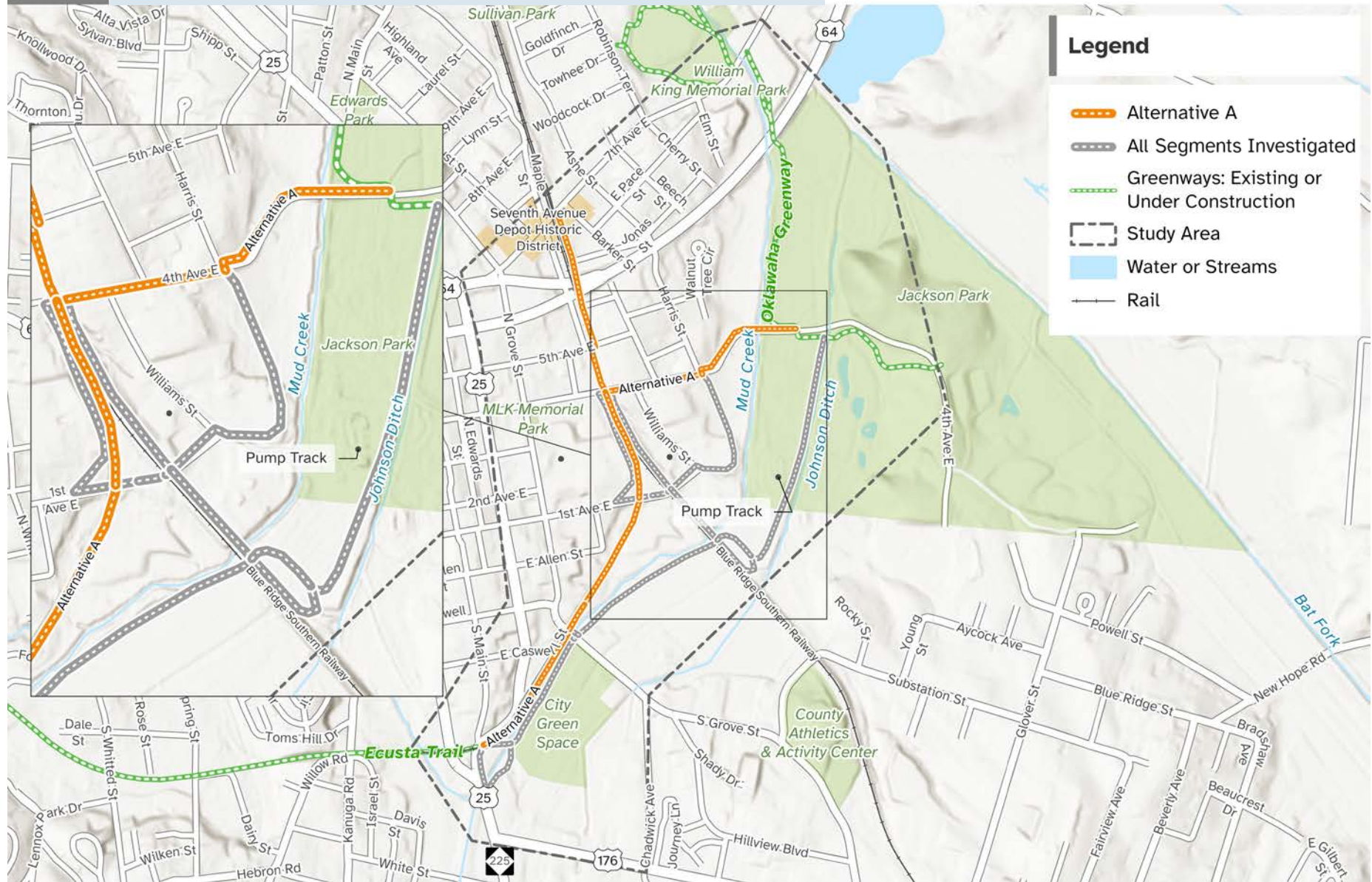
Baseline Construction	\$3,000,000
Engineering Design & Inspection	\$1,010,000
Utilities	\$110,000
Right-of-Way	\$600,000 *
Additional Contingency (20%)	\$950,000
Total Estimated Budget	\$5,670,000

See Cost Estimate Summary in Appendix for breakdown, assumptions, and exclusions.

* Value is estimated pending negotiations with the rail corridor owner. Based on recent rail line acquisitions in the region, the purchase of the remaining 3,300 linear feet of the Ecusta line could range from \$325,000 - \$625,000.

NOTE: The segment from 4th Avenue East to 7th Avenue East is included in the cost estimate (approximately \$1.4 million).

Map 36. Alternative A



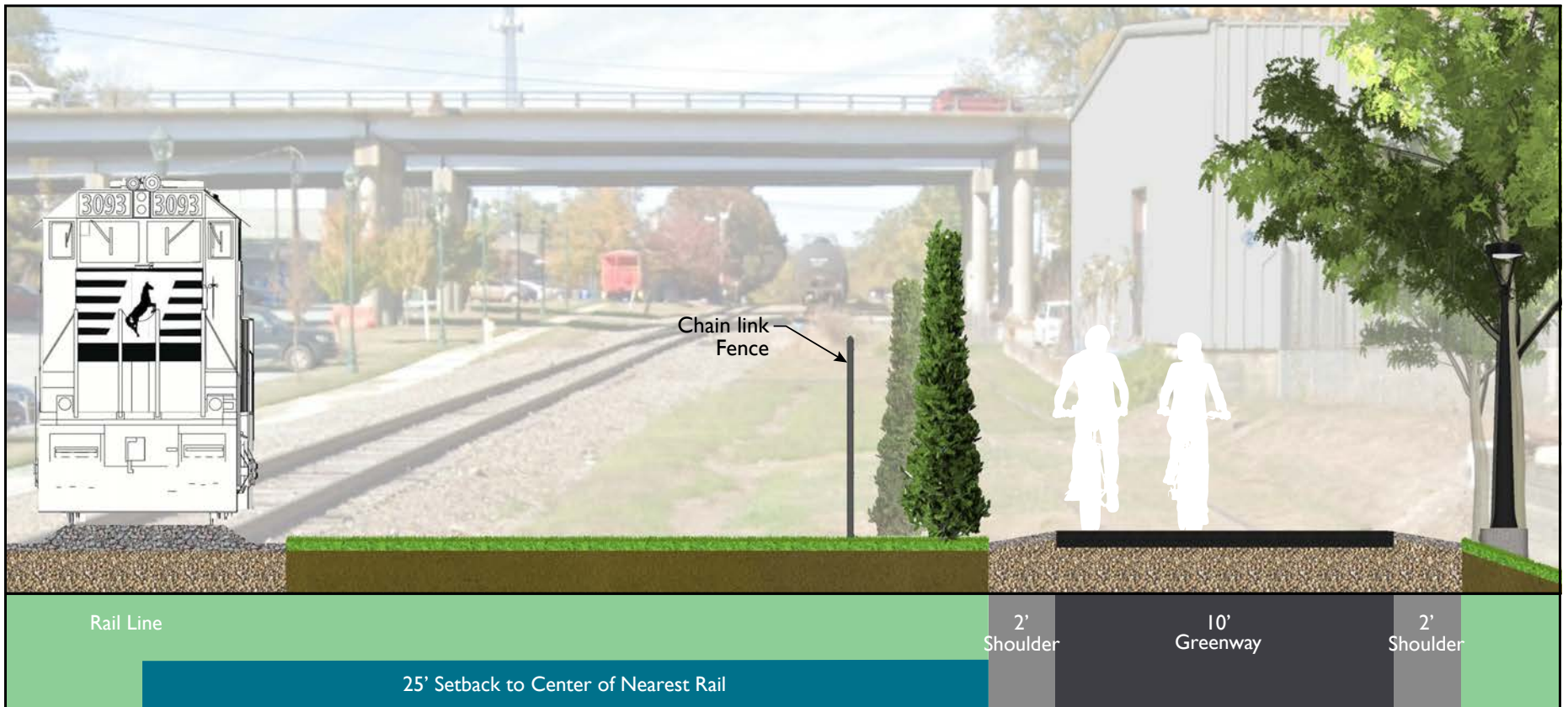
Typical Cross-Section

ALT A

For Alignment A, there are two typical treatments:

1. A 12' greenway as a rail-to-trail conversion from South King Street to the Seventh Avenue Depot Historic District.
2. Along 4th Avenue East, the treatment is a 10' paved sidepath (12' where feasible) that parallels the roadway.
3. From 4th Avenue East to 7th Avenue East, the recommended treatment is a 10' rail-with-trail (12' where feasible) as illustrated in **Image 57 - 10-Foot Rail-With-Trail Typical Cross-Section**.

Image 56. 10-Foot Rail-With-Trail Typical Cross-Section



When considering a greenway alongside a rail line, it's crucial to recognize that while these greenways can provide connectivity and accessibility, they also pose safety concerns due to the proximity of active rail operations. Therefore, ensuring a safe distance and appropriate barriers between the greenway and the railway is paramount to prevent accidents and enhance user security.

Image 57. Rail-With-Trail Rendering



It might be a good idea to address potential issues such as noise, vibrations, and visual impacts associated with train traffic. Implementing sound barriers, landscaping, and aesthetic enhancements can help mitigate these challenges and create a more pleasant greenway experience.

PROPOSED



ALTERNATIVE B

Floodplain Restoration Projects Alignment

This alternative assumes that it is *not* feasible to convert the remaining active Ecusta Line to a greenway. From the Ecusta Trail section that is under construction, Alternative B would depart from the rail bed at a point just east of South King Street and turn south to cross Mud Creek via a proposed pedestrian bridge. On the south side of Mud Creek, it would continue to the east on City-owned land. It would cross South Grove Street and then follow a proposed sewer easement to connect to Jackson Park as it passes under a railroad bridge. This alternative would connect to the existing Oklawaha Greenway in Jackson Park and then continue west towards downtown as a sidepath along 4th Avenue East. This alternative also includes an optional greenway spur between 4th Avenue East and 7th Avenue East, generally following the Watco rail right-of-way, connecting to the 7th Avenue Historic District. This alternative will require modifications to the existing dog park layout and fencing in order to separate the greenway.

PROJECT SNAPSHOT

Location: Connects to the Ecusta Trail terminus at South Main Street and crosses Mud Creek to south side to Jackson Park. Also includes sidepath on 4th Avenue East to downtown. Optional spur (pending Watco approval): Extension north to 7th Avenue East.

Facility Type(s): Paved off road greenway from Ecusta Trail to Jackson Park; Paved sidepath on 4th Avenue East; Optional spur (pending Watco approval): Paved greenway adjacent to rail line between 4th Avenue and 7th Avenue.

Total Length: ~8,045 linear feet

Structures: Two (2) greenway bridges over Mud Creek (one near South Main Street and one near 4th Avenue East)

At-Grade Road Crossings: Six (6)

Greenway Connections: Oklawaha Greenway (Hellbender Trail system); Ecusta Trail

Destinations Served:

- Downtown via 4th Avenue East
- Jackson Park
- City Operations Center
- 7th Avenue Historic Depot and commercial district

POTENTIAL REAL ESTATE ACQUISITION NEEDS

- Easements will be needed along 4th Avenue East

NOTE: The majority of this alternative is on current or planned City or County land as well as a planned sewer easement.

POTENTIAL PERMITTING NEEDS

- Erosion and sedimentation control permit
- NCDOT encroachment agreement
- Optional 7th Avenue East extension requires Watco encroachment permit
- Floodway permits for Mud Creek crossings

COST ESTIMATE

Baseline Construction	\$3,720,000
Engineering Design & Inspection	\$1,250,000
Utilities	\$110,000
Right-of-Way	\$200,000
Additional Contingency (20%)	\$1,060,000
Total Estimated Budget	\$6,340,000

See Cost Estimate Summary in the Appendix for breakdown, assumptions, and exclusions.

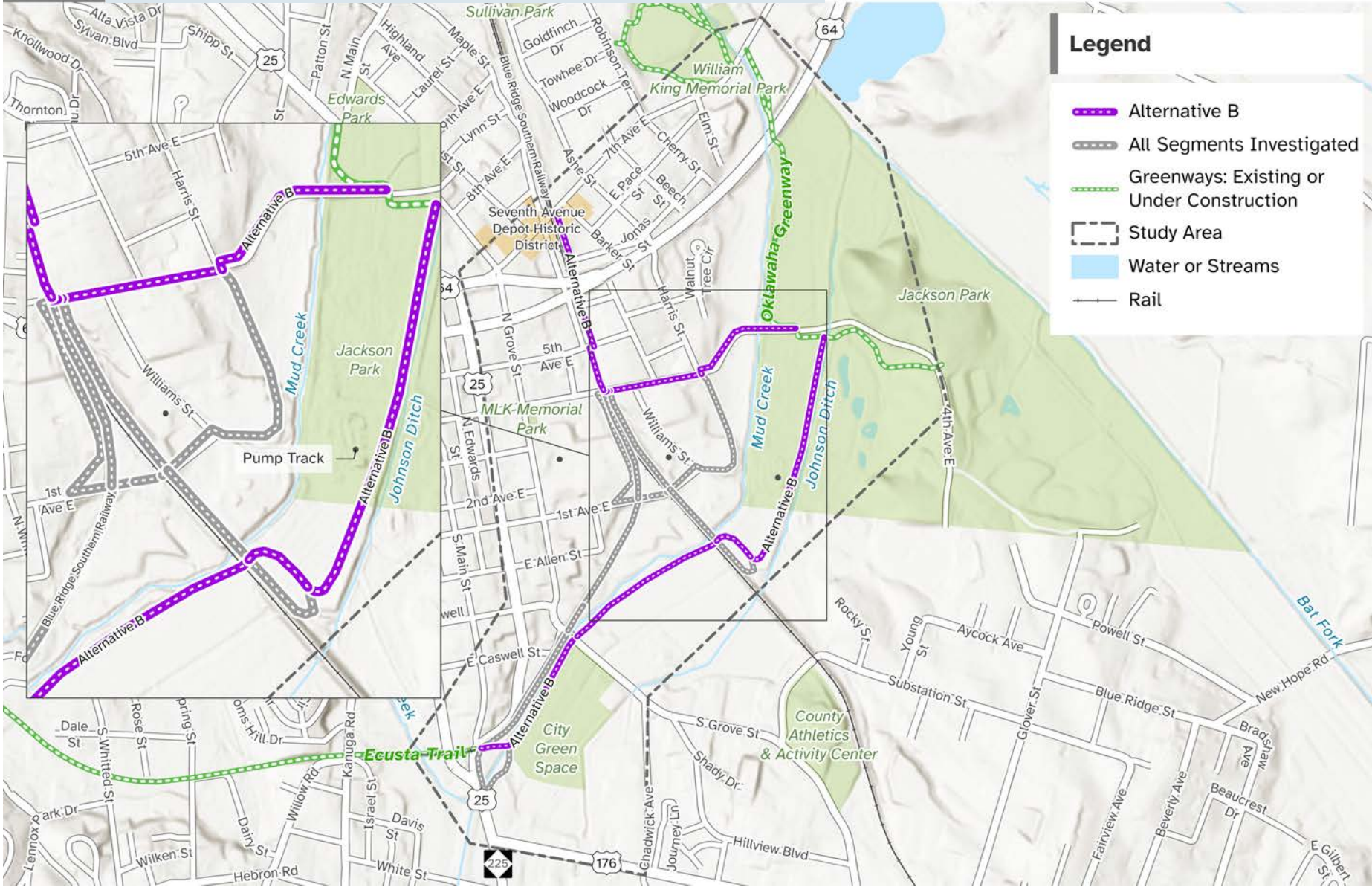
NOTE: The segment from 4th Avenue East to 7th Avenue East is included in the cost estimate (approximately \$1.4 million).

Map 37. Alternative B



Legend

- Alternative B
- All Segments Investigated
- Greenways: Existing or Under Construction
- Study Area
- Water or Streams
- Rail



Typical Cross-Section

ALT B

Alignment B includes three typical treatments:

1. A 12' greenway connecting from South King Street to Jackson Park, traversing City-owned land and a proposed sewer easement.
2. Along 4th Avenue, the treatment is a 10' paved sidepath (12' where feasible) that parallels the roadway. This is illustrated in **Image 59 - 10-Foot Sidepath Typical Cross-Section**.
3. From 4th to 7th Avenue, the recommended treatment is a 10' rail-with-trail (12' where feasible). See *Images 40 and 41 for a conceptual design*.

Image 58. 10-Foot Sidepath (12-Foot Where Feasible) Typical Cross Section on 4th Avenue East



Image 59. Trail Along Mud Creek Rendering



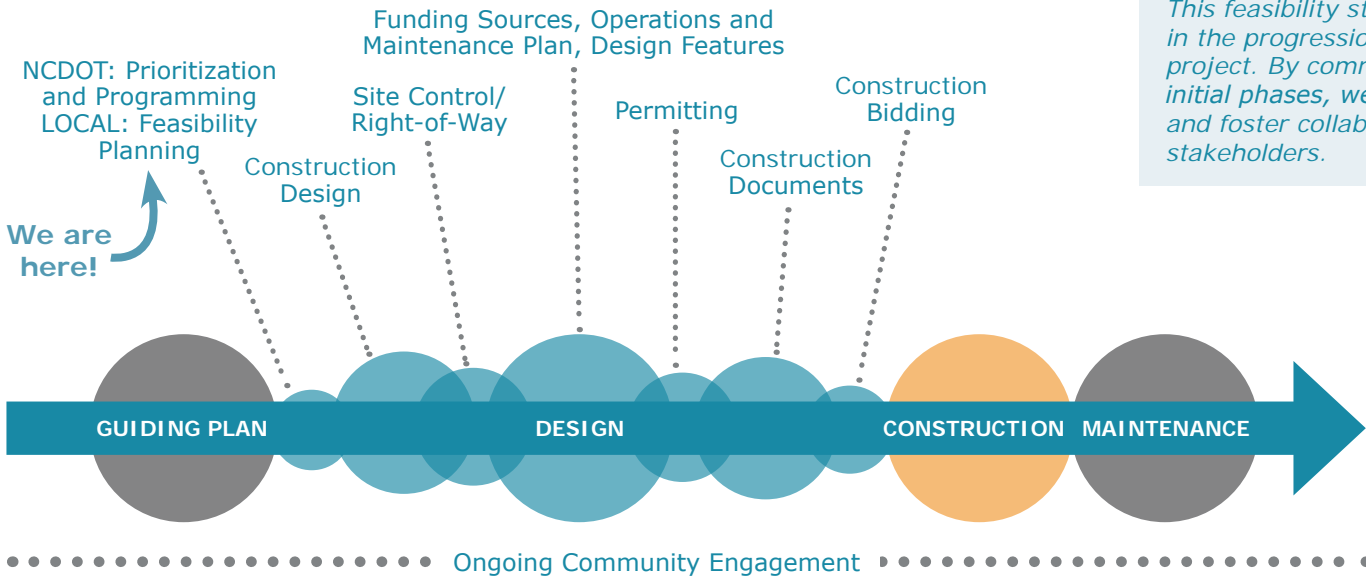
Railroad rights-of-way and creek beds frequently present optimal locations for greenway placement due to their level ground, few obstructions, and direct connectivity to transportation routes. By capitalizing on the natural features of these areas and integrating thoughtful design solutions, greenways situated within rail corridors and creek beds can provide both practical connectivity and enriching recreational experiences for users.

LIFECYCLE OF A PROJECT

One of the most asked questions in the work of building pedestrian and bicycle networks is "when will the project be finished so I can take a walk or bike?" While seemingly straightforward, the answer is often complex. **Figure 20 - Lifecycle of a Transportation Project** illustrates the typical lifecycle of an active transportation project. The time it takes to implement a project depends on the project's complexity, managerial oversight (whether by local authorities or NCDOT), the type of funding involved, how much ROW is needed, and the scale (size) of the project.

The Above the Mud greenway project represents the 'Feasibility Planning' stage of projects, and from there it will move into the subsequent stages of funding (programming), design, construction, and then maintenance. The cutsheets will enable these projects to be well-presented for funding opportunities, facilitating their advancement through the subsequent lifecycle stages.

Figure 20. Lifecycle of a Transportation Project



This feasibility study marks a crucial stage in the progression of a transportation project. By committing resources to these initial phases, we lay a solid foundation and foster collaboration with essential stakeholders.

KEY PARTNERS FOR IMPLEMENTATION

Future success for the Above the Mud Greenway will involve collaboration with regional and state agencies, local partners, the private sector, and nonprofit organizations. **Figure 21 - Key Implementation Partners** indicates the key partners whose roles are described below.

Hendersonville City Council

Through their leadership and decision-making, the City Council contributes to the successful realization of Above the Mud's goals and objectives. As the governing body, the City Council has the authority to guide implementation, including making budget decisions related to the greenway's progress and affirming their support of walking and bicycling. Additionally, they play a role in collaborating with entities such as NCDOT and the French Broad River MPO to ensure effective coordination.

City Staff

City of Hendersonville staff play a crucial role in facilitating the coordination and collaboration necessary for the successful implementation of walking and biking projects and initiatives in Hendersonville, such as Above the Mud. Staff coordinates with the City Council to develop and refine project plans, seeking their guidance and support throughout the process. They work closely with key stakeholders such as the French Broad River MPO, the County, and NCDOT to secure funding and ensure smooth project implementation. They seek other funding opportunities, they work with private development, and they and guide projects through design, construction, and maintenance. They direct the creation and implementation of policies to ensure smooth project development.

French Broad River MPO

The French Broad River Metropolitan Planning Organization (MPO) assumes a role in facilitating funding opportunities and coordinating collaboration between the City, Henderson County, and NCDOT. Their responsibilities encompass the coordination

of funding for various projects through programs like the State Transportation Improvement Program (STIP) and other available avenues, such as discretionary funding.

Henderson County

Collaboration between the City and County on multimodal projects is of utmost importance, especially considering the potential for growth and connectivity opportunities in areas located just beyond the city limits. It is important for both the City and County to work in tandem to establish connections, develop maintenance agreements, and coordinate policy decisions. The Henderson County Transportation Advisory Committee (TAC) is a great avenue for intergovernmental collaboration, working to ensure that various parties coordinate on local transportation decisions.

What is an MPO?

The French Broad River Metropolitan Planning Organization (FBRMPO) is a partnership between local and state government that makes decisions about transportation planning in urbanized areas and meets planning requirements established by federal authorizing legislation for transportation funding. FBRMPO is required to prepare long range transportation plans for the planning area and assist in prioritization of projects to be included in the State Transportation Improvement Program (NCDOT's funding for a 10-year period). FBRMPO was created in 1962 as the region centered around Asheville continued to experience growth and reached a population density threshold of 50,000 which constitutes the federally-mandated creation of a Metropolitan Planning Organization (MPO). The MPO currently serves over 414,000 people across 21 municipalities.



NCDOT Division 14

There are ample opportunities to foster coordination with NCDOT Division 14. These opportunities encompass a range of initiatives, such as projects outlined in the State Transportation Improvement Program (STIP), as well as resurfacing, roadway, and bridge reconstruction projects. Additionally, Division 14 offers other funding opportunities that can be explored to support and enhance transportation endeavors in the region. By actively engaging with the Division, the City can tap into their expertise, resources, and funding mechanisms to implement transportation initiatives.

Community & Business Members

Hendersonville benefits from a committed group of community and business volunteers who contribute their time and efforts to enhance the city. Their contributions have played a significant role in the progress and achievements of the city over the past decade. This is evident through the progress led by partners such as Friends of the Oklawaha Greenway and Friends of the Ecusta Trail. Furthermore, community members contribute to promoting walking by engaging in conversations with their neighbors, friends, colleagues, and other individuals in their networks. Through these interactions, they generate public support and enthusiasm for pedestrian initiatives. They also advocate for improved projects and initiatives by engaging with elected officials and other relevant stakeholders, effectively conveying the community's needs and aspirations.

NCDOT Integrated Mobility Division

Based out of Raleigh, this division of NCDOT develops guidance on bicycle and pedestrian policy and complete streets, which is critical to project development. They also provide funding for plans and studies, which can include more detailed analysis of greenway or sidewalk alignments and help move a specific project closer to implementation.

Private Sector (developers, other funders such as nonprofits)

By engaging with developers, the City can explore additional avenues for incorporating infrastructure improvements, such as greenways, into new development projects. This proactive approach ensures that new developments contribute to the overall walkability and accessibility of the city.

Figure 21. Key Implementation Partners



ACTION PLAN

For this Feasibility Study to be effective, it needs a clear action plan that identifies the next steps to achieving its vision. The following action plan indicates a time frame to implementation,

lead agency, key partners, and performance measures to evaluate success. This approach will allow the city to be strategic yet flexible as opportunities arise.

Table 4. Action Plan

TASK #	DESCRIPTION	LEAD	PARTNER	TIME FRAME	HOW WILL SUCCESS BE MEASURED
1	Adopt this plan, which allows the study to become the official planning document for the Above the Mud Greenway and shows intention to support implementation over time.	City Council	City Staff, NCDOT IMD and Division 14, FBRMPO	Fall/Winter 2024	Adopted plan.
2	Ensure that the preferred route alternatives from this study are incorporated into regional plans, such as the CTP/MTP.	NCDOT, FBRMPO	City Staff, City Council, NCDOT IMD and Division 14	Winter 2024	Amendments to Plan documents.
3	Consider the creation of an annual work plan to guide the development of this study. The work plan may include key milestones, timelines, and roles.	City Staff	FBRMPO, NCDOT Division 14	Ongoing	Annual work plan document.
4	Coordinate with NCDOT Division 14 on the U-6049 and EB-3963 STIP projects to understand project designs and timelines.	NCDOT Division 14, City Staff	FBRMPO	Summer 2024	Coordination notes/meeting minutes.
5	Coordinate with City projects such as the South Main Street bike and pedestrian improvements and Mud Creek floodplain restoration projects.	City Staff	City Council	Summer 2024	Coordination notes/meeting minutes.
6	Coordinate with NCDOT and the MPO on submitting the project to a future round of the NCDOT SPOT process (SPOT 8.0). All project segments would be eligible for funding.	FBRMPO, NCDOT Division 14, City Staff	City Council	Fall 2024	SPOT submittal.
7	Develop a landowner outreach approach to coordinate with landowners along the project corridor - specifically along 4th Avenue East. Develop strategies to acquire easements from willing landowners.	City Staff	City Council	Spring 2025	Landowner outreach approach.
8	Continue to work with key stakeholder Watco to pursue route alternatives that involve a rail-to-trail or rail-with-trail conversion.	City Staff	County, City Council	Fall/Winter 2024	Coordination notes/meeting minutes.

Table 4. Action Plan (Continued)

TASK #	DESCRIPTION	LEAD	PARTNER	TIME FRAME	HOW WILL SUCCESS BE MEASURED
9	Coordinate with Henderson County to create the optimal trail connection to Jackson Park.	City Staff	Henderson County	Fall/Winter 2024	Connection point determined.
10	Coordinate with key project partners to evaluate and advance phasing options based on the scenarios presented in Chapter 5.	City Staff	NCDOT Division 14, FBRMPO	Ongoing, Winter 2025	Coordination notes/meeting minutes.
11	Seek future funding opportunities for construction.	City Staff, FBRMPO	NCDOT Division 14 and IMD	Ongoing	Funding sources identified.
12	Coordinate with community partners such as Friends of the Oklawaha Greenway and Friends of the Ecusta Trail to advocate for project prioritization and funding.	City Staff	Community partners, County	Ongoing	Coordination notes/meeting minutes.
13	Coordinate with regional partners to ensure system-wide branding, design consistency, and wayfinding.	City Staff, Henderson County	Transylvania County, NCDOT Division 14, FBRMPO, Community partners	Summer 2025	Branding and wayfinding plan.
14	Develop a maintenance plan for the project.	City Staff	County, NCDOT Division 14	Summer 2026	Maintenance plan document.

FUNDING RESOURCES

The following provides possible funding sources to advance the design and development of the Above the Mud greenway. For additional funding sources, see the Appendix.

Henderson County Tourism Project Development Fund

Overnight visitors to Henderson County pay a lodging tax that generates occupancy tax revenue and supports the Tourism Product Development Fund. The Henderson County Tourism

Development Authority oversees this fund with the goal to encourage more tourism related activities, attracting people to the County to stay overnight and spend more money. The funds can be used for the development of plans/studies that support the tourism industry, which greenway design and development may fall within. Other projects that will expand, strengthen, and sustain local tourism.

The funding requires a 50% match. Any organization or business including public or private, for-profit, or nonprofit is eligible to apply for a Tourism Product Development Grant. More **HERE**.

NCDOT STIP (State Transportation Improvement Program)

The current STIP identifies transportation projects that will receive funding from 2024-2033. The next round of Strategic Transportation Prioritization, referred to as "P8.0", will be underway soon to update the STIP. This project could be submitted to P8.0; the City of Hendersonville would need to supply the 20% match. More [HERE](#).

NC Land and Water Fund (NCLWF)

The North Carolina Land and Water Fund improves water quality, sustains ecological diversity, and protects historic sites and military installations by funding projects to acquire lands, restore the habitat for fish, wildlife, and other species, and enhance the filtering of stormwater runoff to reduce pollutants from entering water supplies. Bike/ped projects are eligible for funding under their planning grants. More [HERE](#).

Transportation Alternatives Program (TAP)

The Transportation Alternative Program (TAP) projects are federally-funded community-based projects, disbursed on a reimbursement basis. TAP is the leading source of federal funding for bicycling and walking projects, accounting about half of federal funding for walking and bicycling. Under the new Infrastructure Law, TAP funding increased by 60%. More [HERE](#).

Recreation Trails Program (RTP)

The NC Division of Parks and Recreation, part of the NC Department of Natural and Cultural Resources, administers the Recreation Trails Program under the approval of the Federal Highway Administration. The goal of the program is to help states provide and maintain recreational trails for both motorized and non-motorized recreational use. A 25% local match is required for funding, and the minimum grant amount for on-the-ground trail projects is \$10,000 with a maximum of \$100,000. RTP funding flows through the TAP program. More [HERE](#) and [HERE](#).

NC Parks & Recreation Trust Fund (PARTF)

Managed by the North Carolina State Parks, PARTF provides dollar-for-dollar matching grants to local governments for parks and recreational projects to serve the public. The grant helps fund and maintain recreational resources, which includes parks, greenways, and trails. More [HERE](#).

Safe Streets & Roads for All (SS4A)

Safe Streets and Roads for All (SS4A) discretionary program supports regional, local, and Tribal initiatives through grants to prevent roadway deaths and serious injuries. The funding can be used to:

- Develop or update a Comprehensive Safety Action Plan.
- Conduct planning, design, and development activities in support of an Action Plan.
- Carry out projects and strategies identified in an Action Plan.

Note that to be eligible for design funding, an applicant must have an approved Safety Action Plan. The MPO is undertaking a regional planning study, which may open up implementation funding. More [HERE](#).

