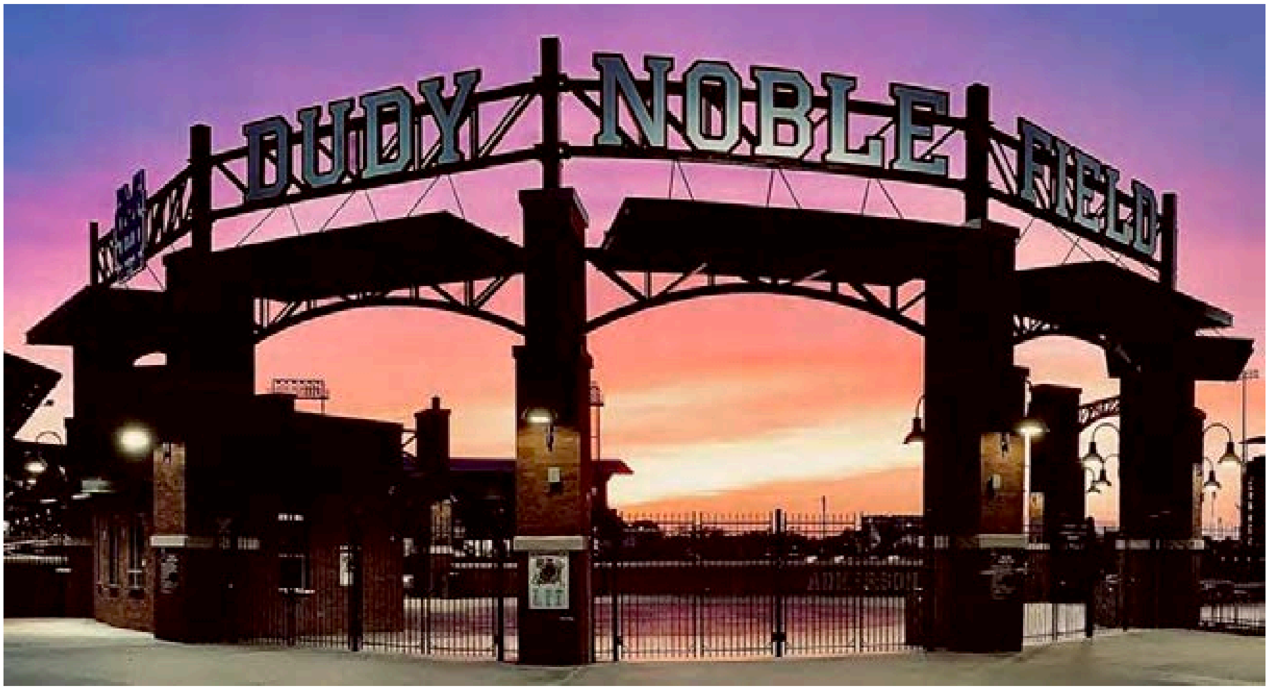
Regional Transportation Plan for Starkville, Mississippi State University, and Oktibbeha County



January 2022

Prepared for

City of Starkville, Oktibbeha County,
Mississippi State University &
Mississippi Department of Transportation

Prepared by:

NEEL-SCHAFFER

Table of Contents

List of Figures

List of Tables

1.0 Introduction

Oktibbeha County's population continues growing each year according to data published by the United States Census Bureau. This growth creates pressure on the transportation network and facilitates the need for an area wide transportation plan. Three local agencies are primarily responsible for this plan throughout the region: the City of Starkville, Mississippi State University, and Oktibbeha County. Each entity is responsible for their respective jurisdictions along with the Mississippi Department of Transportation on the state routes passing through the area. The goal of this project is to provide these agencies a consolidated transportation plan to provide guidance for future decisions that will consider the area as a whole instead of just on a jurisdictional level.

2.0 Project Overview

This project is divided into three primary focus areas. The first of these is an update to the existing golden triangle travel demand model. This consists of developing a 2019 network, demographic data, and external trip estimation as well as developing a 2045 horizon year network including an existing plus committed network. The second focus area is the evaluation and identification of multimodal needs including bicycle, pedestrian, and transit. This evaluation includes recommended changes and additions to the network as well as an associated planning level cost. Similarly, the final focus area is the evaluation and identification of roadway needs. Roadway projects identified here are also tested in the travel demand models developed as a part of this project. All this information is then utilized to develop both a short-term and long-term regional transportation plan.

The following sections outline this report.

- Section 1 – Introduction
- Section 2 – Project Overview
- Section 3 – Golden Triangle Travel Demand Model Documentation
- Section 4 – Multimodal Needs Evaluation and Identification
- Section 5 – Roadway Needs Evaluation and Identification
- Section 6 – Project Planning and Potential Funding Sources

3.0 Golden Triangle Travel Demand Model Documentation

3.1 Model Development

This section includes a brief description of the procedures used in the creation of the Starkville Travel Demand Model. It also includes a description of:

- the development of updated demographics and travel estimates,
- calibration and validation of the model,
- development of forecast demographics and their relationship to land use,
- the growth of the transportation network, and
- testing of future traffic needs and alternative projects.

3.1.1 Model Overview

The Regional Transportation Plan updates the Golden Triangle Travel Demand Model (GT TDM) that was created in 2013. The TDM, which covers the entirety of Lowndes and Oktibbeha Counties, now has a 2019 base year and 2045 horizon year.

The model traffic analysis zone (TAZ) structure remains unchanged from the 2013 model. However, the model network was updated to reflect changes in functional classification, new roadways, roadway widenings, new capacity factors, and add connectivity where needed. The socioeconomic data in the model was also updated to reflect the new base and horizon years. The updates to the socioeconomic data were conducted by Neel-Schaffer, Inc. using aerial imagery analysis to locate obvious housing growth in each TAZ, and InfoUSA data from the MULTIPLAN 2045 to update employment data. **Table 3.1.1.1** displays the key study area socioeconomic data.

The Starkville model external-internal and external-external trips are derived from the same methodology used in the 2013 model but updated using 2019 MDOT traffic counts. Internal-internal trip rates and behaviors are the same as those of the previous model but adjusted as needed for model calibration and validation.

Table 3.1.1.1 Study Area Socioeconomic Data, Base Year 2019

Variable	Description	Total
OCCDU	Occupied Dwelling Units / Households	46,002
TOTPOP	Total Population	115,156
SCHATT	School Enrollment	41,564
TOT_EMP	Total Employment	56,964
RET_EMP	Retail Employment	12,517

Source: Census 2010; InfoUSA, 2020; NSI, 2020

3.1.2 Model Validation

The purpose of model validation is to make the adjustments necessary to replicate base-year traffic conditions as closely as possible. In practice, this means making link assignment volumes approximate actual traffic counts within acceptable limits of deviation. The validation process is intended to ensure that the model is performing within the limits that define acceptable ranges of deviation from observed "real-world" values.

Validation of the GT TDM proceeded from consideration of its area wide performance to the relative distribution of traffic by roadway functional classification and ADT range. An appropriate degree of accuracy was defined in terms of the maximum tolerable deviation from base-year vehicular volumes (i.e., estimated annual average daily traffic) and Root Mean Square Error (RMSE).

Overall, the cumulative model volume for all network links associated with MDOT traffic count locations (2,095,615 vehicles) differed from total model estimated ADT (2,084,444 vehicles) by -0.5 percent compared to an allowable error limit of five (5) percent.

Validation results by ADT group and functional class are shown in **Table 3.1.2.1** through **Table 3.1.2.4**.

Table 3.1.2.1 RMSE by ADT Group

ADT Range	Number of Observations	Total Count	Total Model Volume	% RMSE	% RMSE Limit[1]
ADT<5,000	322	520,608	555,697	68.4	45.0 - 100.0
5,000 <= ADT < 10,000	68	471,007	469,086	24.5	35.0 - 45.0
10,000 < =ADT < 15,000	25	306,000	289,503	20.1	27.0 - 35.0
15,000 < =ADT < 20,000	18	292,000	279,521	17.3	25.0 – 30.0
20,000 < =ADT < 30,000	20	475,000	456,335	13.0	15.0 – 27.0
30,000 < =ADT <50,000	1	31,000	34,302	10.7	15.0 – 25.0
Areawide	454	2,095,615	2,084,444	33.5	35.0 – 45.0

Source: Minimum Travel Demand Model Calibration and Validation Guidelines for State of Tennessee; NSI, 2019
(1) % RMSE Limit is the maximum acceptable magnitude of the error relative to that of the counts conducted by MDOT

Table 3.1.2.2 RMSE by Functional Classification

Functional Classification	Number of Observations	Total Count	Total Model Volume	% RMSE	% RMSE Limit1
Principal Arterial	67	939,817	931,992	17.7	30.0
Minor Arterial	89	584,344	578,933	26.2	40.0
Collector	201	449,864	454,401	57.6	70.0
Local	97	121,590	119,117	69.6	N/A
Areawide	454	2,095,615	2,084,444	33.5	35.0-45.0

Source: Minimum Travel Demand Model Calibration and Validation Guidelines for State of Tennessee; NSI, 2019
(1) % RMSE Limit is the maximum acceptable magnitude of the error relative to that of the counts conducted by MDOT

Table 3.1.2.3 Percent Deviation by ADT Group

ADT Range	Number of Observations	Total Count	Total Model Volume	% RMSE	% RMSE Limit[1]
ADT<1,000	139	57,464	84,632	47.3	200.0
1,000 < =ADT < 2,500	97	164,334	190,010	15.6	100.0
2,500 <= ADT < 5,000	86	298,810	281,055	-5.9	50.0
5,000 <= ADT < 10,000	68	471,007	469,086	-0.4	25.0
10,000 < =ADT <25,000	57	917,000	874,811	-4.6	20.0
25,000 < =ADT < 50,000	7	187,000	184,850	-1.1	15.0
Areawide	454	2,095,615	2,084,444	-0.5	5.0

Source: Minimum Travel Demand Model Calibration and Validation Guidelines for State of Tennessee; NSI, 2019
(1) % Deviation Limit is the maximum acceptable magnitude of the error relative to that of the counts conducted by MDOT

Table 3.1.2.4 Percent Deviation by Functional Classification

Functional Classification	Number of Observations	Total Count	Total Model Volume	% RMSE	% RMSE Limit1
Principal Arterial	67	939,817	931,992	-0.8	+/- 15.0
Minor Arterial	89	584,344	578,933	-0.9	+/- 15.0
Collector	201	449,864	454,401	1.0	+/- 25.0
Local	97	121,590	119,117	-2.0	N/A
Areawide	454	2,095,615	2,084,444	-0.5	+/- 5.0

Source: Minimum Travel Demand Model Calibration and Validation Guidelines for State of Tennessee; NSI, 2019
(1) % Deviation Limit is the maximum acceptable magnitude of the error relative to that of the counts conducted by MDOT

The validation effort concluded that the Starkville study area travel demand forecasting model performs within the established limits of acceptable deviation from base-year traffic counts.

3.2 Model Projections

3.2.1 Future Land Use and Transportation Network

In order to model future transportation needs, forecast socioeconomic data and known imminent future transportation projects needed to be developed. The forecast data for the horizon year, 2045, was derived from data provided through stakeholder input which included representatives from the City of Starkville, Oktibbeha County, and Mississippi State University. **Table 3.2.1.1** displays the horizon year study area socioeconomic data.

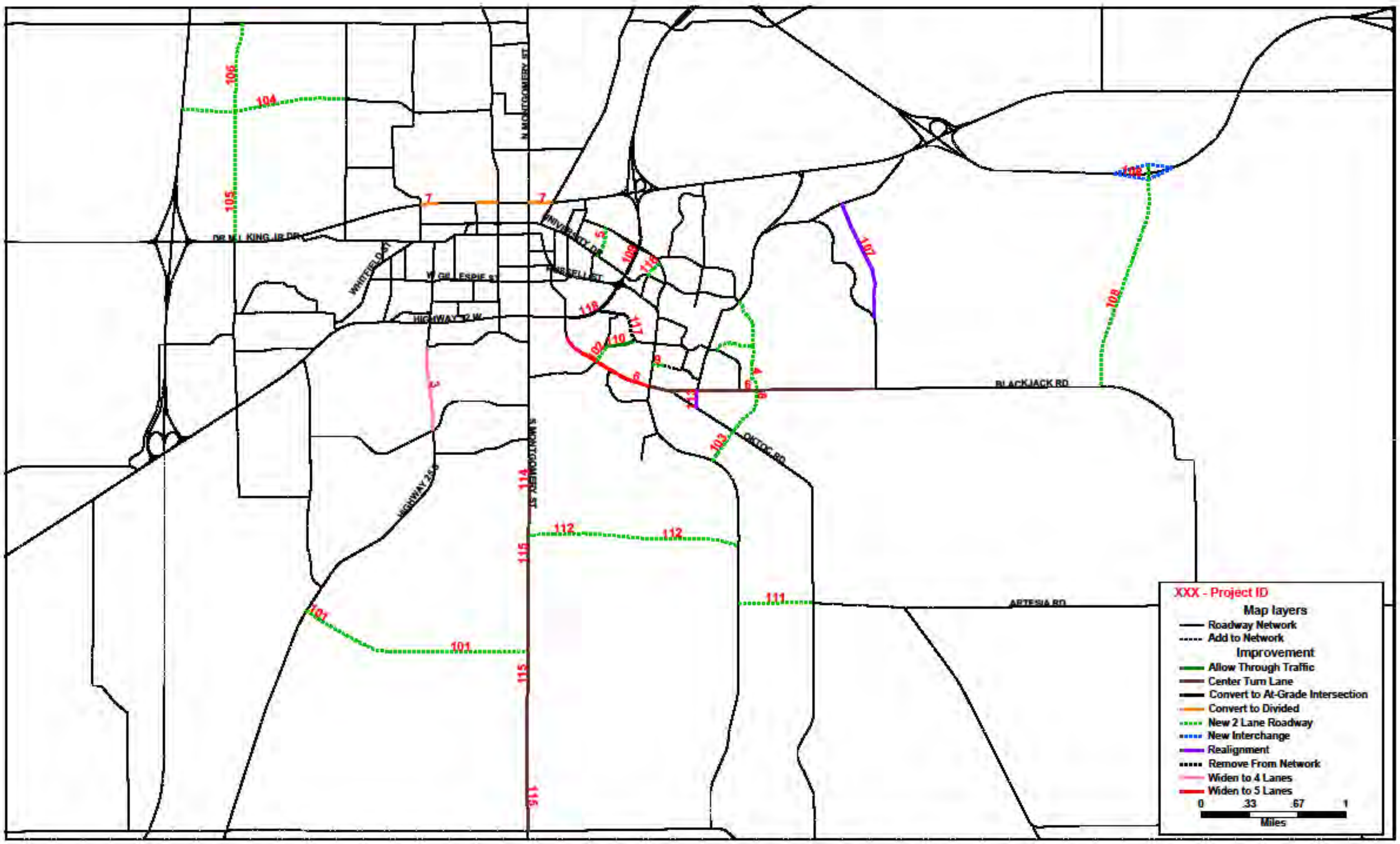
Table 3.2.1.1 Study Area Socioeconomic Data, Horizon Year 2045

Variable	Description	Total
OCCDU	Occupied Dwelling Units / Households	52,969
TOTPOP	Total Population	129,207
SCHATT	School Enrollment	47,066
TOT_EMP	Total Employment	66,780
RET_EMP	Retail Employment	15,357

Improvements to the transportation network also affect travel demand. In addition to the socioeconomic forecasts, transportation projects that have committed funding or have been constructed since 2019 were noted. These projects were then added to the model network to create a 2045 Existing Plus Committed (E+C) Network. These E+C projects are displayed in **Table 3.2.1.2** and shown in **Figure 3.2.1.1**.
Using this network and the forecast socioeconomic data, model runs for the horizon year without any further transportation improvements were conducted. **Figure 3.2.1.2** displays the model volume/capacity ratios for the horizon year, showing where congestion will occur without any future transportation projects beyond the projects listed in **Table 3.2.1.2**.

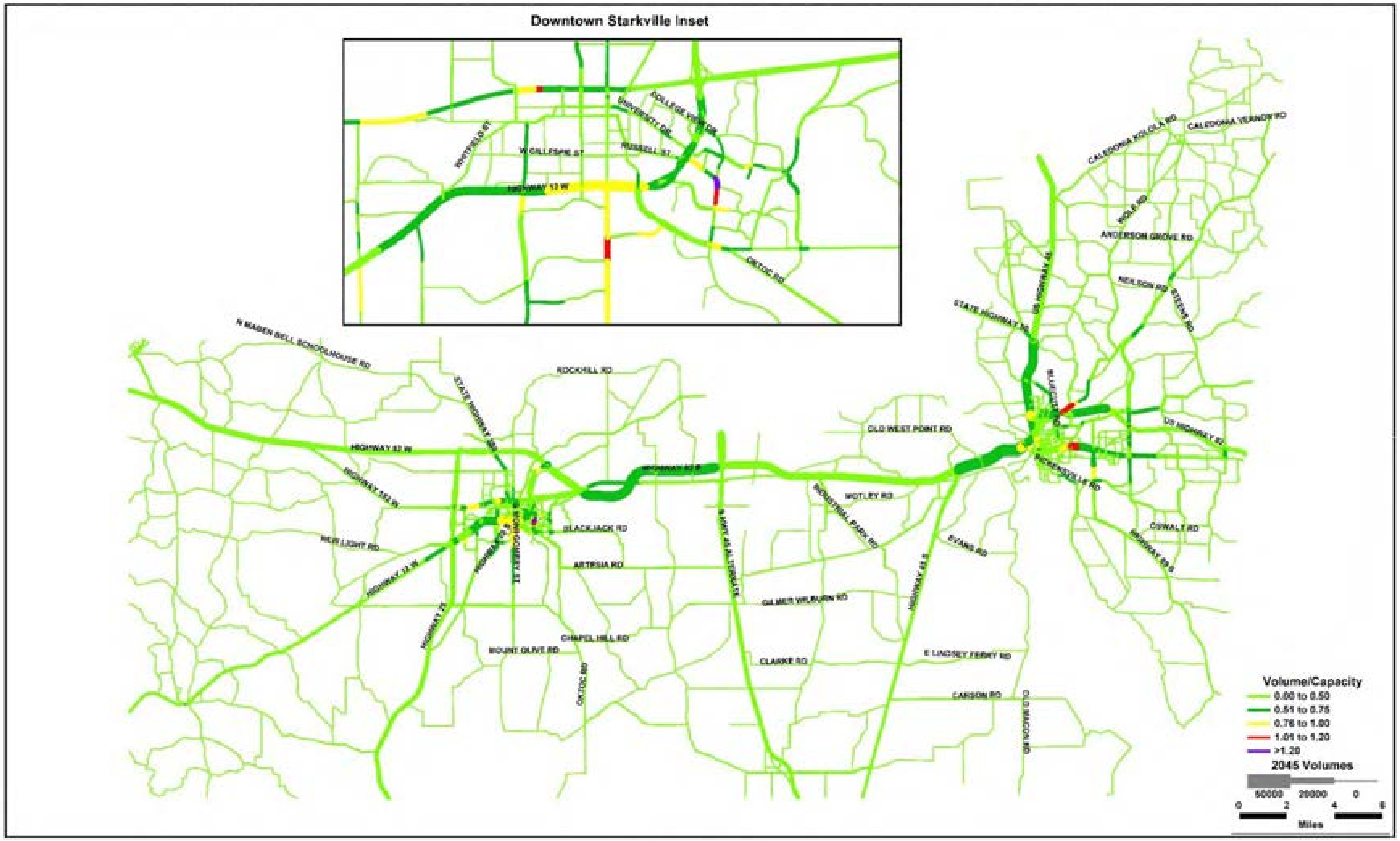
Table 3.2.1.2 Existing Plus Committed Projects

Project ID	Project Name	Project Limits	Project Description
3	MS 25 S	Lynn Ln to Yellow Jacket Dr	Widen to 4 Lanes
4	BUILD Grant (Bulldog Way)	Blackjack Rd to Lee Blvd & Morrill Rd	New 2 Lane Roadway
5	Adkerson Way	University Dr to College View Dr	New 2 Lane Roadway
6	Blackjack Rd	Hoover Dr to Stone Blvd Stone Blvd to Bardwell Rd	Widen to 5 Lanes Center Turn Lane
7	MS 182	N Long St to Pilcher St Douglas L Conner Dr to N Jackson St N Montgomery St to Old West Point Rd	Convert to 2 Lanes Divided
8	Campus Trail Extension Phase 1	Oktoc Rd to Blackjack Rd	New 2 Lane Roadway
9	Morgan Ave Extension	Stone Blvd to Morgan Ave	New 2 Lane Roadway



Starkville Existing + Committed and Test Projects

Figure 3.2.1.1 Existing Plus Committed Projects



2045 Volume/Capacity

Figure 3.2.1.2 Existing Plus Committed Network, 2045 Volume/Capacity

3.2.2 Test Projects and Analysis

An analysis was conducted on various test projects, what-if scenarios for planned or considered future roadway projects, identified by the local stakeholders and the City of Starkville. The test projects are shown in **Table 3.2.2.1** and displayed in **Figure 3.2.1.1** above. These test projects were analyzed in the Golden Triangle TDM to determine how they would impact traffic patterns within the region.

Table 3.2.2.1 Test Projects

Project ID	Project Name	Project Limits	Project Description
101	South Montgomery to Louisville Connector	Old Hwy 25 to S Montgomery St	New 2 Lane Roadway
102	Locksley Way Extension	Blackjack Rd to Robert Louis Jones Cir	New 2 Lane Roadway
103	Hail State Blvd to Oktoc Rd Connector	Hail State Blvd to Oktoc Rd	New 2 Lane Roadway
104	Hospital Rd Extension	MS 25 to Reed Rd	New 2 Lane Roadway
105	Stark Rd Extension Phase 1	MS 182 to Hospital Rd Extension	New 2 Lane Roadway
106	Stark Rd Extension Phase 2	Hospital Rd Extension to Reed Rd	New 2 Lane Roadway
107	Bardwell Rd Realignment	Blackjack Rd to Old Mayhew Rd	Realignment
108	Blackjack to US 82 Connector	Blackjack Rd to US 82	New 2 Lane Roadway and Interchange
109	MS 12	@ College View Dr	Convert to At-Grade Intersection
110	Bully Blvd Connector	Robert Louis Jones Cir to Bully Blvd	Open for Public Access, New 2 Lane Roadway
111	Artesia Rd Extension	South Montgomery St to Oktoc Rd	New 2 Lane Roadway
113	Oktoc Rd Realignment	Oktoc Rd to Blackjack Rd	Realignment
114	S Montgomery St	Shadowwood Ln to Sherwood Rd	Center Turn Lane
115	S Montgomery St	E Poor House Rd to Shadowwood Ln	Center Turn Lane
116	Bost Extension	Barr Ave to College View Dr	New 2 Lane Roadway
117	Bully Blvd	Near Robert L Jones Blvd to Twelve Ln	No Longer Public Access
118	MS 12	@ Bully Blvd	Convert to At-Grade Intersection

4.0 Multimodal Needs Evaluation and Identification

4.1 Bicycle and Pedestrian Needs Analysis

4.1.1 Existing Facilities

This section provides an overview of existing bicycle and pedestrian facilities in Oktibbeha County. This information comes from an inventory conducted in the spring of 2020 using aerial and street maps and in-person site visits.

4.1.1.1 Bicycle Facilities

Oktibbeha County currently has 20 miles of bicycle facilities and 6 miles of shared use (bicycle and pedestrian) facilities. The most common facilities are sharrows, which are on-road facilities in which bicycles share the lane with motorists, but a bicycle marking is painted on the road and/or posted on roadway signage. Bicycle lanes and cycle tracks are the next most common facilities. A bicycle lane is an on-road bicycle facility separated from traffic by a painted line while a cycle track is also an on-road lane but with a more significant painted or physical buffer. Finally, there are about six miles of shared-used paths that are physically distinct from roadways but may still follow roadway corridors or their own paths.

Figure 4.1.1.1 provides examples of each bicycle facility type and **Figure 4.1.1.2** maps these facilities.

The majority of bicycle facilities are concentrated around MSU with other facilities scattered around Starkville. Outside of Starkville and MSU there are no bicycle facilities. However, there are some rural routes with wide shoulders that can accommodate confident bicyclists.

4.1.1.2 Pedestrian Facilities

Oktibbeha County has almost 100 miles of pedestrian facilities, most of which are sidewalks. Most of the MSU campus and older parts of Starkville have sidewalks. Outside of these older areas, some major roads and developments in Starkville have sidewalks, and Maben and Sturgis have limited sidewalks. There are a few pedestrian paths in the county and shared-use paths in Starkville and MSU.

Figure 4.1.1.1 provides examples of the pedestrian facility types and **Figure 4.1.1.3** maps these facilities.

Table 4.1.1.1 Bicycle and Pedestrian Facility Inventory

Bicycle Facilities	
Type	Miles
Cycle Track	1.9
Bike Lane	7.3
Sharrow	10.8
Total	**19.9**

Shared Use Facilities	
Type	Miles
Shared Use Path	5.9
Shared Use Lane	0.1
Total	**6.0**

Pedestrian Facilities	
Type	Miles
Sidewalk	87.9
Ped Lane	2.1
Total	**91.7**

Note: These are centerline miles.
Source: NSI

Figure 4.1.1.1 Bicycle and Pedestrian Facility Examples

Pedestrian Path, Chadwick Lane Trail

Shared Use Path, Lynn Lane

Pedestrian and Bicycle Crossing, MSU South Entrance

Cycle Track, Locksley Way

Bicycle Lane, Russell Street

Sidewalk, Russell Street

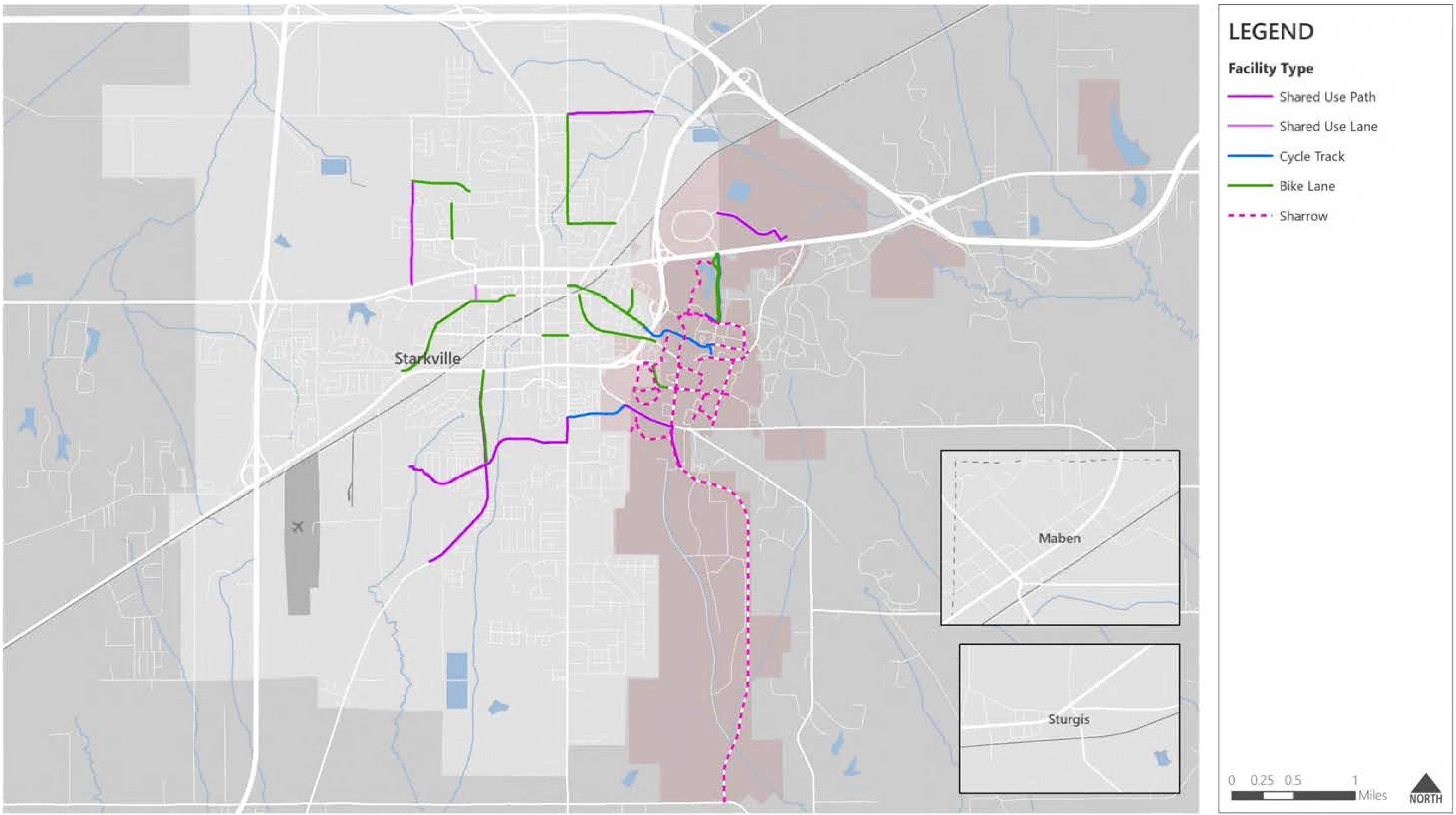
Pedestrian Path, MSU Walking Trail

Pedestrian Lane, Hospital Road

Sharrow, Hail State Blvd

Source: NSI

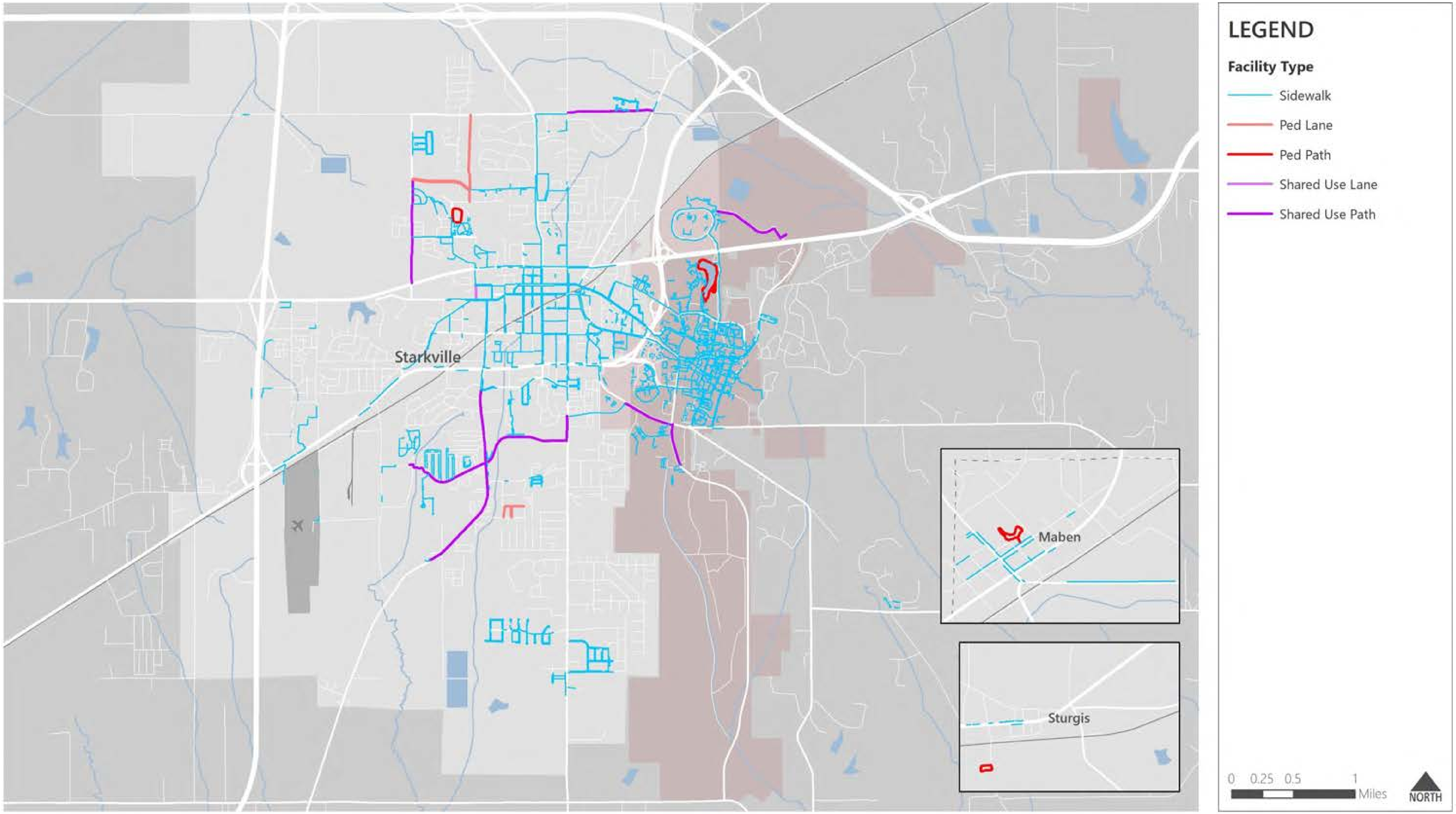
Figure 4.1.1.2 Existing Bicycle Facilities



Data Source: Neel-Schaffer

Disclaimer: This map is for planning purposes only.

Figure 4.1.1.3 Existing Pedestrian Facilities



Data Source: Neel-Schaffer

Disclaimer: This map is for planning purposes only.

4.1.2 Market Analysis

4.1.2.1 Existing Market Demand

In order to better understand existing demand for pedestrian and bicycle trips, a latent demand score analysis was conducted that illustrates potential demand based on characteristics of the built environment, location of major attractors, and demographics.

The demand analysis is the same for pedestrians and bicyclists. The demand mapping used fine-grained point-level information to assess an area's potential demand for pedestrian or bicycle trips based on a 0-100 scale. Points were awarded based on the factors summarized in **Table 4.1.2.1**.

Figure 4.1.2.1 shows the results of the market demand analysis. This map reflects relative potential demand, not absolute demand. Simply put, it shows which areas are more likely to have high or low demand relative to all other areas in Oktibbeha County. It does not attempt to quantify the actual number of bicycle or pedestrian trips occurring in these areas.

The analysis indicates that the greatest potential bicycle and pedestrian demand occurs around:

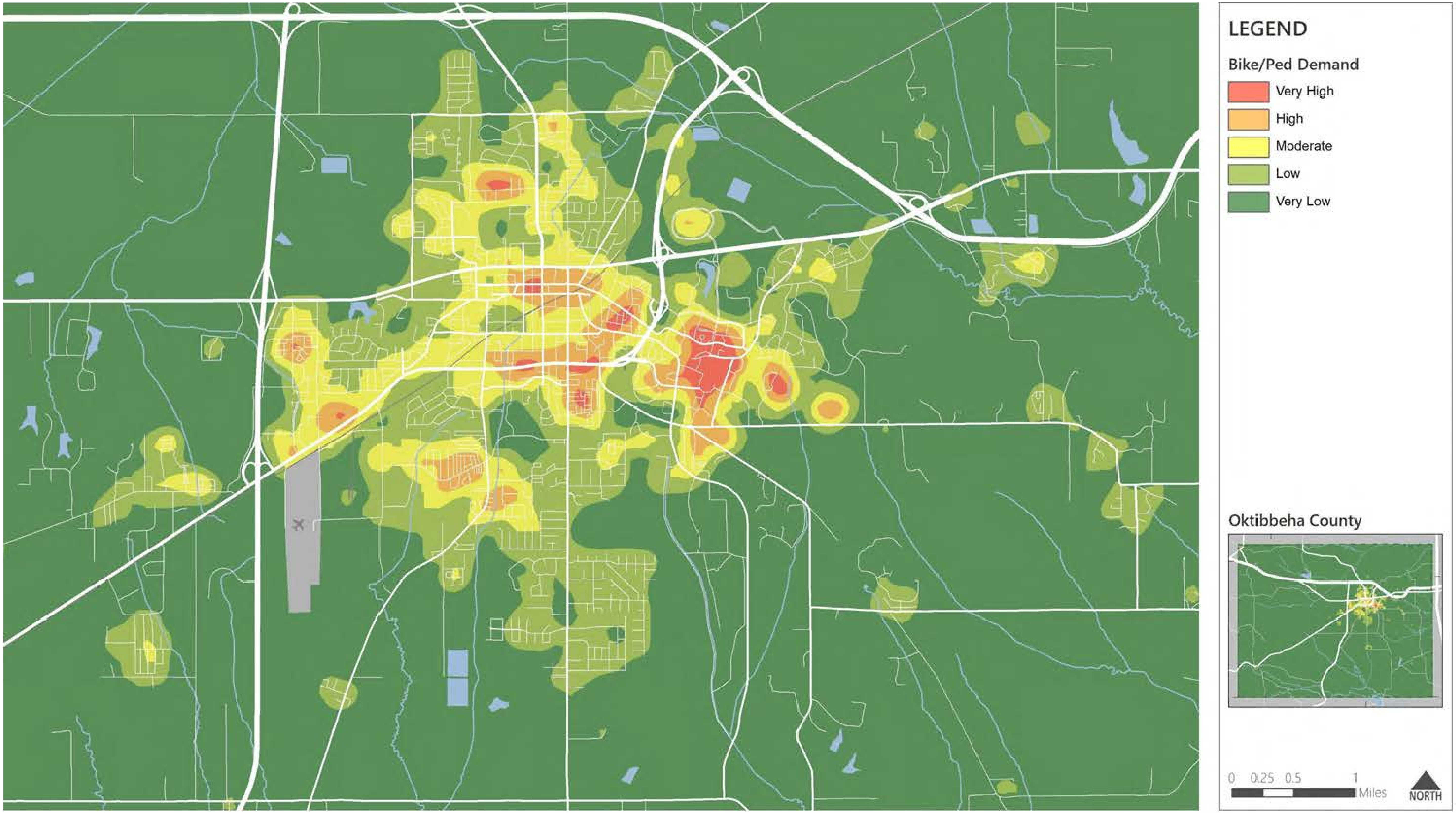
- MSU Campus
- Downtown Starkville, especially along Main St between Meigs St and the railroad
- A broad area including the Cotton District, MS-12 from Louisville St to Blackjack Rd, and S. Montgomery St from Gillespie St to Locksley Way.
- OCH Regional Medical Center
- Developments around Lynn Lane between Louisville Street and Spruill Industrial Park Road
- Crossgates Apartments.

Table 4.1.2.1 Bicycle and Pedestrian Demand Criteria and Breaks

Factor	Measure	Max Points
Land Use	Population, jobs, and students per acre	30
	Popular Destinations Nearby[1]	15
Demographic	Senior (65+) and youth (<18) population per acre	10
	Households with no vehicle available (or on-campus housing unit[2]) per acre	25
Travel Environment	Intersections per square mile[3]	20
Total Possible Points		**100**

[1]Popular destinations are parks, major recreation centers, schools, libraries, hospitals, grocery stores, pharmacies, convenience stores, eating/drinking places, casinos, hotels/motels, and military bases. Universities and military bases were weighted 10x, other schools, hospitals, casinos, and beaches were weighted 5x and grocery stores, pharmacies, convenience stores, hotels/motels, and parks/rec centers were weighted 2x.
[2]On-campus housing units calculated by dividing group quarters dorm population by 2.2
[3]Intersections with at least 4 segments are weighted 2x

Figure 4.1.2.1 Regional Bicycle and Pedestrian Demand



Data Source: Neel-Schaffer

Disclaimer: This map is for planning purposes only.

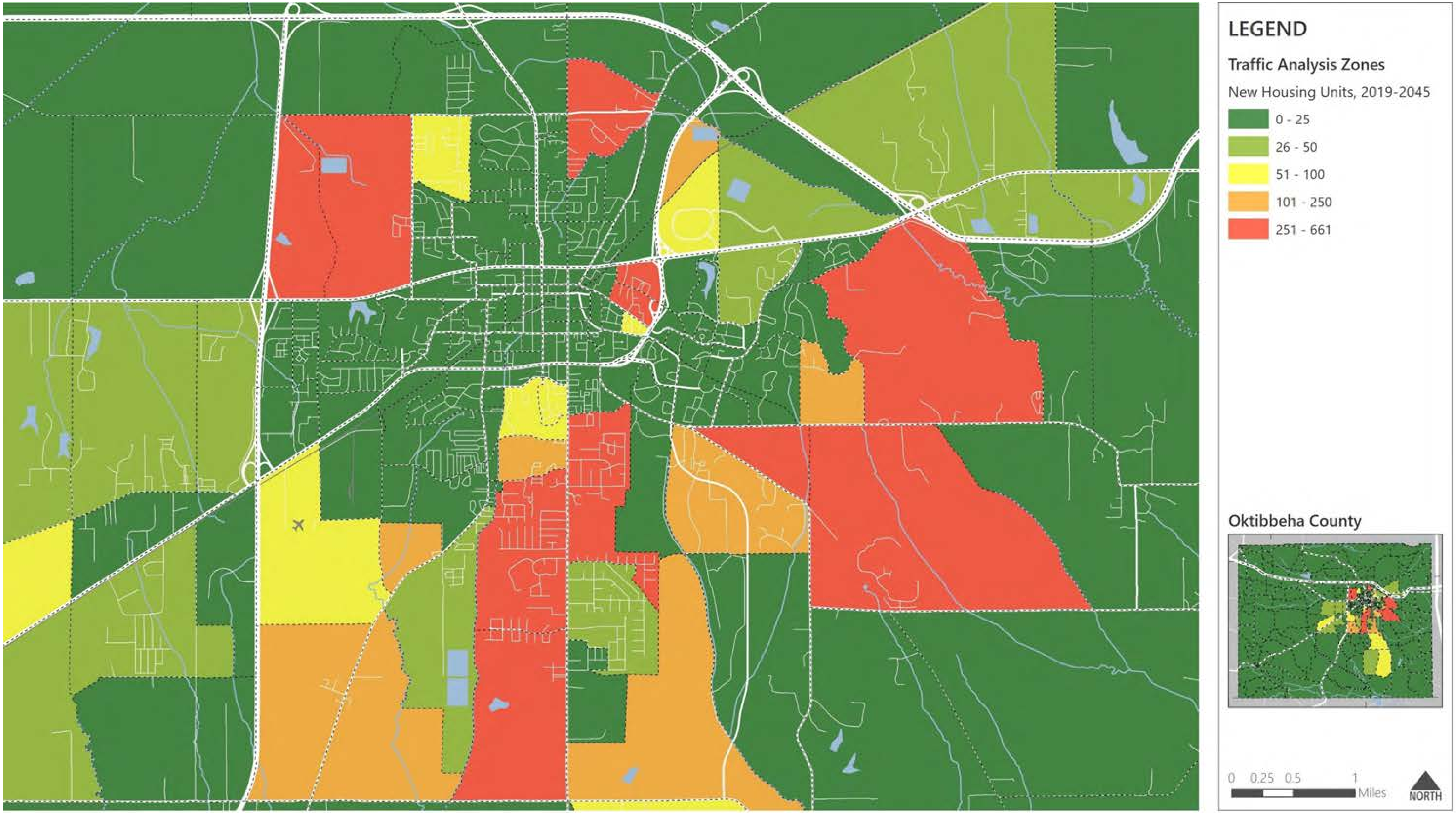
4.1.2.2 Future Growth Impacts

In addition to the existing demand for bicyclists and pedestrians, future growth will increase demand in certain areas. As part of the travel demand modeling process, housing unit and employment growth was forecasted for small geographic units called Traffic Analysis Zones (TAZs). These forecasts are shown in **Figure 4.1.2.2** and **Figure 4.1.2.3**.

These forecasts suggest that the following areas will experience major increases in bicycle and pedestrian demand over the next 25 years:

- **Russell Street/Cotton District/College View**: This area has undergone rapid redevelopment and continues to grow with new mixed use and multi-family developments. This area already has high demand and demand will increase further.
- **Blackjack Road**: This area is anticipated to undergo further development, including both single-family and multi-family residential development and small-scale commercial development. This will further increase the need for bike/ped facilities along Blackjack Road.
- **Northwest Starkville**: The area bounded by MS 182, Garrard Road, MS 25, and Reed Rd is anticipated to transition from mostly undeveloped to a mix of commercial and residential uses, similar to the area immediately to its south. This already developed southern area, especially around Stark Road, is also expected to add more jobs.
- **South Montgomery Rd**: This area is projected to experience significant residential development from Academy Rd to Poor House Rd. While this may be mostly lower-density development, it will still increase the demand for walking and biking.

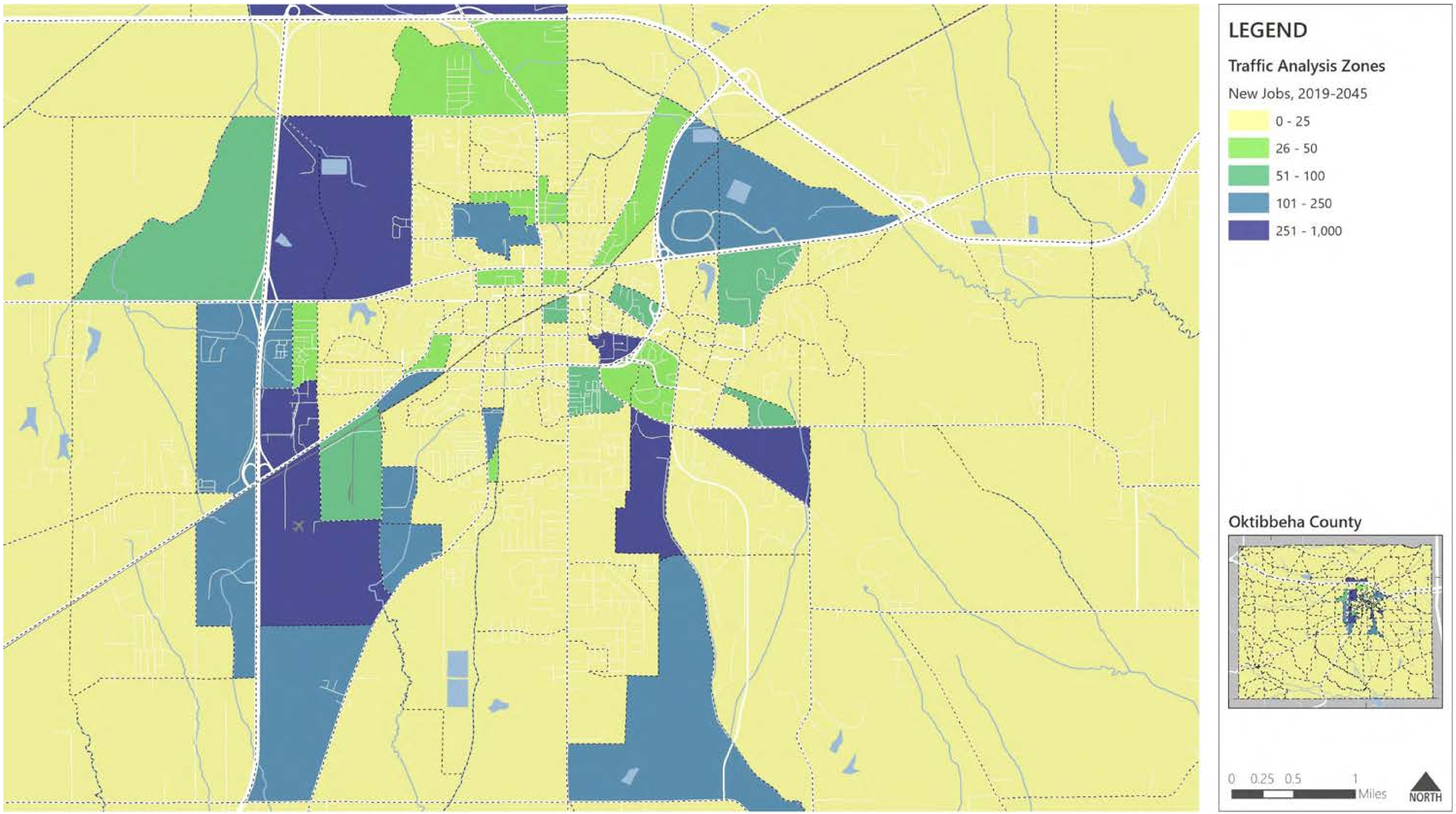
Figure 4.1.2.2 Housing Unit Growth, 2019-2045



Data Source: Neel-Schaffer

Disclaimer: This map is for planning purposes only.

Figure 4.1.2.3 Employment Growth, 2019-2045



Data Source: Neel-Schaffer

Disclaimer: This map is for planning purposes only.

4.1.2.3 Health and Equity

Some populations of people are more likely to rely on biking or walking as a primary means of transportation than others. Additionally, these populations may also be less likely to access safe facilities for exercise and recreation and could enjoy the physical and mental benefits from active transportation. A Health and Equity Analysis was performed to target TAZs that have the highest densities of vulnerable populations. These populations include:

- **Households Without Vehicles**: Automobile ownership is a strong indicator that a person may walk or bike as they may lack other options for transportation. A person may lack a vehicle because of economic reasons, physical or mental ability, or because of a decision to live a car-free lifestyle.
- **Low-Income Households:** Low-income households are more likely to walk or bike due to a greater likelihood that they lack regular access to a vehicle or seek to save money by minimizing travel by car.
- **Student-Aged Population:** Persons under 25 are less likely to have access to a personal vehicle, as they may be in school or early in their career and live on a lower income.
- **Seniors:** Some seniors may be unable to drive or may be on a fixed income and cannot afford a vehicle.
- **People of Color**: Ensuring communities of color have access to safe bicycling and walking facilities is critical to ensuring environmental justice.
- **Unemployed Persons:** Similar to low-income households, unemployed persons are less likely to afford their own vehicle and are more likely to walk or bike.

Some households and people may fall into more than one of these criteria while others do not. This criterion is not meant to generalize the needs or characteristics of any household or person but to ensure that groups who may have the most needs are targeted and addressed in planning efforts.

Methodology

Data for these categories was taken from the 2019 5-year American Community Survey. The density for each population was calculated by TAZ. The scoring was based on relative equity needs for the county. To put this another way, the tiers of equity do not represent a specific level of need but rank the TAZs to show where the populations with highest equity needs are located.

Each category was awarded points from zero to four. The tiers for these points were determined by dividing the highest TAZ density per category into four equal intervals. The numbers were not normalized. **Table 4.1.2.2** shows the density for each category and how many points it was awarded. With four points and six categories, the highest points possible are 24. However, the highest point value for a TAZ was thirteen. In order to rank the TAZs, **Table 4.1.2.3** shows what number of points equate to each tier.

Table 4.1.2.2 Health and Equity Scoring

Factor	Measure	Points			
		1	2	3	4
Vehicle Access	Households without access to a vehicle per acre	0.001-0.427	0.428-0.854	0.855-1.281	1.282-1.709
Low-Income Households	Households with SNAP benefits per acre	0.001-0.466	0.467-0.931	0.932-1.397	1.398-1.863
Student-Aged Population	Population aged 15-25 per acre	0.001-5.846	5.847-11.691	11.692-17.537	17.538-23.382
Seniors	Population aged 65 and over per acre	0.001-0.522	0.523-1.043	1.044-1.564	1.565-2.086
Minority Population	Non-white population per acre	0.001-2.79	2.791-5.581	5.582-8.371	8.372-11.161
Unemployed Population	Unemployed population over the age of 16 per acre	0.001-2.41	2.412-4.821	4.822-7.231	7.231-9.642

Source: Neel-Schaffer

Table 4.1.2.3 Health and Equity Tiers

Tier	Points
Tier 1: Lowest Priority	0-3
Tier 2: Low Priority	4-6
Tier 3: High Priority	7-9
Tier 4: Highest Priority	10-13

Source: Neel-Schaffer

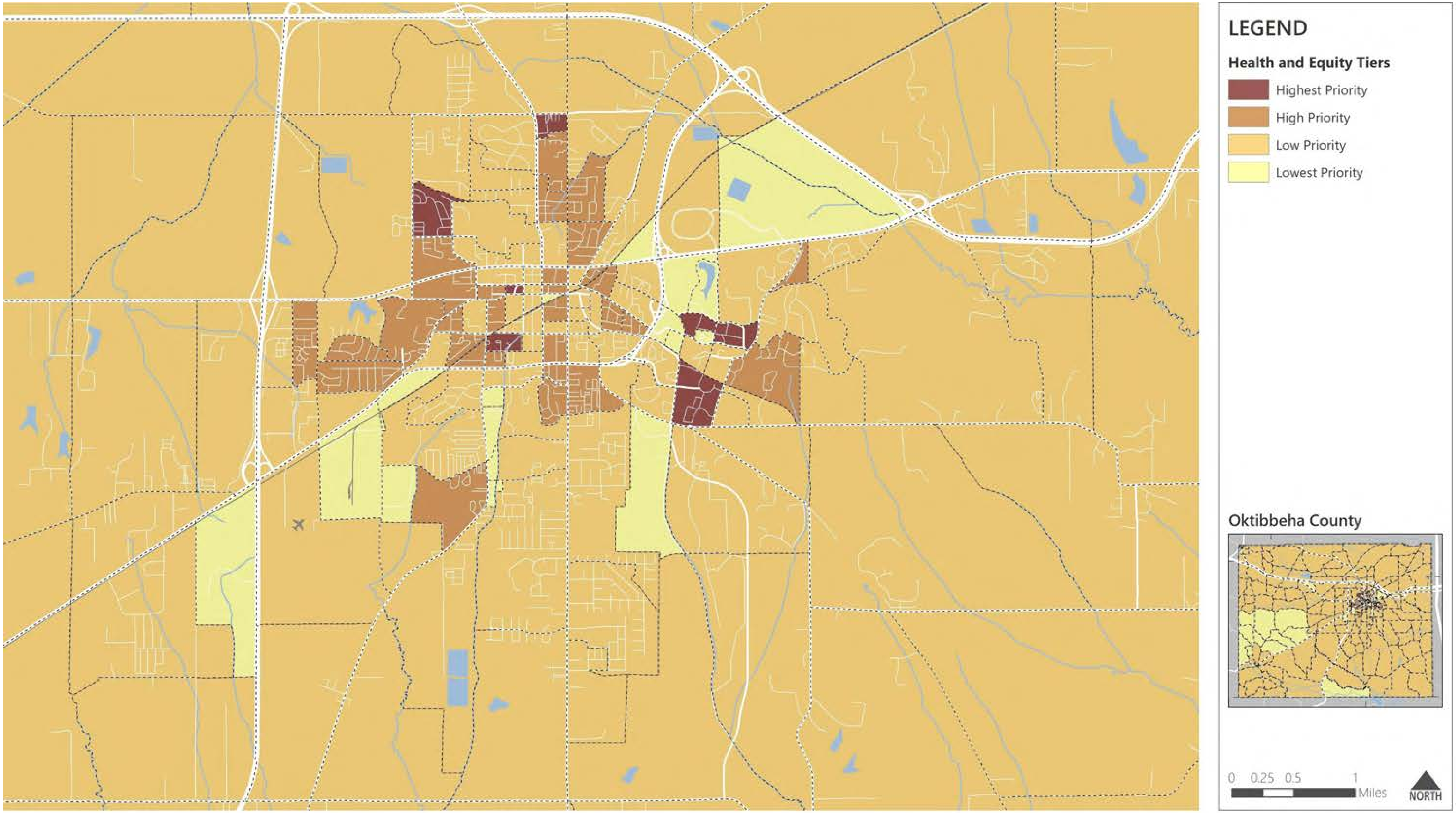
Results

Figure 4.1.2.4 maps the results. Five areas stood out as the highest priority areas for ensuring equity. Again, these tiers show relative needs for the region and not absolute.

- **Downtown Starkville- between MS-182, MS-12, Hwy-12, and Hwy-25:** In general, this area has a higher concentration of low-income households. There are also pockets of households without vehicles, seniors, and minority households.
- **Area bounded by Garrard Rd, MS-182, Jackson St, and Old West Point Rd:** Most of this area has a higher concentration of seniors and/or low-income households.
- **MSU campus**: Students are more likely to lack vehicles or have lower incomes as they are in school or are early in their careers.
- **Multi-family neighborhood between Westside Rd and Hospital Rd to the east of Reed Rd:** This neighborhood has a higher concentration of minority households and seniors.
- **Northern corner of Maben bordering Webster and Choctaw Counties:** This neighborhood has a higher concentration of seniors.

Some of these areas, such as MSU campus, are currently served with strong bicycle and pedestrian facilities. Later in this chapter the existing facilities and demand factors will be considered in conjunction with the location of these top health and equity TAZs to identify where the highest needs are for the bicycle and pedestrian network.

Figure 4.1.2.4 Health and Equity Priority Tiers



Data Source: Neel-Schaffer

Disclaimer: This map is for planning purposes only.

4.1.3 Safety and Suitability

4.1.3.1 Safety

An analysis was conducted of bicycle and pedestrian crashes in Oktibbeha County from 2014-2018. A total of 93 crashes occurred during this period. Over 70 percent of these crashes involved a pedestrian, which can be explained by the greater number of pedestrians than bicyclists. There were a total of eight fatalites during this time period. Over two-thirds of injuries resulted in a complaint of pain injury or property damage only. The majority of crashes occurred during daylight. **Table 4.1.3.1** and **Figure 4.1.3.1** and **Figure 4.1.3.2** show these statistics.

Figure 4.1.3.3 and **Figure 4.1.3.4** map where the crashes occurred. Three trends emerged in where crashes occurred:

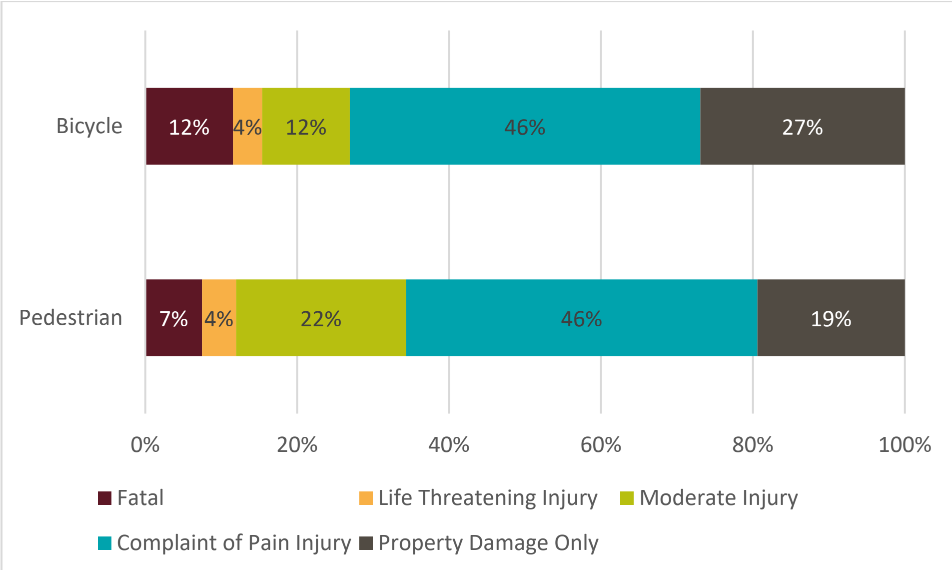
- Most pedestrian and almost all bicycle crashes occurred around MSU campus. Most of these crashes resulted in low levels of injury or damage. There are a greater percentage of pedestrian and bicyclists on campus, so it is reasonable that this area has a large share of the crashes. However, these crashes should still be considered when designing facilities or public education campaigns and enforcing rules of the road.
- All fatalities occurred on major roads or highways outside the downtown of Starkville. This suggests that perhaps high speeds contribute to these crashes, and it should be studied how frequently pedestrians or bicyclists use these roads and what alternatives are available.
- Outside of MSU, pedestrian crashes mostly occurred in downtown Starkville and by some of the major intersections.

Table 4.1.3.1 Bicycle and Pedestrian Crashes, 2014-2018

Severity of Injury	Bicycle	Pedestrian	Severity of Injury	Bicycle
	Number	Percentage	Number	Percentage
Fatal	3	12%	5	7%
Life-Threatening Injury	1	4%	3	4%
Moderate Injury	3	12%	15	22%
Complaint of Pain Injury	12	46%	31	46%
Property Damage Only	7	27%	13	19%
Total	**26**	**100%**	**67**	**100%**

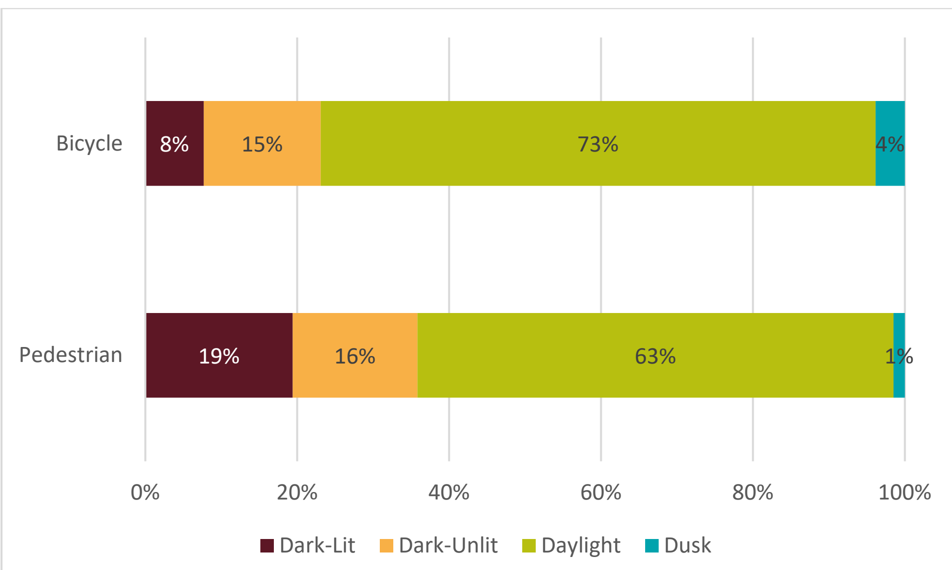
Source: MDOT

Figure 4.1.3.1 Bike/Ped Crashes by Severity, 2014-2018



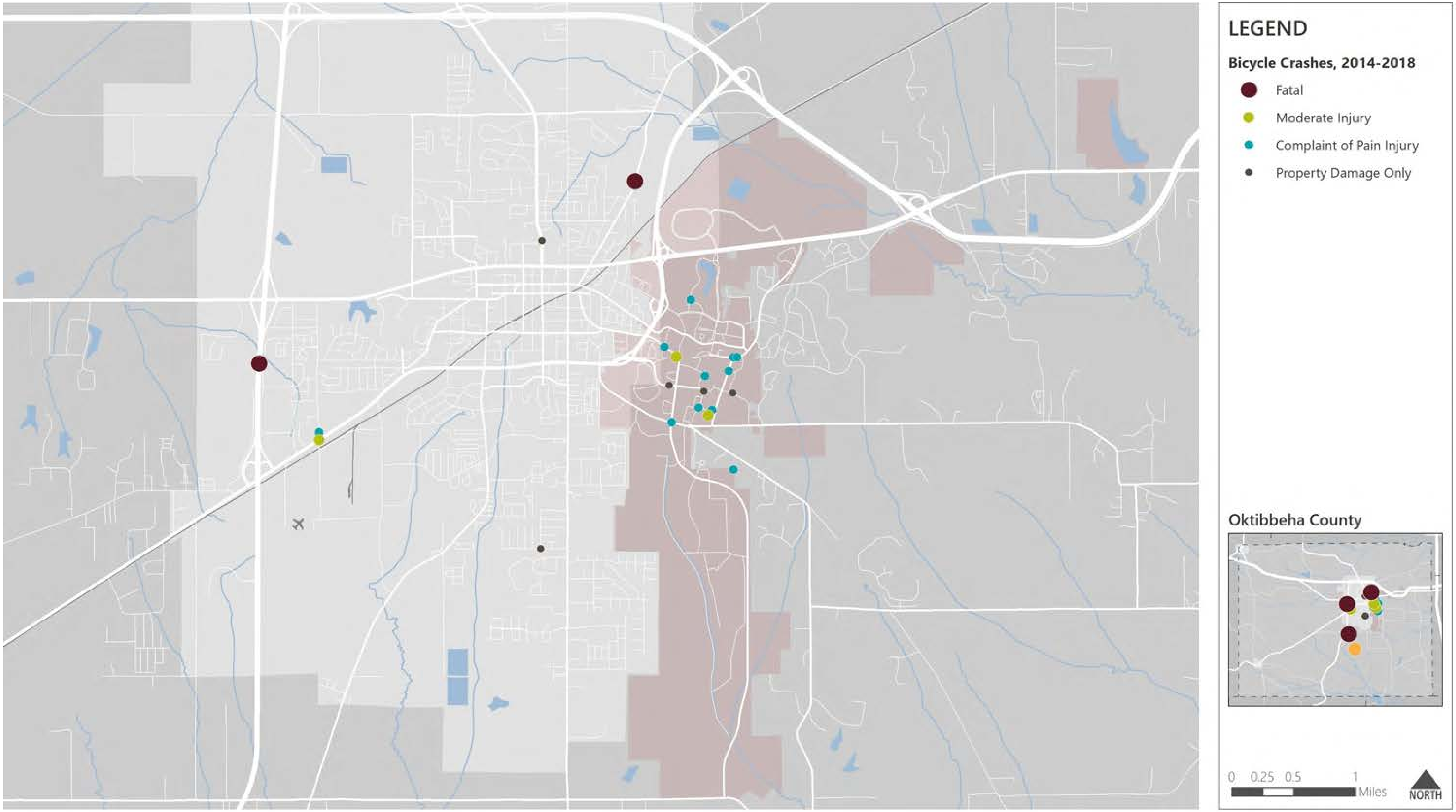
Source: MDOT

Figure 4.1.3.2 Bike/Ped Crashes by Lighting Conditions, 2014-2018



Source: MDOT

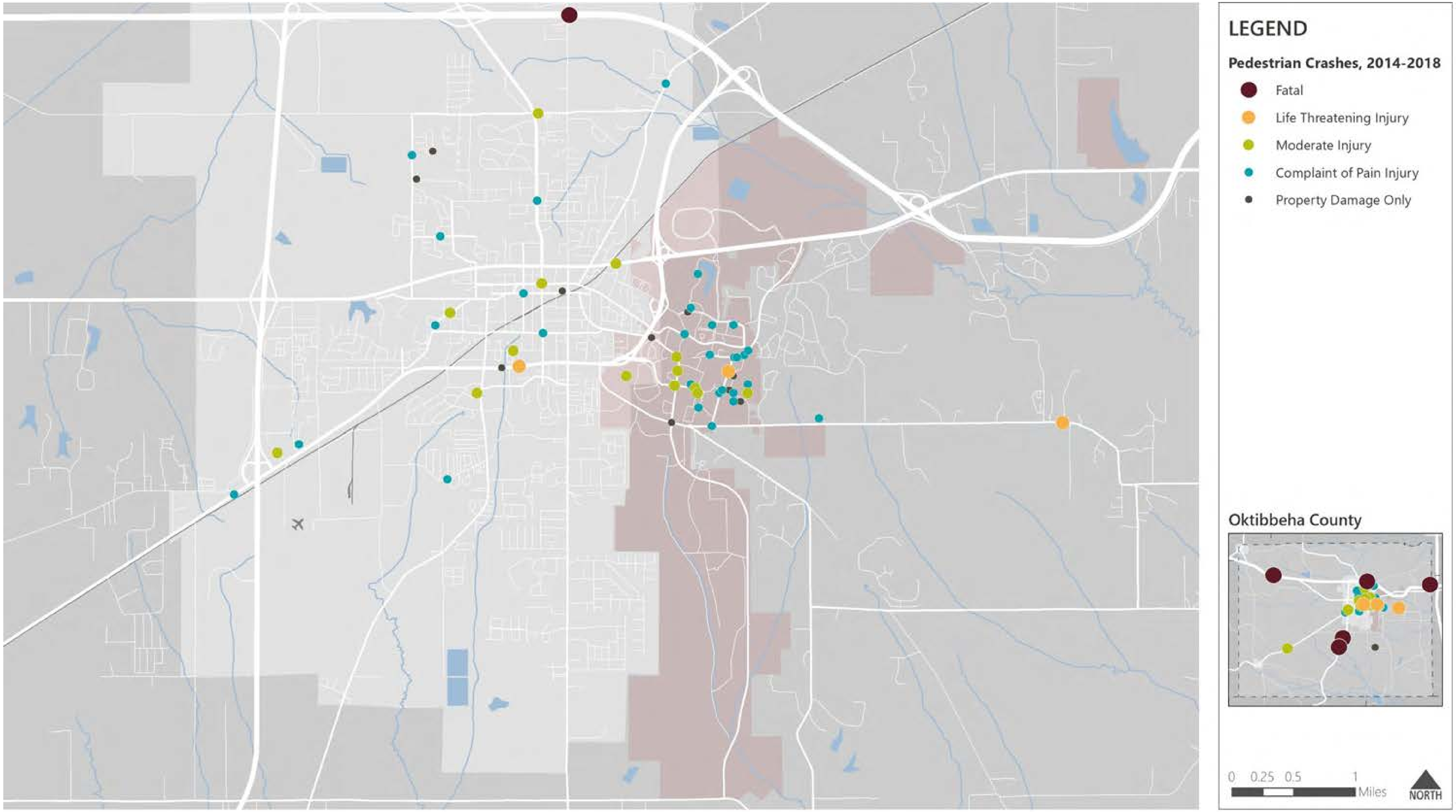
Figure 4.1.3.3 Bicycle Crashes, 2014-2018



Data Source: MDOT

Disclaimer: This map is for planning purposes only.

Figure 4.1.3.4 Pedestrian Crashes, 2014-2018



Data Source: MDOT

Disclaimer: This map is for planning purposes only.

4.1.3.2 Bicycle Level of Comfort

The experience of bicycling on roadways can greatly vary based on the road's level of stress. The Mineta Transportation Institute[1] classifies levels of comfort by defining what amounts of stress bicyclists are willing to tolerate. These are as follows:

- **Stress Level 1**: These roads are comfortable for most of the population to ride, including children. These roads are similar to neighborhood streets and off-road paths.
- **Stress Level 2**: These roads are low stress and suitable for about 60 percent of the population. These roads have low vehicle volumes and speeds.
- **Stress Level 3**: These roads are moderate stress and suitable for about 10 percent of the population. These roads may have more than two lanes but include a bicycle lane. Many bicycle commuters fall into this category.
- **Stress Level 4**: These roads are comfortable for less than one percent of the population. These bicyclists are comfortable biking in high stress environments alongside vehicles travelling at 40 miles per hour or faster. Many recreational bicyclists fall into this category.

Methodology

A level of comfort analysis was performed to assign stress levels to major road segments in order to find gaps in a connected network. The methodology for this analysis was adapted from the Mineta Transportation Institute and People for Bikes and the classification criteria are summarized in **Table 4.1.3.2** and **Table 4.1.3.3**. Level 1 Comfort roads are comfortable for most of the population to ride, while Level 4 Comfort roads are comfortable for only the most confident bicyclists.

The criteria considers the type of bicycle facility, traffic speed and volume, and the presence of parking. The presence of parking can increase stress for bicyclists because vehicle passengers can "door", or hit bicyclists with their door, and because bicyclists and drivers can collide as drivers pull in and out of spots. Parking spaces that are fifteen feet or wider provide a buffer between bicyclists and vehicles and are considered to be less stressful. One special case in this methodology is that the new buffered bicycle lane on Locksley Way was considered to be a shared-use path because the design features create significant protection for bicyclists from vehicles.

In cases where the condition of the road changed within one segment, the majority condition was considered. For example, if a bicycle lane covered only a quarter of the road segment, it was classified as having no bicycle facility. In cases where the different conditions covered equal amounts of a segment, the more dangerous condition was used. For example, if a road segment had a speed limit of 40 mph for half the segment and a speed limit of 30 mph for half, the speed limit of 40 mph was used.

This analysis relied on base year (2019) data from the Golden Triangle Regional Travel Demand Model, which only includes roadways classified as a collector road or higher. Local roads are considered to be low-stress for bicyclists and were not included in the analysis. Additionally, highways US-82 and MS-25 and all ramps were considered unsuitable for bicycles and were excluded from the analysis.

1 Mineta Transportation Institute, *Low-Stress Bicycling and Network Connectivity,* MTI Report 11-9

Table 4.1.3.2 Bicycle Level of Comfort Classification – Mixed Traffic

Travel Speed	**Number of Travel Lanes**	**Annual Daily Traffic (ADT)**		
		≥3000	3000-6000	>6000
≤25	1-2	1	2	3
	3-4	3	3	3
	≥5	4	4	4
>25 to ≤35	1-2	2	3	3
	≥3	4	4	4
>35	≥1	4	4	4

Source: Adapted from Mineta Transportation Institute

Table 4.1.3.3 Bicycle Level of Comfort Classification – With Facilities

Facility type	**Speed**	**Parking**	**Facility Width**	**Stress**
Shared-Use Path	→	→	→	1
Bike lane	>35	→	→	4
	30-35	Yes	≤14 ft	3
		Yes or No	≥15 ft	2
	<30	→	→	ADT>3000 = 2
				ADT≤3000 = 1
Sharrow	Treat as Mixed Traffic → See Table 3.6			

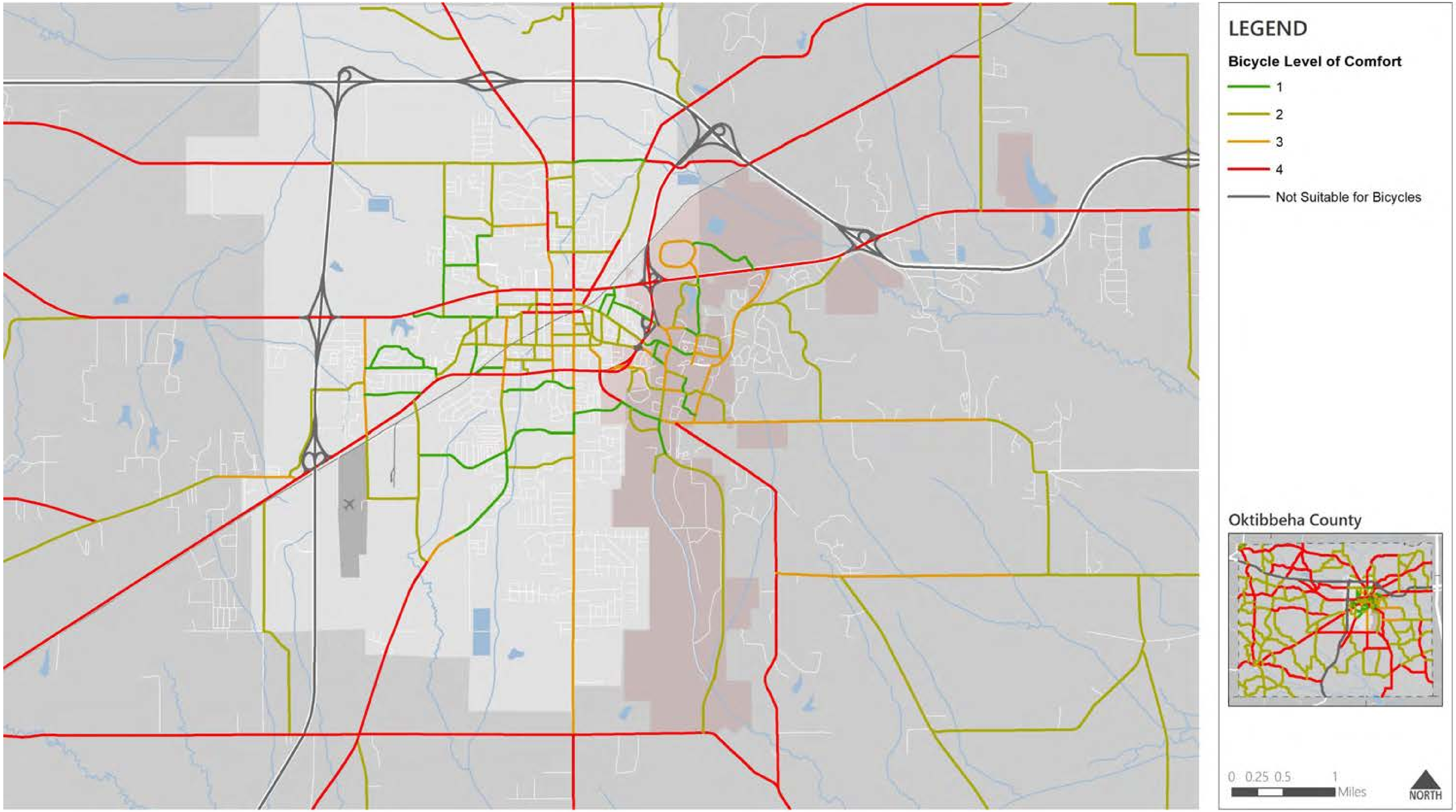
Source: Adapted from People for Bikes

<u>Results</u>

Figure 4.1.3.5 shows results for the Level of Comfort analysis. At the county level, most roads are either a Level 2 (Low-Moderate Stress) or Level 4 (High Stress). Rural routes with higher speeds and traffic are Level 4, but rural routes with slower speed limits and less traffic are more comfortable for most bicyclists to ride.

Within the City of Starkville and MSU, many roads are a Level 1 or Level 2. However, these low-stress roads do not form a well-connected network and are interrupted by Level 3 or 4 road segments. Some areas with strong Level 1 or 2 networks include MSU campus, the neighborhoods around Lynn Lane, and northwestern Starkville. The downtown core of Starkville has several Level 2 roads but also has several roads that act as barriers to a more complete, low-stress network.

Figure 4.1.3.5 Bicycle Level of Comfort



Data Source: Neel-Schaffer

Disclaimer: This map is for planning purposes only.

4.1.3.3 Pedestrian Level of Service

The Pedestrian Level of Service analysis seeks to understand areas that are safe for pedestrians to travel. Areas are graded on an A-F scale with A being a road segment providing a safe and comfortable experience to pedestrians and F being a very uncomfortable pedestrian experience.

Methodology

When measuring pedestrian level of service, this analysis considered the presence of a sidewalk or shared use path, the number of lanes, and the road speed limit. Just like in the Bicycle Level of Comfort analysis, only collector and arterial roads were analyzed since these are the roads included in the regional travel demand model. Furthermore, local roads are considered to be low-stress for pedestrians. Highways US-82 and MS-25 and all ramps were considered unsuitable for pedestrians and were excluded from the analysis.

Table 4.1.3.4 provides the methodology and criteria for scoring road segments for pedestrian level of service. Road segments that had a shared use path alongside them were scored as an A for Level of Service. This methodology does not consider ADA accessibility or condition of existing bike/ped infrastructure, but these are important considerations for Level of Service.

Table 4.1.3.4 Pedestrian Level of Service Criteria

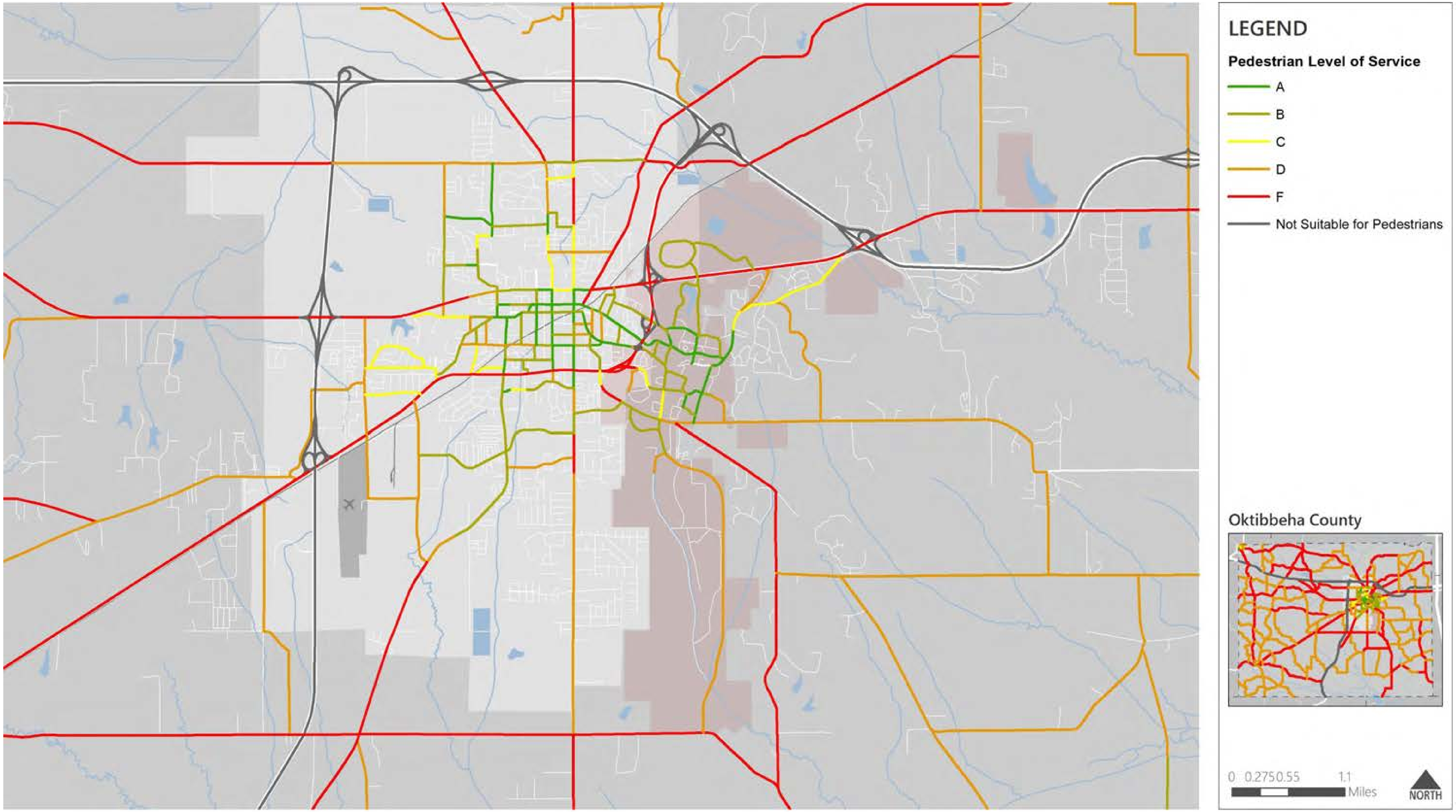
Presence of Sidewalk or Path	**≤25**		**30-35 MPH**		**≥40 MPH**	
	2 lanes	**>2 lanes**	**2 lanes**	**>2 lanes**	**2 lanes**	**>2 lanes**
Mostly complete on both sides	A	A	A	A	B	C
Mostly complete on one side	B	B	B	C	C	D
Partial or no sidewalk	C	C	D	F	F	F

Source: Adapted by Neel-Schaffer based on review of best practices

Results

Figure 4.1.3.6 provide results. At the county level, most rural roads provide a low level of service for pedestrians. In downtown Starkville and MSU, most roads provide high level of service for pedestrians. However, there are some low-level segments that interrupt that Level A and B segments. Even if most of a pedestrian trip is comfortable, having an uncomfortable segment can ruin the experience or dissuade people from walking. These gaps provide opportunities to strengthen the Level A and B network.

Figure 4.1.3.6 Pedestrian Level of Service



Data Source: Neel-Schaffer

Disclaimer: This map is for planning purposes only.

4.1.3.4 Composite Needs Analysis

The market analysis illustrated which locations have higher and lower demand for bicycling and pedestrian facilities. The health and equity analysis showed where the greatest populations of need are concentrated. The level of comfort/service analyses showed where bicycle and pedestrian facilities currently exist and where there are gaps. Together, these three analyses indicate where there is supply and demand for bicycle and pedestrian facilities.

The Composite Needs analysis intersects these analyses to indicate where investments in new facilities or programming could be most effective.

Methodology

First, road segments were assigned a score from the Health and Equity Tiers and Demand Tiers. The Health and Equity Tiers had been distributed by TAZ and the Demand Tiers had been created at points with a 330 feet buffer. If a road segment fell within more than one TAZ or demand point buffer, that segment was assigned the highest score from the Health and Equity Tier and Demand Tier. Then both measures were scaled to be a five-point scale and the road segment was assigned the highest of the two scores.

From this score, the criteria shown in **Table 4.1.3.5** and **Table 4.1.3.6** were applied, based on the Bicycle Level of Comfort score or the Pedestrian Level of Service Score. Road segments that had a shared use path alongside them were considered to have a High Suitability for bicyclists and pedestrians.

Results

Figure 4.1.3.7 and **Figure 4.1.3.8** show results for the Composite Needs Analyses for bicyclists and pedestrians. **Table 4.1.3.7** provides some potential strategies for different locations. In general, the rural areas of the county have Low Suitability/Low Demand for pedestrians and bicyclists, and some slower rural roads have High Suitability/Low Demand for bicyclists. The best strategy for these areas is to maintain basic infrastructure, such as good road and shoulder conditions, and enforcement of vehicle speeds.

Around Starkville and MSU there are several pockets of High Suitability/High Demand roads. These facilities should be maintained, and their connectivity can be extended by adding infrastructure on nearby segments with Low Suitability. Several of these Low Suitability/High Demand areas are good places to invest in new facilities, or to add buffers or innovative features to increase the safety of existing facilities. Finally, there are some Low Demand/High Suitability. These areas might be better utilized if their segments are connected with facilities, but marketing could also increase their use.

Table 4.1.3.5 Bicycle Composite Need Categories

Highest Equity or Demand Score	**Bicycle Level of Comfort Score**			
	1	**2**	**3**	**4**
1	HS/LD	HS/LD	LS/LD	LS/LD
2	HS/LD	HS/LD	LS/LD	LS/LD
3	HS/HD	HS/HD	LS/HD	LS/HD
4	HS/HD	HS/HD	LS/HD	LS/HD
5	HS/HD	HS/HD	LS/HD	LS/HD

Source: Neel-Schaffer

Table 4.1.3.6 Pedestrian Composite Need Categories

Highest Equity or Demand Score	Pedestrian Level of Service Score				
	1	2	3	4	5
1	HS/LD	HS/LD	LS/LD	LS/LD	LS/LD
2	HS/LD	HS/LD	LS/LD	LS/LD	LS/LD
3	HS/HD	HS/HD	LS/HD	LS/HD	LS/HD
4	HS/HD	HS/HD	LS/HD	LS/HD	LS/HD
5	HS/HD	HS/HD	LS/HD	LS/HD	LS/HD

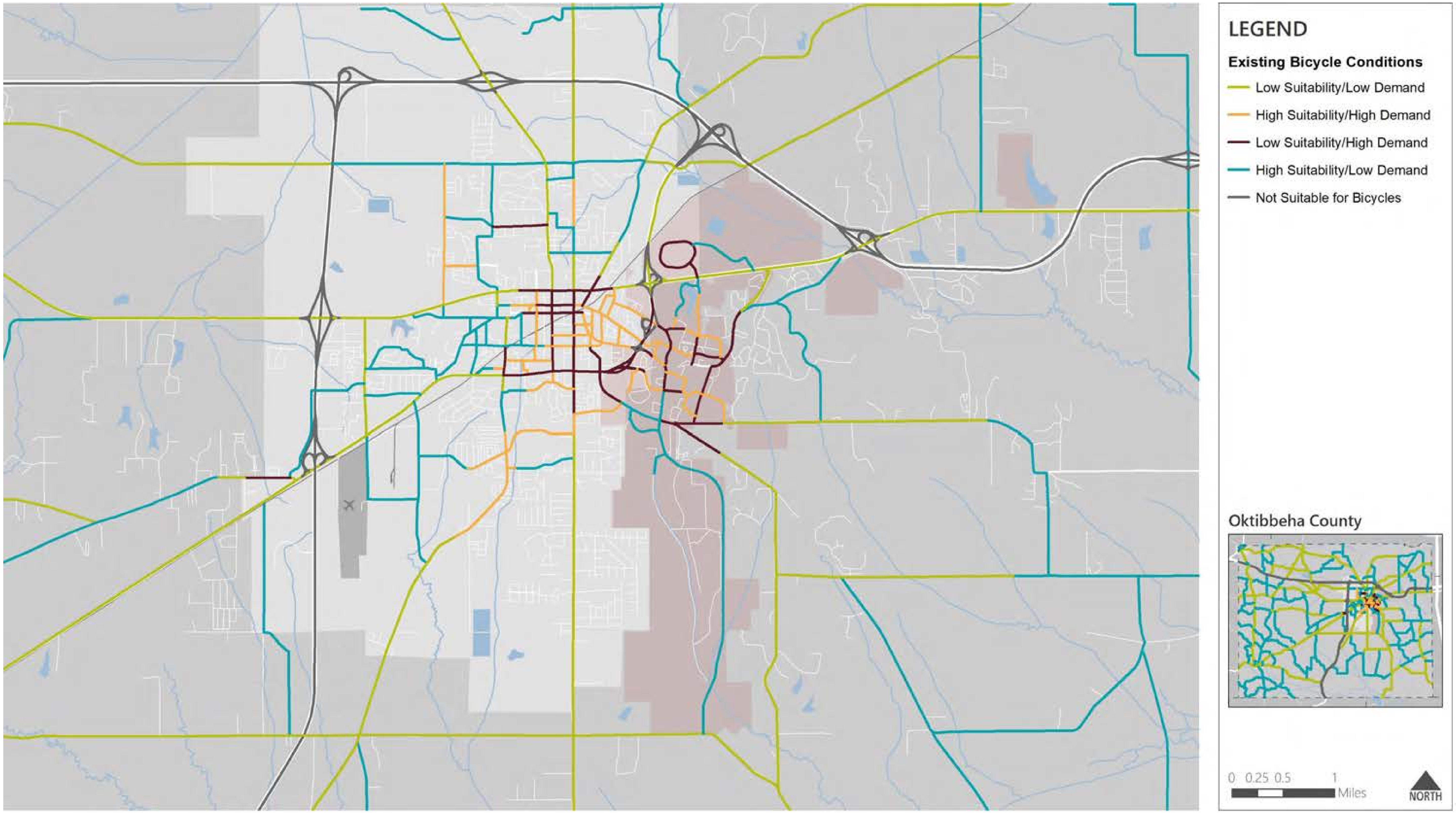
Source: Neel-Schaffer

Table 4.1.3.7 Composite Needs Summary

Category	Investment Priority	Strategies	Key Areas: Bicycle	Key Areas: Pedestrian
Low Suitability/ Low Demand	Low	Maintain basic infrastructure	-Rural county roads -MS-182 outside of downtown Starkville -Jackson St	-Rural county roads -Outer Starkville roads
High Suitability/ High Demand	High	Close gaps in network	-Most of MSU campus -Lynn Ln to Locksley Way -Segments in downtown Starkville around University Dr	-MSU -Lynn Lane -Reed Road -Main St/University Dr
Low Suitability/ High Demand	High	Invest in new facilities to meet demand or add buffers to existing facilities, or invest in facilities along a parallel route	-MS-182 and MS-12 through downtown Starkville -Lampkin St -Hardy Blvd and Lee Blvd -Spring St -Coliseum Blvd	-MS-182 -MS-12 -N Montgomery St -Connect MSU facilities to low suitability segments
High Suitability/ Low Demand	Low	Connect to High Suitability/High Demand segments; Encourage public use through campaigns or events	-Rural county roads -Whitfield St, Scales St, and surrounding roads -Jackson St -Outer areas of MSU and Starkville	-Whitfield St/N Long St -Jackson St -Outer areas of MSU

Source: Neel-Schaffer

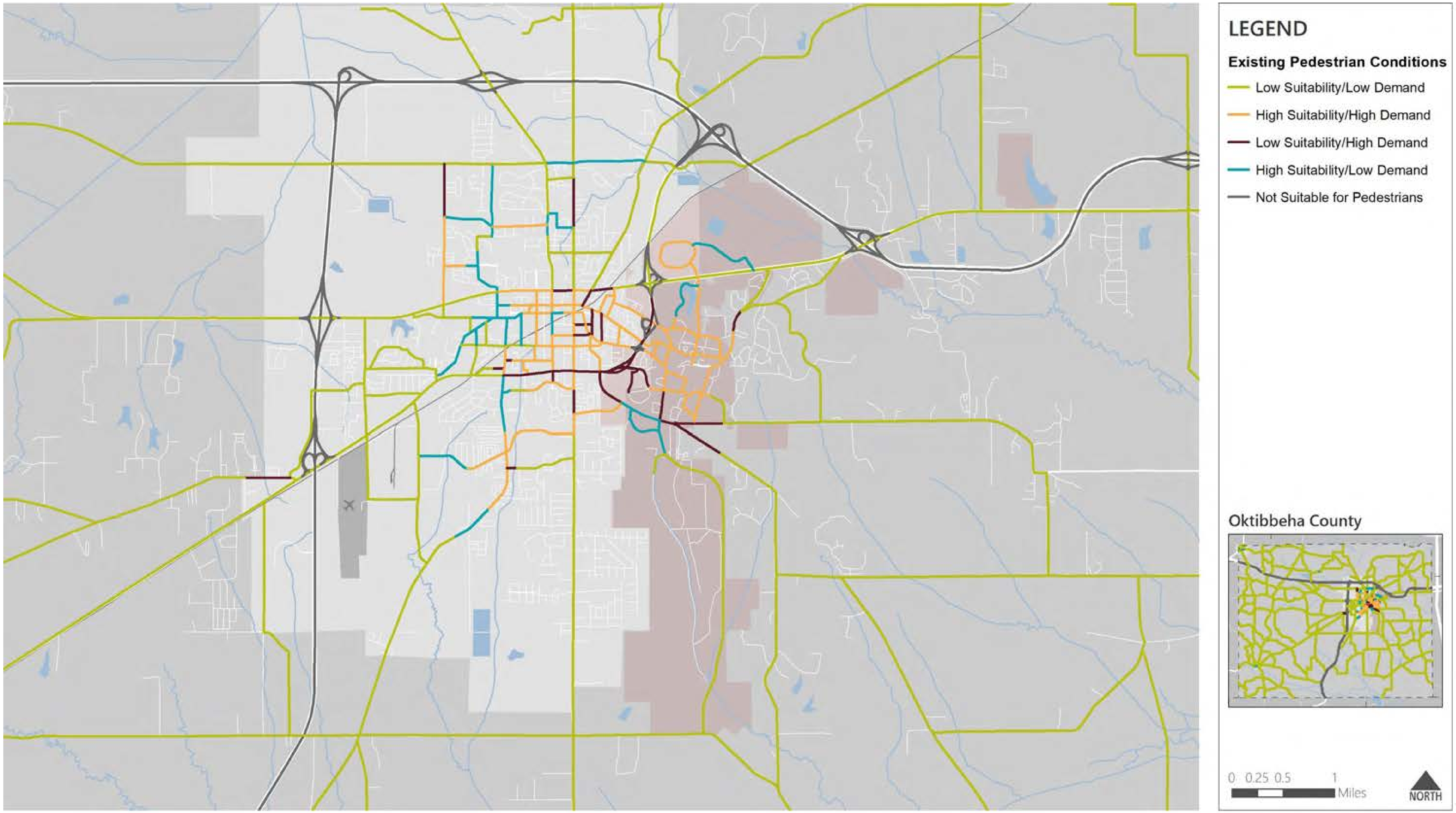
Figure 4.1.3.7 Composite Bicycle Needs Analysis



Data Source: Neel-Schaffer

Disclaimer: This map is for planning purposes only.

Figure 4.1.3.8 Composite Pedestrian Needs Analysis



Data Source: Neel-Schaffer

Disclaimer: This map is for planning purposes only.

4.1.4 Network Opportunities

There are several unique opportunities that will need to be considered when planning for a future bicycle and pedestrian network in the Starkville/MSU area. In particular, the following opportunities will be evaluated during the design process: a potential Rail Trail corridor, public right-of-way connections, and roadway re-striping.

4.1.4.1 Rail-to-Trail / Rail-with-Trail

Many communities have used railroad corridors as opportunities to expand their low-stress biking and walking network. The Starkville area has a potential opportunity to do something similar, with the active Kansas City Southern rail line. In general communities approach these rail trail opportunities in two ways:

- **Rail-to-trail**: Multipurpose paths located on former train tracks. These paths tend to be mostly flat and accessible for a variety of community members to use. While they are often used for recreation, they can also connect pedestrian and bicycle networks for those travelling to destinations like work or school. A nearby example is the Tanglefoot Trail in NE Mississippi.
- **Rail-with-trail**: a multipurpose path that runs parallel to active rail lines. While the relationship between the trail and the rail varies, often the railroad and trail share an easement and are separated by robust fencing.

Both options provide similar benefits, such as opportunities for improved community health, increased bicycle and pedestrian accessibility for transportation, economic gains for nearby businesses, and even opportunities for cultural or historical preservation along the trail. The difference between the two approaches boils down to the ability to use the rail.

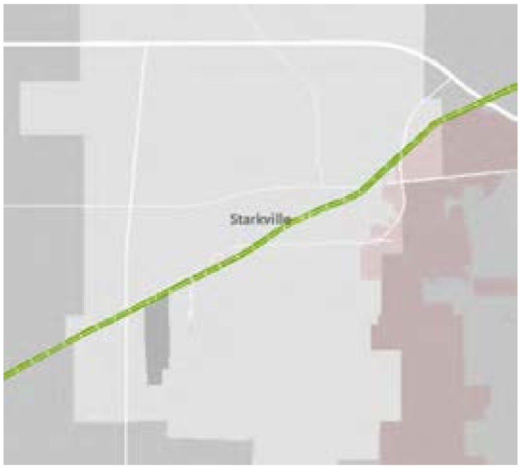
If the rail is no longer in use and the owner is willing to sell the land, then a rail trail can be constructed. This option could be more expensive for the trail, but there would be no safety or noise issues with the rail and a wider trail could be constructed.

If the rail is still active or unwilling to sell the land, the trail can purchase an easement from the railroad owner. This option can be financially beneficial for the railroad and can be cheaper for the trail. The safety and legal issues of trail users interacting with trains can raise concerns. However, as of 2021 there are almost 400 safely functioning rails-with-trails in the United States[2]. Many of these rails-with-trails have constructed secure fencing and have had little to no safety incidents. Research by the Rails to Trails Conservancy found that most of these trails were insured by the same existing local umbrella policy as rails-to-trails.

---

2 Rails to Trails Conservancy, 2021, https://www.railstotrails.org/build-trails/trail-building-toolbox/basics/rail-with-trail/

Figure 4.1.4.1 Rail Corridor in Starkville Area and Rail Trail Examples




Sources: Neel-Schaffer; TanglefootTrail.com; Bryce Hall, America's Rails-with-Trails by Rails to Trails Conservancy

4.1.4.2 Public Right-of-Way Connections

One challenge in creating a connected bicycle pedestrian network is assembling right-of-way (ROW) to construct facilities. Public ROWS are typically easier to obtain than with private lands. These ROWS could be paper streets, which are designated streets that were never fully paved, or located on public or semi-public property (e.g. university).

4.1.4.3 Roadway Re-Striping

Many roads were not constructed to accommodate bicycles or pedestrians. A cost-efficient and effective way to retrofit roads to accommodate active modes is by re-striping, either as a stand-alone project or as part of resurfacing project.

Since roads require routine resurfacing for maintenance, adding in bicycle or pedestrian accommodations during resurfacing is more efficient and cost-effective than performing a stand-alone project. The City of Starkville Comprehensive Plan adopted a Complete Streets Policy to support the integration of bicycle and pedestrian facilities into new road or restriping projects.

The Federal Highway Administration published a report in 2016 called "Incorporating On-Road Bicycle Networks into Resurfacing Projects." This report is a useful resource to decide when considering whether bicycle facilities are viable and provides guidance on selecting the best design. Pedestrian facilities are not addressed in this report, however. FHWA identifies four methods for incorporating on-road bicycle facilities:

- Lane Narrowing/Diet
- Roadway Reconfiguration/Road Diet
- Parking Removal
- Shoulder Paving

When wondering whether to add a bicycle facility, the following questions should be considered:

- Would this facility increase bicycle network connectivity?
- Does the speed and traffic volume of the road support this facility? For example, a neighborhood street may not require any facility. A road with a high speed and high traffic would probably require more separation from vehicles.
- Who will be the primary users of this facility and what is their bicycle comfort level?
- Are there existing safety issues that restriping could help? For example, a road diet can help with speeding.
- Are there significant areas of stress, such as driveways, intersections, or curves?
- What kinds of studies would need to be conducted to thoroughly answer these questions?

If answers to those questions are favorable to re-striping for bicycles, then specific designs should be considered. For example, rural roads are good candidates for wide, well-maintained shoulders. Bicyclists who ride on these roads are generally comfortable with little separation from vehicles.

4.1.5 Recommendations

The City of Starkville's recently adopted Bicycle and Pedestrian Master Plan (2021) became the starting point for recommendations within the City's limits. In instances where right-of-way allowed, recommended facility types were upgraded to provide a better level of service for bicyclists and pedestrians. This resulted in more recommendations with protected or off-street bicycle facilities. Furthermore, some new recommendations were identified based on the needs analysis and an assessment of opportunities in the area. For unaltered projects included in the City's existing plan, project costs were taken directly from the existing plan. For other projects, costs were developed using unit cost assumptions described elsewhere in this plan.

4.1.5.1 Bicycle and Pedestrian Facility Types

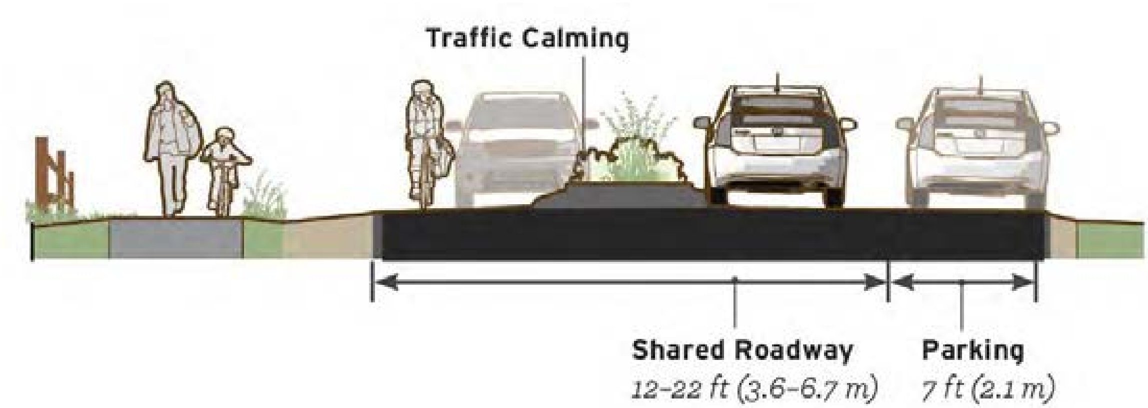
This plan recommends a variety of bicycle and pedestrian facilities to be constructed over the next 25 years. The recommended facilities are based on the needs analysis, site-specific constraints, and existing plans. Facilities include the following:

- Mixed Traffic
    - **Sharrow / Bicycle Boulevard -** a low-stress shared roadway designed to offer priority for bicyclists operating within a roadway shared with motor vehicle traffic.
    - **Yield Roadway** - designed to serve pedestrians, bicyclists, and motor vehicle traffic in the same slow-speed travel area. Yield roadways serve bidirectional motor vehicle traffic without lane markings in the roadway travel area.
- Visually Separated
    - **Pedestrian Lane** – a facility that may be appropriate on roads with low to moderate speeds and volumes. A pedestrian lane is a designated space on the roadway for exclusive use of pedestrians. The lane may be on one or both sides of the roadway.
    - **Bike Lane** - exclusive space for bicyclists through the use of pavement markings and optional signs. A bike lane is located directly adjacent to motor vehicle travel lanes and follows the same direction as motor vehicle traffic.
    - **Paved Shoulder** - the edge of roadways can be enhanced to serve as a functional space for bicyclists and pedestrians to travel in the absence of other facilities with more separation. This is especially true in more rural or less developed areas.
- Physically Separated
    - **Separated Bike Lane -** facility for exclusive use by bicyclists that is located within or directly adjacent to the roadway and is physically separated from motor vehicle traffic with a vertical element.
    - **Sidewalk -** dedicated space intended for use by pedestrians that is safe, comfortable, and accessible to all. Sidewalks are physically separated from the roadway by a curb or unpaved buffer space.
    - **Sidepath -** a bidirectional shared use path located immediately adjacent and parallel to a roadway. Sidepaths can offer a high-quality experience for users of all ages and abilities as compared to on-roadway facilities in heavy traffic environments.
    - **Shared Use Path -** a travel area separate from motorized traffic for bicyclists, pedestrians, skaters, wheelchair users, joggers, and other users. Shared use paths can provide a low-stress experience for a variety of users using the network for transportation or recreation.

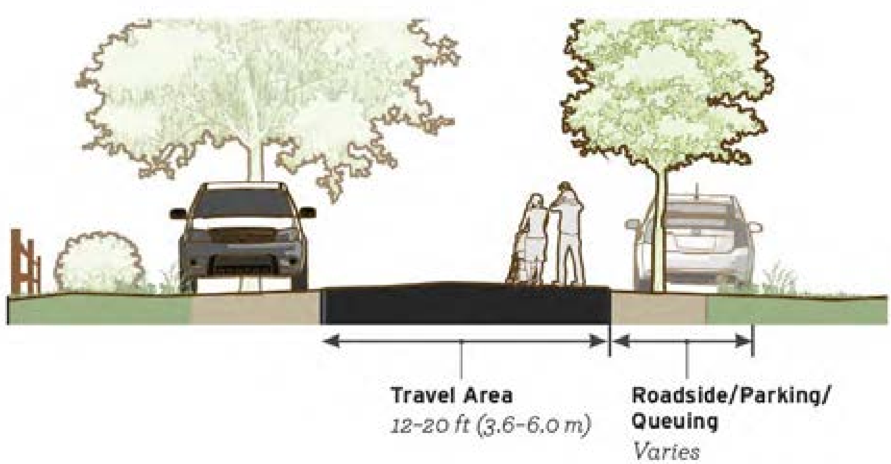
4.1.5.2 Facility Design Guidelines

Design guidelines from the Federal Highway Administration's *Small Town and Rural Multimodal Networks* are provided on the following pages. Additional information can be found online at https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/page00.cfm

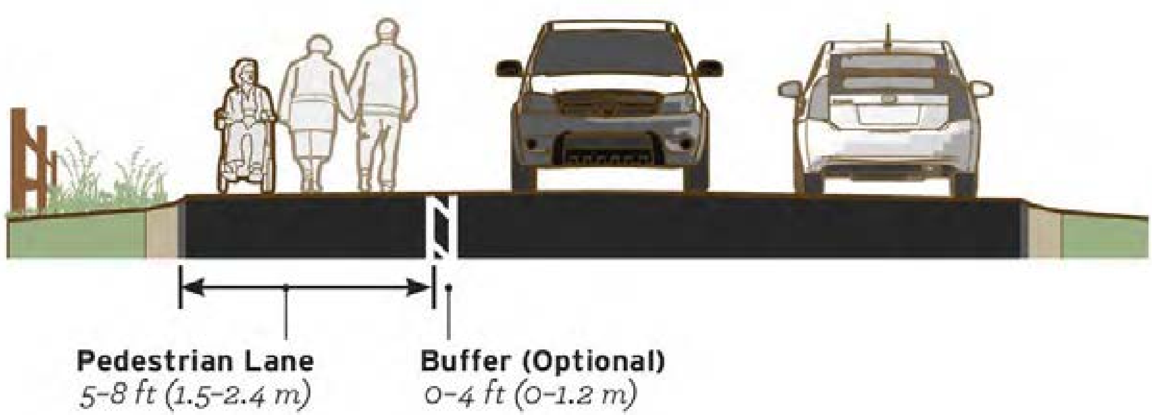
Sharrow / Bicycle Boulevard



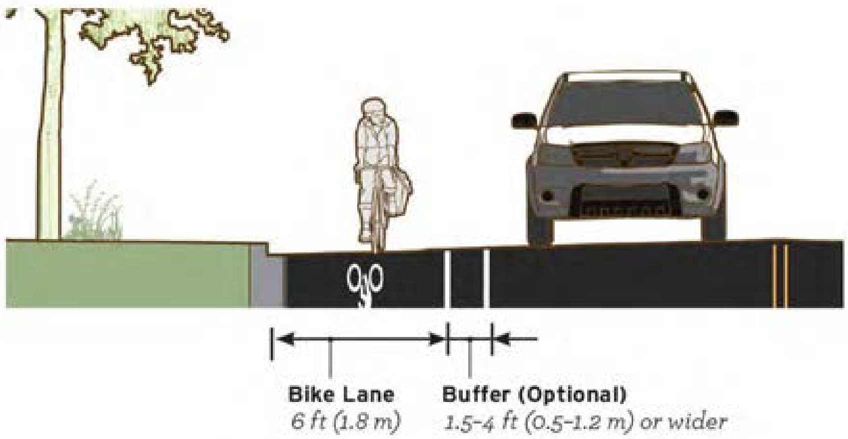
Yield Roadway



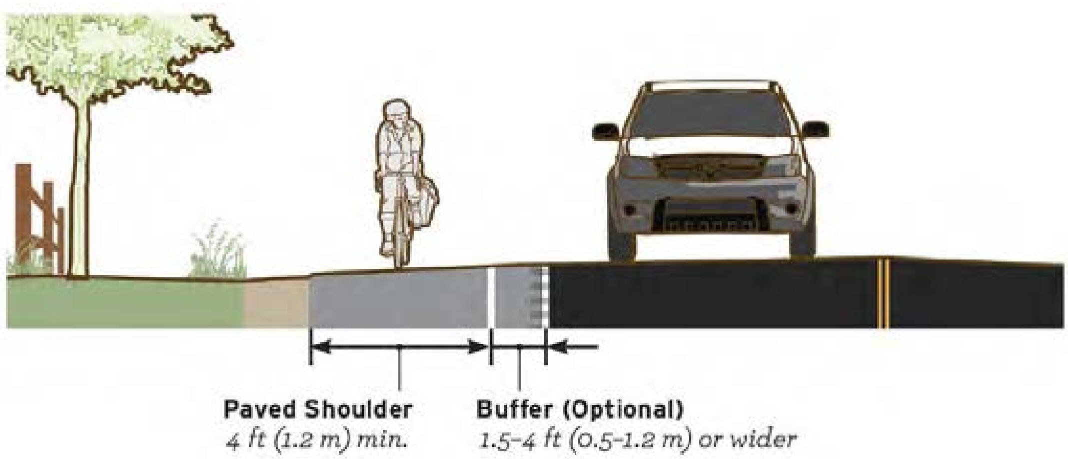
Pedestrian Lane



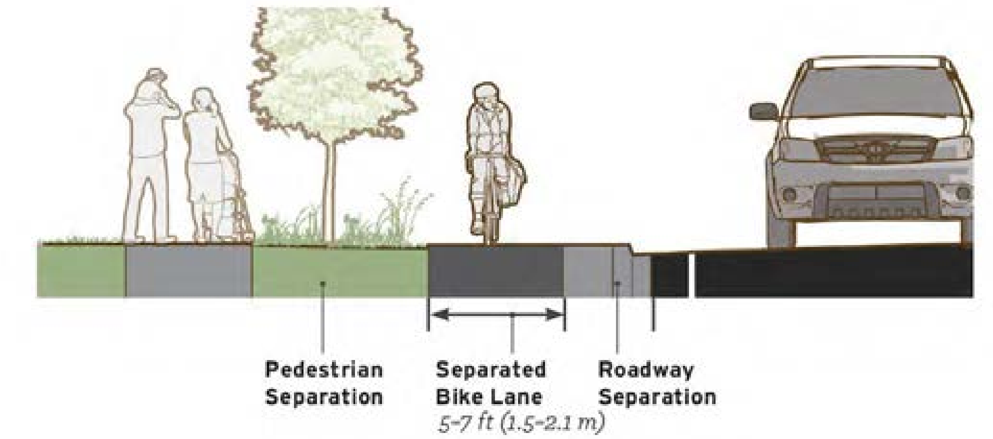
Bike Lane



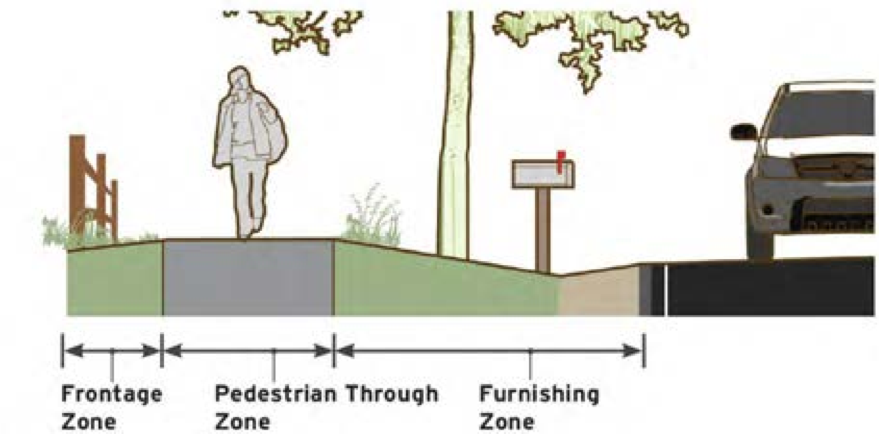
Paved Shoulder



Separated Bike Lane

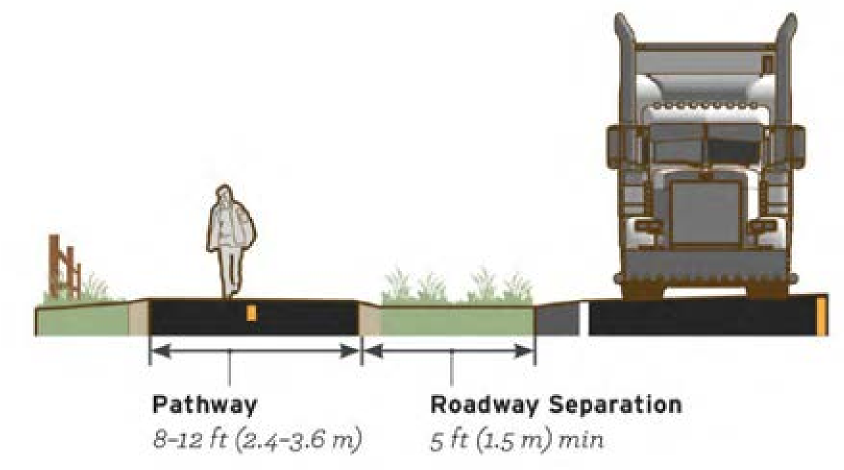


Sidewalk

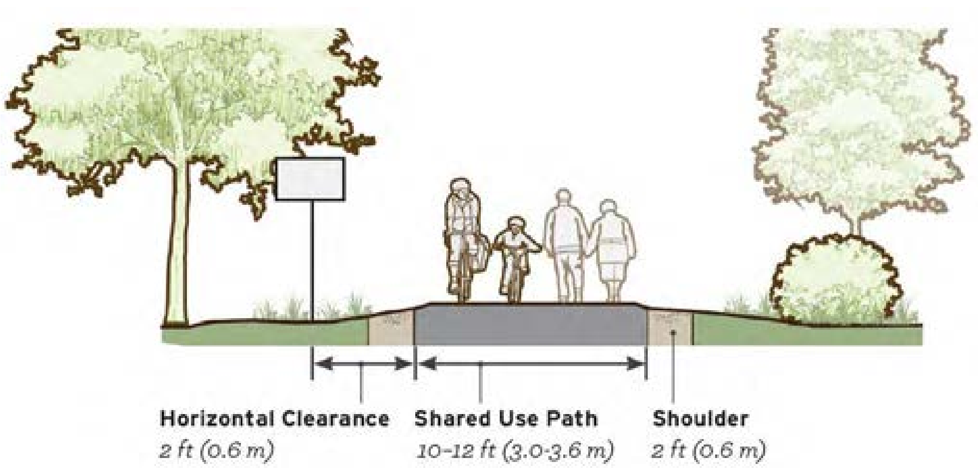


VOLUME AND USER MIX	FRONTAGE ZONE	PEDESTRIAN THROUGH ZONE	FURNISHING ZONE	TOTAL WIDTH
Constrained Minimum	1 ft	5 ft	2 ft	8 ft
Recommended Minimum	2 ft	6 ft	4 ft	12 ft

Sidepath



Shared Use Path



4.1.5.3 Costs

Recommended bicycle and pedestrian improvements were grouped into projects and high-level construction cost estimates were developed for each project. Construction costs are based on recent bike/ped projects constructed by the Mississippi Department of Transportation (MDOT) and the costs identified in the recently completed *City of Starkville Bicycle and Pedestrian Network Master Plan*.

The table below shows the unit costs used to estimate construction costs. If a project was in the *City of Starkville Bicycle and Pedestrian Network Master Plan* and no changes were recommended, the cost cited in that plan was utilized.

Table 4.1.5.1 Construction Cost Assumptions for Bike/Ped Projects

Facility Type	Cost per Mile
Sidepath (one-side)	1,000,000
Shared Use Path (single)	675,000
Sidewalk (one side)	575,000
Separated Bike Lane (both sides) or Cycle Track	575,000
Paved Shoulder (both sides)	575,000
Bike Lane (both sides)	450,000
Ped Lane (both sides)	450,000
Convert Roadway to Bike/Ped/Transit Mall	450,000

Note: Cost is in 2021 dollars and rounded to nearest 1,000.

4.1.5.4 Bicycle and Pedestrian Network Recommendations

This plan recommends bicycle and pedestrian projects for all of Oktibbeha County. Some of these projects will be implemented independently by the respective local public agency (e.g. Oktibbeha County, City of Starkville, or Mississippi State University) but many will also require coordination between these agencies and with the Mississippi Department of Transportation, private landowners, and other stakeholders. **Figure 4.1.5.1** shows the recommended bicycle network and **Figure 4.1.5.2** shows the recommended pedestrian network. Projects are shown as dashed lines with project ID numbers overlaid on top.

Each project is categorized as either a short-term (0-10 years) or long-term (10-25 years) project. Detailed information for short-term projects can be found in **Table 4.1.5.2** and similar information for long-term projects can be found in **Table 4.1.5.3**.

The total construction cost for short-term projects is $17,687,000 and $101,042,00 for long-term projects. While not every project can be implemented, the recommended network will provide local decision-makers with a menu of potential improvements.

Table 4.1.5.2 Short-Term Bicycle and Pedestrian Projects

Project	Part	Improvement	Facility	From	To	Side	Cost for Part	Cost for Total Project
BP-1	-	Sharrow	Meigs St / Main St / Cushman St	Washington St	Lampkin St	both	$5,000	$5,000
BP-2	-	Separated Bike Lane	Main St	Jackson St	Montgomery St	north	$360,000	$360,000
BP-3	-	Sharrow	Main St	Jackson St	Washington St	both	$11,000	$11,000
BP-5	A	Sidewalk	Henderson St	JW Mosley Dr	Pilcher St	east	$117,000	$211,000
	B	Sidewalk	Pilcher St	Henderson St	MS 182	west	$94,000	
BP-6	-	Sidewalk	Everglades Ave	Highland Ave	Holly St	east	$20,000	$20,000
BP-7	-	Sidewalk	Carver Dr / Long St / JW Mosley Dr	Hiwassee Dr	Henderson St	one	$317,000	$317,000
BP-11	A	Ped Lane	Chestnut Dr / Sycamore St	Linden Cir	McKee Park	north / east	$197,000	$480,000
	B	Sidewalk	Chestnut Dr	Louisville St	Linden Cir	west	$168,000	
	C	Sidewalk	Linden Cir	Louisville St	Chestnut Dr	north	$115,000	
BP-13	-	Sidewalk	McKee Ave	Lindbergh Blvd	Whitfield St	east	$192,000	$192,000
BP-14	-	Sidewalk	Josey Ave	McKee Ave	Josey Park	west	$46,000	$46,000
BP-15	-	Sidewalk	Lindbergh Blvd	MS 12	McKee Ave	east	$120,000	$120,000
BP-16	-	Sidewalk	Scales St	Whitfield St	Louisville St	north	$221,000	$221,000
BP-17	-	Sidewalk	Greensboro St	MS 182	Whitfield St	one - varies	$432,000	$432,000
BP-27	-	Sidewalk	Nash St	College View St	MS 182	east	$80,000	$80,000
BP-28	-	Sidewalk	Lummus St	Jarnigan St	Colonel Muldrow Ave	north	$119,000	$119,000
BP-30	-	Sidewalk	Maxwell St	University Dr	Russell St	east	$67,000	$67,000
BP-31	-	Sharrow	Greensboro St	MS 182	Whitfield St	both	$29,000	$29,000
BP-36	-	Sidewalk	Gillespie St	Louisville St	Washington St	north	$140,000	$140,000
BP-37	A	Bike Lane	Chestnut Dr	Louisville St	Linden Cir	both	$139,000	$153,000
	B	Sharrow	Chestnut Dr / Sycamore St	Linden Cir	McKee Park	both	$14,000	
BP-38	-	Sidewalk	Green St	Montgomery St	Russell St	north	$72,000	$72,000
BP-41	-	Bike Lane	Gillespie St	Montgomery St	Russell St	both	$134,000	$134,000
BP-43	-	Sharrow	Gillespie St	Louisville St	Montgomery St	both	$17,000	$17,000
BP-44	-	Sidepath	Reed Rd	MS 182	Greensboro St	east	$156,000	$156,000
BP-46		Sharrow	Scales St	Whitfield St	Louisville St	both	$14,000	$14,000
BP-51	-	Bike Lane	Lampkin St	Meigs St	Russell St	both	$235,000	$235,000
BP-54	-	Separated Bike Lane	Spring St	Russell St	MS 12	both	$168,000	$168,000
BP-57	-	Sharrow	Critz St	Jackson St	Montgomery St	both	$8,000	$8,000
BP-58	-	Sidepath	MS 12	Industrial Park Rd	Avenue of Patriots St	north	$292,000	$292,000
BP-60	-	Sidewalk	MS 12	Louisville St	Jackson St	both	$240,000	$240,000
BP-61	-	Sharrow	Old West Point Rd	University Dr	Woodcrest Dr	both	$28,000	$28,000
BP-75	-	Sidewalk	S Montgomery St	MS 12	Locksley Way	both	$259,000	$259,000
BP-69	-	Sidewalk	Jackson St	MS 12	Yellow Jacket Dr	west	$53,000	$53,000
BP-81	A	Sharrow	Long St	Westside Dr	Greensboro St	both	$16,000	$25,000
	B	Sharrow	Main St	Long St	Cushman St	both	$9,000	
BP-82	-	Sharrow	Westside Dr	Reed Rd	Long St	both	$8,000	$8,000
BP-83	A	Ped Lane	Hiwassee Dr	Garrard Rd	Carver Dr	both	$616,000	$934,000
	B	Bike Lane	Hiwassee Dr	Garrard Rd	Carver Dr	both	$314,000	
	C	Sharrow	Carver Dr	Long St	Hiwassee Dr	both	$4,000	

Project	Part	Improvement	Facility	From	To	Side	Cost for Part	Cost for Total Project
BP-88	A	Sidewalk	Wood St	Louisville St	Jackson St	south	$72,000	$84,000
	B	Sharrow	Wood St	Louisville St	Jackson St	both	$12,000	
BP-90	-	Sidepath	Sand Rd	Louisville Rd	Sandhill Arms entrance	west	$123,000	$123,000
BP-91	-	Sidepath	Academy Rd	Louisville St	Montgomery St	south	$646,000	$646,000
BP-93	-	Sidepath	Yellow Jacket Dr	Louisville St	Montgomery St	south	$678,000	$678,000
BP-94	-	Sidewalk	Locksley Way	Montgomery St	Lincoln Green	north	$106,000	$106,000
BP-96	A	Sharrow	Jarnigan St	University Dr	Russell St	all	$7,000	$22,000
	B	Sharrow	Lummus Dr	Jarnigan St	Colonel Muldrow Ave	all	$6,000	
	C	Sharrow	Maxwell St	University Dr	Russell St	all	$5,000	
	D	Sharrow	Colonel Muldrow Ave	University Dr	Russell St	all	$4,000	
BP-98	-	Sidepath	Blackjack Rd	MS 12	Locksley Way	west	$560,000	$560,000
BP-100	-	Sharrow	Research Blvd	MS 182	MS 182	both	$41,000	$41,000
BP-105	A	Sidepath	College View Dr	College View Apts	Bailey Howell Dr	north	$281,000	$560,000
	B	Shared Use Path	College View Trail	Bailey Howell Dr	Russell St	off-street	$234,000	
	C	Sidewalk	Trail connections	Bailey Howell Dr	Russell St	all	$45,000	
BP-106	A	Separated Bike Lane	Barr Ave	Hardy St	Bailey Howell Dr	south	$147,000	$339,000
	B	Separated Bike Lane	George Perry St	Bailey Howell Dr	Old Main Academic Ctr	east	$123,000	
	C	Sidewalk	Hurst Rd	Barr Ave	Hurst Dr	off-street	$42,000	
	D	Separated Bike Lane	Bailey Howell Dr	Barr Ave	Lee Blvd	west	$27,000	
BP-107	A	Shared Use Path	North Campus Trail	Bailey Howell Dr	Barr Ave	off-street	$169,000	$523,000
	B	Shared Use Path	North Campus Trail	Templeton	Bailey Howell Dr	off-street	$153,000	
	C	Sidewalk	Trail connections	Templeton	Bailey Howell Dr	all	$103,000	
	D	Shared Use Path	North Campus Trail	Barr Ave	Lee Blvd	off-street	$81,000	
	E	Separated Bike Lane	Connection to nearby cycle track	trail	existing cycle tack	east	$13,000	
	F	Sidewalk	Trail connections	Barr Ave	Lee Blvd	all	$4,000	
BP-108	A	Separated Bike Lane	New Road	Blackjack Rd	Hardy St	both	$465,000	$602,000
	B	Sidewalk	New Road	Blackjack Rd	Hardy St	both	$137,000	
BP-109	A	Sidepath	Hardy St	Blackjack Rd	Morrill Rd	east	$283,000	$454,000
	B	Bike/Ped/Transit Mall	Hardy St	new gate	Lee Blvd	both	$171,000	
BP-110	A	Bike/Ped/Transit Mall	Lee Blvd	new gate	Walker Rd	both	$181,000	$265,000
	B	Sidewalk	pedestrian connections	new gate	Walker Rd	all	$84,000	
BP-111	-	Separated Bike Lane	Bully Blvd	Greek Loop South	President Cir gate	both	$171,000	$171,000
BP-112	A	Bike/Ped Mall	President Cir / George Perry St	Bully Blvd	Old Main Gate	both	$145,000	$510,000
	B	Bike/Ped Mall	Magruder St	Blackjack Rd	President Cir	both	$129,000	
	C	Bike/Ped Mall	President Cir	Bully Blvd gate	Hardy St	both	$109,000	
	D	Sidewalk	Ped connections	President Cir	Morrill Rd	all	$65,000	
	E	Sidewalk	President Cir / Morrill Rd	President Cir	Morrill Rd	off-street	$62,000	
BP-113	-	Sidepath	Greek Loop South	Twelve Ln	New Road	east	$352,000	$352,000
BP-114	-	Sidepath	Bully Blvd / Mercantile St	Twelve Ln	Russell St	one	$289,000	$289,000
BP-115	A	Sidewalk	Fraternity Area	Bully Blvd	Russell St	one	$179,000	$246,000
	B	Sidewalk	Bost Dr	Old Bully Blvd	Russell St	east	$67,000	

Project	Part	Improvement	Facility	From	To	Side	Cost for Part	Cost for Total Project
BP-116	A	Separated Bike Lane	Stone Blvd	Greek Dr	Blackjack Rd	one or both	$443,000	$600,000
	B	Sidewalk	Stone Blvd	Blackjack Rd	Morgan Ave	east	$79,000	
	C	Sidewalk	Stone Blvd	Bully Blvd	Creelman St	west	$78,000	
BP-117	A	Separated Bike Lane	Wise Center Rd	Hail State Blvd	Wise Center west entrance	both	$201,000	$285,000
	B	Sidepath	Hail State Blvd	Blackjack Rd	Wise Center Rd	west	$84,000	
BP-121	A	Sidewalk	Old Mayhew Rd	Lee Blvd	MS 182	both	$1,065,000	$1,596,000
	B	Bike Lane	Old Mayhew Rd	Lee Blvd	MS 182	both	$531,000	
BP-122	-	Sidepath	Blackjack Rd / Oktoc Rd	Stone Blvd	Bulldog Way Extension	south	$632,000	$632,000
BP-123	-	Sidepath	Blackjack Rd	Stone Blvd	Bardwell Rd	north	$1,526,000	$1,526,000
BP-132	A	Paved Shoulder	Webster St	2nd Ave	County Line	both	$141,000	$144,000
	B	Sharrow	Webster St	Maben Bell Schoolhouse Rd	2nd Ave	both	$3,000	
BP-133	A	Paved Shoulder	MS 15	Chestnut St	County Line	both	$264,000	$383,000
	B	Paved Shoulder	MS 15	County Line	Hunt St	both	$113,000	
	C	Sharrow	MS 15	Hunt St	Chestnut St	both	$6,000	
BP-135	A	Paved Shoulder	MS 12	Sturgis Maben Rd	Louisville Rd	both	$300,000	$304,000
	B	Yield Roadway	McKinnon St	MS 12	Park Parking Lot	both	$4,000	

Note: Costs are in 2021 dollars and for construction only

Table 4.1.5.3 Long-Term Bicycle and Pedestrian Projects

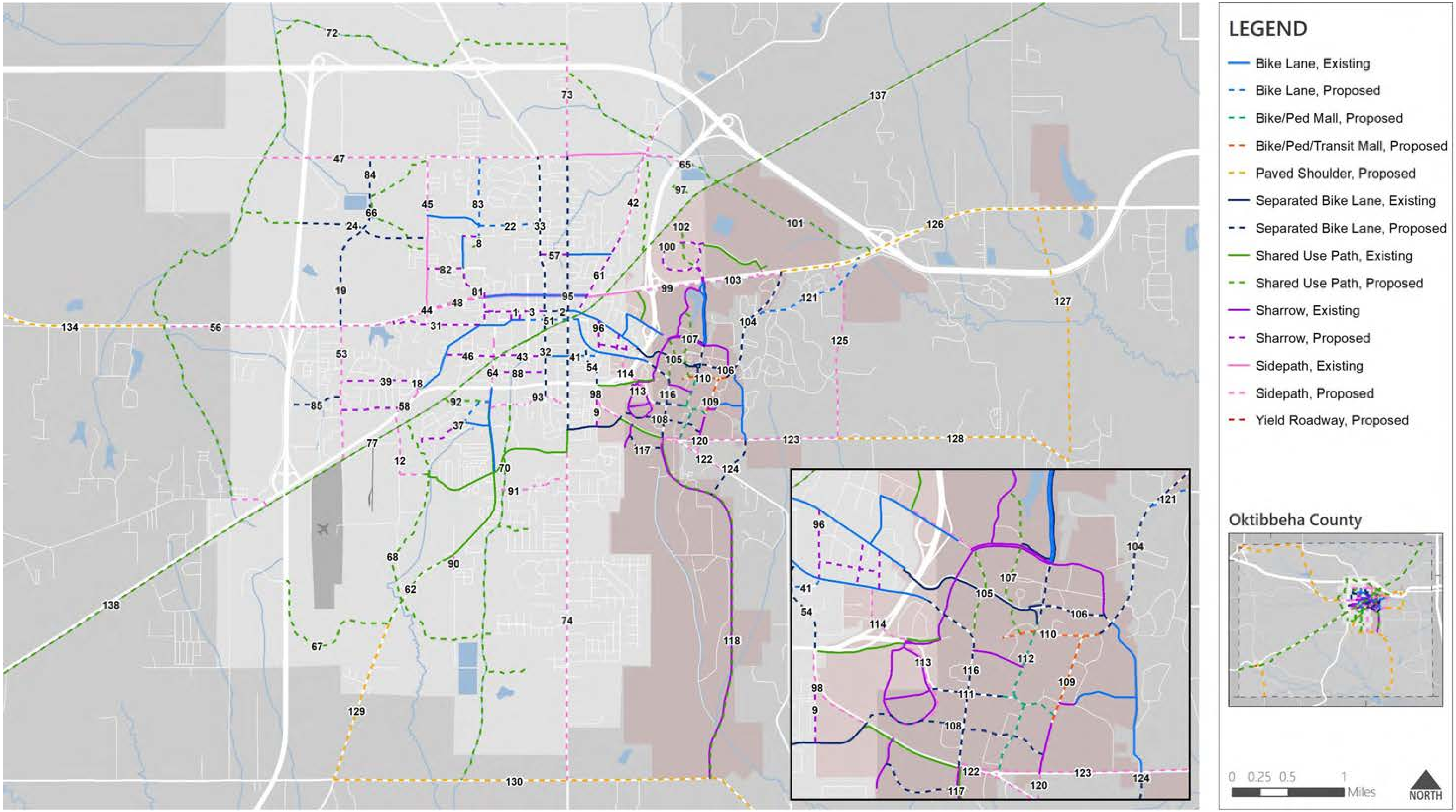
Project	Part	Improvement	Facility	From	To	Side	Cost for Part	Cost for Total Project
BP-4	-	Sidewalk	School St	MS 182	School entrance	one	$116,000	$116,000
BP-8	-	Shared Use Path	Greenway connector	Carver Dr	Westside Park	off-street	$90,000	$90,000
BP-9	-	Sharrow	Lincoln Green	Locksley Way	Blackjack Rd	both	$6,000	$6,000
BP-10	-	Sidewalk	Lynn Ln	McKee Park	Montgomery St	north	$621,000	$621,000
BP-12	A	Sidepath	Industrial Park Rd	MS 12	Lynn Ln	east	$1,078,000	$1,536,000
	B	Sidepath	Lynn Ln	Industrial Park Rd	McKee Park entrance	north	$458,000	
BP-18	A	Ped Lane	Douglas McArthur Dr	Stark Rd	Avenue of the Patriots St	south	$290,000	$615,000
	B	Ped Lane	Maple Dr	Stark Rd	MS 12	south	$229,000	
	C	Sidepath	Avenue of the Patriots St	MS 12	Nathan Hale Dr	west	$96,000	
BP-19	-	Separated Bike Lane	Stark Road Ext	MS 182	Peoples St Ext	both	new road	new road
BP-20	-	Sidewalk	Abernathy Dr	Eudora Welty Way	Stark Rd	south	$200,000	$200,000
BP-21	-	Ped Lane	Clements Ave	Tomlinson Dr	Stark Rd	north	$132,000	$132,000
BP-22	-	Bike Lane	Hospital Dr	Hiwassee Dr	Jackson St	both	$244,000	$244,000
BP-23	A	Ped Lane	Mallory Ln	Clements Ave	Abernathy Rd	east	$210,000	$326,000
	B	Sidewalk	Mallory Ln	MS 182	Clements Ave	east	$116,000	
BP-24	-	Separated Bike Lane	Peoples Street Ext	Reed Rd	North Loop Greenway	both	new road	new road
BP-25	-	Sidewalk	Hogan St	Russell St	Fellowship St	south	$24,000	$24,000
BP-26	-	Sidewalk	Jarnigan St	Russell St	University Dr	east	$115,000	$115,000
BP-29	-	Sidewalk	Nash St	Lummus St	University Dr	east	$82,000	$82,000
BP-32	-	Separated Bike Lane	Jackson St	MS 182	Yellow Jacket Dr	both	$517,000	$517,000
BP-33	-	Separated Bike Lane	Jackson St	Garrard Rd	MS 182	both	$718,000	$718,000
BP-34	-	Sidewalk	Critz St	Jackson St	Old West Point Rd	south	$298,000	$298,000
BP-35	-	Sidewalk	Gillespie St	Montgomery St	Spring St	north	$72,000	$72,000
BP-39	A	Sharrow	Douglas McArthur Dr	Stark Rd	Avenue of the Patriots St	both	$21,000	$38,000
	B	Sharrow	Maple Dr	Stark Rd	MS 12	both	$17,000	
BP-40	-	Sidewalk	Old West Point Rd	University Dr	Woodcrest Dr	both	$1,010,000	$1,010,000
BP-42	-	Sidepath	Old West Point Rd	Woodcrest Dr	Northgate Dr	west	$1,620,000	$1,620,000
BP-45	-	Sidepath	Reed Rd	Garrard Rd	Hospital Rd	east	$855,000	$855,000
BP-47	A	Sidepath	Garrard Rd	North Loop Greenway	Reed Rd	south	$2,276,000	$4,199,000
	B	Sidepath	Garrard Rd	Hiwassee Dr	Montgomery St	south	$1,190,000	
	C	Sidepath	Garrard Rd	Reed Rd	Hiwassee Dr	north	$733,000	
BP-48	-	Bike Lane	MS 182	Reed Rd	Long St	both	$242,000	$242,000
BP-49	-	Sidewalk	Peoples Street Ext	Reed Rd	North Loop Greenway	both	new road	new road
BP-50	-	Sidewalk	Hospital Dr	Hiwassee Dr	Jackson St	south	$250,000	$250,000
BP-52	-	Sidewalk	Stark Road Ext	MS 182	Peoples St Ext	both	new road	new road
BP-53	-	Sidepath	Stark Rd	Rail Trail	MS 182	east	$1,728,000	$1,728,000
BP-55	-	Sidepath	MS 182	Reed Rd	Long St	both	$768,000	$768,000
BP-56	-	Sidepath	MS 182	North Loop Greenway	Reed Rd	south	$3,429,000	$3,429,000
BP-59	-	Sidewalk	MS 12	Crossgates St	Spring St	both	$3,000,000	$3,000,000
BP-62	-	Shared Use Path	Louisville St	Emerson School	Cornerstone Park Connector	west	$501,000	$501,000
BP-63	-	Sidewalk	Louisville St	existing sidewalk	MS 12	east	$39,000	$39,000

Project	Part	Improvement	Facility	From	To	Side	Cost for Part	Cost for Total Project
BP-64	-	Sidepath	Louisville St	Yellow Jacket Dr	Greensboro St	west	$673,000	$673,000
BP-65	A	Sidepath	Garrard Rd	Old West Point Rd	Sand Creek Trail	south	$412,000	$640,000
	B	Shared Use Path	Sand Creek Trail	Pat Station Rd	Rail Trail	off-street	$228,000	
BP-66	-	Shared Use Path	Reed Road Trail	Reed Rd	Reed Rd	off-street	$1,000,000	$1,000,000
BP-67	-	Shared Use Path	Cornerstone Park Connector	Cornerstone Park	Louisville Rd	off-street	$1,018,000	$1,018,000
BP-68	-	Shared Use Path	McKee Park Connector	Rail Trail	Hollis Creek Trail	off-street	$2,500,000	$2,500,000
BP-70	-	Shared Use Path	Hollis Creek Trail	Yellow Jacket Dr	Poor House Rd	off-street	$2,700,000	$2,700,000
BP-71	-	Sidewalk	Jackson St	Garrard Rd	MS 182	both	$520,000	$520,000
BP-72	A	Shared Use Path	North Loop Greenway	Old MS 12	Rail Trail	off-street	$7,500,000	$7,840,000
	B	Sidepath	North Loop Connector	Cornerstone Park	North Loop Greenway	south	$340,000	
BP-73	-	Sidepath	Rockhill Rd	Garrard Rd	North Loop Greenway	west	$1,019,000	$1,019,000
BP-74	-	Sidepath	S Montgomery St	Lynn Ln	Poor House Rd	west	$4,500,000	$4,500,000
BP-76	-	Sidewalk	Mongtomery St	Garrard Rd	MS 12	both	$972,000	$972,000
BP-77	-	Shared Use Path	Rail Trail	Cornerstone Park	Sand Creek Trail	off-street	$4,500,000	$4,500,000
BP-78	A	Sidewalk	Washington St / Lafayette St / Jefferson St	MS 182	Main St	both	$119,000	$158,000
	B	Sidewalk	Lafayette St	Lampkin St	Gillespie St	west	$39,000	
BP-79	A	Sidewalk	Santa Anita Dr	Jackson St	Mongtomery St	south	$132,000	$213,000
	B	Sidewalk	Evergreen St	Santa Anita Dr	Critz St	east	$81,000	
BP-80	-	Sidewalk	Womack Dr	Jackson St	Montgomery St	both	$231,000	$231,000
BP-84	A	Separated Bike Lane	Stark Road Ext	Peoples St Ext	Garrard Rd	both	new road	new road
	B	Sidewalk	Stark Road Ext	Peoples St Ext	Garrard Rd	both	new road	
BP-85	-	Separated Bike Lane	Abernathy Dr	MS 25	Stark Rd	both	$261,000	$261,000
BP-86	A	Sidewalk	Eudora Welty Way / Abernathy Dr	Starkville Storage	Mallory Ln	east	$260,000	$348,000
	B	Sidewalk	Eudora Welty Way	Starkville Storage	Mallory Ln	south	$88,000	
BP-87		Sidewalk	Stark Rd	MS 12	MS 182	west	$548,000	$548,000
BP-89	A	Sidewalk	Spruill Industrial Park Rd	McKee Park Connector	Industrial Park Rd	south	$108,000	$171,000
	B	Sidewalk	Industrial Park Rd	Medicaid Office	Salvation Army	east	$63,000	
BP-92	-	Shared Use Path	Rail Trail Connector	Rail Trail	Chestnut Dr	off-street	$227,000	$227,000
BP-95	A	Separated Bike Lane	Mongtomery St	Garrard Rd	MS 12	both	$1,166,000	$1,407,000
	B	Separated Bike Lane	S Montgomery St	MS 12	Locksley Way	one	$241,000	
BP-97	-	Shared Use Path	Rail Trail Connector	Rail Trail	Walmart	off-street	$162,000	$162,000
BP-99	-	Sidepath	MS 182	College View Connector Trail	George Perry St	south	$768,000	$768,000
BP-101	-	Shared Use Path	Sand Creek Trail	Rail Trail	MS 182	off-street	$1,053,000	$1,053,000
BP-102	A	Shared Use Path	Research Park Trail	Research Blvd	Rail Trail	off-street	$341,000	$344,000
	B	Sharrow	Technology Blvd	Research Blvd	Sidepath	both	$3,000	
BP-103	-	Sidepath	MS 182	George Perry St	Lee Blvd	south	$793,000	$793,000
BP-104	A	Separated Bike Lane	Lee Blvd	MSU gate	MS 182	both	$634,000	$1,240,000
	B	Sidewalk	Lee Blvd	MSU entrance	MS 182	both	$606,000	
BP-118	A	Shared Use Path	Hail State Blvd	Buckner Ln	Poor House Rd	east	$2,060,000	$2,087,000
	B	Sidewalk	Buckner Ln	West Line Rd	Univ. Rec Facility	south	$27,000	
BP-119	-	Sidewalk	Blackjack Rd	Oktoc Rd	Hardy St	south	$67,000	$67,000
BP-120	-	Sidepath	Hardy St Ext	Blackjack Rd	Oktoc Rd	east	$103,000	$103,000

Project	Part	Improvement	Facility	From	To	Side	Cost for Part	Cost for Total Project
BP-124	A	Separated Bike Lane	Bulldog Way Ext	Blackjack Rd	Hail State Blvd	both	new road	new road
	B	Sidewalk	Bulldog Way Ext	Blackjack Rd	Hail State Blvd	both	new road	
BP-125	-	Sidepath	Bardwell Road Realignment	MS 182	Blackjack Rd	both	new road	new road
BP-126	-	Paved Shoulder	MS 182	Lee Blvd	Taggart Ln	both	$1,680,000	$1,680,000
BP-127	-	Paved Shoulder	New Road	MS 182	Blackjack Rd	both	new road	new road
BP-128	-	Paved Shoulder	Blackjack Rd	Bardwell Rd	Proposed new roadway	both	$1,214,000	$1,214,000
BP-129	-	Paved Shoulder	Louisville St	Cornerstone Park Connector	Poor House Rd	both	$851,000	$851,000
BP-130	-	Paved Shoulder	Poor House Rd	Louisville Rd	Oktoc Rd	both	$2,467,000	$2,467,000
BP-131	-	Paved Shoulder	Oktoc Rd / Bluff Lake Rd	Poor House Rd	County Line	both	$5,005,000	$5,005,000
BP-134	-	Paved Shoulder	Maben Bell Schoolhouse / County Lake / MS 182	North Loop Greenway	Maben Starkville Rd	both	$10,102,000	$10,102,000
BP-136	-	Paved Shoulder	Louisville Rd	MS 12	County Line	both	$2,449,000	$2,449,000
BP-137	-	Shared Use Path	Rail Trail	Sand Creek Trail	County Line	off-street	$5,608,000	$5,608,000
BP-138	-	Shared Use Path	Rail Trail	County Line	Cornerstone Park	off-street	$10,212,000	$10,212,000

Note: Costs are in 2021 dollars and for construction only

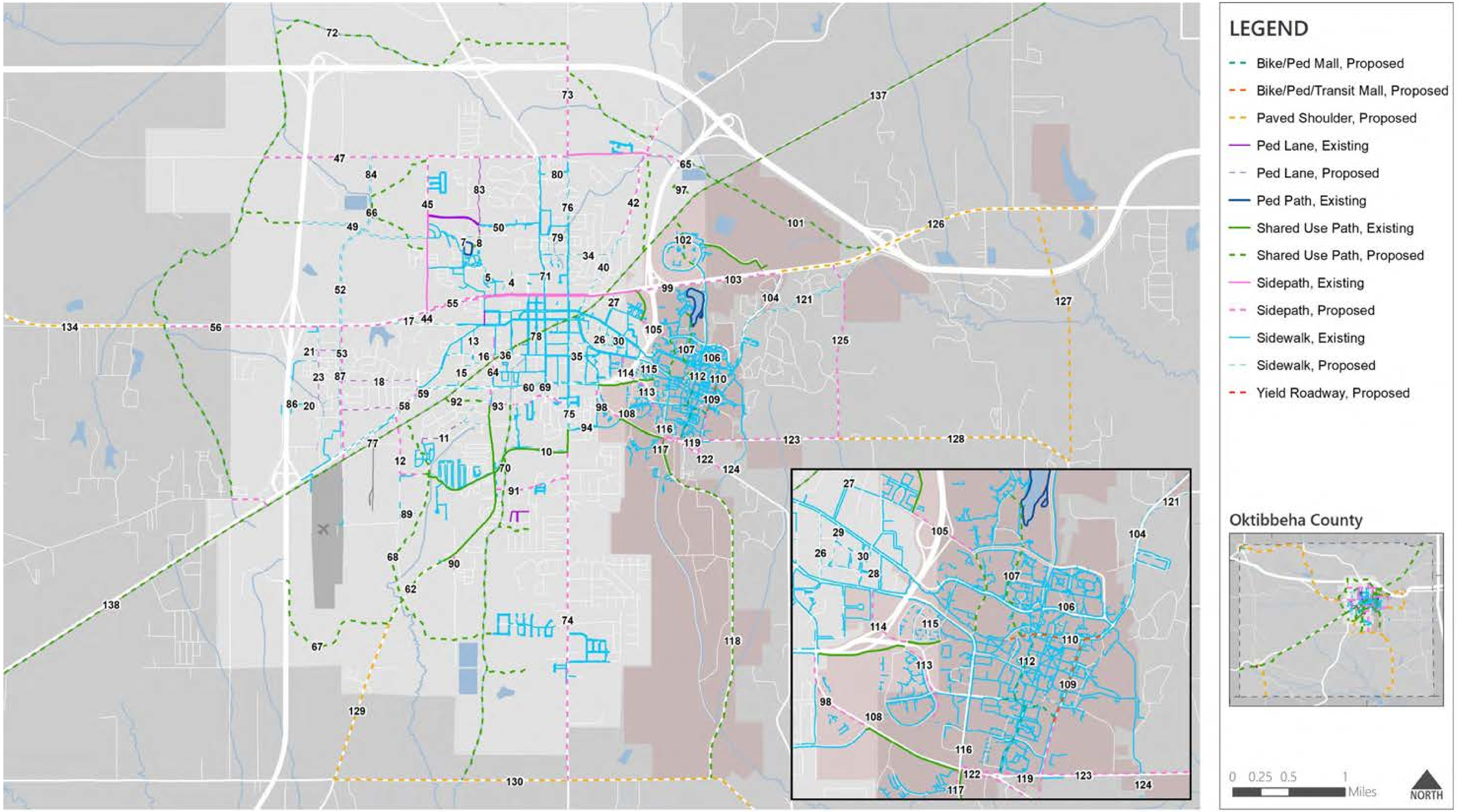
Figure 4.1.5.1 Bicycle Network Recommendations



Data Source: Neel-Schaffer

Disclaimer: This map is for planning purposes only.

Figure 4.1.5.2 Pedestrian Network Recommendations



Data Source: Neel-Schaffer

Disclaimer: This map is for planning purposes only.

4.2 Public Transit Needs Analysis

4.2.1 Transit System Overview

4.2.1.1 Services Provided

The Starkville-MSU Area Rapid Transit (SMART) system provides fare-free fixed route and paratransit service to the general public in the Starkville/MSU area and is operated by MSU Parking and Transit Services. **Table 4.2.1.1** shows the service characteristics of the 11 fixed routes and the system map is shown in **Figure 4.2.1.1**. All routes begin service at 7:00 AM and end between 6:00 PM and 8:00 PM. Some routes operate on Saturdays and only the GTR Airport Express operates on Sundays.

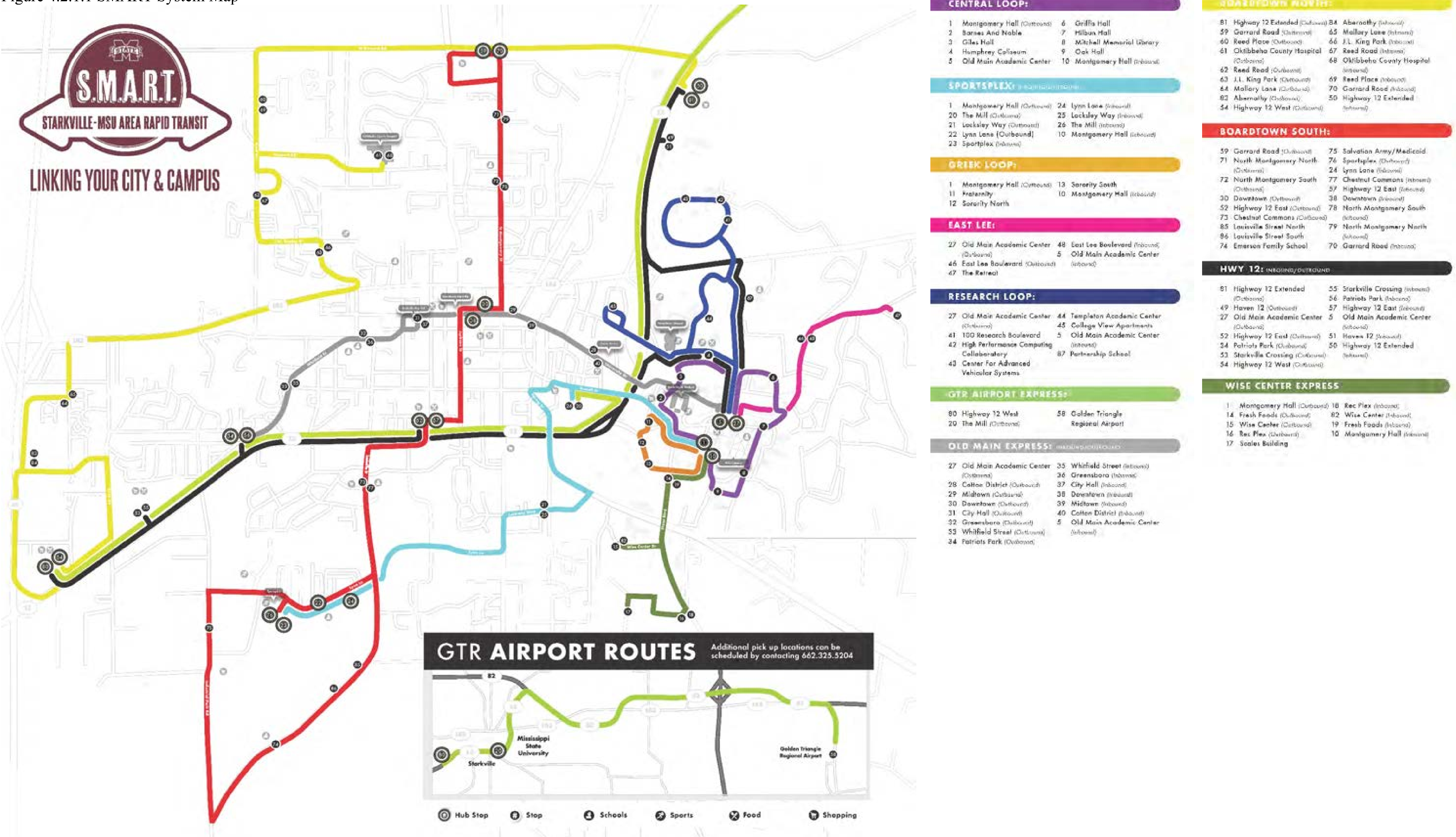
The GTR Airport Express is a flexible fixed route - it may stop anywhere along Hwy 12 by request (e.g. hotels) and its schedule changes depending on flight times.

Paratransit service is a curb-to-curb, demand-response service provided to people with disabilities. To use the paratransit service, people must be certified, and trips must begin and end within the City of Starkville, the MSU campus, or within one mile of a fixed route.

Table 4.2.1.1 SMART 12-Month Routes and Frequencies

Route	Months	Days	Hours	Frequency
Boardtown North	Year-round	Mon-Sat	7:00 AM to 8:00 PM	30 Minutes
Boardtown South	Year-round	Mon-Sat	7:00 AM to 8:00 PM	20-25 Minutes
Central Loop	August to May	Mon-Fri	7:00 AM to 6:00 PM	3-7 Minutes
East Lee Express	Year-round	Mon-Fri	7:00 AM to 6:00 PM	15 Minutes
Greek Loop	August to May	Mon-Fri	7:00 AM to 6:00 PM	3-7 Minutes
GTR Airport Express	Year-round	Mon-Sun	Depends on flights	Depends on flights
Highway 12 Express	Year-round	Mon-Sat	7:00 AM to 8:00 PM	30 Minutes
Old Main Express	Year-round	Mon-Sat	7:00 AM to 8:00 PM	15 Minutes
Research Loop	Year-round	Mon-Fri	7:00 AM to 6:00 PM	8-10 Minutes
Sportsplex Express	Year-round	Mon-Fri	7:00 AM to 8:00 PM	15-18 Minutes
Wise Center Express	August to May	Mon-Fri	7:00 AM to 6:00 PM	7-15 Minutes

Figure 4.2.1.1 SMART System Map



4.2.1.2 Fare Policies

SMART operates as a fare-free transit system. No fares are required to board a fixed route or paratransit vehicle and no money or donations are accepted.

4.2.1.3 Assets

Administrative and Maintenance Facility

SMART operations are currently based at a 2,800 square foot metal building and the surrounding parking lot at 95 Buckner Lane off of Blackjack Road. SMART also utilizes a mechanic shop in the Campus Services Facility as needed.

The existing metal building and surrounding parking lot were constructed in 2017 and are in good condition. However, this facility lacks sufficient administrative space and there are plans for a new 7,700 square foot administrative building to house administrative and dispatch workspaces, meeting spaces, pre and post trip driver areas, a large multi-purpose break and training room, and driver locker and rest areas.

Figure 4.2.1.2 SMART Administrative and Maintenance Facility

Address	95 Buckner Lane, Mississippi State, MS 39762
Opening Year	2017
Ownership	Owned by SMART/MSU
Building Square Footage	2,799
Condition Rating	5 out of 5 (Marginal)

Bus Stops and Hubs

SMART serves 86 bus stops around the MSU campus, the City of Starkville, and at the GTR Airport. 11 of these stops are served by multiple routes and function as hubs for transferring between routes. Of these 11 hubs, the Old Main Academic and Montgomery Hall hubs on the MSU campus are the largest and busiest. All SMART bus stops and hubs can be seen in the system map in **Figure 4.2.1.1**.

Table 4.2.1.2 SMART Hubs

Hub	Routes	Routes Served
Old Main Academic	5	Central Loop, East Lee Express, Highway 12 Express, Old Main Express, and Research Loop
Montgomery Hall	4	Central Loop, Greek Loop, Sportsplex Express, and Wise Center Express
Highway 12 West	3	Boardtown North, GTR Airport Express, and Highway 12 Express
Downtown	2	Boardtown South and Old Main Express
Garrard Road	2	Boardtown North and Boardtown South
Highway 12 East	2	Boardtown South and Highway 12 Express
Highway 12 Extended	2	Boardtown North and Highway 12 Express
Lynn Lane	2	Boardtown South and Sportsplex Express
Patriots Park	2	Highway 12 Express and Old Main Express
Sportsplex	2	Boardtown South and Sportsplex Express
The Mill	2	GTR Airport Express and Sportsplex Express

Figure 4.2.1.3 Major Bus Stop Hubs

Source: Mississippi State University

Vehicles

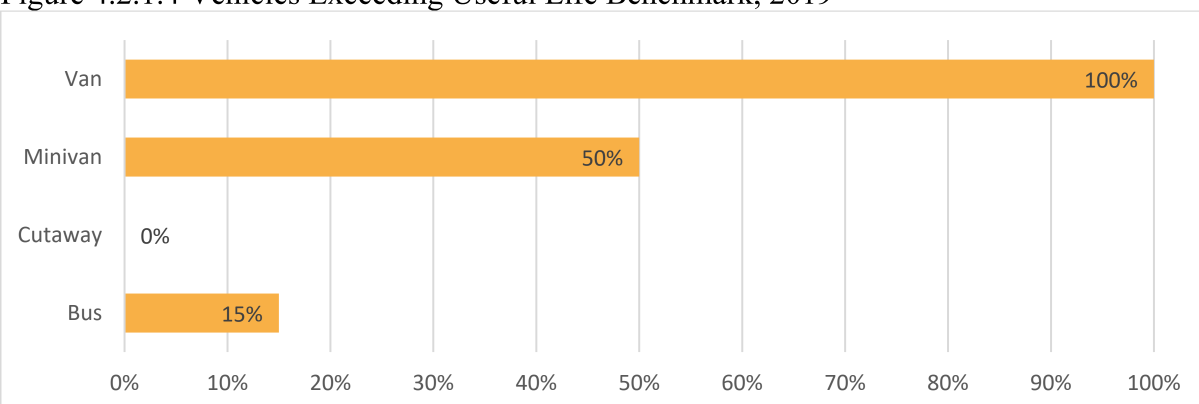
The SMART fleet includes 34 vehicles, most of which are buses or cutaways for the fixed route service. The remaining minivans and vans are utilized for paratransit and other purposes. Many of the minivans and vans are older and exceed their useful life benchmark while the buses and cutaways are mostly within their useful life benchmark.

Table 4.2.1.3 Vehicle Fleet Characteristics, 2019

Vehicle Type	Number	Length	Seating Capacity	Useful Life Benchmark
Bus	20	25-36 feet	25-36 seats	5-7 years
Cutaway	7	24 feet	25 seats	5-10 years
Minivan	6	12-18 feet	6-7 seats	5 years
Van	1	18 feet	15 seats	5 years
All Vehicles	**34**	**n/a**	**n/a**	**n/a**

Source: National Transit Database

Figure 4.2.1.4 Vehicles Exceeding Useful Life Benchmark, 2019



Source: National Transit Database

Source: Mississippi State University

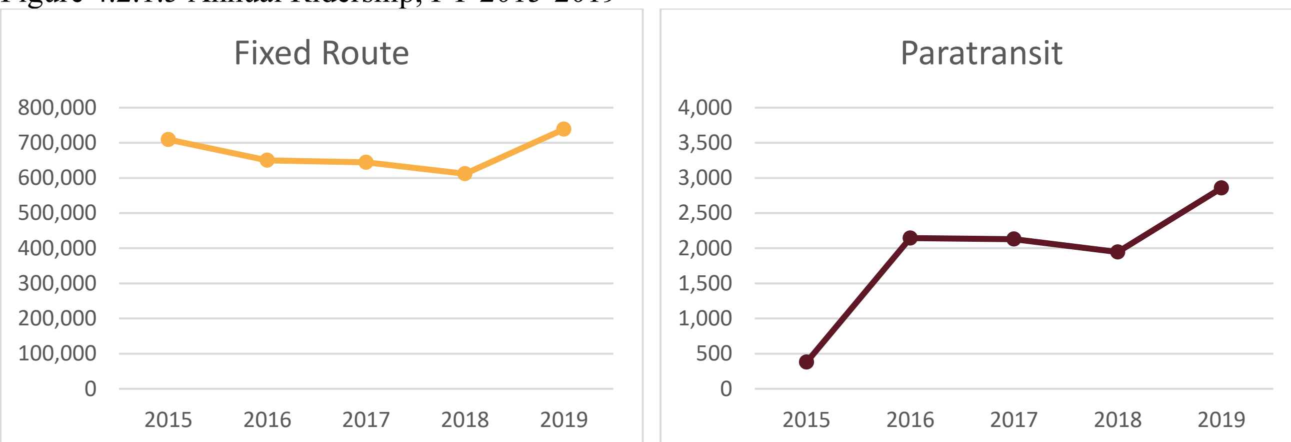
4.2.1.4 Ridership Trends

Annual and Monthly Ridership Trends

Prior to the COVID-19 pandemic, SMART ridership totaled approximately 740,000 fixed route trips and 3,000 paratransit trips in FY 2019. For fixed route ridership, this was a significant rebound after several years of ridership stagnation and decline. Paratransit ridership followed similar trends after being officially rolled out in late 2015.

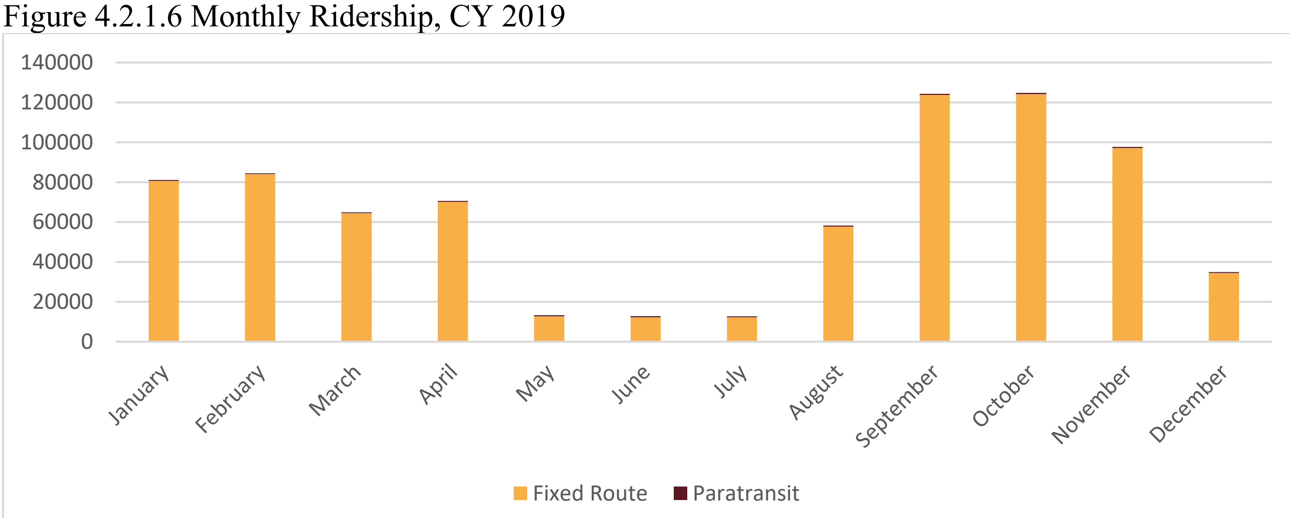
Approximately 80% of SMART riders are estimated to be MSU students based on previous rider surveys. Because of the large influence of students and the orientation of many routes to serve the university, ridership by month largely follows the academic calendar, peaking in the Fall semester and then dropping considerably in the summer months when many on-campus routes do not operate.

Figure 4.2.1.5 Annual Ridership, FY 2015-2019



Source: National Transit Database

Figure 4.2.1.6 Monthly Ridership, CY 2019



Source: SMART

Daily and Hourly Ridership Trends

SMART does not have significant ridership on weekends or outside of the Fall or Spring MSU semesters. Therefore, in order to understand daily ridership trends, it is most useful to look at a typical weekday as opposed to an annual average. For the SMART system, typical weekday ridership figures were calculated for the Fall 2019 semester since this was the most recent semester before the COVID-19 pandemic. This weekday average includes data from the first day of class to the last day of class and excludes holidays.

Table 4.2.1.4 shows that average weekday ridership for SMART is highly variable by route. Three of the on-campus routes, the Central Loop, Greek Loop, and Research Loop, accounted for about two-thirds of all ridership in the Fall 2019 semester and this trend is true of previous years as well. In general, routes with an on-campus connection generated higher ridership than those without one (e.g. Boardtown North, Boardtown South, and GTR Airport Express routes).

When looking at the highest stops by weekday ridership volume, the dominance of the university market is evident again. The top routes consist almost entirely of academic buildings or places with concentrations of student housing (on or off-campus). This pattern is also clear when mapping the concentration of all typical weekday boarding activity, as illustrated in **Figure 4.2.1.8**.

When looking at weekday ridership trends by time of day, ridership is pretty consistent until after 3:00 PM when it tapers off. Again, this is reflective of the large school-related trip purposes of riders as well as the fact that no routes operate beyond 8:00 PM.

Table 4.2.1.4 Average Daily Ridership by Route, Fall 2019

Route	Average Weekday Ridership	% of All Weekday Ridership	Average Saturday Ridership	% of All Saturday Ridership
Boardtown North	76	1.3%	64	21.5%
Boardtown South	141	2.5%	83	27.7%
Central Loop	1,356	24.1%	n/a	n/a
East Lee Express	669	11.9%	n/a	n/a
Greek Loop	1,555	27.7%	n/a	n/a
GTR Airport Express	12	0.2%	6	2.1%
Highway 12 Express	287	5.1%	96	32.1%
Old Main Express	288	5.1%	50	16.6%
Research Loop	822	14.6%	n/a	n/a
Sportsplex Express	280	5.0%	n/a	n/a
Wise Center Express	138	2.5%	n/a	n/a
All Routes	**5,623**	**100.0%**	**299**	**100.0%**

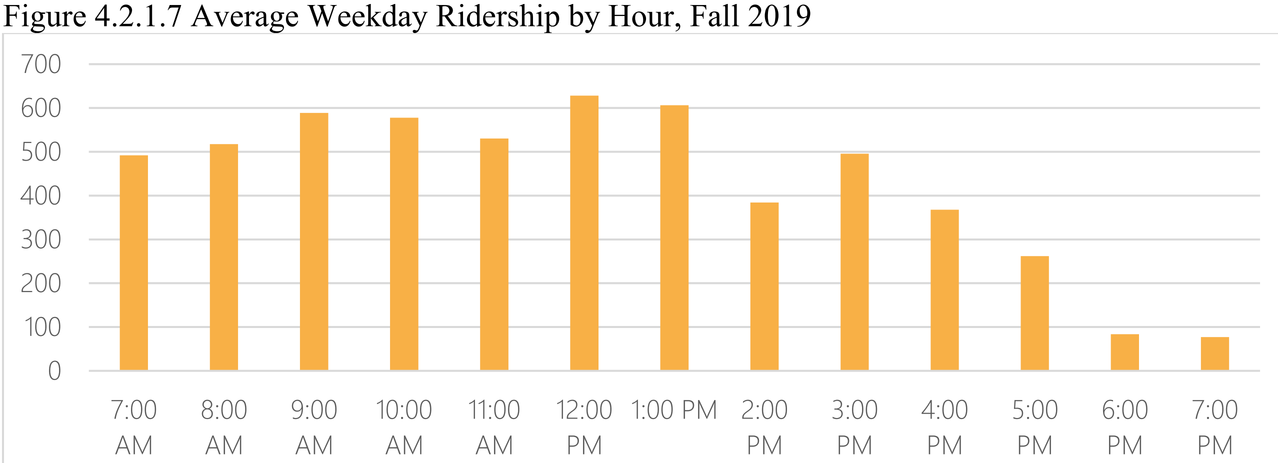
Source: SMART

Table 4.2.1.5 Highest Average Weekday Ridership Stops, Fall 2019

Rank	Stop	Average Daily Boardings	Percent of All Weekday Ridership
1	Montgomery Hall	1,081	19%
2	Old Main Academic Center	527	9%
3	College View Apartments	499	9%
4	Sorority South	395	7%
5	Giles Hall	393	7%
6	The Retreat	347	6%
7	Fraternity	251	4%
8	East Lee Boulevard	211	4%
9	Sorority North	193	3%
10	Oak Hall	126	2%
11	Locksley Way	100	2%
12	Barnes and Noble	97	2%
13	Mitchell Memorial Library	93	2%
14	Cotton District	69	1%
15	Hilbun Hall	69	1%
16	Haven 12	69	1%
17	Lynn Lane	65	1%
18	Griffis Hall	64	1%
19	Highway 12 East	59	1%
20	High Performance Computing Collaboratory	54	1%
21	Highway 12 Extended	54	1%

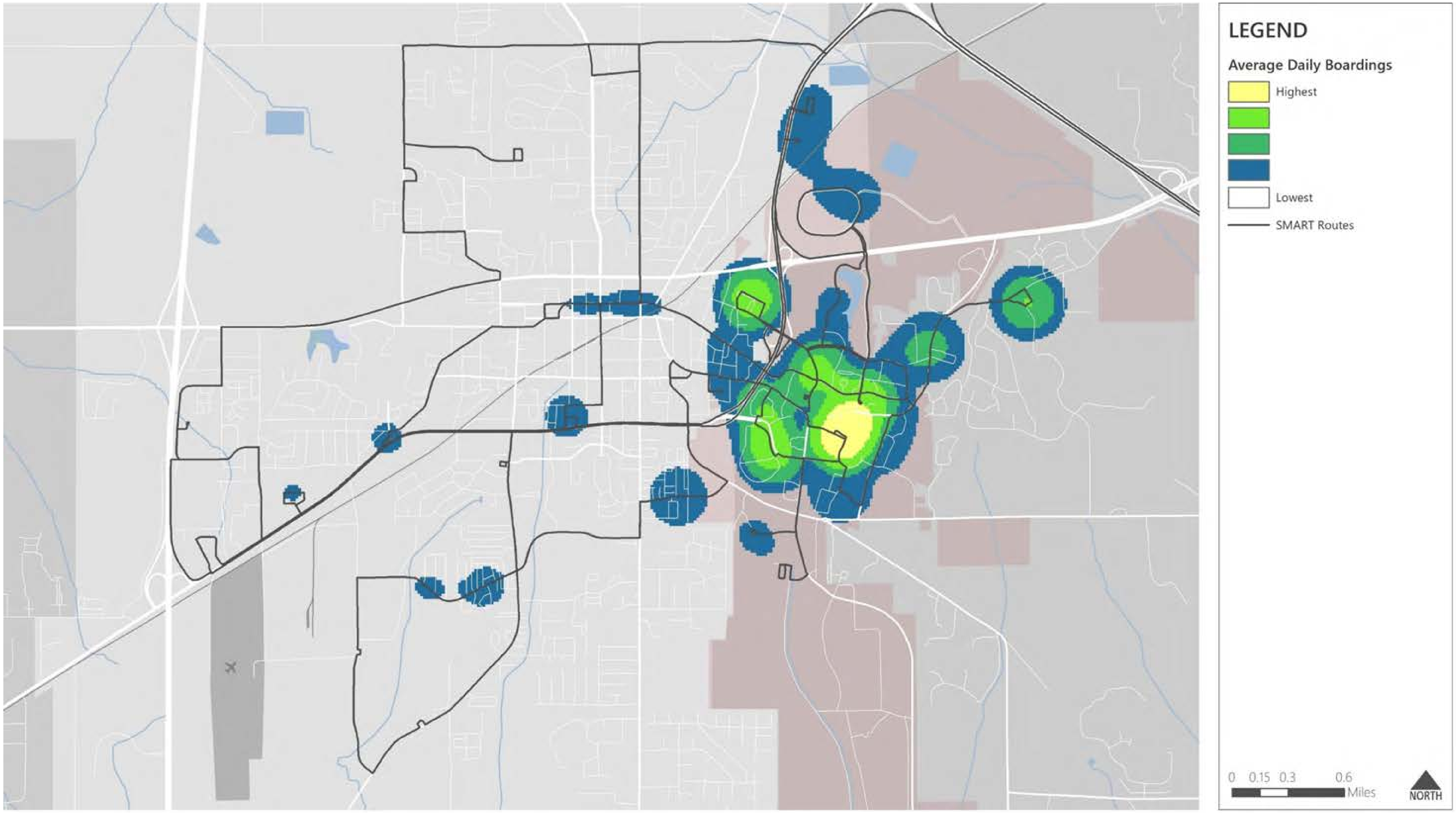
Note 1: Inbound and outbound stops are grouped together.
Note 2: Includes all stops with at least 50 average daily boardings.
Source: SMART

Figure 4.2.1.7 Average Weekday Ridership by Hour, Fall 2019



Source: SMART

Figure 4.2.1.8 Concentration of Average Weekday Ridership, Fall 2019



Data Source: SMART

Disclaimer: This map is for planning purposes only.

4.2.1.5 Operating Trends

Operating and Financial Trends

Table 4.2.1.6 and **Table 4.2.1.7** show operating and financial trends for fixed route and paratransit service.

For fixed route service, the level of service steadily increased from 2015 to 2019 while ridership plateaued until 2019 when it increased. However, productivity has declined by the two most important measures, boardings per hour and boardings per mile. At the same time though, SMART has generally become more cost efficient at providing fixed route service.

For paratransit service, service levels in terms of revenue hours have stayed consistent since 2016, the first full year of data. However, the mileage has increased, indicating a trend towards longer paratransit trips. Ridership grew rapidly in 2019 after stagnating for several years. In terms of productivity, paratransit is serving more passengers per hour but fewer per mile, indicating longer but quicker trips, perhaps in less congested or developed areas. By all measures, paratransit has become less cost efficient.

Table 4.2.1.6 Fixed Route Operating and Financial Trends

General Performance	2015	2016	2017	2018	2019	5-year Trend
Urban Area Population	32,053	32,080	31,991	32,052	32,288	▪
Passenger Boardings	709,064	650,052	644,452	611,905	738,871	▲
Total Operating Expense	$1,423,254	$1,646,916	$1,845,041	$2,454,167	$2,712,884	▲
Level of Service						
Vehicles Operated in Max. Service	16	22	25	24	28	▲
Vehicle Revenue Miles (VRM)	318,363	511,541	542,891	606,661	664,634	▲
Vehicle Revenue Hours (VRH)	31,756	44,661	46,720	57,890	63,803	▲
Productivity						
Boardings per Capita	22.1	20.3	20.1	19.1	22.9	▲
Boardings per Mile	2.2	1.3	1.2	1.0	1.1	▼
Boardings per Hour	22.3	14.6	13.8	10.6	11.6	▼
Cost Efficiency						
Operating Expense per Boarding	$2.01	$2.53	$2.86	$4.01	$3.67	▲
Operating Expense per Mile	$4.47	$3.22	$3.40	$4.05	$4.08	▼
Operating Expense per Hour	$44.82	$36.88	$39.49	$42.39	$42.52	▼

Source: American Community Survey; National Transit Database

Table 4.2.1.7 Paratransit Operating and Financial Trends

General Performance	2015 (Partial)	2016	2017	2018	2019	4-year Trend
Urban Area Population	32,053	32,080	31,991	32,052	32,288	-
Passenger Boardings	379	2,144	2,129	1,946	2,857	▲
Total Operating Expense	$11,241	$32,770	$33,788	$74,152	$94,027	▲
Level of Service						
Vehicles Operated in Max. Service	1	1	1	1	1	-
Vehicle Revenue Miles (VRM)	4,716	13,791	14,985	18,429	25,856	▲
Vehicle Revenue Hours (VRH)	594	2,067	2,176	1,937	2,047	-
Productivity						
Boardings per Capita	0.0	0.1	0.1	0.1	0.1	-
Boardings per Mile	0.1	0.2	0.1	0.1	0.1	▼
Boardings per Hour	0.6	1.0	1.0	1.0	1.4	▲
Cost Efficiency						
Operating Expense per Boarding	$29.66	$15.28	$15.87	$38.10	$32.91	▲
Operating Expense per Mile	$2.38	$2.38	$2.25	$4.02	$3.64	▲
Operating Expense per Hour	$18.92	$15.85	$15.53	$38.28	$45.93	▲

Source: American Community Survey; National Transit Database

Safety and Security Trends

As a recipient of federal transportation funds, SMART is required to report safety and security events occurring on a transit right-of-way, in a transit revenue facility, in a transit maintenance facility, or involving a transit revenue vehicle.

From 2015 to 2019, SMART reported no safety or security events. This low incidence rates compares well with urbanized area transit systems in the state and nation.

Table 4.2.1.8 SMART Safety and Security Events, FY 2015-2019

	2015	2016	2017	2018	2019	2015-2019
All Events	**0**	**0**	**0**	**0**	**0**	**0**
Fatalities	0	0	0	0	0	0
Injuries	0	0	0	0	0	0

Source: National Transit Database

Table 4.2.1.9 Safety and Security Events per 100,000 Vehicle Revenue Miles, FY 2015-2019

	SMART	Mississippi Urbanized Area Providers	U.S. Urbanized Area Providers
All Events	**0.00**	**0.22**	**0.21**
Fatalities	0.00	0.01	0.01
Injuries	0.00	0.24	0.26

Source: National Transit Database

4.2.1.6 Route Profiles

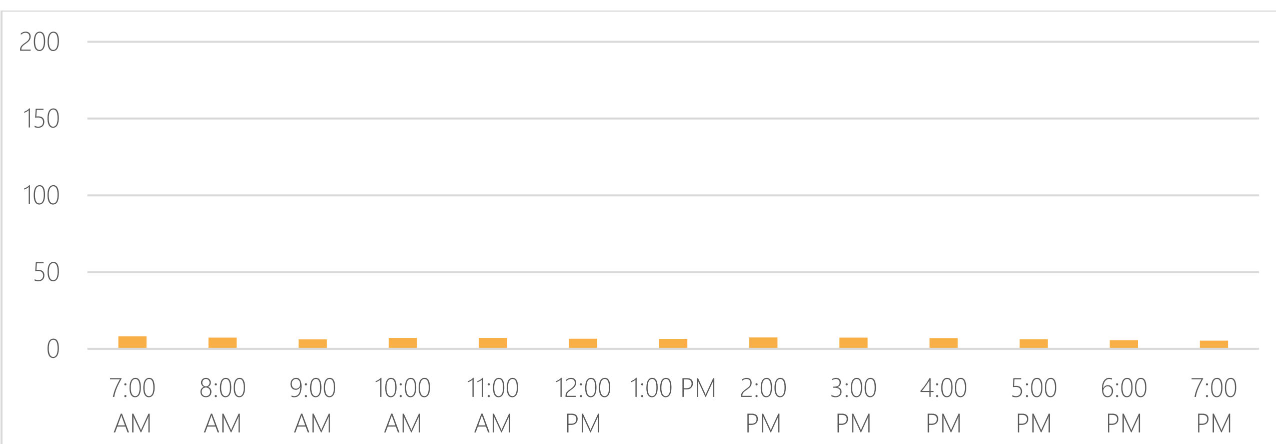
The following pages provide "route profiles" for each fixed route in the SMART system. These profiles provide a snapshot of pre-COVID 19 service levels, route design, and performance for each route. Specifically, it provides the following information:

- **Service Levels**
  - Days of Operation – what days of the week does it run?
  - Span of Service – what hours does it run? For SMART, these hours are the same every day.
  - Frequency – how often does a bus come by?
  - Daily Vehicle Revenue Hours – how many hours are buses spending picking up passengers?
- **Route Design**
  - Route Length (Roundtrip) – how many miles does the route cover, including both inbound and outbound directions?
  - Average Scheduled Speed – what is the average speed that the bus travels while in service?
  - Stops – how many bus stops are on the route? Some locations have both an inbound and outbound stop which are both counted as individual stops.
  - Stop Spacing – what is the average spacing between each stop? Express routes have longer spacing while local routes have shorter spacing.
  - Vehicles Required – how many vehicles are required to operate the route? Some routes require more than one vehicle because of their route design and service level.
- **Ridership**
  - Average Weekday Boardings – how many passengers board the bus on a typical weekday during the Fall 2019 semester?
  - Average Saturday Boardings – how many passengers board the bus on a typical Saturday during the Fall 2019 semester?
  - Weekday Riders per Revenue Hour – how many weekday boardings are occurring while buses are picking up passengers on the route? This is a productivity measure.
  - Weekend Riders per Revenue Hour – how many Saturday boardings are occurring while buses are picking up passengers on the route? This is a productivity measure.
  - Ridership By Time of Day – when are passengers boarding throughout the day?
  - Ridership By Stop – where are passengers boarding along the route?
- **On-Time Performance**
  - On-Time – how often do buses arrive to stops on-time? Per SMART policy, on-time is defined as arriving less than 5 minutes before the schedule time or less than 10 minutes after the scheduled time.
  - Late – how often do buses arrive to stops late? Per SMART policy, late is defined as arriving 10 minutes or more after the scheduled time.
  - Early – how often do buses early to stops late? Per SMART policy, early is defined as arriving 5 minutes or more before the scheduled time.

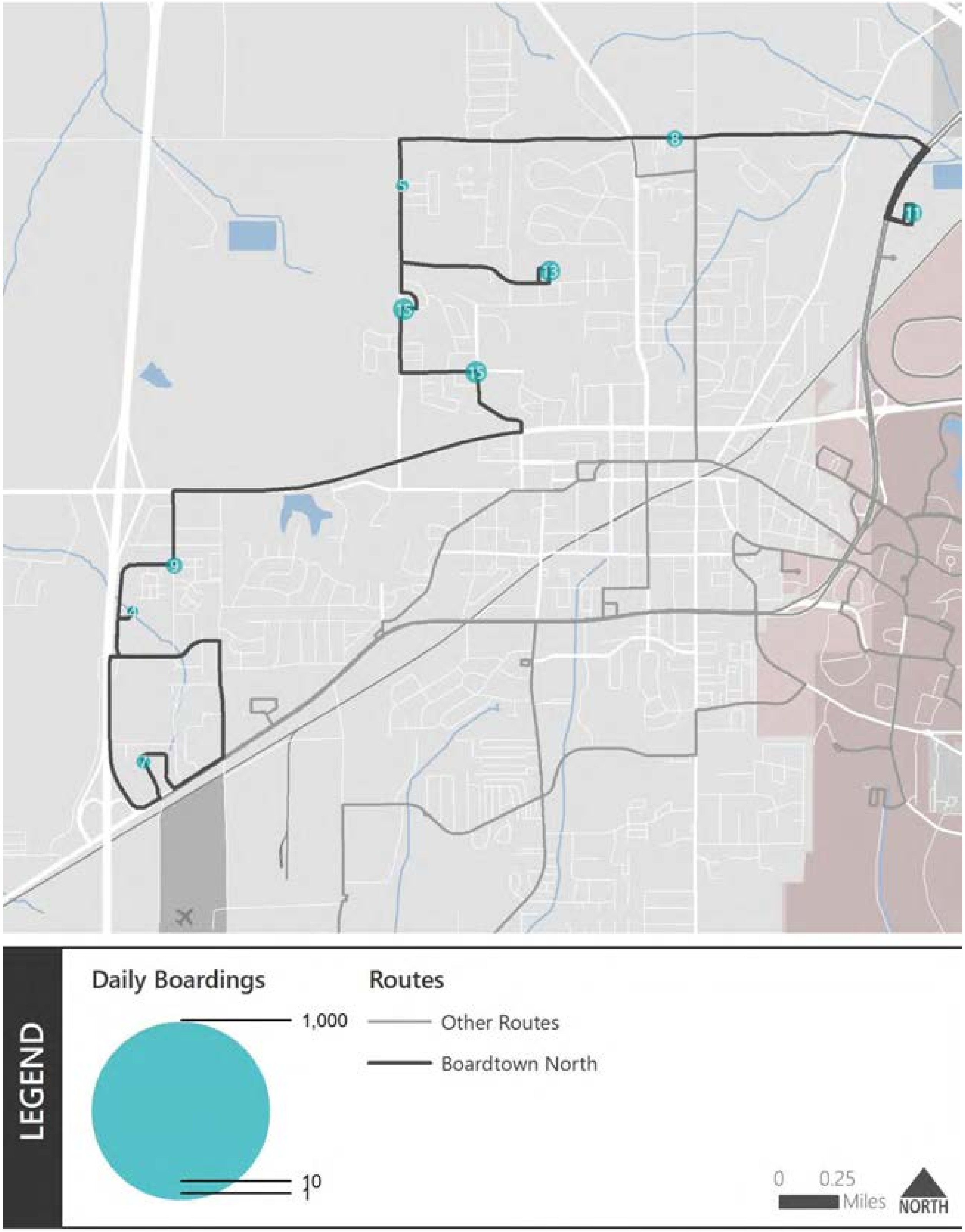
4.2.1.6.1 Boardtown North Route Profile

Service Levels	
Days of Operation	Monday through Saturday
Span of Service	7:00 AM to 8:00 PM
Frequency	Every 30-45 Minutes
Daily Vehicle Revenue Hours	26.0
Route Design	
Route Length (Roundtrip)	19.8 miles
Average Scheduled Speed	19.2 MPH
Stops	17
Stop Spacing	Every 1.2 miles
Vehicles Required	2
Typical Ridership (Fall 2019)	
Average Weekday Boardings	76
Average Saturday Boardings	64
Weekday Riders per Revenue Hour	2.9
Weekend Riders per Revenue Hour	2.5
On-Time Performance (Jan. 2020)	
On-Time	46%
Late	30%
Early	24%

Ridership by Time of Day, Fall 2019



Boardtown North Ridership by Stop, Fall 2019



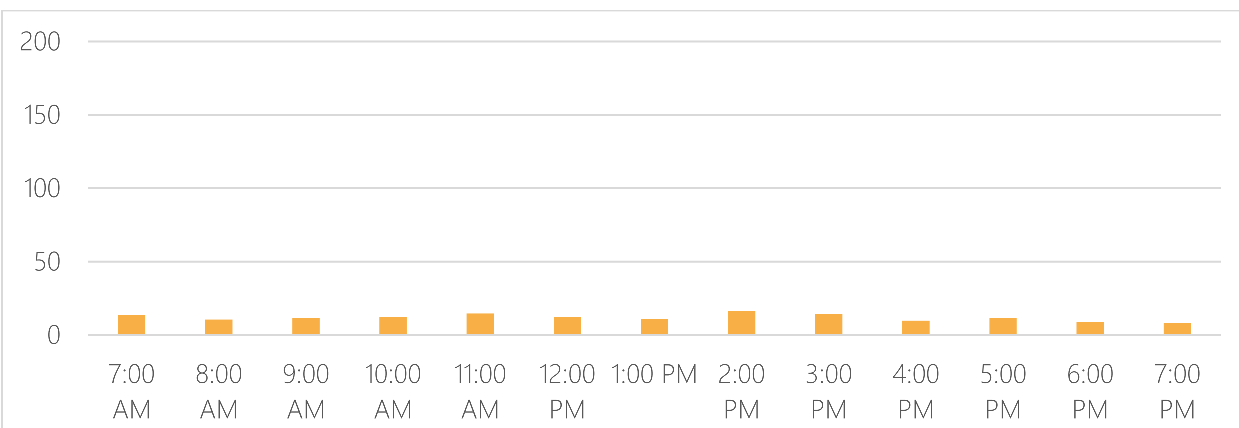
Data Source: SMART

Disclaimer: This map is for planning purposes only.

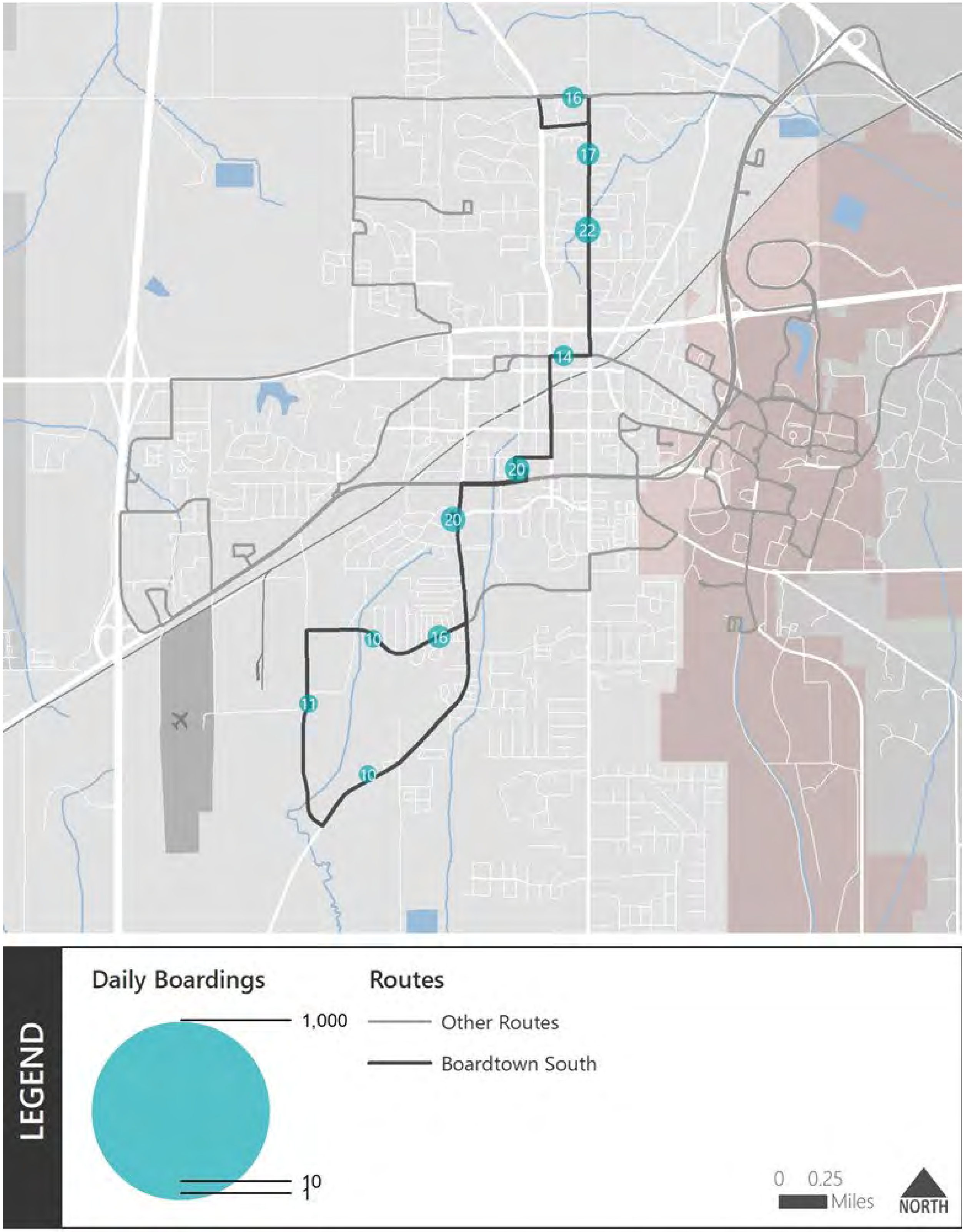
4.2.1.6.2 Boardtown South Route Profile

Service Levels	
Days of Operation	Monday through Saturday
Span of Service	7:00 AM to 8:00 PM
Frequency	Every 20-25 Minutes
Daily Vehicle Revenue Hours	25.8
Route Design	
Route Length (Roundtrip)	11.5 miles
Average Scheduled Speed	16.0 MPH
Stops	18
Stop Spacing	Every 0.6 miles
Vehicles Required	2
Typical Ridership (Fall 2019)	
Average Weekday Boardings	141
Average Saturday Boardings	83
Weekday Riders per Revenue Hour	5.5
Weekend Riders per Revenue Hour	3.2
On-Time Performance (Jan. 2020)	
On-Time	69%
Late	13%
Early	18%

Ridership by Time of Day, Fall 2019



Boardtown South Ridership by Stop, Fall 2019



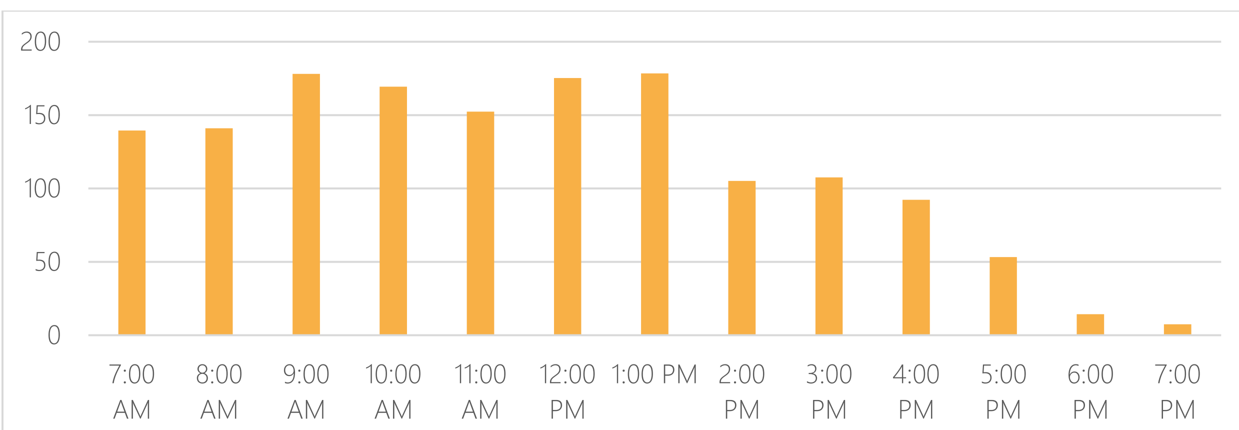
Data Source: SMART

Disclaimer: This map is for planning purposes only.

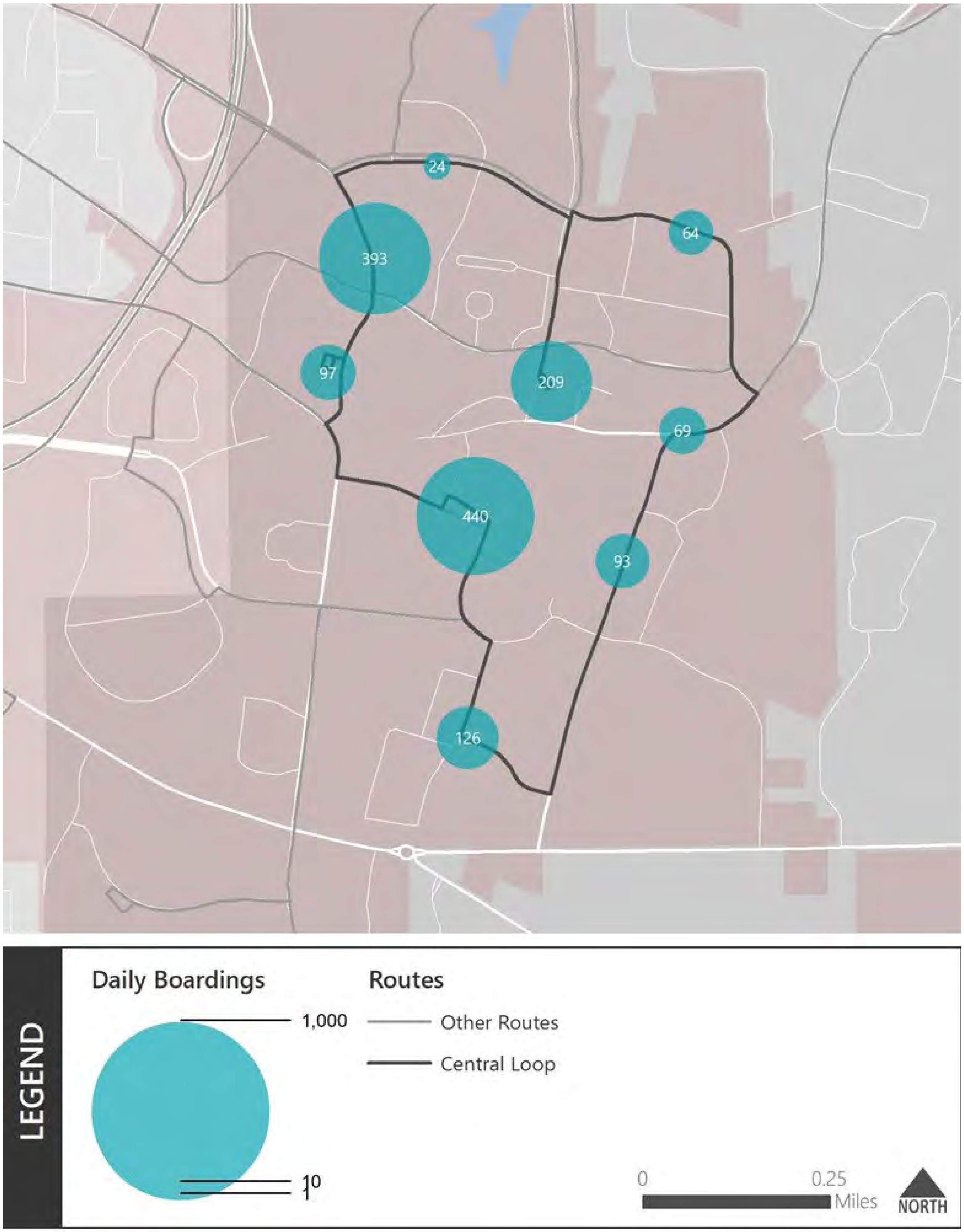
4.2.1.6.3 Central Loop Route Profile

Service Levels	
Days of Operation	Monday through Friday
Span of Service	7:00 AM to 6:00 PM
Frequency	Every 3-7 Minutes
Daily Vehicle Revenue Hours	31.4
Route Design	
Route Length (Roundtrip)	3.1 miles
Average Scheduled Speed	12.1 MPH
Stops	10
Stop Spacing	Every 0.3 miles
Vehicles Required	3
Typical Ridership (Fall 2019)	
Average Weekday Boardings	1,356
Average Saturday Boardings	n/a
Weekday Riders per Revenue Hour	43.1
Weekend Riders per Revenue Hour	n/a
On-Time Performance (Jan. 2020)	
On-Time	95%
Late	0%
Early	5%

Ridership by Time of Day, Fall 2019



Central Loop Ridership by Stop, Fall 2019



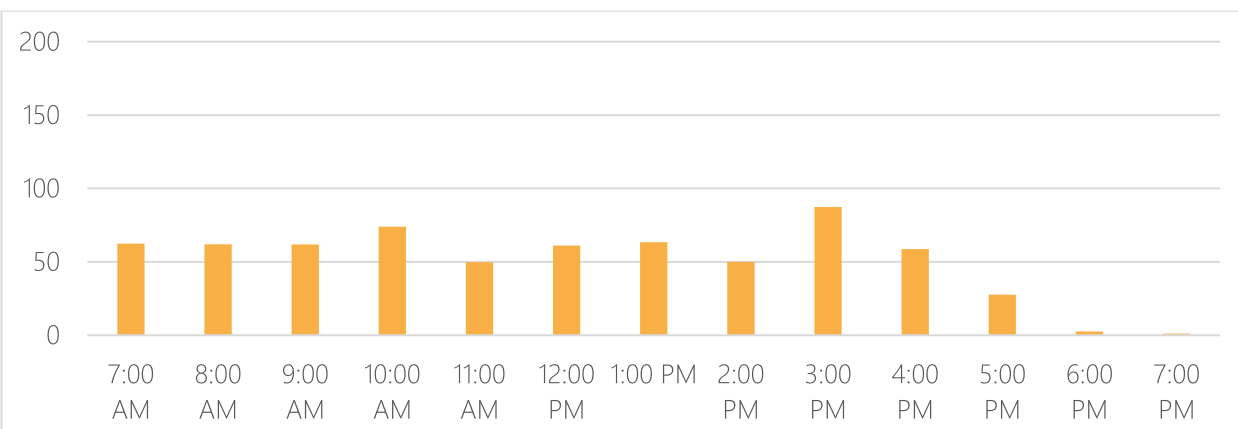
Data Source: SMART

Disclaimer: This map is for planning purposes only.

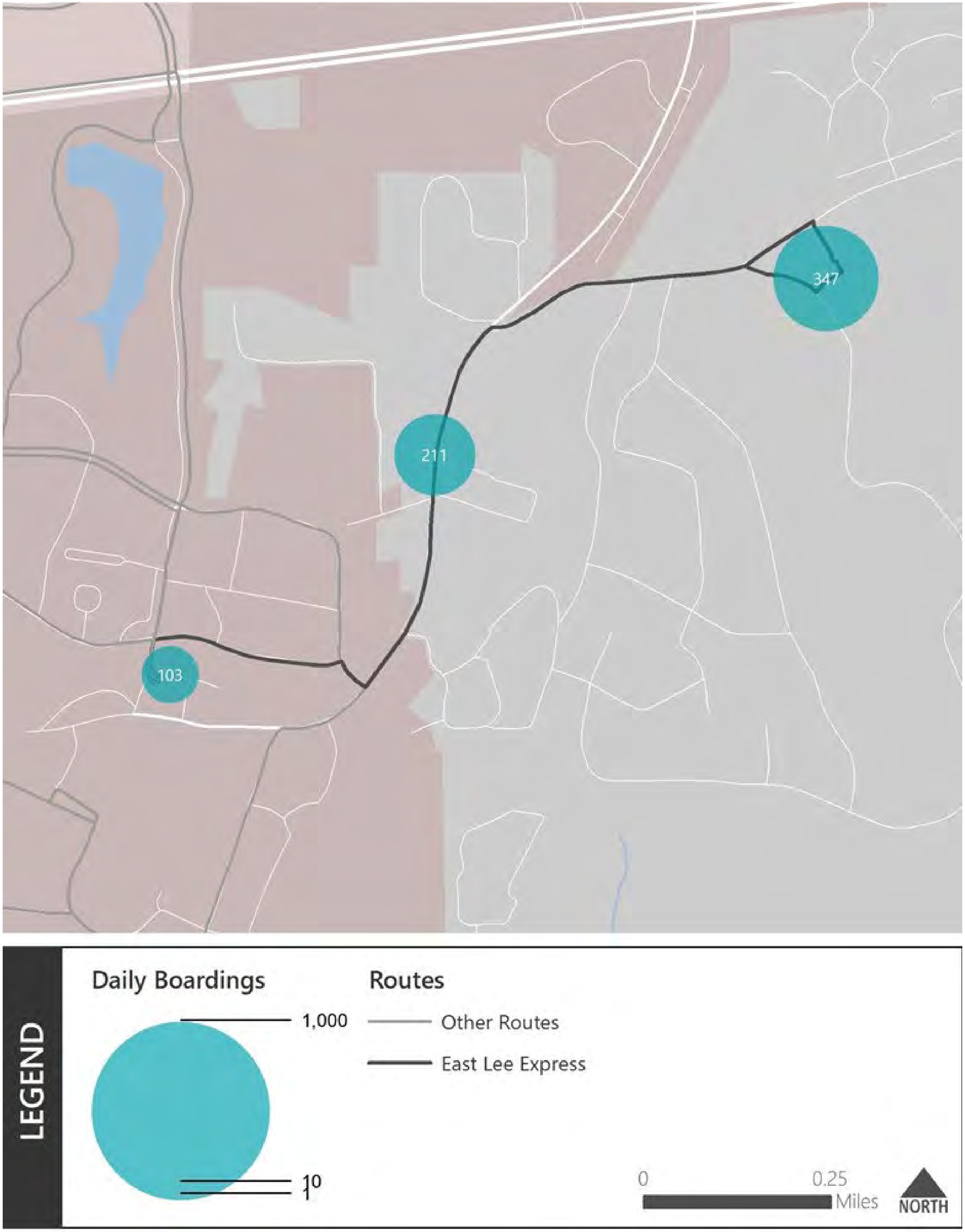
4.2.1.6.4 East Lee Express Route Profile

Service Levels	
Days of Operation	Monday through Friday
Span of Service	7:00 AM to 6:00 PM
Frequency	Every 15 Minutes
Daily Vehicle Revenue Hours	10.8
Route Design	
Route Length (Roundtrip)	2.8 miles
Average Scheduled Speed	12.1 MPH
Stops	5
Stop Spacing	Every 0.6 miles
Vehicles Required	1
Typical Ridership (Fall 2019)	
Average Weekday Boardings	669
Average Saturday Boardings	n/a
Weekday Riders per Revenue Hour	61.8
Weekend Riders per Revenue Hour	n/a
On-Time Performance (Jan. 2020)	
On-Time	79%
Late	5%
Early	16%

Ridership by Time of Day, Fall 2019



East Lee Express Ridership by Stop, Fall 2019



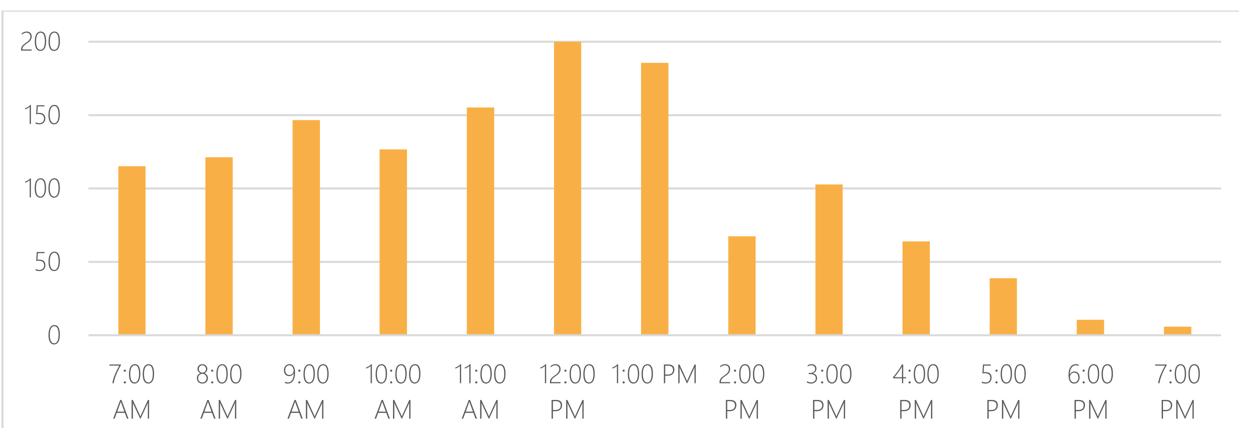
Data Source: SMART

Disclaimer: This map is for planning purposes only.

4.2.1.6.5 Greek Loop Route Profile

Service Levels	
Days of Operation	Monday through Friday
Span of Service	7:00 AM to 6:00 PM
Frequency	Every 3-7 Minutes
Daily Vehicle Revenue Hours	22.0
Route Design	
Route Length (Roundtrip)	1.5 miles
Average Scheduled Speed	8.1 MPH
Stops	5
Stop Spacing	Every 0.3 miles
Vehicles Required	2
Typical Ridership (Fall 2019)	
Average Weekday Boardings	1,555
Average Saturday Boardings	n/a
Weekday Riders per Revenue Hour	70.7
Weekend Riders per Revenue Hour	n/a
On-Time Performance (Jan. 2020)	
On-Time	90%
Late	1%
Early	9%

Ridership by Time of Day, Fall 2019



Greek Loop Ridership by Stop, Fall 2019

Data Source: SMART

Disclaimer: This map is for planning purposes only.

4.2.1.6.6 GTR Airport Express Route Profile

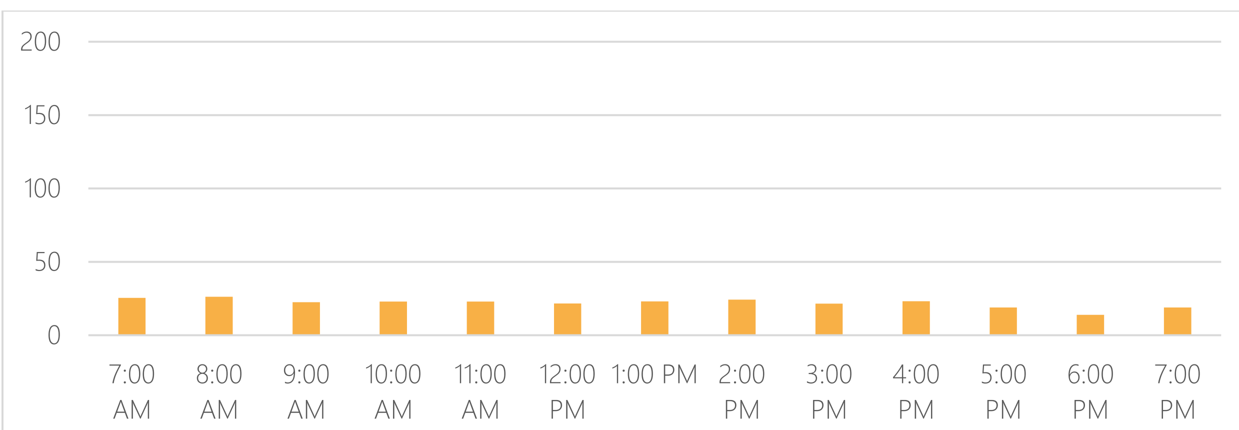
Service Levels	
Days of Operation	Monday through Saturday
Span of Service	7:00 AM to 8:00 PM
Frequency	varies
Daily Vehicle Revenue Hours	varies
Route Design	
Route Length (Roundtrip)	42.8 miles
Average Scheduled Speed	varies
Stops	3 fixed + by request
Stop Spacing	Every 14.3 miles
Vehicles Required	varies
Typical Ridership (Fall 2019)	
Average Weekday Boardings	12
Average Saturday Boardings	6
Weekday Riders per Revenue Hour	n/a
Weekend Riders per Revenue Hour	n/a
On-Time Performance (Jan. 2020)	
On-Time	n/a
Late	n/a
Early	n/a

Note: This route deviates from its schedule as needed. Therefore, some data is not available for this route, such as detailed ridership and on-time performance data.

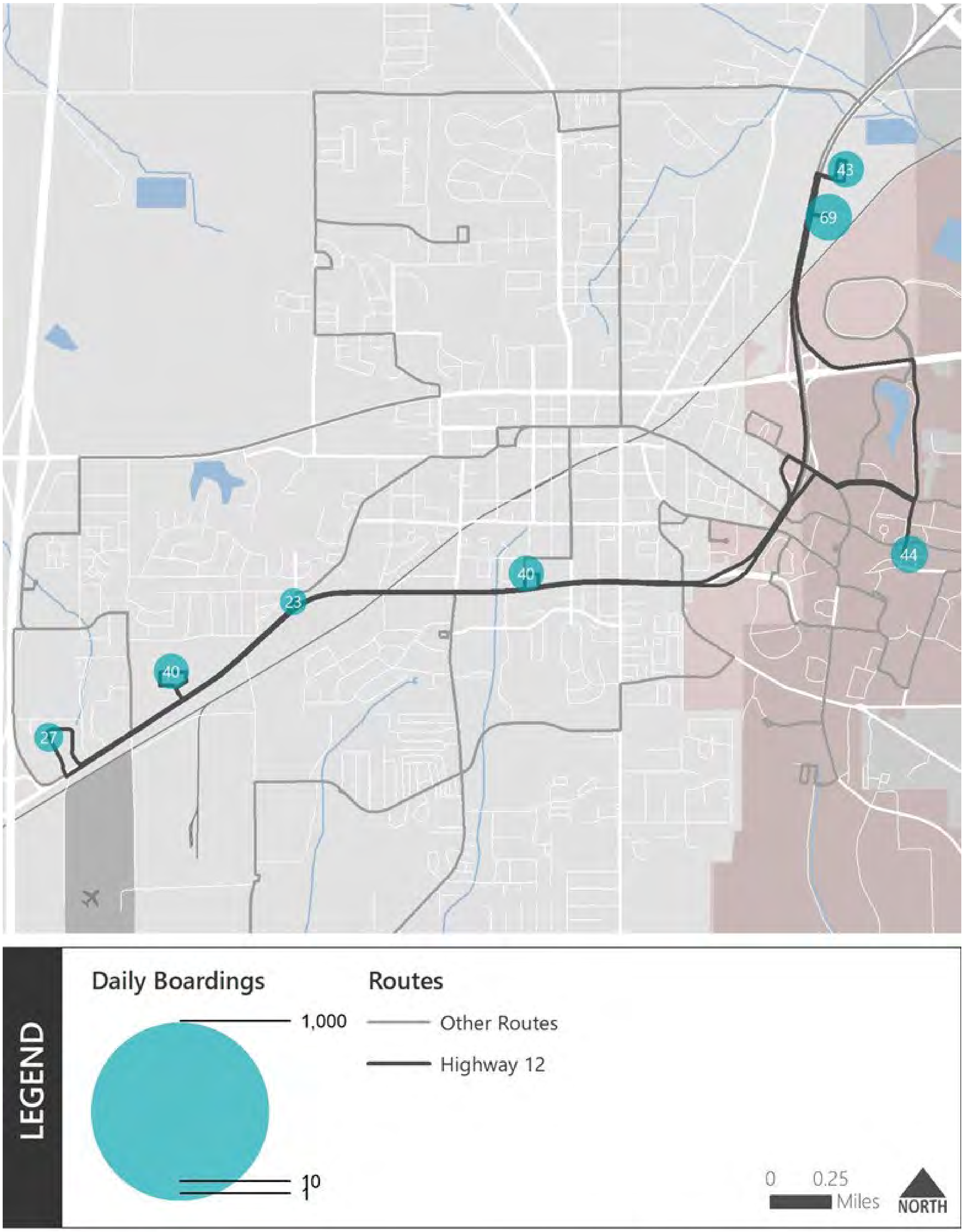
4.2.1.6.7 Highway 12 Express Route Profile

Service Levels	
Days of Operation	Monday through Saturday
Span of Service	7:00 AM to 8:00 PM
Frequency	Every 30 Minutes
Daily Vehicle Revenue Hours	26.0
Route Design	
Route Length (Roundtrip)	15.6 miles
Average Scheduled Speed	17.6 MPH
Stops	13
Stop Spacing	Every 1.2 miles
Vehicles Required	2
Typical Ridership (Fall 2019)	
Average Weekday Boardings	287
Average Saturday Boardings	96
Weekday Riders per Revenue Hour	11.0
Weekend Riders per Revenue Hour	3.7
On-Time Performance (Jan. 2020)	
On-Time	50%
Late	29%
Early	22%

Ridership by Time of Day, Fall 2019



Highway 12 Express Ridership by Stop, Fall 2019



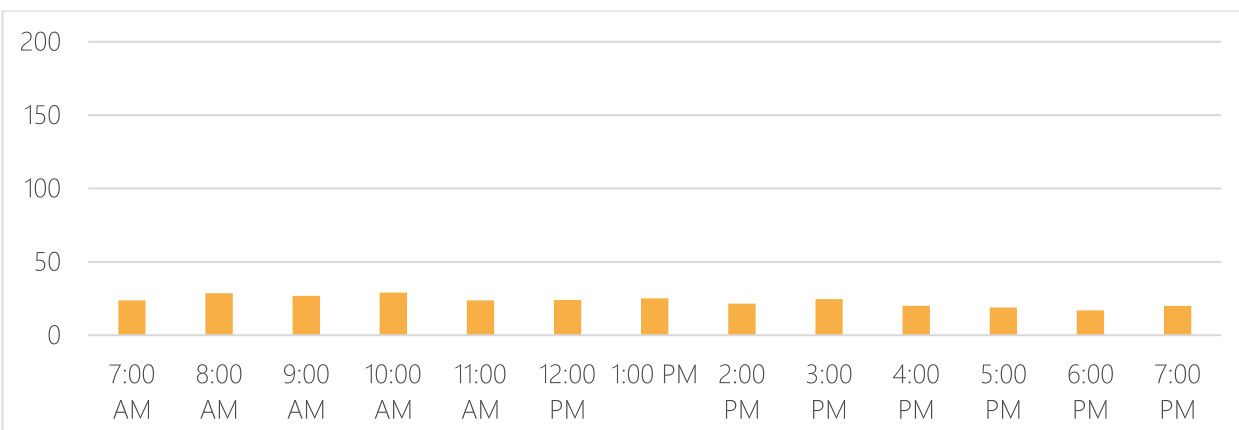
Data Source: SMART

Disclaimer: This map is for planning purposes only.

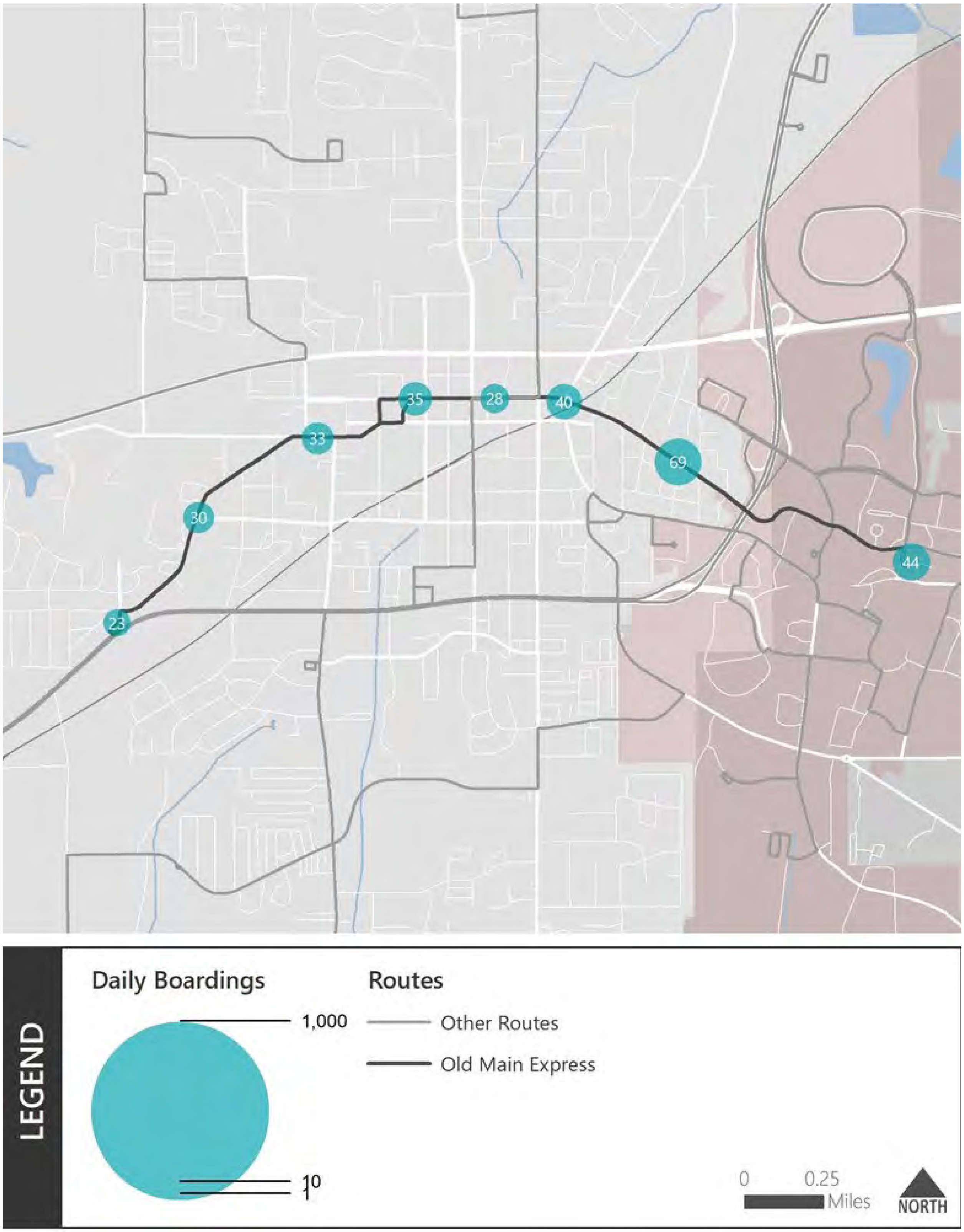
4.2.1.6.8 Old Main Express Route Profile

Service Levels	
Days of Operation	Monday through Saturday
Span of Service	7:00 AM to 8:00 PM
Frequency	Every 15 Minutes
Daily Vehicle Revenue Hours	26.0
Route Design	
Route Length (Roundtrip)	6.4 miles
Average Scheduled Speed	12.4 MPH
Stops	15
Stop Spacing	Every 0.4 miles
Vehicles Required	2
Typical Ridership (Fall 2019)	
Average Weekday Boardings	288
Average Saturday Boardings	50
Weekday Riders per Revenue Hour	11.1
Weekend Riders per Revenue Hour	1.9
On-Time Performance (Jan. 2020)	
On-Time	78%
Late	4%
Early	18%

Ridership by Time of Day, Fall 2019



Old Main Express Ridership by Stop, Fall 2019



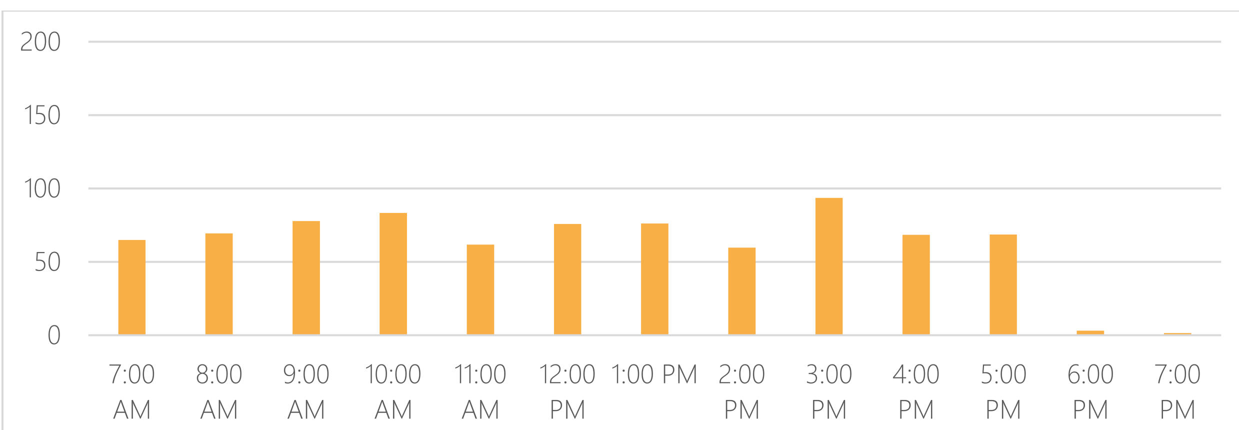
Data Source: SMART

Disclaimer: This map is for planning purposes only.

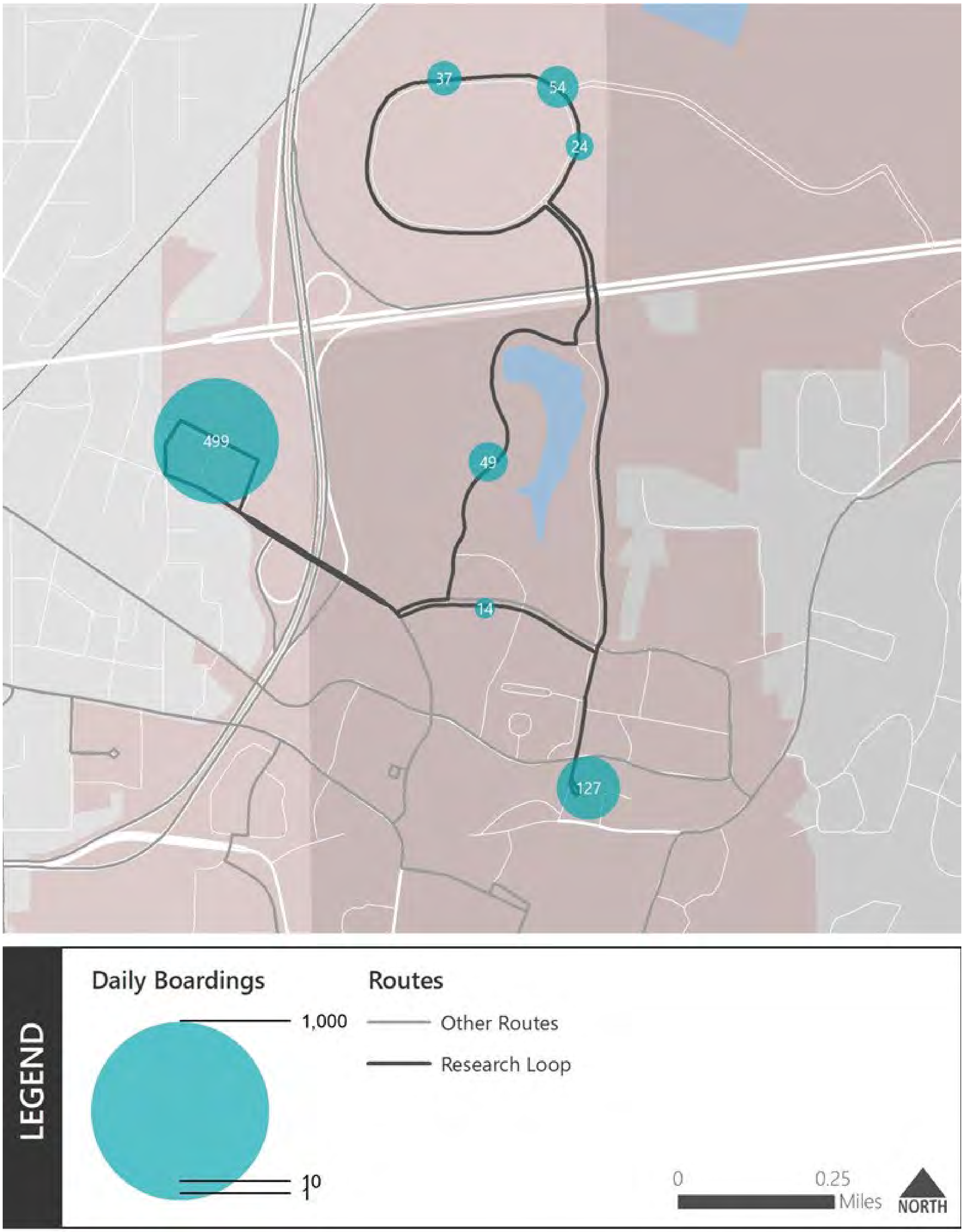
4.2.1.6.9 Research Loop Route Profile

Service Levels	
Days of Operation	Monday through Friday
Span of Service	7:00 AM to 6:00 PM
Frequency	Every 8-10 Minutes
Daily Vehicle Revenue Hours	29.4
Route Design	
Route Length (Roundtrip)	4.5 miles
Average Scheduled Speed	10.8 MPH
Stops	8
Stop Spacing	0.6 stops per mile
Vehicles Required	3
Typical Ridership (Fall 2019)	
Average Weekday Boardings	822
Average Saturday Boardings	n/a
Weekday Riders per Revenue Hour	28.0
Weekend Riders per Revenue Hour	n/a
On-Time Performance (Jan. 2020)	
On-Time	90%
Late	2%
Early	8%

Ridership by Time of Day, Fall 2019



Research Loop Ridership by Stop, Fall 2019



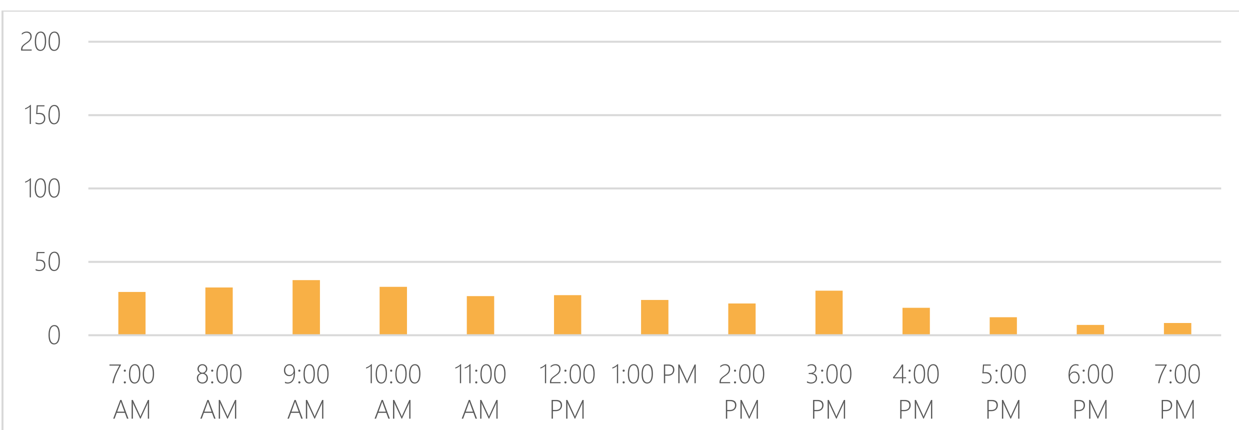
Data Source: SMART

Disclaimer: This map is for planning purposes only.

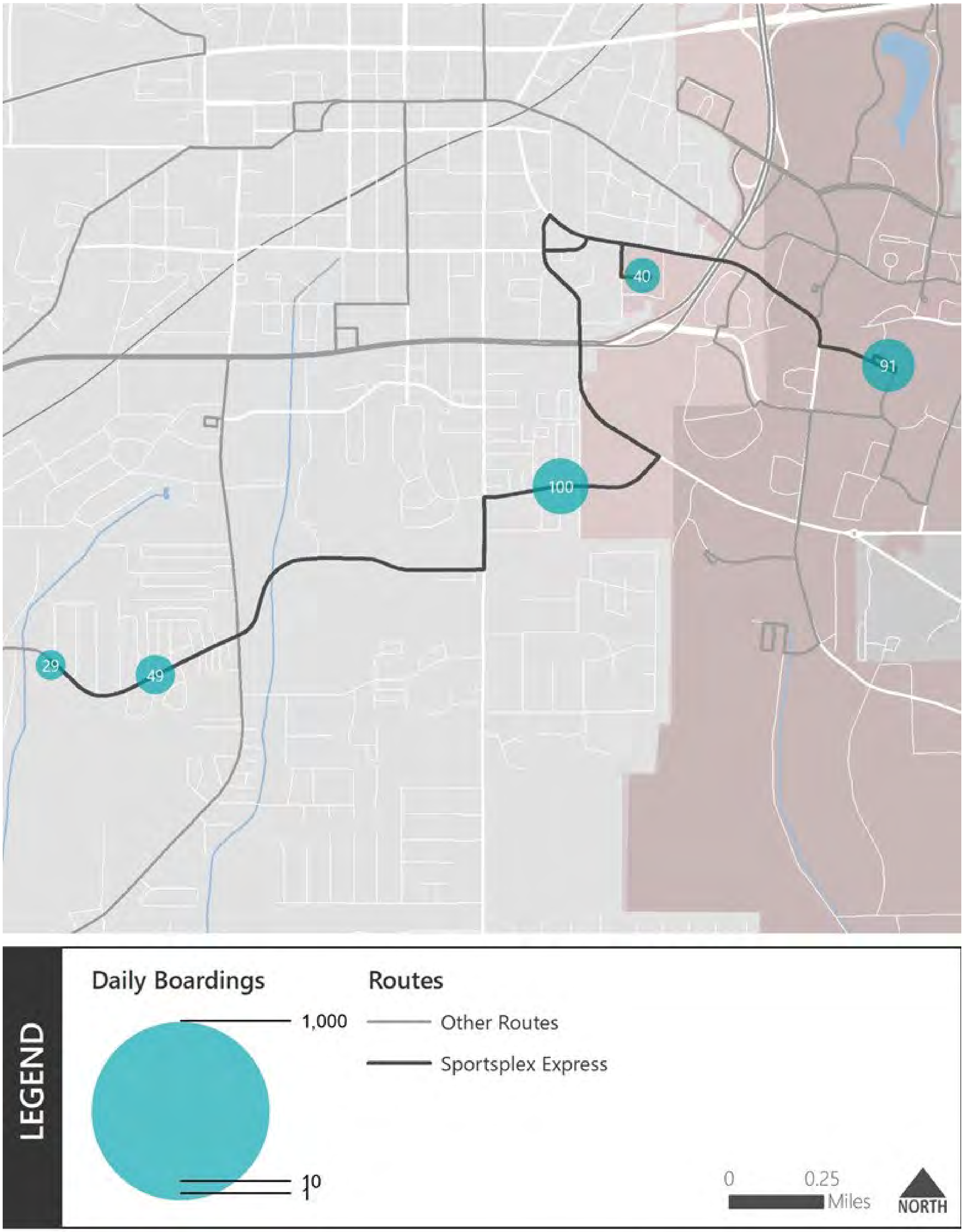
4.2.1.6.10 Sportsplex Express Route Profile

Service Levels	
Days of Operation	Monday through Friday
Span of Service	7:00 AM to 8:00 PM
Frequency	Every 15-18 Minutes
Daily Vehicle Revenue Hours	20.9
Route Design	
Route Length (Roundtrip)	8.4 miles
Average Scheduled Speed	15.4 MPH
Stops	9
Stop Spacing	0.9 stops per mile
Vehicles Required	2
Typical Ridership (Fall 2019)	
Average Weekday Boardings	280
Average Saturday Boardings	n/a
Weekday Riders per Revenue Hour	13.4
Weekend Riders per Revenue Hour	n/a
On-Time Performance (Jan. 2020)	
On-Time	68%
Late	9%
Early	23%

Ridership by Time of Day, Fall 2019



Sportsplex Express Ridership by Stop, Fall 2019



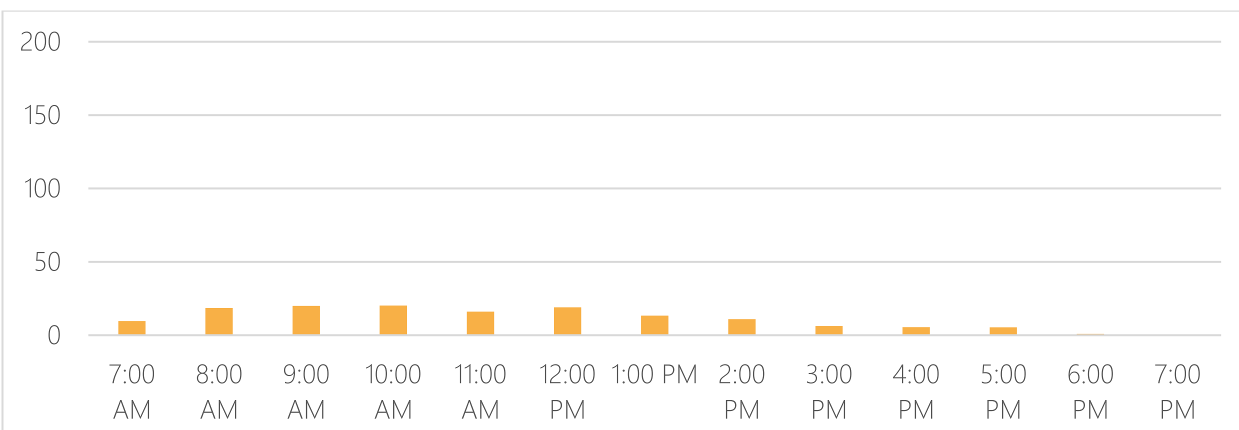
Data Source: SMART

Disclaimer: This map is for planning purposes only.

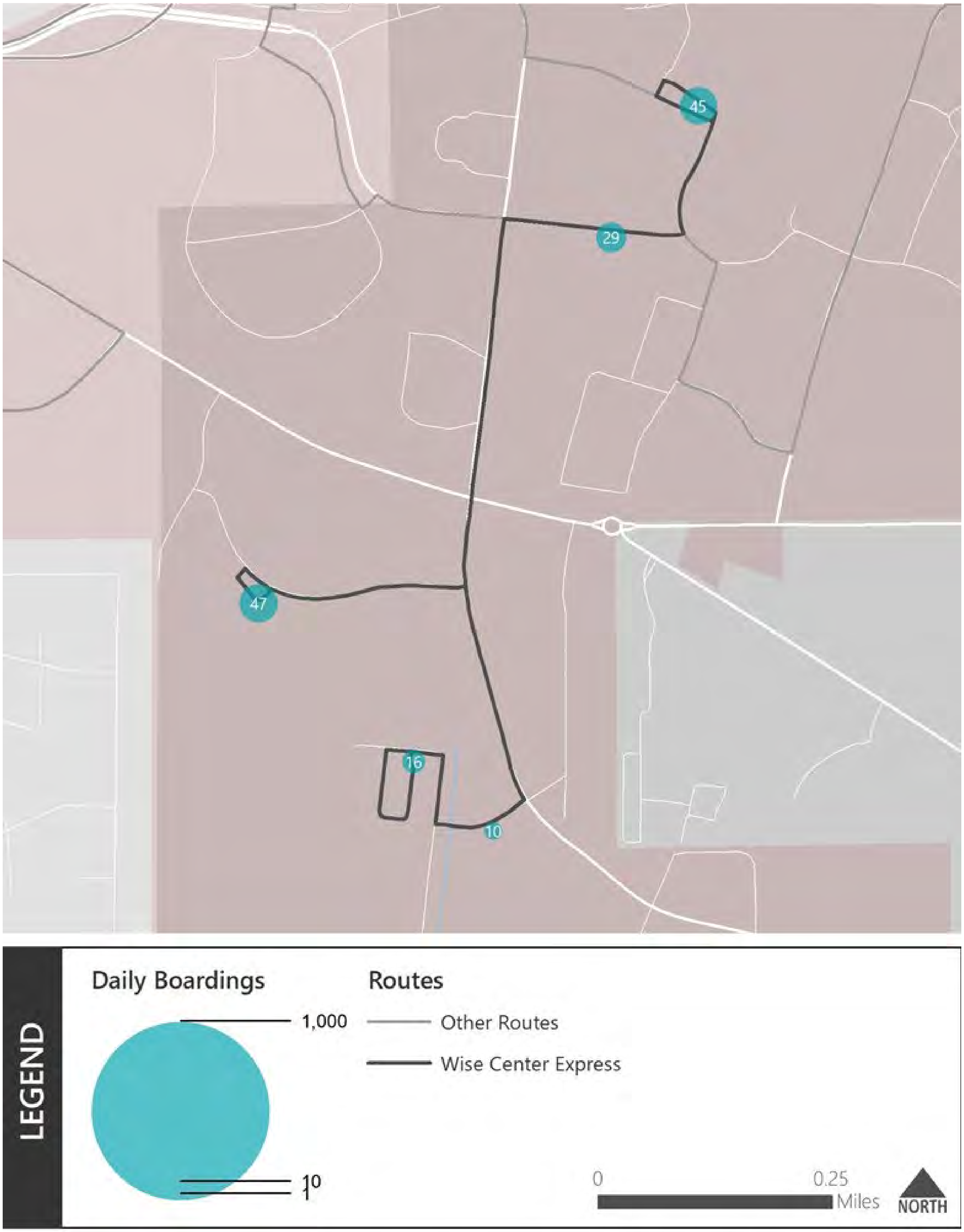
4.2.1.6.11 *Wise Center Express Route Profile*

Service Levels	
Days of Operation	Monday through Friday
Span of Service	7:00 AM to 6:00 PM
Frequency	Every 7-15 Minutes
Daily Vehicle Revenue Hours	21.4
Route Design	
Route Length (Roundtrip)	3.7 miles
Average Scheduled Speed	9.4 MPH
Stops	9
Stop Spacing	0.4 stops per mile
Vehicles Required	2
Typical Ridership (Fall 2019)	
Average Weekday Boardings	138
Average Saturday Boardings	n/a
Weekday Riders per Revenue Hour	6.5
Weekend Riders per Revenue Hour	n/a
On-Time Performance (Jan. 2020)	
On-Time	77%
Late	5%
Early	18%

Ridership by Time of Day, Fall 2019



Wise Center Express Ridership by Stop, Fall 2019



Data Source: SMART

Disclaimer: This map is for planning purposes only.

4.2.2 Peer Comparison Overview

A peer comparison is a benchmarking tool that allows an area or transit system to compare itself to other "peers" that operate under similar conditions. For this comparison, four peers were identified using the criteria described below.

4.2.2.1 Peer Selection Criteria

The Starkville area's transit market is unique due to its college town environment and the fact that there is a single transit provider that serves both the university and general public in the community. Selection criteria were utilized to find peer regions that are similar in geographic setting, demographics, and the type of transit service provided. The selection criteria included:

- **Small Urban Area:** Must be centered around an urban area similar in size.
- **Geographic Location:** Must be located in the Southeast.
- **University Enrollment:** Must have a similar college student population.
- **City and Campus Transit Service:** Must have a consolidated or well-coordinated transit system that serves both the university and community at large.

Using this criteria, four peer areas were identified, and characteristics of these areas are shown in **Table 4.2.2.1**. **Table 4.2.2.2** on the following page compares different performance indicators for these peer areas and Starkville and the following pages show recent performance trends for the Starkville area alongside its most current performance relative to the peer areas.

Table 4.2.2.1 Characteristics of Selected Peer Areas

Area	Transit System	University	Urban Area Population	College Enrollment
Boone, NC	AppalCart	Appalachian State University (ASU)	24,027	19,280
Harrisonburg, VA	Harrisonburg Department of Public Transportation (HDPT)	James Madison University (JMU)	72,330	21,820
Morgantown, WV	Mountain Line Transit Authority + WVU PRT/Buses	West Virginia University (WVU)	76,599	26,839
Oxford, MS	Oxford-University Transit (OUT)	University of Mississippi (Ole Miss)	29,075	21,617
Starkville, MS	**SMART**	**Mississippi State University**	**32,288**	**22,226**

Sources: Census Bureau ACS 2019 5-Year Estimates; National Center for Education Statistics (Fall 2019)

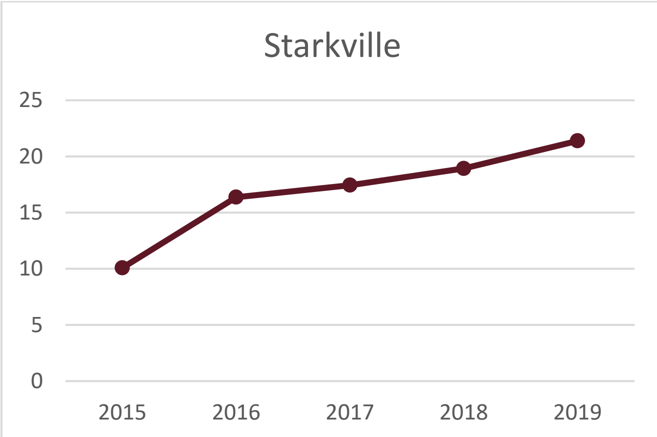
Table 4.2.2.2 Peer System Performance Indicators, 2019

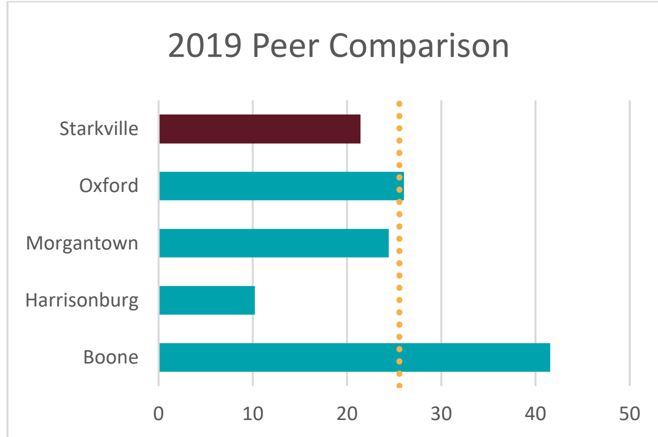
Indicator	Boone	Harrisonburg	Morgantown	Oxford	Peer Average	Starkville
General System Statistics						
Urban Area Pop.	24,027	72,330	76,599	29,075	50,508	32,288
Urban Area Sq. Miles	14	33	39	16	25	17
Urban Area Pop. Density	1,779	2,217	1,976	1,809	1,945	1,885
Peak Vehicles in Service	33	40	67	28	42	29
Revenue Miles	998,344	738,854	1,870,383	756,875	1,091,114	690,490
Revenue Hours	79,486	75,663	159,147	36,676	87,743	65,850
Annual Boardings	1,820,412	2,120,458	2,372,583	1,078,708	1,848,040	741,728
Annual Operating Cost	$4,083,186	$4,956,323	$11,369,066	$3,322,788	$5,932,841	$2,806,911
Level of Service						
Revenue Miles per Capita	41.6	10.2	24.4	26.0	25.6	21.4
Revenue Hours per Capita	3.3	1.0	2.1	1.3	1.9	2.0
Productivity						
Boardings per Mile	1.8	2.9	1.3	1.4	1.8	1.1
Boardings per Hour	22.9	28.0	14.9	29.4	23.8	11.3
Boardings per Capita	75.8	29.3	31.0	37.1	43.3	23.0
Cost Efficiency						
Operating Cost per Mile	$4.09	$6.71	$6.08	$4.39	$5.32	$4.07
Operating Cost per Hour	$51.37	$65.51	$71.44	$90.60	$69.73	$42.63
Operating Cost per Boarding	$2.24	$2.34	$4.79	$3.08	$3.11	$3.78

Source: National Transit Database; American Community Survey 2019 5-Year Summary

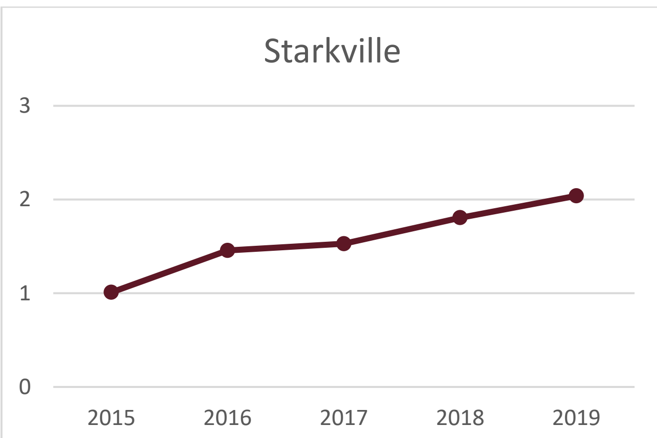
4.2.2.1.1 Level of Service Indicators

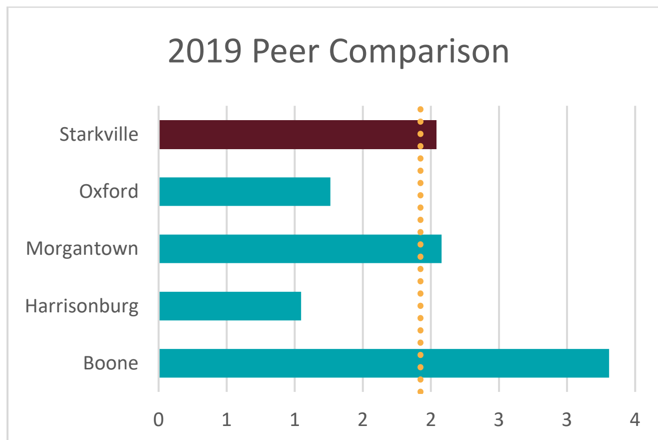
Vehicle Revenue Miles per Capita





Vehicle Revenue Hours per Capita

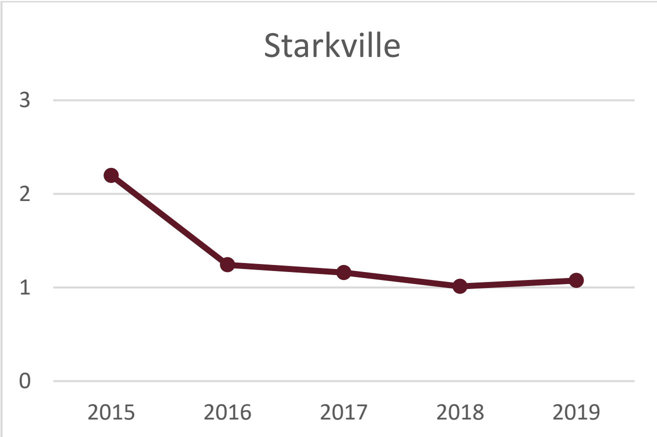


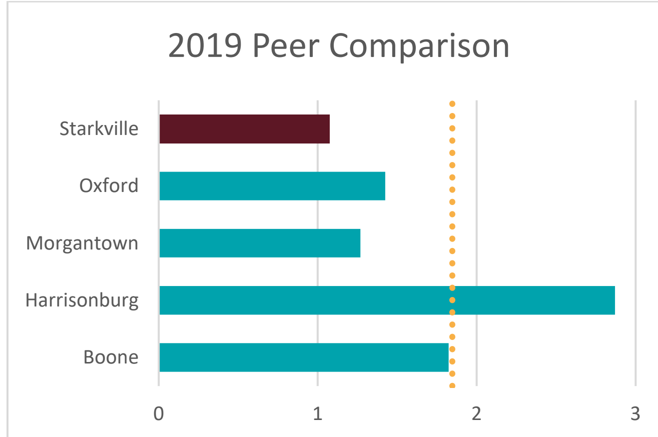


••• Peer Average

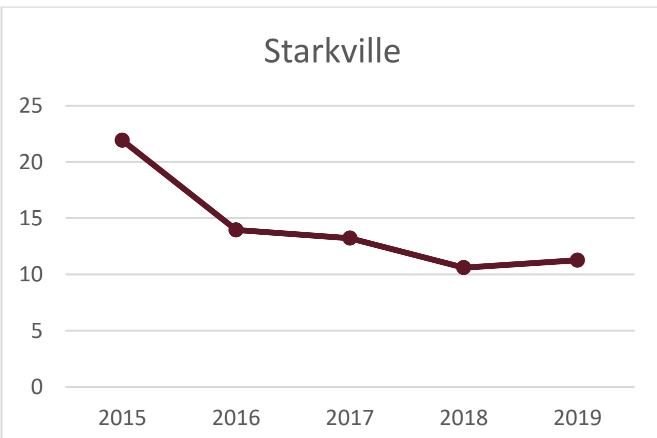
4.2.2.1.2 Productivity Indicators

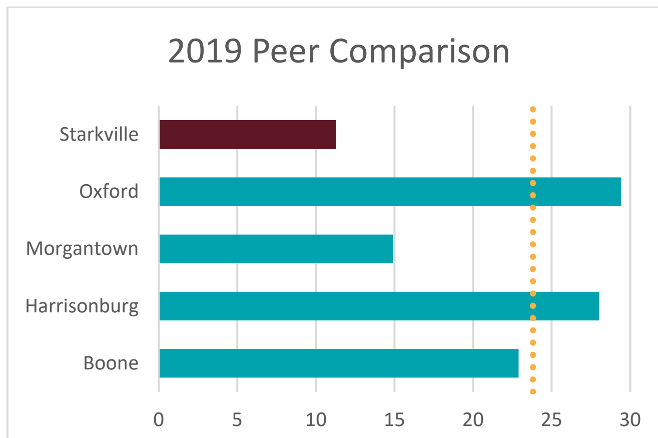
Boardings per Revenue Mile



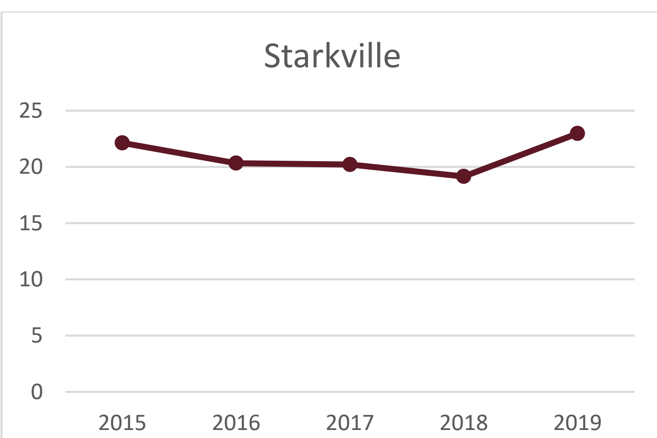


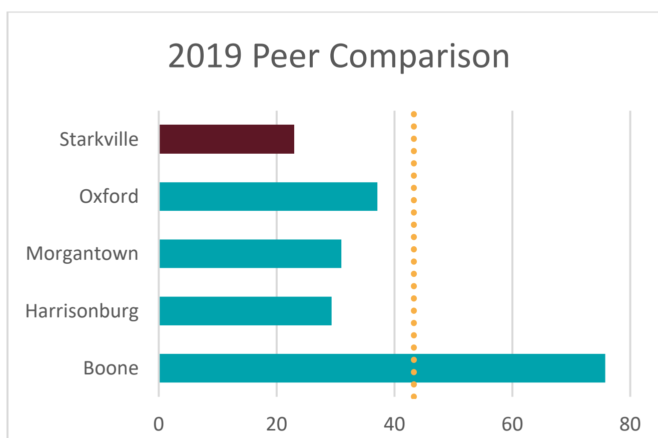
Boardings per Revenue Hour





Boardings per Capita

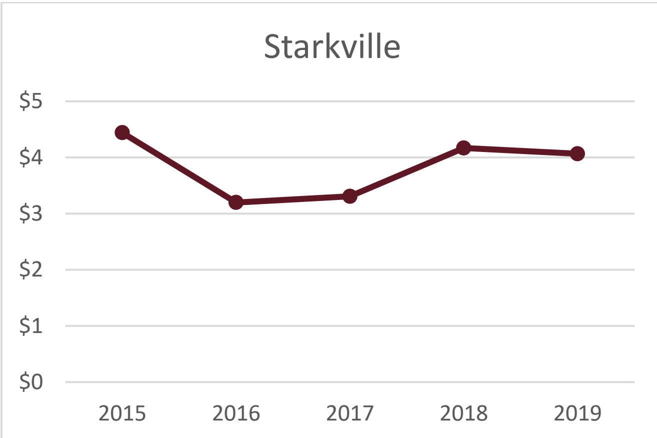


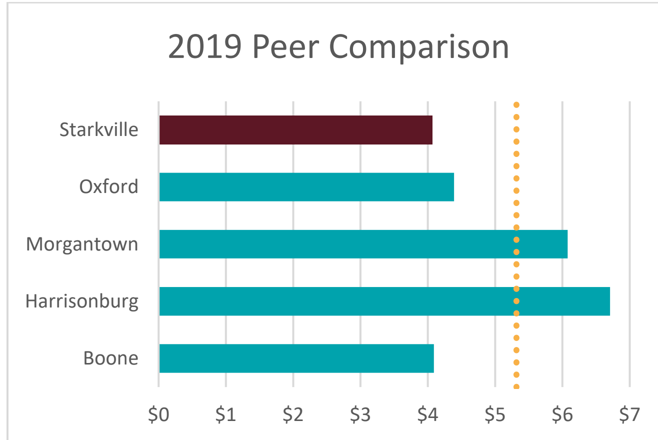


••• Peer Average

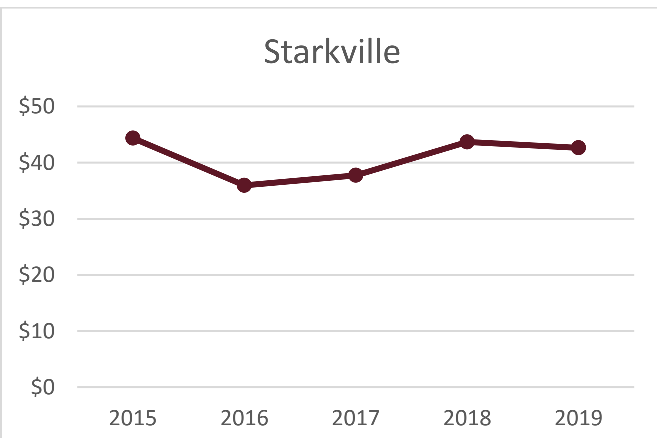
4.2.2.1.3 Cost Efficiency Indicators

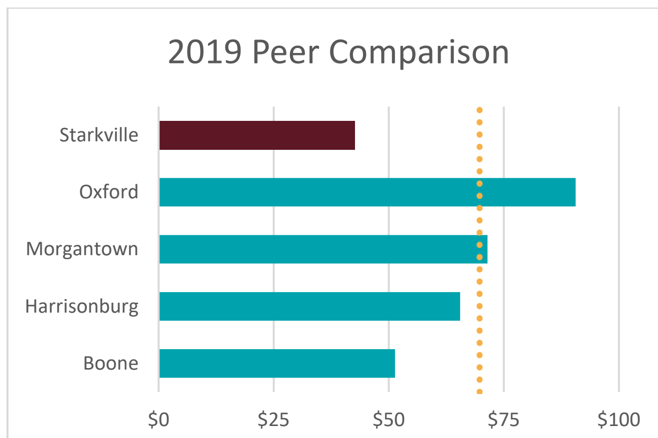
Operating Expense per Revenue Mile



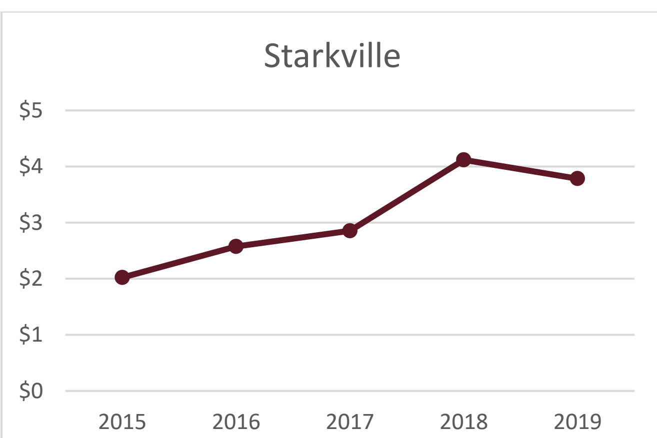


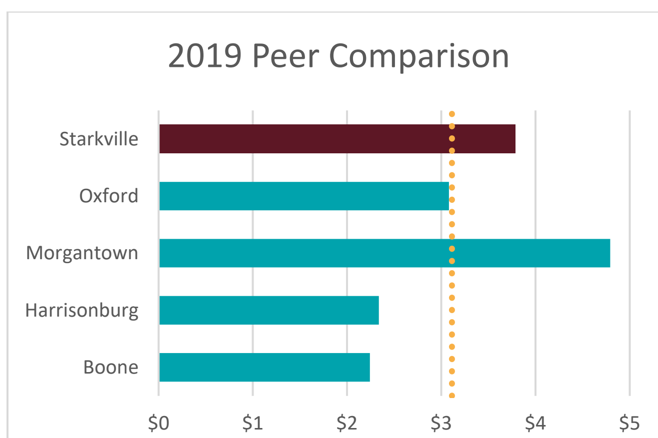
Operating Expense per Revenue Hour





Operating Expense per Boarding





••• Peer Average

4.2.2.2 Summary of Peer Comparison

Based on the performance indicators in **Table 4.2.2.2** and the trendline comparisons on the previous pages, the following trends can be gleaned:

- **Similar Level of Service**: After several years of increasing transit service, Starkville provides similar levels of service as the peer areas, especially in terms of vehicle revenue hours per capita. However, its vehicle revenue miles per capita are slightly below average, likely indicating slower travel speeds and/or a more “urban focus” of the SMART system.
- **Lower Productivity**: Starkville’s ridership has not increased as a result of the service increases in recent years. In fact, the system has become less productive in recent years and underperforms its peers in terms of productivity. Riders typically take at least a year to respond to service changes, so there is either a communication or operational problem. For example, public information may be confusing or inadequate or the quality of service could be worsening (e.g. worsening on-time performance).
- **Lower Overall Cost but Higher Cost per Boarding**: When looking at operating expense per revenue hour and mile, Starkville is the most cost-efficient system amongst its peers. However, due to its low productivity, Starkville has the highest operating expense per boarding.

4.2.3 Rider Survey Analysis

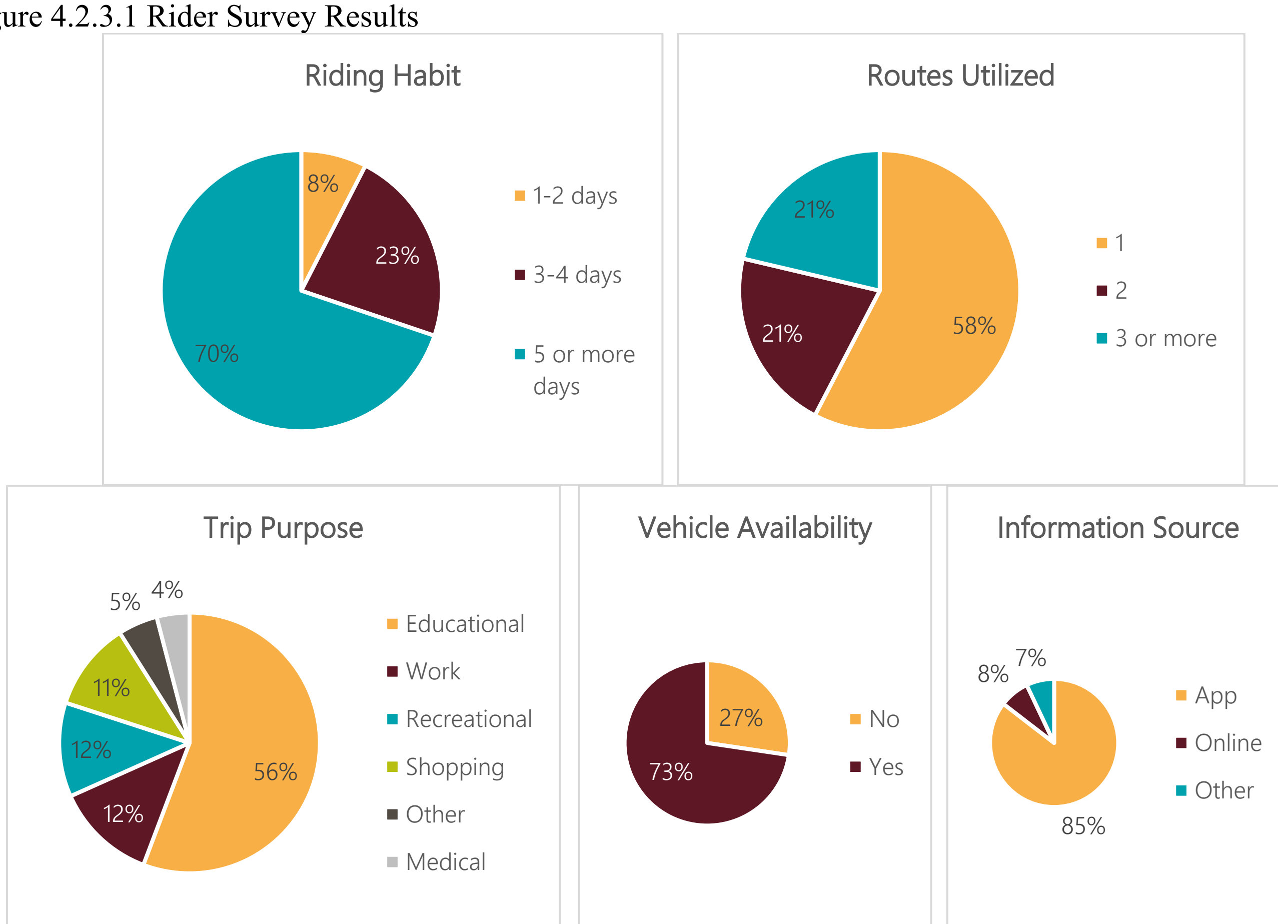
SMART routinely surveys its rider to better understand their needs. The most recent survey prior to the COVID-19 pandemic was conducted in January 2020 and yielded responses from 353 riders. Riders were asked which routes they take, their reasons for riding, how frequently they ride, whether they own vehicles, how they stay informed, and if they had any open-ended comments.

4.2.3.1 Rider Profile

The results of the rider survey illustrate the following characteristics of SMART riders:

- A vast majority of riders are frequent riders, riding five days a week or more.
- Most riders only use one route and only about 21% use more than two routes.
- Most trips are for educational purposes with work, recreational, and shopping trips being the next most popular trip purposes.
- Approximately 27% of riders do not have access to a car.
- The vast majority of riders use the Doublemap/Bullywalk app to stay informed.

Figure 4.2.3.1 Rider Survey Results



Source: SMART

4.2.3.2 Rider Feedback

Of the 353 people surveyed, almost 200 provided open-ended comments about the bus service. The majority of these comments were very positive, saying that the service is great, and the drivers are wonderful. The most frequently voiced constructive comments were:

- Add the ADS Building to a route,
- Post the breaks of drivers and to schedule these breaks around the beginning of classes,
- And to increase the frequency of the Greek and Wise buses during lunch and in the afternoon.

Table 4.2.3.1 below summarizes all the comments received.

Table 4.2.3.1 Rider Feedback Summary

Comment Category	Number of Comments	Popular Comments
Service is great	68	• Convenient • On-Time
Drivers are great	47	• Drivers are friendly and welcoming and provide great service
Improve routes	29	• Add ADS building to route
Increase frequency	29	• Add more Greek and Wise buses, especially during lunch and afternoon hours • Increase Research route frequency and extend hours to evening and weekend • Need more frequent service in general
Communicate bus schedules and breaks	18	• Please post the driver break schedules and plan these breaks so they don't occur at the beginning of classes • Make the schedule clear and available
Improve reliability	5	• None
Rider Experience	5	• Buses stop abruptly

Source: SMART

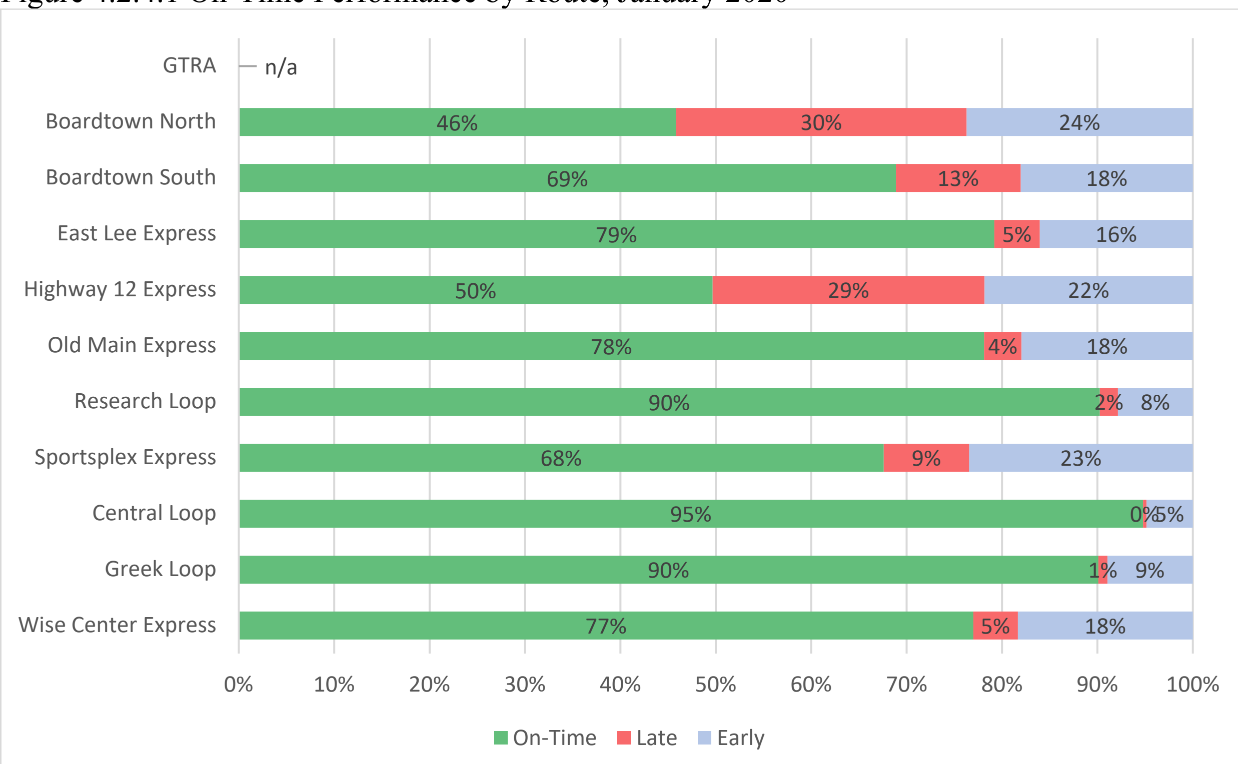
4.2.4 Reliability Analysis

Reliability of transit service is critical to providing high-quality transit service and maintaining and attracting riders. Reliability is typically monitored in terms of on-time performance at bus stops. Every transit system has their own policy or standard for what is considered on-time, late, and early. SMART policy states the following on-time performance definitions:

- **On-Time**: Arriving less than 5 minutes before the schedule time or less than 10 minutes after the scheduled time.
- **Late**: Arriving 10 minutes or more after the scheduled time.
- **Early**: Arriving 5 minutes or more before the scheduled time.

SMART monitors on-time performance for every transit stop with Automatic Vehicle Location (AVL) technology. **Figure 4.2.4.1** shows the overall on-time performance for each route from January 2020, the last typical month before the COVID-19 pandemic. This data will be analyzed in detail in the following sections to better understand where reliability issues are occurring.

Figure 4.2.4.1 On-Time Performance by Route, January 2020



Source: SMART

4.2.4.1 Reliability Analysis by Segment and Stop

Detailed data from the Automatic Vehicle Location (AVL) software on SMART buses make it possible to drill down and identify reliability issues at the segment and stop level. The following pages present detailed reliability data for each route using the AVL data from January 2020, the last typical month before the COVID-19 pandemic.

For each route, three measures related to reliability are presented for each hour of the day. These three measures include:

- **On-Time Performance**: The percentage of buses that arrived at a given stop within the window of five minutes before and ten minutes after the scheduled time. This data helps understand the significance of reliability issues and when they worsen or improve.
- **Dwell Times**: How long a bus remains stationary at a stop. This is measured as the difference between the actual arrival time and the actual departure time. It is normal to have longer dwell times at stops with layovers or breaks for drivers, but reliability problems will arise when there is high variation in dwell times across the day.
- **Travel Time Delays**: The difference between travel time during free flow traffic (the slowest hourly average) and the actual travel time. This helps understand where reliability issues are related to congestion or other driving related issues.

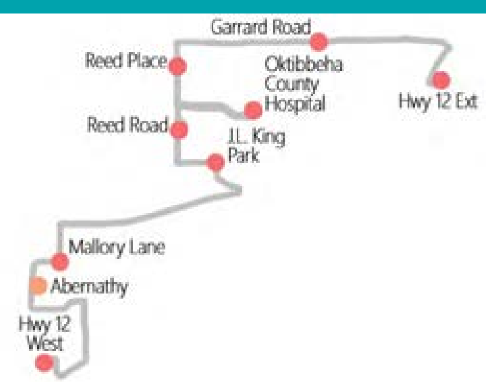
Figure 4.2.4.2 On-Time Performance, Boardtown North

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm
Highway 12 extended (Out)	91%	6%	13%	31%	4%	57%	5%	63%	75%	29%	11%	40%	50%
Garrard Road (Out)	100%	14%	29%	42%	4%	43%	6%	40%	75%	27%	22%	53%	43%
Reed Place (Out)	100%	15%	29%	40%	4%	43%	7%	42%	54%	20%	30%	37%	45%
Oktibbeha Co. Hospital (Out)	86%	46%	8%	33%	14%	20%	27%	61%	83%	67%	43%	25%	67%
Reed Road (Out)	68%	62%	8%	29%	7%	42%	19%	100%	88%	70%	24%	13%	70%
J.L. King Park (Out)	63%	53%	8%	35%	7%	50%	15%	93%	85%	76%	27%	12%	71%
Mallory Lane (Out)	92%	48%	8%	24%	5%	57%	4%	93%	68%	57%	24%	22%	77%
Abernathy (Out)	50%	90%	9%	56%	0%	85%	33%	92%	83%	58%	37%	33%	67%
Highway 12 West (Out)	n/a	0%	22%	35%	12%	86%	10%	63%	65%	20%	20%	6%	52%
Abernathy (In)	100%	0%	40%	60%	29%	83%	20%	71%	75%	13%	27%	36%	75%
Mallory Lane (In)	92%	0%	25%	71%	38%	93%	14%	52%	85%	42%	48%	26%	50%
J.L. King Park (In)	96%	0%	0%	58%	17%	78%	14%	21%	84%	45%	30%	21%	57%
Reed Road (In)	100%	0%	0%	58%	27%	70%	14%	15%	88%	56%	30%	24%	58%
Oktibbeha Co. Hospital (In)	100%	0%	0%	59%	17%	52%	7%	54%	85%	56%	9%	22%	68%
Reed Place (In)	100%	21%	0%	76%	42%	83%	14%	71%	96%	73%	42%	47%	48%
Garrard Road (In)	100%	39%	0%	75%	17%	89%	10%	80%	88%	67%	36%	37%	61%

On-Time Performance

n/a	>90%	80-90%	70-80%	60-70%	50-60%	<50%

Outbound Average



Inbound Average

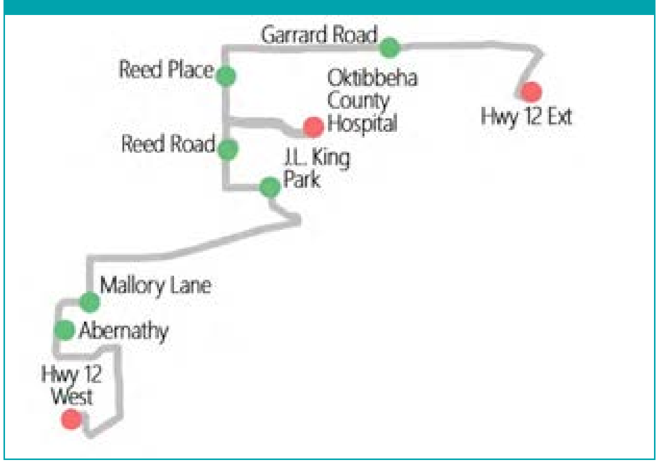
Figure 4.12: Dwell Times, Boardtown North

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm
Highway 12 extended (Out)	6	15	18	10	6	8	8	12	4	20	5	15	4
Garrard Road (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Reed Place (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Oktibbeha Co. Hospital (Out)	6	7	7	6	3	15	1	13	0	0	0	0	0
Reed Road (Out)	0	0	0	0	0	0	0	0	1	1	1	1	0
J.L. King Park (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Mallory Lane (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Abernathy (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Highway 12 West (Out)		9	11	3	2	0	6	7	1	11	2	2	3
Abernathy (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
Mallory Lane (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
J.L. King Park (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
Reed Road (In)	0	0	0	0	0	0	0	0	0	1	1	1	0
Oktibbeha Co. Hospital (In)	1	1	1	1	1	10	1	11	0	0	0	0	0
Reed Place (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
Garrard Road (In)	0	0	0	0	0	0	0	0	0	0	0	0	0

Average Dwell Time (minutes)

n/a	0	1	2	3	4	5+

Outbound Average



Inbound Average

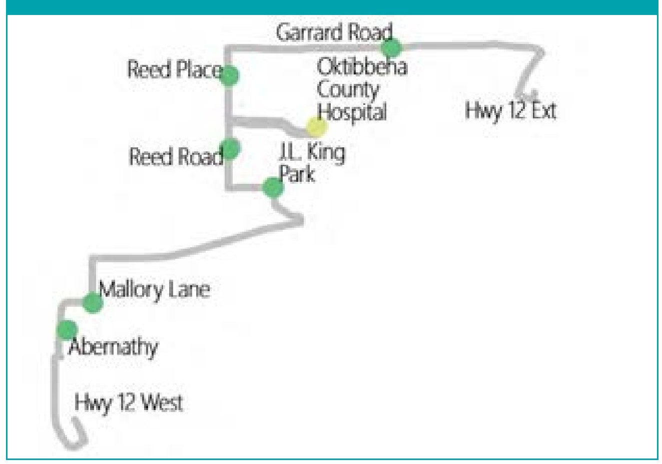


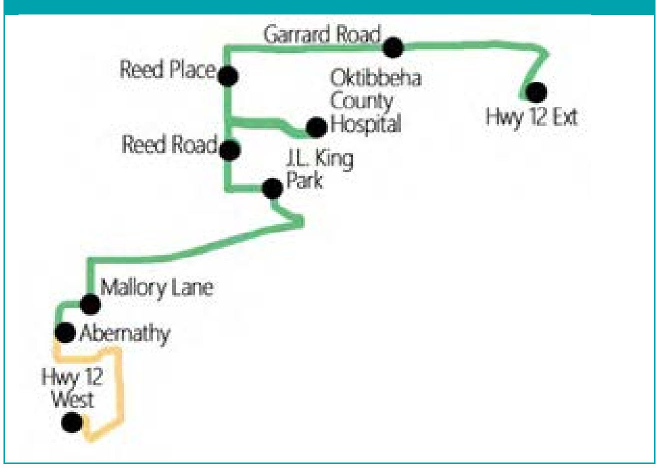
Figure 4.2.4.3 Travel Time Delays, Boardtown North

Segment	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm
Hwy 12 Ext to Garrard (Out)	0	0	0	0	0	0	0	0	0	0	1	0	0
Garrard to Reed Pl (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Reed Pl to OC Hospital (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
OC Hospital to Reed Rd (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Reed Rd to JL King Park (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
JL King Park to Mallory Ln (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Mallory Ln to Abernathy (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Abernathy to Hwy 12 W (Out)		6	4	5	1	2	6	1	2	4	2	3	0
Hwy 12 W to Abernathy (In)		0	0	0	0	0	1	1	0	5	0	9	3
Abernathy to Mallory Ln (In)	0	0	0	0	0	0	0	0	1	0	0	0	0
Mallory Ln to JL King Park (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
JL King Park to Reed Rd (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
Reed Rd to OC Hospital (In)	0	0	0	0	0	0	0	1	0	0	0	0	0
OC Hospital to Reed Pl (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
Reed Pl to Garrard (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
Garrard to Hwy 12 Ext (In)	2	2	0	0	2	2	3	2	1	2	2	2	2

Actual vs. Scheduled Travel Time (minutes)

n/a	early	0	1	2	3	4	5+

Outbound Average



Inbound Average

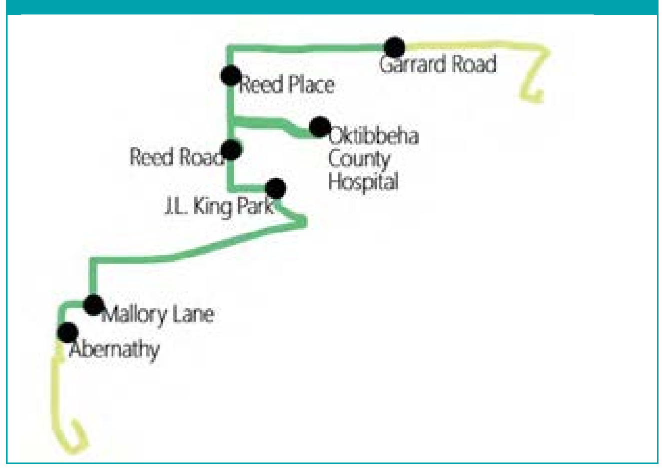


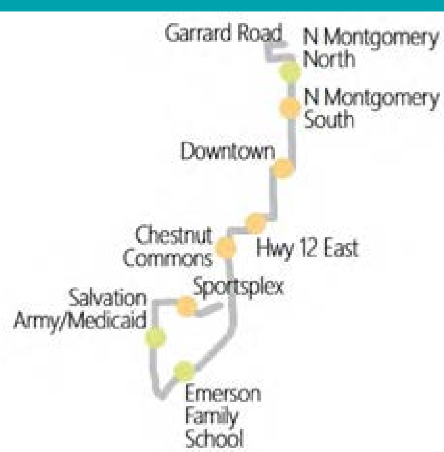
Figure 4.2.4.4 On-Time Performance, Boardtown South

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm
Garrard Road (Out)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
N Montgomery North (Out)	100%	n/a	n/a	n/a	n/a	n/a	n/a	n/a	100%	n/a	50%	n/a	n/a
N Montgomery South (Out)	80%	40%	100%	33%	33%	0%	80%	43%	100%	100%	60%	80%	100%
Downtown (Out)	95%	39%	86%	79%	68%	50%	74%	71%	75%	64%	76%	63%	27%
Highway 12 East (Out)	97%	48%	52%	81%	53%	73%	67%	81%	67%	56%	62%	52%	19%
Chestnut Commons (Out)	97%	57%	75%	84%	56%	77%	90%	70%	64%	55%	71%	64%	39%
Emerson Family School (Out)	100%	61%	76%	77%	76%	65%	95%	68%	68%	67%	71%	75%	50%
Salvation Army (Out))	100%	54%	88%	79%	63%	68%	92%	56%	68%	67%	76%	63%	50%
Sportsplex (Out)	100%	52%	88%	79%	63%	68%	92%	54%	71%	52%	74%	65%	43%
Lynn Lane (In)	100%	50%	92%	73%	63%	65%	92%	52%	77%	50%	71%	67%	50%
Chestnut Commons (In)	100%	52%	81%	73%	60%	69%	92%	60%	79%	50%	68%	65%	47%
Highway 12 East (In)	100%	52%	50%	68%	65%	52%	78%	61%	73%	58%	74%	52%	32%
Downtown (In)	100%	58%	61%	62%	76%	74%	83%	75%	68%	60%	59%	71%	50%
N Montgomery South (In)	100%	59%	62%	62%	81%	67%	88%	89%	68%	68%	67%	74%	50%
N Montgomery North (In)	100%	57%	58%	63%	73%	64%	89%	90%	64%	74%	65%	68%	53%

On-Time Performance

n/a	>90%	80-90%	70-80%	60-70%	50-60%	<50%

Outbound Average



Inbound Average

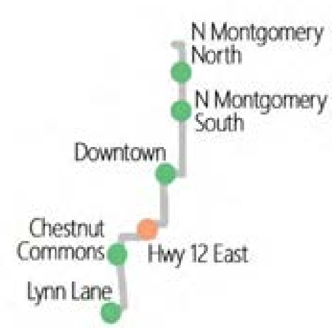


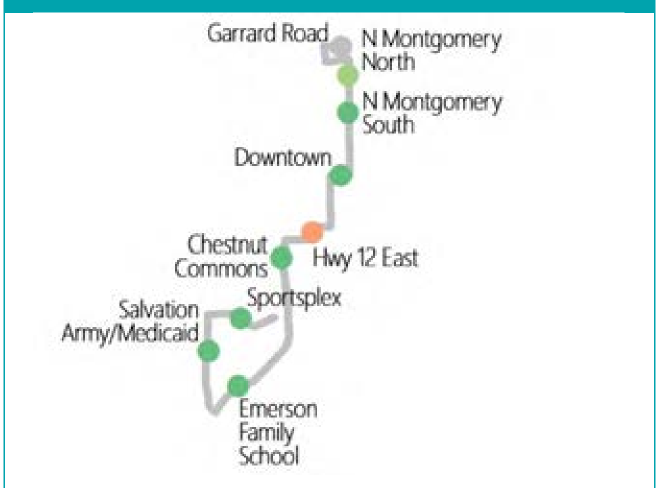
Figure 4.2.4.5 Dwell Times, Boardtown South

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm
Garrard Road (Out)													
N Montgomery North (Out)	1								1		0		
N Montgomery South (Out)	0	0	0	0	0	1	0	0	0	0	0	0	1
Downtown (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Highway 12 East (Out)	1	4	8	2	3	7	7	5	4	3	2	3	3
Chestnut Commons (Out)	0	0	0	0	1	0	0	0	0	0	0	0	0
Emerson Family School (Out)	0	0	0	1	0	0	0	0	0	0	0	0	0
Salvation Army (Out))	0	0	0	0	0	0	0	0	0	0	0	0	0
Sportsplex (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Lynn Lane (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
Chestnut Commons (In)	0	0	0	0	0	0	0	0	0	1	0	0	1
Highway 12 East (In)	1	5	8	2	5	5	8	8	2	1	3	1	3
Downtown (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
N Montgomery South (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
N Montgomery North (In)	0	0	0	0	0	0	0	0	0	0	0	0	0

Average Dwell Time (minutes)

n/a	0	1	2	3	4	5+

Outbound Average



Inbound Average

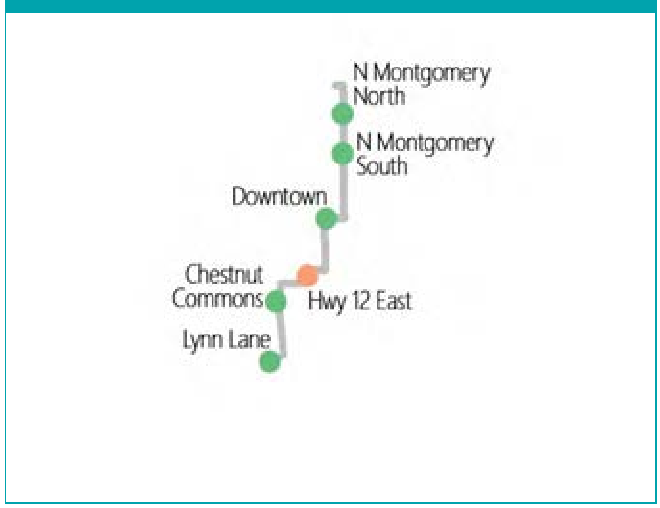


Figure 4.2.4.6 Travel Time Delays, Boardtown South

Segments	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm
Garrard Rd to N Mont N (Out)													
N Mont N to N Mont S (Out)	1								0		0		
N Mont S to Downtown (Out)	4	5	4	3	3	0	4	5	3	3	2	4	4
Downtown to Hwy 12 E (Out)	1	0	0	0	0	0	0	0	0	1	2	0	0
Hwy 12 E to Chestnut Com (Out)	0	0	1	0	1	1	1	1	0	0	2	1	5
Chestnut Com to Emerson (Out)	0	0	0	0	0	0	0	0	1	2	1	0	1
Emerson to Sal. Army (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Sal. Army to Sportsplex (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Sportsplex to Lynn Ln (Out)	0	0	0	0	0	0	0	0	1	0	0	0	0
Lynn Ln to Chestnut Com (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
Chestnut Com to Hwy 12 E (In)	0	0	0	0	0	1	1	0	1	1	1	1	1
Hwy 12 E to Downtown (In)	0	0	0	0	0	2	0	0	0	0	2	0	4
Downtown to N Mont S (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
N Mont S to N Mont N (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
N Mont N to Garrard Rd (In)													

Actual vs. Scheduled Travel Time (minutes)

n/a	early	0	1	2	3	4	5+

Outbound Average	Inbound Average

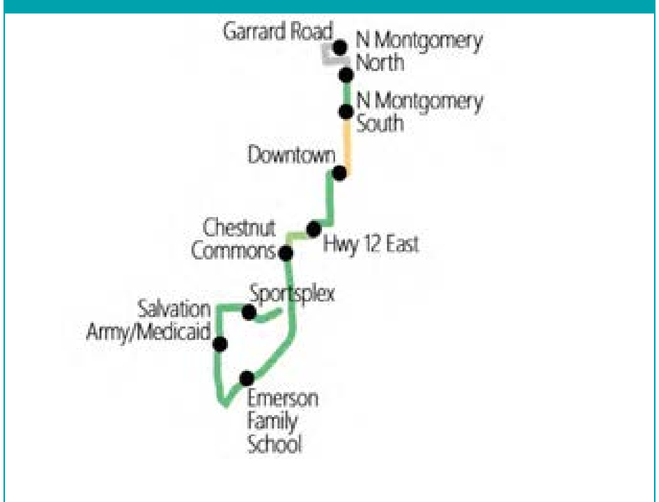


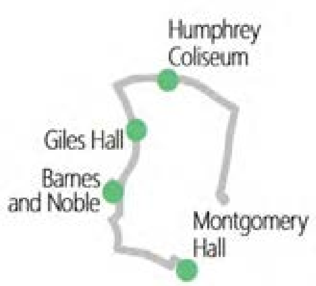
Figure 4.2.4.7 On-Time Performance, Central Loop

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm
Montgomery Hall (Out)	100%	96%	97%	98%	96%	96%	93%	97%	83%	67%	98%
Barnes and Noble (Out)	100%	97%	100%	100%	94%	100%	98%	98%	86%	86%	86%
Giles Hall (Out)	100%	100%	100%	99%	91%	100%	95%	100%	77%	90%	89%
Humphrey Coliseum (Out)	100%	94%	100%	100%	88%	100%	87%	100%	72%	65%	86%
Old Main Academic Center (In)	100%	96%	99%	100%	93%	100%	97%	100%	80%	68%	95%
Griffis Hall (In)	100%	97%	97%	100%	90%	99%	93%	100%	75%	70%	94%
Hilbun Hall (In)	100%	97%	98%	100%	90%	100%	98%	100%	70%	67%	98%
Mitchell Memorial Library (In)	100%	95%	98%	100%	91%	98%	95%	100%	71%	63%	91%
Oak Hall (In)	100%	97%	100%	100%	93%	100%	93%	97%	73%	66%	98%

On-Time Performance

n/a	>90%	80-90%	70-80%	60-70%	50-60%	<50%

Outbound Average



Inbound Average

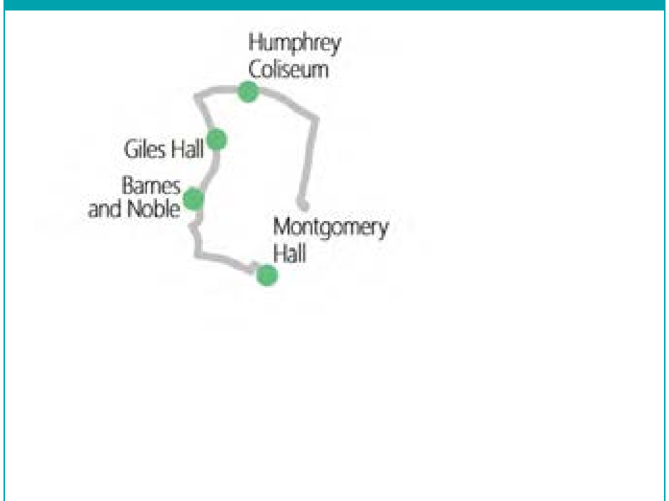
Figure 4.2.4.8 Dwell Times, Central Loop

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm
Montgomery Hall (Out)	0	0	0	0	0	0	0	0	0	0	0
Barnes and Noble (Out)	0	0	0	0	0	0	0	0	0	0	0
Giles Hall (Out)	0	0	0	0	0	0	0	0	0	0	0
Humphrey Coliseum (Out)	0	0	0	0	0	0	0	0	0	0	0
Old Main Academic Center (In)	1	1	1	1	1	1	1	1	1	1	1
Griffis Hall (In)	0	0	0	0	0	0	0	0	0	0	0
Hilbun Hall (In)	0	0	0	0	0	0	0	0	0	0	0
Mitchell Memorial Library (In)	0	0	0	0	0	0	0	0	0	0	0
Oak Hall (In)	0	0	0	0	0	0	0	1	0	0	0

Average Dwell Time (minutes)

n/a	0	1	2	3	4	5+

Outbound Average	Inbound Average



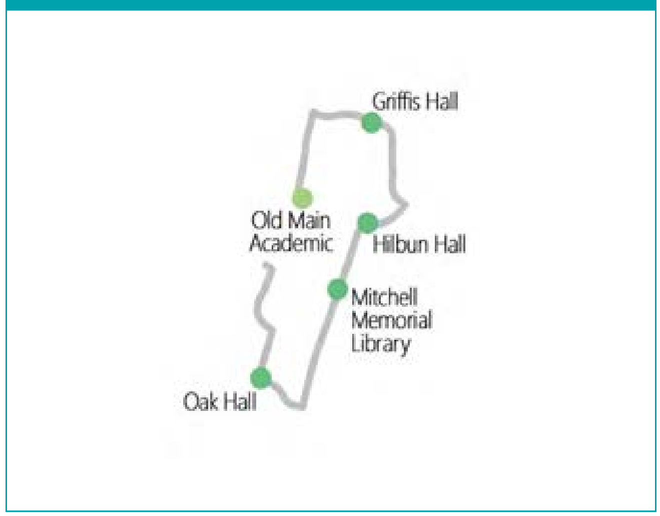


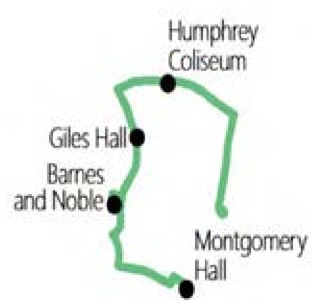
Figure 4.2.4.9 Travel Time Delays, Central Loop

Segments	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm
Mont. Hall to Barn. & Nob. (Out)	0	0	0	0	0	0	0	0	0	0	0
Barn. & Nob. to Giles Hall (Out)	0	0	0	0	0	0	0	0	0	0	0
Giles Hall to Hump. Col. (Out)	0	0	0	0	0	0	0	0	0	0	0
Hump. Col to Old Main (Out)	0	0	0	0	0	0	0	0	0	0	0
Old Main AC to Griffis Hall (In)	0	0	0	0	0	0	0	0	0	0	0
Griffis Hall to Hilbun Hall (In)	0	0	0	0	0	0	0	0	0	0	0
Hilbun Hall to Mitchell Lib. (In)	0	0	0	0	0	0	0	0	0	0	0
Mitchell Lib. to Oak Hall (In)	0	0	0	0	0	0	0	0	0	0	0
Oak Hall to Mont. Hall (In)	0	0	0	0	0	0	0	0	0	0	0

Actual vs. Scheduled Travel Time (minutes)

n/a	early	0	1	2	3	4	5+

Outbound Average



Inbound Average

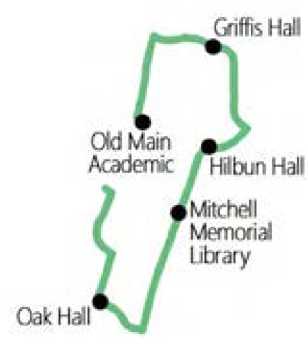


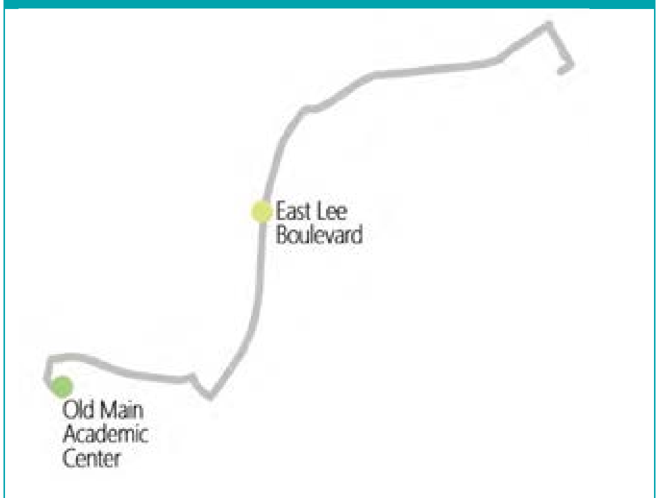
Figure 4.2.4.10 On-Time Performance, East Lee Express

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm
Old Main Academic Center (Out)	76%	67%	82%	70%	91%	87%	91%	78%	98%	72%	85%
East Lee Boulevard (Out)	61%	64%	82%	62%	85%	81%	86%	82%	92%	66%	80%
The Retreat (In)	79%	73%	90%	68%	91%	91%	87%	90%	92%	71%	84%
East Lee Boulevard (In)	56%	62%	79%	60%	84%	80%	83%	86%	88%	70%	87%

On-Time Performance

n/a	>90%	80-90%	70-80%	60-70%	50-60%	<50%

Outbound Average



Inbound Average

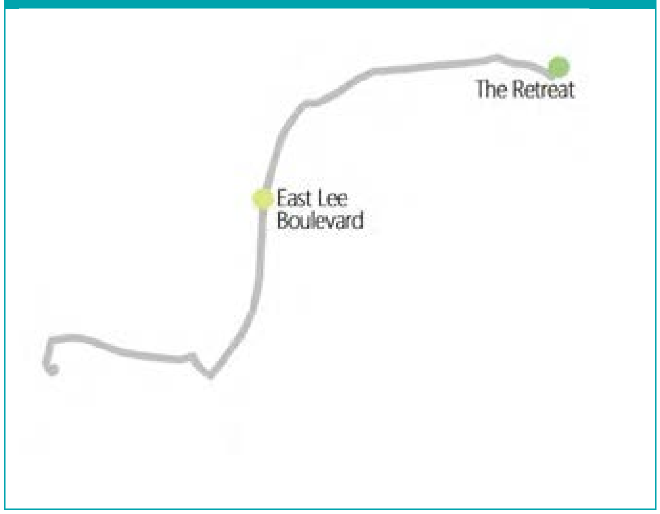


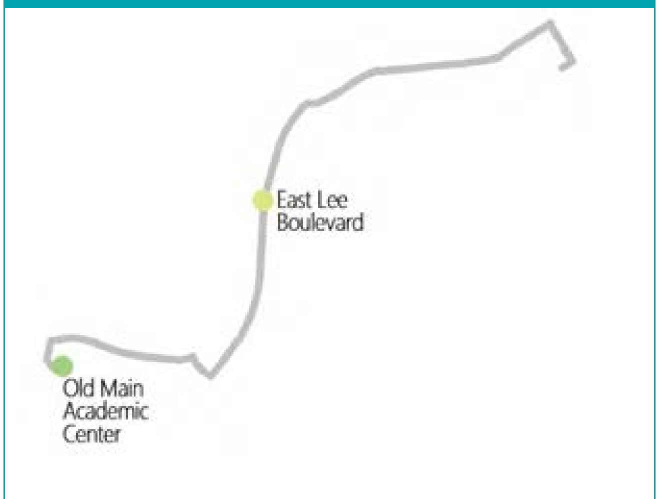
Figure 4.2.4.11 Dwell Times, East Lee Express

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm
Old Main Academic Center (Out)	1	1	1	2	1	1	1	3	2	2	2
East Lee Boulevard (Out)	0	0	0	0	0	0	0	0	0	0	0
The Retreat (In)	1	1	1	1	1	1	1	1	2	1	1
East Lee Boulevard (In)	0	0	0	0	0	0	0	0	0	0	0

Average Dwell Time (minutes)

n/a	0	1	2	3	4	5+

Outbound Average



Inbound Average

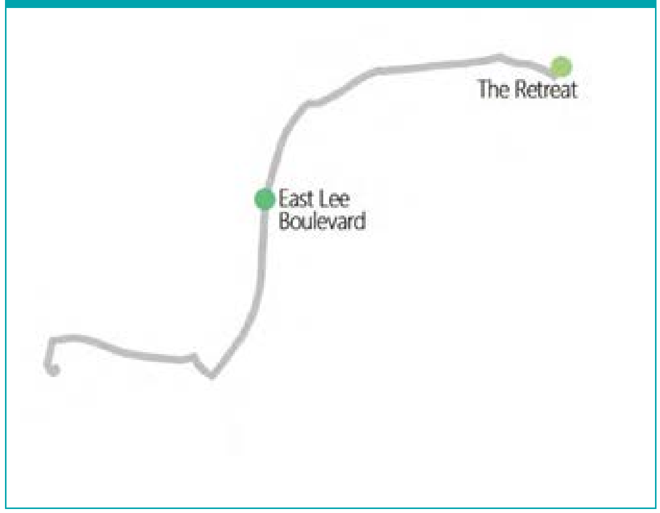


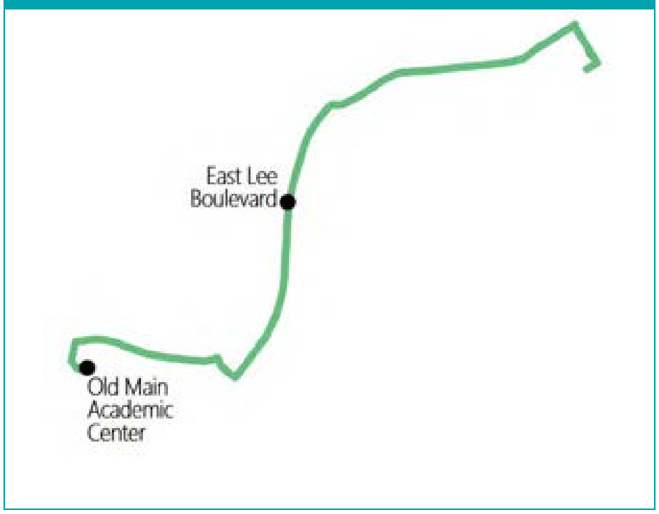
Figure 4.2.4.12 Travel Time Delays, East Lee Express

Segments	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm
Old Main AC to East Lee Blvd (Out)	0	0	0	0	0	0	0	0	0	0	0
East Lee Blvd to The Retreat (Out)	0	0	0	0	0	0	0	0	0	0	0
The Retreat to East Lee Blvd (In)	0	0	0	0	0	0	0	0	0	0	0
East Lee Blvd to Old Main AC (In)	0	0	0	0	0	0	0	0	1	0	1

Actual vs. Scheduled Travel Time (minutes)

n/a	early	0	1	2	3	4	5+

Outbound Average



Inbound Average

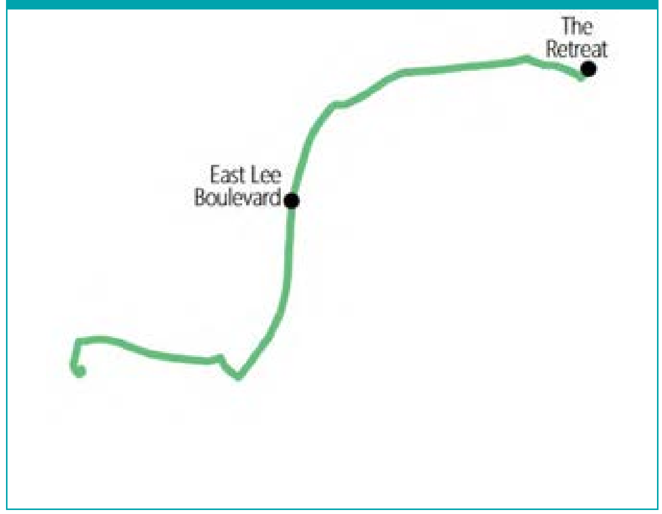


Figure 4.2.4.13 On-Time Performance, Greek Loop

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm
Montgomery Hall	95%	96%	88%	96%	89%	89%	90%	91%	86%	59%	80%
Fraternity	96%	98%	90%	100%	92%	90%	94%	91%	77%	65%	84%
Sorority North	98%	99%	88%	97%	97%	82%	90%	93%	73%	55%	83%
Sorority South	100%	99%	88%	100%	97%	86%	88%	91%	80%	59%	83%

On-Time Performance

n/a	>90%	80-90%	70-80%	60-70%	50-60%	<50%

Loop Average

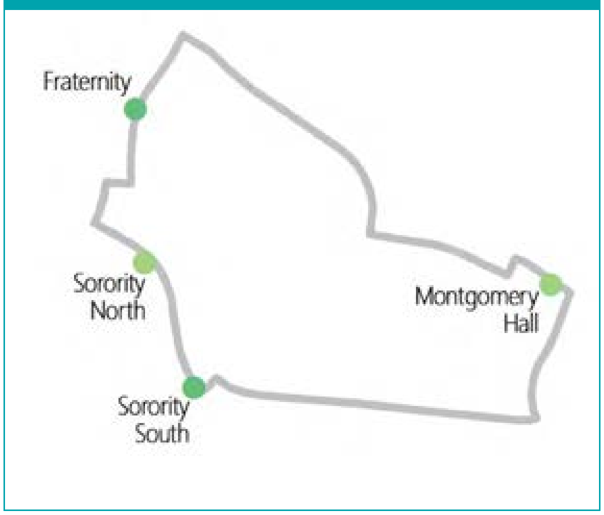


Figure 4.2.4.14 Dwell Times, Greek Loop

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm
Montgomery Hall	0	0	0	0	0	0	0	0	0	0	0
Fraternity	0	0	0	0	0	0	0	0	0	0	0
Sorority North	0	0	0	0	0	0	0	0	0	0	0
Sorority South	1	0	1	1	1	1	1	0	1	1	1

Average Dwell Time (minutes)

n/a	0	1	2	3	4	5+

Loop Average

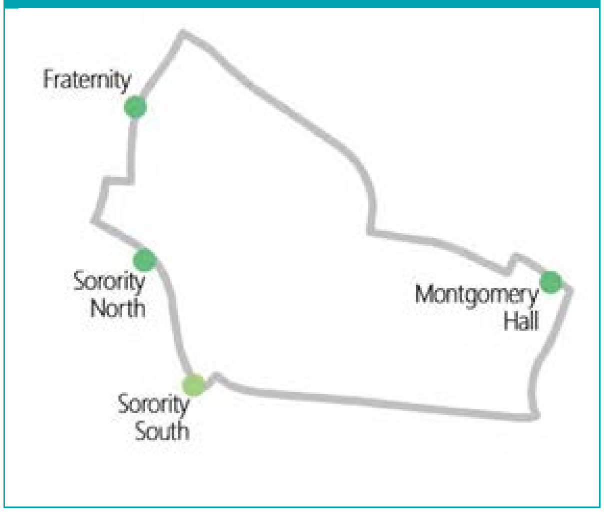


Figure 4.2.4.15 Travel Time Delays, Greek Loop

Segments	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm
Mont. Hall to Fraternity Row	0	0	0	0	0	0	0	0	0	0	0
Fraternity Row to Sorority N	0	0	0	0	0	0	0	0	0	0	0
Sorority N to Sorority S	0	0	0	0	0	0	0	0	0	0	0
Sorority S to Mont. Hall	0	0	0	0	0	0	0	0	0	0	0

Actual vs. Scheduled Travel Time (minutes)

n/a	early	0	1	2	3	4	5+

Loop Average

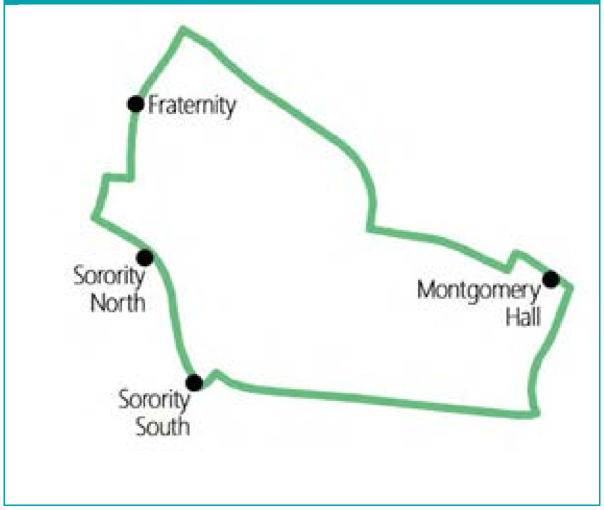


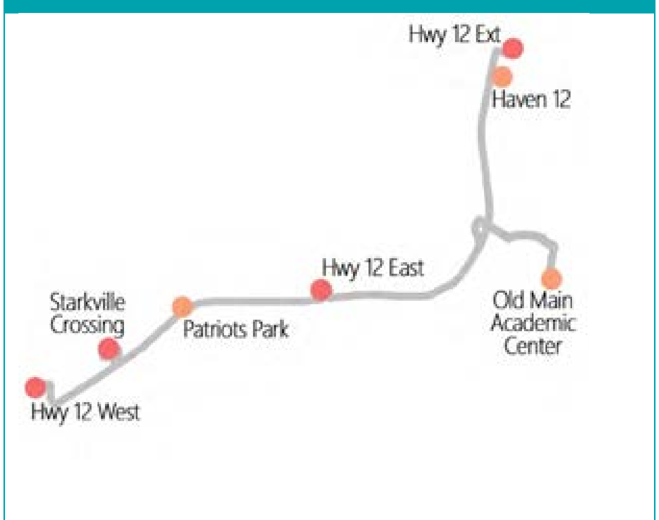
Figure 4.2.4.16 On-Time Performance, Highway 12 Express

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm
Highway 12 (Out)	n/a	27%	50%	45%	50%	64%	50%	55%	65%	50%	11%	44%	53%
Haven 12 (Out)	92%	28%	69%	59%	50%	71%	64%	55%	53%	50%	11%	53%	69%
Old Main Ac. Center (Out)	88%	13%	64%	45%	73%	79%	43%	41%	43%	57%	23%	53%	77%
Highway 12 East (Out)	78%	0%	32%	56%	76%	78%	38%	44%	52%	54%	44%	38%	36%
Patriots Park (Out)	73%	0%	22%	61%	78%	44%	40%	100%	50%	71%	53%	54%	38%
Starkville Crossing (Out)	83%	0%	25%	64%	68%	27%	43%	86%	50%	59%	56%	38%	41%
Highway 12 West (Out)	53%	9%	62%	33%	50%	36%	30%	63%	35%	35%	38%	53%	41%
Starkville Crossing (In)	85%	25%	67%	50%	64%	39%	25%	44%	47%	44%	38%	57%	40%
Patriots Park (In)	100%	33%	59%	48%	61%	39%	33%	48%	44%	53%	47%	58%	17%
Highway 12 East (In)	80%	30%	56%	43%	63%	68%	29%	59%	54%	38%	31%	27%	29%
Old Main Academic Center (In)	74%	32%	42%	47%	44%	33%	48%	100%	59%	33%	60%	36%	53%
Haven 12 (In)	93%	33%	36%	45%	48%	33%	42%	86%	58%	40%	50%	56%	56%

On-Time Performance

n/a	>90%	80-90%	70-80%	60-70%	50-60%	<50%

Outbound Average



Inbound Average

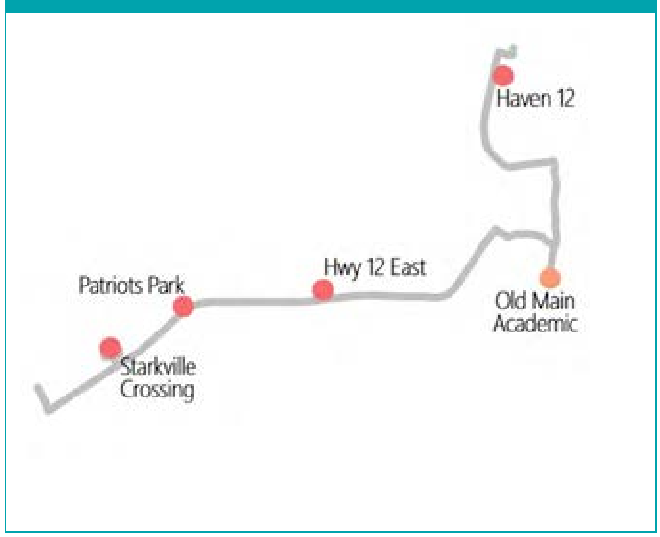


Figure 4.2.4.17 Dwell Times, Highway 12 Express

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm
Highway 12 (Out)		2	6	7	2	2	5	7	1	8	8	8	4
Haven 12 (Out)	2	1	1	1	0	0	0	0	1	0	0	0	0
Old Main Ac. Center (Out)	1	5	1	1	5	1	1	1	1	1	0	1	2
Highway 12 East (Out)	0	1	2	1	2	2	1	3	1	2	2	1	2
Patriots Park (Out)	0	1	0	0	0	0	1	0	0	0	0	0	0
Starkville Crossing (Out)	0	0	0	0	1	1	1	0	0	0	0	0	0
Highway 12 West (Out)	3	4	4	8	3	4	5	7	5	5	5	6	3
Starkville Crossing (In)	0	0	0	0	1	1	1	0	0	1	0	0	0
Patriots Park (In)	0	0	0	0	0	0	0	0	0	1	1	1	0
Highway 12 East (In)	1	2	1	1	4	2	2	3	4	3	5	6	3
Old Main Academic Center (In)	1	0	1	1	1	1	1	1	1	1	1	1	1
Haven 12 (In)	1	1	1	1	1	1	1	0	1	0	0	1	0

Average Dwell Time (minutes)

n/a	0	1	2	3	4	5+

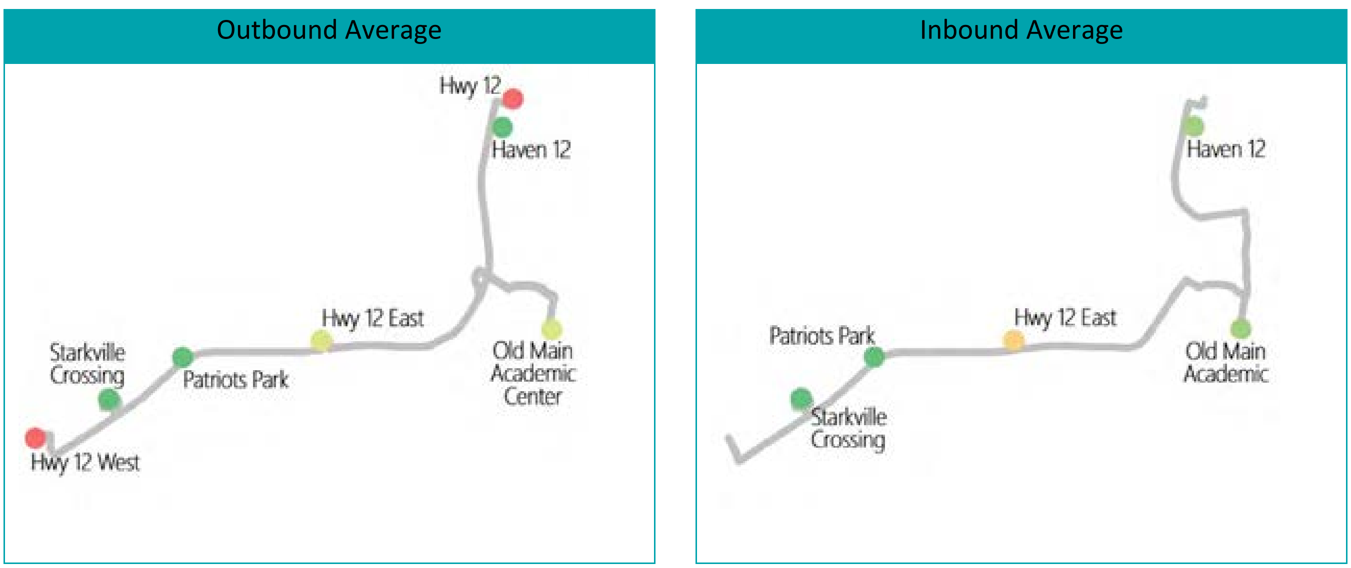


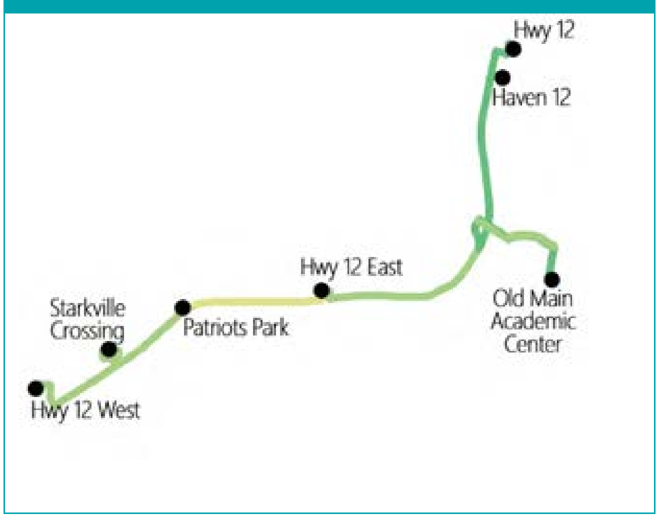
Figure 4.2.4.18 Travel Time Delays, Highway 12 Express

Segment	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm
Hwy 12 Ext to Haven 12 (Out)	-1	0	0	0	0	0	0	0	1	0	1	1	0
Haven 12 to Old Main AC (Out)	0	0	0	0	0	0	0	0	0	0	1	1	2
Old Main AC to Hwy 12 E (Out)	0	0	0	0	1	1	1	0	2	1	4	2	2
Hwy 12 E to Patriots P. (Out)	0	0	0	0	1	5	0	4	1	0	3	1	5
Patriots P. to Stark. Cross (Out)	0	0	0	0	1	1	0	1	1	1	1	2	1
Stark. Cross. To Hwy 12 W (Out)	0	0	0	0	0	1	1	1	1	0	1	0	2
Hwy 12 W to Stark. Cross. (In)	0	0	0	2	0	3	1	3	3	3	5	2	5
Stark. Cross. to Patriots P. (In)	0	0	0	0	0	1	0	0	1	1	1	1	0
Patriots P. to Hwy 12 E (In)	1	0	0	1	1	1	1	1	1	2	1	2	1
Hwy 12 E to Old Main AC (In)	0	0	0	1	0	6	2	5	2	3	3	2	4
Old Main AC to Haven 12 (In)	0	0	0	0	0	0	0	0	0	0	1	0	1
Haven 12 to Hwy 12 Ext (In)	0	0	0	0	0	0	0	0	0	0	0	0	0

Actual vs. Scheduled Travel Time (minutes)

n/a	early	0	1	2	3	4	5+

Outbound Average



Inbound Average

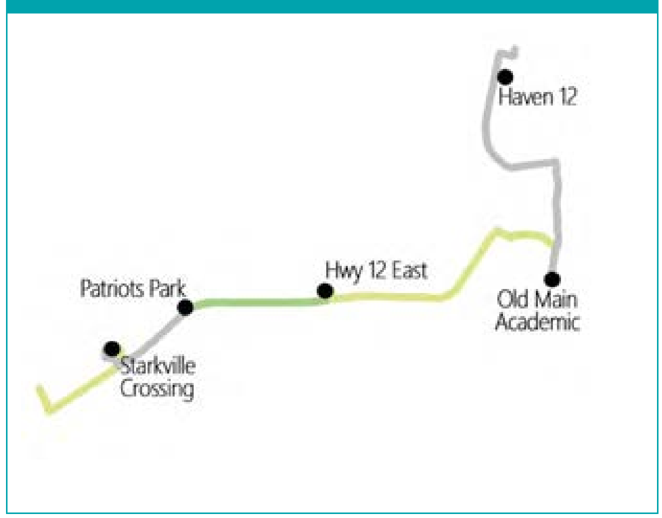


Figure 4.2.4.19 On-Time Performance, Old Main Express

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm
Old Main Academic (Out)	100%	73%	89%	91%	92%	77%	45%	85%	97%	70%	90%	47%	84%
Cotton District (Out)	96%	72%	97%	91%	88%	93%	59%	75%	95%	68%	83%	52%	83%
Midtown (Out)	98%	73%	100%	95%	87%	94%	58%	90%	95%	62%	90%	55%	81%
Downtown (Out)	100%	79%	92%	91%	91%	70%	50%	74%	93%	57%	81%	64%	82%
City Hall (Out)	100%	75%	91%	91%	88%	80%	56%	89%	92%	64%	87%	50%	79%
Greensboro (Out)	100%	83%	80%	89%	89%	77%	51%	92%	89%	60%	84%	57%	79%
Whitfield Street (Out)	30%	61%	45%	80%	78%	77%	51%	81%	80%	56%	66%	60%	79%
Patriots Park (Out)	100%	92%	57%	85%	92%	71%	50%	83%	82%	84%	76%	81%	88%
Whitfield Street (In)	89%	94%	56%	85%	92%	94%	66%	83%	74%	59%	86%	80%	83%
Greensboro (In)	90%	73%	54%	70%	65%	77%	49%	80%	83%	82%	81%	69%	86%
City Hall (In)	92%	80%	54%	72%	67%	81%	55%	85%	89%	88%	88%	71%	79%
Downtown (In)	94%	63%	58%	74%	66%	81%	51%	77%	82%	79%	84%	71%	84%
Midtown (In)	94%	71%	47%	65%	76%	82%	59%	85%	73%	78%	77%	76%	87%
Cotton District (In)	94%	71%	47%	72%	69%	76%	67%	84%	78%	76%	83%	70%	81%

On-Time Performance

n/a	>90%	80-90%	70-80%	60-70%	50-60%	<50%

Outbound Average

Inbound Average

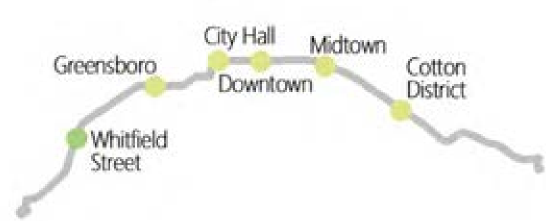


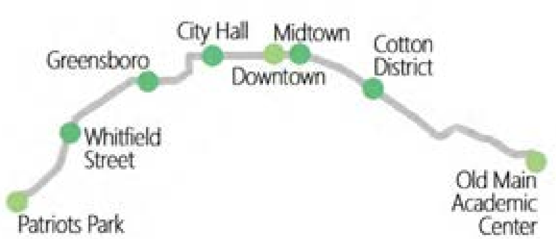
Figure 4.2.4.20 Dwell Times, Old Main Express

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm
Old Main Academic (Out)	1	1	2	1	1	1	1	1	1	1	1	1	1
Cotton District (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Midtown (Out)	0	0	0	0	0	0	0	0	1	1	1	0	0
Downtown (Out)	0	1	0	0	0	1	1	5	1	0	1	1	1
City Hall (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Greensboro (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Whitfield Street (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Patriots Park (Out)	0	0	0	0	0	0	0	0	1	2	2	3	0
Whitfield Street (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
Greensboro (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
City Hall (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
Downtown (In)	0	0	0	0	0	0	0	0	1	1	2	2	2
Midtown (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton District (In)	0	0	0	0	0	0	0	0	0	0	0	0	0

Average Dwell Time (minutes)

n/a	0	1	2	3	4	5+

Outbound Average



Inbound Average

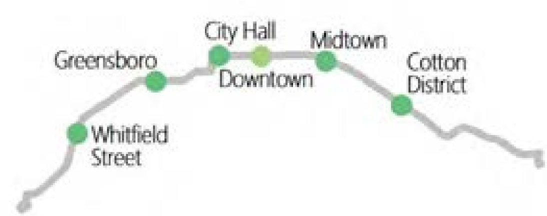


Figure 4.2.4.21 Travel Time Delays, Old Main Express

Segments	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm
Old Main to Cotton Dist. (Out)	0	0	0	0	0	2	0	0	0	0	1	1	0
Cotton Dist. to Midtown (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Midtown to Downtown (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Downtown to City Hall (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
City Hall to Greensboro (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Greensboro to Whitfield (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Whitfield to Patriots Park (Out)	0	0	0	0	0	0	0	0	0	0	1	1	1
Patriots Park to Whitfield (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
Whitfield to Greensboro (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
Greensboro to City Hall (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
City Hall to Downtown (In)	0	0	0	0	0	0	0	1	1	1	0	0	0
Downtown to Midtown (In)	0	0	0	0	0	0	0	3	0	0	0	0	0
Midtown to Cotton Dist. (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Dist. to Old Main (In)	1	0	0	0	1	4	0	0	1	1	1	2	1

Actual vs. Scheduled Travel Time (minutes)

n/a	early	0	1	2	3	4	5+

Outbound Average

Inbound Average

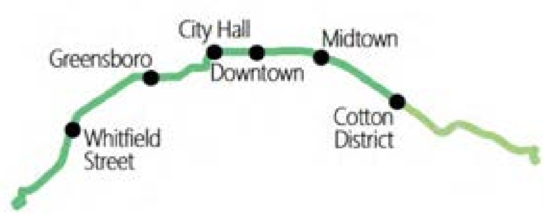


Figure 4.2.4.22 On-Time Performance, Research Loop

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm
Old Main Academic (Out)	100%	100%	77%	100%	100%	86%	86%	100%	77%	67%	75%
100 Research Boulevard	100%	99%	85%	100%	100%	86%	76%	94%	72%	58%	80%
High Perf. Comp. Collaboratory	100%	100%	82%	100%	100%	90%	83%	95%	71%	63%	80%
CAVS	97%	97%	80%	100%	100%	84%	83%	95%	75%	63%	80%
Templeton Academic Center	99%	99%	83%	100%	100%	90%	82%	100%	62%	65%	75%
College View Apartments	100%	100%	77%	100%	100%	84%	75%	98%	66%	71%	74%

On-Time Performance

n/a	>90%	80-90%	70-80%	60-70%	50-60%	<50%

Loop Average

Figure 4.2.4.23 Dwell Times, Research Loop

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm
Old Main Academic (Out)	0	0	0	0	0	0	0	0	0	0	0
100 Research Boulevard	0	0	0	0	0	0	0	0	0	1	0
High Perf. Comp. Collaboratory	0	0	0	0	0	0	0	0	0	0	0
CAVS	0	0	0	0	0	0	0	0	0	0	0
Templeton Academic Center	0	0	0	0	0	0	0	0	0	0	0
College View Apartments	0	0	0	0	0	0	0	0	0	0	0

Average Dwell Time (minutes)

n/a	0	1	2	3	4	5+

Loop Average

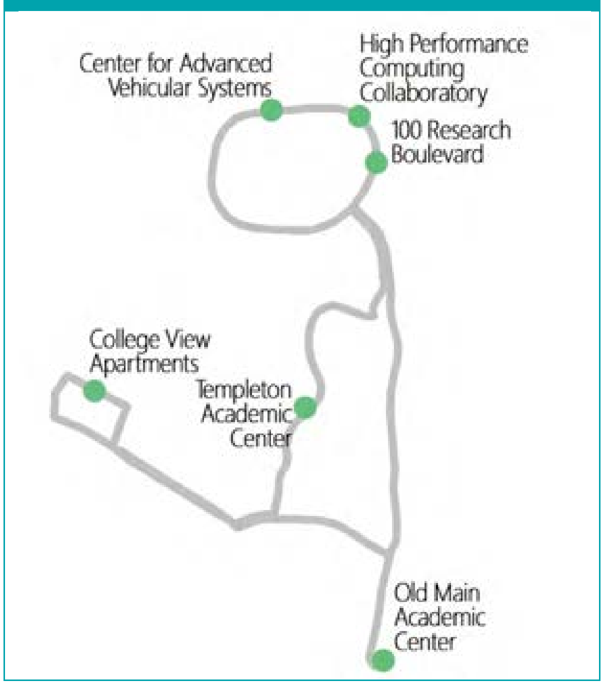


Figure 4.2.4.24 Travel Time Delays, Research Loop

Segments	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm
Old Main to 100 Research (Out)	0	0	0	0	0	0	0	0	0	0	1
100 Research to HPCC (Out)	0	0	0	0	0	0	0	0	0	0	0
HPCC to CAVS (Out)	0	0	0	0	0	0	0	0	0	0	0
CAVS to Templeton (Out)	0	0	0	0	0	0	0	0	0	0	0
Templeton to CV Apt (Out)	0	0	0	0	0	0	0	0	0	0	0
CV Apt to Old Main (In)	0	0	0	0	0	0	0	0	2	1	1

Actual vs. Scheduled Travel Time (minutes)

n/a	early	0	1	2	3	4	5+

Loop Average

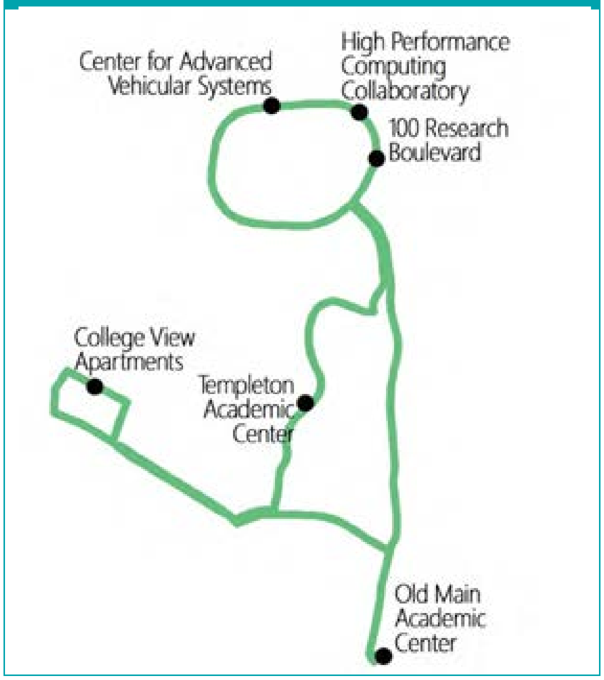


Figure 4.2.4.25 On-Time Performance, Sportsplex Express

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm
Montgomery Hall (Out)	90%	68%	59%	79%	69%	37%	55%	74%	67%	78%	71%	75%	91%
The Mill (Out)	89%	63%	88%	82%	50%	44%	67%	79%	80%	62%	71%	89%	90%
Locksley Way (Out)	87%	64%	87%	78%	52%	41%	68%	75%	86%	67%	82%	55%	75%
Lynn Lane (Out)	94%	51%	80%	81%	47%	52%	58%	86%	79%	67%	86%	58%	63%
Sportsplex (In)	90%	51%	82%	76%	43%	64%	42%	92%	78%	50%	86%	50%	63%
Lynn Lane (In)	86%	50%	85%	75%	61%	52%	40%	77%	70%	33%	73%	50%	42%
Locksley Way (In)	89%	55%	81%	72%	61%	57%	35%	68%	73%	25%	71%	50%	75%
The Mill (In)	78%	64%	76%	67%	67%	58%	50%	80%	56%	47%	50%	64%	64%

On-Time Performance

n/a	>90%	80-90%	70-80%	60-70%	50-60%	<50%

Outbound Average

Inbound Average

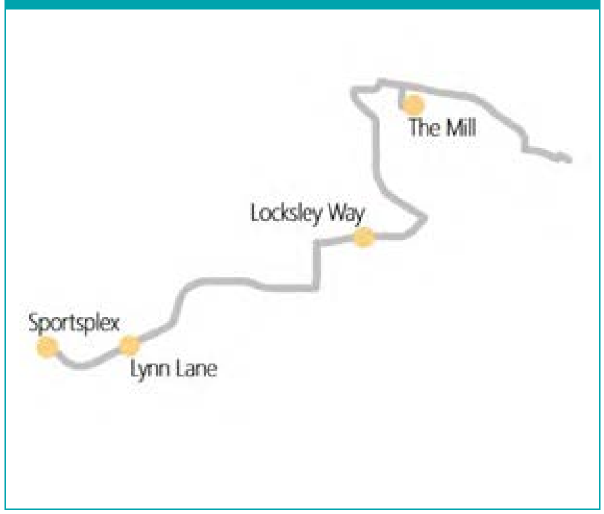


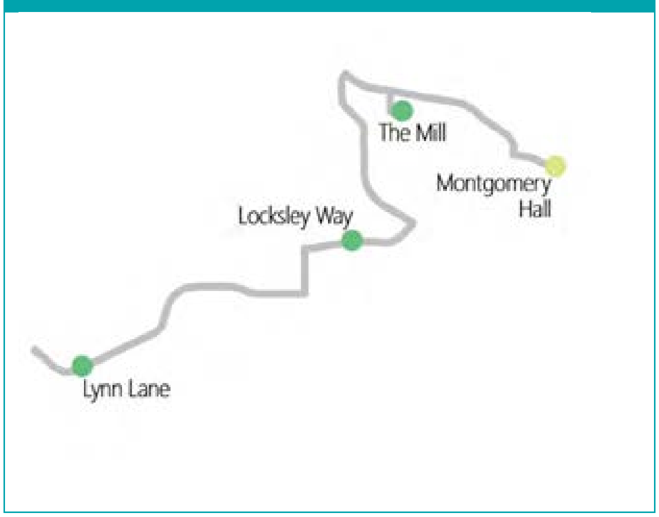
Figure 4.2.4.26 Dwell Times, Sportsplex Express

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm
Montgomery Hall (Out)	1	2	2	2	2	3	2	2	2	1	1	1	1
The Mill (Out)	0	1	0	0	0	0	0	1	0	0	0	0	0
Locksley Way (Out)	0	0	0	0	0	0	0	0	0	0	0	0	0
Lynn Lane (Out)	0	0	0	0	0	0	0	0	1	0	0	0	0
Sportsplex (In)	0	0	0	1	0	0	1	0	0	0	0	0	0
Lynn Lane (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
Locksley Way (In)	0	0	0	0	0	0	0	0	0	0	0	0	0
The Mill (In)	0	0	0	0	0	0	0	1	0	9	1	4	5

Average Dwell Time (minutes)

n/a	0	1	2	3	4	5+

Outbound Average



Inbound Average

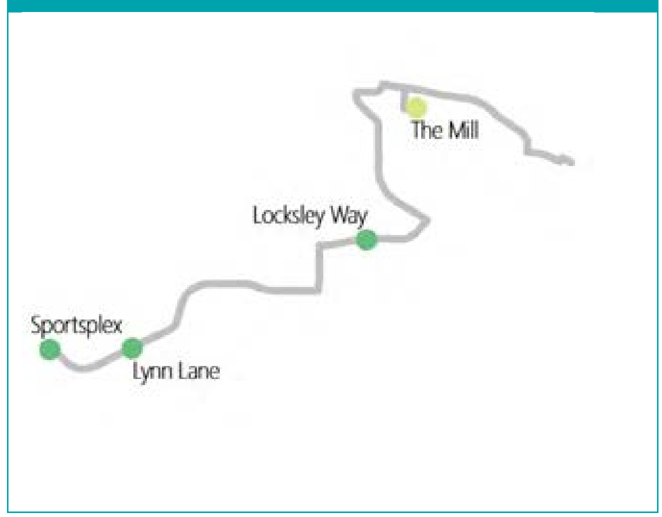


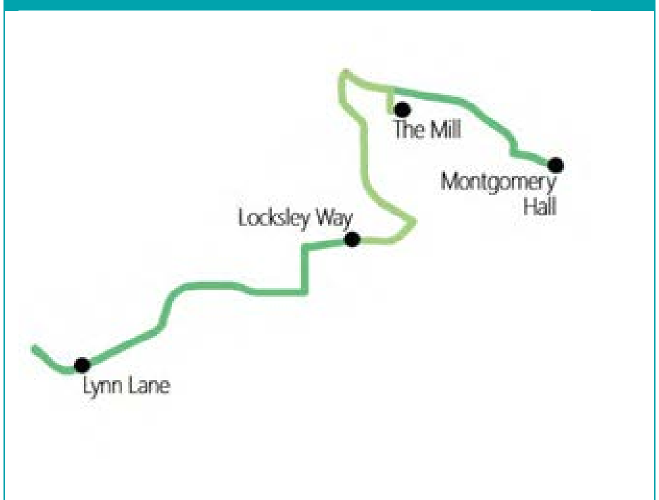
Figure 4.2.4.27 Travel Time Delays, Sportsplex Express

Segments	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm
Mont. Hall to The Mill (Out)	0	0	0	1	0	1	1	1	0	0	0	0	0
The Mill to Locksley Way (Out)	0	0	0	0	1	1	1	0	0	1	2	1	0
Locksley Way to Lynn Ln (Out)	0	0	0	0	0	0	0	0	0	0	0	1	0
Lynn Ln to Sportsplex (Out)	0	0	1	3	0	0	2	0	0	0	0	0	0
Sportsplex to Lynn Ln (In)	0	0	0	1	0	0	2	1	0	0	0	0	0
Lynn Ln to Locksley Way (In)	1	0	0	0	0	0	0	0	0	0	0	0	0
Locksley Way to The Mill (In)	4	3	4	4	4	4	4	5	4	2	5	1	0
The Mill to Mont. Hall (In)	0	0	0	0	0	1	0	0	0	0	1	1	0

Actual vs. Scheduled Travel Time (minutes)

n/a	early	0	1	2	3	4	5+

Outbound Average



Inbound Average

Figure 4.2.4.28 On-Time Performance, Wise Center Express

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm
Montgomery Hall (Out)	90%	90%	81%	85%	73%	87%	81%	91%	57%	45%	56%
Fresh Foods (Out)	84%	86%	82%	91%	65%	80%	63%	73%	58%	41%	61%
Wise Center (Out)	89%	80%	77%	87%	69%	80%	71%	69%	41%	50%	60%
RecPlex (Out)	88%	74%	83%	89%	66%	93%	71%	83%	36%	48%	71%
Scales Building (Out)	86%	78%	90%	94%	61%	91%	70%	83%	33%	41%	67%
RecPlex (In)	88%	76%	84%	89%	60%	92%	74%	88%	46%	50%	37%
Wise Center (In)	88%	80%	90%	92%	60%	96%	65%	97%	45%	55%	62%
Fresh Foods (In)	89%	81%	88%	83%	67%	94%	76%	91%	53%	55%	50%

On-Time Performance

n/a	>90%	80-90%	70-80%	60-70%	50-60%	<50%

Outbound Average

Inbound Average

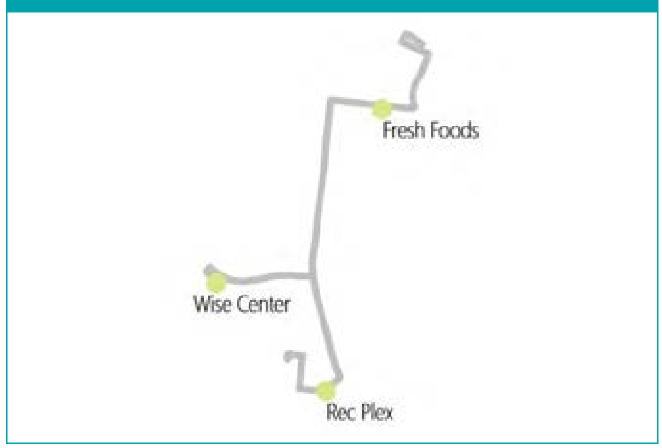


Figure 4.2.4.29 Dwell Times, Wise Center Express

Stop Name	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm
Montgomery Hall (Out)	1	1	1	1	1	1	1	1	1	1	1
Fresh Foods (Out)	0	0	0	0	0	0	0	0	0	0	0
Wise Center (Out)	0	0	0	0	0	1	1	0	0	0	0
RecPlex (Out)	0	0	0	0	0	0	0	0	0	0	0
Scales Building (Out)	0	0	0	0	0	0	0	0	0	0	0
RecPlex (In)	0	0	0	0	0	0	0	0	0	0	0
Wise Center (In)	0	0	0	0	0	0	0	0	0	0	1
Fresh Foods (In)	0	0	0	0	0	0	0	0	0	0	0

Average Dwell Time (minutes)

n/a	0	1	2	3	4	5+

Outbound Average

Inbound Average

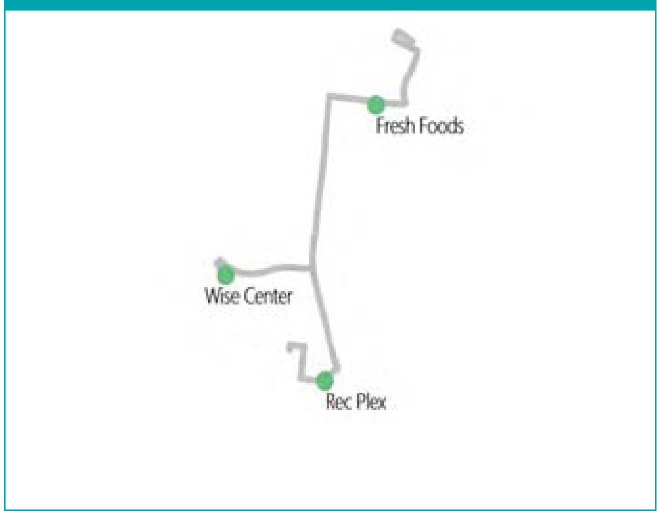


Figure 4.2.4.30 Travel Time Delays, Wise Center Express

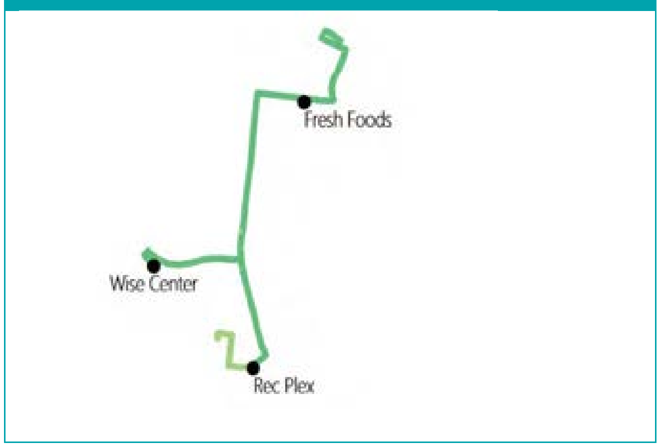
Segments	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm
Mont. Hall to Fresh Foods (Out)	0	0	0	0	0	0	0	0	0	0	1
Fresh Foods to Wise Ctr (Out)	0	0	0	0	0	0	0	0	1	1	1
Wise Ctr to Rec Plex (Out)	0	0	0	0	0	0	0	0	0	0	0
Rec Plex to Scales Building (Out)	0	0	0	0	0	0	0	0	0	0	0
Scales Building to Rec Plex (In)	1	0	0	0	0	0	0	0	1	2	4
Rec Plex to Wise Center (In)	0	0	0	0	0	0	0	0	0	0	1
Wise Center to Fresh Foods (In)	0	0	0	0	0	0	0	0	0	0	1
Fresh Foods to Mont. Hall (In)	0	0	0	0	0	0	0	0	0	0	0

Actual vs. Scheduled Travel Time (minutes)

n/a	early	0	1	2	3	4	5+

Outbound Average

Inbound Average



4.2.4.2 Summary of Reliability Issues

In order to better understand the magnitude of reliability issues, average travel time delays for route segments and standard deviations for dwell times at stops were calculated for each route. Using this data, unreliable segments and stops were categorized into the following:

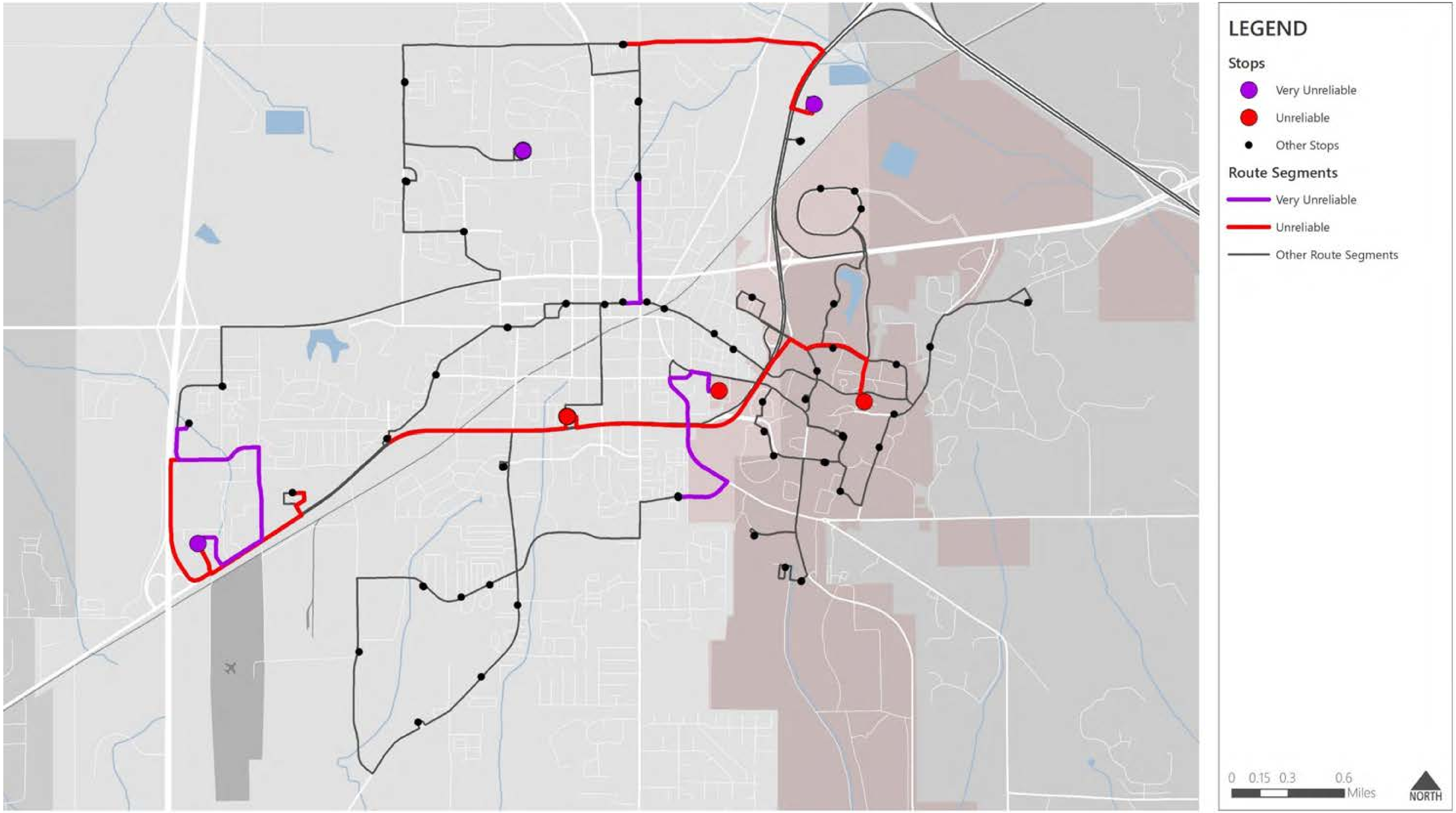
- **Unreliable Segments**: These segments experienced an average travel time delay of 1.5 to 3 minutes throughout the day.
- **Very Unreliable Segments**: These segments experienced an average travel time delay of 3 minutes or more throughout the day.
- **Unreliable Stops**: These stops had a standard deviation for dwell times of 1.5 to 3 minutes throughout the day.
- **Very Unreliable Stops**: These stops had a standard deviation for dwell times of 3 minutes or more throughout the day.

Figure 4.2.4.31 shows where these unreliable segments and stops are located and **Table 4.2.4.1** summarizes these problem areas by route. Inconsistent layover times and congestion plague all of the four routes with major reliability issues.

Table 4.2.4.1 Summary of Major Reliability Issues

Route	Issue	Times of Day	Stop or Segment	Root Cause
Boardtown North	Dwell Time	All or Most	Hwy 12 West, Oktibbeha County Hospital, and Highway 12 Ext	Layovers/breaks
	Travel Time	All or Most	Between Abernathy and Hwy 12 West; Between Garrard Rd and Hwy 12 Ext	Congestion or maneuvering in parking lots
Boardtown South	Dwell Time	All or Most	Highway 12 East	Layovers/breaks
	Travel Time	All or Most	Between N. Montgomery South and Downtown	Congestion
Highway 12 Express	Dwell Time	All or Most	Hwy 12 Ext, Old Main, Hwy 12 East, Hwy 12 West	Layovers/breaks
	Travel Time	Afternoon and Evening	Between Old Main and Patriots Park; Between Hwy 12 West and Starkville Crossing	Congestion or maneuvering in parking lots
Sportsplex Express	Dwell Time	All or Most	The Mill	Layovers/breaks
	Travel Time	All or Most	Between the Mill and Locksley Way	Congestion or maneuvering in parking lots

Figure 4.2.4.31 Unreliable Route Segments and Stops



Data Source: SMART

Disclaimer: This map is for planning purposes only.

4.2.5 Access to Transit Analysis

Providing convenient and useful transit routes and services is only one part of the rider experience. The rider experience also includes how they access transit and what amenities are available at transit stops while they wait. This section will focus on bicycle and pedestrian access to bus stops and amenities at bus stops.

4.2.5.1 Identifying High Demand Stops

The first step in analyzing access to transit is to identify the stops that are likely to have high demand for transit. This includes identifying stops with the highest latent demand (potential ridership) and/or highest realized demand (actual ridership). The following high demand stops were identified:

- **Highest On-Campus Ridership**: The top 10 on-campus stops. On-campus stops have the highest ridership overall and primarily serve the university community.
- **Highest Off-Campus Ridership**: The top 10 off-campus stops were identified. These stops have lower ridership when compared to on-campus stops but they have broader geographic and demographic coverage.
- **Highest Untapped Demand**: These are the 10 stops across the entire SMART system that have the biggest gap in their actual ridership versus their latent demand.

Table 4.2.5.1 High Demand Stops

Top 10 On-Campus		Top 10 Off-Campus		Top 10 Untapped Demand	
Stop Name	Avg. Weekday Boardings	Stop Name	Avg. Weekday Boardings	Stop Name	Avg. Weekday Boardings
Montgomery Hall	1,081	The Retreat	347	Downtown	41
Old Main Acad. Ctr	527	East Lee Boulevard	211	Midtown	40
College View Apts	499	Locksley Way	100	The Mill	40
Sorority South	395	Cotton District	69	Fresh Foods	29
Giles Hall	393	Haven 12	69	N Montgomery South	22
Fraternity	251	Lynn Lane	65	N Montgomery North	17
Sorority North	193	Highway 12 East	59	J.L. King Park	15
Oak Hall	126	Highway 12 Extended	54	Mallory Lane	9
Barnes and Noble	97	Patriots Park	46	Louisville St North	0
Mitchell Mem. Library	93	Downtown	41	Louisville St South	0

Note: Inbound and outbound stops are grouped together.

4.2.5.2 Bicycle and Pedestrian Access

Nearly all people who ride transit are pedestrians (by foot or wheelchair) or bicyclists at the beginning or end of their trip. The 2009 National Household Travel Survey (NHTS) found that 85% of transit trips began or ended with walking. Rates of bicycling to transit are considerably lower (1%)., but this rate is higher in university areas and continues to grow as bicycling becomes more popular. Furthermore, biking and transit can be complementary modes- transit can cover farther distances faster, and bicycling can quickly connect the first and last mile to the transit stop.

Bicycle Access

Figure 4.2.5.1 maps bicycle facilities that fall within a quarter mile of SMART bus stops. While people will bike much longer distance to transit, this distance is utilized to understand the connectivity of the immediate area to the local bicycle network.

Figure 4.2.5.1 shows that the majority of bus stops contain a bicycle facility within their quarter mile radius. On MSU, most of the bicycle facilities are part of a connected network. However, most bus stops off campus have at most one bicycle facility that is not well-connected to other facilities.

Table 4.2.5.2, **Table 4.2.5.3**, and **Table 4.2.5.4** summarize the level of bicycle access to bus stops with the highest demand and highlight which stops need improvement the most.

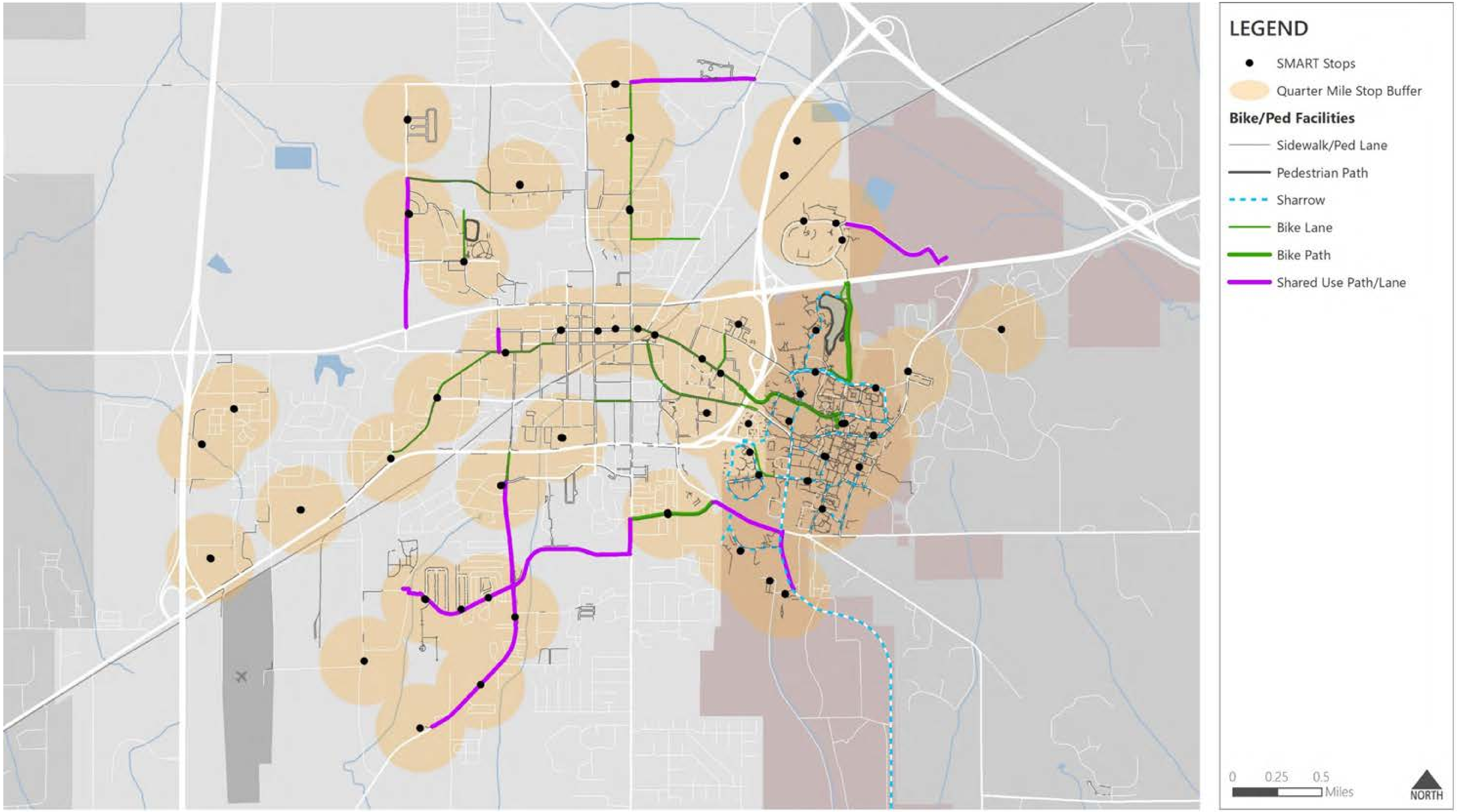
Pedestrian Access

A quarter mile radius from the bus stop should contain safe and appealing pedestrian facilities. **Figure 4.2.5.1** shows the pedestrian facilities that fall within a quarter mile radius of SMART bus stops.

Figure 4.2.5.1 shows that most bus stops on the MSU campus are surrounded by a very strong network of sidewalks and walking paths. Outside of MSU, most bus stops do not have sidewalks or walking paths nearby, with the exception of Downtown Starkville, Oktibbeha County Hospital, and Lynn Lane developments. The pedestrian facilities that do exist around the bus stops are not connected to a larger network.

Table 4.2.5.2, **Table 4.2.5.3**, and **Table 4.2.5.4** summarize the level of pedestrian access to bus stops with the highest demand and highlight which stops need improvement the most.

Figure 4.2.5.1 Bicycle and Pedestrian Access to Transit



Data Source: Neel-Schaffer

Disclaimer: This map is for planning purposes only.

Table 4.2.5.2 Bike/Ped Access for High On-Campus Ridership Stops

Bus Stop	Pedestrian Access	Bicycle Access
Montgomery Hall	Satisfactory	Satisfactory
Old Main Academic Center	Satisfactory	Satisfactory
College View Apartments	Satisfactory	Needs Improvement
Sorority South	Satisfactory	Satisfactory
Giles Hall	Satisfactory	Satisfactory
Fraternity	Limited Access	Limited Access
Sorority North	Satisfactory	Satisfactory
Oak Hall	Satisfactory	Satisfactory
Barnes and Noble	Satisfactory	Satisfactory
Mitchell Memorial Library	Satisfactory	Satisfactory

Table 4.2.5.3 Bike/Ped Access for High Off-Campus Ridership Stops

Bus Stop	Pedestrian Access	Bicycle Access
The Retreat	Limited Access	Needs Improvement
East Lee Boulevard	Limited Access	Needs Improvement
Locksley Way	Satisfactory	Satisfactory
Cotton District	Satisfactory	Satisfactory
Haven 12	Limited Access	Needs Improvement
Lynn Lane	Satisfactory	Satisfactory
Highway 12 East	Limited Access	Limited Access
Highway 12 Extended	Needs Improvement	Needs Improvement
Patriots Park	Limited Access	Limited Access
Downtown	Satisfactory	Satisfactory

Table 4.2.5.4 Bike/Ped Access for High Untapped Demand Stops

Bus Stop	Pedestrian Access	Bicycle Access
Downtown	Satisfactory	Satisfactory
Midtown	Satisfactory	Satisfactory
The Mill	Satisfactory	Satisfactory
Fresh Foods	Satisfactory	Satisfactory
North Montgomery South	Limited Access	Satisfactory
North Montgomery North	Needs Improvement	Satisfactory
J.L. King Park	Satisfactory	Satisfactory
Mallory Lane	Needs Improvement	Needs Improvement
Louisville Street North	Limited Access	Satisfactory
Louisville Street South	Limited Access	Satisfactory

Legend

Access Level	Pedestrian	Bicycle
Satisfactory	The bus stop and surrounding area has decent pedestrian facility coverage.	There is one or more bicycle facility nearby.
Limited Access	There are some pedestrian facilities but are not connected to the larger area.	There is a bicycle facility nearby but may not be part of a connected network.
Needs Improvement	There are few to no pedestrian facilities nearby.	There are few to no bicycle facilities destinations nearby.

4.2.5.3 Bus Stop Amenities

Transit systems provide amenities at transit stops to improve the rider experience. These includes amenities like shelters, benches, trash cans, and lighting. Shelters and benches are the amenities that this section will focus on.

Existing Shelters and Benches

SMART provides service to 86 bus stops in the Starkville/MSU area. Shelters or benches are installed at most of these stops (65%), as shown in **Table 4.2.5.5**. **Figure 4.2.5.2** shows where these amenities are located.

Table 4.2.5.5 SMART Stop Amenities Summary

Stops	Number	Percent
With Shelter or at Hub	43	50%
With Bench Only	13	15%
With No Shelter or Bench	30	35%
All Stops	**86**	**100%**

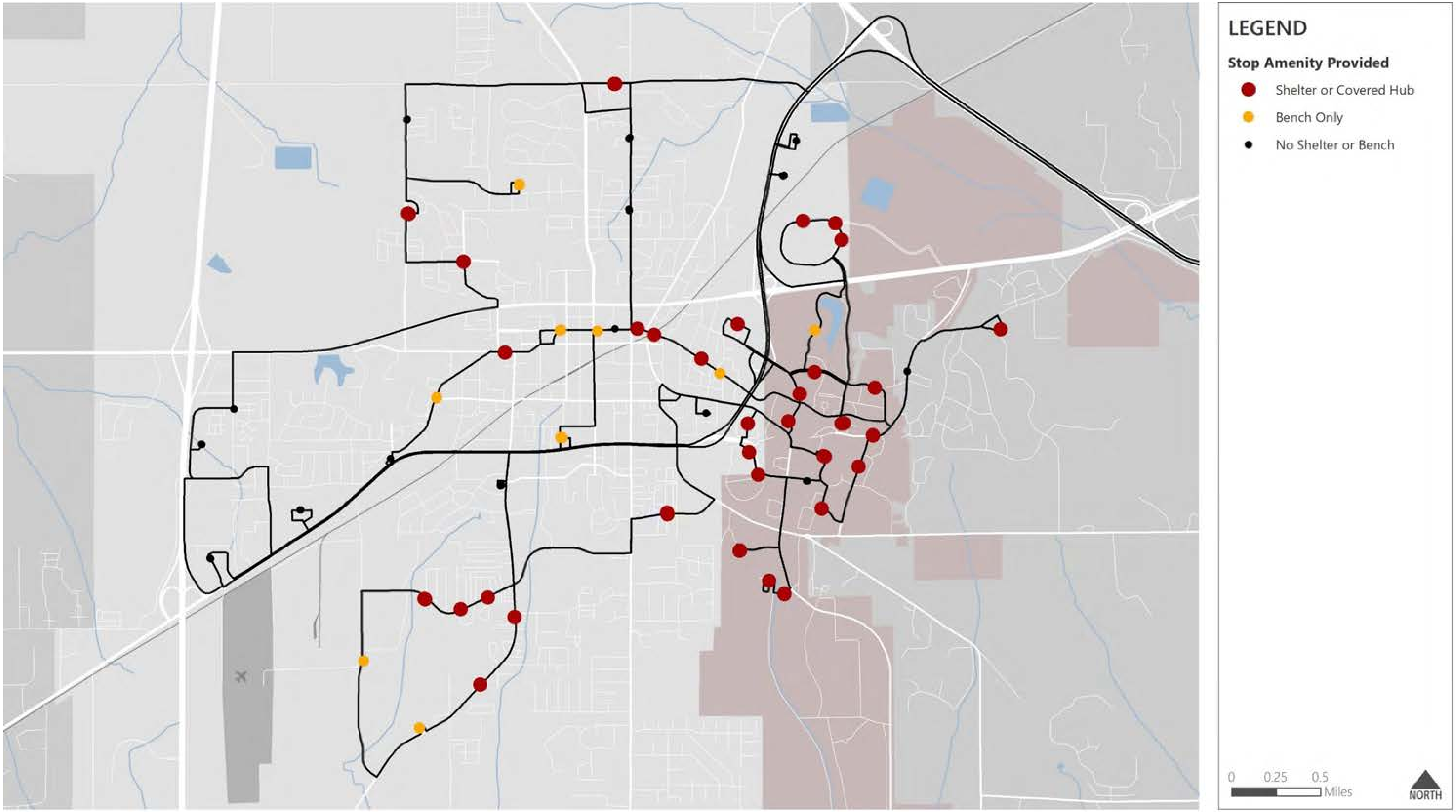
Source: SMART

High Priority Stops for Amenities

While transit systems would ideally provide a shelter or bench at all transit stops, costs and site feasibility make this impossible in practice. Therefore, transit systems much prioritize which stops receive amenities and evaluate the feasibility of installing these amenities.

Table 4.2.5.6, **Table 4.2.5.7**, and **Table 4.2.5.8** show the amenities provided at high demand stops and highlight the gaps at these stops.

Figure 4.2.5.2 SMART Bus Stop Amenities



Data Source: Neel-Schaffer

Disclaimer: This map is for planning purposes only.

Table 4.2.5.6 Amenities at High On-Campus Ridership Stops

Bus Stop	Stops	Stops without Shelter	Stops without Bench
Montgomery Hall	2	0	0
Old Main Academic Center	2	0	0
College View Apartments	1	0	0
Sorority South	1	0	0
Giles Hall	1	0	0
Fraternity	1	0	0
Sorority North	1	0	0
Oak Hall	1	0	0
Barnes and Noble	1	0	0
Mitchell Memorial Library	1	0	0

Table 4.2.5.7 Amenities at High Off-Campus Ridership Stops

Bus Stop	Stops	Stops without Shelter	Stops without Bench
The Retreat	1	0	0
East Lee Boulevard	2	2	2
Locksley Way	2	0	0
Cotton District	2	1	0
Haven 12	2	2	2
Lynn Lane	2	0	0
Highway 12 East	2	2	0
Highway 12 Extended	2	2	2
Patriots Park	2	2	2
Downtown	2	2	1

Table 4.2.5.8 Amenities at High Untapped Demand Stops

Bus Stop	Stops	Stops without Shelter	Stops without Bench
Downtown	2	2	1
Midtown	2	0	0
The Mill	2	2	2
Fresh Foods	2	2	2
North Montgomery South	2	2	2
North Montgomery North	2	2	2
J.L. King Park	2	0	0
Mallory Lane	2	2	2
Louisville Street North	1	0	0
Louisville Street South	1	0	0

4.2.5.4 Summary of Access to Transit Needs

In general, there is a good foundation of bike/ped facilities and bus stop amenities for the SMART system. However, there is still room for improvement, especially off-campus. The following needs emerged from the access to transit analysis:

- **Bike/Ped Access Gaps**: There are 13 high demand stops that warrant bike/ped access improvements. In no particular order, these include: College View Apartments, Fraternity, The Retreat, East Lee Boulevard, Haven 12, Highway 12 East, Highway 12 Extended, Patriots Park, North Montgomery South, North Montgomery North, Mallory Lane, Louisville Street North, and Louisville Street South.
- **Bus Stop Shelters and Benches**: There are 12 high demand stops that warrant the installation of new shelters or benches. In no particular order, these include: East Lee Boulevard, Cotton District, Haven 12, Highway 12 East, Highway 12 Extended, Patriots Park, Downtown, The Mill, Fresh Foods, North Montgomery South, North Montgomery North, and Mallory Lane.

4.2.6 Service Expansion Analysis

This analysis looks at the need for service expansion in three ways: evaluating existing market demand for service expansion, estimating the likely impacts of future growth, and comparing the span of service for SMART to those of its peer systems.

4.2.6.1 Existing Market Analysis

The density of development and socioeconomic patterns of an area drive transit demand. This section provides an overview of the existing transit market analysis conducted to provide insight into where transit demand today is higher or lower in the Starkville area.

To conduct the market analysis, detailed socioeconomic data was obtained and a Density Threshold Analysis (DTA) was conducted. This analysis, summarized in **Table 4.2.6.1**, focused on three different types of densities: household density, job density, and a combined household and jobs (activity) density. Furthermore, it accounts for socioeconomic differences by making adjustments for low-income households and workers, households without access to vehicle, and transit-supportive workers.

Table 4.2.6.1 Transit Density Threshold Analysis Criteria and Thresholds

Criteria	Measurement	Transit Level of Service Supported				
		On-Demand	Flexible	60 min.	30 min.	15 min.
Residential Density	Households or household equivalents[1] per acre	0 to 1	1 to 2	2 to 4	4 to 7	7+
Employment Density	Jobs and high school and college students per acre	0 to 5	5 to 10	10 to 25	25 to 50	50+
Low-Income Residential Density	Households or household equivalents[1] using food stamps per acre	0 to 0.33	0.33 to 0.66	0.66 to 1.33	1.33 to 2.33	2.33+
Transit Supportive Employment Density	Jobs in industries with high percentage of workers riding transit[2] and high school and college students per acre	0 to 2.5	2.5 to 5	5 to 12.5	12.5 to 25	25+
Residential Vehicle Availability	Households or household equivalents[1] without vehicle per acre	0 to 0.25	0.25 to 0.5	0.5 to 1	1 to 1.75	1.75+
Activity Density	Sum of highest residential and employment density value	0 to 3.75	3.75 to 7.5	7.5 to 18.75	18.75 to 37.5	37.5+

Note 1: Dorms and hotel rooms were converted to household unit equivalents
Note 2: Industries with high percentage of workers riding transit included NAICS codes: 44-45, 61, 62, 71, and 72

Figure 4.2.6.1 shows the results of the market analysis and highlights major transit service gaps, or areas where transit demand is high but not within walking distance of an existing stop. These gaps include:

- **Links and Lakeside**: These two apartment complexes generate a high amount of transit demand.
- **Louisville Street and Leigh Lane**: There are several multi-family developments are this area that warrant a new stop or the relocation of the stop immediately north of this area.
- **Louisville Street and W Wood Street**: There are several multi-family developments in this area that warrant a transit stop.
- **S. Montgomery Street and MS 12 Area**: This expansive area goes from Locksley Way to E. Gillespie Street and includes several multi-family developments and commercial areas like University Square.
- **N. Jackson Street and Womack Road**: There are some multi-family developments that are not well served by the closest existing stops.
- **21 and Helix Apartments**: These two apartment complexes generate a high amount of transit demand.
- **Campus Trails and the Social Campus Apartments**: These two apartment complexes generate a high amount of transit demand.
- **Aspen Heights**: This multi-family development generates a high amount of transit demand.
- **Highlands Plantation**: This multi-family development generates a moderate amount of transit demand.

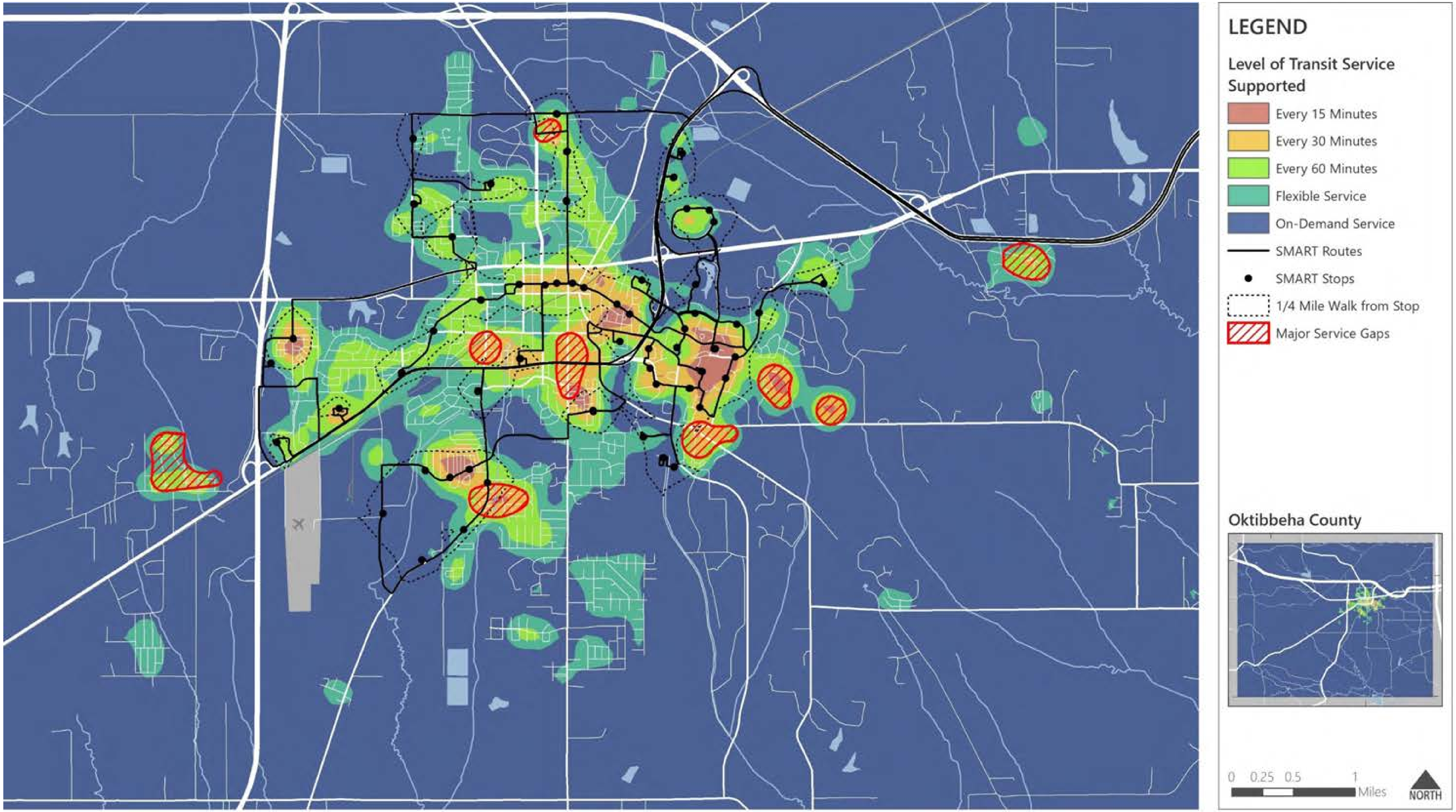
4.2.6.2 Future Growth Impacts

In addition to the existing market demand for transit, future growth will increase demand in certain areas. As part of the travel demand modeling process, housing unit and employment growth was forecasted for small geographic units called Traffic Analysis Zones (TAZs). These forecasts are shown in **Figure 4.2.6.2** and **Figure 4.2.6.3**.

These forecasts suggest that the following areas will experience major increases in transit demand:

- **The Mill/Cotton District/College View**: This area has undergone rapid redevelopment and continues to grow with new mixed use and multi-family developments. This area already has high transit demand and demand will increase further.
- **Blackjack Road**: This area is anticipated to undergo further development, including both single-family and multi-family residential development and small-scale commercial development. This will further increase the need for transit service along Blackjack Road.
- **West Starkville**: The area between MS 182 and Reed Road is anticipated to transition from mostly undeveloped to a mix of commercial and residential uses, similar to the area immediately to its south. This already developed southern area, especially around Stark Road, is also expected to add more jobs.
- **New Northern Industrial Park:** There is a major industrial park planned just north of Starkville, off N. Jackson Street, that could generate significant demand for transit service.

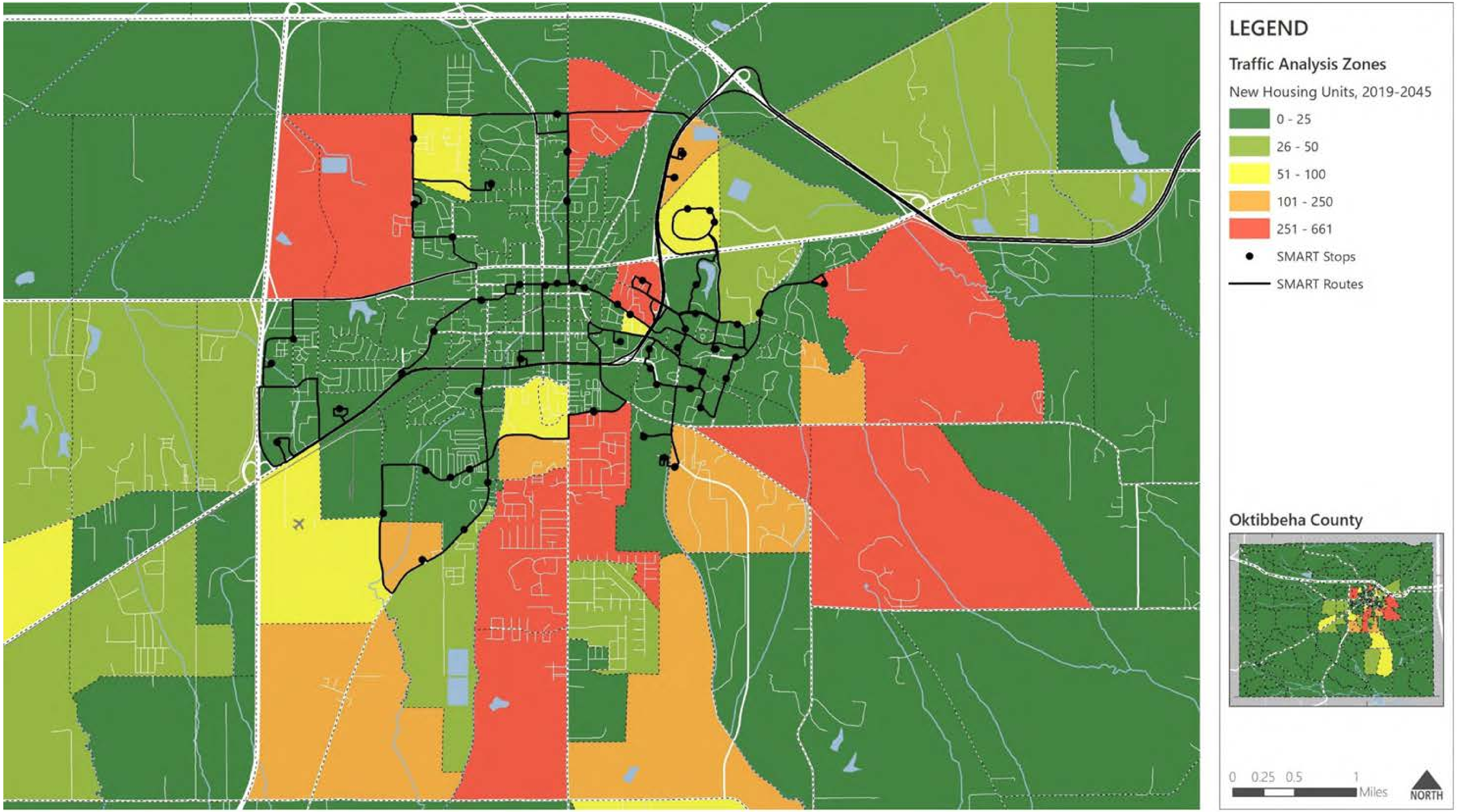
Figure 4.2.6.1 Regional Transit Demand Analysis



Data Source: Neel-Schaffer

Disclaimer: This map is for planning purposes only.

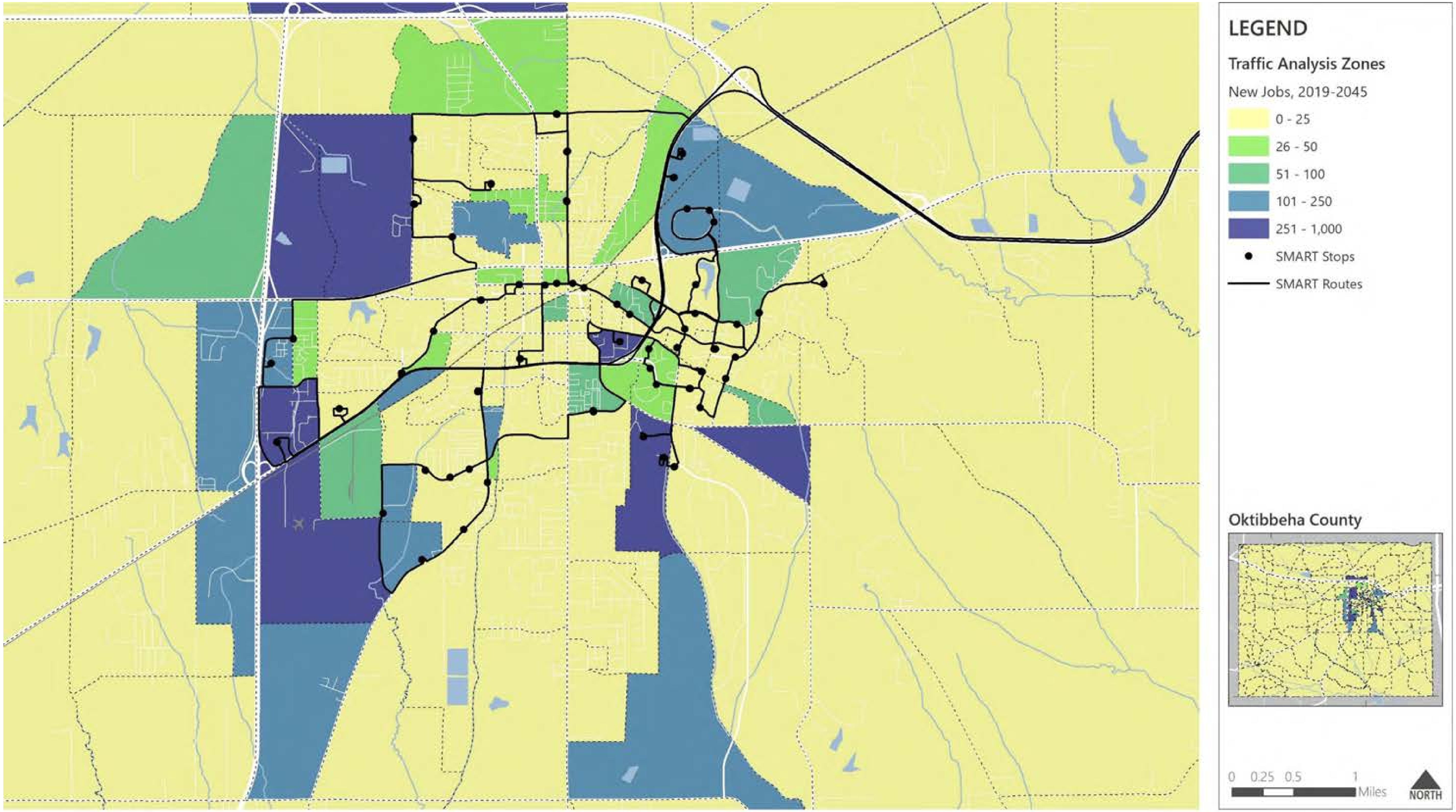
Figure 4.2.6.2 Housing Unit Growth, 2019-2045



Data Source: Neel-Schaffer

Disclaimer: This map is for planning purposes only.

Figure 4.2.6.3 Employment Growth, 2019-2045



Data Source: Neel-Schaffer

Disclaimer: This map is for planning purposes only.

4.2.6.3 Span of Service

Beyond expanding service to new areas, it is important to consider if service should be expanded to new times of day or days of the week. Currently, SMART does not operate after 8:00 PM and does not operate at all on Sundays.

Providing a span of service that is useful for evening shift workers and other late-night trips is a challenge for most transit systems. These times are less productive than peak or midday times, but they can be critical to meeting the needs of the community.

Table 4.2.6.2 compares SMART's span of service to the peer systems identified in Section 4.2. It looks at daytime service (7:00 AM to 8:00 PM), later evening service (8:00 PM to 11:00 PM) and owl service (11:00 PM to 3:00 AM). If a system provided service within most of these timeframes, a yes was assigned.

What this table shows is that SMART provides the shortest span of service and is the only system besides OUT that does not provide any Sunday service. It is important to note that no system provides later evening and owl service for all routes. Rather, the routes with the highest demand for late night travel receive this service. These are typically areas with lots of late-night activities like restaurants, bars, nightlife, and entertainment and areas with low-income or student housing.

Table 4.2.6.2 Span of Service Peer Comparison

Transit System	**Weekdays**			**Saturdays**			**Sundays**		
	Daytime	**Later Evening**	**Owl**	**Daytime**	**Later Evening**	**Owl**	**Daytime**	**Later Evening**	**Owl**
AppalCart *Boone, NC*	Yes	Yes	Thu/Fri	Yes	Yes	Yes	Yes	Yes	No
HDPT *Harrisonburg, VA*	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
MLTA/PRT *Morgantown, WV*	Yes	Yes	Thu/Fri	Yes	Yes	Yes	Yes	Yes	No
OUT *Oxford, MS*	Yes	Yes	No	Yes	Yes	No	No	No	No
SMART ***Starkville, MS***	**Yes**	**No**	**No**	**Yes**	**No**	**No**	**No**	**No**	**No**

4.2.6.4 Summary of Service Expansion Needs

There are many needs for service expansion in the Starkville area, mostly within or near the City of Starkville and MSU campus. Based on the service expansion analysis, the following high-level needs emerge:

- **Address Existing Service Gaps**: There are several gaps that were identified that would likely increase ridership and the usefulness of the SMART system if they were served with a bus stop. In no particular order, these gaps include:
  - Links and Lakeside off Hwy 12
  - Louisville Street and Leigh Lane
  - Louisville Street and W Wood Street
  - S. Montgomery Street and MS 12 Area
  - N. Jackson Street and Womack Road
  - 21 and Helix Apartments
  - Campus Trails and the Social Campus Apartments
  - Aspen Heights
  - Highlands Plantation
- **Plan for Future Growth**: Starkville and the surrounding area are growing faster than the state average and there will be new areas that warrant new bus stops and/or routes. SMART should monitor growth in the following areas and consider expanding service as appropriate:
  - The Mill/Cotton District/College View
  - Blackjack Road
  - West Starkville
  - New Northern Industrial Park
- **Consider Expanding the Span of Service**: SMART should consider expanding its span of service on some routes to better serve late night workers and late-night travel in general. Sunday service should also be considered. These types of day and week are the least productive but may be necessary to meet the community's needs for transit, especially for people with limited access to a vehicle.

4.2.7 Recommendations

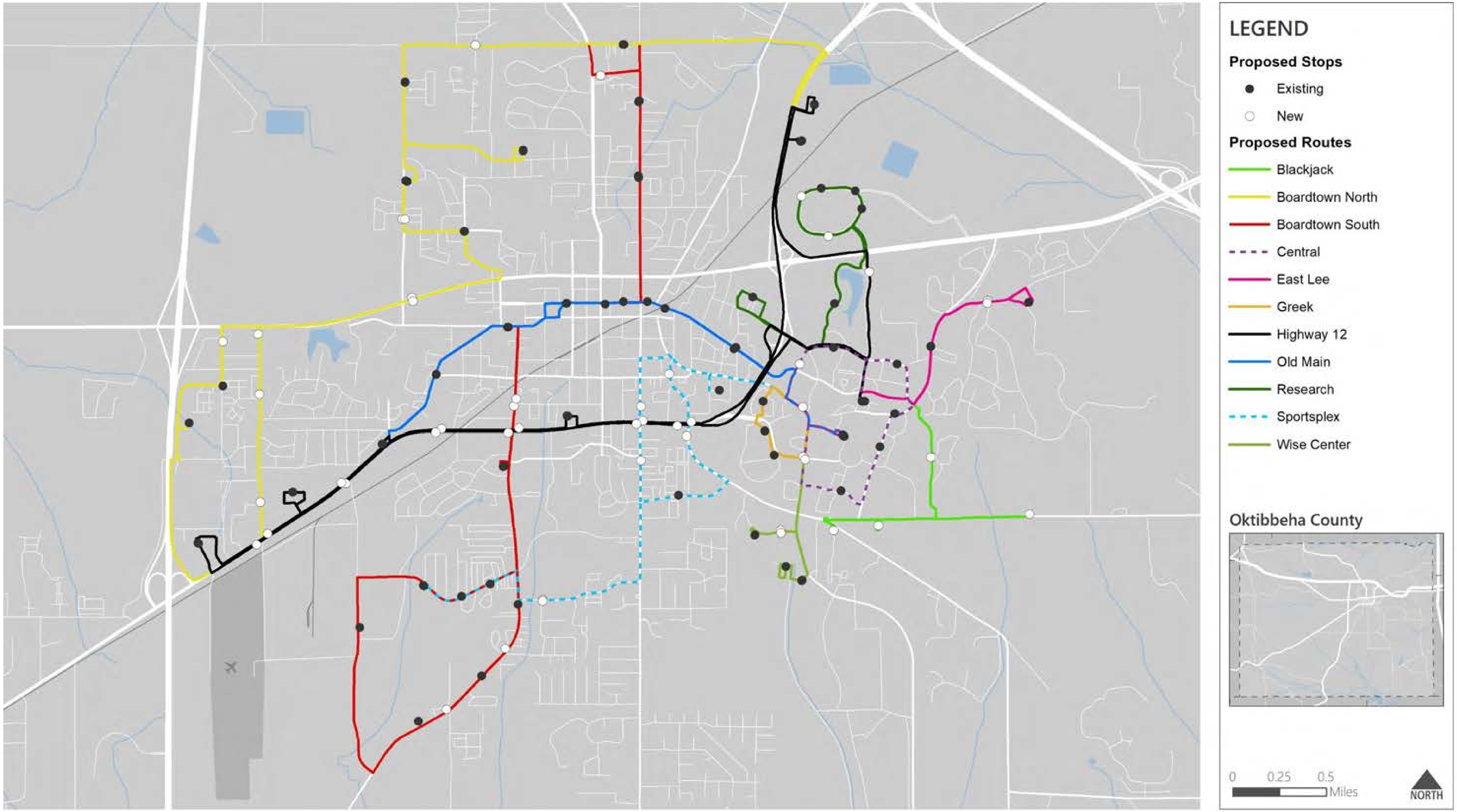
4.2.7.1 Strategies and Projects

This plan recommends a variety of changes and improvements to the local public transit system and associated infrastructure over the next 25 years. The recommendations are based on the needs analysis and stakeholder input. Recommendations include the following:

- **Explore extending the span of service (hours of operation)**
    - Description: Consider extending Saturday service for all routes, offering limited transit service for late evenings (up to 11:00PM), and/or offering limited "owl" service (11:00PM to 3:00AM) on Friday and Saturday nights.
    - Routes Impacted: To Be Determined.
    - Cost Impact: Varies depending on implementation.
    - Timeframe: Short-term and/or long-term.
- **Explore implementing Traffic Signal Priority (TSP) at key intersections**
    - Description: Transit Signal Priority (TSP) tools modify traffic signal timing or phasing when transit vehicles are present. TSP can be a powerful tool to improve both reliability and travel time on corridors with long signal delays and distances between signals.
    - Location: Highway 12 and other locations with transit service and frequent congestion.
    - Cost Impact: $10,000 to $50,000 per intersection for installation plus maintenance.
    - Timeframe: Long-term.
- **Modify routes for planned on-campus street closures**
    - Description: Mississippi State University is planning to close some on-campus streets to automobile traffic, including transit vehicles. This will impact the alignments and stop locations of some routes but is not anticipated to have a major impact.
    - Routes Impacted: Central, Greek, Old Main, Wise Center.
    - Cost Impact: Cost-neutral.
    - Timeframe: Short-term.
- **Modify existing routes to serve more areas**
    - Description: There are many opportunities to serve more people and destinations by adding stops to the existing routes. Some of these will require slight route modifications while others will simply involve adding a stop. **Figure 4.2.7.1** shows the proposed new stops.
    - Routes Impacted: All.
    - Cost Impact: Cost-neutral.
    - Timeframe: Short-term.

- **Add Blackjack Road area route**
  - Description: Add a new route serving the apartments immediately south and east of campus. This route is assumed to operate with 30-minute frequencies from Monday through Friday. A conceptual route can be seen in **Figure 4.2.7.1** but the final route will be refined and is subject to change depending on coordination with the private housing providers. Furthermore, depending on the timing of this project, the extension of Bulldog Way from Blackjack Rd to Oktoc Rd may allow for more efficient routing.
  - Routes Impacted: New Blackjack route established.
  - Cost Impact: Approximately $125,000 in annual operating costs (assumes $45/hour operating costs based on data from National Transit Database).
  - Timeframe: Long-term.
- **Implement bike/ped projects near key stops**
  - Description: Many of the existing and proposed stops would be better served with enhanced bicycle and pedestrian infrastructure. These improvements have already been identified in the bicycle and pedestrian recommendations.
  - Routes Impacted: All.
  - Cost Impact: Varies based on project (see bike/ped recommendations).
  - Timeframe: Varies based on project (see bike/ped recommendations).

Figure 4.2.7.1 Recommended Fixed Route Transit Network



Data Source: Neel-Schaffer

Disclaimer: This map is for planning purposes only.

5.0 Roadway Needs Evaluation and Identification

This section summarizes and provides recommendations for the existing transportation facilities analyzed as part of the transportation plan for Starkville, Mississippi State University, and Oktibbeha County. Determined by stakeholder input and existing data, these recommendations include improvements to intersections, congested corridors, and new routes to improve network connectivity. This section presents the evaluation of multiple intersections and corridors that have been isolated into individual subsections related to specific areas, corridors, or intersections.

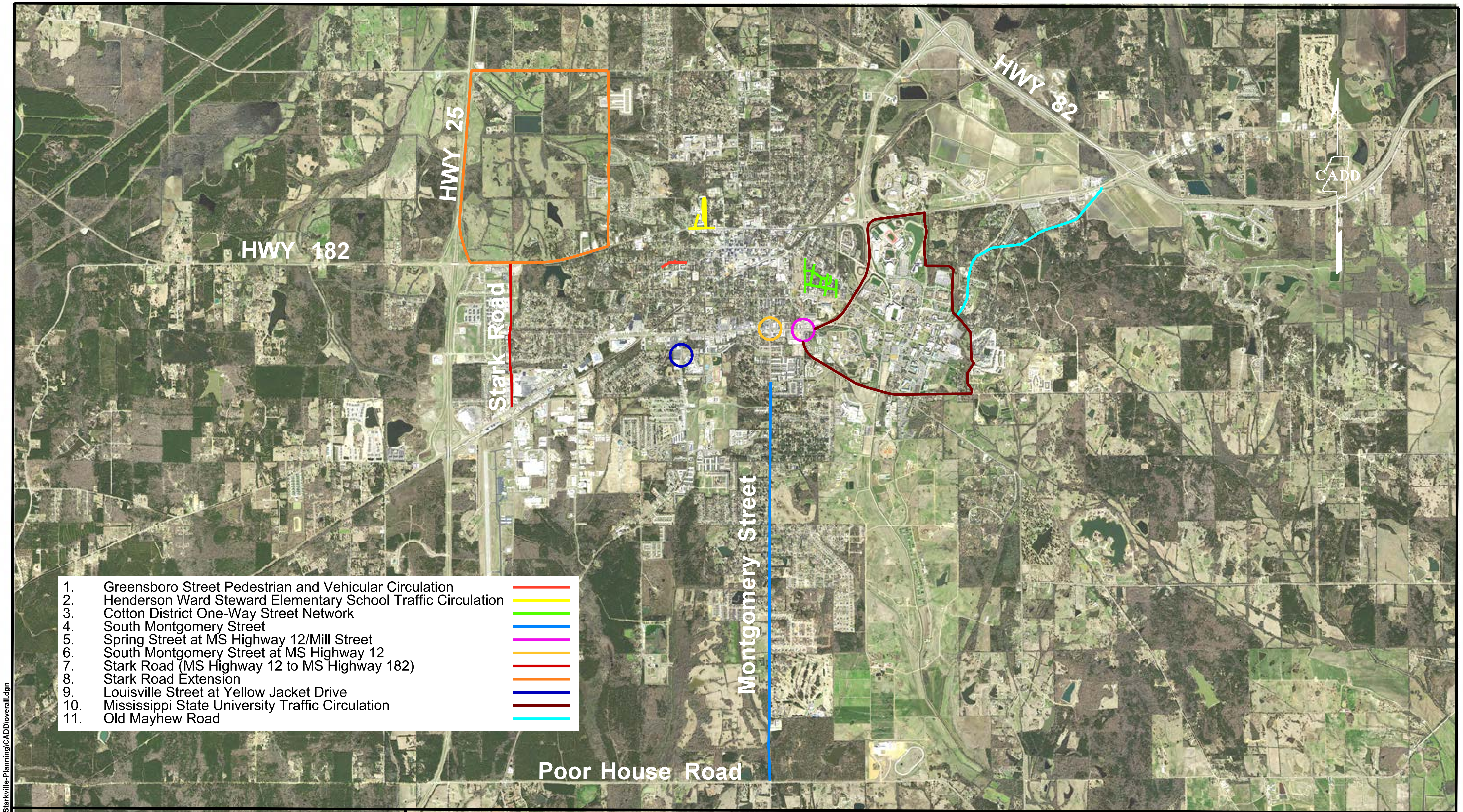
5.1 Deficiency Identification

5.1.1 Stakeholder Identified Deficiencies

Stakeholder input was received through meetings and conversations to identify areas of concern.

- City of Starkville
  - Greensboro Street pedestrian and vehicular circulation issues near Ernest Jones Jr. Drive
  - Henderson Ward Steward Elementary School circulation issues
  - Cotton District Street system and traffic flow
  - Congestion and capacity issues along South Montgomery Street
  - Issues with Spring Street at both Highway 12 and Mill Street
  - Issues with South Montgomery Street at Highway 12
  - Congestion issues along Stark Road
  - Future extension of Stark Road
  - Issues with Louisville Street at Yellow Jacket Drive
- Mississippi State University
  - Transitioning the core of campus away from vehicular traffic to mitigate major pedestrian conflicts
    - Planned transition of B.S. Hood Road to pedestrian/transit only
    - Planned transition of President's Circle to pedestrian/transit only
    - Planned transition of Hardy Road north of Morrill Road to pedestrian/transit only
  - Constructing a new roadway, Bulldog Way, from Bailey Howell Drive to Blackjack Road
  - Constructing a new roadway from Bost Extension Drive to Bailey Howell Drive
  - Replacing existing intersections on campus with roundabouts (specifically along Stone Boulevard and the intersection of George Perry Street and Bailey Howell Drive)
  - Increasing access to the north by replacing interchanges with at grade intersections
  - Congested conditions along Blackjack Road, Stone Boulevard, and Hardy Road
- Oktibbeha County
  - Improvements along Old Mayhew Road

A map of these locations are provided in **Figure 5.1.1.1**.



NEEL-SCHAFFER
Solutions you can build upon

STAKEHOLDER IDENTIFIED DEFICIENT LOCATIONS

Figure 5.1.1.1

S:\Projects\14995.001-Starkville-Planning\CADD\overall.dgn

5.1.2 Existing LOS Analysis

In addition to these areas from the stakeholders, a capacity and level-of-service (LOS) analysis was performed on the intersections where turning movement counts were provided to determine where other deficiencies may exist. Level-of-service is evaluated based on the average vehicular delay during the peak hour periods which is directly related to the turning movement counts, traffic composition, and roadway geometrics at the individual study locations. For this analysis, the methodology used is based on the Highway Capacity Manual 6th Edition (HCM). The level-of-service, as outlined in the HCM, is reported as a letter designation of LOS A (least delay) through LOS F (most delay) as shown in

Table 5.1.2.1. LOS E and LOS F are considered unacceptable for the purposes of this analysis. The results of this analysis are shown in **Table 5.1.2.2** to **Table 5.1.2.4**.

Table 5.1.2.1 HCM 6 Level-Of-Service

Signalized Intersections		
	LOS by Volume-to-Capacity Ratio	
Control Delay (s / veh)	**≤ 1.0**	**> 1.0**
≤ 10	A	F
> 10 - 20	B	F
> 20 – 35	C	F
> 35 – 55	D	F
> 55 – 80	E	F
> 80	F	F
Unsignalized Intersections		
	LOS by Volume-to-Capacity Ratio	
Control Delay (s / veh)	**≤ 1.0**	**> 1.0**
0 – 10	A	F
> 10 – 15	B	F
> 15 – 25	C	F
> 25 – 35	D	F
> 35 – 50	E	F
> 50	F	F

Table 5.1.2.2 Existing Traffic Levels-of-Service – Signalized Intersections

Signalized Intersections	Time Period	Approach LOS				Intersection LOS
		EB	WB	NB	SB	
Louisville St @ Yellowjacket Dr	AM Peak	D	C	B	A	B
	PM Peak	D	C	B	B	B
Louisville St @ Lynn Ln	AM Peak	C	C	B	B	C
	PM Peak	D	C	B	C	C
Louisville St @ Academy Rd	AM Peak	-	C	A	A	B
	PM Peak	-	D	A	A	B
S Montgomery St @ Lynn Ln	AM Peak	B	-	A	A	B
	PM Peak	C	-	A	B	B
S Montgomery St @ Locksley Way	AM Peak	D	C	B	A	B
	PM Peak	D	C	B	B	C
Louisville St @ Highway 12	AM Peak	B	B	C	C	B
	PM Peak	C	C	C	D	C
Louisville St @ Scales St	AM Peak	C	C	A	A	B
	PM Peak	C	C	A	A	B
S Montgomery St @ Gillespie St	AM Peak	C	C	A	A	B
	PM Peak	C	C	A	A	B
Highway 12 @ Hwy 25 SB Ramps	AM Peak	A	A	-	B	A
	PM Peak	A	A	-	B	A
S Montgomery @ University Dr	AM Peak	C	C	A	A	B
	PM Peak	D	C	B	B	C
E Lee Blvd @ Highway 182	AM Peak	C	-	B	A	B
	PM Peak	C	-	B	A	B

Source: Neel-Schaffer, 2021, HCM 6th Edition.

Table 5.1.2.3 Existing Traffic Levels-of-Service – Unsignalized Intersections

Unsignalized Intersections (All-Way Stop)	**Time Period**	**Critical Movement Level of Service**											
		Eastbound			**Westbound**			**Northbound**			**Southbound**		
		Lt	**Th**	**Rt**	**Lt**	**Th**	**Rt**	**Lt**	**Th**	**Rt**	**Lt**	**Th**	**Rt**
B.S. Hood Dr @	AM Peak	A	A	A	A	A	A	A	A	A	A	A	A
College View St	PM Peak	B	B	B	B	B	B	A	B	B	A	B	B
Hardy Rd @	AM Peak	A	A	A	A	A	A	A	A	A	A	A	A
President's Circle	PM Peak	B	B	A	B	B	B	B	B	A	C	C	C
Magruder St @	AM Peak	-	A	A	A	A	-	-	-	-	A	-	A
President's Circle	PM Peak	-	A	A	A	A	-	-	-	-	A	-	A
Maxwell St @	AM Peak	-	A	A	A	A	-	-	-	-	-	-	-
University Dr	PM Peak	-	A	A	A	A	-	-	-	-	-	-	-
S Montgomery St @	AM Peak	B	B	A	B	B	A	B	B	B	B	B	B
Lampkin St	PM Peak	B	B	B	B	B	B	B	C	C	B	C	C
Unsignalized Intersections (Two-Way Stop)*	**Time Period**	**Critical Movement Level of Service**											
		Eastbound			**Westbound**			**Northbound**			**Southbound**		
		Lt	**Th**	**Rt**	**Lt**	**Th**	**Rt**	**Lt**	**Th**	**Rt**	**Lt**	**Th**	**Rt**
Oktoc Rd @	AM Peak	-	-	-	A	A	-	C	-	B	-	-	-
21 Apartment Drwy	PM Peak	-	-	-	A	A	-	C	-	B	-	-	-
Russell St @	AM Peak	A	-	-	A	-	-	B	A	A	B	B	B
Gillespie St	PM Peak	A	-	-	A	-	-	C	B	B	C	C	C
Russel St @	AM Peak	A	-	-	A	-	-	B	-	A	-	-	-
Mill St	PM Peak	A	-	-	A	-	-	B	-	A	-	-	-
Russel St @	AM Peak	A	-	-	-	-	-	-	-	-	A	-	A
Colonel Muldrow Ave	PM Peak	A	-	-	-	-	-	-	-	-	B	-	B
University Dr @	AM Peak	-	-	-	-	-	-	A	-	A	-	-	-
Colonel Muldrow Ave	PM Peak	-	-	-	-	-	-	B	-	B	-	-	-
Stone Blvd @	AM Peak	-	-	-	C	-	A	-	-	-	A	-	-
B.S. Hood Dr	PM Peak	-	-	-	**E**	-	B	-	-	-	A	-	-
Blackjack Rd @	AM Peak	A	A	-	-	-	-	-	-	-	A	-	A
Bardwell Rd	PM Peak	A	A	-	-	-	-	-	-	-	A	-	A
Lee Blvd @	AM Peak	-	-	-	A	A	-	-	-	A	-	-	-
Hardy Rd West Int	PM Peak	-	-	-	A	A	-	-	-	B	-	-	-
Lee Blvd @	AM Peak	-	-	-	-	-	-	A	-	-	-	-	-
Hardy Rd East Int	PM Peak	-	-	-	-	-	-	A	-	-	-	-	-
Lee Blvd @	AM Peak	-	-	A	-	-	-	A	A	A	-	-	-
Hardy Rd South Int	PM Peak	-	-	B	-	-	-	A	A	A	-	-	-
Blackjack Rd @	AM Peak	A	A	-	-	-	-	-	-	-	A	-	A
Aspen Heights W Drwy	PM Peak	A	A	-	-	-	-	-	-	-	B	-	B
Reed Rd @	AM Peak	-	-	-	B	-	A	-	-	-	A	A	-
Hospital Rd	PM Peak	-	-	-	B	-	A	-	-	-	A	A	-
S Montgomery @	AM Peak	-	-	-	B	-	B	-	-	-	A	A	-
Sherwood Rd	PM Peak	-	-	-	B	-	B	-	-	-	A	A	-
Highway 182 @	AM Peak	-	-	-	A	-	-	B	-	B	-	-	-
Hebert St	PM Peak	-	-	-	A	-	-	B	-	B	-	-	-
University Dr @	AM Peak	A	-	-	-	-	-	-	-	-	A	-	A
N Nash St	PM Peak	A	-	-	-	-	-	-	-	-	B	-	B

*Major @ Minor; Source: Neel-Schaffer, 2021, HCM 6th Edition.

Table 5.1.2.4 Existing Traffic Levels-of-Service – Unsignalized Intersections (Cont.)

Unsignalized Intersections (Two-Way Stop)*	Time Period	Critical Movement Level of Service											
		Eastbound			Westbound			Northbound			Southbound		
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt
Colonel Muldrow Ave @ Lummus Dr	AM Peak	-	-	-	-	-	-	-	-	-	-	-	-
	PM Peak	-	-	-	-	-	-	-	-	-	-	-	-
Russel St @ Maxwell St	AM Peak	A	-	-	-	-	-	-	-	-	B	-	B
	PM Peak	A	-	-	-	-	-	-	-	-	B	-	B
Maxwell St @ Lummus Dr	AM Peak	-	A	A	A	A	-	A	-	-	A	A	-
	PM Peak	-	A	A	A	A	-	A	-	-	A	A	-
Lummus Dr @ Planters Row	AM Peak	-	-	-	-	-	-	A	-	A	-	-	-
	PM Peak	-	-	-	-	-	-	A	-	A	-	-	-
University Dr @ Page Ave	AM Peak	A	A	-	A	A	-	A	A	A	A	A	A
	PM Peak	A	A	-	A	A	-	B	B	B	B	B	B
Highway 82 @ Highway 182	AM Peak	A	-	-	A	-	-	C	-	C	-	-	-
	PM Peak	A	-	-	A	-	-	B	-	B	-	-	-
Highway 25 @ Old Highway 25	AM Peak	-	-	-	B	-	B	A	-	-	A	-	-
	PM Peak	-	-	-	B	-	B	A	-	-	A	-	-
Highway 25 @ Abernathy Dr	AM Peak	**E**	**E**	**E**	B	B	B	A	-	-	A	-	-
	PM Peak	**E**	**E**	**E**	C	C	C	A	-	-	A	-	-
Abernathy Dr @ Eudora Welty Dr	AM Peak	A	A	-	A	A	-	A	A	A	A	A	A
	PM Peak	A	A	-	A	A	-	A	A	A	A	A	A
Highway 182 @ Highway 25 SB Ramps	AM Peak	-	-	-	A	-	-	-	-	-	A	A	A
	PM Peak	-	-	-	A	-	-	-	-	-	A	A	A
Highway 182 @ Highway 25 NB Ramps	AM Peak	A	-	-	-	-	-	B	B	B	-	-	-
	PM Peak	A	-	-	-	-	-	A	A	A	-	-	-
Industrial Park Rd @ Lynn Ln	AM Peak	C	C	C	C	C	A	A	-	-	A	-	-
	PM Peak	**E**	**E**	**E**	D	D	B	A	-	-	A	-	-

*Major @ Minor; Source: Neel-Schaffer, 2021, HCM 6th Edition.

The capacity analyses show that all intersections are operating at acceptable levels with existing traffic (2019) except the westbound left from B.S. Hood Drive at Stone Boulevard, the eastbound approach of Lynn Lane at Industrial Park Rd in the PM peak hour, and the eastbound approach of Abernathy Drive at Highway 25 is operating at an LOS E in both the AM and PM peak hours.

B.S. Hood Drive is expected to be closed to through traffic in the near future as per stakeholder input and is thus not added to the list of deficient locations.

The two-way stop control intersection of Lynn Lane at Industrial Park Rd has a low volume eastbound approach, and side street delays are common for two-way stop-controlled intersections. The hourly volumes were compared against the traffic signal warrant volumes provided in the Manual on Uniform Traffic Control Devices (2009 Edition) with the results shown in **Table 5.1.2.5**. The intersection fails to meet either Warrant 1, 8-hour volume, or Warrant 2, 4-hour volume; therefore, this intersection was not added to the list of deficient locations.

Table 5.1.2.5 Lynn Lane at Industrial Park Rd MUTCD Warrants 2020 Volumes

Hour	Major Volume	Max Minor Volume	Meets Warrant 1A (8hr)	Meets Warrant 1B (8hr)	Meets Warrant 2 (4hr)
7-8	454	210	--	--	--
8-9	332	159	--	--	--
9-10	282	178	--	--	--
10-11	331	184	--	--	--
11-12	376	203	--	--	--
12-1	465	270	--	--	--
1-2	400	237	--	--	--
2-3	479	259	--	--	--
3-4	485	314	--	--	--
4-5	614	288	X	--	X
5-6	521	288	--	--	--
6-7	416	233	--	--	--
			Fail (1 of 8)	**Fail (0 of 8)**	**Fail (1 of 4)**

Abernathy Drive at Highway 25 was also not added to the list of study locations as it also did not meet either of the traffic signal warrants shown in **Table 5.1.2.6** and a review of the location along with field observations revealed that the eastbound approach of Abernathy Drive serves primarily as cut-through road with the only existing traffic generator being Pinelake Church. Drivers desiring to travel northbound on Highway 25 from the west take Carter Boulevard to Abernathy Drive to avoid the three signalized intersections along Highway 12 (Old Highway 12, Highway 25 southbound ramps, and Highway 25 northbound ramps). This left-turn movement makes up 95% of the AM peak and 83% of the PM peak volumes of the eastbound approach at Abernathy Drive and Highway 25, and there are no right turn movements during either peak period. As this intersection gets congested, it is expected the volume will decrease as more drivers will choose the signalized route.

Table 5.1.2.6 Highway 25 at Abernathy Dr MUTCD Warrants 2020 Volumes

Hour	Major Volume	Max Minor Volume	Meets Warrant 1A (8hr) – 70%*	Meets Warrant 1B (8hr) – 70%*	Meets Warrant 2 (4hr) – 70%*
7-8	967	130	X	X	X
8-9	736	88	--	X	--
9-10	604	49	--	--	--
10-11	658	46	--	--	--
11-12	675	47	--	--	--
12-1	809	47	--	--	--
1-2	829	72	--	X	--
2-3	896	67	--	X	X
3-4	944	51	--	--	--
4-5	1061	48	--	--	--
5-6	1086	46	--	--	--
6-7	796	61	--	X	--
			Fail (1 of 8)	**Fail (5 of 8)**	**Fail (2 of 4)**

*As per the 2009 MUTCD, 70% warrants may be used when the major-street speed exceeds 40mph

From this analysis, considering the additional information for those areas with deficiencies above, no additional locations were added to the list of study locations for study in this report. The capacity analyses sheets are provided in the appendix.

5.1.3 Growth Rate Determination

A future analysis was performed to determine if any future deficiencies should be expected or could be mitigated prior to their development. For this, a growth rate needed to be developed to apply to the base year traffic to estimate a future (2045) traffic volume. The area travel demand model presented in section 3 of this report was utilized for this purpose. The model was run for 2019 to establish an existing model run which was compared to the 2045 model run to establish the growth rate. The model results are provided in the appendix. A summary of select model locations is shown in **Table 5.1.3.1** as a sample of the model results. In addition, **Table 5.1.3.2** shows the recent historical population growth of Starkville as per the American Community Survey and **Table 5.1.3.3** shows the recent historical growth of Mississippi State University as per the MSU Office of Institutional Research and Effectiveness. From all this information, a singular annual growth rate of 1% is assumed to develop 2045 future traffic volumes from the existing counts for all locations.

Table 5.1.3.1 Sample Location Growth Rate Summary

Location	Average Annual Growth Rate
Blackjack Road	1.3%
Spring Street	1.4%
Bully Boulevard	0.1%
Russel Street	0.9%
College View Street	1.6%
Stone Boulevard	0.8%
Highway 12	0.8%
Locksley Way	2.1%
South Montgomery Street	1.4%
Stark Road	0.7%
Highway 182	1.2%
Garrard Road	2.0%
Highway 25	2.7%
Louisville Street	1.0%

Table 5.1.3.2 Starkville Growth Rate

Date	Population	Annual Growth Rate
07/01/2019	25653	0.8%
04/01/2010	23874	

Table 5.1.3.3 Mississippi State University Growth Rate

Semester	Total Students	Total Employees	Total	Annual Growth Rate
Fall 2015	20429	4921	25350	1.5%
Fall 2020	22272	5104	27376	

5.1.4 2045 No Build LOS Analysis

A capacity and level-of-service analysis was performed on the same intersections for the 2045 volumes. The results of this analysis are shown in **Table 5.1.4.1** to **Table 5.1.4.3**.

Table 5.1.4.1 2045 No Build Traffic Levels-of-Service – Signalized Intersections

Signalized Intersections	Time Period	Approach LOS				Intersection LOS
		EB	WB	NB	SB	
Louisville St @ Yellowjacket Dr	AM Peak	D	C	C	A	B
	PM Peak	D	C	C	B	C
Louisville St @ Lynn Ln	AM Peak	D	C	C	C	C
	PM Peak	D	C	C	C	C
Louisville St @ Academy Rd	AM Peak	-	D	A	A	B
	PM Peak	-	D	A	A	B
S Montgomery St @ Lynn Ln	AM Peak	D	-	B	B	C
	PM Peak	D	-	A	C	B
S Montgomery St @ Locksley Way	AM Peak	D	D	C	A	C
	PM Peak	D	D	C	C	C
Louisville St @ Highway 12	AM Peak	C	B	C	D	C
	PM Peak	D	C	D	**E**	D
Louisville St @ Scales St	AM Peak	C	C	A	A	B
	PM Peak	C	C	A	A	B
S Montgomery St @ Gillespie St	AM Peak	C	C	A	A	B
	PM Peak	D	C	A	A	B
Highway 12 @ Hwy 25 SB Ramps	AM Peak	A	A	-	B	A
	PM Peak	A	A	-	B	A
S Montgomery @ University Dr	AM Peak	C	C	A	B	B
	PM Peak	D	D	B	C	C
E Lee Blvd @ Highway 182	AM Peak	C	-	B	A	B
	PM Peak	C	-	B	B	B

Source: Neel-Schaffer, 2021, HCM 6th Edition.

Table 5.1.4.2 2045 No Build Traffic Levels-of-Service – Unsignalized Intersections

Unsignalized Intersections (All-Way Stop)	Time Period	Critical Movement Level of Service											
		Eastbound			Westbound			Northbound			Southbound		
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt
B.S. Hood Dr @	AM Peak	B	B	B	A	A	A	A	A	A	A	A	A
College View St	PM Peak	C	C	C	B	B	B	B	C	C	B	C	C
Hardy Rd @	AM Peak	A	A	A	A	A	A	B	B	A	B	B	B
President's Circle	PM Peak	C	C	B	C	C	C	D	D	A	**F**	**F**	**F**
Magruder St @	AM Peak	-	A	A	A	A	-	-	-	-	A	-	A
President's Circle	PM Peak	-	B	B	B	B	-	-	-	-	B	-	B
Maxwell St @	AM Peak	-	A	A	A	A	-	-	-	-	-	-	-
University Dr	PM Peak	-	A	A	A	A	-	-	-	-	-	-	-
S Montgomery St @	AM Peak	B	B	B	B	B	B	B	C	C	B	C	C
Lampkin St	PM Peak	C	C	B	B	C	C	B	D	D	B	**F**	**F**
Unsignalized Intersections (Two-Way Stop)*	**Time Period**	**Critical Movement Level of Service**											
		Eastbound			**Westbound**			**Northbound**			**Southbound**		
		Lt	**Th**	**Rt**	**Lt**	**Th**	**Rt**	**Lt**	**Th**	**Rt**	**Lt**	**Th**	**Rt**
Oktoc Rd @	AM Peak	-	-	-	A	A	-	C	-	B	-	-	-
21 Apartment Drwy	PM Peak	-	-	-	A	A	-	**E**	-	B	-	-	-
Russell St @	AM Peak	A	-	-	A	-	-	B	A	A	B	B	B
Gillespie St	PM Peak	A	-	-	A	-	-	D	B	B	D	D	D
Russel St @	AM Peak	A	-	-	A	-	-	B	-	B	-	-	-
Mill St	PM Peak	A	-	-	A	-	-	C	-	B	-	-	-
Russel St @	AM Peak	A	-	-	-	-	-	-	-	-	B	-	B
Colonel Muldrow Ave	PM Peak	A	-	-	-	-	-	-	-	-	C	-	C
University Dr @	AM Peak	-	-	-	-	-	-	A	-	A	-	-	-
Colonel Muldrow Ave	PM Peak	-	-	-	-	-	-	B	-	B	-	-	-
Stone Blvd @	AM Peak	-	-	-	C	-	A	-	-	-	A	-	-
B.S. Hood Dr	PM Peak	-	-	-	**F**	-	C	-	-	-	A	-	-
Blackjack Rd @	AM Peak	A	A	-	-	-	-	-	-	-	A	-	A
Bardwell Rd	PM Peak	A	A	-	-	-	-	-	-	-	A	-	A
Lee Blvd @	AM Peak	-	-	-	A	A	-	-	-	A	-	-	-
Hardy Rd West Int	PM Peak	-	-	-	A	A	-	-	-	B	-	-	-
Lee Blvd @	AM Peak	-	-	-	-	-	-	A	-	-	-	-	-
Hardy Rd East Int	PM Peak	-	-	-	-	-	-	A	-	-	-	-	-
Lee Blvd @	AM Peak	-	-	A	-	-	-	A	A	A	-	-	-
Hardy Rd South Int	PM Peak	-	-	B	-	-	-	A	A	A	-	-	-
Blackjack Rd @	AM Peak	A	A	-	-	-	-	-	-	-	A	-	A
Aspen Heights W Drwy	PM Peak	A	A	-	-	-	-	-	-	-	B	-	B
Reed Rd @	AM Peak	-	-	-	B	-	A	-	-	-	A	A	-
Hospital Rd	PM Peak	-	-	-	B	-	A	-	-	-	A	A	-
S Montgomery @	AM Peak	-	-	-	C	-	C	-	-	-	A	A	-
Sherwood Rd	PM Peak	-	-	-	B	-	B	-	-	-	A	A	-
Highway 182 @	AM Peak	-	-	-	A	-	-	B	-	B	-	-	-
Hebert St	PM Peak	-	-	-	A	-	-	B	-	B	-	-	-
University Dr @	AM Peak	A	-	-	-	-	-	-	-	-	A	-	A
N Nash St	PM Peak	A	-	-	-	-	-	-	-	-	B	-	B

*Major @ Minor; Source: Neel-Schaffer, 2021, HCM 6th Edition.

Table 5.1.4.3 2045 No Build Traffic Levels-of-Service – Unsignalized Intersections (Cont.)

Unsignalized Intersections (Two-Way Stop)*	Time Period	Critical Movement Level of Service											
		Eastbound			Westbound			Northbound			Southbound		
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt
Colonel Muldrow Ave @ Lummus Dr	AM Peak	-	-	-	-	-	-	-	-	-	-	-	-
	PM Peak	-	-	-	-	-	-	-	-	-	-	-	-
Russel St @ Maxwell St	AM Peak	A	-	-	-	-	-	-	-	-	B	-	B
	PM Peak	A	-	-	-	-	-	-	-	-	C	-	C
Maxwell St @ Lummus Dr	AM Peak	-	A	A	A	A	-	A	-	-	A	A	-
	PM Peak	-	A	A	A	A	-	A	-	-	A	A	-
Lummus Dr @ Planters Row	AM Peak	-	-	-	-	-	-	A	-	A	-	-	-
	PM Peak	-	-	-	-	-	-	A	-	A	-	-	-
University Dr @ Page Ave	AM Peak	A	A	-	A	A	-	B	B	B	A	A	A
	PM Peak	A	A	-	A	A	-	C	C	C	C	C	C
Highway 82 @ Highway 182	AM Peak	A	-	-	A	-	-	C	-	C	-	-	-
	PM Peak	A	-	-	A	-	-	C	-	C	-	-	-
Highway 25 @ Old Highway 25	AM Peak	-	-	-	B	-	B	A	-	-	A	-	-
	PM Peak	-	-	-	B	-	B	A	-	-	A	-	-
Highway 25 @ Abernathy Dr	AM Peak	**F**	**F**	**F**	C	C	C	A	-	-	A	-	-
	PM Peak	**F**	**F**	**F**	**E**	**E**	**E**	A	-	-	A	-	-
Abernathy Dr @ Eudora Welty Dr	AM Peak	A	A	-	A	A	-	A	A	A	A	A	A
	PM Peak	A	A	-	A	A	-	A	A	A	A	A	A
Highway 182 @ Highway 25 SB Ramps	AM Peak	-	-	-	A	-	-	-	-	-	A	A	A
	PM Peak	-	-	-	A	-	-	-	-	-	A	A	A
Highway 182 @ Highway 25 NB Ramps	AM Peak	A	-	-	-	-	-	B	B	B	-	-	-
	PM Peak	A	-	-	-	-	-	A	A	A	-	-	-
Industrial Park Rd @ Lynn Ln	AM Peak	**E**	**E**	**E**	D	D	B	A	-	-	A	-	-
	PM Peak	**F**	**F**	**F**	**F**	**F**	B	A	-	-	A	-	-

*Major @ Minor; Source: Neel-Schaffer, 2021, HCM 6th Edition.

The capacity analysis shows that all but six intersections are operating at acceptable levels with future traffic (2045). These five locations are listed below:

- Louisville Street @ Highway 12
  - This intersection with the projected 2045 traffic volumes has the minor southbound approach at LOS E but has no failing movements.
- Hardy Road @ President's Circle
  - The southbound, Hardy Road, and eastbound, President's Circle, approaches at this intersection are expected to be closed to through traffic in the near future as per stakeholder input; therefore, this intersection is not added to the list of study locations for review in this report.
- Stone Boulevard @ B.S. Hood Drive
  - B.S. Hood Drive, as previously mentioned, is expected to be closed to through traffic in the near future as per stakeholder input and is thus not added to the list of study locations for review in this report.

- Highway 25 @ Abernathy Drive
  - The eastbound movement, as previously discussed, is a cut through to avoid three signalized locations for vehicles from the west attempting to travel north on Highway 25. The westbound movement is also low-volume roadway providing unsignalized access to a major highway. While this westbound approach does have more development than the eastbound approach, it is also used to some degree as a cut through to avoid the signalized intersections on Highway 12 and Highway 182. The street network through this area has many access points to Highway 25 and therefore traffic is expected to choose alternate routes as the delay increases; however, . Thus, this intersection is not added to the list of study locations for review in this report.

- South Montgomery Street @ Lampkin Street
  - The south approach of the intersection is deficient and has a failing LOS with the projected 2045 traffic volumes and existing traffic control. This intersection was not added to the locations for review in this report; however, if volumes increase as projected a change in traffic control may be necessary as shown in **Table 5.1.4.4**.

Table 5.1.4.4 South Montgomery Street at Lampkin Street MUTCD Warrants 2020 and 2045 Volumes

Hour	Major Volume		Max Minor Volume		Meets Warrant 1A (8hr)		Meets Warrant 1B (8hr)		Meets Warrant 2 (4hr)	
	2020	2045	2020	2045	2020	2045	2020	2045	2020	2045
7-8	512	656	149	191	--	--	--	--	--	--
8-9	399	512	123	158	--	--	--	--	--	--
9-10	453	581	151	194	--	--	--	--	--	--
10-11	428	549	175	224	--	--	--	--	--	--
11-12	573	735	220	282	--	x	--	--	--	--
12-1	590	756	255	327	--	x	--	--	--	x
1-2	646	829	263	337	x	x	--	--	--	x
2-3	569	729	243	312	--	x	--	--	--	--
3-4	560	718	214	274	--	x	--	--	--	--
4-5	581	745	255	327	--	x	--	--	--	x
5-6	598	767	203	260	--	x	--	--	--	--
6-7	499	640	164	210	--	x	--	--	--	--
					1 of 8	**8 of 8**	**0 of 8**	**0 of 8**	**0 of 4**	**3 of 4**
					Fail	**Pass**	**Fail**	**Fail**	**Fail**	**Fail**

- Industrial Park Road @ Lynn Lane
  - This intersection is overcapacity with the projected 2045 traffic volumes and existing traffic control. This intersection was not added to the locations for review in this report; however, if volumes increase as projected a change in traffic control may be necessary as shown in **Table 5.1.4.5**.

Table 5.1.4.5 Lynn Lane at Industrial Park Rd MUTCD Warrants 2045 Volumes

Hour	Major Volume	Max Minor Volume	Meets Warrant 1A (8hr)	Meets Warrant 1B (8hr)	Meets Warrant 2 (4hr)
7-8	582	269	--	--	--
8-9	426	204	--	--	--
9-10	361	228	--	--	--
10-11	425	236	--	--	--
11-12	482	260	--	--	--
12-1	597	346	--	--	X
1-2	513	304	--	--	--
2-3	614	332	X	--	X
3-4	622	403	X	--	X
4-5	787	369	X	--	X
5-6	668	369	X	--	X
6-7	534	299	--	--	--
			Fail (4 of 8)	**Fail (0 of 8)**	**Pass (5 of 4)**

From this analysis, considering the additional information for those areas with deficiencies above, no additional locations were added to the list of study locations for study in this report. The capacity analyses sheets are provided in the appendix.

5.1.5 Needs Identification and Analysis Summary

No additional study locations were added from the capacity and level-of-service analysis in addition to the ones already noted through the stakeholders' comments. These study locations are listed below and individually addressed in the following section of this document.

- Greensboro Street Pedestrian Circulation
- Henderson Ward Stewart Elementary School Traffic Circulation
- Cotton District One-Way Street Network
- South Montgomery Street (Academy Road to East Poor House Road)
- Spring Street at MS Highway 12/Mill Street
- South Montgomery Street at MS Highway 12
- Stark Road (MS Highway 12 to MS Highway 182)
- Stark Road Extension
- Louisville Street at Yellow Jacket Drive
- George Perry Street at Bailey Howell Drive: Roundabout
- Campus Planning and Circulation
- Old Mayhew Road

5.2 Analysis and Recommendations for Identified Deficiencies

5.2.1 Greensboro Street Pedestrian and Vehicular Circulation

Per the city's request, Neel-Schaffer has conducted a review of the circulation of traffic and pedestrians north of Armstrong Junior High School along Whitfield Street and Greensboro Street. This review is intended to address the pedestrian circulation concerns that were brought to our attention through preliminary meetings, including:

- Pedestrian/bicycle issues along Greensboro Street,
- The intersection of Ernest Jones Jr. Drive and Greensboro Street
- The movement/interaction of pedestrians/vehicles at the Starkville School District administrative building.

5.2.1.1 Existing Conditions

A field visit of the site was conducted to document and observe the existing conditions and traffic patterns in the area. Ernest Jones Jr. Drive is a one-way southbound roadway with a pedestrian/bicycle lane on the west side physically divided by concrete curb stops. The intersection of Ernest Jones Jr. Drive and Greensboro Street had previously been impacted by landscaping along the west shoulder. The landscaping had previously been a solid vegetative wall that impacted intersection visibility, particularly of pedestrians walking along the north sidewalk along Greensboro Street. The landscaping has been trimmed back to alleviate the majority of the sight distance issues.

Above: Looking north along Ernest Jones Jr. Drive, north of Greensboro Street

Above: Looking south on Ernest Jones Jr. Drive, north of Greensboro Street
Below: Looking southwest on Ernest Jones Jr. Drive, north of Greensboro Street at trimmed vegetation

Observations confirmed previous information that the parking lot of the Starkville School District administrative building was being used by parents as a location to pick up students. No traffic control or school personnel were observed directing traffic. A group of ± 80 students walks from the school on Whitfield Street, east along the south side of Greensboro Street to the Admin parking lot.

Above: Looking west along Greensboro Street at School Admin building driveway.
Below: Students in driveway with cars enter/exiting driveway.

As shown below, some students waited along the north and south curbs to be picked up by vehicles on Greensboro Street.

The volume of pedestrians along Greensboro Street overwhelms the pedestrian facilities that exist. The 3.5 ft sidewalk is not wide enough for two people to walk side by side. Students are walking along the striped bike lane adjacent to the travel lanes.

The existing sidewalk along the south side of Whitfield Street and Greensboro Street from McKee Avenue to the Starkville School District administrative building driveway on Greensboro Street is not wide enough to accommodate the pedestrian demand created by the school's release of students. The existing sidewalk is 3.5 ft wide adjacent to a 6" curb, providing a 4 ft concrete walking surface adjacent to the paved roadway surface along Greensboro Street which does not meet general design standards. The Public Right-of-Way Accessibility Guidelines (PROWAG) requires a minimum sidewalk width of 4 ft excluding the curb with all pathways less than 5 ft providing passing areas every 200 ft. The Mississippi Department of Transportation requires a minimum of 5 ft for sidewalks. The areas where the sidewalk intersects three residential driveways do not provide a sidewalk across the driveway which is not compliant with the American with Disabilities Act (ADA) of 1990 2010 standards due to the cross slope and trip hazards present.

Above: Looking west along Greensboro Street at driveway, sidewalk, and paved shoulder.
Below: Looking east along Greensboro Street at School Admin building crosswalk/driveway

5.2.1.2 Recommendations

No significant congestion delays or high vehicle speeds were observed in field observations at along Whitfield Street, Greensboro Street, nor Ernest Jones Jr. Drive. A Level of Service Analysis which is provided in the appendix also did not reveal any vehicular issues. The primary issues observed were related to providing adequate pedestrian accommodations/space, and improved protection for the pedestrian crossings. The vegetation along the north side of Greensboro Street is also recommended to be maintained at Ernest Jones Jr. Drive such that the sight distance at the intersection is not impacted and obscures pedestrians approaching the crosswalk.

The recommended improvements for increased pedestrian safety include:

- A gate is recommended to be installed at the driveway of the Starkville School District administrative building driveway on Greensboro Street. This gate should be closed at 2:30 PM to restrict ingress/egress vehicular traffic across the driveway to remove the conflict potential between automobiles and pedestrians. The parking area would still be accessible from the driveway on Louisville Street.

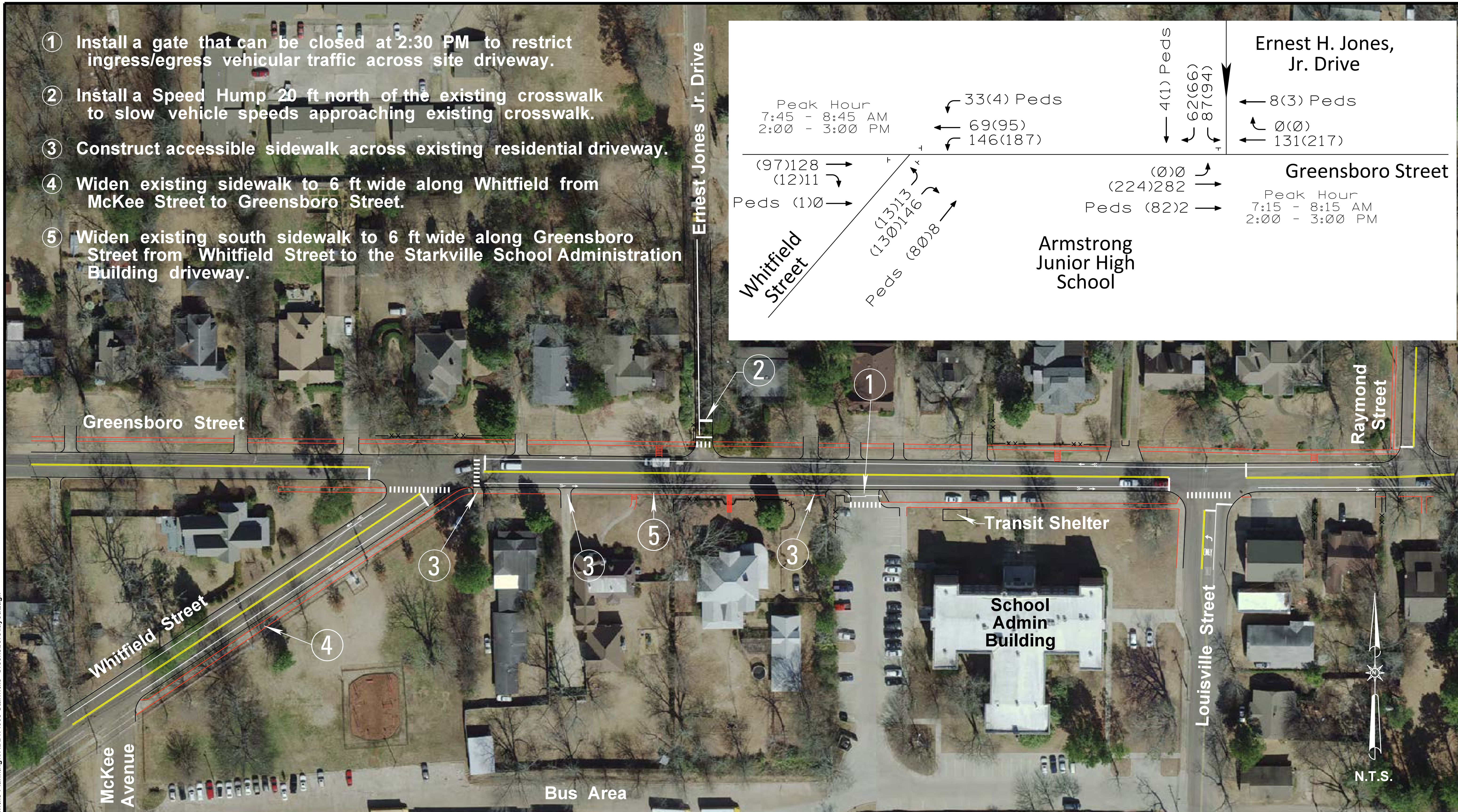
- A speed hump is recommended to be installed approximately 20 ft north of the existing crosswalk on Ernest Jones Jr. Drive at the intersection with Greensboro Street. The speed hump will slow vehicles approaching the crosswalk. Additionally, maintenance of vegetation is recommended to maintain adequate sight distance at the intersection.

- The three existing residential driveways that cross the sidewalk on the south side of Greensboro Street are recommended to be replaced/reconstructed with an accessible sidewalk/driveway that meets ADA standards.

- The existing sidewalk along the south side of Whitfield Street from McKee Avenue to Greensboro Street is recommended to be widened to 6 ft to better accommodate the pedestrian movements/demand when students are dismissed from the school.

- The existing sidewalk along the south side of Greensboro Street from Whitfield Street to the Starkville School District administration building driveway is recommended to be widened to 6 ft to better accommodate the pedestrian movements/demand when students are released from the school.

The recommended improvements are shown graphically in **Figure 5.2.1.1**.



NEEL-SCHAFFER
Solutions you can build upon

GREENSBORO STREET PEDESTRIAN CIRCULATION RECOMMENDATIONS

Figure 5.2.1.1

S:\Projects\14995.001-Starkville-Planning\CADD\14995-Starkville Greensborolayout.dgn

5.2.2 Henderson Ward Stewart Elementary School Traffic Circulation

Per the City's request, Neel-Schaffer conducted a traffic count on MS Highway 182 at the intersection with School Street and Pilcher Street in Starkville, MS. The traffic volumes were recorded on February 4, 2021. The east school access on MS Hwy 182 is signalized but is also using officer control during the AM and PM peak hours of school traffic. Parent pick-up/drop-off occurs on the east side of the school, and buses use the west side of the school. The location of the school, existing traffic volumes and student drop-off areas by grade are shown in **Figure 5.2.2.1**.

Location of Study Intersection Source: Google Maps, Neel-Schaffer, 2021

5.2.2.1 Existing Traffic Circulation

The parent drop-off/pickup occurs primarily along School Street on the east side of the school, although some 4th grade parents drop off on the south side of the School from MS Hwy 182. The northern area of School Street is for 2nd Grade drop off/pick-up, central area for 3rd Grade, and southern area for 4th Grade. The 2nd Grade parents are required to stay in the 3rd/4th grade drop-off/pickup line and not allowed to go down the adjacent parking aisle.

The volume of traffic entering the school along School Street during the AM peak hour was recorded at 379 vehicles per hour (vph), with the majority (66%) making a westbound right turn from MS Hwy 182. The security guard/ police officer took over traffic control at 7:00 AM and placed a "Right turn only" sign in the school driveway, requiring southbound traffic leaving the school to turn right on MS Hwy 182. As a result, many of the southbound right turning vehicles execute U-turns through the private driveways of the businesses on the south side of the Highway. The traffic count reveals a difference of 99 vehicles westbound between School Street and Pilcher Street in the AM peak hour, likely as a result of the U-turn activity. The officer removed the sign at 7:40 AM and stopped his traffic control efforts.

Above: 4 vehicles U-turning through parking lot in background. Officer control (behind sign) and right turn only

The parent traffic queue for the afternoon student pickup extends into MS Highway 182. The existing westbound right turn lane is only ±70 ft. There were 65 vehicles recorded entering the school from 1-1:30 PM, and traffic backed up into MS Highway 182 at 1:32 PM on 2/4/21. The vehicle queue extends into the thru traffic lane at 1:36 PM. Some thru vehicles drive westbound in the eastbound travel lane to bypass the traffic queue. As the queue blocks westbound thru volumes on MS Hwy 182, the queue was observed to extend east to N. Jackson Street, approximately 1,500 lf. The parents started departing the site at 1:41 PM, and thru traffic was not blocked by 1:47. The officer took over traffic control from 1:49-2:06 PM. Congestion along MS Hwy 182 had dissipated by 2:10 PM. The major impact to MS Hwy 182 was observed to last for approximately 11 minutes in the afternoon.

Above: Looking east along MS Hwy 182 at School Street traffic queue for student pick-up by parents.
Below: Westbound MS Hwy 182 traffic crossing double yellow to drive around school queue

Above: Westbound MS Hwy 182 traffic backed up to N. Jackson Street because of school queue

The on-site parent parking demand for afternoon pickup was estimated by totaling the ingress traffic from 12:45 – 2:00 PM, as some parents cannot enter the site to be counted until more space becomes available as people leave. The entering traffic from 12:45-1:00 PM was 24 vehicles and from 1:00-2:00 PM was 177 vehicles, yielding an on-site parking demand of 201 vehicles.

A measurement of the available on-site parking space from the 4th grade pickup area north, in a loop around School Street, back to MS Highway 182 and including the westbound right turn lane on MS Highway 182 includes approximately 2,360 ft, accommodating approximately 95 vehicles (at 25 ft/vehicle).

The traffic count shows that 117 vehicles entered the site from 1:45-2:15 PM. While some of this traffic could be arriving late, the majority is likely in the traffic queue and not able to enter the site until others leave. This volume of traffic entering after school is dismissed is consistent with the calculation of on-site storage of 95 vehicles out of the demand (201) would yield 106 vehicles staged off-site, a difference of 11 vehicles.

5.2.2.2 Recommendations

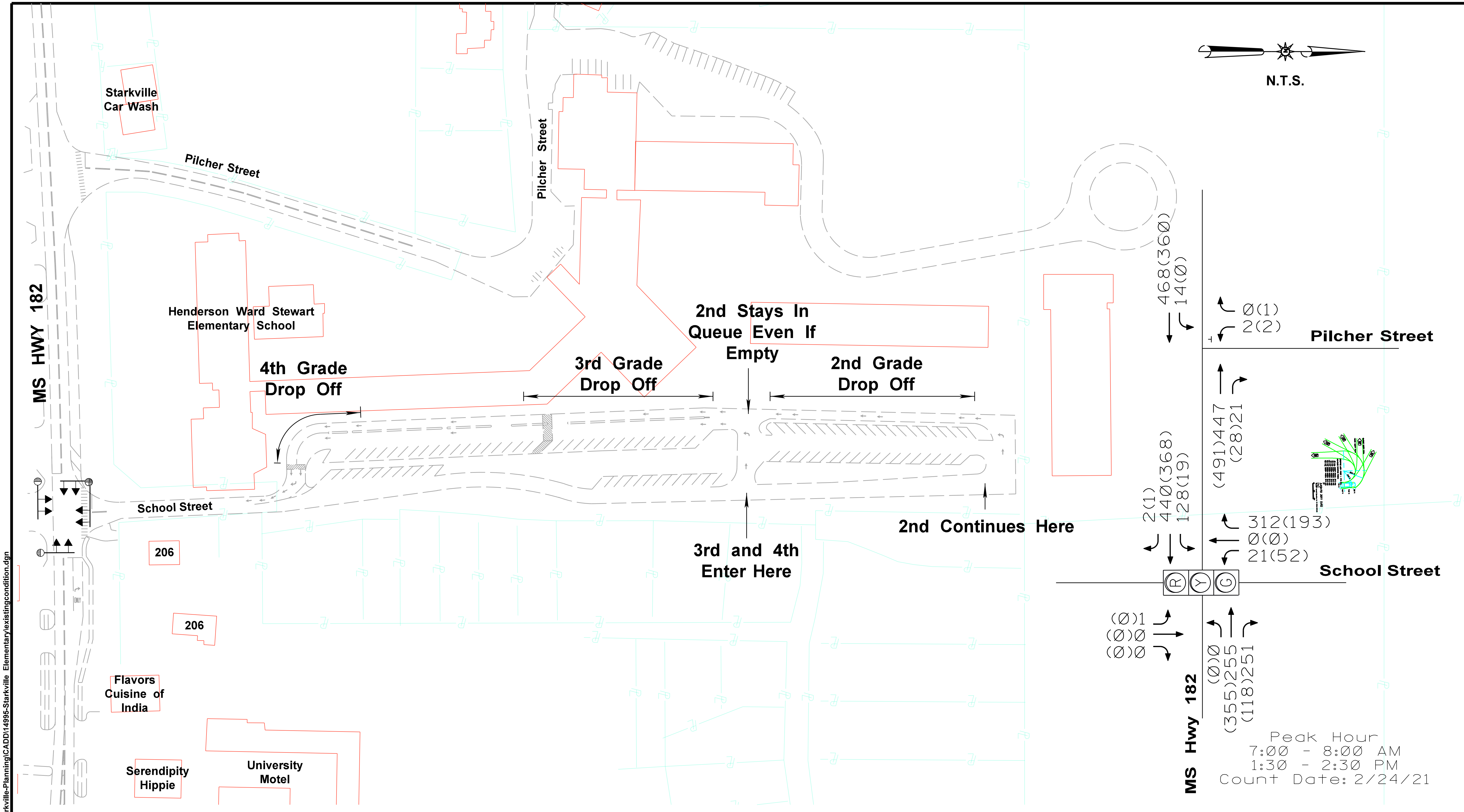
The automobile storage demand on the school property on School Street exceeds the available space on campus. More storage is needed either off-site or on-site. Additional off-site storage could be provided with the extension of the westbound right turn lane at School Street, extending ±600 ft east to Douglas Conner Drive to provide approximately 675 ft of storage (an increase of storage for 24 more cars-off site). However, cars would continue to block MS Highway 182 westbound, unless they staged along Douglas Conner Drive.

Widening MS Highway 182 to provide an eastbound left turn lane is recommended at School Street. The combination of an eastbound left turn lane and split phase north/south, would likely allow the traffic control to function without the southbound right turn lane restriction on exiting traffic. The signal would need to be coordinated with the signal at Douglas Conner Drive, so that the eastbound traffic queue between the signals would not back up in the School Street intersection. The distance between intersections is approximately 700 ft, allowing for 28 vehicles to queue between the intersections.

The in-street traffic control by the officer and southbound *Right Turn Only* restriction in the AM Peak could be improved with some modifications to the existing traffic signal and the use of the manual signal controls by the officer. Reprogramming the controller to provide split phasing for north/south movements, along with protected turn arrows for southbound traffic is recommended. The manual controls could then allow the officer to control the signal and limit the phasing under manual control to southbound, then eastbound left/thru, then east/west traffic. The lack of an eastbound left turn lane complicates the traffic signal control, as a single left turning vehicle with a permissive left turn signal would block all thru eastbound traffic, unless a left turn lane is constructed.

If the existing building along the north end of the campus were to be demolished, an on-site staging area could be constructed with approximate dimension of 450'x95' to accommodate 5 aisles of 20 cars each staging for the afternoon parent pick-up. The existing space plus the proposed additional parking space could accommodate in excess of 200 passenger cars on-site, without blocking thru traffic on MS Highway 182.

The parking aisle through the east campus is not allowed to be used by 2nd grade parents, as they are required to stay in the drop off/pick up line for 3rd/4th grade drop off/pick up. The installation of speed humps along the parking aisles could help to keep vehicle speeds low and alleviate concerns of students/teachers walking across these aisles with the additional traffic. Use of the center aisle for staging and departure traffic could help to reduce on-site delays. The recommended improvements are shown in **Figure 5.2.2.2** – Off Site Improvements and **Figure 5.2.2.3 –** On Site Improvements.

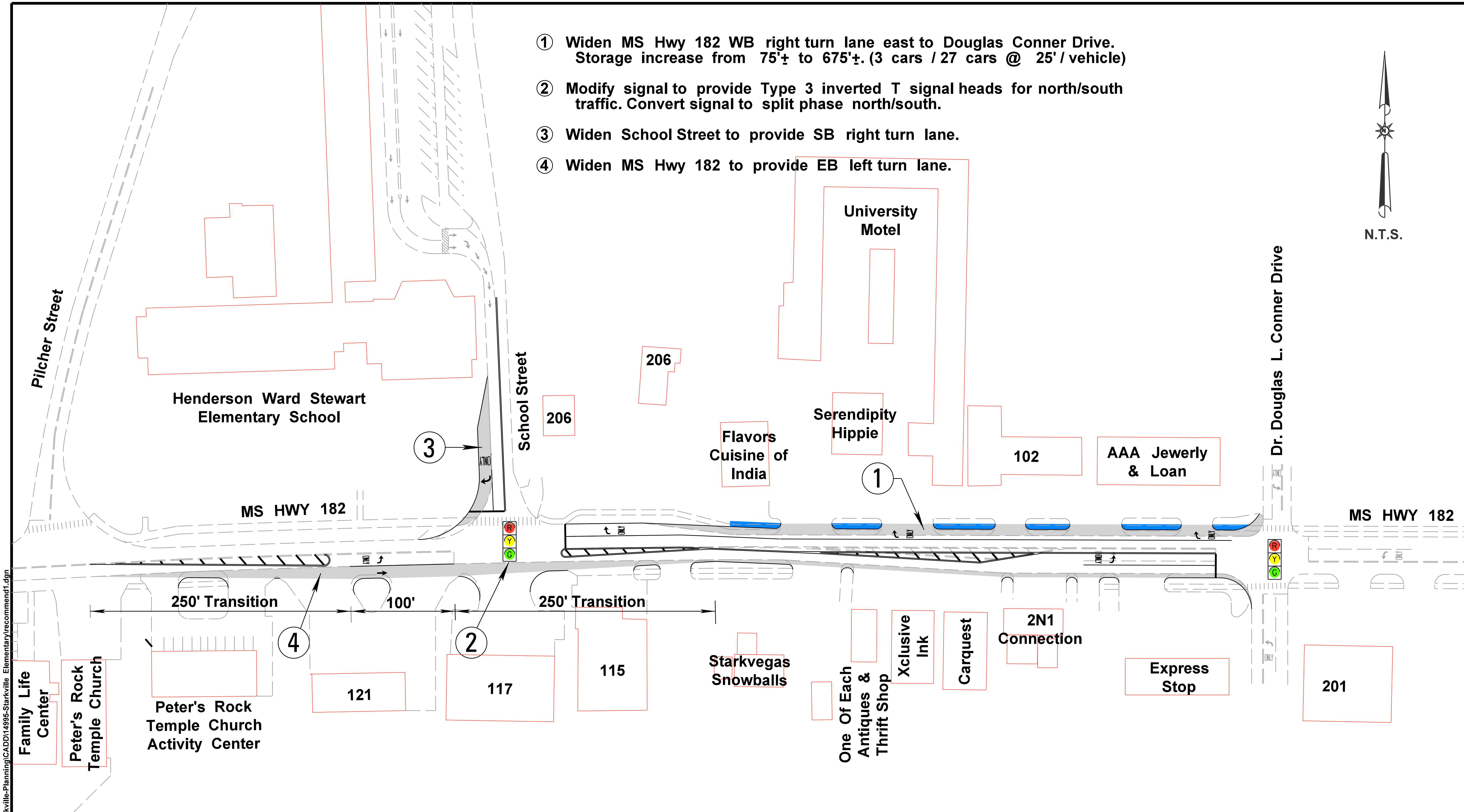


S:\Projects\14995.001-Starkville-Planning\CADD\14995-Starkville Elementary\existingcondition.dgn

NEEL-SCHAFFER
Solutions you can build upon

HWS ELEMENTARY SCHOOL EXISTING CONDITIONS

Figure 5.2.2.1

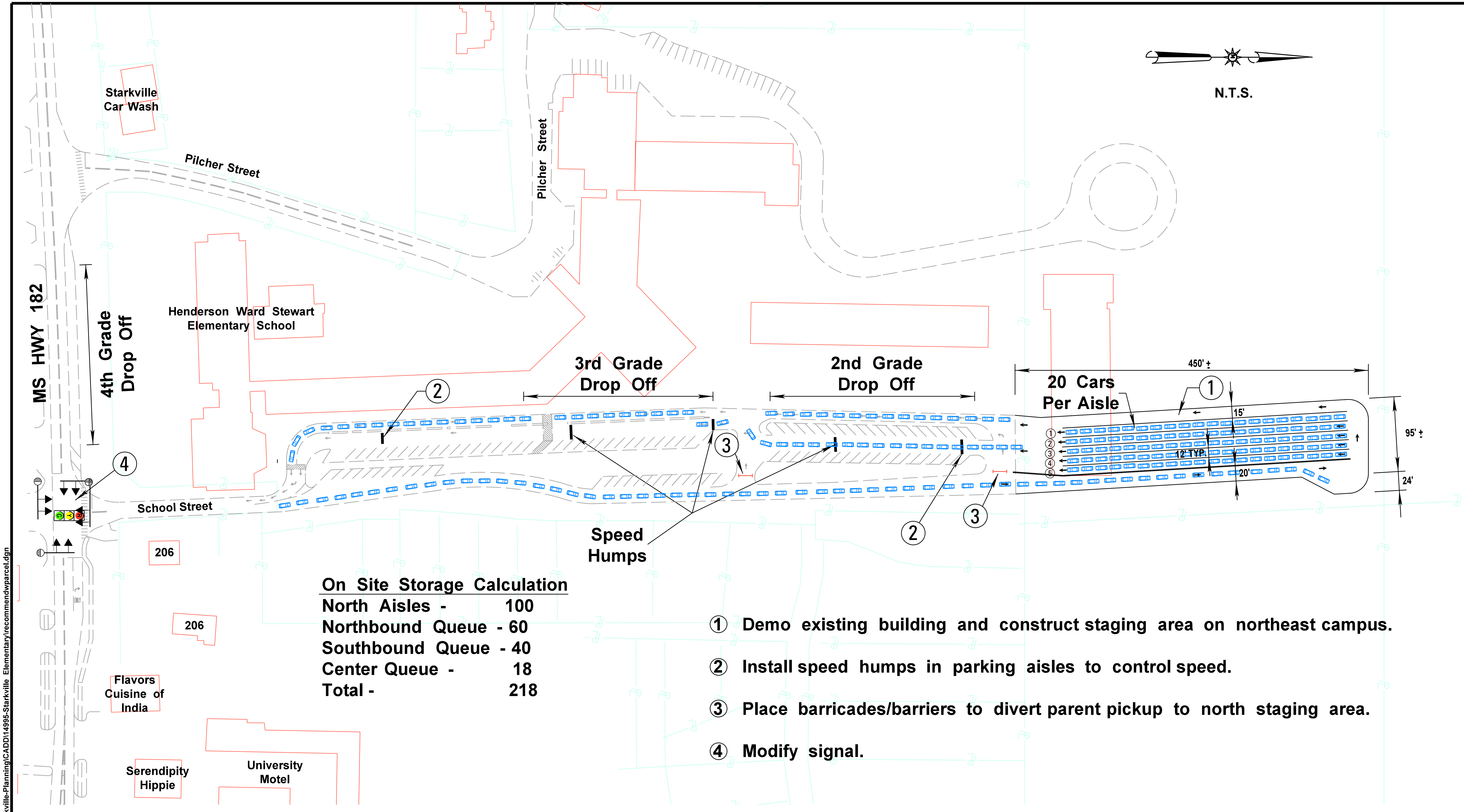


S:\Projects\14995.001-Starkville-Planning\CADD\14995-Starkville Elementary\recommend1.dgn

NEEL-SCHAFFER
Solutions you can build upon

HWS ELEMENTARY SCHOOL ALT 1
RECOMMEND OFF SITE IMPROVEMENTS

Figure 5.2.2.2



NEEL-SCHAFFER
Solutions you can build upon

HWS ELEMENTARY SCHOOL ALT 2 RECOMMENDED ON SITE IMPROVEMENTS

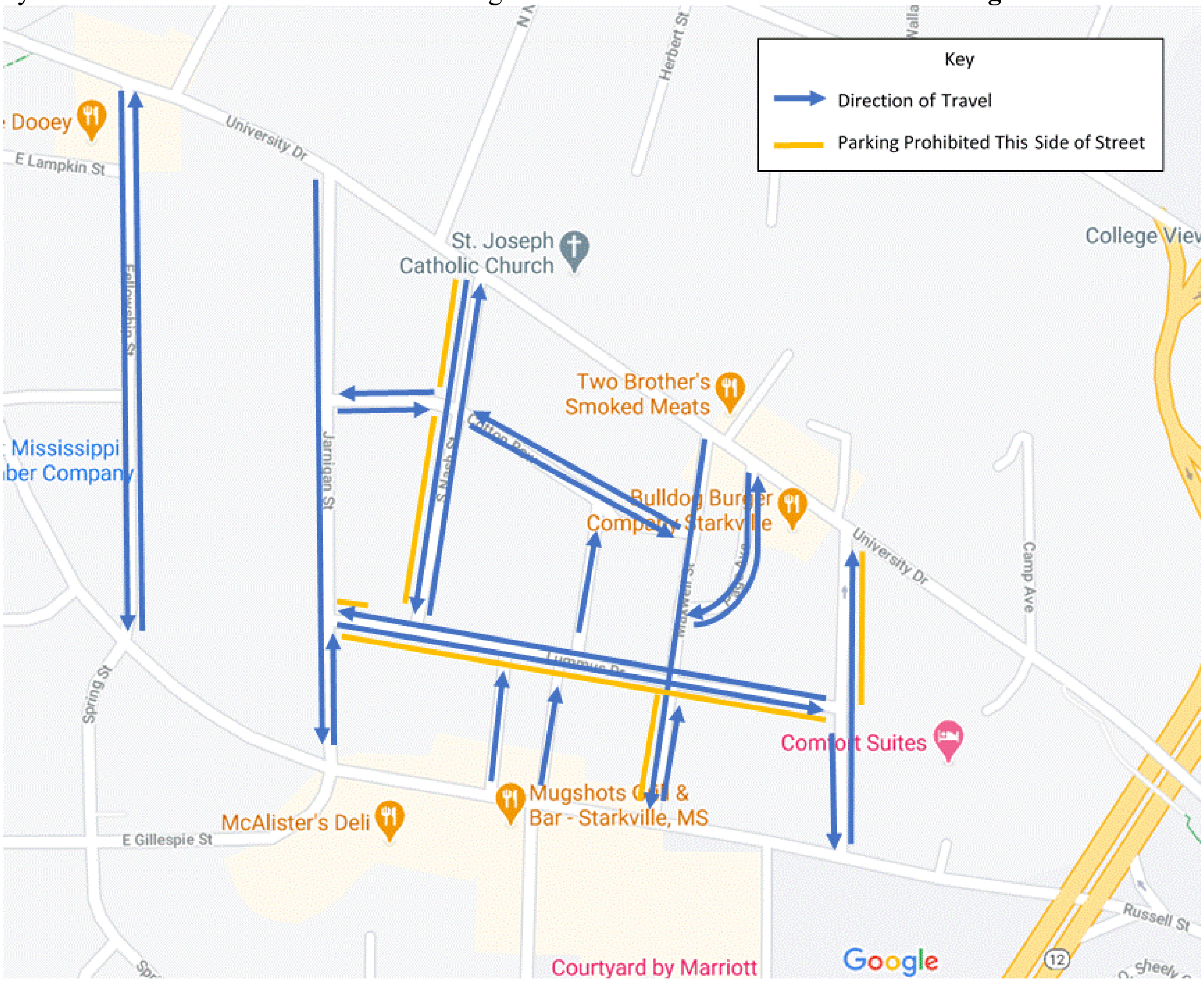
Figure 5.2.2.3

S:\Projects\14995.001-Starkville-Planning\CADD\14995-Starkville Elementary\recommendwparcel.dgn

5.2.3 Cotton District One-Way Street Network

5.2.3.1 Existing System

A field visit of the site was conducted to document the existing system of the area, which is bounded to the north by University Drive, to the south by Russell Street, to the west by Fellowship St, and to the east by Colonel Muldrow Avenue. The existing street traffic flow/direction is shown in **Figure 5.2.3.1**.



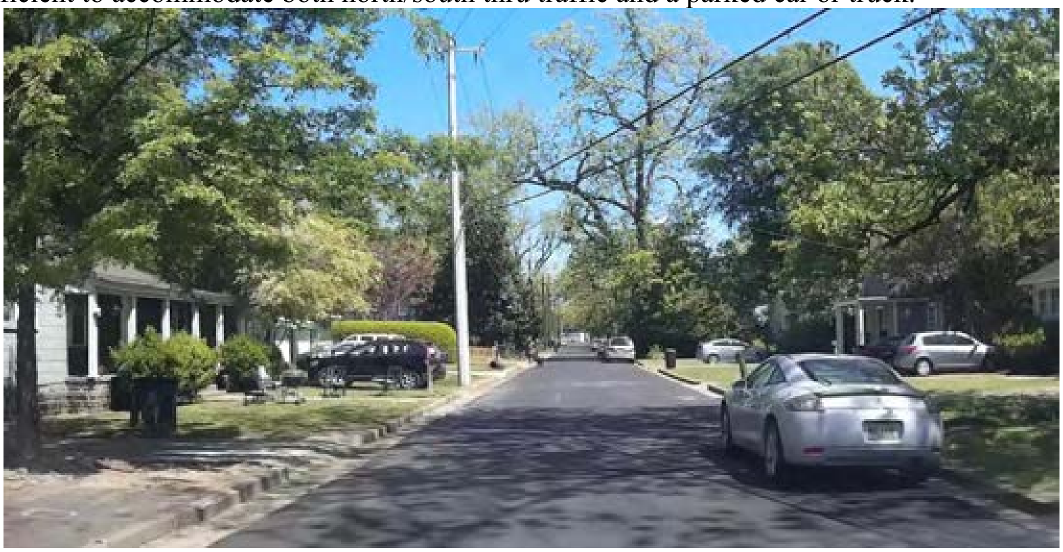
Map data ©2019 Google

Figure 5.2.3.1 Cotton District Existing Street Traffic Flow

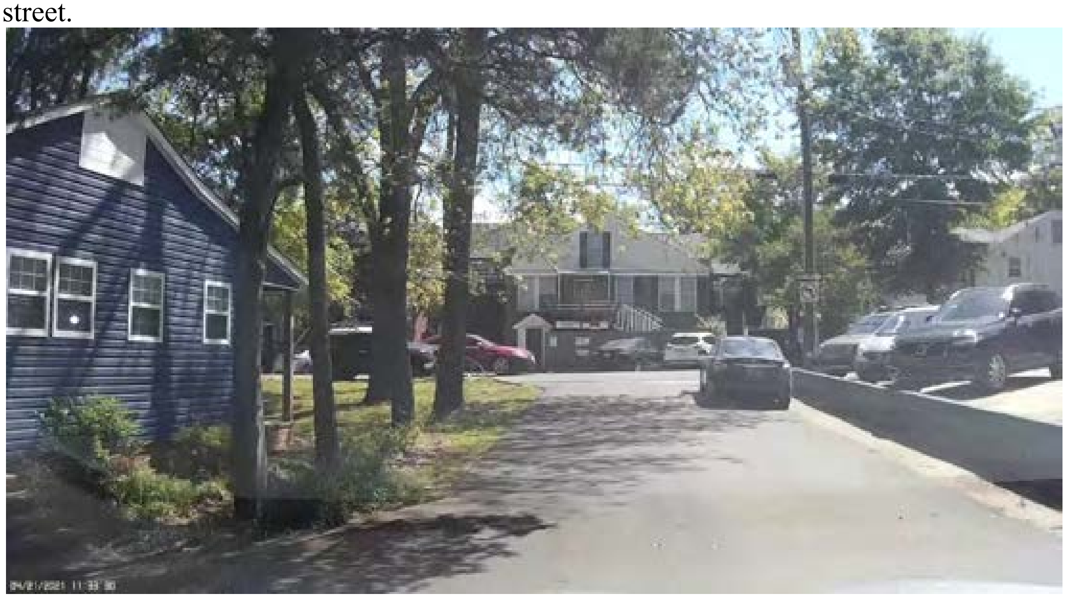
5.2.3.2 Observed Issues

On the field visit, multiple conflicts with the existing system were observed as described below:

- S Nash Street, a two-way street with on-street parking prohibited on the west side, is 25 ft wide curb to curb and requires cooperation/courtesy between opposing drivers when vehicles are parked legally along the east side of the street and vehicles travelling in opposing directions must pass, as the width is not sufficient to accommodate both north/south thru traffic and a parked car or truck.

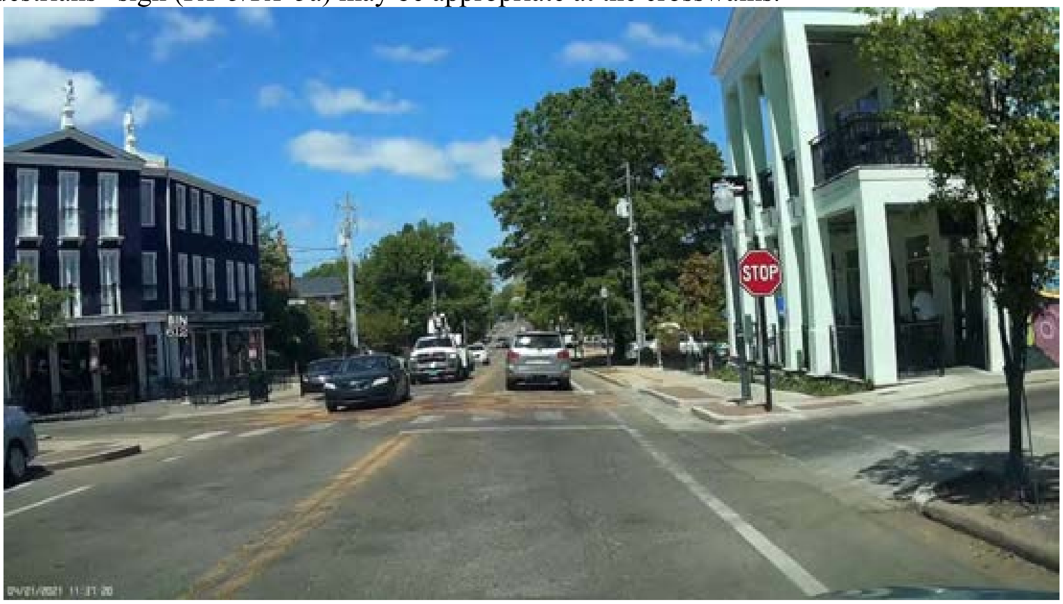


- Cotton Row, a two-way street with no visible parking prohibition, is also narrow (25 ft wide curb to curb to the west of S Nash Street and 17ft wide to the east of S Nash Street) and again, two-way traffic cannot simultaneously pass opposing traffic adjacent to a parked car because of the limited width. In the photo below at the intersection of Cotton Row and Maxwell Street, the red car abandoned turning onto Cotton Row as there was not sufficient width for it to pass the opposing vehicle with the parked vehicles along the street.



- The intersection of University Dr and Maxwell St is stop controlled along University Dr. With Maxwell St being one-way SB, there appears to be no vehicular reason to require traffic along University Dr to stop.

Removal of the stop signs/stop line striping along University Drive are recommended. A "Yield for Pedestrians" sign (R1-5/R1-5a) may be appropriate at the crosswalks.



- Holtsinger Avenue is a one-way northbound street with no visible parking restrictions; however, on-street parking only appears to be present on the east side of the street. The width of the street is 19 ft curb to curb, and therefore signage is recommended to prohibit parking on the west side of the street.

- At Holtsinger Avenue, the primary issue observed is at the intersection with Cotton Row where the Stop Sign was completely blocked from view for northbound traffic because vehicles were parked at the stop line on the east curb. A second Stop Sign is recommended behind the west curb/sidewalk.

- Lummus Drive is a two-way street with on-street parking prohibited on the south side. The roadway is 25 ft wide curb to curb. With the presence of on-street parking, opposing direction traffic must coordinate to pass parked vehicles due to the narrow width.

- Baltzegar Court is 17 ft wide and operates as a one-way northbound street and has northbound adjacent angle parking on both sides of the roadway; however, there is no signage to restrict this street to one-way northbound traffic, nor are there stop signs at either end of the street.

Above: Southern Intersection of Russell Street and Baltzegar Court (looking east)
Below: Northern Intersection of Lummus Drive and Baltzegar Court (looking west)

- Planters Row is 14 ft wide and operates as a one-way northbound street and has northbound adjacent angle parking on the west side of the roadway; however, there are no "One-Way" signs restricting traffic to these movements, nor are there "Stop" signs present at either end of the street. Installation of one-way northbound signage and Wrong way signage for southbound traffic, along with Stop sign installation is recommended.

Above: Southern Intersection of Russell Street and Planters Row (looking east)
Below: Northern Intersection of Lummus Drive and Planters Row (looking east)

- The intersection of University Dr and N Nash St is stop controlled only on the south bound (N Nash St) approach; however, stop line striping is still present along University Drive from its previous configuration as a signalized intersection. Removal of the stop line striping along University Drive is recommended. As an alternative recommendation, a "Stop Here for Pedestrians" sign (R1-5b/R1-5c) may be installed on both University Drive approaches.

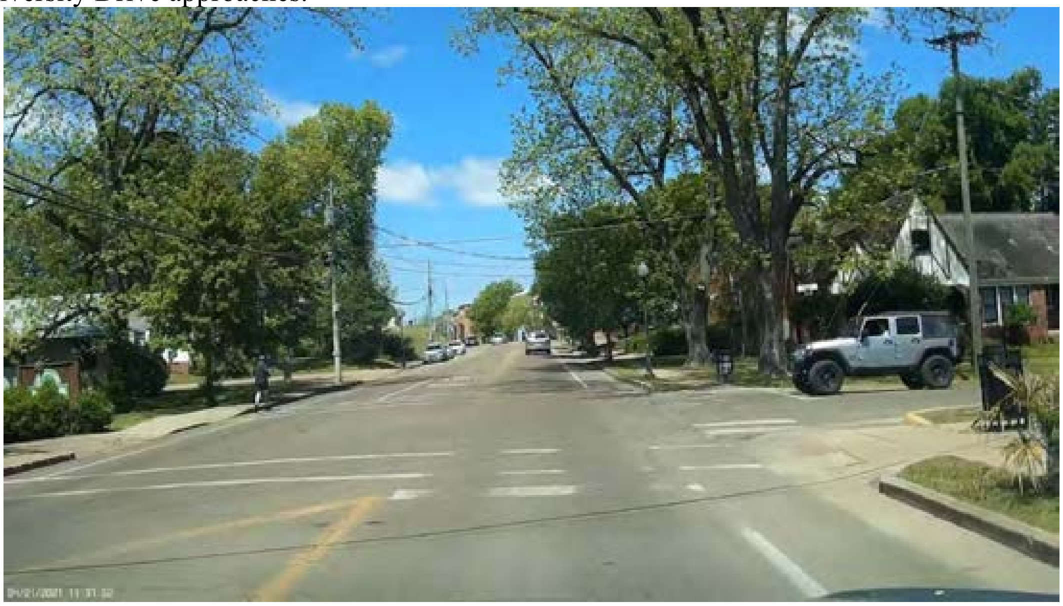
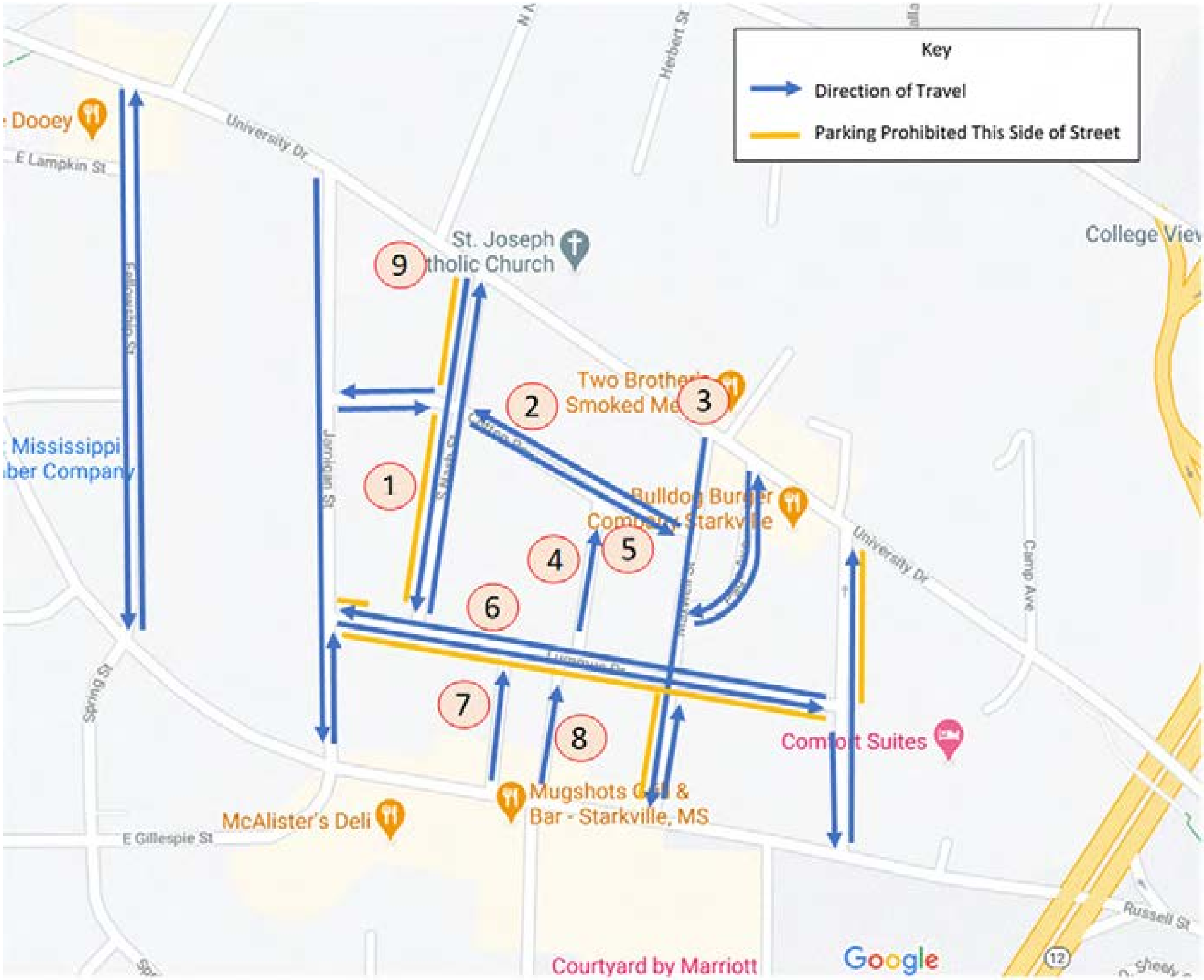


Figure 5.2.3.2 shows the location of the comments for the one-way circulation within the Cotton District study area.



Map data ©2019 Google

Figure 5.2.3.2 Location of Cotton District Comments 1-9

5.2.3.3 Summary of Recommendations

Based on the prior comments, conversion of traffic flow from two-way operation to one-way operation is recommended on S Nash Street (#1), Cotton Row (#2), and Lummus Drive (#6). The recommendations for circulation changes are presented in **Figure 5.2.3.3**, identifying the segments that are recommended to be converted to one-way traffic. In addition to conversion to one-way traffic, parking restrictions are recommended to restrict on-street parking to one side of the street, as the street widths do not have sufficient width to accommodate the width of 3 vehicles. A second Stop Sign is recommended to be installed on Holtsinger Avenue at Cotton Row behind the west sidewalk, as the sign on the east side is routinely obscured from view by parked vehicles.

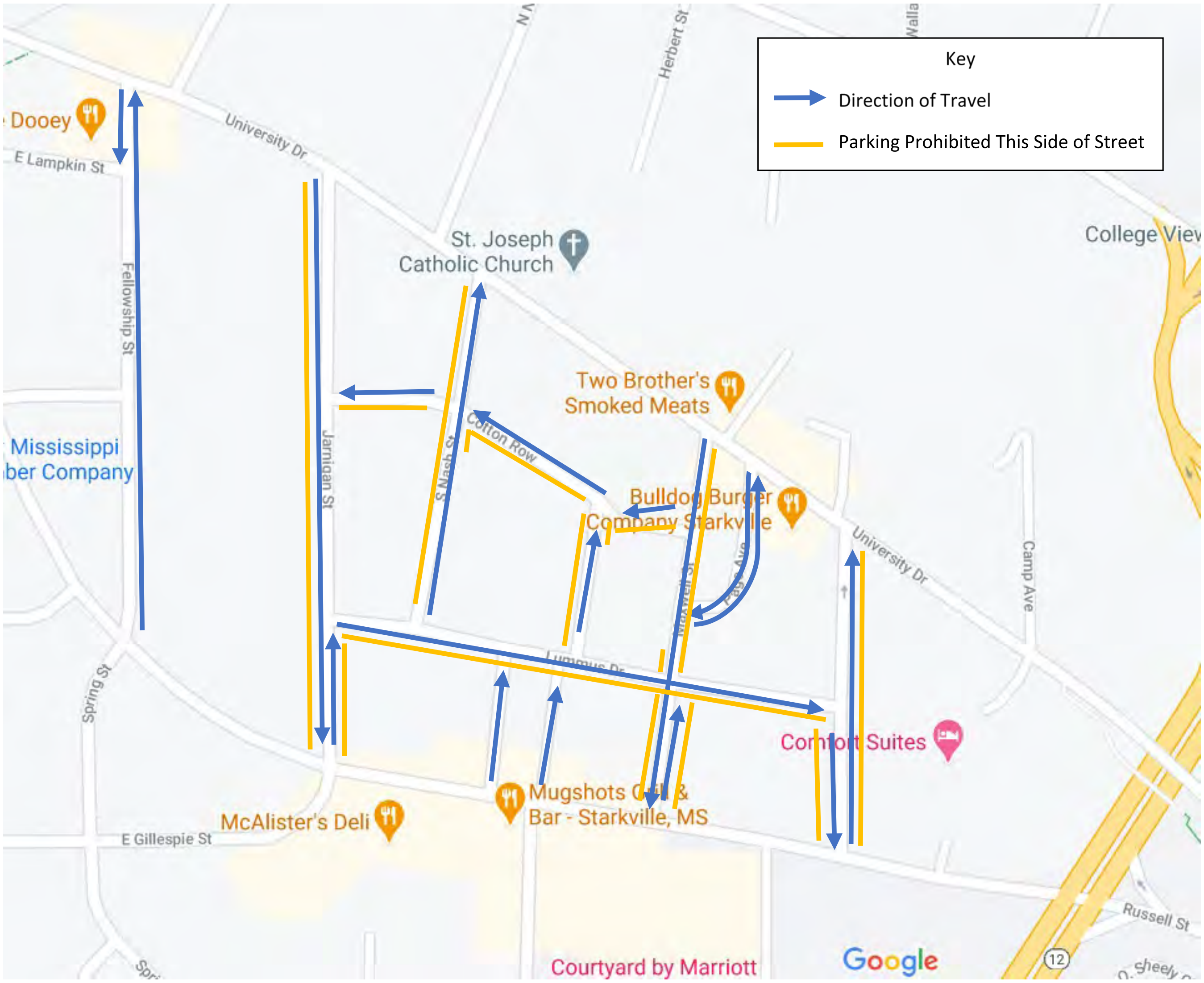
The intersection of Maxwell Street and University Drive (#3) provides stop control at the pedestrian crosswalk. A HAWK (High-intensity Activated crossWalK) beacon or R1-5/R1-5a "Yield for Pedestrians" may be more appropriate and would provide a significant reduction in vehicular delays.

Holtsinger Avenue (#4 and #5) can be accommodated with a Stop sign on the west side of the street or with a prohibition of on-street parking at the intersection and along the west side of the road.

For Baltzeger Place and Planters Row (#7 and #8), installation of One-Way, Do Not Enter, and Stop Signs are recommended at the intersections with Lummus Drive.

The intersection of University Dr and N Nash St (#9) could be addressed by either removal of the stop lines on University Drive or the installation of R1-5b/R1-5c "Stop Here for Pedestrians" signage.

Figure 5.2.3.3 also identifies the potential to convert the majority of Fellowship Street to one-way northbound circulation, as an option to provide on-street parking along Fellowship Street, if desired. This would require geometric alterations to the intersection of East Lampkin Street and Fellowship Street to prevent southbound vehicles from continuing onto the one-way portion of Fellowship Street. In addition, further study would be required to ensure East Lampkin Street has sufficient capacity and to determine a new timing plan for the intersection of East Lampkin Street and Russell Street.

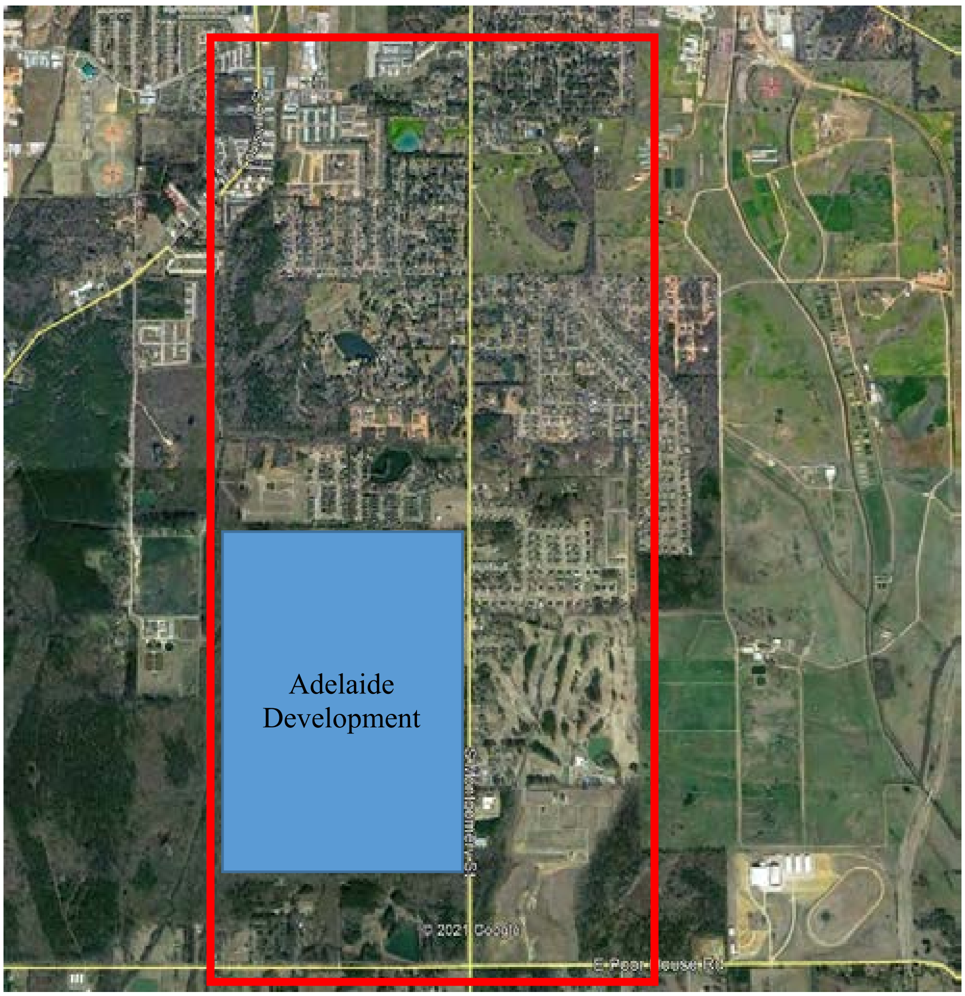


Map data ©2019 Google

Figure 5.2.3.3 Cotton District Recommended Circulation Improvements

5.2.4 South Montgomery Street

Per the City's request, Neel-Schaffer reviewed the South Montgomery Street corridor from Academy Road to Poor House Road. This area is rapidly growing and has a large residential subdivision development, Adelaide, that is planned which anticipates constructing ±840 single-family homes by the year 2035 with other development currently underway. With the additional traffic created by the planned development the capacity of the existing 2-lane cross section of South Montgomery Street will likely be exceeded.



Study Area and Adelaide Development Source: Google Maps, Neel-Schaffer, 2021.

5.2.4.1 Existing Conditions

Based on the Starkville Urban Area functional classification system, South Montgomery Street is classified as a *Major Collector* on the Federal Aid roadway system. It is a north/south two-lane roadway with 22 ft of asphalt and open ditches without paved shoulders. The posted speed limit along the section of the roadway within the study area is 35 mph.

Above: Looking south on S Montgomery Street at Lawrence Avenue (The Claiborne access).

Above: Looking south on South Montgomery Street at Adelaide Blvd.

The intersection of Poor House Road/South Montgomery Street is a signalized intersection without dedicated left turn lanes. Posted speed limits are 45 mph on the east/west and south approaches and 35 mph on the north approach. The (recent) construction of Hail State Blvd to the east provides a direct route into the MSU campus via Poor House Road. This direct connection to the MSU campus provides an alternate to the (typically congested) Locksley Way connection between South Montgomery Street and Blackjack Road; however, traffic counts conducted before and after the opening of Hail State Boulevard do not show a significant shift in traffic to this new route (for typical weekday commuting traffic).

The intersection of Academy Road /South Montgomery Street is a signalized 3-leg intersection with dedicated left and right turn lanes on the eastbound approach, a dedicated southbound right turn lane, and a dedicated northbound left turn lane.

5.2.4.2 Traffic Volumes

Turning movement counts were conducted at the Academy Road/South Montgomery Street intersection by MDOT/Michael Baker on 9/15/2020.

Turning movement counts were conducted at Poor House Road/South Montgomery Street on July 22, 2020, and then adjusted to reflect the increase in traffic on Poor House Road with the recent completion of Hail State Boulevard as part of the Adelaide Traffic Impact Analysis using historical MDOT traffic counts at Old Hwy 25 (2019) and Hail State Boulevard (2018). These historical counts as well as the adjusted count are shown in **Figure 5.2.4.1.**

5.2.4.3 Existing Level of Service Analysis

The capacity and level-of-service (LOS) of an intersection is evaluated based on the average vehicular delay during the peak hour periods. The vehicular delays are directly related to the turning movement volumes, traffic composition and roadway geometrics at the study intersections. The methodology used in this analysis is based on the *Highway Capacity Manual* (HCM). The level-of-service, as outlined in the HCM, is reported as a letter designation of LOS A through LOS F (A is least delay and F is most delay). The adjusted 2020 traffic volumes at the study intersections were evaluated to determine the existing traffic levels-of-service based on the information provided in the HCM. The results of this analysis are shown in **Table 5.2.4.1**.

Table 5.2.4.1 Existing Traffic Level-of-Service

Signalized Intersection	Time Period	Approach LOS				Intersection LOS
		EB	WB	NB	SB	
Academy Rd/ S. Montgomery St	AM Peak	B	-	A	B	B (11.2)
	PM Peak	B	-	A	B	B (12.7)
Poor House Rd/ S. Montgomery St	AM Peak	B	B	B	B	B (15.6)
	PM Peak	B	B	B	B	B (16.1)

Source: Neel-Schaffer, 2021, HCM 6th Edition.

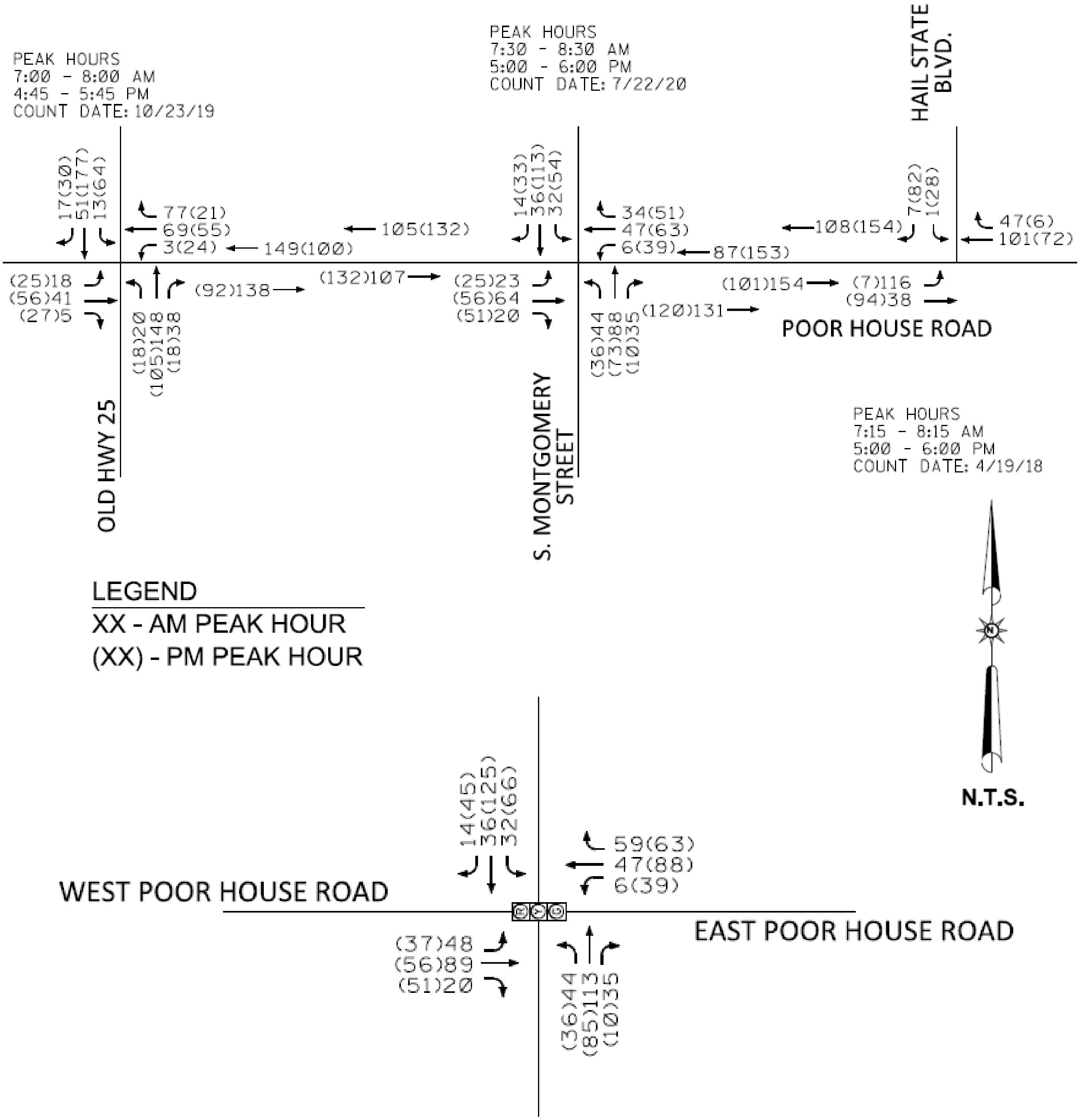


Figure 5.2.4.1 Counts at Poor House Road/South Montgomery Street

A segment analysis was also performed along South Montgomery from Locksley Way to Poor House Road. This analysis was divided into three segments by the signalized intersections. This analysis was based on the high-level planning methodology provided in Chapter 30 of the 6th Edition of the Highway Capacity Manual (HCM). For this analysis, defaults values as defined in the HCM were used for unknown values such as driveway turning movement percentages and signal timing parameters. The results of this analysis are shown in **Table 5.2.4.2**.

Table 5.2.4.2 Planning Level Segment Level of Service

Signalized Intersection	Time Period	Travel Direction	Travel Speed (mph)	Volume To Capacity	Level of Service
Locksley Way To Lynn Lane	AM Peak	NB	17.5	0.39	D
		SB	18.9	0.18	D
	PM Peak	NB	18.7	0.22	D
		SB	17.3	0.44	D
Lynn Lane To Academy Road	AM Peak	NB	**10.4**	**1.06**	**F**
		SB	20.4	0.24	C
	PM Peak	NB	18.7	0.49	D
		SB	18.0	0.66	D
Academy Road To Poor House Road	AM Peak	NB	30.9	0.72	A
		SB	34.0	0.17	A
	PM Peak	NB	33.5	0.32	A
		SB	31.8	0.47	A

Source: Neel-Schaffer, 2021, HCM 6th Edition.

The analysis reveals that each segment is operating at an acceptable level of service except the northbound segment between Lynn Lane and Academy Road in the AM Peak which is currently over capacity. A predictive analysis was then performed assuming no geometric or traffic pattern changes to determine the expected peak hour volume on the segment where the level of service would become unacceptable (LOS E or F) or the segment volume exceeds capacity in at least one direction. These volumes are shown in **Table 5.2.4.3**.

Table 5.2.4.3 Projected Peak Hour Volume of Deficiency

Signalized Intersection	Time Period	Existing Volume	Deficient Volume
Locksley Way To Lynn Lane	AM Peak	1363	2269
	PM Peak	1447	2175
Lynn Lane To Academy Road	AM Peak	**1007**	**912**
	PM Peak	1092	1586
Academy Road To Poor House Road	AM Peak	907	1252
	PM Peak	927	1963

Source: Neel-Schaffer, 2021, HCM 6th Edition.

5.2.4.4 Projected Traffic

The traffic projected by the Adelaide development is shown in **Figure 5.2.4.2**. All other non-site traffic was grown by the annual growth rate of 1% which was developed based on both the area model runs and the historic growth rate of Starkville. This development was described in detail in the overview portion of the encompassing full report.

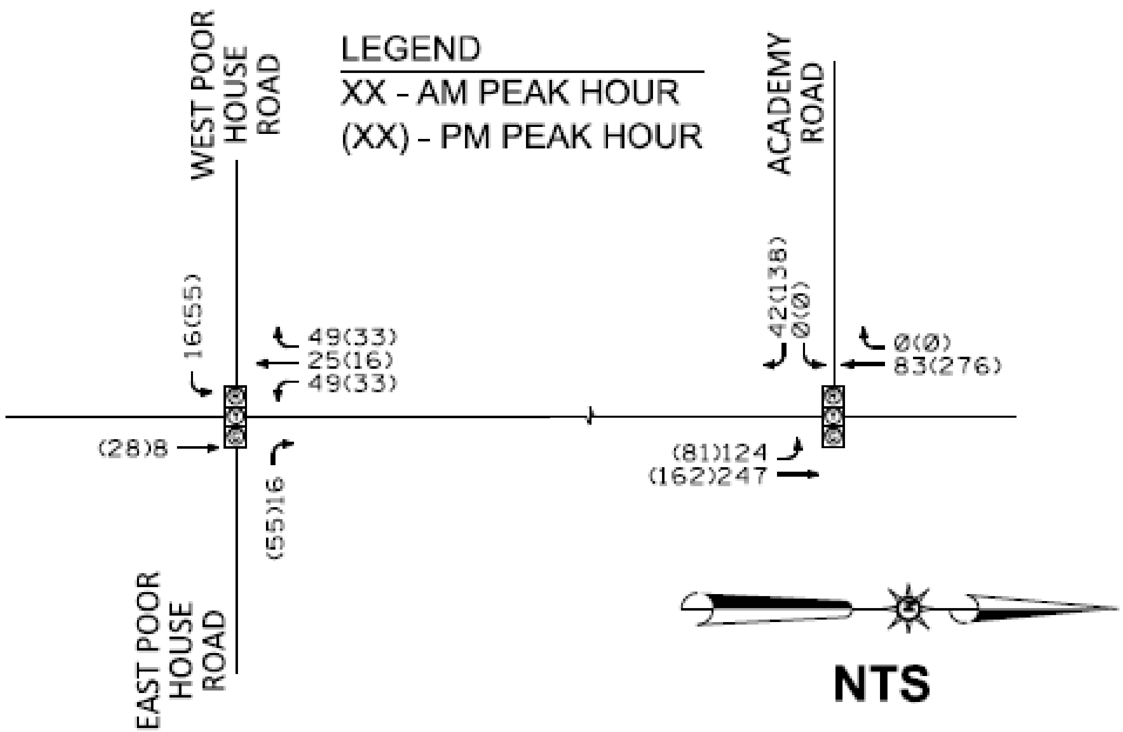


Figure 5.2.4.2 Adelaide Full Build (2035) Projected Site Traffic

<u>Future (2045) Level of Service Analysis</u>

The 2045 traffic level of service analysis is shown in **Table 5.2.4.4**.

Table 5.2.4.4 Year 2045 No Build Traffic Level-of-Service

Signalized Intersection	Time Period	Approach LOS				Intersection LOS
		EB	WB	NB	SB	
Academy Rd/ S. Montgomery St	AM Peak	C	-	B	B	C (21.2)
	PM Peak	**F**	-	C	**E**	**E (64.1)**
Poor House Rd/ S. Montgomery St	AM Peak	B	B	B	B	B (16.6)
	PM Peak	C	C	B	B	B (18.8)

Source: Neel-Schaffer, 2021, HCM 6th Edition.

Under projected 2045 traffic including the trips generated from the Adelaide development, the Academy Road/South Montgomery Street intersection has a failing level of service on the eastbound approach with the average vehicle experiencing over a minute of delay (64.1 seconds).

5.2.4.5 Recommendations

With the development occurring along South Montgomery Street, increasing capacity is necessary to maintain acceptable level of service. The intersection of Academy Road/South Montgomery Street needs added capacity by 2045; however, adding additional through lanes (converting from a 2/3 lane roadway to a 5-lane roadway) would be costly due to the numerous residential structures that would be affected. Due to this, it is recommended to convert this intersection into a single lane roundabout with channelized right turn lanes for southbound and eastbound traffic. This is shown to reduce delays to acceptable levels on all approaches as seen in **Table 5.2.4.5**. It is, however, recommended to coordinate with the fire department if a roundabout is considered regarding their access to the roadways and current emergency signal pre-emption.

Table 5.2.4.5 Year 2045 Roundabout Level-of-Service

Roundabout	Time Period	Approach LOS				Intersection LOS
		EB	WB	NB	SB	
Academy Rd/ S. Montgomery St	AM Peak	A	-	A	A	A (0.8)
	PM Peak	A	-	A	A	A (1.8)

Source: Neel-Schaffer, 2021, SIDRA Intersection 9.0.

In addition, the traffic impact study performed for the Adelaide development shows a need for left turns lanes at most of the site driveways once all phases of the development are complete. It is anticipated that other existing two-way stop-controlled intersections along this segment would also warrant left turn lanes if all volumes were known. That said, it is recommended to widen South Montgomery from Academy Road to Poor House Road from a 2-lane undivided to a 3-lane with a center two-way left turn lane. This construction would provide left turn lanes, as well as reduce delays for left turn turning onto South Montgomery Street by allowing a staged movement meaning a gap is only needed in one direction at a time.

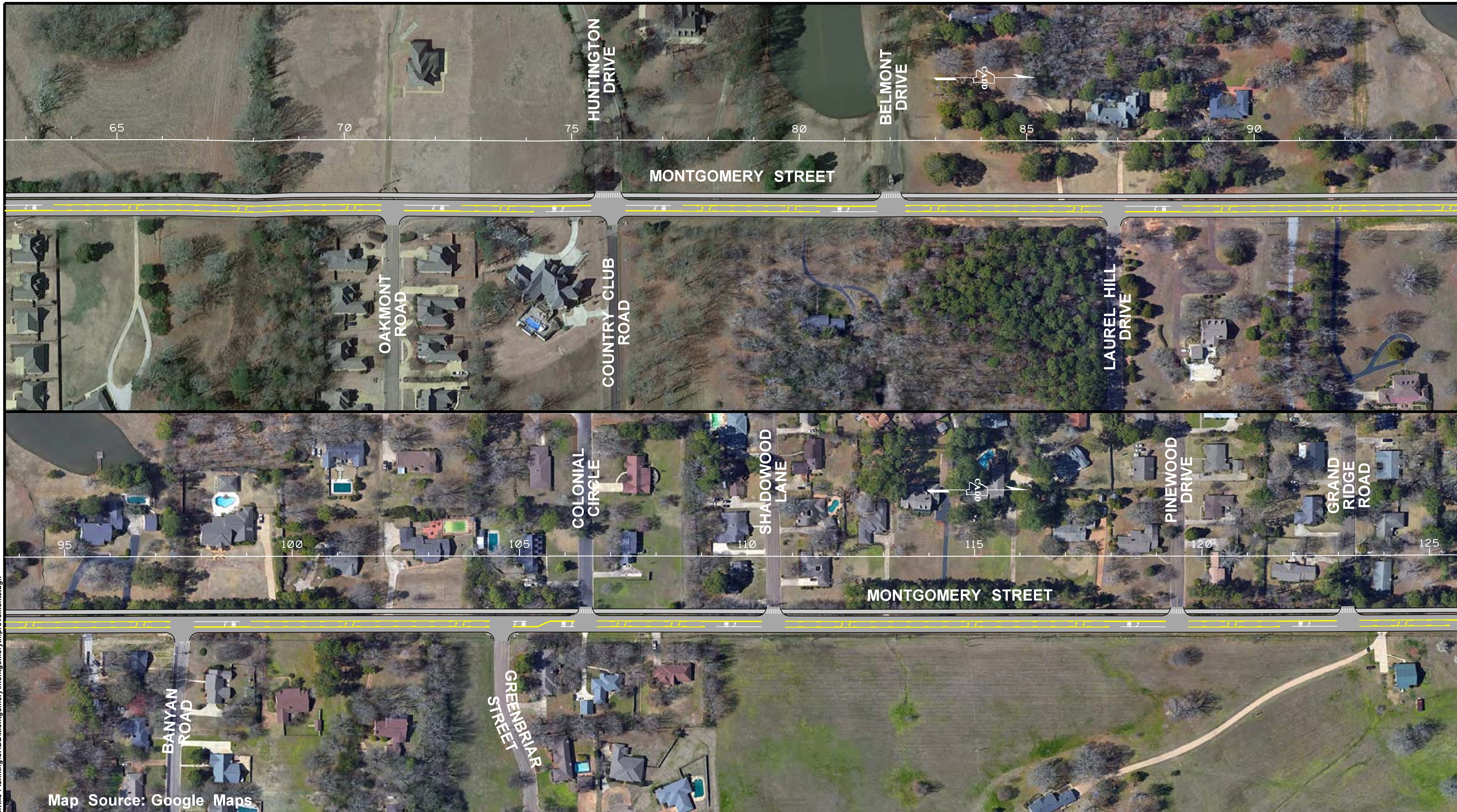
A concept showing all recommendations is shown in **Figure 5.2.4.3** to **Figure 5.2.4.5**.

NEEL-SCHAFFER
Solutions you can build upon

SOUTH MONTGOMERY STREET CONCEPT

Figure 5.2.4.3

S:\Projects\14995.001-Starkville-Planning\CADD\Montgomery\montgomeryimprovements.dgn



S:\Projects\14995.001-Starkville-Planning\CADD\Montgomery\montgomeryimprovements.dgn

NEEL-SCHAFFER
Solutions you can build upon

SOUTH MONTGOMERY STREET CONCEPT

Figure 5.2.4.4

S:\Projects\14995.001-Starkville-Planning\CADD\Montgomery\montgomeryimprovements.dgn

NEEL-SCHAFFER
Solutions you can build upon

SOUTH MONTGOMERY STREET CONCEPT

Figure 5.2.4.5

5.2.5 Spring Street at MS Highway 12/Mill Street

5.2.5.1 Existing Conditions

The intersection of Spring Street/Mill Street is a two-way stop-controlled intersection with the west approach serving as a secondary entrance/exit for McDonalds and the east approach as the primary entrance to both Chick-Fil-A and the Cotton Mill Marketplace shopping center. Concern was raised about traffic congestion at this intersection. Northbound left turn traffic on Spring Street queues and occasionally backs into the intersection of Spring Street/MS Highway 12. This is problematic, as there is approximately only 200 feet of storge distance to the south along Spring Street. Congestion around a Chick-fil-A franchise is a problem at many locations nationally. The peak demands create traffic queue/delays on both Mill Street and Spring Street.

Spring St/Highway 12 is a major intersection in Starkville. This intersection with Highway 12 is the primary route for two main MSU campus access points: Bully Boulevard and Blackjack Road. Currently the north and south approaches are operating as split phases (each operates separately instead of as a simultaneous movement) due to the lane geometry of the northbound approach having a shared through-left turn lane. Because this lane is shared, it cannot run concurrently with southbound traffic. In addition, observations revealed that northbound vehicles turning left into the gas station on the corner are also creating a queue that extends into Highway 12.

Above: Looking North on Spring Street from MS Highway 12.


Above: Looking South on Spring Street from Mill Street.

5.2.5.2 Traffic Volumes

Turning movement counts were conducted at Spring Street/MS Highway 12 on 9/19/19 and at Spring Street/Mill Street on 9/16/20 by MDOT/Michael Baker.

5.2.5.3 Existing Level of Service Analysis

The capacity and level-of-service (LOS) of an intersection is evaluated based on the average vehicular delay during the peak hour periods. The vehicular delays are directly related to the turning movement volumes, traffic composition and roadway geometrics at the study intersections. The methodology used in this analysis is based on the Highway Capacity Manual (HCM). The level-of-service, as outlined in the HCM, is reported as a letter designation of LOS A through LOS F (A is least delay and F is most delay). The adjusted 2020 traffic volumes at the study intersections were evaluated to determine the existing traffic levels-of-service based on the information provided in the HCM. The results of this analysis are shown in **Table 5.2.5.1**.

Table 5.2.5.1 Existing Traffic Level-of-Service

Signalized Intersections	Time Period	Approach LOS EB	WB	NB	SB	Intersection LOS
Hwy 12 @ Spring Street / Blackjack Road-2019	AM Peak	D	C	D	D	D (42.0)
	PM Peak	D	D	D	**E**	D (47.5)

Unsignalized Intersections	Time Period	Eastbound Lt	Eastbound Th	Eastbound Rt	Westbound Lt	Westbound Th	Westbound Rt	Northbound Lt	Northbound Th	Northbound Rt	Southbound Lt	Southbound Th	Southbound Rt
Spring Street @ Mill Street -2020	AM Peak	B	B	B	C	C	A	A	A	-	A	A	-
	PM Peak	B	B	B	C	C	B	A	A	-	A	A	-

Critical Movement Level of Service.

Source: Neel-Schaffer, 2021, HCM 6th Edition, Synchro Version 11.0.168.0.

The capacity analyses show that the two intersections are operating at acceptable levels with existing traffic (2020) with the southbound approach of Spring Street at the signalized intersection with Highway 12 operating at an LOS E in the PM peak hour. However, both visual observations and the initial concern expressed by the City identify that queuing issues between these two intersections may be creating additional delays/conflicts in the field. To quantify this concern, Table 2 provides the calculated 95th percentile queue, which is defined as the queue length with a five percent probability of being exceeded in the analysis period, although the calculation identifies the queue could be longer.

Table 5.2.5.2 Existing 95th Percentile Queue Length

Signalized Intersections	Time Period	Maximum Approach Queue (ft)			
		EB	**WB**	**NB**	**SB**
Hwy 12 @ Spring Street / Blackjack Road	AM Peak	#282	#172	129	173
	PM Peak	162	#303	#261	#268

95th percentile volume exceeds capacity, queue may be longer.
Source: Neel-Schaffer, 2021, HCM 6th Edition, Synchro Version 11.0.168.0.

The Spring Street/MS Highway 12 southbound queue exceeds 200 ft in the PM which confirms information provided that the queue extends through the Spring Street/Mill Street intersection. The northbound left turn into McDonalds during peak hours (typically) would not be possible without cooperation from a southbound vehicle in the queue. The westbound left turns from Mill Street to Spring are also typically blocked from the southbound queue that extends north from Highway 12.

The traffic queues at the Spring Street/Mill Street intersection are the result of multiple driveways, southbound queues blocking driveways, and heavy minor street left turn demand. The primary issue is not with this intersection singularly but its interaction with the signalized intersection to the south.

5.2.5.4 Alternative Descriptions

Increasing southbound capacity at the Spring Street/MS Highway 12 intersection would reduce the queue and mitigate the issues observed at Spring Street/Mill Street. To do this, three primary concepts were developed and then integrated together to create five alternatives:

- Alternative 1: Northbound (Blackjack Road) Lane Restriping
    - The existing striped configuration has one exclusive left, a through-left, and an exclusive right. This configuration requires the signal to operate with split phasing. By altering the configuration through striping to two exclusive lefts and a shared through-right turn lane, the split phase could be converted to concurrent north/south phasing. This lane assignment would require that the left turns would operate as a protected only phase, which would also require a modification of the northbound signal heads. This change can increase capacity by providing the side streets with more green time without reducing the mainline green within the same cycle length.
- Alternative 2: Southbound (Spring Street) Right Turn Lane
    - Providing a southbound right turn lane at the signal would increase capacity through the lane addition but would also allow more permissive right-on-red movements by separating the right and through traffic streams. The existing conditions prevent this due to through vehicles sharing the right turn lane and blocking the right-on-red movement for all vehicles in the following traffic stream. The existing lanes could be narrowed, and some widening provided on each side of Spring Street to accommodate a southbound right turn lane. In addition, a slotted curb is recommended to be installed to prevent northbound left turns into the gas station. This alternative is shown in **Figure 5.2.5.1**.

- Alternative 3: Southbound Spring Street Right Turn Lane/3-Lane Spring Street
  - In addition to the benefits of adding the southbound right turn lane and a slotted curb (preventing northbound left turns at the gas station), converting Spring Street into a 3-lane roadway with a center two-way-left-turn lane (TWLTL) would remove the left turn queue from the through lanes. Shifting this queue to the center turn lane would reduce the potential for northbound left turning traffic to queue south into MS Highway 12 and conflict with southbound left turning traffic. The 3-lane would replace the four-lane undivided roadway, extending north to Russell Street. With the number of driveways along Spring Street, the lack of a center turn lane causes the left lane northbound and southbound to routinely have left turning vehicles stopped in thru traffic. The capacity of the roadway is anticipated to be improved by converting the striping from four lanes to three, with a striped bike lane on the outside shoulder in both directions. This alternative is shown in **Figure 5.2.5.2**.
- Alternative 4: Northbound (Blackjack Road) Lane Restriping & Southbound Spring Street Right Turn Lane
  - This Alternative is a combination of Alternative 1 & Alternative 2
- Alternative 5: Northbound (Blackjack Road) Lane Restriping & Southbound Spring Street Right Turn Lane/3-Lane Spring Street
  - This Alternative is a combination of Alternative 1 & Alternative 3
- Alternative 6: Northbound (Blackjack Road) Lane Restriping/3-Lane Spring Street
  - This alternative closely resembles Alternative 5; however, it removes a north bound lane between MS Highway 12 and Mill Street to better fit in the existing geometry and extends the bike lanes to Hwy 12. This alternative is shown in **Figure 5.2.5.3**.

The slotted curb recommended in most of the above alternatives was considered to be extended through the Mill Street intersection; however, doing this would prevent access to Mill Street from the north and, due to the existing slotted curb on Highway 12, would also prevent access to McDonalds from the west while significantly increasing the northbound volume on Spring Street. Therefore, the slotted curb is only recommended at this time to be installed extending approximately 150ft north of Highway 12 to prevent left turns across the southbound queue of the signalized intersection.

5.2.5.5 Alternative Level of Service Analysis

The level of service and queue analyses results for each alternative are shown in **Table 5.2.5.3** to **Table 5.2.5.12**.

Table 5.2.5.3 Alt 1 Existing Traffic Level-of-Service

Signalized Intersections	Time Period	Approach LOS				Intersection LOS
		EB	WB	NB	SB	
Hwy 12 @ Spring Street / Blackjack Road-2019	AM Peak	C	C	D	C	D (35.8)
	PM Peak	C	D	D	D	D (36.4)

Unsignalized Intersections	Time Period	Critical Movement Level of Service											
		Eastbound			Westbound			Northbound			Southbound		
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt
Spring Street @ Mill Street -2020	AM Peak	B	B	B	C	C	A	A	A	-	A	A	-
	PM Peak	B	B	B	C	C	B	A	A	-	A	A	-

Source: Neel-Schaffer, 2021, HCM 6th Edition, Synchro Version 11.0.168.0.

Table 5.2.5.4 Alt 1 Existing 95th Percentile Queue Length

Signalized Intersections	Time Period	Maximum Approach Queue (ft)			
		EB	WB	NB	SB
Hwy 12 @ Spring Street / Blackjack Road	AM Peak	238	#171	240	165
	PM Peak	147	#283	246	225

95th percentile volume exceeds capacity, queue may be longer.
Source: Neel-Schaffer, 2021, HCM 6th Edition, Synchro Version 11.0.168.0.

Table 5.2.5.5 Alt 2 Existing Traffic Level-of-Service

Signalized Intersections	Time Period	Approach LOS				Intersection LOS
		EB	WB	NB	SB	
Hwy 12 @ Spring Street / Blackjack Road-2019	AM Peak	C	C	D	D	D (34.5)
	PM Peak	C	D	D	D	D (37.0)

Unsignalized Intersections	Time Period	Critical Movement Level of Service											
		Eastbound			Westbound			Northbound			Southbound		
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt
Spring Street @ Mill Street -2020	AM Peak	B	B	B	C	C	A	A	A	-	A	A	-
	PM Peak	B	B	B	C	C	B	A	A	-	A	A	-

Source: Neel-Schaffer, 2021, HCM 6th Edition, Synchro Version 11.0.168.0.

Table 5.2.5.6 Alt 2 Existing 95th Percentile Queue Length

Signalized Intersections	Time Period	Maximum Approach Queue (ft)			
		EB	WB	NB	SB
Hwy 12 @ Spring Street / Blackjack Road	AM Peak	238	#170	127	#169
	PM Peak	145	272	#287	172

95th percentile volume exceeds capacity, queue may be longer.
Source: Neel-Schaffer, 2021, HCM 6th Edition, Synchro Version 11.0.168.0.

Table 5.2.5.7 Alt 3 Existing Traffic Level-of-Service

Signalized Intersections	Time Period	Approach LOS				Intersection LOS
		EB	WB	NB	SB	
Hwy 12 @ Spring Street / Blackjack Road-2019	AM Peak	C	C	D	D	D (34.5)
	PM Peak	C	D	D	D	D (37.0)

Unsignalized Intersections	Time Period	Critical Movement Level of Service											
		Eastbound			Westbound			Northbound			Southbound		
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt
Spring Street @ Mill Street -2020	AM Peak	B	B	B	C	C	A	A	-	-	A	-	-
	PM Peak	B	B	B	C	C	B	A	-	-	A	-	-

Source: Neel-Schaffer, 2021, HCM 6th Edition, Synchro Version 11.0.168.0.

Table 5.2.5.8 Alt 3 Existing 95th Percentile Queue Length

Signalized Intersections	Time Period	Maximum Approach Queue (ft)			
		EB	WB	NB	SB
Hwy 12 @ Spring Street / Blackjack Road	AM Peak	238	#170	127	#169
	PM Peak	145	272	#287	172

95th percentile volume exceeds capacity, queue may be longer.
Source: Neel-Schaffer, 2021, HCM 6th Edition, Synchro Version 11.0.168.0.

Table 5.2.5.9 Alt 4 Existing Traffic Level-of-Service

Signalized Intersections	Time Period	Approach LOS				Intersection LOS
		EB	WB	NB	SB	
Hwy 12 @ Spring Street / Blackjack Road-2019	AM Peak PM Peak	C C	C C	D D	C C	D (35.7) C (32.3)

Unsignalized Intersections	Time Period	Critical Movement Level of Service											
		Eastbound			Westbound			Northbound			Southbound		
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt
Spring Street @ Mill Street -2020	AM Peak	B	B	B	C	C	A	A	A	-	A	A	-
	PM Peak	B	B	B	C	C	B	A	A	-	A	A	-

Source: Neel-Schaffer, 2021, HCM 6th Edition, Synchro Version 11.0.168.0.

Table 5.2.5.10 Alt 4 Existing 95th Percentile Queue Length

Signalized Intersections	Time Period	Maximum Approach Queue (ft)			
		EB	WB	NB	SB
Hwy 12 @ Spring Street / Blackjack Road	AM Peak	238	#171	240	132
	PM Peak	143	267	246	167

95th percentile volume exceeds capacity, queue may be longer.
Source: Neel-Schaffer, 2021, HCM 6th Edition, Synchro Version 11.0.168.0.

Table 5.2.5.11 Alt 5 Existing Traffic Level-of-Service

Signalized Intersections	Time Period	Approach LOS				Intersection LOS
		EB	WB	NB	SB	
Hwy 12 @ Spring Street / Blackjack Road-2019	AM Peak PM Peak	C C	C C	D D	C C	D (35.7) C (32.3)

Unsignalized Intersections	Time Period	Critical Movement Level of Service											
		Eastbound			Westbound			Northbound			Southbound		
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt
Spring Street @ Mill Street -2020	AM Peak	B	B	B	C	C	A	A	-	-	A	-	-
	PM Peak	B	B	B	C	C	B	A	-	-	A	-	-

Source: Neel-Schaffer, 2021, HCM 6th Edition, Synchro Version 11.0.168.0.

Table 5.2.5.12 Alt 5 Existing 95th Percentile Queue Length

Signalized Intersections	Time Period	Maximum Approach Queue (ft)			
		EB	WB	NB	SB
Hwy 12 @ Spring Street / Blackjack Road	AM Peak	238	#171	240	132
	PM Peak	143	267	246	167

95th percentile volume exceeds capacity, queue may be longer.
Source: Neel-Schaffer, 2021, HCM 6th Edition, Synchro Version 11.0.168.0.

Table 5.2.5.13 Alt 6 Existing Traffic Level-of-Service

Signalized Intersections	Time Period	Approach LOS				Intersection LOS
		EB	WB	NB	SB	
Hwy 12 @ Spring Street / Blackjack Road-2019	AM Peak	C	C	D	C	D (35.7)
	PM Peak	C	C	D	C	C (32.3)

Unsignalized Intersections	Time Period	Critical Movement Level of Service											
		Eastbound			Westbound			Northbound			Southbound		
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt
Spring Street @ Mill Street -2020	AM Peak	B	B	B	C	C	A	A	-	-	A	-	-
	PM Peak	B	B	B	D	D	B	A	-	-	A	-	-

Source: Neel-Schaffer, 2021, HCM 6th Edition, Synchro Version 11.0.168.0.

Table 5.2.5.14 Alt 6 Existing 95th Percentile Queue Length

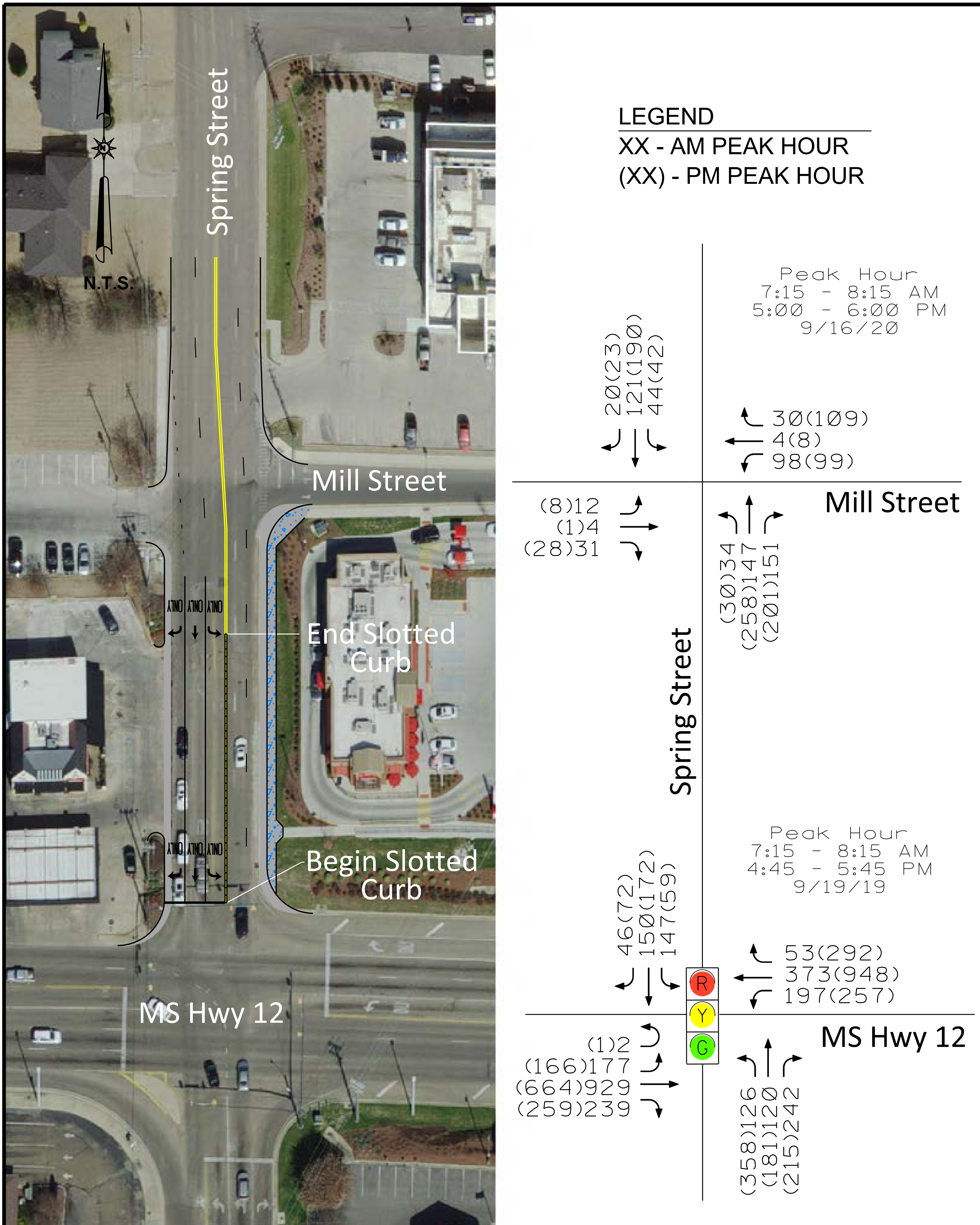
Signalized Intersections	Time Period	Maximum Approach Queue (ft)			
		EB	WB	NB	SB
Hwy 12 @ Spring Street / Blackjack Road	AM Peak	238	#171	240	132
	PM Peak	143	267	246	167

95th percentile volume exceeds capacity, queue may be longer.
Source: Neel-Schaffer, 2021, HCM 6th Edition, Synchro Version 11.0.168.0.

Each alternative shows improved levels of service and queues over the existing; however, alternative 1 revealed a southbound queue exceeding 200 ft - which does not resolve the existing queuing issues and alternative 6 increased the westbound through/left movement from an LOS C to LOS D which is expected with the removal of a northbound through lane decreasing the number of available gaps to complete the movement. Each of the other alternatives calculates a reduction in the southbound queue below 200 ft reducing the potential blockage of the Spring Street/Mill Street intersection. The results show only minor delay/queue improvements between converting Spring Street to a 3-lane with a center TWLTL or leaving it as a four-lane undivided. The conversion to a 3-lane would facilitate the addition of bike lanes and provide less potential for rear-end crashes with a refuge area for left turning traffic out of the thru lanes.

5.2.5.6 Summary

The analysis of existing traffic volumes identified that each individual intersection is not the primary issue, but the interaction/queuing between the two intersections and significant volume of traffic on Mill Street is contributing to the congestion issues. Although changing the northbound lane striping at Spring Street/MS Highway 12 will reduce delays and queues, the restriping by itself is not anticipated to eliminate southbound queues from extending into/through the Spring Street/Mill Street intersection. Adding a southbound right turn lane will help to reduce the southbound traffic queue. Restriping both the northbound and southbound lanes is calculated to have the largest impact in reducing both delays and queues of the alternatives evaluated. In addition, restriping Spring Street to a 3-lane with a center TWLTL will not resolve the queuing interaction issue between Highway 12 and Mill Street on Spring Street, but it will provide a refuge area for left turning traffic north to Russell Street and facilitate the addition of bike lanes along Spring Street, with striping. In addition, the capacity of the roadway is anticipated to be improved by converting the striping from four lanes to three.

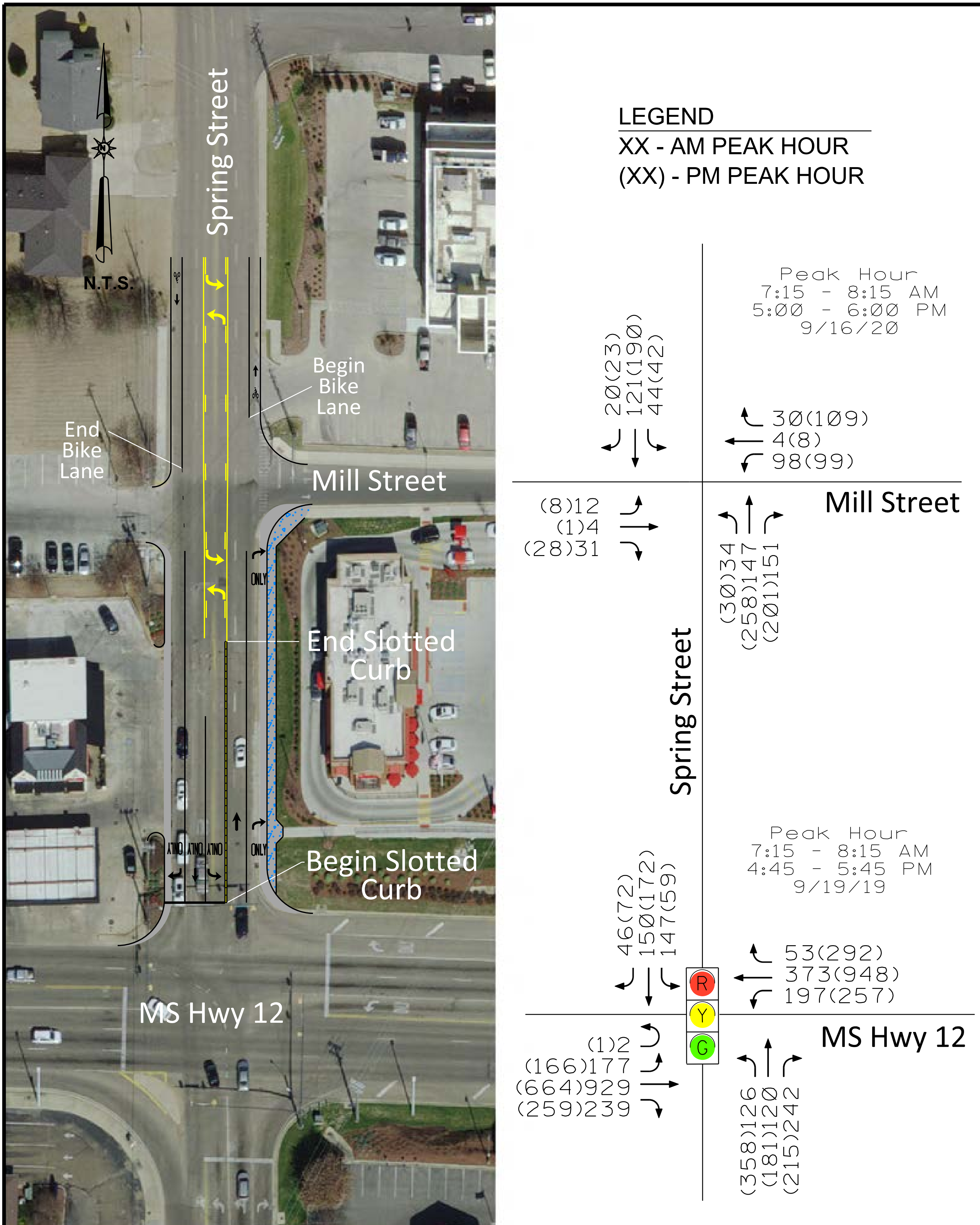


NEEL-SCHAFFER
Solutions you can build upon

SPRING STREET ALTERNATIVE 2
SB RIGHT TURN LANE

Figure 5.2.5.1

S:\Projects\14995.001-Starkville-Planning\CADD\SpringStreet\springstreet.dgn



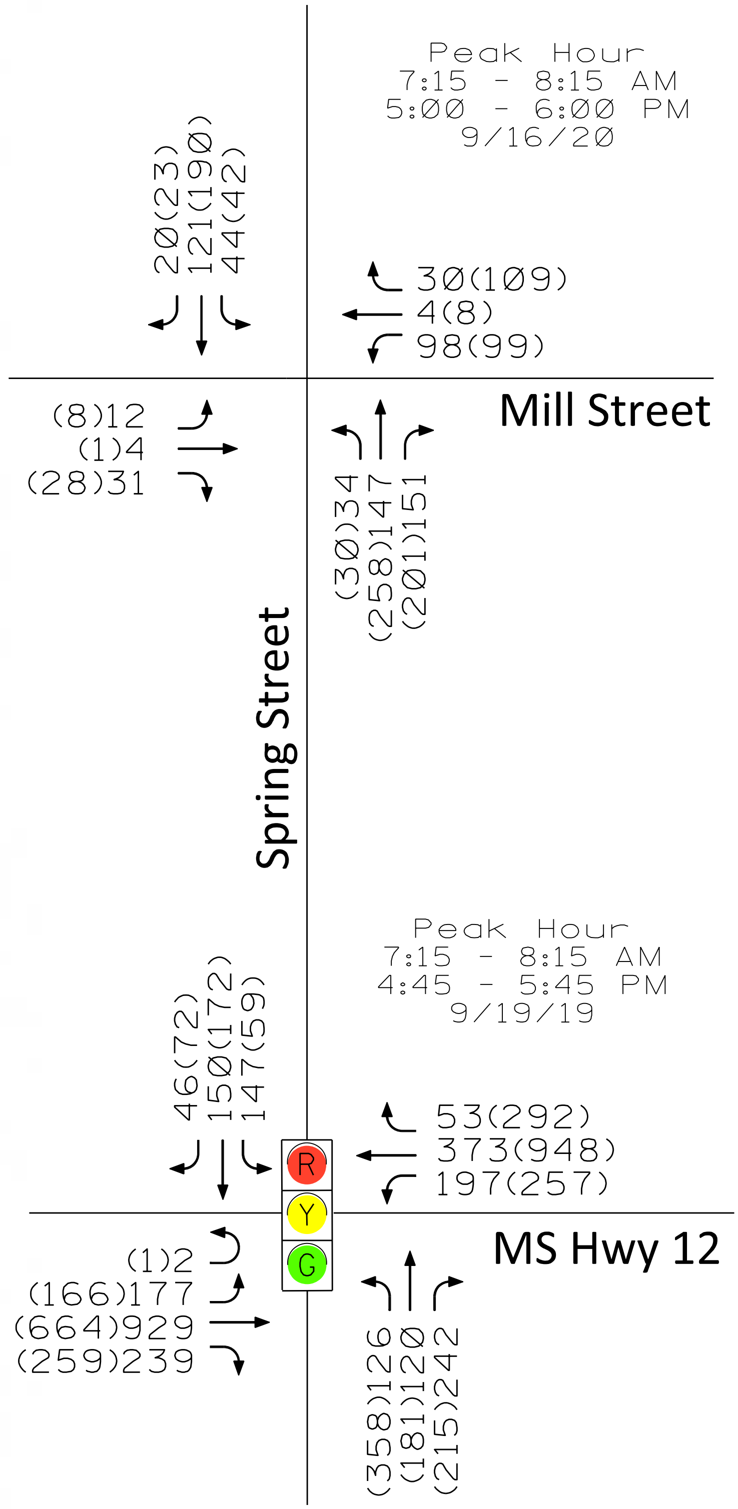
S:\Projects\14995.001-Starkville-Planning\CADD\SpringStreet\springstreet3lane.dgn

NEEL-SCHAFFER
Solutions you can build upon

SPRING STREET ALTERNATIVE 3 - SB RIGHT TURN LANE W/3-LANE SEGMENT

Figure 5.2.5.2

LEGEND
XX - AM PEAK HOUR
(XX) - PM PEAK HOUR



S:\Projects\14995.001-Starkville-Planning\CADD\SpringStreet\springstreetalt6.dgn

NEEL-SCHAFFER
Solutions you can build upon

SPRING STREET ALTERNATIVE 6 - NB LANE RESTRIPING/3-LANE SEGMENT

Figure 5.2.5.3

5.2.6 South Montgomery Street at MS Highway 12

Neel-Schaffer evaluated the turning issues along Montgomery Street at MS Highway 12. The intersection has a Sprint Mart gas station in the southwest quadrant, Southdale Center -Harvey's Restaurant-Lodge/ strip retail center in the southeast quadrant, CVS Pharmacy in northeast quadrant and Chevron gas station in the northwest quadrant.

5.2.6.1 Existing Conditions

Based on the Starkville Urban Area functional classification system, South Montgomery Street is classified as a Major Collector on the Federal Aid roadway system south of MS Highway 12. MS Highway 12 is a Principal Arterial. MS Highway 12 was modified in recent years to restrict mid-block left turns through the installation of a raised concrete curb. With gas stations on both sides of MS Highway 12 at Montgomery Street, the majority of patrons will make right turns in/out of the gas stations; however, some will turn left. The left turns from Montgomery Street to the Chevron on the north and to the Southdale Center on the south create the most disruption to through traffic. A single car waiting to turn left, blocks through traffic and routinely has traffic queue into MS Highway 12.

Above: Looking East: Southbound Queue on Montgomery Street Blocking Southdale Center Driveway.

5.2.6.2 Traffic Volumes

Turning movement counts were conducted at the MS Highway 12/Montgomery Street intersection by MDOT/Michael Baker on 9/19/2019. A summary of the volumes by approach are listed in Table 1.

Table 5.2.6.1 Peak Hour Approach Volumes

Approach	NB	SB	Total
	AM Peak (vph)		
North	326	282	608
South	657	338	995
	PM Peak (vph)		
North	361	468	829
South	474	651	1125

Source: Neel-Schaffer, 2021, Michael Baker, 2019

The existing traffic volumes reveal that the south approach of the intersection has the most traffic. The vehicles coming from MS Highway 12 that want to turn left into the Chevron or Southdale Center occasionally stop and back up traffic into Highway 12.

The proximity of the driveways on Montgomery Street to MS Highway 12 causes traffic behind the left turning vehicles to back up into the intersection. Chevron has a 50 ft driveway that is only 40 ft north of Highway 12. The Southdale Center has one driveway that is 80 ft south of the highway and another that is 265 ft south of Highway 12.

5.2.6.3 Existing Level of Service Analysis

The capacity and level-of-service (LOS) of an intersection is evaluated based on the average vehicular delay during the peak hour periods. The vehicular delays are directly related to the turning movement volumes, traffic composition and roadway geometrics at the study intersections. The methodology used in this analysis is based on the Highway Capacity Manual (HCM). The level-of-service, as outlined in the HCM, is reported as a letter designation of LOS A through LOS F (A is least delay and F is most delay). The 2019 traffic volumes at the study intersection were evaluated to determine the existing traffic levels-of-service based on the information provided in the HCM. The results of this analysis are shown in Table 2.

Table 5.2.6.2 5 Existing Traffic Level-of-Service – Montgomery Street/MS Highway 12

Signalized Intersections	Time Period	Approach LOS				Intersection LOS
		EB	WB	NB	SB	
S Montgomery @ Highway 12	AM Peak	C	B	C	C	C
	PM Peak	C	C	C	D	C

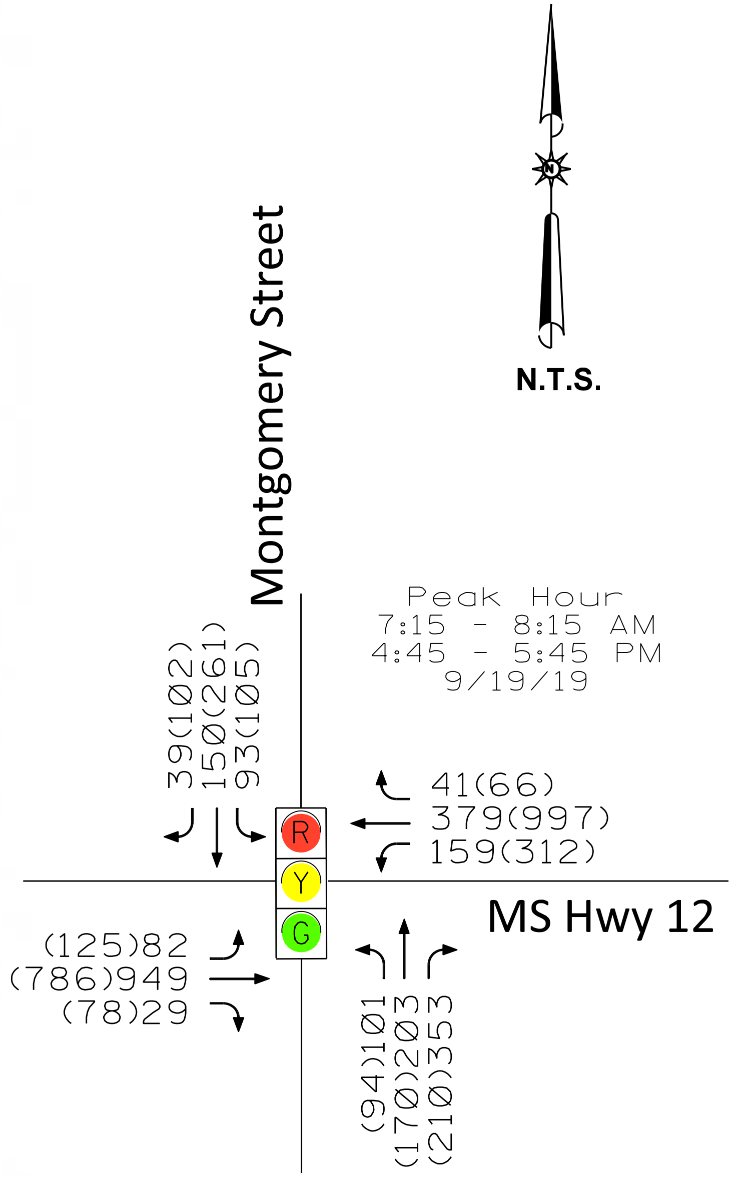
5.2.6.4 Recommendations

With the narrow cross section of Montgomery Street (3-lanes on north approach/4 lanes on south approach) and the retail development bordering right-of-way on both sides, widening Montgomery Street to provide a dedicated turn lane for traffic traveling from MS Highway 12 is likely cost prohibitive. Turning restrictions are recommended to help thru traffic move through these commercial driveway areas with less delay/traffic queues. A slotted curb is recommended on Montgomery Street south of MS

Highway 12, extending approximately 190 ft south of MS Highway 12. This curb would allow left turns at the southern driveways of Sprint Mart and Southdale Center. The distance of 190 ft would allow for queuing of approximately 7 vehicles along Montgomery Street before traffic would back into MS Highway 12.

The north approach has two driveways for the Chevron on Montgomery Street. Slotted curb is recommended to extend approximately 200 ft north of Highway 12, prohibiting left turns at the Chevron gas station, and allowing them at the Slim Chickens/CVS driveways. The Slim Chickens driveway has a shared access with the Express Oil Change and Chevron on the west side. The left turn restrictions on MS Highway 12 and those proposed on Montgomery Street would make it a circuitous route for traffic to access Chevron from the west. The queuing distance would allow for approximately 8 vehicles to queue before traffic would back into MS Highway 12. If the curb was extended 110 ft to allow left turns at the northern driveway of the gas station on Montgomery Street, this would only stage approximately 4 to 5 vehicles.

A concept showing all recommendations is shown in **Figure 5.2.6.1**.



Count data provided by MDOT/Michael Baker

LEGEND
XX - AM PEAK HOUR
(XX) - PM PEAK HOUR

NEEL-SCHAFFER
Solutions you can build upon

PROPOSED LEFT TURN RESTRICTIONS ON MONTGOMERY STREET

Figure 5.2.6.1

S:\Projects\14995.001-Starkville-Planning\CADD\Montgomery\montgomerystreet.dgn

5.2.7 Stark Road (MS Highway 12 to MS Highway 182)

The existing Stark Road section from Highway 12 to MS Highway 182 is a two-lane undivided roadway that widens at Hwy 12 to provide a left turn lane and widens at Hwy 182 to provide a right turn lane. Stark Road has transitioned into a major route with the addition of multi-family/apartments, office, and retail development, mostly along the west side of the corridor. The access to Stark Road at the Lowe's/Kroger retail center routinely has traffic congestion due to the traffic volumes and lack of left turn lanes on Stark Road.

5.2.7.1 Existing Conditions

The construction of MS Highway 25 to the west and MS Highway 82 to the north has changed circulation patterns, as much of the traffic from Old Highway 82 has moved to new Highway 82, and the new alignment of Highway 25 to the west helps to divert some traffic from Highway 12. Additionally, a median project along Highway 12 restricted left turns along the corridor and reduced the crash rate and improved east/west circulation.

The density of the residential development along Stark Road and the retail along Highway 12, with left turn restrictions, has significantly increased traffic. Left turns along Stark Road are difficult to execute during peak hours, requiring a gap in both directions.

5.2.7.2 Traffic Volumes

Turning movement counts were conducted at the Stark Road/MS Hwy 12 intersection and Stark Road/ Abernathy Road intersection by MDOT/Michael Baker on 9/17/2020 and 9/18/2019, respectively. In addition, turning movement counts were conducted at Stark Road/Starkville Crossing on 8/19/2021. A summary of the volumes by approach are listed in **Table 5.2.7.1**.

Table 5.2.7.1 Stark Road Peak Hour Approach Volumes

Approach	NB	SB	Total
	AM Peak (vph)		
N of Hwy 12	187	406	593
S of Starkville Crossing	193	375	568
N of Starkville Crossing	216	438	654
S of Abernathy	201	474	675
	PM Peak (vph)		
N of Hwy 12	363	439	810
S of Starkville Crossing	385	409	794
N of Starkville Crossing	488	520	1008
S of Abernathy	534	520	1054

Source: Neel-Schaffer, 2021, Michael Baker, 2019, 2020.

The existing Stark Road traffic volumes are congested in the peak hours, as left turns are difficult due to the heavy north/south traffic and no center turn lane provided.

5.2.7.3 Existing Level of Service Analysis

The capacity and level-of-service (LOS) of an intersection is evaluated based on the average vehicular delay during the peak hour periods. The vehicular delays are directly related to the turning movement volumes, traffic composition and roadway geometrics at the study intersections. The methodology used in this analysis is based on the Highway Capacity Manual (HCM). The level-of-service, as outlined in the HCM, is reported as a letter designation of LOS A through LOS F (A is least delay and F is most delay). The 2019/2020 traffic volumes at the study intersections were evaluated to determine the existing traffic levels-of-service based on the information provided in the HCM. The results of this analysis are shown in **Table 5.2.7.2**.

Table 5.2.7.2 Existing Traffic Level-of-Service

Signalized Intersections	Time Period	Approach LOS				Intersection LOS
		EB	WB	NB	SB	
MS Highway 12 @ Stark Rd/Airport Rd	AM Peak	B	B	C	C	B (19.1)
	PM Peak	B	C	C	C	C (21.9)

Unsignalized Intersections	Time Period	Critical Movement Level of Service											
		Eastbound			Westbound			Northbound			Southbound		
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt
Stark Rd @ Starkville Crossing	AM Peak	A	A	A	B	B	B	A	A	-	A	A	-
	PM Peak	C	C	C	C	C	C	A	A	-	A	A	-
Stark Rd @ Abernathy Dr	AM Peak	B	-	B	-	-	-	A	A	-	-	-	-
	PM Peak	C	-	B	-	-	-	A	A	-	-	-	-

Source: Neel-Schaffer, 2021, HCM 6th Edition.

The level of service analysis shows that existing conditions operate at an acceptable level. To further explore why this area was an area of concern for stakeholders, a warrant analysis was provided for the two unsignalized locations where counts were taken as shown in **Table 5.2.7.3** and **Table 5.2.7.4**.

Table 5.2.7.3 Stark Road at Starkville Crossing MUTCD Warrants 2020 Volumes

Hour	Major Volume	Max Minor Volume	Meets Warrant 1A (8hr)	Meets Warrant 1B (8hr)	Meets Warrant 2 (4hr)
8-9	563	62	--	--	--
9-10	568	103	--	--	--
10-11	646	116	--	--	--
11-12	713	145	--	--	--
12-1	771	174	X	X	X
1-2	721	160	X	--	--
2-3	736	155	X	--	--
3-4	716	157	X	--	--
4-5	861	177	X	X	X
5-6	813	177	X	-X	-X
6-7	619	156	X	--	--
7-8	495	137	--	--	--
			Fail (7 of 8)	**Fail (3 of 8)**	**Fail (3 of 4)**

Table 5.2.7.4 Stark Road at Abernathy Dr MUTCD Warrants 2020 Volumes

Hour	Major Volume	Max Minor Volume	Meets Warrant 1A (8hr)	Meets Warrant 1B (8hr)	Meets Warrant 2 (4hr)
7-8	454	210	--	--	--
8-9	332	159	--	--	--
9-10	282	178	--	--	--
10-11	331	184	--	--	--
11-12	376	203	--	--	--
12-1	465	270	--	--	--
1-2	400	237	--	--	--
2-3	479	259	--	--	--
3-4	485	314	--	--	--
4-5	614	288	--	--	--
5-6	521	288	--	--	--
6-7	416	233	--	--	--
			Fail (0 of 8)	**Fail (0 of 8)**	**Fail (0 of 4)**

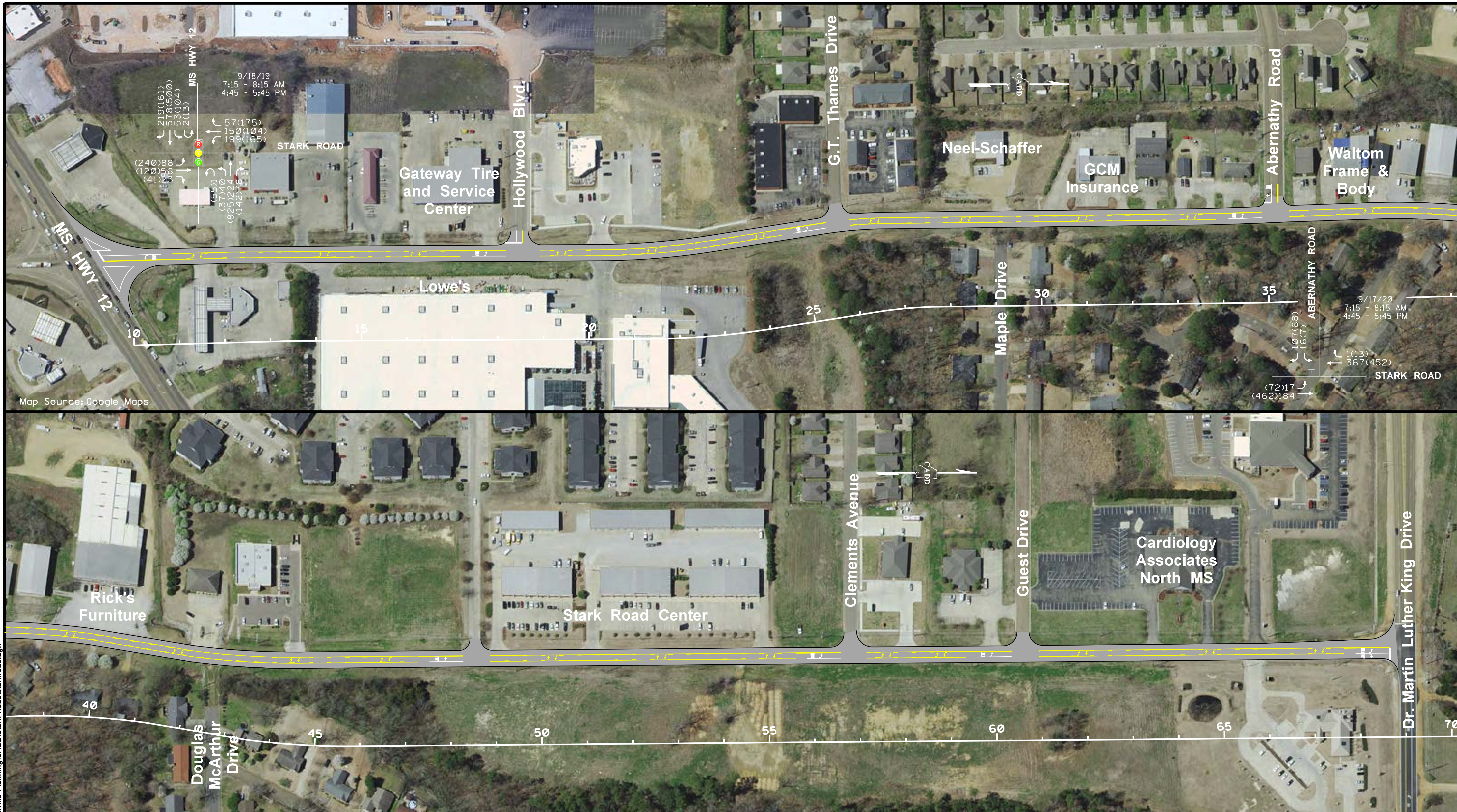
While neither intersection meet warrants, the Stark Road/Starkville Crossing intersection was within five vehicles of meeting Warrant 1 and fourteen vehicles of meeting Warrant 2. A secondary count with the constant variation of traffic could result in one of these warrants being met. Regardless, the intersection is right at the threshold for installing a signal when considered as a one-lane approach in all directions. Installing left turn lanes on the northbound and southbound approaches or a right turn lane on the westbound approach would increase the warrant volume threshold and the intersection would no longer meet any warrant for any hour. That said, the westbound approach is occasionally utilized as if it were a two lane approach (through-left and right only); however, it is currently striped as a single lane.

The maximum queues observed during the Stark Road/Starkville Crossing turning movement count were two vehicles northbound, six vehicles southbound, one vehicle eastbound, and twelve plus vehicles (queue extending into parking lot and was no longer visible) westbound. The northbound, southbound, and westbound max queues were caused by left turning vehicles.

5.2.7.4 Recommendations

With the narrow cross section of Stark Road and density of multi-family developments, coupled with the large retail developments along MS Highway 12, and the multiple direct driveways/businesses along Stark Road, widening Stark Road to 3 lanes is recommended between Airport Road and MS Highway 182. The 3-lane concept of Stark Road is shown in **Figure 5.2.7.1**.

In the event the entire 3-lane section is not feasible from a cost perspective or a shorter term project is desired, a 3-lane section from Highway 12 extending 150 feet north of the Starkville Crossing intersection for a total length of approximately 1300 feet would provide turning movements into the majority of the existing large retail development, which appears to be the most pressing need in terms of additional capacity.



S:\Projects\14995.001-Starkville-Planning\CADD\Stark-Road\starkroad.dgn

NEEL-SCHAFFER
Solutions you can build upon

STARK ROAD 3 - LANE CONCEPT

Figure 5.2.7.1

5.2.8 Stark Road Extension

The undeveloped property north of MS Highway 182 is bordered by MS Highway 25 to the west, W Garrard Road to the north, and Reed Road to the east. This area includes approximately 1,000 acres of mostly undeveloped property. New access to this large area of land has renewed interest since the construction of MS Highway 25 and US Highway 82 in close proximity to this property.

5.2.8.1 Existing Conditions

Josey Creek has multiple tributaries draining west/northwest toward the City's treatment lagoon, along with property that is within the 100-year flood zone. The direct extension of Hospital Road aligns with the flood zone/flood way of one of the tributaries for Josey Creek. Prior development plans had proposed access to MS Hwy 182 between Stark Road and Reed Road. There are some sight distance restrictions in this area, as a result of horizontal and vertical curves on MS Highway 182.

Much of MS Highway 25 is access controlled. However, there are 5 median openings on MS Highway 25 between MS Highway 182 and US Highway 82. These median openings are spaced at approximately 1,000 ft intervals, with the northern most median opening aligning with W Garrard Road/W. Reed Road at MS Highway 25.

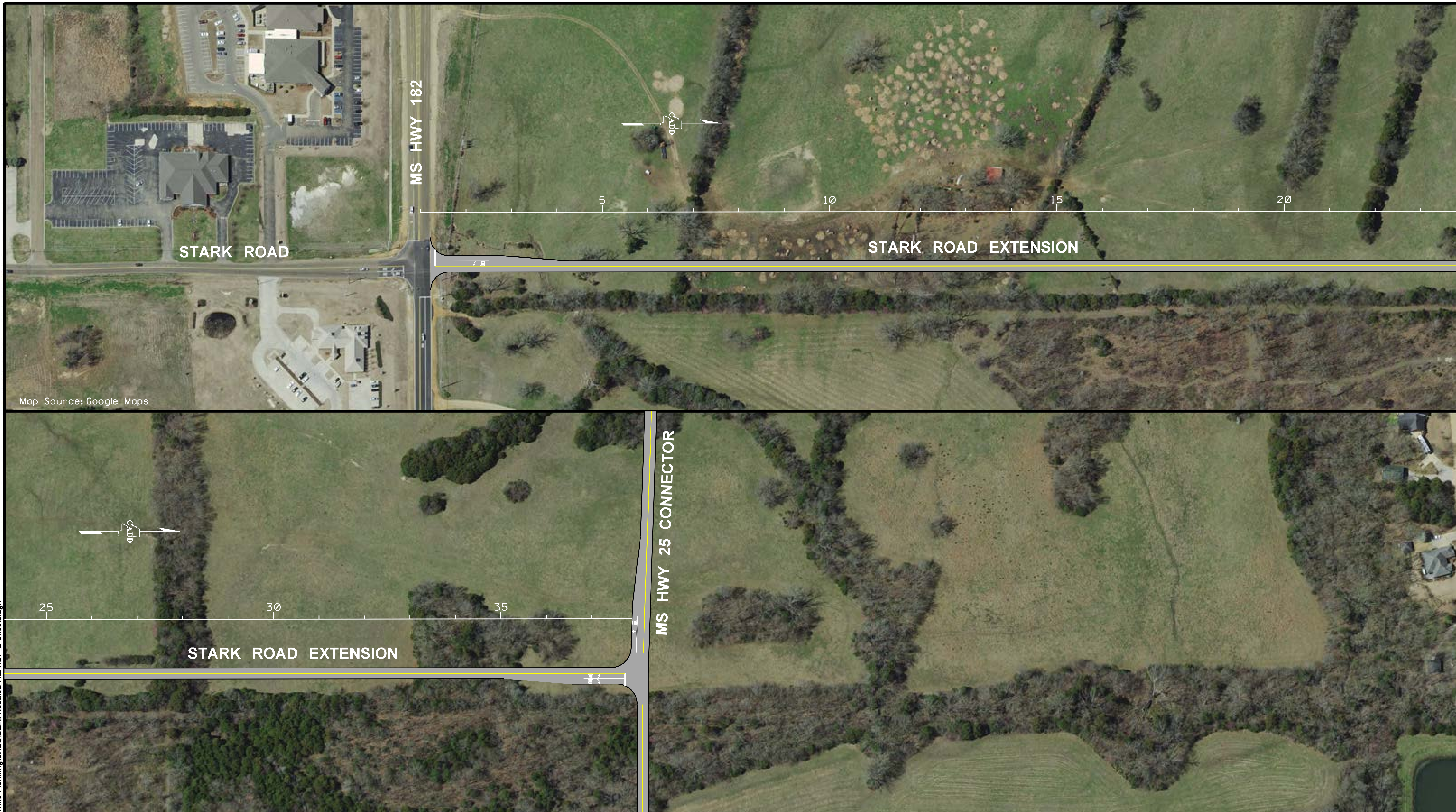
5.2.8.2 Future Development/Access Roads

The anticipated growth in the area is likely to justify widening W. Garrard Road and Reed Road to 3-lane roadways with curb/gutter sidewalks and full width travel lanes (12 ft each). Similarly, MS Highway 182 would benefit from widening to provide a dedicated left turn lane at any major access point east of Stark Road, as east/west left turn lanes exist on MS Highway 182 at Stark Road currently.

The primary north/south access into these 1,000 acres is recommended to be an extension of Stark Road north of MS Highway 182 and extending north to a recommended east/west connector which is recommended to intersect MS Highway 25 at either the 1st or 2nd median opening north of MS Highway 182 to the west and Reed Road as an extension of Hospital Road to the east. To minimize the impact of the Josey Creek tributaries that are in direct alignment with Hospital Road, two alternative concepts were developed.

5.2.8.3 Recommendations

A more detailed analysis of the proposed land uses/zoning is recommended to evaluate the proposed concepts and their ability to support the levels of development/density anticipated with the Stark Road Extension and east/west connector roadway. A preliminary hydraulic review is also recommended for the proposed tributary crossings to more accurately identify potential bridge costs. The Stark Road Extension and east/west connector route concepts are shown in **Figure 5.2.8.1** to **Figure 5.2.8.6**.



NEEL-SCHAFFER
Solutions you can build upon

STARK ROAD EXTENSION - ALT 1

Figure 5.2.8.1

S:\Projects\14995.001-Starkville-Planning\CADD\Stark-Road\3D-ALI-ALT B-Sheets.dgn

NEEL-SCHAFFER
Solutions you can build upon

EAST/WEST HWY 25 CONNECTOR - ALT 1

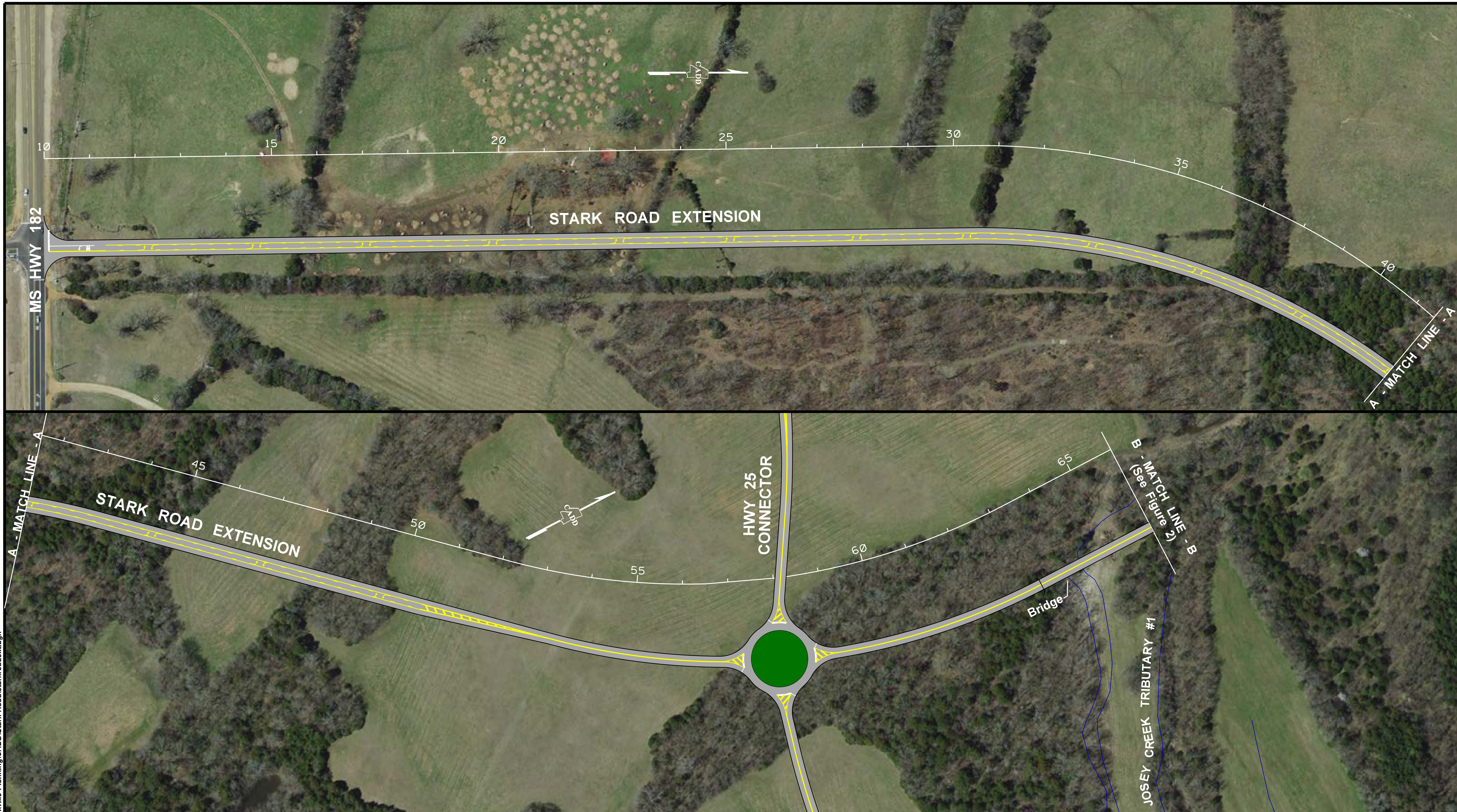
Figure 5.2.8.2

NEEL-SCHAFFER
Solutions you can build upon

EAST/WEST HWY 25 CONNECTOR - ALT 1

Figure 5.2.8.3

S:\Projects\14995.001-Starkville-Planning\CADD\Stark-Road\3D-ALt-ALT B-Sheets.dgn



S:\Projects\14995.001-Starkville-Planning\CADD\Stark-Road\starkroadext.dgn

NEEL-SCHAFFER
Solutions you can build upon

STARK ROAD EXTENSION - ALT 2

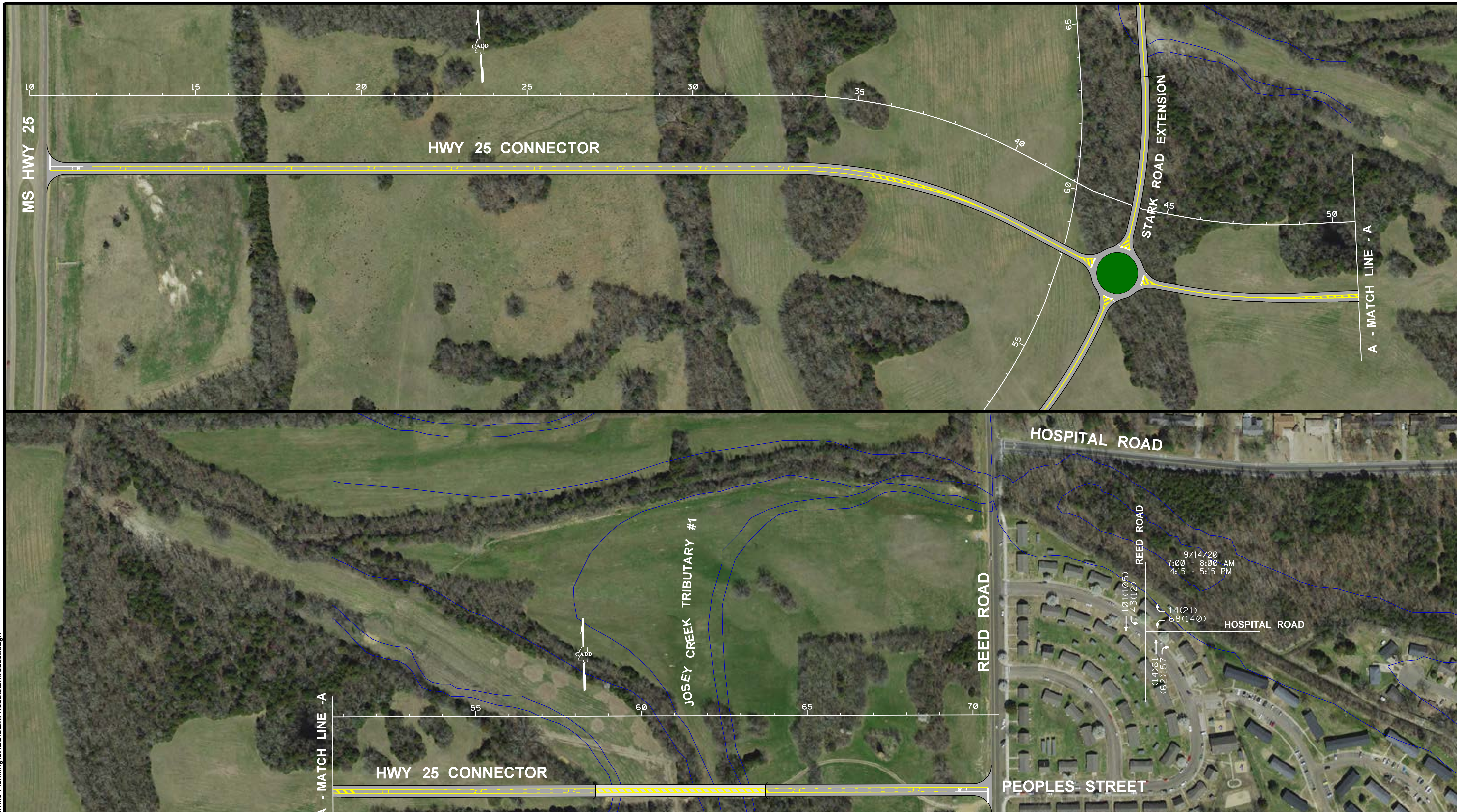
Figure 5.2.8.4

NEEL-SCHAFFER
Solutions you can build upon

STARK ROAD EXTENSION - ALT 2

Figure 5.2.8.5

S:\Projects\14995.001-Starkville-Planning\CADD\Stark-Road\starkroadext.dgn



S:\Projects\14995.001-Starkville-Planning\CADD\Stark-Road\starkroadext.dgn

NEEL-SCHAFFER *Solutions you can build upon*

EAST/WEST HWY 25 CONNECTION - ALT 2

Figure 5.2.8.6

5.2.9 Louisville Street at Yellow Jacket Drive

Per the city's request, Neel-Schaffer has conducted a review of the Louisville Street/Yellow Jacket Drive intersection to identify the cause of observed congestion.

5.2.9.1 Existing Conditions

The intersection of Louisville Street and Yellow Jacket Drive is a four-way signalized intersection. The west approach consists of the sole entrance to the private parking lot of a shopping center currently housing Dirt Cheap, Teresa's Hair Designs, and Hill's Barber Shop. Louisville Street (Old Highway 25) is a three-lane roadway with a center two-way left turn lane north of the intersection. To the south, Louisville Street is a divided two-lane roadway converting back to a three-lane roadway with a center two-way left turn lane 400 feet south of the intersection. In addition, bike lanes are marked between the lane line and face of curb on both sides of Louisville Street south of the intersection. Yellow Jacket Drive is a two-way undivided roadway with parallel parking present on the north side of the roadway and a channelized pick-up/drop-off lane for Starkville High School, which occupies the southeast quadrant of the intersection, on the south side of the roadway.

Dedicated left turn lanes exist on the north, south, and east approaches with the west approach striped as a single shared left-through-right lane; however, the west approach occasionally operates as if a dedicated left turn lane exists. The southbound left is permitted/protected with all other turning movements being permitted only. In addition, pedestrian crossing pavement markings are present on all approaches, with pedestrian push buttons and signal heads present only on the northbound approach.

Above: Louisville St (Old Hwy 25) @ Yellow Jacket Dr Source: Google Maps, Neel-Schaffer, 2021

5.2.9.2 Observations

This intersection was observed through video on 5/19/2021. The following observations were made:

- AM
  - Students observed to park in the private parking lot and walk to school.
  - Parents observed using private parking lot to drop students off instead of the channelized lane on Yellow Jacket Drive.
  - No congestion issues observed in AM operations.
- PM
  - Parents queueing in the channelized pick-up lane on Yellow Jacket Drive back into its intersection with Louisville Street. Once this lane fills, parents begin to enter the private parking lot to wait for pick-up.
  - A large platoon (approximately 40) of pedestrians cross Louisville Street from east to west when school releases. Smaller platoons (2 to 6) of pedestrians continue to utilize the crossing for approximately 15 minutes.
  - A congestion issue occurs as the students begin to leave the parking lot. The westbound approach cannot handle the demand. The interaction of the concurrent permissive only east and west approaches also contributes to congestion on the east approach. The issue clears after fifteen minutes.
  - A significant pedestrian safety conflict was observed between the westbound left and the pedestrians crossing the south approach.

5.2.9.3 Recommendations

The observed issues at this location appear to result from students using the private parking lot to the west of the intersection to park or be dropped-off/picked-up even though the lot is signed “No Student Parking”. This issue is two-fold as it adds significant pedestrian traffic crossing the south approach of the intersection as well as creating an instantaneous large demand on the west approach during the afternoon peak that appears to be greater than the capacity of the west approach with the given signal phasing. A future development is also planned to be built in the northwest corner of the existing parking lot which will remove some of the parking area currently being used by the students; however, it is likely they will just shift to parking in another location of the lot as the lot has sufficient capacity.

Providing enforcement to prevent student parking in this location is a potential resolution; however, it would require continuous monitoring and may not be feasible. Restriping the west (parking lot) approach to an exclusive left turn lane and a shared through right would increase capacity on the west approach and remove some driver confusion as some utilize it as if this geometry is currently in place and others utilize it as currently striped, a shared left-through-right lane. Additionally, retiming the signal to provide increased green time to the west bound approach could increase capacity; however, a signal timing study would be required to balance the demand to prevent creating a capacity issue on any of the other approaches. In addition to retiming the signal, the other exclusive left turn lanes, including the west approach if restriped, could be changed from permissive only to permissive/protected. This would require signal head upgrades and potentially additional detection.

While doing any combination of these has the potential to improve congestion, the safety issue relating to the conflict between the westbound permissive left and the pedestrian movement across the south approach could be improved by adding a permitted protective westbound left. Doing so would allow turning vehicles a protected movement that would not be affected by the pedestrian crossing as the pedestrian phase could be set to “Don’t Walk” during the protected movement. Otherwise, a “Turning Vehicles Yield to Pedestrian” (R10-15) sign is recommended for both the east and west approaches.

Above: Pedestrian Platoon Crossing Northbound Approach at 3:00pm: Looking North

Below: "No Student Parking Sign", Side Street Congestion: Looking North

Below: Congestion Westbound (Yellow Jacket Dr) and Eastbound (Parking Lot): Looking North

5.2.10 George Perry Street at Bailey Howell Drive: Roundabout

5.2.10.1 Existing Conditions

The existing George Perry St/Bailey Howell Dr intersection is an all-way stop control intersection that provides access to MS Hwy 182 to the north, MS Hwy 12 to the west, Lee Blvd to the east, and the central MSU campus to the south. George Perry St is a four-lane divided roadway to the north and a two-lane undivided roadway to the south. Bailey Howell Dr is a four-lane divided roadway on the west approach and a two-lane undivided roadway on the east approach. The speed limit on all four approaches is 20 miles per hour. An aerial of the intersection is shown below.

George Perry St/Bailey Howell Dr Existing Source: Google Maps, Neel-Schaffer, 2021.

5.2.10.2 Traffic Volumes

Turning movement counts were conducted at on 9/24/20 by MDOT/Michael Baker.

5.2.10.3 Existing Level of Service Analysis

The capacity and level-of-service (LOS) of an intersection is evaluated based on the average vehicular delay during the peak hour periods. The vehicular delays are directly related to the turning movement volumes, traffic composition and roadway geometrics at the study intersections. The methodology used in this analysis is based on the Highway Capacity Manual (HCM). The level-of-service, as outlined in the HCM, is reported as a letter designation of LOS A through LOS F (A is least delay and F is most delay). The adjusted 2020 traffic volumes at the study intersections were evaluated to determine the existing traffic levels-of-service based on the information provided in the HCM. The results of this analysis are shown in **Table 5.2.10.1**.

Table 5.2.10.1 Existing Traffic Level of Service – All-Way Stop

Unsignalized Intersections	Time Period	Critical Movement Level of Service												Intersection LOS
		Eastbound			LOS			Northbound			Southbound			
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	
George Perry Street @ Bailey Howell Drive	AM Peak	A	A	A	A	A	A	A	A	A	A	A	A	A (8.2)
	PM Peak	A	A	A	A	A	A	A	A	A	A	A	A	A (9.0)

Source: Neel-Schaffer, 2021, HCM 6th Edition, Synchro Version 11.0.168.0.

5.2.10.4 Roundabout Analysis

The level of service analysis results for a roundabout at the George Perry St/Bailey Howell Dr intersection are shown in **Table 5.2.10.2**.

Table 5.2.10.2 Existing Traffic Level of Service – Roundabout

Roundabout	Time Period	Approach LOS				Intersection LOS
		EB	WB	NB	SB	
George Perry Street @ Bailey Howell Drive	AM Peak	A	A	A	A	A (2.9)
	PM Peak	A	A	A	A	A (3.7)

Source: Neel-Schaffer, 2021, SIDRA Intersection 9.0.

This analysis shows that converting the all-way stop control intersection to a single lane roundabout improves the level of service for each peak hour.

In addition, converting a stop-controlled intersection to a single lane roundabout have multiple crash modification factors listed on the CMF Clearinghouse that range from a crash reduction of 25% to 85%. This conversion also will reduce pedestrian exposure by reducing the crossing width and providing larger pedestrian refuge islands increasing pedestrian safety.

5.2.10.5 Summary

Although the existing all-way stop control intersection operates at acceptable levels of service, converting this intersection to a roundabout provides the opportunity to improve both vehicular and pedestrian safety. Guidance for pedestrian safety at roundabouts is provided in the Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG). In addition, the center island of the roundabout could provide additional landscaping opportunity. A roundabout concept is shown below in **Figure 5.2.10.1**. Prior to implementation, this roundabout is recommended to be studied in relation to traffic demand and pedestrian demand so that the best design can be determined.

Figure 5.2.10.1 George Perry St/Bailey Howell Dr Roundabout Concept

5.2.11 Campus Planning and Circulation

5.2.11.1 Introduction and Summary

This report summarizes the findings of a traffic analysis performed by Neel-Schaffer, Inc. as requested by Mississippi State University for proposed circulation improvements/modifications to the internal street network. The core campus area was evaluated to identify changes that the University wishes to make in access modifications to restrict vehicles through specific high pedestrian traffic areas of the campus. Construction is underway along Blackjack Road east of Oktoc Road, widening from a 2-lane to a 3-lane roadway. The core campus area bordered by MS Hwy 182 to the north, MS Hwy 12 to the west, Blackjack Road to the south, Campus Trails and Lee Blvd to the east, includes approximately 700 acres of property.

The impacts of the COVID 19 pandemic have reduced local traffic volumes, through fewer sports/clubs/public events, as well as school attendance and increased work-from-home activity. While this was considered as part of this report, it did not drive decision making as traffic in the area is anticipated to return to pre-pandemic trends and volumes.

5.2.11.1.1 Purpose

The purpose of this analysis is to evaluate the existing traffic circulation and the impacts that roadway alignment modifications would have on circulating traffic. To analyze the related impact to the surrounding area, existing roadway capacity and non-site traffic levels-of-service were evaluated. In addition, a field review was conducted to observe existing peak periods and congestion levels within the study area of the project site and the existing geometrics of the surrounding roadways.

5.2.11.2 Existing Conditions

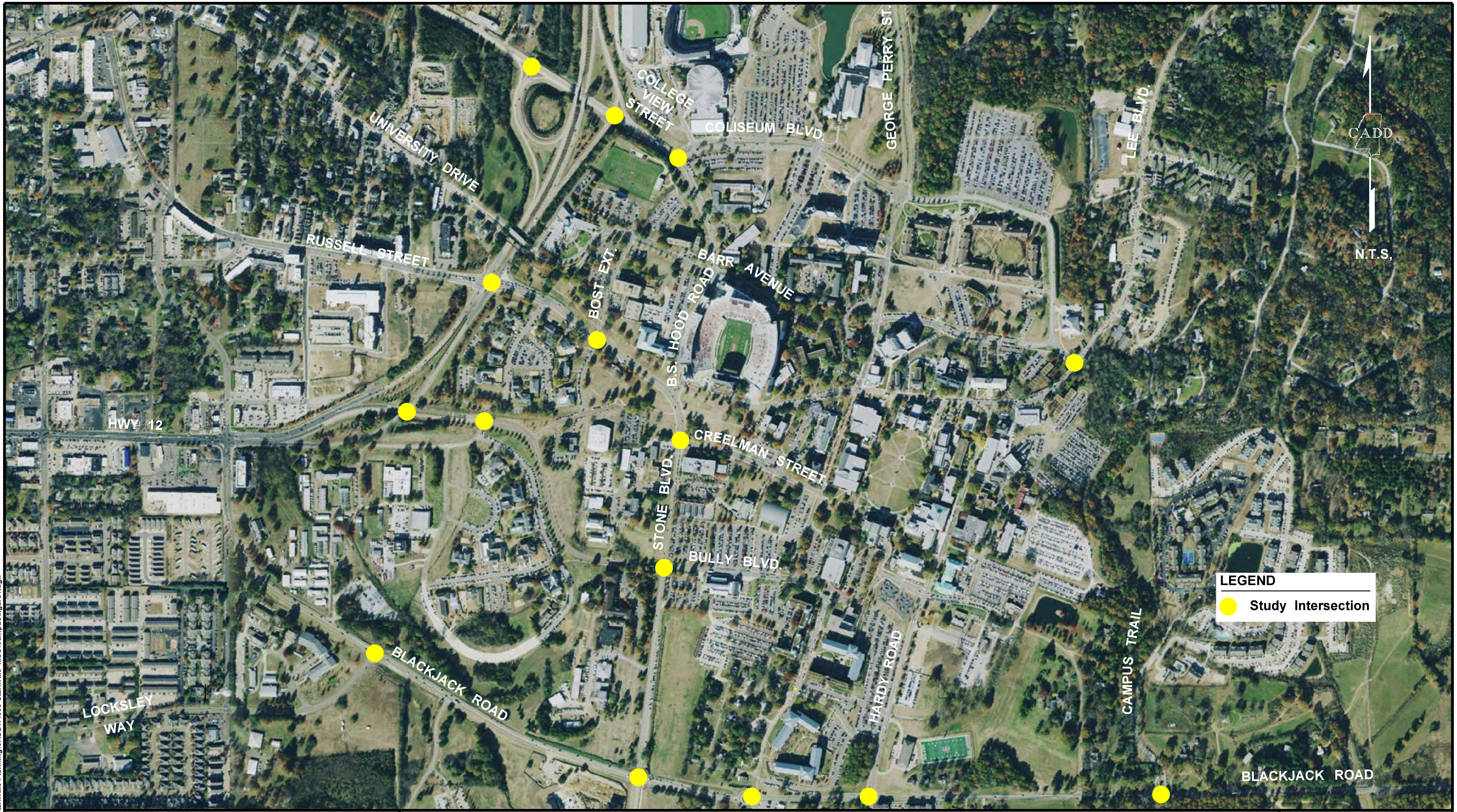
5.2.11.2.1 Study Area

The primary roadways providing access to the core campus include MS Hwy 182, MS Highway 12, College View Drive, University Drive/Barr Ave, Russell Street/Stone Blvd, Bully Blvd, Hardy Road, Lee Blvd, and George Perry Street. A roadway project is underway along the east campus to connect Campus Trail Drive with Barr Avenue at Lee Blvd. The study intersections (as shown in **Figure 5.2.11.1**) were determined to include:

Blackjack Road	-Locksley Way, Stone Blvd, Hardy Rd & Campus Trails
Stone Blvd	-Bully Blvd, Creelman Street, Bost Dr/Bost Ext
SR 12	-Bully Blvd, Russell Street, College View Drive
Bully Blvd	-Fraternity Row/Sorority Row
Barr Ave	-Lee Blvd

5.2.11.2.2 Land Use

The MSU central campus is approximately 700 acres bordered by MS Hwy 182 to the north, SR 12 to the west, Blackjack Road to the south, and Campus Trails/Montgomery Hill Road to the east. The site has continued to develop/redevelop and restrict vehicular traffic to the outer limits of the campus while the interior of the campus is more walkable, yet also supported by bus service.



NEEL-SCHAFFER
Solutions you can build upon

STUDY AREA

Figure 5.2.11.1

S:\Projects\14995.001-Starkville-Planning\CADD\14995-Starkville MSUCampus\figure1.dgn

5.2.11.2.3 Roadways and Intersections

The primary roadways serving the MSU campus include: MS Hwy 182, MS Hwy 12, E. Lee Blvd, Hardy Road, Stone Blvd, Bully Blvd, University Drive, College View Drive and George Perry Blvd. The majority of these campus access points are signal controlled, while two intersections have grade separated interchanges/traffic movements. Campus Trails at Blackjack Road will provide campus access with the new extension north to Lee Blvd at Barr Avenue that is currently in construction and is being named "Bulldog Way". The intersections of Campus Trails at Blackjack Road and Lee Boulevard are not currently signalized.

5.2.11.2.4 Traffic Volumes

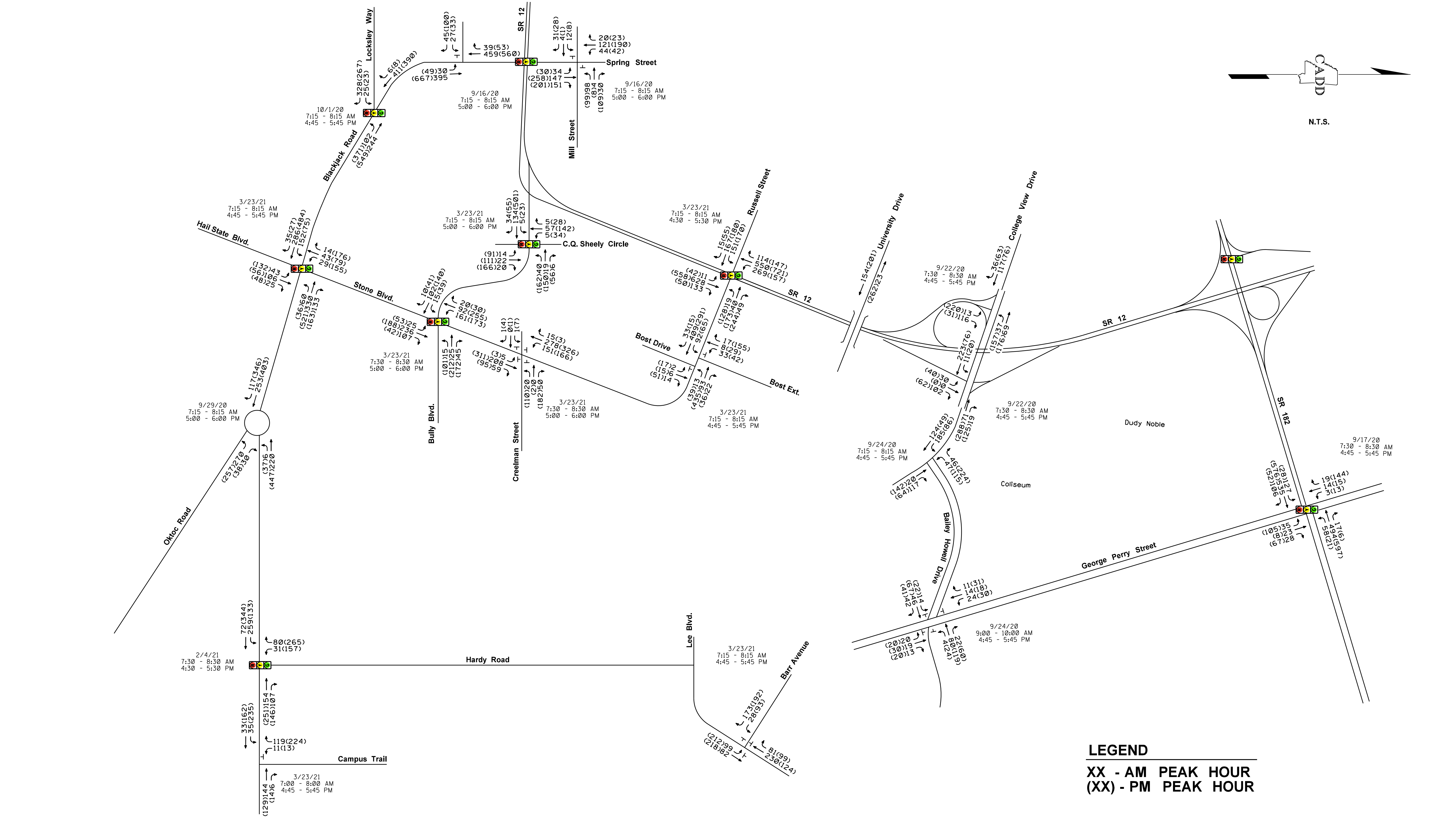
The existing traffic volumes were collected at the study intersections at/adjacent to the MSU campus. Traffic volumes were collected by MDOT/Michael Baker on 9/17/20-10/1/20, and by Neel-Schaffer on 2/4/21 and 3/23/21 to document the existing traffic demands. The existing peak hour volumes are shown graphically in **Figure 5.2.11.2**.

The peak hour volumes were totaled at the gateway intersections to campus to identify a peak hour entering/exiting volume from the campus for each roadway. While traffic counts were not conducted on the same day, the totals provide insight into the percentage/volume of traffic entering/exiting the campus from each roadway. The intersection totals and percentages for each roadway are summarized in **Table 5.2.11.1**.

Table 5.2.11.1 Total Vehicular Traffic In/Out of MSU Main Campus

Peak	Hwy 12/ Russell St	Bully-Frat Row	Stone/ Black-jack	Hardy/ Black-jack	Lee Blvd/ Barr Ave	Hwy 182/ George Perry	College View/ Bailey Howell	University Dr/ Col. Muldrow	Hour Total
Ingress									
AM Pk*	569	173	391	388	311	173	309	154	2,468
PM Pk	386	142	294	283	223	88	135	201	1,752
AM Pk	23%	7%	16%	16%	13%	7%	13%	6%	
PM Pk	22%	8%	17%	16%	13%	5%	8%	11%	
Egress									
AM Pk	118	53	128	134	101	91	95	43	763
PM Pk	557	266	410	424	311	180	366	262	2,776
AM Pk	15%	7%	17%	18%	13%	12%	12%	6%	
PM Pk	20%	10%	15%	15%	11%	6%	13%	9%	
In+Out									
AM Pk	677	211	477	485	421	246	375	177	3,069
PM Pk	943	408	704	707	534	268	501	463	4,528
AM Pk	22%	7%	16%	16%	14%	8%	12%	6%	
PM Pk	21%	9%	16%	16%	12%	6%	11%	10%	

Peaks 7:15-8:15 AM, 4:45-5:45 PM



NEEL-SCHAFFER
Solutions you can build upon

EXISTING PEAK HOUR VOLUMES

Figure 5.2.11.2

S:\Projects\14995.001-Starkville-Planning\CADD\14995-Starkville MSU\Campusfigure2.dgn

The counts revealed a total of 3,069 vehicles in the AM Peak and 4,528 in the PM Peak hour traveling in/out of the core MSU campus. Blackjack Road accounts for 32% of the in/out traffic for the entire campus at Stone Blvd and Hardy Road. Russell Street is the second busiest access at 22%. Traffic to/from the north at George Perry and Lee Blvd total 22% AM/18% PM combined. Bully Blvd (7%/9%), University Drive (6%/10%) and College View (12%/11%). The Hwy 12/Russell Street intersection had the highest volumes of traffic entering the campus in both the AM and PM peak hours.

5.2.11.2.5 Existing Traffic - Level of Service Analysis

The capacity and level-of-service (LOS) of an intersection is evaluated based on the average vehicular delay during the peak hour periods. The vehicular delays are directly related to the turning movement volumes, traffic composition and roadway geometrics at the study intersections. The methodology used in this analysis is based on the *Highway Capacity Manual* (HCM). The level-of-service, as outlined in the HCM, is reported as a letter designation of LOS A through LOS F (A is least delay and F is most delay). The traffic volumes at the study intersections were evaluated to determine the existing traffic levels-of-service based on the information provided in the HCM. The results of this analysis are shown in **Table 5.2.11.2** and **Table 5.2.11.3**.

Table 5.2.11.2 Existing Traffic Level-of-Service

Signalized Intersections	Time Period	Approach LOS				Intersection LOS
		EB	WB	NB	SB	
Hwy 12 @ Blackjack Road / Spring Street	AM Peak	D	C	D	D	D
	PM Peak	D	D	D	**E**	D
Hardy Road @ Blackjack Road	AM Peak	B	C	-	B	B
	PM Peak	B	C	-	C	B
Stone Boulevard @ Blackjack Road	AM Peak	A	B	C	C	B
	PM Peak	C	C	C	D	C
Locksley Way @ Blackjack Road	AM Peak	A	A	D	-	A
	PM Peak	A	A	D	-	A
C.Q. Sheely Circle @ Bully Boulevard	AM Peak	C	B	A	C	C
	PM Peak	D	C	C	D	C
Stone Boulevard @ Bully Boulevard	AM Peak	C	C	A	A	B
	PM Peak	C	C	B	B	C
Stone Boulevard @ Highway 12	AM Peak	B	C	B	A	B
	PM Peak	B	C	B	B	B
George Perry Street @ Highway 182	AM Peak	B	C	B	C	B
	PM Peak	C	C	B	C	C
Roundabout Intersections	**Time Period**	**Approach LOS**				**Intersection LOS**
		EB	**WB**	**NB**	**SB**	
Oktoc Road @ Blackjack Road	AM Peak	A	A	A	-	A
	PM Peak	B	A	A	-	A

Source: Neel-Schaffer, 2021, HCM 6th Edition.

Table 5.2.11.3 Existing Traffic Level-of-Service (cont'd)

Unsignalized Intersections (All-Way Stop)	Time Period	Critical Movement Level of Service											
		Eastbound			Westbound			Northbound			Southbound		
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt
Lee Boulevard @ Bailey Howell Drive	AM Peak	A	A	-	-	B	A	-	-	-	A	-	A
	PM Peak	B	B	-	-	B	A	-	-	-	B	-	B
George Perry Street @ Bailey Howell Drive	AM Peak	A	A	A	A	A	A	A	A	A	A	A	A
	PM Peak	A	A	A	A	A	A	A	A	A	A	A	A
Unsignalized Intersections (Two-Way Stop)*	**Time Period**	**Critical Movement Level of Service**											
		Eastbound			**Westbound**			**Northbound**			**Southbound**		
		Lt	**Th**	**Rt**	**Lt**	**Th**	**Rt**	**Lt**	**Th**	**Rt**	**Lt**	**Th**	**Rt**
Blackjack Road @ Campus View Drive	AM Peak	A	A	-	-	-	-	-	-	-	B	-	A
	PM Peak	A	A	-	-	-	-	-	-	-	C	-	B
Blackjack Road @ University Crossing	AM Peak	B	-	B	-	-	-	A	-	-	-	-	-
	PM Peak	C	-	B	-	-	-	A	-	-	-	-	-
Spring Street @ Mill Street	AM Peak	B	B	B	C	C	A	A	A	-	A	A	-
	PM Peak	B	B	B	C	C	B	A	A	-	A	A	-
Stone Boulevard @ Creelman Street	AM Peak	A	A	A	A	A	A	A	B	B	B	B	B
	PM Peak	B	B	B	B	B	B	A	D	D	B	C	C
Stone Boulevard @ Bost Drive	AM Peak	A	-	-	A	-	-	B	B	B	C	C	A
	PM Peak	A	-	-	A	-	-	D	D	D	**E**	**E**	B
College View Drive @ Bailey Howell Drive	AM Peak	-	-	-	B	-	A	-	-	-	A	A	-
	PM Peak	-	-	-	B	-	B	-	-	-	A	A	-
College View Drive @ Highway 12 NB Ramps	AM Peak	A	A	-	-	-	-	B	B	B	-	-	-
	PM Peak	A	A	-	-	-	-	B	B	B	-	-	-
College View Drive @ Highway 12 SB Ramps	AM Peak	-	-	-	A	A	-	A	A	A	-	-	-
	PM Peak	-	-	-	A	A	-	D	D	D	-	-	-

*Major @ Minor; Source: Neel-Schaffer, 2021, HCM 6th Edition.

The capacity analysis shows that the study intersections are operating at acceptable levels with existing traffic (2020) with exception to the southbound movement at Bost Extension/Stone Blvd and Highway 12/Spring St operating at LOS E in the PM peak hour. However, the visual observations identify that there is a metering effect of the signals with congestion in both the AM and PM peak hours on Blackjack Road. The volumes during the peaks are not necessarily reflecting the "Demand" volume, but rather the saturation flow. If more capacity was provided, then more vehicles would go through the intersection, as there is a queue on Blackjack Road extending through Oktoc back to Hardy Road during a portion of the PM Peak hour. The capacity analysis sheets are provided in the report Appendix.

A no-build analysis is provided in **Table 5.2.11.4** and **Table 5.2.11.5** for the year 2045 using the established 1% growth rate from section 5.1.3. This analysis is provided as a comparison for the proposed traffic network improvements as some of the projects have a high level of investment and should be reviewed for both existing and future conditions. The capacity analysis sheets are provided in the report Appendix.

Table 5.2.11.4 2045 No Build Traffic Level-of-Service

Signalized Intersections	Time Period	Approach LOS				Intersection LOS
		EB	**WB**	**NB**	**SB**	
Hwy 12 @ Blackjack Road / Spring Street	AM Peak	D	D	**F**	**E**	**F**
	PM Peak	**E**	**E**	**F**	**F**	**F**
Hardy Road @ Blackjack Road	AM Peak	B	C	-	B	B
	PM Peak	B	C	-	D	C
Stone Boulevard @ Blackjack Road	AM Peak	B	B	D	C	B
	PM Peak	C	C	D	**F**	D
Locksley Way @ Blackjack Road	AM Peak	A	A	D	-	A
	PM Peak	A	A	D	-	A
C.Q. Sheely Circle @ Bully Boulevard	AM Peak	C	B	A	C	C
	PM Peak	**E**	C	D	D	D
Stone Boulevard @ Bully Boulevard	AM Peak	D	C	B	A	B
	PM Peak	C	D	C	C	C
Stone Boulevard @ Highway 12	AM Peak	C	C	B	B	B
	PM Peak	C	C	B	B	C
George Perry Street @ Highway 182	AM Peak	B	C	B	C	C
	PM Peak	C	C	C	C	C
Roundabout Intersections	**Time Period**	**Approach LOS**				**Intersection LOS**
		EB	**WB**	**NB**	**SB**	
Oktoc Road @ Blackjack Road	AM Peak	A	A	A	-	A
	PM Peak	C	A	B	-	B

Source: Neel-Schaffer, 2021, HCM 6th Edition.

Table 5.2.11.5 2045 No Build Traffic Level-of-Service (cont'd)

Unsignalized Intersections (All-Way Stop)	Time Period	Critical Movement Level of Service											
		Eastbound			Westbound			Northbound			Southbound		
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt
Lee Boulevard @ Bailey Howell Drive	AM Peak	B	A	-	-	B	A	-	-	-	B	-	B
	PM Peak	C	C	-	-	B	B	-	-	-	B	-	B
George Perry Street @ Bailey Howell Drive	AM Peak	A	A	A	A	A	A	A	A	A	A	A	A
	PM Peak	A	A	A	A	B	B	A	A	A	A	A	A
Unsignalized Intersections (Two-Way Stop)*	**Time Period**	**Critical Movement Level of Service**											
		Eastbound			**Westbound**			**Northbound**			**Southbound**		
		Lt	**Th**	**Rt**	**Lt**	**Th**	**Rt**	**Lt**	**Th**	**Rt**	**Lt**	**Th**	**Rt**
Blackjack Road @ Campus View Drive	AM Peak	A	A	-	-	-	-	-	-	-	B	-	B
	PM Peak	A	A	-	-	-	-	-	-	-	D	-	B
Blackjack Road @ University Crossing	AM Peak	C	-	B	-	-	-	A	-	-	-	-	-
	PM Peak	C	-	B	-	-	-	B	-	-	-	-	-
Spring Street @ Mill Street	AM Peak	B	B	B	C	C	A	A	A	-	A	A	-
	PM Peak	B	B	B	**E**	**E**	B	A	A	-	A	A	-
Stone Boulevard @ Creelman Street	AM Peak	A	A	A	B	A	A	A	B	B	B	B	B
	PM Peak	B	B	B	C	C	C	B	**F**	**F**	C	**E**	**E**
Stone Boulevard @ Bost Drive	AM Peak	A	-	-	A	-	-	C	C	C	D	D	A
	PM Peak	A	-	-	A	-	-	**F**	**F**	**F**	**F**	**F**	C
College View Drive @ Bailey Howell Drive	AM Peak	-	-	-	C	-	A	-	-	-	A	A	-
	PM Peak	-	-	-	C	-	B	-	-	-	A	A	-
College View Drive @ Highway 12 NB Ramps	AM Peak	A	A	-	-	-	-	B	B	B	-	-	-
	PM Peak	A	A	-	-	-	-	B	B	B	-	-	-
College View Drive @ Highway 12 SB Ramps	AM Peak	-	-	-	A	A	-	A	A	A	-	-	-
	PM Peak	-	-	-	A	A	-	**F**	**F**	**F**	-	-	-

*Major @ Minor; Source: Neel-Schaffer, 2021, HCM 6th Edition.

5.2.11.3 Improved Network Traffic

5.2.11.3.1 Internal Street Network Changes

The internal street network for the MSU campus has transitioned over the years to continue to push parking/vehicular traffic toward the outer limits of the main campus, while promoting pedestrian activity in the central campus. Bus service to these outer parking lots helps commuters travel from these parking lots to the internal campus. Discussions with MSU staff identified potential changes to the street network to include construction of some new roadways and closure of existing roads. A summary of the roadways with potential alignment or access changes includes:

Campus Trail Extension	BS Hood Rd (stadium)/College View Drive
Hardy Road – Limited Access	Bully Blvd – at Hwy 12-Mill Street Access (Mercantile Extension)
President Circle-Restricted Access	Bully Blvd - east of Sorority Row
Bost Drive Extension	Hwy 12 – entry/exit ramps at Bully Blvd & College View St
Bailey Howell Drive Road Diet	

Campus Trail is currently under construction to the north, to extend to the intersection with Lee Boulevard at Barr Avenue. This new route will allow an east connection for the campus, providing some relief to Blackjack Road. A direct connection will also be made to the satellite parking areas east of Hardy Road.

Hardy Road is proposed to be restricted to bus access only, north of Morrill Road. Similarly, Morrill Road west of Hardy and President Circle will have limited access areas (bus traffic). BS Hood Road from Stone Blvd to Barr Avenue and College View Drive from Barr Avenue to Coliseum Drive are proposed to be closed to vehicular traffic and reconfigured as a pedestrian/bicycle corridor. This vehicular corridor is planned to be replaced by Bost Extension which is an extension from Barr Avenue to the north intersecting with College View Street at Coliseum Boulevard.

The section of Bully Blvd east of Sorority Row is proposed to be removed for future campus development. A new east/west roadway is proposed to extend from the end of Locksley Way to Hardy Road, parallel to Blackjack Road.

SR 12 is proposed to be reconstructed at Bully Blvd to remove the grade separated ramps and have an at-grade intersection that is signal controlled, with an access to Mill Street to the north. Two alignments are proposed for the southern approach. The first ties the southern approach to the existing Bully Boulevard which is preferred under existing conditions. With the expected closure of Bully Boulevard east of Sorority Row and the proposed Locksley Way connection, Robert Louis Jones Circle is expected to transition to the primary roadway in the area. Thus, the second alignment would be preferred that ties the south approach directly into Robert Louis Jones Circle.

Similarly, the ramps at SR 12/College View Street are proposed to be removed to provide an at-grade signal-controlled intersection for the campus. Ingress access to eastbound Highway 12 is proposed between Blackjack Road and Bully Blvd, and between Bully Blvd and Russell Street.

The four-lane section of Bailey Howell Drive is also proposed to undergo a road diet, reducing to two through lanes, one in each direction of travel providing shorter pedestrian crossings and allowing space for additional turn lanes at select intersections.

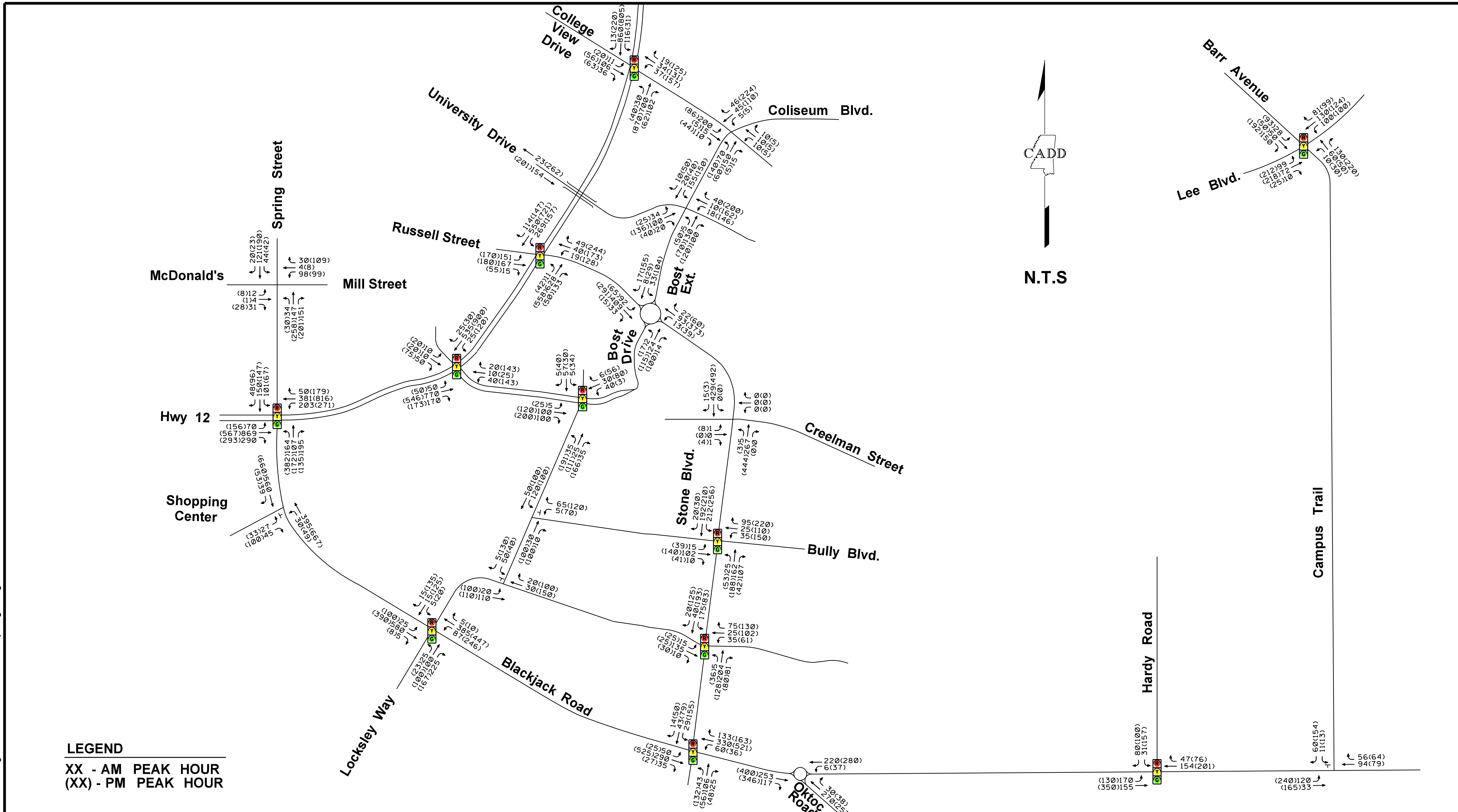
The proposed circulation concepts are shown in **Figure 5.2.11.3**. The existing base year site traffic was reassigned to the proposed roadway network, considering the proposed access modifications listed. The conceptual AM/PM peak hour volumes on the improved roadway network are shown in **Figure 5.2.11.4**.

S:\Projects\14995.001-Starkville-Planning\CADD\14995-Starkville MSU\Campus\figure3.dgn

NEEL-SCHAFFER
Solutions you can build upon

CAMPUS CIRCULATION CONCEPTS

Figure 5.2.11.3

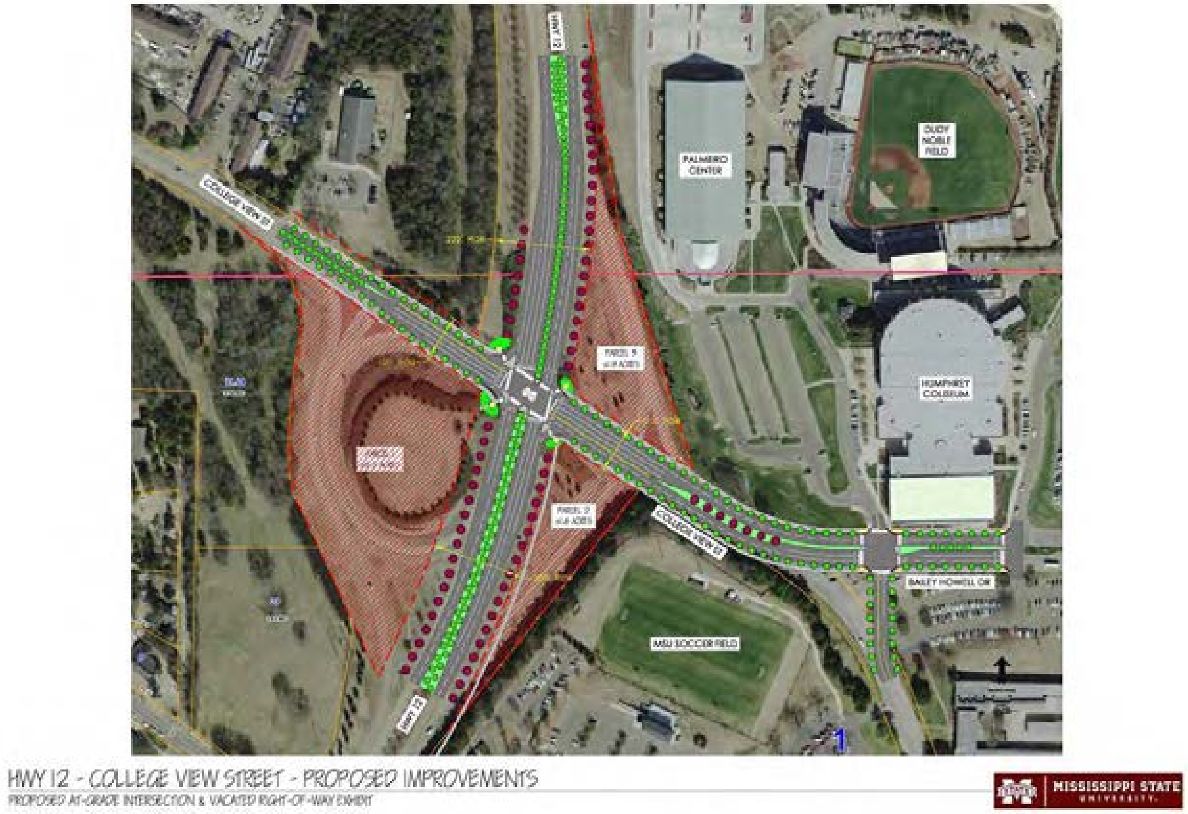


S:\Projects\14995.001-Starkville-Planning\CADD\14995-Starkville MSU\Campus\figure4.dgn

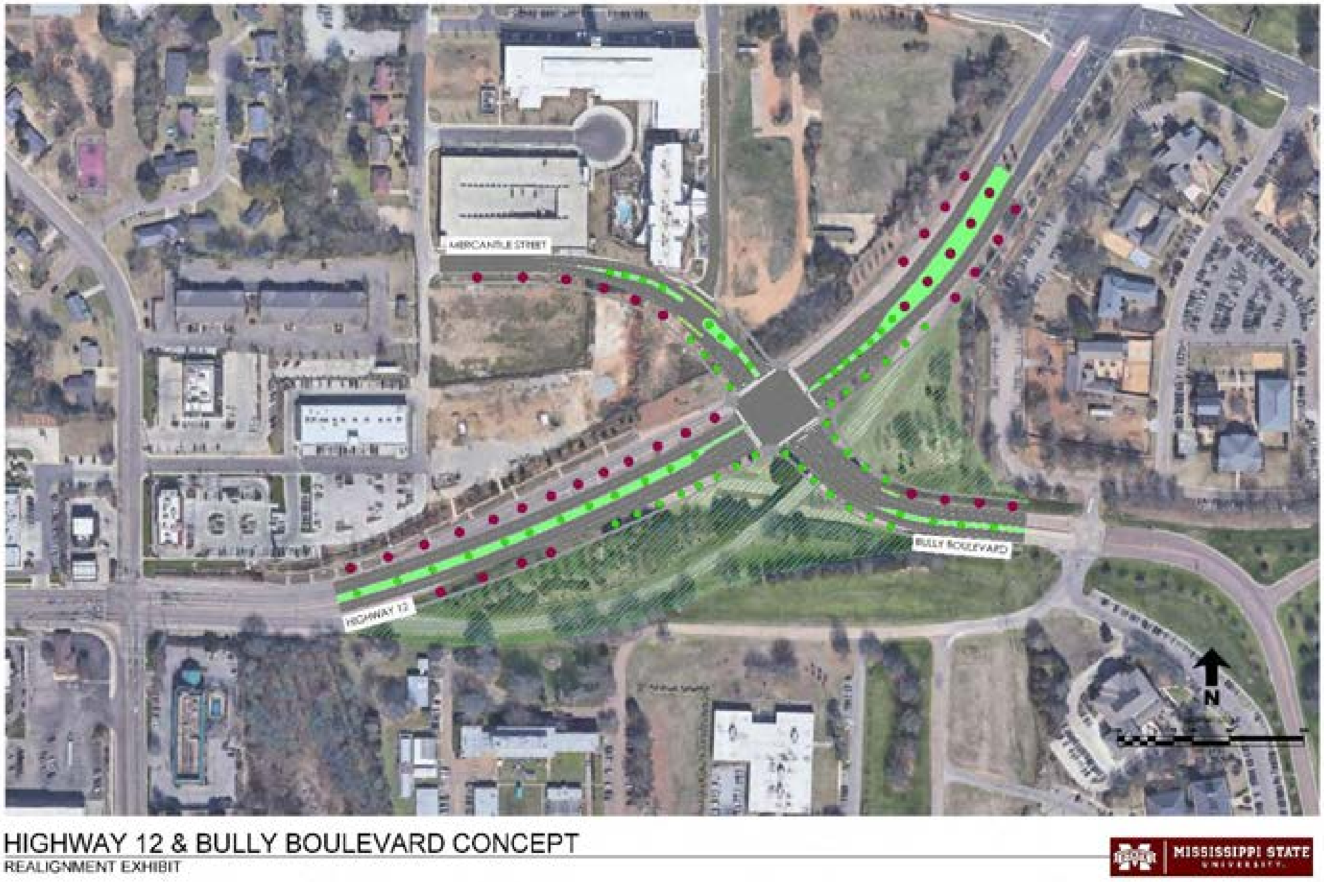
NEEL-SCHAFFER
Solutions you can build upon

REASSIGNED TRAFFIC VOLUMES

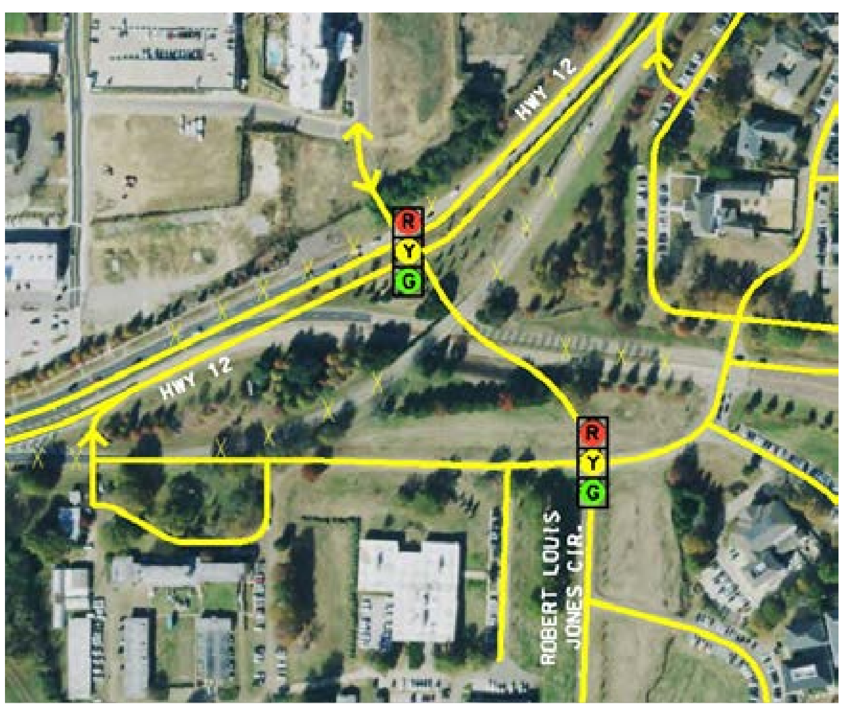
Figure 5.2.11.4

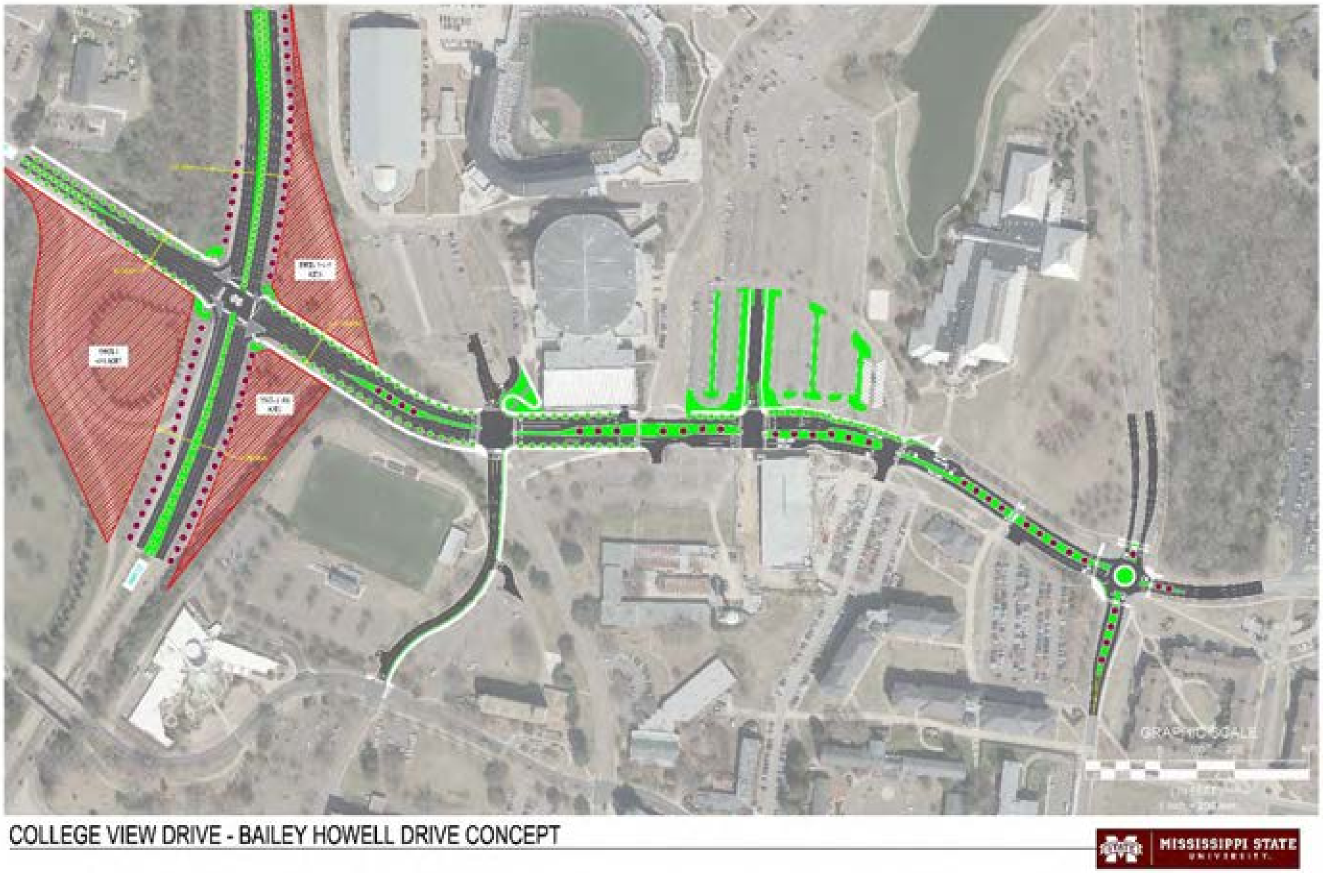


Above: At-grade intersection concept at College View Street/MS Hwy 12.
Right: Mini-Roundabout concept along Stone Blvd, replacing signals.



Above: At-grade intersection concept 1 at Mercantile Street – Bully Boulevard/MS Hwy 12.
Below: At-grade intersection concept 2 at Mercantile Street – Bully Boulevard/MS Hwy 12.





Above: Bailey Howell Drive Concept

5.2.11.3.2 Modified Network/Levels-of-Service

The reassigned traffic volumes were analyzed for the base year traffic. The results of the traffic volume analyses are provided in **Table 5.2.11.6** and **Table 5.2.11.7**.

Table 5.2.11.6 Reassigned Existing Traffic Levels-of-Service

Signalized Intersections	Time Period	Approach LOS				Intersection LOS
		EB	WB	NB	SB	
Hwy 12 @ Blackjack Road / Spring Street+	AM Peak	C	C	D	C	C
	PM Peak	C	C	D	D	C
Hardy Road @ Blackjack Road	AM Peak	B	C	--	B	B
	PM Peak	B	C	--	B	B
Stone Boulevard @ Blackjack Road	AM Peak	A	A	C	C	B
	PM Peak	B	B	C	C	C
Locksley Way @ Blackjack Road	AM Peak	C	B	C	C	C
	PM Peak	C	B	C	C	C
Bost Dr @ Bully Boulevard	AM Peak	C	B	B	C	C
	PM Peak	C	C	B	D	C
Stone Boulevard @ Highway 12	AM Peak	B	C	B	A	B
	PM Peak	B	C	B	B	B
College View @ Highway 12	AM Peak	C	C	A	A	B
	PM Peak	C	C	B	B	B
Bully Boulevard @ Highway 12	AM Peak	B	B	B	B	B
	PM Peak	B	C	B	C	C
Lee Boulevard @ Bailey Howell Drive	AM Peak	B	B	B	B	B
	PM Peak	B	B	B	B	B
Roundabout Intersections	**Time Period**	**Approach LOS**				**Intersection LOS**
		EB	**WB**	**NB**	**SB**	
Oktoc Road @ Blackjack Road	AM Peak	A	A	A	-	A
	PM Peak	B	A	A	-	A
Stone Boulevard @ Bost Drive	AM Peak	A	A	A	A	A
	PM Peak	A	A	A	A	A
Stone Boulevard @ Creelman Street	AM Peak	A	A	A	A	A
	PM Peak	A	A	A	A	A
Stone Boulevard @ Bully Boulevard	AM Peak	A	A	A	A	A
	PM Peak	B	B	A	B	B
Stone Boulevard @ Famous Marron Band St	AM Peak	A	A	A	A	A
	PM Peak	A	A	A	A	A

+Assumes Alt 5 From Section 5.2.5; Source: Neel-Schaffer, 2021, HCM 6th Edition.

Table 5.2.11.7 Reassigned Existing Traffic Levels-of-Service (cont'd)

Unsignalized Intersections (All-Way Stop)	**Time Period**	**Critical Movement Level of Service**											
		Eastbound			**Westbound**			**Northbound**			**Southbound**		
		Lt	**Th**	**Rt**	**Lt**	**Th**	**Rt**	**Lt**	**Th**	**Rt**	**Lt**	**Th**	**Rt**
Bost Drive @ University Drive	AM Peak	B	B	A	A	A	A	A	A	A	B	B	B
	PM Peak	C	C	B	**F**	**F**	**F**	C	C	C	C	C	C
Unsignalized Intersections (Two-Way Stop)*	**Time Period**	**Critical Movement Level of Service**											
		Eastbound			**Westbound**			**Northbound**			**Southbound**		
		Lt	**Th**	**Rt**	**Lt**	**Th**	**Rt**	**Lt**	**Th**	**Rt**	**Lt**	**Th**	**Rt**
Blackjack Road @ Campus Trails	AM Peak	A	A	-	-	-	-	-	-	-	B	-	A
	PM Peak	A	A	-	-	-	-	-	-	-	B	-	A
Blackjack Road @ University Crossing	AM Peak	C	-	B	-	-	-	A	-	-	-	-	-
	PM Peak	C	-	B	-	-	-	A	-	-	-	-	-
Spring Street @ Mill Street+	AM Peak	B	B	B	C	C	A	A	-	-	A	-	-
	PM Peak	B	B	B	C	C	B	A	-	-	A	-	-
Robert Louis Jones Dr @ Bully Boulevard	AM Peak	-	-	-	B	-	A	-	-	-	A	-	-
	PM Peak	-	-	-	B	-	A	-	-	-	A	-	-
East-West Connection @ Robert Louis Jones Dr	AM Peak	A	-	-	-	-	-	-	-	-	B	-	A
	PM Peak	A	-	-	-	-	-	-	-	-	B	-	A
College View Drive @ Bailey Howell Drive	AM Peak	C	A	A	B	B	B	A	-	-	A	A	-
	PM Peak	C	A	A	B	B	B	A	-	-	A	A	-

*Major @ Minor; +Assumes Alt 5 From Section 5.2.5; Source: Neel-Schaffer, 2021, HCM 6th Edition.

The reassigned traffic volumes are forecast to operate with less delays based on the widening of Blackjack Road and the extension of Campus Trails-Bulldog Way to Lee Boulevard. The intersection of Campus Trails-Bulldog Way at Blackjack Road is anticipated to warrant signalization as development increases, along with construction of a westbound right turn lane. The capacity analysis does show a failing level of service at the intersection of Bost Extension Drive and University Drive which may warrant future turn lanes or alternative traffic control. While the capacity analysis shows acceptable levels for all other locations, the demand volume is anticipated to be higher with more delays than the software calculates. However, the opportunity for east campus traffic to access Bulldog Way to go north/east, will likely divert traffic to the new route. The capacity analysis sheets are provided in the report Appendix.

The reassigned traffic volumes were then grown by the established 1% growth rate and analyzed for 2045 traffic. The results of the traffic volume analyses are provided in **Table 5.2.11.8** and **Table 5.2.11.9**. The capacity analysis sheets are provided in the report Appendix.

Table 5.2.11.8 Reassigned 2045 Traffic Levels-of-Service

Signalized Intersections	**Time Period**	**Approach LOS**				**Intersection LOS**
		EB	**WB**	**NB**	**SB**	
Hwy 12 @ Blackjack Road / Spring Street+	AM Peak	**E**	D	**E**	D	D
	PM Peak	**E**	D	**E**	**E**	**E**
Hardy Road @ Blackjack Road	AM Peak	B	C	--	B	B
	PM Peak	B	C	--	B	B
Stone Boulevard @ Blackjack Road	AM Peak	B	B	C	C	B
	PM Peak	C	D	B	B	C
Locksley Way @ Blackjack Road	AM Peak	D	C	C	C	D
	PM Peak	C	C	C	C	C
Bost Dr @ Bully Boulevard	AM Peak	C	B	B	C	C
	PM Peak	C	C	C	D	C
Stone Boulevard @ Highway 12	AM Peak	C	C	B	B	B
	PM Peak	C	C	B	B	C
College View @ Highway 12	AM Peak	D	C	B	B	B
	PM Peak	D	C	B	B	B
Bully Boulevard @ Highway 12	AM Peak	B	B	B	C	B
	PM Peak	C	C	C	C	C
Lee Boulevard @ Bailey Howell Drive	AM Peak	B	B	B	B	B
	PM Peak	B	C	C	B	B
Roundabout Intersections	**Time Period**	**Approach LOS**				**Intersection LOS**
		EB	**WB**	**NB**	**SB**	
Oktoc Road @ Blackjack Road	AM Peak	A	A	A	-	A
	PM Peak	C	A	B	-	B
Stone Boulevard @ Bost Drive	AM Peak	B	A	B	A	A
	PM Peak	A	B	B	B	B
Stone Boulevard @ Creelman Street	AM Peak	A	A	A	A	A
	PM Peak	A	A	A	A	A
Stone Boulevard @ Bully Boulevard	AM Peak	A	A	B	A	A
	PM Peak	C	C	B	C	C
Stone Boulevard @ Famous Marron Band St	AM Peak	A	A	B	A	A
	PM Peak	A	A	A	B	A

+Assumes Alt 5 From Section 5.2.5; Source: Neel-Schaffer, 2021, HCM 6th Edition.

Table 5.2.11.9 Reassigned 2045 Traffic Levels-of-Service (cont'd)

Unsignalized Intersections (All-Way Stop)	Time Period	Critical Movement Level of Service											
		Eastbound			Westbound			Northbound			Southbound		
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt
Bost Drive @ University Drive	AM Peak	B	B	A	A	A	A	B	B	B	B	B	B
	PM Peak	C	C	B	**F**	**F**	**F**	D	D	D	D	D	D
Unsignalized Intersections (Two-Way Stop)*	**Time Period**	**Critical Movement Level of Service**											
		Eastbound			**Westbound**			**Northbound**			**Southbound**		
		Lt	**Th**	**Rt**	**Lt**	**Th**	**Rt**	**Lt**	**Th**	**Rt**	**Lt**	**Th**	**Rt**
Blackjack Road @ Campus Trails	AM Peak	A	A	-	-	-	-	-	-	-	B	-	A
	PM Peak	A	A	-	-	-	-	-	-	-	C	-	B
Blackjack Road @ University Crossing	AM Peak	C	-	B	-	-	-	A	-	-	-	-	-
	PM Peak	D	-	B	-	-	-	B	-	-	-	-	-
Spring Street @ Mill Street+	AM Peak	B	B	B	C	C	A	A	-	-	A	-	-
	PM Peak	C	C	C	**E**	**E**	B	A	-	-	A	-	-
Robert Louis Jones Dr @ Bully Boulevard	AM Peak	-	-	-	B	-	A	-	-	-	A	-	-
	PM Peak	-	-	-	C	-	A	-	-	-	A	-	-
East-West Connection @ Robert Louis Jones Dr	AM Peak	A	-	-	-	-	-	-	-	-	B	-	A
	PM Peak	A	-	-	-	-	-	-	-	-	C	-	B
College View Drive @ Bailey Howell Drive	AM Peak	D	B	B	B	B	B	A	-	-	A	A	-
	PM Peak	C	B	B	C	C	C	A	-	-	A	A	-

*Major @ Minor; +Assumes Alt 5 From Section 5.2.5; Source: Neel-Schaffer, 2021, HCM 6th Edition.

The improvements analyzed remove all failing values that existed in the no build and are anticipated based on this analysis to perform with less delay than the No Build with exception to three locations. One of these is the intersection of Locksley Way and Blackjack Road where the delay is expected with the additional approach and by design as this new intersection leg provides a connection to campus to relieve pressure from Blackjack Road especially at its intersections with Stone Boulevard and Hardy Road. Even with this increase in delay, the intersection is still expected to operate at acceptable levels of service. The east bound approach of the intersection at Spring Street and Mill Street also shows an expected increase as narrowing to three lanes concentrates the southbound conflicting traffic creating fewer gaps for movements; however, the approach still operates at a LOS C. The final location with increased delay is the driveway of University Crossing on Blackjack Road. While this delay increase does not have a direct geometric cause, the impact is minor as the LOS only increases from a LOS C to a LOS D.

The intersection with Blackjack Road is recommended to be modified to include standard lane striping, using thermoplastic reflective stripes and arrow legends. The southbound island has been removed. Installation of standard stop signs on aluminum sheeting with retro-reflective faces at a mounting height of 5 ft (minimum from top of asphalt) are recommended on both the right and left sides of the approach. "Do Not Enter" signs are recommended on the same post as the Stop signs on the back side of these signs, to help drivers navigate through the entry point, concurrent with the placement of the R4-7, Keep Right sign in the median to direct ingress traffic to the appropriate side of the remaining median island.

Signage and striping are recommended to be upgraded on Campus Trail to meet the minimum standards outlined in the MUTCD. Lane stripes with a double yellow stripe as the centerline is recommended to be placed along Campus Trail. Lane striping will help to minimize the potential for head-on conflicts. All street signs are recommended to be placed on standard signposts made of galvanized steel.

5.2.11.4 Regional Traffic Improvements

5.2.11.4.1 East Campus Access

The current roadway project to connect the east campus to Blackjack Road via Campus Trails-Bulldog Way will provide some relief to the apartment complexes and residents that have been forced to navigate Blackjack Road west to Hardy/Stone/Locksley/Hwy 12. However, there continues to be interest in developing this area to the east that has indirect/limited access via Bardwell Road. The condition of Bardwell Road does not meet current design standards. The roadway appears to be an old gravel road that was paved, so the horizontal and vertical curves do not meet standards, and the pavement condition is poor.

Bardwell's northern terminus is an all-way stop at Old Mayhew Road. Reconstructing Bardwell to current design standards, along with realignment to be a more direct route to MS Hwy 182 along the MSU property to the east is recommended to attract more traffic to this eastern bypass of the internal campus roadway network. This reconstruction/realignment of Bardwell is anticipated to alleviate some of the congestion that currently occurs on Hardy Road and allow the residents of the apartment units and east Blackjack Road to have a more efficient/direct connection to MS Hwy 182.

5.2.11.4.2 US Highway 82 Access

The current roadway project to connect the east campus to Blackjack Road via Campus Trails-Bulldog Way will provide some relief to the apartment complexes and residents that had exclusive access to Blackjack Road. However, the area east of Campus Trails has significant potential for development. The construction of a new interchange with US Highway 82 between MS Highway 182 and Hickory Grove Road would meet minimum interchange spacing requirements. This connection could provide an alternate entry to the campus from the east. The connection from Blackjack Road to the new interchange would require crossing Sand Creek and tributaries to Sand Creek. Much of the property between Blackjack Road and US Highway 82 is within the 100-year flood zone (Zone AE). The combined volume of traffic coming to/from campus from both Bardwell Road and Blackjack Road east of Bardwell Road was recorded as 115 vph in the AM Peak hour and 153 vph in PM peak hour.

5.2.11.4.3 Artesia Road

The current alignment of Artesia Road terminates at Oktoc Road on the west end. Artesia Road is a rural 2-lane roadway and is classified as a Major Collector route. With the recent construction of Hail State Boulevard from Blackjack Road south to Poor House Road, the extension of Artesia Road west 0.5 miles to Hail State Boulevard would help to divert some of the commuting/school traffic from Oktoc Road.

5.2.11.4.4 Oktoc Road

Oktoc Road is a rural two-lane roadway that is classified as a Major Collector in the Functional Class system. Oktoc extends southeast of Blackjack Road at a Roundabout. The current alignment is at approximately a 45-degree intersection with Blackjack Road. The introduction of northbound Oktoc Road traffic from the southeast approach affects/delays the westbound movement of campus traffic from Hardy Road. The introduction of the 21 Apartments has also significantly increased pedestrian traffic across the intersection's east approach and thru the gas station parking lot. Realignment of Oktoc Road to intersect Blackjack at the Hardy Road signal is recommended. This realignment will improve the circulation at Oktoc/Blackjack, as the Oktoc Road traffic will not have a priority over westbound Blackjack Road traffic.

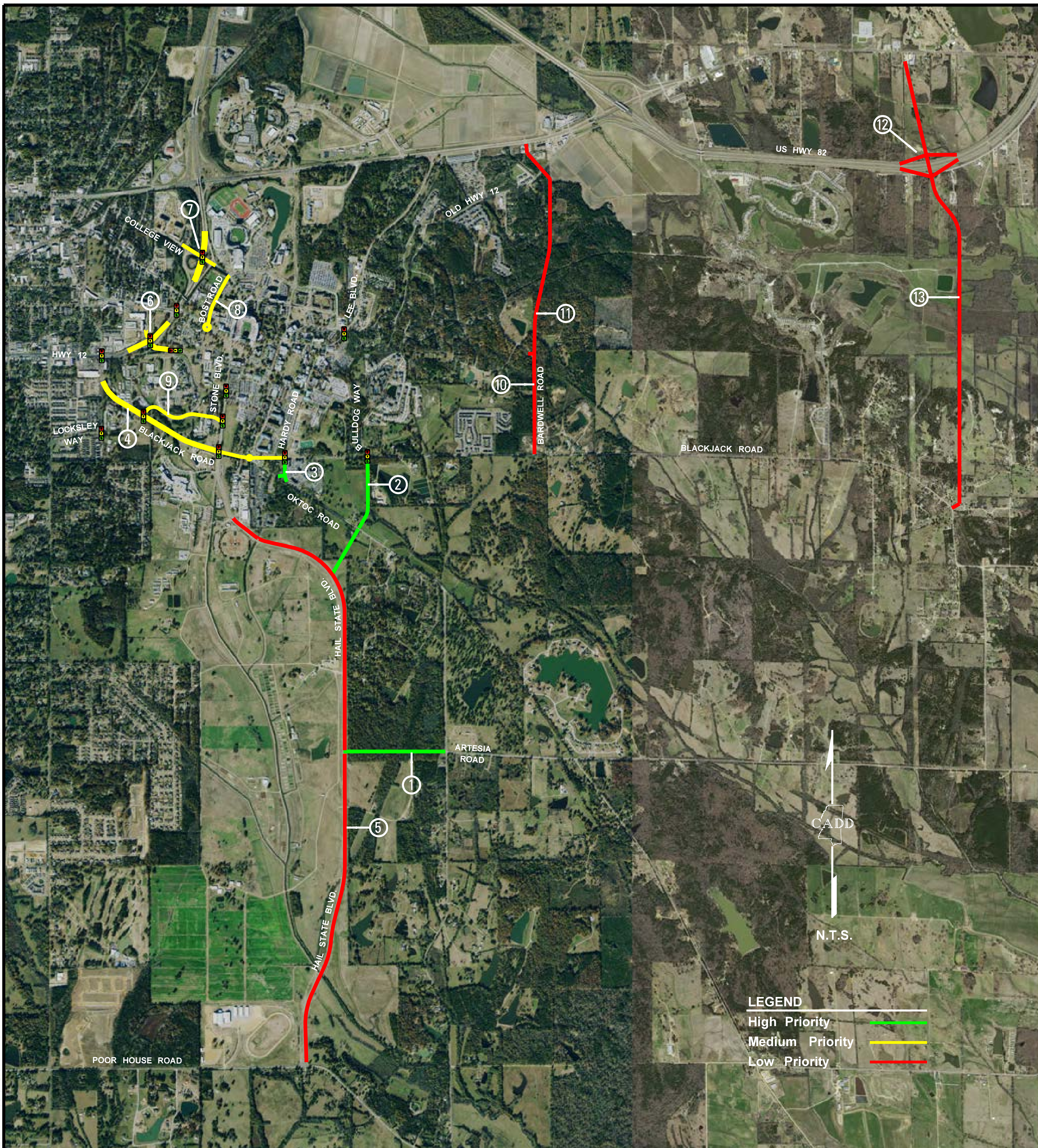
5.2.11.4.5 Campus Trail-Bulldog Way

A connection between Hail State Boulevard to the south and the new Bulldog Way connection at Campus Trail can help to divert some of the east/west traffic movements along Blackjack Road. As more residential units/multi-family dwellings are constructed along the undeveloped south campus property, the more demand will be placed on Blackjack Road. Providing a connection to Hail State Boulevard will provide a southern bypass of the campus and help to relieve some of the traffic on Blackjack Road.

5.2.11.4.6 Hail State Blvd – Multi-use Path

A multi-use path was constructed along the section of Hail State Boulevard from Blackjack Road south, approximately 1,800 LF. The multi-use path is recommended to be extended south to Poor House Road, a distance of approximately 3 miles.

The access and circulation concepts are shown graphically in **Figure 5.2.11.5**.



1. Connect Artesia Road to Hail State Blvd. - 2,600 L.F. - 2 Lanes
2. Connect Hail State Blvd. with Blackjack Road / Oktoc Road - 3,250 L.F. - 3 Lanes
3. Realign Oktoc Road to intersect Blackjack Road at Hardy Road - 700 L.F. - 3 Lanes
4. Widen Blackjack Road to 5 lanes from Hardy Road to Lincoln Green - 5,280 L.F. - 5 Lanes
5. Hail State Boulevard Sidewalk Extension - 16,000 L.F.
6. Bullyvard interchange reconstruction to an at-grade signalized intersection.
7. Collegeview interchange reconstruction to an at-grade signalized intersection.
8. Bost Road extension.
9. Locksley Way extension and connector.
10. Reconstruct / realign Bardwell Road with 2 lanes - 2,500 L.F. - 2 Lanes
11. Construct new connection from Hwy 182 to Bardwell Road - 6,000 L.F. - 2 Lanes
12. Construct new interchange with US Hwy 82 - Interchange
13. Connect Blackjack Road with US Hwy 82 - 8,000 L.F. - 2 Lanes

NEEL-SCHAFFER
Solutions you can build upon

CAMPUS ACCESS/CIRCULATION CONCEPTS

Figure 5.2.11.5

S:\Projects\14995.001-Starkville-Planning\CADD\14995-Starkville MSU\Campus\figure5.dgn

5.2.11.5 Recommendations and Conclusions

The campus street network has many proposed changes, along with planned improvements to the major routes serving the campus from the west and south. Blackjack Road is currently being widened to provide 2 westbound travel lanes from Stone Blvd to Hardy Road, and a center turn lane from Hardy Road east to Bardwell Road. Extension of the 5-lane section from Lincoln Green to Hardy Road (1.1 miles) would help to alleviate the entry/exit traffic delays on this southern access to campus.

The removal of the section of Bully Blvd east of Sorority Row would open this area of the campus up for more development. A new east/west roadway could extend from Locksley Way at Blackjack Road and connect with Hardy Road. The Campus Trail extension to Lee Boulevard will attract a significant amount of traffic to the east campus. Signal warrants are recommended to be evaluated at the Lee Blvd/Barr Ave-Campus Trail intersection and at Blackjack Road/Campus Trail intersection. The Blackjack Road/Campus Trail intersection is also recommended to be evaluated to see if a westbound right turn lane is warranted. Street signs and striping are recommended to be upgraded to meet MUTCD standards.

The SR 12 intersections at College View Street and Bully Blvd are recommended to be reconstructed to eliminate the grade separation/ramps, and provide at-grade signals, allowing for direct access to Mill Street north of SR 12 at Bully Blvd.

Mini roundabouts are recommended along Stone Blvd at Creelman Street, Bully Blvd and the new east/west route parallel to Blackjack Road. The mini roundabouts are more pedestrian friendly than traffic signals, will slow through traffic more than a series of coordinated traffic signals, and yet have less delays than an all-way stop controlled intersection.

East Campus traffic congestion could get some additional relief with the reconstruction/ realignment of Bardwell Road, along with a future connection to US Highway 82 via a new interchange/connection to Blackjack Road across Sand Creek.

The realignment of Oktoc Road to intersect Blackjack Road at Hardy Road is anticipated to improve the east/west flows of Blackjack Road traffic between Hardy and Stone. The extension of Artesia Road from Oktoc Road west to Hail State Boulevard, may provide some diversion of Oktoc Road traffic from Blackjack Road. The connection of Hail State Blvd to Bulldog Way-Campus Trails, may also divert some of the east/west traffic from Blackjack Road.

5.2.12 Old Mayhew Road

Per the city's request, Neel-Schaffer has conducted a review of the portion of East Lee Boulevard from Mississippi State University to Old Mayhew Road and Old Mayhew Road which are portions of the cities' planned annexation of the area to determine any improvements that could made to the existing transportation network.

5.2.12.1 Existing Conditions

Old Mayhew Road (Old Highway 12) is a two-lane local roadway with a posted speed limit of 25 mph west of McKeen Dr and 35 mph east of McKeen Drive. The existing pavement is in poor condition and there are no visible pavement markings.

Above: Pavement Conditions Along Old Mayhew Road (Looking West)

East Lee Boulevard is a two-lane curb and gutter local roadway with a posted speed limit of 30 mph. Centerline and edgeline markings are present but badly faded. Parallel parking is present on both sides of the street. A short, approximately 450ft, section of sidewalk is present on the west side of the roadway. A sidewalk also exists on the east side of the roadway and extends to the intersection with Montgomery Hill Road. These sidewalks, however, do not meet ADA guidelines at driveways. The existing pavement is concrete in the travel lanes except for an approximately 125 ft section of asphalt overlay and the parallel parking areas are also asphalt. The concrete pavement is in fair condition with the asphalt pavement having areas in poor condition but is overall also in fair condition.

The intersection between East Lee Boulevard and Old Mayhew Road is a two-way stop-controlled intersection with a significant skew angle. This skew creates safety concerns for westbound vehicles due to sight distance restrictions.

Above: Westbound Approach of Old Mayhew Road at East Lee Boulevard (Looking West)

Above: Old Mayhew Road (Old Hwy 12) @ East Lee Boulevard Source: Google Maps, Neel-Schaffer, 2021

5.2.12.2 Traffic Volumes

Turning movement counts were conducted at the East Lee Boulevard/Old Mayhew Road intersection and Old Mayhew Road/ Highway 182 intersection by MDOT/Michael Baker on 10/08/2020 and 10/06/2019, respectively.

5.2.12.3 Existing Level of Service Analysis

The capacity and level-of-service (LOS) of an intersection is evaluated based on the average vehicular delay during the peak hour periods. The vehicular delays are directly related to the turning movement volumes, traffic composition and roadway geometrics at the study intersections. The methodology used in this analysis is based on the Highway Capacity Manual (HCM). The level-of-service, as outlined in the HCM, is reported as a letter designation of LOS A through LOS F (A is least delay and F is most delay). The 2020 traffic volumes at the study intersections were evaluated to determine the existing traffic levels-of-service based on the information provided in the HCM. The results of this analysis are shown in **Table 5.2.12.1**.

Table 5.2.12.1 Existing Traffic Level-of-Service

Signalized Intersections	**Time Period**	**Approach LOS**				**Intersection LOS**
		EB	**WB**	**NB**	**SB**	
Old Mayhew Rd @ Highway 182	AM Peak	C	C	B	**E**	C
	PM Peak	C	C	B	D	B

Unsignalized Intersections	**Time Period**	**Critical Movement Level of Service**											
		Eastbound			**Westbound**			**Northbound**			**Southbound**		
		Lt	**Th**	**Rt**	**Lt**	**Th**	**Rt**	**Lt**	**Th**	**Rt**	**Lt**	**Th**	**Rt**
E Lee Blvd @ Old Mayhew Rd (Two-Way)	AM Peak	-	-	-	B	-	B	-	-	-	A	A	-
	PM Peak	-	-	-	B	-	B	-	-	-	A	A	-

Source: Neel-Schaffer, 2021, HCM 6th Edition.

The southbound approach of the signalized intersection is shown to have an LOS E in the am peak period; however, this approach is a minor movement with only four movements in the peak hour as it serves as one of two driveways for a car dealership.

5.2.12.4 Recommendations

The vicinity of this area, especially with its annexation into the city, has significant potential for growth, especially residential growth, considering its proximity to Mississippi State University. To facilitate this growth roadway improvements are recommended as follows.

Old Mayhew Road is recommended to be resurfaced as the existing pavement is in extremely poor condition.

Another pressing issue within this area is the safety concern at the intersection of East Lee Boulevard and Old Mayhew Road resulting from the intersection skew angle. Removing the skew angle at the intersection of East Lee Boulevard and Old Mayhew Road is recommended. This could be done by realigning Old Mayhew Road to remove the skew angle or by installing a roundabout. A lower cost option to improve safety at this intersection would be installing stop signs on East Lee Boulevard and converting the intersection to an all-way stop which would increase delay along East Lee Boulevard but not enough to change the LOS. The results of these analyses are shown in **Table 5.2.12.2**. A roundabout concept is shown in **Figure 5.2.12.1**.

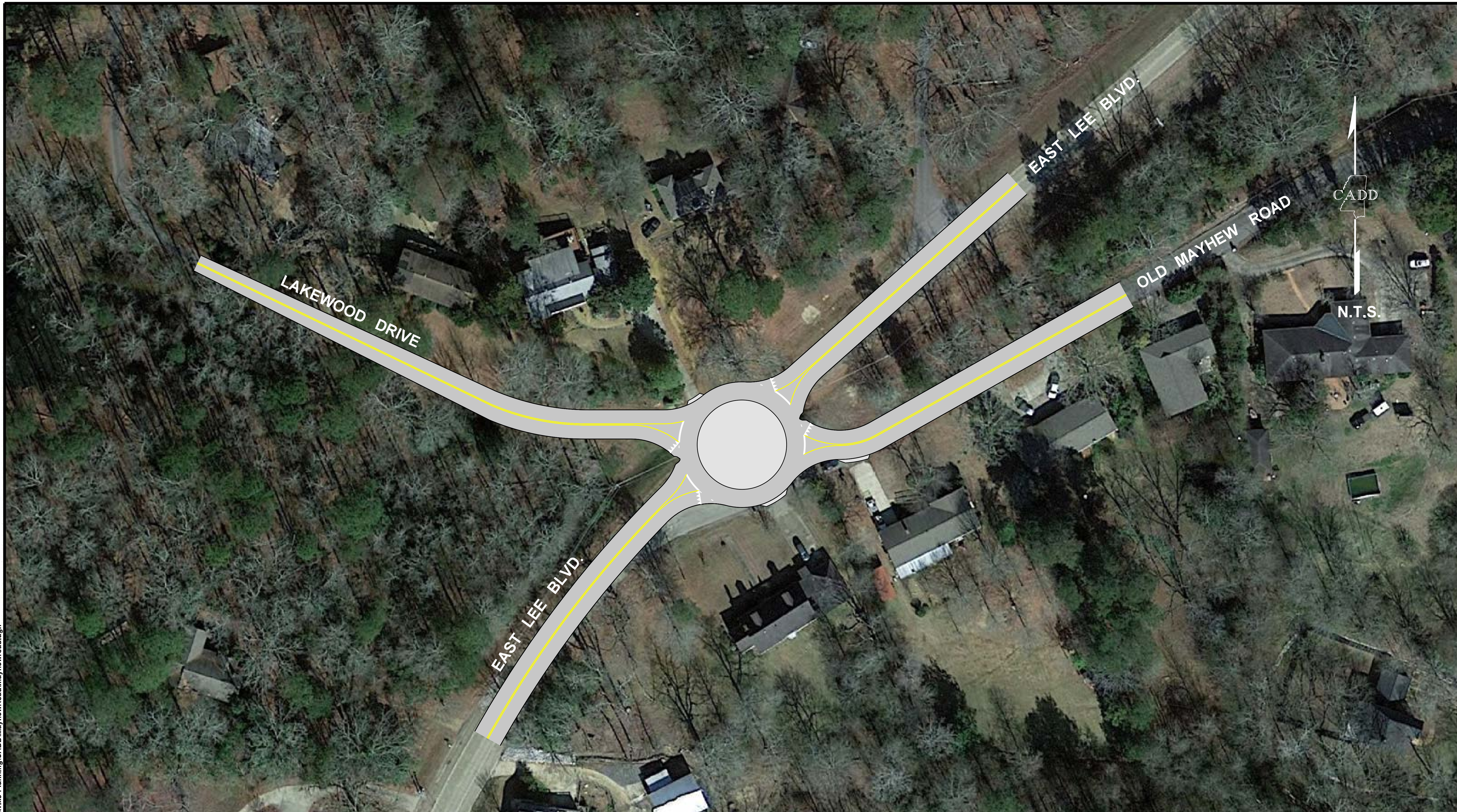
Table 5.2.12.2 Alternative Traffic Level-of-Service

Roundabout	Time Period	Approach LOS				Intersection LOS
		EB	WB	NB	SB	
E Lee Blvd @ Old Mayhew Rd	AM Peak	--	A	A	A	A
	PM Peak	--	A	A	A	A

Unsignalized Intersections	Time Period	Critical Movement Level of Service											
		Eastbound			Westbound			Northbound			Southbound		
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt
E Lee Blvd @ Old Mayhew Rd (All-Way)	AM Peak	-	-	-	A	-	A	-	A	A	A	A	-
	PM Peak	-	-	-	A	-	A	-	A	A	A	A	-

Source: Neel-Schaffer, 2021, SIDRA Intersection 9.0 (roundabout), HCM 6th Edition (all-way stop).

In addition, with the expected residential growth in the area, existing land use, and the vicinity to Mississippi State, it is recommended to add bike lanes and sidewalks along Old Mayhew Road. For East Lee Boulevard, it is recommended to reconfigure the existing roadway to provide a separated bike lane and sidewalks which would remove a significant amount of parking. For details on bike and pedestrian recommendations please refer to section 4 of this report.



NEEL-SCHAFFER
Solutions you can build upon

OLD MAYHEW ROAD ROUNDABOUT CONCEPT

Figure 5.2.12.1

S:\Projects\14995.001-Starkville-Planning\CADD\MayhewRoad\mayhewroad.dgn

5.3 Planning Level Cost for Recommendations

5.3.1 City of Starkville Projects

Table 5.3.1.1 Planning Level Cost Estimates for City Projects

Project	Total Cost
Greensboro Street Pedestrian Circulation	$110,000
Henderson Ward Stewart Elementary School Traffic Circulation – Alt 1	$850,000
Henderson Ward Stewart Elementary School Traffic Circulation – Alt 2	$1,280,000
South Montgomery Street (Academy Road to East Poor House Road)	$11,150,000
Spring Street at MS Highway 12/Mill Street – All Alts	$520,000
South Montgomery Street at MS Highway 12	$40,000
Stark Road (MS Highway 12 to MS Highway 182)	$6,040,000
Stark Road Extension – Alt 1	$20,000,000

5.3.2 Mississippi State University Projects

Table 5.3.2.1 Planning Level Cost Estimates for Campus Projects

Project	Total Cost
Artesia Road Extension	$2,500,000
Bulldog Way Extension	$4,200,000
Hardy Extension	$1,700,000
Blackjack Widening (3 to 5 lane)	$9,100,000
Hail State Blvd – Multi Use Path	$3,250,000
Mercantile Extension	$15,900,000
College View Interchange	$20,900,000
Bost Extension	$1,670,000*
Locksley Way Extension	$7,400,000
Bardwell Road	11,250,000
East Connection (Hwy 82 to Blackjack Rd)	$29,000,000
George Perry/Bailley Howell Roundabout	$1,670,000
Stone Mini Roundabouts	$3,250,000

*Does not include impacts to Soccer facilities or parking lot.

6.0 Project Planning and Potential Funding Sources

6.1 Project Planning

6.1.1 Short-Term (0-10 Year) Improvements

Table 6.1.1.1 Short-Term Roadway Projects (0-10 Years)

Project
Greensboro Street Pedestrian Circulation
Henderson Ward Stewart Elementary School Traffic Circulation
Spring Street at MS Highway 12/Mill Street
South Montgomery Street at MS Highway 12
Louisville Street at Yellow Jacket Drive
George Perry Street at Bailey Howell Drive: Roundabout
Bulldog Way Extension
Hail State Blvd – Multi Use Path
Bost Extension
Locksley Way Extension
Stone Mini Roundabouts
Old Mayhew Road

6.1.2 Long-Term (10-25 Year) Improvements

Table 6.1.2.1 Long-Term Roadway Projects (10-25 Years)

Project
South Montgomery Street (Academy Road to East Poor House Road)
Stark Road (MS Highway 12 to MS Highway 182)
Stark Road Extension
Artesia Road Extension
Hardy Extension
Blackjack Widening (3 to 5 lane)
Mercantile Extension
Collegeview Interchange
Bardwell Road
East Connection (Hwy 82 to Blackjack Rd)
Cotton District One-Way Street Network

6.2 Potential Funding Sources

6.2.1 Roadway Funding Sources

6.2.1.1 Federal Funding Sources

Federal funding for transportation is authorized through the current transportation bill (The FAST Act) and includes several major "formula" programs and discretionary programs. While "formula" programs may change somewhat in future transportation bills, they have been relatively stable over time.

National Highway Performance Program (NHPP)

Overview: The NHPP provides support for the condition and performance of the National Highway System (NHS), for the construction of new facilities on the NHS, and to ensure that investments of Federal-aid funds in highway construction are directed to support progress toward the achievement of performance targets established in a state's asset management plan.

Eligible Activities: Projects or programs supporting progress toward the achievement of national performance goals for improving infrastructure condition, safety, congestion reduction, system reliability, or freight movement on the NHS.

Federal Share: 90 percent for most projects on the Interstate System and 80 percent elsewhere.

Surface Transportation Block Grant Program (STBG)

Overview: The STBG Program provides flexible funding that may be used for just about any type of transportation-related project. The FAST Act continues the regulation that 50 percent of a state's STBG apportionment is sub-allocated to areas based on their relative share of the total state population, with the other 50 percent available for use in any area of the state. These sub-allocations to the urban areas are called attributable funds.

Eligible Activities: Most transportation projects are eligible for STBG funding. See 23 U.S.C. 133(b)(15) for details.

Federal Share: 90 percent for most projects on the Interstate System and 80 percent elsewhere.

Highway Safety Improvement Program (HSIP)

Overview: The HSIP seeks to achieve a significant reduction in traffic fatalities and serious injuries on all public roads, including non-State-owned public roads and roads on tribal lands. The HSIP requires a data-driven, strategic approach to improving highway safety on all public roads that focuses on performance.
Eligible Activities: Safety projects that are consistent with the State's Strategic Highway Safety Plan (SHSP) and that correct or improve a hazardous road location or feature or address a highway safety problem.

Federal Share: 90 percent except as provided in 23 U.S.C. 120 and 130.

National Highway Freight Program (NHFP)

Overview: The NHFP seeks to improve the efficient movement of freight on the National Highway Freight Network (NHFN) and support national freight related goals.

Eligible Activities: Generally, NHFP funds must contribute to the efficient movement of freight on the NHFN and be identified in a freight investment plan included in the State's freight plan.
Federal Share: 90 percent for most projects on the Interstate System and 80 percent elsewhere.

6.2.1.2 State and Local Funding Sources

State Funding

State transportation revenues come from motor fuel taxes and fees and vehicles taxes and fees. The gasoline excise tax in particular is the state's largest funding source for roadway projects.

Property, Sales, and Income Taxes

Taxation contributes the most revenue to local governments in the United States. Property taxes, sales taxes, and income taxes are the most common and biggest sources of local government tax revenue. Taxes may be levied by states, counties, municipalities, or other authorities.

User Fees

User fees are fees collected from those who utilize a service or facility. The fees are collected to pay for the cost of a facility, finance the cost of operations, and/or generate revenue for other uses. User fees are commonly charged for public parks, water and sewer services, transit systems, and solid waste facilities. The theory behind the user fee is that those who directly benefit from these public services pay for the costs.

Special Assessments

Special assessment is a method of generating funds for public improvements, whereby the cost of a public improvement is collected from those who directly benefit from the improvement. In some instances, new streets are financed by special assessment. The owners of property located adjacent to the new streets are assessed a portion of the cost of the new streets, based on the amount of frontage they own along the new streets.

Special assessments have also been used to generate funds for general improvements within special districts, such as central business districts. These assessments may be paid over a period of time rather than as a lump sum payment.

Impact Fees

New developments create increased traffic volumes on the streets around them. Development impact fees are a way of attempting to place a portion of the burden of funding improvements on developers who are creating or adding to the need for improvements.

Bond Issues

Property tax and sales tax funds can be used on a pay-as-you-go basis, or the revenues from them can be used to pay off general obligation or revenue bonds. These bonds are issued by local governments upon approval of the voting public.

6.2.2 Bicycle and Pedestrian Funding Sources

6.2.2.1 Federal Funding Sources

Transportation Alternatives (TA) Set-Aside

Overview: This set-aside program within the Surface Transportation Block Grant (STBG) program includes all projects and activities previously eligible under the Transportation Alternatives Program (TAP).

Eligible Activities: Pedestrian and bicycle facilities, recreational trails, safe routes to school projects, community improvements such as historic preservation and vegetation management, and environmental mitigation related to stormwater and habitat connectivity.

Federal Share: 90 percent for most projects on the Interstate System and 80 percent elsewhere.

"Flex" Funding

Other federal roadway and public transit funding sources are also flexible enough to fund construction of bicycle and pedestrian facilities. Still, most funding from these sources do not go to bicycle and pedestrian projects.

6.2.2.2 State and Local Funding Sources

State and local funding sources for bicycle and pedestrian projects are the same as those listed for roadways.

6.2.3 Public Transit Funding Sources

6.2.3.1 Federal Funding Sources

There are many federal funding sources for public transit. Most of these sources are programs funded by the Federal Transit Administration (FTA) and administered by the State.

Enhanced Mobility of Seniors and Individuals with Disabilities (Section 5310)

Overview: Grants are made by the State to private non-profit organizations (and certain public bodies) to increase the mobility of seniors and persons with disabilities. The former New Freedom program (Section 5317) is folded into this program.

Eligible Activities: Projects must be included in a coordinated human service transportation plan. Funds can be used for buses and vans; wheelchair lifts, ramps, and securement devices; transit-related information technology systems; mobility management programs; acquisition of transportation services under a contract, lease, or other arrangement; travel training; volunteer driver programs; building an accessible path to a bus stop; and incremental cost of providing same day service or door-to-door service.

Federal Share: 80 percent for capital projects, 50 percent for operating assistance.

Rural Area Formula Grants (Section 5311)

Overview: This formula-based funding program provides administration, capital, planning, and operating assistance to support public transportation in rural areas, defined as areas with fewer than 50,000 residents. Eligible Activities: Planning, capital, operating, job access and reverse commute projects, and the acquisition of public transportation services. Activities eligible under the former JARC program, which provided services to low-income individuals to access jobs, are now eligible under the Rural Area Formula program.

Federal Share: 80 percent for capital projects, 50 percent for operating assistance, and 80 percent for ADA non-fixed route paratransit service.

Bus and Bus Facilities Formula Grants (Section 5339a)

Overview: This program provides funds to replace, rehabilitate, and purchase buses and related equipment and to construct bus-related facilities.

Eligible Activities: Capital projects to replace, rehabilitate and purchase buses, vans, and related equipment, and to construct bus-related facilities, including technological changes or innovations to modify low or no emission vehicles or facilities.

Federal Share: 80 percent for capital projects.

Other FTA Grant Programs

The FTA has several other funding sources that each address specific issues. Most of these are more limited in funding and are competitive programs, meaning that applicants must compete for funding based on the merits of their project.

More details can be found at https://www.transit.dot.gov/grants

Flexible, Non-FTA Funds

Surface Transportation Block Grant Program (STBG): Provides funding that may be used by states and localities for a wide range of projects to preserve and improve the conditions and performance of surface transportation, including highway, transit, intercity bus, bicycle and pedestrian projects.

National Highway Performance Program (NHPP): Funds may only be used for the construction of a public transportation project that supports progress toward the achievement of national performance goals for improving infrastructure condition, safety, mobility, or freight movement on the NHS and which is eligible for assistance under chapter 53 of title 49, if: the project is in the same corridor as, and in proximity to, a fully access-controlled NHS route; the construction is more cost-effective (as determined by a benefit-cost analysis) than a NHS improvement; and the project will reduce delays or produce travel time savings on the NHS, as well as improve regional traffic flow. Local match requirement varies.

6.2.3.2 State and Local Funding Sources

State and local funding sources include the same potential sources as those outlined for roadways. Fare revenue and advertising revenue are also important local funding sources but are relatively small.