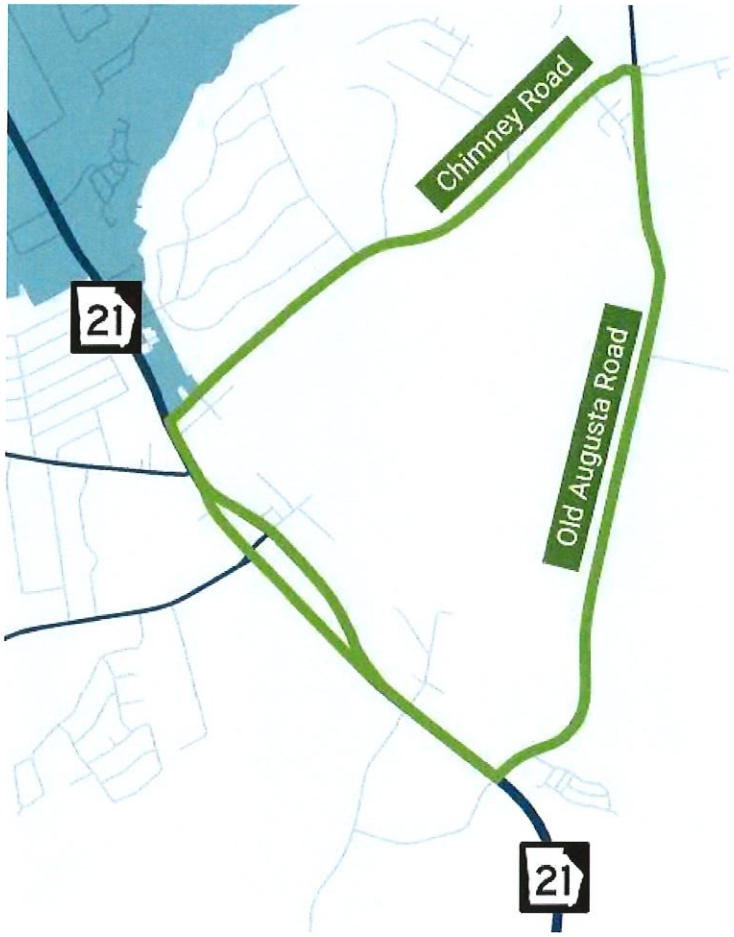
TRAFFIC ANALYSIS REPORT

For the corridor of:
Old Augusta Road
Effingham County



Report Prepared For:
Effingham County

Report Prepared By:
Pond & Company
Richard Fangmann, P.E.
3500 Parkway Lane, Suite 500
Peachtree Corners, GA 30092

Telephone Number: *(678)336-7740*
E-mail Address: *puckettz@pondco.com*
Date Report Prepared: September 2022

Table of Contents

1. INTRODUCTION

This memo was developed in order to summarize the findings and preliminary recommendations regarding the Old Augusta Road Corridor Study. This study analyzes sections of Old Augusta Road, SR 21, and Chimney Road to evaluate the impacts of planned developments along Old Augusta Road, as well as future growth in the study area and aims to determine the appropriate recommendations to meet the corresponding traffic demand.

2. PROJECT BACKGROUND AND EXISTING CONDITIONS

2.1 Project Location

Old Augusta Road is a north-south roadway in southeastern Effingham County. The study area is presented in **Figure 2-1** and includes Old Augusta Road from SR 21 to Chimney Road, Chimney Road from Old Augusta Road to SR 21, and SR 21 between Old Augusta Road and Chimney Road.

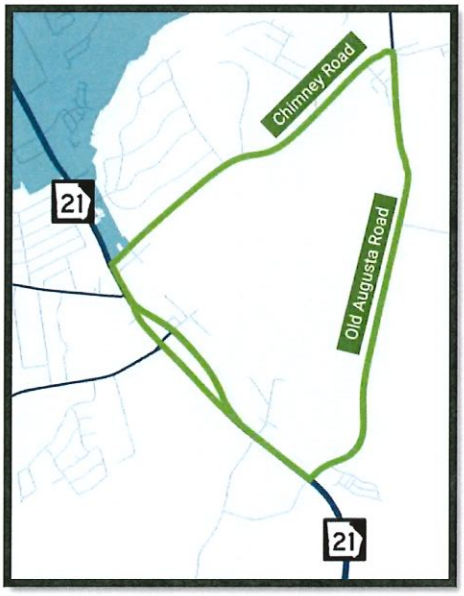


Figure 2-1. Project Area

2.2 Summary of Existing Site

The land use along Old Augusta Road is mostly undeveloped, although a number of large industrial developments are expected in the near future. The primary land use along SR 21 is commercial, while the use along Chimney Road is primarily Residential.

2.3 Bicycle and Pedestrian Facilities

Neither pedestrian facilities nor bicycle facilities are provided along the roadways in the vicinity of the study area with the exception of crosswalks at the intersections of SR 21 with Old Augusta Road, McCall Road, and Goshen Road.

2.4 Existing Transportation Facilities

This section provides a description of the existing roadways within the study area.

- **Old Augusta Road**
  Old Augusta Road is a two-lane, north/south undivided roadway with a rural section. The facility has a posted speed limit of 55 MPH and is classified by GDOT as a Major Collector. The roadway has a rural section with no bicycle or pedestrian facilities, with the exception of crosswalks at its intersection with SR 21.

- **SR 21**
  SR 21 is a four-lane, north/south divided roadway. The roadway has a posted speed limit of 55 MPH and is classified by GDOT as a Principal Arterial. The roadway has a rural section with no bicycle or pedestrian facilities, with the exception of crosswalks at its intersection with Goshen Road, McCall Road, and Old Augusta Road.

- **Chimney Road**
  Chimney Road is a two-lane, east/west undivided roadway with a rural section. The facility has a posted speed limit of 45 MPH and is classified by GDOT as a Local Road. The roadway has a rural section with no bicycle or pedestrian facilities.

While Old Augusta Road is the primary focus of the study, intersections at Chimney Road and SR 21 were also considered. Intersections analyzed at the study, along with respective existing control types are presented in **Table 2-1**. Many of these intersections do not currently exist, as they are future access points for expected developments.

2.5 Study Network Determination

While Old Augusta Road is the primary focus of the study, intersections at Chimney Road and SR 21 were also considered. Intersections analyzed at the study, along with respective existing control types are presented in **Table 2-1**. Many of these intersections do not currently exist, as they are future access points for expected developments.

Table 2-1: Study Intersections

Location	Future Access Point	Existing Control
SR 21 at Old Augusta Road	No	Traffic Signal
Old Augusta Road at Parkers Driveway	Yes	Minor Street Stop Control
Old Augusta Road at South U-Turn Crossover	Yes	N/A
Old Augusta Road at Northgate	Yes	Minor Street Stop Control (Assumed for Existing Conditions)
Old Augusta Road at Exeter/Trailer Yard	Yes	Minor Street Stop Control (Assumed for Existing Conditions)
Old Augusta Road at Cowan South	Yes	Minor Street Stop Control (Assumed for Existing Conditions)
Old Augusta Road at Estes	No	Minor Street Stop Control
Old Augusta Road at Chesterfield/ Becknell	Yes	Minor Street Stop Control (Assumed for Existing Conditions)
Old Augusta Road at Cowan Center	Yes	Minor Street Stop Control (Assumed for Existing Conditions)
Old Augusta Road at Cowan North	Yes	Minor Street Stop Control (Assumed for Existing Conditions)
Old Augusta Road at Chimney Road	No	Minor Street Stop Control
SR 21 at Chimney Road	No	Minor Street Stop Control

2.6 Traffic Volumes

Traffic counts were collected Thursday, August 11, 2022. These counts were collected at the study area intersections when local schools were in session and outside of holiday periods. The traffic counts included 6-Hour Turning Movement Counts (7:00AM-9:00AM, 11:00AM-1:00PM, 4:00PM- 6:00PM), which were collected at the existing study intersections, and 24-HR Average Daily Traffic (ADT) counts with classification, which were collected along SR 21 north of Old Augusta Road, Old Augusta Road south of Abercorn Road, and Chimney Road east of BG Lane. The daily volumes along these roadways were recorded as 31,439; 7,607; and 1,329 vpd respectively. Traffic count data is included in **Appendix A**. Diagrams presenting existing traffic volumes are presented in **Appendix B**.

2.7 Heavy Truck Volumes

Vehicle classification counts were conducted as part of the data collection effort. The FHWA classifies vehicles into 13 separate groupings, based on the number of wheels and axles. The percent of traffic comprised of heavy vehicles during each peak hour are summarized in **Table 2-2** below.

Table 2-2: Existing Conditions Truck Percentages

Existing Heavy Vehicle Percentages 2022 Conditions						
Facility	AM Peak Hour			PM Peak Hour		
	Total Volume	HV Volume	Truck %	Total Volume	HV Volume	Truck %
Old Augusta Road	657	35	5.3%	695	64	9.2%
SR 21	1750	241	13.8%	2461	94	3.8%
Chimney Road	134	6	4.5%	112	4	3.6%

3. TRAFFIC FORECASTING

Future traffic volumes were developed for the AM and PM peak hours at study intersections. Scenarios analyzed include year 2024 without traffic generated by the planned development, year 2024 including the planned development generated traffic, and year 2044 including the development traffic as well as long term growth.

3.1 Short-Term Background Growth

In order to project future traffic volumes in the year 2024 independent of the Northgate and Exeter developments, a growth rate of 3.5%, derived from the Effingham County Transportation Master Plan, was utilized and applied to the collected 2022 traffic volumes. ADT data was utilized to determine existing traffic along Old Augusta Road between SR 21 and Chimney Road. Diagrams displaying 2024 volumes before accounting for expected developments are included in **Appendix B**.

3.2 Development Trip Generation and Distribution

3.2.1 Trip Generation

The Institute of Transportation Engineers' (ITE) Trip Generation Manual, 11th Edition was utilized to estimate AM and PM peak hour trips, including heavy vehicle traffic, to be utilized in the capacity analysis for the expected development along the corridor. Ten planned developments are expected and were included in the analysis. These developments and their expected access locations are shown in **Figure 3-1**, while **Table 3-1** presents the trip generation results for each location. Heavy vehicle trip generation was also included in the process due to the land use types, so that the impact of these vehicles was accounted for in capacity analysis. The following assumptions were utilized in the Trip Generation process:

- The Becknell development will have an alternate access point at an unsignalized location. As Old Augusta Road provides signalized access to SR 21, it was assumed that 60% of personal vehicle trips and 100% of heavy vehicle trips to and from these facilities will utilize Old Augusta Road.
- The future Trailer Yard development does not have directly applicable land use types in ITE Trip Gen 11th Edition. Intermodal Truck Terminal and General Light Industrial land uses were considered, but the size of the development was well out of the range of sizes applicable to trip generation for these development types and resulted in far more trips than could be reasonably expected. Due to similarities in function between the two land uses, Warehouse land use was utilized to generate trips for these facilities.
- Estes express is an existing facility. While no turning movement count was collected at its access point on Old Augusta Road, it was determined the facility should be considered in this study due to the land use type. Trip generation and distribution was performed to estimate peak hour turning movements at this location; however, these trips were not "carried" through the study network and did not impact other study locations.

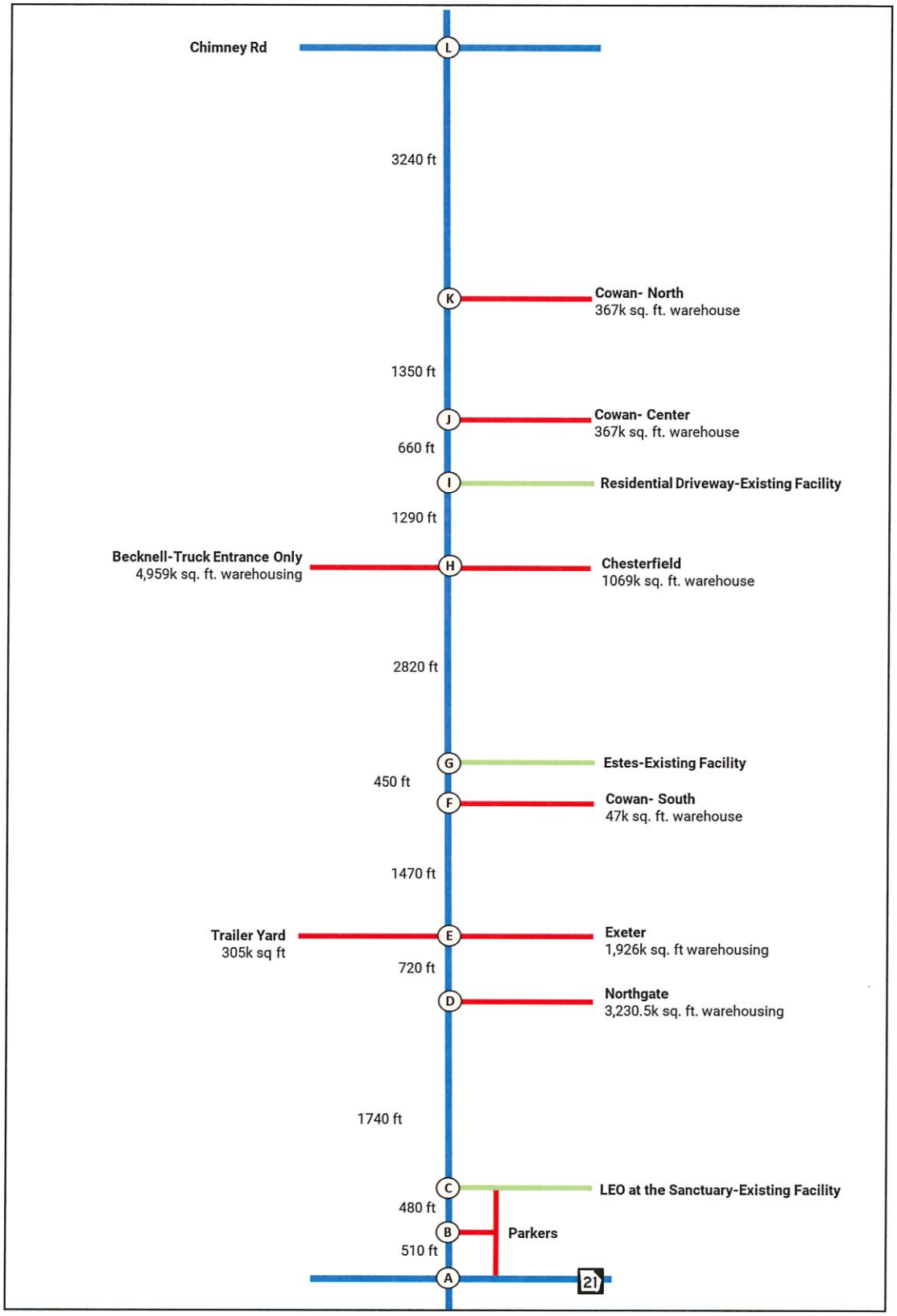


Figure 3-1. Location of Expected Developments

Table 3-1: Expected Development Trip Generation

Development	Land Use	Intensity	Units	AM Peak Hour						PM Peak Hour					
				Entering			Exiting			Entering			Exiting		
				Total Trips	PV Trips	HV Trips	Total Trips	PV Trips	HV Trips	Total Trips	PV Trips	HV Trips	Total Trips	PV Trips	HV Trips
Parkers	944-Gasoline/Service Station	20	Fueling Positions	103	103	0	103	103	0	139	139	0	139	139	0
Northgate	150-Warehousing	3230.5	1000 Square Ft	316	282	34	95	64	31	116	66	50	298	251	47
Exeter	150-Warehousing	1926	1000 Square Ft	196	177	19	59	39	20	72	42	30	186	158	28
Trailer Yard	150-Warehousing	305	1000 Square Ft	46	40	6	14	11	3	18	13	5	45	41	4
Cowan-South	150-Warehousing	47	1000 Square Ft	23	23	0	7	6	1	9	9	0	23	21	2
Chesterfield	150-Warehousing	1069	1000 Square Ft	117	106	11	35	25	10	53	36	17	139	124	15
Becknell	150-Warehousing	4959	1000 Square Ft	476	425	51	143	95	48	250	173	77	643	571	72
Cowan-Center	150-Warehousing	367	1000 Square Ft	52	49	3	16	12	4	18	12	6	48	43	5
Cowan-North	150-Warehousing	367	1000 Square Ft	52	49	3	16	12	4	18	12	6	48	43	5
Estes Express	150-Warehousing	55	1000 Square Ft	23			7			3			7		
Total	**N/A**	**N/A**	**N/A**	**1381**	**1254**	**127**	**488**	**367**	**121**	**693**	**502**	**191**	**1569**	**1391**	**178**

3.2.2 Trip Distribution

Trips were distributed throughout the study network based on the following assumptions:

- All generated personal vehicle trips were distributed to/from either SR 21 south of Old Augusta Road, SR 21 north of Old Augusta Road, or Old Augusta Road north of Chimney Road.
- All generated heavy vehicle trips were distributed to/from either SR 21 south of Old Augusta Road or SR 21 north of Old Augusta Road.
- Personal vehicles were distributed proportionally based on respective peak hour existing directional turning movement patterns at the intersections of Old Augusta Road at SR 21 and Old Augusta Road at Chimney Road. The respective directional volume at each location was compared to the total directional volume for potential distribution location; these ratios were used to assign traffic. **Table 3-2** summarizes this process.
- As heavy vehicles are expected to have different traffic patterns, with heavier travel to and from the interstate, a different methodology was utilized for distribution. Vehicles were distributed proportionally using daily heavy vehicle volumes from GDOT's TADA database. Truck volumes along SR 21 north of Old Augusta Road, I-95 north of Commerce Dr, SR 21 east of I-95, and I-95 south of I-16 were compared, with the distribution performed throughout the network based on the ratio of each volume to the sum of the volumes. As the study area does not include SR 21 east of Old Augusta Road, trips to/from I-95 and SR 21 east of I-95 were distributed in the same manner. **Table 3-3** summarizes this process.
- Generated trips were carried throughout the study area and added to volumes developed using 'background growth' alone.

Table 3-2: Personal Vehicle Distribution Nodes and Percentages

Period	Direction	Location	PHV	Percentage
AM Peak Hour	Entering	SR 21 SB N/O Old Augusta Road	960	45.2%
		SR 21 NB S/O Old Augusta Road	918	43.3%
		Old Augusta Road SB N/O Chimney Rd	244	11.5%
	Exiting	SR 21 NB N/O Old Augusta Road	790	37.6%
		SR 21 SB S/O Old Augusta Road	1194	56.8%
		Old Augusta Road NB N/O Chimney Rd	119	5.7%
PM Peak Hour	Entering	SR 21 SB N/O Old Augusta Road	917	29.1%
		SR 21 NB S/O Old Augusta Road	1997	63.4%
		Old Augusta Road SB N/O Chimney Rd	235	7.5%
	Exiting	SR 21 NB N/O Old Augusta Road	1544	49.0%
		SR 21 SB S/O Old Augusta Road	1154	36.7%
		Old Augusta Road NB N/O Chimney Rd	450	14.3%

Table 3-3: Heavy Vehicle Distribution Nodes and Percentages

TC Station	Location	HV AADT	Percentage	Distribution	
103-0128	SR 21 N/O Commerce Dr	2658	9.5%	To/From SR 21 N/O Old Augusta Road	9.5%
051-0387	I-95 N/O SR 21	9854	35.0%		
051-0112	SR 21 S/O I-95	4026	14.3%	To/From SR 21 S/O Old Augusta Road	90.5%
051-0383	I-95 N/O I-16	11587	41.2%		

This methodology was applied to generated personal and heavy vehicle trips for the AM and PM peak hours. Trip distributions are presented in **Tables 3-4** and **3-5**, while diagrams displaying the distribution of generated total, personal vehicle, and heavy vehicle trips as well as 2024 traffic volumes are included in **Appendix B**.

Table 3-4: Personal Vehicle Trip Distribution

Development	AM Peak Hour								PM Peak Hour							
	Entering				Exiting				Entering				Exiting			
	PV Trips	From SR 21 N/O Old Augusta Road	From SR 21 S/O Old Augusta Road	From Old Augusta Road N/O Chimney Road	PV Trips	To SR 21 N/O Old Augusta Road	To SR 21 S/O Old Augusta Road	To Old Augusta Road N/O Chimney Road	PV Trips	From SR 21 N/O Old Augusta Road	From SR 21 S/O Old Augusta Road	From Old Augusta Road N/O Chimney Road	PV Trips	To SR 21 N/O Old Augusta Road	To SR 21 S/O Old Augusta Road	To Old Augusta Road N/O Chimney Road
Parkers	103	47	45	11	103	39	58	6	139	40	88	11	139	68	51	20
Northgate	282	128	122	32	64	24	36	4	66	19	42	5	251	123	92	36
Exeter	177	80	77	20	39	15	22	2	42	12	27	3	158	77	58	23
Trailer Yard	40	18	17	5	11	4	6	1	13	4	8	1	41	20	15	6
Cowan-South	23	10	10	3	6	2	3	1	9	3	6	0	21	10	8	3
Chesterfield	106	48	46	12	25	9	14	2	36	10	23	3	124	61	45	18
Becknell	255	115	110	30	57	22	32	3	104	30	66	8	343	168	125	50
Cowan-Center	49	22	21	6	12	5	7	0	12	3	8	1	43	21	16	6
Cowan-North	49	22	21	6	12	5	7	0	12	3	8	1	43	21	16	6
Estes Express	23	10	10	3	7	3	4	0	12	3	8	1	43	21	16	6

Table 3-5: Heavy Vehicle Trip Distribution

Development	AM Peak Hour						PM Peak Hour					
	Entering			Exiting			Entering			Exiting		
	HV Trips	From SR 21 N/O Old Augusta Road	From SR 21 S/O Old Augusta Road	HV Trips	To SR 21 N/O Old Augusta Road	To SR 21 S/O Old Augusta Road	HV Trips	From SR 21 N/O Old Augusta Road	From SR 21 S/O Old Augusta Road	HV Trips	To SR 21 N/O Old Augusta Road	To SR 21 S/O Old Augusta Road
Parkers	0	0	0	0	0	0	0	0	0	0	0	0
Northgate	34	3	31	31	3	28	50	5	45	47	4	43
Exeter	19	2	17	20	2	18	5	0	5	4	0	4
Trailer Yard	6	1	5	3	0	3	22	2	20	24	2	22
Cowan-South	0	0	0	1	0	1	0	0	0	2	0	2
Chesterfield	11	1	10	10	1	9	17	2	15	15	1	14
Becknell	51	5	46	48	5	43	77	7	70	72	7	65
Cowan-Center	3	0	3	4	0	4	6	1	5	5	0	5
Cowan-North	3	0	3	4	0	4	6	1	5	5	0	5
Total	127	12	115	121	11	110	183	18	165	174	14	160

3.3 Long-Term Traffic Growth

Traffic volumes for the year 2044 were developed by applying the long-term growth rate of 1.5% from the Effingham County Transportation Master Plan to 2024 'background growth'-only volumes. While in the Transportation Master Plan the short-term growth rate was utilized to grow volumes up to the year 2031, the trip generation and distribution performed captures the aggressive growth between the years 2024 and 2031. was applied to volumes between the years of 2031 and 2044 within the study area. Volumes developed in the trip generation and distribution process were then added to these 'long-term' background volumes to develop 2044 traffic volumes. Diagrams presenting 2044 volumes are included in **Appendix B**.

3.4 Heavy Vehicle Percentages

In order to account for the significant volume of heavy vehicle traffic projected to be generated by future development in the area, heavy vehicle percentages for use in capacity analysis were adjusted along Old Augusta Road, SR 21, and Chimney Road. In order to do so, peak hour ADT total and heavy vehicle volumes were grown to 2024 conditions utilizing a growth rate of 3.5%. Peak hour total and heavy vehicle volumes projected generated by future development were added to these 2024 volumes, and new heavy vehicle percentages were calculated. In order to properly account for the truck traffic that is projected, Old Augusta Road south of Northgate/Park of Commerce, SR 21 south of Old Augusta Road, and Chimney Road west of Old Augusta Road were selected as the links to extract generated traffic. This process is summarized in **Table 3-6**. These adjusted heavy vehicle percentages were utilized in capacity analysis.

Table 3-6: Heavy Vehicle Percentage Adjustments

Existing Heavy Vehicle Percentages 2022 Conditions						
Facility	AM Peak Hour			PM Peak Hour		
	Total Volume	HV Volume	Truck %	Total Volume	HV Volume	Truck %
Old Augusta Road	657	35	5.3%	695	64	9.2%
SR 21	1750	241	13.8%	2461	94	3.8%
Chimney Road	134	6	4.5%	112	4	3.6%
Background Heavy Vehicle Percentages 2024 Conditions						
Facility	AM Peak Hour			PM Peak Hour		
	Total Volume	HV Volume	Truck %	Total Volume	HV Volume	Truck %
Old Augusta Road	704	38	5.3%	745	69	9.2%
SR 21	1875	258	13.8%	2636	101	3.8%
Chimney Road	144	6	4.5%	120	4	3.6%
Generated Trips Heavy Vehicle Percentages						
Facility	AM Peak Hour			PM Peak Hour		
	Total Volume	HV Volume	Truck %	Total Volume	HV Volume	Truck %
Old Augusta Road	1345	248	18.4%	1536	357	23.2%
SR 21	879	225	25.6%	1027	325	31.6%
Chimney Road	0	0	0.0%	0	0	0.0%
Adjusted Heavy Vehicle Percentages (Background and Generated Traffic)						
Facility	AM Peak Hour			PM Peak Hour		
	Total Volume	HV Volume	Truck %	Total Volume	HV Volume	Truck %
Old Augusta Road	2049	286	14.0%	2281	426	18.7%
SR 21	2754	483	17.5%	3663	426	11.6%
Chimney Road	144	6	4.5%	120	4	3.6%

4. CRASH ANALYSIS

Future traffic volumes were developed for the AM and PM peak hours at study intersections. Crash analysis was performed to determine any crash trends indicative of conditions unaccommodating to future development and growth within the study area. Crash data from the years 2017-2021 was extracted from GDOT's Numetric database and analyzed. This was performed for the existing study intersections (excluding the future development access points) as well as along Old Augusta Road between SR 21 and Chimney Road. A summary of this data by crash type and injury severity is presented in **Tables 4-1** through **4-4** below.

Table 4-1: Crash Review Summary for the Intersection of Old Augusta Road and SR 21

Crash Type	K	A	B	C	O	Unknown	Total	Percentage of Total Crashes
Angle (Other)	0	0	0	0	4	0	4	3.8%
Left Angle Crash	0	1	3	5	4	0	13	12.5%
Right Angle Crash	0	0	0	0	0	0	0	0.0%
Rear End	0	0	2	16	42	3	63	60.6%
Head-On	0	0	0	1	0	0	1	1.0%
Sideswipe-Opposite Direction	0	0	0	0	1	0	1	1.0%
Sideswipe-Same Direction	0	0	0	2	9	0	11	10.6%
Not a Collision with Motor Vehicle	0	0	0	0	10	0	10	9.6%
Other/Unspecified	0	0	0	0	1	0	1	1.0%
Total Crashes	0	1	5	24	71	3	104	100%
Crashes Involving Pedestrians	0	0	0	0	0	0	0	0.0%
Crashes Involving Bicyclists	0	0	0	0	0	0	0	0.0%
Crashes Involving Heavy Vehicles	0	0	0	3	12	0	15	14.4%

Table 4-2: Crash Review Summary for the Intersection of Chimney Road and SR 21

Crash Type	K	A	B	C	O	Total	Percentage of Total Crashes
Angle (Other)	0	0	1	1	2	4	17.4%
Left Angle Crash	0	0	0	0	5	5	21.7%
Right Angle Crash	0	0	0	0	0	0	0.0%
Rear End	0	0	0	1	4	5	21.7%
Head-On	0	0	0	0	1	1	4.3%
Sideswipe-Opposite Direction	0	0	0	0	0	0	0.0%
Sideswipe-Same Direction	0	0	0	0	5	5	21.7%
Not a Collision with Motor Vehicle	0	0	0	0	3	3	13.0%
Other/Unspecified	0	0	0	0	0	0	0.0%
Total Crashes	0	0	1	2	20	23	100%
Crashes Involving Pedestrians	0	0	0	0	0	0	0.0%
Crashes Involving Bicyclists	0	0	0	0	0	0	0.0%
Crashes Involving Heavy Vehicles	0	0	1	0	2	3	13.0%

Table 4-3: Crash Review Summary for the Intersection of Chimney Road and Old Augusta Road

Crash Type	K	A	B	C	O	Total	Percentage of Total Crashes
Angle (Other)	0	0	0	1	1	2	33.3%
Left Angle Crash	0	0	1	0	0	1	16.7%
Right Angle Crash	0	0	0	0	0	0	0.0%
Rear End	0	0	0	1	1	2	33.3%
Head-On	0	0	0	0	0	0	0.0%
Sideswipe-Opposite Direction	0	1	0	0	0	1	16.7%
Sideswipe-Same Direction	0	0	0	0	0	0	0.0%
Not a Collision with Motor Vehicle	0	0	0	0	0	0	0.0%
Other/Unspecified	0	0	0	0	0	0	0.0%
Total Crashes	0	1	1	2	2	6	100.0%
Crashes Involving Pedestrians	0	0	0	0	0	0	0.0%
Crashes Involving Bicyclists	0	0	0	0	0	0	0.0%
Crashes Involving Heavy Vehicles	0	1	0	0	0	1	16.7%

Table 4-4: Crash Review Summary for Old Augusta Road Corridor

Crash Type	K	A	B	C	O	Total	Percentage of Total Crashes
Angle (Other)	0	0	0	0	0	0	0.0%
Left Angle Crash	0	0	0	0	1	1	4.8%
Right Angle Crash	0	0	0	0	0	0	0.0%
Rear End	0	0	1	0	1	2	9.5%
Head-On	0	0	0	0	0	0	0.0%
Sideswipe-Opposite Direction	0	0	0	0	0	0	0.0%
Sideswipe-Same Direction	0	0	0	0	2	2	9.5%
Not a Collision with Motor Vehicle	0	0	3	2	11	16	76.2%
Other/Unspecified	0	0	0	0	0	0	0.0%
Total Crashes	0	0	4	2	15	21	100.0%
Crashes Involving Pedestrians	0	0	0	0	0	0	0.0%
Crashes Involving Bicyclists	0	0	0	0	0	0	0.0%
Crashes Involving Heavy Vehicles	0	0	0	0	1	1	4.8%

At the intersection of SR 21 at Old Augusta Road, the majority of crashes are rear-end crashes. As turn lanes are present for all approaches at the intersection, this is likely indicative of congestion-related collisions. The crash data regarding the intersections of Old Augusta Road at Chimney Road and SR 21 at Chimney Road indicates infrequent crashes with no notable trends among crash type. While crashes are infrequent along the Old Augusta Road corridor between SR 21 and Chimney Road, over 75% of crashes are of the Not a Collision with a Motor Vehicle type. Upon further investigation, 4 out of 16 of these incidents (25%) involved collisions with animals while 3 (19%) involved the driver losing control. As there are shoulders and sufficient clear zones along the roadway, the curvature of the facility and rural character may be contributing factors to these crashes. The installation of signage along the approach of the three horizontal curves of the roadway may reduce the frequency of these crashes. The crash datasets utilized for this analysis are included in **Appendix C**.

5. EXISTING AND NO-BUILD CAPACITY ANALYSIS

Capacity analysis was performed utilizing Synchro 11 software. In this study, delay for unsignalized intersections (minor street stop control and roundabout control) was calculated utilizing Highway Capacity Manual (HCM), 6th Edition methodology, while delay for signalized intersections was calculated utilizing Synchro methodology.

Capacity is defined as the maximum number of vehicles that can pass over a particular road segment or through a particular intersection within a specified period under prevailing roadway, traffic, and control conditions. Level of Service (LOS) describes the operating characteristics of a road segment or intersection in relation to its capacity. LOS is defined as a qualitative measure that describes operational conditions and motorists' perceptions. The Highway Capacity Manual defines six levels of service: LOS A through LOS F. Level of service A indicates excellent operations with little delay to motorists, while level of service F indicates extremely long delay. Acceptable LOS is typically defined as D or better, although LOS E may be accepted along high volume corridors.

Level of service for unsignalized intersections is calculated for the average controlled delay incurred for vehicles on the stop-controlled approaches. Controlled delay for unsignalized intersections includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Several factors affect the controlled delay for unsignalized intersections, including the availability of gaps in the cross-street traffic and acceptable gap time to make the movement from the stop position. LOS is reported as total intersection delay for signalized, all way stop-controlled, and roundabout intersections and as the highest delay approach for minor street stop-controlled intersections. The LOS criteria for unsignalized and signalized intersections is presented in **Table 5-1.** All Capacity analysis results for this study are included in **Appendix D**.

Table 5-1: Level of Service Thresholds

	Unsignalized Intersections	Signalized Intersections
LOS	Average Delay (seconds)	Average Delay (seconds)
A	<= 10	<= 10
B	> 10 and <= 15	> 10 and <= 20
C	> 15 and <= 25	> 20 and <= 35
D	> 25 and <= 35	> 35 and <= 55
E	> 35 and <= 50	> 55 and <= 80
F	> 50	> 80

Source: 2010 Highway Capacity Manual

Existing and no build analysis assumes the existing roadway network, lane configurations, and intersection control types. Scenarios analyzed included AM and PM scenarios for the year 2022, the year 2024 with and without the planned developments, and the year 2044. At the intersections of Old Augusta Road with the development access points, the no build scenarios assumed minor street stop control with no turn lanes. Results are presented in **Table 5-2** below:

Table 5-2: Existing and No Build Capacity Analysis Results

ID	Location	Existing Year 2022				Background Growth Only								With Generated Traffic and Existing Network							
						Year 2024				Year 2044				Year 2024				Year 2044			
		AM		PM		AM		PM		AM		PM		AM		PM		AM		PM	
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
A	SR 21 at Old Augusta Road	B	13.6	A	10	B	14.1	B	11.8	C	20.4	C	23.3	F	108.2	F	91.2	F	141.7	F	145.9
B	Old Augusta Road at Parkers Driveway	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	F	1382	F	2464	F	1794	F	4579
N/A	Old Augusta Road at South U-Turn Crossover	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D	Old Augusta Road at Northgate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	F	3403	F	4063	F	1912	F	6846
E	Old Augusta Road at Exeter/Trailer Yard	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	F	367.3	F	2115	F	768.9	F	3890
F	Old Augusta Road at Cowan South	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	E	35.9	F	64.1	F	50.9	F	113.3
G	Old Augusta Road at Estes	B	14.2	C	15	B	14.9	C	15.8	C	19.3	C	21.2	E	38.2	F	57.6	F	55.5	F	93.7
H	Old Augusta Road at Chesterfield/ Becknell	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	F	409	F	3526	F	1035	F	10293
J	Old Augusta Road at Cowan Center	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	20.3	C	24.3	D	27.1	E	37.4
K	Old Augusta Road at Cowan North	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	18.9	C	22.5	D	25	D	33.9
L	Old Augusta Road at Chimney Road	B	12.6	C	16.6	B	12.9	C	17.7	C	15.1	D	29.7	C	15.5	C	24.1	C	18.3	E	48.8
N/A	SR 21 at Chimney Road	F	68.7	F	734.4	F	112.3	F	1378	F	1470	F	14569	F	619.5	F	1567	F	5232	F	***

The results of the analysis indicate that the traffic generated by the development leads to significant congestion, with unacceptable level of service for most development access points. The additional traffic also leads to an unacceptable level of service at the intersections of SR 21 at Old Augusta Road and Old Augusta Road at Estes. While the intersection of SR 21 at Chimney Road is failing under existing conditions, the added traffic significantly increases delay. These results indicate a need for improvements along Old Augusta Road to accommodate the expected changes in traffic patterns in the near future.

6. ALTERNATIVE DEVELOPMENT

Multiple alternatives were developed for analysis in order to accommodate the projected traffic demand. Alternatives were developed at the intersections of SR 21 at Old Augusta Road and SR 21 at Chimney Road, consisting of improvements to the individual intersections. However, the remaining intersections along Old Augusta Road were developed with the operation of the corridor as a system in mind. One alternative along this section consisted of the installation of a two-way center turn lane along Old Augusta Road while maintaining full access. The other alternatives considered for the section involved access management via the restriction of most driveways to right in/right out configuration with strategically placed crossover locations that may permit a U-turn movement either at a roundabout or traffic signal. These locations were selected using the following principals:

- Attempt to maintain a spacing standard of full access median breaks for rural highways of 2,640 feet or more in accordance with the Georgia Department of Transportation's (GDOT) Driveway and Encroachment Control Manual. The county's goal was to be at or near this spacing standard. This principal was significantly breeched in one location: a U-turn only location south of Northgate access. As a result of the full access locations selected, this is necessary to provide a southbound U-turn location for vehicles attempting to enter Northgate from the north leg of Old Augusta Road without utilizing the traffic signal at SR 21, as the geometry at that intersection is not ideal for U-turning movement. In addition, a northbound U-turn provision is recommended at this location due to accommodate the recommendation of the access driveway for LEO at the Sanctuary to be converted to an RCUT configuration. As there is no minor street volume, queueing is expected to be minimal and the spacing not a concern.
- Prioritize roundabouts/signal placement at locations that provide direct access for higher trip generating developments.
- Prioritize roundabouts/signal placement at four-leg intersections.
- Prioritize roundabout control type over traffic signal control type at locations where the implementation is feasible, as is the preference of Effingham County.

In addition to the intersections and access points quantitatively analyzed in this study, the driveway at LEO at the Sanctuary was considered. A right in/right out configuration would negatively affect the existing residential development, while the location is spaced too closely with the intersection at SR 21 to consider a roundabout or traffic signals. As the access management strategy employed seeks to eliminate all unsignalized full access median breaks along Old Augusta Road, an RCUT configuration was selected at this location. This will allow vehicles to turn left and right into the facility, but only allow right turns exiting; left turning vehicles will make a downstream U-turn.

Alternatives developed for analysis at each location are presented in **Table 6-1**, while a line diagram presenting locations selected for U-turn locations in Old Augusta Road access management alternatives is presented in **Figure 6-1**.

Table 6-1: Developed Roadway Improvement Alternatives

ID	Intersection	Existing Control	Alternative 1	Alternative 2	Alternative 3	Alternative 4
A	SR 21 at Old Augusta Road	Traffic Signal	Install Dual Eastbound Left Turn Lanes along SR 21	Install Dual Eastbound Left Turn Lanes, Install Triple Southbound Left Turn Lanes along Old Augusta Road and Widen SR 21 to Six Lanes	Install Displaced Left Turn For Eastbound Left Movement along SR 21	N/A
B	Old Augusta Road at Parkers Driveway	Minor Street Stop Control (Assumed for Future Conditions)	Install Two Way Left Turn Lane along Old Augusta Road	Install Right In/Right Out Driveway	Install Right In/Right Out Driveway	Widen Old Augusta Road to Four Lanes and Install Right In/Right Out Driveway
N/A	Old Augusta Road at South U-Turn Crossover	N/A	N/A	Singe Lane Unsignalized Median Break w/ Turn Lanes	Singe Lane Unsignalized Median Break w/ Turn Lanes	Multi Lane Unsignalized Median Break w/ Turn Lanes
C	LEO at the Sanctuary	Minor Street Stop Control	RCUT	Right In/Right Out	Roundabout	N/A
D	Old Augusta Road at Northgate	Minor Street Stop Control (Assumed for Future Conditions)	Install Two Way Left Turn Lane along Old Augusta Road	Install Single Lane Roundabout with Eastbound and Northbound Right Turn Lanes	Install Traffic Signal with Left Turn Lanes along Old Augusta Road	Install Multilane Roundabout
E	Old Augusta Road at Exeter/Trailer Yard	Minor Street Stop Control (Assumed for Future Conditions)	Install Two Way Left Turn Lane along Old Augusta Road	Install Right In/Right Out Driveway	Install Right In/Right Out Driveway	Widen Old Augusta Road to Four Lanes and Install Right In/Right Out Driveway
F	Old Augusta Road at Cowan South	Minor Street Stop Control (Assumed for Future Conditions)	Install Two Way Left Turn Lane along Old Augusta Road	Install Right In/Right Out Driveway	Install Right In/Right Out Driveway	Widen Old Augusta Road to Four Lanes and Install Right In/Right Out Driveway
G	Old Augusta Road at Estes	Minor Street Stop Control (Assumed for Future Conditions)	Install Two Way Left Turn Lane along Old Augusta Road	Install Single Lane Roundabout	Install Traffic Signal with Left Turn Lanes along Old Augusta Road	Install Multilane Roundabout
H	Old Augusta Road at Chesterfield/Becknell	Minor Street Stop Control (Assumed for Future Conditions)	Install Two Way Left Turn Lane along Old Augusta Road	Install Single Lane Roundabout	Install Traffic Signal with Left Turn Lanes along Old Augusta Road	Install Multilane Roundabout
J	Old Augusta Road at Cowan Center	Minor Street Stop Control (Assumed for Future Conditions)	Install Two Way Left Turn Lane along Old Augusta Road	Install Right In/Right Out Driveway	Install Right In/Right Out Driveway	Widen Old Augusta Road to Four Lanes and Install Right In/Right Out Driveway
K	Old Augusta Road at Cowan North	Minor Street Stop Control (Assumed for Future Conditions)	Install Two Way Left Turn Lane along Old Augusta Road	Install Single Lane Roundabout	Install Traffic Signal with Left Turn Lanes along Old Augusta Road	Install Multilane Roundabout
L	Old Augusta Road at Chimney Road	Minor Street Stop Control	Install Two Way Left Turn Lane along Old Augusta Road	Install Single Lane Roundabout	Install Traffic Signal with Left Turn Lanes along Old Augusta Road	N/A
N/A	SR 21 at Chimney Road	Minor Street Stop Control	Install Left and Right Turn Lanes along Minor Streets	Install Unsignalized RCUT	Install Multilane Roundabout	N/A

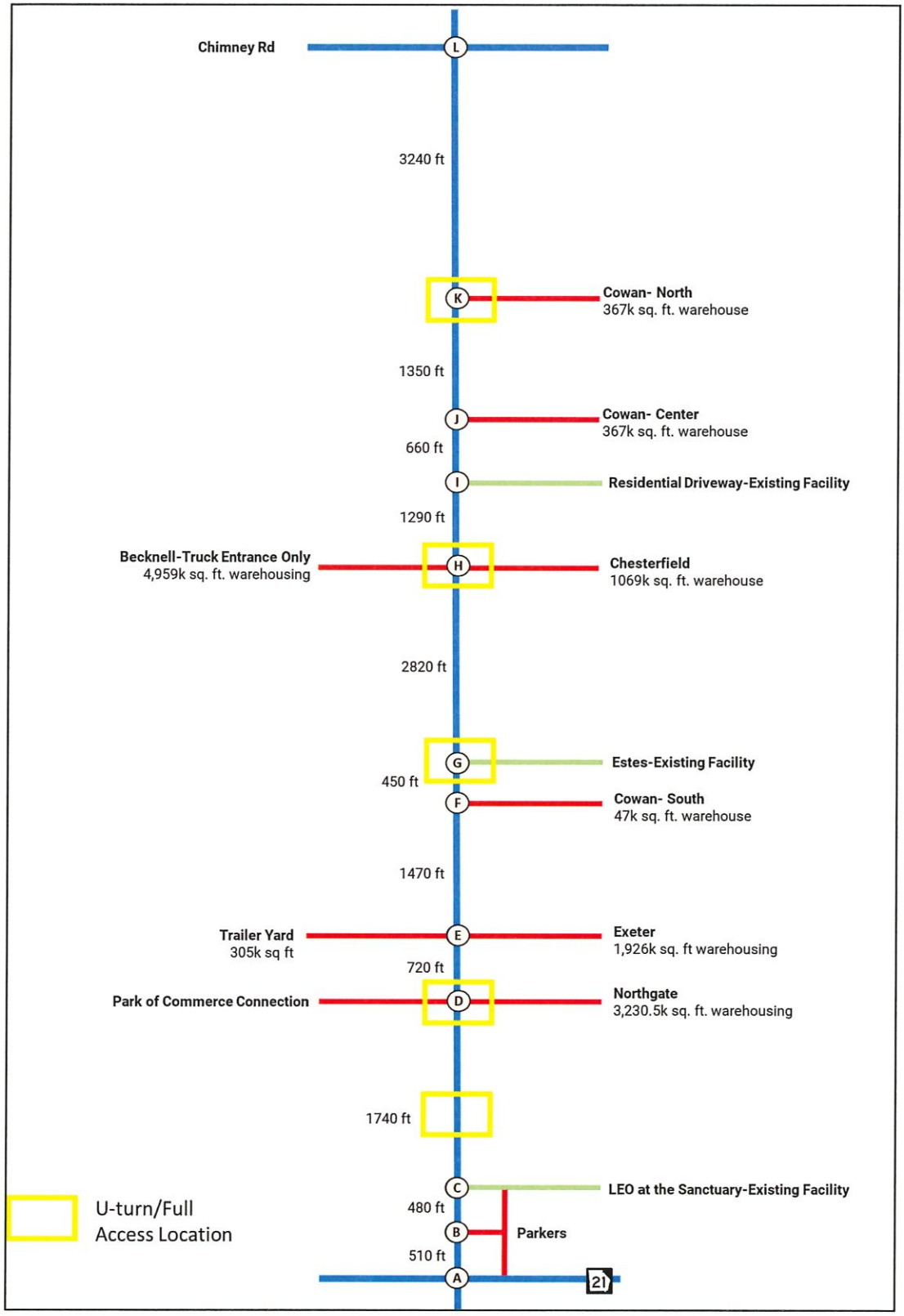


Figure 6-1. U-Turn Locations for Alternatives 2, 3, and 4

7. ALTERNATIVES ANALYSIS RESULTS

Capacity analysis was performed for each developed alternative utilizing the methodology described in the *Existing and No Build Capacity Analysis* section of this document. The results are presented **Table 7-1** below:

Table 7-1: Capacity Analysis of Alternatives

ID	Location	Build- Alternative 1								Build- Alternative 2								Build- Alternative 3								Build- Alternative 4							
		Year 2024				Year 2044				Year 2024				Year 2044				Year 2024				Year 2044				Year 2024				Year 2044			
		AM		PM		AM		PM		AM		PM		AM		PM		AM		PM		AM		PM		AM		PM		AM		PM	
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
A	SR 21 at Old Augusta Road	C	32.2	**E**	**59.1**	D	51.3	**F**	**132**	C	23.1	C	25	C	30.7	D	45.1	B	17.2	D	37.8	C	22.8	**F**	**97.3**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
B	Old Augusta Road at Parkers Driveway	**F**	**87.4**	**F**	**206**	**F**	**128**	**F**	**311**	**F**	**62.7**	**E**	**36.4**	**F**	**82**	**F**	**58.6**	**F**	**62.7**	**E**	**36.4**	**F**	**82**	**F**	**58.6**	C	20.3	C	17.6	C	21.9	C	20.5
N/A	Old Augusta Road at South U-Turn Crossover	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B	13.1	C	18.1	B	13.8	C	20.3	B	13.1	C	18.1	B	13.8	C	20.3	A	8	A	9.8	A	8.7	B	11.1
D	Old Augusta Road at Northgate	**F**	**88.2**	**F**	**704**	**F**	**139**	**F**	**986**	**E**	**36.8**	**F**	**113**	**E**	**44.9**	**F**	**222**	**E**	**36.8**	**F**	**113**	**E**	**44.9**	**F**	**222**	C	18.8	D	27.3	C	20.2	**E**	**37.8**
E	Old Augusta Road at Exeter/Trailer Yard	**E**	**47.2**	**F**	**339**	**F**	**71.1**	**F**	**578**	C	18.1	**F**	**133**	D	33.4	**F**	**189**	B	11.4	D	37.8	B	14.3	**E**	**63.5**	A	8.1	B	14.6	A	9.1	C	17.9
F	Old Augusta Road at Cowan South	C	19.3	C	24.1	C	22.2	D	29.1	B	14.9	C	16.6	C	16.2	C	19.8	B	14.9	C	16.6	C	16.2	C	19.8	B	11.5	B	12.1	B	11.9	B	13.2
G	Old Augusta Road at Estes	C	19.7	C	23.5	C	23.1	D	28.2	B	11.6	C	20.2	C	15.8	D	33.7	A	3.3	A	5.9	A	3.8	A	6.4	A	6	A	7.3	A	6.7	A	8.2
H	Old Augusta Road at Chesterfield/ Becknell	C	16.7	**F**	**80.6**	C	21.5	**F**	**166**	C	17.2	C	19.4	**E**	**36.9**	D	31.8	B	10.7	B	16.3	B	16.4	C	23.6	A	7.3	B	10.5	A	8.5	B	12.6
J	Old Augusta Road at Cowan Center	C	15.1	C	16.8	C	17.6	C	20.4	B	10.4	B	14.6	B	11	C	17.3	B	10.4	B	14.6	B	11	C	17.3	A	9.6	B	11.5	A	9.9	B	12.4
K	Old Augusta Road at Cowan North	B	14.7	C	16.3	C	17.1	C	19.7	A	8.2	A	9.6	B	11.1	B	13.2	A	2.2	A	4.5	A	2.7	A	6.3	A	5.1	A	5.7	A	5.8	A	6.5
L	Old Augusta Road at Chimney Road	B	13.4	C	16.8	B	14.9	C	22.8	A	6.4	A	9.6	A	7.6	B	14.7	A	2.8	A	5.7	A	4	B	10.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	SR 21 at Chimney Road	**F**	**226**	**F**	**732**	**F**	**2026**	**F**	***	C	17	**E**	**47.6**	C	23.4	**F**	**215**	B	12.1	**E**	**41.7**	C	24.7	**F**	**121**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

The results along the Old Augusta Road Corridor indicate that while the two-way center turn alternative provides a reduction in delay, the provision of a two stage left turn is does not provide sufficient capacity for development access points given high volume and truck percentages along the corridor. The traffic signal and single lane roundabout access management alternatives operate more effectively as right in-right out access reduces the delay at driveways, although U-turn locations experience unacceptable level of service at the Exeter/Trailer Yard access location; while the Chesterfield/Becknell access location operates acceptably under the traffic signal alternative but not as a single lane roundabout. Multilane roundabouts operate at LOS C or better in all scenarios U-turn and full access locations, while widening Old Augusta Road to four lanes provides acceptable level of service for all driveways. Additionally, multilane roundabouts have a lower crash risk and lower maintenance cost than traffic signals with full turn lanes; while there is no concern with queues overspilling or starving left and right turn lanes and negatively affecting operations. In addition, the current low density of development along the corridor is ideal for multilane roundabout installation as the large footprint of the intersection type will have lower costs than in more densely developed areas.

At the intersection of SR 21 at Old Augusta Road, the installation of dual southbound left turn lanes along SR 21 and the provision of a protected phase for the movement drastically reduces delay and operated effectively in 2024 but does not provide sufficient capacity by 2044. The displaced left turn alternative likewise does not meet future demand, indicating a need for general widening along SR 21. In addition to widening and the addition of dual southbound left turn lanes along SR 21, triple southbound left turn lanes are necessary along Old Augusta Road to meet the projected demand in year 2044.

The intersection of SR 21 at Chimney Road is most effectively treated with the restricted crossing U-turn alternative. The addition of turn lanes along Chimney Road still results in excessive delay. In addition, the multilane roundabout alternative does not provide acceptably level of service by year 2044 in spite of the high impact that would be necessitated.

The preferred alternatives for each intersection, selected as a result of the capacity analysis are presented in the **Table 7-2**, while the operational performance of the preferred alternatives are presented in **Table 7-3**.

Table 7-2: Developed Roadway Improvement Alternatives

ID	Intersection	Preferred Alternative
A	SR 21 at Old Augusta Road	**Install Dual Eastbound Left Turn Lanes, Install Triple Southbound Left Turn Lanes along Old Augusta Road and Widen SR 21 to Six Lanes**
B	Old Augusta Road at Parkers Driveway	**Widen Old Augusta Road to Four Lanes and Install Right In/Right Out Driveway**
N/A	Old Augusta Road at South U-Turn Crossover	**Multi Lane Unsignalized Median Break w/ Turn Lanes**
C	LEO at the Sanctuary	**Install Unsignalized RCUT**
D	Old Augusta Road at Northgate	**Install Multilane Roundabout**
E	Old Augusta Road at Exeter/Trailer Yard	**Widen Old Augusta Road to Four Lanes and Install Right In/Right Out Driveway**
F	Old Augusta Road at Cowan South	**Widen Old Augusta Road to Four Lanes and Install Right In/Right Out Driveway**
G	Old Augusta Road at Estes	**Install Multilane Roundabout**
H	Old Augusta Road at Chesterfield/Becknell	**Install Multilane Roundabout**
J	Old Augusta Road at Cowan Center	**Widen Old Augusta Road to Four Lanes and Install Right In/Right Out Driveway**
K	Old Augusta Road at Cowan North	**Install Single Lane Roundabout**
L	Old Augusta Road at Chimney Road	**Install Single Lane Roundabout**
N/A	SR 21 at Chimney Road	**Install Unsignalized RCUT**

Table 7-3: Operational Performance of Recommended Conditions

ID	Location	Preferred Alternative Operational Performance							
		Year 2024				Year 2044			
		AM		PM		AM		PM	
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
A	SR 21 at Old Augusta Road	C	23.1	C	25	C	30.7	D	45.1
B	Old Augusta Road at Parkers Driveway	C	20.3	C	17.6	C	21.9	C	20.5
N/A	Old Augusta Road at South U-Turn Crossover	A	8	A	9.8	A	8.7	B	11.1
D	Old Augusta Road at Northgate	C	18.8	D	27.3	C	20.2	**E**	**37.8**
E	Old Augusta Road at Exeter/Trailer Yard	A	8.1	B	14.6	A	9.1	C	17.9
F	Old Augusta Road at Cowan South	B	11.5	B	12.1	B	11.9	B	13.2
G	Old Augusta Road at Estes	A	6	A	7.3	A	6.7	A	8.2
H	Old Augusta Road at Chesterfield/ Becknell	A	7.3	B	10.5	A	8.5	B	12.6
J	Old Augusta Road at Cowan Center	A	9.6	B	11.5	A	9.9	B	12.4
K	Old Augusta Road at Cowan North	A	8.2	A	9.6	B	11.1	B	13.2
L	Old Augusta Road at Chimney Road	A	6.4	A	9.6	A	7.6	B	14.7
N/A	SR 21 at Chimney Road	C	17	E	47.6	C	23.4	**F**	**214.7**

8. CONCLUSION AND RECOMMENDATIONS

The findings of the study indicate a clear need for roadway improvements in order to accommodate the traffic generated by upcoming development. This projected demand can be met with a four lane section from SR 21 through the Chesterfield/Becknell access driveways and a two lane section for the remainder of the corridor. This set of recommendations meets Effingham County's objective of operating the corridor utilizing roundabouts, with two three-leg and three four-leg roundabouts included in the proposed conditions. In addition, the spacing standard of 2640 feet between full access locations is met in all but one section, while the average spacing exceeds the standard.

The existing intersection at LEO at the Sanctuary access driveway is provided RCUT in order to avoid unduly impacting the development while maintaining the access management goals of the study.

Major intersection improvements are required at the intersection of SR 21 at Old Augusta Road in order to accommodate projected demand. Both short term lower cost improvements as well as major capacity improvements are recommended.

The recommendations resulting from the study process are presented below:

- At the intersection of SR 21 at Old Augusta Road, it is recommended to install dual southeast bound left turn lanes along SR 21 in the short to midterm, while the long-term recommendation is to install triple southwest bound left turn lanes along Old Augusta Road and widen SR 21 to six lanes.
- It is recommended to convert the intersection of SR 21 at Chimney Road to an RCUT. While this does not result operations at LOS D standards, it significantly reduces delay at the intersection. Also, it is not uncommon for minor street stop-controlled intersections to operate at LOS E or F conditions during peak hours along arterial roadways. The conversion of a full access minor street stop-controlled intersection to an uncontrolled RCUT also reduces crash risk significantly. The capacity results developed in this study, as well as the residential character of the corridor, indicate Chimney Road is not suitable as a secondary access facility to developments along Old Augusta Road.
- Along Old Augusta Road, it is recommended to install multilane roundabouts at the intersections with Exeter/Trailer Yard access driveways, the Estes Express driveway, and the Chesterfield/Becknell driveway while installing single lane roundabouts at the intersections of Old Augusta Road at Cowan North driveway and Chimney Rd. All other new access points along the facility from SR 21 to Chimney Road are recommended to be restricted to right in/right out access.
- In addition, it is recommended to widen Old Augusta to four lanes with a divided median from SR 21 to north of the Chesterfield/Becknell driveways; however, it is not necessary to complete the widening in order to install multilane roundabouts as the roadway can taper to/from two from/to four lanes north and south of the roundabout locations. Therefore, the roadway widening is recommended as a long-term improvement not critical to accommodate the expected near-term development. It is also recommended to install a median break with left turn lanes at some

location to be determined after further study between the Northgate and LEO at the Summit Access locations to provide for U-turns.

These improvements will result in a corridor that can meet the operational needs of the expected industrial growth along the facility while eliminating side street left turns along the corridor, providing a significant safety benefit. The recommended conditions along Old Augusta Road are summarized in **Figure 8-1**.

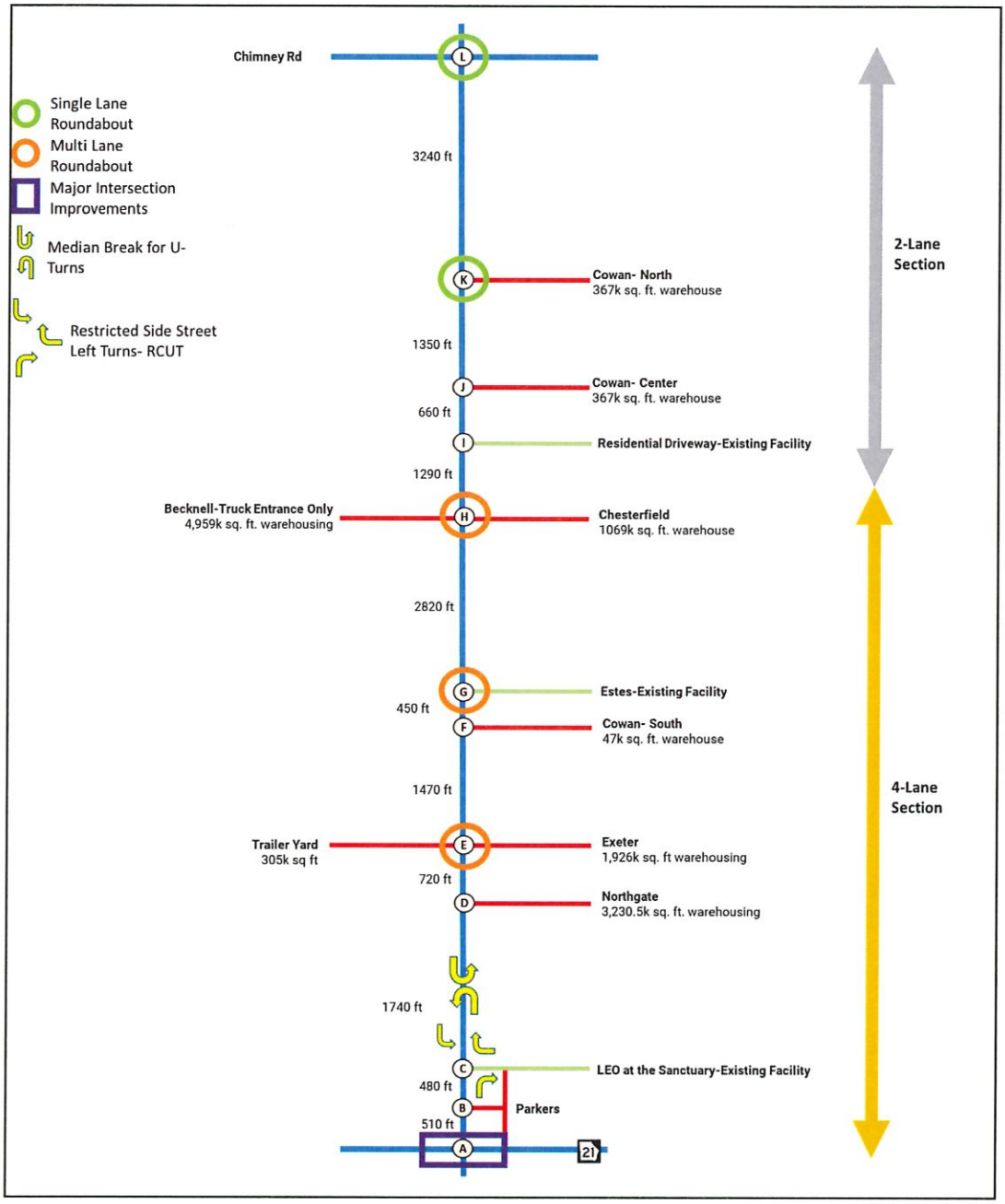


Figure 8-1. Study Recommendations

Appendix

A. Traffic Count Data

B. Traffic Volume Diagrams

C. Crash Datasets

D. Capacity Analysis

E. Effingham County Transportation Master Plan

F. Preliminary Overlay Graphic for Planned Developments