

Waxhaw-Marin Road Corridor Study

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Purpose and Process

Planning is most successful when it helps us prepare and react to current and future needs. Understanding the implications of future growth as well as recent trends helps ensure a successful planning process that results in a feasible concept.

Though Waxhaw-Marvin Road may seem like a simple corridor with obvious current needs, future growth in the surrounding area creates the need to plan for how Waxhaw-Marvin should be designed for the future. The Town of Waxhaw identified the need for this study to determine a realistic vision for the corridor. This document highlights existing trends and conditions, describes the vision and need, and provides design and strategy recommendations for Waxhaw-Marvin Road.

Purpose of Study

The Waxhaw-Marvin Road Corridor Study represents a unique opportunity for the Town of Waxhaw to be proactive and make planning decisions to mitigate issues before they happen. The study area runs north-south and parallels NC-16 (Providence Road). As growth from Charlotte has moved south into Union County, NC-16 has become a primary artery for travel in the area. Commuters living in Waxhaw use NC-16 on a daily basis to reach commercial districts in Ballantyne, Uptown Charlotte, and elsewhere. Furthermore, much of the commercial development in the immediate area is focused along NC-16. As growth continues, travelers will look for alternative routes for travel to avoid congestion and safety issues on NC-16. Waxhaw-Marvin Road is a prime candidate to see increased traffic volume as this growth continues.

Waxhaw-Marvin Road provides an alternative route with easier access to the Ballantyne area and I-485 beyond. This study looked at existing conditions and future trends through that lens as the recommendations were developed. Future development patterns in the area likely will change, due to a large number of single-family development projects in the pipeline along the corridor. Recommendations to improve the corridor should focus on mobility as a whole, not simply just car travel. Looking forward, the Town of Waxhaw can use this document as guidance for making decisions for the future of travel along Waxhaw-Marvin Road and for development implications in the area as well.



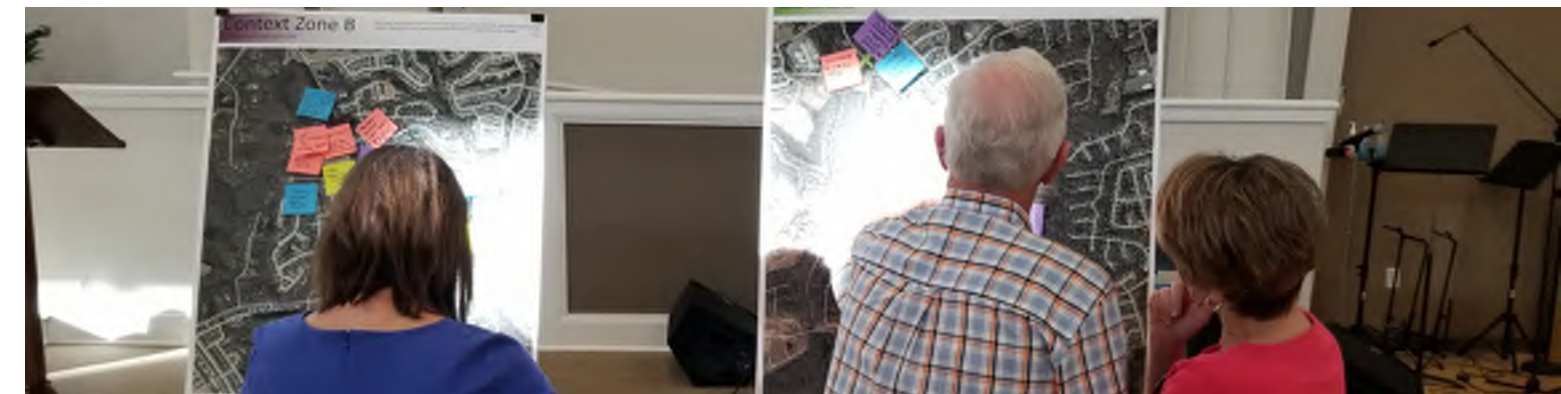
Project Process

The Waxhaw-Marvin Road Corridor Study was Town-led with oversight by CRTPO and NCDOT, and followed the process illustrated below. The first phase documented existing conditions and identified the vision and community themes. The second phase balanced technical analysis with design elements. The entire process was then communicated and memorialized in this report. Throughout all phases of the study development, planning analysis and traffic analysis were conducted in tandem in order to develop the most comprehensive set of recommendations.

The Town created a project advisory group designed to help guide the initial project process. This group partnered with the core project team to develop a vision and goals for the study, and was also invited to participate in the public engagement portion of the project.

What should the Study consider?

- ▶ Community-driven strategy
- ▶ Balanced transportation options
- ▶ Conceptual roadway improvements
- ▶ Implementation strategies



Community Vision

A Vision Statement was developed to give the Study clear and concise guidance moving forward through its development. In addition, seven goals support the vision statement and guided the development of recommendations.

Vision Statement

Waxhaw-Marvin Road will promote safe, efficient, and multimodal travel options that connect people to the places they want and need to go. Over time, the corridor will advance broader community initiatives related to mobility, economic vitality, parks and open space, and infrastructure.

Goals

Connected



Improve access and mobility by focusing on strategic connections between homes, businesses, parks, and activity centers.

Safe & Efficient



Promote safety and efficiency for all users by addressing key intersections and balancing future capacity needs.

Multimodal



Provide critical links in the area's comprehensive bicycle and pedestrian network to encourage active use by all modes.

Integrated



Align the corridor with preferred development patterns and design qualities within the community by integrating potential solutions with local context.

Character



Give the corridor a defined identity by making it feel like the communities it connects.

Public Input

Understanding current and future considerations for the area requires strong public input.

A community workshop was held on May 1st, 2018 at St. Matthew Catholic Church in Waxhaw. The event featured a variety of stations and exercises, as well as a high-definition video of the corridor taken with a drone. This footage was displayed on two projector screens and played continuously. Attendees went through 4 specific stations that were meant to inform and gather feedback.

Project Background

The Project Background station used boards, maps, and graphics to educate attendees on existing conditions and to offer some considerations when going through the subsequent stations. In addition to the informative graphics, a "Where Do You Live?" map asked attendees to identify their home and helped to orient them to the Corridor Study Area.

The informational boards showcased the **Vision and Goals** for the study, outlined the **Context Zones**, and highlighted **Existing Considerations**.

Attendees visited four stations:

- ▶ Project Background
- ▶ One Word
- ▶ Corridor Priority Pyramid
- ▶ Mapping Exercise

Key Takeaways

Feedback from this station focused on issues along the corridor. This included intersection issues at Bonds Grove Church Road, Anclin Forrest Drive and Quellan Drive related to congestion and sight distance. Bonds Grove Church Road was identified as an area of current congestion. Bicycle and pedestrian facilities were also a common topic, as several attendees noted a lack of safe accommodations for bikers and walkers, specifically at the bridge of Twelvemile Creek. Speeding was a perceived issue along the Corridor Study Area.



One Word

The One Word exercise gathered broad views on transportation along Waxhaw-Marvin Road today and individual visions for its future. Participants were given a simple game board that asked them to describe transportation along the corridor today in one word and their ideal vision for transportation in one word. The activity captures the existing sentiments as well as future hopes for travel along the corridor. Results are shown below - larger words imply a higher frequency of that response being given.

Key Takeaways

Bikeability was a key takeaway from the One Word exercise. As evident by the word clouds, many respondents felt that current bike conditions along the corridor were severely lacking, and their vision for the future of the corridor included better bike facilities. Along the same vein, walkability was also a common theme with this exercise. The other notable response centered around travel speed, which most felt was too high along the Corridor Study Area.

One Word for today...



One Word for future vision...



Corridor Priority Pyramid

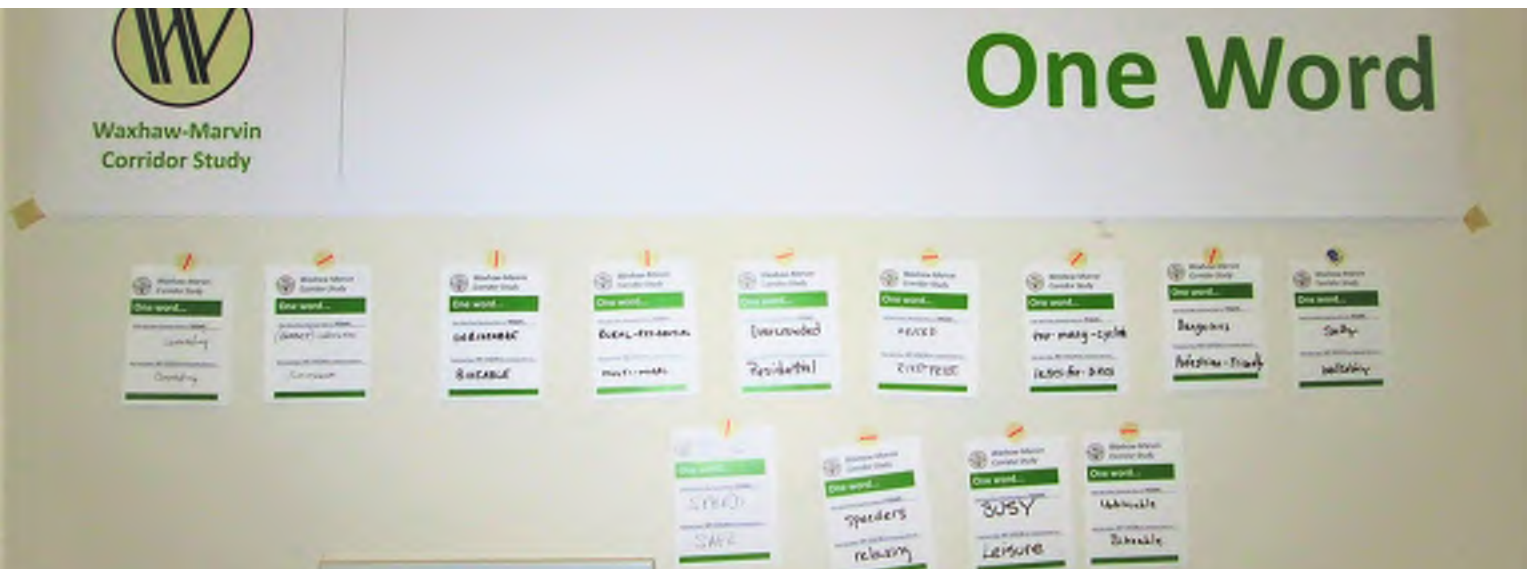
The Corridor Priority Pyramid exercise asked individuals to express a priority for planning themes related to the corridor. It also helped to educate the public on trade-offs, promoting the idea that resources are finite and initiatives must be prioritized for future investment. Participants were given a game board and a series of stickers that represented six planning themes. A single theme was placed into the top tier, two themes on the second tier, with the remaining three left off entirely. Participants posted their pyramid on the wall underneath the theme heading that was their top priority. Individuals were also given the opportunity to write additional thoughts on separate pages and put them under any theme that they wished.

Key Takeaways

Safety was the top priority by a wide margin (9 top responses). Aesthetics came in second with 5 top responses. Those who favored safety pointed out that the corridor was primarily residential and that protecting families along the corridor was a top goal. Lowering travel speeds and improving intersection geometry were two ways the public identified to improve these issues. Bikeability and Walkability were also popular answers as second tier priorities. Proponents of these themes felt that bike/pedestrian infrastructure could be improved with more sidewalks and/or multi-use paths, which would in turn improve safety. Connectivity and Travel Time received the lowest number of total responses.

Rank:

	1	2	3	4	5	6
	Safety	Aesthetics	Walkability	Bikeability	Connectivity	Travel Time
Top Priority = 2						
Second Tier Priority = 1						
Total Responses	9	4	5	3	1	9
Percent	69%	31%	63%	38%	10%	90%

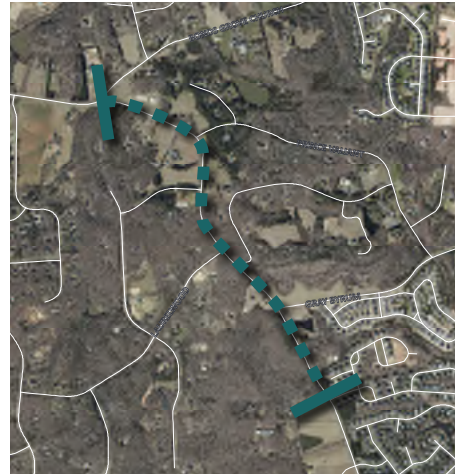


Mapping Exercise

The intent of the mapping exercise was to obtain feedback from attendees about specific locations along the corridor. Using three context zones, participants used sticky notes on the map with hand written notes to provide on specific locations. This allowed for geographic context and more focused and targeted feedback

rather than general comments about the entire corridor. Several topics emerged based on the comments. The comments, sorted by topic and context zone, are summarized in the tables below and on the adjacent page.

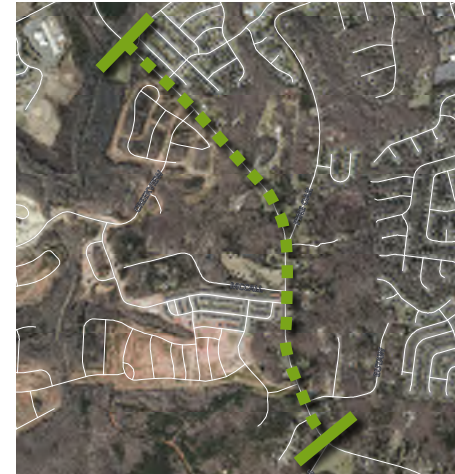
Context Zone A



Context Zone B



Context Zone C



Context Zone A Bonds Grove Church to Carindale

<i>Travel Speed</i>	Reduce speed to improve safety.
<i>Green Space</i>	
<i>Bikeability</i>	Need for bike infrastructure.
<i>Walkability</i>	
<i>Intersection Geometry</i>	Intersection geometry improvements needed at Bonds Grove Church Road due to confusing design and poor sight lines. Add a roundabout at Gray Byrum Road and Bonds Grove Church Road.
<i>Road Laneage</i>	Additional turn lane/space Gray Byrum Rd-Waxhaw Rd.
<i>Other</i>	Create a Gateway Entrance or feel into Waxhaw. Take inspiration from Colony Road between NC-51 and Carmel.

Context Zone B Carindale to Twelvemile Creek

<i>Travel Speed</i>	Lower speed limit from Bonds Grove to Town Creek Park.
<i>Green Space</i>	Better entry and access to Waxhaw-Marvin Park.
<i>Bikeability</i>	Need for bike infrastructure.
<i>Walkability</i>	Add more sidewalks. Pedestrian connection to trail system. Pedestrian connection to Kensington Road.
<i>Intersection Geometry</i>	Sight distance at Quellin Drive is poor.
<i>Road Laneage</i>	Turn lanes at all subdivision entrances. Turn lanes at intersection with Kensington Road.
<i>Other</i>	Take inspiration from Colony Road between NC-51 and Carmel. Make improvements to bridge, including bicycle and pedestrian elements, and lane widening.

Context Zone C Twelvemile Creek to Helms

<i>Travel Speed</i>	Speed limit to remain 35mph until Kensington Rd.
<i>Green Space</i>	
<i>Bikeability</i>	Add shoulders for bikes.
<i>Walkability</i>	Crosswalks with pedestrian safety elements are needed. Add sidewalks along Waxhaw-Marvin Road to connect with sidewalk system from the south.
<i>Intersection Geometry</i>	Make geometry improvements at Pine Oak due to poor design. Potential for roundabout at intersection with Helms Road.
<i>Road Laneage</i>	
<i>Other</i>	Enforce blight ordinance.

Key Takeaways

The mapping exercise revealed concerns about how future development could affect the corridor in the coming years, specifically related to congestion and travel time reliability. Intersection geometry was a key concern, mainly focused on the intersections at Bonds Grove Church, Gray Byrum, Kensington, and Pine Oak. These four intersections are perceived to have geometry and visibility issues according to those who participated in the exercise. Furthermore, walkability and bikeability were key topics of discussion. Many attendees felt the Corridor Study Area is not safe for cyclists or pedestrians, which is particularly a concern with the large number of families that live along the corridor, and the families that will presumably be living along the corridor in the near future. Many people also expressed a desire to use Waxhaw-Marvin Road as a northerly route to Charlotte and Ballantyne as a reliable alternative to NC-16.



Corridor Considerations

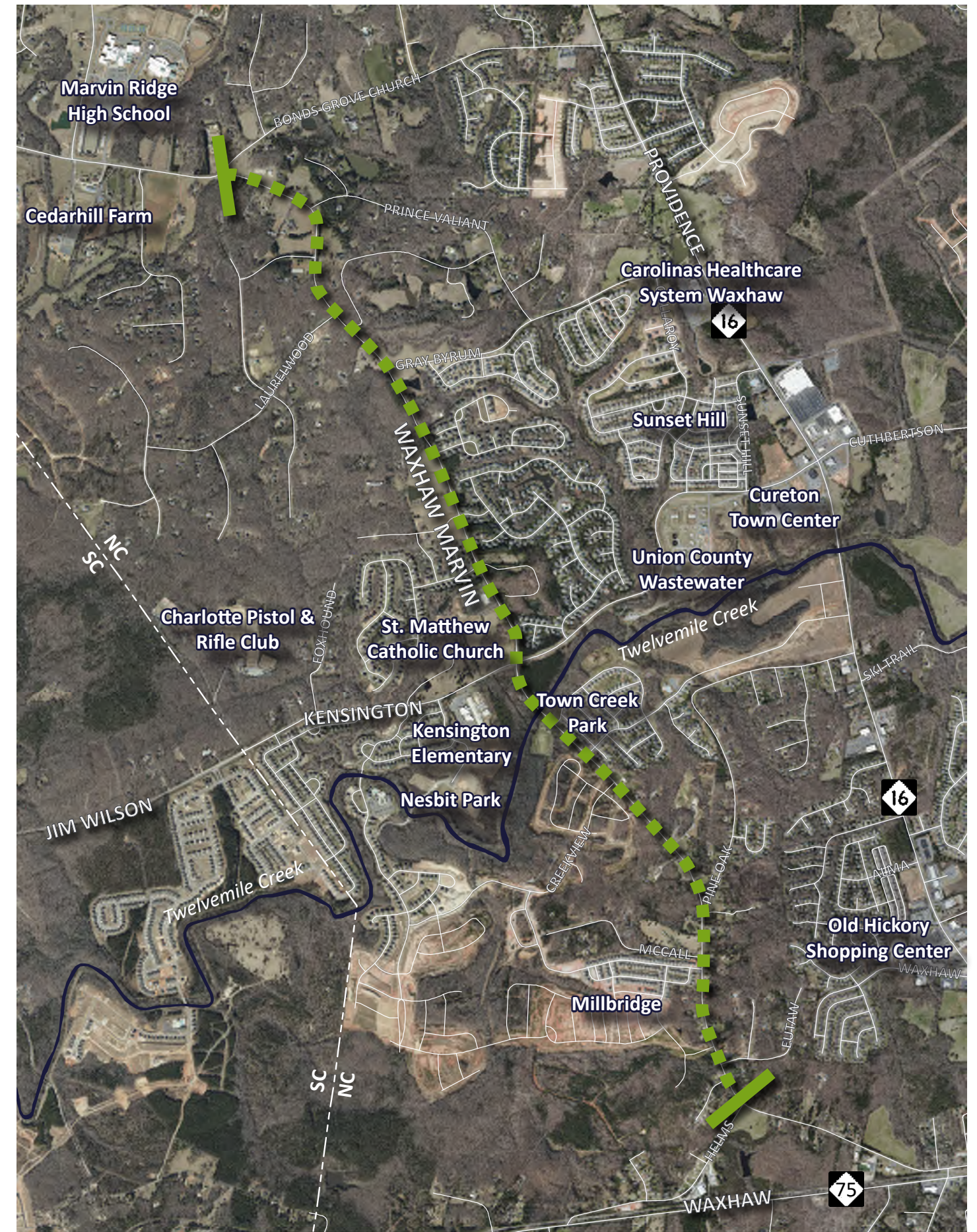
This chapter highlights factors for consideration when developing recommendations for Waxhaw-Marvin Road. These considerations for the corridor, along with the goals and vision, and the input from the public engagement, create the foundation for the strategy recommendations and concept design alternatives highlighted in the next chapter.

Waxhaw-Marvin Road Today

Between the 2000 and 2010 census, the Town of Waxhaw saw a 275% population increase. With its pastoral and small town character, the Town of Waxhaw is feeling the pressures of being a destination within the Charlotte Metropolitan Area. Indicators show an influx of commuting patterns which puts a heavy burden on directional flows during peak hours. The dependence of local commuters, coupled with the potential demand for increased development, results in a conflict between current development and transportation interests. Recognizing the continued pressures and demands placed on the transportation system, the Town of Waxhaw is being proactive in its planning for continued growth.

Waxhaw-Marvin Road runs north-south through the northwest portion of the Town of Waxhaw and serves as a connector between Downtown Waxhaw and the Village of Marvin. It also serves as a gateway to the Ballantyne area of South Charlotte. Waxhaw-Marvin Road generally parallels Providence Road (NC-16), which acts as the primary means of north-south travel for Waxhaw. As growth from Charlotte continues south toward Waxhaw and congestion increases along Providence Road, the importance of the Waxhaw-Marvin Road Corridor is heightened as it becomes an alternate route for north-south travel.

The extents of the Corridor Study capture a critical section of Waxhaw-Marvin Road that is most likely to change due to proposed and under-construction single-family neighborhoods. The Corridor Study Area extends from Bonds Grove Church Road to the north to Helms Road to the south.



Context Zones

Context zones were developed to divide the corridor into distinct areas to gather more targeted feedback from the public and stakeholders and allow for more focused recommendations that address specific needs along the corridor.

Context Zone A Bonds Grove Church Road to Carindale Road

Zone A is the northernmost section and is bordered by the intersections with Bonds Grove Church Road to the north and Carindale Road to the south. The majority of intersections in this zone are with rural two-lane roads that serve low-density single family homes. Bonds Grove Church Road and Gray Byrum Road act as important connections to Providence Road (NC-16) to the east.

As a part of the funded NC-16 widening project (U-5769), traffic signals are being considered at both Bonds Grove Church Road and Gray Byrum Road intersections with NC-16. With these signalized, more drivers are expected to utilize these east/west connections, increasing the importance of these connections to Waxhaw-Marvin Road.

Key Intersections

- ▶ Bonds Grove Church Road
- ▶ Gray Byrum Road

Considerations

- ▶ Gateway potential for Waxhaw from west and north (Indian Land, Fort Mill, Ballantyne)
- ▶ Increased demand expected with intersection improvements planned as part of U-5769

Context Zone B Carindale Road to Twelvemile Creek

Zone B is bordered by Carindale Road to the north and the bridge over Twelvemile Creek to the south. This zone is most notable because of the intersection with Kensington Drive, which is the only signalized intersection and serves as the primary east-west connection to Providence Road.

The bridge at Twelvemile Creek is currently being designed by NCDOT to be replaced as part of B-5791. The Town is coordinating with NCDOT as it relates to the desired cross-section for the bridge replacement, most notably the importance of accommodating both bicycles and pedestrians across this bridge.

Key Intersections

- ▶ Kensington Drive

Considerations

- ▶ Major intersection at Kensington Drive - only signalized intersection currently along the corridor
- ▶ Potential bottleneck point at Twelvemile Creek
- ▶ Current NCDOT bridge replacement project (B-5791)
- ▶ Opportunity to connect to existing Carolina Thread Trail at Twelvemile Creek

Context Zone C Twelvemile Creek to Helms Road

Zone C is the southernmost zone and is bordered by Twelvemile Creek to the north and Helms Road to the south. This section of Waxhaw-Marvin Road leads into Downtown Waxhaw for travelers going south. Pine Oak Road acts as another east-west connection to Providence Road, and Helms Road provides a connection to Waxhaw Highway (NC-75). Both town staff and the community have expressed concerns of the current geometry of the intersection at Pine Oak Road.

Key Intersections

- ▶ Pine Oak Road
- ▶ Helms Road

Considerations

- ▶ Gateway potential for Downtown Waxhaw from the north
- ▶ Multiple access points for the Millbridge community
- ▶ Opportunity to connect to the Carolina Thread Trail near Helms road



Environmental Considerations

A variety of environmental considerations exist along the Waxhaw-Marvin Road Corridor, mostly related to hydrology. Twelvemile Creek is the most significant water feature in the area and is the catalyst for a number of smaller tributaries, streams, and ponds that surround the Corridor Study Area.

FEMA floodplain data shows two floodplains that affect the corridor; the 100-year floodplain, and the 500-year floodplain. Neither pose any significant or immediate threat to future congestion and development along the corridor. However, it is worth noting that the bridge area over Twelvemile Creek, just south of Kensington Drive, poses the highest risk (1% in each year) of significant flooding. Town staff is in coordination with NCDOT in efforts to address this current issue through NCDOT's bridge replacement project (B-5791) over Twelvemile Creek.

A greenway trail (not shown on map) runs along the south side of the creek and is part of the regional Carolina Thread Trail.

Smaller Tributaries

Twelvemile Creek features a variety of smaller tributaries and streams that run generally north-south. These smaller streams pose minimal considerations for development along the corridor.

500-Year Floodplain

The 500 year flood has a 0.2% chance of occurring within any given year. Given the low risk and minimal coverage of this floodplain in the area, it doesn't bear much consideration.

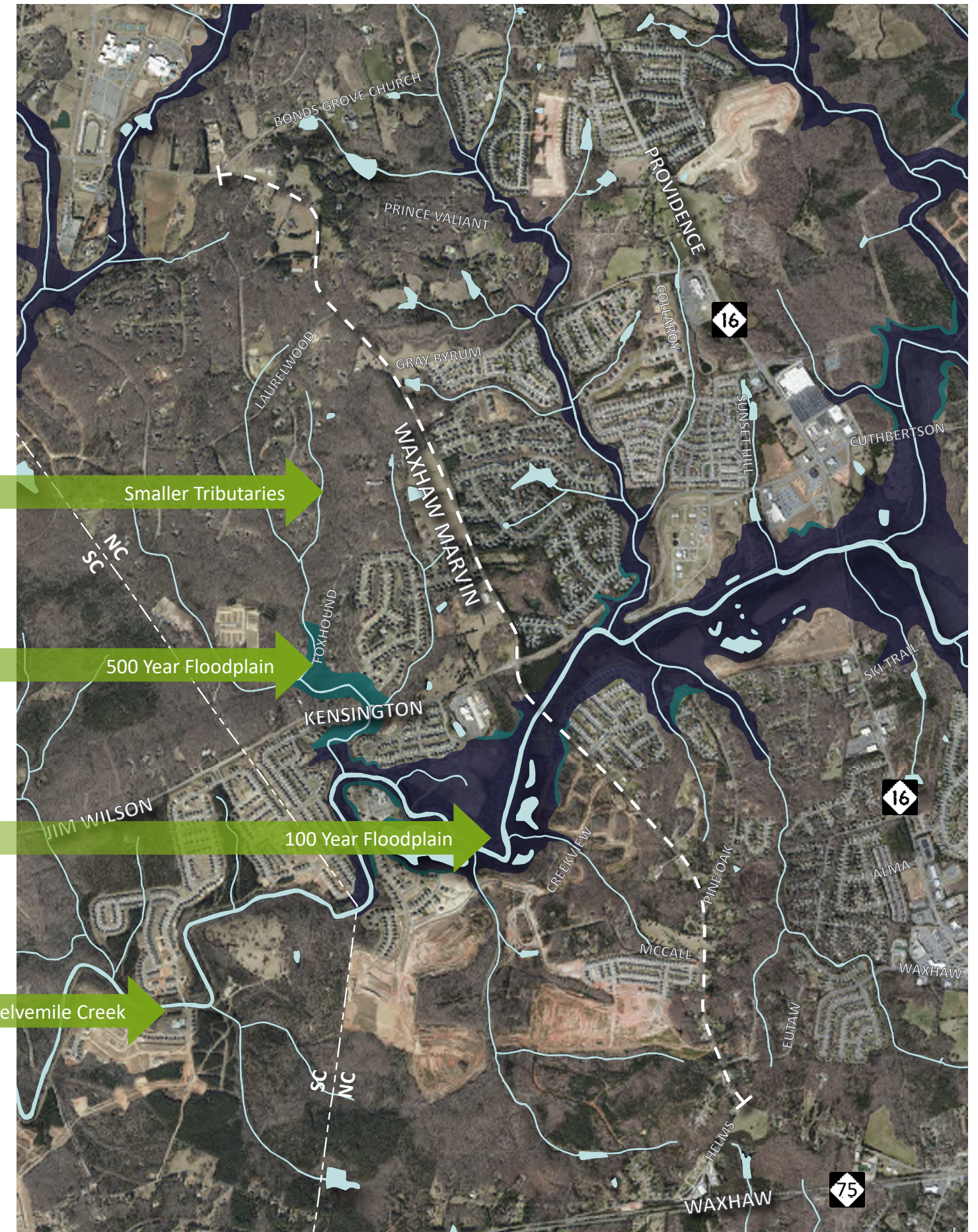
100-Year Floodplain

The 100 year flood has a 1% chance of occurring within any given year. Most development within these areas, like that around the bridge over Twelvemile Creek, is fairly restricted.

Twelvemile Creek

Twelvemile Creek is the most significant hydrological feature that affects the corridor. The creek runs generally east-west and a key bridge along the corridor crosses the creek south of Kensington Drive.

The bridge replacement project (B-5791) is currently being designed by NCDOT and is currently scheduled for construction in 2020.



Crash History

The map to the right showcases hot spots along the Corridor Study Area that feature reported vehicular crashes since 2013. The four identified hot spots to the right total 67 crashes, which is roughly 83% of the total 80 crashes that have occurred along the Corridor Study Area in that time span. Because of the higher volume of travel that the Waxhaw-Marvin Road - Kensington Drive intersection sees on a daily basis, it features a significant percentage of the total crashes (almost 43%).

Frontal impact and lane departure crashes were the most common crash types and most often occurred near one of the four hot spots. Additionally, a high number of crashes related to animals were reported- likely due to the rural nature of the corridor. These types of crashes generally occurred away from the four intersection locations identified to the right.

A single reported crash incident involved a bicycle and none involving pedestrians, according to the acquired data.

Bonds Grove Church Road

Reported Crashes since 2013.....14

Bonds Grove Church Road intersects with Waxhaw-Marvin Road at an odd angle, which likely contributes to crashes at this location. This intersection is not signalized. The most prevalent accident types here were impacts related to turning.

Gray Byrum Road

Reported Crashes since 2013.....10

Gray Byrum Road provides direct connection to Providence Road to the east. Accidents in this area were more spread out and weren't solely concentrated on the intersection. Frontal impacts, lane departures, and sideswipes were common here. This intersection is not currently signalized.

Kensington Drive

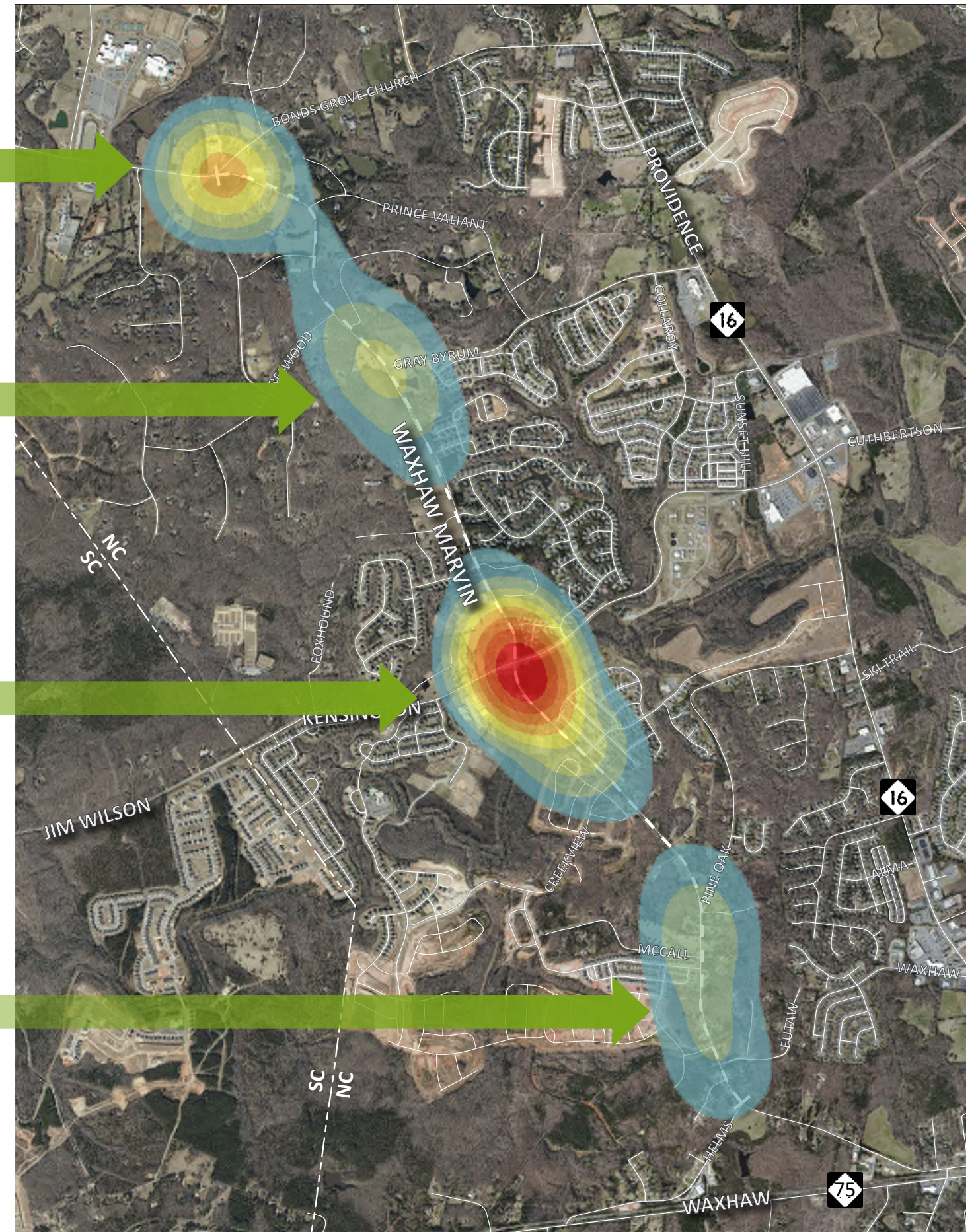
Reported Crashes since 2013.....34

The intersection with Kensington Drive is the largest and most heavily traveled along the Corridor Study Area. As a result, it accounts for a higher number of crashes. Frontal impacts and rear endings were common at this intersection. This is the only signalized intersection along the corridor.

Pine Oak Road, Helms Road

Reported Crashes since 2013.....9

This area of the corridor serves the lowest amount of traffic volume and features the fewest amount of reported crashes of the four hot spots. The incidents were spread out between Pine Oak Road and Helms Road. The intersection with Pine Oak Road has odd geometry that restricts sight distance and likely contributes to some crashes. Rear end collisions were common in this area.



Bicycle and Pedestrian Elements

The map to the right shows existing pedestrian facilities on or near the Corridor Study Area. Most of these facilities exist in the surrounding neighborhoods, rather than directly on Waxhaw-Marvin Road. A trail system, which is part of the Carolina Thread Trail, exists along Twelvemile Creek, and runs generally east-west across the corridor, just south of Kensington Drive.

The existing sidewalk system is useful for the single-family neighborhoods, however, limited connectivity extends beyond those places. Sidewalks start and end at the entrances to the neighborhoods, and no sidewalks exist along Waxhaw-Marvin Road to fully connect these places.

Though no dedicated bike facilities currently exist, participants in the public outreach noted that the corridor is often used by road bikers on the weekend. Additionally, because of the high number of neighborhoods along the corridor, there is demand for recreational bike use.

Neighborhood Sidewalks

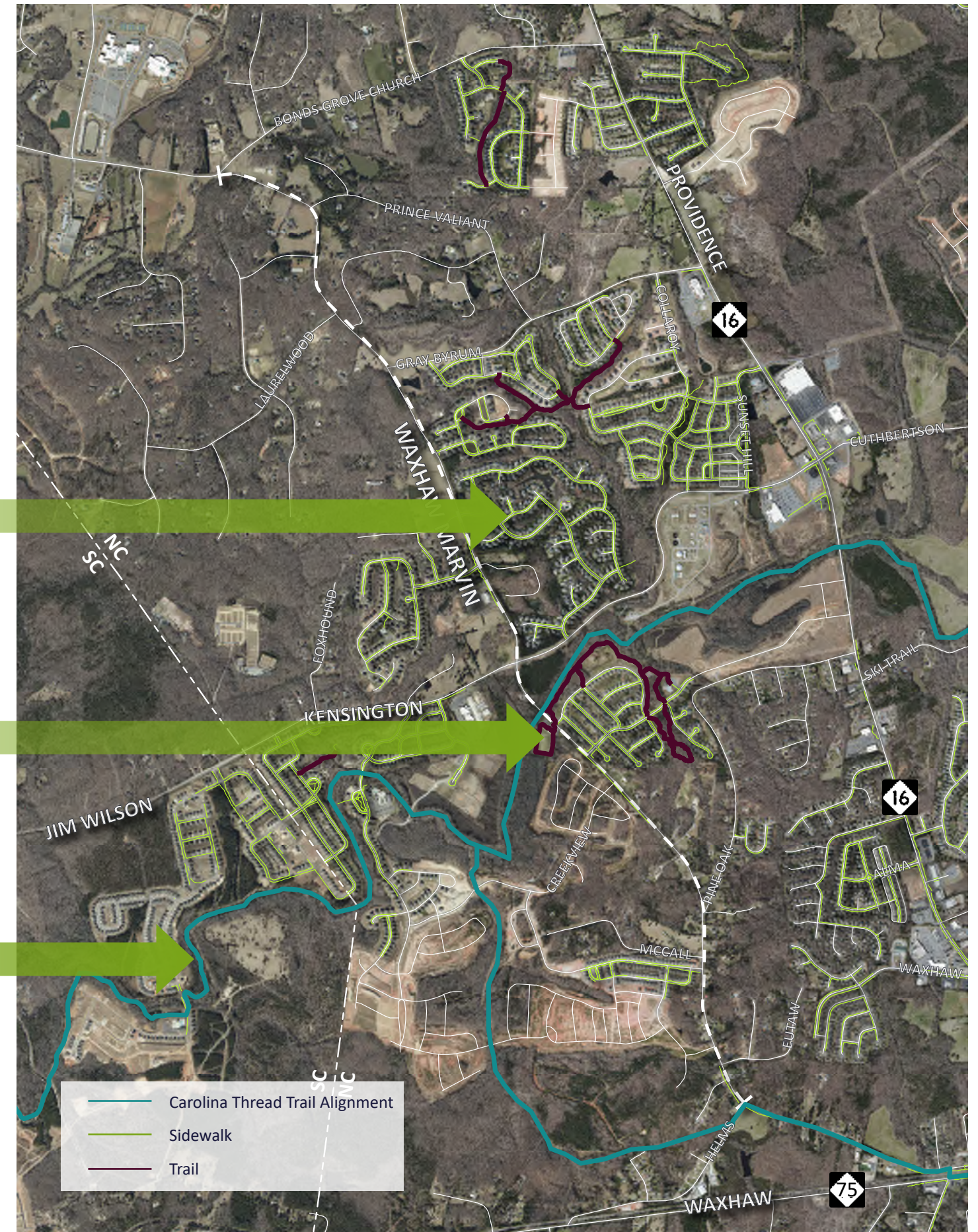
Most of the single-family neighborhoods along the corridor have internal sidewalk systems. However, these networks currently have little connection to other areas along the corridor and are self-contained.

Town Creek Park

This park is easily accessible off of Waxhaw-Marvin Road, just south of the Twelvemile Creek Bridge. The park includes a trail head for the Carolina Thread Trail, as well as a small parking lot. As noted earlier, this trail head isn't very well connected to other elements of the pedestrian network, aside from the neighborhood sidewalks directly adjacent.

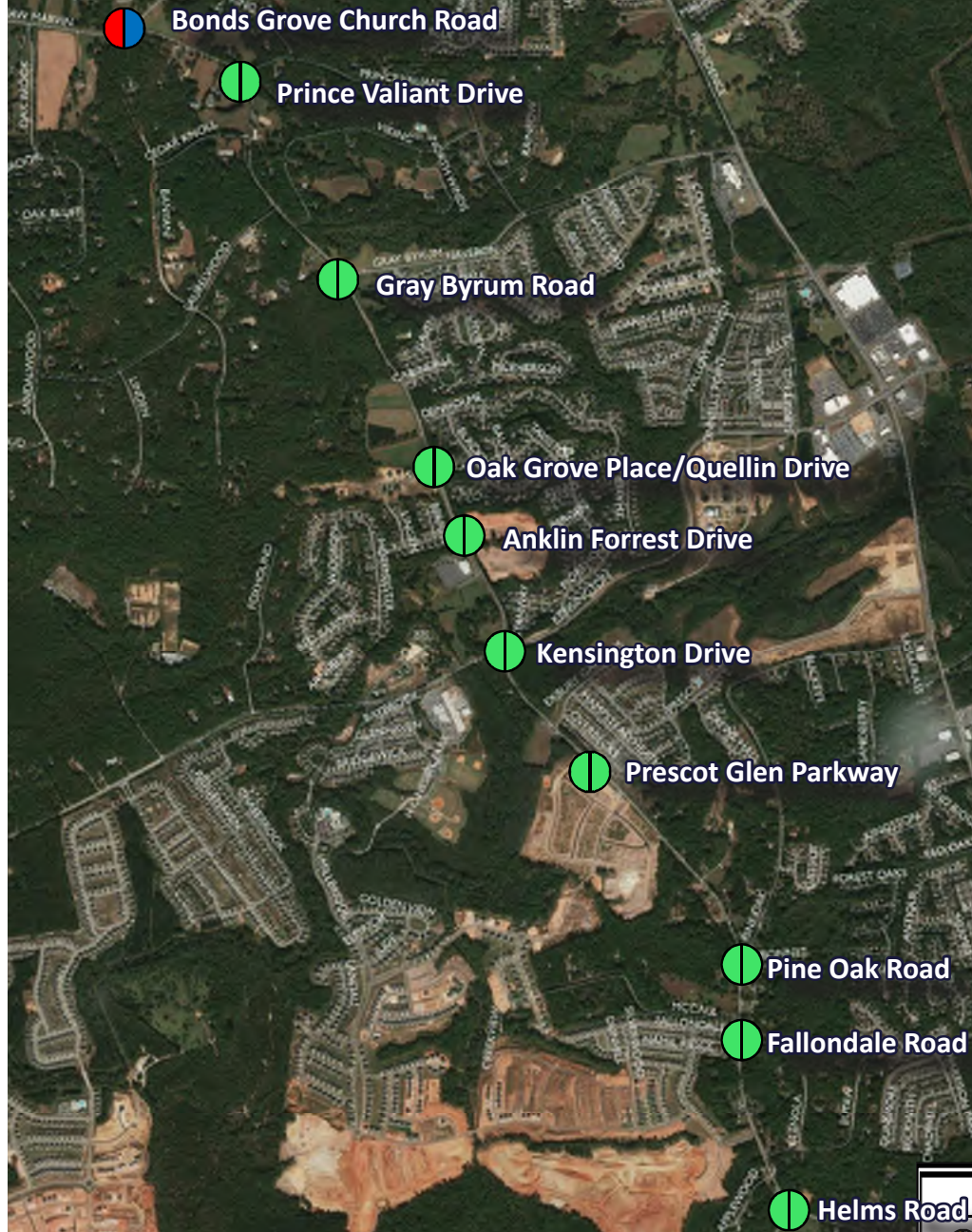
Carolina Thread Trail

The alignment shown on the map shows the preferred alignment for the Carolina Thread Trail. As of the adoption of this plan, only some portions of this alignment have currently been completed. There are other surrounding neighborhood trails along the corridor as well.



Existing Intersection Peak-Hour LOS

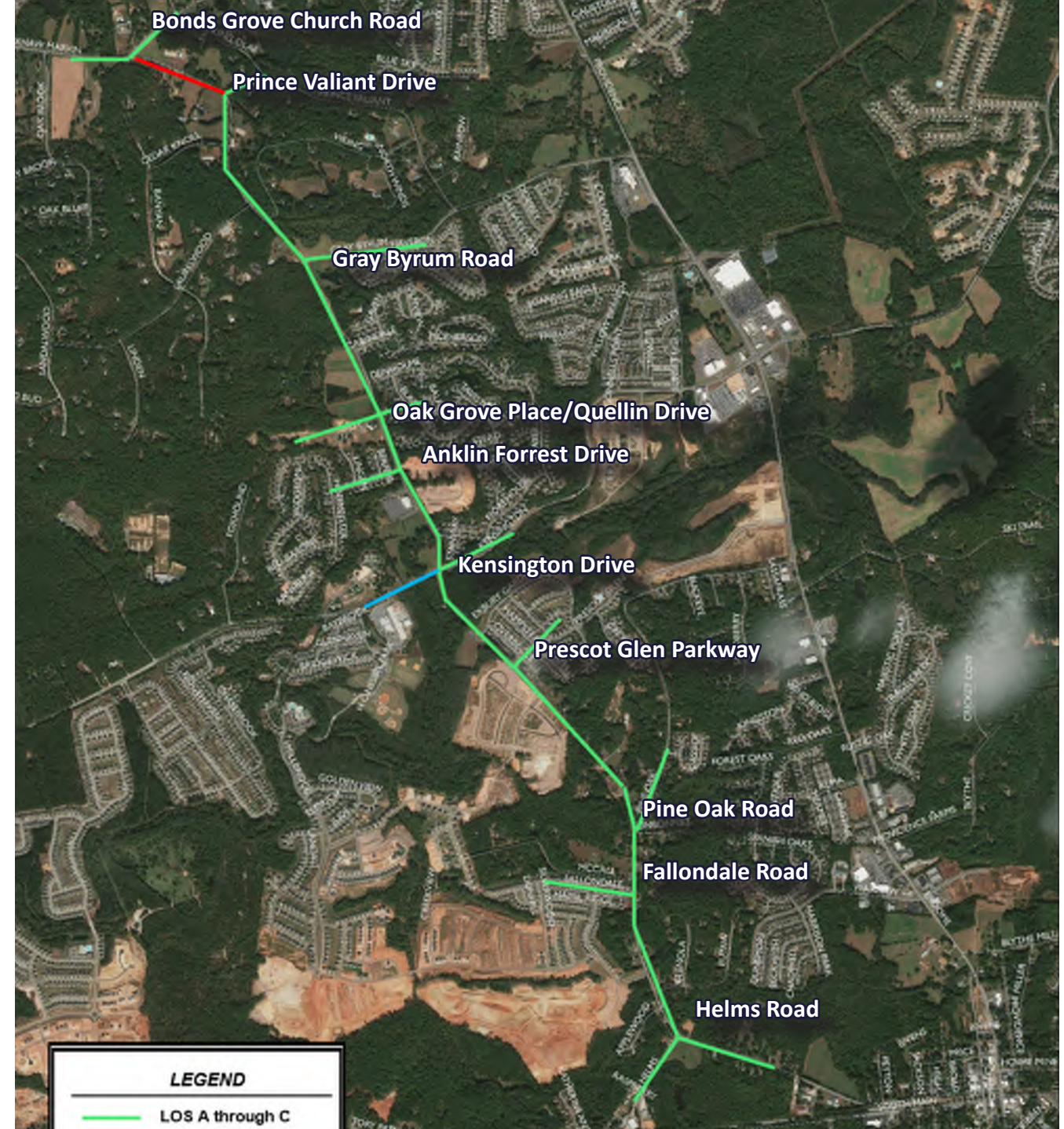
Note: Level of Service (LOS) for two-way, stop-controlled (TWSC) intersections are reported for the worst minor-street approach. LOS for signalized intersections (Waxhaw-Marvin Rd/Kensington Dr) are reported for the overall intersection.



LEGEND	
	AM Level of Service
	PM Level of Service
	LOS A through C
	LOS D
	LOS E
	LOS F

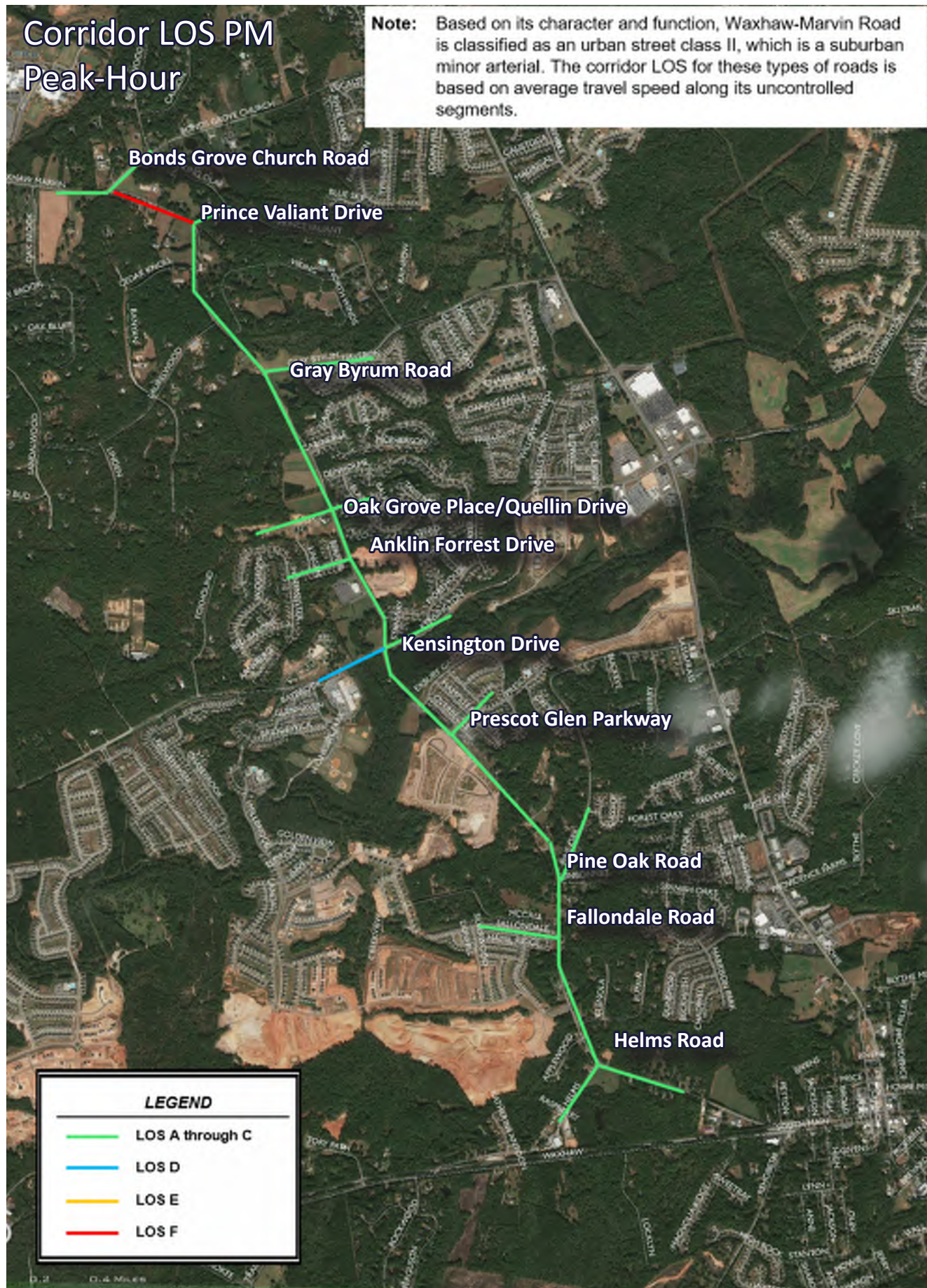
Corridor LOS AM Peak-Hour

Note: Based on its character and function, Waxhaw-Marvin Road is classified as an urban street class II, which is a suburban minor arterial. The corridor LOS for these types of roads is based on average travel speed along its uncontrolled segments.



LEGEND	
	LOS A through C
	LOS D
	LOS E
	LOS F





Future Considerations

In addition to documenting existing trends and conditions, it is vital to assess potential trends and development that would affect the Corridor Study Area. This includes direct, localized effects such as future development along Waxhaw-Marvin Road, or more indirect and regional affects, such as growth patterns in the Charlotte Region.

Future Considerations

- ▶ Twelvemile Creek Bridge
- ▶ Traffic Forecasting
- ▶ Regional Context
- ▶ NC-16 (Providence Road)
- ▶ Future Development

Twelvemile Creek Bridge

Identified as a need in the Waxhaw Comprehensive Pedestrian Plan (2012) and the Charlotte Regional Transportation Planning Organization Comprehensive Transportation Plan (2017), the bridge is currently funded to be replaced by NCDOT as part of a federal bridge project (B-5791). The bridge is located on Waxhaw-Marvin Road, just south of the intersection with Kensington Drive, and provides a crossing over Twelvemile Creek.

Key Takeaways

The bridge could be a bottleneck for traffic and create issues in the future, should traffic volumes increase. This widening helps to alleviate some of those concerns.

Additionally, the new bicycle and pedestrian facilities on the bridge should be considered in the concept design for the Corridor Study Area.

Based on coordination with NCDOT, the width of the bridge is being designed to accommodate 5' sidewalks on both sides, 5' bike lanes on both sides, two or three 12' travel lanes (currently being coordinated between NCDOT and the Town), and standard curb and gutter on both sides. This width provides the option for the town to include a multi-use path on one side in place of the bike lanes and one side of sidewalk.



Traffic Analysis/Forecasting

As part of the corridor traffic analyses, peak-hour intersection counts were collected at ten study intersections to establish existing operating conditions along Waxhaw-Marvin Road. The Metrolina Regional Travel Demand Model (MRTDM) was reviewed to determine non-specific growth rates to apply to the existing volumes in addition to specific developments already approved, but not yet fully constructed when the counts were collected. Volumes were first grown to 2023 using a 1% growth rate along with traffic from portions of Millbridge (50%) and Cureton (10%) and full build-out of Prescott Village and St Matthews Phase II. The graph below shows that a significant increase in delay is expected at some of the corridor intersections by 2023 with no additional capacity improvements beyond the intersection improvements required at the Kensington Drive intersection to mitigate the approved development traffic. The graph to the right reflects those improvements in place in 2023 and 2040.

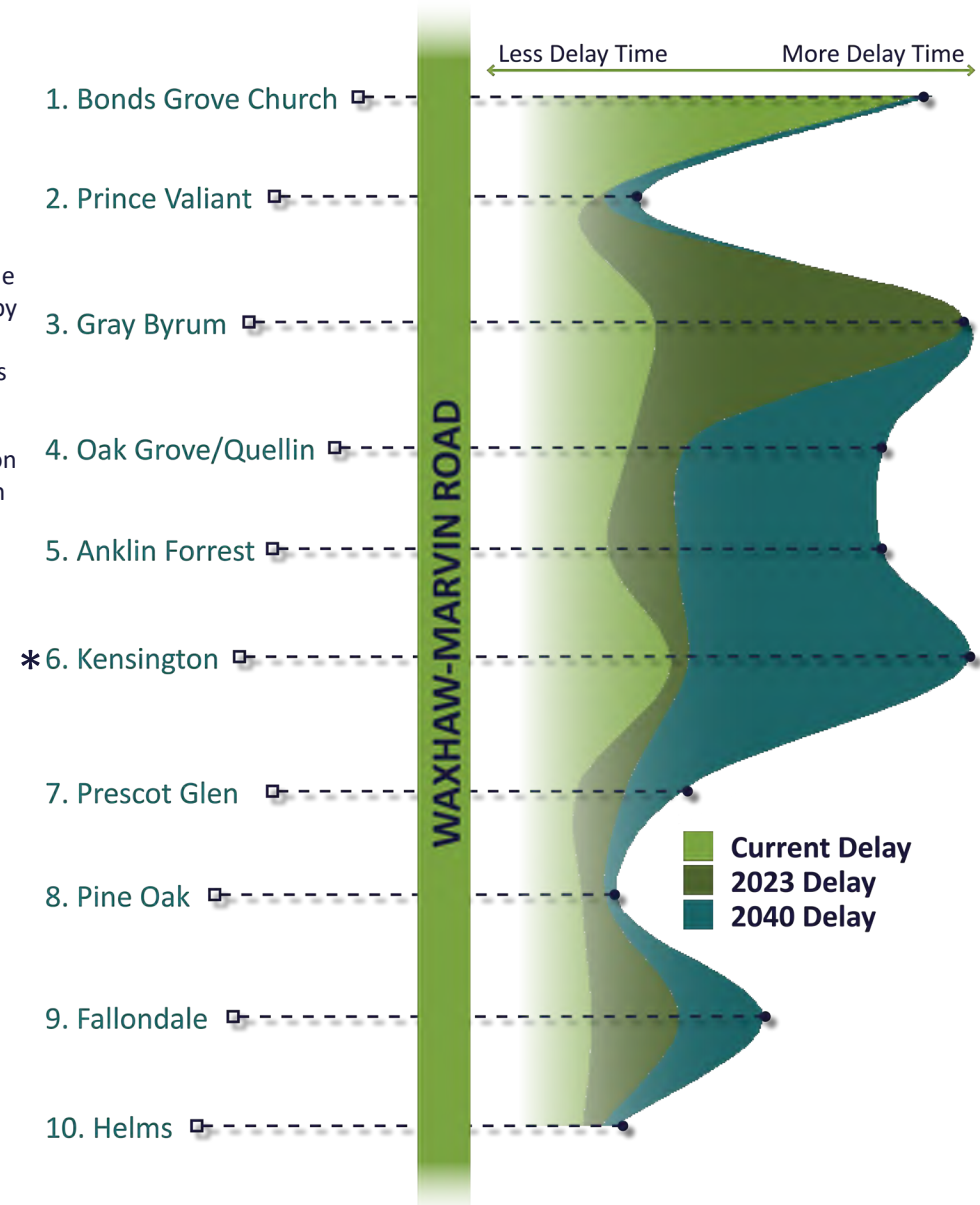
Volumes were then grown from 2023 to 2040 using a 2% growth rate based on the MRTDM. The graph to the right shows a significant level of congestion expected along the corridor in 2040 with no other improvements beyond the improvements planned to be installed by the approved developments. From this information, intersection improvements were identified and prioritized.

A detailed breakdown of the intersection capacity analysis results can be found in the appendix.

*Development improvements include EBR, WBR, NBL, SBR & SBL; included in 2023/2040 analyses (also described on p. 38).

Key Takeaways

The delay from the side street is typically reported for unsignalized intersections to illustrate the level of congestion and difficulty to turn on and off a corridor with little to no signals. As shown in the graphic, if no significant improvements are constructed along the corridor, significant delay will be expected at the Bonds Grove Church Road and Gray Byrum intersections by 2023 (based on the completion of specific developments currently known by Town staff), and the remainder of the corridor by 2040.



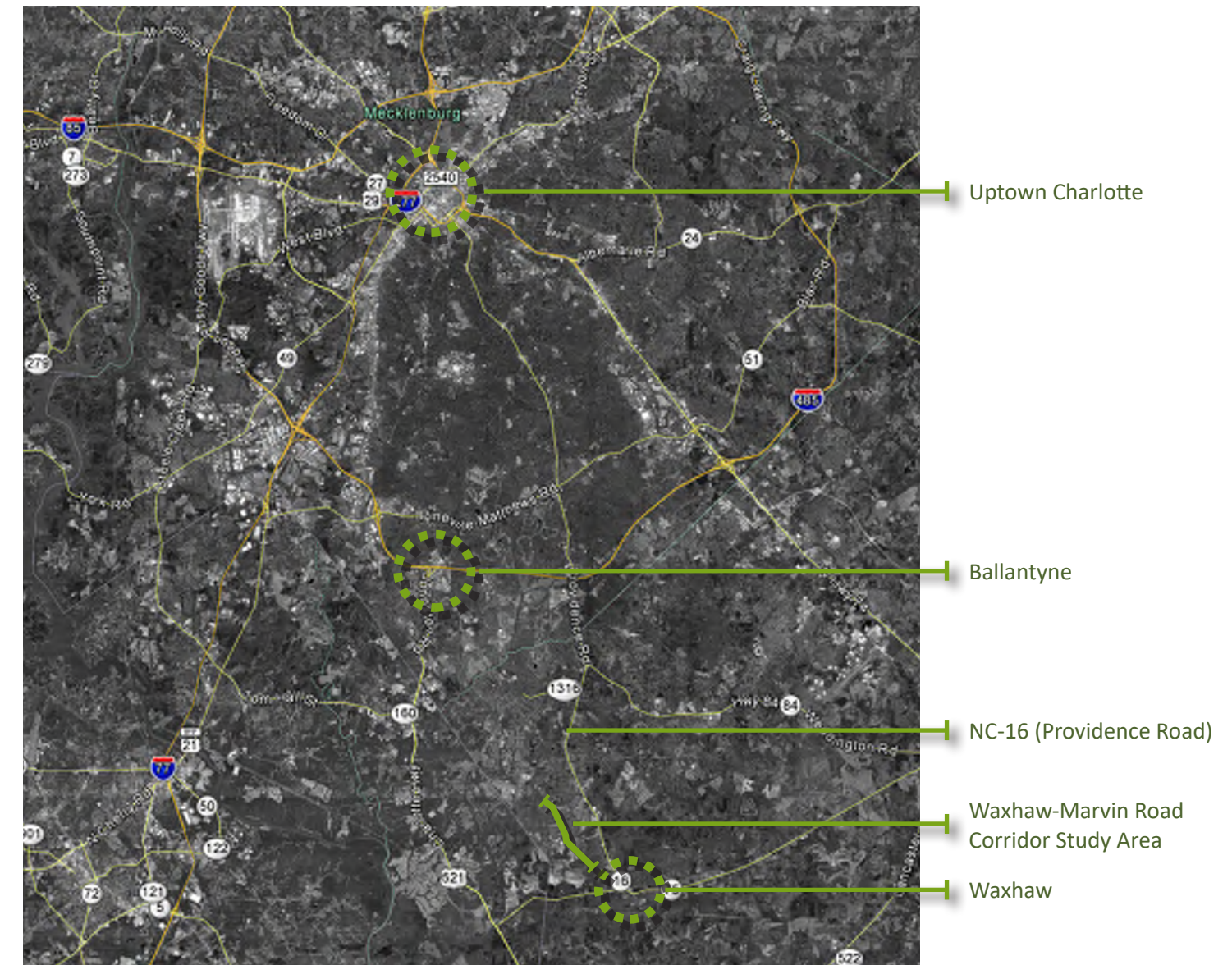
Regional Context

Growth patterns in the region show a significant amount of growth into Union County. **Since 2010, the population in Union County has increased approximately 12.6%**, almost identical to the growth rate in Mecklenburg County. This growth rate is important for considering the future of Waxhaw-Marvin Road. As more people move into the area, traffic will increase.

Waxhaw's proximity to Ballantyne is also an important consideration. Ballantyne is a major job center for the region, and many employees choose to live in and around Waxhaw. As congestion on NC-16 increases, commuters likely will use Waxhaw-Marvin Road as an alternative for daily commuting.

Key Takeaways

Population growth, and proximity to major job centers is likely to increase the use and importance of the Waxhaw-Marvin Road Corridor in the near future. Planning now to accommodate that growth will allow for a more successful mobility future in Waxhaw.



NC-16 (Providence Road)

As the preferred commuter route and a parallel facility to Waxhaw-Marvin Road, changes to NC-16 (Providence Road) will affect the Corridor Study Area.

The 2018 - 2027 NCDOT Transportation Improvement Program (TIP) is the short term planning document for the region. Two connected projects (U-5769A and U-5979B) set aside funds to widen NC-16 from Rea Road to Kensington Drive and then to Waxhaw Parkway. These projects respond to projected growth in the area and will likely lead to more commercial development along NC-16. Land uses along Waxhaw-Marvin Road are almost solely residential at this time. With the commercial activity likely to continue on NC-16 as it is widened and new facilities are built, single-family residential growth is expected to continue along Waxhaw-Marvin Road.

Key Takeaways

As NC-16 is widened and supported with new facilities, commercial development along that corridor is likely to increase the desire for more residential developments in the area, specifically along Waxhaw-Marvin Road. The conceptual design for the corridor should focus on improving mobility for families that will move to the area.

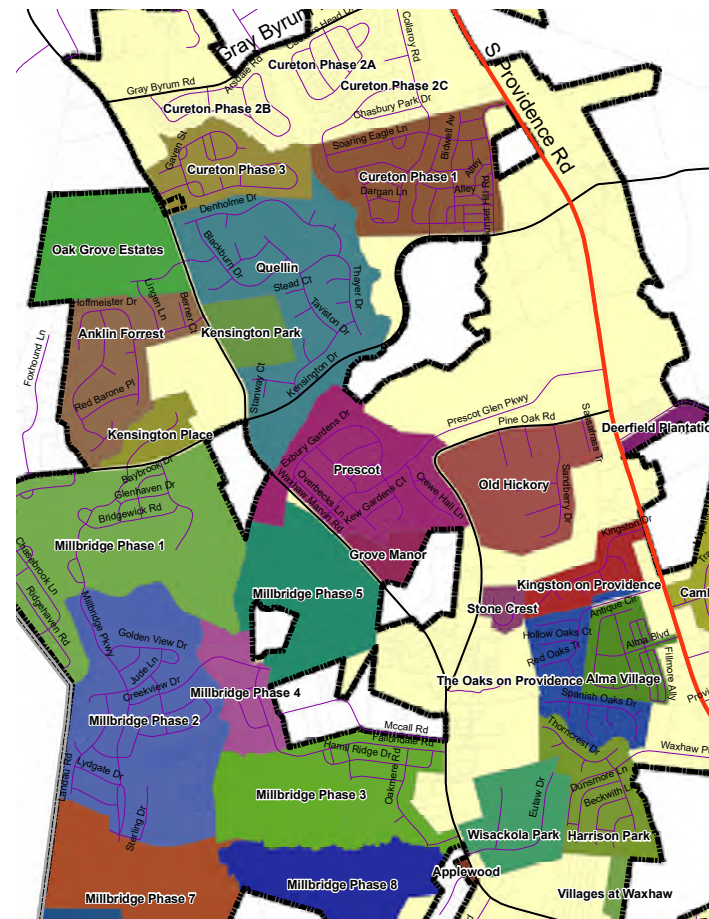
NCDOT Project within the Town of Woodlinton				ROW	CNST	Cost	
NC 16	Widen to multi-lanes, Rea Road Extension to Cuthbertson Road. Increase programmed funding amount from \$38.4 to \$52.2 million.	U-5769A	Regional Impact	Committed Project	2021	2023	\$52.2
NCDOT Project within the Towns of Waxhaw and Woodlinton							
NC 16	Widen to multi-lanes, Cuthbertson Road to Waxhaw Parkway. Accelerate right-of-way from FY 2022 to FY 2021 and accelerate construction from FY 2024 to FY 2023.	U-5979B	Regional Impact	Committed Project	2021	2023	\$38.3

Future Development

Several single-family residential neighborhoods are in various stages of approval and construction. The Millbridge development will be the largest contributor to this future residential growth. Currently, phases 1-4 are either fully or mostly completed. Phases 4-8 are expected to significantly increase the amount of housing in the immediate area around the corridor. The map to the right shows the breakdown of neighborhoods along the Corridor Study Area.

Key Takeaways

This sharp increase in housing will likely lead to increased traffic volumes and a need for improved mobility along the corridor. As more residents move to the area as these developments are built, there will be a need to increase the connectivity and viability of the multimodal system along the corridor.



Corridor Recommendations

Building upon the existing conditions data collected, the analysis of future trends, and the input received from the community, recommendations for Waxhaw-Marvin Road have been developed. These recommendations include access management, a conceptual corridor design, analysis and design alternatives for four key intersections, multimodal strategies and recommendations, corridor context zone recommendations, and strategies for implementation and funding. The recommendations adhere to the overall vision and goals for the corridor by promoting a safe, efficient, and multimodal corridor that connects people to the places they want and need to go.

Access Management

Overview

As Waxhaw-Marvin Road continues to develop, protecting the through capacity becomes essential for the efficiency of the transportation system and continued economic growth. Access management balances the needs of motorists using a roadway with the needs of adjacent property owners dependent upon access to the roadway. In an environment with limited funds for transportation projects and competing agendas, access management is not just good policy but crucial to the health of the entire transportation network.

Poor access management directly affects the livability and economic vitality of commercial corridors, ultimately discouraging potential customers from entering the area. A corridor with poor access management lengthens commute times, creates unsafe conditions, lowers fuel efficiency, and increases vehicle emissions. Signs of a corridor with poor access management include:

- ▶ Increased crashes between motorists, pedestrians, and cyclists
- ▶ Worsening efficiency of the roadway
- ▶ Congestion outpacing growth in traffic
- ▶ Spillover cut-through traffic on adjacent residential streets
- ▶ Limited sustainability of commercial development

Without access management, the function and character of major roadway corridors can deteriorate rapidly and adjacent properties can suffer from declining property values and high turnover. Access management has wideranging benefits to a variety of users as shown in the table on the next page.

Number of Driveways

Only the minimum number of connections necessary to provide reasonable access should be permitted. For those situations where outparcels are under separate ownership, easements for shared access can be used to reduce the number of necessary connections. Reducing the number of access points also decreases the number of conflict points, making the arterial safer and more efficient. Approximate construction cost varies and usually is the responsibility of private development.

Driveway Placement/Relocation

Driveways located close to intersections create and contribute to operational and safety issues. These issues include intersection and driveway blockages, increased points of conflict, frequent/unexpected stops in the through travel lanes, and driver confusion as to where vehicles are turning. Driveways close to intersections should be relocated or closed, as appropriate. As a best planning practice, no driveway should be allowed within 100 feet of the nearest intersection.

Access management results from a cooperative effort between state and local agencies and private land owners to systematically control the location, spacing, design, and operation of driveways, median openings, intersections, and street connections to a roadway.

Benefits of Corridor Access Management

<i>Motorists</i>	<ul style="list-style-type: none"> ▶ Fewer delays and reduced travel times ▶ Safer traveling conditions
<i>Bicyclists</i>	<ul style="list-style-type: none"> ▶ Safer traveling conditions ▶ More predictable motorist movements ▶ More options in a connected street network
<i>Pedestrians</i>	<ul style="list-style-type: none"> ▶ Fewer access points and more median refuges increases safety ▶ More pleasant walking environment
<i>Business Owners</i>	<ul style="list-style-type: none"> ▶ More efficient roadway system serves local and regional customers ▶ More pleasant roadway corridor attracts customers ▶ Improved corridor aesthetics ▶ Stable property values
<i>Government Agencies</i>	<ul style="list-style-type: none"> ▶ Lower costs to achieve transportation goals and objectives ▶ Protection of long-term investment in transportation infrastructure
<i>Communities</i>	<ul style="list-style-type: none"> ▶ More attractive, efficient roadways without the need for constant road widening

Corridor Design

The conceptual design for the Waxhaw-Marvin Road Corridor Study Area considers the foundational analysis from previous sections of this document. Improvements to intersections help to mitigate issues caused by increased volume and delay in the future. Furthermore, a sidewalk and multi-use path network along the corridor improves mobility and connectivity between the surrounding neighborhoods. Specific areas for recommended pedestrian crossings have been noted as well.

Additional focus on four key intersections (Bonds Grove Church, Gray Byrum, Kensington, and Pine Oak) can be found on subsequent pages.

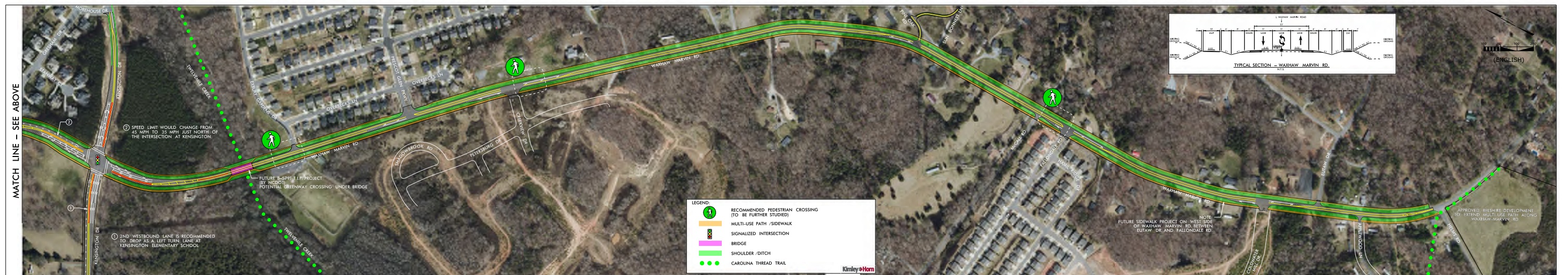
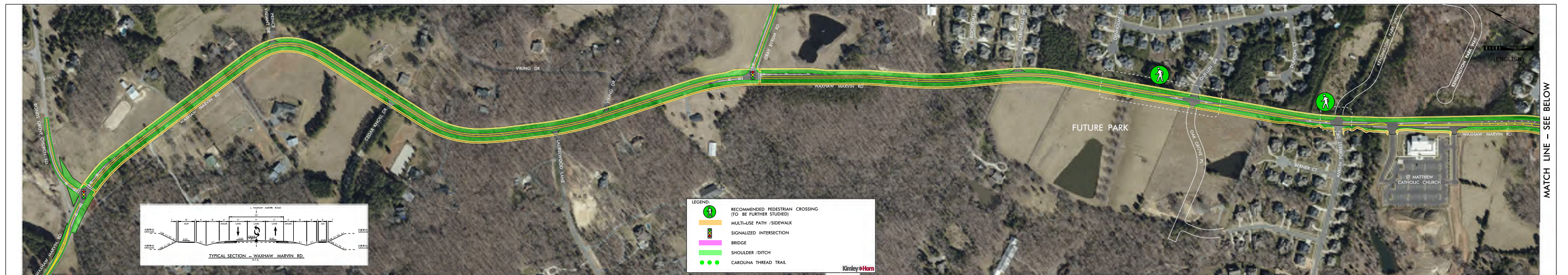
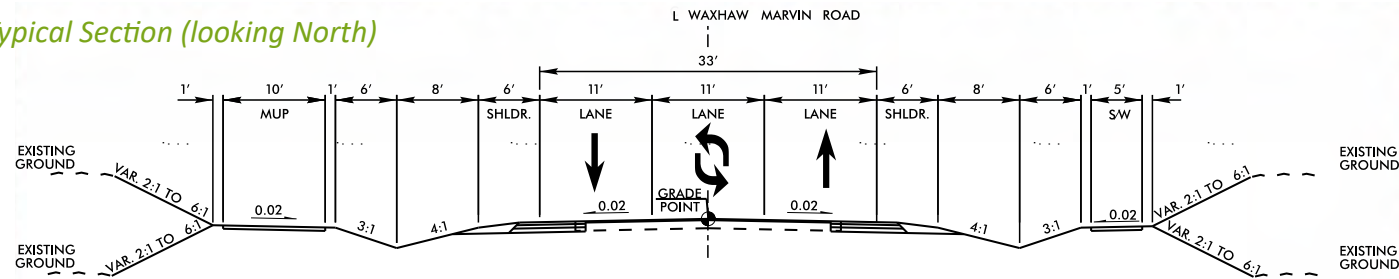
As part of the process for the design recommendations for multimodal elements, the design team looked closely at recommending dedicated bike lanes along the length of the corridor. However, it was determined that it would be a more efficient use of existing right-of-way to include a multi-use-path on one side of the corridor, which can be used by walkers and bikers. Because the majority of the bikers in the area are families or recreational bikers, it was determined that for the time being, a recommendation of the multi-use-path was most efficient. The avid cyclists will still likely use the road, but the added third lane would provide more room for vehicles to safely pass the cyclists, if need. Should the Town look to widen Waxhaw-Marvin Road significantly in the future, adding dedicated bike lanes can then be reviewed as an option.

Illustrative Section (looking North)

Preserving available capacity of the roadway will become increasingly important as traffic volumes increase throughout the network of collector streets. Achieving roadway longevity will require removing the left-turning vehicle from the travel lane. Three lane sections accomplish this with the provision of left-turn lanes either at intersections or across portions of roadways where there is a high frequency of driveways. Based on the Waxhaw-Marvin Road Corridor MUP Study, performed by Town staff and adopted by the Town Board on June 11, 2019, the multi-use path is recommended to be placed on the west side of the street. This study is included in the Appendix and summarizes the methodology and analysis that identified the west side as the best location for the ten-foot multi-use path.



Typical Section (looking North)



Context Zone Design

Context Zone A

The design recommendations for this zone focus mainly on planning for future growth. The only established residential development is at the south edge of the zone. Future development is planned for areas along this zone, and intersection improvements to Gray Byrum Road and Bonds Grove Church Road will help mitigate volume and delay issues in the future. Improvements to these two intersections are further described later in the section.

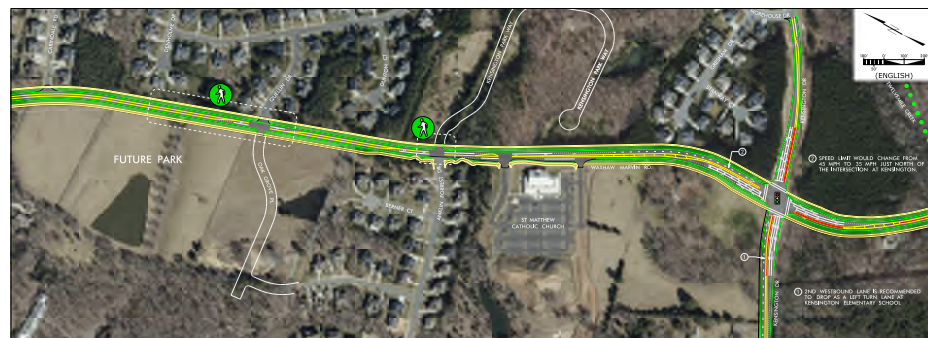
Multimodal elements include a continuous sidewalk on the eastern side, and a 10' wide multi-use path on the western side. These facilities link up with existing sidewalk networks in the residential developments on the southern boundary.



Context Zone B

The design recommendations for this zone focus on mobility for residential uses and major intersection improvements at Kensington. The intersection of Waxhaw-Marvin and Kensington is the most significant intersection along the Corridor Study Area because it serves the highest conflicting volume and provides the most direct connection to NC-16 of all cross streets in the Study Area. New turn lane options make the intersection safer, and more efficient, therefore reducing delay. Improvements to this intersection are further described later in the section.

Additionally, the speed limit along Waxhaw-Marvin Road is recommended to transition from 45 mph north of Kensington Drive to 35 mph south of Kensington Drive. Currently this transition occurs near Pine Oak Road; however, considering the existing and planned residential driveways along with a planned Carolina Thread Trail crossing/connection in the vicinity of a bridge crossing and curve, safety should be improved by lowering the speed limit in this area. Additionally, lowering the speed limit would allow for the recommended dual left-turn lanes at the Kensington Drive signal to provide adequate storage and taper back before the bridge at Twelvemile Creek.



Multimodal elements include a continuous sidewalk on the eastern side, and a 10' wide multi-use path on the western side. These facilities link up with existing sidewalk networks in the residential developments. Two key pedestrian crossing areas are highlighted near existing single-family development, these are at Quellin and Anklin Forrest.

Context Zone C

The next phases of the Millbridge developments have a strong impact on this context zone. Multiple phases of future single-family development are planned here, and the corridor design reflects easy access for vehicles, bikes, and pedestrians from these new developments.

Multimodal elements include a continuous sidewalk on the eastern side, and a 10' wide multi-use path on the western side. These facilities link up with existing sidewalk networks in the residential developments and future developments. Three key pedestrian crossing areas are highlighted near existing and future single-family development. These are located at Exbury Gardens, Creekview, and Fallondale. The crossing at Exbury Gardens also accommodates a crossing to provide access to Town Creek Park and the Carolina Thread Trail.

The design at the southern limits at Helms Road is intended to connect to the Carolina Thread Trail and the recently approved Belshire development south of Helms Road, which is planned to extend the multi-use path along its frontage.



Intersection Design Concepts

Waxhaw-Marvin Road at Bonds Grove Church Road

Existing

Existing Signal	Existing Turn Lanes	2018 Level of Service (LOS)	
No	None	AM F	PM D

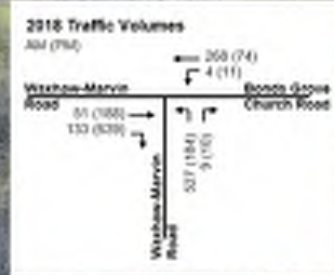
*See appendix for LOS definitions

Design Considerations

- ▶ Three-leg intersection.
- ▶ High number of conflicting westbound throughs and northbound lefts in AM peak hour.
- ▶ High number of eastbound rights in PM peak hour.
- ▶ TIP Project U-5769 proposes to signalize the intersection of Bonds Grove Church Road at NC 16 which will likely increase demand along Bonds Grove Church Road.

Design Deficiencies

- ▶ Traffic concerns due to limited capacity at the intersection.
- ▶ Sharp angle at T-intersection causes poor sight visibility for north and westbound vehicles.
- ▶ Intersection skew causes driver confusion and high-speed turns from west to south.



Proposed Design

Considered Design Alternatives

- ▶ A roundabout option was analyzed and did not perform well in 2040 due to conflicting movements within the roundabout and lack of gaps for incoming vehicles. Slip lanes would likely only relocate the bottleneck without fully alleviating the issue.
- ▶ Realignment of the approaches to keep the intersection under stop-control was also considered; the Waxhaw-Marvin approaches would both become the through movements and Bonds Grove Church would be realigned to be the stop-controlled approach. Bonds Grove Church would have a similar issue as the roundabout with a lack of gaps in the Waxhaw-Marvin traffic to turn.

Proposed Design Improvements

- ▶ Add turn lanes on all approaches to create two lane approaches at each leg of the intersection.
- ▶ Install signal at the intersection.
- ▶ Realign the intersection to improve intersection skew and sight visibility.
- ▶ Install bicycle and pedestrian accommodations.

Estimated Total Project Cost

\$1,900,000 (based on CRTPO 2019 Discretionary Funds Policy Guide)

2040 No Build LOS		2040 Build LOS	
AM F	PM F	AM C	PM B



Waxhaw-Marvin Road at Gray Byrum Road

Existing

Existing Signal No	Existing Turn Lanes <ul style="list-style-type: none"> ▶ Northbound right-turn lane ▶ Westbound left- and right-turn lanes 	2018 Level of Service (LOS) <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">AM C</td> <td style="width: 50%; text-align: center;">PM C</td> </tr> </table> <small>*See appendix for LOS definitions</small>	AM C	PM C
AM C	PM C			

Design Considerations

- ▶ Three-leg intersection.
- ▶ High number of northbound vehicles in AM peak hour.
- ▶ High number of southbound vehicles in PM peak hour.
- ▶ TIP Project U-5769 proposes to signalize the intersection of Gray Byrum Road at NC 16, which will likely will likely increase demand along Gray Byrum Road.

Design Deficiencies

- ▶ Traffic concerns due to limited capacity at the intersection.
- ▶ Delays and queues for high number of southbound left-turning vehicles in PM peak hour causes a back-up for high number of southbound through vehicles.
- ▶ Expected increase in volume on Gray Byrum Road will increase delay and queuing on westbound approach.

Proposed

Proposed Design Improvements

- ▶ Add southbound left-turn lane.
- ▶ Widen south leg to appropriately receive southbound through lane that will be shifted to the west for installation of the southbound left-turn lane.
- ▶ Install signal at the intersection.
- ▶ Install bicycle and pedestrian accommodations.

Estimated Total Project Cost

\$1,500,000 (based on CRTPO 2019 Discretionary Funds Policy Guide)

2040 No Build LOS		2040 Build LOS	
AM F	PM F	AM B	PM B



Waxhaw-Marvin Road at Kensington Drive

Existing

Existing Signal Yes	Existing Turn Lanes <ul style="list-style-type: none"> ▶ Eastbound left-turn lane ▶ Westbound left-turn lane 	2018 Level of Service (LOS) <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; border-right: 1px solid white;">AM</td> <td style="text-align: center;">PM</td> </tr> <tr> <td style="text-align: center; border-right: 1px solid white;">C</td> <td style="text-align: center;">C</td> </tr> </table> <p style="font-size: small; color: white;">*See appendix for LOS definitions</p>	AM	PM	C	C
AM	PM					
C	C					

Design Considerations

- ▶ Kensington Elementary School, located just west of the intersection, attracts a high volume of traffic through this intersection.
- ▶ There is a narrow two-lane bridge approximately 850' south of intersection, limiting the possibility of a second southbound receiving lane.
- ▶ Nearby approved developments are required to construct improvements to this intersection, which include: northbound left-turn lane along Waxhaw-Marvin Road, southbound left- and right-turn lane along Waxhaw-Marvin Road, eastbound right-turn lane along Kensington Drive, westbound right-turn lane along Kensington Drive.

Proposed

Proposed Design Improvements
(in addition to planned development improvements)

- ▶ Add a second eastbound left-turn lane.
- ▶ Add a northbound right-turn lane.
- ▶ Add a second northbound left-turn lane.
- ▶ Add a second receiving lane along Kensington Drive and drop as a left-turn lane at Kensington Elementary School.
- ▶ Install bicycle and pedestrian accommodations.
- ▶ Lower speed limit from 45 mph to 35 mph north of the intersection.

Estimated Total Project Cost

\$4,700,000 (based on CRTPO 2019 Discretionary Funds Policy Guide)

2040 No Build LOS (Delay)		2040 Build LOS (Delay)	
AM	PM	AM	PM
E (77 sec)	D (41 sec)	D (38 sec)	D (40 sec)

The numbers above reflect average delay per vehicle and includes the planned development improvements. With this proposed design, the eastbound approach improves in the AM from 142 seconds for no build to 35 seconds for build.



Waxhaw-Marvin Road at Pine Oak Road

Existing

Existing Signal	Existing Turn Lanes	2018 Level of Service (LOS)	
No	None	AM B	PM B

*See appendix for LOS definitions

Design Considerations

- ▶ Delays and queues for southbound left-turning vehicles in PM peak hour causes a back-up for high number of southbound through vehicles.

Design Deficiencies

- ▶ Sharp angle at T-intersection causes poor sight visibility for northbound and westbound vehicles.
- ▶ Intersection skew allows high-speed turns from south to east.

Proposed

Proposed Design Improvements

- ▶ Add southbound left-turn lane.
- ▶ Realign the intersection to improve intersection skew and sight visibility.
- ▶ Install bicycle and pedestrian accommodations.

Estimated Total Project Cost

\$400,000 (based on CRTPO 2019 Discretionary Funds Policy Guide)
 *Cost does not include widening for a new SBL. It is assumed that this would be done as part of the 2 to 3 lane corridor recommendation.

2040 No Build LOS		2040 Build LOS	
AM C	PM C	AM C	PM C



Multimodal Elements

Improving mobility, connectivity, and safety for all travel modes was a consistent theme that emerged through public engagement and as part of the technical analysis for the Waxhaw-Marvin Road Corridor Study. As previously stated, the existing sidewalk network and trail system are disjointed and disconnected, and no bicycle facilities exist on Waxhaw-Marvin Road. The conceptual design addresses this need with new facilities along Waxhaw-Marvin Road and strategic connections to Downtown Waxhaw and the Carolina Thread Trail. The anticipated result is a safer, more connected community.

The design concept for the corridor highlights pedestrian crossing areas that the Town should evaluate in more detail. These locations are notable due to their proximity to current and future residential development. This section highlights strategies and best practices that the Town should consider when examining these locations more closely in the future.

Marked Crosswalks

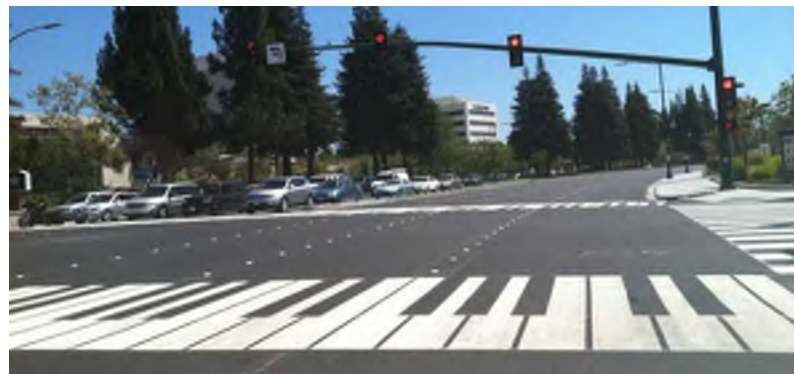
Marked crosswalks alert motorists of potential pedestrian activity and direct pedestrians to the safest crossing locations. Marked pedestrian crosswalks may be used under the following conditions:

- ▶ At locations with stop signs or traffic signals.
- ▶ At non-signalized street crossing locations in designated school zones.
- ▶ At non-signalized locations where engineering judgment dictates that the use of specifically designated crosswalks is desirable.

A study should be completed prior to placing crosswalks to determine the need and the best type and location of that crosswalk. North Carolina state law permits crossing at all intersections whether the intersection is marked with a crosswalk or not, and every attempt should be made to install crossings in places where pedestrians are most likely to cross. A well-designed traffic calming location is not effective if pedestrians are using other unmodified and potentially dangerous locations to cross the street. While the form, pattern, and materials for a marked crosswalk can vary, crosswalks should not be slippery, free of tripping hazards, and otherwise easy to maneuver by any person including those with physical mobility or vision impairments.

Pedestrian Crossing Study Areas

- Quellin/Oak Grove/Future park site
- Anklin Forrest/Kensington Park
- Exbury Garden/Town Creek Park/Twelvemile Creek
- Creekview/Grove Manor/Millbridge Phase 5
- Fallondale/Millbridge Phase 3



Mid-Block Crossings

Mid-block crossings occur away from intersections. These crossings typically occur near larger pedestrian generators or where intersections are spaced too far apart. Because pedestrians often choose to cross at the most convenient rather than the safest location, general guidelines for mid-block crossings have been developed.

- ▶ Provide only on roads with a speed limit of less than 45 MPH.
- ▶ Do not install within 300 feet from another signalized crossing point.
- ▶ Base installation of a mid-block crossing on an engineering study or pedestrian route placement.
- ▶ Consider near schools, pedestrian routes, retail areas, recreation, and residential areas.
- ▶ Ensure advance auto-warning signs and good visibility for both the driver and the pedestrian.
- ▶ Provide an audible tone.



Pedestrian Refuge Islands

When used in conjunction with mid-block or intersection crossings, medians can be used as a crossing island to provide a place of refuge for pedestrians. Median pedestrian refuge islands should be provided for pedestrians crossing busy roadways at either mid-block locations or intersections. Median crossings should be at least six feet wide to accommodate more than one pedestrian, while a width of 8 feet (where feasible) should be provided for bicycles, wheelchairs, and groups of pedestrians.



Advance Stop Bars

Vehicle and pedestrian visibility is increased by placing a vehicle advance stop bar 4- to 10-feet back from the pedestrian crosswalk at signalized crossings and mid-block crossings. In certain situations, a larger setback of the advance stop bar may be required. Advance stop bars are 1 to 2 feet wide and extend across all approach lanes at intersections. The time and distance created allows a buffer in which the pedestrian and motorist can interpret each other's intentions. Studies have shown that this distance translates directly into increased safety for both motorist and pedestrian. One study showed that adding a "Stop Here for Pedestrians" sign reduced pedestrian motorist conflict by 67%. When used in conjunction with advance stop bars, pedestrian-motorist conflicts declined 90%.



Pedestrian Signals

Traffic signals assign the right-of-way to motorists and pedestrians and produce openings in traffic flow to allow pedestrians time to cross the street. When used in conjunction with pedestrian friendly design, proper signalization allows for adequate time for an individual to cross the street. The Manual on Uniform Traffic Control Devices (MUTCD) suggest four feet per second in normal situations. However, a longer crossing time (3.5 feet per second) may be necessary to accommodate the walking speed of the elderly or children. Engineering, as well as urban design judgment, must be used when determining the location of traffic signals and the accompanying timing intervals. Although warrants for pedestrian signal timing have been produced by the MUTCD, each site must be analyzed for various factors. In addition, creating better access to existing places may in fact generate a higher pedestrian volume. Ideally, crossings should include countdown signals and audible signals.

Signage

Signage can be an effective tool to alert drivers to reduce speeds and allow pedestrians to exercise extra caution. It is important not to cause “clutter” when using a variety of signage. This can cause complacency and noncompliance with signs in general. Signs, and the sign text, should be large enough to be seen from a distance. It is imperative that all signs be properly located so as not to obstruct the pedestrian and visibility triangles of motorists.

Countdown Signals

Countdown signals show how many seconds the pedestrian has remaining to cross the street. The countdown can begin at the beginning of the WALK phase, perhaps flashing white or yellow, or at the beginning of the clearance, or DON'T WALK phase, flashing yellow as it counts down.

Audible Signals

Audible cues can be used to pulse along with a countdown signal. The signals are used for visually-impaired pedestrians. Consideration should be paid to the noise impact on the surrounding neighborhoods when deciding to use audible signals.

Lighting

Two-thirds of all pedestrian fatalities occur during low-light conditions. The quality, placement, and sufficiency of lighting helps create a safe environment for motorists and pedestrians. Attention should be paid to lighting walkways and crossings, to provide sufficient ambiance for motorists to see pedestrians. Pedestrian lighting should be considered for areas of higher pedestrian volume, including downtown and key intersections. Lighting in commercial areas should be provided on both sides of the street.

Implementation and Funding

Next Steps

The Waxhaw-Marvin Road Corridor Study began with the intent to collect, refine, and communicate a mobility strategy for the corridor. Successful implementation will require partnerships among government entities, stakeholders, private developers, and the people that live and work in the Corridor Study Area.

Given the critical role the study area streets play in the overall transportation network supporting the Waxhaw-Marvin Road Corridor, there is a sense of urgency to consider immediate implementation of elements of this study. This project complements the overall development strategies set forth by each community within the community and represents an investment in this corridor that will help promote economic vitality of the region.

Identifying the most appropriate outcome represents a major milestone in the process; however, several work tasks remain. In order to realize the vision established during this planning process the following tasks will require follow-through by the communities:

Study Endorsement

The results of the Waxhaw-Marvin Road Corridor Study should be carefully considered and endorsed by the Town of Waxhaw, CRTPO, NCDOT and Union County. This endorsement will memorialize the agreements established during the planning process and reduce the risk of having to revisit some of the issues contemplated during the study. Endorsement should happen both as individual entities as well as collectively.

Financing Partnership

The expense associated with implementation suggests that an exclusive local funding source is not likely. In addition, the traditional process for funding via the NCDOT Strategic Transportation Investments (STI) program may not yield a desired project schedule. If the parties involved are interested in improving their chance of a reduced implementation duration, creativity, initiative, and partnerships may prove beneficial. Considerations that may increase the likelihood of funding include: dedication of right-of-way by affected property owners (rather than NCDOT right-of-way acquisition), the use of local dollars supplemented with funds from grants and programs outside of existing NCDOT funding, and mitigation requirements identified through the Town's TIA ordinance. The four intersection design concepts provided on pages 34 - 41 should be used as supporting information when funding opportunities through CRTPO or NCDOT become available.

Establishment of Design Themes

The design of any new infrastructure should be done with the recognition of area context. New infrastructure has an opportunity to establish a recognized identity for the area. The Town of Waxhaw should develop an approach to design, including signage, so that a sense of arrival is clearly established when passing through and accessing the Corridor Study Area. Recommendations include coordinated wayfinding and signing, materials and lighting details, and landscaping. In areas along the corridor where turn lanes may not be needed, opportunities to install landscaping within the median should be explored.

Concept Support

Endorsement of the preferred corridor plan and intersection configurations contained herein by the Town of Waxhaw, CRTPO, NCDOT, and Union County will ensure a consistent implementation of the study. It will likewise allow the Town to continue with some certainty that future planning efforts will consider the work contained herein.

Guiding Document

The Waxhaw-Marvin Road Corridor Study should serve as the guiding document for Town staff, NCDOT, and potential developers when identifying potential driveway access requests along Waxhaw-Marvin Road.