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# East Butler Road Corridor Study

## Final Report

January 2016

prepared for



prepared by



and





## East Butler Road Corridor Study Final Report

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Appendix A Traffic Analysis Report

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## I Introduction

The purpose of the East Butler Road Corridor Study is to determine the most appropriate design solutions that meet future transportation needs of East Butler Road but are also responsive to the desires of the community. The City of Mauldin undertook the East Butler Road Corridor Study to consider viable alternatives to the five-lane cross section originally proposed by the South Carolina Department of Transportation (SCDOT). The focus of the planning process was to **make people priority** – people of all ages, abilities, and incomes who drive cars, walk, bike, ride transit, and live and work along/near the street – and create an environment where **the trip is as enjoyable as the destination**.

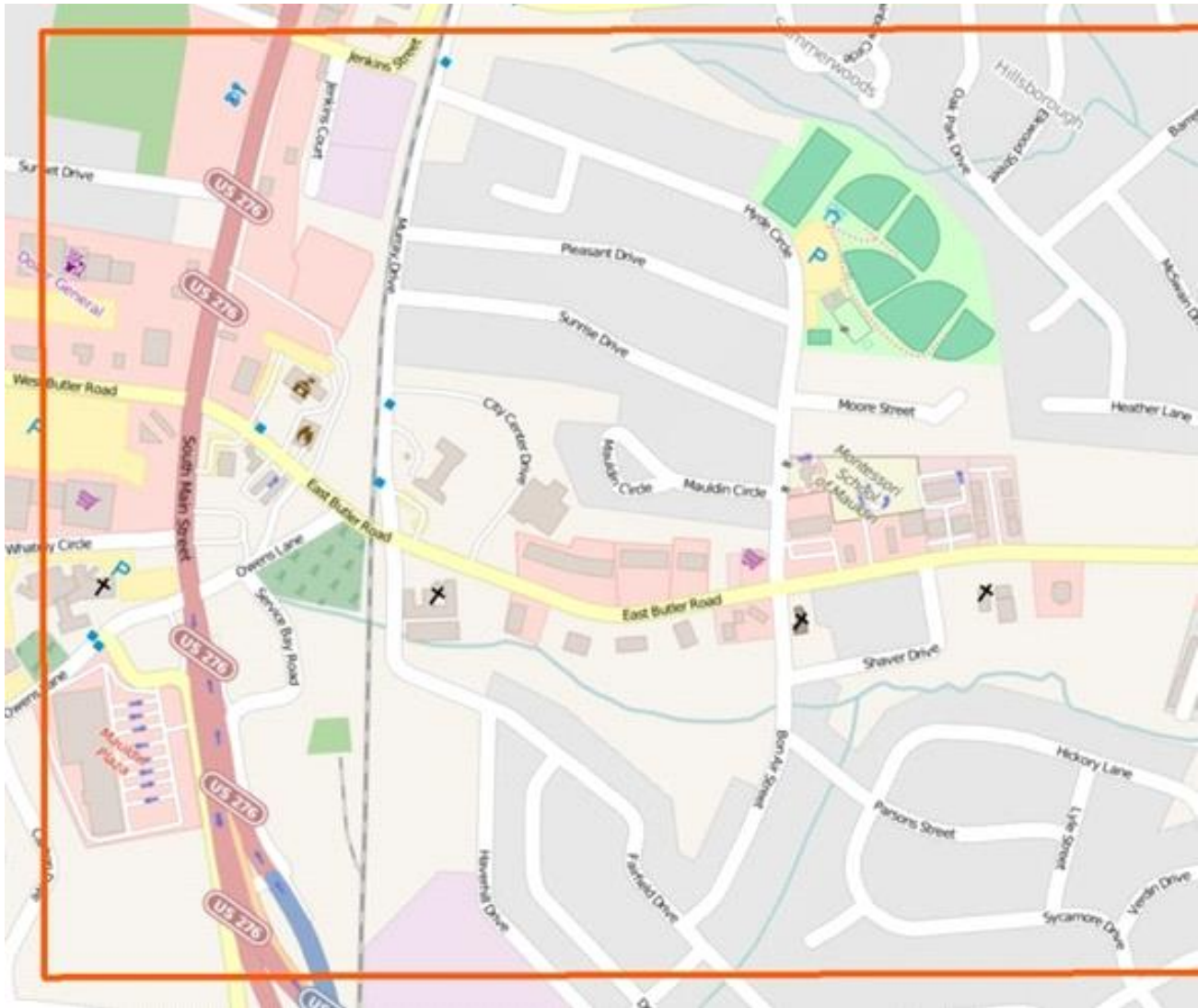
The East Butler Road Corridor Study seeks to balance transportation needs with the community's desires for the future.

### I.1 Plan Overview

This report is divided into four sections. This **Introduction** provides information regarding the purpose of the Study and public participation process. **Baseline Review** summarizes existing conditions and planning considerations. The third section is entitled **Traffic Analysis** and presents the evaluation of the existing transportation network. Finally, solutions and strategies for moving forward are included in **Recommendations**.

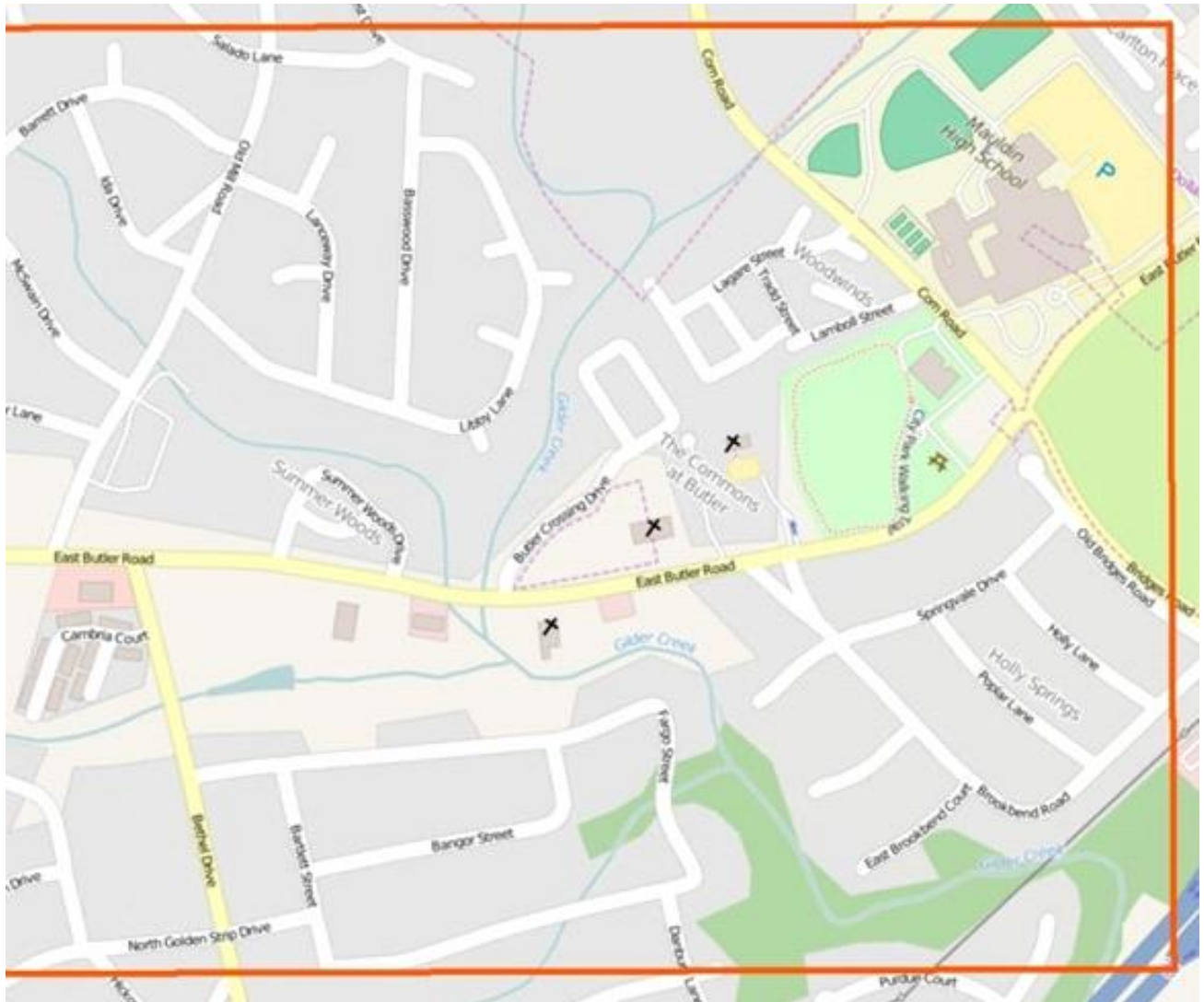
## 1.2 Area of Interest

As depicted in **Figure I-1**, the East Butler Road Corridor Study area of interest consists of an approximate 1.7-mile segment between Main Street (US 276) and Corn Road/Bridges Road.



**Figure I-1:** East Butler Road Corridor Study Area of Interest





### 1.3 Public Participation

The East Butler Road Corridor Study was crafted through a process that included meaningful public participation. While the public participation process was continuous, several distinct opportunities for involvement were offered:

- **Project Website** – The City of Mauldin dedicated a page on its website to the provision of updates and the dissemination of information on the East Butler Road Corridor Study. The site included links to the online interactive map, comment forms, and materials used at public workshops and meetings.
- **Interactive Online Map** – WikiMap, an interactive online map was utilized for the Study. While it received only modest input, it did provide an avenue for the public to document their concerns geographically. A brief survey was included.
- **Planning Workshop** – On the evening of July 7, 2015, a planning workshop was held at the Mauldin Cultural Center. This workshop offered interactive activities for participants to receive information on the project, express concerns about the corridor, and contribute ideas to the planning process. Included were display boards with background information on existing conditions and the goals of the Study, mapping exercises, visual preference survey, a video of the corridor from a bicyclist's perspective, and comment forms.
- **Stakeholder Interviews** – As a complement to the planning workshop, a series of stakeholder interviews were conducted to gain a better understanding of the goals of the community. Various groups were engaged, including elected officials, business leaders, residents, property owners, active transportation advocates, and SCDOT.
- **Alternatives Meeting** – Based on the input received during the planning workshop and stakeholder interviews, alternatives were developed and presented at a public meeting on the evening of July 21, 2015 at the Mauldin Cultural Center. Questions and comments were received from attendees and these influenced refinements to the alternatives.
- **Council Presentation** – On the evening of November 16, 2015, the recommendations for the East Butler Road Corridor Study were presented during a City Council meeting. Opportunity was provided for the public in attendance to provide comments on the recommendations and the planning process as a whole.

by the numbers

2 public meetings

5 stakeholder meetings

130 participants

## 1.4 Guiding Principles

Based on public input received, a series of Guiding Principles were established to direct the East Butler Road Corridor Study, and ultimately the development of recommendations:

- Minimize impacts on adjacent properties
- Mitigate congestion
- Address safety
- Address drainage
- Enhance character
- Balance mobility and access
- Ensure quality design



***Participants providing mapping comments at July 7, 2015 Planning Workshop***

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## 2 Baseline Review

Prior to developing alternatives and recommendations, it was important to establish a baseline for analysis and discussion with project stakeholders and the general public. This section presents that review, summarizing existing land use and transportation conditions within the corridor and establishing a baseline of information for further consideration.

**Existing planning, land use, and transportation contexts were examined to gain an understanding of baseline conditions in the corridor.**

The information that follows is the result of field research, GIS data review, and a review of previous and ongoing planning and design initiatives.

### 2.1 Planning Context

A number of reports and planning documents have been prepared at the local, regional, and state levels that have relevance to the East Butler Road corridor. To better understand the impact each document has on the area of interest, applicable recommendations and supporting documentation have been summarized in the sections below. Documents reviewed include the following:

- South Carolina Department of Transportation Advanced Project Planning Report
- Greenville-Pickens Area Transportation Study Transportation Improvement Program
- City of Mauldin Comprehensive Plan
- City of Mauldin Downtown Master Plan
- City of Mauldin Zoning Ordinance, Zoning Map & Land Development Standards

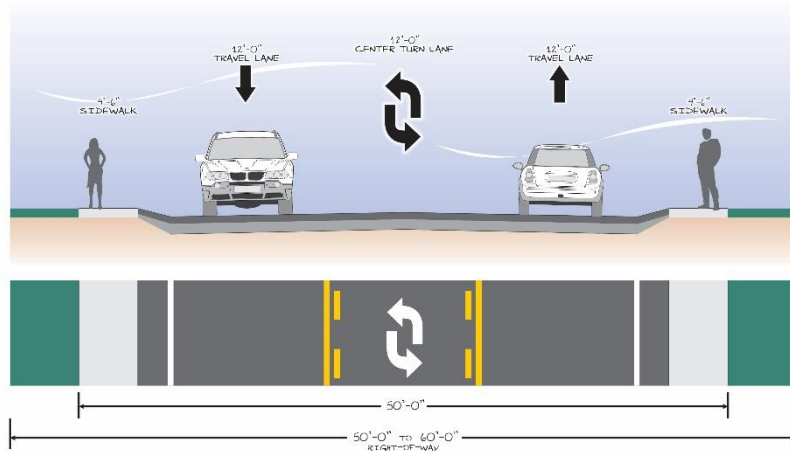


#### South Carolina Department of Transportation Advanced Project Planning Report

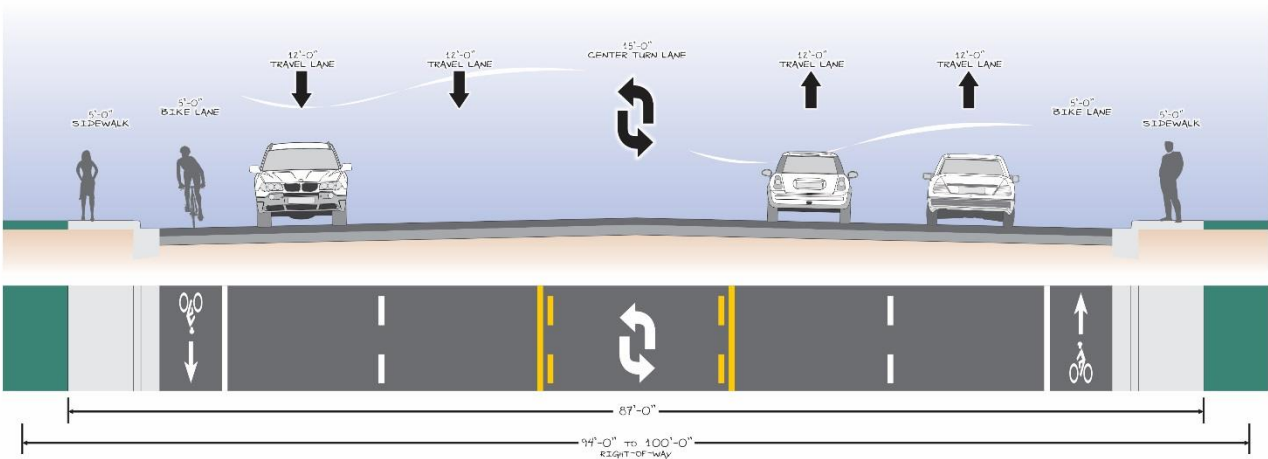
In 2008, the South Carolina Department of Transportation (SCDOT) developed an Advanced Project Planning Report (APPR) for improvement to East Butler Road. The purpose of the APPR report was to identify potential benefits, impacts and areas of concern to the human and natural environment caused by proposed improvements.

The purpose and need as stated in the APPR was to provide additional capacity to address existing and future traffic congestion and to provide for improved bicycle access to the adjacent high school. To meet these goals, SCDOT proposed to widen the existing three-lane roadway (i.e., one travel lane in each direction with a continuous center turn lane) (see **Figure 2-1**) to a five-lane cross section that would include two travel lanes in each direction, continuous center turn lane, bike lanes, and sidewalks (see **Figure 2-2**), similar to the existing cross-section between Mauldin High School and I-385. If implemented, this widening would take East Butler Road from its current variable right-of-way of 50-60 feet to a right-of-way of approximately 100 feet. The report also calls for further studies to the signalized intersections to determine impacts and appropriate design. The proposed facility would operate at a level of service B, carrying 24,800 vehicles per day.

The public was not receptive to the proposed changes recommended in the APPR, citing that it would encourage more through traffic and higher speeds while significantly damaging the character of the City of Mauldin. Therefore, the City of Mauldin received funding through GPATS to conduct the East Butler Road Corridor Study to gain a better understanding of future travel demand as well as document citizen desires to develop a context sensitive design alternative to the five-lane cross section previously proposed by SCDOT.



**Figure 2-1: East Butler Road Existing Cross Section**



**Figure 2-2: East Butler Road SCDOT APPR Proposed Cross Section**

#### **Greenville-Pickens Area Transportation Study Transportation Improvement Program**

The Greenville-Pickens Area Transportation Study (GPATS) is the Metropolitan Planning Organization (MPO) for the Greenville urbanized area. The MPO is tasked, as per federal requirements, with creating a Long-Range Transportation Plan (LRTP), a Transportation Improvement Program (TIP), as well as developing a Unified Planning Work Program (UPWP). The TIP serves as the region's short-range program that schedules funding for transportation projects to be implemented over a six-year cycle.

The most recent TIP for fiscal years 2014-2019 identifies East Butler Road as a project to receive \$17M in funding beginning in the year 2019. That funding is currently set at \$1M for planning, environmental, and engineering services (PE). An additional \$16M is shown as being beyond 2019. The TIP describes the project as a roadway widening from the existing two-lane section to a four-lane highway with a raised median, turn lanes at intersections, bicycle lanes, and concrete sidewalk. The purpose and need as stated in the TIP is to “provide additional capacity to address existing and future traffic congestion while improving left turns at intersections.”

Funding sources identified include the Surface Transportation Program (i.e., now called the Surface Transportation Block Grant Program (STBGP)) and Transportation Enhancement (i.e., now called the STBGP Set-Aside) funds under the federal Guideshare program. The Transportation Enhancement monies have been allocated to specifically improve landscaping and pedestrian amenities along the corridor.

#### **City of Mauldin Comprehensive Plan**

The City of Mauldin's Comprehensive Plan, originally developed in 2008 and updated in 2014, is a community-wide guiding document that assists citizens, elected officials, appointed board members, staff, and other interested stakeholders in establishing a vision and defining concrete goals to focus future growth of the community. The plan is intended to chart a course in a number of governing areas and includes sections specific to population, housing, natural resources, land use, and transportation, among others.

Future land use along East Butler Road is depicted in the Comprehensive Plan as a mixture of commercial and medium-high density residential uses, surrounded by the prevailing single-family residential developments found adjacent to the corridor.

Several recurring themes were found in the plan with regard to key land use issues including a call for more “complete streets” that include accommodations for all street users, reinforce appropriate vehicle speeds and enhance the aesthetic character of the streetscape. Infill development and neighborhood-scale commercial areas are also encouraged where undeveloped properties are sited close to schools, shopping, and employment centers.

The Land Use section of the Comprehensive Plan also calls out three distinct corridor types for major roadways in the community. Much of East Butler Road is identified as a “Community Corridor” which is defined as “appropriate for less intense commercial uses, such as professional offices, office parks, mixed-use developments, restaurants, and small retail centers. Big-box retail centers are inappropriate in these corridors. Schools, churches, and residential areas will fit well in these areas.



Good interconnections among properties should be pursued as well to create a local circulation network and reduce local traffic use of the arterial streets.”

The Transportation section of the plan addresses all modes of transportation and identifies needs for streets and highways, pedestrian and bicycle facilities, and public transportation. A strength, weaknesses, opportunities, threats (SWOT) analysis performed during the planning process found several weaknesses and opportunities related to transportation issues. Weaknesses include the appearance of commercial areas, fragmented/inadequate bicycle and pedestrian facilities, bottlenecks on major roads, including East Butler Road, and a weak community identity. The intersections of Bethel Drive, Old Mill Road, Owens Lane, and Murray Drive with East Butler Road were all cited as the top intersections in the City with “additional problems.” Opportunities found in the SWOT analysis include the chance to create a city-wide greenway system and enhance regional and local bus services.

### **Downtown Mauldin Master Plan**

The Downtown Mauldin Master Plan is a development plan created by the City that envisions the potential for a twelve-block area located just north of the City’s municipal complex between North Main Street and Murray Road.

Among the traffic system recommendations found in the plan, there are a number with direct relevance to East Butler Road. One recommendation calls for a dedicated left-turn lane to allow for eastbound traffic on East Butler Road to turn into the City Hall complex. The plan also calls for the creation of a pedestrian crossing and bus stop on Murray Drive to provide cross-access between the downtown area and the Cultural Center.

The Downtown Mauldin Master Plan also describes a new street connecting East Butler Road to the downtown that would run generally across from the current Owens Lane alignment. This intersection is recommended to be signalized. Additional transportation improvements recommended include enhanced design features like decorative lamp posts, sidewalks, transit stops, and other pedestrian and bicycle facilities to create active transportation connections between the downtown and surrounding neighborhoods.

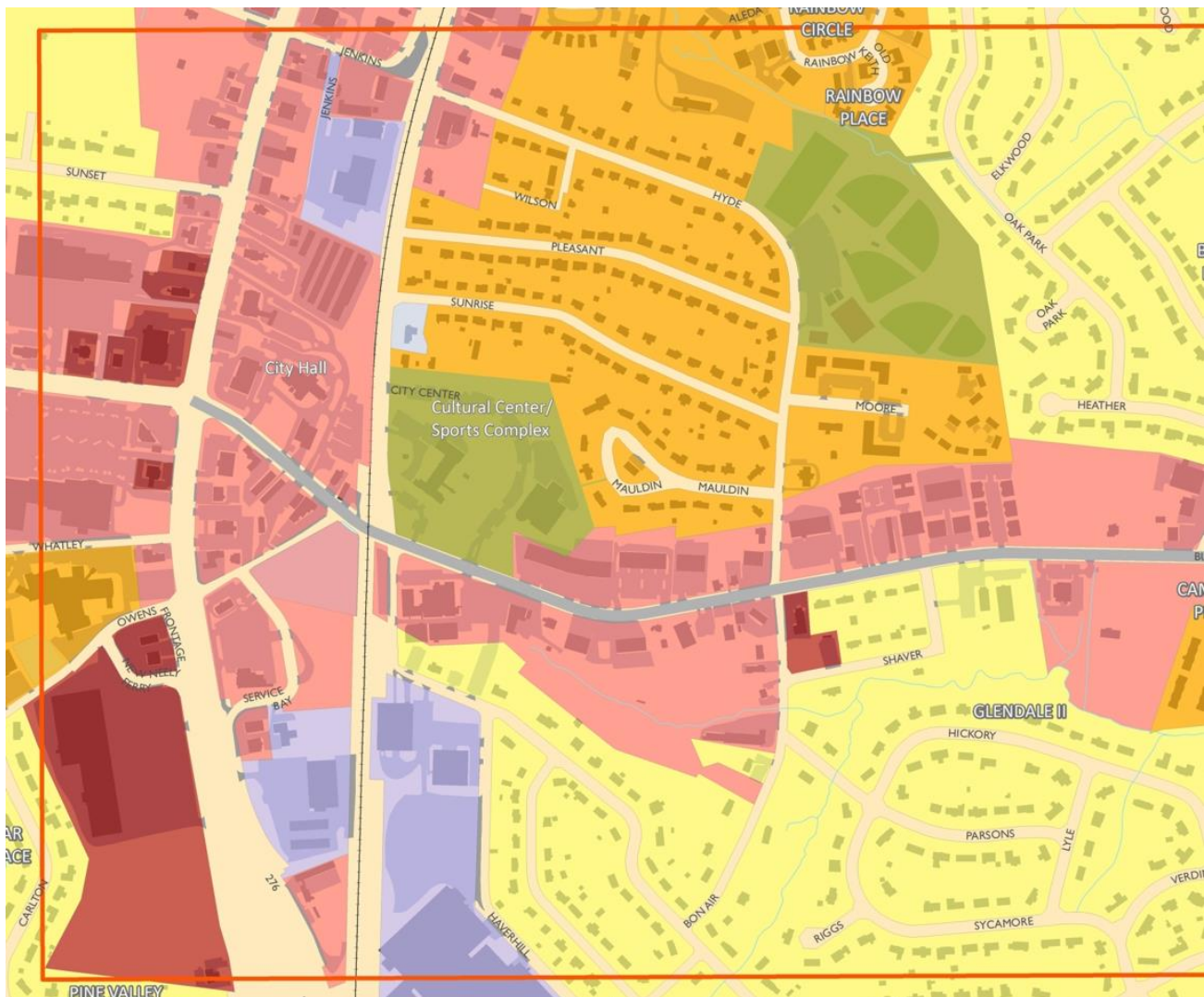


**Figure 2-3:** Rendering of Vision for Downtown Mauldin

#### City of Mauldin Zoning Ordinance & Zoning Map

The current zoning map designates a mixture of zoning districts along the East Butler Road corridor. The primary zoning district adjacent to East Butler Road between North Main Street and Bethel Drive is Highway Commercial (C-2). This district is intended to provide goods and services oriented to customers traveling by automobile along major transportation routes through the city. There are also three individual parcels along the corridor with General Commercial (C-1) zoning. The C-1 district provides for the establishment of convenience services for local residents.

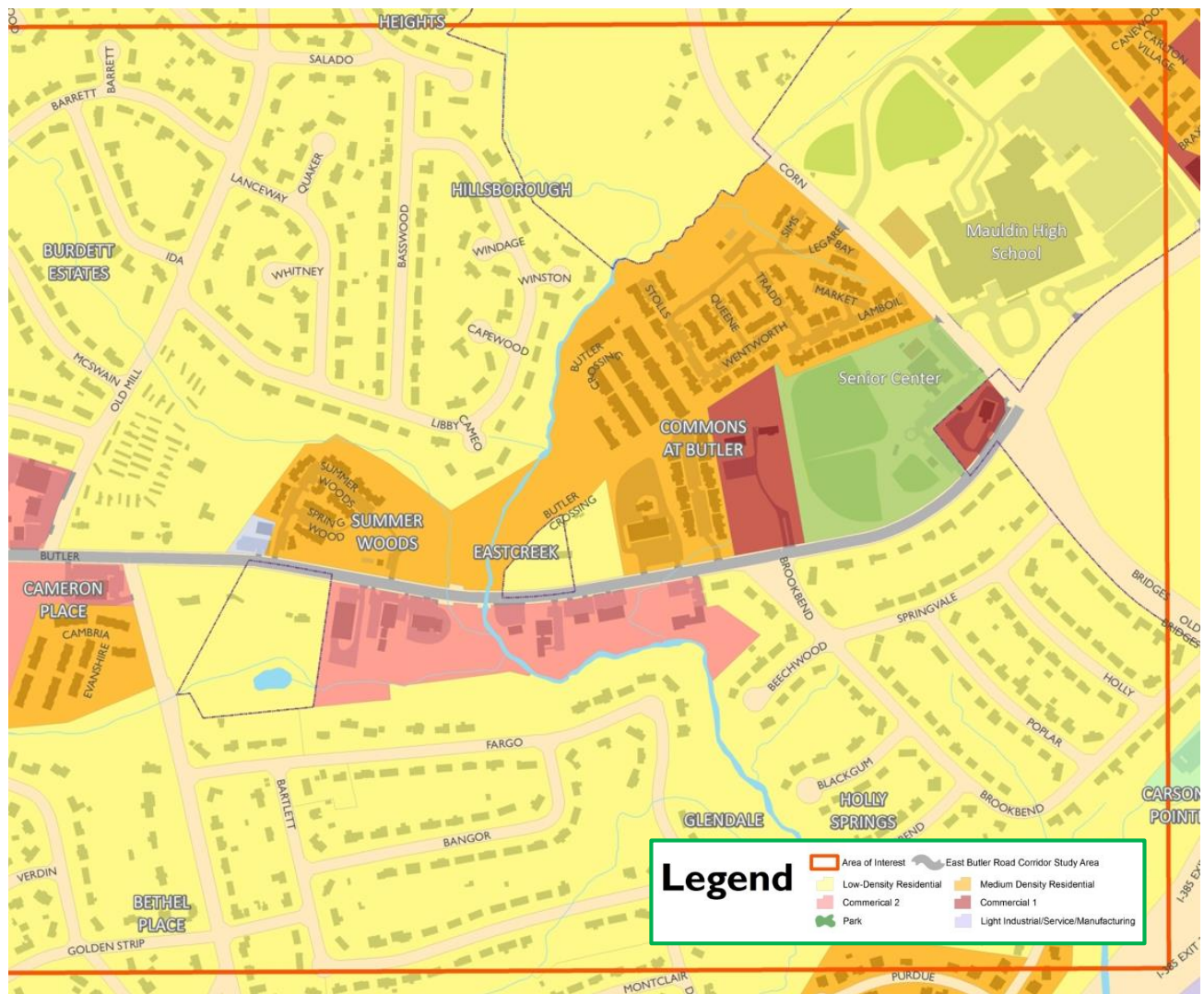
In addition to commercial districts, the corridor also includes a number of low-density and moderate density residential zoning districts. The primary residential zoning districts along the corridor include R-20, R-12, and R-M. The R-20 and R-12 categories permit residential lots with minimum acreages of 0.5-acre and 0.25-acre, respectively. The R-M district is a multi-family designation that provides for a full range of medium to high density residential development that serves as a transitional area between single-family and commercial districts. **Figure 2-4**, presented at the bottom of this page and the opposite page, illustrates the existing zoning within the area of interest.



**Figure 2-4: Existing Zoning**



The City Zoning Ordinance also outlines development and design standards required for all new development, including development affecting streetscapes. Landscaping standards require street trees as part of new development/redevelopment to create an attractive streetscape and provide for a pedestrian friendly environment. Street trees are required along all public and private street frontages and must be planted in a planting strip that is no less than seven feet in width.



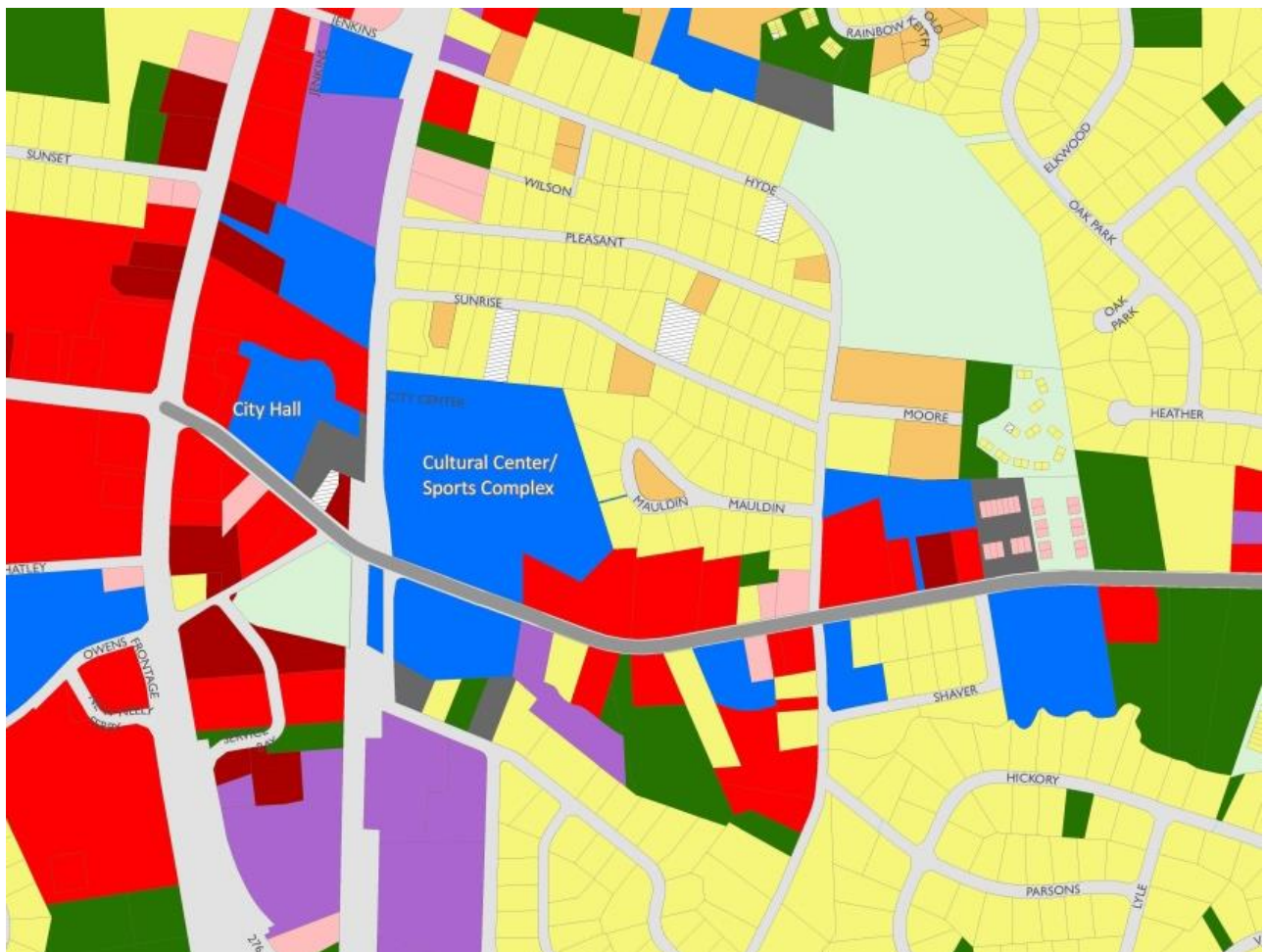
## 2.2 Land Use Context

While a variety of land uses exist along East Butler Road, the corridor's land use character is predominantly suburban with buildings set back from the street and large surface parking lots. In addition to commercial uses, single-family homes, churches, schools, and municipal/civic uses are present. Most properties are provided with multiple driveways for exclusive access and very few properties have any level of parcel interconnectivity.

### Existing Land Use

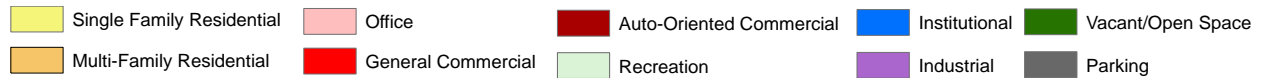
Greenville County classifies each parcel with a land use code to describe the current use of the property for tax purposes. Generally, these land use classifications can be broken into six major categories: Residential, Commercial, Institutional, Industrial, Recreational, and Vacant. Each of these categories can be further subcategorized for more specific uses.

East Butler Road contains a mixture of existing uses along the study corridor, including each of the major categories listed above. **Figure 2-5** illustrates existing land uses along the corridor.



**Figure 2-5: Existing Land Use**





## 2.3 Transportation Context

This section reviews the existing transportation context along East Butler Road, including street characteristics, historical crashes, and bicycle and pedestrian facilities. Detailed traffic analysis is presented in Section 3 of this report.

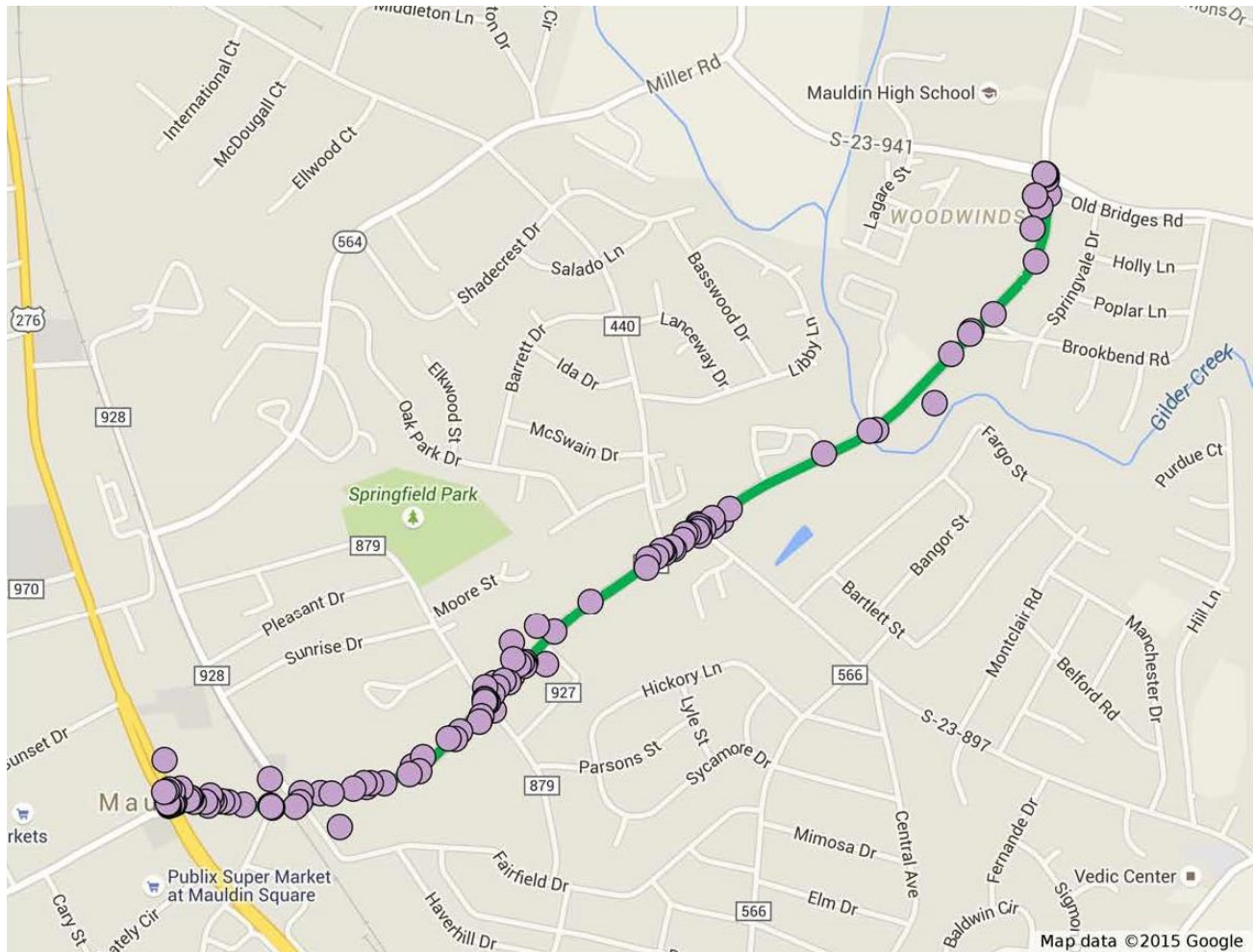
### Roadway Characteristics

East Butler Road is the central east-west connector in the City of Mauldin. The portion of East Butler Road between Main Street (US 276) and Corn Road/Bridges Road is generally a three-lane road (i.e., one travel lane in each direction and a continuous center turn lane) (see graphic depiction of cross section presented previously in Figure 2-1). West of Main Street, Butler Road is generally a five-lane road (i.e., two travel lanes in each direction with a continuous center turn lane). East of Corn Road/Bridges Road, Butler Road is also generally a five-lane road. The speed limit along the corridor is 35 miles per hour but vehicle speeds are well in excess of this posted speed limit.

### Crash Data

SCDOT reports that in the most recent five-year period (2009-2014) for which data is available, a total of 162 crashes occurred along the East Butler Road corridor between Main Street and Corn Road/Bridges Road. These are depicted geographically in **Figure 2-6**. Sixty-five of those crashes occurred at intersection locations that are being considered as part of this study (i.e., for more information, see Section 3 of this report). These intersection crashes represent 40% of the total crashes along the corridor. Of the 162 crashes, a resulting 46 injuries were reported, including one incapacitating injury. Rear-end collisions accounted for 52% of the crashes, 7% were the result of sideswipes, and 25% were head-on collisions. Specific details include:

- There were 21 crashes reported at the intersection of East Butler Road and Bethel Drive, resulting in 6 non-incapacitating injuries. The most frequent collision type (30% of total) was due to rear-end impacts. One crash involved a bicyclist.
- The intersection of East Butler Road and Old Mill Road reported 22 crashes. Seven minor injuries were reported. Rear-end collisions made up 77% of the crashes at this intersection.
- The intersection of East Butler Road and Murray Drive experienced eight crashes. No injuries were reported with the highest rate of incidents (50%) attributed to rear-end collisions.
- The intersection of East Butler Road and Owens Lane contributed to 14 of the 162 total incidents along the corridor, resulting in two minor injuries. Rear-end collisions accounted for 36% of these crashes, 14% were sideswipes, and 36% were angled collisions.



**Figure 2-6: Crash Locations 2009-2014<sup>1</sup>**

<sup>1</sup> Source: SCDOT

## 2.4 Bicycle and Pedestrian Facilities

While bicyclists are regularly seen along East Butler Road, there are currently no dedicated bicycle facilities within the area of interest.

Sidewalks are currently present along the entire East Butler Road corridor. Generally, these pedestrian facilities can be categorized as a five-foot wide concrete sidewalk located immediately adjacent to the back of the valley gutter. Pedestrian crossing facilities are as follows:

- The intersection of Corn Road/Bridges Road, which is adjacent to Mauldin High School, has enhanced “ladder style” crosswalks and pedestrian signals on all four crossings.
- Standard crosswalks and pedestrian signals are present on the south and west sides of the Bethel Drive intersection.
- The intersection of East Butler Road with Bon Air Street has standard crosswalks and pedestrian signals on all four crossings.
- Standard crosswalks and pedestrian signals exist on all four approaches of East Butler Road’s intersection with Main Street (US 276).
- Unsignalized side streets, including Old Mill Road, Fairfield Drive, Murray Drive, and Owens Lane do not have crosswalks.
- A midblock, “ladder style” crosswalk connects Mauldin United Methodist Church on the south side of East Butler Road to the Mauldin Cultural Center on the north side. This is primarily utilized on Sundays and during special events to allow for overflow parking access for the church and/or Cultural Center.





### 3 Traffic Analysis

To inform the development of project recommendations, traffic data was collected and subsequently analyzed for East Butler Road and its intersection with several roads along the corridor. Turning movements were counted during the weekday morning and afternoon peak hours in May 2015. To establish a growth rate for the corridor, SCDOT historic average daily traffic counts were utilized, as shown in **Table 3-1**.

Existing and projected traffic conditions were analyzed to inform the development of recommendations.

**Table 3-1: Historic Average Daily Traffic**

Count Location	2014	2013	2012	2011	2010	2009	2008	2007	2006
Butler Road East of Murray Drive	15,900	17,200	16,300	17,100	17,000	17,700	17,600	17,100	17,100
Butler Road East of Bethel Drive	15,900	14,700	16,000	14,800	14,300	14,000	n/a	n/a	n/a

Source: SCDOT

Future year traffic is made up of existing traffic and any increase or decrease in volumes which might occur from general growth trends in the surrounding area or from nearby specific developments. Recent traffic growth trends can be determined from the SCDOT annual traffic counts, as shown above in Table 3-1. Daily volumes at many locations across South Carolina went up and down during the recent economic downturn which occurred during this period. An indication of sustained growth would be volumes in 2011 or 2012 that had recovered to 2008 levels and have increased since then. However, there is no such pattern on East Butler Road.

As is the case in many mature, developed areas, traffic volumes, with an occasional exception, have remained mostly constant. It would be reasonable, therefore, to assume no sustained traffic growth in the East Butler Road corridor. However, redevelopment of parcels just off the corridor is anticipated, so some traffic growth will certainly occur. Between 2006 and 2009, traffic east of Murray Drive grew at 1.1 percent per year. The City of Mauldin provided the GPATS 2025 model projections of 18,456 east of Murray Drive and 18,062 east of Bethel Drive. These volumes indicate growth rates between 2014 and 2035 of 0.7 percent per year east of Murray Drive and 0.6% east of Bethel Drive. Based on these inputs, a sustained growth rate of 1.0 percent per year was used in this study to project 2040 peak hour traffic volumes at the study intersections.

### 3.1 Intersection Level of Service

Level of Service (LOS) is a metric used to describe the amount of delay a vehicle may typically experience at a given intersection. As shown in **Table 3-2**, LOS is a letter designation that corresponds to a certain range of roadway operating conditions, with A signifying the best operating condition and F indicating the worst, or a failing, operating condition. For reference, it is considered acceptable for a signalized intersection to operate at LOS D or E during peak periods. At unsignalized intersections, it is not unusual for side streets to experience LOS E or F during peak periods.

Highway Capacity Manual (HCM) methodology was employed to analyze the capacity of two intersection pairs on the East Butler Road corridor. In addition to existing conditions, future operational scenarios were evaluated as part of this process: 2040 conditions based on existing intersection configuration; and 2040 conditions based on intersection reconfigurations recommended in Section 4 of this report. The results of this analysis for each intersection are presented below; detailed HCM worksheets are included in **Appendix A**.

**Table 3-2: Intersection Level of Service Criteria**

Level of Service	Description	Control Delay Range (seconds/vehicle)	
		Unsignalized Intersection	Signalized Intersection
<b>A</b>	Operations with very low control delay occurring with favorable progression and/or short cycle lengths.	$\leq 10.0$	$\leq 10.0$
<b>B</b>	Operations with low control delay occurring with good progression and/or short cycle lengths.	$> 10.0$ and $\leq 15.0$	$> 10.0$ and $\leq 20.0$
<b>C</b>	Operations with average control delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	$> 15.0$ and $\leq 25.0$	$> 20.0$ and $\leq 35.0$
<b>D</b>	Operations with longer control delays due to a combination of unfavorable progression, long cycle lengths, or high volume-to-capacity (V/C) ratios. Many vehicles stop and individual cycle failures are noticeable.	$> 25.0$ and $\leq 35.0$	$> 35.0$ and $\leq 55.0$
<b>E</b>	Operations with high control delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered to be the limit of acceptable delay for a signalized intersection.	$> 35.0$ and $\leq 50.0$	$> 55.0$ and $\leq 80.0$
<b>F</b>	Operation with control delays unacceptable to most drivers occurring due to oversaturation, poor progression, or very long cycle lengths. This can be considered reasonable for short periods of time on unsignalized side streets during peak hours.	$> 50.0$	$> 80.0$

Source: 2010 Highway Capacity Manual

#### **East Butler Road at Owens Lane and Murray Drive/Fairfield Drive**

While being two distinct intersections, due to their close proximity to one another, the East Butler Road intersections at Owens Lane and Murray Drive/Fairfield Drive should be considered in connection with each other from a traffic operations standpoint. Both intersections are stop sign controlled with East Butler Road having the free-flow movement. Between Owens Lane and Murray Drive, the middle lane on East Butler Road is marked as a back-to-back left-turn lane with storage of about 90 feet westbound and about 60 feet eastbound. Owens Lane, Murray Drive, and Fairfield Drive are two-lane streets, and there is a short left-turn lane on Owens Lane at East Butler Road. A railroad crosses East Butler Road between the intersections.

The spacing between Owens Lane and Murray Drive/Fairfield Drive does not currently accommodate the required left-turn storage, and the situation will worsen by 2040. Westbound through queues on East Butler Road will extend from Owens Lane to Murray Drive, causing gridlock. Widening of East Butler Road to provide side-by-side left turn lanes of about 170 feet would nearly accommodate the westbound left-turn queue at this intersection, but westbound through queues will still extend to Murray Drive. Any opportunity to further separate Owens Lane and Murray Drive/Fairfield Drive should be pursued. The northbound left-turn lane storage should be extended to at least 70 feet.

As shown in **Table 3-3**, from a capacity standpoint this intersection currently operates acceptably and will operate with reasonable delay in 2040. The capacity analysis results shown in Table 3-3 indicate the proposed side-by-side left-turn lane revisions on East Butler Road have little effect on the operation of the intersection from a capacity standpoint but do allow for more adequate left-turn storage on East Butler Road.

**Table 3-3: Capacity Analysis – East Butler Road/Owens Lane**

Movement	Level of Service/Delay (seconds/vehicle)		
	Existing Volumes Existing Geometry	2040 Volumes Existing Geometry	2040 Volumes Side-by-Side Lefts on East Butler
<b>AM Peak Hour</b>			
Westbound - Left	A/10	B/11	B/11
Northbound - Left	C/19	D/26	D/26
Right	C/22	F/70	F/70
<b>PM Peak Hour</b>			
Westbound - Left	B/11	B/14	B/14
Northbound - Left	D/27	E/46	E/46
Right	C/16	D/26	D/26

As shown in **Table 3-4**, Murray Drive and Fairfield Drive already operate at LOS E and F in the afternoon peak hour. By 2040 delay on the sides streets will be very high without a change in traffic control, but signalization of the intersection would be difficult this close to the railroad. Other options such as rerouting Murray Drive behind the Mauldin Cultural Center were considered but have significant disadvantages, including adding traffic to City Center Drive, which has on-street parking.

The projected queue for the eastbound left will exceed the existing left-turn storage. As mentioned above, a widening of East Butler Road between Owens Lane and Murray Drive to provide side-by-side left turn lanes with storage of at least 170 feet was considered. The capacity analysis results shown in Table 3-4 indicate the proposed revisions have little effect on the operation of the intersection from a capacity standpoint but do allow for more adequate left-turn storage on East Butler Road.

Because the proposed revision at this intersection will not address side street delay and because other options such as signalization and diversion of left turns from the side street will be difficult, it is suggested that additional width be reserved at this intersection for a center median in case left turns from these side streets have to be prohibited in the future.

**Table 3-4: Capacity Analysis –  
East Butler Road/Murray Drive/Fairfield Drive**

Movement		Level of Service/Delay (seconds/vehicle)		
		Existing Volumes Existing Geometry	2040 Volumes Existing Geometry	2040 Volumes Side-by-Side Lefts on East Butler
<b>AM Peak Hour</b>				
Eastbound -	Left	B/10	B/12	B/12
Westbound -	Left	A/10	B/11	B/11
Northbound -	Left/through/right	F/65	F/278	F/278
Southbound -	Left/through/right	D/26	F/98	F/98
<b>PM Peak Hour</b>				
Eastbound -	Left	B/11	B/14	B/14
Westbound -	Left	A/9	B/10	B/10
Northbound -	Left/through/right	F/149	F/1420	F/1420
Southbound -	Left/through/right	E/41	F/233	F/233

### East Butler Road at Old Mill Road and Bethel Drive

While being two distinct intersections, due to their close proximity to one another, the East Butler Road intersections at Old Mill Road and Bethel Drive should be considered in connection with each other from a traffic operations standpoint. The intersection with Old Mill Road is stop sign controlled with East Butler Road having the free-flow movement. Bethel Drive is a signalized intersection. At Old Mill Road and Bethel Drive there are left-turn lanes on East Butler Road and separate left- and right-turn lanes on Bethel Drive. Although a two-lane approach is not marked on Old Mill Road, the approach is wide enough for two narrow lanes and was examined for that geometry.

As shown in **Table 3-5**, the left turn from Old Mill Road already operates with high delay in the peak hours. By 2040, left turns from this side street will be nearly impossible in the peak hours. A new connector from Old Mill Road north of East Butler Road to the East Butler Road/Bethel Drive intersection was considered and this would result in reasonable delay at this intersection.

**Table 3-5: Capacity Analysis – East Butler Road/Old Mill Road**

Movement	Level of Service/Delay (seconds/vehicle)		
	Existing Volumes Existing Geometry	2040 Volumes Existing Geometry	2040 Volumes Connector to East Butler/Bethel Intersection
<i>AM Peak Hour</i>			
Eastbound - Left	B/11	B/13	B/11
Southbound - Left	F/115	F/719	F/111
Right	C/17	C/24	C/21
<i>PM Peak Hour</i>			
Eastbound - Left	B/10	B/12	B/11
Southbound - Left	F/188	F/1048	F/98
Right	C/20	E/42	E/37

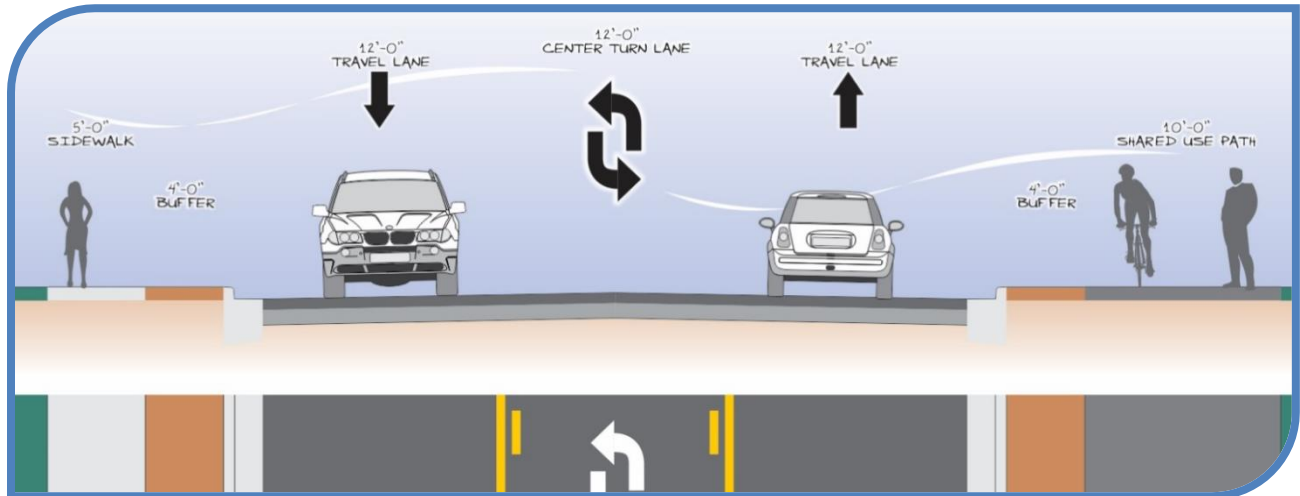
As shown in **Table 3-6**, the intersection of East Butler Road/Bethel Drive currently operates acceptably and will continue to do so in the afternoon peak hour in 2040, (i.e., a signal timing change is necessary with 2040 volumes to achieve acceptable operation). In the morning peak hour, however, the intersection will operate at LOS E if no changes are made (i.e., the opportunity to move green time is less in the morning when the side street demand is high). As described above, the provision of a new connector from Old Mill Road north of East Butler Road to the East Butler Road/Bethel Drive intersection would allow acceptable operation during both peak hours at this intersection.



**Table 3-6: Capacity Analysis – East Butler Road/Bethel Drive**

Movement	Level of Service/Delay (seconds/vehicle)		
	Existing Volumes Existing Geometry	2040 Volumes Existing Geometry	2040 Volumes Connector to East Butler/Bethel Intersection
<b>AM Peak Hour</b>			
Eastbound - (Left)	-	-	C/28
Through/right	C/28	F/97	D/48
Westbound - Left	B/16	C/22	C/32
Through/(right)	A/10	B/13	B/18
Northbound - Left	D/45	F/96	E/71
(Through)/right	C/21	C/23	D/40
Southbound - Left	-	-	E/59
Through/right	-	-	E/55
<b>Overall</b>	<b>C/25</b>	<b>E/64</b>	<b>D/41</b>
<b>PM Peak Hour</b>			
Eastbound - (Left)	-	-	C/32
Through/right	B/19	C/32	D/37
Westbound - Left	B/12	C/32	D/40
Through/(right)	A/5	A/8	B/18
Northbound - Left	C/35	D/46	D/46
(Through)/right	C/26	C/33	D/42
Southbound - Left	-	-	E/60
Through/right	-	-	E/55
<b>Overall</b>	<b>B/14</b>	<b>C/24</b>	<b>C/32</b>

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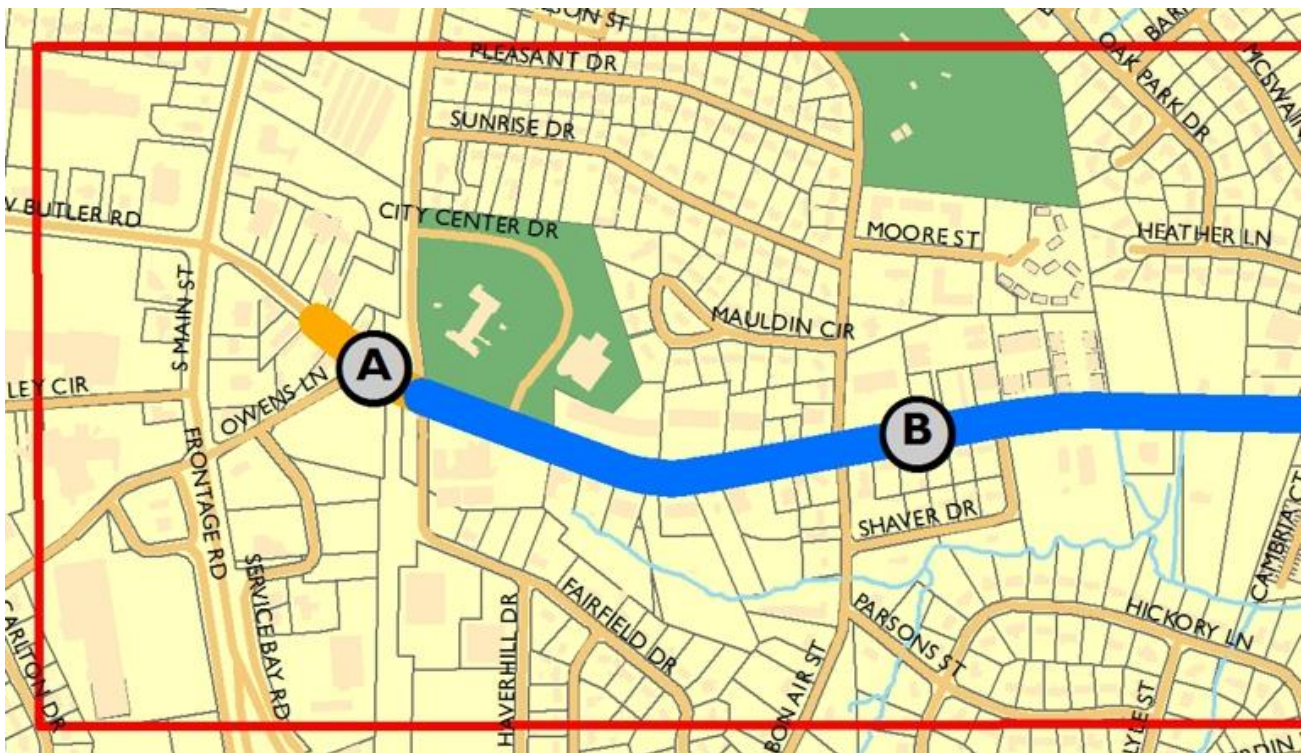
## 4 Recommendations

Based on technical analyses performed and public input received through the public participation process, recommendations were crafted for the East Butler Road Corridor Study. Emphasis was placed on remaining true to the Guiding Principles that were established in collaboration with the public and stakeholders to ensure that recommendations are in harmony with community desires for the future while also meeting the transportation needs of the corridor. Recommendations have been broken into two categories: 1) Cross Section Recommendations; and 2) Intersection Recommendations. These are presented on the following pages.

**Public desires and technical analyses were balanced to produce recommendations for the East Butler Road corridor.**

## 4.1 Cross Section Recommendations

In response to present and future travel demand, need for dedicated bicycle and pedestrian facilities, public comments received, and the Guiding Principles of the project, three distinct cross sections for East Butler Road have been developed. Each is shown graphically and are briefly described in the sections that follow. The geographic limits for each cross section type is shown in **Figure 4-1** below. Improvements would stop short of East Butler Road's intersection with Corn Road/Bridges Road, as all four quadrants of this intersection have been previously improved. At this level of planning, the limits presented in Figure 4-1 should be considered general in nature; the design process should determine the most appropriate origins and termini for each cross section.



**Figure 4-1:** Cross Section Limits





### Cross Section A: Four-Lane with Bike Lanes and Sidewalk

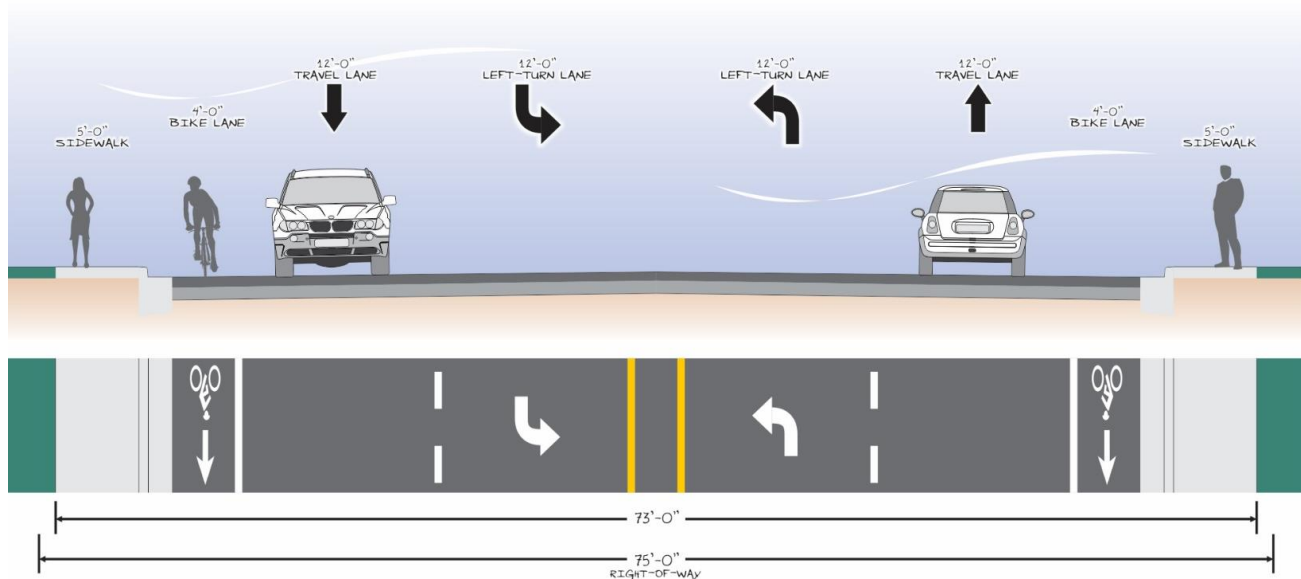
In the area just east of the Main Street (US 276) intersection, a four-lane cross section is required to address left-turning traffic. Two travel lanes (i.e., one in each direction) and two side-by-side left-turn lanes to accommodate long turning queues are provided. Additionally, bike lanes and sidewalks are present. Cross Section A is graphically shown in **Figure 4-2**.

### Cross Section B: Three-Lane with Bike Lanes and Sidewalks

From Murray Drive to Bethel Drive, a three-lane cross section is proposed (see **Figure 4-3**). Coupling this with recommended intersection improvements, traffic needs will be addressed today and in the future. Two travel lanes (i.e., one in each direction) and a continuous center turn lane are provided. Where possible, the center turn lane could double as a planted median for traffic calming, access management, and beautification. Bike lanes and sidewalks are also included.

### Cross Section C: Three-Lane with Shared Use Path and Sidewalk

Between Bethel Drive and west of Corn Road/Bridges Road, bike lanes transition off the road to a buffered (i.e., hardscape or grass) shared use path on the north side of East Butler Road; a buffered (i.e., hardscape or grass) sidewalk is provided on the south side. The lane configuration has two travel lanes (i.e., one in each direction) and a continuous center turn lane. **Figure 4-4** graphically depicts Cross Section C. As mentioned previously, improvements would stop short of East Butler Road's intersection with Corn Road/Bridges Road, as all four quadrants of this intersection have been previously improved.



**Figure 4-2: Cross Section A**

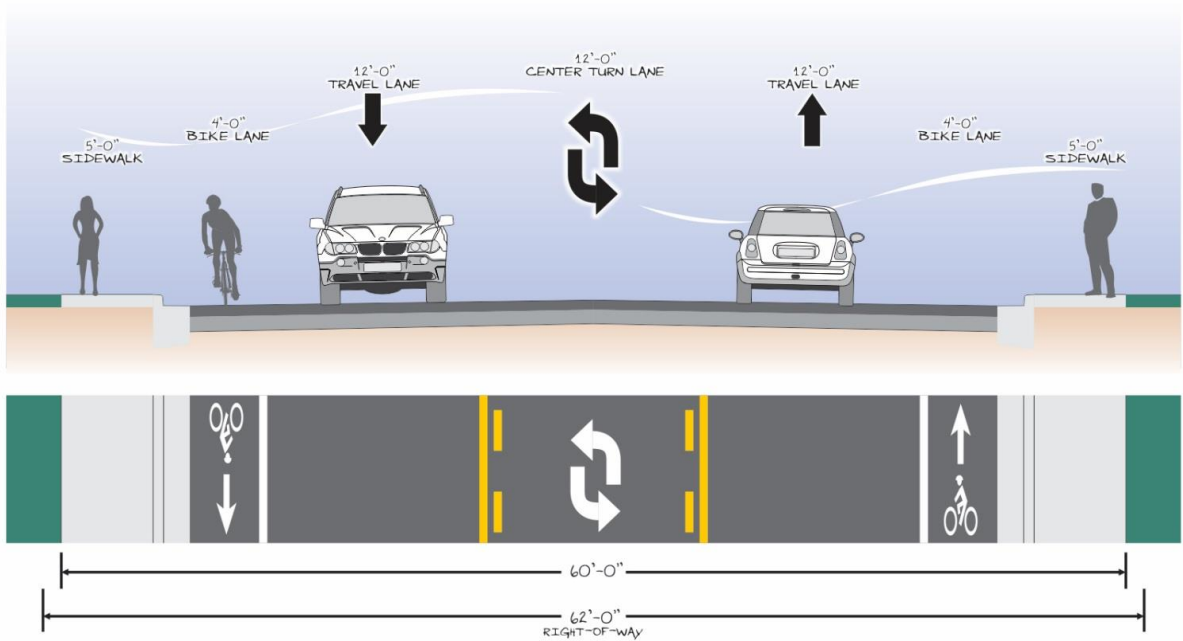


Figure 4-3: Cross Section B

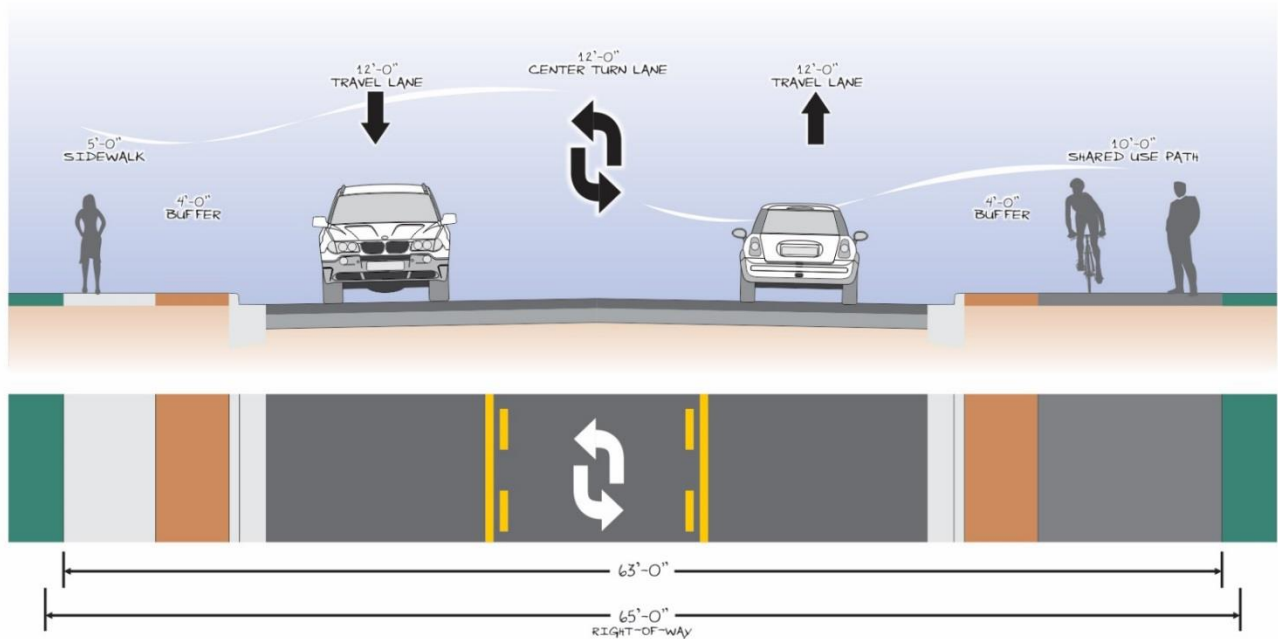


Figure 4-4: Cross Section C

## **4.2 Intersection Recommendations**

As described in Section 3 of this report, several intersection improvements are needed to provide better traffic operations today and in the design year of 2040. The following sections describe the recommended intersection improvements.

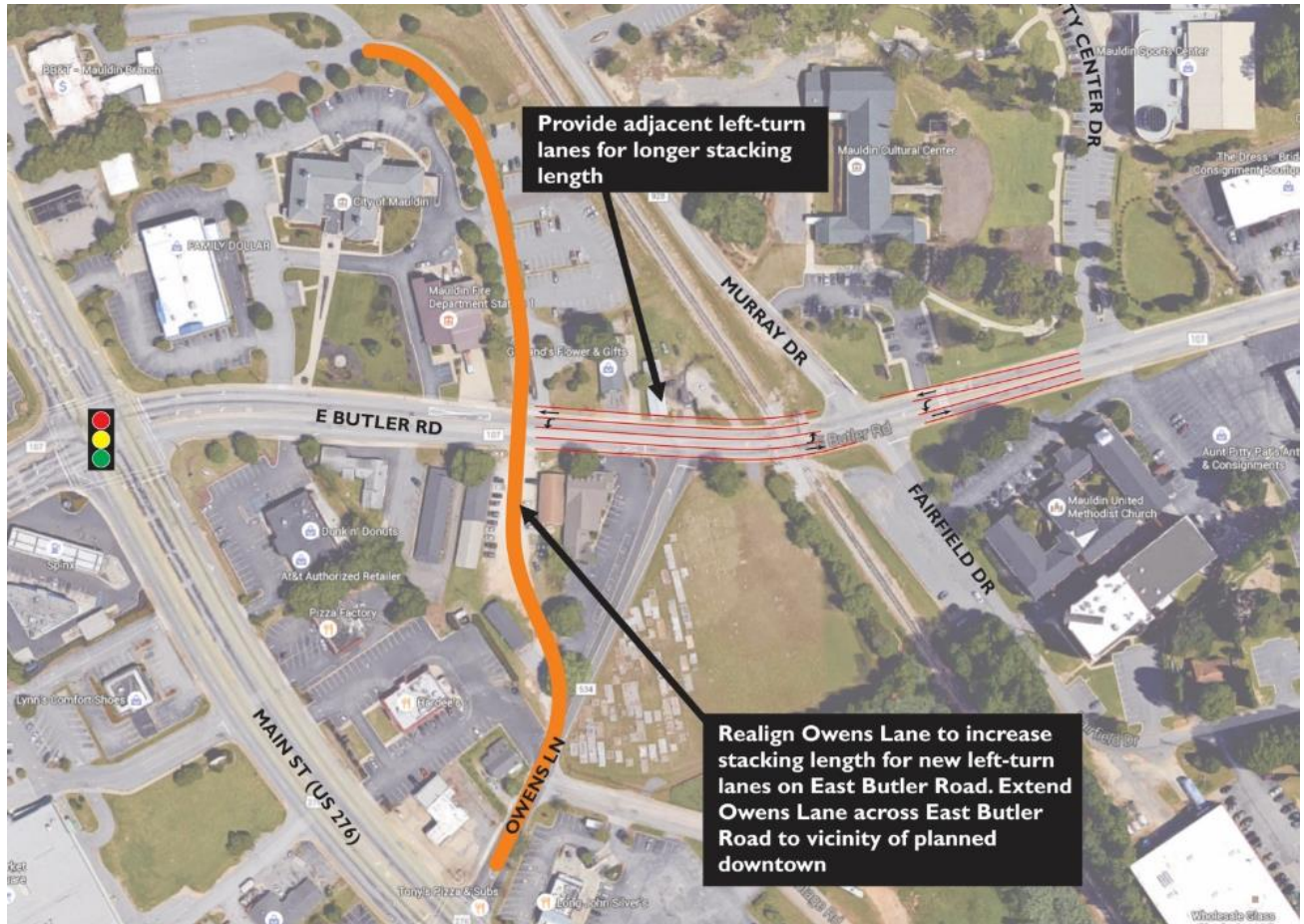
### **East Butler Road at Owens Lane**

From a capacity standpoint, this intersection currently operates acceptably and will operate with reasonable delay in 2040. However, the projected queue (i.e., stacking traffic) for the westbound left will exceed the existing left-turn storage, and westbound through queues will extend to Murray Drive/Fairfield Drive. A widening of East Butler Road between Owens Lane and Murray Drive, as illustrated in **Figure 4-5**, would provide side-by-side left-turn lanes with storage adequate to meet future needs. Additionally, it is recommended that Owens Lane be relocated approximately 200 feet to the west of its present location to align with the driveway that accesses the existing BB&T ATM and City Hall parking area. This will increase the stacking length of the new side-by-side left-turn lanes on East Butler Road to provide the needed queuing area for turning traffic.

### **East Butler Road at Murray Drive/Fairfield Drive**

The side streets at this intersection already experience delay in the afternoon peak hour. By 2040, delay will be very high without signalization, but signalization of the intersection is problematic so close to the railroad. It is anticipated that motorists will begin to rely more on the signalized intersection at Hyde Circle/Bon Air Street to the west, as this intersection's delay increases. Similar to Owens Lane above, the eastbound left-turn queue will exceed available storage in 2040, but the recommendations presented in Figure 4-5 will resolve this issue.





**Figure 4-5: East Butler Road at Owens Lane and Murray Drive/Fairfield Drive Recommended Improvements**

#### East Butler Road at Old Mill Road

The left-turn from Old Mill Road already operates with high delay in both the morning and afternoon peak hours. By 2040, left-turns from Old Mill Road will be nearly impossible at peak hours. As shown in **Figure 4-6**, provision of a new connector from Old Mill Road north of East Butler Road to the East Butler Road/Bethel Drive intersection would result in acceptable traffic flow. Left turns from southbound Old Mill Road onto East Butler Road would no longer be permitted; however, left turns from eastbound East Butler Road onto Old Mill Road would still be allowed.

#### East Butler Road at Bethel Drive

This intersection currently operates acceptably and will continue to do so in the afternoon peak hour in 2040. In the morning peak hour, however, long delays will occur in the future if no changes are made. Creation of the full intersection with a connector to Old Mill Road (see Figure 4-6) will allow for acceptable operation during both peak hours. Additionally, turn lane lengths on Bethel Drive should be extended per the detailed analysis presented in Appendix A.

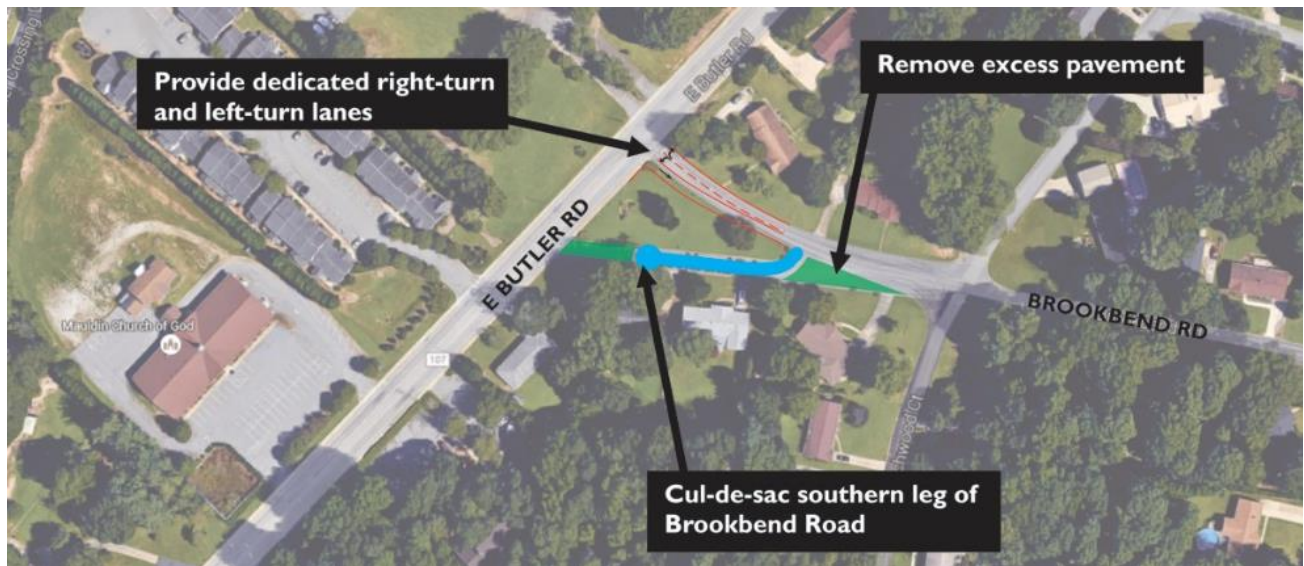


**Figure 4-6:** East Butler Road at Old Mill Road and Bethel Drive Recommended Improvements



### East Butler Road at Brookbend Road

The “Y” configuration of Brookbend Road currently creates confusion and conflicts for motorists, as both legs provide two-way travel. In many instances, motorists desiring to turn right onto East Butler Road from Brookbend Road will utilize the southern leg to avoid left-turning vehicles at the northern leg. This exacerbates traffic flow issues. As shown in **Figure 4-7**, it is recommended that the southern leg be converted to a cul-de-sac and the northern leg be improved to allow for dedicated right-turn and left-turn lanes.



**Figure 4-7:** East Butler Road at Brookbend Road Recommended Improvements

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