BULLOCH COUNTY / CITY OF STATESBORO

2035 LONG RANGE TRANSPORTATION PLAN

Sub-Area Study and Policy Guide Report

HNTB

Bulloch County / City of Statesboro 2035 Long Range Transportation Plan

Sub Area Study and Policy Guide Report

Prepared for:

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Table of Contents

1.0 Introduction 5
2.0 Intersection Operations and Maintenance 6
3.0 Sub Area Intersection Analysis 15
4.0 Potential Intersection Improvements 21
5.0 Access Management Policies 25
6.0 Conceptual Street Hierarchy and Design Guidelines 28
7.0 Development Review 37

Appendix A - Access Management Toolkit 42

List of Tables

Table 2.0 Advantages and Disadvantages of Roundabouts..13

Table 3.0 Existing Intersection Characteristics..16

Table 3.1 Existing AM Peak Turning Movement Counts 17

Table 3.2 Existing PM Peak Turning Movement Counts 17

Table 3.3 2035 AM Peak Turning Movement Counts...18

Table 3.4 2035 PM Peak Turning Movement Counts...18

Table 3.5 LOS Threshold for Signalized Intersections 19

Table 3.6 LOS Thresholds for Unsignalized Intersections...20

Table 3.7 2007 Existing Intersection Operational Analysis..20

Table 3.8 2035 No-Build Intersection Operational Analysis..21

Table 4.1 2035 Build Intersection Operation Analysis (Signal or Stop Controlled Intersections) 24

Table 4.2 2035 Build Intersection Operation Analysis (Roundabouts)...............................24

Table 6.0 Conceptual Street Hierarchy – Summary of Elements 31

List of Figures

Figure 1.0 Bulloch County Sub Area Map 6

Figure 2.0 Intersection Control Guidelines 7

Figure 2.1 Urban Roundabout........ 10

Figure 2.2 Sustainable Roundabout........ 11

Figure 3.0 Study Intersections 15

Figure 4.0 Proposed Intersection Improvements........ 22

Figure 4.1 Roundabout with a Traversable Apron 23

Figure 6.0 Conceptual Street Hierarchy Map 30

Figure 6.1 Conceptual Street Hierarchy – Boulevards........ 32

Figure 6.2 Conceptual Street Hierarchy – Avenues 33

Figure 6.3 Conceptual Street Hierarchy – Main Streets 34

Figure 6.4 Conceptual Street Hierarchy – Minor Connectors 35

Figure 6.5 Conceptual Street Hierarchy – Neighborhood Streets........ 36

SUB AREA STUDY REPORT

1.0 Introduction

Bulloch County and the City of Statesboro have experienced considerable growth over the last several decades, increasing population by more than 50% between 1980 and 2000 and exceeding the statewide growth rate. Much of this growth can be attributed to the presence of Georgia Southern University, the largest university in South Georgia boasting the 6th largest student enrollment in the Georgia University System, with approximately, 17,748 students enrolled in the fall of 2008. As part of the Bulloch County / City of Statesboro 2035 LRTP analysis efforts, a sub-area study was initiated to take a closer look at the area just south of the Georgia Southern University campus where some development currently exists and is anticipated to further increase with university enrollment. The sub-area includes development south of the US 301 Bypass, bounded to the east by Highway 80, to the south by Burkhalter Road and Golf Club Drive / Josh Deal Road and to the west by Old Register Road. Figure 1.0 on page 2 illustrates the sub-area study area. This area is expected to see tremendous development pressure as growth continues. The population of the sub-area is expected to increase 50% from 3,583 to 5,359 by the year 2035. Households are also expected to increase by 50% from 1,485 to 2,225 within these boundaries.

This memorandum includes intersection-level analysis along Langston Chapel Road and Burkhalter Road, the major east-west transportation corridor in the sub-area as well as policy guidance to support the future development of the transportation network within the area. Proactively planning for anticipated growth and development provides Bulloch County and the City of Statesboro with an opportunity to introduce concepts that will benefit the area and alleviate future roadway congestion by providing transportation options, establishing an appropriate balance of land uses, and developing a safe, well connected system for mobility throughout the area.

The intent of this document is not an exhaustive set of policies and recommendations but an overview of policies, references and potential recommendations that support the future goals of Bulloch County and the City of Statesboro. It is anticipated that this information will serve as a foundation to the County and City that can be expanded and refined to reflect local realities and respond to changing development pressures in the sub-area.

The report addresses the following topics:

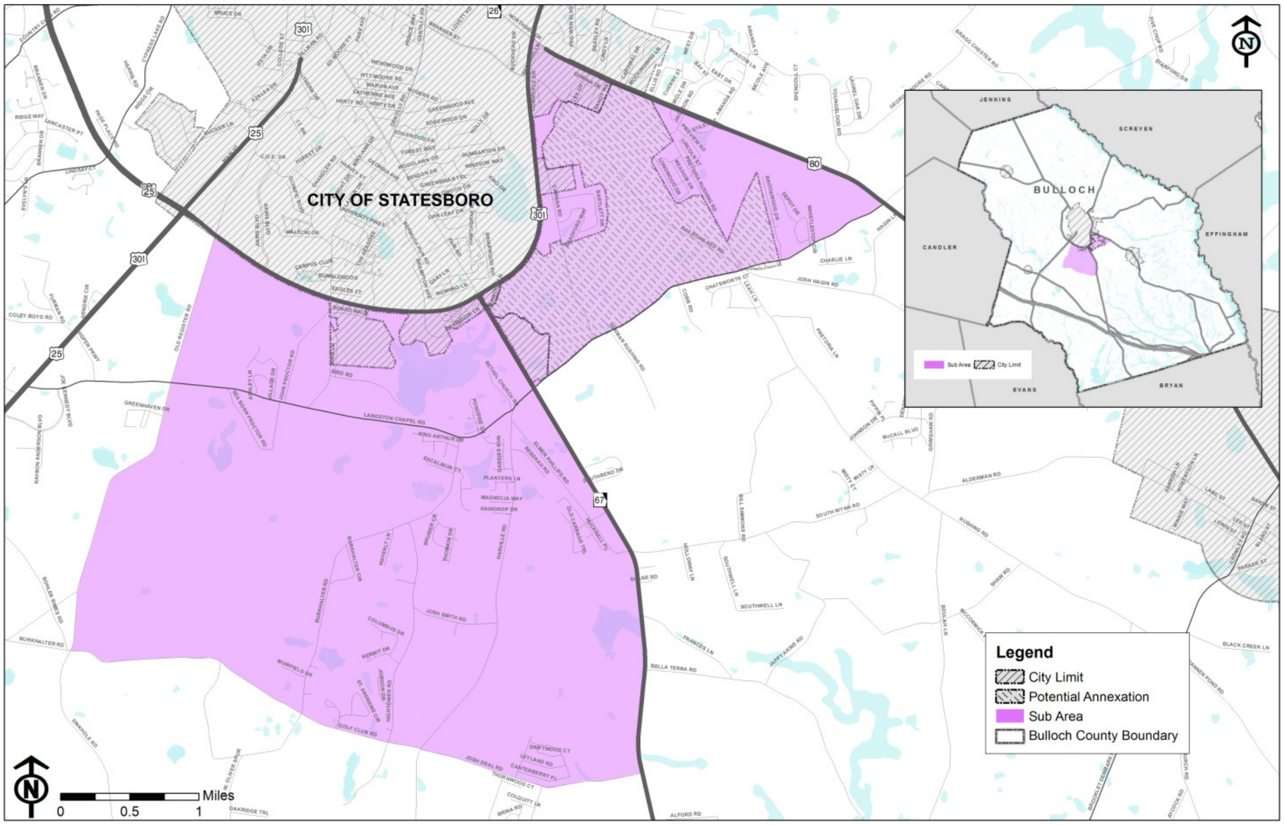
Intersection Operations and Maintenance;

Access Management Strategies,

Conceptual Street Hierarchy and Design Guidelines; and

Development Review.

Figure 1.0 Bulloch County Sub Area Map



2.0 Intersection Operations and Maintenance

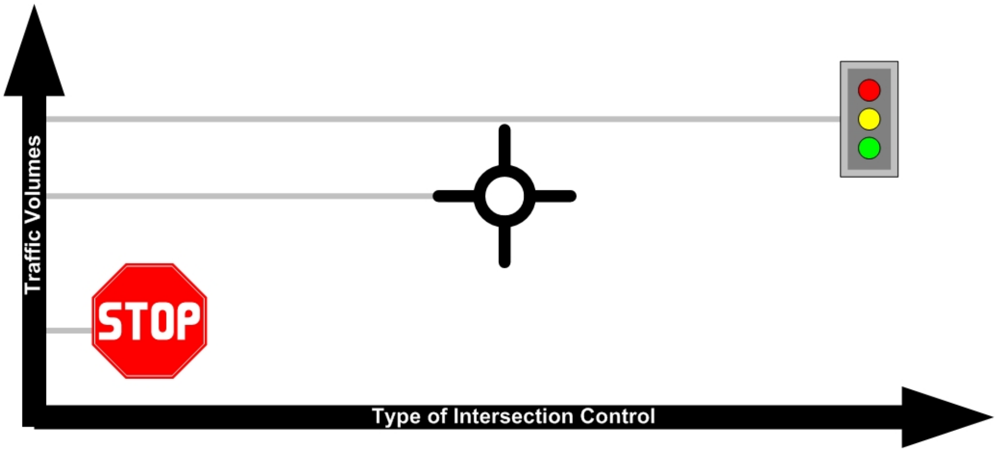
Effective intersection operations can significantly contribute to facility safety and performance as an area experiences increases in traffic volumes. The identification and implementation of the appropriate type of traffic control at an intersection is therefore integral to a facility's long-term performance. There are many factors to consider when determining appropriate intersection controls. Certainly the volume and distribution of traffic are key factors; however, it is also important to note the cost of maintenance.

Often intersection control is provided by allowing free movements on the main approaches and providing a stop sign as a control device on the minor facility. Under more balanced traffic volumes, stop control may be provided on each approach to an intersection.

As traffic increases, stop controlled intersections are unable to maintain an acceptable level of service on the minor approaches. This can be overcome by converting the intersection control to a traffic signal. Traffic signals provide a more efficient traffic control method as traffic volumes exceed the stop controlled intersections' capability to provide a safe and efficient intersection control; however, delay is introduced to the main approaches. There are also higher costs associated with maintaining and operating traffic signals.

One intermediate option for intersections with higher traffic volumes is the use of roundabouts. A properly designed roundabout can handle nearly as much traffic as a signalized intersection with lower maintenance costs as well as secondary traffic calming benefits. The following sections present the characteristics associated with the three main types of intersection controls as illustrated in Figure 2.0 below.

Figure 2.0 Intersection Control Guidelines



Stop Controlled Intersections

There are two main types of stop controlled intersections:

- Two-Way Stop Control (TWSC); and
- All-Way Stop Control (AWSC).

Two-Way Stop Control

TWSC accommodates low to moderate traffic volumes and introduces less delay than traffic signals; however, this type of intersection control protects major street movements at the expense of the minor street movements. When the major street traffic volumes are 1,400 vehicles per hour (vph) or more there is little or no opportunity for cross street access. This increased delay on the minor approaches places a limit on the application of TWSC. Even when TWSC capacity is not exceeded, there is often public pressure to install signals at TWSC intersections.

All-Way Stop Control

AWSC provides stop control to all approaches of an intersection. This traffic control benefits cross street movements more favorably, without the wasted delay time associated with traffic signals. However, the rate at which vehicles may enter an intersection (headway) under AWSC is relatively low and, therefore, the total intersection capacity is somewhat limited.

It is difficult to justify AWSC when there is an unequal distribution of traffic volumes along the intersection approaches. AWSC applications are also limited on intersection approaches with high posted speeds and limited or no roadway lighting introducing stop situations increasing the likelihood of rear end collisions.

Signalized Intersections

Traffic signals are able to provide adequate traffic operations for facilities with high approach volumes. Traffic signals do however cause unnecessary delay such as:

- Providing a minimum green time to each movement in every cycle, which creates time intervals where no vehicles are entering the intersection;
- Startup and termination times of a green phase;
- Left turns from shared lanes can impede the other movements in the lane; and,
- Dedicated left turn phases that use time from the major movements and increase the total time lost due to startup and termination of traffic movements.

Another thing to consider is that traffic signals are mechanical devices that require maintenance and have a potential of malfunctioning, such as during power failures. Additionally, many signal violations occur at higher speeds so that the severity of accidents is often high. Permitted left turns and right turns on red introduce additional conflicts.

Signal Warrants

The Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition contains eight warrants that are used to aid engineers in determining if a traffic signal is appropriate for an intersection under study. All eight warrants do not have to be met; however, the more warrants an intersection meets, the higher the potential need for signalization. The signal warrants should always be accompanied with a professional engineer’s qualitative assessment which includes a review of traffic volumes and geometric conditions. The following eight warrants are documented in further detailed in the MUTCD 2003 Edition:

- **Warrant 1 – Eight-Hour Vehicular Volume**
  - This warrant is intended for application where a large volume of intersecting traffic is the principal reason for consideration of signal installation. This warrant applies to operating conditions where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or hazard in entering a major street. Minimum volumes are given for each of any 8 hours of an average day.
- **Warrant 2 – Four-Hour Vehicular Volume**
  - This warrant is satisfied when each of any 4 hours of an average day are above a certain volume combination for the major and minor streets.

- **Warrant 3 – Peak Hour**
    - This warrant is intended for application when traffic conditions are such that for a minimum of one hour of an average day, minor street traffic suffers undue traffic delay in entering or crossing the major street.

- **Warrant 4 – Pedestrian Volume**
    - This warrant states that a traffic signal may be installed where the pedestrian volume crossing the major street at a location during an average day is:
    - 100 or more per hour for each of any 4 hours, or
    - 190 or more during any one hour
    - and there shall be less than 60 adequate gaps per hour in the traffic stream.

- **Warrant 5 – School Crossing**
    - This warrant states a traffic signal may be installed at an established school crossing where the number of adequate gaps in the traffic stream is less than one per minute in the period when children are using the crossing and there are a minimum of 20 students crossing during the highest crossing hour.

- **Warrant 6 – Coordinated Signal System**
    - This warrant specifies conditions where a traffic signal may be warranted in order to maintain proper platooning of vehicles.

- **Warrant 7 – Crash Experience**
    - This warrant is satisfied when an adequate trial of less restrictive remedies has failed to reduce the crash frequency of five or more reported crashes of types susceptible to correction by traffic signal control and minimum vehicle and pedestrian volumes are present.

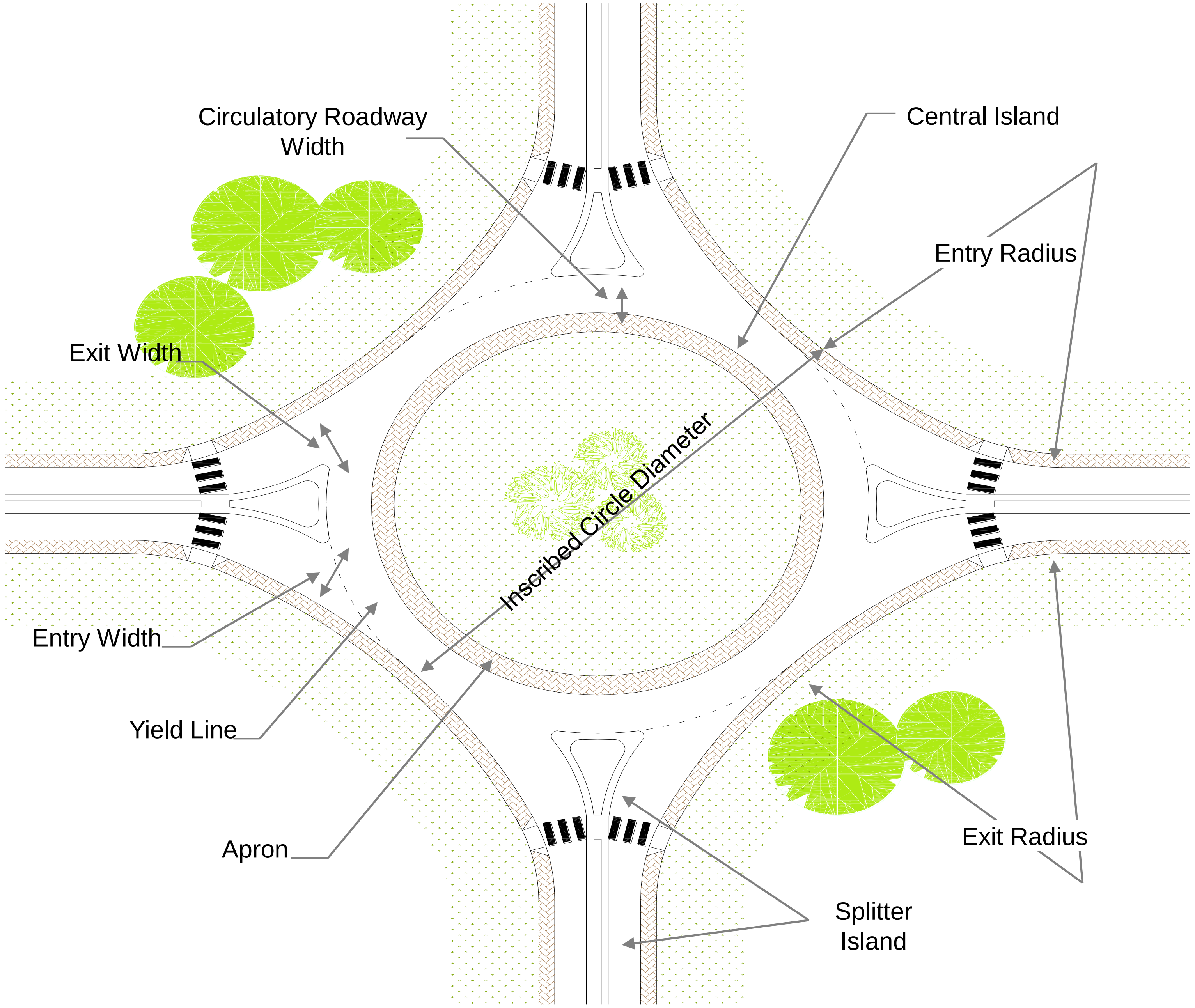
- **Warrant 8 – Roadway Network**
    - This warrant specifies conditions where a traffic signal may be justified to encourage concentration and organization of traffic flow.

Roundabouts

Although roundabouts are commonly used as intersection control in numerous countries around the world, they are not as common in the U.S. Roundabouts provide an alternative to stop controlled and signalized intersections. Roundabouts handle more traffic than a stop controlled intersection, but require less ongoing maintenance than signalized intersections.

A roundabout allows traffic to flow counterclockwise around a central island. As vehicular traffic approaches a roundabout intersection, it is required to yield to traffic traveling within the roundabout.

A roundabout overcomes several disadvantages encountered with signalized or stop controlled intersections. First, there is no sequential assignment of operational right-of-way and therefore no wasted time or delay per vehicle. Second, left turns are not subordinated to through traffic as they are with the other intersection controls. Vehicles enter under yield control instead of stop control and therefore have shorter headways which translate to higher intersection capacity. Additionally, there are no electrical components that require maintenance and may potentially malfunction. An urban roundabout is presented in Figure 2.1 on page 10.



<u>Inscribed Circle:</u> The circle formed just inside of the outer curb line of the circulatory roadway.

<u>Circulatory Roadway:</u> The roadway around the central island on which circulating vehicles travel in a counterclockwise direction. The width of the circulatory roadway depends mainly on the number of entry lanes and the radius of vehicle paths.

<u>Central Island:</u> Traffic circulates around the central island. The central island may either be raised (non-traversable) or flush (traversable). Its size is determined by the width of the circulatory roadway and the diameter of the inscribed circle. The width of any truck apron provided is included in the central island width.

<u>Truck Apron:</u> The mountable portion of the central island that is drivable specifically provided to accommodate the path of the rear left wheels of larger vehicles.

<u>Splitter Island:</u> A splitter island is placed within the approach leg of a roundabout to separate entering and exiting traffic, provide a refuge for crossing pedestrians and bicyclists, and prevent wrong way movements. It is usually designed with raised curbing to deflect, and thereby reduce the speed of, entering traffic, and to provide a safer refuge.

<u>Yield Line:</u> A broken line marked across the entry roadway where it meets the outer edge of the circulatory roadway and where entering vehicles wait, if necessary, for an acceptable gap to enter the circulating flow.

<u>Approach Width:</u> This approach width refers to the half of the roadway that is approaching the roundabout. It is also referred to as approach half-width.

<u>Departure Width:</u> This departure width refers to the half of the roadway that is departing the roundabout. It is also referred to as departure half-width.

<u>Entry Width:</u> The entry width is the perpendicular distance from the right curb line of the entry to the intersection of the left edge line and the inscribed circle.

<u>Exit Width:</u> The exit width is the perpendicular distance from the right curb line of the exit to the intersection of the left edge line and the inscribed circle. Exits should be easily negotiable in order to keep traffic flowing through the roundabout and accelerate out of it. Exit radii should then be larger than entering radii.

<u>Flare:</u> A flare may be used to increase the capacity of a roundabout by providing additional lanes at the entry. Because flared entries tend to increase the potential for accidents, they should be used only when required by traffic volumes.

<u>Entry Angle:</u> To provide the optimum deflection for entering vehicles, the angle of entry should be approximately 30 to 60 degrees. Smaller angles reduce visibility to the driver's left, while larger angles cause excessive braking on entry and a resulting decrease in capacity.

<u>Entry Radius:</u> The entry radius is the minimum radius of curvature measured along the right curb at entry. Smaller radii may decrease capacity, while larger radii may cause inadequate entry deflection.

<u>Exit Radius:</u> The exit radius is the minimum radius of curvature measured along the right curb at exit.

<u>Bypass Lane:</u> A bypass lane may be warranted for heavy right turn volumes.

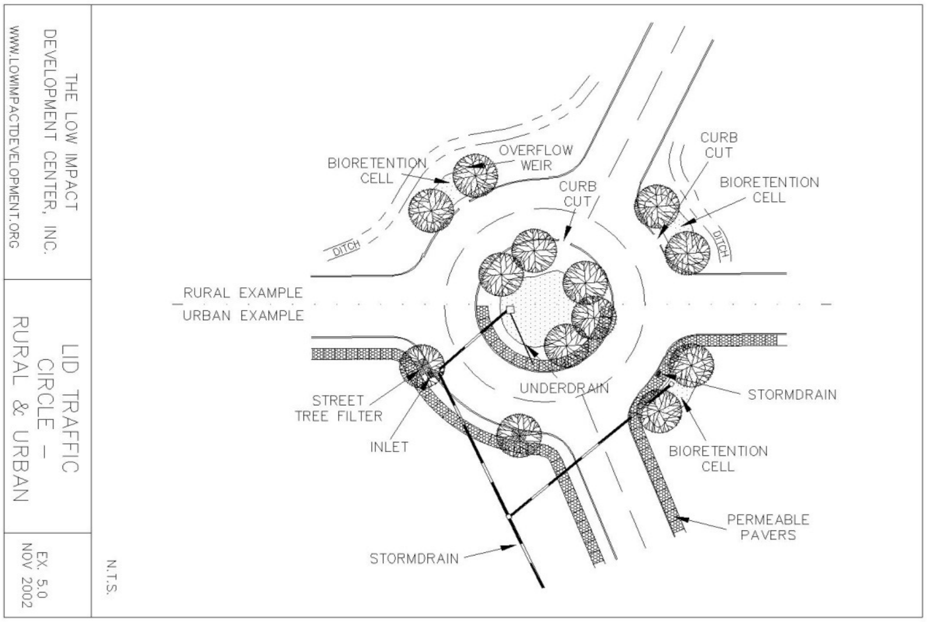
<u>Pedestrian Crossing:</u> The location of the pedestrian crossing, if one is provided, is generally recommended to be one to three vehicle lengths behind the yield line. Bringing crossings closer to the circle would reduce roundabout capacity, and place pedestrians at greater risk from entering and exiting vehicles, while placing crossings further away would expose pedestrians to higher speed approaching and departing vehicles. Care must be taken, however, to ensure that pedestrian crossings are visible to all drivers.

Urban Roundabout

Figure 2.1

Roundabouts also provide the opportunity to incorporate environmentally sustainable practices into transportation infrastructure, such as bioretention, which helps filter pollutants from stormwater runoff. The example in Figure 2.2 below includes overflow weirs, bioretention cells, and curb cuts to allow for drainage. The urban example uses street tree filters, permeable pavers, and a bioretention cells as well as stormdrains, underdrains, and inlets. For more information, visit www.lowimpactdevelopment.org.

Figure 2.2 Sustainable Roundabout



Source: www.lowimpactdevelopment.org

Generally, roundabouts experience fewer accidents than comparable signal or stop controlled intersections. However, roundabouts do have some limitations:

- Entry headways are typically shorter at traffic signals because of the positive assignment of right-of-way. By using long cycle times to minimize startup lost time, it is possible to achieve higher approach capacities.
- For very low-volume intersections, Three Way Stop Controls and All Way Stop Controls are easier and less expensive to implement.
- Since roundabout operation is not periodic, it is not possible to coordinate the operation of roundabouts on an arterial route to provide smooth progression for arterial flows.
- Each vehicle entering the intersection must yield to all traffic that has already entered.

- Roundabouts are a relatively new form of traffic control that is not familiar to many motorists in the US, but experience has found that drivers learn quickly how to drive through a roundabout.

- Roundabouts may not be lighted resulting in the possibility of night time crashes.

Therefore, roundabouts are not the solution to all traffic problems at all locations. Careful study is required to identify the most appropriate control method at any given location. The studies required to justify the installation of traffic signal control and all-way stop control are based on the warrants and requirements set forth in the Manual of Uniform Traffic Control Devices (MUTCD) however; there are no warrants specifically for roundabouts.

Roundabout Resources

FHWA published a comprehensive report on roundabouts entitled "Roundabouts: An Informational Guide" (FHWA 2000). This report contains additional information concerning roundabouts and can be downloaded at http://www.tfhrc.gov/safety/00068.htm.

Software, such as SIDRA, RODEL, ARCADY, and HCS, has been developed to help analyze the operations of roundabouts. SIDRA is more commonly used in the United States and RODEL and ARCADY are more commonly used overseas. These software are useful in determining capacities, queue lengths and delays associated with roundabouts.

Roundabouts in Georgia

GDOT has a policy guide concerning roundabouts in section 4A-2 of their Transportation Online Policy & Procedure System (TOPPS). Currently, GDOT accepts requests for roundabouts only at intersections with single lane approaches. Additional GDOT criteria are as follows:

- Total entering annual daily traffic (ADT) less than 16,000 vehicles per day (vpd);
- Circulating traffic less than 1,800 vehicles per hour (vph); and,
- A maximum mainline to sidestreet traffic split of 75% / 25%.

GDOT has identified the following conditions as appropriate for roundabout installation:

- Locations with high delays;
- Locations where traffic signals are not warranted;
- Four-way stop intersections;
- Intersections with more than four legs;
- Intersections with high left-turn flows;
- Intersections with unusual geometry;
- Intersections with changing traffic patterns;
- Locations where storage capacities for signalized intersections are restricted; and,
- Intersections that are important from an urban design or visual point of view.

Table 2.0 on page 13 displays the advantages and disadvantages of roundabouts. In addition, a comparison between stop sign controls, traffic signals, and roundabouts can be found in Table 6.I. on page 131 of the Bulloch County / City of Statesboro 2035 Long Range Transportation Plan Technical Memorandum.

Table 2.0 Advantages and Disadvantages of Roundabouts

Category	Advantages	Disadvantages
Safety	- There are a reduced number of conflict points compared to uncontrolled intersection. - Lower operational speeds yield fewer and less severe accidents. - Slower speeds because of intersection geometry reduce accidents.	- Since roundabouts are unfamiliar to the average driver in the US, there may be an initial period where accidents increase. - Signalized intersections can preempt control for emergency vehicles.
Capacity	- Traffic yields rather than stops, often resulting in the acceptance of smaller gaps. - For isolated intersections, roundabouts should give higher capacity/lane than signalized intersections due to the omission of lost time (red and yellow) at signalized intersections.	- Where the coordinated signal network can be used, a signalized intersection will increase the overall capacity of the network. - Signals may be preferred at intersections that periodically operate at higher than designed capacities.
Delay	- Overall delay will probably be less than for an equivalent volume signalized intersection (this does not equate to a higher level of service). - During the off-peak, signalized intersections with no retiming produce unnecessary delays to stopped traffic when gaps on the other flow are available.	- Drivers may not like the geometric delays which force them to divert their cars from straight paths. - When queuing develops, entering drivers tend to force into the circulating streams with shorter gaps. This may increase the delays on other legs and the number of accidents.
Cost	- Maintenance costs of signalized intersections include electricity, maintenance of loops, signal heads, controller, and timing plans (roundabout maintenance includes only landscape maintenance, illumination, and occasional sign replacement). - Accident costs are low due to the low number of accidents and	- Construction costs may be higher. - In some locations, roundabouts may require more illumination, increasing costs.

Category	Advantages	Disadvantages
	severity.	
Pedestrians and Bicyclists	- A splitter island provides a refuge for pedestrians that will increase safety. - Low speeds reduce frequency and severity of pedestrian-vehicle accidents.	- Difficult for visually impaired pedestrians to interpret vehicle-pedestrian priority. - No stopped phase for pedestrians who want security of a signal. - Tight dimensions of roundabouts may create an uncomfortable feeling to bicyclists. - Longer paths increase travel distances for both pedestrians and bicyclists. - Roundabouts may increase delay for pedestrians seeking acceptable gaps to cross.

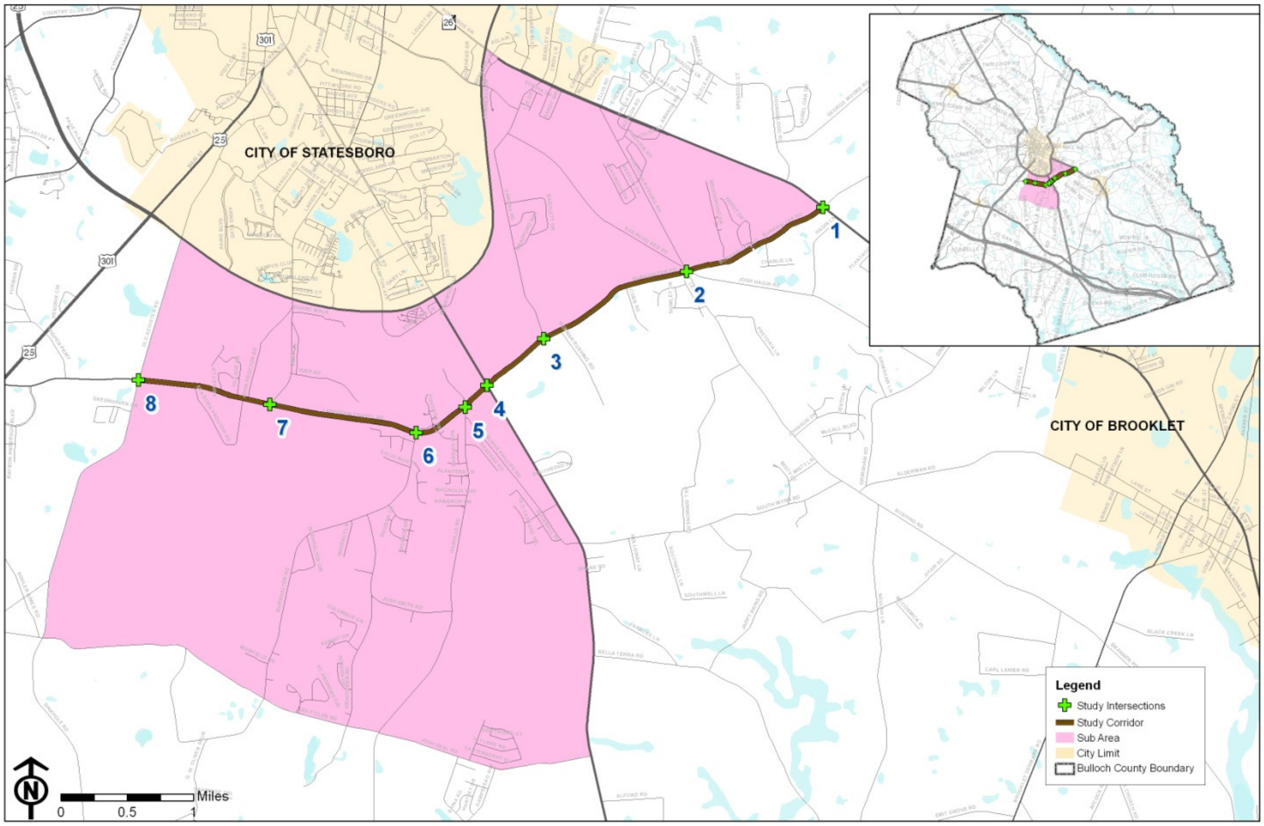
Source: GDOT's TOPPS 4A-2

3.0 Sub Area Intersection Analysis

When evaluating the operations of intersections, it is important to consider the full range of traffic control options – including stop control, traffic signals and roundabouts. As a part of the sub-area study, an operational analysis was conducted for eight intersections along Langston Chapel Road and Burkhalter Road between Old Register Road and US 80 to identify potential intersection improvements. This corridor serves as a primary east-west primary transportation route connecting US 301, SR 67, and US 80. Projected growth and anticipated development in the sub-area are expected to contribute to increased traffic volumes on this corridor in the future. Future traffic should be accommodated with necessary improvements to ensure the efficient operations and safety of this facility in the future.

Highway Capacity Software (HCS) was utilized to perform this intersection analysis. HCS implements the procedures for signalized or unsignalized intersection analysis defined in the 2000 Highway Capacity Manual (HCM 2000). The output of the HCS analysis is an evaluation of intersection Level of Service (LOS) based on inputs including intersection characteristics and traffic volumes. The following section describes the analysis of existing LOS of major intersections along the study corridor as illustrated in Figure 3.0 on page 16, including estimation of the future LOS for each intersection. Potential improvements for each intersection are recommended based on the analysis results.

Figure 3.0 Study Intersections



Existing and Future Traffic Data

Existing (2007) Intersection Characteristics

The study corridor is a 6.5-mile bi-directional two-lane facility functionally classified as an Urbanized Minor Arterial. Eight intersections along the Study Corridor were selected as study intersections based on discussions with Bulloch County Staff and the Bulloch County / City of Statesboro 2035 LRTP Study Advisory Committee. Characteristics of each of the eight intersections along the corridor are listed in Table 3.0 on page 17 – these serve as input information for the HCS analysis.

As shown in Table 3.0 on page 16, the only signalized intersection along the corridor is located at the intersection of Burkhalter Road and SR 67. There is an exclusive left turn lane on SR 67 with a length of 280 feet. SR 67 is a bi-directional two-lane facility at this intersection. All other stop controlled intersections along the corridor are comprised of bi-directional two-lane facilities with no exclusive turn lanes. Field research shows that the angles of most of these intersections are acceptable geometries (equal to or close to 90 degrees), with the exception of intersection 5 in Figure 3.0 above, at Harville Rd and Burkhalter Rd. These two roads meet at a sharp angle, which is an undesirable geometric design according to the AASHTO Green Book intersection design policy (“A Policy on Geometric Design of Highways and Streets”, 2004, American Association of State Highway and Transportation Officials).

Table 3.0 Existing Intersection Characteristics

ID	Intersection	Type	Turn Lane	Intersection Control	Posted Speed
1	Burkhalter Rd at US 80	Four-way	No	Two-way Stop	45
2	Burkhalter Rd at Rushing Rd	Four-way	No	Four-way Stop	45
3	Burkhalter Rd at Cawana Rd	T-Junction	No	One-way Stop	45
4	Burkhalter Rd at SR 67	Four-way	Yes	Signalized	55
5	Burkhalter Rd at Harville Rd	T-Junction	No	One-way Stop	45
6	Burkhalter Rd at Langston Chapel Rd	T-Junction	No	One-way Stop	45
7	Langston Chapel Rd at Lanier Rd	T-Junction	No	One-way Stop	45
8	Langston Chapel Rd at Old Register Rd	Four-way	No	Four-way Stop	55

Source: field research

Existing (2007) Traffic Data

Two types of traffic count data was collected along the study corridor in January of 2009. These counts included 24-hour bi-directional vehicle tube volume counts and AM and PM peak hour turning movement counts (TMC) at six of the eight intersections. Based on field data collection, the highest volumes of traffic along the corridor occur between 7:30 a.m. and 8:30 a.m. and between 5:00 p.m. and 6:00 p.m. Total turning movement counts in AM and PM peak hour are shown in Tables 3.1 and 3.2 below. These counts served as key inputs into the HCS analysis. Turning movement counts at Burhalter Rd & Cawana Rd, Burkhalter Rd & Harville Rd were developed based on data from the Bulloch County Travel Demand Model developed for the Bulloch County / City of Statesboro 2035 LRTP study.

Table 3.1 Existing AM Peak Turning Movement Counts

Intersection	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
US 80 & Burkhalter	98	357	14	22	236	11	16	19	42	8	73	81
Burkhalter & Rushing	82	141	9	14	67	29	25	63	32	15	225	31
Burkhalter & Cawana	0	0	0	21	0	3	64	125	0	0	208	3
Burkhalter & SR 67	67	460	27	47	243	64	258	133	34	38	181	214
Burkhalter & Harville	19	0	147	0	0	0	0	91	6	43	147	0
Langston Chapel & Burkhalter	101	0	63	0	0	0	0	133	19	21	312	0
Langston Chapel & Lanier	0	0	0	31	0	84	98	118	0	0	278	154
Langston Chapel & Old Register	73	102	39	9	26	92	57	182	23	16	341	38

Table 3.2 Existing PM Peak Turning Movement Counts

Intersection	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
US 80 & Burkhalter	58	267	12	79	382	35	19	61	105	13	41	41
Burkhalter & Rushing	30	68	18	29	118	29	43	176	55	16	131	23
Burkhalter & Cawana	0	0	0	95	0	3	52	224	0	0	142	3
Burkhalter & SR 67	50	383	48	149	473	331	211	185	58	51	148	68
Burkhalter & Harville	18	0	244	0	0	0	0	172	30	346	116	0
Langston Chapel & Burkhalter	97	0	105	0	0	0	0	253	90	170	245	0
Langston Chapel & Lanier	0	0	0	142	0	81	79	211	0	0	190	122
Langston Chapel & Old Register	30	64	43	42	112	51	20	222	50	42	198	24

Future Year (2035) Traffic Projections

Future year turning movements were forecasted based on population and employment growth rates provided by Bulloch County during the development of the Bulloch County Travel Demand Model. Table 3.3 and Table 3.4 below summarize the 2035 AM and PM peak hour traffic counts.

Table 3.3 2035 AM Peak Turning Movement Counts

Intersection	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
US 80 & Burkhalter	147	536	21	33	354	17	24	29	63	12	110	122
Burkhalter & Rushing	123	212	14	21	101	44	38	95	48	23	338	47
Burkhalter & Cawana	0	0	0	41	0	18	127	183	0	0	303	20
Burkhalter & SR 67	101	690	41	71	365	96	387	200	51	57	272	321
Burkhalter & Harville	27	0	222	0	0	0	0	129	9	64	211	0
Langston Chapel & Burkhalter	152	0	95	0	0	0	0	200	29	32	468	0
Langston Chapel & Lanier	35	160	12	74	99	0	201	164	23	8	267	0
Langston Chapel & Old Register	110	153	59	14	39	138	86	273	35	24	512	57

Table 3.4 2035 PM Peak Turning Movement Counts

Intersection	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
US 80 & Burkhalter	87	401	18	119	573	53	29	92	158	20	62	62
Burkhalter & Rushing	45	102	27	44	177	44	65	264	83	24	197	35
Burkhalter & Cawana	0	0	0	189	0	17	102	327	0	0	207	16
Burkhalter & SR 67	75	575	72	224	710	497	317	278	87	77	222	102
Burkhalter & Harville	26	0	369	0	0	0	0	246	43	522	165	0
Langston Chapel & Burkhalter	146	0	158	0	0	0	0	380	135	255	368	0
Langston Chapel & Lanier	29	133	10	337	194	0	162	293	41	15	182	0
Langston Chapel & Old Register	45	96	65	63	168	77	30	333	75	63	297	36

Intersection Analysis Results

HCS inputs included traffic data, intersection lane configuration, signal timing, roadway geometry and posted speed limits.

Prior to analyzing operating conditions, it is useful to summarize the level of service methodology. Level of service (LOS) is a qualitative measure of traffic flow used by transportation professionals worldwide to describe operating conditions from the perspective of travelers. Six levels of service are defined. They are given letter designations from A to F, with LOS A representing the best operating conditions and LOS F representing the worst. Transportation facilities may operate at a range of level of service depending upon time of day, day of week, or period of the year. A description of the different levels of service is provided below.

LOS A – Drivers perceive little or no delay and easily progress along a corridor.

LOS B – Drivers experience some delay, but generally driving conditions are favorable.

LOS C – Travel speeds are slightly lower than the posted speed with noticeable delay in intersection areas.

LOS D – Travel speeds are well below the posted speed with few opportunities to pass and considerable intersection delay.

LOS E – The facility is operating at capacity and there are virtually no useable gaps in the traffic.

LOS F – More traffic desires to use a particular facility than it is designed to handle resulting in extreme delays.

As seen above, LOS correlates with the intersection traffic control delay value. Table 3.5 below and Table 3.6 on page 20 shows the LOS threshold based on intersection type.

Table 3.5 LOS Threshold for Signalized Intersections

LOS	Control Delay per Vehicle (s/veh)
A	<=10
B	>10-20
C	>20-35
D	>35-55
E	>55-80
F	>80

Source: 2000 Highway Capacity Manual

Table 3.6 LOS Thresholds for Unsignalized Intersections

LOS	Control Delay per Vehicle (s/veh)
A	<=10
B	>10-15
C	>15-25
D	>25-35
E	>35-50
F	>50

Source: 2000 Highway Capacity Manual

Existing (2007) Intersection Level of Service

Table 3.7 below displays the 2007 existing AM and PM peak hour level of service based on HCS analysis. During the AM peak period, intersections 2, 3, 5, 6 and 7 have favorable operating conditions with minimum delay; intersections 4 and 8 show slightly higher delay; intersection 1, Burkhalter Rd at US80, has the highest delay with LOS D at US 80. In the PM peak hours, intersections 2, 3 and 8 exhibit favorable operating conditions with minimum delay; intersections 4 and 7 shows slightly higher delay; intersection 1, 5 and 6 have higher delay with LOS equal to or above D. As the sub-area continues to grow and traffic volumes further increase, the current LOS of these intersections is expected to degrade if no improvements are implemented.

Table 3.7 2007 Existing Intersection Operational Analysis

ID	Intersection	AM		PM	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	Burkhalter Rd at US 80	27.9/22.4	D/C	33.0/44.1	D/E
2	Burkhalter Rd at Rushing Rd	11.0	B	10.7	B
3	Burkhalter Rd at Cawana Rd	10.9	B	13.3	B
4	Burkhalter Rd at SR 67	24.8	C	21.9	C
5	Burkhalter Rd at Harville Rd	9.8/10.8	A/B	13.6/103.1	B/F
6	Burkhalter Rd at Langston Chapel Rd	12.2/7.6	B/A	33.3/8.6	D/A
7	Langston Chapel Rd at Lanier Rd	13.9	B	20.8	C
8	Langston Chapel Rd at Old Register Rd	16.2	C	13.2	B

Future Year (2035) No-Build Intersection Level of Service

Table 3.8 displays the future year (2035) AM and PM peak hour level of service assuming no roadway improvements are implemented along the corridor. As seen in the table, all intersections operate with significant delay except for intersection 2, Burkhalter Rd at Rushing Rd. Extreme delay is found at intersections 1, 7 and 8. Note that the delay time calculated by the HCS software is just a tool and these times might not be exact in the real world; however, by order of magnitude, the longer delay time indicates worse operating conditions. For purposes of this analysis, intersections identified with LOS D or worse are considered deficient and strong candidates for improvements.

Table 3.8 2035 No-Build Intersection Operational Analysis

ID	Intersection	AM		PM	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	Burkhalter Rd at US 80	815.0	F	3038.0	F
2	Burkhalter Rd at Rushing Rd	24.5	C	22.3	C
3	Burkhalter Rd at Cawana Rd	17.1	C	36.5	E
4	Burkhalter Rd at SR 67	49.7	D	66.3	E
5	Burkhalter Rd at Harville Rd	10.3/12.4	B	16.0/1464	C/F
6	Burkhalter Rd at Langston Chapel Rd	19.3/7.8	C/A	1857/9.9	F/A
7	Langston Chapel Rd at Lanier Rd	27.5	D	519.8	F
8	Langston Chapel Rd at Old Register Rd	321.3	F	117.7	F

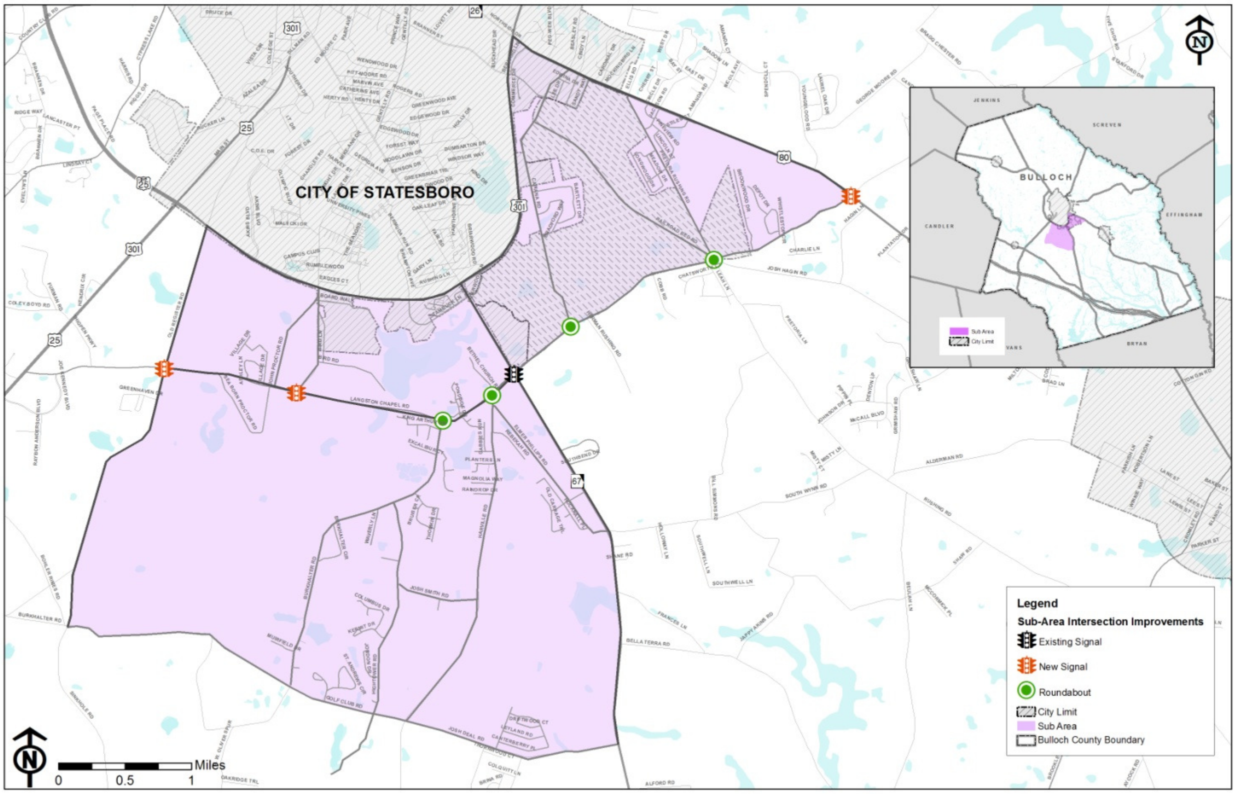
4.0 Potential Intersection Improvements

Based on the LOS analysis, each of the 8 intersections along the study corridor were considered as candidates for future improvements. Intersection 2, Burkhalter Rd at Rushing Rd, was included in spite of its acceptable level of service because Bulloch County has identified that the S&S Greenway Trail corridor will join this intersection and appropriate modifications or improvements to accommodate this improvement should be developed. The potential improvements are summarized below and represented in Figure 4.0 on page 22:

Intersection 1: Burkhalter Road at US 80. – The *Bulloch County / City of Statesboro 2035 LRTP* analysis identified the need to widen US 80 from 2 lanes to 4 lanes in the vicinity of Burkhalter Road. Due to the anticipated widening project, operating conditions at this intersection are anticipated to degrade from the no-build scenario. A new traffic signal at this intersection will increase safety and improve its operations. A signalized intersection with exclusive left turn lanes on both approaches of US 80 was tested in the HCS tool. The resulting LOS is an acceptable LOS C. Results are shown in Table 4.1 on page 24.

Intersection 2: Burkhalter Road at Rushing Road – Due to the development of the S&S Greenway Trail, the recommendation for this intersection is a one-lane four legged roundabout which will accommodate smoother traffic flow and provide opportunities for streetscaping, as well as safe bicycle and pedestrian use.

Figure 4.0 Proposed Intersection Improvements



Intersection 3: Burkhalter Road at Cawana Road – Due to the anticipated development along Cawana Road between US 80 and Burkhalter Road, which includes an elementary school, the improvement recommendation is a one-lane roundabout that could accommodate buses and trucks. This type of roundabout is built with a gradually sloped and flat curb, called a truck apron or a traversable apron. The apron is an additional area added to the outer edge of the central island of a roundabout. The apron allows the over-tracking of large vehicles, such as school buses and semi-trailer vehicles, on the central island without compromising the deflection for smaller vehicles. A typical central island with a traversable apron is shown in Figure 4.1 on page 23. More details on the design of the traversable apron can be found on a report published by FHWA "Roundabouts: An Informational Guide" (FHWA 2000). This report can be downloaded at http://www.tfhrc.gov/safety/00068.htm.

Figure 4.1 Roundabout with a Traversable Apron

Source: Roundabouts: An Information Guide (FHWA 200)

Intersection 4: Burkhalter Road at SR 67 – Recommendations include modified signal timing and the provision of exclusive left and right turn lanes on westbound of SR 67. Due to the high traffic volumes on SR 67, it is likely that the intersection will operate slightly below LOS C.

Intersection 5: Burkhalter Road at Harville Road – A roundabout is proposed at this location to accommodate future traffic volumes and to help address existing geometric issues. The distance between this intersection and intersection 4, Burkhalter Road and SR 67, is about 0.22 mile (1161 feet). Although a standard for spacing distance between roundabouts and adjacent signalized intersection has not been determined, designers should ensure that the spacing distance should accommodate 95th-percentile queue lengths, including queues approaching the roundabouts as well as queues approaching the adjacent intersection. Through HCS operational analysis, the 95th-percentile queue length on eastbound Burkhalter Road approaching to the SR 67 is about 455 feet at peak hour, which indicates that the spacing between intersections 4 and 5 is sufficient for queue vehicles.

Intersection 6: Burkhalter Road at Langston Chapel Road – Proposed a roundabout. This would improve traffic flow and provide opportunities for landscaping, and safe bicycle and pedestrian use.

Intersection 7: Langston Chapel Road at Lanier Road - Proposed a traffic signal and provided an exclusive left turn lane on Lanier Road.

Intersection 8: Langston Chapel Road at Old Register Road – Proposed a traffic signal. The *Bulloch County / City of Statesboro 2035 LRTP* recommended that Old Register Road serve as a parallel relief facility to US 301, therefore, more through traffic is anticipated on this corridor. A signalized intersection would provide more efficient and safer operating conditions.

HCS was used to predict future level of service with the above improvements. Table 4.1 on page 24 displays the results for proposed signal or stop controlled intersections and Table 4.2 on page 24 displays the results for proposed roundabouts. Note that for intersections with proposed roundabouts, LOS is determined by the volume to capacity ratio (V/C), rather than the delay in seconds, for each approach since traffic continues to flow. The higher the V/C ratio, the longer the anticipated delay at each approach of the intersection. A V/C ratio equal to or above 1.0 indicates that the roadway approach is operating at or above capacity. Typically, roundabout approaches with a V/C ratio lower than 0.7 are considered to be operating at an acceptable LOS.

Table 4.1 2035 Build Intersection Operation Analysis (Signal or Stop Controlled Intersections)

ID	Intersection	AM		PM	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	Burkhalter Rd at US 80	22.8	C	27.2	C
4	Burkhalter Rd at SR 67	36.8	D	32.8	C
7	Langston Chapel Rd at Lanier Rd	16.9	B	19.0	B
8	Langston Chapel Rd at Old Register Rd	22.5	C	20.6	C

Table 4.2 2035 Build Intersection Operation Analysis (Roundabouts)

ID	Intersection	AM – V/C Ratio				PM – V/C Ratio			
		EB	WB	NB	SB	EB	WB	NB	SB
2	Burkhalter Rd at Rushing Rd	0.17	0.39	0.20	0.37	0.10	0.16	0.23	0.15
3	Burkhalter Rd at Cawana Rd	0.23	0.26	0.00	0.04	0.17	0.36	0.00	0.18
5	Burkhalter Rd at Harville Rd	0.10	0.20	0.00	0.20	0.17	0.36	0.00	0.16
6	Burkhalter Rd at Langston Chapel Rd	0.23	0.00	0.44	0.19	0.34	0.00	0.57	0.52

5.0 Access Management Policies

One way to address increased travel demand without capacity enhancements is through access management. Access management strategies extend the useful, functional life of a transportation facility, aiming to improve arterial flow by controlling access to and from roadways. GDOT has developed standards which govern road design and driveway connections. In general, these measures are appropriate for application in the study area. However, local governments may wish to enforce more strict access management criteria through the site plan review process. Access management strategies can be used to plan for:

- Driveway control (both residential and commercial);
- Median control; and
- Frontage roads.

According to GDOT, raised medians increase the capacity of the roadway, reduce accidents, lower congestion, provide pedestrian refuge and often save lives. They may also be landscaped to beautify corridors and may become focal points for community landscaping efforts.

Each of these strategies requires the appropriate application of accepted engineering criteria. For new developments, access control can be implemented during the permitting process. Retrofitting existing roadways typically requires studies to identify the impact of proposed changes and the identification of alternate access opportunities. Public outreach and education can be beneficial when implementing access control, with special attention placed on property directly impacted by the improvements.

Access Management Plans

Developing an Access Management Plan for an area is one way to provide comprehensive guidelines for managing access as development occurs along corridors. Access management guidance can also be incorporated into Land Development Codes. As the sub-area develops, Bulloch County and the City of Statesboro can benefit from the establishment of access management policies to better control and coordinate the evolution of the transportation network in the area. Research demonstrates that uncontrolled access to development is a significant contributor to the degraded performance of roadway facilities. The policy suggestions in this section and in Appendix A: Access Management Toolkit, found on page 42, should be considered in the future

Developing Access Management Goals and Objectives

In order to develop appropriate access management strategies for an area, it is first necessary to establish specific goals and objectives. Some goals focus on a proactive approach to managing new development while others address issues associated with retroactive action to improve access management along a corridor. The six goals and associated objectives listed below are typical to access management plans.

1. Fewer driveway accesses.
    - Reduce the number of driveways per mile
    - Reduce the number of driveways servicing individual land uses
    - Pursue joint use driveways
    - Pursue back frontage roads and interparcel connectivity

2. Proper connection spacing (driveways and side streets).
   - Establish minimum spacing requirements for roadway connections based on roadway classification scheme. Typically, roadway classifications are divided into the following four categories: freeways; arterials; collectors; and, local roads.
   - Driveways would not be provided for properties that did not have a certain amount of frontage (e.g. 330')
   - Individual driveways would not be provided for properties that generated less than an established threshold of trips either during the peak hour or on a daily basis (e.g. 125 peak hour trips; 750 daily trips).

3. Consolidate median openings.
   - Median openings provided to service only certain roadways based on the roadway classification scheme (e.g. arterials and collectors).
   - Median openings would not be provided for undeveloped properties with less than an established amount frontage along a corridor (e.g. 330').
   - Median openings would not be provided for properties or side streets that generated less than an established threshold of trips during the peak hour or on a daily basis (e.g. < 125 peak hour trips; < 750 daily trips).

4. Reduce conflict points.
   - Closure of median openings and driveways based on roadway classification scheme or daily/peak hour trip generation.
   - Left turn deceleration and storage lanes provided at median openings.
   - Right turn deceleration lanes provided at major trip generators and side street connections.

5. Proactive access management policy.
   - Link access management requirements to a Land Development Code. Access to new development would be thoroughly evaluated during the site plan review process.
   - Prior to approving development, ensure that adequate right of way and/or easements are provided for interparcel access/connection if the proposed development occupies less than a designated amount of frontage along a corridor (e.g. 330').

6. Reduce the costs of access management improvements.
   - Identify access management needs during the site plan review process.
   - An access management plan should be submitted for all new developments. Extra scrutiny should be placed on developments with less than the designated threshold frontage along a corridor (e.g. 330').
   - If a development is permitted that does not meet the minimum frontage requirements, then adequate right of way should be preserved for frontage roads or interparcel connectivity.

Developing an Access Management Vision

Access management strategies can be more valuable and have a better chance for successful implementation when centered on a vision. Corridors with varying land use and traffic patterns usually result in hindered operations as traffic volumes increase. To address this issue, there is a need to establish larger, more distinct character areas along a corridor. This can result in enhanced traffic operations for the corridor, both on a local and regional level.

The successful application of access management principles can be supported by an Access Management Toolbox. The Access Management Toolbox found in Appendix A on page 42 provides a list of techniques that may be appropriate for Bulloch County and the City of Statesboro to solve existing or potential access management issues within the sub-area and in other parts of the county.

Based on a review of best management practices, the Toolbox outlines four sets of access management strategies. These are:

- Strategy Set 1 - Intersection Spacing Access Management Techniques
    - Intersection Spacing
    - Spacing of Signalized Intersections

- Strategy Set 2 - Driveway and Minor Intersection Access Management Techniques
    - Driveway Spacing Standards
    - Driveway Location and Design - Sight Distance
    - Corner Clearance
    - Turn radius, driveway width and driveway slope
    - Driveway throat length
    - Landscaped Buffer

- Strategy Set 3 - Turning Movement Related Access Management Techniques
    - Right turn lane
    - Left turn lane

- Strategy Set 4 - Land and Subdivision Controls
    - Reverse Frontage Road
    - Maximum number of driveways per lot
    - Connectivity of supporting streets
    - Service Roads
    - Shared Driveways – Residential Development
    - Shared Driveways – Non-residential Development
    - Outparcel requirements

The Appendix A: Access Management Toolbox, page 42, presents the recommendations, benefits, and potential issues for each of these strategy sets.

6.0 Conceptual Street Hierarchy and Design Guidelines

Urban and rural streets have a functional classification used to define the traffic carrying purpose of the roadways. Functional classification is determined in cooperation with GDOT. The classifications include principal arterials, minor arterials, collector streets and local streets. Principal arterials carry high volumes of traffic at high speeds for long distances. These provide continuous routes within and between urban areas and usually include freeways and interstates. Minor urban arterials, such as SR67 in the City of Statesboro, are continuous routes through urban areas that carry upwards of half of all vehicle miles traveled. Most of a City's commercial and institutional uses are contained along these roads. Collector streets are short tributaries that gather traffic from smaller, local streets and deliver to minor arterials. Most of these streets are bordered by business and residential properties having driveways accessible from the street. Local streets account for approximately 90% of street mileage and are used to access the nearest collector street. Speeds on local streets are typically in the 20-30 mph range and are conducive to residential areas and neighborhood-scale commercial land uses. The functional classification map for Bulloch County and the City of Statesboro can be found in Figure 3.L.1 of the Bulloch County / City of Statesboro 2035 LRTP Technical Memorandum on page 69.

As part of the Sub-Area Analysis, a conceptual street hierarchy was developed to help proactively identify and develop future transportation corridors that are likely to see increased traffic volumes based on future growth and development. The hierarchy is based upon the planning principals of street connectivity and traditional neighborhood development, which work together to minimize roadway trips and the potential for future traffic conflicts. Because there is enormous potential for future development in the area, this conceptual hierarchy provides the County and City an opportunity to go beyond the traditional roadway functional classification system and incorporate the land use context surrounding these transportation corridors. The hierarchy provides a framework for future development of the area, taking into account potential development types and the appropriate scale of development for transportation corridors based on anticipated future land use in the area so that the County and City can proactively make decisions regarding how the area evolves in the future. The framework includes guidelines for street function, access, setbacks, lane number and width, as well as provisions for sidewalks, transit, parking, and other supporting infrastructure as appropriate. Coordination of land use decisions with regard to these guidelines will help the County and City to proactively address challenges that stem from increased traffic volumes in the future.

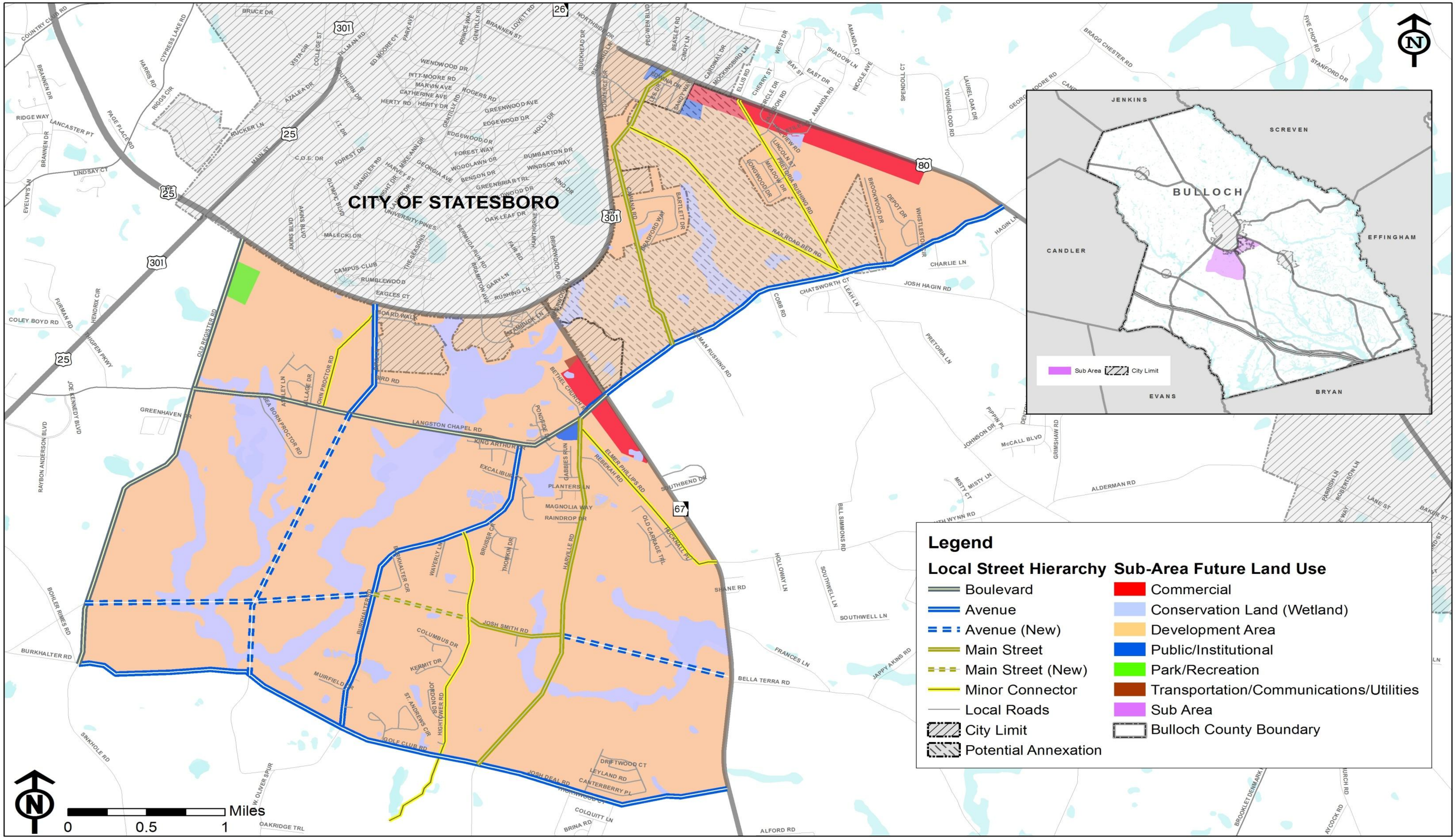
A hierarchy of five facility types was developed as part of this effort and applied to existing and potential future roadways in the sub-area. These include:

- Boulevards
- Avenues
- Main Street
- Minor Connector
- Neighborhood Street

Candidate roads in the study area were identified for each facility type based on the location of current and anticipated land uses and development types, with special attention to connectivity and access points that will maximize mobility in the area in the future based on the types of trips that those land uses are likely to generate (i.e. a residential development will generate trips to employment, shopping, etc.). The demand for these trip types is captured as output in the Bulloch County Travel Demand Model.

Figure 6.0 on page 30 illustrates the proposed Conceptual Street Hierarchy Map. It should be noted that the proposed location of each facility type on the map is based upon current conditions and trends in the Sub-Area. It may be appropriate to revise these locations as conditions in the study area change over time. It is recommended that the County and City review the hierarchy in conjunction with the review of future development proposals in the area to determine if it remains consistent with local development goals and objectives.

Guidelines regarding the proposed design for each facility type are summarized in Table 6.0 on page 31. The designs are illustrated through typical sections and plan views in Figures 6.1 - 6.5 on pages 32 through 36.



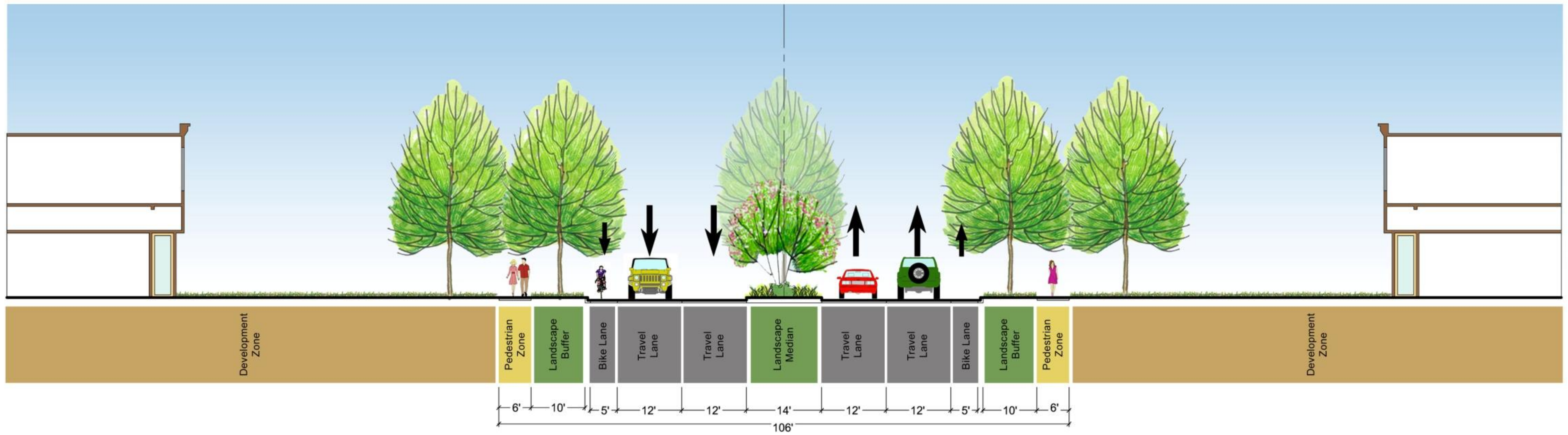
Conceptual Street Hierarchy Map

Figure 6.0

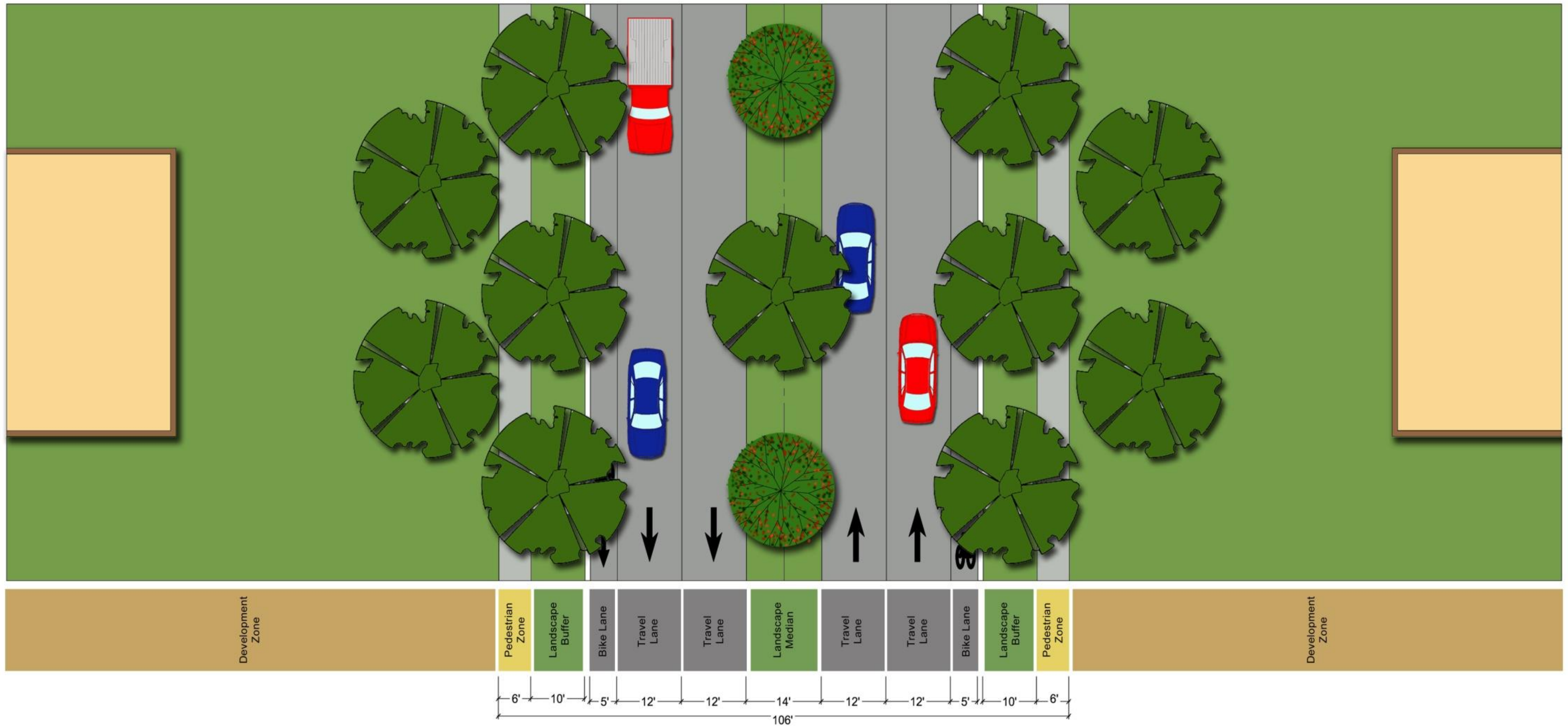
	BOULEVARDS	AVENUES	MAIN STREETS	MINOR CONNECTOR	NEIGHBORHOOD STREETS
PRIMARY FUNCTION	maintain vehicular movement	most common street type/diverse function (thoroughfares)	destination streets	residential collector	streets within residential developments
ACCESS TO/FROM	between key destinations in an area - connecting to lower level streets	from neighborhoods to commercial areas	access to/function as neighborhood centers	primary access to neighborhood	neighborhood circulation
DEVELOPMENT	development set back from street	development is set back from street	development is people-scaled, buildings close to streets	development is oriented along adjacent street types	sub-division style development
LAND USES	mix of land uses	mix of land uses	mix of land uses: institutional, retail, offices, squares/plazas, multi-fam residential	single or multi-family residential	single or multi-family residential
SPEEDS	35-40 mph, up to 45mph	25-30 mph preferred, 35 mph allowed	25 mph max (traffic calming elements, center islands, roundabouts, etc)	25 mph (traffic calming elements)	25 mph, traffic calming elements
LANE NUMBER/ WIDTH	2 each direction (4 total), 10-14 feet, bike lane desirable, median or turn lanes	3-5 lanes, 10-14 feet, shared bike lanes, off street bike paths	3 lanes, 8-12 feet typically	2 lanes typically, 12-foot lane widths with minimum 4-foot wide bike lanes	1 lane, 12 to 14 feet
SIDEWALKS	min 6 feet	min 6 feet, sidewalk amenity zone not necessary	prefer 10 feet, includes -pedestrian zone and curb / amenity zone (street trees, streetlights, benches, transit amenities)	minimum 5 feet - at least one side, with 5 foot minimum landscape buffer	min 5 feet on both sides with 5 foot minimum landscape buffer
PARKING	inappropriate for on street	parallel and parking lanes 7 feet wide on adjacent commercial/residential	on street or behind development	on street (8" parking lane)	on street parking both sides
INAPPROPRIATE ELEMENTS	sidewalk amenity zone, shoulder, curb extensions	shoulder	medians, driveways	medians, shoulders	ped refuge, curb extensions, shoulder, bicycle lanes, mid-block ped crossing, medians
TRANSIT	bus lanes desired	transit routes, bus stops	transit routes, bus stops	transit routes, bus stops	none - access from minor collector
GREEN INFRASTRUCTURE	on median or roadside	treelined lawn terraces to buffer pedestrian from traffic	streetscape treatments, plantings, trees, street furniture	roadside	private yards or development landscaping
CANDIDATE ROADS	Langston Chapel Rd, Old Register Rd	Burkhalter Rd, Golf Club Dr. Lanier Rd,	Cawana Rd, Harville Rd	Hightower Rd, Rushing Rd, John Proctor Rd, S & S Greenway , Elmer Philips Rd	Various

Conceptual Street Hierarchy – Summary of Elements

Figure 6.0



BOULEVARDS
TYPICAL SECTION



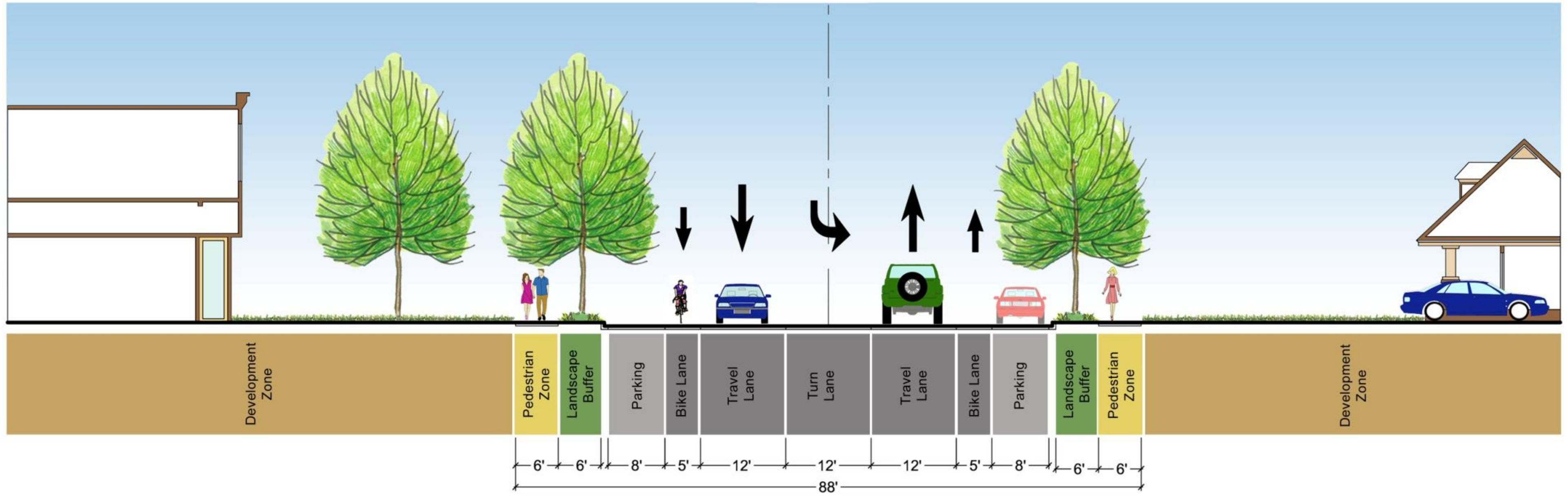
BOULEVARDS
TYPICAL PLAN VIEW

Boulevards	
Primary Function	maintain vehicular movement
Access To/From	between key destinations in an area – connecting to lower level streets
Development	development set back from street
Land Uses	mix of land uses
Speed	35 – 40 mph, up to 45 mph
Lane Number / Width	2 each direction (4 total), 10-14 feet, bike lane desirable, median or turn lanes
Sidewalks	min 6 feet
Parking	inappropriate for on street
Inappropriate Elements	sidewalk amenity zone, shoulder, curb extensions
Transit	bus lanes desirable
Green Infrastructure	on median or roadside

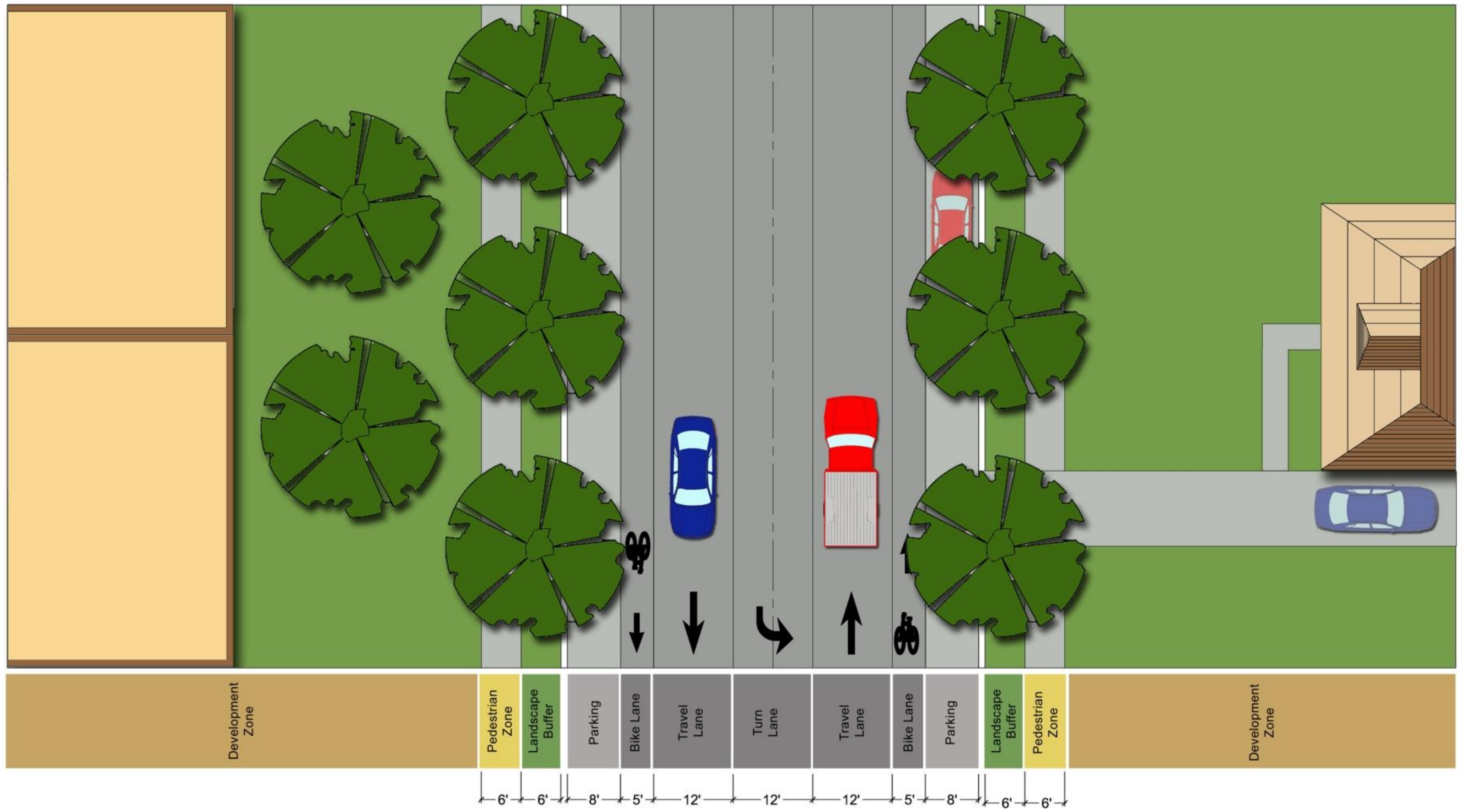
Candidate Roads: Langston Chapel Road
Old Register Road

Conceptual Street Hierarchy - Boulevards

Figure 6.1



AVENUES
TYPICAL SECTION



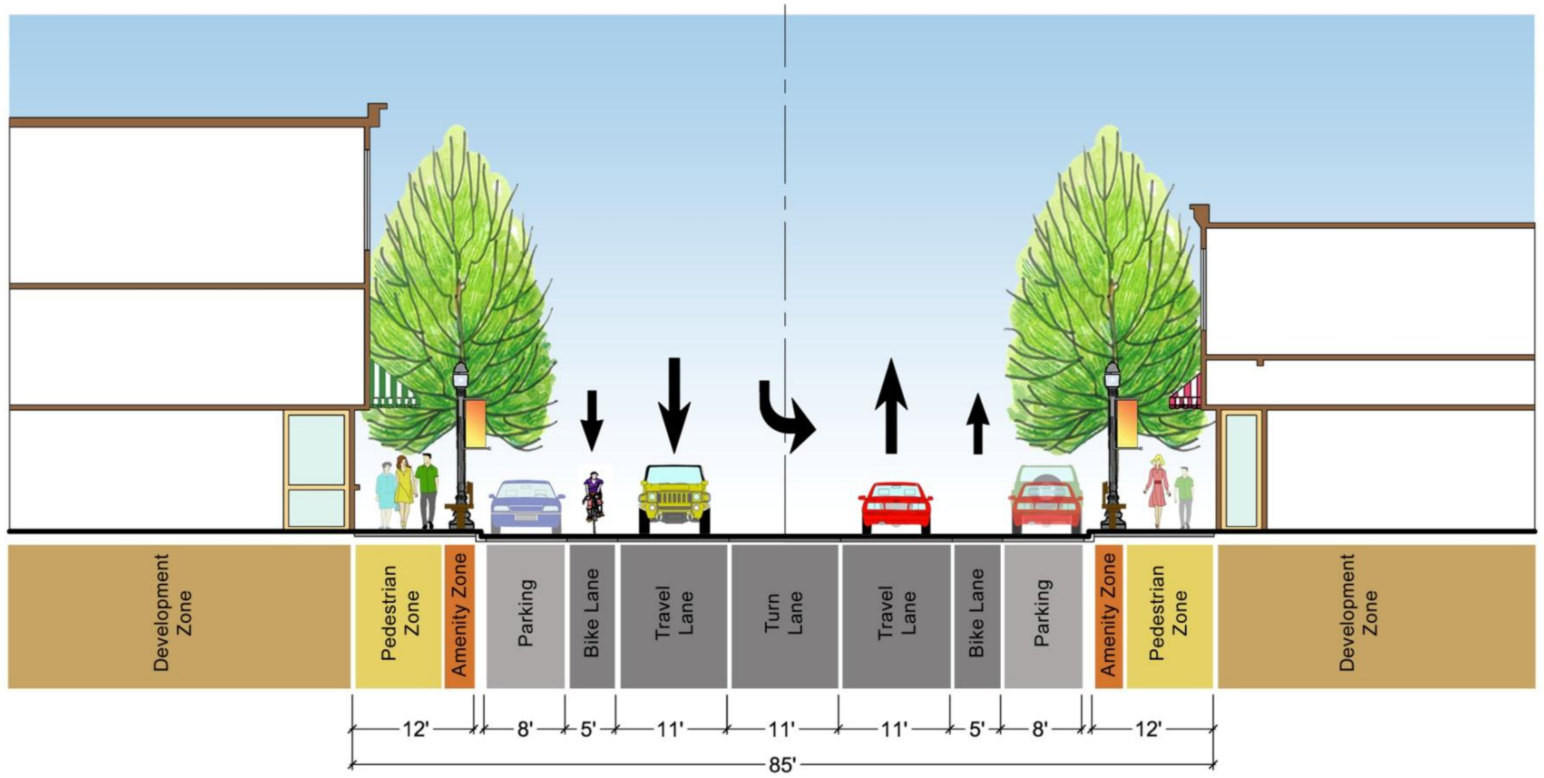
AVENUES
TYPICAL PLAN VIEW

Avenues	
Primary Function	most common street type / diverse function (thoroughfares)
Access To/From	from neighborhoods to commercial areas
Development	development is set back from street
Land Uses	mix of land uses
Speed	25-30 mph preferred, 35 mph allowed
Lane Number / Width	3 – 5 lanes, 10-14 feet, shared bike lanes, off street bike paths
Sidewalks	min 6 feet, sidewalk amenity zone not necessary
Parking	Parallel and parking lanes 7 feet wide on adjacent commercial / residential
Inappropriate Elements	shoulder
Transit	transit routes, bus stops
Green Infrastructure	treelined lawn terraces to buffer pedestrian from traffic

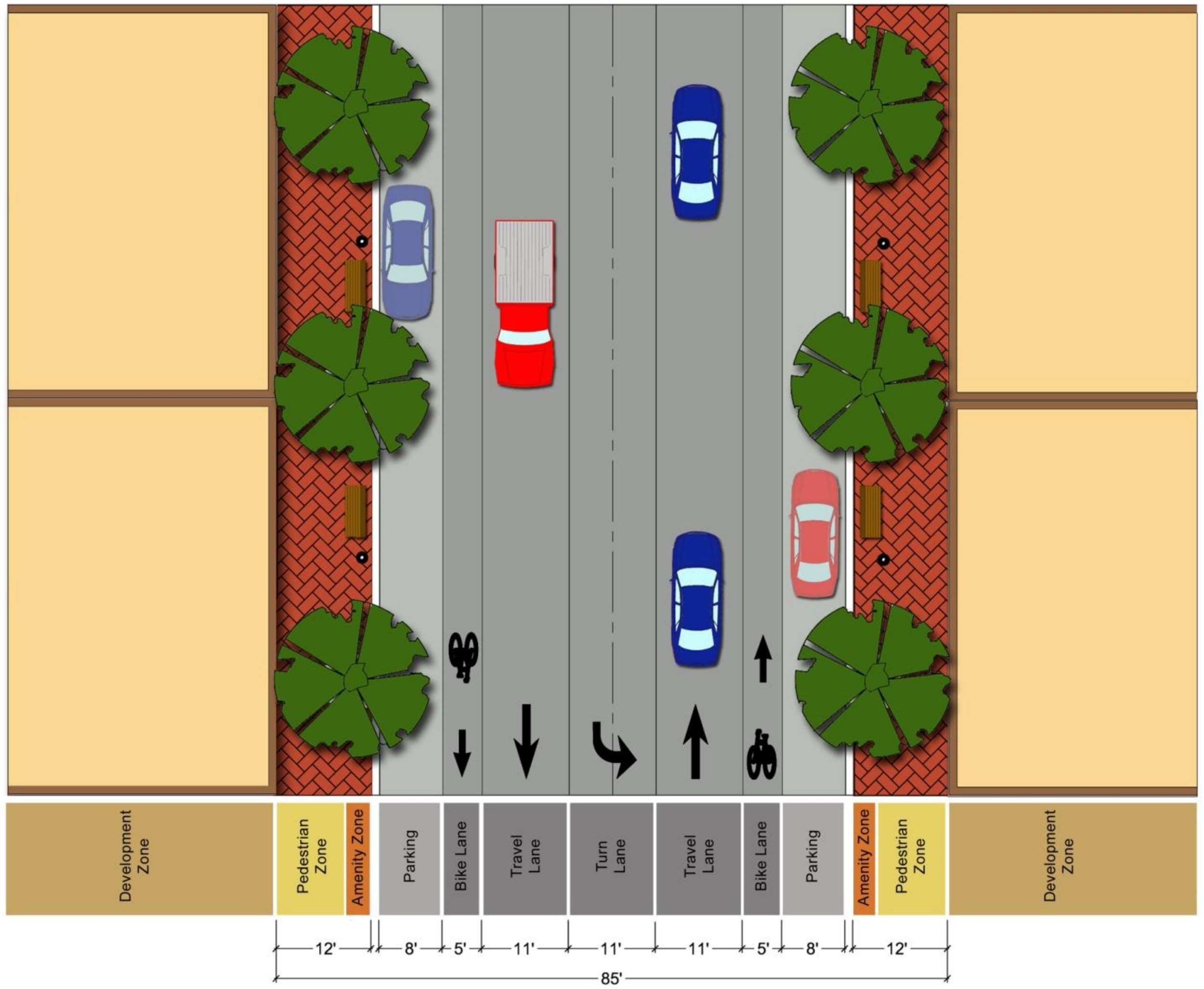
Candidate roads: Burkhalter Road
Lanier Road
Golf Club Drive
Josh Deal Road

Conceptual Street Hierarchy - Avenues

Figure 6.2



MAIN STREET
TYPICAL SECTION



MAIN STREET
TYPICAL PLAN VIEW

Main Streets

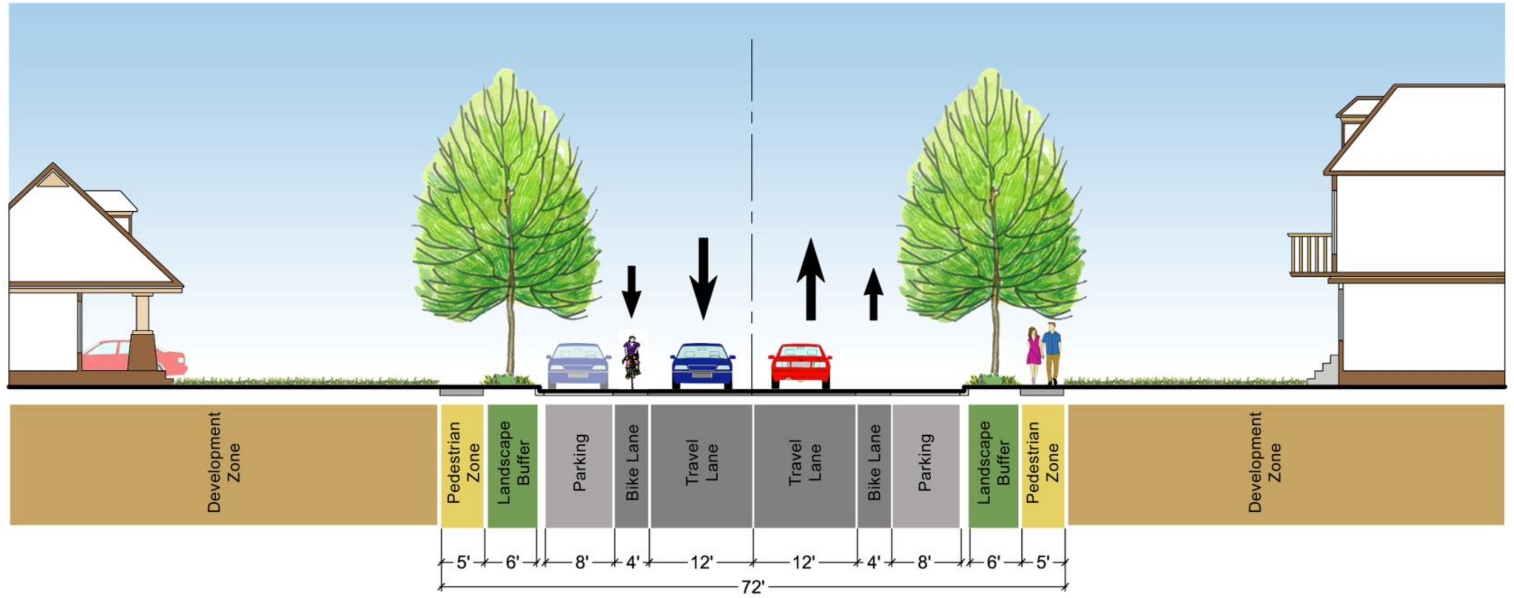
Primary Function	destination streets
Access To/From	access to/function as neighborhood centers
Development	development is people-scaled, buildings close to streets
Land Uses	mix of land uses; institutional, retail, offices, squares/plazas, multi-family residential
Speed	25 mph max (traffic calming elements, center islands, roundabouts, etc)
Lane Number / Width	3 lanes, 8 – 12 feet typically

Sidewalks	prefer 10-feet, includes – pedestrian zone and curb/amenity zone (street trees, streetlights, benches, transit amenities)
Parking	on street or behind development
Inappropriate Elements	medians, driveways
Transit	Transit routes, bus stops
Green Infrastructure	streetscape treatments, plantings, trees, street furniture

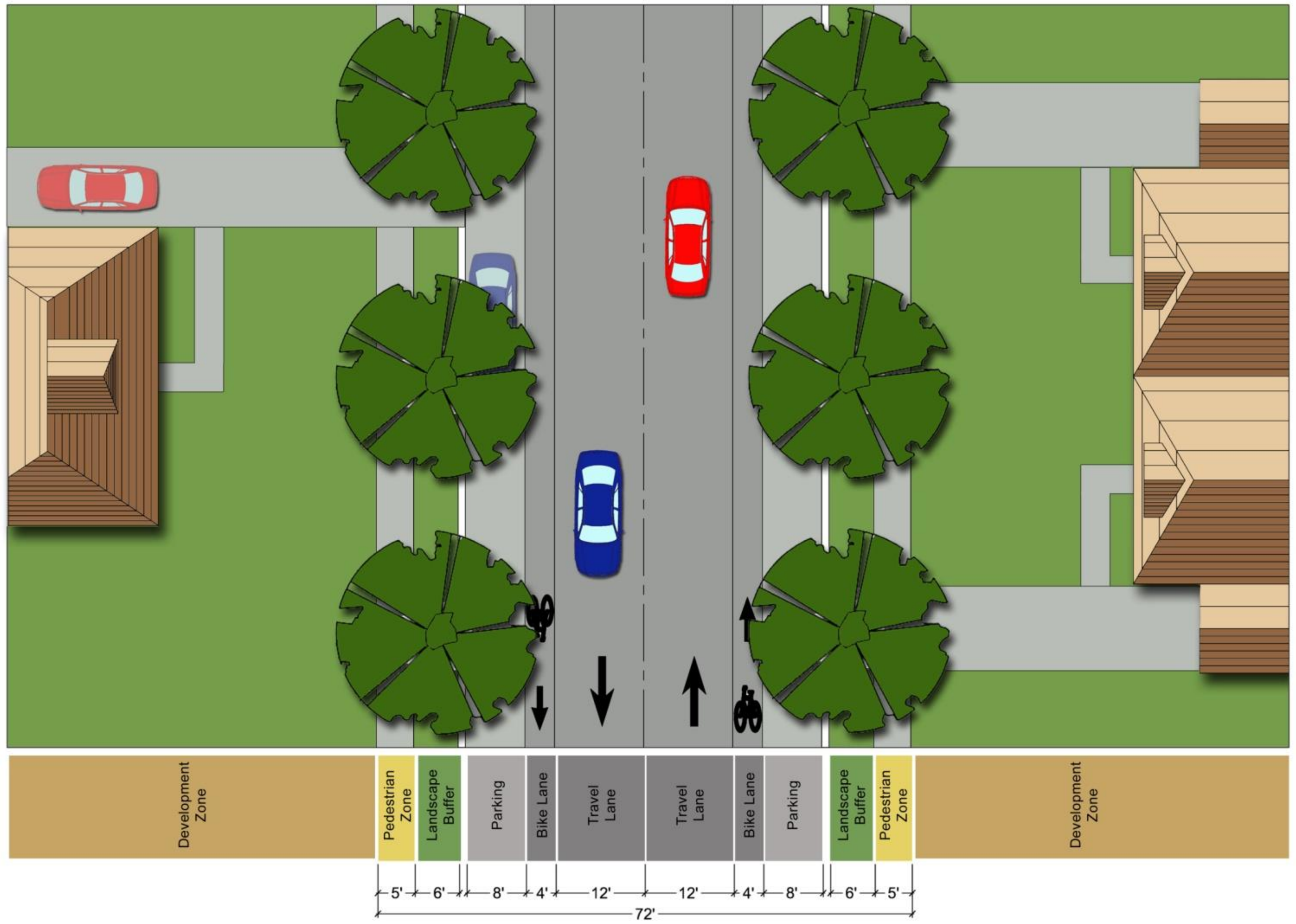
Candidate roads: Harville Road
Cawana Road

Conceptual Street Hierarchy – Main Streets

Figure 6.3



MINOR CONNECTOR
TYPICAL SECTION



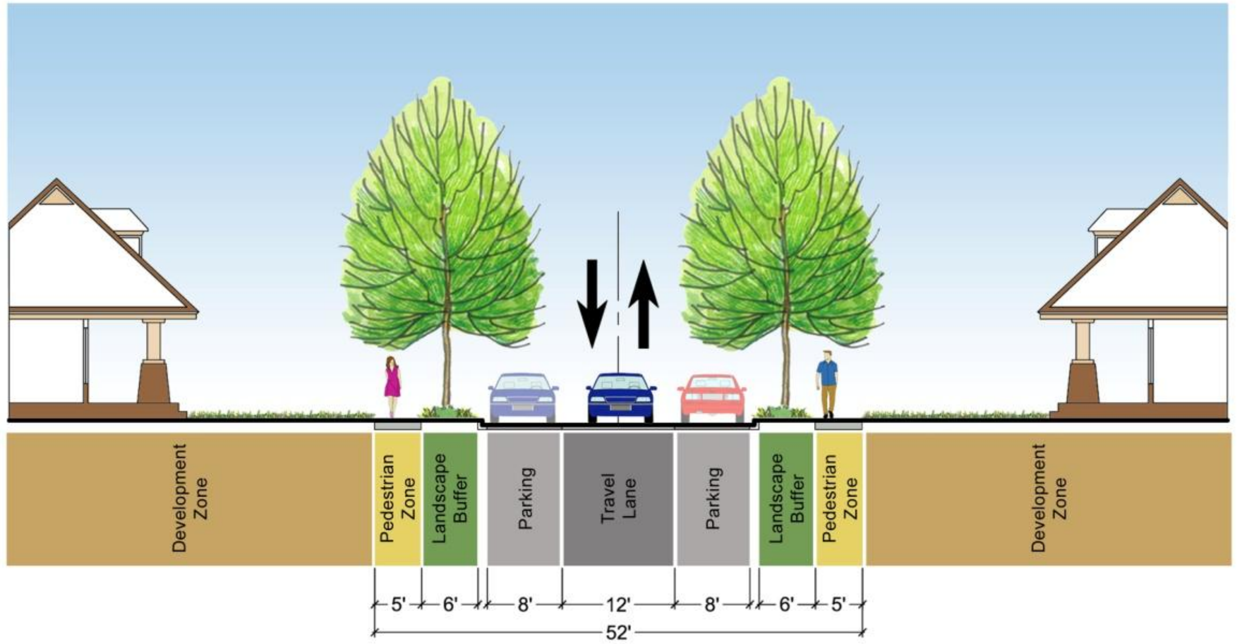
MINOR CONNECTOR
TYPICAL PLAN VIEW

Minor Connector			
Primary Function	residential collector	**Sidewalks**	minimum 5 feet – at least one side
Access To/From	primary access to neighborhood		
Development	development is oriented along adjacent street types		
Land Uses	single or multi-family residential	**Parking**	on street (8-foot parking lane)
		Inappropriate Elements	medians, shoulders
Speed	25 mph (traffic calming elements)	**Transit**	transit routes, bus stops
Lane Number / Width	2 lane typically, 12 foot lane widths with minimum 4-foot wide bike lanes	**Green Infrastructure**	roadside

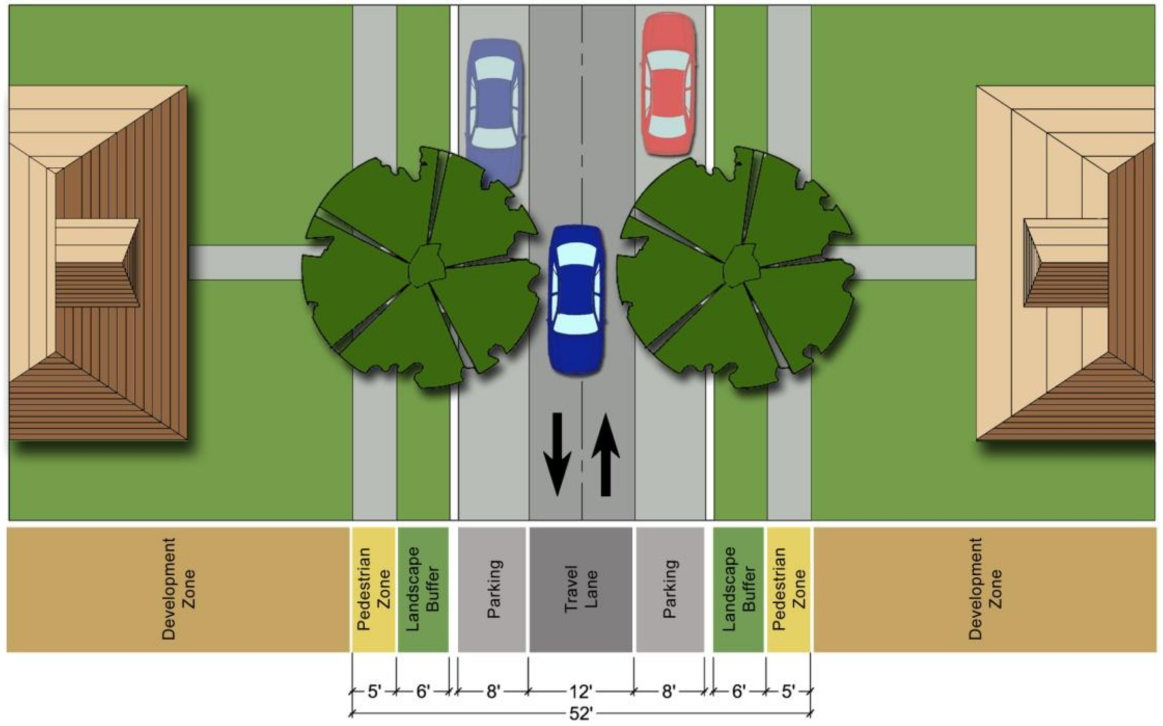
Candidate roads: Hightower Road
Rushing Road
John Proctor Road
Elmer Phillips Road

Conceptual Street Hierarchy – Minor Connectors

Figure 6.4



NEIGHBORHOOD STREET
TYPICAL SECTION
(YIELD STREET)



NEIGHBORHOOD STREET
TYPICAL PLAN VIEW
(YIELD STREET)

Neighborhood Street			
Primary Function	streets within residential developments	**Sidewalks**	minimum 5 feet on both sides with 5-foot minimum landscape buffer
Access To/From	neighborhood circulation		
Development	sub-division style development	**Parking**	on street parking on both sides
Land Uses	single or multi-family residential	**Inappropriate Elements**	pedestrian refuge, curb extensions, shoulder, bicycle lanes, midblock pedestrian crossing, medians
Speed	25 mph with traffic calming elements	**Transit**	none- access from minor collector
Lane Number / Width	1 lane at 12-14 feet	**Green Infrastructure**	private yards or development landscaping

Candidate roads: Various – residential development

Conceptual Street Hierarchy – Neighborhood Streets

Figure 6.5

7.0 Development Review

There are several reasons to emphasize the need for coordinated and multi-disciplinary development review – particularly with respect to land use changes impacts to the transportation system. There is a large body of work documenting the linkages between land use and transportation. What is somewhat less robust are policies and procedures to support the evaluation of development impacts on the transportation system. Even less well developed are mechanisms to ensure that appropriate infrastructure is planned, designed, funded and implemented in a manner consistent with comprehensive planning documents. The purpose of this section is to demonstrate some opportunities to formalize a cooperative development review process in Bulloch County and the City of Statesboro in order to proactively introduce and integrate the concepts presented in this document with current process and procedures.

Transportation Land Use Linkage

It is generally accepted that a link exists between transportation investment and land use development. However, it is useful to document this relationship in summary format to clearly demonstrate the need for and value of development review and site impact analysis. Widely accepted transportation literature characterizes the linkage as follows: Transportation facilities are essential for development to occur. High levels of mobility and accessibility are needed to attract the economic development necessary for a high quality of life. Development often impacts transportation system performance. This creates a need to improve nearby transportation facilities. Transportation improvements increase capacity in large increments while traffic demand increases slowly, mostly through small changes in land development patterns. The nature of these two systems is that they are rarely balanced. Failure to address the management of land development and the subsequent need for improved transportation planning and facilities will result in premature degradation of the transportation system.[1]

The sub-area is now starting to experience some development pressures around the Georgia Southern University activity center. It is anticipated that this type of development will continue to occur at an increasing rate as more intensive development is proposed to accommodate growth associated with the university. Proactively linking transportation and land development will ensure adequate mobility is provided throughout the planning horizon.

Development Review Process

Bulloch County and the City of Statesboro should ensure a rigorous site impact analysis process that fairly and accurately evaluates the impacts of development proposals to the transportation system. The process can incorporate thresholds for development sizes that trigger the development review process. These should be based upon local trends and experience regarding the types of development applications submitted. The Florida Department of Transportation defines the following eleven steps to characterize the site impact process. Key elements of each step are summarized.

1. Methodology Development
    a. Applicant and local government meet to agree on a methodology prior to initiation of site impact analysis. This may include the identification of a firm to conduct the analysis.

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[1] Site Impact Handbook, Florida Department of Transportation

2. Existing Conditions Analysis
    a. Establishes a baseline condition for the surrounding transportation network – typical measured as level of service (LOS)
    b. Identification of physical characteristics of transportation system and traffic operating conditions
3. Background Traffic
    a. Traffic related to increases in non-development traffic and traffic associated with other developments
    b. Establishes a ‘no build’ condition for comparison with the proposed development
4. Trip Generation
    a. Calculation of the trips a proposed development will generate
    b. Calculations are typically based on the Institute of Transportation Engineers (ITE) Trip Generation Manual
5. Trip Distribution
    a. Allocation of trips to origins and destinations
    b. Typical calculated with a travel demand model
6. Mode Split
    a. Distribution of trips by mode – vehicle trips, transit trips
7. Traffic Assignment
    a. Assigning trips, by mode, to the roadway network
    b. Typically calculated with a travel demand model
8. Future Conditions Analysis
    a. Assessment of the impact of the proposed development on the surrounding transportation network
9. Mitigation Analysis
    a. Required if traffic from the proposed development results in unacceptable LOS on the surrounding transportation network.
    b. May be required if the proposed development provides a significant portion of traffic on an existing unacceptable LOS facility.
    c. An improvement plan to make any operation improvements to deficiencies caused by proposed development
10. Site Access, Circulation and Parking
    a. Applying access management and parking principles to the development
11. Review and Permitting
    a. Allows for all departments and agencies to review and comment on the proposed development.

Benefits of a Development Review Process

Some of the significant benefits of an effective development review process include:

- Development and developers are held accountable for impacts to the transportation network assuring appropriate mobility is provided.
- Predictable development allows both the County/City and the applicant to have expectations that can be relied upon at each step in the process. Predictable means what is asked and what is promised will continue to be both required and delivered through to the end of the project. Exceptions may be made, but not without the understanding and agreement of all parties involved.
- Consistent development review affords both the County/City and the applicant the reassurance that what is required by one Department will not be contradicted by another, what commitments are made by both the applicant and the County/City will not be withdrawn or changed on the next drawing.
- Timely development means the County/City will make a commitment that if the applicant fulfills the expectations outlined in the development review, the County/City will meet the timelines outlined in the development review.
- Responsible development is the type of development that will make the County/City a better place to live; that is consistent with Comprehensive Plan; and that demonstrates excellence in architectural design, sound engineering and overall quality development.

Who Should Be Involved?

It is important to have the right people involved in the development review process. Typically this falls under the Planning and Zoning or Community Development Departments. It is also common to have these duties in the Public Works Department. A qualified transportation engineer or planner should be identified for performing the development reviews. It is important that this individual ensure coordination and collaboration between the individuals reviewing the land use and zoning portions and those reviewing the transportation elements. Key review agencies and roles could potentially include:

1. Community Development
   a. Land Use/Zoning
   b. Transportation Impacts
   c. Mitigations
2. County / City Engineer
   a. Transportation Impacts
   b. Mitigations

3. Public Works
    a. Transportation Impacts
    b. Mitigations
4. Regional Centers
    a. Development of Regional Impact
5. Georgia Department of Transportation
    a. Transportation Impacts
    b. Access Management
    c. Mitigations
    d. Permitting
6. Developer/Applicant
    a. Land Use/Zoning
    b. Transportation Impacts
    c. Mitigations

Why is this important?

A thorough development review process is an important step to ensuring the successful implementation of many of the concepts presented in this report. In addition, through development review is essential to the development and utilization of transportation impact fees. As part of the Bulloch County / City of Statesboro 2035 LRTP Development Process, the potential for impact fees in Bulloch County was explored and documented in the *Bulloch County / City of Statesboro 2035 LRTP Impact Fee Analysis Report, July20*09.

Resources

A range of resources are available to assist with the development review process. The resources listed below should provide a useful starting point if the County or City decide to refine the development review process.

The Georgia Department of Community Affairs (DCA) requirements for DRIs:
http://www.dca.state.ga.us/development/PlanningQualityGrowth/programs/regionalimpact.asp

Florida Department of Transportation Site Impact Handbook:
http://www.dot.state.fl.us/planning/systems/sm/siteimp/PDFs/site.pdf

GDOT's Regulations for Driveway and Encroachment Control
http://www.dot.state.ga.us/dot/preconstruction/r-o-a-d-s/DesignPolicies/documents/pdf/DrivewayFull.pdf

GDOT Access Control;
http://www.dot.state.ga.us/topps/ss/chengr/4a-3.htm

Appendix A: Access Management Toolkit

Table A.1.
Strategy Set 1 - Intersection Spacing Techniques

Strategy	Description	Benefits	Potential Issues
Roadway Spacing	The design and location of intersections should be consistent with the specifications of the "A Policy on Geometric Design of Highways and Streets" referred to as the "Green Book". • An arterial may intersect an arterial but only if aligned with and extending an existing arterial, or at a desirable distance of 1 mile from the intersection of existing arterials. • A collector or a local street may intersect an arterial but only if aligned with and extending an existing collector or local street which intersects the arterial, or at a desirable distance of 1,320' from the intersection of an existing collector or local street and the arterial. • A minor collector may intersect another minor collector only if aligned with and extending an existing collector or at a desirable distance of 330' from any other intersection. • A local street may intersect a minor collector if spaced at a minimum of 330' from any other intersection, or in the case of a "T" type intersection, at a desirable distance of 200' from any other intersection. • Local streets and minor collectors may intersect other major collectors if spaced at a minimum of 660' from other intersections. • Major collectors may intersect other major collectors if spaced at a minimum of 1,320' from the intersection of an existing major collector.	• Improves flow along arterial • Reduces delay associated with slowing and turning vehicles	• Difficult to remove existing side street access to major arterials

<table>
<tr><th>Strategy</th><th>Description</th><th>Benefits</th><th>Potential Issues</th></tr>
<tr>
<td>Spacing of Signalized Intersections</td>
<td>It is desirable that intersections that are to be signalized have spacing specifications that are different from that of non-signalized intersections in order that the distance between the signals is capable of providing reasonable cycle lengths and coordination between signals. The need for signals should be based upon one or more of the warrants included in the “Manual on Uniform Traffic Control Devices” being satisfied.

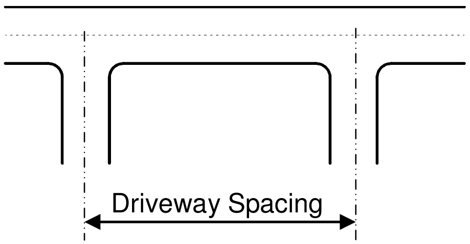
The following are recommended minimum spacing of signalized intersections for roadways:
<table>
<tr><th>Functional Classification</th><th>Spacing (ft.)</th></tr>
<tr><td>Principal Arterial</td><td>1,600’ - 2,000’</td></tr>
<tr><td>Minor Arterial</td><td>1,200’ - 1,600’</td></tr>
<tr><td>Collector</td><td>1,000’</td></tr>
</table>
GDOT’s[2] spacing standards for signalized intersections (for the State Highway System) are summarized in the table below:
<table>
<tr><th rowspan="2">Condition</th><th colspan="2">Signal Spacing, ft</th></tr>
<tr><th>Desirable</th><th>Minimum</th></tr>
<tr><td>Rural</td><td>2,640</td><td>1,320</td></tr>
<tr><td>Urban</td><td>1,320</td><td>1,000</td></tr>
</table>
</td>
<td>• Allows for appropriate platoon progression
• Reduces queuing
• Reduces the potential for rear end collisions</td>
<td>• Difficult to remove existing signals
• Closely spaced signals cause an increase in travel time along a corridor. The table below summarizes the percent increase in travel time as signalized density along a corridor increases:
<table>
<tr><th>Signals per Mile</th><th>Percent Increase in Travel Time</th></tr>
<tr><td>2</td><td>0</td></tr>
<tr><td>3</td><td>9</td></tr>
<tr><td>4</td><td>16</td></tr>
<tr><td>5</td><td>23</td></tr>
<tr><td>6</td><td>29</td></tr>
<tr><td>7</td><td>34</td></tr>
<tr><td>8</td><td>39</td></tr>
</table>
</td>
</tr>
</table>

---

[2] Regulations for Driveway and Encroachment Control, Georgia Department of Transportation, 2004

Table A.2.
Strategy Set 2 – Driveway and Minor Intersection Techniques

Strategy	Description	Benefits	Potential Issues

Driveway Spacing Standards Minimum Distance between Driveways	Appropriate spacing between driveways is necessary to allow drivers to perceive and react to conditions at each intersection. Driveway spacing includes the following criteria:
	• Roadway Classification determines whether a roadway is designed to provide greater mobility or greater access
	• Speed limit on the roadway
	• Distance traveled at the posted speed limit using the normal perception and reaction time plus the distance traveled as the vehicle slows to a stop
	While selecting and applying access spacing criteria, the following points should be considered:
	• Spacing between driveways, other than single-family residential lots, fronting on the same side of the street should have a minimum separation as illustrated below, based upon functional classification.
	  • Arterial 330’
	  • Collector 200’
	  • Local 200’
	
	• Parcels, which are otherwise unable to meet the minimum separation requirements, should utilize cross access easements to provide needed separation.
		• Reduces potential conflicts and crashes
		• Protects mobility for through movements
		• Reduces delay associated with slowing and turning vehicles
			• May limit driveway potential for some parcels along the corridor
			• Requires frontage roads
			• Requires shared driveways
			• Requires action during the site plan review process

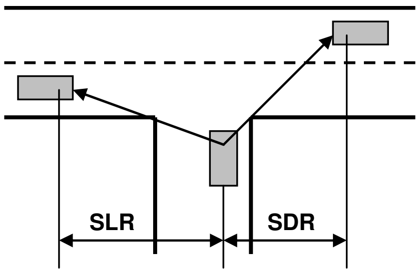
<table>
<tr><th>Strategy</th><th>Description</th><th>Benefits</th><th>Potential Issues</th></tr>
<tr><td></td><td>
Driveways on opposite sides of any undivided street classified collector or arterial should either be aligned on the same centerline or be offset at least 200’ centerline to centerline.
More than one two-way driveway may be permitted based upon parcel size, projected trip generation of the site, amount of roadway frontage, and other appropriate design considerations.
Driveways shall be located as far as possible from roadway intersections.

Access drives for non-residential parcels located in the corner of two or more roads shall be located no closer than 200’ from the intersection.
If the corner parcel accesses one or more arterial/collector roadways, full access shall be limited to 660’; with a right in/right out permitted at least 330’ from the intersection.

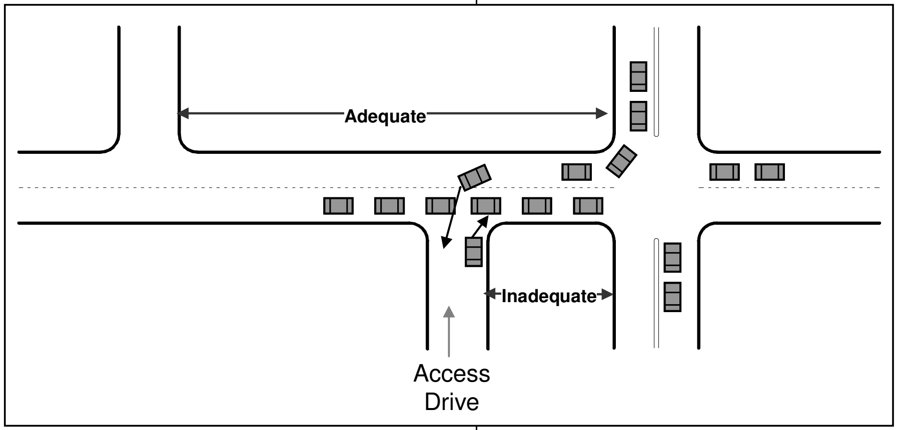
Roadway with speeds greater than 45 mph are typically more critical than those with speeds less than 40 mph.

The spacing criteria for driveways on State Routes (as prescribed by GDOT) are listed in the table below:
<table>
<tr><th>Posted Speed (mph)</th><th>Driveway Minimum Spacing (ft)</th></tr>
<tr><td>25 -30</td><td>125’</td></tr>
<tr><td>35</td><td>150’</td></tr>
<tr><td>40</td><td>185’</td></tr>
<tr><td>45</td><td>230’</td></tr>
<tr><td>50</td><td>275’</td></tr>
<tr><td>55</td><td>350’</td></tr>
<tr><td>60</td><td>450’</td></tr>
<tr><td>65</td><td>550’</td></tr>
</table></td><td></td><td></td></tr>
<tr><td>Driveway</td><td>Stopping sight distance and intersection sight</td><td>Safety</td><td>Sight distance requirements</td></tr>
</table>

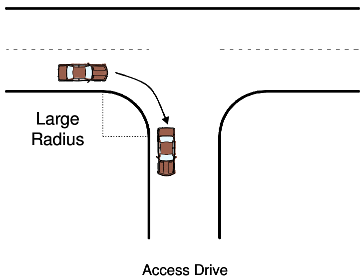
<table>
<tr><th>Strategy</th><th>Description</th><th>Benefits</th><th>Potential Issues</th></tr>
<tr>
<td>Location and Design
Sight Distance</td>
<td>distance are important considerations in driveway location and design.

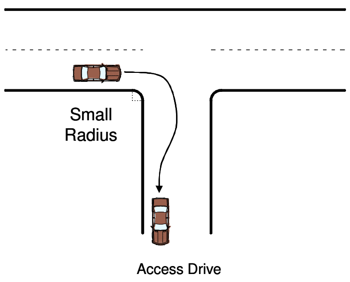
Intersection sight distance is the sight distance needed for driver decisions at intersections. Driveway design must be consistent with the intersection sight distance values described by the AASHTO Green Book. The sight distance requirements prescribed by GDOT for undivided state highways are described below:
<table>
<tr><th rowspan="3">Speed Limit (mph)</th><th colspan="3">Intersection Sight Distance (ft)</th></tr>
<tr><th colspan="2">2 lane</th><th>3–4 lane</th></tr>
<tr><th>SDL=SDR</th><th>SDL</th><th>SDR</th></tr>
<tr><td>30</td><td>335’</td><td>350’</td><td>375’</td></tr>
<tr><td>35</td><td>390’</td><td>410’</td><td>440’</td></tr>
<tr><td>40</td><td>445’</td><td>470’</td><td>500’</td></tr>
<tr><td>45</td><td>500’</td><td>530’</td><td>560’</td></tr>
<tr><td>50</td><td>555’</td><td>590’</td><td>625’</td></tr>
<tr><td>55</td><td>610’</td><td>650’</td><td>685’</td></tr>
</table>


</td>
<td>• Reduces the potential for angle or left/right turn collisions</td>
<td>may limit the number of potential driveway locations</td>
</tr>
<tr>
<td>Corner Clearance</td>
<td>If the distance between an access driveway and intersection on a major road is inadequate, it creates disruptions in traffic flow. For major roadways, like arterials, ideally the corner clearance should equal the driveway spacing requirements.</td>
<td>• Reduces potential conflicts and crashes.
• Protects mobility for through movements
• Reduces delay associated with</td>
<td>• May limit driveway potential for some parcels along the corridor
• Requires frontage roads
• Requires shared driveways
• Requires action during the site</td>
</tr>
</table>

<table>
<tr><th>Strategy</th><th>Description</th><th>Benefits</th><th>Potential Issues</th></tr>
<tr><td></td><td>The following factors can aid in deciding a safe corner clearance:
• Posted speed limit
• Whether driveway is “upstream” or “downstream” from intersection
• Whether an intersection is signalized or not</td><td>slowing and turning vehicles

 </td><td>plan review process.</td></tr>
<tr><td>Turn Radius, Driveway Width and Driveway Slope</td><td>Providing adequate turn radii can help traffic enter or exit driveways more efficiently and smoothly. The following factors need to be considered to determine the adequate radii:
• Operating speeds of the accessed roadway
• The number of pedestrians crossing the access road
• The type of vehicle to be accommodated

The minimum corner radius for driveways as noted in GDOT’s ‘Regulations for Driveway and Encroachment Control’ manual are:
<table>
<tr><th>Driveway Use</th><th>Minimum Radius (ft)</th></tr>
<tr><td>Residential</td><td>15’</td></tr>
<tr><td>Commercial</td><td>35’</td></tr>
<tr><td>When Designed for Trucks</td><td>75’</td></tr>
</table>

The minimum and maximum driveway widths as noted in GDOT’s ‘Regulations for Driveway and</td><td>• Efficiently remove turning vehicles from through lanes without unnecessary slowing
• Reduces delay associated with slowing and turning vehicles
• Reduces potential for rear end collisions in through travel lanes

 </td><td>• Requires action during site plan review process
• Creating too wide a driveway is confusing to motorists and pedestrians.
• Creating too narrow a driveway will lower the access speed to and from the driveway and increases the likelihood of crashes involving faster-moving through vehicles and turning vehicles.</td></tr>
</table>

<table>
<tr><th>Strategy</th><th>Description</th><th>Benefits</th><th>Potential Issues</th></tr>
<tr><td></td><td>Encroachment Control' manual are:
<table>
<tr><th rowspan="2">Driveway Use</th><th colspan="2">Width (ft)</th></tr>
<tr><th>Min</th><th>Max</th></tr>
<tr><td>Current GA Standard – Residential</td><td>14</td><td>18</td></tr>
<tr><td>Current GA Standard – Commercial (One Way)</td><td>16</td><td>20</td></tr>
<tr><td>Current GA Standard – Commercial (Two Way)</td><td>24</td><td>40</td></tr>
</table></td><td></td><td>
</td></tr>
<tr><td>Driveway Throat Length</td><td>Throat length is the distance between the street and the end of the driveway inside the development. The purpose of providing adequate driveway throat length is to allow for traffic entering the site to be stored on site in order to avoid vehicles backing out onto the arterial and interrupting traffic flow.
Driveway throat length varies according to the number of trips generated by the land use. But it is particularly important for drive-through businesses service or the businesses that generate a high number of vehicle trips.
Throat-length should be determined on a case-by-case basis. Suggested throat-lengths for various retail uses are listed below:
<table>
<tr><th>Type of Retail Establishment</th><th>Recommended Throat Length (ft)</th><th>Approximate Number of Vehicles</th></tr>
<tr><td>Small strip mall</td><td>75-95'</td><td>5</td></tr>
<tr><td>Small shopping center/ Large supermarket</td><td>200'</td><td>11</td></tr>
<tr><td>Large regional mall</td><td>500'</td><td>28</td></tr>
</table></td><td>• Efficient internal circulation
• Reduces slowing vehicles from through travel lanes
• Reduces potential for rear end collisions in through travel lanes</td><td>• Requires action during site plan review process</td></tr>
<tr><td>Landscaped</td><td>Landscape buffer can visually define the</td><td>• Helps improve safety</td><td>• Clear zone impacts</td></tr>
</table>

Strategy	Description	Benefits	Potential Issues
Buffer	driveway locations and help improve safety. It should not interfere with sight distance from exit. These buffers can also help preserve the character of rural corridors. The width of the buffer depends on multiple factors, such as the building setbacks and the function of the buffer.	• Aesthetics	• Landscaping requirements

Table A.3.
Strategy Set 3 – Turning Movement Related Techniques

<table>
<tr><th>Strategy</th><th>Description</th><th>Benefits</th><th>Potential Issues</th></tr>
<tr>
<td>**Right Turn Lane**</td>
<td>Right turn deceleration lane provides a dedicated space for vehicles to decelerate and turn. It can help remove turning vehicles from through lanes more quickly and reduce the traffic delays on the through movement.
In determining whether right turn lane is needed, the following criteria or warrants should be considered:
• Level of Service Criteria
• Volume Warrants
• Safety Warrants
Right-turn deceleration lanes should be considered if the daily right turn volumes (based on ITE Trip Generation rates) meet or exceed the values listed in the tables below:
<table>
<tr><th rowspan="2">Posted Speed</th><th colspan="2">2 Lane Routes</th></tr>
<tr><th>< 6,000 AADT</th><th>≥ 6,000 AADT</th></tr>
<tr><td>≤ 35 MPH</td><td>200 RTV/Day</td><td>100 RTV/Day</td></tr>
<tr><td>40 to 50 MPH</td><td>150 RTV/Day</td><td>75 RTV/Day</td></tr>
<tr><td>55 to 60 MPH</td><td>100 RTV/Day</td><td>50 RTV/Day</td></tr>
<tr><td>≥ 65 MPH</td><td>Always</td><td>Always</td></tr>
</table>
<table>
<tr><th rowspan="2">Posted Speed</th><th colspan="2">> 2 Lanes on Main Road</th></tr>
<tr><th><10,000 AADT</th><th>≥ 10,000 AADT</th></tr>
<tr><td>≤ 35 MPH</td><td>200 RTV/Day</td><td>100 RTV/Day</td></tr>
<tr><td>40 to 50 MPH</td><td>150 RTV/Day</td><td>75 RTV/Day</td></tr>
<tr><td>55 to 60 MPH</td><td>100 RTV/Day</td><td>50 RTV/Day</td></tr>
<tr><td>≥ 65 MPH</td><td>Always</td><td>Always</td></tr>
</table>
</td>
<td>• Reduces delay associated with slowing and turning vehicles
• Reduces potential for rear end collisions in through travel lanes</td>
<td>• Requires additional right-of-way
• Appropriate deceleration length and storage should be provided</td>
</tr>
</table>

<table>
<tr><th>Strategy</th><th>Description</th><th>Benefits</th><th>Potential Issues</th></tr>
<tr>
<td>**Left Turn Lane**</td>
<td>Left turn lane separates the turning vehicles from through travel lanes and provides a dedicated storage area for vehicles to decelerate/stop and make a left-turn. Providing a left-turn lane can improve the operation and safety at an intersection.

In determining whether a left turn lane is needed, the following criteria or warrants should be considered :
• Level of Service Criteria
• Volume Warrants
• Safety Warrants

Left-turn deceleration lanes should be considered if the daily left turn volumes (based on ITE Trip Generation rates) meet or exceed the values listed in the tables below:

<table>
<tr><th rowspan="2">Posted Speed</th><th colspan="2">2 Lane Routes</th></tr>
<tr><th>< 6,000 AADT</th><th>≥ 6,000 AADT</th></tr>
<tr><td>≤ 35 MPH</td><td>300 LTV/Day</td><td>200 LTV/Day</td></tr>
<tr><td>40 to 50 MPH</td><td>250 LTV/Day</td><td>175 LTV/Day</td></tr>
<tr><td>≥ 55 MPH</td><td>200 LTV/Day</td><td>150 LTV/Day</td></tr>
</table>

<table>
<tr><th rowspan="2">Posted Speed</th><th colspan="2">> 2 Lanes on Main Road</th></tr>
<tr><th><10,000 AADT</th><th>≥ 10,000 AADT</th></tr>
<tr><td>≤ 35 MPH</td><td>400 LTV/Day</td><td>300 LTV/Day</td></tr>
<tr><td>40 to 50 MPH</td><td>325 LTV/Day</td><td>250 LTV/Day</td></tr>
<tr><td>≥ 55 MPH</td><td>250 LTV/Day</td><td>200 LTV/Day</td></tr>
</table>
</td>
<td>• Reduces delay associated with slowing and turning vehicles

• Reduces potential for angle and left-turn collisions</td>
<td>• Requires additional right-of-way
• Appropriate deceleration length and storage should be provided

• Increases crossing distances for pedestrians</td>
</tr>
</table>

Table A.4
Strategy Set 4 – Land Use and Subdivision Controls

Strategy	Description	Benefits	Potential Issues
Reverse Frontage	Reverse frontage refers to a design that requires lots along the arterial obtain access from an interior local road. Buildings could either front on a local access road or front on a major road, but the direct property access between individual lots and the abutting arterials/collectors would be denied.	• Connectivity • Internal Circulation • Removes turning and slowing vehicles from through travel lanes • Reduces potential for rear end collisions	• Requires additional right-of-way • Must be addressed during site plan review process
Maximum Number of Driveways per Lot	Regulating maximum number of driveways per lot can reduce the conflict points between traffic traveling through an area and the traffic turning into or exiting from land developments.	• Removes turning and slowing vehicles from through travel lanes • Reduces potential for rear end collisions • Improve travel speeds in through travel lanes	• Requires action during site plan review process
Connectivity of Supporting Streets	Poor connectivity of supporting streets will increase demand for arterial access while desired connectivity of supporting streets will increase opportunity for alternative access and reduce the travel demand on major arterials/collectors.	• Removes "local" trips or short trips from arterials • Reduces potential for rear end collisions • Improve travel speeds in through travel lanes	• Difficult to retrofit "supporting" street network in a built-up area
Service Roads	Building service roads can help to reduce traffic conflicts and improve safety.	• Consolidates access to the arterial system • Removes turning and slowing vehicles from through travel lanes • Improve travel speeds in through	• Requires additional right-of-way • Difficult to retrofit service road in a built-up area

Strategy	Description	Benefits	Potential Issues
		travel lanes	
Shared Driveways – Residential Development	Shared driveways in residential development area should be considered and applied to where property frontages are short or among clustered units.	• Reduces the interference of turning and slowing traffic with through traffic. • Reduces conflict points • Preserves the arterial carrying capacity	• All parcels do not have individual driveway access to the arterial. • Requires coordination through the site plan review process
Shared Driveways – Non-residential Development	Shared commercial driveways should be considered and applied when there are multiple non-residential developments proposed at one location or adjacent developments proposed over time.	• Reduces the interference of turning and slowing traffic with through traffic. • Reduces conflict points • Preserves the arterial carrying capacity	• All parcels do not have individual driveway access to the arterial. • Requires coordination through the site plan review process
Outparcel Requirements	Outparcel refers to a parcel external to the larger, main parcel that abuts a roadway. The outparcel regulation should be considered to encourage interior circulation system usage and reduce the need for driveways along the arterial.	• Controlled and consolidated access • Provides access to internal circulation – removes turning vehicles from through travel lanes • Reduces conflict points on arterial road network	• Requires coordination during site plan review process