
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.

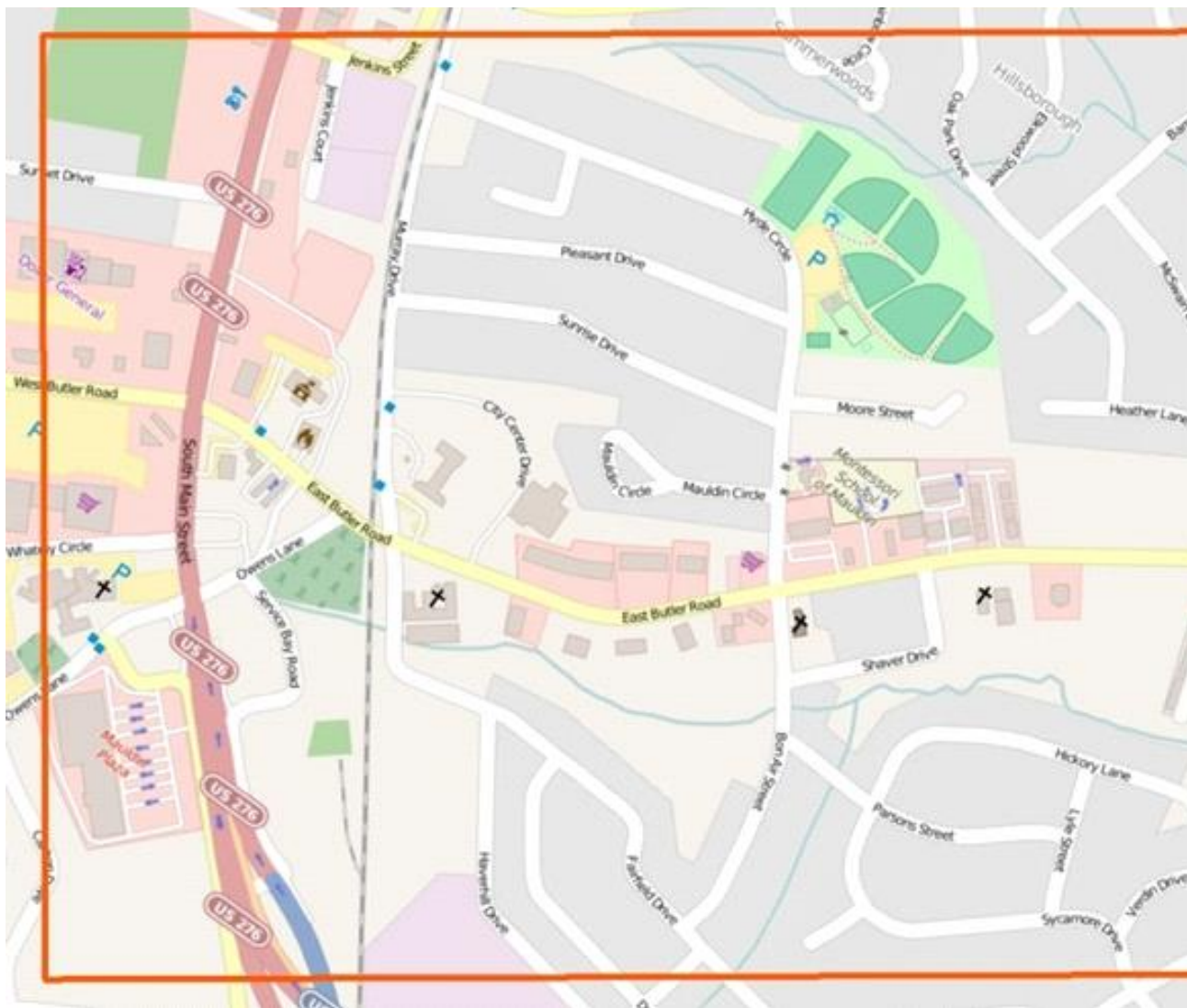
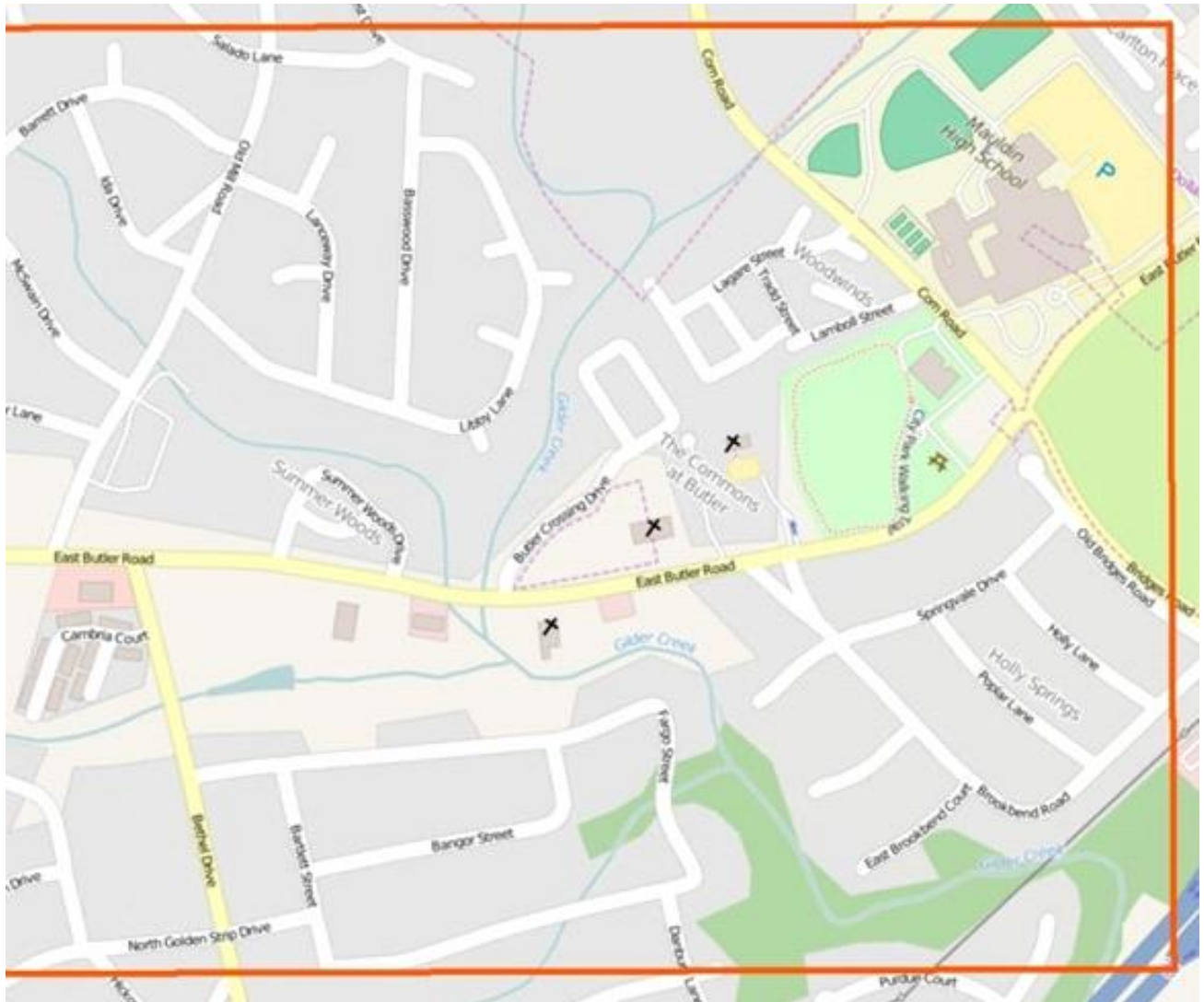


Figure I-1: East Butler Road Corridor Study Area of Interest



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.

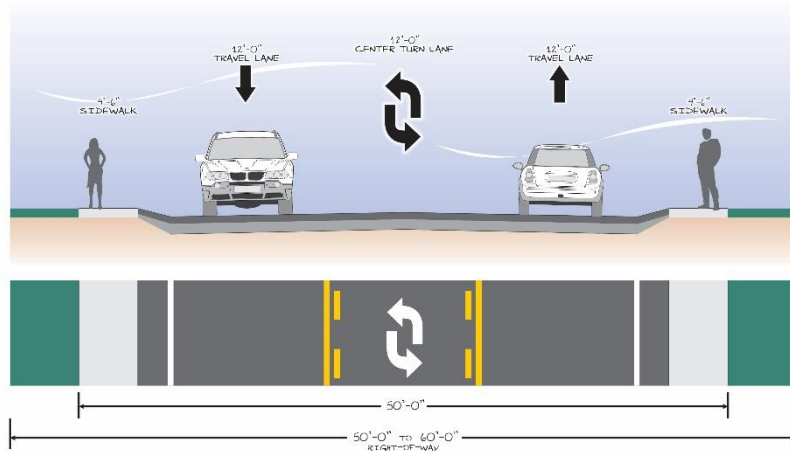


Figure 2-1: East Butler Road Existing Cross Section

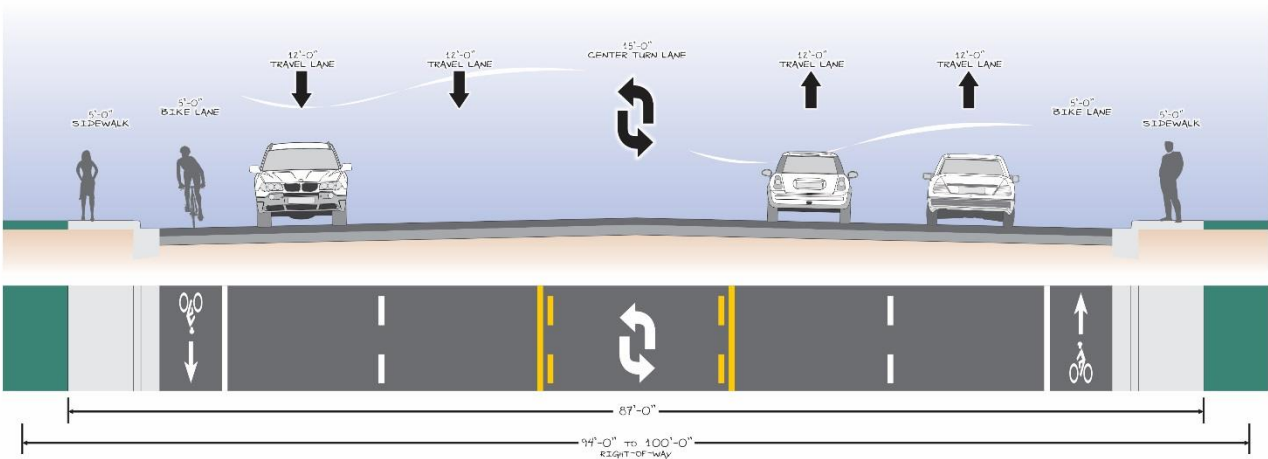


Figure 2-2: East Butler Road SCDOT APPR Proposed Cross Section

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.

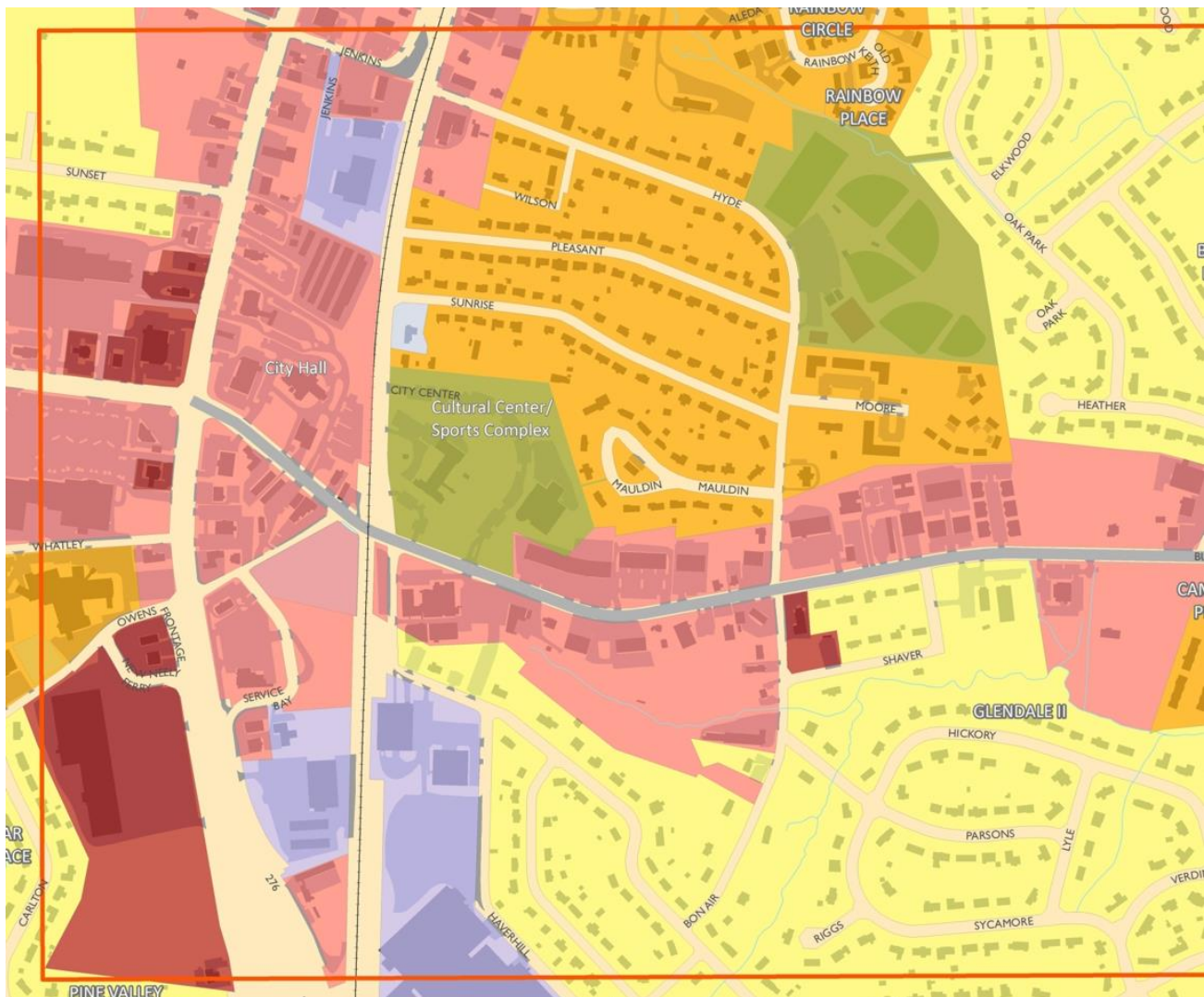
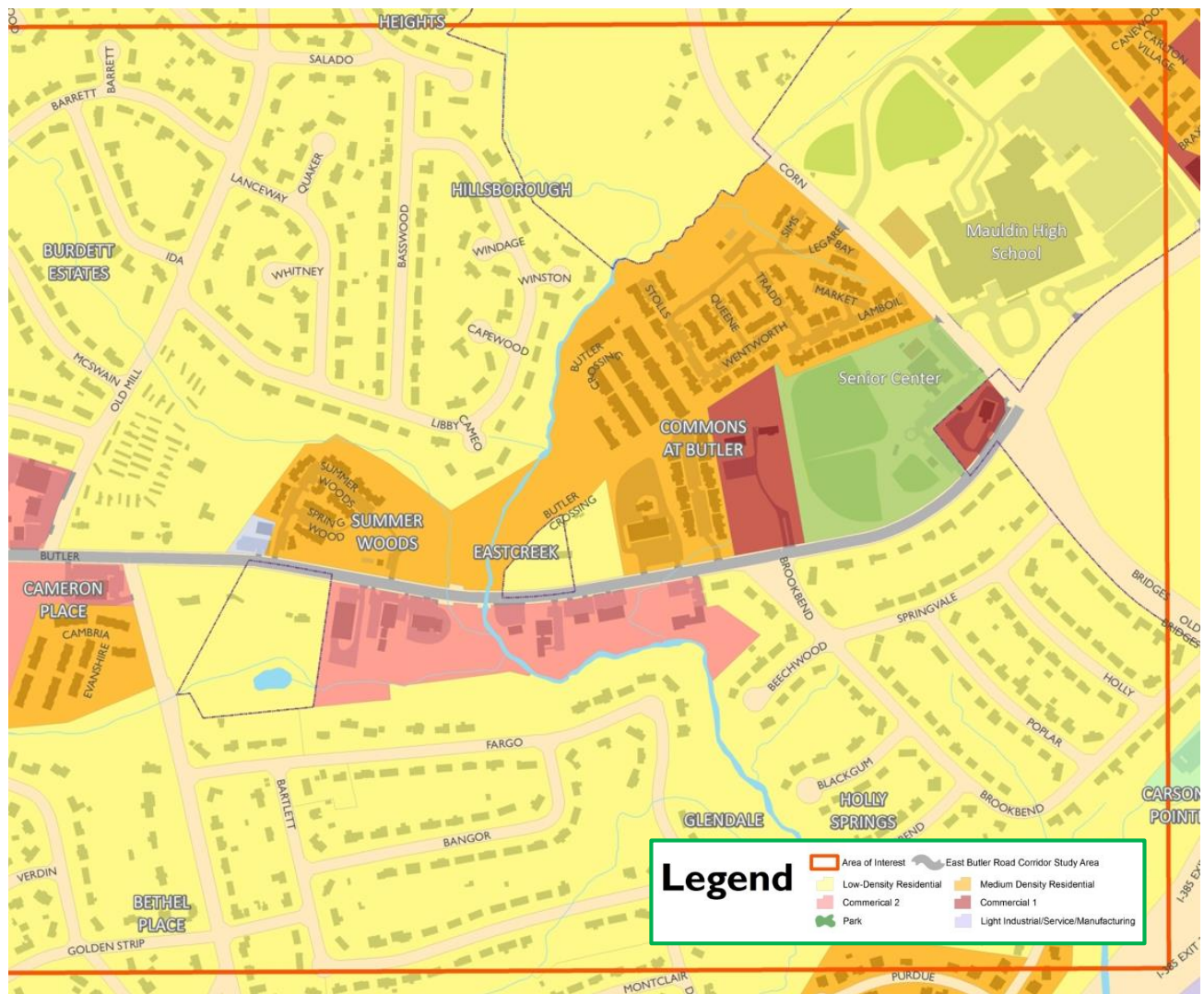


Figure 2-4: Existing Zoning

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.

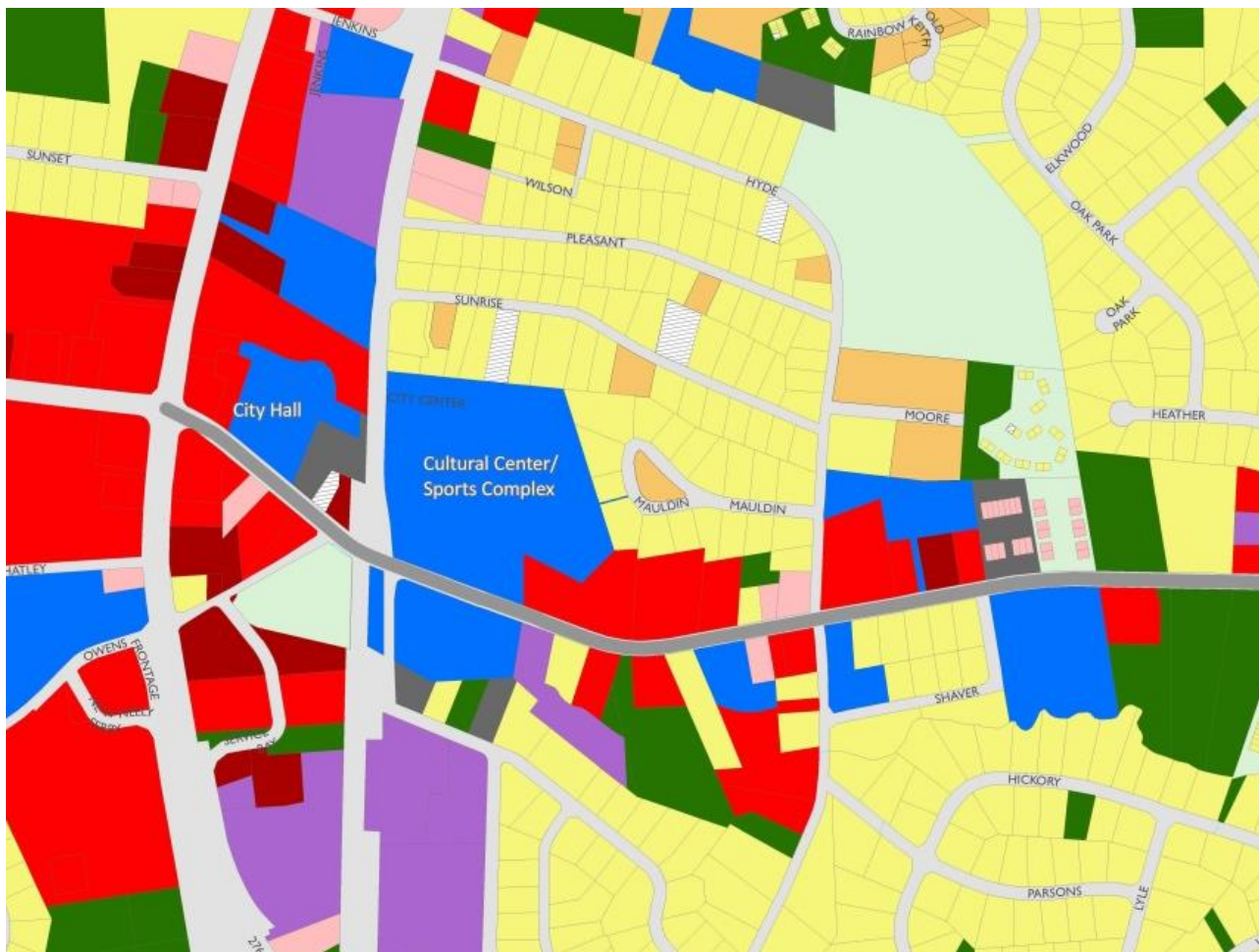
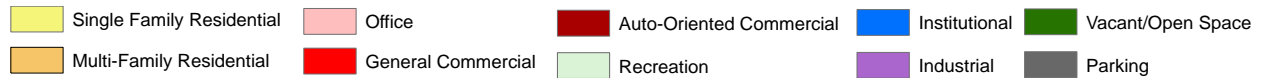


Figure 2-5: Existing Land Use



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.

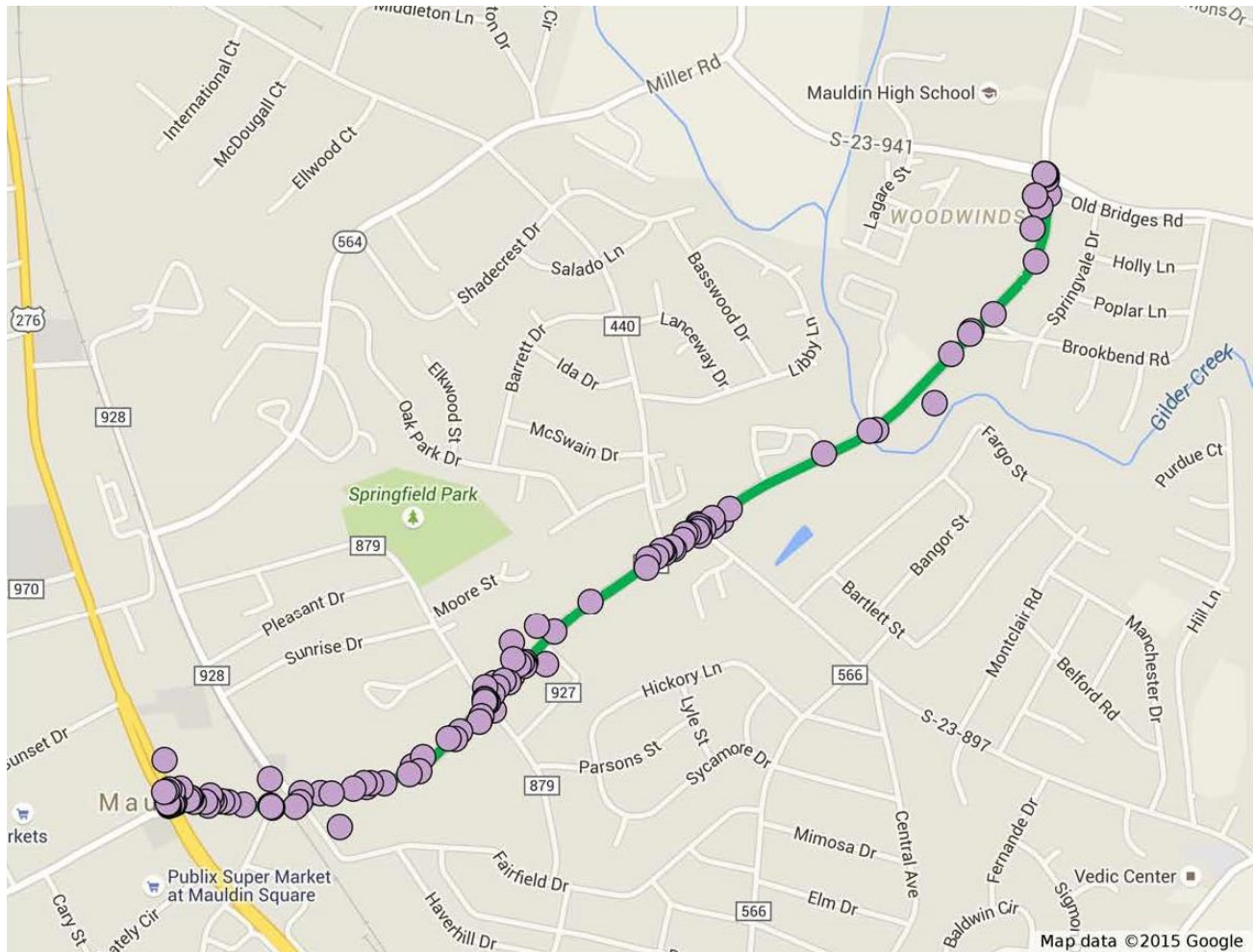


Figure 2-6: Crash Locations 2009-2014¹

¹ 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
A	Operations with very low control delay occurring with favorable progression and/or short cycle lengths.	≤ 10.0	≤ 10.0
B	Operations with low control delay occurring with good progression and/or short cycle lengths.	> 10.0 and ≤ 15.0	> 10.0 and ≤ 20.0
C	Operations with average control delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	> 15.0 and ≤ 25.0	> 20.0 and ≤ 35.0
D	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 ≤ 35.0	> 35.0 and ≤ 55.0
E	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 ≤ 50.0	> 55.0 and ≤ 80.0
F	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
AM Peak Hour			
Westbound - Left	A/10	B/11	B/11
Northbound - Left	C/19	D/26	D/26
Right	C/22	F/70	F/70
PM Peak Hour			
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
AM Peak Hour				
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
PM Peak Hour				
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

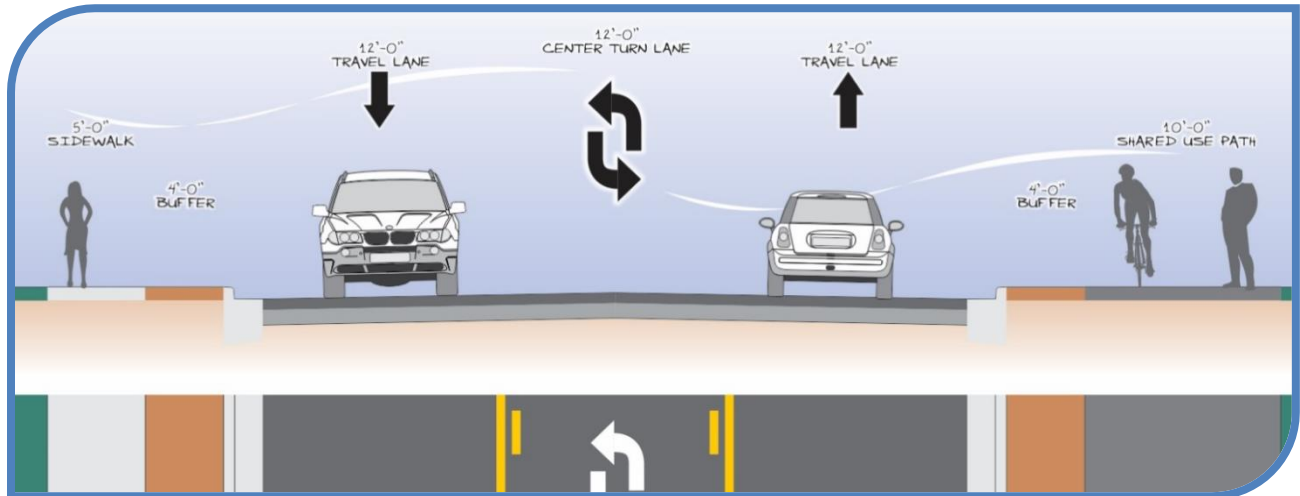
Movement	Level of Service/Delay (seconds/vehicle)		
	Existing Volumes Existing Geometry	2040 Volumes Existing Geometry	2040 Volumes Connector to East Butler/Bethel Intersection
AM Peak Hour			
Eastbound - Left	B/11	B/13	B/11
Southbound - Left	F/115	F/719	F/111
Right	C/17	C/24	C/21
PM Peak Hour			
Eastbound - 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
AM Peak Hour			
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
Overall	C/25	E/64	D/41
PM Peak Hour			
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
Overall	B/14	C/24	C/32

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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.

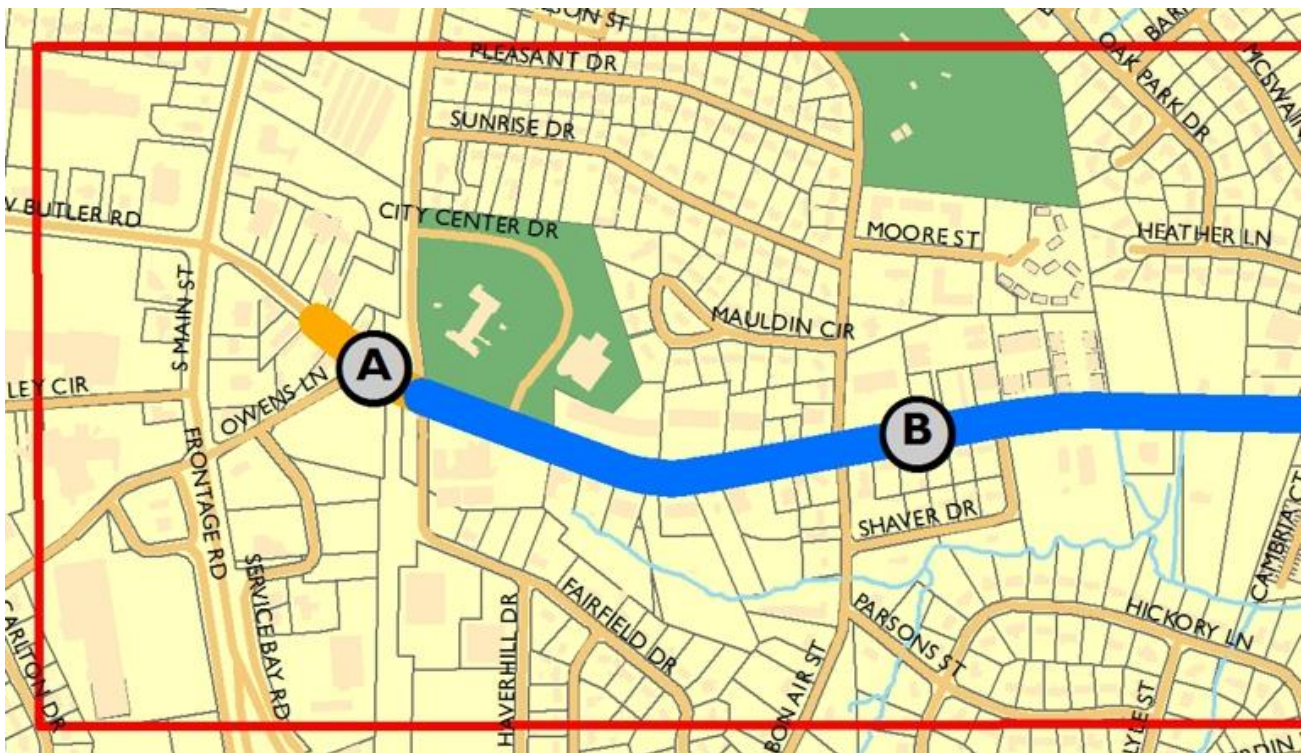


Figure 4-1: Cross Section Limits



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.

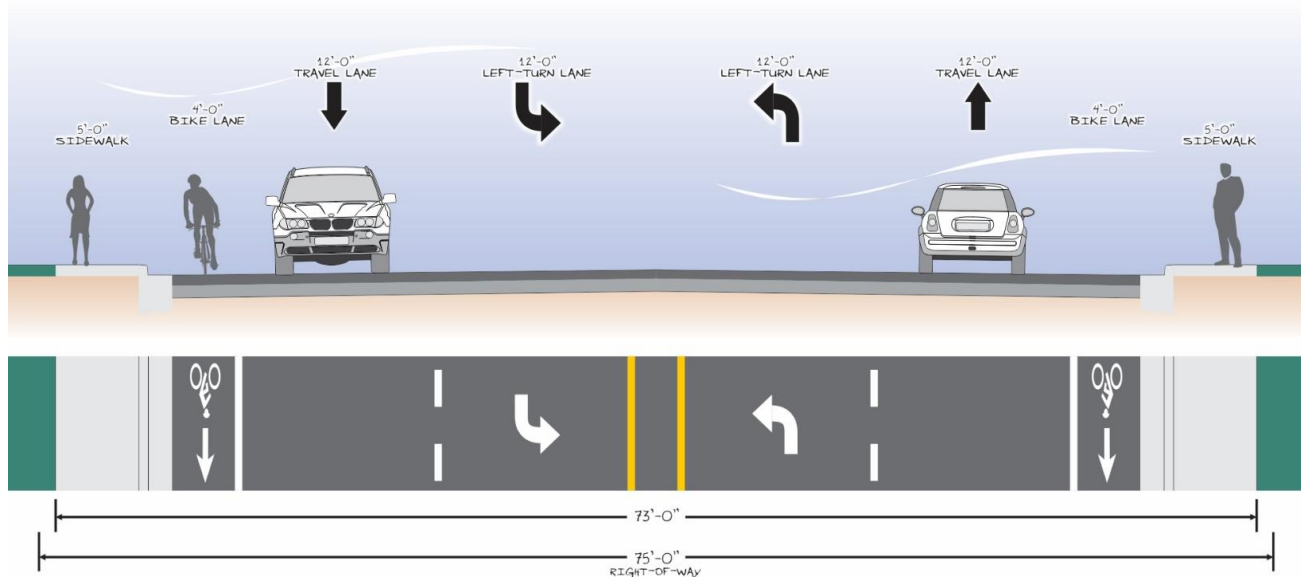


Figure 4-2: Cross Section A

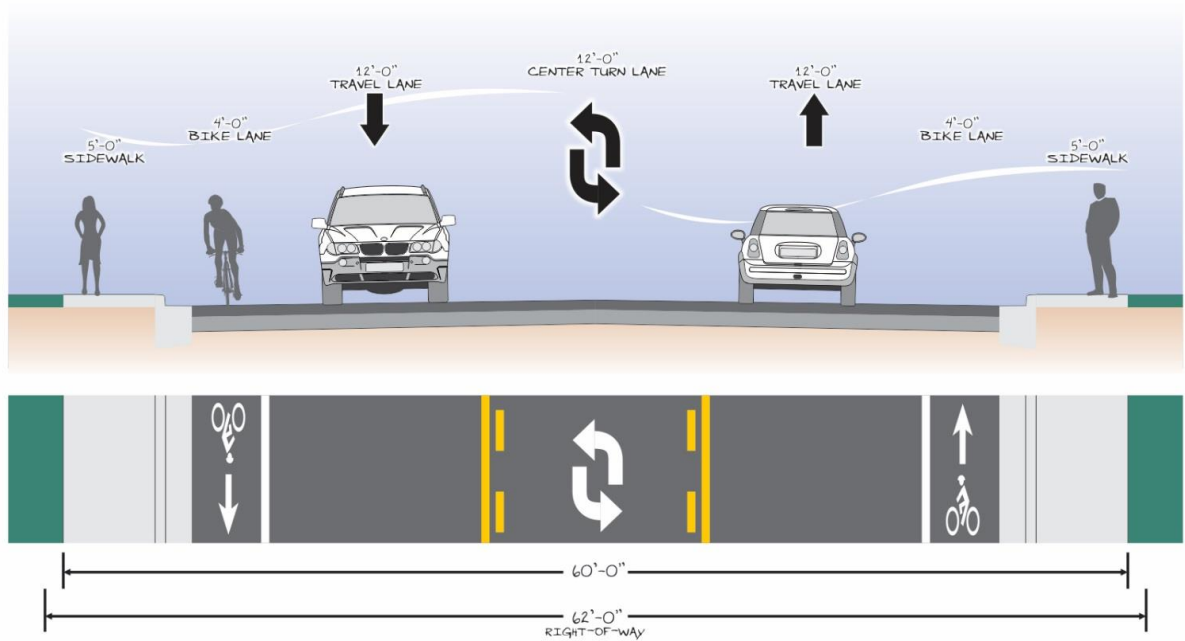


Figure 4-3: Cross Section B

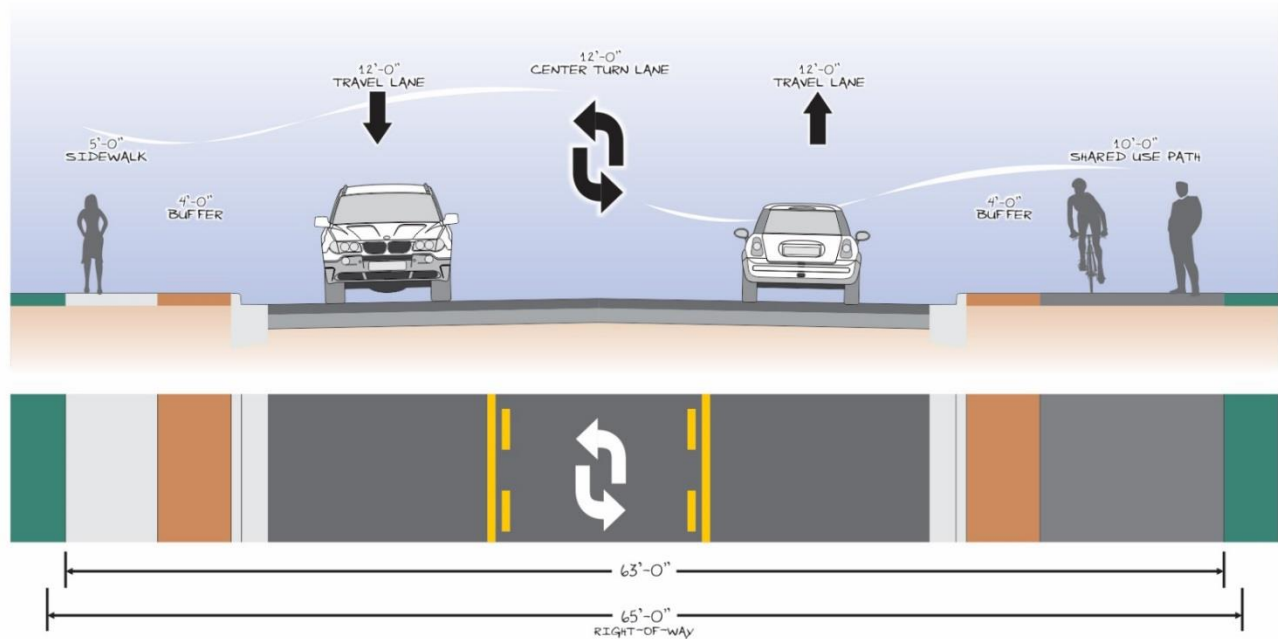


Figure 4-4: Cross Section C

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.

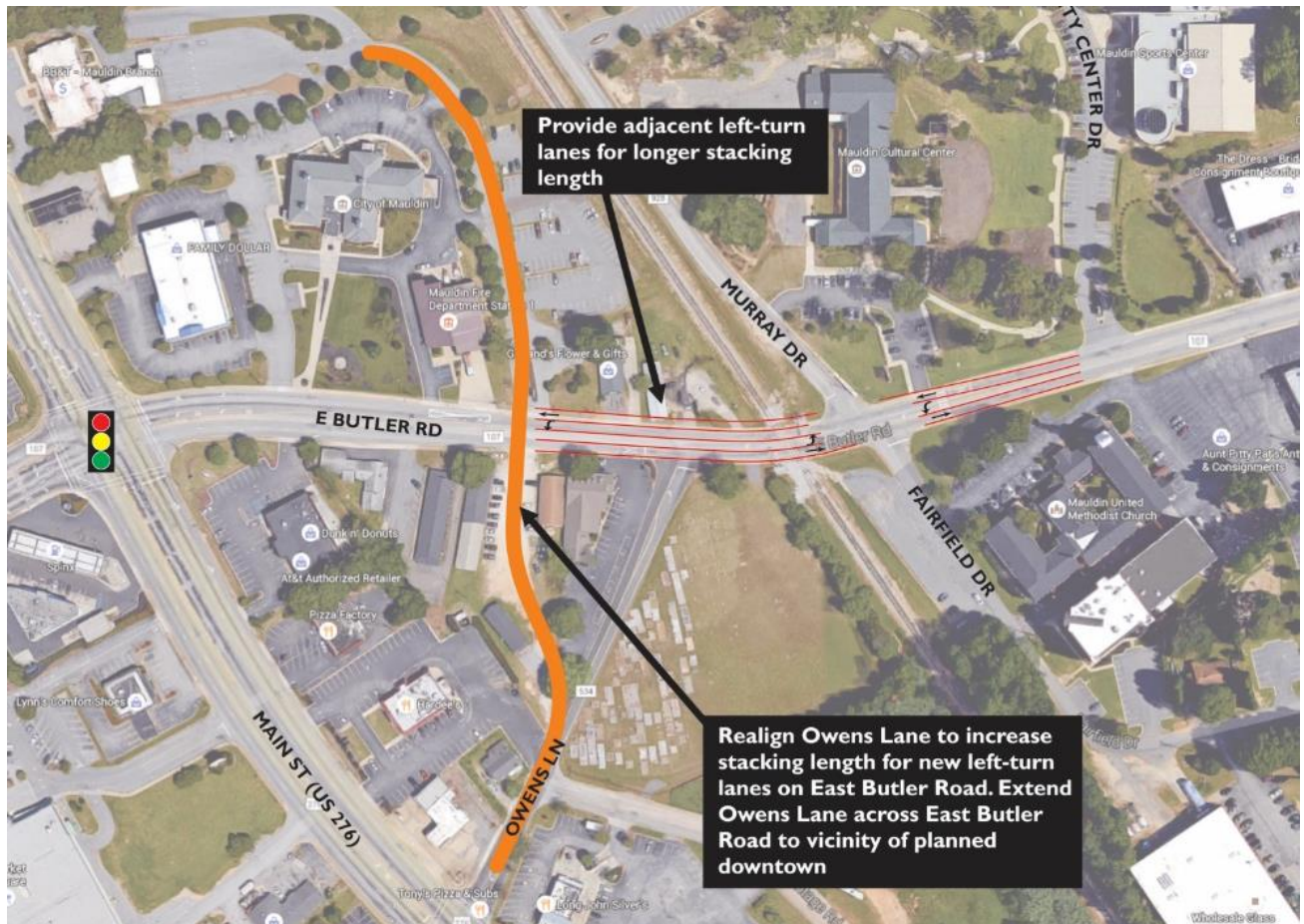


Figure 4-5: East Butler Road at Owens Lane and Murray Drive/Fairfield Drive Recommended Improvements

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.

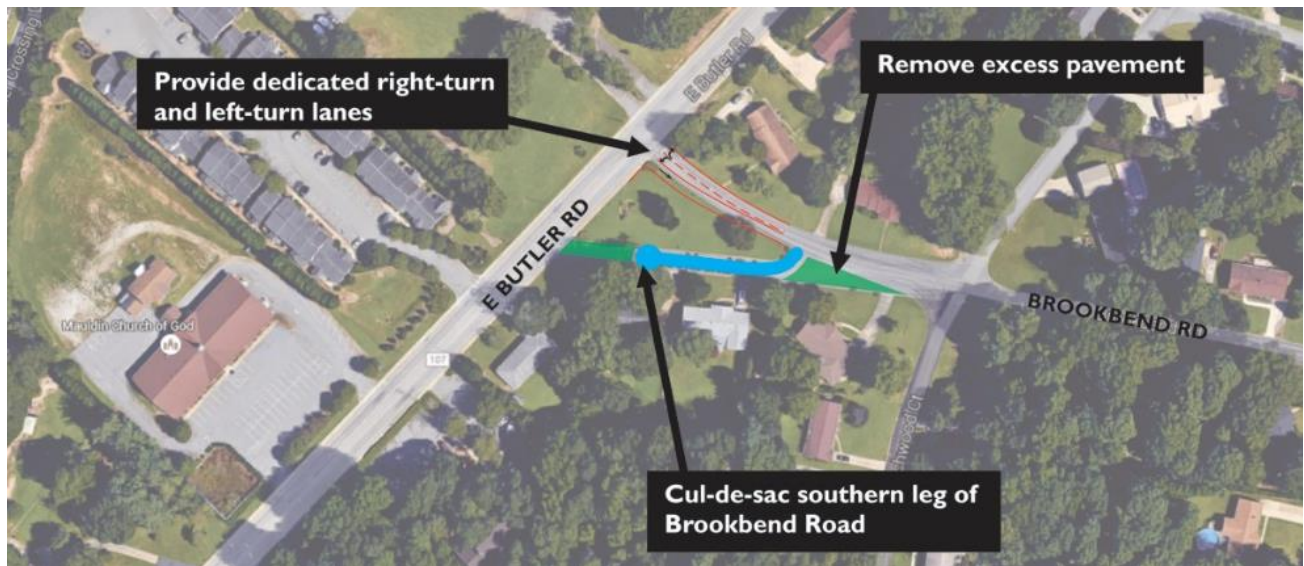


Figure 4-7: East Butler Road at Brookbend Road Recommended Improvements

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APPENDIX A

Traffic Analysis Report

**EAST BUTLER CORRIDOR
TRAFFIC STUDY
Mauldin, South Carolina**

**Prepared for
City of Mauldin**

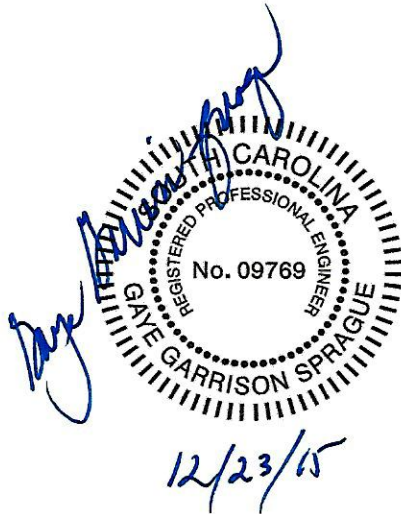
**In association
Toole Design Group**

Prepared by
 **Sprague & Sprague**
Consulting Engineers

December 23, 2015

Signature Page
EAST BUTLER ROAD CORRIDOR TRAFFIC STUDY
Mauldin, South Carolina
December 23, 2015

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EAST BUTLER ROAD CORRIDOR TRAFFIC STUDY
Mauldin, South Carolina
December 23, 2015

Executive Summary

Butler Road is the central east-west connector in the City of Mauldin. Regional transportation plans have called for widening of the three-lane section east of Main Street (US 276) to five lanes, but the City of Mauldin is concerned about the right-of-way and contextual impacts of a five-lane roadway on this segment of East Butler. If the roadway remains three lanes:

- Queue storage in the back to back left turn lanes between Owens and Murray/Fairfield will be insufficient, and side street delays on Murray and Fairfield will be long. Widening East Butler between Owens and Murray to provide side-by-side left turn lanes, as shown in Appendix D, will nearly accommodate future left turn queues. Any opportunity to further separate Owens and Murray/Fairfield should be pursued to increase this storage.
- Because the proposed revision at Murray/Fairfield 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.
- The left turn from Old Mill already operates with high delay, and by 2040, lefts turns from the side street will be nearly impossible in the peak hours. As shown in Appendix D, provision of a new connector from Old Mill north of East Butler to the East Butler/Bethel intersection would result in reasonable delay at this intersection and nearly eliminate the lefts off of Old Mill which have to deal with the eastbound queue on this section of East Butler in the peak hours.
- During the morning peak hour in 2040, the signalized intersection of East Butler/Bethel will operate at LOS E if no changes are made. The provision of a new connector from Old Mill north of East Butler to the East Butler/Bethel intersection as shown in Appendix D would allow acceptable operation during both peak hours at this intersection and reduce the eastbound queues on this section of East Butler in the morning.
- The intersection of realigned Old Mill/Old Mill connector will operate acceptably.
- Turn lane storage requirements are detailed in the conclusions and recommendations of this study.

Introduction

Butler Road is the central east-west connector in the City of Mauldin. West of Main Street (US 276), West Butler road is generally a five-lane road. East of Corn Road/Bridges Road, East Butler is also generally a five-lane road. The portion of East Butler between Main Street and Corn/Bridges is generally a three-lane road. Regional transportation plans have called for widening of this section to five lanes, but the City of Mauldin is concerned about the right-of-way and contextual impacts of a five-lane roadway on this segment of East Butler. To determine what alternatives to a five-lane section would be productive and practical, the City of Mauldin has undertaken the East Butler Road Corridor Study. This traffic study is the vehicular traffic analysis for that study.

Purpose of Study

The purpose of this study is to examine the operations of the key intersections in the subject section of East Butler to determine if there are auxiliary lane and intersection alignment changes which could improve traffic operations without a full-length widening to five lanes.

The study was conducted for morning and afternoon peak hours. In this report, East Butler is referred to as east-west, and the intersecting streets are referred to as north-south. The horizon year for the study is 2040. There are two signalized intersections in the subject section of East Butler: at Bon Air and at Bethel, and these would usually be the study intersections for a study such as this, but in this case, the more challenging intersections are the two closely spaced pairs of Owens Lane and Murray Drive/Fairfield Drive (both unsignalized) and Old Mill Road (unsignalized) and Bethel Road (signalized). These intersections are the study intersections.

Existing Conditions

Aerial photographs of the two intersection pairs are shown in Appendix A. Between Owens and Murray, the middle lane on East Butler is marked as a back to back left turn lane with storage of about 90 feet westbound and about 60 feet eastbound. Owens, Murray, and Fairfield are two-lane streets, and there is a short left turn lane on Owens at East Butler. A railroad crosses East Butler between the intersections. At Old Mill and Bethel, there are left turn lanes on East Butler and separate left and right turn lanes on Bethel. Although a two-lane approach is not marked on Old Mill, the approach is wide enough for two narrow lanes and was examined for that geometry.

As mentioned previously, the Bethel intersection is signalized, but the other three intersections have side street stop sign control. The speed limit on East Butler is 35 miles per hour except at Owens where the speed limit changes to 40 miles per hour immediately west of Murray. The speed limits on Bethel and Old Mill are 35 miles per hour and on Murray and Fairfield are 25 miles per hour. The speed limit on Owens is not posted and was assumed to be the *prima facie* speed of 30 miles per hour.

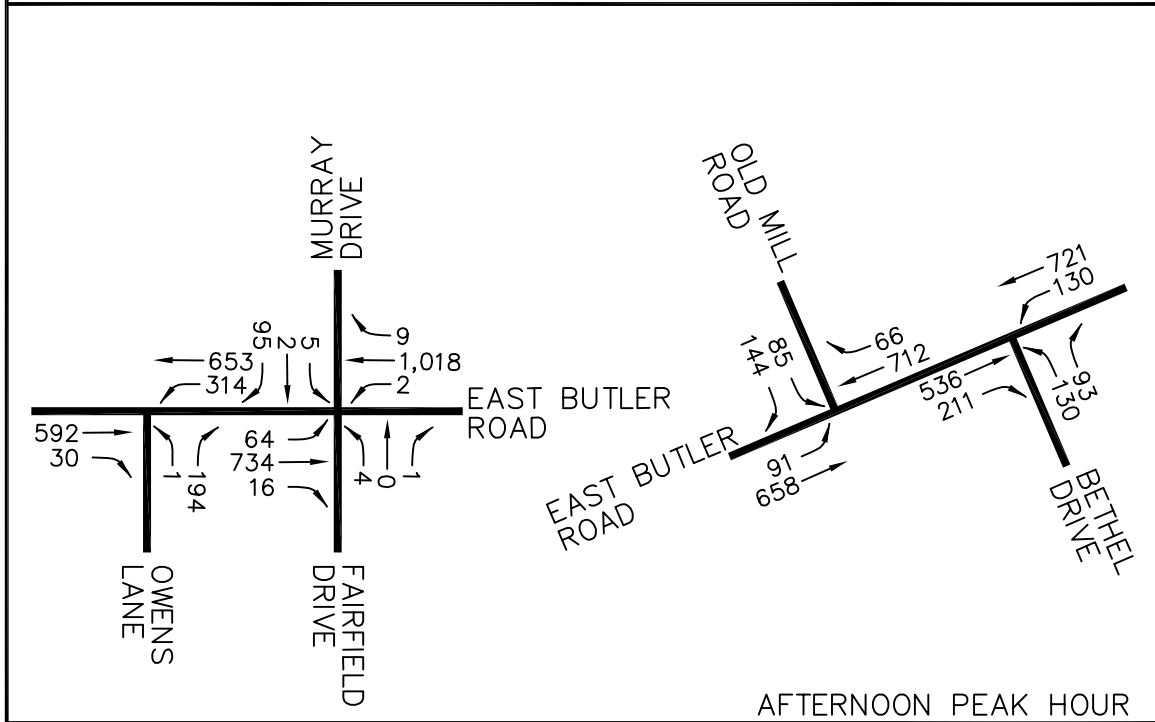
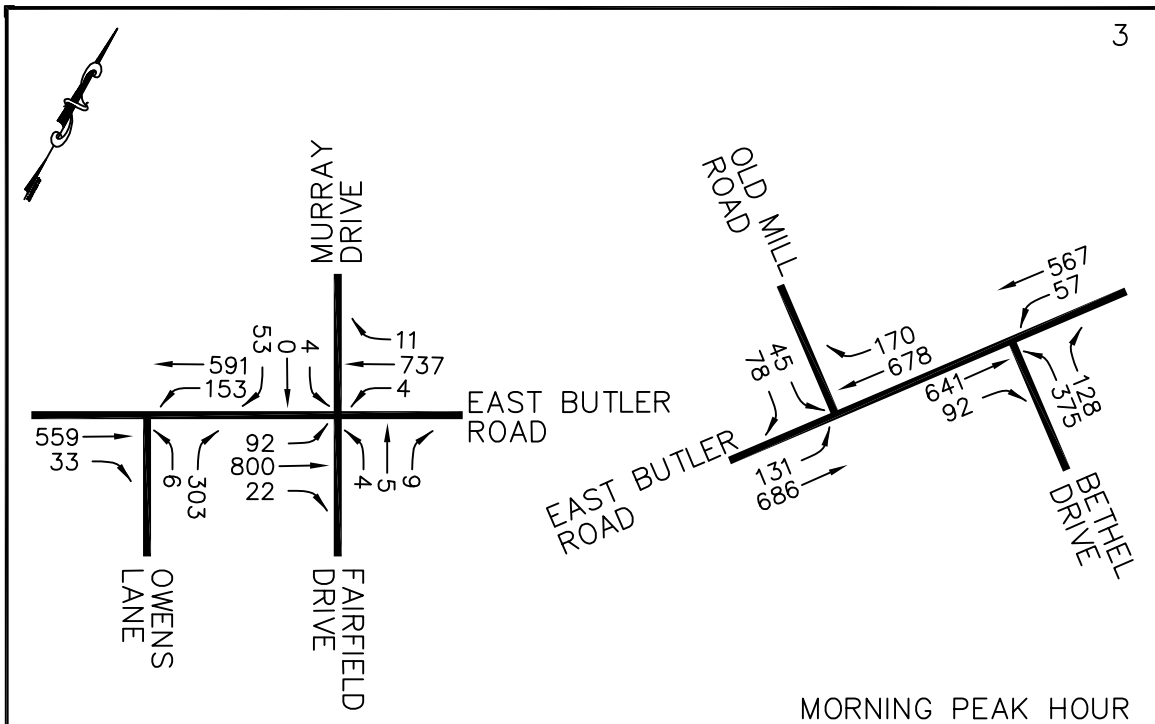
Turning movement counts were conducted at the study intersections between 7:00 and 9:00 a.m. and 4:00 and 6:00 p.m. in May, 2015. The existing peak hour volumes were identified and are shown in Figure 1. The counts are contained in Appendix B.


SCDOT provided accident listings for the East Butler intersections for 2010 through 2014. The accident types with five or more accidents at an intersection during this period were: five rear ends at Owens, seven rear ends and five collisions with other than motor vehicles (no injuries and no indication of pedestrians involved) at Bethel, and 17 rear ends at Old Mill.

2040 Traffic Volumes

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 taken in the corridor. The counts are shown in Table 1 and indicate that the volume has gone up and down in recent years. 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. There is no such pattern on East Butler. As is the case in many maturely 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 Corridor. However, redevelopment of parcels just off the corridor is planned so some traffic growth will certainly occur. Between 2006 and 2009, traffic east of Murray grew at 1.1 percent per year. The City of Mauldin provided the GPATS 2025 model projections of 18,456 east of Murray and 18,062 east of Bethel. These volumes indicate growth rates between 2014 and 2035 of 0.7 percent per year east of Murray and 0.6% east of Bethel. Given all of this



<p>EXISTING PEAK HOUR TRAFFIC VOLUMES</p>	<p>15-013ST-GGS.DWG</p> <p>Figure 1</p> <p>10/25/15</p>
<p>EAST BUTLER ROAD CORRIDOR STUDY MAULDIN, SOUTH CAROLINA</p>	

information, a sustained growth rate of one percent per year was used in this study to project 2040 peak hour traffic volumes at the study intersections.

Table 1
HISTORIC SCDOT TRAFFIC COUNTS
East Butler Corridor Traffic Study
Mauldin, South Carolina
Source: SCDOT Website

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

Note: Counts are not available for the count station east of Bethel before 2009.

Existing peak hour traffic volumes were increased at one percent per year for 25 years, and the 2040 peak hour volumes are shown in Figure 2.

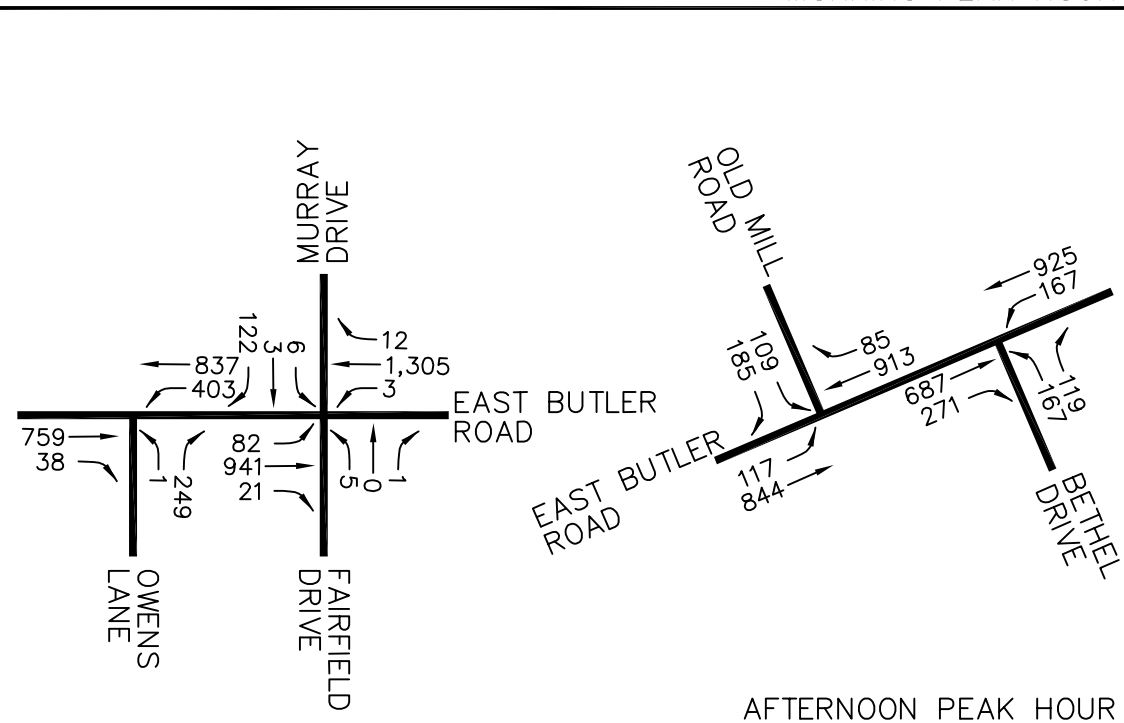
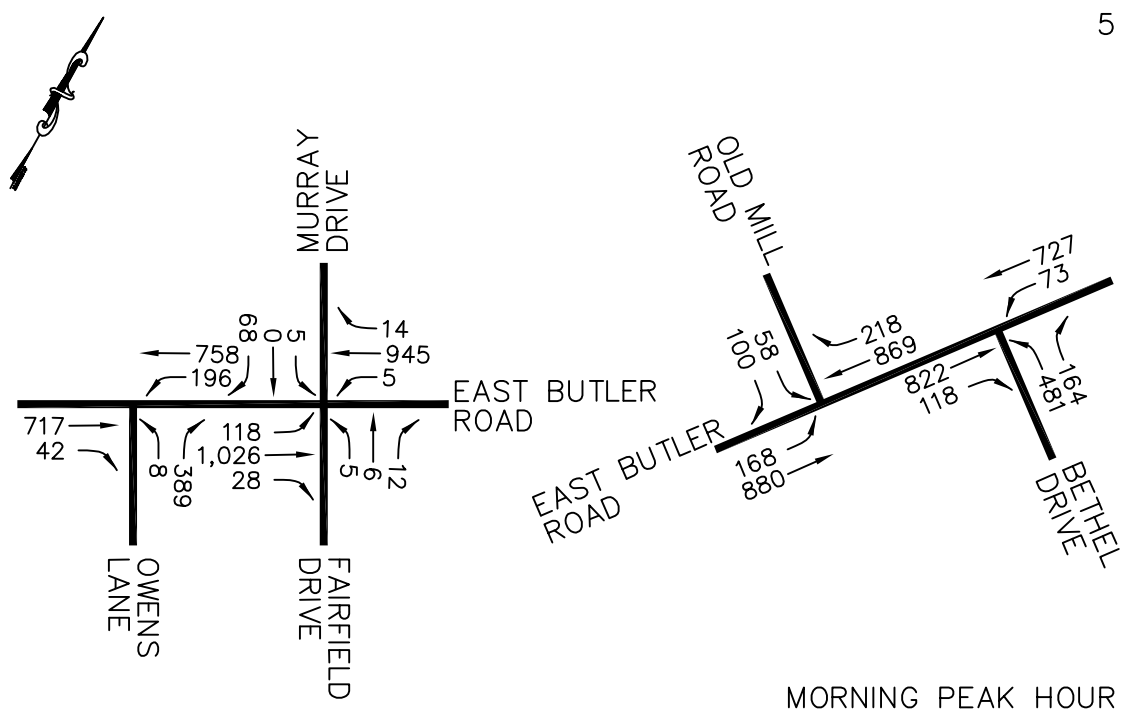
Proposed Revisions to Closely Spaced Intersections

Through the corridor study process, revisions to the two sets of closely spaced intersections were developed and are considered in this study. The revisions are described in the discussion for each intersection, and the reassigned peak hour volumes are shown in Figure 3.

Capacity Analyses

To this point, this report has regarded the *quantity* of traffic flow, but the purpose of the report is to examine the *quality* of traffic flow. Synchro 9 was used to conduct analyses for the study intersections. The methodology used is that described in the 2010 Highway Capacity Manual. In general, the analyses express quality of flow in terms of Level of Service (LOS).

The criteria for intersection LOS are shown in Table 2. The variable used is delay per vehicle. Usually, at a signalized intersection LOS D is considered the lowest acceptable LOS. At an unsignalized intersection, it is not unusual for a side street to experience LOS E or F during the peak hour. It is suggested, therefore, that the results of the unsignalized intersection analyses be used as guidance rather than as an absolute determinant of acceptable operation.



2040 PEAK HOUR TRAFFIC VOLUMES

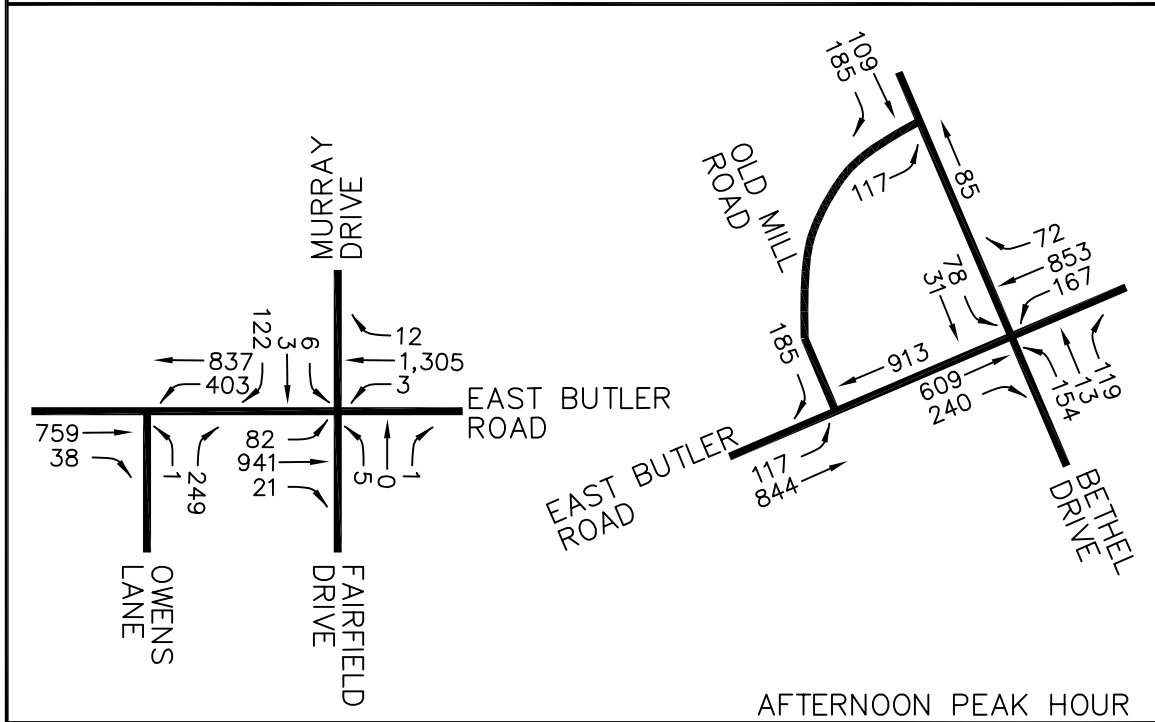
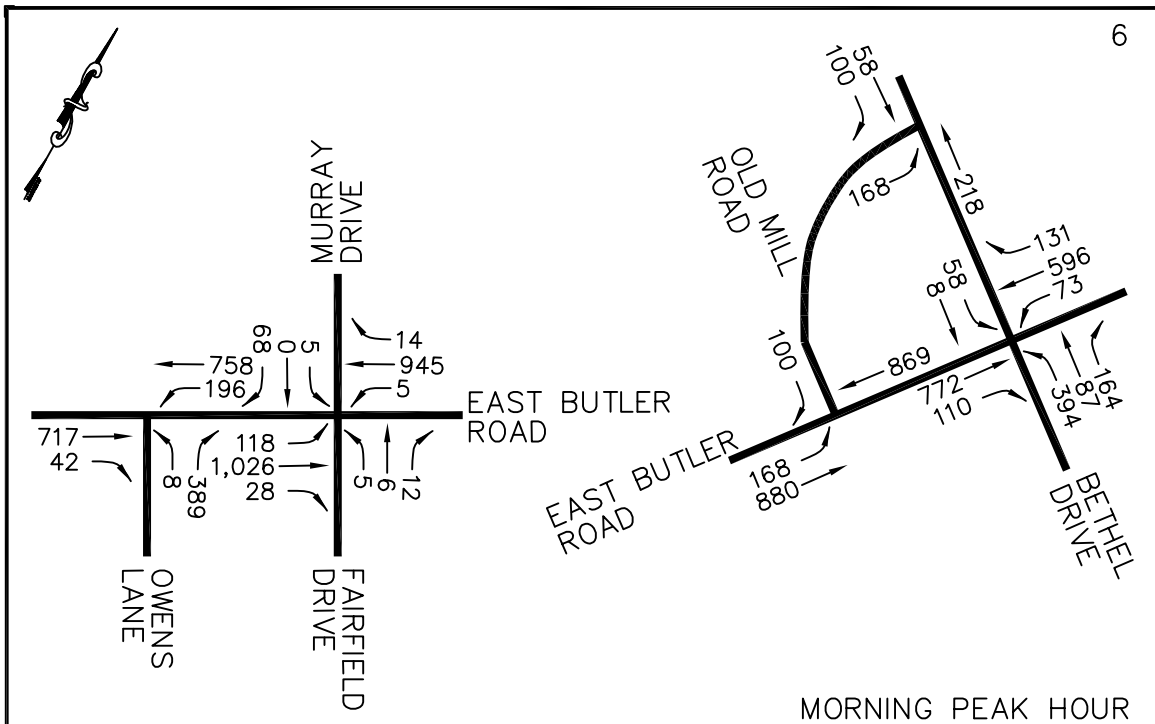
Figure 2

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EAST BUTLER ROAD CORRIDOR STUDY
MAULDIN, SOUTH CAROLINA





2040 REASSIGNED PEAK HOUR TRAFFIC VOLUMES

Figure 3

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10/25/15

EAST BUTLER ROAD CORRIDOR STUDY
MAULDIN, SOUTH CAROLINA



Table 2
INTERSECTION LEVEL OF SERVICE CRITERIA
East Butler Corridor Traffic Study
Mauldin, South Carolina

Level of Service	Control Delay Range (seconds/vehicle)	
	Unsignalized Intersection	Signalized Intersection
A	<10	<10
B	>10 and <15	>10 and <20
C	>15 and <25	>20 and <35
D	>25 and <35	>35 and <55
E	>35 and <50	>55 and <80
F	>50	>80

Peak hour factors, percentages of heavy vehicles, and numbers of pedestrians were taken from existing traffic counts. Lane widths, storage lengths, and grades were taken from Greenville County GIS arials. Signal timing was assumed for East Butler/Bethel. The study intersections were analyzed for morning and afternoon peak hours with existing and 2040 peak hour volumes and existing and proposed geometry. Capacity analysis printouts are included in Appendix C.

East Butler Road/Owens Lane - As shown in Table 3, from a capacity standpoint this intersection currently operates acceptably and will operate with reasonable delay in 2040. As will be discussed later in this report, the projected queue for the westbound left will exceed the existing left turn storage. Therefore, a widening of East Butler between Owens and Murray as illustrated in Appendix D would provide side-by-side left turn lanes with storage of at least 170 feet. The capacity analysis results shown in Table 3 indicate the proposed revisions have little effect on the operation of the intersection from a capacity standpoint.

Table 3
CAPACITY ANALYSES RESULTS – UNSIGNALIZED INTERSECTION
EAST BUTLER ROAD/OWENS LANE
East Butler Corridor Traffic Study
Mauldin, South Carolina

Movement		Level of Service/Delay (seconds/vehicle)		
		Existing Volumes Existing Geometry	2040 Volumes Existing Geometry	2040 Volumes Proposed Revision
<i>Morning Peak Hour</i>				
Westbound –	Left	A/10	B/11	B/11
Northbound –	Left	C/19	D/26	D/26
	Right	C/22	F/70	F/70
<i>Afternoon Peak Hour</i>				
Westbound –	Left	B/11	B/14	B/14
Northbound –	Left	D/27	E/46	E/46
	Right	C/16	D/26	D/26

Notes:

- East Butler is east-west. Owens Lane is north-south.

East Butler Road/Murray Drive/Fairfield Drive - As shown in Table 4, the side streets already operate at LOS E and F in the afternoon peak hour. By 2040 delay on the side 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 behind the cultural center were considered but have significant disadvantages.

As will be discussed later in this report, the projected queue for the eastbound left will exceed the existing left turn storage. Therefore, a widening of East Butler between Owens and Murray as illustrated in Appendix D would provide side-by-side left turn lanes with storage of at least 170 feet. The capacity analysis results shown in Table 4 indicate the proposed revisions have little effect on the operation of the intersection from a capacity standpoint.

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 4
CAPACITY ANALYSES RESULTS – UNSIGNALIZED INTERSECTION
EAST BUTLER ROAD/MURRAY DRIVE/FAIRFIELD DRIVE
East Butler Corridor Traffic Study
Mauldin, South Carolina

Movement	Level of Service/Delay (seconds/vehicle)		
	Existing Volumes Existing Geometry	2040 Volumes Existing Geometry	2040 Volumes Proposed Revision
<i>Morning Peak Hour</i>			
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
<i>Afternoon Peak Hour</i>			
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

Notes:

- East Butler is east-west. Murray Drive/Fairfield Drive is north-south.

East Butler Road/Old Mill Road - As shown in Table 5, the left turn from Old Mill already operates with high delay in the peak hours. By 2040, lefts turns from the side street will be nearly impossible in the peak hours. As shown in Appendix D, provision of a new connector from Old Mill north of East Butler to the East Butler/Bethel intersection would result in reasonable delay at this intersection.

Table 5
CAPACITY ANALYSES RESULTS – UNSIGNALIZED INTERSECTION
EAST BUTLER ROAD/OLD MILL ROAD
East Butler Corridor Traffic Study
Mauldin, South Carolina

Movement		Level of Service/Delay (seconds/vehicle)		
		Existing Volumes Existing Geometry	2040 Volumes Existing Geometry	2040 Volumes Proposed Revision
<i>Morning 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>Afternoon 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

Notes:

- East Butler is east-west. Old Mill Road is north-south.

East Butler Road/Bethel Drive - As shown in Table 6, this intersection currently operates acceptably and will continue to do so in the afternoon peak hour in 2040. (A timing change was 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. (The opportunity to move green time is less in the morning when the side street demand is high.)

The provision of a new connector from Old Mill north of East Butler to the East Butler/Bethel intersection as shown in Appendix D would allow acceptable operation during both peak hours at this intersection.

Table 6
CAPACITY ANALYSES RESULTS – SIGNALIZED INTERSECTION
EAST BUTLER ROAD/BETHEL DRIVE
East Butler Corridor Traffic Study
Mauldin, South Carolina

Movement	Level of Service/Delay (seconds/vehicle)		
	Existing Volumes Existing Geometry	2040 Volumes Existing Geometry	2040 Volumes Proposed Revision
<i>Morning Peak Hour</i>			
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
Overall	C/25	E/64	D/41
<i>Afternoon Peak Hour</i>			
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
Overall	B/14	C/24	C/32

Notes:

- East Butler is east-west. Bethel Drive is north-south.

Old Mill Road/Old Mill Connector - As shown in Table 7, this intersection will operate acceptably with 2040 reassigned volumes.

Table 7
CAPACITY ANALYSES RESULTS – UNSIGNALIZED INTERSECTION – 2040 VOLUMES
OLD MILL ROAD/OLD MILL ROAD CONNECTOR
East Butler Corridor Traffic Study
Mauldin, South Carolina

Movement	Level of Service/Delay (seconds/vehicle)	
	Morning Peak Hour	Afternoon Peak Hour
Eastbound – Left/right	B/13	B/11
Northbound - Left	A/8	A/8

Notes:

- Old Mill realignment is east-west. Old Mill/Old Mill connector is north-south.

Queues and Turn Lane Storage

While the LOS at an intersection can describe the basic operation of traffic, other factors influence that operation. For instance, if turn queues extend past their storage, they can interrupt traffic flow. Between closely spaced intersections, the through queues can also interrupt traffic flow. SimTraffic was run for morning and afternoon peak hours with existing and 2040 volumes with existing geometry, and the printouts are included in Appendix C. The 95th percentile queues and noted deficiencies are shown in Table 8 and indicate that:

- 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 Butler will extend from Owens Lane to Murray causing gridlock. The proposed widening of East Butler to provide side-by-side left turn lanes of about 170 feet will nearly accommodate the westbound left turn queue at this intersection, but westbound through queues will still extend to Murray. Any opportunity to further separate Owens and Murray/Fairfield should be pursued. The northbound left turn lane storage should be extended to at least 70 feet.
- The queue for the eastbound left onto Old Mill will exceed storage in 2040, and the projected queue of 2279 feet for the westbound through at this unsignalized intersection indicates an operational issue caused by the insufficient storage for the left turn or from a queue extending from Bethel. The queue for the southbound left will exceed available storage in 2040. The proposed revision at this intersection improves operations. The eastbound left turn lane storage should be increased to at least 220 feet.
- Queues for the westbound and northbound lefts at East Butler/Bethel already exceed available storage, and the eastbound through queue at Bethel extends to Old Mill causing gridlock. The revision proposed for this intersection will improve operation, and very few lefts from Old Mill will have to deal with the eastbound queue at Bethel. The westbound left turn lane storage should be increased to 150 feet. The new eastbound left turn lane storage should be 100 feet, and the southbound left turn lane should be at least 150 feet.

Table 8
QUEUE AND STORAGE LENGTHS
East Butler Corridor Traffic Study
Mauldin, South Carolina

Intersection	Turn	SimTraffic 95 th Percentile Queues						Existing Storage	Comments
		Morning Peak Hour			Afternoon Peak Hour				
		Existing Geometry		Revised Geometry	Existing Geometry		Revised Geometry		
		Exist	2040		Exist	2040			
Owens	WB Left	74'	99'	125'	108'	130'	188'	90' Ex 170' Rev	Existing exceeds storage; Revised nearly accommodates 2040
	WB Thru	-	74'	87'	85'	232'	250'	230'	Extends to Murray in 2040
	NB Left	38'	64'	63'	6'	-	9'	50'	Exceeds storage in 2040
Murray/ Fairfield	EB Left	52'	55'	74'	56'	80'	130'	60' Ex 170' Rev	Exceeds storage in 2040; Revised storage OK
	WB Left	17'	16'	17'	5'	7'	22'	50'	OK
	EB Thru	-	25'	-	-	94'	103'	250'	OK
Old Mill	EB Left	109'	222'	216'	66'	128'	161'	150'	Exceeds storage in 2040
	EB Thru	220'	2279'	1492'	68'	264'	761'	n/a	Queue indicates operational issue; improve with revision
	WB Thru	25'	38'	24'	12'	33'	13'	330'	OK
	SB Left	182'	1024'	70'	192'	1043'	57'	200'	Exceeds storage in 2040; improved with revision
Bethel	EB Left			43'			38'	New	Provide 100'
	WB Left	84'	119'	136'	111'	135'	149'	100'	Existing and 2040 exceed storage
	EB Thru	315'	282'	273'	303'	316'	302'	330'	Extends to Old Mill
	NB Left	333'	914'	178'	125'	183'	175'	150'	Existing and 2040 exceed storage
	SB Left			105'			132'	New	Provide 150'

Notes:

- EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound

Conclusions and Recommendations

- *East Butler Road/Owens Lane* - From a capacity standpoint this intersection currently operates acceptably and will operate with reasonable delay in 2040. However, the projected queue for the westbound left will exceed the existing left turn storage, and westbound through queues will extend to Murray/Fairfield. A widening of East Butler between Owens and Murray as illustrated in Appendix D would provide side-by-side left turn lanes with storage of at least 170 feet which will nearly meet the storage requirement in 2040. Any opportunity to further separate Owens and Murray/Fairfield should be pursued to provide additional left turn storage at Owens and help prevent the westbound through queue from extending to Murray. The northbound left turn lane storage should be extended to at least 70 feet.
- *East Butler Road/Murray Drive/Fairfield Drive* - The side streets at this intersection already operate at LOS E and F in the afternoon peak hour. By 2040 delay on the side 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 behind the cultural center were considered but have significant disadvantages. The eastbound left turn queue will exceed available storage in 2040. A widening of East Butler between Owens and Murray as illustrated in Appendix D would provide side-by-side left turn lanes with storage of at least 170 feet and would accommodate the eastbound left turn queue at this intersection in 2040. 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.
- *East Butler Road/Old Mill Road* - The left turn from Old Mill already operates with high delay in the peak hours. By 2040, lefts turns from the side street will be nearly impossible in the peak hours. As shown in Appendix D, provision of a new connector from Old Mill north of East Butler to the East Butler/Bethel intersection would result in reasonable delay at this intersection. The queue for the eastbound left onto Old Mill will exceed storage in 2040, and the projected queue of 2279 feet for the westbound through at this unsignalized intersection indicates an operational issue caused by the insufficient storage for the left turn or from a queue extending from Bethel. The queue for the southbound left will exceed available storage in 2040. The proposed revision at this intersection improves operations. The eastbound left turn lane storage should be increased to at least 220 feet.
- *East Butler Road/Bethel Road* - This intersection currently operates acceptably and will continue to do so in the afternoon peak hour in 2040. In the morning peak hour, however, the intersection will operate at LOS E if no changes are made. The provision of a new connector from Old Mill north of East Butler to the East Butler/Bethel intersection as shown in Appendix D would allow acceptable operation during both peak hours at this intersection. The westbound left turn lane storage should be increased to 150 feet. The new eastbound left turn lane storage should be 100 feet, and the southbound left turn lane should be at least 150 feet.
- *Old Mill Road/Old Mill Connector* - This intersection will operate acceptably with 2040 reassigned volumes.

Appendix A

AERIAL PHOTOGRAPHS OF STUDY INTERSECTIONS

Greenville County, SC



Disclaimer: This map is **not a LAND SURVEY** and is for reference purposes only. Data contained in this map are prepared for the inventory of Real Property found within this jurisdiction, and are compiled from recorded deeds, plats, and other public records. Users of this map are hereby notified aforementioned public primary information sources should be consulted for verification of the information contained in this map. Greenville County assumes no legal responsibility for the information contained in this map.

Map Scale
1 inch = 100 feet

Greenville County, SC



Disclaimer: This map is not a LAND SURVEY and is for reference purposes only. Data contained in this map are prepared for the inventory of Real Property found within this jurisdiction, and are compiled from recorded deeds, plats, and other public records. Users of this map are hereby notified aforementioned public primary information sources should be consulted for verification of the information contained in this map. Greenville County assumes no legal responsibility for the information contained in this map.

Map Scale
1 inch = 100 feet

Appendix B
EXISTING TRAFFIC COUNTS

Traffic Data Connection

PO Box 445
Abbeville, Ga 31001

843-412-6222

Counter: T-4422

Counted By: BE

Weather: Mild

Other: S&S

File Name : 15729-01

Site Code : 01572901

Start Date : 5/28/2015

Page No : 1

Groups Printed- Cars - Trucks & Buses - School Buses

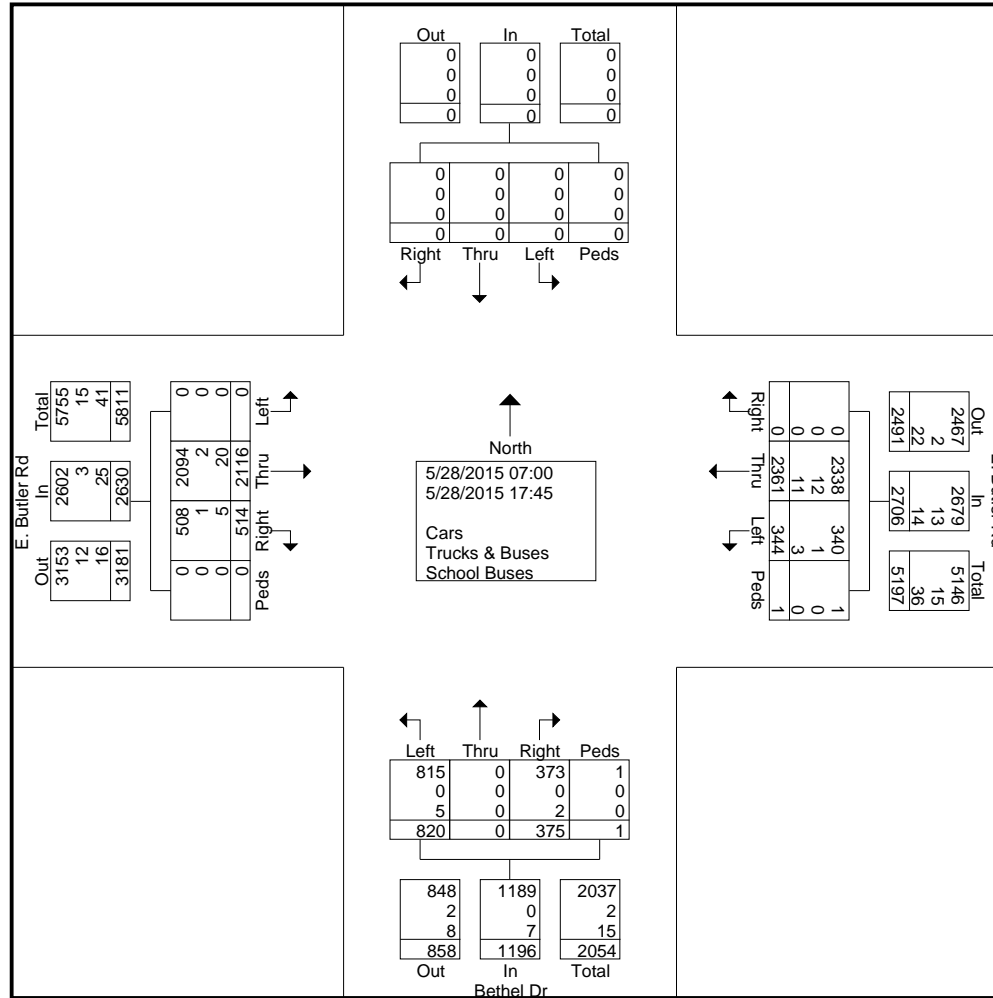
Start Time	Bethel Dr Northbound					Southbound					E. Butler Rd Eastbound					E. Butler Rd Westbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00	41	0	18	0	59	0	0	0	0	0	0	80	24	0	104	5	92	0	0	97	260
07:15	86	0	27	1	114	0	0	0	0	0	0	109	17	0	126	8	89	0	0	97	337
07:30	123	0	26	0	149	0	0	0	0	0	0	162	31	0	193	10	132	0	0	142	484
07:45	90	0	27	0	117	0	0	0	0	0	0	174	29	0	203	16	156	0	0	172	492
Total	340	0	98	1	439	0	0	0	0	0	0	525	101	0	626	39	469	0	0	508	1573
08:00	92	0	37	0	129	0	0	0	0	0	0	127	20	0	147	17	152	0	0	169	445
08:15	70	0	38	0	108	0	0	0	0	0	0	178	12	0	190	14	127	0	1	142	440
08:30	43	0	22	0	65	0	0	0	0	0	0	134	15	0	149	9	138	0	0	147	361
08:45	26	0	24	0	50	0	0	0	0	0	0	117	16	0	133	13	86	0	0	99	282
Total	231	0	121	0	352	0	0	0	0	0	0	556	63	0	619	53	503	0	1	557	1528
*** BREAK ***																					
16:00	29	0	12	0	41	0	0	0	0	0	0	114	31	0	145	43	204	0	0	247	433
16:15	44	0	11	0	55	0	0	0	0	0	0	127	35	0	162	23	170	0	0	193	410
16:30	24	0	23	0	47	0	0	0	0	0	0	142	35	0	177	23	135	0	0	158	382
16:45	22	0	17	0	39	0	0	0	0	0	0	116	38	0	154	33	159	0	0	192	385
Total	119	0	63	0	182	0	0	0	0	0	0	499	139	0	638	122	668	0	0	790	1610
17:00	21	0	17	0	38	0	0	0	0	0	0	123	51	0	174	44	158	0	0	202	414
17:15	29	0	22	0	51	0	0	0	0	0	0	132	50	0	182	42	214	0	0	256	489
17:30	41	0	28	0	69	0	0	0	0	0	0	156	64	0	220	16	192	0	0	208	497
17:45	39	0	26	0	65	0	0	0	0	0	0	125	46	0	171	28	157	0	0	185	421
Total	130	0	93	0	223	0	0	0	0	0	0	536	211	0	747	130	721	0	0	851	1821
Grand Total	820	0	375	1	1196	0	0	0	0	0	0	2116	514	0	2630	344	2361	0	1	2706	6532
Apprch %	68.6	0	31.4	0.1		0	0	0	0		0	80.5	19.5	0		12.7	87.3	0	0		
Total %	12.6	0	5.7	0	18.3	0	0	0	0	0	0	32.4	7.9	0	40.3	5.3	36.1	0	0	41.4	
Cars	815	0	373	1	1189	0	0	0	0	0	0	2094	508	0	2602	340	2338	0	1	2679	6470
% Cars	99.4	0	99.5	100	99.4	0	0	0	0	0	0	99	98.8	0	98.9	98.8	99	0	100	99	99.1
Trucks & Buses	0	0	0	0	0	0	0	0	0	0	0	2	1	0	3	1	12	0	0	13	16
% Trucks & Buses	0	0	0	0	0	0	0	0	0	0	0	0.1	0.2	0	0.1	0.3	0.5	0	0	0.5	0.2
School Buses	5	0	2	0	7	0	0	0	0	0	0	20	5	0	25	3	11	0	0	14	46
% School Buses	0.6	0	0.5	0	0.6	0	0	0	0	0	0	0.9	1	0	1	0.9	0.5	0	0	0.5	0.7

Traffic Data Connection

PO Box 445
Abbeville, Ga 31001
843-412-6222

Counter: T-4422
Counted By: BE
Weather: Mild
Other: S&S

File Name : 15729-01
Site Code : 01572901
Start Date : 5/28/2015
Page No : 2



Traffic Data Connection

PO Box 445
Abbeville, Ga 31001
843-412-6222

Counter: T-4422
Counted By: BE
Weather: Mild
Other: S&S

File Name : 15729-01
Site Code : 01572901
Start Date : 5/28/2015
Page No : 3

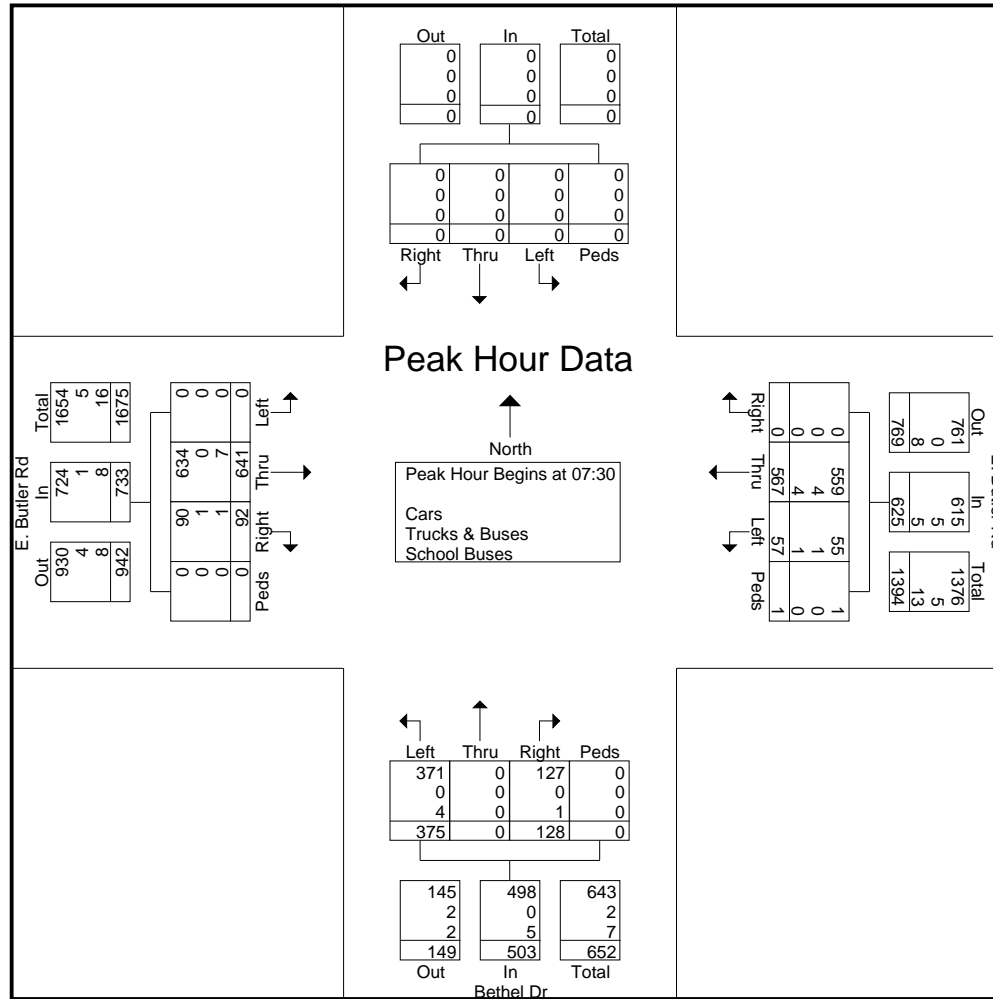
	Bethel Dr Northbound					Southbound					E. Butler Rd Eastbound					E. Butler Rd Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 12:30 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30																					
07:30	123	0	26	0	149	0	0	0	0	0	0	162	31	0	193	10	132	0	0	142	484
07:45	90	0	27	0	117	0	0	0	0	0	0	174	29	0	203	16	156	0	0	172	492
08:00	92	0	37	0	129	0	0	0	0	0	0	127	20	0	147	17	152	0	0	169	445
08:15	70	0	38	0	108	0	0	0	0	0	0	178	12	0	190	14	127	0	1	142	440
Total Volume	375	0	128	0	503	0	0	0	0	0	0	641	92	0	733	57	567	0	1	625	1861
% App. Total	74.6	0	25.4	0		0	0	0	0	0	0	87.4	12.6	0		9.1	90.7	0	0.2		
PHF	.762	.000	.842	.000	.844	.000	.000	.000	.000	.000	.000	.900	.742	.000	.903	.838	.909	.000	.250	.908	.946
Cars	371	0	127	0	498	0	0	0	0	0	0	634	90	0	724	55	559	0	1	615	1837
% Cars	98.9	0	99.2	0	99.0	0	0	0	0	0	0	98.9	97.8	0	98.8	96.5	98.6	0	100	98.4	98.7
Trucks & Buses	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	4	0	0	5	6
% Trucks & Buses	0	0	0	0	0	0	0	0	0	0	0	0	1.1	0	0.1	1.8	0.7	0	0	0.8	0.3
School Buses	4	0	1	0	5	0	0	0	0	0	0	7	1	0	8	1	4	0	0	5	18
% School Buses	1.1	0	0.8	0	1.0	0	0	0	0	0	0	1.1	1.1	0	1.1	1.8	0.7	0	0	0.8	1.0

Traffic Data Connection

PO Box 445
Abbeville, Ga 31001
843-412-6222

Counter: T-4422
Counted By: BE
Weather: Mild
Other: S&S

File Name : 15729-01
Site Code : 01572901
Start Date : 5/28/2015
Page No : 4



Traffic Data Connection

PO Box 445
Abbeville, Ga 31001

843-412-6222

Counter: T-4422

Counted By: BE

Weather: Mild

Other: S&S

File Name : 15729-01

Site Code : 01572901

Start Date : 5/28/2015

Page No : 5

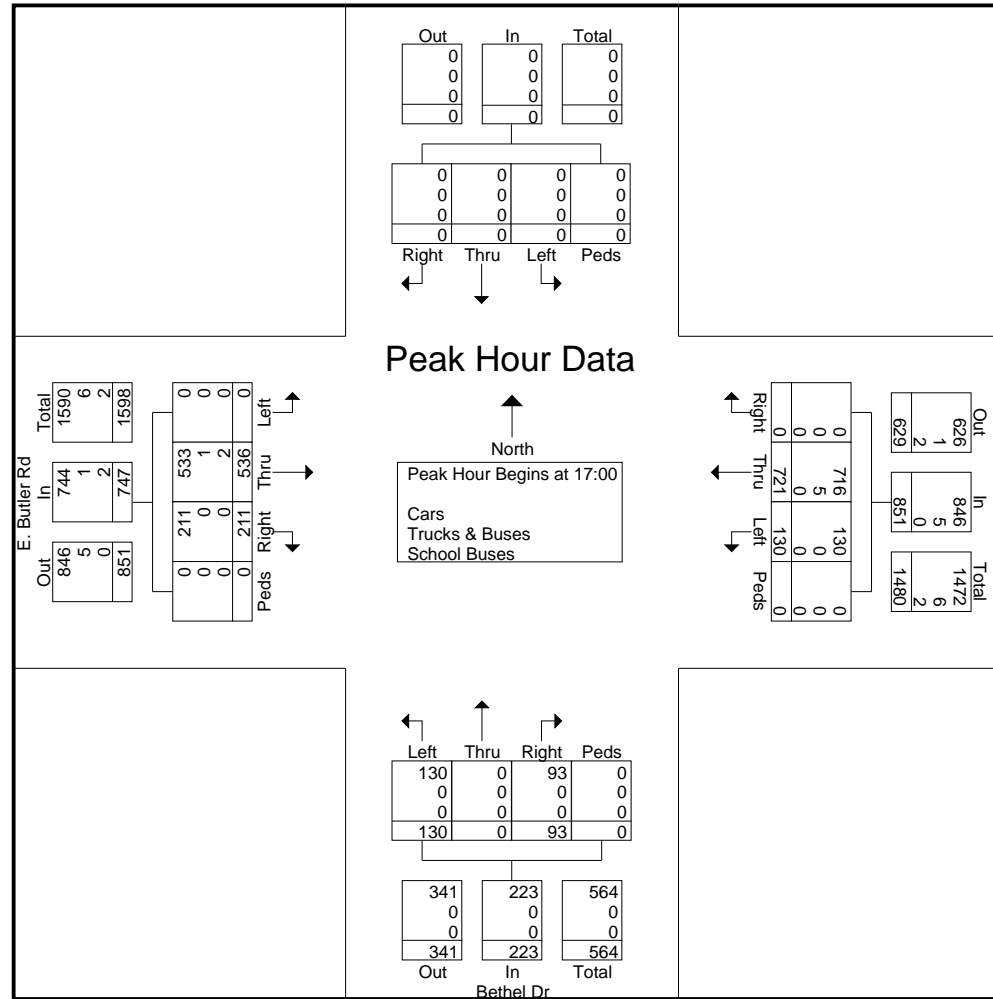
	Bethel Dr Northbound					Southbound					E. Butler Rd Eastbound					E. Butler Rd Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:45 to 17:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 17:00																					
17:00	21	0	17	0	38	0	0	0	0	0	0	123	51	0	174	44	158	0	0	202	414
17:15	29	0	22	0	51	0	0	0	0	0	0	132	50	0	182	42	214	0	0	256	489
17:30	41	0	28	0	69	0	0	0	0	0	0	156	64	0	220	16	192	0	0	208	497
17:45	39	0	26	0	65	0	0	0	0	0	0	125	46	0	171	28	157	0	0	185	421
Total Volume	130	0	93	0	223	0	0	0	0	0	0	536	211	0	747	130	721	0	0	851	1821
% App. Total	58.3	0	41.7	0		0	0	0	0		0	71.8	28.2	0		15.3	84.7	0	0		
PHF	.793	.000	.830	.000	.808	.000	.000	.000	.000	.000	.000	.859	.824	.000	.849	.739	.842	.000	.000	.831	.916
Cars	130	0	93	0	223	0	0	0	0	0	0	533	211	0	744	130	716	0	0	846	1813
% Cars	100	0	100	0	100	0	0	0	0	0	0	99.4	100	0	99.6	100	99.3	0	0	99.4	99.6
Trucks & Buses	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	5	0	0	5	6
% Trucks & Buses	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0.1	0	0.7	0	0	0.6	0.3
School Buses	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
% School Buses	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0.3	0	0	0	0	0	0.1

Traffic Data Connection

PO Box 445
Abbeville, Ga 31001
843-412-6222

Counter: T-4422
Counted By: BE
Weather: Mild
Other: S&S

File Name : 15729-01
Site Code : 01572901
Start Date : 5/28/2015
Page No : 6



Traffic Data Connection

PO Box 445
Abbeville, Ga 31001

843-412-6222

Counter: T-2291
Counted By: LME
Weather: Mild
Other: S&S

File Name : 15729-02
Site Code : 01572902
Start Date : 5/28/2015
Page No : 1

Groups Printed- Cars - Trucks & Buses - School Buses

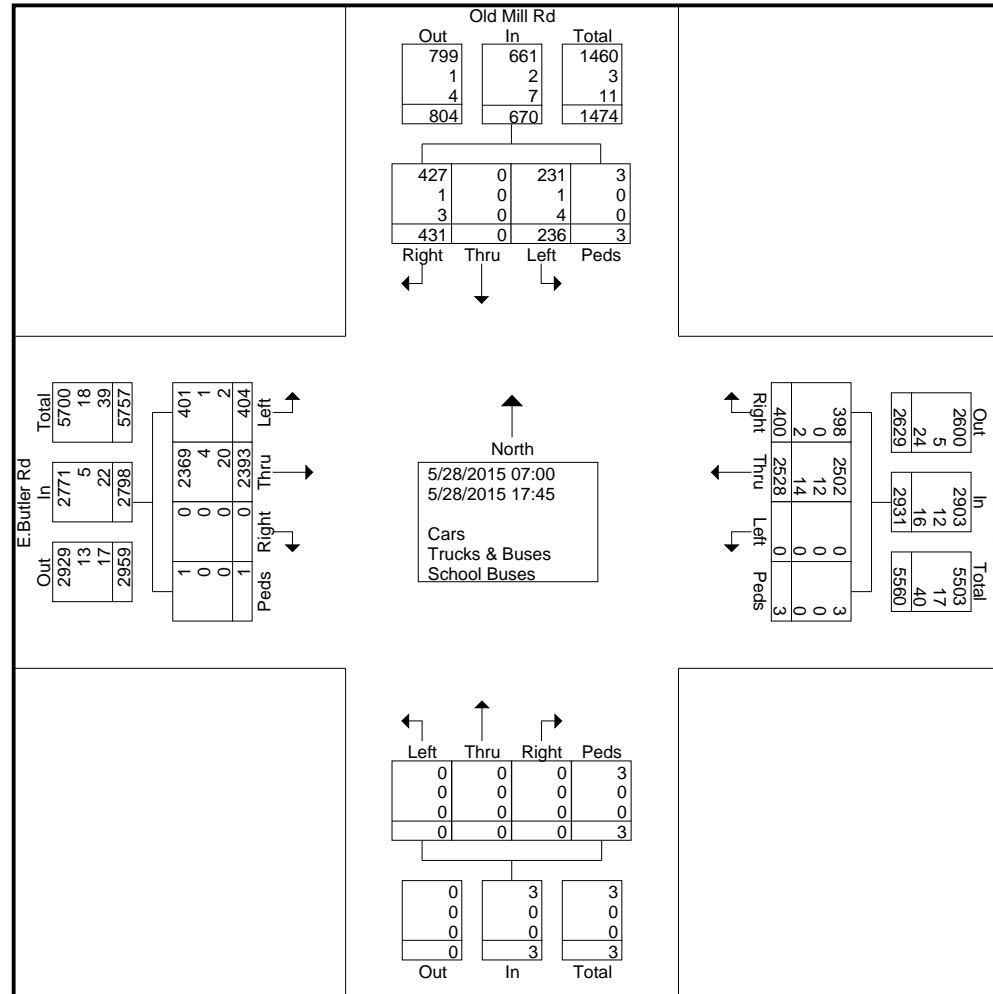
Start Time	Northbound					Old Mill Rd Southbound					E.Butler Rd Eastbound					E.Butler Rd Westbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00	0	0	0	1	1	19	0	16	0	35	21	78	0	0	99	0	101	21	0	122	257
07:15	0	0	0	1	1	13	0	22	0	35	26	121	0	0	147	0	125	37	0	162	345
07:30	0	0	0	0	0	18	0	14	0	32	38	169	0	0	207	0	166	53	0	219	458
07:45	0	0	0	0	0	15	0	22	0	37	29	178	0	0	207	0	180	41	0	221	465
Total	0	0	0	2	2	65	0	74	0	139	114	546	0	0	660	0	572	152	0	724	1525
08:00	0	0	0	0	0	7	0	21	0	28	42	147	0	0	189	0	183	43	0	226	443
08:15	0	0	0	0	0	5	0	21	0	26	22	192	0	1	215	0	149	33	0	182	423
08:30	0	0	0	0	0	8	0	14	2	24	18	133	0	0	151	0	139	20	0	159	334
08:45	0	0	0	0	0	13	0	24	0	37	12	127	0	0	139	0	92	15	0	107	283
Total	0	0	0	0	0	33	0	80	2	115	94	599	0	1	694	0	563	111	0	674	1483
*** BREAK ***																					
16:00	0	0	0	0	0	14	0	36	0	50	28	128	0	0	156	0	199	23	0	222	428
16:15	0	0	0	0	0	16	0	29	0	45	23	152	0	0	175	0	175	24	2	201	421
16:30	0	0	0	0	0	16	0	35	0	51	30	159	0	0	189	0	142	13	0	155	395
16:45	0	0	0	1	1	7	0	33	0	40	24	151	0	0	175	0	165	11	0	176	392
Total	0	0	0	1	1	53	0	133	0	186	105	590	0	0	695	0	681	71	2	754	1636
17:00	0	0	0	0	0	18	0	36	0	54	32	160	0	0	192	0	158	13	1	172	418
17:15	0	0	0	0	0	20	0	32	0	52	20	158	0	0	178	0	203	17	0	220	450
17:30	0	0	0	0	0	27	0	41	0	68	15	186	0	0	201	0	183	23	0	206	475
17:45	0	0	0	0	0	20	0	35	1	56	24	154	0	0	178	0	168	13	0	181	415
Total	0	0	0	0	0	85	0	144	1	230	91	658	0	0	749	0	712	66	1	779	1758
Grand Total	0	0	0	3	3	236	0	431	3	670	404	2393	0	1	2798	0	2528	400	3	2931	6402
Apprch %	0	0	0	100		35.2	0	64.3	0.4		14.4	85.5	0	0		0	86.3	13.6	0.1		
Total %	0	0	0	0	0	3.7	0	6.7	0	10.5	6.3	37.4	0	0	43.7	0	39.5	6.2	0	45.8	
Cars	0	0	0	3	3	231	0	427	3	661	401	2369	0	1	2771	0	2502	398	3	2903	6338
% Cars	0	0	0	100	100	97.9	0	99.1	100	98.7	99.3	99	0	100	99	0	99	99.5	100	99	99
Trucks & Buses	0	0	0	0	0	1	0	1	0	2	1	4	0	0	5	0	12	0	0	12	19
% Trucks & Buses	0	0	0	0	0	0.4	0	0.2	0	0.3	0.2	0.2	0	0	0.2	0	0.5	0	0	0.4	0.3
School Buses	0	0	0	0	0	4	0	3	0	7	2	20	0	0	22	0	14	2	0	16	45
% School Buses	0	0	0	0	0	1.7	0	0.7	0	1	0.5	0.8	0	0	0.8	0	0.6	0.5	0	0.5	0.7

Traffic Data Connection

PO Box 445
Abbeville, Ga 31001
843-412-6222

Counter: T-2291
Counted By: LME
Weather: Mild
Other: S&S

File Name : 15729-02
Site Code : 01572902
Start Date : 5/28/2015
Page No : 2



Traffic Data Connection

PO Box 445
Abbeville, Ga 31001
843-412-6222

Counter: T-2291
Counted By: LME
Weather: Mild
Other: S&S

File Name : 15729-02
Site Code : 01572902
Start Date : 5/28/2015
Page No : 3

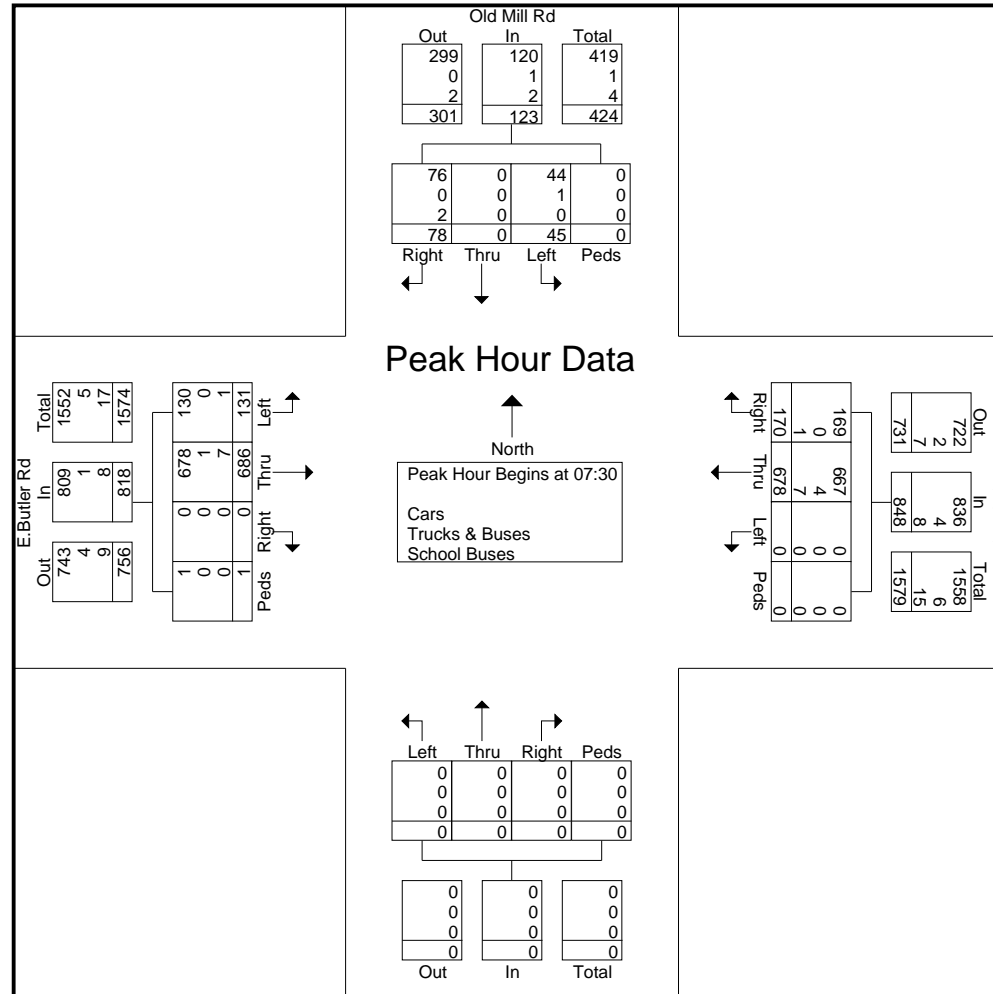
	Northbound					Old Mill Rd Southbound					E.Butler Rd Eastbound					E.Butler Rd Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 12:30 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30																					
07:30	0	0	0	0	0	18	0	14	0	32	38	169	0	0	207	0	166	53	0	219	458
07:45	0	0	0	0	0	15	0	22	0	37	29	178	0	0	207	0	180	41	0	221	465
08:00	0	0	0	0	0	7	0	21	0	28	42	147	0	0	189	0	183	43	0	226	443
08:15	0	0	0	0	0	5	0	21	0	26	22	192	0	1	215	0	149	33	0	182	423
Total Volume	0	0	0	0	0	45	0	78	0	123	131	686	0	1	818	0	678	170	0	848	1789
% App. Total	0	0	0	0	0	36.6	0	63.4	0		16	83.9	0	0.1		0	80	20	0		
PHF	.000	.000	.000	.000	.000	.625	.000	.886	.000	.831	.780	.893	.000	.250	.951	.000	.926	.802	.000	.938	.962
Cars	0	0	0	0	0	44	0	76	0	120	130	678	0	1	809	0	667	169	0	836	1765
% Cars	0	0	0	0	0	97.8	0	97.4	0	97.6	99.2	98.8	0	100	98.9	0	98.4	99.4	0	98.6	98.7
Trucks & Buses	0	0	0	0	0	1	0	0	0	1	0	1	0	0	1	0	4	0	0	4	6
% Trucks & Buses	0	0	0	0	0	2.2	0	0	0	0.8	0	0.1	0	0	0.1	0	0.6	0	0	0.5	0.3
School Buses	0	0	0	0	0	0	0	2	0	2	1	7	0	0	8	0	7	1	0	8	18
% School Buses	0	0	0	0	0	0	0	2.6	0	1.6	0.8	1.0	0	0	1.0	0	1.0	0.6	0	0.9	1.0

Traffic Data Connection

PO Box 445
Abbeville, Ga 31001
843-412-6222

Counter: T-2291
Counted By: LME
Weather: Mild
Other: S&S

File Name : 15729-02
Site Code : 01572902
Start Date : 5/28/2015
Page No : 4



Traffic Data Connection

PO Box 445
Abbeville, Ga 31001

843-412-6222

Counter: T-2291
Counted By: LME
Weather: Mild
Other: S&S

File Name : 15729-02
Site Code : 01572902
Start Date : 5/28/2015
Page No : 5

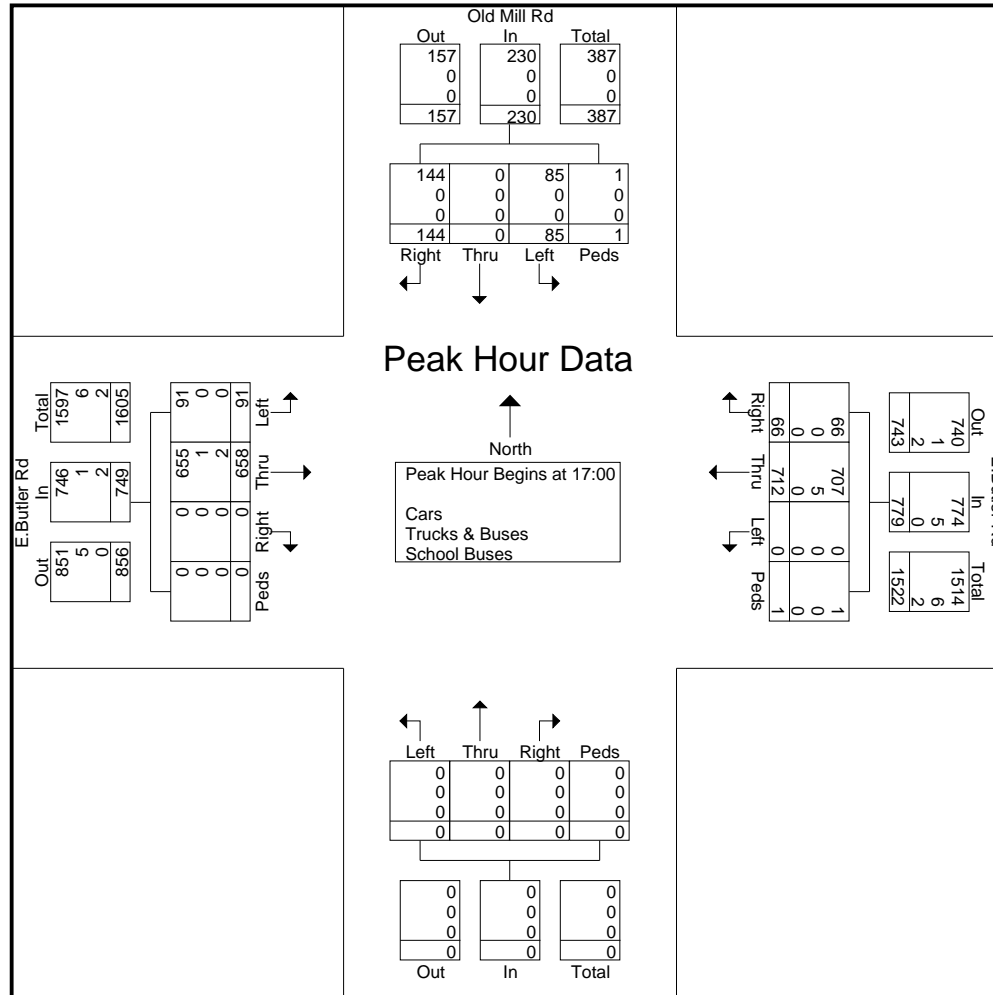
	Northbound					Old Mill Rd Southbound					E.Butler Rd Eastbound					E.Butler Rd Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:45 to 17:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 17:00																					
17:00	0	0	0	0	0	18	0	36	0	54	32	160	0	0	192	0	158	13	1	172	418
17:15	0	0	0	0	0	20	0	32	0	52	20	158	0	0	178	0	203	17	0	220	450
17:30	0	0	0	0	0	27	0	41	0	68	15	186	0	0	201	0	183	23	0	206	475
17:45	0	0	0	0	0	20	0	35	1	56	24	154	0	0	178	0	168	13	0	181	415
Total Volume	0	0	0	0	0	85	0	144	1	230	91	658	0	0	749	0	712	66	1	779	1758
% App. Total	0	0	0	0	0	37	0	62.6	0.4		12.1	87.9	0	0		0	91.4	8.5	0.1		
PHF	.000	.000	.000	.000	.000	.787	.000	.878	.250	.846	.711	.884	.000	.000	.932	.000	.877	.717	.250	.885	.925
Cars	0	0	0	0	0	85	0	144	1	230	91	655	0	0	746	0	707	66	1	774	1750
% Cars	0	0	0	0	0	100	0	100	100	100	100	99.5	0	0	99.6	0	99.3	100	100	99.4	99.5
Trucks & Buses	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	5	0	0	5	6
% Trucks & Buses	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0.1	0	0.7	0	0	0.6	0.3
School Buses	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
% School Buses	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0.3	0	0	0	0	0	0.1

Traffic Data Connection

PO Box 445
Abbeville, Ga 31001
843-412-6222

Counter: T-2291
Counted By: LME
Weather: Mild
Other: S&S

File Name : 15729-02
Site Code : 01572902
Start Date : 5/28/2015
Page No : 6



Traffic Data Connection

PO Box 445
Abbeville, Ga 31001

843-412-6222

Counter: T-4422

Counted By: BE

Weather: Mild

Other: S&S

File Name : 15729-03

Site Code : 01572903

Start Date : 5/27/2015

Page No : 1

Groups Printed- Cars - Trucks & Buses - School Buses

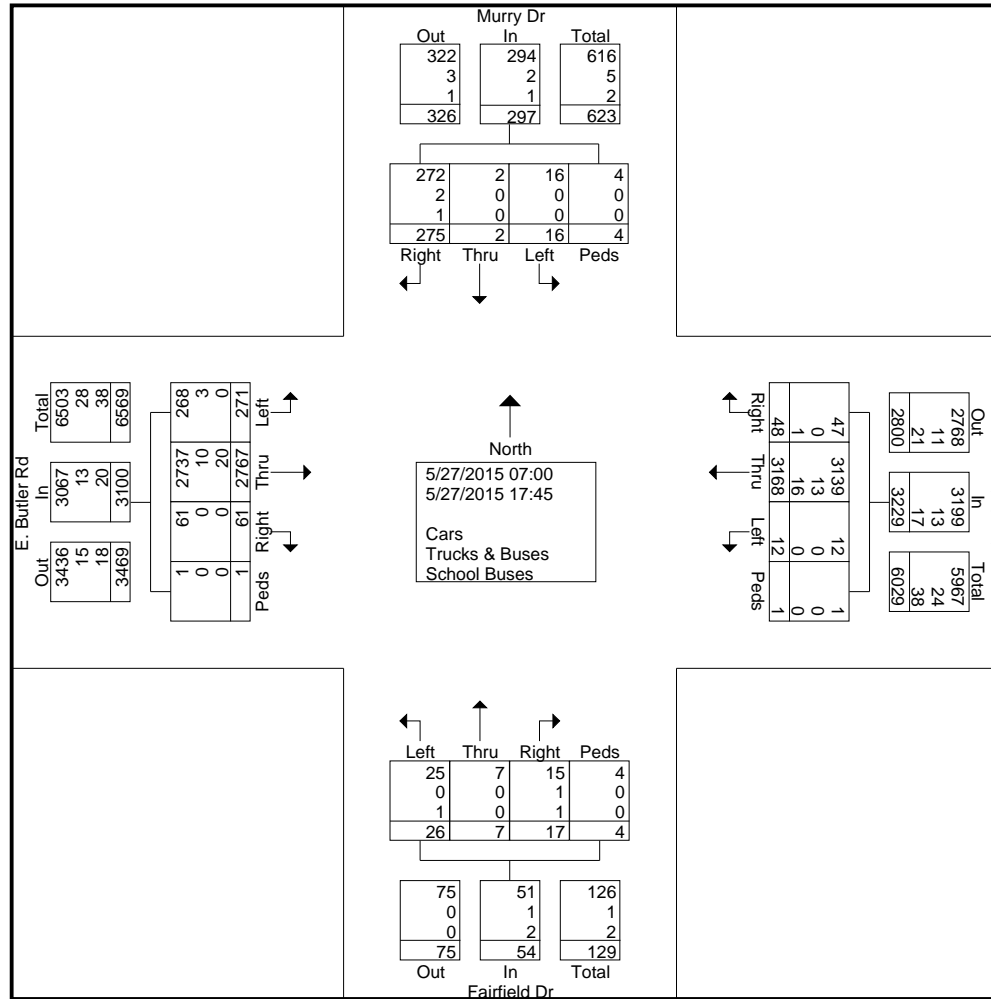
	Fairfield Dr Northbound					Murry Dr Southbound					E. Butler Rd Eastbound					E. Butler Rd Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00	1	0	0	0	1	0	0	13	1	14	8	96	2	0	106	1	110	3	0	114	235
07:15	4	1	0	0	5	0	0	9	1	10	19	140	2	0	161	1	156	3	0	160	336
07:30	0	3	2	0	5	2	0	9	0	11	17	180	7	0	204	2	183	2	0	187	407
07:45	2	2	2	0	6	1	0	14	0	15	30	229	5	0	264	2	193	3	0	198	483
Total	7	6	4	0	17	3	0	45	2	50	74	645	16	0	735	6	642	11	0	659	1461
08:00	2	0	1	0	3	1	0	14	0	15	28	203	3	0	234	0	195	2	0	197	449
08:15	0	0	4	0	4	0	0	16	0	16	17	188	7	0	212	0	166	4	0	170	402
08:30	3	0	0	0	3	2	0	19	2	23	24	170	2	0	196	2	147	3	0	152	374
08:45	3	0	2	0	5	2	0	8	0	10	16	116	1	0	133	0	131	3	0	134	282
Total	8	0	7	0	15	5	0	57	2	64	85	677	13	0	775	2	639	12	0	653	1507
*** BREAK ***																					
16:00	2	0	0	0	2	0	0	25	0	25	11	159	4	0	174	0	250	3	1	254	455
16:15	1	0	1	1	3	1	0	10	0	11	12	187	4	0	203	1	199	5	0	205	422
16:30	3	1	3	0	7	1	0	13	0	14	11	163	6	1	181	0	218	3	0	221	423
16:45	1	0	1	1	3	1	0	30	0	31	14	202	2	0	218	1	202	5	0	208	460
Total	7	1	5	2	15	3	0	78	0	81	48	711	16	1	776	2	869	16	1	888	1760
17:00	3	0	1	0	4	3	0	22	0	25	18	173	5	0	196	0	247	2	0	249	474
17:15	0	0	0	0	0	1	0	20	0	21	13	204	4	0	221	0	229	1	0	230	472
17:30	0	0	0	2	2	0	0	37	0	37	10	167	2	0	179	1	286	1	0	288	506
17:45	1	0	0	0	1	1	2	16	0	19	23	190	5	0	218	1	256	5	0	262	500
Total	4	0	1	2	7	5	2	95	0	102	64	734	16	0	814	2	1018	9	0	1029	1952
Grand Total	26	7	17	4	54	16	2	275	4	297	271	2767	61	1	3100	12	3168	48	1	3229	6680
Apprch %	48.1	13	31.5	7.4		5.4	0.7	92.6	1.3		8.7	89.3	2	0		0.4	98.1	1.5	0		
Total %	0.4	0.1	0.3	0.1	0.8	0.2	0	4.1	0.1	4.4	4.1	41.4	0.9	0	46.4	0.2	47.4	0.7	0	48.3	
Cars	25	7	15	4	51	16	2	272	4	294	268	2737	61	1	3067	12	3139	47	1	3199	6611
% Cars	96.2	100	88.2	100	94.4	100	100	98.9	100	99	98.9	98.9	100	100	98.9	100	99.1	97.9	100	99.1	99
Trucks & Buses	0	0	1	0	1	0	0	2	0	2	3	10	0	0	13	0	13	0	0	13	29
% Trucks & Buses	0	0	5.9	0	1.9	0	0	0.7	0	0.7	1.1	0.4	0	0	0.4	0	0.4	0	0	0.4	0.4
School Buses	1	0	1	0	2	0	0	1	0	1	0	20	0	0	20	0	16	1	0	17	40
% School Buses	3.8	0	5.9	0	3.7	0	0	0.4	0	0.3	0	0.7	0	0	0.6	0	0.5	2.1	0	0.5	0.6

Traffic Data Connection

PO Box 445
Abbeville, Ga 31001
843-412-6222

Counter: T-4422
Counted By: BE
Weather: Mild
Other: S&S

File Name : 15729-03
Site Code : 01572903
Start Date : 5/27/2015
Page No : 2



Traffic Data Connection

PO Box 445
Abbeville, Ga 31001
843-412-6222

Counter: T-4422
Counted By: BE
Weather: Mild
Other: S&S

File Name : 15729-03
Site Code : 01572903
Start Date : 5/27/2015
Page No : 3

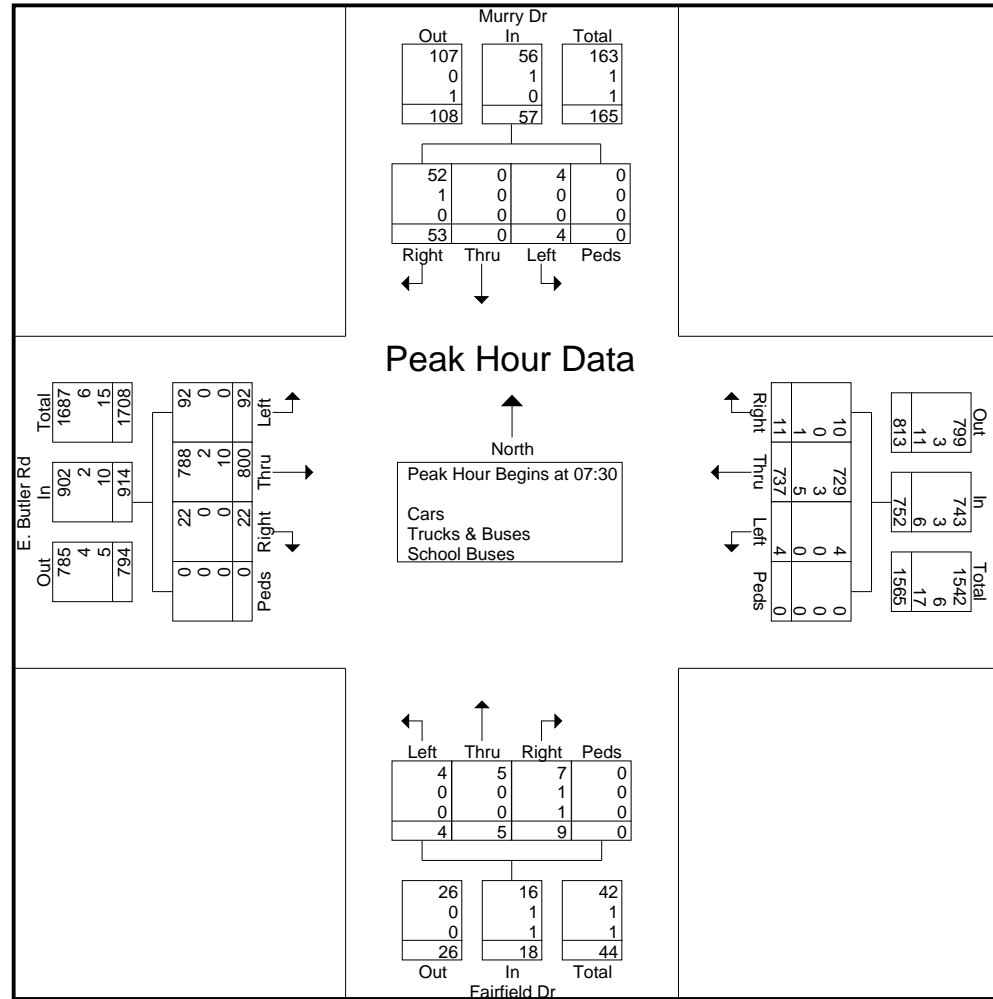
	Fairfield Dr Northbound					Murry Dr Southbound					E. Butler Rd Eastbound					E. Butler Rd Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 12:30 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30																					
07:30	0	3	2	0	5	2	0	9	0	11	17	180	7	0	204	2	183	2	0	187	407
07:45	2	2	2	0	6	1	0	14	0	15	30	229	5	0	264	2	193	3	0	198	483
08:00	2	0	1	0	3	1	0	14	0	15	28	203	3	0	234	0	195	2	0	197	449
08:15	0	0	4	0	4	0	0	16	0	16	17	188	7	0	212	0	166	4	0	170	402
Total Volume	4	5	9	0	18	4	0	53	0	57	92	800	22	0	914	4	737	11	0	752	1741
% App. Total	22.2	27.8	50	0		7	0	93	0		10.1	87.5	2.4	0		0.5	98	1.5	0		
PHF	.500	.417	.563	.000	.750	.500	.000	.828	.000	.891	.767	.873	.786	.000	.866	.500	.945	.688	.000	.949	.901
Cars	4	5	7	0	16	4	0	52	0	56	92	788	22	0	902	4	729	10	0	743	1717
% Cars	100	100	77.8	0	88.9	100	0	98.1	0	98.2	100	98.5	100	0	98.7	100	98.9	90.9	0	98.8	98.6
Trucks & Buses	0	0	1	0	1	0	0	1	0	1	0	2	0	0	2	0	3	0	0	3	7
% Trucks & Buses	0	0	11.1	0	5.6	0	0	1.9	0	1.8	0	0.3	0	0	0.2	0	0.4	0	0	0.4	0.4
School Buses	0	0	1	0	1	0	0	0	0	0	0	10	0	0	10	0	5	1	0	6	17
% School Buses	0	0	11.1	0	5.6	0	0	0	0	0	0	1.3	0	0	1.1	0	0.7	9.1	0	0.8	1.0

Traffic Data Connection

PO Box 445
Abbeville, Ga 31001
843-412-6222

Counter: T-4422
Counted By: BE
Weather: Mild
Other: S&S

File Name : 15729-03
Site Code : 01572903
Start Date : 5/27/2015
Page No : 4



Traffic Data Connection

PO Box 445
Abbeville, Ga 31001

843-412-6222

Counter: T-4422

Counted By: BE

Weather: Mild

Other: S&S

File Name : 15729-03

Site Code : 01572903

Start Date : 5/27/2015

Page No : 5

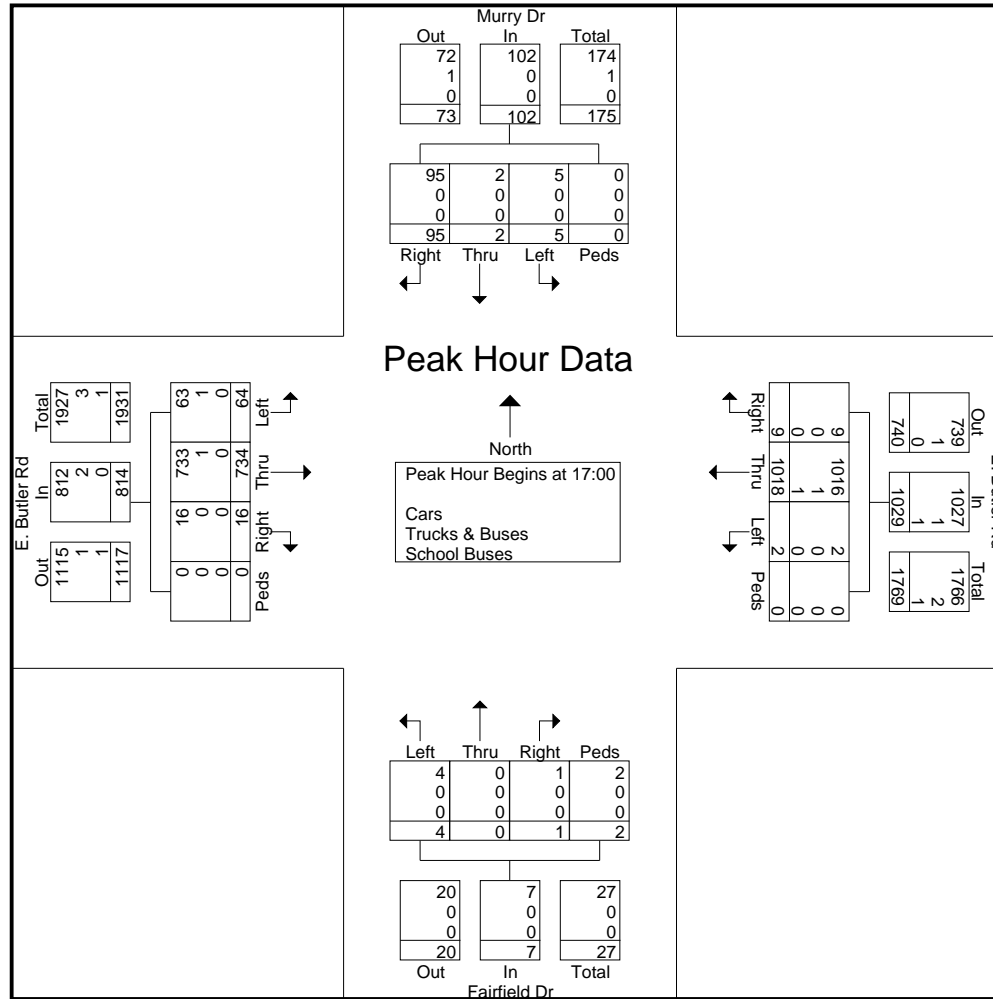
	Fairfield Dr Northbound					Murry Dr Southbound					E. Butler Rd Eastbound					E. Butler Rd Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:45 to 17:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 17:00																					
17:00	3	0	1	0	4	3	0	22	0	25	18	173	5	0	196	0	247	2	0	249	474
17:15	0	0	0	0	0	1	0	20	0	21	13	204	4	0	221	0	229	1	0	230	472
17:30	0	0	0	2	2	0	0	37	0	37	10	167	2	0	179	1	286	1	0	288	506
17:45	1	0	0	0	1	1	2	16	0	19	23	190	5	0	218	1	256	5	0	262	500
Total Volume	4	0	1	2	7	5	2	95	0	102	64	734	16	0	814	2	1018	9	0	1029	1952
% App. Total	57.1	0	14.3	28.6		4.9	2	93.1	0		7.9	90.2	2	0		0.2	98.9	0.9	0		
PHF	.333	.000	.250	.250	.438	.417	.250	.642	.000	.689	.696	.900	.800	.000	.921	.500	.890	.450	.000	.893	.964
Cars	4	0	1	2	7	5	2	95	0	102	63	733	16	0	812	2	1016	9	0	1027	1948
% Cars	100	0	100	100	100	100	100	100	0	100	98.4	99.9	100	0	99.8	100	99.8	100	0	99.8	99.8
Trucks & Buses	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0	1	0	0	1	3
% Trucks & Buses	0	0	0	0	0	0	0	0	0	0	1.6	0.1	0	0	0.2	0	0.1	0	0	0.1	0.2
School Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
% School Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0.1

Traffic Data Connection

PO Box 445
Abbeville, Ga 31001
843-412-6222

Counter: T-4422
Counted By: BE
Weather: Mild
Other: S&S

File Name : 15729-03
Site Code : 01572903
Start Date : 5/27/2015
Page No : 6



Traffic Data Connection

PO Box 445
Abbeville, Ga 31001

843-412-6222

Counter: T-2291
Counted By: LME
Weather: Mild
Other: S&S

File Name : 15729-04
Site Code : 01572904
Start Date : 5/27/2015
Page No : 1

Groups Printed- Cars - Trucks & Buses - School Buses

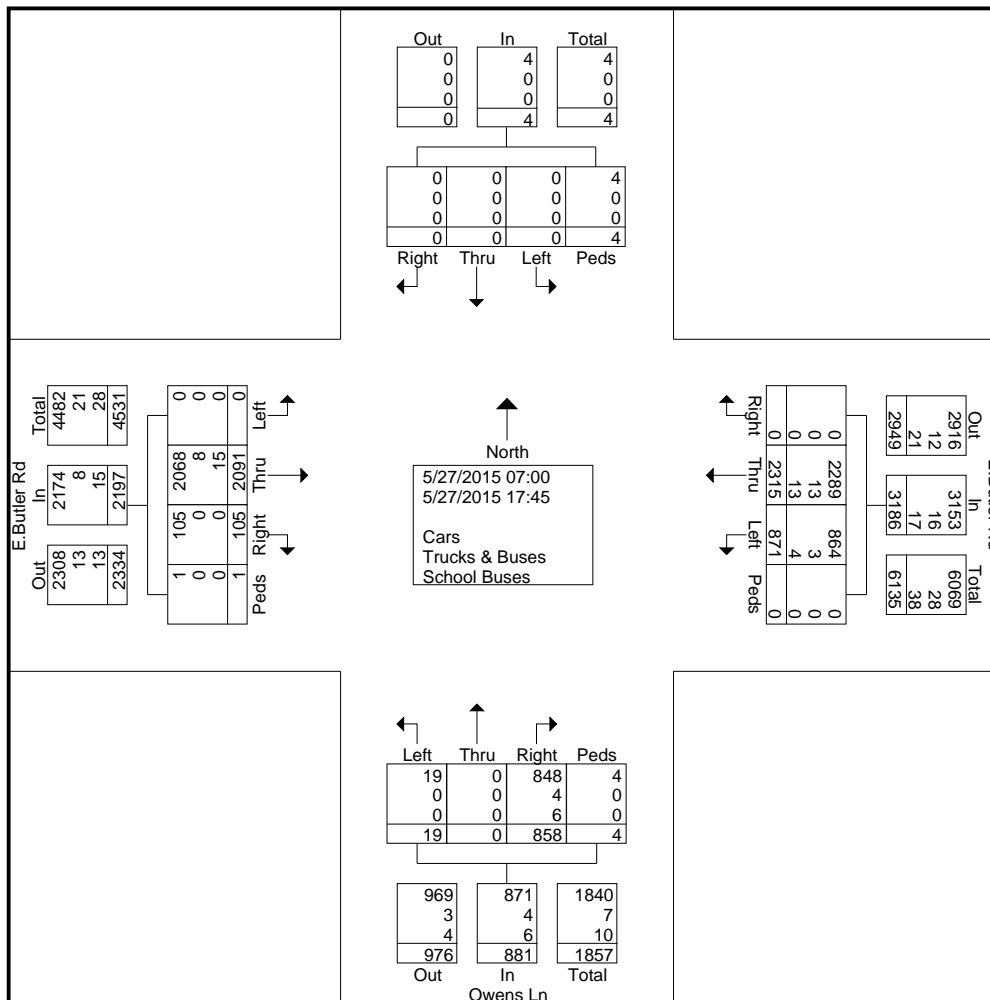
Start Time	Owens Ln Northbound					Southbound					E.Butler Rd Eastbound					E.Butler Rd Westbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00	0	0	24	0	24	0	0	0	1	1	0	81	3	1	85	22	96	0	0	118	228
07:15	0	0	68	0	68	0	0	0	1	1	0	91	5	0	96	35	126	0	0	161	326
07:30	1	0	77	0	78	0	0	0	0	0	0	123	4	0	127	32	154	0	0	186	391
07:45	1	0	81	0	82	0	0	0	0	0	0	155	8	0	163	38	149	0	0	187	432
Total	2	0	250	0	252	0	0	0	2	2	0	450	20	1	471	127	525	0	0	652	1377
08:00	2	0	83	0	85	0	0	0	0	0	0	136	14	0	150	47	157	0	0	204	439
08:15	2	0	62	0	64	0	0	0	0	0	0	145	7	0	152	36	131	0	0	167	383
08:30	2	0	64	0	66	0	0	0	2	2	0	118	3	0	121	42	123	0	0	165	354
08:45	0	0	41	0	41	0	0	0	0	0	0	89	6	0	95	30	101	0	0	131	267
Total	6	0	250	0	256	0	0	0	2	2	0	488	30	0	518	155	512	0	0	667	1443
*** BREAK ***																					
16:00	0	0	46	0	46	0	0	0	0	0	0	134	5	0	139	90	167	0	0	257	442
16:15	2	0	40	1	43	0	0	0	0	0	0	149	7	0	156	62	144	0	0	206	405
16:30	1	0	42	0	43	0	0	0	0	0	0	128	2	0	130	58	159	0	0	217	390
16:45	0	0	53	1	54	0	0	0	0	0	0	157	10	0	167	63	159	0	0	222	443
Total	3	0	181	2	186	0	0	0	0	0	0	568	24	0	592	273	629	0	0	902	1680
17:00	1	0	46	0	47	0	0	0	0	0	0	144	5	0	149	85	156	0	0	241	437
17:15	0	0	53	0	53	0	0	0	0	0	0	156	9	0	165	73	158	0	0	231	449
17:30	0	0	42	2	44	0	0	0	0	0	0	135	6	0	141	93	180	0	0	273	458
17:45	7	0	36	0	43	0	0	0	0	0	0	150	11	0	161	65	155	0	0	220	424
Total	8	0	177	2	187	0	0	0	0	0	0	585	31	0	616	316	649	0	0	965	1768
Grand Total	19	0	858	4	881	0	0	0	4	4	0	2091	105	1	2197	871	2315	0	0	3186	6268
Apprch %	2.2	0	97.4	0.5		0	0	0	100		0	95.2	4.8	0		27.3	72.7	0	0		
Total %	0.3	0	13.7	0.1	14.1	0	0	0	0.1	0.1	0	33.4	1.7	0	35.1	13.9	36.9	0	0	50.8	
Cars	19	0	848	4	871	0	0	0	4	4	0	2068	105	1	2174	864	2289	0	0	3153	6202
% Cars	100	0	98.8	100	98.9	0	0	0	100	100	0	98.9	100	100	99	99.2	98.9	0	0	99	98.9
Trucks & Buses	0	0	4	0	4	0	0	0	0	0	0	8	0	0	8	3	13	0	0	16	28
% Trucks & Buses	0	0	0.5	0	0.5	0	0	0	0	0	0	0.4	0	0	0.4	0.3	0.6	0	0	0.5	0.4
School Buses	0	0	6	0	6	0	0	0	0	0	0	15	0	0	15	4	13	0	0	17	38
% School Buses	0	0	0.7	0	0.7	0	0	0	0	0	0	0.7	0	0	0.7	0.5	0.6	0	0	0.5	0.6

Traffic Data Connection

PO Box 445
Abbeville, Ga 31001
843-412-6222

Counter: T-2291
Counted By: LME
Weather: Mild
Other: S&S

File Name : 15729-04
Site Code : 01572904
Start Date : 5/27/2015
Page No : 2



Traffic Data Connection

PO Box 445
Abbeville, Ga 31001
843-412-6222

Counter: T-2291
Counted By: LME
Weather: Mild
Other: S&S

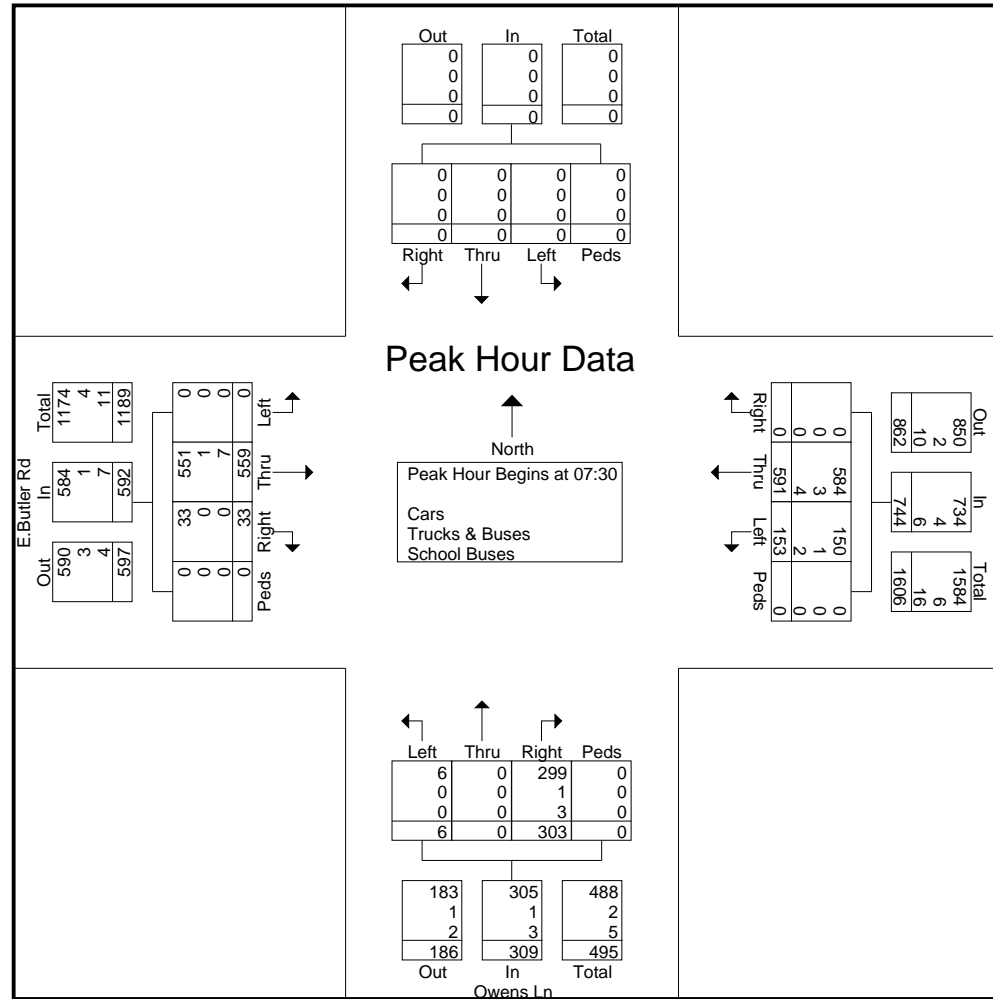
File Name : 15729-04
Site Code : 01572904
Start Date : 5/27/2015
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	Owens Ln Northbound					Southbound					E.Butler Rd Eastbound					E.Butler Rd Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 12:30 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30																					
07:30	1	0	77	0	78	0	0	0	0	0	0	123	4	0	127	32	154	0	0	186	391
07:45	1	0	81	0	82	0	0	0	0	0	0	155	8	0	163	38	149	0	0	187	432
08:00	2	0	83	0	85	0	0	0	0	0	0	136	14	0	150	47	157	0	0	204	439
08:15	2	0	62	0	64	0	0	0	0	0	0	145	7	0	152	36	131	0	0	167	383
Total Volume	6	0	303	0	309	0	0	0	0	0	0	559	33	0	592	153	591	0	0	744	1645
% App. Total	1.9	0	98.1	0		0	0	0	0		0	94.4	5.6	0		20.6	79.4	0	0		
PHF	.750	.000	.913	.000	.909	.000	.000	.000	.000	.000	.000	.902	.589	.000	.908	.814	.941	.000	.000	.912	.937
Cars	6	0	299	0	305	0	0	0	0	0	0	551	33	0	584	150	584	0	0	734	1623
% Cars	100	0	98.7	0	98.7	0	0	0	0	0	0	98.6	100	0	98.6	98.0	98.8	0	0	98.7	98.7
Trucks & Buses	0	0	1	0	1	0	0	0	0	0	0	1	0	0	1	1	3	0	0	4	6
% Trucks & Buses	0	0	0.3	0	0.3	0	0	0	0	0	0	0.2	0	0	0.2	0.7	0.5	0	0	0.5	0.4
School Buses	0	0	3	0	3	0	0	0	0	0	0	7	0	0	7	2	4	0	0	6	16
% School Buses	0	0	1.0	0	1.0	0	0	0	0	0	0	1.3	0	0	1.2	1.3	0.7	0	0	0.8	1.0

PO Box 445
Abbeville, Ga 31001
843-412-6222

Counter: T-2291
Counted By: LME
Weather: Mild
Other: S&S

File Name : 15729-04
Site Code : 01572904
Start Date : 5/27/2015
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Traffic Data Connection

PO Box 445
Abbeville, Ga 31001

843-412-6222

Counter: T-2291
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Weather: Mild
Other: S&S

File Name : 15729-04
Site Code : 01572904
Start Date : 5/27/2015
Page No : 5

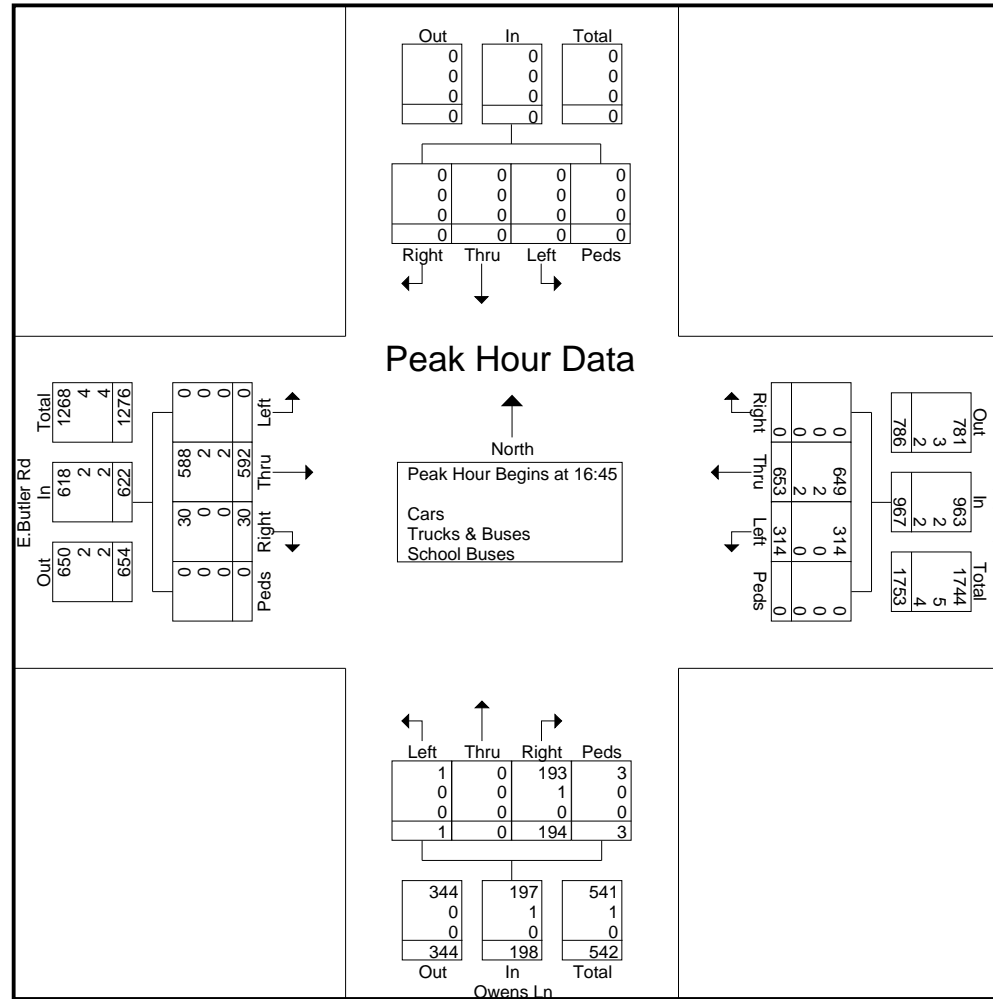
	Owens Ln Northbound					Southbound					E.Butler Rd Eastbound					E.Butler Rd Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:45 to 17:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 16:45																					
16:45	0	0	53	1	54	0	0	0	0	0	0	157	10	0	167	63	159	0	0	222	443
17:00	1	0	46	0	47	0	0	0	0	0	0	144	5	0	149	85	156	0	0	241	437
17:15	0	0	53	0	53	0	0	0	0	0	0	156	9	0	165	73	158	0	0	231	449
17:30	0	0	42	2	44	0	0	0	0	0	0	135	6	0	141	93	180	0	0	273	458
Total Volume	1	0	194	3	198	0	0	0	0	0	0	592	30	0	622	314	653	0	0	967	1787
% App. Total	0.5	0	98	1.5		0	0	0	0		0	95.2	4.8	0		32.5	67.5	0	0		
PHF	.250	.000	.915	.375	.917	.000	.000	.000	.000	.000	.000	.943	.750	.000	.931	.844	.907	.000	.000	.886	.975
Cars	1	0	193	3	197	0	0	0	0	0	0	588	30	0	618	314	649	0	0	963	1778
% Cars	100	0	99.5	100	99.5	0	0	0	0	0	0	99.3	100	0	99.4	100	99.4	0	0	99.6	99.5
Trucks & Buses	0	0	1	0	1	0	0	0	0	0	0	2	0	0	2	0	2	0	0	2	5
% Trucks & Buses	0	0	0.5	0	0.5	0	0	0	0	0	0	0.3	0	0	0.3	0	0.3	0	0	0.2	0.3
School Buses	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	2	0	0	2	4
% School Buses	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0.3	0	0.3	0	0	0.2	0.2

Traffic Data Connection

PO Box 445
Abbeville, Ga 31001
843-412-6222

Counter: T-2291
Counted By: LME
Weather: Mild
Other: S&S












File Name : 15729-04
Site Code : 01572904
Start Date : 5/27/2015
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Appendix C
CAPACITY ANALYSIS PRINTOUTS

10: Bethel Dr & East Butler Rd
East Butler Corridor

AM Peak Hour
Ex Volume; Ex Geometry

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Volume (veh/h)	641	92	57	567	375	128		
Number	2	12	1	6	3	18		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1898	1900	1844	1937	1824	1824		
Adj Flow Rate, veh/h	675	97	60	597	395	135		
Adj No. of Lanes	1	0	1	1	1	1		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Percent Heavy Veh, %	0	0	2	1	0	0		
Cap, veh/h	764	110	238	1149	441	466		
Arrive On Green	0.47	0.47	0.05	0.59	0.25	0.25		
Sat Flow, veh/h	1623	233	1756	1937	1737	1550		
Grp Volume(v), veh/h	0	772	60	597	395	135		
Grp Sat Flow(s),veh/h/ln	0	1856	1756	1937	1737	1550		
Q Serve(g_s), s	0.0	29.6	1.3	14.2	17.2	5.2		
Cycle Q Clear(g_c), s	0.0	29.6	1.3	14.2	17.2	5.2		
Prop In Lane		0.13	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	0	873	238	1149	441	466		
V/C Ratio(X)	0.00	0.88	0.25	0.52	0.90	0.29		
Avail Cap(c_a), veh/h	0	945	357	1356	509	526		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	0.0	18.9	15.5	9.4	28.3	21.1		
Incr Delay (d2), s/veh	0.0	9.5	0.6	0.4	16.8	0.3		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.0	17.3	0.6	7.6	10.3	2.3		
LnGrp Delay(d),s/veh	0.0	28.3	16.0	9.8	45.1	21.4		
LnGrp LOS		C	B	A	D	C		
Approach Vol, veh/h	772			657	530			
Approach Delay, s/veh	28.3			10.3	39.0			
Approach LOS	C			B	D			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	9.6	43.0				52.6		25.9
Change Period (Y+Rc), s	6.0	6.0				6.0		6.0
Max Green Setting (Gmax), s	9.0	40.0				55.0		23.0
Max Q Clear Time (g_c+l1), s	3.3	31.6				16.2		19.2
Green Ext Time (p_c), s	0.0	5.3				12.6		0.7
Intersection Summary								
HCM 2010 Ctrl Delay			25.2					
HCM 2010 LOS			C					

3: Owens Ln & East Butler Rd
East Butler Corridor

AM Peak Hour
Ex Volume; Ex Geometry

Intersection						
Int Delay, s/veh	5.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	559	33	153	591	6	303
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	90	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	2	-3	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	1	1	0	0
Mvmt Flow	595	35	163	629	6	322
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	630	0	1566	612
Stage 1	-	-	-	-	612	-
Stage 2	-	-	-	-	954	-
Critical Hdwy	-	-	4.11	-	5.8	5.9
Critical Hdwy Stg 1	-	-	-	-	4.8	-
Critical Hdwy Stg 2	-	-	-	-	4.8	-
Follow-up Hdwy	-	-	2.209	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	957	-	161	523
Stage 1	-	-	-	-	603	-
Stage 2	-	-	-	-	442	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	957	-	134	523
Mov Cap-2 Maneuver	-	-	-	-	264	-
Stage 1	-	-	-	-	603	-
Stage 2	-	-	-	-	367	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		2		22.2	
HCM LOS					C	
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	264	523	-	-	957	-
HCM Lane V/C Ratio	0.024	0.616	-	-	0.17	-
HCM Control Delay (s)	19	22.3	-	-	9.5	-
HCM Lane LOS	C	C	-	-	A	-
HCM 95th %tile Q(veh)	0.1	4.1	-	-	0.6	-

5: Fairfield Dr/Murray Dr & East Butler Rd
East Butler Corridor

AM Peak Hour
Ex Volume; Ex Geometry

Intersection												
Int Delay, s/veh	2.1											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	92	800	22	4	737	11	4	5	9	4	0	53
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	60	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-1	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	11	0	0	2
Mvmt Flow	102	889	24	4	819	12	4	6	10	4	0	59

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	831	0	0	913	0	0	1969	1946	901	1947	1952	825
Stage 1	-	-	-	-	-	-	1106	1106	-	834	834	-
Stage 2	-	-	-	-	-	-	863	840	-	1113	1118	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.31	7.1	6.5	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.399	3.5	4	3.318
Pot Cap-1 Maneuver	810	-	-	755	-	-	48	66	324	49	65	372
Stage 1	-	-	-	-	-	-	258	289	-	365	386	-
Stage 2	-	-	-	-	-	-	352	384	-	255	285	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	810	-	-	755	-	-	36	57	324	40	57	372
Mov Cap-2 Maneuver	-	-	-	-	-	-	36	57	-	40	57	-
Stage 1	-	-	-	-	-	-	226	253	-	319	384	-
Stage 2	-	-	-	-	-	-	295	382	-	211	249	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1	0.1	65.4	25.9
HCM LOS			F	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	79	810	-	-	755	-	-	235
HCM Lane V/C Ratio	0.253	0.126	-	-	0.006	-	-	0.27
HCM Control Delay (s)	65.4	10.1	-	-	9.8	-	-	25.9
HCM Lane LOS	F	B	-	-	A	-	-	D
HCM 95th %tile Q(veh)	0.9	0.4	-	-	0	-	-	1.1

8: East Butler Rd & Old Mill Rd
East Butler Corridor

AM Peak Hour
Ex Volume; Ex Geometry

Intersection						
Int Delay, s/veh	4.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	131	686	678	170	45	78
Conflicting Peds, #/hr	0	0	0	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	200
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	0	1	0	2	0
Mvmt Flow	136	715	706	177	47	81
Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	884	0	-	0	1784	796
Stage 1	-	-	-	-	796	-
Stage 2	-	-	-	-	988	-
Critical Hdwy	4.1	-	-	-	6.42	6.2
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.2	-	-	-	3.518	3.3
Pot Cap-1 Maneuver	774	-	-	-	90	390
Stage 1	-	-	-	-	444	-
Stage 2	-	-	-	-	361	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	774	-	-	-	74	390
Mov Cap-2 Maneuver	-	-	-	-	74	-
Stage 1	-	-	-	-	444	-
Stage 2	-	-	-	-	297	-
Approach	EB		WB		SB	
HCM Control Delay, s	1.7		0		52.6	
HCM LOS					F	
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	774	-	-	-	74	390
HCM Lane V/C Ratio	0.176	-	-	-	0.633	0.208
HCM Control Delay (s)	10.6	-	-	-	114.9	16.6
HCM Lane LOS	B	-	-	-	F	C
HCM 95th %tile Q(veh)	0.6	-	-	-	2.8	0.8

Queuing and Blocking Report
East Butler Corridor

AM Peak Hour
Ex Volumes; Ex Geometry

Intersection: 3: Owens Ln & East Butler Rd

Movement	EB	WB	NB	NB
Directions Served	TR	L	L	R
Maximum Queue (ft)	27	87	73	219
Average Queue (ft)	2	42	9	95
95th Queue (ft)	16	74	38	167
Link Distance (ft)	471			747
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		90	50	
Storage Blk Time (%)		0	0	33
Queuing Penalty (veh)		1	0	2

Intersection: 5: Fairfield Dr/Murray Dr & East Butler Rd

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 8: East Butler Rd & Old Mill Rd

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 10: Bethel Dr & East Butler Rd

Movement

Directions Served

Maximum Queue (ft)

Average Queue (ft)

95th Queue (ft)

Link Distance (ft)

Upstream Blk Time (%)

Queuing Penalty (veh)

Storage Bay Dist (ft)

Storage Blk Time (%)












Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 3

10: Bethel Dr & East Butler Rd
East Butler Corridor

AM Peak Hour
2040; Ex Geometry

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Volume (veh/h)	822	118	73	727	481	164		
Number	2	12	1	6	3	18		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1898	1900	1844	1937	1824	1824		
Adj Flow Rate, veh/h	865	124	77	765	506	173		
Adj No. of Lanes	1	0	1	1	1	1		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Percent Heavy Veh, %	0	0	2	1	0	0		
Cap, veh/h	762	109	171	1141	469	495		
Arrive On Green	0.47	0.47	0.05	0.59	0.27	0.27		
Sat Flow, veh/h	1624	233	1756	1937	1737	1550		
Grp Volume(v), veh/h	0	989	77	765	506	173		
Grp Sat Flow(s),veh/h/ln	0	1857	1756	1937	1737	1550		
Q Serve(g_s), s	0.0	40.0	1.8	22.8	23.0	7.3		
Cycle Q Clear(g_c), s	0.0	40.0	1.8	22.8	23.0	7.3		
Prop In Lane		0.13	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	0	872	171	1141	469	495		
V/C Ratio(X)	0.00	1.13	0.45	0.67	1.08	0.35		
Avail Cap(c_a), veh/h	0	872	270	1250	469	495		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	0.0	22.6	19.7	11.9	31.1	22.2		
Incr Delay (d2), s/veh	0.0	74.7	1.9	1.2	64.4	0.4		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.0	38.4	1.0	12.5	19.3	3.2		
LnGrp Delay(d),s/veh	0.0	97.3	21.5	13.1	95.5	22.6		
LnGrp LOS		F	C	B	F	C		
Approach Vol, veh/h	989			842	679			
Approach Delay, s/veh	97.3			13.9	77.0			
Approach LOS	F			B	E			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	10.2	46.0				56.2		29.0
Change Period (Y+Rc), s	6.0	6.0				6.0		6.0
Max Green Setting (Gmax), s	9.0	40.0				55.0		23.0
Max Q Clear Time (g_c+l1), s	3.8	42.0				24.8		25.0
Green Ext Time (p_c), s	0.1	0.0				17.0		0.0
Intersection Summary								
HCM 2010 Ctrl Delay			63.8					
HCM 2010 LOS			E					

3: Owens Ln & East Butler Rd
East Butler Corridor

AM Peak Hour
2040; Ex Geometry

Intersection

Int Delay, s/veh 14

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	717	42	196	758	8	389
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	90	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	2	-3	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	1	1	0	0
Mvmt Flow	763	45	209	806	9	414

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	807
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.11
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.209
Pot Cap-1 Maneuver	-	-	822
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	822
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.2	69.1
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	184	423	-	-	822	-
HCM Lane V/C Ratio	0.046	0.978	-	-	0.254	-
HCM Control Delay (s)	25.5	70	-	-	10.9	-
HCM Lane LOS	D	F	-	-	B	-
HCM 95th %tile Q(veh)	0.1	11.9	-	-	1	-

5: Fairfield Dr/Murray Dr & East Butler Rd
East Butler Corridor

AM Peak Hour
2040; Ex Geometry

Intersection												
Int Delay, s/veh	6.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	118	1026	28	5	945	14	5	6	12	5	0	68
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	60	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-1	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	11	0	0	2
Mvmt Flow	131	1140	31	6	1050	16	6	7	13	6	0	76
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1066	0	0	1171	0	0	2525	2495	1156	2497	2502	1058
Stage 1	-	-	-	-	-	-	1418	1418	-	1069	1069	-
Stage 2	-	-	-	-	-	-	1107	1077	-	1428	1433	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.31	7.1	6.5	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.399	3.5	4	3.318
Pot Cap-1 Maneuver	661	-	-	604	-	-	19	29	229	20	29	273
Stage 1	-	-	-	-	-	-	171	205	-	270	300	-
Stage 2	-	-	-	-	-	-	257	298	-	169	201	-
Platoon blocked, %			-	-		-						
Mov Cap-1 Maneuver	661	-	-	604	-	-	12	23	229	12	23	273
Mov Cap-2 Maneuver	-	-	-	-	-	-	12	23	-	12	23	-
Stage 1	-	-	-	-	-	-	137	164	-	216	297	-
Stage 2	-	-	-	-	-	-	184	295	-	122	161	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.2			0.1			278.3			98.4		
HCM LOS							F			F		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	32	661	-	-	604	-	-	110				
HCM Lane V/C Ratio	0.799	0.198	-	-	0.009	-	-	0.737				
HCM Control Delay (s)	278.3	11.8	-	-	11	-	-	98.4				
HCM Lane LOS	F	B	-	-	B	-	-	F				
HCM 95th %tile Q(veh)	2.7	0.7	-	-	0	-	-	4				

8: East Butler Rd & Old Mill Rd
East Butler Corridor

AM Peak Hour
2040; Ex Geometry

Intersection

Int Delay, s/veh 20.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	168	880	869	218	58	100
Conflicting Peds, #/hr	0	0	0	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	200
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	0	1	0	2	0
Mvmt Flow	175	917	905	227	60	104

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	1133	0	2287
Stage 1	-	-	1020
Stage 2	-	-	1267
Critical Hdwy	4.1	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.2	-	3.518
Pot Cap-1 Maneuver	624	-	~ 43
Stage 1	-	-	348
Stage 2	-	-	265
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	624	-	~ 31
Mov Cap-2 Maneuver	-	-	~ 31
Stage 1	-	-	348
Stage 2	-	-	191

Approach	EB	WB	SB
HCM Control Delay, s	2.1	0	279.1
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	624	-	-	-	31	290
HCM Lane V/C Ratio	0.28	-	-	-	1.949	0.359
HCM Control Delay (s)	13	-	-	-	\$ 718.6	24.2
HCM Lane LOS	B	-	-	-	F	C
HCM 95th %tile Q(veh)	1.1	-	-	-	6.9	1.6

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Queuing and Blocking Report
East Butler Corridor

AM Peak Hour
2040; Ex Geometry

Intersection: 3: Owens Ln & East Butler Rd

Movement	EB	WB	WB	NB	NB
Directions Served	TR	L	T	L	R
Maximum Queue (ft)	41	108	128	74	583
Average Queue (ft)	5	56	9	18	339
95th Queue (ft)	24	99	74	64	668
Link Distance (ft)	471		187		747
Upstream Blk Time (%)			1		5
Queuing Penalty (veh)			12		0
Storage Bay Dist (ft)		90		50	
Storage Blk Time (%)		4		2	86
Queuing Penalty (veh)		30		7	7

Intersection: 5: Fairfield Dr/Murray Dr & East Butler Rd

Movement	EB	EB	WB	NB	SB
Directions Served	L	TR	TR	LTR	LTR
Maximum Queue (ft)	80	202	92	52	183
Average Queue (ft)	34	17	4	13	69
95th Queue (ft)	75	102	31	41	139
Link Distance (ft)		187	3551	678	504
Upstream Blk Time (%)		1			
Queuing Penalty (veh)		10			
Storage Bay Dist (ft)	60				
Storage Blk Time (%)	4		0		
Queuing Penalty (veh)	31		0		

Intersection: 8: East Butler Rd & Old Mill Rd

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (ft)	74	172	54	202	220
Average Queue (ft)	38	27	5	84	62
95th Queue (ft)	66	107	28	176	133
Link Distance (ft)		3551	256	833	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	150				200
Storage Blk Time (%)		0		2	0
Queuing Penalty (veh)		0		3	0

Intersection: 10: Bethel Dr & East Butler Rd





















Movement	EB	WB	WB	NB	NB
Directions Served	TR	L	T	L	R
Maximum Queue (ft)	275	124	292	161	96
Average Queue (ft)	177	57	138	74	39
95th Queue (ft)	297	108	257	130	64
Link Distance (ft)	256		1688	798	
Upstream Blk Time (%)	2				
Queuing Penalty (veh)	15				
Storage Bay Dist (ft)		100			150
Storage Blk Time (%)		1	7	1	
Queuing Penalty (veh)		10	9	1	

Network Summary

Network wide Queuing Penalty: 136

10: Bethel Dr & East Butler Rd
East Butler Corridor

AM Peak Hour
2040; Revised

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	772	110	73	596	131	394	87	164	50	8	5
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1898	1900	1844	1933	1881	1824	1811	1824	1863	1863	1900
Adj Flow Rate, veh/h	5	813	116	77	627	142	415	95	173	54	9	5
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.95	0.95	0.95	0.95	0.92	0.95	0.92	0.95	0.92	0.92	0.92
Percent Heavy Veh, %	2	0	0	2	1	1	0	2	2	2	2	2
Cap, veh/h	293	856	122	152	932	211	449	170	309	139	84	47
Arrive On Green	0.53	0.53	0.53	0.04	0.61	0.61	0.17	0.30	0.30	0.07	0.07	0.07
Sat Flow, veh/h	697	1625	232	1756	1527	346	1737	576	1048	1102	1126	626
Grp Volume(v), veh/h	5	0	929	77	0	769	415	0	268	54	0	14
Grp Sat Flow(s),veh/h/ln	697	0	1857	1756	0	1872	1737	0	1624	1102	0	1752
Q Serve(g_s), s	0.6	0.0	60.3	2.5	0.0	34.5	22.0	0.0	17.7	6.1	0.0	0.9
Cycle Q Clear(g_c), s	24.5	0.0	60.3	2.5	0.0	34.5	22.0	0.0	17.7	6.1	0.0	0.9
Prop In Lane	1.00		0.12	1.00		0.18	1.00		0.65	1.00		0.36
Lane Grp Cap(c), veh/h	293	0	978	152	0	1143	449	0	479	139	0	131
V/C Ratio(X)	0.02	0.00	0.95	0.51	0.00	0.67	0.92	0.00	0.56	0.39	0.00	0.11
Avail Cap(c_a), veh/h	293	0	978	212	0	1207	449	0	587	212	0	248
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	28.0	0.0	28.5	29.1	0.0	16.4	46.3	0.0	37.9	57.2	0.0	54.9
Incr Delay (d2), s/veh	0.1	0.0	19.0	2.6	0.0	1.4	24.8	0.0	1.0	1.8	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	35.9	1.6	0.0	18.2	16.2	0.0	8.1	1.9	0.0	0.5
LnGrp Delay(d),s/veh	28.1	0.0	47.5	31.7	0.0	17.8	71.2	0.0	38.9	59.0	0.0	55.2
LnGrp LOS	C		D	C		B	E		D	E		E
Approach Vol, veh/h		934			846			683			68	
Approach Delay, s/veh		47.4			19.0			58.5			58.2	
Approach LOS		D			B			E			E	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4		6		8				
Phs Duration (G+Y+Rc), s	10.7	73.0	28.0	15.5		83.7		43.5				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0		6.0		6.0				
Max Green Setting (Gmax), s	9.0	67.0	22.0	18.0		82.0		46.0				
Max Q Clear Time (g_c+l1), s	4.5	62.3	24.0	8.1		36.5		19.7				
Green Ext Time (p_c), s	0.1	3.9	0.0	1.3		19.8		2.0				
Intersection Summary												
HCM 2010 Ctrl Delay			41.2									
HCM 2010 LOS			D									

3: Owens Ln & East Butler Rd
East Butler Corridor

AM Peak Hour
2040; Revised

Intersection

Int Delay, s/veh 14

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	717	42	196	758	8	389
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	170	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	2	-3	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	1	1	0	0
Mvmt Flow	763	45	209	806	9	414

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	2008
Stage 1	-	-	785
Stage 2	-	-	1223
Critical Hdwy	-	4.11	5.8
Critical Hdwy Stg 1	-	-	4.8
Critical Hdwy Stg 2	-	-	4.8
Follow-up Hdwy	-	2.209	3.5
Pot Cap-1 Maneuver	-	822	92
Stage 1	-	-	516
Stage 2	-	-	344
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	822	69
Mov Cap-2 Maneuver	-	-	184
Stage 1	-	-	516
Stage 2	-	-	257

Approach	EB	WB	NB
HCM Control Delay, s	0	2.2	69.1
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	184	423	-	-	822	-
HCM Lane V/C Ratio	0.046	0.978	-	-	0.254	-
HCM Control Delay (s)	25.5	70	-	-	10.9	-
HCM Lane LOS	D	F	-	-	B	-
HCM 95th %tile Q(veh)	0.1	11.9	-	-	1	-

5: Fairfield Dr/Murray Dr & East Butler Rd
East Butler Corridor

AM Peak Hour
2040; Revised

Intersection												
Int Delay, s/veh	6.8											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	118	1026	28	5	945	14	5	6	12	5	0	68
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	170	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-1	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	11	0	0	2
Mvmt Flow	131	1140	31	6	1050	16	6	7	13	6	0	76

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1066	0	0	1171	0	0	2525	2495	1156	2497	2502	1058
Stage 1	-	-	-	-	-	-	1418	1418	-	1069	1069	-
Stage 2	-	-	-	-	-	-	1107	1077	-	1428	1433	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.31	7.1	6.5	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.399	3.5	4	3.318
Pot Cap-1 Maneuver	661	-	-	604	-	-	19	29	229	20	29	273
Stage 1	-	-	-	-	-	-	171	205	-	270	300	-
Stage 2	-	-	-	-	-	-	257	298	-	169	201	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	661	-	-	604	-	-	12	23	229	12	23	273
Mov Cap-2 Maneuver	-	-	-	-	-	-	12	23	-	12	23	-
Stage 1	-	-	-	-	-	-	137	164	-	216	297	-
Stage 2	-	-	-	-	-	-	184	295	-	122	161	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.2	0.1	278.3	98.4
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	32	661	-	-	604	-	-	110
HCM Lane V/C Ratio	0.799	0.198	-	-	0.009	-	-	0.737
HCM Control Delay (s)	278.3	11.8	-	-	11	-	-	98.4
HCM Lane LOS	F	B	-	-	B	-	-	F
HCM 95th %tile Q(veh)	2.7	0.7	-	-	0	-	-	4

8: East Butler Rd & Old Mill Rd
East Butler Corridor

AM Peak Hour
2040; Revised

Intersection						
Int Delay, s/veh	2.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	168	880	869	5	5	100
Conflicting Peds, #/hr	0	0	0	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	200
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	0	1	0	2	0
Mvmt Flow	175	917	905	5	5	104
Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	911	0	-	0	2176	909
Stage 1	-	-	-	-	909	-
Stage 2	-	-	-	-	1267	-
Critical Hdwy	4.1	-	-	-	6.42	6.2
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.2	-	-	-	3.518	3.3
Pot Cap-1 Maneuver	756	-	-	-	51	336
Stage 1	-	-	-	-	393	-
Stage 2	-	-	-	-	265	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	756	-	-	-	39	336
Mov Cap-2 Maneuver	-	-	-	-	39	-
Stage 1	-	-	-	-	393	-
Stage 2	-	-	-	-	204	-
Approach	EB		WB		SB	
HCM Control Delay, s	1.8		0		24.8	
HCM LOS					C	
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	756	-	-	-	39	336
HCM Lane V/C Ratio	0.231	-	-	-	0.134	0.31
HCM Control Delay (s)	11.2	-	-	-	111.1	20.5
HCM Lane LOS	B	-	-	-	F	C
HCM 95th %tile Q(veh)	0.9	-	-	-	0.4	1.3

Intersection						
Int Delay, s/veh	4.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	168	5	5	218	58	100
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	183	5	5	237	63	109
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	365	117	172	0	-	0
Stage 1	117	-	-	-	-	-
Stage 2	248	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	639	941	1417	-	-	-
Stage 1	913	-	-	-	-	-
Stage 2	798	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	636	941	1417	-	-	-
Mov Cap-2 Maneuver	636	-	-	-	-	-
Stage 1	913	-	-	-	-	-
Stage 2	795	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	12.9	0.2		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1417	-	642	-	-	
HCM Lane V/C Ratio	0.004	-	0.293	-	-	
HCM Control Delay (s)	7.5	0	12.9	-	-	
HCM Lane LOS	A	A	B	-	-	
HCM 95th %tile Q(veh)	0	-	1.2	-	-	

Queuing and Blocking Report
East Butler Corridor

AM Peak Hour
2040; Revised

Intersection: 3: Owens Ln & East Butler Rd

Movement	EB	WB	WB	NB	NB
Directions Served	TR	L	T	L	R
Maximum Queue (ft)	58	141	124	75	636
Average Queue (ft)	7	70	12	16	447
95th Queue (ft)	31	125	87	63	825
Link Distance (ft)	471		187		741
Upstream Blk Time (%)			0		15
Queuing Penalty (veh)			2		0
Storage Bay Dist (ft)		170		50	
Storage Blk Time (%)		0	0	3	93
Queuing Penalty (veh)		0	1	13	7

Intersection: 5: Fairfield Dr/Murray Dr & East Butler Rd

Movement	EB	WB	WB	NB	SB
Directions Served	L	L	TR	LTR	LTR
Maximum Queue (ft)	89	28	51	161	166
Average Queue (ft)	40	3	4	52	51
95th Queue (ft)	74	17	37	163	114
Link Distance (ft)			3552	672	504
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	170	50			
Storage Blk Time (%)			0		
Queuing Penalty (veh)			0		

Intersection: 8: East Butler Rd & Old Mill Rd

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (ft)	174	1447	65	81	75
Average Queue (ft)	105	846	3	37	43
95th Queue (ft)	216	1492	24	88	70
Link Distance (ft)		3552	253	686	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	150				200
Storage Blk Time (%)	0	39			
Queuing Penalty (veh)	0	66			

Queuing and Blocking Report East Butler Corridor

AM Peak Hour
2040; Revised

Intersection: 9: Old Mill Rd

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	104	27
Average Queue (ft)	42	1
95th Queue (ft)	74	11
Link Distance (ft)	686	558
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 10: Bethel Dr & East Butler Rd












Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	68	271	125	547	175	795	124	46
Average Queue (ft)	8	263	69	300	173	488	55	13
95th Queue (ft)	43	273	136	482	178	797	105	39
Link Distance (ft)		253		1685		797		558
Upstream Blk Time (%)		36				4		
Queuing Penalty (veh)		320				0		
Storage Bay Dist (ft)	100		100		150		150	
Storage Blk Time (%)		47	5	27	47	10	0	
Queuing Penalty (veh)		2	38	19	119	39	0	

Network Summary

Network wide Queuing Penalty: 627

10: Bethel Dr & East Butler Rd
East Butler Corridor

PM Peak Hour
Ex Volume; Ex Geometry

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Volume (veh/h)	536	211	130	721	130	93		
Number	2	12	1	6	3	18		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1900	1900	1881	1937	1824	1824		
Adj Flow Rate, veh/h	583	229	141	784	141	101		
Adj No. of Lanes	1	0	1	1	1	1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Percent Heavy Veh, %	0	0	0	1	0	0		
Cap, veh/h	735	289	363	1387	198	280		
Arrive On Green	0.57	0.57	0.07	0.72	0.11	0.11		
Sat Flow, veh/h	1299	510	1791	1937	1737	1550		
Grp Volume(v), veh/h	0	812	141	784	141	101		
Grp Sat Flow(s),veh/h/ln	0	1810	1791	1937	1737	1550		
Q Serve(g_s), s	0.0	25.0	2.1	13.6	5.5	4.0		
Cycle Q Clear(g_c), s	0.0	25.0	2.1	13.6	5.5	4.0		
Prop In Lane		0.28	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	0	1023	363	1387	198	280		
V/C Ratio(X)	0.00	0.79	0.39	0.57	0.71	0.36		
Avail Cap(c_a), veh/h	0	1023	473	1506	565	607		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	0.0	12.1	11.0	4.8	30.2	25.4		
Incr Delay (d2), s/veh	0.0	6.3	0.7	0.4	4.7	0.8		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.0	14.2	1.4	7.3	2.9	1.8		
LnGrp Delay(d),s/veh	0.0	18.5	11.6	5.2	34.9	26.2		
LnGrp LOS		B	B	A	C	C		
Approach Vol, veh/h	812			925	242			
Approach Delay, s/veh	18.5			6.2	31.3			
Approach LOS	B			A	C			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	10.7	46.0				56.7		14.1
Change Period (Y+Rc), s	6.0	6.0				6.0		6.0
Max Green Setting (Gmax), s	9.0	40.0				55.0		23.0
Max Q Clear Time (g_c+l1), s	4.1	27.0				15.6		7.5
Green Ext Time (p_c), s	0.1	8.6				16.5		0.6
Intersection Summary								
HCM 2010 Ctrl Delay			14.3					
HCM 2010 LOS			B					

3: Owens Ln & East Butler Rd
East Butler Corridor

PM Peak Hour
Ex Volume; Ex Geometry

Intersection

Int Delay, s/veh 3.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	592	30	314	653	1	194
Conflicting Peds, #/hr	0	3	3	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	90	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	2	-3	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	0	0	0	1	0	0
Mvmt Flow	604	31	320	666	1	198

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	635
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.1
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.2
Pot Cap-1 Maneuver	-	-	958
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	955
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.5	16.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	165	515	-	-	955	-
HCM Lane V/C Ratio	0.006	0.384	-	-	0.336	-
HCM Control Delay (s)	27	16.3	-	-	10.7	-
HCM Lane LOS	D	C	-	-	B	-
HCM 95th %tile Q(veh)	0	1.8	-	-	1.5	-

5: Fairfield Dr/Murray Dr & East Butler Rd
East Butler Corridor

PM Peak Hour
Ex Volume; Ex Geometry

Intersection												
Int Delay, s/veh	2.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	64	734	16	2	1018	9	4	0	1	5	2	95
Conflicting Peds, #/hr	0	0	2	2	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	60	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-1	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	2	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	67	765	17	2	1060	9	4	0	1	5	2	99
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1070	0	0	781	0	0	2026	1980	775	1976	1984	1067
Stage 1	-	-	-	-	-	-	906	906	-	1069	1069	-
Stage 2	-	-	-	-	-	-	1120	1074	-	907	915	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	651	-	-	845	-	-	43	62	401	47	62	272
Stage 1	-	-	-	-	-	-	333	358	-	270	300	-
Stage 2	-	-	-	-	-	-	253	299	-	333	354	-
Platoon blocked, %												
Mov Cap-1 Maneuver	650	-	-	843	-	-	24	55	400	43	55	271
Mov Cap-2 Maneuver	-	-	-	-	-	-	24	55	-	43	55	-
Stage 1	-	-	-	-	-	-	299	321	-	242	299	-
Stage 2	-	-	-	-	-	-	159	298	-	297	318	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.9			0			148.7			40.7		
HCM LOS							F			E		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	30	650	-	-	843	-	-	203				
HCM Lane V/C Ratio	0.174	0.103	-	-	0.002	-	-	0.523				
HCM Control Delay (s)	148.7	11.2	-	-	9.3	-	-	40.7				
HCM Lane LOS	F	B	-	-	A	-	-	E				
HCM 95th %tile Q(veh)	0.5	0.3	-	-	0	-	-	2.7				

8: East Butler Rd & Old Mill Rd
East Butler Corridor

PM Peak Hour
Ex Volume; Ex Geometry

Intersection

Int Delay, s/veh 11.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	91	658	712	66	85	144
Conflicting Peds, #/hr	1	0	0	1	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	200
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	98	708	766	71	91	155

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	838	0	1705
Stage 1	-	-	802
Stage 2	-	-	903
Critical Hdwy	4.1	-	6.4
Critical Hdwy Stg 1	-	-	5.4
Critical Hdwy Stg 2	-	-	5.4
Follow-up Hdwy	2.2	-	3.5
Pot Cap-1 Maneuver	805	-	102
Stage 1	-	-	445
Stage 2	-	-	399
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	804	-	~ 89
Mov Cap-2 Maneuver	-	-	~ 89
Stage 1	-	-	445
Stage 2	-	-	350

Approach	EB	WB	SB
HCM Control Delay, s	1.2	0	82.8
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	804	-	-	-	89	386
HCM Lane V/C Ratio	0.122	-	-	-	1.027	0.401
HCM Control Delay (s)	10.1	-	-	-	188.4	20.4
HCM Lane LOS	B	-	-	-	F	C
HCM 95th %tile Q(veh)	0.4	-	-	-	6	1.9

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Queuing and Blocking Report
East Butler Corridor

PM Peak Hour
Ex Volumes; Ex Geometry

Intersection: 3: Owens Ln & East Butler Rd

Movement	EB	WB	WB	NB	NB
Directions Served	TR	L	T	L	R
Maximum Queue (ft)	52	113	194	10	139
Average Queue (ft)	5	67	13	0	58
95th Queue (ft)	26	108	85	6	105
Link Distance (ft)	471		187		747
Upstream Blk Time (%)			0		
Queuing Penalty (veh)			3		
Storage Bay Dist (ft)		90		50	
Storage Blk Time (%)		4			14
Queuing Penalty (veh)		29			0

Intersection: 5: Fairfield Dr/Murray Dr & East Butler Rd

Movement	EB	WB	WB	NB	SB
Directions Served	L	L	TR	LTR	LTR
Maximum Queue (ft)	65	9	60	44	180
Average Queue (ft)	31	0	2	7	66
95th Queue (ft)	56	5	26	28	141
Link Distance (ft)			3551	678	504
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	60	50			
Storage Blk Time (%)	1		0		
Queuing Penalty (veh)	8		0		

Intersection: 8: East Butler Rd & Old Mill Rd

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (ft)	74	111	26	217	183
Average Queue (ft)	35	15	1	92	56
95th Queue (ft)	66	68	12	192	135
Link Distance (ft)		3551	256	833	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	150				200
Storage Blk Time (%)		0		5	0
Queuing Penalty (veh)		0		7	0

Queuing and Blocking Report
East Butler Corridor

PM Peak Hour
Ex Volumes; Ex Geometry

Intersection: 10: Bethel Dr & East Butler Rd












Movement	EB	WB	WB	NB	NB
Directions Served	TR	L	T	L	R
Maximum Queue (ft)	273	124	282	157	79
Average Queue (ft)	196	61	109	73	35
95th Queue (ft)	303	111	214	125	62
Link Distance (ft)	256		1688	798	
Upstream Blk Time (%)	3				
Queuing Penalty (veh)	20				
Storage Bay Dist (ft)		100			150
Storage Blk Time (%)		0	6	0	
Queuing Penalty (veh)		3	7	0	

Network Summary

Network wide Queuing Penalty: 77

10: Bethel Dr & East Butler Rd
East Butler Corridor

PM Peak Hour
2040; Ex Geometry

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Volume (veh/h)	687	271	167	925	167	119		
Number	2	12	1	6	3	18		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1900	1900	1881	1937	1824	1824		
Adj Flow Rate, veh/h	747	295	182	1005	182	129		
Adj No. of Lanes	1	0	1	1	1	1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Percent Heavy Veh, %	0	0	0	1	0	0		
Cap, veh/h	793	313	230	1427	226	292		
Arrive On Green	0.61	0.61	0.06	0.74	0.13	0.13		
Sat Flow, veh/h	1297	512	1791	1937	1737	1550		
Grp Volume(v), veh/h	0	1042	182	1005	182	129		
Grp Sat Flow(s),veh/h/ln	0	1810	1791	1937	1737	1550		
Q Serve(g_s), s	0.0	47.4	3.1	25.6	9.2	6.6		
Cycle Q Clear(g_c), s	0.0	47.4	3.1	25.6	9.2	6.6		
Prop In Lane		0.28	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	0	1107	230	1427	226	292		
V/C Ratio(X)	0.00	0.94	0.79	0.70	0.81	0.44		
Avail Cap(c_a), veh/h	0	1107	305	1508	348	401		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	0.0	16.0	21.9	6.5	38.0	32.3		
Incr Delay (d2), s/veh	0.0	16.2	9.8	1.4	7.7	1.1		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.0	28.4	3.5	14.0	4.9	2.9		
LnGrp Delay(d),s/veh	0.0	32.2	31.6	7.9	45.7	33.4		
LnGrp LOS		C	C	A	D	C		
Approach Vol, veh/h	1042			1187	311			
Approach Delay, s/veh	32.2			11.5	40.6			
Approach LOS	C			B	D			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	11.2	61.0				72.2		17.7
Change Period (Y+Rc), s	6.0	6.0				6.0		6.0
Max Green Setting (Gmax), s	9.0	55.0				70.0		18.0
Max Q Clear Time (g_c+l1), s	5.1	49.4				27.6		11.2
Green Ext Time (p_c), s	0.2	5.0				26.6		0.5
Intersection Summary								
HCM 2010 Ctrl Delay			23.6					
HCM 2010 LOS			C					

3: Owens Ln & East Butler Rd
East Butler Corridor

PM Peak Hour
2040; Ex Geometry

Intersection						
Int Delay, s/veh	5.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	759	38	403	837	1	249
Conflicting Peds, #/hr	0	3	3	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	90	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	2	-3	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	0	0	0	1	0	0
Mvmt Flow	774	39	411	854	1	254
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	813	0	2471	797
Stage 1	-	-	-	-	794	-
Stage 2	-	-	-	-	1677	-
Critical Hdwy	-	-	4.1	-	5.8	5.9
Critical Hdwy Stg 1	-	-	-	-	4.8	-
Critical Hdwy Stg 2	-	-	-	-	4.8	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	823	-	51	416
Stage 1	-	-	-	-	512	-
Stage 2	-	-	-	-	223	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	821	-	25	415
Mov Cap-2 Maneuver	-	-	-	-	90	-
Stage 1	-	-	-	-	512	-
Stage 2	-	-	-	-	111	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		4.5		26.5	
HCM LOS					D	
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	90	415	-	-	821	-
HCM Lane V/C Ratio	0.011	0.612	-	-	0.501	-
HCM Control Delay (s)	45.5	26.4	-	-	13.7	-
HCM Lane LOS	E	D	-	-	B	-
HCM 95th %tile Q(veh)	0	4	-	-	2.9	-

5: Fairfield Dr/Murray Dr & East Butler Rd
East Butler Corridor

PM Peak Hour
2040; Ex Geometry

Intersection												
Int Delay, s/veh	16											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	82	941	21	3	1305	12	5	0	1	6	3	122
Conflicting Peds, #/hr	0	0	2	2	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	60	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-1	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	2	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	85	980	22	3	1359	12	5	0	1	6	3	127

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1372	0	0	1002	0	0	2599	2540	993	2535	2545	1368
Stage 1	-	-	-	-	-	-	1162	1162	-	1372	1372	-
Stage 2	-	-	-	-	-	-	1437	1378	-	1163	1173	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	500	-	-	699	-	-	17	28	300	19	27	181
Stage 1	-	-	-	-	-	-	240	272	-	182	216	-
Stage 2	-	-	-	-	-	-	167	214	-	239	268	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	499	-	-	698	-	-	~ 4	23	299	16	22	181
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 4	23	-	16	22	-
Stage 1	-	-	-	-	-	-	199	226	-	151	215	-
Stage 2	-	-	-	-	-	-	49	213	-	197	222	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0	\$ 1420.1	232.6
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	5	499	-	-	698	-	-	111
HCM Lane V/C Ratio	1.25	0.171	-	-	0.004	-	-	1.229
HCM Control Delay (s)	\$ 1420.1	13.7	-	-	10.2	-	-	232.6
HCM Lane LOS	F	B	-	-	B	-	-	F
HCM 95th %tile Q(veh)	1.6	0.6	-	-	0	-	-	8.9

Notes												
~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon												

8: East Butler Rd & Old Mill Rd
East Butler Corridor

PM Peak Hour
2040; Ex Geometry

Intersection

Int Delay, s/veh 54.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	117	844	913	85	109	185
Conflicting Peds, #/hr	1	0	0	1	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	200
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	126	908	982	91	117	199

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	1074	0	2187
Stage 1	-	-	1028
Stage 2	-	-	1159
Critical Hdwy	4.1	-	6.4
Critical Hdwy Stg 1	-	-	5.4
Critical Hdwy Stg 2	-	-	5.4
Follow-up Hdwy	2.2	-	3.5
Pot Cap-1 Maneuver	657	-	~ 51
Stage 1	-	-	348
Stage 2	-	-	301
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	656	-	~ 41
Mov Cap-2 Maneuver	-	-	~ 41
Stage 1	-	-	348
Stage 2	-	-	243

Approach	EB	WB	SB
HCM Control Delay, s	1.4	0	\$ 414.8
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	656	-	-	-	41	286
HCM Lane V/C Ratio	0.192	-	-	-	2.859	0.696
HCM Control Delay (s)	11.8	-	-	\$ 1047.5	42	
HCM Lane LOS	B	-	-	-	F	E
HCM 95th %tile Q(veh)	0.7	-	-	-	12.9	4.8

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Queuing and Blocking Report
East Butler Corridor

PM Peak Hour
2040; Ex Geometry

Intersection: 3: Owens Ln & East Butler Rd

Movement	EB	WB	WB	NB
Directions Served	TR	L	T	R
Maximum Queue (ft)	211	114	209	303
Average Queue (ft)	19	93	78	119
95th Queue (ft)	123	130	232	272
Link Distance (ft)	471		187	747
Upstream Blk Time (%)	0		4	
Queuing Penalty (veh)	0		60	
Storage Bay Dist (ft)		90		
Storage Blk Time (%)		19	0	48
Queuing Penalty (veh)		160	0	0

Intersection: 5: Fairfield Dr/Murray Dr & East Butler Rd

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	83	188	9	1121	52	519
Average Queue (ft)	44	16	1	148	16	491
95th Queue (ft)	80	94	7	737	49	607
Link Distance (ft)		187		3551	678	504
Upstream Blk Time (%)		1				83
Queuing Penalty (veh)		5				0
Storage Bay Dist (ft)	60		50			
Storage Blk Time (%)	10	0		7		
Queuing Penalty (veh)	97	0		0		

Intersection: 8: East Butler Rd & Old Mill Rd

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (ft)	174	331	59	848	225
Average Queue (ft)	61	100	6	779	102
95th Queue (ft)	128	264	33	1043	279
Link Distance (ft)		3551	256	833	
Upstream Blk Time (%)				84	
Queuing Penalty (veh)				0	
Storage Bay Dist (ft)	150				200
Storage Blk Time (%)		5		96	2
Queuing Penalty (veh)		5		178	2

Intersection: 10: Bethel Dr & East Butler Rd





















Movement	EB	WB	WB	NB	NB
Directions Served	TR	L	T	L	R
Maximum Queue (ft)	273	125	605	240	155
Average Queue (ft)	246	82	229	113	54
95th Queue (ft)	316	135	461	183	113
Link Distance (ft)	256		1688	798	
Upstream Blk Time (%)	11				
Queuing Penalty (veh)	100				
Storage Bay Dist (ft)		100			150
Storage Blk Time (%)		12	13	4	0
Queuing Penalty (veh)		112	22	4	0

Network Summary

Network wide Queuing Penalty: 748

10: Bethel Dr & East Butler Rd
East Butler Corridor

PM Peak Hour
2040; Revised

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	609	240	167	853	72	154	13	119	78	31	5
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1900	1900	1881	1935	1881	1824	1820	1824	1863	1863	1900
Adj Flow Rate, veh/h	5	662	261	182	927	78	167	14	129	85	34	5
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	0	0	0	1	1	0	2	2	2	2	2
Cap, veh/h	225	734	289	228	1180	99	325	36	335	166	142	21
Arrive On Green	0.57	0.57	0.57	0.06	0.67	0.67	0.10	0.24	0.24	0.09	0.09	0.09
Sat Flow, veh/h	558	1298	512	1791	1761	148	1737	153	1414	1235	1588	234
Grp Volume(v), veh/h	5	0	923	182	0	1005	167	0	143	85	0	39
Grp Sat Flow(s),veh/h/ln	558	0	1810	1791	0	1909	1737	0	1567	1235	0	1822
Q Serve(g_s), s	0.8	0.0	58.4	5.3	0.0	47.4	10.9	0.0	9.9	8.7	0.0	2.6
Cycle Q Clear(g_c), s	34.7	0.0	58.4	5.3	0.0	47.4	10.9	0.0	9.9	8.7	0.0	2.6
Prop In Lane	1.00		0.28	1.00		0.08	1.00		0.90	1.00		0.13
Lane Grp Cap(c), veh/h	225	0	1023	228	0	1279	325	0	372	166	0	163
V/C Ratio(X)	0.02	0.00	0.90	0.80	0.00	0.79	0.51	0.00	0.38	0.51	0.00	0.24
Avail Cap(c_a), veh/h	225	0	1023	291	0	1346	391	0	510	228	0	254
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	31.7	0.0	24.9	28.4	0.0	14.9	45.1	0.0	41.3	57.5	0.0	54.7
Incr Delay (d2), s/veh	0.2	0.0	12.6	11.4	0.0	3.0	1.3	0.0	0.7	2.4	0.0	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	32.5	4.5	0.0	25.9	5.3	0.0	4.4	3.1	0.0	1.3
LnGrp Delay(d),s/veh	31.8	0.0	37.4	39.8	0.0	17.9	46.3	0.0	42.0	59.9	0.0	55.4
LnGrp LOS	C		D	D		B	D		D	E		E
Approach Vol, veh/h		928			1187			310			124	
Approach Delay, s/veh		37.4			21.2			44.3			58.5	
Approach LOS		D			C			D			E	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4		6		8				
Phs Duration (G+Y+Rc), s	13.5	79.0	19.1	17.5		92.5		36.6				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0		6.0		6.0				
Max Green Setting (Gmax), s	12.0	73.0	18.0	18.0		91.0		42.0				
Max Q Clear Time (g_c+l1), s	7.3	60.4	12.9	10.7		49.4		11.9				
Green Ext Time (p_c), s	0.2	10.1	0.2	0.7		23.9		1.4				
Intersection Summary												
HCM 2010 Ctrl Delay			31.7									
HCM 2010 LOS			C									

3: Owens Ln & East Butler Rd
East Butler Corridor

PM Peak Hour
2040; Revised

Intersection

Int Delay, s/veh 5.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	759	38	403	837	1	249
Conflicting Peds, #/hr	0	3	3	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	170	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	2	-3	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	0	0	0	1	0	0
Mvmt Flow	774	39	411	854	1	254

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	813
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.1
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.2
Pot Cap-1 Maneuver	-	-	823
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	821
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.5	26.5
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	90	415	-	-	821	-
HCM Lane V/C Ratio	0.011	0.612	-	-	0.501	-
HCM Control Delay (s)	45.5	26.4	-	-	13.7	-
HCM Lane LOS	E	D	-	-	B	-
HCM 95th %tile Q(veh)	0	4	-	-	2.9	-

5: Fairfield Dr/Murray Dr & East Butler Rd
East Butler Corridor

PM Peak Hour
2040; Revised

Intersection												
Int Delay, s/veh	16											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	82	941	21	3	1305	12	5	0	1	6	3	122
Conflicting Peds, #/hr	0	0	2	2	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	170	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-1	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	2	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	85	980	22	3	1359	12	5	0	1	6	3	127

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1372	0	0	1002	0	0	2599	2540	993	2535	2545	1368
Stage 1	-	-	-	-	-	-	1162	1162	-	1372	1372	-
Stage 2	-	-	-	-	-	-	1437	1378	-	1163	1173	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	500	-	-	699	-	-	17	28	300	19	27	181
Stage 1	-	-	-	-	-	-	240	272	-	182	216	-
Stage 2	-	-	-	-	-	-	167	214	-	239	268	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	499	-	-	698	-	-	~ 4	23	299	16	22	181
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 4	23	-	16	22	-
Stage 1	-	-	-	-	-	-	199	226	-	151	215	-
Stage 2	-	-	-	-	-	-	49	213	-	197	222	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0	\$ 1420.1	232.6
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	5	499	-	-	698	-	-	111
HCM Lane V/C Ratio	1.25	0.171	-	-	0.004	-	-	1.229
HCM Control Delay (s)	\$ 1420.1	13.7	-	-	10.2	-	-	232.6
HCM Lane LOS	F	B	-	-	B	-	-	F
HCM 95th %tile Q(veh)	1.6	0.6	-	-	0	-	-	8.9

Notes												
~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon												

Intersection						
Int Delay, s/veh	4.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	117	844	913	5	5	185
Conflicting Peds, #/hr	1	0	0	1	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	200
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	126	908	982	5	5	199
Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	988	0	-	0	2144	986
Stage 1	-	-	-	-	985	-
Stage 2	-	-	-	-	1159	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	708	-	-	-	54	303
Stage 1	-	-	-	-	365	-
Stage 2	-	-	-	-	301	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	707	-	-	-	44	302
Mov Cap-2 Maneuver	-	-	-	-	44	-
Stage 1	-	-	-	-	365	-
Stage 2	-	-	-	-	247	-
Approach	EB		WB		SB	
HCM Control Delay, s	1.4		0		38.8	
HCM LOS					E	
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	707	-	-	-	44	302
HCM Lane V/C Ratio	0.178	-	-	-	0.122	0.659
HCM Control Delay (s)	11.2	-	-	-	97.9	37.2
HCM Lane LOS	B	-	-	-	F	E
HCM 95th %tile Q(veh)	0.6	-	-	-	0.4	4.3

Intersection						
Int Delay, s/veh	3.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	117	5	5	85	58	100
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	127	5	5	92	63	109
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	220	117	172	0	-	0
Stage 1	117	-	-	-	-	-
Stage 2	103	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	773	941	1417	-	-	-
Stage 1	913	-	-	-	-	-
Stage 2	926	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	770	941	1417	-	-	-
Mov Cap-2 Maneuver	770	-	-	-	-	-
Stage 1	913	-	-	-	-	-
Stage 2	922	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	10.6	0.4		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1417	-	776	-	-	
HCM Lane V/C Ratio	0.004	-	0.171	-	-	
HCM Control Delay (s)	7.5	0	10.6	-	-	
HCM Lane LOS	A	A	B	-	-	
HCM 95th %tile Q(veh)	0	-	0.6	-	-	

Queuing and Blocking Report
East Butler Corridor

PM Peak Hour
2040; Revised

Intersection: 3: Owens Ln & East Butler Rd

Movement	EB	WB	WB	NB	NB
Directions Served	TR	L	T	L	R
Maximum Queue (ft)	269	187	239	18	337
Average Queue (ft)	21	124	79	1	116
95th Queue (ft)	148	188	250	9	308
Link Distance (ft)	471		187		741
Upstream Blk Time (%)	1	1	8		
Queuing Penalty (veh)	0	0	114		
Storage Bay Dist (ft)		170		50	
Storage Blk Time (%)		4	8		41
Queuing Penalty (veh)		30	33		0

Intersection: 5: Fairfield Dr/Murray Dr & East Butler Rd

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	160	193	43	1430	59	519
Average Queue (ft)	58	16	4	214	13	483
95th Queue (ft)	130	103	22	942	49	633
Link Distance (ft)		187		3552	672	504
Upstream Blk Time (%)	1	2				85
Queuing Penalty (veh)	0	20				0
Storage Bay Dist (ft)	170		50			
Storage Blk Time (%)	4	2		9		
Queuing Penalty (veh)	36	2		0		

Intersection: 8: East Butler Rd & Old Mill Rd

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (ft)	174	735	25	74	148
Average Queue (ft)	66	343	1	20	69
95th Queue (ft)	161	761	13	57	121
Link Distance (ft)		3552	255	1049	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	150				200
Storage Blk Time (%)	0	21			
Queuing Penalty (veh)	1	25			

Intersection: 9: Old Mill Rd

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	73	10
Average Queue (ft)	37	1
95th Queue (ft)	60	8
Link Distance (ft)	1049	828
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

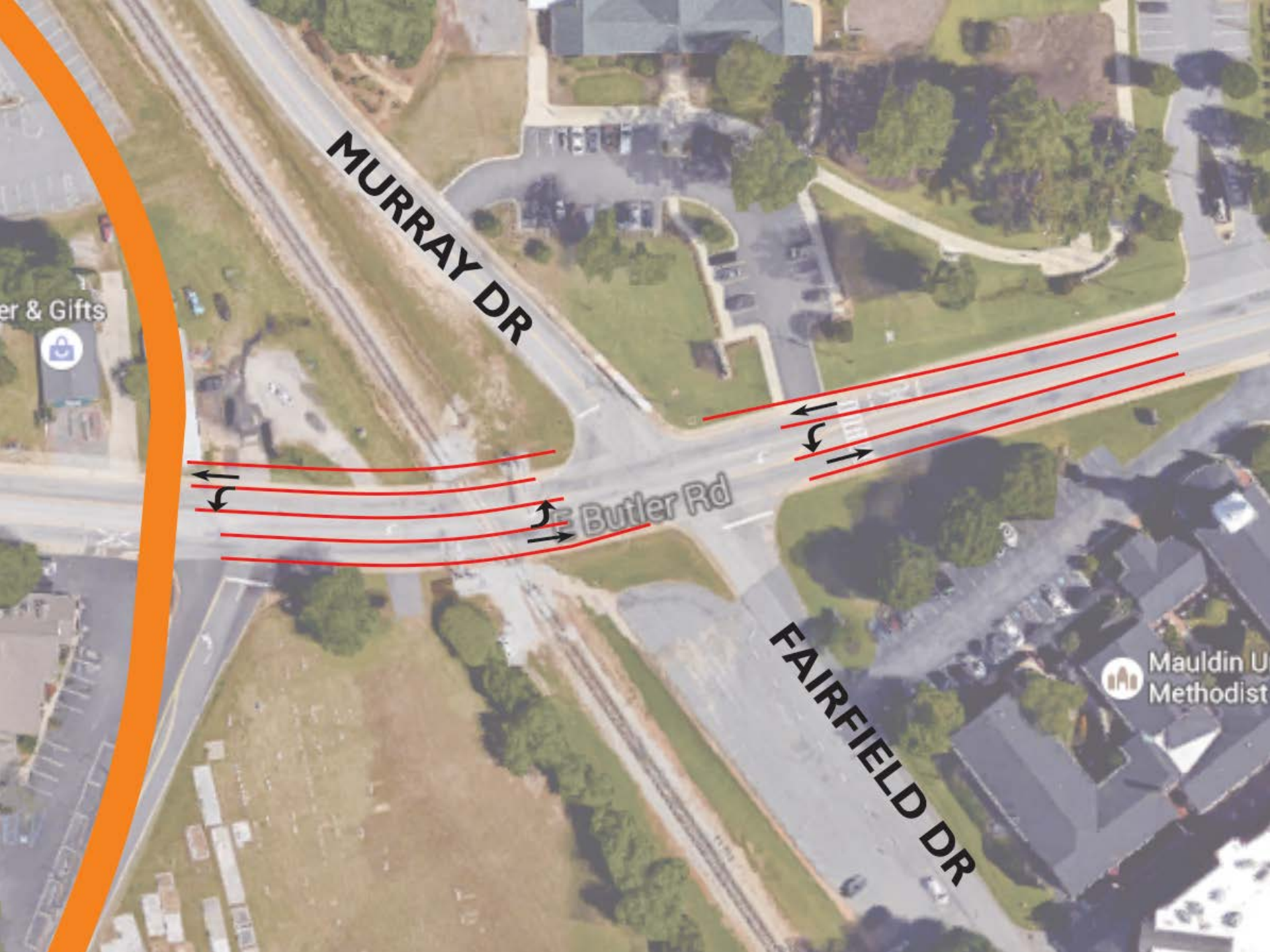
Intersection: 10: Bethel Dr & East Butler Rd

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	93	272	125	1219	170	173	162	134
Average Queue (ft)	5	254	102	579	113	75	71	39
95th Queue (ft)	38	302	149	1082	175	138	132	102
Link Distance (ft)		255		1684		797		828
Upstream Blk Time (%)		25						
Queuing Penalty (veh)		210						
Storage Bay Dist (ft)	100		100		150		150	
Storage Blk Time (%)		40	32	26	4	1	2	
Queuing Penalty (veh)		2	292	43	6	1	1	

Network Summary

Network wide Queuing Penalty: 815

Appendix D
PROPOSED REVISIONS



MURRAY DR

Butler Rd

FAIRFIELD DR

er & Gifts



Mauldin U
Methodist



Realign Old Mill Road with 450' radii curves (design speed ~35mph) to form four-way intersection with Bethel

Convert existing Old Mill Road to right-in/right-out