DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA
TRAFFIC ENGINEERING REPORT

For the intersection of:
SR 124/Braselton Hwy at Flowery Branch Road
Gwinnett County
At Mile Post 25.9

Report prepared by:
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Date report prepared: February 27, 2019

LOCATION

The intersection is located along SR 124/Braselton Hwy at Flowery Branch Road, at approximately milepost 25.9 of SR 124. Flowery Branch Road is the minor-street, which forms a 'T' intersection with SR 124.

REASON FOR THE INVESTIGATION

This Traffic Engineering Report is submitted to Georgia Department of Transportation (GDOT) by Pond and Company on behalf of the Gwinnett County Department of Transportation. In an effort to improve operations and safety, Gwinnett County seeks to install a stop-and-go signal at this location, which is currently acting under side-street stop control. The traffic signal will be designed to improve operations at the intersection, improve pedestrian accessibility, and reduce crash frequency.

DESCRIPTION OF INTERSECTION

SR 124/Braselton Hwy: The major street is a two-lane roadway with an east-west orientation at the study intersection. The roadway has a rural section with grass ditches and a 45 MPH posted speed limit. Georgia DOT classifies the road as a Minor Arterial. There is a short segment of sidewalk along the south side of the road. At the intersection, there is one travel lane in the eastbound direction and westbound direction. There are no turn lanes at the study intersection.

Flowery Branch Road: The minor street forms a 'T' intersection with SR 124. This is a north-south oriented roadway at the study intersection. The roadway has a rural section with grass ditches and a 35 MPH posted speed limit. Georgia DOT classifies the road as a local road. There are no sidewalks along the road. At the intersection, there is one travel lane in the southbound direction; there are no turn lanes. The southbound approach is stop-controlled.

The closest intersection along SR 124 to the west is at Stonewater Dr, approximately 610 feet to the west of the study intersection. This is a subdivision entrance. There is a dedicated westbound left-turn lane at Stonewater Dr. The primary development in the area are single-family homes.

Three Gwinnett County public schools are located less than one mile to the west of the study location along SR 124. The three schools are Mill Creek High School, Frank N. Osbourne Middle School, and Duncan Creek Elementary School).

TRAFFIC VOLUMES

Gwinnett County DOT performed traffic counts on Wednesday, August 23, 2017 at the study intersection. A 13-hour intersection turning movement count (6:00AM-7:00PM) and a 24-hr ADT count (approach volume at intersection) was performed for use in the signal warrant analysis. The daily volume along SR 124 (south of intersection) was 16,593 vpd (estimated based on ADT approach counts at intersection). The hourly volumes are summarized in Table 1. The 13-hour approach counts were used in the evaluation of Signal Warrants 1, 2 and 3. The traffic counts are provided in the Appendix.

The 13-hour approach counts at the study intersection are summarized in **Table 1**.

Table 1: 2017 Existing Intersection Volumes						
SR 124 at Flowery Branch Road						
Hour	SB Left	SB Right	EB Left	EB Through	WB Through	WB Right
6:00 am to 7:00 am	34	165	30	96	410	112
7:00 am to 8:00 am	82	71	50	189	481	252
8:00 am to 9:00 am	78	102	83	317	594	195
9:00 am to 10:00 am	80	31	54	297	424	96
10:00 am to 11:00 am	67	32	28	279	350	69
11:00 am to 12:00 pm	61	40	41	308	339	80
12:00 pm to 1:00 pm	76	48	47	355	308	65
1:00 pm to 2:00 pm	90	35	44	389	360	88
2:00 pm to 3:00 pm	108	64	117	478	324	92
3:00 pm to 4:00 pm	104	63	82	607	345	91
4:00 pm to 5:00 pm	130	45	82	714	378	150
5:00 pm to 6:00 pm	119	38	71	828	429	193
6:00 pm to 7:00 pm	146	52	68	614	412	131

EXISTING TRAFFIC CONTROL

SR 124 operates under free-flow conditions. The southbound approach of Flowery Branch Road is stop-controlled.

VEHICLE SPEEDS

The posted speed limit for SR 124 is 45 MPH. No vehicle speed data was collected as part of this report.

PEDESTRIAN AND BICYCLE VOLUMES

During the 13-hour traffic count, pedestrian and bicycle counts were performed. Only one pedestrian was observed and zero bicycles observed during this period.

EXISTING CONDITIONS CAPACITY ANALYSIS

The existing intersection has side-street stop control. The delay method that is used to evaluate the existing operations at this intersection is found in the Highway Capacity Manual (HCM) 2010 edition. The intersection level of service (LOS) and delay for Flowery Branch Road, which is the only controlled approach at this intersection, is reported in **Table 2** for both the AM and PM peak periods. LOS thresholds are based on average vehicle delay at unsignalized intersections, as defined in the HCM 2010 methodology. Synchro reports for the AM and PM conditions are found in the Appendix.

Table 2: Existing Conditions Capacity Results		
Flowery Branch Road Southbound Approach	Existing Conditions	
	LOS	Delay (sec/veh)
AM Peak	F	56.3
PM Peak	F	144.8

PARKING

There is no on-street parking located in proximity of this intersection.

CRASH HISTORY

Crashes were obtained from the Georgia Electronic Accident Reporting System (GEARS). Crash records for a 4-year period, for years 2013-2016, are summarized in **Table 3**. The records indicate there was a total of 21 crashes; 11 property damage only, 10 with injuries, and no fatalities. These crashes took place at or within proximity of the study site. The majority of rear end collisions occurred in the eastbound direction. Four of the angle collisions involved a southbound left-turning vehicle.

Table 3: Crash Review Summary for Intersection		
Crash Type	Number of Crashes	Percentage of Total Crashes
Angle	6	29%
Head On	2	10%
Not A Collision with Motor Vehicle	0	0%
Rear End	11	51%
Sideswipe-Opposite Direction	1	5%
Sideswipe-Same Direction	1	5%
Other/Unspecified	0	0%
Total Crashes	21	100%
Crashes with Injuries	10	
Crashes with Fatalities	0	
Crashes involving Bicyclists or Pedestrians	0	

SIGNAL WARRANT ANALYSIS

Installation of a traffic signal at this currently unsignalized intersection required an analysis of turning movement volumes over the course of a 13-hour period to determine if any of the MUTCD signal warrants were met. The warrants that were analyzed as a part of this study are as follows:

- Warrant 1: 8-Hour Vehicular Volume
- Warrant 2: 4-Hour Vehicular Volume
- Warrant 3: Peak Hour Vehicular Volume

The 13-hour approach counts used in the warrant analysis are summarized in **Table 4**. Note the side-street right-turn volumes were not included. Additionally, per GDOT policy, 100% volume levels were utilized in the analysis (no reductions were utilized).

Table 4: 2017 Existing Traffic Volumes

Hour	SR 124/Braselton Hwy WB Total Approach Volume	SR 124/Braselton Hwy EB Total Approach Volume	SR 124/Braselton Hwy (Mainline) Total Approach Volume	Flowery Branch Rd (Side Street) Left-Turn Volume
6:00 am to 7:00 am	522	126	648	34
7:00 am to 8:00 am	733	239	972	82
8:00 am to 9:00 am	789	400	1,189	78
9:00 am to 10:00 am	520	351	871	80
10:00 am to 11:00 pm	419	307	726	67
11:00 am to 12:00 pm	419	349	768	61
12:00 pm to 1:00 pm	373	402	775	76
1:00 pm to 2:00 pm	448	433	881	90
2:00 pm to 3:00 pm	416	595	1,011	108
3:00 pm to 4:00 pm	436	689	1,125	104
4:00 pm to 5:00 pm	528	796	1,324	130
5:00 pm to 6:00 pm	622	899	1,521	119
6:00 pm to 7:00 pm	543	682	1,225	146

WARRANT 1, EIGHT-HOUR VEHICULAR VOLUMES

Warrant 1 provides three separate conditions that can be met which indicate that the intersection being studied is suitable for a traffic signal. Condition A, the Minimum Vehicular Volume, is intended for locations where a large volume of intersecting traffic is the principal reason to consider a traffic signal. Condition B, the Interruption of Continuous Traffic, is intended for locations where Condition A is not satisfied, and where the traffic volume on the major street is so heavy that the traffic on the minor intersecting street suffers excessive delay or conflict in entering or crossing the major street. If neither Condition is met for a full eight hours of the day, then the volume thresholds for each condition can be reduced by 20% and the intersection can be reevaluated with these reduced volumes. This method of combining Conditions A and B with a 20% reduction should only be applied after adequate trial of other alternatives that could cause less delay and inconvenience to traffic have failed to solve traffic problems. Figure 1 is an illustration from the MUTCD of the volume thresholds used with each Condition.

Figure 1: MUTCD Warrant 1 Volume Thresholds

Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

[a] Basic minimum hourly volume
[b] Used for combination of Conditions A and B after adequate trial of other remedial measures
[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000
[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

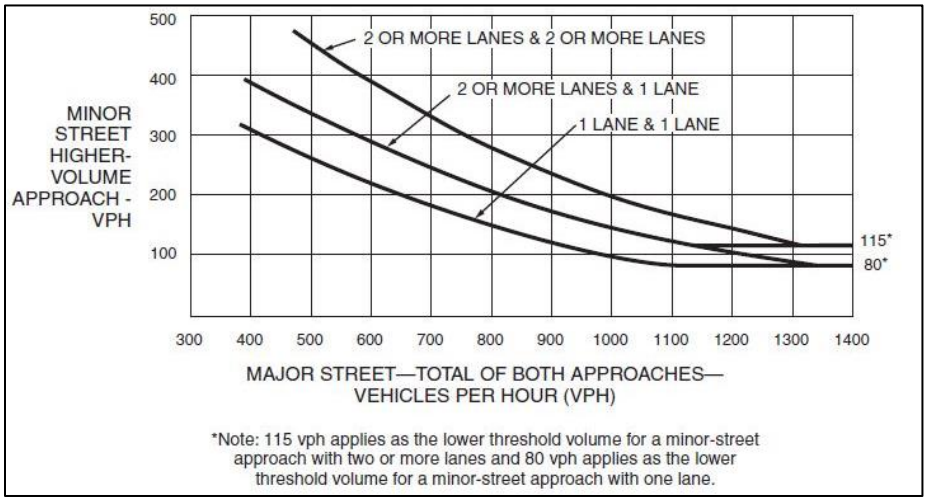
The 13-hour volumes from the intersection count were used in the 8-hour warrant evaluation. The intersection is evaluated as having single lanes on each approach and the side-street right turn volume has been removed from the study, per guidance in the MUTCD and from GDOT.

The existing intersection volumes satisfy the thresholds described in the Warrant 1, Condition B criteria for 10 hours.

WARRANT 2, FOUR-HOUR VEHICULAR VOLUMES

Warrant 2 is applied where intersecting volume is the principal reason to install a signal. It provides a series of curves that should be used to evaluate the intersecting volume of major and minor streets. The selected curve is based on the number of lanes on each road. Figure 2 below illustrates those curves and the corresponding X/Y coordinate system.

Figure 2: MUTCD Warrant 2 Volume Thresholds

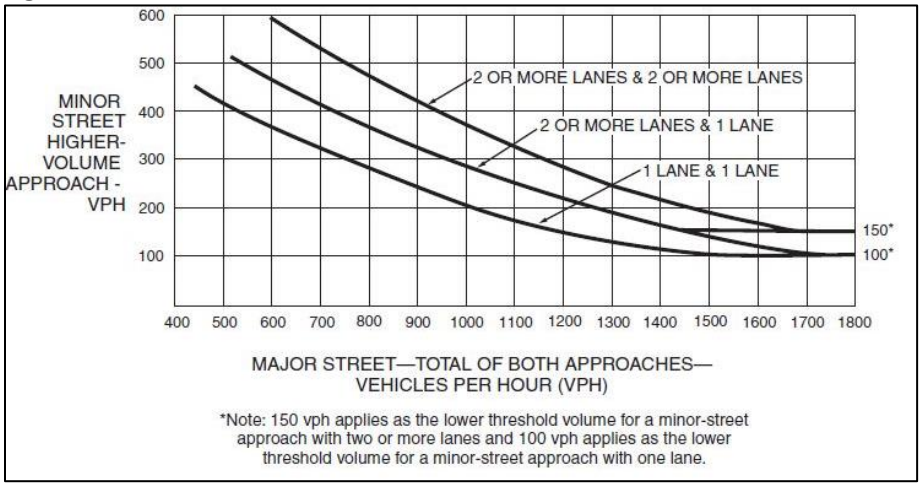


The existing intersection volumes satisfy the thresholds described in the Warrant 2 criteria for 5 hours. A minimum of four hours is required, indicating the intersection meets the minimum volume thresholds to justify signalization.

WARRANT 3, PEAK-HOUR VEHICULAR VOLUMES

Warrant 3 is intended for use at locations where traffic conditions are such that for a minimum of one hour of an average day, the minor street suffers undue delay when entering or crossing the major street. It provides a series of curves that should be used to evaluate the intersecting volume of major and minor streets during a single peak hour of the day. The selected curve is based on the number of lanes on each road. Figure 3 below illustrates those curves and the corresponding X/Y coordinate system.

Figure 3: MUTCD Warrant 3 Volume Thresholds



The existing intersection volumes satisfy the thresholds described in the Warrant 3 criteria for 3 hours. A minimum of one hour is required, indicating the intersection meets the minimum volume thresholds to justify signalization

VEHICULAR WARRANT ANALYSIS SUMMARY

These warrants are based solely on vehicular volumes. These warrants look at total intersecting volume and also consider difficulty that cars from the minor street may have crossing or turning into intersecting traffic. As per Georgia Department of Transportation (GDOT) and FHWA guidance, the right turn volume on each approach was removed from the turning movement analysis. Additionally, per GDOT policy, 100% volume levels were utilized in the analysis (no reductions were utilized). Results from the evaluation of the three warrants conclude that the intersecting volumes are high enough to justify the installation of a signal. **Table 5** provides a summary of the warrant analysis. The signal warrant analysis spreadsheet is included in the Appendix.

Table 5: Summary of Vehicular Warrant Analysis

Warrant	No. of Hours Needed	No. of Hours Met	Warranted?
Warrant 1	8/8	10/8	**Yes**
Warrant 2	4	5	**Yes**
Warrant 3	1	3	**Yes**

Signalizing this intersection is recommended to reduce vehicular delay and improve operations. Signalization and addition of dedicated turn lanes may reduce crashes at the intersection.

PROPOSED INTERSECTION GEOMETRY

The proposed modifications to this intersection include the following:

- The addition of a vehicular traffic control signal.
- The signal control for the intersection should consist of permissive green balls for the SR 124 east/west through movements, and a protected/permissive left turn phase for the SR 124 eastbound movement. Per GDOT Policy 6785-2 regarding signalized left turns, the existing peak hour left turn volumes do not meet the minimum guidelines indicating left turn protection is needed; however, with the nearby GDOT project (H000332 – I-85 Atlanta-Greenville, SC Interstate Road), the traffic volumes are expected to be significantly higher at this intersection. The cross-product results for the existing traffic volumes during the AM peak hour are close to meeting the 50,000 value:
    - 8:00-9:00AM peak hour: 83*594 = 49,302
    - 5:00-6:00PM peak hour: 71*429 = 30,459
- Pedestrian signal heads, countdown timers, and pushbuttons should be added across the west and north legs. A crosswalk is not proposed across the east approach, in part due to the very low pedestrian volumes expected and the desire to not operate an exclusive pedestrian phase at the intersection.
- The eastbound left turn lane bay in the proposed concept plan is approximately 250-feet long. The left turn signal phase should be timed to avoid a queue that exceeds this length. Based on Synchro estimates, a protected left turn phase of approximately 7 seconds of green should provide adequate operation.
- The installation of a raised concrete island to channelize right turns on the Flowery Branch Road southbound approach and provide a pedestrian refuge. The proposed concept plan indicates the right-turn lane will provide approximately 270-feet of storage.
- The proposed concept plan includes the addition of a 250-foot westbound right-turn deceleration lane along SR 124. (Note: Georgia DOT Design Manual requires a minimum 175-foot lane.)
- Vehicle detection for signal actuation.

PROPOSED CONDITIONS CAPACITY ANALYSIS

Expected intersection operations under the proposed signalized conditions is summarized in **Table 6**. These results include providing the eastbound left-turn protected/permitted signal phase.

Table 6: Signalized Conditions Capacity Results

Intersection	Existing Conditions	
	LOS	Delay (sec/veh)
AM Peak	B	13.2
PM Peak	A	9.4

ADJACENT SIGNALIZED INTERSECTIONS

The nearest adjacent signal is located along SR 124 approximately 4,600 feet to the west of the study location. The signal is located at the driveway to two Gwinnett County public schools (Mill Creek High School and Frank N. Osbourne Middle School).

ROUNDABOUT

A roundabout analysis at this intersection was conducted; however, a roundabout was determine not feasible due to physical constraints, costly utility relocation impacts, and timing limitations. Gwinnett County intends to construct the intersection improvements in advance of the GDOT project (H000332 – I-85 Atlanta-Greenville, SC Interstate Road) beginning construction.

ICE POLICY

An ICE analysis is required for the proposed intersection improvement in this study. The ICE Policy Stage 1 and Stage 2 results are found in the Appendix of this document. The stage 1 screening considered converting the side-street stop control to either a traffic signal or single-lane roundabout. The Stage 2 evaluation was performed for the roundabout and traffic signal. The ICE Stage 2 ranked the traffic signal (8.1) higher than the roundabout (7.4). The installation of a traffic signal addresses the project need and is consistent with scope of the project.

RECOMMENDATIONS

It is recommended that a signal permit be issued to Gwinnett County DOT for the modifications to the existing side-street stop controlled intersection of SR 124/Braselton Hwy at Flowery Branch Road.

- The addition of a vehicular traffic control signal.
- The signal control for the intersection should consist of permissive green balls for the SR 124 east/west through movements, and a protected/permissive left turn phase for the SR 124 eastbound movement.
- Pedestrian signal heads, countdown timers, and pushbuttons should be added across the west and north legs.
- The proposed concept plan includes the addition of an approximate 250-feet long eastbound left turn lane.
- The proposed concept plan includes the addition of a right-turn lane with approximately 270-feet of storage. Install a raised concrete island to channelize right turns on the Flowery Branch Road southbound approach and provide a pedestrian refuge.
- The proposed concept plan includes the addition of a 250-foot westbound right-turn deceleration lane along SR 124.
- Vehicle detection for signal actuation.

RECOMMENDED BY: _____ DATE: 2/27/2019
Consulting Engineer

RECOMMENDED BY: _____ DATE: _____
District Traffic Engineer

RECOMMENDED BY: _____ DATE: _____
State Traffic Engineer

APPROVED BY: _____ DATE: _____
Director of Operations

Appendix

A: Signal Warrant Analysis Results Table
B: Traffic Volumes Counts
C: Synchro Reports, HCM 2010 – Existing Un-signalized Conditions
D: Synchro Reports, HCM 2010 – Signalized Conditions
E: GDOT ICE Tool Results

TE Report

Appendix A

Traffic Signal Warrant Analysis

Based on 2009 MUTCD

CASE 1

Date: 11/16/2017

Intersection: SR 124/Braselton Hwy at Flowery Branch Rd

Major Street: SR 124/Braselton Hwy

Major Street number of approach lanes: 1

Minor Street: Flowery Branch Rd

Minor Street number of approach lanes: 1

Isolated Community with population less than 10,000 (Y or N): N

85th persentile speed greater than 40 MPH on major street (Y or N): N *per GDOT policy to use 100% volumes

	Major St Both Approaches	Minor St Highest Approach
Warrant 1: Eight-Hour Vehicular Volume		
Condition A	500	150
Condition B	750	75
Condition C-1 and	400	120
Condition C-2 (needs to meet both)	600	60

Note: Minor Street volumes DO NOT INCLUDE right-turn volumes

Warrant 2: Four-Hour Vehicular Volume
see Figure 4C-2

Warrant 3: Peak Hour
see Figure 4C-4

Case 1: 2017 Existing Traffic Volumes - per GDOT 100% policy

Side-Street Volume vs. SR 124 mainline volume

Time	Major St	Minor St	Eight Hour Warrants			Four Hour Warrant	Peak Hour Warrant
			Condition A	Condition B	Condition C		
6:00 am to 7:00 am	648	34					
7:00 am to 8:00 am	972	82		Y			
8:00 am to 9:00 am	1,189	78		Y			
9:00 am to 10:00 am	871	80		Y			
11:00 am to 12:00 pm	726	67					
12:00 pm to 1:00 pm	768	61					
1:00 pm to 2:00 pm	775	76		Y			
2:00 pm to 3:00 pm	881	90		Y			
3:00 pm to 4:00 pm	1,011	108		Y		Y	
4:00 pm to 5:00 pm	1,125	104		Y		Y	
5:00 pm to 6:00 pm	1,324	130		Y	Y	Y	Y
6:00 pm to 7:00 pm	1,521	119		Y		Y	Y
6:00 pm to 7:00 pm	1,225	146		Y	Y	Y	Y
Total			0	10	2	5	3
Required			8	8	8	4	1
Signal Warrant Met?			No	Yes	No	Yes	Yes

TE Report

Appendix B

PEAK HOUR ITM SUMMARY

#001 Flowery Branch Road & Braselton Highway (S.R. 124)

LOCATION#:	001	QTD PROJ#:	2017256	AM PEAK:	730 AM
NORTH / SOUTH:	Flowery Branch Road	DATE:	Wednesday, August 23, 2017	MD PEAK:	100 PM
EAST / WEST:	Braselton Highway (S.R. 124)	VICINITY:	GA	PM PEAK:	500 PM

Flowery Branch Road

SOUTHBOUND LANES

LN	0.5	0	0.5
AM	104	0	77
MD	35	0	90
PM	38	0	119
TOTAL	177	0	286

Braselton Highway (S.R. 124)

EASTBOUND LANES

LN	AM	MD	PM	TOTAL
0	64	44	71	179
1	262	389	828	1479
0	0	0	0	0

1-WAY STOP (SB)

WESTBOUND LANES

TOTAL	PM	MD	AM	LN
527	193	88	246	0
1465	429	360	676	1
0	0	0	0	0

Braselton Highway (S.R. 124)

TOTAL	0	0	0
PM	0	0	0
MD	0	0	0
AM	0	0	0
LN	0	0	0

NORTHBOUND LANES

Flowery Branch Road

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AM COUNT	6:00 AM	TO	12:00 PM
MD COUNT	12:00 PM	TO	2:00 PM
PM COUNT	2:00 PM	TO	7:00 PM

VEHICLE TURNING MOVEMENT COUNT

#001 Flowery Branch Road & Braselton Highway (S.R. 124) - AM PEAK

LOCATION#:	001	QTD PROJ#:	2017256
NORTH / SOUTH:	Flowery Branch Road	DATE:	Wednesday, August 23, 2017
EAST / WEST:	Braselton Highway (S.R. 124)	VICINITY:	GA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	0	0	0.5	0	0.5	0	1	0	0	1	0	
6:00 AM	0	0	0	14	0	24	8	25	0	0	135	30	236
6:15 AM	0	0	0	9	0	48	8	23	0	0	182	38	308
6:30 AM	0	0	0	5	0	45	12	26	0	0	47	10	145
6:45 AM	0	0	0	6	0	48	2	22	0	0	46	34	158
7:00 AM	0	0	0	17	0	17	12	41	0	0	50	60	197
7:15 AM	0	0	0	20	0	13	16	45	0	0	119	62	275
7:30 AM	0	0	0	21	0	23	12	58	0	0	176	73	363
7:45 AM	0	0	0	24	0	18	10	45	0	0	136	57	290
8:00 AM	0	0	0	12	0	25	14	73	0	0	197	62	383
8:15 AM	0	0	0	20	0	38	28	86	0	0	167	54	393
8:30 AM	0	0	0	32	0	27	22	89	0	0	122	45	337
8:45 AM	0	0	0	14	0	12	19	69	0	0	108	34	256
9:00 AM	0	0	0	19	0	15	16	87	0	0	126	38	301
9:15 AM	0	0	0	14	0	7	18	81	0	0	116	24	260
9:30 AM	0	0	0	24	0	3	11	66	0	0	104	23	231
9:45 AM	0	0	0	23	0	6	9	63	0	0	78	11	190
10:00 AM	0	0	0	18	0	7	8	62	0	0	99	17	211
10:15 AM	0	0	0	19	0	8	8	68	0	0	67	14	184
10:30 AM	0	0	0	16	0	11	4	70	0	0	102	15	218
10:45 AM	0	0	0	14	0	6	8	79	0	0	82	23	212
11:00 AM	0	0	0	11	0	8	9	71	0	0	70	28	197
11:15 AM	0	0	0	20	0	9	16	82	0	0	83	16	226
11:30 AM	0	0	0	16	0	11	9	86	0	0	99	22	243
11:45 AM	0	0	0	14	0	12	7	69	0	0	87	14	203

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	0	0	402	0	441	286	1486	0	0	2598	804	6017
P.H.V: (1)	0	0	0	77	0	104	64	262	0	0	676	246	1429
P.H.F: (2)		0.000			0.780			0.715			0.890		0.909

(1) Peak Hour Volume (Peak Hour Begins At 730 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT

#001 Flowery Branch Road & Braselton Highway (S.R. 124) - MD PEAK

LOCATION#:	001	QTD PROJ#:	2017256
NORTH / SOUTH:	Flowery Branch Road	DATE:	Wednesday, August 23, 2017
EAST / WEST:	Braselton Highway (S.R. 124)	VICINITY:	GA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	0	0	0.5	0	0.5	0	1	0	0	1	0	
12:00 PM	0	0	0	17	0	13	12	68	0	0	73	14	197
12:15 PM	0	0	0	18	0	9	12	99	0	0	85	18	241
12:30 PM	0	0	0	22	0	12	14	93	0	0	74	16	231
12:45 PM	0	0	0	19	0	14	9	95	0	0	76	17	230
1:00 PM	0	0	0	18	0	5	13	97	0	0	94	26	253
1:15 PM	0	0	0	20	0	9	15	103	0	0	84	22	253
1:30 PM	0	0	0	31	0	12	7	98	0	0	91	19	258
1:45 PM	0	0	0	21	0	9	9	91	0	0	91	21	242

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	0	0	166	0	83	91	744	0	0	668	153	1905
P.H.V: [1]	0	0	0	90	0	35	44	389	0	0	360	88	1006
P.H.F: [2]		0.000			0.727			0.917			0.933		0.975

(1) Peak Hour Volume (Peak Hour Begins At 100 PM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT

#001 Flowery Branch Road & Braselton Highway (S.R. 124) - PM PEAK

LOCATION#:	001	QTD PROJ#:	2017256
NORTH / SOUTH:	Flowery Branch Road	DATE:	Wednesday, August 23, 2017
EAST / WEST:	Braselton Highway (S.R. 124)	VICINITY:	GA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	0	0	0.5	0	0.5	0	1	0	0	1	0	
2:00 PM	0	0	0	28	0	15	13	98	0	0	89	20	263
2:15 PM	0	0	0	23	0	7	54	125	0	0	81	34	324
2:30 PM	0	0	0	27	0	25	32	125	0	0	70	24	303
2:45 PM	0	0	0	30	0	17	18	130	0	0	84	14	293
3:00 PM	0	0	0	21	0	14	16	137	0	0	86	24	298
3:15 PM	0	0	0	23	0	15	21	151	0	0	78	23	311
3:30 PM	0	0	0	20	0	18	22	171	0	0	90	21	342
3:45 PM	0	0	0	40	0	16	23	148	0	0	91	23	341
4:00 PM	0	0	0	31	0	11	19	165	0	0	96	36	358
4:15 PM	0	0	0	30	0	11	24	182	0	0	91	40	378
4:30 PM	0	0	0	32	0	14	17	187	0	0	94	37	381
4:45 PM	0	0	0	37	0	9	22	180	0	0	97	37	382
5:00 PM	0	0	0	30	0	11	14	215	0	0	106	42	418
5:15 PM	0	0	0	28	0	8	16	196	0	0	105	46	399
5:30 PM	0	0	0	27	0	7	25	202	0	0	109	53	423
5:45 PM	0	0	0	34	0	12	16	215	0	0	109	52	438
6:00 PM	0	0	0	41	0	15	15	165	0	0	109	35	380
6:15 PM	0	0	0	39	0	14	15	143	0	0	118	36	365
6:30 PM	0	0	0	36	0	13	22	156	0	0	94	29	350
6:45 PM	0	0	0	30	0	10	16	150	0	0	91	31	328

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	0	0	607	0	262	420	3241	0	0	1888	657	7075
P.H.V: [1]	0	0	0	119	0	38	71	828	0	0	429	193	1678
P.H.F: [2]		0.000			0.853			0.973			0.960		0.958

(1) Peak Hour Volume (Peak Hour Begins At 500 PM)
(2) Peak Hour Factor (directional aggregate)

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PEDESTRIAN CROSSWALK COUNTS

#001 Flowery Branch Road & Braselton Highway (S.R. 124) - AM PEAK

LOCATION#:	001	QTD PROJ#:	2017256
NORTH / SOUTH:	Flowery Branch Road	DATE:	Wednesday, August 23, 2017
EAST / WEST:	Braselton Highway (S.R. 124)	VICINITY:	GA

DIRECTION:	NORTHERN CROSSWALK	SOUTHERN CROSSWALK	EASTERN CROSSWALK	WESTERN CROSSWALK	TOTALS
6:00 AM	0	0	0	0	
6:15 AM	0	0	0	0	
6:30 AM	0	0	0	0	
6:45 AM	0	0	0	0	
7:00 AM	0	0	0	0	
7:15 AM	0	0	0	0	
7:30 AM	0	0	0	0	
7:45 AM	0	0	0	0	
8:00 AM	0	0	0	0	
8:15 AM	0	0	0	0	
8:30 AM	0	0	0	0	
8:45 AM	0	0	0	0	
9:00 AM	0	0	0	0	
9:15 AM	0	0	0	0	
9:30 AM	0	0	0	0	
9:45 AM	0	0	0	0	
10:00 AM	0	0	0	0	
10:15 AM	0	0	0	0	
10:30 AM	0	0	0	0	
10:45 AM	0	0	0	0	
11:00 AM	0	0	0	0	
11:15 AM	0	0	0	0	
11:30 AM	0	0	0	0	
11:45 AM	0	0	0	0	

VOLUME STATS:	NORTHERN CROSSWALK	SOUTHERN CROSSWALK	EASTERN CROSSWALK	WESTERN CROSSWALK	
TOTAL:	0	0	0	0	0
P.H.V: [1]	0	0	0	0	0
P.H.F: [2]	0.000	0.000	0.000	0.000	0.000

(1) Peak Hour Volume (Peak hour begins at: 0 AM)
(2) Peak Hour Factor

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PEDESTRIAN CROSSWALK COUNTS

#001 Flowery Branch Road & Braselton Highway (S.R. 124) - MD PEAK

LOCATION#:	001	QTD PROJ#:	2017256
NORTH / SOUTH:	Flowery Branch Road	DATE:	Wednesday, August 23, 2017
EAST / WEST:	Braselton Highway (S.R. 124)	VICINITY:	GA

DIRECTION:	NORTHERN CROSSWALK	SOUTHERN CROSSWALK	EASTERN CROSSWALK	WESTERN CROSSWALK	TOTALS
12:00 PM	0	0	0	0	
12:15 PM	0	0	0	0	
12:30 PM	0	0	0	0	
12:45 PM	0	0	0	0	
1:00 PM	0	0	0	0	
1:15 PM	0	0	0	0	
1:30 PM	0	0	0	0	
1:45 PM	0	0	0	0	

VOLUME STATS:	NORTHERN CROSSWALK	SOUTHERN CROSSWALK	EASTERN CROSSWALK	WESTERN CROSSWALK	
TOTAL:	0	0	0	0	0
P.H.V: [1]	0	0	0	0	0
P.H.F: [2]	0.000	0.000	0.000	0.000	0.000

(1) Peak Hour Volume (Peak hour begins at: 0 AM)
(2) Peak Hour Factor

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PEDESTRIAN CROSSWALK COUNTS

#001 Flowery Branch Road & Braselton Highway (S.R. 124) - PM PEAK

LOCATION#:	001	QTD PROJ#:	2017256
NORTH / SOUTH:	Flowery Branch Road	DATE:	Wednesday, August 23, 2017
EAST / WEST:	Braselton Highway (S.R. 124)	VICINITY:	GA

DIRECTION:	NORTHERN CROSSWALK	SOUTHERN CROSSWALK	EASTERN CROSSWALK	WESTERN CROSSWALK	TOTALS
2:00 PM	0	0	0	0	
2:15 PM	0	0	0	0	
2:30 PM	0	0	0	0	
2:45 PM	0	0	0	0	
3:00 PM	0	0	0	0	
3:15 PM	1	0	0	0	
3:30 PM	0	0	0	0	
3:45 PM	1	0	0	0	
4:00 PM	0	0	0	0	
4:15 PM	0	0	0	0	
4:30 PM	0	0	0	0	
4:45 PM	0	0	0	0	
5:00 PM	0	0	0	0	
5:15 PM	1	0	0	0	1
5:30 PM	0	0	0	0	
5:45 PM	0	0	0	0	
6:00 PM	0	0	0	0	
6:15 PM	0	0	0	0	
6:30 PM	0	0	0	0	
6:45 PM	0	0	0	0	

VOLUME STATS:	NORTHERN CROSSWALK	SOUTHERN CROSSWALK	EASTERN CROSSWALK	WESTERN CROSSWALK	
TOTAL:	3	0	0	0	3
P.H.V. [1]	2	0	0	0	2
P.H.F. [2]	0.500	0.000	0.000	0.000	0.500

(1) Peak Hour Volume (Peak hour begins at: 315 PM)
(2) Peak Hour Factor

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BICYCLE TURNING MOVEMENT COUNT

#001 Flowery Branch Road & Braselton Highway (S.R. 124) - AM PEAK

LOCATION#:	001	QTD PROJ#:	2017256
NORTH / SOUTH:	Flowery Branch Road	DATE:	Wednesday, August 23, 2017
EAST / WEST:	Braselton Highway (S.R. 124)	VICINITY:	GA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	0	0	0.5	0	0.5	0	1	0	0	1	0	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	0	0	0	0	0	0	0	0	0	0	0	0
P.H.V: [1]	0	0	0	0	0	0	0	0	0	0	0	0	0
P.H.F: [2]		0.000			0.000			0.000			0.000		0.000

(1) Peak Hour Volume (Peak Hour Begins At 0 AM)
(2) Peak Hour Factor (directional aggregate)

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BICYCLE TURNING MOVEMENT COUNT

#001 Flowery Branch Road & Braselton Highway (S.R. 124) - AM PEAK

LOCATION#:	001	QTD PROJ#:	2017256
NORTH / SOUTH:	Flowery Branch Road	DATE:	Wednesday, August 23, 2017
EAST / WEST:	Braselton Highway (S.R. 124)	VICINITY:	GA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	0	0	0.5	0	0.5	0	1	0	0	1	0	
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	
1:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	
1:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	
1:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	
1:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	0	0	0	0	0	0	0	0	0	0	0	0
P.H.V: [1]	0	0	0	0	0	0	0	0	0	0	0	0	0
P.H.F: [2]		0.000			0.000			0.000			0.000		0.000

(1) Peak Hour Volume (Peak Hour Begins At 0 AM)
(2) Peak Hour Factor (directional aggregate)

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BICYCLE TURNING MOVEMENT COUNT

#001 Flowery Branch Road & Braselton Highway (S.R. 124) - PM PEAK

LOCATION#:	001	QTD PROJ#:	2017256
NORTH / SOUTH:	Flowery Branch Road	DATE:	Wednesday, August 23, 2017
EAST / WEST:	Braselton Highway (S.R. 124)	VICINITY:	GA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	0	0	0.5	0	0.5	0	1	0	0	1	0	
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	
6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	0	0	0	0	0	0	0	0	0	0	0	0
P.H.V: [1]	0	0	0	0	0	0	0	0	0	0	0	0	0
P.H.F: [2]		0.000			0.000			0.000			0.000		0.000

(1) Peak Hour Volume (Peak Hour Begins At 0 AM)
(2) Peak Hour Factor (directional aggregate)

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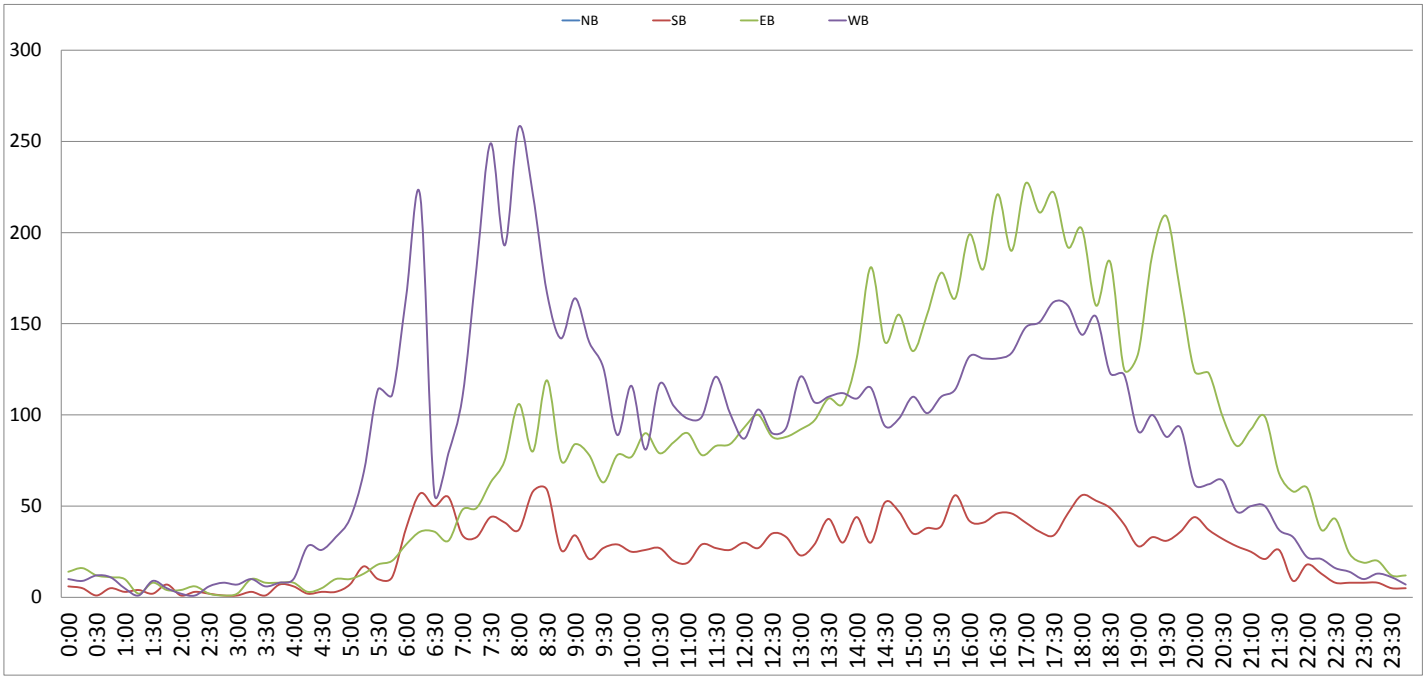
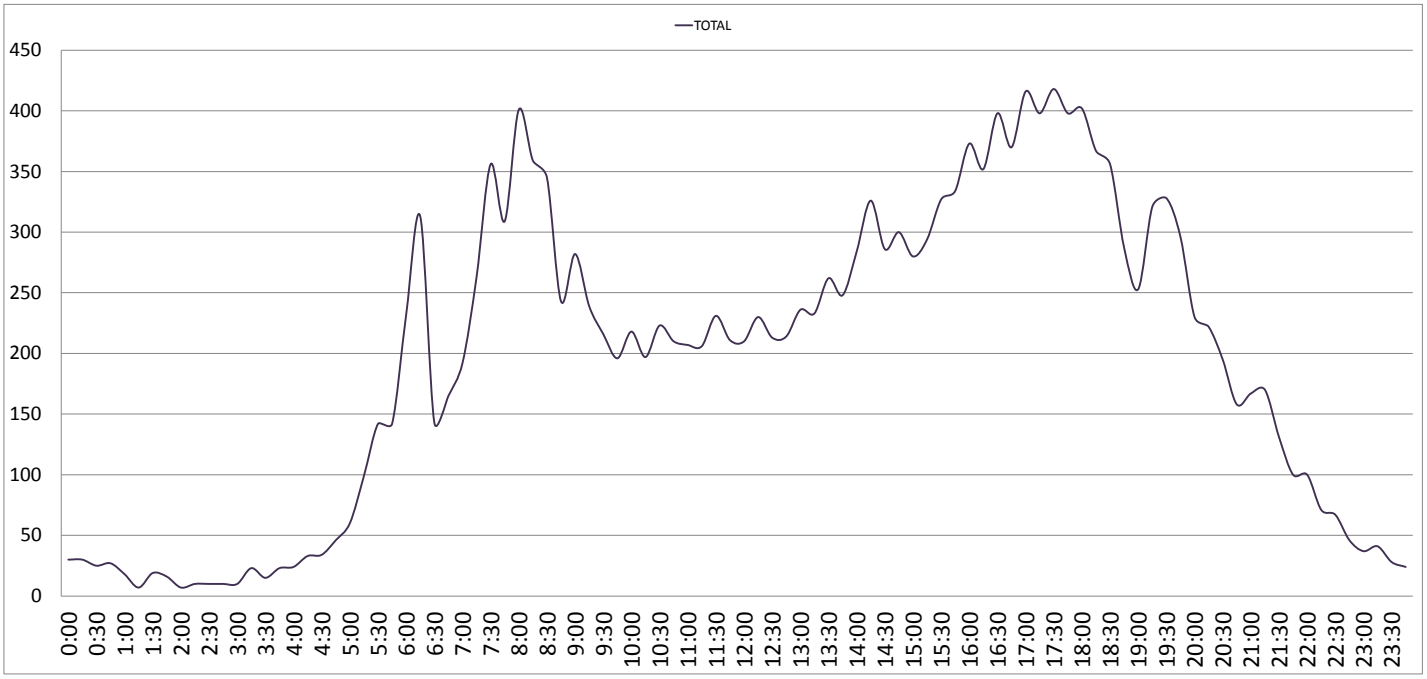
Average Daily Traffic Volumes

Quality Traffic Data, LLC

QTD PROJ/LOC #:	2017256 - 003	GPS COORDINATES:	0
ON STREET:	Braselton Highway (S.R. 124) (E/W)	START DATE:	Wednesday, August 23, 2017
CROSS STREETS:	Flowery Branch Road (N/S)	VICINITY:	GA





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Average Daily Traffic Volumes
Quality Traffic Data, LLC

QTD PROJ/LOC #:	2017256 - 003	GPS COORDINATES:	0
ON STREET:	Braselton Highway (S.R. 124) (E/W)	START DATE:	Wednesday, August 23, 2017
CROSS STREETS:	Flowery Branch Road (N/S)	VICINITY:	GA

AM COUNTS								PM COUNTS							
	NB	SB		EB		WB			NB	SB		EB		WB	
00:00	6			14		10		12:00	30			93		87	
00:15	5			16		9		12:15	27			100		103	
00:30	1			12		12		12:30	35			88		90	
00:45	5	*17*		11	*53*	11	*42*	**12:45**	33	*125*		88	*369*	93	*373*
01:00	3			10		5		13:00	23			92		121	
01:15	4			2		1		13:15	29			97		107	
01:30	2			8		9		13:30	43			109		110	
01:45	7	*16*		4	*24*	5	*20*	**13:45**	30	*125*		106	*404*	112	*450*
02:00	1			4		2		14:00	44			131		109	
02:15	3			6		1		14:15	30			181		115	
02:30	2			2		6		14:30	52			140		94	
02:45	1	*7*		1	*13*	8	*17*	**14:45**	47	*173*		155	*607*	98	*416*
03:00	1			2		7		15:00	35			135		110	
03:15	3			10		10		15:15	38			155		101	
03:30	1			8		6		15:30	39			178		110	
03:45	7	*12*		8	*28*	8	*31*	**15:45**	56	*168*		164	*632*	114	*435*
04:00	6			8		10		16:00	42			199		132	
04:15	2			3		28		16:15	41			180		131	
04:30	3			5		26		16:30	46			221		131	
04:45	3	*14*		10	*26*	33	*97*	**16:45**	46	*175*		190	*790*	134	*528*
05:00	7			10		43		17:00	41			227		148	
05:15	17			13		69		17:15	36			211		151	
05:30	10			18		114		17:30	34			222		162	
05:45	11	*45*		20	*61*	111	*337*	**17:45**	46	*157*		192	*852*	160	*621*
06:00	38			29		165		18:00	56			202		144	
06:15	57			36		220		18:15	53			160		154	
06:30	50			36		57		18:30	49			184		123	
06:45	55	*200*		31	*132*	79	*521*	**18:45**	40	*198*		125	*671*	122	*543*
07:00	34			48		110		19:00	28			134		91	
07:15	33			49		181		19:15	33			188		100	
07:30	44			63		249		19:30	31			209		88	
07:45	41	*152*		75	*235*	193	*733*	**19:45**	36	*128*		167	*698*	93	*372*
08:00	37			106		258		20:00	44			124		62	
08:15	58			80		221		20:15	37			123		62	
08:30	59			119		167		20:30	32			99		64	
08:45	26	*180*		75	*380*	142	*788*	**20:45**	28	*141*		83	*429*	47	*235*
09:00	34			84		164		21:00	25			92		50	
09:15	21			78		140		21:15	21			99		50	
09:30	27			63		126		21:30	26			68		37	
09:45	29	*111*		78	*303*	89	*519*	**21:45**	9	*81*		58	*317*	33	*170*
10:00	25			77		116		22:00	18			60		22	
10:15	26			90		81		22:15	13			37		21	
10:30	27			79		117		22:30	8			43		16	
10:45	20	*98*		85	*331*	105	*419*	**22:45**	8	*47*		24	*164*	14	*73*
11:00	19			90		98		23:00	8			19		10	
11:15	29			78		99		23:15	8			20		13	
11:30	27			83		121		23:30	5			12		11	
11:45	26	*101*		84	*335*	101	*419*	**23:45**	5	*26*		12	*63*	7	*41*
TOTALS:		**953**			**1921**		**3943**	**TOTALS:**		**1544**			**5996**		**4257**

D-FACTOR: 0.52 **K-FACTOR: 0.18**

SPLIT	14.0%	28.2%	57.8%	**36.6%**	SPLIT	13.1%	50.8%	36.1%	**63.4%**
PEAK HOUR	06:00	07:45	07:30	**07:30**	PEAK HOUR	17:45	17:00	17:00	**17:00**
PH VOLUME	200	380	921	**1425**	PH VOLUME	204	852	621	**1630**
PHF	0.88	0.80	0.89	**0.89**	PHF	0.91	0.94	0.96	**0.97**

DAY'S TOTAL				
NB	SB	EB	WB	TOTAL
	2497	7917	8200	**18614**

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Northbound - Total Class %

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13
% of Total:													

Southbound - Total Class %

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13
% of Total:	0%	83%	13%	0%	2%	1%	0%	1%	0%	0%	0%	0%	0%

Eastbound - Total Class %

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13
% of Total:	1%	76%	18%	1%	1%	0%	2%	1%	0%	0%	0%	0%	0%

Westbound - Total Class %

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13
% of Total:	1%	78%	15%	2%	1%	0%	1%	2%	0%	0%	0%	0%	0%

FHWA Vehicle Classification Scheme

1	MOTORCYCLES	5	TWO AXLE, SIX TIRE SINGLE UNIT	9	FIVE-AXLE SINGLE TRAILER
2	PASSENGER CARS	6	THREE AXLE, SINGLE UNIT	10	SIX OR MORE AXLE, SINGLE TRAILER
3	FOUR TIRE, SINGLE UNIT	7	FOUR OR MORE AXLE, SINGLE UNIT	11	FIVE OR LESS AXLE, MULTI TRAILER
4	BUSES	8	FOUR OR LESS AXLE, SINGLE TRAILER	12	SIX AXLE, MULTI TRAILER
				13	SEVEN OR MORE AXLE, MULTI-TRAILER

TE Report

Appendix C

Intersection	
Int Delay, s/veh	8.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	77	104	676	246	77	104
Future Vol, veh/h	77	104	676	246	77	104
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	85	114	743	270	85	114

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1013	0	-	0	1162	878
Stage 1	-	-	-	-	878	-
Stage 2	-	-	-	-	284	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	684	-	-	-	216	347
Stage 1	-	-	-	-	406	-
Stage 2	-	-	-	-	764	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	684	-	-	-	187	347
Mov Cap-2 Maneuver	-	-	-	-	187	-
Stage 1	-	-	-	-	406	-
Stage 2	-	-	-	-	662	-

Approach	EB	WB	SB
HCM Control Delay, s	4.7	0	56.3
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	684	-	-	-	254
HCM Lane V/C Ratio	0.124	-	-	-	0.783
HCM Control Delay (s)	11	0	-	-	56.3
HCM Lane LOS	B	A	-	-	F
HCM 95th %tile Q(veh)	0.4	-	-	-	5.9

Intersection	
Int Delay, s/veh	17.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	82	714	378	150	130	45
Future Vol, veh/h	82	714	378	150	130	45
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	85	744	394	156	135	47

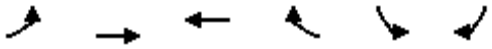
Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	550	0	-	0	1387	472
Stage 1	-	-	-	-	472	-
Stage 2	-	-	-	-	915	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1020	-	-	-	158	592
Stage 1	-	-	-	-	628	-
Stage 2	-	-	-	-	390	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1020	-	-	-	136	592
Mov Cap-2 Maneuver	-	-	-	-	136	-
Stage 1	-	-	-	-	628	-
Stage 2	-	-	-	-	335	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	144.8
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1020	-	-	-	170
HCM Lane V/C Ratio	0.084	-	-	-	1.072
HCM Control Delay (s)	8.9	0	-	-	144.8
HCM Lane LOS	A	A	-	-	F
HCM 95th %tile Q(veh)	0.3	-	-	-	9.1

TE Report

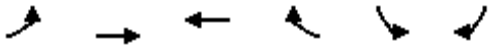
Appendix D



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	77	104	676	246	77	104
Future Volume (veh/h)	77	104	676	246	77	104
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	85	114	743	270	85	114
Adj No. of Lanes	1	1	1	1	1	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	337	1250	926	787	200	178
Arrive On Green	0.07	0.67	0.50	0.50	0.11	0.11
Sat Flow, veh/h	1774	1863	1863	1583	1774	1583
Grp Volume(v), veh/h	85	114	743	270	85	114
Grp Sat Flow(s),veh/h/ln	1774	1863	1863	1583	1774	1583
Q Serve(g_s), s	1.1	1.2	18.5	5.7	2.5	3.8
Cycle Q Clear(g_c), s	1.1	1.2	18.5	5.7	2.5	3.8
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	337	1250	926	787	200	178
V/C Ratio(X)	0.25	0.09	0.80	0.34	0.43	0.64
Avail Cap(c_a), veh/h	380	2015	1646	1399	576	514
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	9.2	3.2	11.7	8.5	22.9	23.5
Incr Delay (d2), s/veh	0.4	0.0	1.7	0.3	1.4	3.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.6	9.7	2.5	1.3	1.9
LnGrp Delay(d),s/veh	9.6	3.2	13.4	8.7	24.4	27.3
LnGrp LOS	A	A	B	A	C	C
Approach Vol, veh/h		199	1013		199	
Approach Delay, s/veh		5.9	12.1		26.0	
Approach LOS		A	B		C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		43.2		12.3	9.7	33.6		
Change Period (Y+Rc), s		6.0		6.0	6.0	6.0		
Max Green Setting (Gmax), s		60.0		18.0	5.0	49.0		
Max Q Clear Time (g_c+I1), s		3.2		5.8	3.1	20.5		
Green Ext Time (p_c), s		7.7		0.4	0.0	7.0		

Intersection Summary	
HCM 2010 Ctrl Delay	13.2
HCM 2010 LOS	B



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	82	714	378	150	130	45
Future Volume (veh/h)	82	714	378	150	130	45
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	85	744	394	156	135	47
Adj No. of Lanes	1	1	1	1	1	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	499	1139	759	645	222	198
Arrive On Green	0.07	0.61	0.41	0.41	0.12	0.12
Sat Flow, veh/h	1774	1863	1863	1583	1774	1583
Grp Volume(v), veh/h	85	744	394	156	135	47
Grp Sat Flow(s),veh/h/ln	1774	1863	1863	1583	1774	1583
Q Serve(g_s), s	1.1	11.8	7.2	2.9	3.3	1.2
Cycle Q Clear(g_c), s	1.1	11.8	7.2	2.9	3.3	1.2
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	499	1139	759	645	222	198
V/C Ratio(X)	0.17	0.65	0.52	0.24	0.61	0.24
Avail Cap(c_a), veh/h	565	2373	1923	1635	779	696
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	6.5	5.7	10.1	8.9	18.9	18.0
Incr Delay (d2), s/veh	0.2	0.6	0.6	0.2	2.7	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	6.0	3.7	1.3	1.8	0.6
LnGrp Delay(d),s/veh	6.6	6.4	10.7	9.1	21.6	18.6
LnGrp LOS	A	A	B	A	C	B
Approach Vol, veh/h		829	550		182	
Approach Delay, s/veh		6.4	10.2		20.8	
Approach LOS		A	B		C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		33.8		11.7	9.3	24.5		
Change Period (Y+Rc), s		6.0		6.0	6.0	6.0		
Max Green Setting (Gmax), s		58.0		20.0	5.0	47.0		
Max Q Clear Time (g_c+I1), s		13.8		5.3	3.1	9.2		
Green Ext Time (p_c), s		9.5		0.4	0.0	9.3		

Intersection Summary	
HCM 2010 Ctrl Delay	9.4
HCM 2010 LOS	A

TE Report

Appendix E

GDOT INTERSECTION CONTROL EVALUATION (ICE) TOOL

ICE Version 2.14 | Revised 08/03/2018

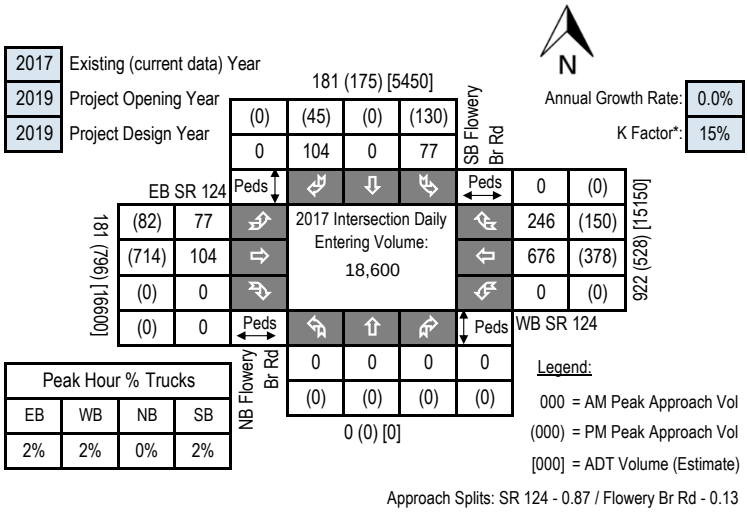
Georgia Department of Transportation

GDOT PI # (or N/A):	n/a	Request By:	Gwinnett County DOT
County:	Gwinnett	GDOT District:	1 - Gainesville
Major (State) Road:	SR 124	Speed Limit:	45 mph
Minor (Crossing) ST:	Flowery Br Rd	Speed Limit:	35 mph
Major ST Direction:	East/West	Area Type:	Suburb/Transition
Intersection Control:	Conventional (Minor Stop)		
Prepared By:	POND	Analyst:	A. Antweiler
Date:	11/7/2018	Project ID:	
Project Purpose:	New Traffic Signal and turn lane improvements		

2017	Existing (current data) Year
2019	Project Opening Year
2019	Project Design Year

Annual Growth Rate: 0.0%

K Factor*: 15%



Peak Hour % Trucks			
EB	WB	NB	SB
2%	2%	0%	2%

Legend:

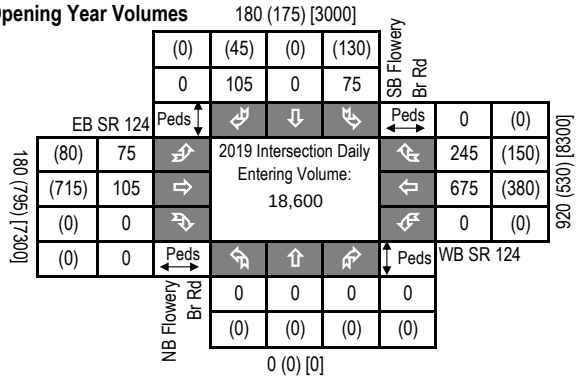
000 = AM Peak Approach Vol

(000) = PM Peak Approach Vol

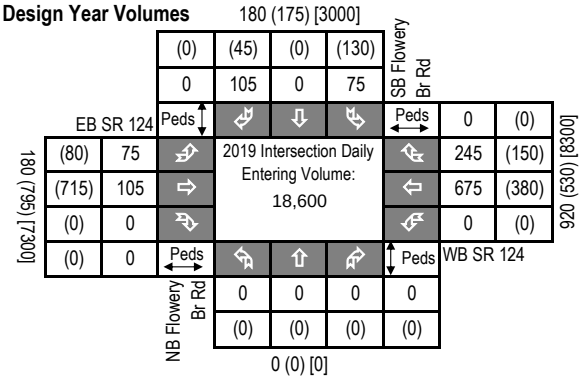
[000] = ADT Volume (Estimate)

Approach Splits: SR 124 - 0.87 / Flowery Br Rd - 0.13

2019 Opening Year Volumes



2019 Design Year Volumes



Introduction: In 2005, SAFETEA-LU established the Highway Safety Improvement Program (HSIP) and mandated that each state prepare a Strategic Highway Safety Plan (SHSP) to prioritize safety funding investments. Intersections quickly became a common component of most states' SHSP emphasis areas and HSIP project lists, including Georgia's SHSP. Intersection Control Evaluation (ICE) policies and procedures represent a traceable and transparent procedure to streamline the evaluation of intersection control alternatives, and further leverage safety advancements for intersection improvements beyond just the safety program. Approximately one-third of all traffic fatalities and roughly seventy five percent of all traffic crashes in Georgia occur at or adjacent to intersections. Accordingly, the Georgia SHSP includes an emphasis on enhancing intersection safety to advance the *Toward Zero Deaths* vision embraced by the Georgia Governor's Office of Highway Safety (GOHS). This ICE tool was developed to support the ICE policy, developed and adopted to help ensure that intersection investments across the entire Georgia highway system are selected, prioritized and implemented with defensible benefits for safety towards those ends.

Tool Goal: The goal of this ICE tool is to provide a simplified and consistent way of importing traffic, safety, cost, environmental impact and stakeholder posture data to assess and quantify intersection control improvement benefits. The tool supports the ICE policy and procedures to provide traceability, transparency, consistency and accountability when identifying and selecting an intersection control solution that both meets project purpose and reflects overall best value in terms of specific performance-based criteria.

Requirements: An ICE is required for any intersection improvement (e.g. new or modified intersection, widening/reconstruction or corridor project, or work accomplished through a driveway or encroachment permit that affects an intersection) where: **1)** the intersection includes at least one roadway designated as a State Route (State Highway System) or as part of the National Highway System; or **2)** the intersection will be designed or constructed using State or Federal funding. In certain circumstances where an ICE would otherwise be required, the requirement may be waived based on appropriate evidence presented with a written request. (See the "**Waiver**" tab to review criteria that may make a project waiver eligible and for instructions to submit a waiver request to the Department). An ICE is not required when the proposed work does not include any changes to the intersection design, involves only routine traffic signal timing and equipment maintenance, or for driveway permits where the driveway is not a new leg to an already existing intersection on either 1) a divided, multi-lane highway with a closed median and only right-in/right-out access or 2) an undivided roadway where the development is not required to construct left and/or right turn lanes (as per the Driveway Manual and District Traffic Engineer).

Two-Stage Process: A complete ICE process consists of two (2) distinct stages, and it is expected that the respective level of effort for completing both stages of ICE will correspond to the magnitude and complexity of the intersection. Prior to starting an ICE, the District Traffic Engineer and/or State Traffic Engineer should be consulted for advice on an appropriate level of effort. The Stage 1 and Stage 2 ICE forms are designed minimize required data inputs using drop-down menu choices and limiting text entry. All fields shaded grey include drop down menu choices and all fields shaded blue require data entry. All other cells in the worksheet are locked.

Stage 1: Screening Decision Record Stage 1 should be conducted early in the project development process and is intended to inform which alternatives are worthy of further evaluation in Stage 2. Stage 1 serves as a screening effort meant to *eliminate* non-competitive options and identify which alternatives merit further considerations based on their practical feasibility. Users should use good engineering judgement in responding to the seven policy questions by selecting "Yes" or "No" in the drop-down boxes. Alternatives should not be summarily eliminated without due consideration, and reasons for eliminating or advancing an alternative should be documented in the "Screening Decision Justification" column.

Stage 2: Alternative Selection Decision Record Stage 2 involves a more detailed and familiar evaluation of the alternatives identified in Stage 1 in order to support the selection of a preferred alternative that may be advanced to detailed design. Stage 2 data entry may require the use of external analysis tools to determine costs, operations and/or safety data that, combined with environmental and stakeholder posture data, form the basis of the ICE evaluation. A separate "CostEst" worksheet tab helps users develop pre-planning-level cost estimates for each Stage 2 alternative evaluated, and a separate Users Guide has been prepared to give guidance on Stage 1 and Stage 2 data entry. Once all data is entered, each alternative is scored and ranked, with the results reported at the bottom of the Stage 2 worksheet to inform on the best of the intersection controls evaluated for project recommendation.

Documentation: A complete ICE document consists of the combination of the outputs from either a completed and signed waiver form or both Stage 1 and Stage 2 worksheets (along with supporting costing and/or environmental documentation), to be included in the approved project Concept Report (or equivalent) or as a stand-alone document.

GDOT ICE STAGE 1: SCREENING DECISION RECORD

ICE Version 2.14 | Revised 08/03/2018

GDOT PI #	n/a
Project Location:	SR 124 @ Flowery Br Rd
Prepared by:	POND
Analyst:	A. Antweiler
Date:	11/7/2018

Answer "Yes" or "No" to each policy question for each control type to identify which alternatives should be evaluated in the Stage 2 Decision Record; enter justification in the rightmost column

Note: Up to 5 alternatives may be selected and evaluated; Use this ICE Stage 1 to screen 5 or fewer alternatives to evaluate in Stage 2

	Intersection Alternative (see "Intersections" tab for detailed description of intersection/interchange type)	1. Does alternative address the project need in a balanced manner and in scale with the project?	2. Does alternative improve safety performance in terms of reducing severe crashes?	3. Does alternative incorporate safety, convenience and accessibility for pedestrians and/or bicyclists?	4. Does alternative improve (or preserve) traffic operations (congestion, delay, reliability, etc.)?	5. Does alternative appear feasible given the site characteristics, constrains & location context?	6. Does alternative appear feasible with respect to other project factors?	7. Overall feasible alternative (select alternative for further evaluation in Stage 2)?	**Screening Decision Justification:**
Unsignalized Intersections	Conventional (Minor Stop)	No	No	No	No	No	No	No	Current Condition
	Conventional (All-Way Stop)	No	No	No	No	No	No	No	Not appropriate
	Mini Roundabout	No	No	No	No	No	No	No	Not appropriate
	Single Lane Roundabout	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**No**	**Yes**	Alternative Option
	Multilane Roundabout	No	No	No	No	No	No	No	Not needed
	RCUT (stop control)	No	No	No	No	No	No	No	Not appropriate
	RIRO w/down stream U-Turn	No	No	No	No	No	No	No	Not appropriate
	High-T (unsignalized)	No	No	No	No	No	No	No	Not appropriate
	Offset-T Intersections	No	No	No	No	No	No	No	Not appropriate
	Diamond Interch (Stop Control)	No	No	No	No	No	No	No	Not an interchange
	Diamond Interch (RAB Control)	No	No	No	No	No	No	No	Not an interchange
	No LT Lane Improvements No RT Lane Improvements	No	No	No	No	No	No	No	N/A
	Other unignalized (provide description):	No	No	No	No	No	No	No	N/A
Signalized Intersections	Traffic Signal	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	Proposed improvement
	Median U-Turn (Indirect Left)	No	No	No	No	No	No	No	Not appropriate
	RCUT (signalized)	No	No	No	No	No	No	No	Not appropriate
	Displaced Left Turn (CFI)	No	No	No	No	No	No	No	Not appropriate
	Continuous Green-T	No	No	No	No	No	No	No	Not recommended; requires additional widening
	Jughandle	No	No	No	No	No	No	No	Not appropriate
	Quadrant Roadway	No	No	No	No	No	No	No	Not appropriate
	Diamond Interch (Signal Control)	No	No	No	No	No	No	No	Not an interchange
	Diverging Diamond	No	No	No	No	No	No	No	Not an interchange
	Single Point Interchange	No	No	No	No	No	No	No	Not an interchange
	No LT Lane Improvements No RT Lane Improvements	No	No	No	No	No	No	No	N/A
	Other Signalized (provide description):	No	No	No	No	No	No	No	N/A

= Intersection type selected for more detailed analysis in Stage 2 Alternative Selection Decision Record

GDOT ICE STAGE 2: ALTERNATIVE SELECTION DECISION RECORD

ICE Version 2.14 | Revised 08/03/2018

GDOT PI # (or N/A): n/a
County: Gwinnett
Project Location: SR 124 @ Flowery Br Rd
Existing Intersection Control: Conventional (Minor Stop)

GDOT District: 1 - Gainesville
Area Type: Suburb/Transition

Date: 11/7/2018
Agency/Firm: POND
Analyst: A. Antweiler
Type of Analysis: Conventional Non-Safety Funded Project

Opening / Design Year Traffic Operations

Intersection meets signal/AWS warrants?	Meets Signal Warrants	
Traffic Analysis Measure of Effectiveness	Intersection Delay	
Traffic Analysis Software Used	HCS 2010	
Analysis Time Period	AM Peak Hr	PM Peak Hr
2019 Opening Yr No-Build Peak Hr Intersection Delay	56.3 sec	144.8 sec
2019 Opening Yr No-Build Peak Hr Intersection V/C	0.78	1.07
2019 Design Yr No-Build Peak Hr Intersection Delay	56.3 sec	144.8 sec
2019 Design Yr No-Build Peak Hr Intersection V/C	0.78	1.07

Complete Streets Warrants Met?
- ☐ PEDESTRIANS
- ☐ BICYCLES
- ☐ TRANSIT

Crash Data: Enter 5 most recent years of intersection crash data	Crash Severity: PDO	Injury Crash*	Fatal Crash*	
Crash Type: Angle	8	5	0	34%
Head-On	2	2	0	11%
Rear End	14	4	0	47%
Sideswipe - same	1	0	0	3%
Sideswipe - opposite	1	1	0	5%
Not Collision w/Motor Veh	0	0	0	0%
TOTALS:	26	12	0	38

* Number of crashes resulting in injuries / fatalities, not number of persons

Alternatives Analysis:

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Proposed Control Type/Improvement:	Single Lane Roundabout	Traffic Signal	N/A	N/A	N/A
Project Cost: (From CostEst Worksheet)	*Additional description here*	*Add LT bays all approaches*			
Construction Cost	$1,500,000	$500,000			
ROW Cost	$200,000	$50,000			
Environmental Cost	$0	$0			
Reimbursable Utility Cost	$800,000	$50,000			
Design & Contingency Cost	$300,000	$200,000			
Cost Adjustment (justification req'd)					
Total Cost	$2,800,000	$800,000			
Traffic Operations:					
Traffic Analysis Software Used	GDOT RND Tool 4.1	HCS 2010			
Analysis Period	AM Peak Hr / PM Peak Hr	AM Peak Hr / PM Peak Hr			
2019 Design Yr Build Intersection Delay	10.0 sec / 6.0 sec	13.2 sec / 9.4 sec			
2019 Design Yr Build Intersection V/C	0.32 / 0.20	0.09 / 0.17			
Safety Analysis:					
Predefined CRF: PDO	39%	39%			
Predefined CRF: Fatal/Inj	78%	40%			
Predefined CRF Source:	FHWA Clearinghouse #s 233 / 234	FHWA Clearinghouse #s 325 / 7984			
User Defined CRF: PDO					
User Defined CRF: Fatal/Inj					
User Defined CRF Source (write in if applicable):					
Environmental Impacts:[1]					
Historic District/Property	None	None			
Archaeology Resources	None	None			
Graveyard	None	None			
Stream	None	None			
Underground Tank/Hazmat	None	None			
Park Land	None	None			
EJ Community	None	None			
Wooded Area	None	None			
Wetland	None	None			

*Note: If environmental impact is significant (**RED**), provide justification impact won't jeopardize project delivery using "Env" worksheet*

[1] *Environmental impacts are only preliminary estimates; detailed environmental impact documentation will be included with project concept report*

Stakeholder Posture:					
Local Community Support	Neutral	Supportive			
GDOT Support	Neutral	Neutral			
Final ICE Stage 2 Score:	7.4	8.1			
Rank of Control Type Alternatives:	2	1			

Note: Stage 2 score is not given (shown as "**-**") if signal or AWS is selected as control type but respective warrants are not met

Provide additional comments and/or explain any unique analysis inputs, or results (as necessary):

Preliminary utility reimbursement cost for the roundabout alternative is +/- $800,000