KITTELSON & ASSOCIATES

FIVE POINTS STREETSCAPE AND SAFETY STUDY

Raleigh, NC

March 21, 2025

Inside front cover

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Five Points Streetscape and Safety Study

Raleigh, NC

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Chapter 1
Executive Summary

Executive Summary

The Five Points Streetscape and Safety Study was executed by the City of Raleigh beginning in April 2022 to address multimodal safety and mobility at the Glenwood Avenue/Whitaker Mill Road/Fairview Road/Glenn Avenue intersection, also known as the Five Points intersection. This study identified ways to address safety, speeding, and crash history, inadequate pedestrian and bicycling infrastructure, transit connectivity and accessibility, and the need for bicycle and pedestrian connections to the Crabtree Creek Greenway Trail.

Public Engagement

The project team worked with a broad range of agency and community leaders throughout the study. Five Points is an engaged community of residents and businesses who have regularly communicated with the City about the transportation issues along Glenwood Avenue and at the Five Points intersection. The study area is an important connection for many community leaders within the City of Raleigh. Therefore, it was critical to meet with these personnel ahead of each public engagement touchpoint in order to present initial information, gather feedback, and screen project updates and results.

Public engagement for the study was organized into three touchpoints: the first, held in fall 2022, covered existing conditions themes and also explored a series of nine initial concepts for improving safety and multimodal connectivity at the Five Points intersection. The second touchpoint, held in spring 2023, provided the results of a comparison of three remaining intersection concepts as well as draft recommendations for improving bicycling and walking facilities between Five Points and the Crabtree Creek Greenway. The third touchpoint will be held in spring 2025 around the time that this report is completed. Before each touchpoint, the project team met with City of Raleigh and NCDOT staff to gather feedback on the project updates and to share engagement materials.

Within each touchpoint, the project team held a public open house at the Five Points Center for Active Adults to share updates on the study and solicit public input. The first two open house events were attended by approximately 100 people each. In-person activities were supplemented by a robust project website and online surveys. Each of the first two online surveys received over 600 responses. In addition to these activities, the project team met with the Five Points CAC and other stakeholders throughout the project to deliver periodic updates and to vet concepts and identify fatal flaws before sharing more broadly with the public.

Existing Conditions

The Five Points intersection is made up of six approaches with skewed intersection geometry. Traffic on the Whitaker Mill Road and Fairview Road approaches moves during the same signal phases despite the limited sightlines to see oncoming traffic. Glenwood Avenue has a horizontal curve and vertical crest at the Five Points intersection These together limit sight distance for left-turning vehicles controlled by protected-permissive (flashing yellow arrow) signal phasing. The Glenn Avenue approach, while close to the intersection, is not included in the traffic signal and is controlled by a stop sign.

During the most recent five-year crash analysis period from 2017 to 2022, there were 143 reported crashes within 300 feet of the intersection, for a rate of 2.46 crashes per million entering vehicles. This is both a very high frequency and a high rate of crashes when compared with other intersections in Wake County. Twenty-two percent of crashes resulted in an injury, including one fatal crash and two other crashes with severe (A) injuries. High-profile crashes between 2019 and 2021 have occurred when vehicles left the roadway and struck adjacent properties. In addition to these trends, extreme speeding and red light running at the intersection are two major concerns received from the community. Additionally, intersection users who walk, bike, or take transit feel uncomfortable traveling alongside or across Glenwood Avenue within Five Points due to traffic volume, speeds, and crash history.

While the Five Points intersection experiences heavy traffic demand, it currently operates at a level of service B during the weekday morning and afternoon peak periods due to the amount of green time received by Glenwood Avenue. Other turning movements at the intersection operate with higher delays, including the westbound Whitaker Mill Road approach, where traffic demand is near capacity.

Concept Development

To address traffic safety concerns at the Five Points intersection, a series of nine concepts were prepared and shared with City and NCDOT staff for feedback and viability before being presented for public feedback. These concepts ranged from near-term signal timing and geometric improvements within the existing footprint of the intersection, major changes or redirected turning movements at the intersection, and single and multilane roundabout configurations. Draft concepts for providing walking and bicycling connectivity between Five Points and the Crabtree Creek Greenway were also presented to the public.

Out of the nine initial concepts, three were received favorably by the public and advanced: Concept A (Near-term improvements), Concept G (Single-lane roundabout), and Concept I (Multilane roundabout). Other concepts were not advanced because they created substantial impacts to existing turning movements at the intersection and were perceived as disruptive to the community.

Concept Assessment

The three remaining concepts were then refined by developing CAD drawings over base survey information to explore property and right-of-way impacts as well as preliminary costs. These concepts were assessed in more detail using traffic modeling software to weigh relative tradeoffs in congestion, delay, queuing, and potential traffic diversion. Other performance measures used to assess these concepts were their relative benefit to multimodal safety, pedestrian and bicyclist connectivity, and impacts to on-street parking and open space.

When presented with the results of the concept assessment and comparison, the public responded the most positively to Concept G (Single-lane roundabout) due to its potential to reduce speeds and improve safety at the intersection, as well as improve bicycling and walking conditions. Concept I (Multilane roundabout) was also received favorably but with more hesitancy due to its high cost and property impacts and public skepticism toward multilane roundabouts. The potential for traffic diversion and additional queueing on Glenwood Avenue due to the lane removal in Concept G was generally not viewed as a major concern by the public.

Recommendations and Implementation

In fall 2023, the City and NCDOT implemented a series of signal timing and phasing changes intended to improve multimodal safety at the Five Points intersection. These included adding Leading Pedestrian walk intervals (LPI), adjusting flashing do not walk (FDW) times, and adding a protected left turn phase for the westbound Whitaker Mill Road approach. These changes were received positively by the public and are being monitored as part of an ongoing crash assessment by the City and NCDOT.

The City and project team identified additional near-term improvements to increase visibility and safety conditions for pedestrians around the intersection. These improvements include the removal of the right-turn lane on Fairview Road and its conversion to additional on-street parking with curb extensions near the intersection as well as enhanced median striping along Glenwood Avenue. These enhancements are expected to be implemented by the summer of 2025.

If City Council has interest in pursuing future changes to the area, such as one of the roundabout concepts (Concepts G and I) or installation of protected bicycle facilities connecting to the Greenway, then advanced planning efforts should be updated to provide updated cost estimates. This is especially important as construction and real estate costs continue to fluctuate rapidly over relatively short periods. Major changes to Glenwood Avenue are also subject to NCDOT; therefore any future projects would necessitate receiving their approval or would be subject to the City's ability to transfer ownership of portions of the corridor.

Chapter 2
Introduction

Introduction

The Five Points Streetscape and Safety Study was executed by the City of Raleigh beginning in April 2022 to address multimodal safety and mobility at the Glenwood Avenue/Whitaker Mill Road/Fairview Road/Glenn Avenue intersection, also known as the Five Points intersection. This study identified ways to address safety, speeding, and crash history, inadequate pedestrian and bicycling infrastructure, transit connectivity and accessibility, and the need for bicycle and pedestrian connections to the Crabtree Creek Greenway Trail. As shown in Figure 1, the Five Points intersection is a complex intersection with challenges for vehicles and pedestrians. It is also an iconic location within Raleigh and a focal point for several National Register-listed historic districts. Addressing the transportation challenges effectively will require context-sensitive approaches grounded in an understanding of the importance of this area to the surrounding neighborhoods and Raleigh as a whole.

Figure 1. Five Points Intersection Study Area

PURPOSE AND NEED

The Five Points intersection is made up of six approaches with skewed intersection geometry. Traffic on the Whitaker Mill Road and Fairview Road approaches moves during the same signal phases despite the limited sightlines to see oncoming traffic. Glenwood Avenue has a horizontal curve and vertical crest at the Five Points intersection These together limit sight distance for left-turning vehicles controlled by protected-permissive (flashing yellow arrow) signal phasing. The Glenn Avenue approach, while close to the intersection, is not included in the traffic signal and is controlled by a stop sign.

Intersection Configuration

There are several turn lanes provided at the Five Points intersection, and varying traffic control devices. All streets are two-way, with the exception of Fairview Road, for the block between Glenwood Avenue and Scales Street. Fairview Road operates as a one-way eastbound leg and is therefore only has one receiving lane for the intersection. The lane configurations by approach consist of the following:

- Glenwood Avenue (Northbound) – Left turn lane, two through lanes, and right turn lane. The left turns currently operate as protected-permissive with flashing yellow arrow.
- Glenwood Avenue (Southbound) – Left turn lane, one exclusive through lane, and one shared through/right lane. The left turns currently operate as protected-permissive with flashing yellow arrow.
- Fairview Road (Eastbound) – Shared left/through lane and right turn lane. The left turns currently operate as permissive.
- Whitaker Mill Road (Westbound) – Left turn lane and shared through/right lane. The left turns previously operated as permissive. In 2023, a protected left turn phase was added for the Whitaker Mill Road approach, which now operates as protected-permissive with flashing yellow arrow.
- Glenn Avenue (Northeastbound) – Right turn lane. The approach currently is stop-controlled.

As previously noted, the alignment of Glenwood Avenue changes at the Five Points intersection. This results in an intersection skew that limits driver sight distance around the bend in Glenwood Avenue, which poses a particular safety concern for left-turning vehicles. The eastbound and westbound approaches are similarly misaligned. The Fairview Road and Whitaker Mill Road approaches are not perpendicularly aligned, which makes it difficult for drivers to see approaching vehicles. Improving the driver view angle is important for clear sightlines during these two approaches' concurrent signal.

In addition to the horizontal alignment challenges, the vertical elevations also present an obstacle to safe intersection operations. Glenwood Avenue slopes down heading southbound from White Oak Road, which creates a slight hump for northbound traffic sight lines to see oncoming vehicles (see Figure 2).

Figure 2. Southbound Glenwood Avenue Approach

The transportation challenges present at the Five Points intersection extend to the overall Glenwood Avenue corridor. Because of this, the study also considered impacts along Glenwood Avenue and at other key intersections from Oberlin Road to the Wade Avenue interchange, depicted in Figure 3. The community context study area was based on a distance of one-fourth mile from the corridor; however, context was described for whole historic neighborhoods situated along the corridor.

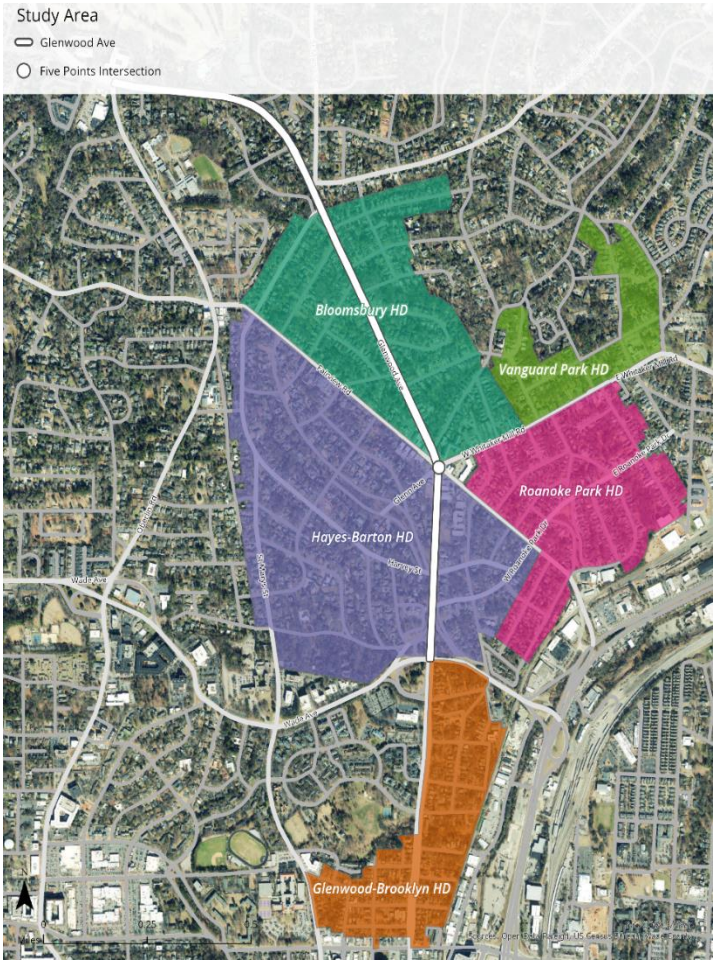

Figure 3. Glenwood Corridor Study Area

STUDY TIMELINE

Figure 4 displays the timeline for the Five Points Streetscape and Safety Study. Due to the complexity of the existing transportation issues, multiple interests within the study area, commitment to broad public outreach, and many tradeoffs to evaluate, the study took approximately three years to be completed. The City began by holding a listening session in April 2022 at Hayes Barton Baptist Church to introduce the study and gather initial public feedback and questions. Then the project team completed the existing conditions analysis in spring and summer 2022 in collaboration with the City and NCDOT. At the end of summer 2022 and early fall 2022, the project team met with a group of stakeholders from different community and interest groups throughout Five Points, held a public open house at the Five Points Center for Active Adults, and held a pop-up event at the Five Points Fall Festival. The purpose of this touchpoint was to present the existing conditions findings and solicit feedback on preliminary concepts for addressing speeding and safety at the Five Points intersection.

After the first round of public engagement in October 2022, the project team performed a detailed evaluation of several alternatives for the Five Points intersection and surrounding area, which included a second agency workshop with the City and NCDOT in December 2022. The results of the alternatives assessment were presented at a second open house held at the Five Points Center for Active Adults in May 2023. The team then discussed the feedback from the public and community partners and held a workshop with City of Raleigh staff across multiple departments in August 2023 to brainstorm near- and long-term recommendations for the project. Over the following year, the City moved to implement some of the near-term recommendations immediately, including signal timing and phasing adjustments at the Five Points intersection, while other long-term recommendations were evaluated and weighed against project costs and other tradeoffs.

In August 2024, the project team held a third and final agency workshop with the City and NCDOT to discuss the preferred alternative, which consists of curb extensions, striping, and additional signal timing and phasing changes for the Five Points intersection. The team then prepared updated drawings and cost estimates for the preferred alternative and developed an implementation plan, as well as the draft final report. A third and final public open house was held at the Five Points Center for Active Adults in March 2025 to share the preferred alternative and the final report.

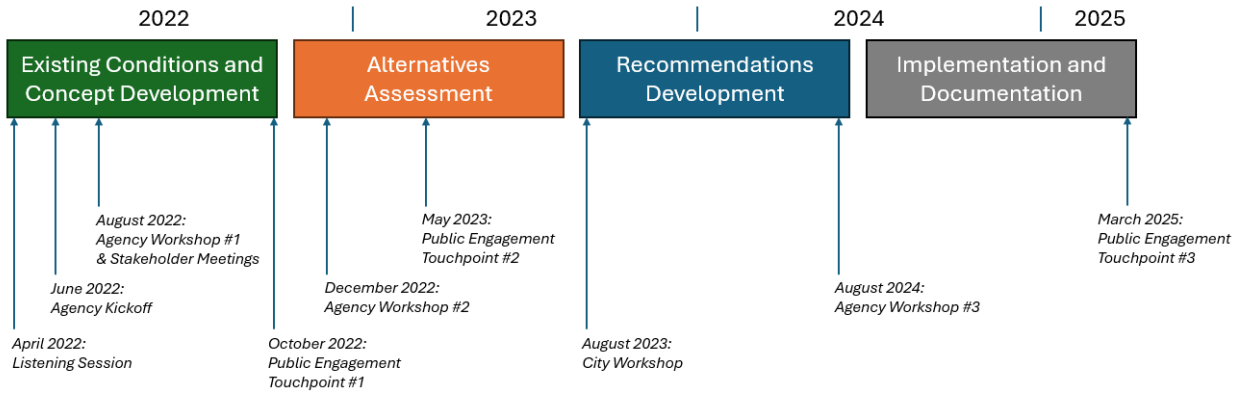

Figure 4. Study Timeline

Chapter 3
Public Engagement

Public Engagement

Broad public outreach is critical to maximizing the public support, effectiveness, and equitable recommendations for the Five Points Streetscape and Safety Study. It was important to provide continued public outreach over multiple platforms throughout the project to reach residents, business owners, and other interested parties. This chapter provides an overview of the public engagement strategy as well as findings and feedback from the engagement process.

CITY AND NCDOT ENGAGEMENT

While the Five Points study area lies entirely within the City of Raleigh, Glenwood Avenue is maintained by NCDOT and facilitates both local and regional traffic. There were multiple touchpoints with these decision-makers to help guide the process and select the final recommendation. A study kickoff meeting was held with City of Raleigh staff in June 2022 to introduce the study purpose and need, present the draft public engagement plan, discuss initial data collection results, and brainstorm preliminary concepts for improving the Five Points intersection and surrounding area.

Additionally, three interagency workshops were held at key milestones within the study. Staff from various departments with the City of Raleigh (including transportation and planning) and NCDOT (including Traffic Safety Unit, Congestion Management, Division 5, and District 1) participated in each of the workshops. These workshops provided the opportunity to discuss the feasibility of potential recommendations and implementation opportunities and constraints. The first workshop, held in July 2022, was used to screen initial concepts for improving the Five Points intersection, develop performance metrics for the project, and identify fatal flaws. At the second workshop (held in December 2022), the project team presented the outcomes of the first public engagement touchpoint, discussed benefits and tradeoffs of each of the concepts, and screened the nine initial concepts into three remaining alternatives for further analysis. A separate City agency workshop was held in August 2023 to discuss the results of the second public engagement touchpoint, and then a final interagency workshop with the City of Raleigh and NCDOT was held in August 2024 to discuss the preferred alternative for the study, as well as next steps.

COMMUNITY LEADERS AND PARTNERS

Five Points is an engaged community of residents and businesses who have regularly communicated with the City about the transportation issues along Glenwood Avenue and at the Five Points intersection. The study area is an important connection for many community leaders within the City of Raleigh. Therefore, it was critical to meet with these personnel ahead of each public engagement touchpoint in order to present initial information, gather feedback, and screen project updates and results. The bulk of these meetings took place in August 2022, well in advance of formal public open house events, to present initial findings and themes from the existing conditions assessment, screen preliminary concepts, and encourage attendees to help advertise the upcoming public touchpoints. The City and project team anticipated a heavy level of interest and potential attendance at in person engagement events and recognized that it

was critical to share initial materials with local residents and businesses ahead of these broader public events.

The team regularly engaged with the Five Points Citizen Advisory Council (CAC) to provide updates on the study and foster discussions between the community and the City of Raleigh. In addition, the project team held individual small group meetings with the Five Points Business District Association, Rotary Club of the Capital City, community business operators (tenants/lessees), places of worship, commercial property owners, and local school staff and parents, including Underwood Magnet Elementary School, Oberlin Magnet Middle School, and Joyner Elementary Magnet School.

A list of study partners is provided in Appendix A.

COMMUNITY ENGAGEMENT

Due to the broad range of community members and interest groups served by the Five Points study area, community engagement was conducted as a phased series of "touchpoints" rather than singular meetings or events. The study built upon the strategy of meeting people where they are by attending community organizations' events in addition to project-specific public engagement sessions. Key elements of the engagement approach included the following:

- Public Open Houses: These sessions provided the opportunity to directly engage the public, give detailed updates on the progress on the study, present poster boards showing detailed concepts for improving the Five Points intersection and the surrounding area, discuss results, and solicit feedback in a small group setting. Each open house was held at the Five Points Center for Active Adults in a two- to three-hour afternoon session with the goal of facilitating in-person engagement from parents, retirees, business owners, and residents who work traditional and non-traditional shifts.
- Pop-Up Events: To support more granular outreach to the public, the study team attended pop-up meetings and community outreach events. These often took place as a table with project information in the neighborhood, a talk to residents at places such as bus stops, or a visit businesses in the community. One such example is shown in Figure 5.

Figure 5. October 2022 Fall Festival Pop-Up Event

- Virtual Engagement: In addition to in-person opportunities, robust virtual engagement was provided, including a project website (Figure 6), remote meetings and Q&A sessions, recorded video presentations, online surveys, and online comment map. These were intended to mirror the interactivity of in-person engagement for those who could not attend the open house events.

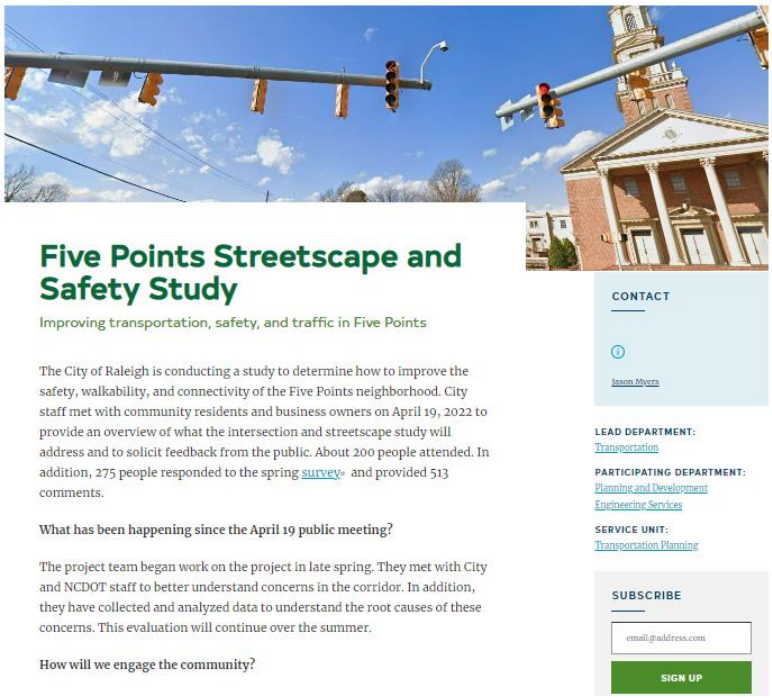

Figure 6. Five Points Streetscape and Safety Study Website

Public outreach for the study was conducted over the following phases:

- Listening session – held in April 2022 before the formal kickoff of the study
- Touchpoint #1: Existing Conditions and Initial Concepts:
    - August 2022 – stakeholder and small group meetings
    - October 2022 – public open house and Fall Festival pop-up event
- Touchpoint #2: Alternatives Refinement and Assessment
    - April 2023 – stakeholder and small group meetings
    - May 2023 – public open house
- Touchpoint #3: Recommendations
    - January 2025 – CAC engagement
    - March 2025 – public open house

The content and findings of each phase are discussed in the following sections. A detailed compilation of public engagement activities and feedback is provided in Appendix A.

Touchpoint #1: Existing Conditions and Initial Concepts

The first touchpoint included a presentation to recap the study purpose and need and initial concerns raised by the public. The team presented findings and themes from the existing conditions assessment (see Chapter 3), including recently reported crash data, traffic speeds, traffic operations, on-street parking, and walking/bicycling/transit conditions. The touchpoint also introduced a series of nine initial concepts for improving safety and multimodal connectivity at the Five Points intersection (see Chapter 4).

Approximately 100 attendees attended Open House #1 (Figure 7), which consisted of four stations including an introductory video, existing conditions dot exercise, draft concepts, and online/in person survey. Many more people stopped by the event booth at the Five Points Fall Festival, and over 700 responses were received on the online survey. Attendees identified the following existing conditions themes:

- There is a high prevalence of speeding and red light running.
- Recent high-profile run-off road crashes on Glenwood Avenue hitting church and business property gave a general negative feeling of safety for those who travel the intersection inside or outside a vehicle.
- Misaligned through and turning movements on Glenwood Avenue and limited sight distance created and exacerbated conflicts between vehicles and between vehicles and active transportation uses.

Figure 7. Open House #1

Out of the nine concepts that were presented at the touchpoint, those with the most positive responses included the near-term signal phasing/timing and geometric improvements (Concept A), closing intersection approaches (Concept C), and the roundabout concepts (Concepts G, H, and I). Other general concerns and comments included the need for coordination with Underwood Elementary School, parking and business access, maintaining all existing turning movements at the Five Points intersection, and providing comfortable and usable walking and bicycling facilities.

Touchpoint #2: Alternatives Refinement and Assessment

The next touchpoint discussed how the nine initial intersection concepts were refined to three remaining alternatives. The project team presented the compiled feedback and outcomes of touchpoint #1 and the follow-up agency workshop #2, as well as the detailed performance assessment and comparison of the remaining alternatives (see Chapter 5).

Open House #2 was held in a similar format as the first open house, with materials arranged over four stations: an introductory video, a summary of public feedback and themes to-date, refined concept drawings for the remaining intersection and greenway connection concepts, and additional traffic analysis including a VISSIM microsimulation animation (Figure 8). Approximately 100 people attended the in-person open house, and over 650 responses to the online survey were received. Participants responded to targeted questions about each of the intersection concepts, with the following results:

- Concept G (single-lane roundabout) scored highest in reducing speeds, improving safety, improving bicycling and walking conditions, and improving the “look and feel” of the intersection.

- No concept was perceived to improve traffic congestion, but Concept I (multilane roundabout) scored highest in this category. Most participants were not concerned or did not think that traffic diversion from Concept G was a major concern.
- Participants were skeptical of multilane roundabouts.
- Improving crosswalks and providing separated bicycling facilities was a major point of emphasis.
- Participants acknowledged that Concept A (near-term improvements) would not reduce traffic speeds at Five Points.

Figure 8. Open House #2

Providing multimodal connections to the City's Greenway network was a separate, but important consideration of the study. Participants confirmed the primary goals for the development of greenway connection concepts. Participants also provided specific feedback on locations of concern for pedestrian/bicyclist safety and accessibility, key connections to Crabtree Creek Greenway and other important pedestrian/bicycle facilities, and draft recommendations for pedestrian/bicycle improvements.

Touchpoint #3: Recommendations

The final touchpoint will provide an opportunity to share the project recommendations with the public, including near- and long-term improvements for the Five Points intersection and surrounding area. The touchpoint will also provide the public with the final report for review and invite participants to ask questions and engage with members of the project team and City staff.

Chapter 4
Existing Conditions

Existing Conditions

This chapter provides key findings from the existing conditions report for the Five Points Streetscape and Safety Study. Topics included in this section are as follows:

- Land Use
- Demographic
- Safety
- Traffic Operations
- Multimodal Operations

The Existing Conditions Report, including additional analyses and findings, is included in Appendix B**.**

LAND USE

The 2030 Comprehensive Plan for the City of Raleigh[1] recognizes that single-family detached housing is the most prevalent type of housing in the city[2]. The area surrounding the Five Points Intersection is predominantly zoned as Residential, with relatively higher density of housing R-10 to the east of the intersection when compared to the west of it. The immediate vicinity of the intersection contains more mixed use categories, such as Neighborhood Mixed Use, Commercial Mixed Use, and Office Mixed Use.

The areas along the Glenwood Avenue corridor follow a similar pattern of residential zoning with pockets of mixed use at the north end of the corridor at Oberlin Road, around the Five Points intersection, and south of Five Points near Roanoke Park Drive. The City's future land use map shows many of the residential areas around the intersection could be rezoned to allow for institutional and public facilities and mixed use[3]. Owing to the intersection's proximity to Downtown Raleigh, these scheduled measures would increase access to public and educational facilities and improve the walkability in the vicinity of the intersection. Along the broader Glenwood Avenue corridor, zoning is anticipated to change. Areas previously zoned for Office Mixed Use will be upgraded to Office and Residential Mixed Use, making way for denser housing and better walkability. Future land use would rezone some areas currently zoned as Industrial Mixed Use areas to Regional Mixed Use and Medium Scale Residential.

[1] City of Raleigh, 2018.
[2] City of Raleigh, 2020.
[3] City of Raleigh, 2021.

DEMOGRAPHICS

Population characteristics for the Five Points Intersection and along the Glenwood corridor are compared to the City of Raleigh as a whole where possible. Values for the City of Raleigh are based on the 2020 United States Census American Community Survey 5-year estimates. Key findings include:

- The highest population density lies just south of the study area. Near the Five Points intersection, population density ranges from 2,500 to 4,500 people per square mile.
- Most of the study area consists of less than 15 percent minority (non-white and Hispanic) population. This does increase slightly immediately west of the Five Points intersection.
- A large portion of the study area consists of median household incomes over $150K. This is largely true for Census Block Groups immediately adjacent to the Five Points intersection.
- Employment within the study area varies. Near the Five Points intersection, most Census Block Groups report 85 to 90 percent total employment. However, the area immediately west of the intersection includes less than 65 percent participation in the labor force.
- Areas to the immediate east of the Five Points intersection consist of the largest youth population, with 26 to 30 percent of the population being under 18. Immediately to the west of the intersection, approximately 13 to 19 percent of the population is under 18.
- The percentage of the population over 75 varies within the study area. To the immediate west of the Five Points intersection, 9 to 17 percent of the population is age 75 or older. The area east of the Five Points intersection only exhibits 1 to 3 percent of the population age 75 or older.
- Most of the study area consists of Census Tracts with 7 to 11 percent of the population having a disability. This percentage drops east of the Five Points intersection, with only 2 to 5 percent of the population having a disability.
- Most residents in the study area have access to vehicles. Near the Five Points intersection, 0 to 5 percent of housing units have no vehicles.

Maps to illustrate these findings can be found in the Existing Conditions Report as part of Appendix B.

SAFETY

The study team obtained and analyzed the most recent five (5) years of reported crash data available for the Five Points intersection (Glenwood Avenue/Whittaker Mill Road/Fairview Avenue) using NCDOT's TEAAS tool and Crash Web program, consisting of data from May 1, 2017, to April 30, 2022. An extended intersection y-line (300' compared to a typical 150') was utilized to capture the influence of the different intersection approaches, including their vehicular queues and sight distance challenges. It is important to note that this time-period was inclusive of crash data in 2020 that was impacted by the COVID-19 pandemic; statewide data indicated that the frequency of total crashes in 2020 decreased from prior years, but the frequency of fatal crashes in 2020 had increased. Detailed crash data are provided in Appendix B.

From a review of the project background information, including field visits, aerial photography, and early stakeholder and public comments, several geometric and traffic control elements near the Five Points intersection may be contributing to high crash frequency, including the following:

- The horizontal and vertical alignment near the Five points intersection limits sight distance for both vehicles and pedestrians.

- The horizontal curvature and negative superelevation/cross slope on northbound Glenwood Avenue coupled with a preponderance of speeding vehicles, has contributed to several run off road/fixed object crashes, as well as a general feeling of discomfort for pedestrians and bicyclists near the intersection. Recent crashes have damaged restaurants, Hayes Barton Baptist Church, and residential property adjacent to the intersection.
- The skewed geometry of the opposing movements on Glenwood Avenue limits sight distance for left-turning vehicles, which currently are controlled by protected-permissive (flashing yellow arrow) signal phasing. This is exacerbated by the multiple possible turning movements from the left turn lanes (onto Fairview Avenue, Whittaker Mill Road, or Glenn Avenue).
- The skewed geometry of the opposing movements on Fairview Avenue and Whittaker Mill Road coupled with permissive left turn phasing creates confusion about which vehicles have the right of way, and it is unclear where to look for oncoming traffic.
- High traffic volume and speeding on Glenwood Avenue and periodic congestion have contributed to rear end conflicts between vehicles approaching the intersection.
- Off-peak on-street parking on Glenwood Avenue north and south of the intersection has contributed to sideswipe conflicts between merging vehicles near the intersection.
- The carpool line for schools near the intersection backs up onto Glenwood Avenue which adds to the confusion and congestion within the study area.

The following key crash patterns and trends emerged from the review of the most recent five years of reported crash data at the intersection:

- There were 143 reported crashes within the study period within 300’ of the study intersection, constituting a crash rate of approximately 2.46 crashes per million entering vehicles. This is both a very high frequency and high rate of crashes when compared with other intersections in Wake County.
- During the five-year study period, the 143 total reported crashes was the highest crash frequency of any intersection along Glenwood Avenue between I-440 and Peace Street, not including the boundary intersections at I-440 and Peace Street.
- 22% of the 143 total crashes resulted in a reported injury, including one fatal crash and two other crashes with severe (A) injuries. The crash rate and severity index exceeded the average values for Wake County.
- Rear-end, same-direction sideswipe, and run-off-road crashes were the three most common crash types. These accounted for nearly 61% of all crashes at the intersection. Crashes on northbound Glenwood Avenue were disproportionately represented in these three most common crash types. Specifically, 18 run off road or fixed object crashes were reported during the five-year study period, indicating a trend of drivers losing control of the vehicle near the intersection. As shown in Figure 9, additional chevron signage was installed in 2022 to address run off road crashes on Glenwood Avenue. This new signage is intended to illuminate based on the speed feedback sign that was installed south of the intersection on Glenwood Avenue.
- A disproportionate share of the crashes occurred at night. A total of 47 of the 143 crashes, including the fatality and both severe crashes, occurred under dark conditions.
- A disproportionate share (25%) of crashes occurred when the roadways were considered wet.

- Red-light running and speeding are two primary safety concerns at the Five Points intersection perceived by the local community. However, neither was observed to be a considerable crash pattern at the intersection from the reported data.
- A total of 19 of the 143 crashes involved parked vehicles. Of these, 11 involved parked vehicles on Fairview Road between Glenwood Avenue and Jarvis Street. While these crashes reflect a conflict between moving and parked vehicles, the high frequency of crashes involving parked vehicles tends to mask the predominance of some of the other crash types when expressing them as a function of total crashes at the intersection.
- None of the NCDOT Highway Safety Improvement Program (HSIP) warrants were met for intersection-related or section-related crashes within the study area. However, these warrants tend to be targeted toward specific crash types such as run off road or frontal impact and require that a predominant crash type be present. Due to the wide range of crash types reported at the intersection, multiple strategies may be needed to address these safety concerns.

Additional safety-related findings can be found in the Existing Conditions Report as part of Appendix B.

Figure 9. Recent Safety Improvements (Chevrons) along the Northbound Approach on Glenwood Avenue

TRAFFIC OPERATIONS

While the focus of this study is on the Five Points intersection, the City identified the need to study several additional intersections along the Glenwood Avenue corridor so that impacts to upstream and downstream intersections could be assessed for various project alternatives. The following six study intersections were identified for detailed traffic operations analysis:

1. Glenwood Avenue/Oberlin Road
2. Glenwood Avenue/Anderson Drive
3. Glenwood Avenue/Street Marys Street
4. Glenwood Avenue/Whitaker Mill Road/Fairview Road/Glenn Avenue

5. Glenwood Avenue/Harvey Street
6. Glenwood Avenue/Wade Avenue Off-ramp

Intersection level of service (LOS) was calculated for each intersection and corresponds to the average delay of all automobile movements. All LOS analyses described in this report were performed in accordance with the procedures stated in the *Highway Capacity Manual* [4]. Analysis was also completed following NCDOT congestion management guidelines and best practices. LOS is categorized qualitatively from A-F, with A being the best LOS and F being the worst in terms of traffic flow. Typically, City of Raleigh roadways are designed to experience LOS E or better during the peak 15 minutes of the peak hour.

Turning movement counts were generally conducted at the study intersections on Tuesday, May 24, 2022[5] from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM. Synchro software was used to model the existing traffic operations and LOS at the signalized study intersections. Existing Synchro models were provided by City staff, which were reviewed and updated to reflect current conditions. System-wide peak hours were identified as 7:45 AM to 8:45 AM and 4:45 PM to 5:45 PM for the AM and PM peak hours, respectively. Table 1 displays the results of the traffic operations analysis for the Five Points intersection for both peak hours.

Table 1. Existing LOS, Delay, V/C, and 95th percentile queues

Intersection	Movement	AM Peak Hour				PM Peak Hour			
		LOS	Delay	v/c	95th percentile	LOS	Delay	v/c	95th percentile
Glenwood Avenue / Whitaker Mill Road / Fairview Road / Glenn Avenue	EBLT	D	44.6	0.23	79	D	45.9	0.41	121
	EBR	D	43.6	0.28	86	D	43.2	0.26	84
	WBL	E	55.4	0.67	178	E	56.1	0.72	189
	WBTR	E	58.3	0.73	234	D	53.3	0.71	231
	NBL	A	8.4	0.29	41	A	6.1	0.12	m11
	NBT	B	11.3	0.38	235	B	12.8	0.61	495
	NBR	A	9.9	0.16	101	A	8.4	0.26	148
	SBL	A	6.2	0.32	m25	A	9.7	0.43	60
	SBTR	A	5.2	0.57	101	B	12.0	0.44	306
	Overall	**B**	**15.4**	**0.62**	**-**	**B**	**18.5**	**0.65**	**-**

m Volume for 95th percentile queue is metered by upstream signal
95th percentile volume exceeds capacity, queue may be longer

As shown, the westbound Whitaker Mill Road movements operate at LOS E during the AM peak hour, as well as the left movement operating at LOS E during the PM peak hour. Synchro's ability to predict actual driver behavior at intersections with unique and challenging geometry is limited. In reality, these movements may operate with more delay, along with the eastbound Fairview Road approach. The misalignment of these two intersection approaches is likely met with more hesitant maneuvers being made by drivers, along with a greater likelihood of crashes. While future safety improvements to convert the signal to split phase may appear to have capacity impacts, it is important to note that the existing concurrent phasing is not likely to be operating as a typical intersection.

[4] Highway Capacity Manual 2000, 3rd Edition (2000). Transportation Research Board of the National Academies. Washington, DC, 2000.
[5] A supplemental count was conducted for the intersection at Oberlin Road on Wednesday, June 1, 2022.

The mainline left-turn movements, currently operating as protected-permitted with flashing yellow arrow, operate with ample capacity today. During both the AM and PM peak hours, the mainline left-turns operate at LOS A with v/c ratios below 0.50. The one exception to efficient operations is queuing, which is metered by an upstream signal for the southbound left in the AM peak hour and for the northbound left in the PM peak hour. During both time periods, the overall intersection operates well within capacity with a v/c of no more than 0.65 and a LOS of B.

MULTIMODAL ACCESS

On-Street Parking

Peak period on-street parking restrictions are generally in place on both sides of Glenwood Avenue between Woodland Avenue and Harvey Street. An inventory of existing parking restrictions is shown in Figure 10.

Figure 10. Five Points On-Street Parking Restrictions

In addition to an inventory, parking occupancy counts were conducted within ¼ mile of the intersection on a Thursday, Friday, and Saturday in early June 2022 while school was in session. Counts were conducted at two-hour intervals from 6:00 AM to 10:00 PM. The percent parking utilization within ¼ mile of the intersection for each day is displayed in Figure 11.

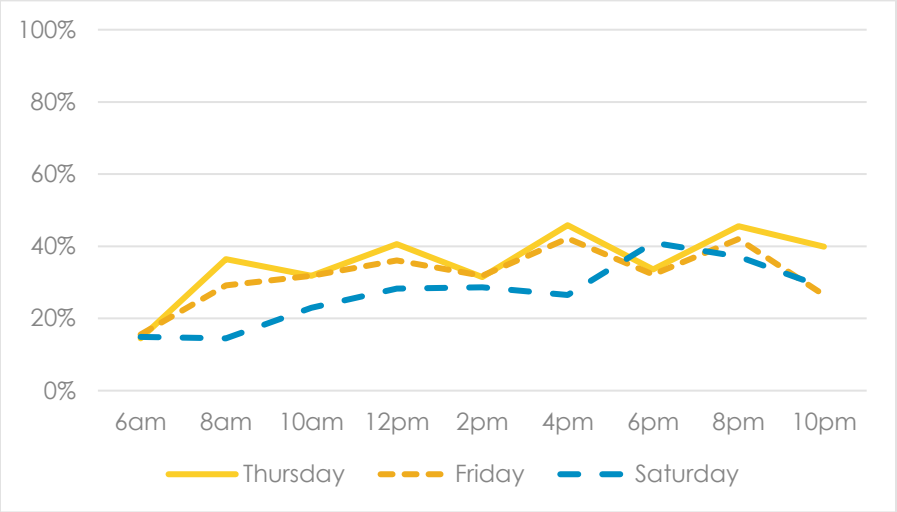

Figure 11. Five Points Parking Utilization

As shown, overall there is parking available within ¼ mile of the Five Points intersection. However, it is important to note that parking may not always be close to the intended destination or on a preferred side of Glenwood Avenue. As a result, people may have to cross the intersection on foot and/or drive to a different block in search of parking. There are a few areas that approach parking capacity including:

- Fairview Road from Glenwood Avenue to Scales Street (Thursday 12:00 PM, Friday 6:00 PM, and Thursday 8:00 PM)
- Fairview Road (Figure 12) from Jarvis Street to Glenwood Avenue (Thursday 12:00 PM, Thursday 6:00 PM, Friday 8:00 PM, and Saturday 8:00 PM)
- West side of Glenwood Avenue from Fairview Road to Alexander Road (Saturday 6:00 PM)

Figure 12. Parking along Fairview Road

During stakeholder engagement for the study, some business owners acknowledged that peak parking demand is significantly higher during the November-December holiday shopping season.

Walking Conditions

Overall, moderate pedestrian activity at the Five Points intersection was observed during field visits and during traffic counts, including children and the elderly. Pedestrians may have difficulty comfortably navigating through the Five Points intersection for several reasons:

- The skew of the intersecting streets, utilities, and visual clutter of necessary signage and signals may make it difficult for pedestrians to locate the correct crossing signals.
- There are two different kinds of crosswalk markings used at the intersection. Some crosswalk markings are badly faded and/or interrupted by utility cuts.
- The complicated signal phasing makes it difficult for pedestrians and cyclists to anticipate when their signal will come.
- Crossing distances and traffic speeds vary widely depending upon which leg of the intersection users are attempting to cross.
- Permitted left turns on Glenwood Avenue and the side streets operate at the same time as the pedestrian walk indication for all crosswalks, creating conflicts between vehicles and pedestrians (Figure 13).
- Planting strips with street trees are very infrequent along the roadways to/from the Five Points intersection. The lack of these buffers contributes to a high-stress walking experience, especially on Glenwood Ave, which is exacerbated by a concern for nearby crashes and vehicles leaving the roadway.
- The relatively high percentage of children and older adults in the neighborhoods around Five Points highlights the need for pedestrian infrastructure that is safe and comfortable for people of all ages and abilities.

It is notable that these concerns apply not only to those pedestrians who complete the entirety of their trip on foot but also to those who park near Five Points and walk to their home, place of worship, or a business, as well as transit passengers.

Figure 13. Pedestrian Crossing Glenwood Avenue

Bicycling Conditions

Observed bicycling demand at the intersection was minimal. As there is plentiful bicycling demand in the City of Raleigh, the lack of activity near Five Points could potentially be attributed to the dearth of dedicated bicycling infrastructure in the area, no direct connections to the City's Greenway system, and high-stress streets and crossings at the Five Points intersection.

EXISTING BICYCLING INFRASTRUCTURE

Dedicated bicycle infrastructure in the Five Points neighborhoods is found infrequently. Portions of Anderson Drive, Oberlin Road, Street Mary's Street, Whitaker Mill Road, and Glenwood Avenue have standard bike lanes. Some of the most direct bicycle routes are marked as "Difficult Connection" or "Use With Caution" on the City's BikeRaleigh Map (Figure 14). Other than Crabtree Creek Greenway, there are no separated bicycle facilities suitable for users of all ages and abilities in the Five Points area.

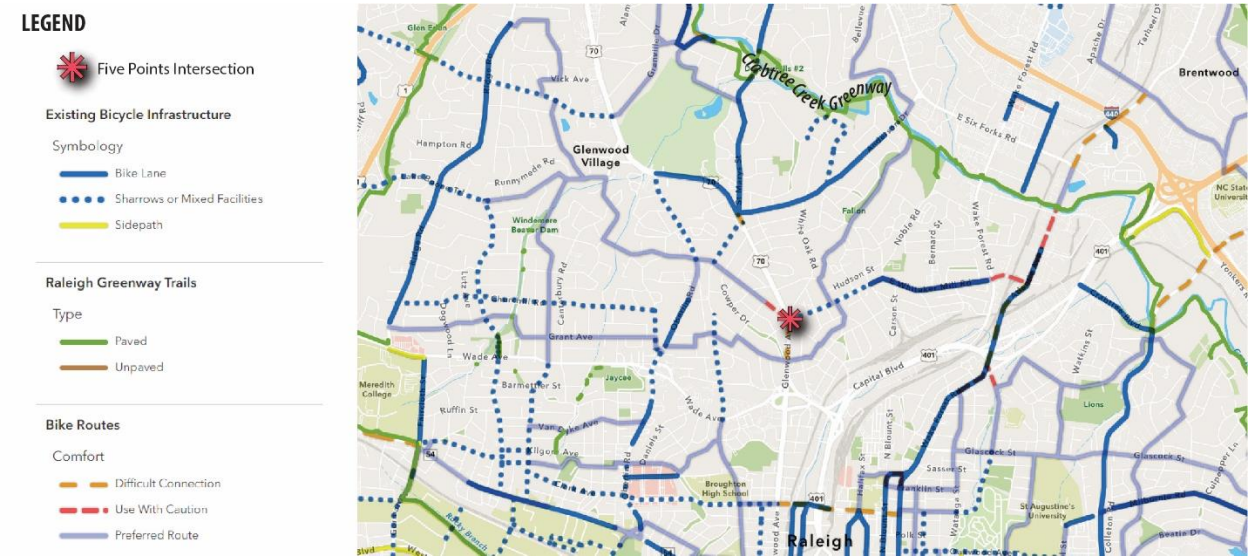

Figure 14. BikeRaleigh Map – Existing Bicycle Infrastructure, Trails, and Bike Routes

EXISTING BICYCLE ROUTES

There are several alternative routes to traveling through the Five Points intersections, as shown in Figure 15:

- Oberlin Road and Street Mary's Street provide popular north-south bicycle connections through the Five Points neighborhoods.
- Whitaker Mill Road and Fairview Road (to the northwest of the Five Points intersection) provide a popular east-west route for bicyclists navigating through the Five Points neighborhoods.
- The pedestrian/bicycle underpass beneath Wade Avenue at the interchange with Capital Boulevard (connecting to West Street) could be an important destination for pedestrians/bicyclists in the Five Points neighborhoods, especially for cyclists trying to travel downtown. It provides the lowest-stress option for bike commuters on the east side of Glenwood Avenue and allows cyclists to avoid major barriers. White Oak Road is a low-traffic stress option for pedestrians and bicyclists, but the one-way

block of White Oak Road (from Glenwood Avenue to Sunset Drive) makes this a more challenging street for bicyclists to navigate.

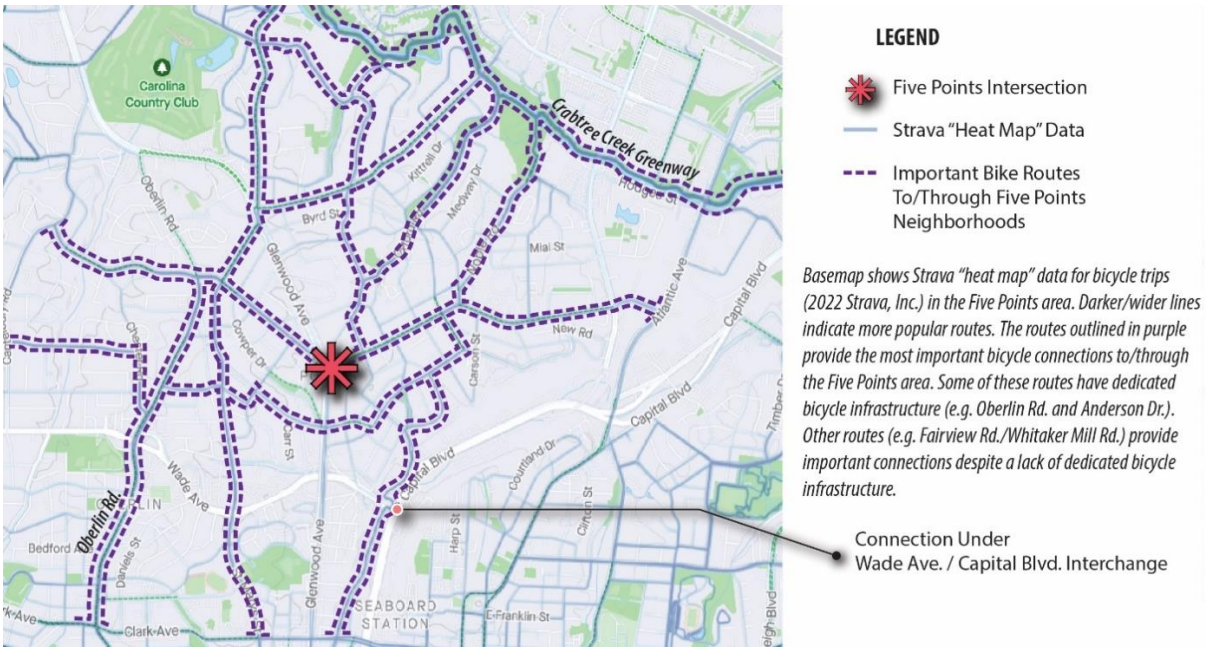

Figure 15. Important Bicycle Routes in the Five Points Area

CONNECTIONS TO GREENWAY NETWORK

Better understanding the existing and desired connections to the City's Greenway Network was a priority for the City of Raleigh to support multimodal activity within the community. As shown in Figure 16, the most direct and popular connections from the Five Points intersection to the Crabtree Creek Greenway are the following:

- Whitaker Mill Road → Pine Drive → Noble Road → Crabtree Creek Greenway (at Kiwanis Park)
- White Oak Road → Oxford Road → Crabtree Creek Greenway (across from Our Lady of Lourdes Catholic Church/School campus)
- Sunset Drive → Anderson Drive → Crabtree Creek Greenway (at Claremont Park)

Without any signage or dedicated infrastructure to support these connections, they are mostly ad hoc and likely known only by a narrow subset of Raleigh residents within the immediate area. The irregular block structure and one-way streets near the Five Points intersection exacerbate this challenge and make it difficult for pedestrians and cyclists to navigate between Five Points and Crabtree Creek Greenway.

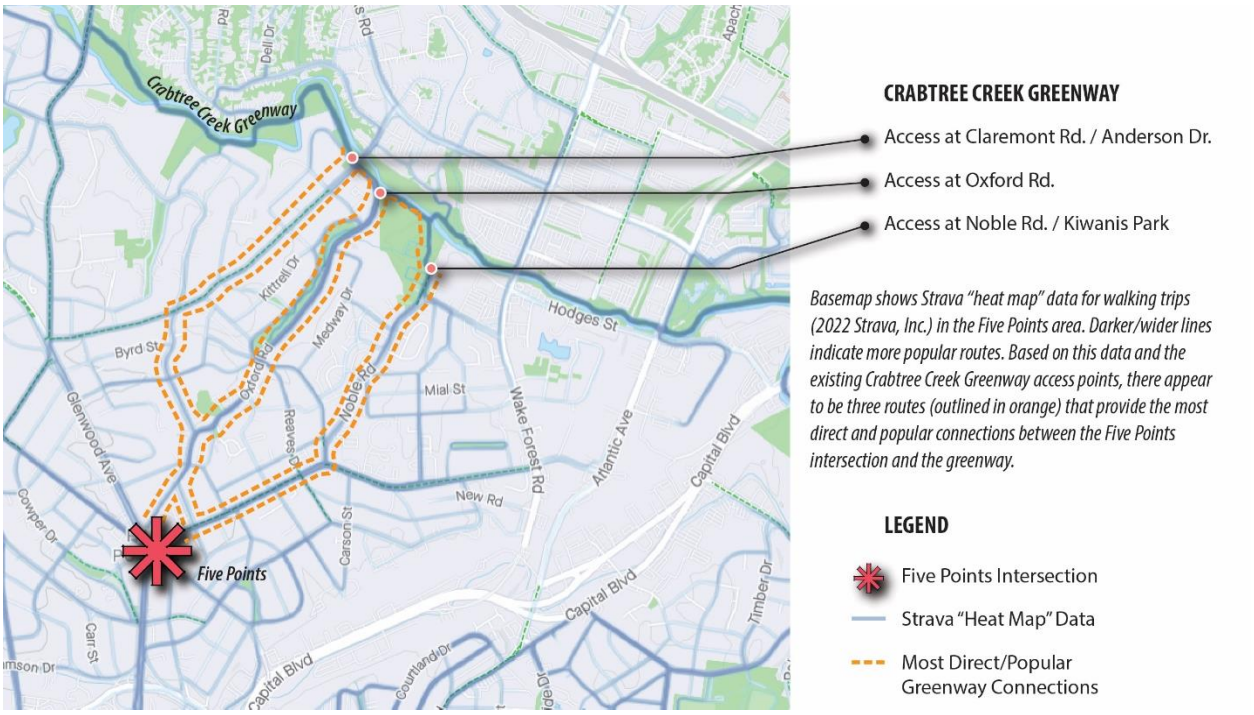

Figure 16. Crabtree Creek Greenway Connections

Transit Conditions

At the time of the writing of this report in 2025, two GoRaleigh transit routes serve the Five Points area, Route 2 and Route 6 (Figure 17). Route 2 runs from GoRaleigh Station to Strickland Rd with approximately 30 minute headways between 5 AM and 11 PM on weekdays. Weekend service for Route 2 includes approximately 1 hour headways between 5:30 AM and 10 PM. Route 6 runs from GoRaleigh Station to Townridge Shopping Center from 6 AM to midnight on weekdays and Saturdays, with 15-minute headways from approximately 7am-7pm and 30-minute headways otherwise. Sunday service for Route 6 includes approximately 30-minuteheadways between 7 AM and 11 PM. Service on Route 2 is planned to increase to every 15 minutes in 2026. Transit is a key component of the multimodal study, so it is important to consider the needs of current and potential future transit riders in the area.

Figure 17. GoRaleigh Services in the Five Points Intersection

TRANSIT STOPS

The four bus stops closest to the Five Points intersection are the following:

- Glenwood Avenue at Fairview Road – trash receptacle and bench provided
- Glenwood Avenue at Glenn Avenue – shelter, bench, and trash receptacle provided
- Whitaker Mill Road at Fairview Road (EB) – no amenities provided
- Whitaker Mill Road at Fairview Road (WB) – no amenities provided

In addition to the general lack of amenities at bus stops along the corridor, several lack accessible connections to the surrounding sidewalk network. Additionally, there are few signalized or mid-block crosswalks near these bus stops, making it more challenging to transfer between buses on opposite sides of the street.

TRANSIT RIDERSHIP

Daily ridership data was obtained from GoRaleigh for stops along the Glenwood Avenue corridor for July to December 2024. A summary of boardings and alightings is shown in Table 2.

Table 2. Bus Stop Ridership Activity

Stop	Daily On	Daily Off
Glenwood Avenue at Harvey Street (NB)	2	3
Glenwood Avenue at Harvey Street (SB)	6	4
Glenwood Avenue at Fairview Road	23	16
Glenwood Avenue at Glenn Avenue	20	27
Whitaker Mill Road at Fairview Road (EB)	7	2
Whitaker Mill Road at Fairview Road (WB)	1	6
Glenwood Avenue at Alexander Road	1	2
Glenwood Avenue at Myrtle Avenue	1	1

Additional analyses, including transit rider demographics, can be found in the Existing Conditions Report as part of Appendix B.

Chapter 5
Concept Development

Concept Development

This study identified and evaluated concepts that will enhance the Five Points intersection and the Glenwood Avenue corridor, including reducing conflicts between vehicles, between vehicles and pedestrians, and improving the streetscape of the corridor. The key element of this study's approach was the broad consideration of concepts for the Five Points area.

Knowing that traffic operations are a significant concern for the community, relative operational performance of each of the initial concepts was completed using the HCM quick estimation procedure (critical movement analysis). This evaluation provided high-level tradeoffs that should be considered. Concepts that did not meet the vision and goals of the project, are inconsistent with planning goals, or that have clear feasibility fatal flaws were documented as part of this process but will not be pursued further.

INITIAL INTERSECTION CONCEPTS

The following is a brief description of each of the initial intersection concepts that was presented and evaluated prior to and throughout the first agency workshop, stakeholder meetings, and first public engagement touchpoint. In addition to the no-build alternative (Concept 0), the following intersection concepts were developed:

- Concept A: Near-Term Improvements
- Concept B: Convert Side Streets to One-Way
- Concept C: Close Intersection Approaches
- Concept D: Prohibit Left Turns on Glenwood
- Concept E: Directional Crossover on Glenwood
- Concept F: Extend Median on Glenwood
- Concept G: Single-lane Roundabout
- Concept H: Hybrid Roundabout
- Concept I: Multilane Roundabout

The concepts were intended to represent a range of viable solutions that addressed various issues raised by the existing conditions assessment and public feedback. All concepts are expected to result in at least some reduction in capacity of the intersection, leading to additional queuing and delay for vehicles. These concepts were presented to the public during the first engagement touchpoint with the intent of showing that a range of options had been explored and also to gather feedback on fatal flaws.

Concept 0: No Build

The no build concept maintains the status quo and offers a baseline for which to compare the other concepts. This concept was presented with the others at public engagement events and agency workshops but was not seriously considered due to the purpose and need of the study.

Concept A: Near Term-Improvements

This concept (Figure 18) includes treatments intended to incrementally improve safety and reduce conflicts at the intersection without expanding the intersection footprint or substantially changing travel patterns. The following components were identified as near-term:

- Removal of the northbound right turn lane on Glenwood Avenue
- Adding curb extensions on the northeast and southeast quadrants, the potential to expand on-street parking
- Changing left turn movements on Glenwood Avenue to protected-only phasing
- Changing side street signal phasing on Whitaker Mill Road and Fairview Avenue to split phasing

The benefit of this concept would be removing some of the left-turn conflicts from the intersection which are confusing to drivers and uncomfortable for pedestrians. While the concept would not be expected to significantly address extreme speeding on Glenwood Avenue, the curb extensions and reduced footprint could be expected to have some affect on speeds, i.e. a "traffic calming" effect.

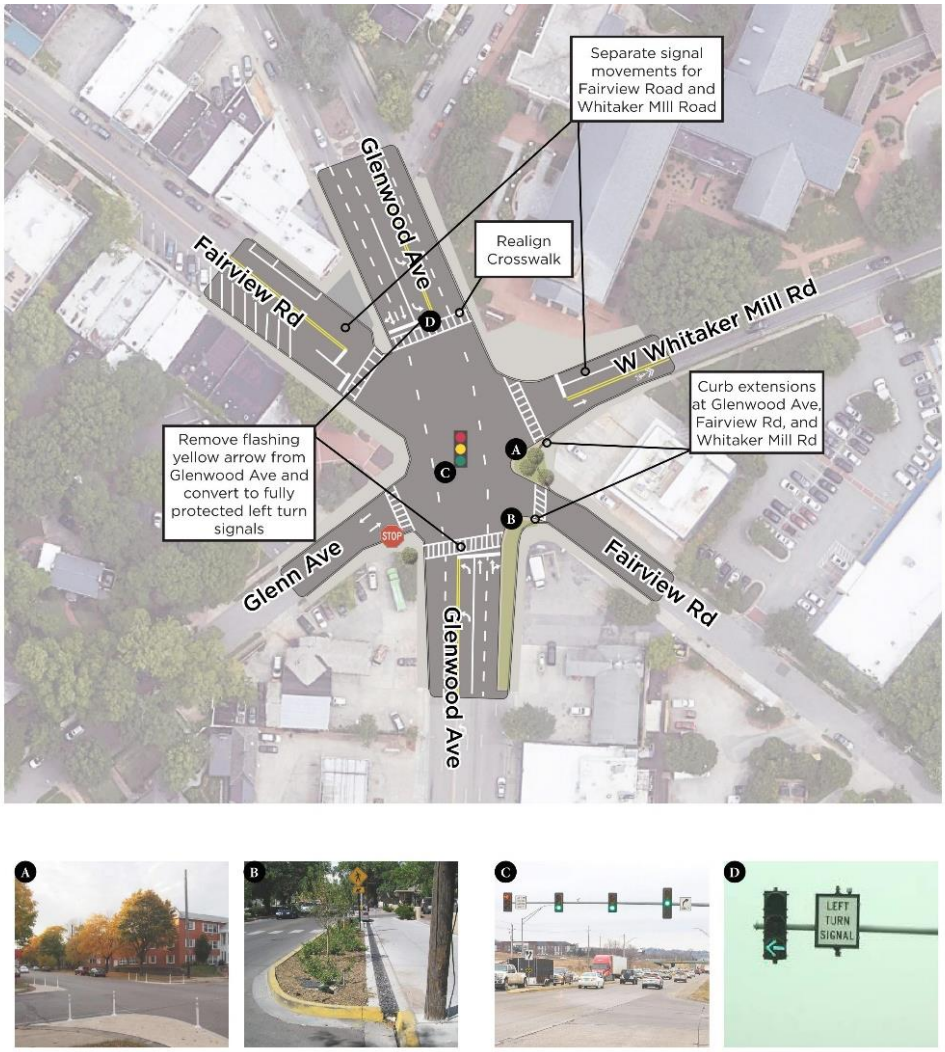

Figure 18. Concept A: Near-Term Improvements

Concept B: Convert Side Streets to One-Way

As shown in Figure 19, Concept B includes conversion of some minor street movements to one-way in order to simplify the intersection and eliminate some turning conflicts between vehicles and between vehicles and pedestrians. This would include the following changes:

- Conversion of Fairview Avenue west of the intersection to one-way westbound (leaving the intersection).
- Conversion of Glenn Avenue west of the intersection to one-way eastbound (entering the intersection) and retaining stop-control for the Glenn Avenue approach.

Note that Fairview Avenue is already one-way eastbound east of Glennwood Avenue and this would be retained. Concept B also maintains two-way traffic on Whitaker Mill Road.

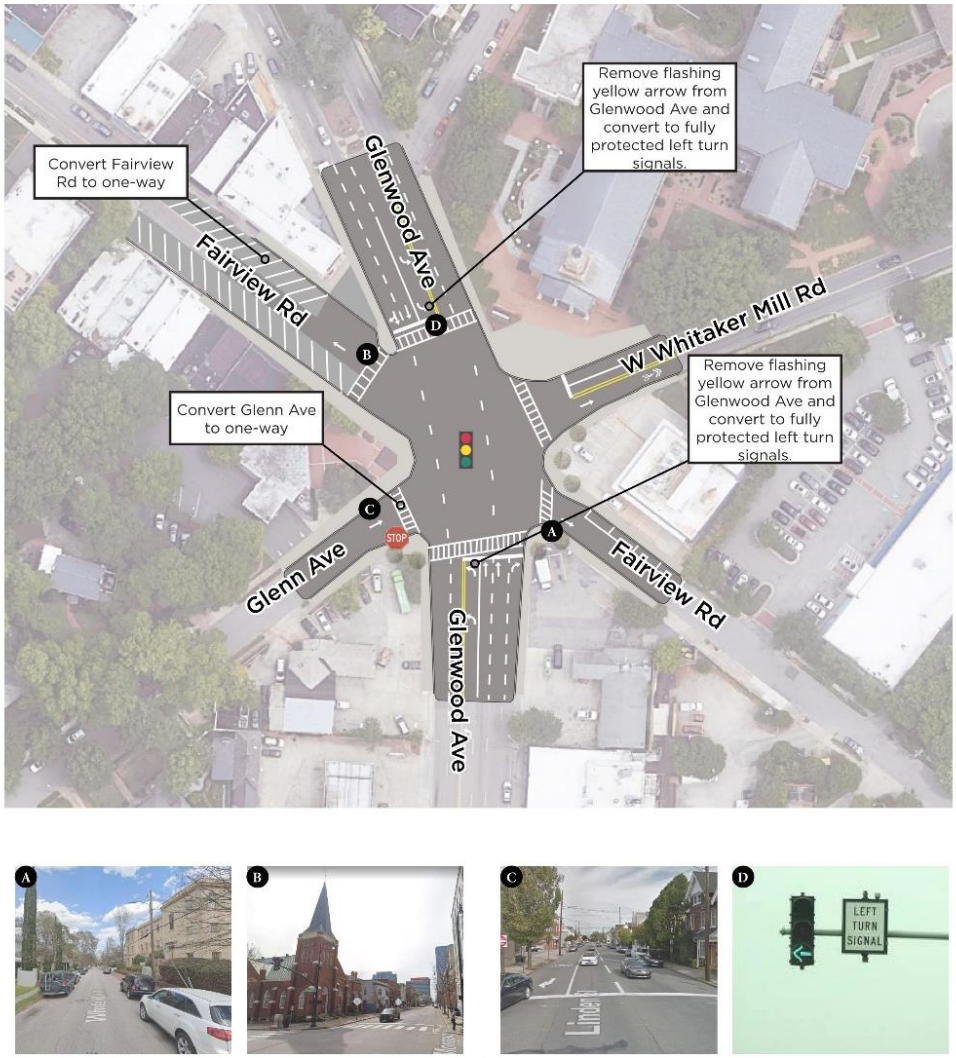

Figure 19. Concept B: Convert Side Streets to One-Way

Concept C: Close Intersection Approaches

This concept (Figure 20) would reduce the number of intersection legs by closing Glenn Avenue west of the intersection and Fairview Road east of the intersection. The main benefit of Concept C would be to simplify the intersection operations and reduce conflicts between vehicles and between vehicles and pedestrians. This unused space within the closed intersection legs could be reallocated to open space, parking, and/or business accesses.

Figure 20. Concept C: Close Intersection Approaches

Concept D: Prohibit Left Turns on Glenwood

Concept D (Figure 21) would prohibit left turns on Glenwood Avenue and enforce the restriction through signage, by extending the medians north and south of the intersection to remove the existing left turn lanes, as well as removing the mainline protected left turn phases. This would result in fewer conflicts between vehicles and between vehicles and pedestrians on the crosswalks parallel to Glenwood Avenue. The additional median space on Glenwood Avenue could also be used for landscaping or Green Stormwater Infrastructure and for a refuge island for pedestrians crossing Glenwood Avenue at the intersection.

Figure 21. Concept D: Prohibit Left Turns on Glenwood

Concept E: Directional Crossover on Glenwood

As shown in Figure 22, Concept E would extend the median on Glenwood Avenue north and south of the intersection but preserve left turn movements from Glenwood Avenue onto Fairview Road, Whitaker Mill Road, and Glenn Avenue. This would simplify the signal phasing at the intersection and reduce conflicts between vehicles and between vehicles and pedestrians crossing Glenwood Avenue.

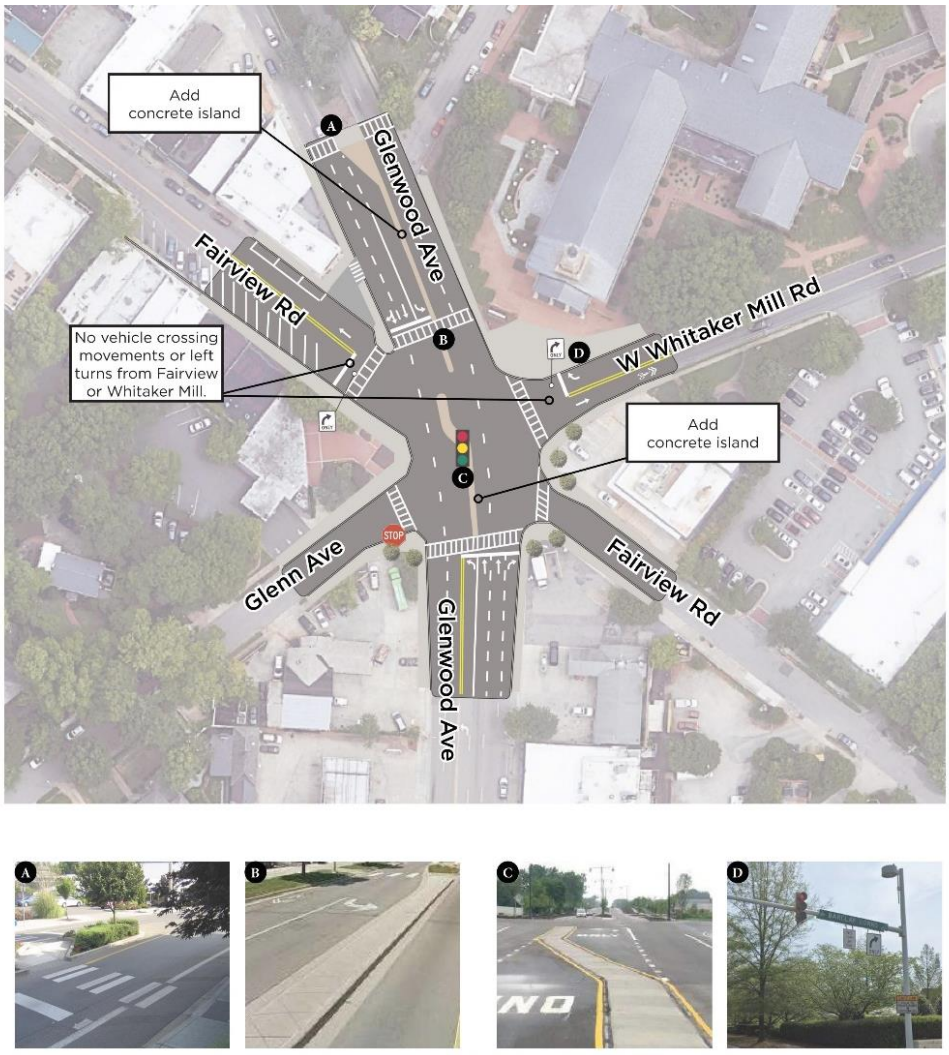

Figure 22. Concept E: Directional Crossover on Glenwood

Concept F: Extend Median on Glenwood

Concept F (Figure 23) would extend the median on Glenwood Avenue through the intersection, limiting the side street movements to right-in/right-out. This would simplify the intersection, reduce conflicts between vehicles, and reduce conflicts between vehicles and pedestrians.

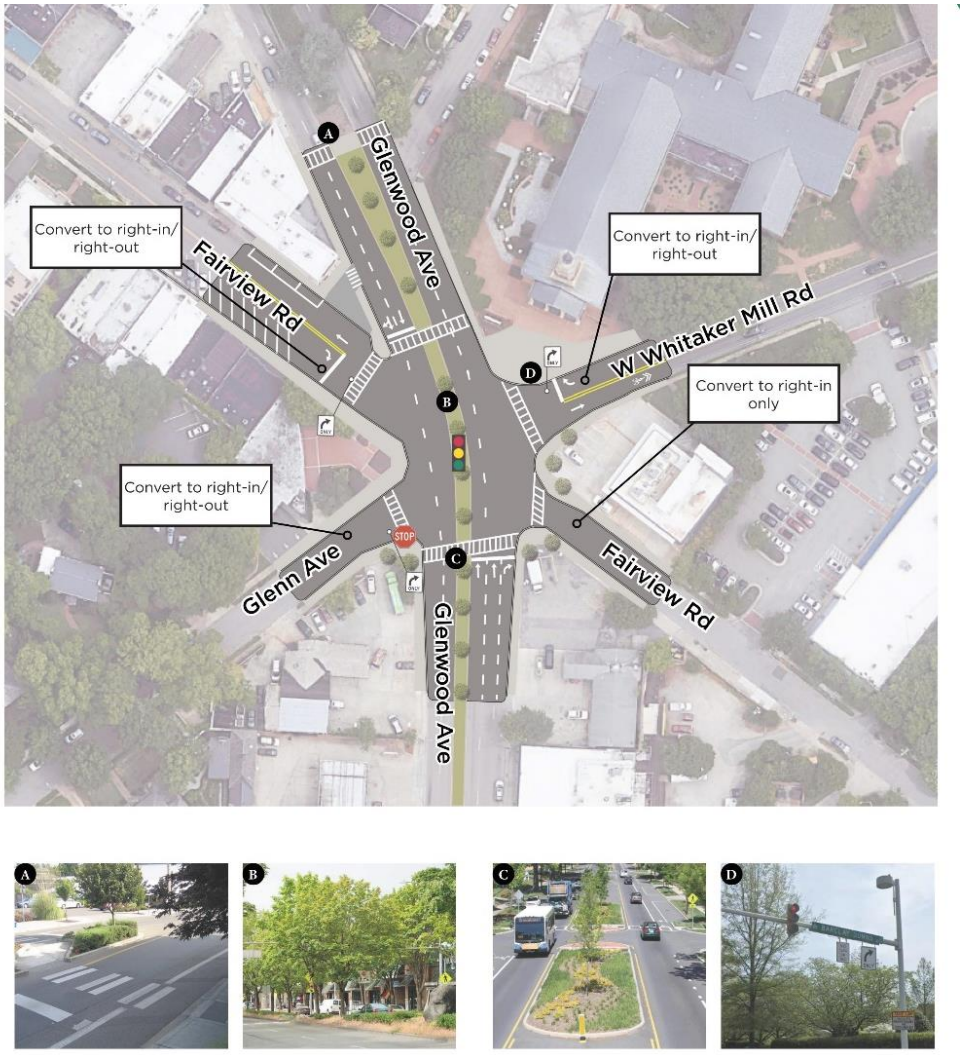

Figure 23. Concept F: Extend Median on Glenwood

Concept G: Single-Lane Roundabout

Concept G (Figure 24) would install a single-lane roundabout at the intersection and reduce Glenwood Avenue to a single lane in each direction north and south of the intersection. Crosswalks would be provided on all approaches, and reallocated curb space on Glenwood Avenue could be converted to on-street parking and/or open space. The open space may also be utilized for Green Stormwater Infrastructure that will improve aesthetics and manage stormwater. Speeds would be limited to a maximum of 25 mph within the roundabout on all approaches.

Figure 24. Concept G: Single-Lane Roundabout

Concept H: Hybrid Roundabout

This concept (Figure 25) would maintain a single through lane in each direction of Glenwood Avenue through the intersection but also provide exclusive right turn lanes on the Glenwood Avenue approaches. Reallocated curb space on the roundabout exits could be converted to on-street parking and/or open space. Traffic speeds would be limited to a maximum of 30 mph entering the roundabout from northbound Glenwood Avenue and to a maximum of 25 mph on all other approaches. Minor property impacts would be expected to accommodate the footprint of the roundabout.

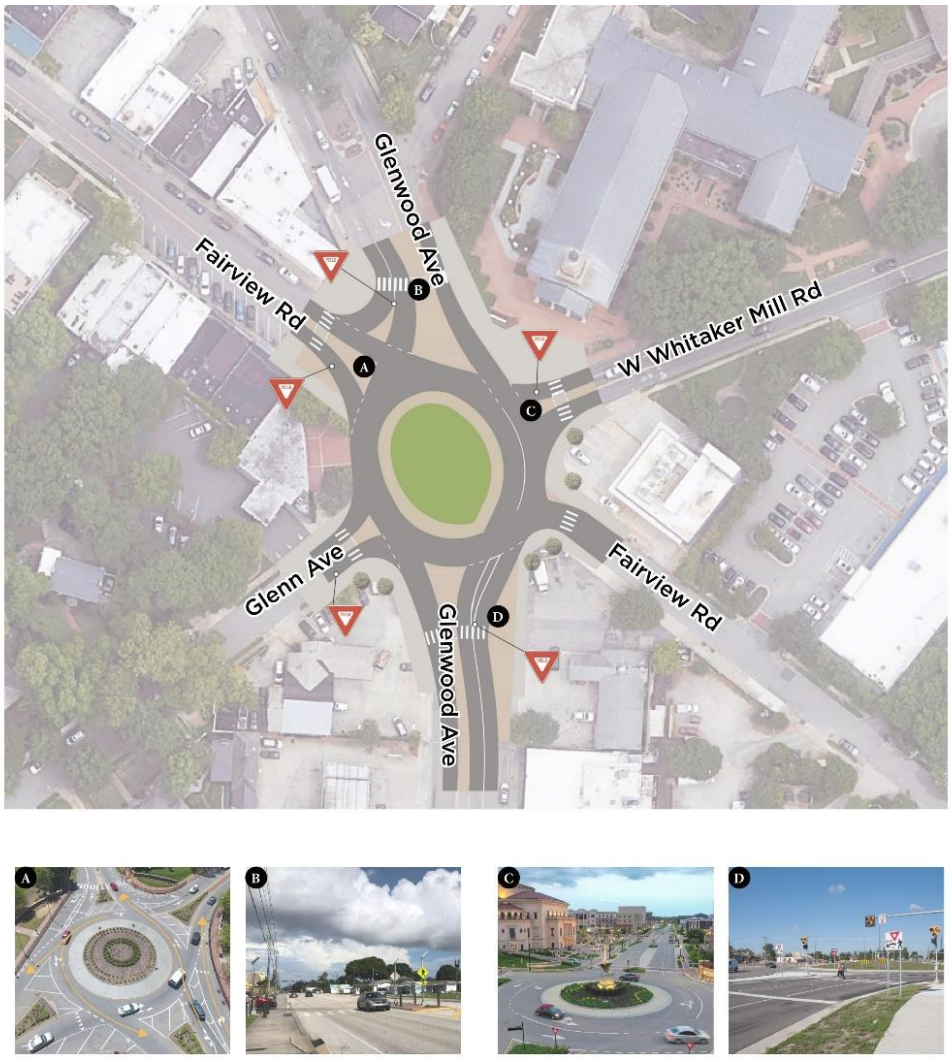

Figure 25. Concept H: Hybrid Roundabout

Concept I: Multilane Roundabout

As shown in Figure 26, Concept I would install a roundabout with dual lanes on the Glenwood Avenue approaches and single lanes on all side street approaches. Small to moderate property impacts would be expected to accommodate the footprint of the roundabout. Traffic speeds would be limited to a maximum of 30 mph entering the roundabout from Glenwood Avenue and to a maximum of 25 mph on all other approaches.

Figure 26. Concept I: Multilane Roundabout

CRABTREE CREEK GREENWAY CONNECTION CONCEPT DEVELOPMENT

To support the multimodal access to the City of Raleigh's Greenway Network (Crabtree Creek Greenway), concepts and connections were identified through a robust process of community discussions and an analysis of how users currently use the network. Through this process, it was apparent the needs varied by users – pedestrians and bicyclist. The primary goals for the development of greenway connection concepts were as follows for each user:

Pedestrian Goals

- Create an intuitive and uninterrupted pedestrian route between Five Points and the Crabtree Creek Greenway.
- Improve safety and comfort at key pedestrian crossings.
- Establish comfortable pedestrian connections between key destinations, schools, parks, and transit stops.

Concept development for potential pedestrian improvements focused on:

- Understanding where planned investments, like the sidewalk project on Oxford Road from Kenmore to Overbrook, might support better greenway connections;
- Understanding existing walking patterns and preferences in the Five Points area based on resident feedback and available data;
- Utilizing signalized crossing opportunities to accommodate crossings of collector / arterial streets;
- Evaluating the feasibility of filling key sidewalk gaps based on the roadway and land-use context (roadway width, topography, presence of curb and gutter, presence of on-street parking);
- Minimizing out-of-direction travel on the primary pedestrian route between Five Points and Crabtree Creek Greenway.

Bicycle Goals

- Create a neighborhood bikeway ("sharrow") connecting Five Points to the Crabtree Creek Greenway and the shared-use underpass at Wade Avenue.
- Improve safety and comfort for bicyclists crossing major roadways.
- Establish safe and comfortable bicycle connections between key destinations, schools, parks, and transit stops.

Concept development for potential bicycle improvements focused on:

- Understanding where planned investments, like speed cushions and intersection improvements, might support the designation of new bicycle routes;
- Understanding existing cycling patterns and preferences in the Five Points area based on resident feedback and available data;
- Supporting connections to the broader citywide bikeway network via existing bike infrastructure (e.g. the Downtown North-South Greenway Connector (West Street underpass); existing bike lanes on Oberlin Road, Whitaker Mill Road, and Anderson Drive);
- Utilizing signalized crossing opportunities to accommodate crossings of collector / arterial streets;
- Minimizing the level of traffic stress on the primary bicycle route between Five Points and Crabtree Creek Greenway.

The project team worked with City staff to develop these initial concepts and then presented them for public viewing and discussion during public engagement touchpoint #2. The resulting changes and recommendations are presented in Chapter 7.

Chapter 6
Concept Assessment

Concept Assessment

The following three concepts received generally positive feedback from public and stakeholders during touchpoint #1 and were advanced to more detailed analysis:

- Concept A: Near-Term Improvements (Figure 27),
- Concept G: Single-lane Roundabout (Figure 28), and
- Concept I: Multilane Roundabout (Figure 29).

These concepts were further refined and developed over a CAD base rendering that included survey information and parcel lines so that potential right-of-way and property impacts could be evaluated in more detail. The drawings on the following pages provide additional detail for these three remaining concepts and were presented at public touchpoint #2. Note that in each concept, Glenn Avenue was converted to one-way westbound (leaving the intersection)—this was a treatment that City staff explored, but it was ultimately rejected after public touchpoint #2.

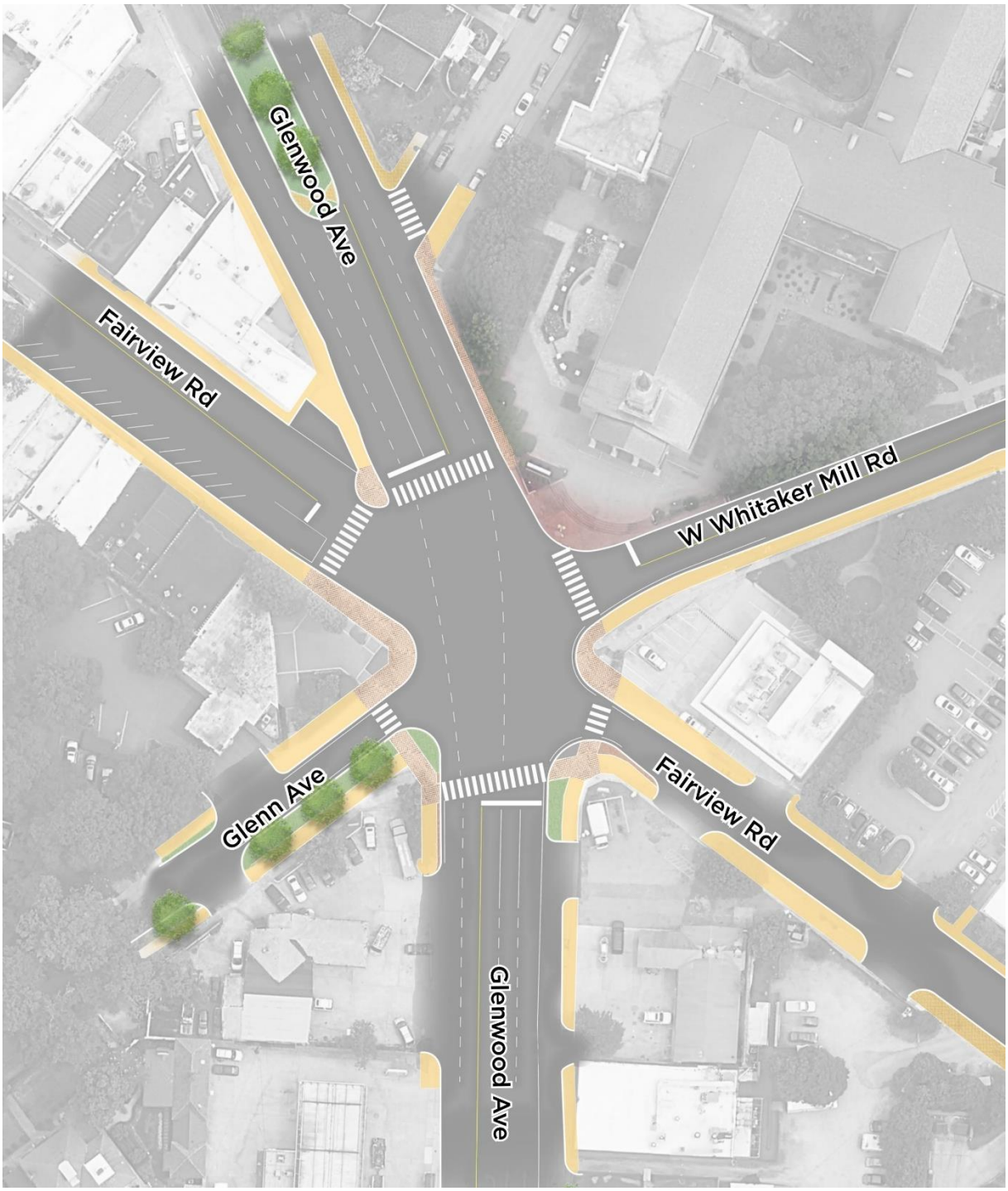

Figure 27. Concept A (Refined for Alternatives Analysis)

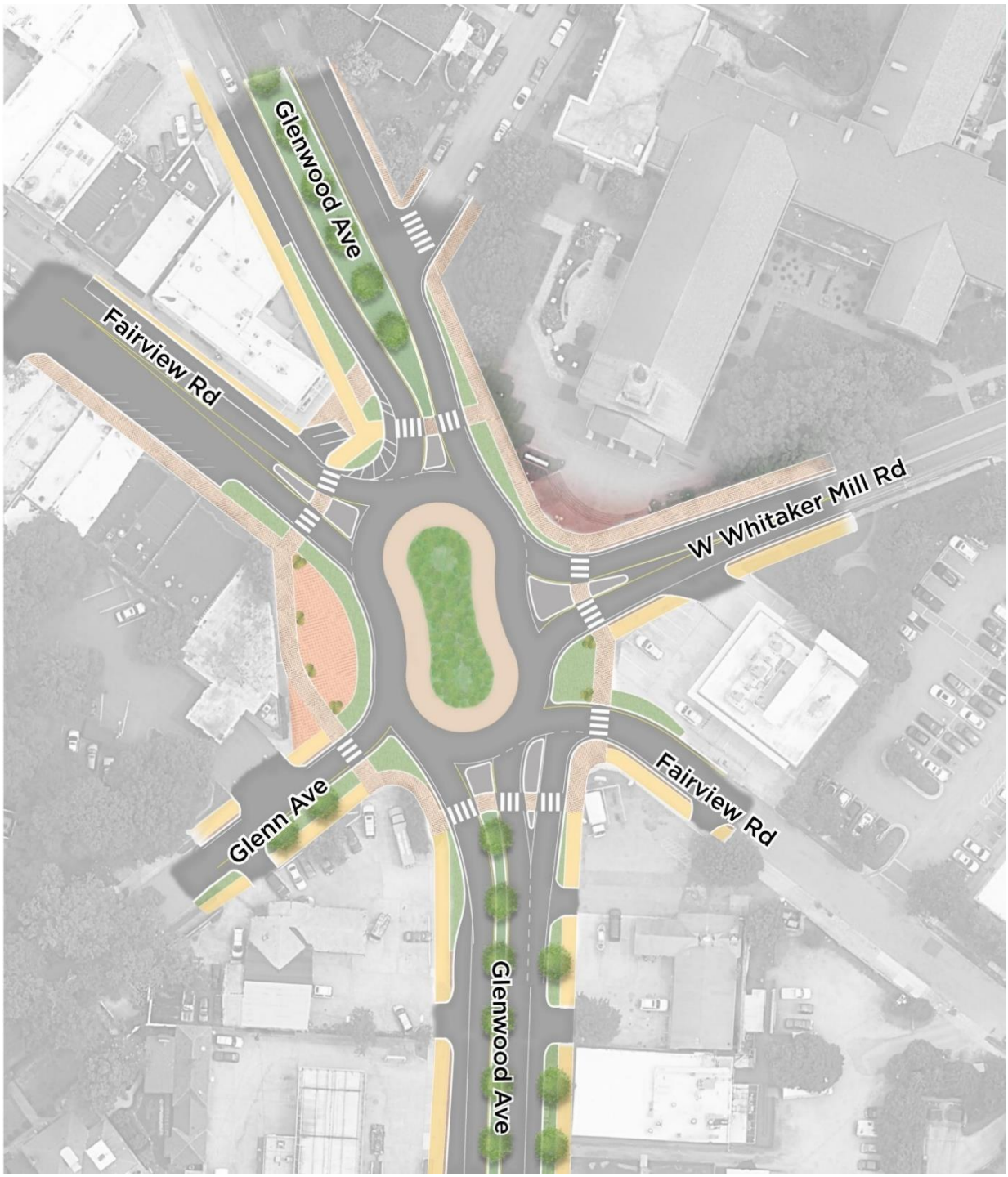

Figure 28. Concept G (Refined for Alternatives Analysis)

Figure 29. Concept I (Refined for Alternatives Analysis)

FUTURE TRAFFIC CONDITIONS

To investigate future traffic demand, the project team compiled historic turning movement count data provided by the City of Raleigh. Figures 30 and 31 plot the total number of entering vehicles at the Five Points intersection as well as the peak hour entering volume along the peak direction of Glenwood Avenue (southbound during the AM peak hour and northbound during the PM peak hour) over the past 25 years of available data. As shown, traffic volumes have stayed level or slightly declined over the past 20-25 years. With the focus of the Five Points Streetscape and Safety Study being primarily on reducing speeding and conflict points, the City chose to move forward with assuming no growth in existing travel demand for evaluating the concepts; i.e. all were evaluated under existing turning movement volumes.

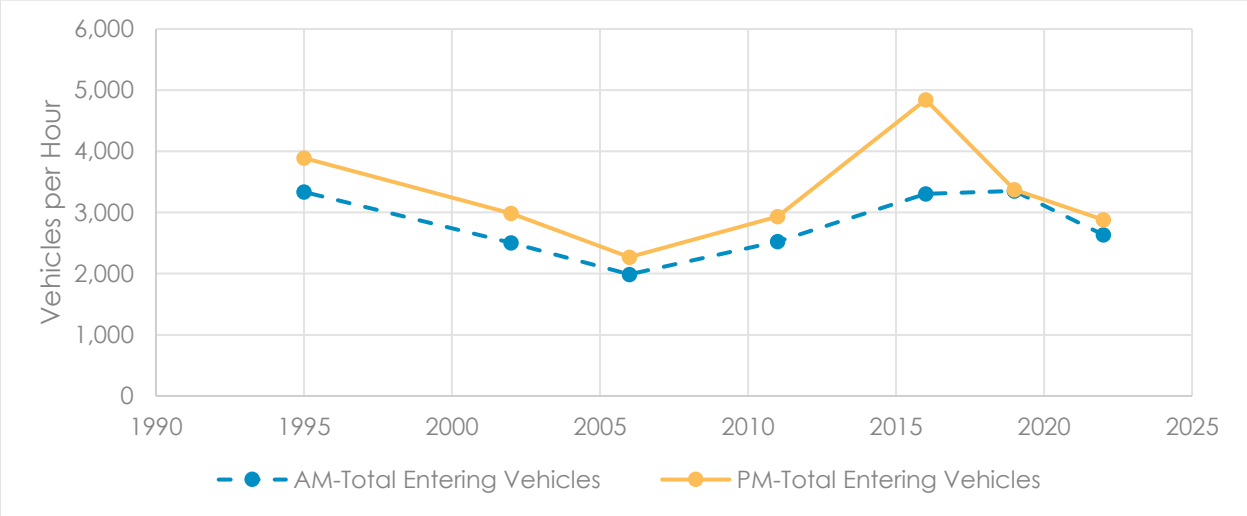

Figure 30. Historical Traffic Counts (Total Entering Volume) at Five Points

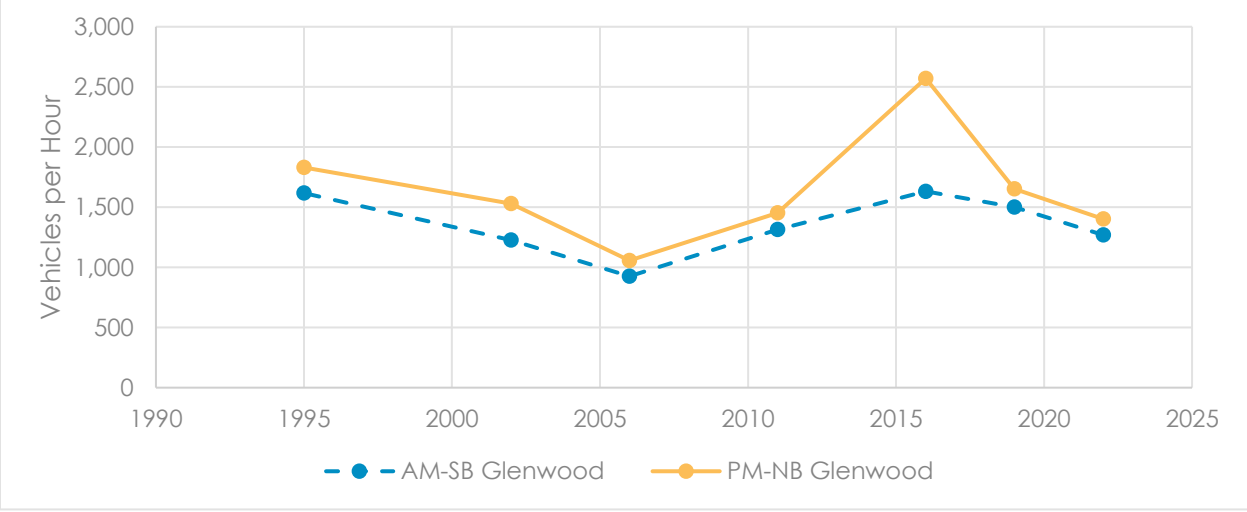

Figure 31. Historical Traffic Counts (Peak Hour Volumes by Peak Direction) at Five Points

PERFORMANCE METRICS

A series of multimodal quantitative and qualitative performance metrics was used to evaluate and compare the remaining concepts, with a focus on addressing concerns from community members and agency partners, including vehicle queuing and delay, multimodal safety and level of comfort, potential traffic diversion, and impacts to parking, driveways, and properties. The following performance measures were identified through engagement with City of Raleigh and NCDOT staff:

- Traffic operations analysis, including movement level of service, delay, and 95th-percentile queue lengths;
- Traffic safety analysis, including conflict points and types;
- Vehicle traffic diversion;
- Multimodal connectivity, including crosswalk lengths and qualitative assessment of walkability;
- Potential right-of-way impacts, including qualitative assessment of design quality and sense of place; and
- Planning-level cost estimate.

Traffic Analysis Tools

Additionally, each concept was evaluated using a more detailed traffic analysis, including the following modeling tools:

- Synchro was used to estimated the delay and level of service for each movement at the Five Points intersection as well as the surrounding area along Glenwood Avenue for Concept A as well as the other concepts where travel lanes on Glenwood Avenue were repurposed (mainly Concept G).
- SIDRA software was utilized to identify basic turn lane needs and estimate delay, level of service, and volume-to-capacity ratio for the two roundabout concepts (Concepts G and I).
- VISSIM was utilized to assess queuing at the Five Points intersection and potential queue interaction with adjacent intersections upstream and downstream of Five Points for the two roundabout concepts (Concepts G and I). VISSIM was also used to prepare a video animation comparison the traffic operations and queue lengths of Concepts G and I over the same time period using a split-screen view.

The traffic operations analysis was discussed with NCDOT Congestion Management staff at agency workshop #2 and in follow-up discussions, and staff approved of the modeling tools and basic assumptions of the analysis. More detail on the traffic analysis and results is provided in the remainder of this chapter.

Traffic Diversion Analysis

Concept G (single-lane roundabout) includes reducing the number of travel lanes on Glenwood Avenue from four to two within the vicinity of Five Points. During the heaviest travel times, traffic may divert to parallel corridors such as St. Mary's Street, Capital Boulevard, and Wade Avenue, each of which currently has excess capacity. In addition to diversion to parallel corridors, people who normally drive through Five

Points may choose to move their trip outside of peak travel periods, use a different travel mode, or not take the trip.

To explore the level of traffic diversion, a calibrated VISSIM microsimulation model was used to assess the amount of queuing that would occur on Glenwood Avenue at the Five Points intersection at a single-lane roundabout under a series of traffic diversion scenarios ranging from zero diversion to 30 percent diversion of existing travel demand. Table 3 displays the approximate start and end times during the morning and afternoon peak travel periods when the demand would exceed the capacity of a single lane roundabout and the approximate maximum queue length. As shown, demands can be processed throughout the peak hours if 30 percent of existing traffic demand is diverted, and maximum queues extend less than one-third mile. Therefore, no more than 30 percent of traffic is expected to shift to parallel corridors or change to a different mode or time of day.

Table 3. VISSIM Traffic Diversion Analysis of Concept G

Scenario	Peak Hour	Demand Exceeds Capacity		Maximum Queue	
		Start Time	End Time	NB Glenwood	SB Glenwood
0% Diversion	AM	8:00 AM	After 9:30 AM		1.5 miles
	PM	4:55 PM	After 6:30 PM	1.0 mile	
10% Diversion	AM	8:00 AM	9:10 AM		0.65 mile
	PM	5:05 PM	After 6:30 PM	0.6 mile	
20% Diversion	AM	N/A			0.28 mile
	PM	5:30 PM	5:45 PM	0.29 mile	
30% Diversion	AM	N/A			1,320 feet
	PM	N/A		600 feet	

RESULTS

Table 4 summarizes the comparison of the three remaining concepts using the selected performance metrics for the study. As shown, Concept G (single-lane roundabout) is anticipated to provide the most benefit of the three concepts toward reducing traffic speeds, improving safety through limiting vehicle conflicts and crash severity, improving bicycling/walking conditions, and providing more open space.

While Concept A (near-term improvements) and Concept I (multilane roundabout) provide the least impacts to travel time and congestion at the Five Points intersection, Concept A has the least benefit toward safety, and Concept I has the most significant cost and property impacts. As noted in Chapter 3, the public generally reacted favorably toward Concept G, even with being presented with the congestion and traffic diversion results.

Table 4. Comparison of Remaining Concepts

Measure	 Concept A	 Concept G	 Concept I
Travel Time and Congestion	🔴	🔴🔴🔴	🔴
Traffic Speeds	⚫	🔵🔵🔵	🔵🔵
Traffic Safety	🔵	🔵🔵🔵	🔵🔵
Walking/Bicycling Conditions	🔵	🔵🔵🔵	🔵🔵
Access to Businesses	⚫	🔵🔵	🔵
On-Street Parking	⚫	🔵	🔴
Green Space	🔵	🔵🔵🔵	🔵🔵

Compared with existing:
🔵 - Improvement ⚫ - No Change 🔴 - Disimprovement

Chapter 7
Recommendations and Implementation

Recommendations and Implementation

After the concept evaluation and comparison was presented and discussed with the community during public engagement touchpoint #2, the City brought together multiple departments to discuss next steps.

RECENT SIGNAL TIMING CHANGES

In fall 2023, the City of Raleigh and NCDOT implemented the following signal timing and phasing adjustments to the Five Points intersection:

- Leading pedestrian walk intervals (LPI) was added to all crosswalks.
- Flashing don't walk (FDW) times were reviewed for all crosswalks and increased to meet minimum values.
- The westbound left turn on Whitaker Mill Road was converted to protected/permissive phasing.

These changes have been received positively by the public, and the City is working with NCDOT to monitor crash data after the improvements.

NEAR TERM IMPROVEMENTS

While the public had favored both of the roundabouts (Concept G and Concept I) as viable improvements, the high cost of each of these options was a barrier to near-term consideration. After reviewing the public feedback from touchpoint #2 and the positive reaction toward the roundabout concepts (Concepts G and I), the City and the project team identified additional near-term improvements that could be implemented while funding mechanisms for longer-term improvements were being explored. These improvements, shown in Figure 32, included removal of the right turn lane on Fairview Road and conversion to additional on-street parking, curb extensions near the intersection, and enhanced median striping along Glenwood Avenue.

Figure 32. Recommended Alternative

CRABTREE CREEK GREENWAY CONNECTION RECOMMENDATIONS

As a result of the public feedback received at Touchpoint #2 and subsequent conversations with City of Raleigh staff, the following changes were made to the preliminary greenway connection concepts:

- Addition of recommended intersection improvements at Harvey Street / Glenwood Avenue.
- Addition of recommended intersection improvements at St. Mary's Street / Glenwood Avenue / Anderson Drive – to better connect the bikeways on St. Mary's Street and Anderson Drive
- Intersection improvements at Oxford Road / Claremont Road / Anderson Drive to carry the recommended SUP across the north leg of Anderson Drive
- A recommended neighborhood bikeway (shared roadway or "sharrow") was added on St. Mary's Street between Fairview Road and Harvey Street (Note - Speed/volume management features would be needed to accomplish this.)
- The recommended neighborhood bikeway on Fairview Road between the Five Points intersection and Oberlin Road was upgraded to a priority recommendation.

For all recommendations, further engineering study is recommended to confirm/determine the most feasible side-of-street.

Recommendations for Pedestrians

Priority Pedestrian Recommendations

1. Complete the funded sidewalk project on Oxford Road from Kenmore to Overbrook.
2. Install a curb extension at the southwest corner of the Noble Road / Pine Drive intersection and install a crosswalk across Noble Road.
3. Evaluate an all-way stop at the Oxford Road / Reaves Drive / Kenmore Drive intersection with a crosswalk across the northeast Oxford Road leg.
4. Install a shared-use path on the north side of Claremont Road from the Crabtree Creek Greenway trailhead to Anderson Street (roughly 90 linear feet).
5. Widen the 6-foot sidewalk on Oxford Road between Anderson Drive and the Crabtree Creek Greenway trailhead to a 12-foot shared-use path (roughly 590 linear feet).

Other Pedestrian Recommendations

(Further study recommended to evaluate feasibility, cost, and potential construction challenges/impacts)

1. Narrow portions of White Oak Road and Oxford Road to allow for sidewalk installation from the intersection of White Oak Road / Alexander Road to the intersection of Oxford Road / Kenmore Drive.
2. Install sidewalk on the south side of Craig Street from Oberlin Rd. to St. Mary's Street.
3. Install sidewalk on the west side of Pineview Street from Arlington Street to Craig Street.
4. Install a crosswalk across Noble Road at the Kiwanis Park trailhead for Crabtree Creek Greenway.
5. Install sidewalk on the west side of Noble Road along Kiwanis Park.
6. Install sidewalk on Roanoke Park Dr. from Sunrise Avenue to Reaves Drive.

7. Install sidewalk on Reaves Dr./Pershing Rd. from Whitaker Mill Rd. to Gavin St. (northwest intersection).

Figure 33 displays these recommendations.

Figure 33. Recommended Pedestrian Improvements Diagram

Recommendations for Bicyclists

(Note – Traffic speed/volume management features may be needed to accomplish some of the neighborhood bikeway recommendations below.)

Priority Bikeway Recommendations

1. Install a neighborhood bikeway between the bike lanes on Oberlin Road and the traffic signal at Harvey Street / Glenwood Avenue.
2. Install a neighborhood bikeway between the traffic signal at Harvey Street / Glenwood Avenue and the intersection of Reaves Drive / Whitaker Mill Road.
3. Install crosswalks and push-button-activated rapid flashing beacons to support pedestrian/bicycle crossings of Whitaker Mill Road at Reaves Drive.
4. Install a neighborhood bikeway between the intersection of Reaves Drive and Whitaker Mill Road and the Crabtree Creek Greenway trailhead at Claremont Road.
5. Install a shared-use path on the north side of Claremont Road from the Crabtree Creek Greenway trailhead to Anderson Street (roughly 90 linear feet).
6. Widen the 6-foot sidewalk on Oxford Road between Anderson Drive and the Crabtree Creek Greenway trailhead to a 12-foot shared-use path (roughly 590 linear feet).
7. Install a contraflow bike lane and neighborhood bikeway on Fairview Road between Five Points and Scales Street (maintains 1-way vehicle travel, but allows 2-way bicycle travel to/from Five Points).
8. Install a bikeway connector between the Downtown North-South Greenway Connector (West Street underpass) and the neighborhood bikeway on Fairview Road (Requires further study and improvements at the intersection of Fairview Road, the railroad, and Capital Boulevard on/off ramps.)
9. Install a neighborhood bikeway on Fairview Road between Five Points and Oberlin Road.
10. Install destination-based wayfinding at turns and key points on neighborhood bikeways.
11. Lower the speed limit to 25mph on all neighborhood bikeways.

Other Bikeway Recommendations

1. Install a neighborhood bikeway between the intersection of Reaves Drive and Roanoke Park Drive and the intersection of Pershing Road and Whitaker Mill Road.
2. Install a neighborhood bikeway between the intersection of Oxford Road and Reaves Drive and the Crabtree Creek Greenway trailhead at Rothgeb Drive – utilizing the existing signalized crossing of Anderson Drive at White Oak Road.
3. Fill the neighborhood bikeway gap on St. Mary's Street between Harvey Street and Fairview Road.
4. Do not allow parking in Anderson Drive bike lanes.
5. Do not allow parking in Saint Mary's Street bike lanes.

Figure 34 displays these recommendations.

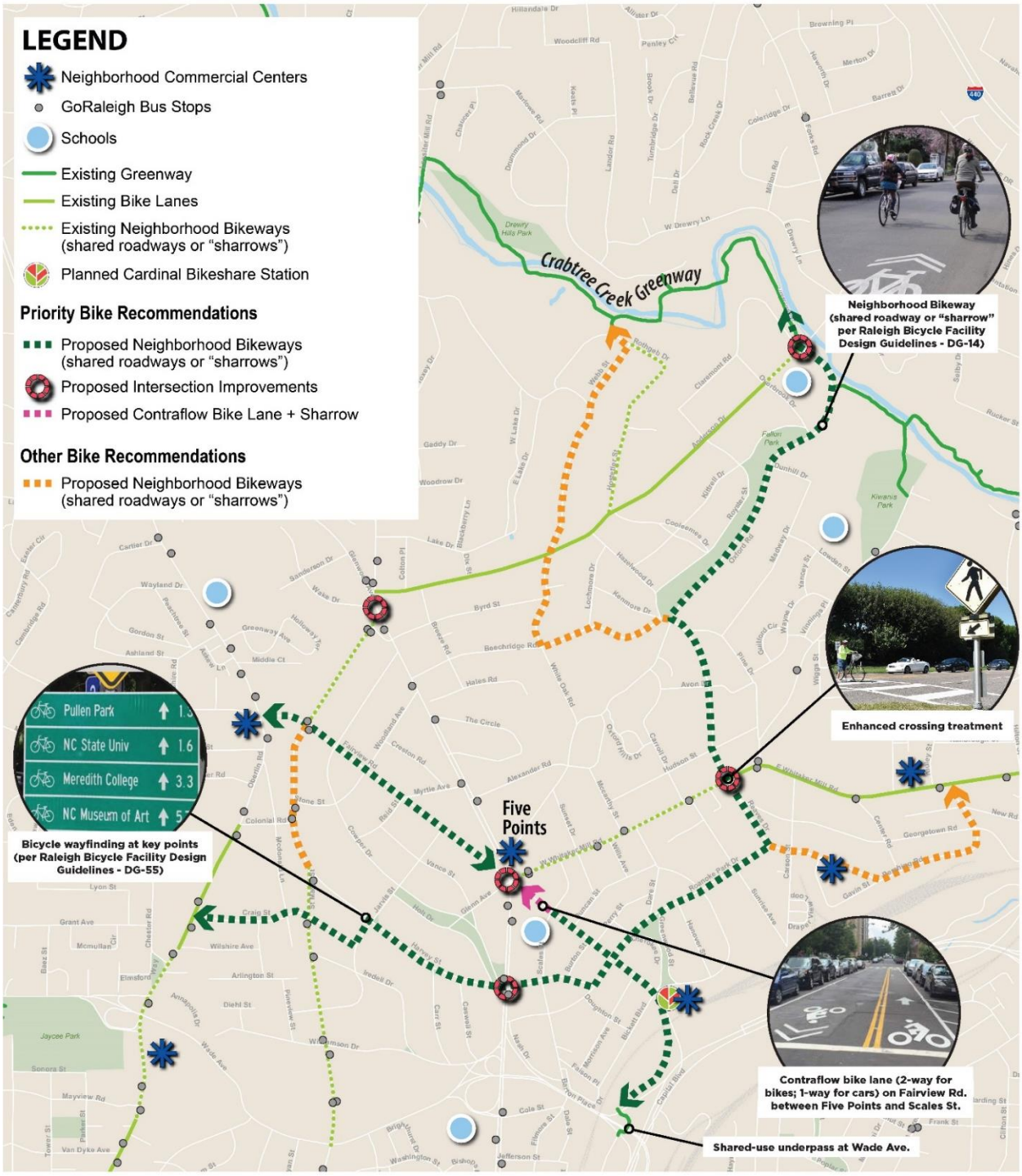

Figure 34. Recommended Bicycle Improvements Diagram

NEXT STEPS

The City of Raleigh intends to fund design and construction of the near-term improvements identified in this chapter as early as summer 2025. The City will continue connecting with its partner agencies, including NCDOT, to monitor the performance of the recent signal timing adjustments and any additional near-term improvements that are implemented.

If City Council has interest in pursuing future changes to the area, such as one of the roundabout concepts (Concepts G and I) or installation of protected bicycle facilities connecting to the Greenway, then advanced planning efforts should be updated to provide updated cost estimates. This is especially important as construction and real estate costs continue to fluctuate rapidly over relatively short periods. Major changes to Glenwood Avenue are also subject to NCDOT; therefore any future projects would necessitate receiving their approval or would be subject to the City's ability to transfer ownership of portions of the corridor.

In the meantime, the City of Raleigh and NCDOT will encourage ongoing dialogue and welcome feedback about transportation needs in the region beyond this planning study. Milestones and next steps will continue to be shared with the project stakeholders and posted on the project website: Five Points Streetscape and Safety Study | Raleighnc.gov. In addition, the findings from this study should be considered and further vetted with the City's on-going and future plans and studies, including the Active Mobility Plan and Safe Streets and Roads for All Users (SS4A)-funded Comprehensive Safety Action Plan. These future plans may also evaluate for the use of Green Stormwater Infrastructure (GSI) as part of the City's internal GSI policy to incorporate nature-based stormwater management into City-led projects.