Corridor Mobility Strategy

Town of Troutman, North Carolina

Kimley»Horn

Introduction

Within the Charlotte Regional Transportation Planning Organization (CRTPO) urbanized area, US 21/NC 115 through Troutman is consistently reported as one of the area's most congested commuter routes. The dependence of local commuters on US 21/NC 115, coupled with potential demand for increased development results in a potential conflict between current development, existing neighborhoods, and transportation interests. Regional growth pressures have heavily impacted the transportation network in southern Iredell County. The US 21/NC 115 corridor, which functions as the Town's "Main Street" and provides access to the Richardson Greenway, is also navigated by commercial tractor trailers. This creates regular conflict between pedestrians, personal vehicles, and commercial trucks.

The Town of Troutman is seeking to develop a comprehensive multi-modal strategy for balancing mobility needs to the Town under current and projected traffic conditions. The plan should be developed based on the vision of community which would be tied to land use recommendations and backed by a strategy that addresses traffic safety, and access for all modes of travel without compromising the character of the Troutman. This approach will make sure that both transportation and land use are not considered in isolation.

What should it consider?	Why now?
• Community-driven strategy • Balanced transportation recommendations • Conceptual roadway improvements • Implementation strategies	• Rapid growth – recent and on the horizon • Community wants to establish a vision and a plan to achieve it • Existing traffic congestion

Understanding that the Town of Troutman is located just north of the largest city in North Carolina and is beginning to feel the pressures of a neighboring community, brings to light the challenge required in developing a strategy based on proved planning concepts and tested engineering principles. The US 21/NC 115 Corridor Mobility Strategy blends the needs of motorists, bicyclists, and pedestrians into a plan for residents and visitors, all while respecting the history and amenities that give these communities their charm and unique personality.

The US 21/NC 115 Corridor Mobility Strategy is the blueprint for transportation alternative improvements and the foundation upon which future transportation decisions will be based. The plan responds to existing challenges, and anticipated future needs, and prepares the community to accommodate future growth. The plan will guide the Town of Troutman as well as the Charlotte Regional Transportation Planning Organization (CRTPO) to accommodate future growth and changes to the roadway network. This study will guide future Town projects, small area plans, capital projects, and the implementation of the North Carolina Department of Transportation (NCDOT) Transportation Improvement Program (TIP) Project R-2522.

At its core this study evaluates the mobility needs for US 21/NC 115 and determines interim and long term strategic approaches to improve mobility.

Why study the US 21/ NC 115 Corridor?

Impacts to the Town of Troutman is undeniable. Troutman is impacted by the growth of Charlotte, growth on its own, and responding to the changes within its corporate limits, the county, and the region. A town's transportation strategy is crucial when dealing with existing congestion and preparing for future growth and emerging challenges such as traffic congestion, changes in land use, and economic sustainability. This mobility strategy establishes a blueprint and documents the transportation needs facing the study area. It also establishes a set of strategies that address the existing and projected transportation needs in the interim and long term buildout of the study area. As the foundational document for the corridor, this study sets a course of action for future initiatives to work towards a goal for improved mobility in the study area. It also serves as a guide for other town plans, capital projects, regulations, and programs, all of which affect the community in large or small ways.

Purpose and Need

The purpose of the *US 21/NC 115 Corridor Mobility Strategy* is to:

1) Develop guiding principles for the development of a transportation strategy;
2) Identify mobility issues;
3) Develop a comprehensive transportation solution(s) that protects what makes the Town of Troutman great and enhances mobility for all modes.

The planning process for this study delves into issues identified during the stakeholder and community outreach. The underlying need for the plan is based on these outcomes and is expressed in the recommendations discussed later in this report. More importantly, it develops a foundation for which the through lane widening of I-85 should be evaluated.

The ultimate design for the US 21/NC 115 corridor and intersections must incorporate the principles of complete streets and blend the needs of non-motorized users with the mobility of the roadway.

What is in the Study

The *US 21/NC 115 Corridor Mobility Strategy* is designed to be a readable, functional document that will outline the Cities' transportation priorities and guide the Cities' future growth and development. This plan is organized into six chapters.

- Chapter 1 | Starting Point: Provides a foundation for understanding the plan, how it was developed and how it will be used.
- Chapter 2 | Existing Conditions: Describes the conditions of the study area roadways, intersections, and the operations for these elements.
- Chapter 3 | Community Vision: Describes how community input yielded a vision and set of community themes that percolate throughout the recommendations.
- Chapter 4 | Transportation Alternatives: Graphically depicts alternatives for potential improvements, both short and long term, for the study area.
- Chapter 5 | Next Steps: Identifies and prioritizes the necessary plans, programs, policies, and projects to fulfill the community's vision.

How the Study should be Implemented

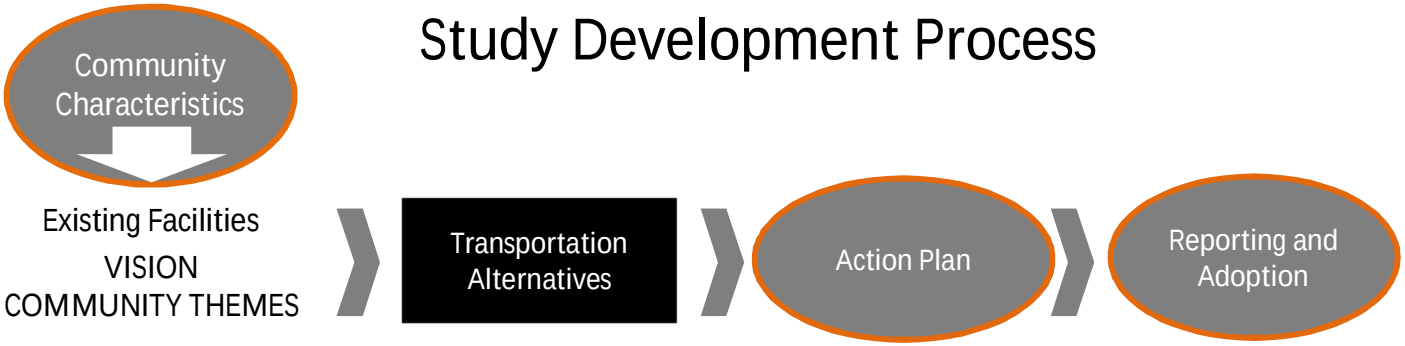
Adopting *the US 21/NC 115 Corridor Mobility Strategy* is the first step toward shaping the Town's future and implementing the study requires a combination of short- and long-term actions. Some of the short-term actions include minor adjustment to turn lane storage lengths, intersection timings, and corridor timings. Long-term actions include new connector streets, intersection and interchange modifications, and grade separations. More importantly, this study should serve as the starting point and guide for the NCDOT TIP project R-222 which will widen US 21-NC 115 to a multi-lane section through or around the Town of Troutman.

The Process

The *US 21/NC 115 Corridor Mobility Strategy* was initiated to create a transportation strategy that best positions the Town of Troutman to achieve success against a set of metrics that are clear, relatable, and important to Town leaders and residents. The underlying philosophy is based on the belief that planning should be done by community leaders, citizens, and stakeholders. Participants not only should value the process and support the outcome but also have a clear understanding of how to execute and achieve desired results.

The *US 21/NC 115 Corridor Mobility Strategy* followed an intuitive process, as illustrated below, to arrive at a blueprint for the future. The first phase documented existing conditions and identified the vision and community themes introduced in the pages that follow. The plan development phase balanced technical analysis with design elements. Once the short and long-term improvements were set, the action plan identified a phased set of improvements for implementation. The entire process is communicated and memorialized in this report.

Study Development Process



The Town

Troutman is a quintessential small town of 2,000 people in the heart of Iredell County. Located 30 miles north of the City of Charlotte and 6 miles south of the City of Statesville and on the northern edge of Lake Norman, North Carolina's largest inland lake. The Town of Troutman benefits from its proximity and relative ease of access to the region's core and surrounding activity centers. The Town's relative ease of access to both I-77 and I-40 is both a benefit and a detriment to overall mobility in and through the Town.

But there is more to Town of Troutman than its proximity to Charlotte, Statesville, and access to I-77. The Town boasts an appealing downtown surrounded by historic neighborhoods, an abundance of city and county government activities, and a growing industrial base. The Town of Troutman is truly moving forward, and this motion occurs with the backdrop of knowing it is...

- a diverse community
- in the path of growth
- more than bedroom community
- poised for growth and change

Study Philosophy

As multimodal issues are evaluated, local decision-makers can't lose focus that in most cases they are trying to protect what they have today. In other words, major infrastructure recommendations must be reinforced through comprehensive planning, analysis, and supported by the community. The philosophy of the *US 21/NC 115 Corridor Mobility Strategy* is to protect and enhance what exists today by making strategic decisions that provide transportation choices. The underlying progression of this philosophy is Planning, Design, and Construction.

As with any transportation plan, implementation is the key to success. Developing a strategic plan rooted in engineering principles lays the groundwork for future infrastructure needs that can be evaluated against competing priorities and programmed for funding. This study provides direction regarding priority, implementable solutions that improve safety, minimizing additional traffic congestion, and enhancing aesthetics.

The plan philosophy has been translated into a process structured to evaluate alternatives with a planning, design, and construction perspective. While some plans may sit on the shelf because they are unrealistic, the *US 21/NC 115 Corridor Mobility Strategy* is conceived to go beyond planning by including engineering and design expressed in conceptual drawings for key focus areas.

Guiding Principles

The following guiding principles represent five interrelated value statements that add depth and vision representing some of the most significant content generated during the early phases of the project. These guiding statements were developed based on conversations with each of the communities, technical staff, stakeholder interviews, and elected officials.

Integrated | Blend previous planning efforts with new analysis and purposeful community involvement to create realistic and implementable solutions.

Community-based | Establish an understanding of the Town's needs and achieve informed consent through active and transparent outreach.

Choice | Connect homes, businesses, and other key destinations with facilities designed for motorists, pedestrians, and bicyclists.

Identity | Foster a sense of place tied to livability and community character with a focus on enhancing gateways, critical intersections, and key corridors.

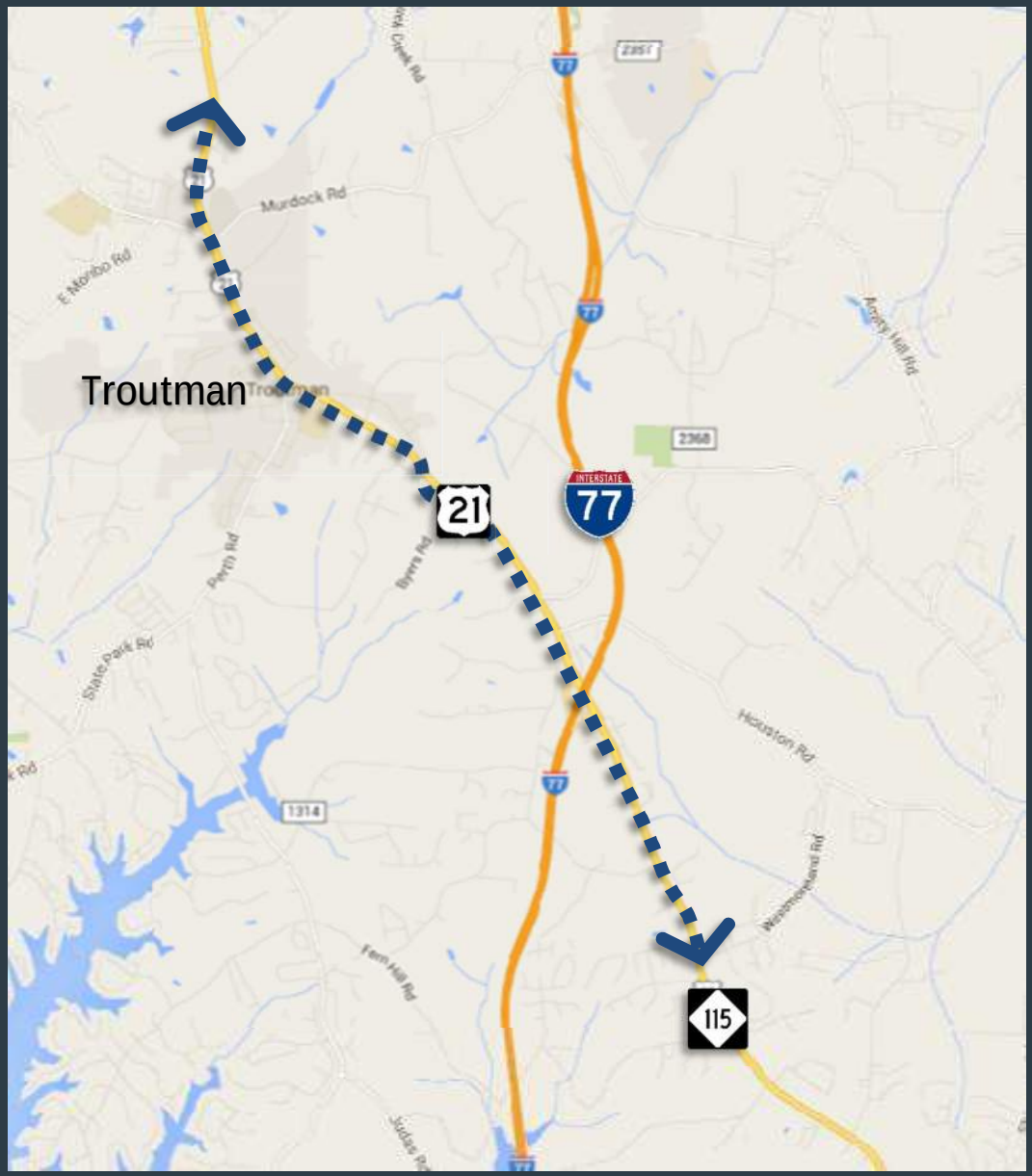
Safety | Promote safe travel and enhance the sense of comfort for using and interacting with different travel modes.

The Study Area

The US 21/NC 115 study area accounts for 5.8 miles of roadway. The corridor limits start to the south at Westmoreland Road and continue north through the Town of Troutman to Moose Club Road.

Through this section of roadway both US 21 and NC 115 are designated route markers.

Currently, US 21 and NC 115 carries between 8,000 to over 14,000 vehicles per day throughout various portions of the corridor.



Introduction

The Town of Troutman has experienced a lot of change over the last 10-15 years. Rapid growth within the community and the steady migration of the population northward from Charlotte has shifted the dynamics of the community and raised new concerns associated with natural resource protection, land use and urban design, and the function of the area's transportation network. This chapter describes the existing context of the study area. This chapter describes the existing context of the study area. Combined with feedback received during various outreach activities, the existing context helped shape the recommendations in this plan.

Existing Conditions – Chapter Overview

This Chapter provides a set of facts and figures related to growth, development, constraints, traffic and safety. The chapter concludes with a collection of maps that reflect the environmental and transportation land uses of the study area. The following topics are covered in this chapter:

Transportation Characteristics

Land Use

Safety

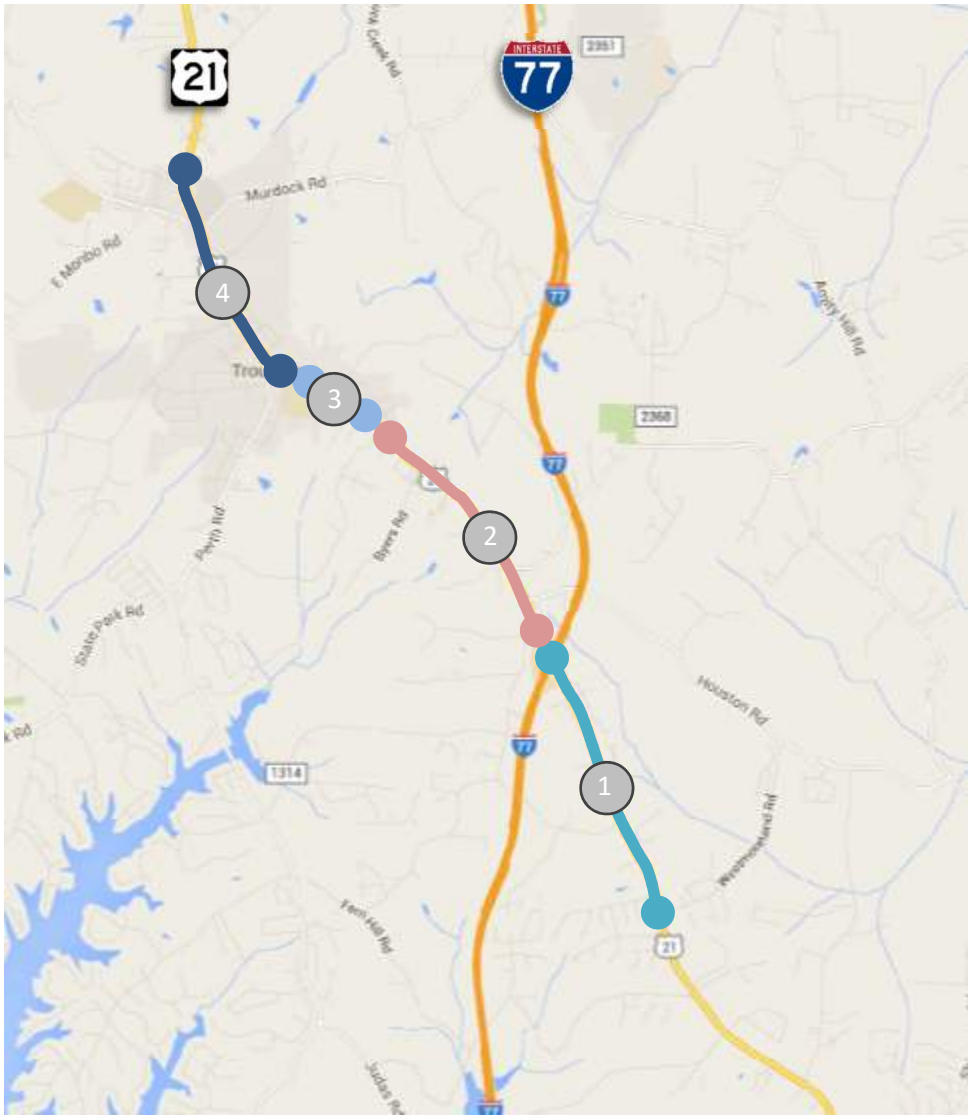
Future Conditions

Existing Study Area Roadway Characteristics

US 21/NC 115 generally provides a single travel lane in each direction throughout the study area, with some exceptions along segments of the corridor. Dedicated left-turn lanes are provided at key locations throughout the corridor. A more detailed description of existing study area roadway characteristics is outlined below. For purposes of this analysis, the corridor was divided into four segments:

1) **Westmoreland Road to I-77**
2) **I-77 to Eastway Drive**
3) **Eastway Drive to Cedar Lane**
4) **Cedar Lane to Barium Lane**

These segments were selected based on the roadway characteristics, current land use and development pattern, and multimodal considerations.



Segment 1: Westmoreland Road to I-77

South of I-77, US 21/NC 115 is built to a rural cross-section with a limited shoulder provided in some areas. Pedestrian and bicycle facilities are generally not provided with the exception of discontinuous sidewalk provided along some of the commercial property frontages near the I-77 interchange.

South of McAllister Hill Lane, US 21/NC115 widens to provide two travel lanes in the northwesterly direction, and north of Lexus Drive/Garden Center Drive two travel lanes are provided in the southwesterly direction. Dedicated left- and right-turn lanes are provided at key locations in both directions. At the signalized intersection of US 21/NC 115 and Lexus Drive/Garden Center Drive, a dedicated left-turn lane, two through lanes, and a dedicated right-turn lane are provided on the northbound approach, and dual left-turn lanes, one through lane, and one shared through/right-turn lane are provided on the southbound approach. At the I-77 Northbound Ramps, a dedicated left-turn and two through lanes are provided on the northbound approach, and two through lanes and a dedicated right-turn lane are provided on the southbound approach.

Between Westmoreland Road and south of Crosstie Lane, the posted speed limit is 55 miles per hour (MPH). South of Crosstie Lane to north of the I-77 interchange, the posted speed limit is 45 MPH.

Segment 2: I-77 to Eastway Drive

Between the I-77 interchange and Julian Place/I-77 Southbound Ramps, US 21/NC 115 provides two through travel lanes in each direction. North of the Julian Place intersection, US 21/NC 115 transitions to a single travel lane in the northwesterly direction. North of Flower House Loop, the southeasterly direction provides a single travel lane.

Except for the dedicated turn lanes provided at the Julian Place intersection, turn lanes are not provided along this segment of the corridor. Individual site access driveways are provided with no evidence of consolidated access between properties fronting the corridor.

The corridor is built to a rural cross-section throughout this segment with a limited paved shoulder in some areas. A gravel shoulder exists along some portions of this corridor segment. Pedestrian and bicycle facilities are not provided. From the I-77 interchange to approximately Byers Road, the posted speed limit is 45 MPH. North of Byers Road the posted speed limit is 35 MPH.

Segment 3: Eastway Drive to Cedar Lane

From Eastway Drive to Cedar Lane, US 21/NC 115 provides a single travel lane in each direction with site access driveways located throughout the corridor segment. Again, there is no evidence of consolidated access between properties fronting the corridor. A dedicated left-turn lane is provided in the northwesterly direction at Aberdeen Drive. In addition, dedicated left-turn lanes at Cedar Lane provide access to Troutman Elementary and Middle Schools on the west and the commercial uses on the east side of the street.

The corridor is built to a rural cross-section throughout most of this segment with a limited paved shoulder in some areas. A gravel shoulder exists along some portions of this corridor segment. Curb and gutter is provided beginning approximately 450 feet south of Cedar Lane and extends about 450 feet north of the intersection. Pedestrian and bicycle facilities are not provided; sidewalk is located across the Troutman Elementary School frontage north of Cedar Lane. The posted speed limit from Eastway Drive to Cedar Lane is 35 MPH. A school zone begins at approximately Perry Road and extends northwesterly to north of Rumple Street, north of Cedar Lane. The school zone includes pavement markings and a posted 25 MPH speed limit, effective school days from 7:00 to 8:00 AM and 1:45 to 2:45 PM.

Segment 4: Cedar Lane to Barium Lane

Curb and gutter is provided from approximately 450 feet south of Cedar Lane to approximately 450 feet north of the intersection. In other areas of this segment of the corridor, curb and gutter is not provided. North of the curb and gutter segment to Old Murdock Road, limited shoulder is provided. North of Old Murdock Road, a paved shoulder is generally provided on at least one side of the roadway.

Throughout this corridor segment a single travel lane is provided in each direction. Dedicated turn lanes are provided at key locations as follows:

- Signalized intersection at Wagner Street: Left-turn lane on the northbound approach, and right-turn lane on the southbound approach.
- Unsignalized intersection at Old Murdock Road: Left- and right-turn lanes on the northbound approach, and a left-turn lane on the southbound approach.
- Signalized intersection at Murdock Road: Left-turn lanes for both approaches.

- Unsignalized intersection at Burroughs Lane: Left-turn lane on the northbound approach.

In addition to the turn lanes listed above, a two-way left-turn lane is provided in the center median of US 21/NC 115 from north of Murdock Road to less than one-quarter of a mile south of Barium Lane.

On the west side of the street, sidewalk is generally continuous from the Troutman Elementary School frontage to approximately 900 feet north of Talley Street. Sidewalk is also provided across the frontage of the commercial property at the northwest corner of US 21/NC 115 and Old Murdock Road. Through downtown Troutman, the sidewalk is generally carried through the commercial site driveways. In some cases, the sidewalk abuts the shoulder, whereas in other cases a landscape parkway provides separation from the roadway. On the east side of the street, the Richardson Greenway is located between US 21/NC 115 and Eastway Drive. The Richardson Greenway extends from Rumple Street on the south to Old Murdock Road on the north. Another segment of the paved sidewalk and greenway is provided from the Iredell County Fairgrounds at Old Mountain Road/Murdock Road to the YMCA/Barium Springs Campus at Grannis Lane. The two segments of Richardson Greenway are separated by a gap. The posted speed limit along this segment of the corridor is 35 mph with the exception of the previously noted school zone which extends from Perry Road to north of Rumple Street. On-street parking is generally not permitted along the corridor. Within downtown Troutman, a 30-minute loading zone is provided on the west side of the street south of Wagner Street. Commercial sites generally provide onsite parking and a public lot is provided on the east side of US 21/NC 115 opposite Wagner Street.

Land Use

Land Use is regulated through the Town of Troutman 2035 Comprehensive Plan, the Zoning Map, and the Troutman Unified Development Ordinance. Existing zoning within the study area and the future land use map for the Town are shown on subsequent pages. Land use and development patterns along the US 21/NC 115 corridor vary in the study area. For purposes of this analysis, the four corridor segments previously discussed under *Section 4.1 Existing Study Area Roadway Characteristics* were utilized to describe land use and development characteristics. A summary of the existing land use and development patterns for each segment is provided below.

Segment 1: Westmoreland Road to I-77

The area south of I-77 is characterized by unincorporated vacant land and single-family residences. Large-lot single-family residences front US 21/NC 115 from Westmoreland Road to the I-77 interchange. Sutter's Mill, a single-family residential subdivision, is located on Westmoreland Road at Houston Road. The current land use pattern is consistent with the Zoning Map and Future Land Use Plan.

The incorporated property located south of the I-77 interchange is developed with commercial uses, including a fueling center and home improvement store. The parcels adjacent to I-77 are zoned Highway Business District which provides for a wide array of retail and service uses. According to the Future Land Use Plan, these types of commercial uses are anticipated to extend south along the corridor to Westmoreland Road. The Future Land Use Plan designates the northwest side of Westmoreland as Medium Density Residential.

Segment 2: I-77 to Eastway Drive

North of the I-77 interchange, the property fronting the corridor is developed with limited commercial and service uses, including a fueling center and a vehicle sales facility. Additional commercial uses, including a mix of office and warehouse uses, are located along Houston Road and Ostwalt Amity Road.

With the exception of the commercial properties on the northeast quadrant of the Ostwalt Amity Road intersection and the northwest quadrant of the Royal Oaks Drive intersection, the property fronting US 21/NC 115 from Ostwalt Amity Road to just south of Carrigan Road is unincorporated with single-family residences. Incorporated residential developments include a manufactured home community on the southwest side of US 21/NC 115 along Carrigan Road, and Jacob's

Woods, a single-family residential subdivision, located off of Byers Road. New Life Missionary Baptist Church is located opposite Byers Road, on the northeast side of the corridor.

The Future Land Use Plan designates the frontage along this segment of the corridor as Heavy Industrial to approximately Byers Road where the future land use designation becomes Medium Density Residential.

Segment 3: Eastway Drive to Cedar Lane

A mix of residential and commercial uses front the US 21/NC 115 corridor from Eastway Drive to Cedar Lane. Troutman Church of God is located on the southwest quadrant of the US 21/NC 115 and Autumn Leaf Road intersection. Aberdeen Village, a single-family residential subdivision, is located off of US 21/NC 115, along Aberdeen Drive. Troutman American Legion is located at the southwest corner of US 21/NC 115 and Cedar Lane. The parcels on the southwest side of the corridor are generally zoned Suburban Residential with the exception of Aberdeen Village which is zoned Mixed Residential. The parcels on the northeast side of the street are zoned Office and Institutional, Suburban Residential, Heavy Industrial, and Highway Business. According to the Future Land Use Plan, these properties are designated as High Density Residential-Mixed Use and Office-Institutions-Civic.

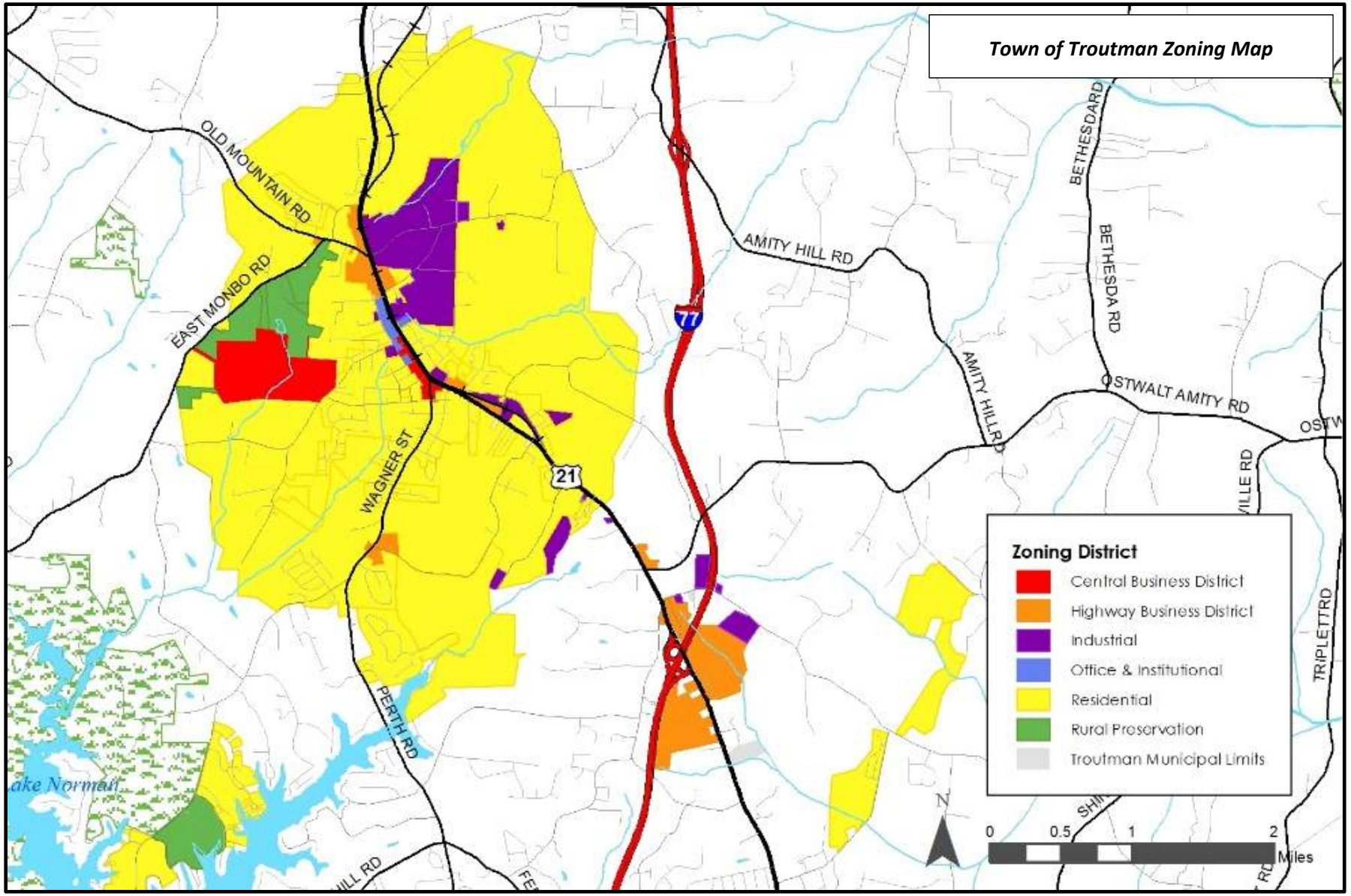
Segment 4: Cedar Lane to Barium Lane

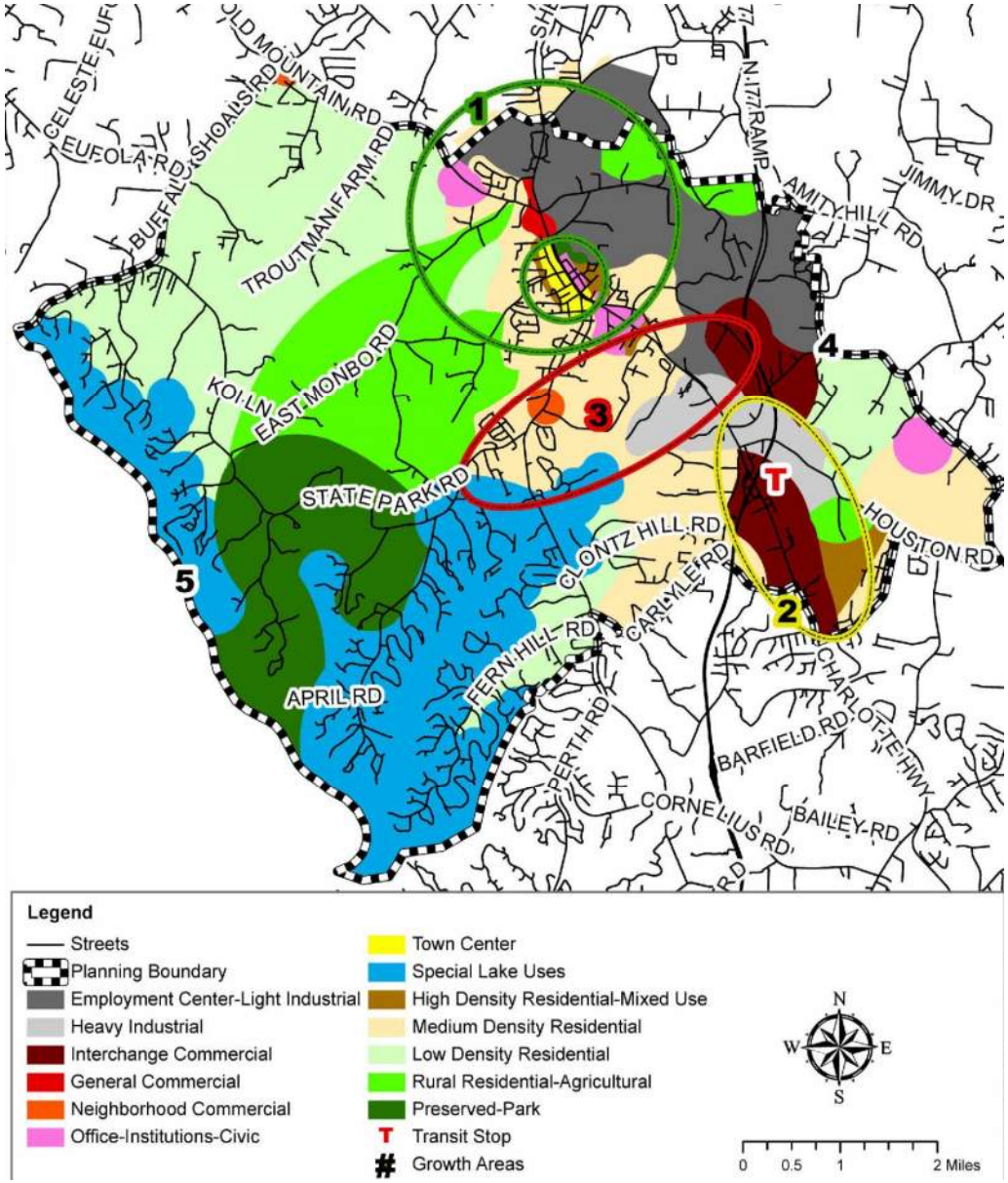
The Troutman Elementary and Middle School campus is located on the northwest quadrant of the US 21/NC 115 and Cedar Lane intersection. Downtown Troutman is located to the north, with the Town Center located at the signalized intersection of Wagner Street. The Troutman Depot, a popular bandstand and home to the local farmer's market, is located on the east side of US 21/NC 115 and marks the beginning of the Richardson Greenway. One block away from the Town Center, on the corner of Wagner Street and West Avenue, is the Troutman Post Office. Development through downtown Troutman is located on the west side of US 21/NC 115; the Richardson Greenway is located on the east side of the street. A variety of service-focused businesses are provided through downtown. The Main Street buildings reflect the small-town character of the community. North of Talley Street there are a number of home-to-office conversions mixed with single-family residences, extending the small-town character north.

North of Old Murdock Road, commercial uses are located on both sides of US 21/NC 115, including Troutman Village Shopping Center on the east side of the street. Commercial uses continue through Murdock Road/Old Mountain Road. Iredell County Fairgrounds is located at the northeast corner of US 21/NC 115 and Murdock Road/Old Mountain Road.

The Town of Troutman municipal boundary ends north of Murdock Road/Old Mountain Road. The unincorporated community of Barium Springs is located to the north. While some commercial uses are located along the corridor, the predominant development is the Barium Springs Home for Children, a home for disadvantaged and troubled children. A post office is also located in Barium Springs on the east side of US 21/NC 115, and the Barium Springs Family YMCA is located immediately east of the Post Office. The Calvary Chapel of Lake Norman is located at the northern terminus of the study area on the southeast quadrant of the US 21/NC 115 and Moose Club Road intersection.

Through downtown Troutman, the parcels on the west side of US 21/NC 115 are zoned Central Business. North of Talley Street the parcels fronting the corridor are zoned Office and Institutional. As the corridor continues north, the zoning intensifies, with parcels north of Old Murdock Road zoned Highway Business on the west and Heavy Industrial on the east. According to the Future Land Use Plan, parcels through downtown Troutman are designated Town Center. Between Old Murdock Road and Murdock Road/Old Mountain Road, the future land use designation is General Commercial. North of Murdock Road/Old Mountain Road, the future land use designation is primarily Employment Center-Light Industrial, except for the west side of the street from Murdock Road/Old Mountain Road to Barium Lane which is designated General Commercial.


Town of Troutman Zoning Map
OLD MOUNTAIN RD
EAST MONBO RD
AMITY HILL RD
BETHESDA RD
OSTWALT AMITY RD
WAGNER ST
PERTH RD
TRIPLETT RD
21
77
Zoning District
Central Business District
Highway Business District
Industrial
Office & Institutional
Residential
Rural Preservation
Troutman Municipal Limits
N
0
0.5
1
2
Miles



Town of Troutman Future Lane Use Map

Source: Town of Troutman 2035 Comprehensive Land Use Plan (Adopted May 14, 2015)

Special Traffic Generators

A general description of a special traffic generator is a facility, business, industry, or other land use that generates large amounts of traffic. Several of these land uses and the associated traffic generation characteristics that qualify as special traffic generators (i.e., Troutman Elementary School, Troutman Middle School, New Life Missionary Baptist Church, Troutman Church of God, and Calvary Chapel of Lake Norman) are located along the US 21/NC 115 corridor.

The various religious institutions fronting the corridor generate concentrated traffic before and after Sunday worship services. In addition, special events such as weddings, youth programs, and outreach efforts generate traffic during weekdays and Saturdays. The inbound and outbound traffic associated with the religious institutions often occurs for a short period of time. While the concentrated arrival and departure of vehicles may disrupt operations along the corridor, the impact and additional delay experienced by some motorists is limited to a brief period of time. Further, the religious institutions generally generate the highest volume of traffic on Sundays, when the US 21/NC 115 corridor does not experience a peak in travel demand.

During the school year, Troutman Elementary School and Troutman Middle School have distinct periods of high traffic volume activity. During the morning peak, students, faculty, staff, and buses arrive to Troutman Elementary School prior to the beginning of the school day between approximately 7:00 and 7:30 AM. The arrival period for Troutman Middle School generally occurs between 7:30 and 7:50 AM; however, some overlap with Troutman Elementary School arrival period also occurs. Afternoon peak traffic generation occurs around mid-afternoon with Troutman Elementary School releasing at 2:15 PM and Troutman Middle School releasing at 3:25 PM. Although the afternoon release does not conflict or add to traditional evening peak hour traffic characteristics (i.e., 5:00 to 6:00 PM), the volume of traffic leaving the sites within such a short period of time creates a notable impact to operations at the intersections immediately adjacent to the Schools and along portions of the corridor for approximately 15 to 20 minutes. Additional special generator events at the Schools that occur after evening peak hours may include extracurricular activities and evening events (e.g., open house or back-to-school night).

Traffic Volumes and Operational Characteristics

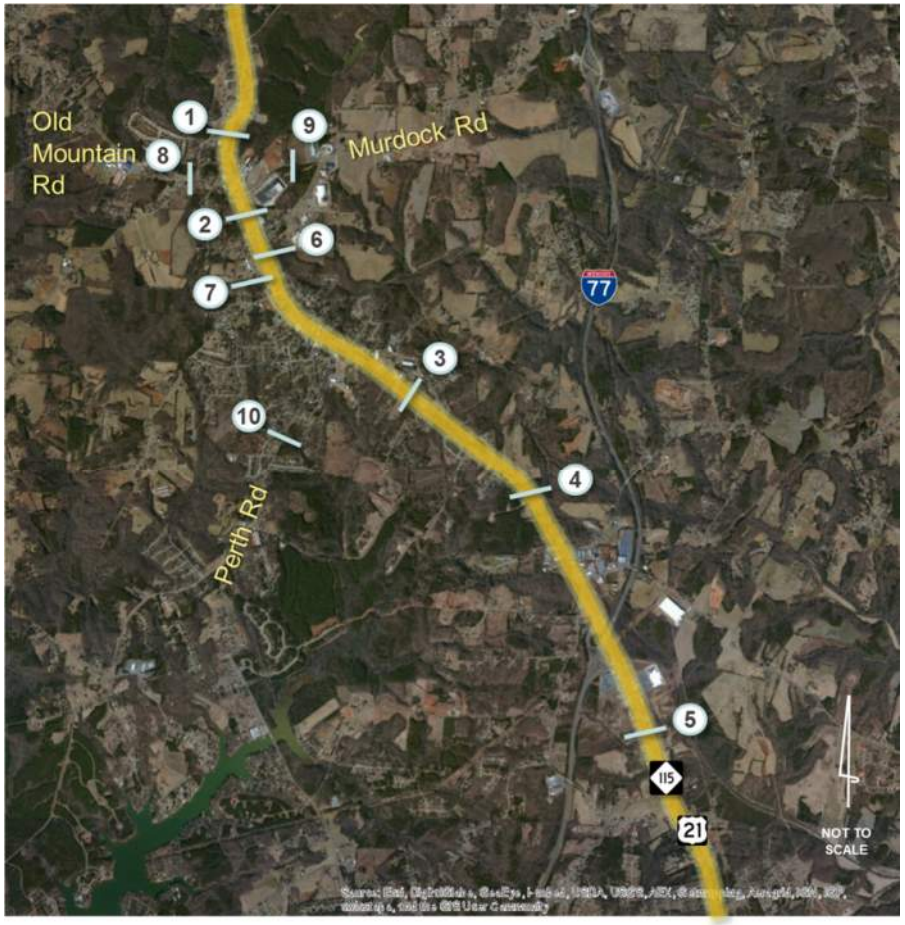
Based on information reviewed as part of the Phase I Study, traffic congestion on US 21/NC 115 is not directional during peak hours. As a major thoroughfare connecting Statesville and I-40 to the north and I-77 and Mooresville to the south, this section of US 21/NC 115 facilitates significant traffic throughout the entire day. Heavy truck traffic is present along the corridor given the regional connectivity it provides. This section of the corridor serves not only as a regional facility connecting higher order streets but also as a main street for the Town of Troutman.

In order to evaluate current traffic operations along the corridor, quantify congestion, and identify opportunities for future improvements, a review of average daily traffic volumes was completed. Further, capacity analysis was conducted at key intersections along the corridor. A summary of these analyses is provided below.

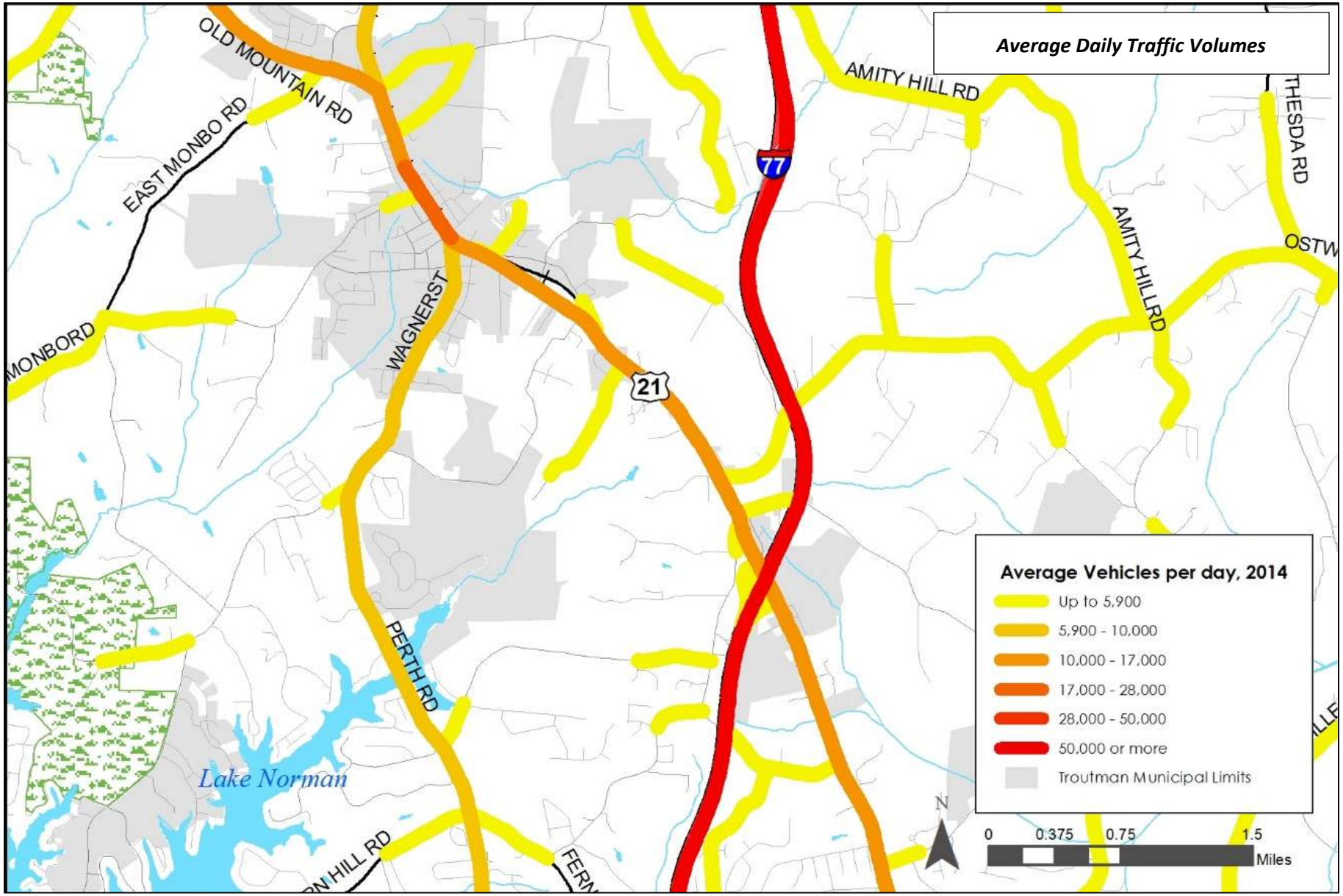
Study Corridor Average Daily Traffic Volumes

Average daily traffic volumes were collected for four consecutive days at 10 locations throughout the study corridor and roadways connecting to the study corridor. The 24-hour traffic counts were conducted Thursday, January 29, 2015 through Sunday, February 1, 2015. The count data is summarized in in graphical and tabular form on the following page. As shown, US 21/NC 115 carries between 8,000 to over 14,000 vehicles per day throughout various portions of the corridor.

Study Corridor Average Daily Traffic (ADT) Volumes



Count Location	Average Daily Traffic (ADT) (vehicles per day)			
	Thursday	Friday	Saturday	Sunday
1	8,138	8,362	5,755	4,388
2	14,245	15,505	11,304	8,298
3	10,923	11,828	9,283	6,691
4	12,055	12,860	10,375	7,571
5	12,380	13,167	11,316	9,248
6	1,179	1,200	809	837
7	99	93	74	57
8	10,062	11,348	7,969	6,032
9	3,356	3,802	1,982	1,453
10	5,844	6,522	5,567	4,355


Average Daily Traffic Volumes
OLD MOUNTAIN RD
EAST MONBO RD
MONBORD
WAGNERST
PERTH RD
AMITY HILL RD
AMITY HILLRD
THESDA RD
OSTW
77
21
Lake Norman
Average Vehicles per day, 2014
Up to 5,900
5,900 - 10,000
10,000 - 17,000
17,000 - 28,000
28,000 - 50,000
50,000 or more
Troutman Municipal Limits
N
0
0.375
0.75
1.5
Miles

Intersection Traffic Volumes and Operational Characteristics

In conjunction with the daily traffic volumes, intersection traffic counts were conducted at the key intersections listed below and depicted on the following page

1. US 21/NC 115 and Old Mountain Road/Murdock Road
2. US 21/NC 115 and Old Murdock Road
3. US 21/NC 115 and Talley Street
4. US 21/NC 115 and West Church Street
5. N. Eastway Drive and West Church Street
6. US 21 and Wagner Street
7. US 21/NC 115 and Ostwalt Amity Road
8. US 21/NC 115 and Houston Road
9. US 21/NC 115 and Flower House Loop (North)
10. US 21/NC 115 and I-77 SB Ramps/Julian Place
11. US 21/NC 115 I-77 NB Ramps
12. US 21/NC 115 Lexus Drive
13. US 21/NC 115 Flower House Loop (South)

Turning movement traffic count data was collected for the weekday peak periods at the study intersections listed above. Counts were conducted on Thursday, January 21, 2016 from 7:00 to 9:00 AM and 4:00 to 6:00 PM. Based on input received from the PAC, supplemental traffic counts were conducted at the intersections listed below. These counts were conducted on Tuesday, November 15, 2016 from 7:00 to 9:00 AM and 4:00 to 6:00 PM.

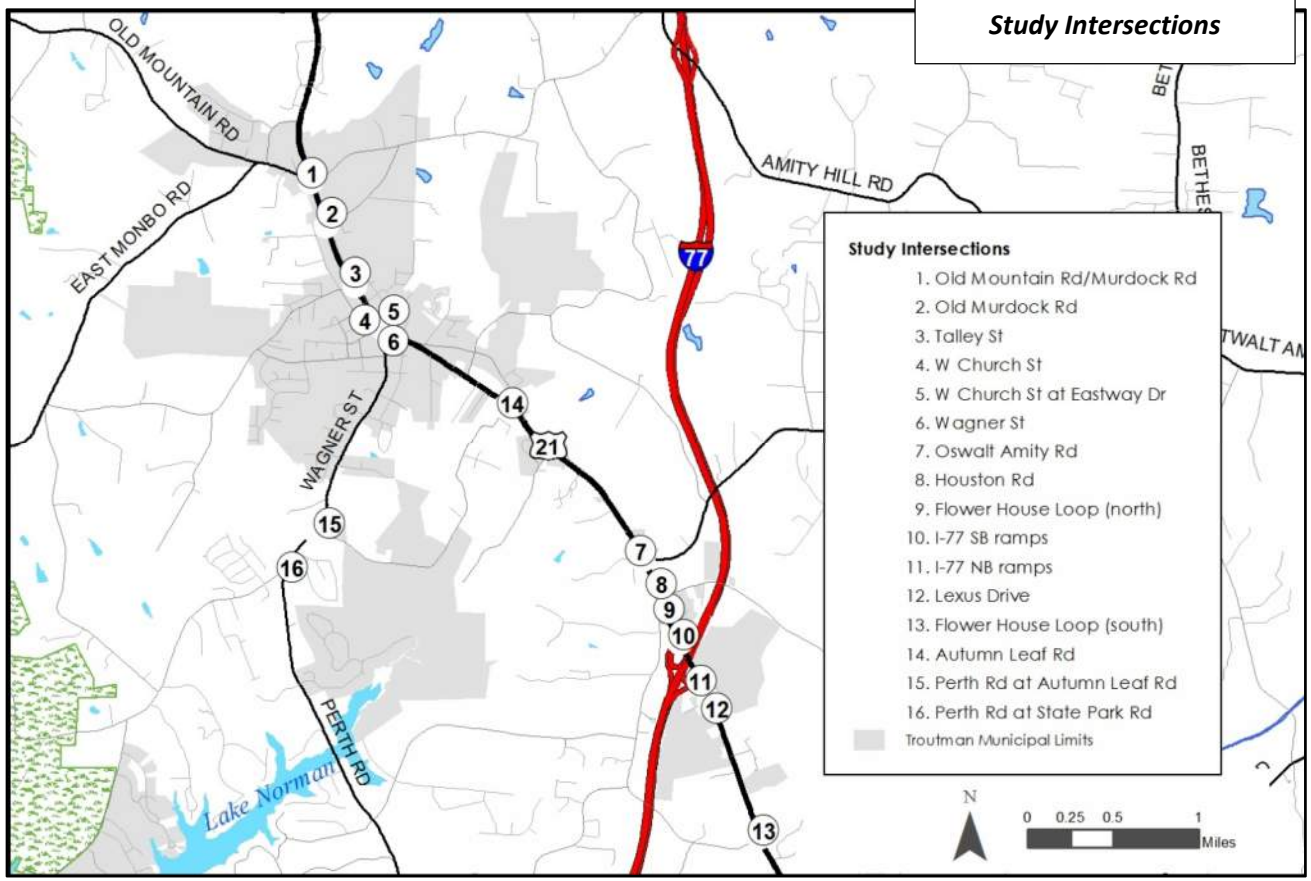
14. US 21/NC 115 and Autumn Leaf Road
15. Perth Road and Autumn Leaf Road

16. Perth Road and State Park Road

The traffic count data was utilized to evaluate the existing operations and project future traffic volumes at the study intersection. For purposes of a conservative analysis, the morning and evening peak hour traffic volumes were identified for each intersection. A copy of the traffic count data is provided in the Appendix.

Traffic volume data was analyzed with Synchro capacity analysis software in order to determine the quality of operation in the existing network. Capacity is combined with Level of Service (LOS) to describe the operating characteristics of a road segment or intersection. Capacity is defined as the maximum number of vehicles that can pass over a road segment or through a particular intersection within a specified period under prevailing roadway, traffic, and control conditions. LOS is a qualitative measure that describes operational conditions and motorist perceptions within a traffic stream. The Transportation Research Board Highway Capacity Manual (HCM) defines six levels of service, LOS A through LOS F, with A representing the shortest average delays and F representing the longest average delays.

Study Intersections



The LOS grades shown below, which are provided in the HCM, quantify and categorize a driver's discomfort, frustration, fuel consumption, and travel times experienced as a result of intersection control and the resulting traffic queuing.

Level of Service Grading Descriptions[1]

Level of Service	Description
A	*Minimal control delay; traffic operates at primarily free-flow conditions; unimpeded movement within traffic stream.*
B	*Minor control delay at signalized intersections; traffic operates at a fairly unimpeded level with slightly restricted movement within traffic stream.*
C	*Moderate control delay; movement within traffic stream more restricted than at LOS B; formation of queues contributes to lower average travel speeds.*
D	*Considerable control delay that may be substantially increased by small increases in flow; average travel speeds continue to decrease.*
E	*High control delay; average travel speed no more than 33 percent of free flow speed.*
F	*Extremely high control delay; extensive queuing and high volumes create exceedingly restricted traffic flow.*

[1]Highway Capacity Manual 2010

LOS D is the typically accepted standard for signalized intersections in urbanized areas. For signalized intersections, LOS is defined for the overall intersection operation.

For unsignalized intersections, only the movements that must yield right-of-way experience control delay. Therefore, LOS criteria for the overall intersection is not reported by Synchro or computable using methodology published in the HCM. Results between LOS A and LOS C for the side street approach are assumed to represent short delays. Results between LOS D and LOS E for the side street approach are assumed to represent moderate delays, and LOS F for the side street approach is assumed to represent long delays. It is typical for stop sign controlled side streets and driveways intersecting major streets to experience long delays during peak hours, while the majority of the traffic moving through the intersection on the major street experiences little or no delay.

Table 2 presents the range of control delay for each LOS rating as detailed in the HCM. Because signalized intersections are expected to carry a larger volume of vehicles and stopping is required during red time, note that higher delays are tolerated for the corresponding LOS ratings.

Table 3. Level of Service Grading Criteria[1]

Level of Service	Average Control Delay (s/veh) at:	
	Unsignalized Intersections	Signalized Intersections
A	0 – 10	0 – 10
B	> 10 – 15	> 10 – 20
C	> 15 – 25	> 20 – 35
D	> 25 – 35	> 35 – 55
E	> 35 – 50	> 55 – 80
F[2]	> 50	> 80

[1]Highway Capacity Manual 2010
[2]All movements with a Volume to Capacity (v/C) ratio greater than 1 receive a rating of LOS F.

Based on the HCM standards, each approach LOS and delay was determined for the identified weekday morning and evening peak hours. LOS data for the signalized and unsignalized intersections is reported on the following pages. Intersection geometries were based on field reviews and aerial photography. Signal timings were obtained from NCDOT.

Intersection	AM Peak Hour LOS (Delay, s/veh)	PM Peak Hour LOS (Delay, s/veh)
1. US 21/NC 115 and Old Mountain Road/ Murdock Road ★		
Eastbound	C (25.2)	B (13.7)
Westbound	C (21.8)	E (69.6)
Northbound	A (5.5)	B (11.2)
Southbound	B (12.1)	C (23.9)
Intersection	B (15.0)	C (24.0)
2. US 21/NC 115 and Old Murdock Road ★		
Eastbound	C (17.2)	C (21.3)
Westbound	C (16.2)	F (67.4)
3. US 21/NC 115 and Talley Street △		
Eastbound	C (17.1)	E (36.4)
4. US 21/NC 115 and West Church Street		
Eastbound	C (16.2)	F (63.9)
Westbound	B (12.8)	E (38.4)
5. N. Eastway Drive and West Church Street △		
Eastbound	A (9.1)	B (10.5)
Westbound	A (9.2)	B (10.6)
6. US 21/NC 115 and Wagner Street ★		
Eastbound	B (15.1)	C (22.6)
Northbound	A (9.8)	B (17.3)
Southbound	A (9.3)	A (8.7)
Intersection	B (10.7)	B (14.8)
7. US 21/NC 115 and Ostwalt Amity Road △		
Eastbound	B (12.7)	C (22.1)
Westbound	E (48.3)	F (>120)
8. US 21/NC 115 and Houston Road △		
Westbound	C (17.9)	F (52.5)
9. US 21/NC 115 and Flower House Loop (North) △		
Westbound	C (22.9)	F (86.2)

★ - *Signalized Intersection*
△ - *Minor-Leg Stop-Controlled Intersection*
LOS D LOS E LOS F

Intersection	AM Peak Hour LOS (Delay, s/veh)	PM Peak Hour LOS (Delay, s/veh)
10. US 21/NC 115 and I-77 SB Ramps/Julian Place ★		
Eastbound	B (10.5)	B (10.4)
Westbound	D (38.4)	D (37.6)
Northbound	A (3.8)	A (3.3)
Southbound	A (4.5)	A (4.8)
Intersection	A (6.4)	A (6.3)
11. US 21/NC 115 and I-77 NB Ramps ★		
Eastbound	D (35.8)	D (35.4)
Northbound	C (24.3)	C (24.1)
Southbound	B (16.1)	B (15.8)
Intersection	C (22.8)	C (23.5)
12. US 21/NC 115 and Lexus Drive ★		
Eastbound	E (65.9)	D (53.4)
Westbound	D (42.8)	D (45.1)
Northbound	B (13.8)	B (12.8)
Southbound	B (13.5)	B (15.1)
Intersection	B (19.9)	C (20.8)
13. US 21/NC 115 and Flower House Loop (South) △		
Westbound	C (17.5)	C (17.9)
14. US 21/NC 115 and Autumn Leaf Road △		
Eastbound	C (15.7)	B (15.0)
15. Perth Road and Autumn Leaf Road △		
Westbound	B (13.1)	B (14.1)
16. Perth Road and State Park Road △		
Eastbound	C (17.4)	C (17.6)

★ - *Signalized Intersection*
△ - *Minor-Leg Stop-Controlled Intersection*
LOS D LOS E LOS F

For signalized intersections, the delay represents the average delay experienced by all vehicles that pass through the intersection in the peak hour. For unsignalized intersections, the delay represents the average delay experienced on the worst unsignalized approach to the intersection (since vehicles on the primary facility do not experience any delay at an unsignalized intersection). Yellow shading indicates LOS D, orange shading indicates LOS E, and red shading indicates LOS F.

Based on the results of the capacity analysis, the signalized intersections are generally operating at an acceptable level of service during the peak hours. While the overall intersections operate at LOS C or better during the peak hours, there are some instances where approaches are operating at LOS D during one or both peak hours. Although this is not ideal, it is likely that the higher delay is concentrated during the peak hour(s) with lower delay and acceptable level of service expected outside the peak hours.

In some cases, while the overall signalized intersection operates at an acceptable level of service, an approach is operating at an LOS E during the morning or evening peak hour. This is the case for the westbound approach of the US 21/NC 115 and Old Mountain Road/Murdock Road intersection during the PM peak hour. This is also evident for the eastbound approach of the intersection of US 21/NC 115 and Lexus Drive during the AM peak hour.

As shown in Table 5, there are several approaches at unsignalized intersections that are currently operating at a LOS E or F during the evening peak hour. The westbound approach of the US 21/NC 115 and Ostwalt Amity Road intersection experiences an LOS E in the AM peak hour and a LOS F in the PM peak hour. The delay experienced at this intersection is a function of the volume of traffic on US 21/NC 115 and the limited gaps in traffic for the minor leg approach. Opportunities to improve operations at these intersections as part of the concept alternatives described in *Chapter 4: Transportation Strategies.*

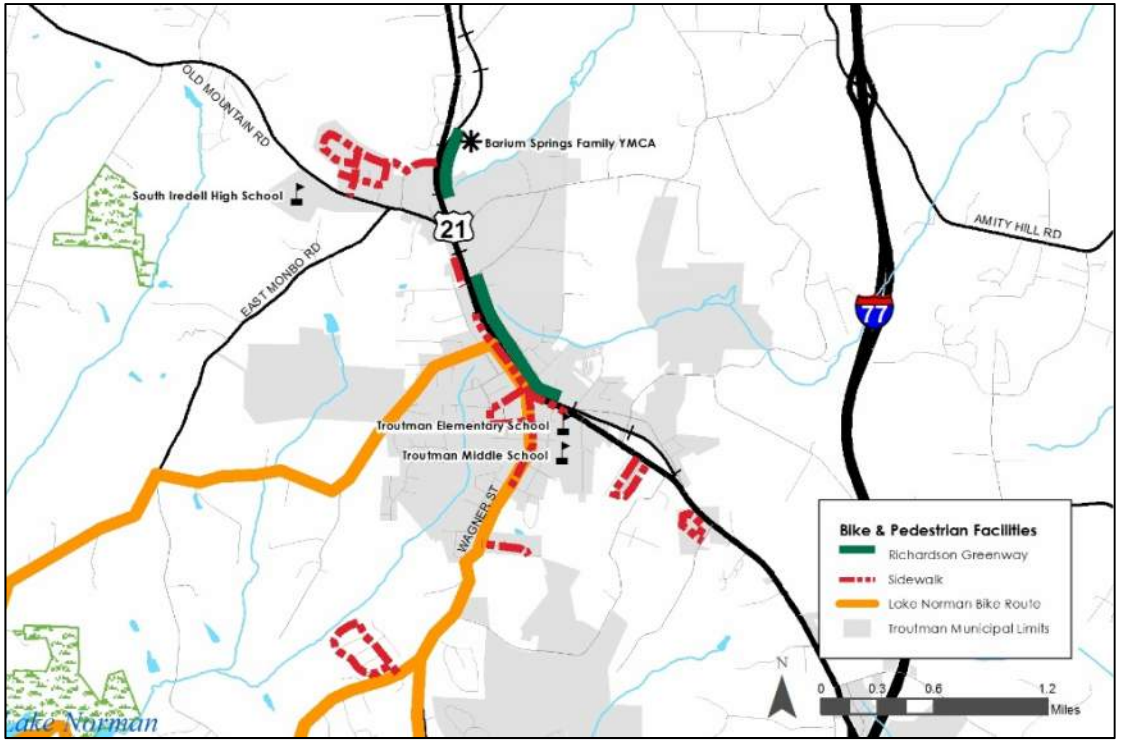
Active Transportation

An important component of accessibility and connectivity along key corridors such as US 21/NC 115 is the provision of accommodations for non-motorized transportation or "active transportation" (e.g., pedestrian and bicycle facilities). Accessibility and connectivity for residents, employees, and visitors is typically achieved through a combination of greenways (multiuse paths), bikeways, and sidewalks to connect with other travel modes and activity centers. A summary of existing pedestrian and bicycle facilities is outlined and depicted below.

Existing Sidewalks and Greenways

Sidewalks are provided through downtown Troutman on the west side of US 21/NC 115. The sidewalk generally extends from the Troutman Elementary School frontage to approximately 900 feet north of Talley Street. Sidewalk is also provided across the frontage of the commercial property at the northwest corner of US 21/NC 115 and Old Murdock Road.

According to the Troutman Pedestrian Plan (February 2008), the majority of existing sidewalks remain in fairly good condition, though some sections have seriously deteriorated. The sidewalks are generally four to five feet in width, but vary throughout Town. Through downtown Troutman there are several segments of sidewalk that abut the roadway (i.e., no landscaped parkway). Pedestrian amenities such as awnings, benches, and storefront windows are provided along limited segments of downtown. In some cases, connectivity between the public sidewalk and commercial property is provided; however, this is more prevalent at recently developed commercial sites.



Per Section 8.9 (Greenways and Sidewalks) of the Troutman Unified Development Ordinance, sidewalk installation is required for new development. Sidewalk is required along the property frontage adjoining an existing or proposed major or minor Thoroughfare as shown on the Thoroughfare Plan. The construction of sidewalk is required as follows:

- Thoroughfares: Both sides of the street
- Commercial: Both sides of the street
- Urban Residential: One side of the street
- Streets in Industrial Subdivisions: At the discretion of the Technical Review Committee
- Private Streets: At the discretion of the Technical Review Committee

In addition to the existing sidewalk network, a number of trails have been prosed for the Troutman area. Currently, the Richardson Greenway is the only constructed trail through downtown Troutman. The Richardson Greenway is located between US 21/NC115 and North Eastway Drive. This paved trail provides access from Rumple Street on the south to Old Murdock Road on the north.

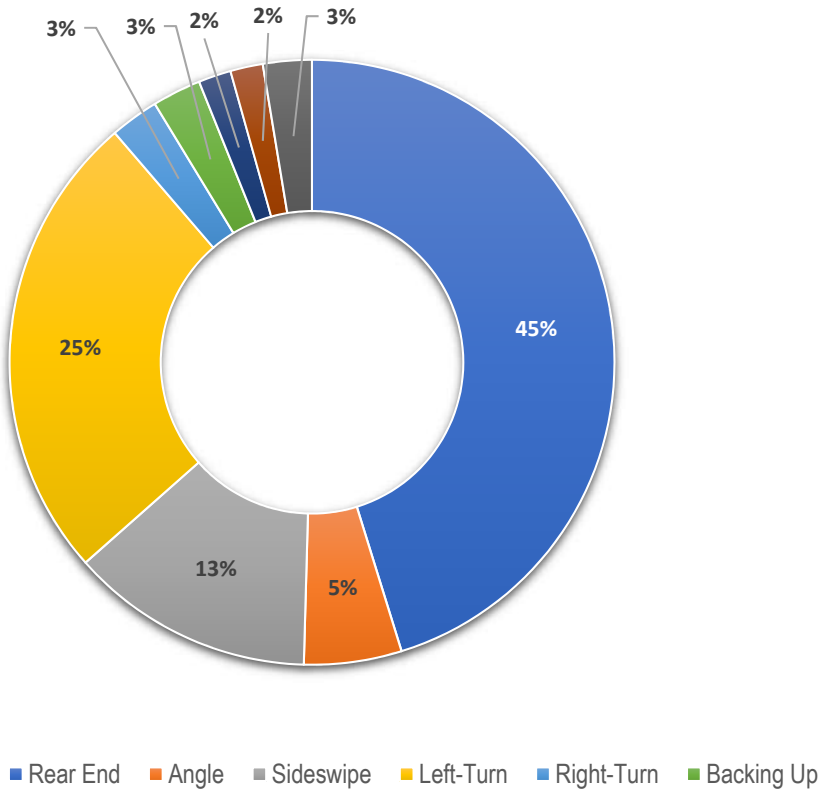
Crosswalks and pedestrian pushbuttons are provided at the signalized intersection of US 21/NC 115 and Wagner Street. In addition, crosswalks are provided on the side streets to facilitate crossings for the Greenway trail. However, north of Wagner Street there are no crosswalks to facilitate crossings from the Greenway to the sidewalk on the west side of US 21/NC 115.

Existing Bicycle Facilities

Limited signed or striped bicycle facilities are provided in the Town of Troutman. The Comprehensive Transportation Plan (July 2009) identifies several existing recommended on-road bicycle routes. Within the study area, an on-road bicycle route is currently provided on US 21/NC 115 from Talley Street to Wagner Street. The proposed bicycle route continues along Wagner Street to the south Town limits, and along Talley Street to the western Town limits. This route provides access to downtown Troutman and serves as part of the Lake Norman Bicycle Route.

Safety

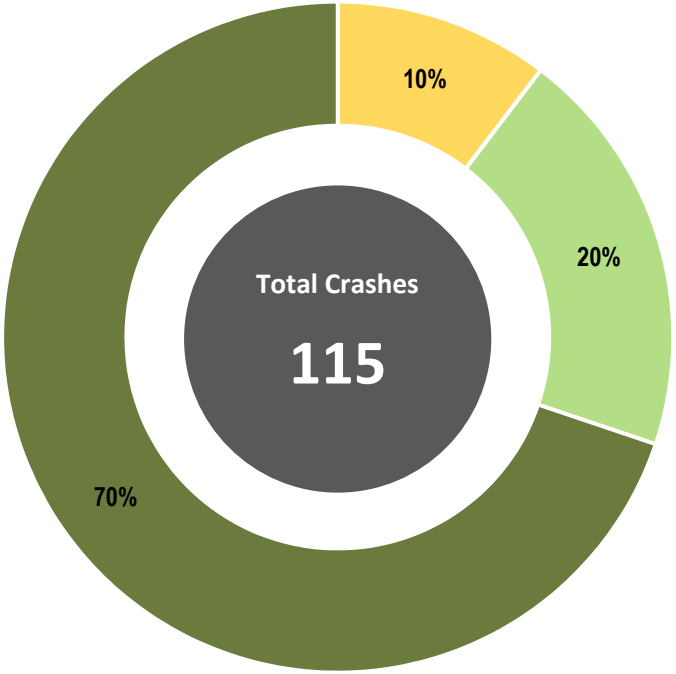
An analysis of the most recent three-year crash history for the study intersections was completed in order to identify existing safety concerns. NCDOT maintains records of crashes that occur on state-maintained roadways. Each crash is classified by the type of crash (e.g., rear end, angle, sideswipe, left-turn, right-turn, pedestrian) and by the worst injury occurring as a result of the incident. Based on a review of the three-year crash history for the period from June 1, 2013 to May 31, 2016, a total of 99 crashes occurred within the study area. The graph to the right summarizes the distribution of crashes in the study area by type. As shown, approximately 45 percent of crashes in the study area were rear end crashes and about 25 percent were attributed to left-turn movements. The graph to the right provides a summary of the crash type and severity for the study intersections. As shown, the highest number of crashes during the three-year reporting period occurred at the intersection of US 21/NC 115 and I-71 southbound ramps. Of the 39 total crashes reported at this intersection, nearly 35 percent were attributed to left-turn movements and about 30 percent were rear end crashes. A total of 30 crashes were reported at intersection of US 21/NC 115 and Old Mountain Road/Murdock Road during the three-year period. Of the crashes that occurred at this intersection, approximately 70 percent were rear end crashes.



Intersection	Crash Type								
	Rear End	Angle	Sideswipe	Left-Turn	Right-Turn	Backing Up	Pedestrian	Other	Total
1. US 21 / NC 115 and Old Mountain Road / Murdock Road	21	1	1	3	2	1	1	0	30
2. US 21 / NC 115 and Old Murdock Road	4	1	1	0	0	0	0	0	6
3. US 21 / NC 115 and Talley Street	5	1	0	1	0	0	0	2	9
4. US 21 / NC 115 and Church Street	5	0	1	2	0	1	0	0	9
5. Eastway Drive and Church Street	0	0	1	0	0	1	0	0	2
6. US 21 / NC 115 and Wagner Street	1	0	1	1	0	0	0	0	3
7. US 21 / NC 115 and Ostwalt Amity Road	1	0	0	0	0	0	0	0	1
8. US 21 / NC 115 and Houston Road	0	0	0	0	0	0	0	0	0
9. US 21 / NC 115 and Flower House Loop (N)	2	0	0	1	0	0	0	0	3
10. US 21 / NC 115 and I-77 NB Ramps	2	0	0	1	0	0	0	0	3
11. US 21 / NC 115 and I-77 SB Ramps	11	1	9	13	1	0	1	3	39
12. US 21 / NC 115 and Lexus Drive	0	2	0	1	0	0	0	0	3
13. US 21 / NC 115 and Flower House Loop (S)	0	0	0	0	0	0	0	0	0
14. US 21 / NC 115 and Autumn Leaf Road	0	0	0	0	0	0	0	0	0
15. Perth Road and Autumn Leaf Road	0	0	0	0	0	0	0	0	0
16. Perth Road and State Park Road	0	0	0	0	0	0	0	0	0
Total	**52**	**6**	**15**	**29**	**3**	**3**	**2**	**3**	**115**
Percentage of Crash Types within Study Area	**45%**	**5%**	**13%**	**25%**	**3%**	**3%**	**2%**	**3%**	**100%**

The graph to the right summarizes the crash severity within the study area. As shown, approximately 70 percent of crashes reported at the study intersections resulted in property damage only. Property damage crashes are only reported if the damage is equal to or more than $1,000; therefore, it should be noted that crashes with property damage resulting in less than $1,000 of damage may not be captured. Approximately 10 percent of the crashes reported non-fatal or disabling injuries. There were no crashes at the study intersections that resulted in a fatality along the US 21/NC 115 corridor within the study area.

Based on a review of the crash history for each study intersection, opportunities to address potential contributing factors were considered as part of the development of concept alternatives and analyses of future traffic conditions. Based on the frequency of rear end crashes and crashes involving left-turn movements, dedicated left-turn lanes were evaluated at key intersections in the study area. Dedicated left-turn lanes provides an area for stopped/turning traffic to get out of the through lane thus reducing the potential for rear end crashes.

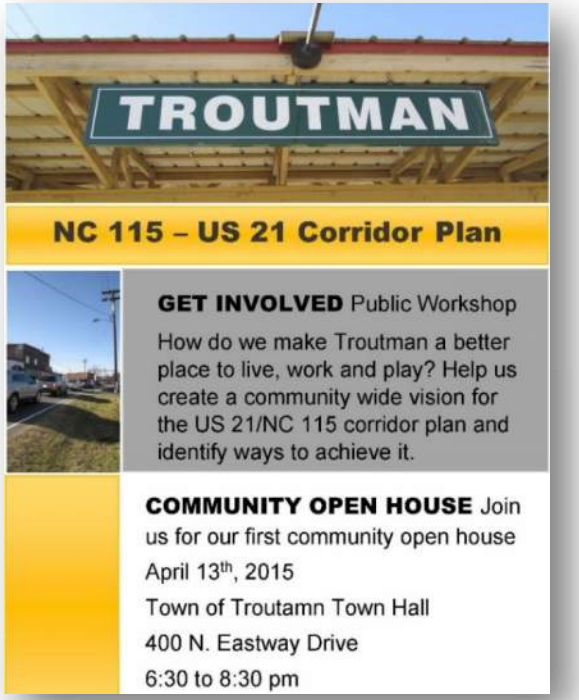


Type	Description
Fatal (K)	Death occurring within 12 months of the crash.
Disabling (A)	Injury is serious enough to prevent normal activity for at least one day.
Evident (B)	Non-fatal or disabling injuries that are evident at the scene of the crash.
Possible (C)	No visible injury, but those involved in the crash complain of pain or momentary unconsciousness.
None (O)	No injury; property damage only.
Unknown (U)	Unknown if any injury occurred.

Introduction

For the outcomes of any corridor plan to reflect the community values and be implementable, a community engagement process with created to generate information equal in value to the technical data collected. The process resulted in residents, business owners, and other stakeholders joining the staff to create a community vision, explore alternatives and select preferred strategies for land use and transportation. It was important to create a process that allowed participants to understand why decisions are made and the effect of those decisions on a future plan.

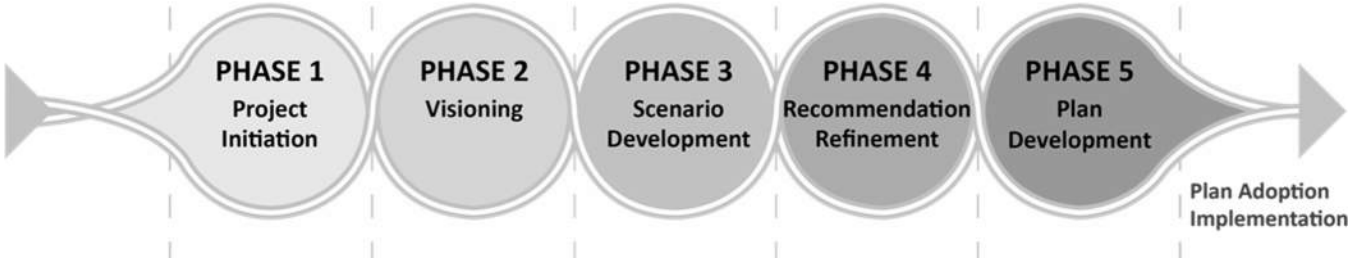
The following pages highlight the findings of the public engagement process.



Community Outreach

An inclusive process that involved residents, business owners, staff, elected officials and other stakeholders was critical in the creation of the Franklin Boulevard Corridor Access and Alternative Development Mobility Strategy. The process tapped into the intimate knowledge of these groups through a variety of outreach events. Special consideration was given to reaching a balanced cross-section of the community with the intent to accomplish several objectives:

- Engaging key community leaders
- Sequencing engagement activities to build ongoing participation
- Offering decision and/or influence opportunities for citizens
- Ensuring representation from those that understand and cherish the heritage of the community
- Using the engagement process to raise awareness of the project and of planning in general.



An initial visioning process was conducted as part of Phase I of the US 21/NC 115 Corridor Study. Through the initial public engagement process, residents, business owners, and other stakeholders identified preferred strategies for land use and transportation.

The community input received through Phase I was used as the framework for the future alternatives evaluated in Phase II. A Project Advisory Committee (PAC) was formed to guide Phase II of the planning process. PAC members provided a broad perspective on the existing conditions identified through Phase I and potential future opportunities to address mobility and accessibility along the corridor. PAC members included key community and agency representatives that provided a communication link to constituents and their respective groups regarding project progress and preferred future alternatives. A summary of the public engagement process and PAC meetings is provided below.

Phase I: Community Symposium | April 13, 2015

The initial Community Symposium provided an opportunity to introduce the corridor study and provide an overview of the planning process. Through the activities listed below, priority issues and concerns were identified by community members.

- **One Word -** Symposium participants were asked to provide one word to describe their ***hope*** for Troutman, and one word to describe their ***fear***. The words used to describe hope reflected the community's perception of existing conditions, and the fears were used to define future opportunities.

- **Priority Pyramid -** Symposium participants were asked to rank planning themes in order of importance: congestion, safety, bicycle, pedestrian, economic vitality, and neighborhood. Based on participants' input, the overwhelming priority themes included ***congestion, safety, and economic vitality***.

- **Visual Preference Survey -** Participants were invited to provide input on the design and priority elements of transportation system planning through visual images. Input was provided for a variety of design themes such as lighting, street design, pedestrian facilities, crosswalks, signalized intersections, intersection treatments, landscaping, and public art.

A summary of the input received from meeting participants is provided in the Appendix.

Phase II Kick-Off Meeting | October 25, 2016

PAC members participated in a Phase II kick-off meeting, which included an overview of the existing conditions identified through Phase I. At this meeting three future mobility strategies were developed. Based on discussions with the PAC, three (3) distinct strategies were developed for the US 21/ NC 115 corridor. Each are discussed below.

Strategy A: Key Intersection Improvements

This strategy focuses on identifying geometric and traffic control improvements to address operational conditions at key intersections or nodes along the corridor.

Strategy B: New Main Street

Widen US 21/NC 115 to provide a multilane typical section, but in this scenario "Main Street" or downtown Troutman is moved to Lytton Street, moving local mobility & circulation off US 21/NC 15. The concept plan provided in Appendix B was used to develop the baseline assumptions for this alternative.

Strategy C: Multilane Widening

Consider widening US 21/NC 115 to provide a multilane typical section. In this scenario, improved shoulders and sidewalk would be provided in key locations.

Public Open House | December 12, 2016

An overview of the existing conditions and future concept alternatives were shared with the public during a community-wide Town of Troutman open house in December. A survey of open house participants was completed in order to solicit input on existing transportation conditions. A copy of the presentation and survey results are provided in the Appendix.

PAC Alternatives Analyses Meeting | January 31, 2017

In order to quantify the benefits and challenges associated with each concept alternative, a summary of the traffic analyses completed for existing and future conditions was presented. For each alternative, the anticipated Year 2025 and Year 2040 traffic operations were presented for PAC member review and comment. A copy of the presentation is included in the Appendix.

PAC Revised Alternatives Meeting | March 17, 2017

Based on input received during the January PAC meeting, the future concept alternatives were revised. During the follow-up meeting with PAC members, the key intersection improvements were identified as a preferred alternative to widening the corridor. A copy of the revised concept alternatives presentation is provided in the Appendix.

Introduction

For many residents and commuters in Troutman, the congestion these communities have experienced over the last 10-20 years is most evident on the community's roadway network. The challenges facing the community are not limited to vehicles on the road. Throughout the planning process, the communities noted the need for improved bicycle and pedestrian amenities. The transportation strategy for the study area represents a balanced approach serving all travel modes.

This strategy is a partnership by the Town of Troutman, CRTPO and NCDOT, which are responsible for transportation improvements throughout the region.

The recommendations for the *US 21/NC 115 Corridor Mobility Strategy* are the result of community involvement, staff engagement, stakeholder interviews, public input, analysis and comprehensive planning and transportation engineering.

Specifically, this chapter communicates a plan to improve safety and mobility of the existing streets and addresses the design of key roadway intersections. Specific recommendations have been made including: roadway typical sections, intersection designs, and connector roads.

The community played an integral part during the planning process. Their local knowledge offered a collective insight that if overlooked, could have potentially minimized the success of the study. Using this insight, the consultant team developed alternatives that addressed the issues the community raised.

The following pages offer an overview of the recommendations both in the interim and long term.

Future Transportation Analysis

As a primary northwest-southeast corridor that traverses the Town of Troutman, US 21/NC 115 serves as a gateway and primary route to downtown Troutman. In addition, the corridor provides regional mobility with access to I-77 and I-40 for both commuter and truck traffic. The need for US 21/NC 115 corridor improvements is based on traffic operations, accessibility, and mobility. The existing traffic volumes reflect current local, commuter, and truck travel patterns through the study area.

Based on public input received throughout the planning process, some intersections along the corridor are characterized by deteriorating traffic operations under peak hour conditions. In addition, approved development plans and the potential for further growth and development within the general vicinity of the study area will likely result in increased traffic volumes and additional demand on the roadway network. With a potential increase in traffic volumes, the need to plan for future improvements is confirmed. For purposes of this study, Year 2025 and Year 2040 traffic conditions were evaluated with the addition of background traffic growth only (i.e., no-build scenario). In order to address the anticipated traffic conditions, concept alternatives were identified to enhance operations, safety, accessibility and mobility. Each alternative was evaluated for Year 2025 and Year 2040. A summary of the methodology and findings of the future traffic analyses is provided on the pages that follow.

Future Traffic Volumes

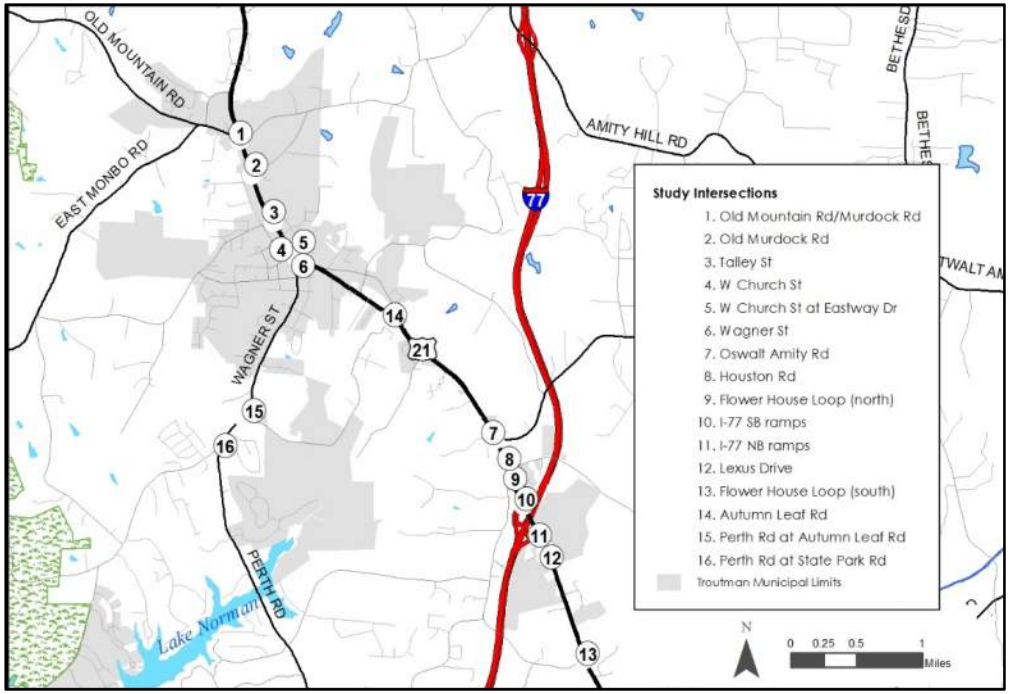
To establish future traffic projections, existing and future annual average daily traffic (AADT) volumes from the CRTPO Metrolina Regional Travel Demand Model (MRTDM) were consulted. The table to the right provides a summary of the MRTDM baseline Year 2015 and projected Year 2040 traffic volumes for roadway segments within the study area. Based on this data, an average annual growth rate of 1.7 percent per year was applied to the existing traffic volumes depicted in Figure 7 to estimate Year 2025 and Year 2040 traffic volumes for the study intersections.

In order to evaluate future baseline traffic operations, capacity analyses were performed for Year 2025 and Year 2040. For purposes of this analysis, the existing geometrics and traffic control were assumed for the study intersections with the exception of the following improvements:

- **US 21/NC 115 and Houston Road / Flower House Loop (North) -** The State Transportation Improvement Program (STIP) includes realignment of Houston Road and Flower House Loop (North) and installation of a new traffic signal for the realigned intersection (TIP ID R-5711). This future improvement, identified for construction in Year 2020 was included in the analysis of future traffic conditions.

Roadway	Segment	AADT		Annual Growth Rate
		Year 2015	Year 2040	
US 21 / NC 115	South of I-77	11,000	14,200	1.0%
	North of I-77	16,300	19,400	0.7%
	North of Ostwalt Amity Rd	11,500	16,200	1.4%
	North of Eastway Dr	11,000	16,500	1.6%
	South of Wagner St	10,800	16,200	1.6%
	North of Wagner St	13,900	22,000	1.9%
	South of Murdock/ Old Mountain Rd	12,900	21,000	2.0%
	North of Murdock/ Old Mountain Rd	7,000	14,200	2.9%
	North of Moose Club Rd	8,100	14,500	2.4%
Ostwalt Amity Rd	East of US 21/NC 115	8,600	13,900	1.9%
Wagner St	West of US 21/NC 115	8,300	10,300	0.9%
Old Mountain Rd	West of US 21/NC 115	9,900	13,500	1.2%
Murdock Rd	East of US 21/NC 115	4,900	5,900	0.7%
Moose Club Rd	East of US 21/NC 115	1,100	2,300	3.0%
			Overall Average Growth Rate	**1.7%**
			Average Growth Rate for US 21/NC 115	**1.7%**

The projected future traffic operations for Year 2025 and Year 2040 are summarized in **Table 7** and **Table 8**, respectively. Similar to reporting for existing conditions, yellow shading indicates LOS D, orange shading indicates LOS E, and red shading indicates LOS F.



With the addition of background traffic growth through Year 2025, the study intersections are expected to continue to operate with an acceptable overall level of service. A summary of key findings with respect to projected delay and queueing is provided below.

- **Intersection #1. US 21/NC 115 and Old Mountain Road/Murdock Road** - The signalized intersection is expected to operate at a LOS B during the morning peak hour and LOS D during the evening peak hour. Delay on the westbound approach is expected to increase to LOS F during the evening peak hour (LOS E under existing conditions). The projected 95th percentile queues for the southbound through movement are expected to increase by approximately 40 percent during the evening peak hour. Based on the projected queues, opportunities to increase storage capacity or enhance turning movements should be considered as part of the evaluation of the future concept alternatives.

- **Intersection #6. US 21/NC 115 and Wagner Street** - During the evening peak hour, delay on the eastbound approach is expected to increase to LOS D and delay on the westbound approach is anticipated to be LOS F. The 95th percentile queue on the westbound approach is projected to more than double during the evening peak hour.

- **Intersection #3. US 21/NC 115 and Talley Street** - Delay on the eastbound approach is projected to increase from LOS E to LOS F during the evening peak hour.

- **Intersection #4. US 21/NC 115 and Church Street** - Delay on the eastbound approach is expected to continue to operate at LOS F during the evening peak hour. Delay on the westbound approach is expected to increase from LOS E to LOS F during the evening peak hour.

- **Intersection #7. US 21/NC 115 and Ostwalt Amity Road -** The westbound approach is expected to operate at LOS F during the morning peak hour and both the eastbound and westbound approaches are expected to operate at LOS F during the evening peak hour. The anticipated 95th percentile queues are expected to exceed the available storage provided on the westbound approach.

- **Intersection #12. US 21/NC 115 and Lexus Drive -** The overall intersection is expected to operate at LOS C during both peak hours. While the northbound and southbound approaches are expected to continue to operate at LOS B, the eastbound approach is expected to operate at LOS E and the westbound approach is anticipated to operate at LOS D during both peak hours.

- **Intersection #16. Perth Road and State Park Road -** While the eastbound approach is estimated to operate at LOS C under existing conditions, with the addition of background traffic growth the eastbound approach is expected to operate at LOS D during both the morning and evening peak hours.

Background traffic growth through Year 2040 is projected to result in increased delay and queueing at many of the study intersections, with failing conditions projected at key intersections along the corridor. A summary of key findings is provided below.

- **Intersection #1. US 21/NC 115 and Old Mountain Road/Murdock Road** - The intersection is expected to operate at an overall LOS C during the morning peak hour and LOS F during the evening peak hour. During the evening peak hour the westbound, northbound, and southbound approaches are expected to operate with high delay at LOS F. The queues projected for the southbound movement in Year 2025 are expected to increase significantly during the evening peak hour. The 95th percentile queue projected for the northbound left-turn movement exceeds the existing storage lane.

- **Intersection #2. US 21/NC 115 and Old Murdock Road** - The westbound approach is projected to operate at LOS E during the morning peak hour. Both the eastbound and westbound approaches are expected to experience high delay during the evening peak hour.

- **Intersection #3. US 21/NC 115 and Talley Street** – The eastbound approach is projected to operate at LOS E during the morning peak hour and LOS F during the evening peak hour. The projected 95th percentile queue is approximately four vehicles during the morning peak hour and eleven vehicles during the evening peak hour. While high delay is not uncommon for a minor-street stop-controlled roadway at an intersection with a heavily traveled roadway, the projected eastbound queue during the evening peak hour should be considered when evaluating future alternatives.

- **Intersection #4. US 21/NC 115 and Church Street -** The eastbound approach is projected to operate at LOS E during the morning peak hour and at LOS F during the evening peak hours. Given the proximity of this intersection to Wagner Street and the

connectivity to the Richardson Greenway, review of potential opportunities to minimize turning conflicts at this intersection should be considered.

- **Intersection #6. US 21/NC 115 and Wagner Street** - During the evening peak hour, delay on the eastbound approach is expected to increase to LOS E. The projected 95th percentile queue for the eastbound left-turn movement exceeds the existing storage lane. Signal timing modifications should be considered in order to enhance the eastbound left-turn movement and reduce delays and queues at this intersection.

- **Intersection #7. US 21/NC 115 and Ostwalt Amity Road** - Similar to the Year 2025 condition, the westbound approach is expected to operate at LOS F during the morning peak hour and both the eastbound and westbound approaches are expected to operate at LOS F during the evening peak hour. The anticipated 95th percentile queues are expected to exceed the available storage provided on both approaches during the evening peak hour.

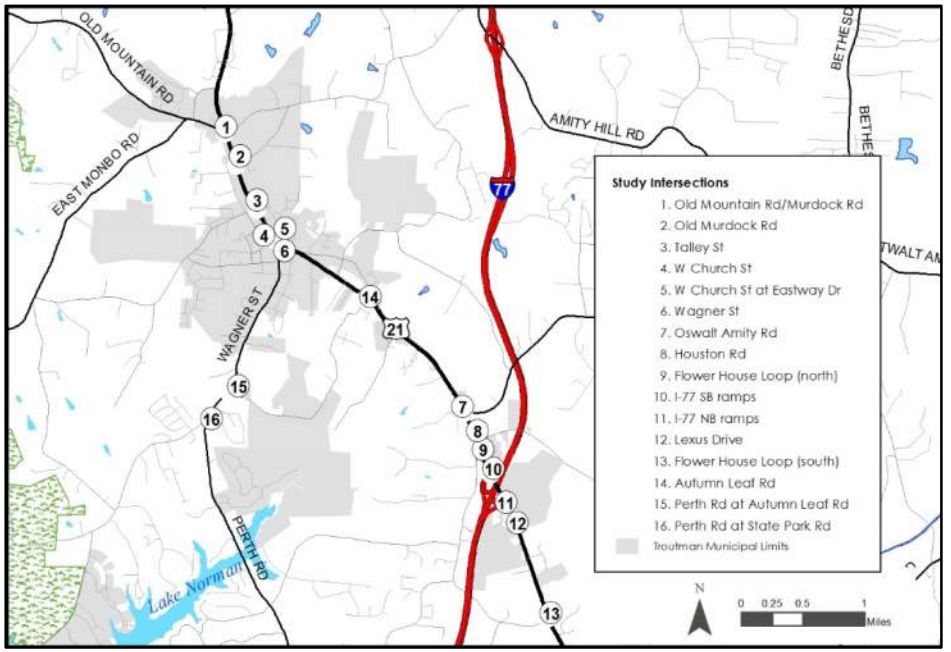
- **Intersection #12. US 21/NC 115 and Lexus Drive** - While the overall intersection is expected to continue to operate at LOS C during both peak hours in Year 2040, the eastbound approach is expected to operate at LOS F during the morning peak hour at LOS E during the evening peak hour.

- **Intersection #13. US 21/NC 115 and Flower House Loop (South)** - With the addition of background traffic growth, this intersection is expected to operate at LOS F during both the morning and evening peak hours. This delay; however, is not uncommon for a minor-street stop-controlled roadway at an intersection with a heavily traveled roadway. The projected 95th percentile queues are limited at this intersection; therefore, no improvements are anticipated for this location.

- **Intersection #16. Perth Road and State Park Road** - Without future improvements the eastbound approach of this intersection is expected to experience high delays and queues. The projected 95th percentile queue is approximately 17 vehicles during the morning peak hour and 10 vehicles during the evening peak hour. As this intersection serves as a primary access point to Lake Norman State Park, opportunities to reduce delay and queues should be emphasized.

Table 7. Future (Year 2025) Background Levels of Service

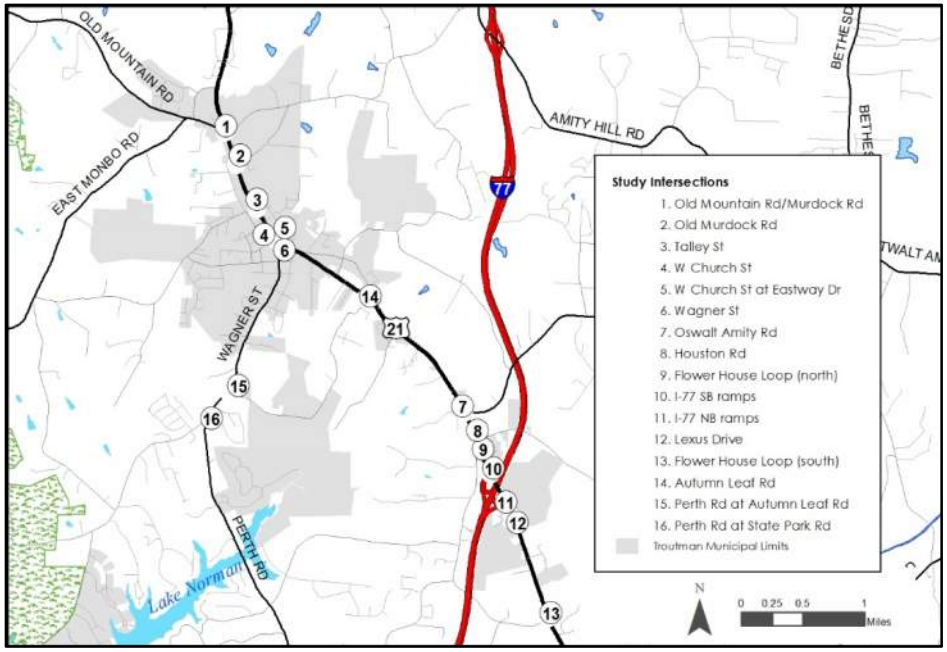
Intersection	AM Peak Hour LOS (Delay, s/veh)	PM Peak Hour LOS (Delay, s/veh)
1. US 21/NC 115 and Old Mountain Road/ Murdock Road ★		
Eastbound	C (29.7)	B (16.2)
Westbound	C (21.5)	F (82.7)
Northbound	A (7.5)	C (34.8)
Southbound	B (15.7)	D (43.0)
Intersection	*B (17.9)*	*D (40.3)*
2. US 21/NC 115 and Old Murdock Road △		
Eastbound	C (18.7)	D (34.1)
Westbound	C (19.8)	F (282.9)
3. US 21/NC 115 and Talley Street △		
Eastbound	C (22.2)	F (87.1)
4. US 21/NC 115 and West Church Street △		
Eastbound	C (21.4)	F (233.1)
Westbound	B (14.2)	F (113.0)
5. N. Eastway Drive and West Church Street △		
Eastbound	A (9.2)	B (11.0)
Westbound	A (9.4)	B (11.1)
6. US 21/NC 115 and Wagner Street ★		
Eastbound	C (18.7)	D (34.1)
Westbound	C (19.8)	F (282.9)
7. US 21/NC 115 and Ostwalt Amity Road △		
Eastbound	B (14.0)	F (194.8)
Westbound	F (151.2)	F (*)
8 / 9. US 21/NC 115 and Houston Road/Flower House Loop (North) ★		
Eastbound	B (10.3)	B (20.0)
Westbound	B (17.7)	C (25.2)
Northbound	A (6.5)	B (11.4)
Southbound	B (10.4)	A (5.4)
Intersection	*A (9.4)*	*B (11.0)*



★ - *Signalized Intersection*
△ - *Minor-Leg Stop-Controlled Intersection*
LOS D LOS E LOS F

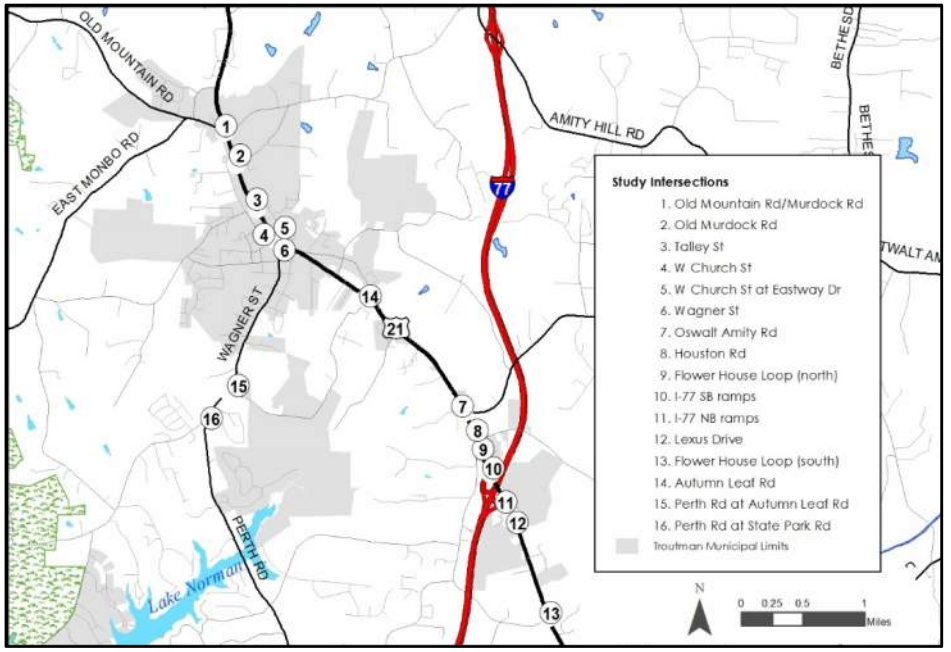
Table 7. Future (Year 2025) Background Levels of Service (continued)

Intersection	AM Peak Hour LOS (Delay, s/veh)	PM Peak Hour LOS (Delay, s/veh)
10. US 21/NC 115 and I-77 SB Ramps/Julian Place ★		
Eastbound	B (10.6)	B (10.6)
Westbound	D (37.8)	D (36.9)
Northbound	A (5.1)	A (5.2)
Southbound	A (5.2)	A (5.2)
Intersection	*A (7.1)*	*A (7.3)*
11. US 21/NC 115 and I-77 NB Ramps ★		
Eastbound	D (37.4)	D (36.2)
Northbound	C (24.6)	C (24.0)
Southbound	C (20.1)	B (19.1)
Intersection	*C (24.8)*	*C (24.9)*
12. US 21/NC 115 and Lexus Drive ★		
Eastbound	E (72.9)	E (59.5)
Westbound	D (40.1)	D (43.5)
Northbound	B (16.9)	B (14.8)
Southbound	B (15.1)	B (15.4)
Intersection	*C (21.8)*	*C (21.8)*
13. US 21/NC 115 and Flower House Loop (South) △		
Westbound	C (22.6)	C (23.3)
14. US 21/NC 115 and Autumn Leaf Road △		
Eastbound	C (19.0)	C (18.0)
15. Perth Road and Autumn Leaf Road △		
Westbound	B (14.4)	C (16.3)
16. Perth Road and State Park Road △		
Eastbound	D (25.5)	D (25.1)



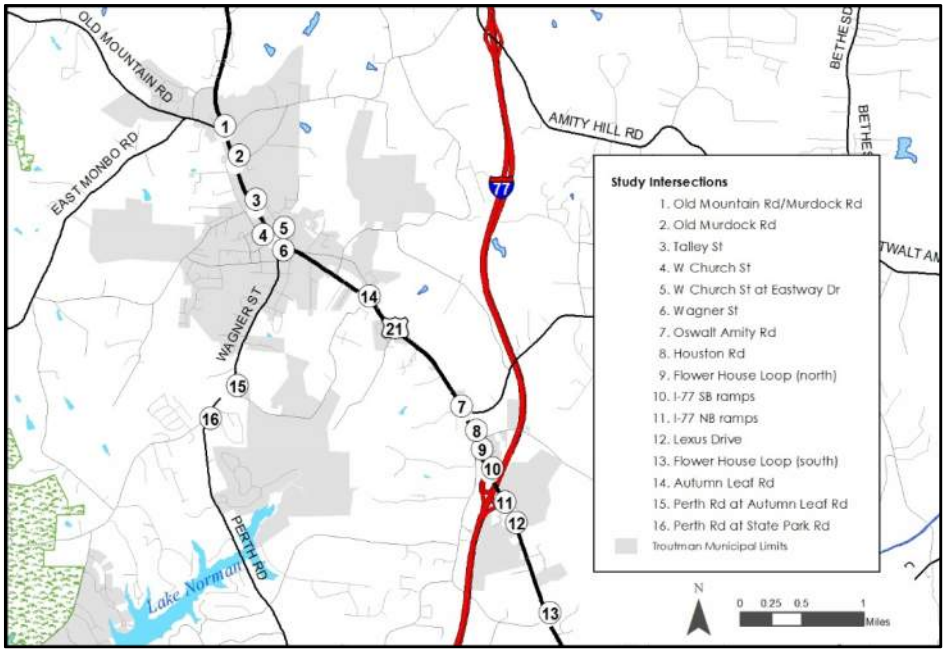
★ - *Signalized Intersection*
△ - *Minor-Leg Stop-Controlled Intersection*
LOS D LOS E LOS F

Intersection	AM Peak Hour LOS (Delay, s/veh)	PM Peak Hour LOS (Delay , s/veh)
1. US 21/NC 115 and Old Mountain Road/ Murdock Road ★		
Eastbound	D (35.7)	C (30.4)
Westbound	C (25.6)	F (163.8)
Northbound	B (13.0)	F (94.5)
Southbound	C (23.4)	F (94.3)
Intersection	*C (23.8)*	*F (91.5)*
2. US 21/NC 115 and Old Murdock Road △		
Eastbound	C (22.0)	F (143.2)
Westbound	E (35.2)	F (*)
3. US 21/NC 115 and Talley Street △		
Eastbound	E (48.4)	F (685.4)
4. US 21/NC 115 and West Church Street		
Eastbound	E (37.0)	F (*)
Westbound	C (22.1)	F (*)
5. N. Eastway Drive and West Church Street △		
Eastbound	A (9.4)	B (12.1)
Westbound	A (9.6)	B (11.9)
6. US 21/NC 115 and Wagner Street ★		
Eastbound	C (21.3)	E (71.0)
Northbound	B (12.8)	D (37.7)
Southbound	B (14.4)	B (11.0)
Intersection	*B (15.5)*	*C (33.8)*
7. US 21/NC 115 and Ostwalt Amity Road △		
Eastbound	C (19.9)	F (*)
Westbound	F (836.7)	F (*)
8 / 9. US 21/NC 115 and Houston Road/Flower House Loop (North) ★		
Eastbound	B (16.8)	C (29.3)
Westbound	C (25.0)	D (47.7)
Northbound	A (7.8)	C (23.6)
Southbound	B (14.5)	A (7.3)
Intersection	*B (13.0)*	*C (20.4)*



★ - *Signalized Intersection*
△ - *Minor-Leg Stop-Controlled Intersection*
LOS D LOS E LOS F

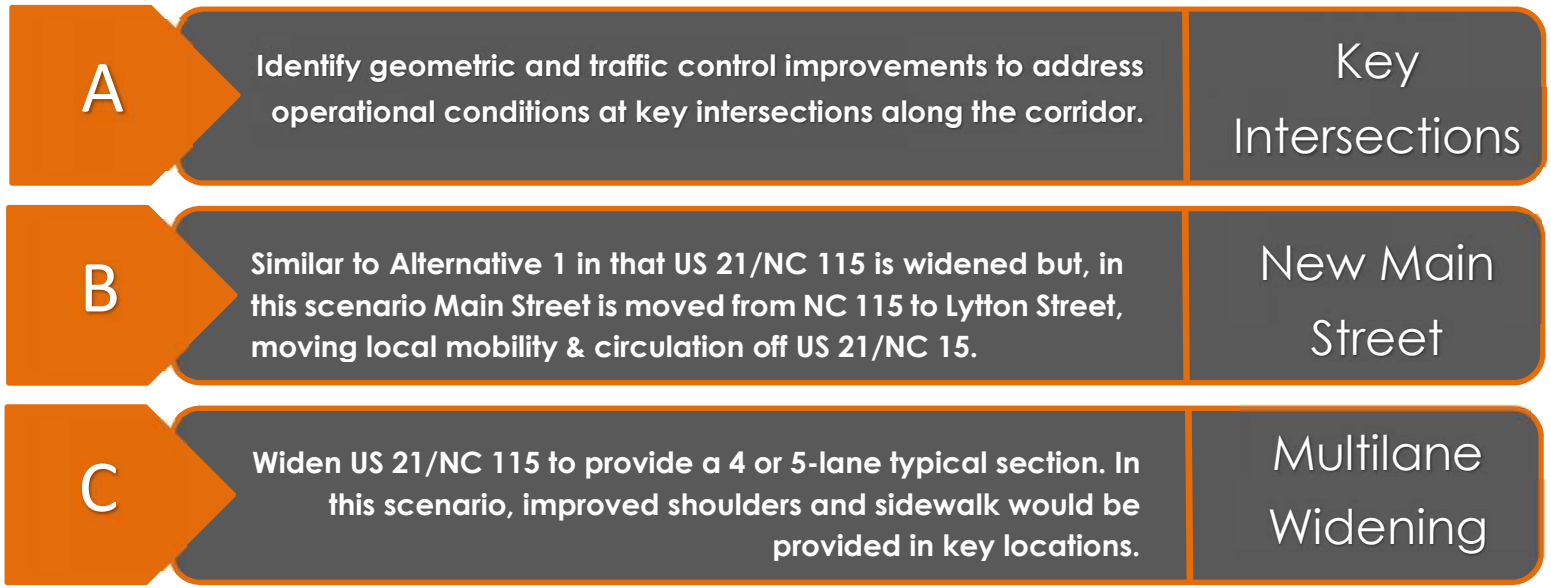
Intersection	AM Peak Hour LOS (Delay, s/veh)	PM Peak Hour LOS (Delay , s/veh)
10. US 21/NC 115 and I-77 SB Ramps/Julian Place ✱		
Eastbound	B (11.0)	B (10.9)
Westbound	D (36.7)	D (35.8)
Northbound	A (7.4)	A (8.5)
Southbound	A (6.4)	A (6.5)
Intersection	*A (8.5)*	*A (9.1)*
11. US 21/NC 115 and I-77 NB Ramps ✱		
Eastbound	D (45.0)	D (42.9)
Northbound	C (30.1)	C (25.1)
Southbound	D (51.2)	C (29.9)
Intersection	D (41.1)	C (30.7)
12. US 21/NC 115 and Lexus Drive ✱		
Eastbound	F (90.6)	E (70.9)
Westbound	D (36.1)	D (39.3)
Northbound	C (22.9)	B (19.7)
Southbound	B (18.6)	B (18.8)
Intersection	C (26.2)	C (25.4)
13. US 21/NC 115 and Flower House Loop (South) △		
Westbound	F (51.7)	F (50.4)
14. US 21/NC 115 and Autumn Leaf Road △		
Eastbound	D (32.4)	D (27.5)
15. Perth Road and Autumn Leaf Road △		
Westbound	C (18.2)	C (22.7)
16. Perth Road and State Park Road △		
Eastbound	F (109.1)	F (100.5)



✱ - *Signalized Intersection*
△ - *Minor-Leg Stop-Controlled Intersection*
LOS D LOS E LOS F

Future Mobility Strategies

Based on the analyses of existing and future year conditions, improvements are recommended to mitigate existing operations and to address the congestion which is expected to occur as traffic volumes increase along the corridor. As discussed and developed in coordination with the Project Advisory Committee, the following Future Mobility Strategies where developed. Each are briefly highlighted below.



Each of these strategies represents a different approach to solving long term mobility as well as their impacts against adjacent land uses or context. Throughout the discussions with the PAC, it became evident that there were only two strategies to improve mobility along US 21/NC 115: Widen or improve operations at key intersections. Strategy B still requires either A or C to improve mobility. Based on these discussions Strategy A and C were advanced for further operational analysis for the 2040 horizon year. The following pages highlight the operations of the corridor under these two strategies.

A KEY INTERSECTIONS

Based on the analysis of existing and future background traffic growth, improvements were identified to address operational or safety issues at key intersections along the corridor. A summary of the improvements and the operations under both 2025 and 2040 horizon years are shown in the following tables.

US 21/NC 115 and Old Mountain Road/Murdock Road - For Year 2025, modify the westbound left-turn signal phasing from permitted to permitted and protected. For Year 2040 conditions, add a northbound right-turn lane and an eastbound right-turn lane. Based on this analysis, a storage length of 400 feet with a 125-foot taper is recommended on the northbound approach, and a 50-foot storage lane with a 50-foot taper is recommended on the eastbound approach.

Table 1 - US 21 and Old Mountain Road/Murdock Road

Condition	Measure	EB			WB			NB			SB			Intersection
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
AM Peak Hour														
2025 Build *	LOS (Delay)	D (35.5)			B (14.3)			B (12.9)			C (23.3)			C (22.6)
	Synchro 95th Q	21'	246'	0'	32'	46'	0'	123'	197'	0'	47'	157'	0'	
2040 Build **	LOS (Delay)	B (18.4)			B (19.4)			A (7.8)			B (17.6)			B (14.2)
	Synchro 95th Q	29'	111'	82'	45'	66'	0'	109'	163'	3'	48'	163'	0'	
PM Peak Hour														
2025 Build *	LOS (Delay)	D (53.0)			D (35.0)			C (28.3)			D (40.0)			D (37.5)
	Synchro 95th Q	30'	#358'	0'	#115'	189'	0'	#389'	182'	0'	36'	#460'	0'	
2040 Build **	LOS (Delay)	C (23.0)			D (49.5)			D (42.7)			E (63.0)			D (44.2)
	Synchro 95th Q	36'	103'	#143'	#134'	#288'	0'	#539'	168'	0'	41'	#592'	0'	

**Change WBL phasing from permitted to protected-permitted*
***add a NBR and EBR turn lane*

US 21/NC 115 and Old Murdock Road –

While the option to address the close spacing between Eastway Drive and US 21/NC 115 intersections with Old Murdock is address later, several intersection options were developed for the US 21 and NC 115 to address the current operations of the intersection. Signalization and the installation of a single lane and dual lane roundabout were evaluated for the 2025 and 2040 horizon years.

The operations shown to the right indicate that under signalized or dual lane roundabout operations the intersection will operate at an acceptable LOS for both the 2025 and 2040 horizon years. The single lane roundabout begins to experience additional delay and congestion in 2040, making it not a viable concept. It is important to note that under the dual lane roundabout configuration, this would be

Table 2 - US 21 and Old Murdock Road

Condition	Measure	EB	WB	NB	SB	Intersection
AM Peak Hour						
2025 Build - Dual Lane RAB	LOS (Delay)	-	A (5.1)	A (4.7)	A (4.6)	A (4.7)
	Synchro 95th Q		8'	32'	30'	
2025 Build - Single Lane RAB	LOS (Delay)	A (5.0)	A (5.4)	A (7.5)	A (7.2)	A (7.2)
	Synchro 95th Q	1'	8'	89'	81'	
2025 Build - SIGNAL	LOS (Delay)	A (0.0)	A (4.2)	A (4.0)	A (4.4)	A (4.2)
	Synchro 95th Q	0'	14'	48'	52'	
2040 Build - Dual lane RAB	LOS (Delay)	-	A (6.3)	A (5.5)	A (5.3)	A (5.4)
	Synchro 95th Q		12'	45'	41'	
2040 Build - Single Lane RAB	LOS (Delay)	A (6.1)	A (6.7)	A (10.0)	A (9.4)	A (9.5)
	Synchro 95th Q	1'	12'	150'	133'	
2040 Build - SIGNAL	LOS (Delay)	A (0.0)	A (5.9)	A (4.1)	A (4.6)	A (4.4)
	Synchro 95th Q	0'	23'	67'	73'	
PM Peak Hour						
2025 Build - Dual Lane RAB	LOS (Delay)	-	A (8.7)	A (6.3)	A (6.5)	A (6.5)
	Synchro 95th Q		21'	61'	63'	
2025 Build - Single Lane RAB	LOS (Delay)	A (8.8)	A (9.3)	B (14.8)	B (14.6)	B (14.2)
	Synchro 95th Q	11'	22'	272'	243'	
2025 Build - SIGNAL	LOS (Delay)	A (5.6)	A (9.6)	A (5.6)	A (6.4)	A (6.2)
	Synchro 95th Q	13'	45'	97'	110'	
2040 Build - Dual lane RAB	LOS (Delay)	-	B (13.4)	A (7.9)	A (8.2)	A (8.4)
	Synchro 95th Q		37'	94'	97'	
2040 Build - Single Lane RAB	LOS (Delay)	B (13.1)	B (14.6)	E (40.9)	E (40.6)	E (38.5)
	Synchro 95th Q	18'	38'	1354'	1026'	
2040 Build - SIGNAL	LOS (Delay)	A (7.7)	B (11.8)	A (5.8)	A 96.9)	A (6.7)
	Synchro 95th Q	20'	61'	138'	160'	

implemented in conjunction with a widening of US 21/NC 115 and not just a stand-alone intersection improvement. The multilane configurations are discussed in subsequent sections. Both roundabout configurations are shown below

Single Lane Roundabout

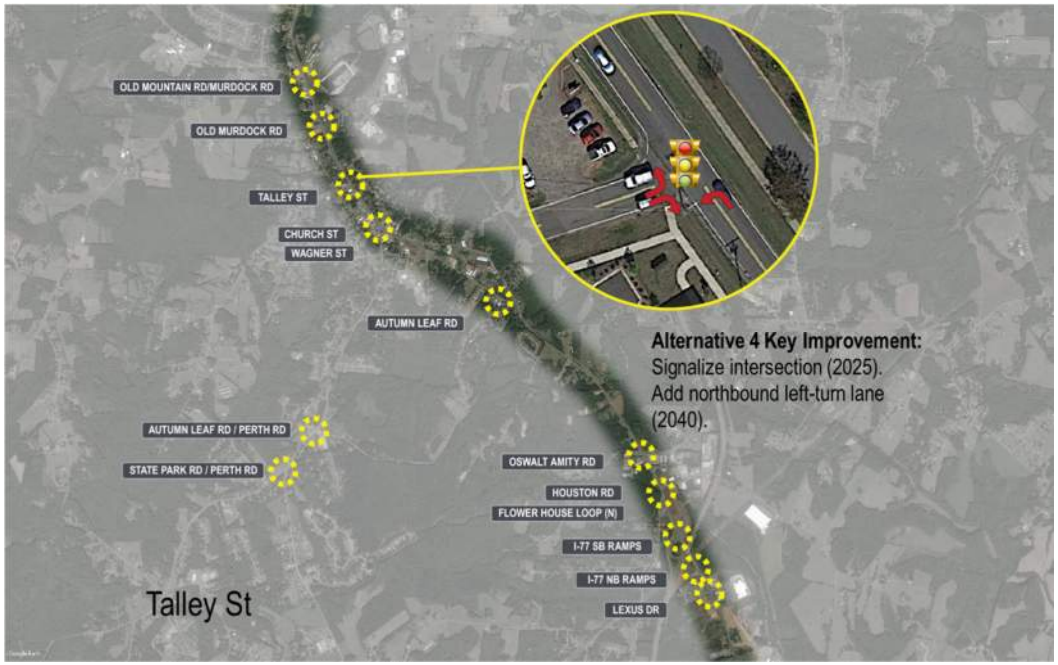
Dual Lane Roundabout

Under the dual lane configuration, the entrance to the pharmacy driveway, which creates the fourth leg to the current intersection, is removed due to the short throat distance. Under both alternatives, right-of-way will be required from the property in the northeast quadrant of the intersection. However, the parcel and existing building will remain operational.

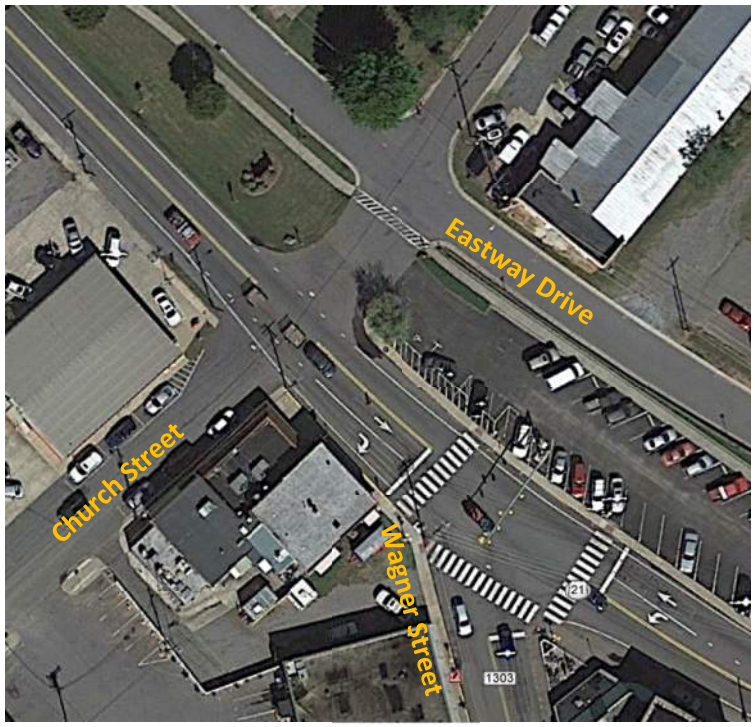
US 21/NC 115 and Talley Street – Based on conversations with the public and members of the PAC, the installation of a new traffic signal should be evaluated for implementation. Based on the results of the analysis presented below, a traffic signal is anticipated to meet applicable traffic signal warrants and operate at an acceptable LOS in both peak hours. However, in the 2040 horizon year, the southbound approach is projected to experience significant queuing resulting in the need for additional through lane capacity.

Table 3 - US 21 and Talley Street

Condition	Measure	EB	NB		SB	Intersection
			NBL	NBT		
AM Peak Hour						
2025 Build - Signalized	LOS (Delay)	A (7.9)	A (5.0)		A (5.0)	A (5.2)
	Synchro 95th Q	21’	11’	56’	58’	-
2040 Build – Signalized**	LOS (Delay)	C (20.1)	A (6.3)		B (12.0)	B (10.0)
	Synchro 95th Q	86'	9'	206'	405'	
PM Peak Hour						
2025 Build - Signalized	LOS (Delay)	B (12.2)	A (5.9)		A (5.2)	A (5.8)
	Synchro 95th Q	50’	58’	126’	126’	-
2040 Build – Signalized**	LOS (Delay)	C (26.2)	B (11.9)		D (44.4)	C (27.5)
	Synchro 95th Q	76'	69'	559'	#1108'	



US 21/NC 115 at Church Street and Wagner Street – The intersection of US 21/NC 115 and Church Street is currently one of three crossovers that connects US 21/NC 115 with Eastway Drive within the downtown. It is also located within close proximity (140 feet) to the intersection of US 21/NC 115 and Wagner Street. The intersection of US 21/NC 115 and Wagner Street is the intersection of "main and main" within downtown Troutman. Wagner Street serves as the primary main street for downtown but also serves as a major connector to Lake Norman State Park and Perth Road in southern Iredell County/Mooresville. Wagner Street also intersects US 21/NC 115 at a 135-degree angle, forcing a complex NB to WB left-turn movement.



Considering the following elements, the need to provide a comprehensive solution of this critical area in downtown, two alternatives were developed:

- Close spacing between Wagner Street and Church Street
- Intersection angle of Wagner Street to US 21/NC 115
- Peak Hour congestion
- Main Street for Troutman
- Gateway to southern Iredell County and Lake Norman State Park

Alternative 1 realigns Wagner Street to the north to create a new intersection with US 21/NC 115 at the current intersection location as Church Street. The realignment would also extend Lytton Street from its current terminus at Mills Street to a new intersection with realigned Wagner Street. Church Street would in turn tie into the newly extended Lytton Street. With this realignment, the current intersection of Wagner Street with US 21/NC 115 is converted to a RIRO intersection.

Alternative 2 realigns Wagner Street in a more traditional approach, in lieu of heading to the north, Wagner Street is realigned to the south creating a new intersection approximately 300 feet south of its current location. As with Alternative 1, Lytton Street is extended to connect with existing Wagner Street and Wagner Street at US 21/NC 115 is converted to a RIRO.

As shown on the following pages, a connection to Eastway Drive could be accommodated if under the couplet option which is discussed later in this chapter.

ALTERNATIVE 1 – Realigned Wagner Street

ALTERNATIVE 2 – Realigned Wagner Street

Table 4 - US 21 and New Wagner Intersection						
Condition	Measure	EB	WB	NB	SB	Intersection
				NBL	SBL	
AM Peak Hour						
2025 Build	LOS (Delay)	B (16.2)	A (6.7)	B (12.4)	B (12.7)	B (13.1)
	Synchro 95th Q	129'	13'	17'	15'	
2040 Build	LOS (Delay)	C (21.5)	A (6.7)	B (15.1)	B (15.6)	B (16.3)
	Synchro 95th Q	182'	17'	21'	19'	
PM Peak Hour						
2025 Build	LOS (Delay)	B (13.5)	B (10.2)	A (3.2)	A (3.0)	A (3.3)
	Synchro 95th Q	16'	21'	6'	10'	
2040 Build	LOS (Delay)	B (16.4)	B (11.9)	A (4.6)	A (4.1)	A (4.6)
	Synchro 95th Q	21'	27'	7'	14'	

With an improved intersection angle, increased auxiliary turn lane storage, and additional through lane capacity the intersection of Wagner Street and US 21/NC 115 is projected to operate at an acceptable LOS during both 2025 and 2040 horizon years. It is important to note, that while not shown on the preliminary concept plans, the Wagner Street approach under either configuration would have a dedicated left-turn lane and a shared through/right turn lane.

Based on conversations with the PAC, Alternative 1 is the preferred recommendation for improving Wagner Street. Members felt that under this alternative, the core downtown can organically grow further north similar to what was envisioned in the Lytton Street and Downtown plan developed by the Town.

US 21/NC 115 and Ostwalt Amity Road - Add a new coordinated traffic signal at this study intersection. In addition, a dedicated northbound right-turn lane is recommended. The recommended improvements would facilitate turning movements and enhance truck access to/from Ostwalt Amity Road.

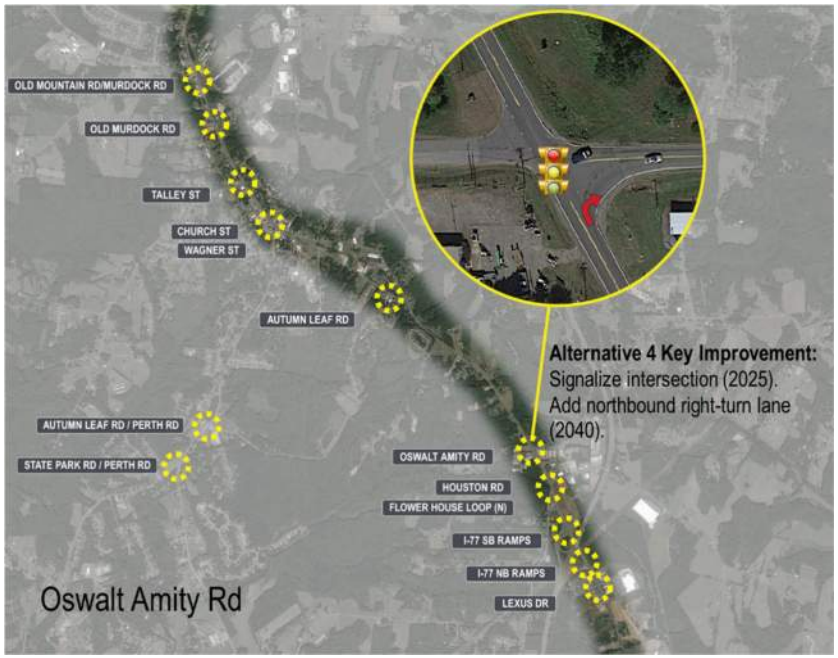


Table 7 - US 21 and Ostwalt Amity Road

Condition	Measure	EB	WB	NB	SB	Intersection
AM Peak Hour						
2025 Build *	LOS (Delay)	A (0.1)	D (40.4)	A (9.7)	B (11.3)	B (15.4)
	Synchro 95th Q	0'	167'	225'	318'	
2040 Build **	LOS (Delay)	A (0.01)	D (46.3)	A (9.6)	B (16.3)	B (18.7)
	Synchro 95th Q	0'	#252'	239'	453'	
PM Peak Hour						
2025 Build *	LOS (Delay)	C (21.2)	D (41.1)	B (13.1)	A (7.1)	B (14.1)
	Synchro 95th Q	21'	146'	#842	196'	
2040 Build **	LOS (Delay)	C (20.3)	D (54.9)	B (11.0)	C (27.7)	C (20.3)
	Synchro 95th Q	24'	#234'	m360'	#623'	

*Addition of a coordinated signal
**Addition of a coordinated signal and a NBR

US 21/NC 115 and I-77 NB Ramps - Convert the northbound left-turn to a free-flow I-77 northbound on-ramp.

Table 11 - US 21 and I-77 NB Ramps

Condition	Measure	EB			NB			SB			Intersection
		EBL	EBT	EBR	NBL	NBT	NBR	SBL	SBT	SBR	
AM Peak Hour											
2025 Build *	LOS (Delay)	D (38.9)			A (2.2)			A (8.9)			B (10.9)
	Synchro 95th Q	107'	0'	89'	0'	55'	38'	0'	157'	0'	
2040 Build *	LOS (Delay)	D (38.6)			A (3.2)			B (13.6)			B (13.1)
	Synchro 95th Q	131'	0'	108'	0'	55'	107'	0'	315'	0'	
PM Peak Hour											
2025 Build *	LOS (Delay)	D (38.5)			A (1.5)			A (8.7)			B (12.0)
	Synchro 95th Q	129'	0'	103'	0'	33'	8'	0'	126'	0'	
2040 Build *	LOS (Delay)	D (37.9)			A (2.5)			B (13.0)			B (13.9)
	Synchro 95th Q	158'	0'	123'	0'	58'	14'	0'	248'	0'	

* Northbound left-turn converted to a free flow I-77 NB on-ramp

Perth Road/State Park Road - In order to formalize existing traffic patterns at this study intersection, add a dedicated eastbound right-turn lane.

Table 16 - Perth Road and State Park Road		
Condition	Measure	EB
AM Peak Hour		
2025 Build *	LOS (Delay)	C (15.4)
	Synchro 95th Q	50'
2040 Build *	LOS (Delay)	D (26.2)
	Synchro 95th Q	126'
PM Peak Hour		
2025 Build *	LOS (Delay)	C (18.5)
	Synchro 95th Q	39'
2040 Build *	LOS (Delay)	E (39.7)
	Synchro 95th Q	110'

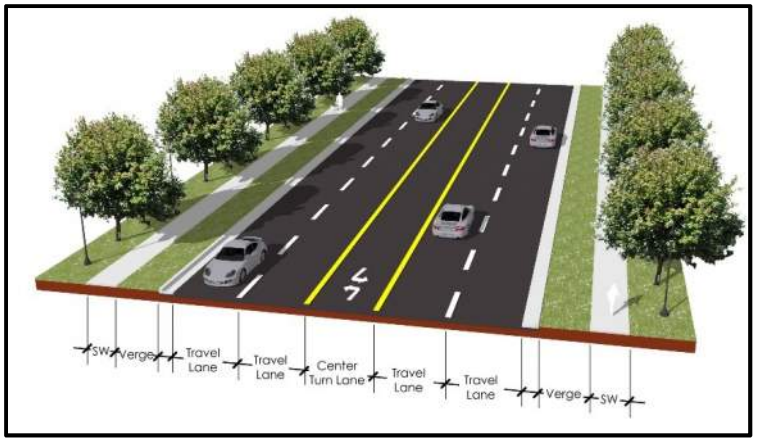
*Addition of EBR turn lane (existing conditions were modeled without the defacto turn lane through the dirt)

C MULTILANE WIDENING

Under this operational strategy two different alternatives were developed and evaluated along US 21/NC 115 through the section of that would primarily be considered the central business district and downtown. The two options developed were:

- **1: Five-lane section**
- **2: Couplet (four-lane divided)**

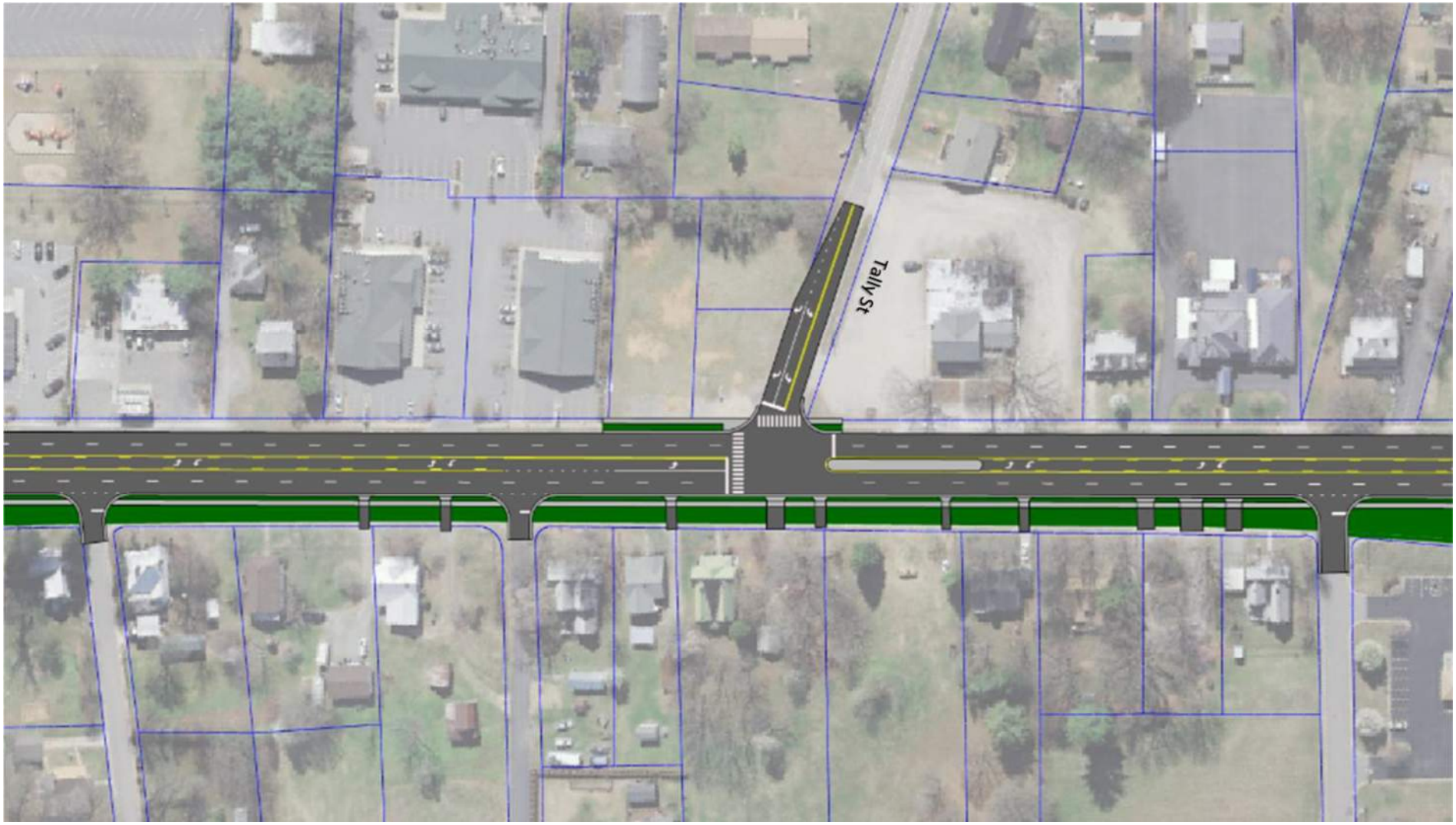
Both are discussed below and depicted graphically on the following pages.



Under the five-lane section, the existing two lane section would be widened to provide for four through lanes and a center, continuous, bi-directional turn lane. Given the current degree of access to existing residences and businesses, the desire for a similar level of access was strong from the PAC and community. While the additional capacity may support through traffic along the corridor, the multi-lane widening is expected to affect the character of downtown Troutman. The existing two-way roadway provides for slower travel speeds and limited access control along the corridor, particularly the segment through downtown Troutman. The existing configuration supports the small-town character identified as a priority for the community through the planning process. Furthermore, with a multi-lane widening, access control and careful site planning would be required to facilitate commercial site access. Pedestrian crossing enhancements would also likely be required at key intersections. The Richardson Greenway and Eastway Drive rights-of-way would be needed to accommodate the multi-lane widening through downtown Troutman, which has the potential to diminish the attractiveness of the greenway as well as its use by residents and visitors. The five-lane section is depicted graphically on the following pages.

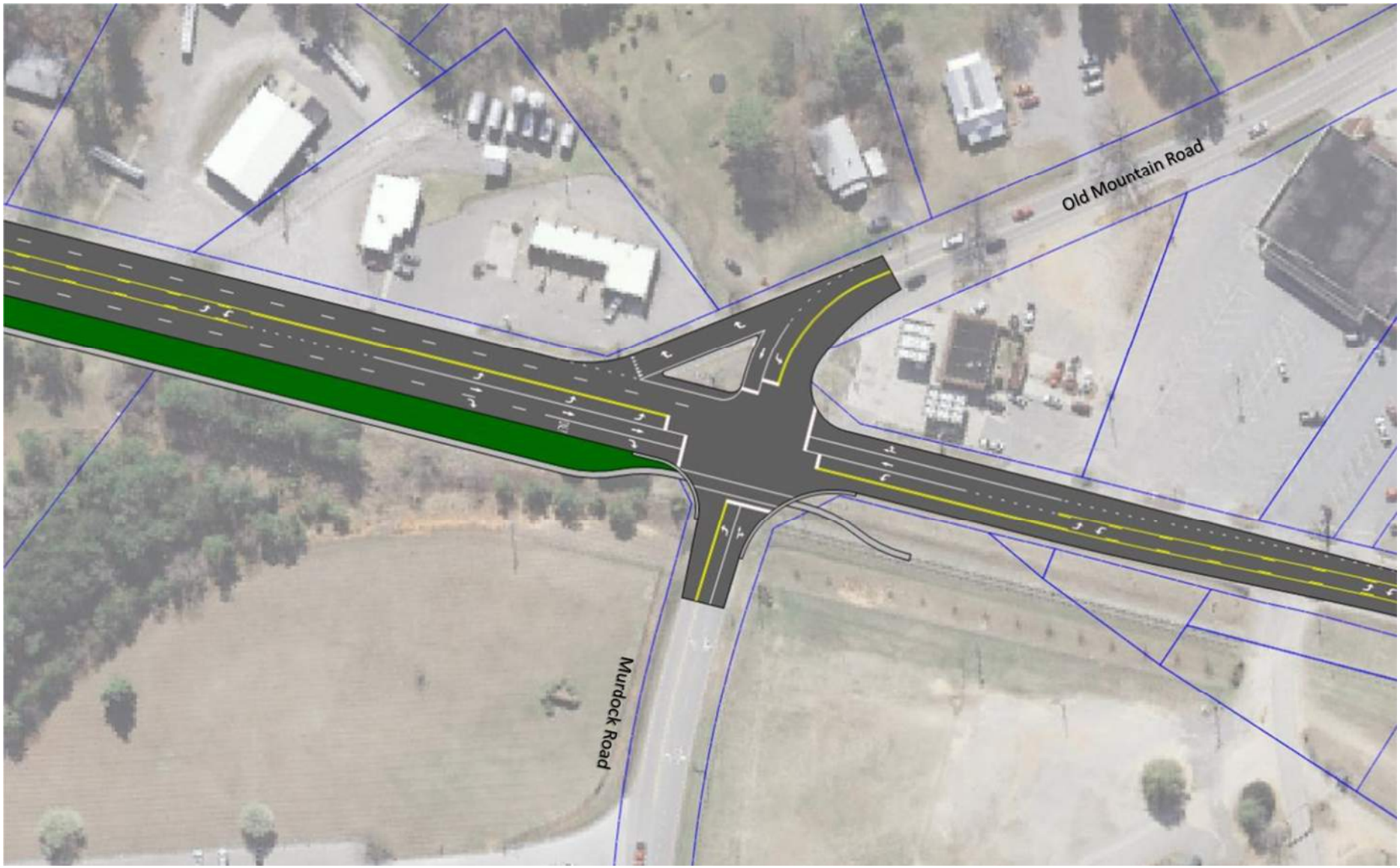
ALTERNATIVE 1 – *Cedar Lane to Rumple Street*

ALTERNATIVE 1 – *Rumple Street to Church Street*



ALTERNATIVE 1 – *Tally Street*

ALTERNATIVE 1 – *Old Murdock Road*



ALTERNATIVE 1 – *Murdock Road*

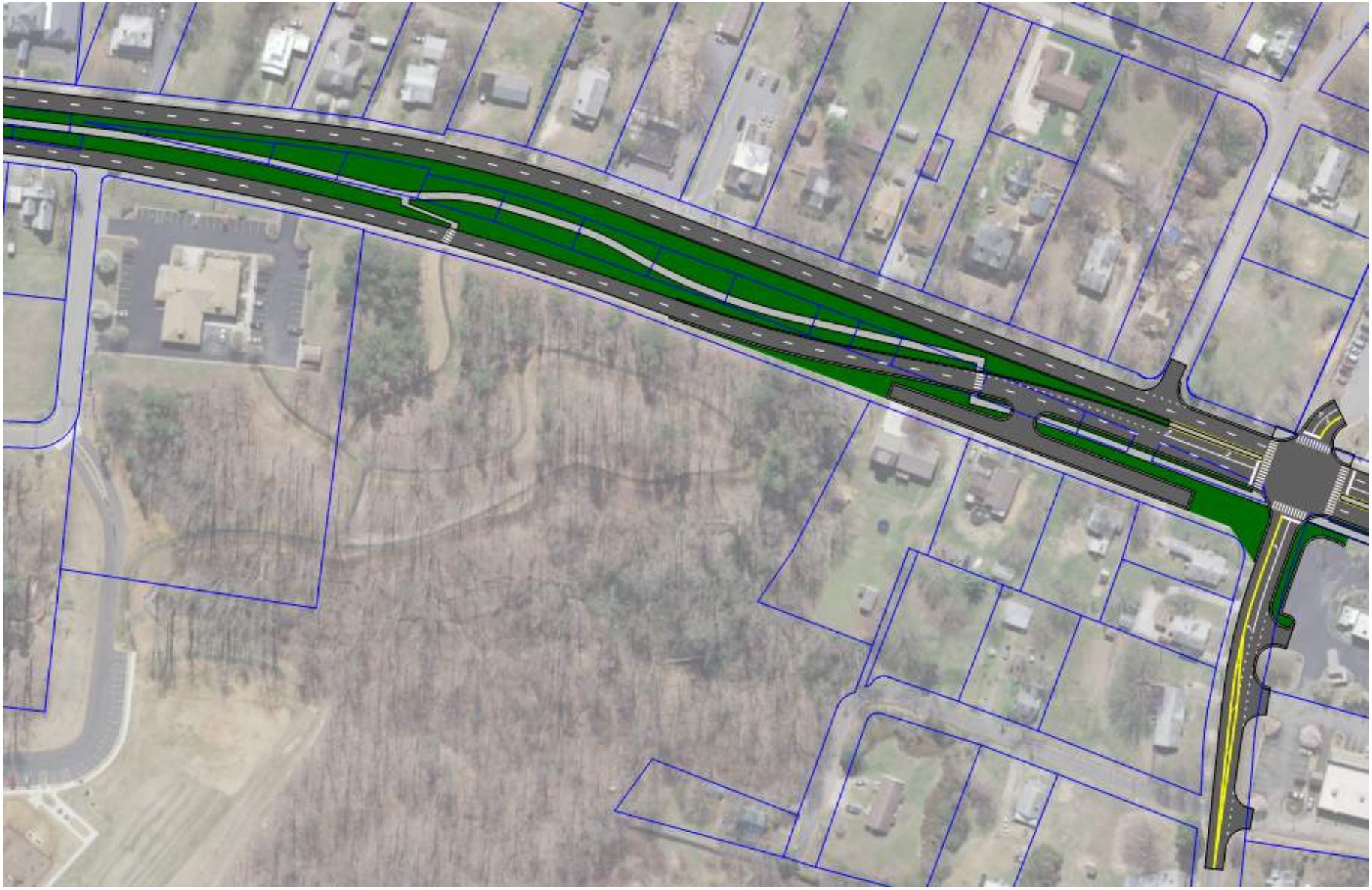
Alternative 2 considers the potential for US 21/NC 115 and Eastway Drive to function as a one-way couplet through the central business district from Eastway Drive/Winecoff Street to Eastway Drive/Old Murdock Road. While similar to the five-lane section in that additional through capacity is added in each direction, the couplet offers the ability to improve operational capacity without the need to significant widening and disruption to the existing businesses and more importantly the Richardson Greenway. Throughout the public outreach portion of this project, the community and members of the PAC stressed the importance of preserving the greenway as much as possible. The couplet alternative provides for that opportunity.

Alternative 2 provides for additional roadway capacity with limited impacts to the existing right-of-way. The existing pavement along US 21/NC 115 and Eastway Drive would be restriped to accommodate one-way traffic. Limited widening would be needed to accommodate turn lanes at the north and south termini of the couplet network. The Richardson Greenway would be preserved under this alternative. Opportunities to enhance crossings and connectivity to the Richardson Greenway would need to be further explored if the couplet design was to be considered for future implementation.

The couplet alternative is depicted graphically on the following pages.

ALTERNATIVE 1 – *Crossover to Church Street*

ALTERNATIVE 1 – *Church Street to Tally Street*



ALTERNATIVE 1 –*Scroggs Street to Old Murdock Road*

ALTERNATIVE 1 –*Old Murdock Road to Murdock Road*

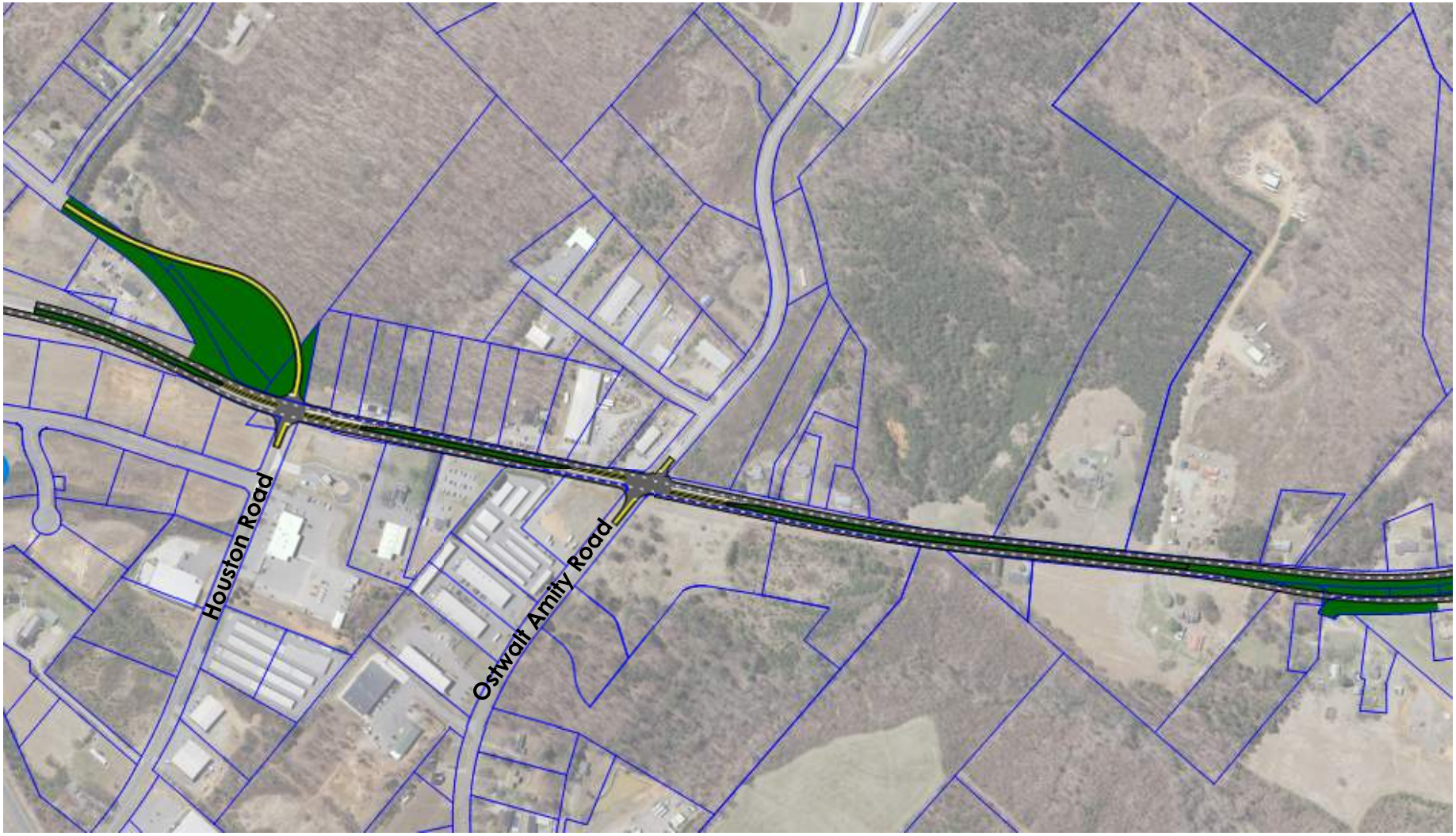
For the segment of US 21/NC 115 south of Cedar Lane to the interchange with I-77, a hybrid section of both a five-lane section and a four-lane divided section would be utilized. The variable section is in response to the context of the corridor. South of cedar lane the US 21/NC 115 quickly turns from the central business district to residential with increased separation the further south one travels. Through this section there are two controlling land uses; New Life Missionary Baptist Church and St. Michael's Cemetery. Adjacent to New Life Missionary Baptist Church are the above ground utilities for the corridor.

To minimize the impacts to both land uses in addition to the homes along this section, a five-lane typical section is recommended. The implementation of a five-lane typical section allows for additional capacity while minimizing right-of-way needs through this section. The concept for this section is shown below.

Just south of New Life Missionary Baptist Church the typical section for the corridor expands to a four-lane divided section. The concept recommends using Trackside Road to increase the throughput of the corridor while minimizing the necessary right-of-way. Similar to the Couplet concept through downtown, this section of US 21/NC 115 can be enhanced through the utilization of the existing roadways through the corridor.

Four-Lane section – Byers Road to Trackside Road

As Trackside Road ends, the typical section along US 21/NC 115 transitions back to a traditional four-lane divided section south to the I-77 interchange as shown on the following page.



Four-Lane section – Houston Road to Trackside Road

As with the intersection of Old Murdock Road, the intersection of Murdock Road was evaluated with both a roundabout and a signalized intersection. Under both of these scenarios the intersection point of Murdock Road with US 21/NC 115 was shifted north to remove the existing skew. This also increased the distance between the intersection at Old Murdock Road. The operational results for both intersection configurations are shown below.

US 21 and Old Mountain Road/Murdock Road														
Condition	Measure	EB			WB			NB			SB			Intersection
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
AM Peak Hour														
2025 Build - Alt. 2 (Dual Lane RAB) ^	LOS (Delay)	A (6.6)			A (6.3)			A (5.6)			A (6.2)			A (6.1)
	Synchro 95th Q	50'			18'			41'			30'			
2025 Build - FINAL LANEAGE	LOS (Delay)	C (20.8)			C (21.1)			A (6.6)			B (12.9)			B (14.0)
	Synchro 95th Q	27'	101'	80'	41'	58'	0'	80'	117'	4'	35'	54'	0'	
2040 Build - Alt. 2 (Dual lane RAB) ^	LOS (Delay)	A (8.9)			A (8.4)			A (6.9)			A (8.1)			A (7.9)
	Synchro 95th Q	82'			28'			60'			44'			
2040 Build - FINAL LANEAGE	LOS (Delay)	C (22.1)			C (23.1)			A (7.9)			B (14.8)			B (15.4)
	Synchro 95th Q	32'	127'	92'	52'	78'	0'	109'	163'	6'	46'	74'	0'	
PM Peak Hour														
2025 Build - Alt. 2 (Dual Lane RAB) ^	LOS (Delay)	B (13.1)			C (24.2)			A (7.1)			E (46.4)			C (19.8)
	Synchro 95th Q	100'			119'			72'			303'			
2025 Build - FINAL LANEAGE	LOS (Delay)	C (24.0)			D (44.1)			A (9.4)			B (18.3)			C (20.2)
	Synchro 95th Q	34'	94'	93'	115'	222'	0'	199'	154'	0'	38'	183'	0'	
2040 Build - Alt. 2 (Dual lane RAB) ^	LOS (Delay)	C (17.4)			F (135.4)			A (9.4)			F (225.4)			F (78.7)
	Synchro 95th Q	164'			810'			115'			1872'			
2040 Build - FINAL LANEAGE	LOS (Delay)	C (22.4)			E (57.5)			B (16.5)			C (32.0)			C (27.9)
	Synchro 95th Q	41'	117'	107'	150'	302'	0'	415'	230'	2'	57'	297'	0'	

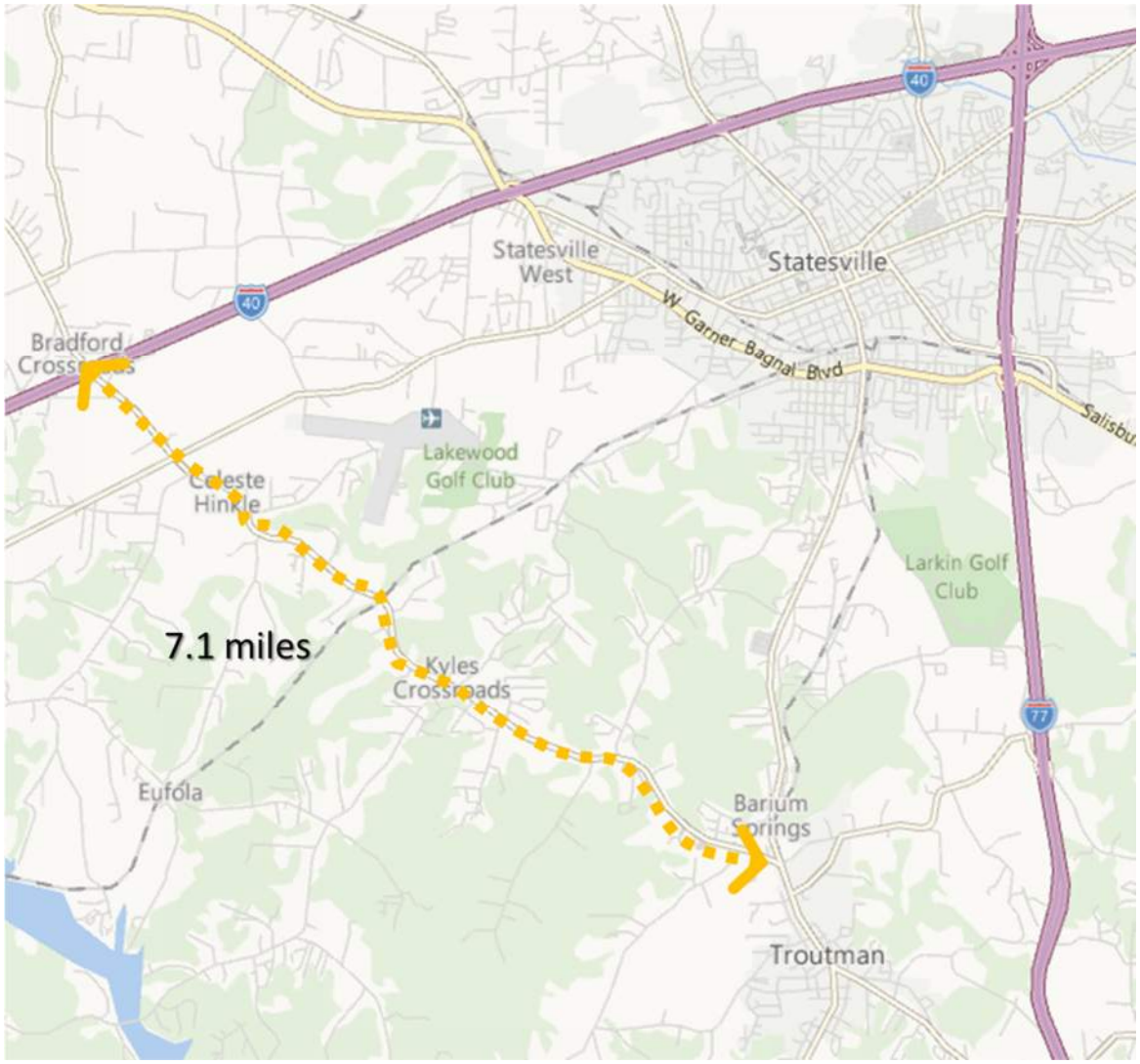
Both intersection treatments operate at an acceptable LOS for the 2025 horizon year. In the 2040 horizon year, the roundabout begins to experience congestion and failing operations for the westbound and southbound approaches. Both alternatives are graphically depicted on the following page.

Dual Lane Roundabout

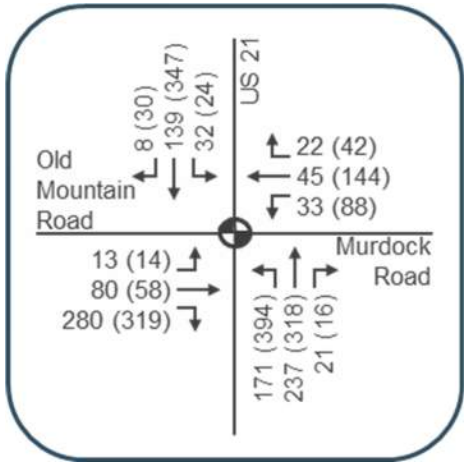
Signalized Intersection

Regional Connectivity

The section of US 21/NC 115 experiences a significant volume of not only automobile traffic but also heavy vehicle traffic. When there is an incident on either I-40 or I-77, this section of Us 21/NC 115 serves as the alternative route for vehicles wanting to avoid the incident. Others use the Old Mountain Road as a short cut from Exit 144 on I-40 to I-77.



Field observations and existing traffic counts (2015) indicate that at the intersection of US 21/NC 115 and Old Mountain Road/ Murdock Road traffic splits, as shown to the right. The AM peak hour has a higher percentage of traffic heading north to Statesville, while the PM peak hour has a higher percentage traveling to the west on Old Murdock Road.

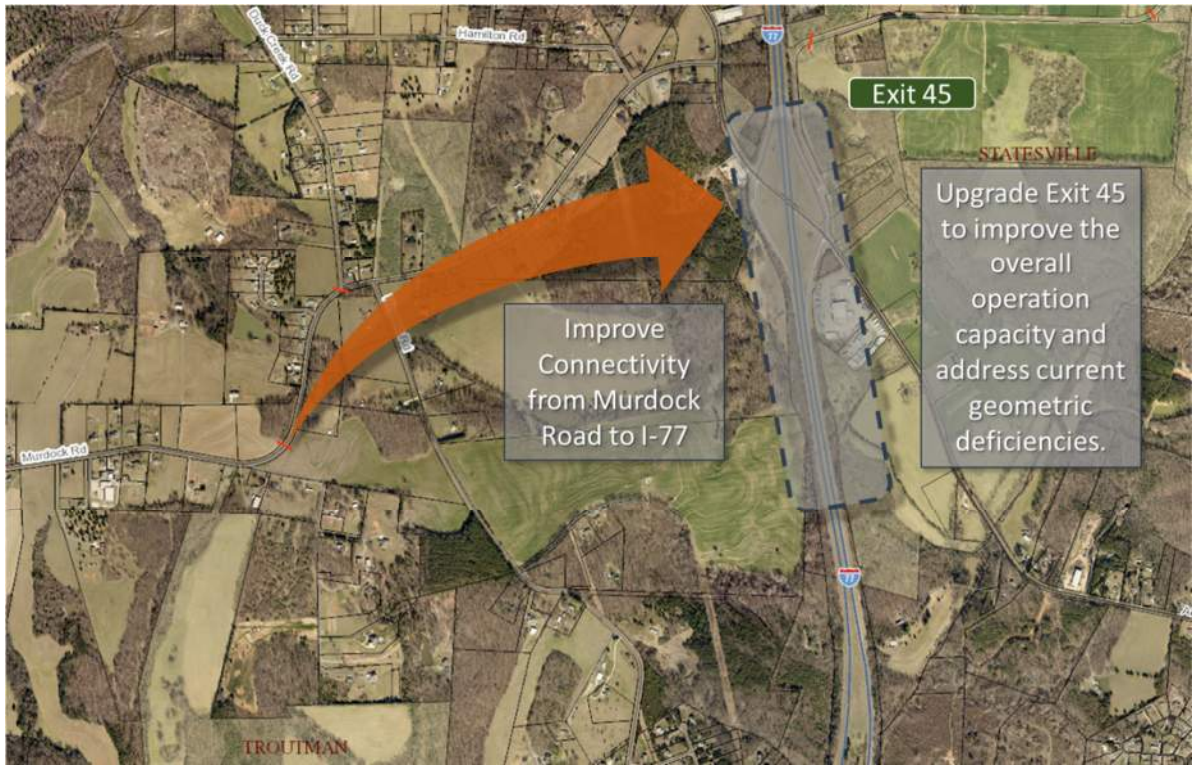


Additionally, to the north, the City of Statesville has recently completed a streetscaping project that reduced the number of through lanes on US 21/NC 115 through downtown to a three-lane section. While US 21/NC 115 does intersect with US 70 south of downtown, which ultimately connects with I-40 to the west at Exit 148, numerous traffic signals are present along this section of US 70. Because of this many heavy vehicles choose to utilize Old Mountain Road to I-40 than continuing north on US 21/NC 115 to US 70 to I-40. Field observations confirmed this as shown in the image below which depicts a tractor trailer turning onto Old Mountain Road rather than continuing north.

Located just to the northwest of the Town of Troutman is the Statesville Regional Airport which provides regional jet service throughout NC as well as serving as the homeport for local corporation's aircraft (Lowe's, etc.) With the recent expansion of industrial development along Murdock Road and future plans for the City of Statesville to increase industrial development in and around the airport, Old Mountain Road/Murdock Road, which connects I-77 and I-40 becomes a critical connection through the study area.

With the increase in development and traffic utilizing the Old Mountain Road/Murdock Road corridor, the interchange with Amity Hill Road (Exit 45) and I-77 needs to be evaluated for improved connectivity to Murdock Road. The current configuration of the interchange is at a significant skew with I-77 and connects via Amity Hill Road rather than Old Murdock Road. Due to this configuration, there is significant peak hour congestion along the corridor. Furthermore, Amity Hill Road serves as a minor connector in the regional roadway network.

To improve regional connectivity and mobility within the study area to better adapt to growth in the corridor, to the industrial development in Troutman, Statesville Regional Airport, and future industrial development along Amity Hill Road and Old Mountain Road, a modification to the existing Exit 45 should be considered.



Next Steps

The US 21/NC 115 Corridor Mobility Strategy began with the intent to collect, refine, and communicate a mobility strategy for the study area. This plan represents the contributions of the Town of Troutman, the Public Advisory Committee, technical staffs at NCDOT and CRTPO, and the citizens of the Town of Troutman. For successful implementation, it will require partnerships among government entities, stakeholders, private developers, and the residents that live and work in Troutman.

Given the critical role that US 21/NC 115 plays within the Town of Troutman, there is a sense of urgency to expedite the implementation of this mobility strategy. This project complements the overall development strategy set forth by the Town of Troutman and Iredell County and represent an investment on the US 21/NC 115 corridor that will help promote economic vitality through sustainable transportation design.

The US 21/NC 115 Corridor Mobility Strategy began with the intent to alleviate congestion associated with the existing corridor, its intersection streets and interchanges. The magnitude of the recommendations identified are beyond what local funding can absorb for implementation. Therefore, it should serve as the guiding document for NCDOT's TIP project R-2522.

As a regional commuter route, local northwest-southeast connector, lifeline to businesses and neighborhoods, and designated truck route, a one-size fits all solution is not feasible or desirable for US 21/NC 115. The US 21/NC 115 Corridor Study provides direction for a corridor that enhances the Town of Troutman and supports mobility and accessibility. This study is built upon the foundation that multimodal transportation solutions should not only enhance safety and operations, but should reflect the community context.

Based on input received from the PAC, key stakeholders, and members of the public, a set of priorities for the US 21/NC 115 improvements were developed. The following priorities generally support, encourage, and implement the community's vision for the US 21/NC 115 corridor.

Traffic Operations

- Reduces delay at key intersections.
- Enhances safety along the corridor.

Mobility and Access

- Promotes the safe and efficient movement of passenger vehicles and trucks.
- Provides access to key destinations in the Town of Troutman.

Pedestrian / Bicycle Connectivity

- Incorporates pedestrian and bicycle facilities.
- Connects Richardson Greenway to the adjacent sidewalk network.
- Improves cyclist and pedestrian comfort and safety.

Economic Development

- Supports the viability of existing businesses and future economic development opportunities through convenient site access.

Community Character

- Maintains or enhances the small-town character of the Town of Troutman.

Right-of-Way Impact

- Limits the impact to adjacent property through implementation accommodated within the existing right-of-way.

Based on a review of the community input, coupled with the safety and traffic operations, context the following configuration is recommended for the US 21/NC 115 corridor:

I-77 to Trackside Road – *Four-lane Divided section*

Trackside Road to Byers Road – *Modified Four-lane divided section*

Byers Road to Cedar Lane – *Five-lane section*

Cedar Lane to Old Murdock Road – *Couplet*

Murdock Road to Old Mountain Road – *Four-lane divided*

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 *US 21/NC 115 Corridor Mobility Strategy* should be carefully considered and endorsed by Town of Troutman, CRTPO, NCDOT and Iredell 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. A Memorandum of Understanding that is endorsed by these collective parties will guarantee a consistent partnership remains in place until implementation is complete.

- **Foundational Document:** The *US 21/NC115 Corridor Mobility Strategy* should serve as the starting point for the development of the R-2522 Environmental Document.

- **Update MTP:** The CRTPO LRTP should be amended to reflect the recommendations of this study.

- **Establish 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. Town of Troutman

should develop an approach to design including signing so that a sense of arrival is clearly established when passing through and accessing the study area. Recommendations include: coordinated wayfinding and signing, materials and lighting details and landscaping.

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

- **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 reduced implementation duration creativity, initiative, and partnerships may prove beneficial. Considerations that may increase the likelihood of funding include: adoption of the Memorandum of Understanding, dedication of right-of-way by affected property owners (rather than NCDOT right-of-way acquisition), and the use of local dollars supplemented with funds from grants and programs external to existing NCDOT funding. All of these should help elevate the exposure of the project and increase the likelihood of securing full funding and implementation in a timely manner.

Local partnerships can take many forms, but in this case, it represents an opportunity to leverage that fact that the projects discussed in this study are located in an area of change and growth. The Town of Troutman should continue to foster their relationships with the CRTPO, NCDOT, and Iredell County as they work towards implementation of the recommendations contained within this study.