

# TRAFFIC IMPACT STUDY

FOR

ATLAS TOWNHOMES

HALL COUNTY, GA

Prepared By:



2470 Sandy Plains Road  
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February 22, 2024

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## EXECUTIVE SUMMARY

Atlas Development Townhouse Project is a proposed residential development located along SR 211 in Hall County, GA. The site is approximately 20 acres and is located along the east side of SR 211, south of SR 53. The development will include 105 townhomes is expected to be constructed by 2027. The site will be accessed by one new driveway on SR 211. This study analyzed existing and future traffic operations and capacity analysis for the study intersections to determine if recommendations to the existing roadway network should be made to accommodate the new traffic and determine how the new driveway should be controlled.

This study analyzed the impacts the development's generated trips are expected to have on the surrounding roadway network and study intersections. The study intersections are listed below:

1. SR 53 at SR 211
2. SR 211 at Atlas Drive

The ITE Trip Generation Manual, was referenced to estimate the trips generated by the residential development. The expected trips were added to the future projected traffic volumes to analyze delay and level of service at the study intersections in build condition and compare with the existing conditions. The geometry and method of control for the access driveway intersection on the State Route was determined utilizing GDOT's auxiliary lane requirements and ICE tool.

The existing intersection is operating at an overall acceptable level of service in the existing year (2024) and no-build year (2027). The development traffic has a nominal effect on the existing intersection's delay and operation. The development driveway is expected to operate acceptably upon full build-out of the development. Based on the auxiliary lane analysis per GDOT guidelines, both a left-turn and a right-turn lane are recommended at the driveway intersection.

The following is the recommended configuration at the development driveway:

### SR 211 at Atlas Drive

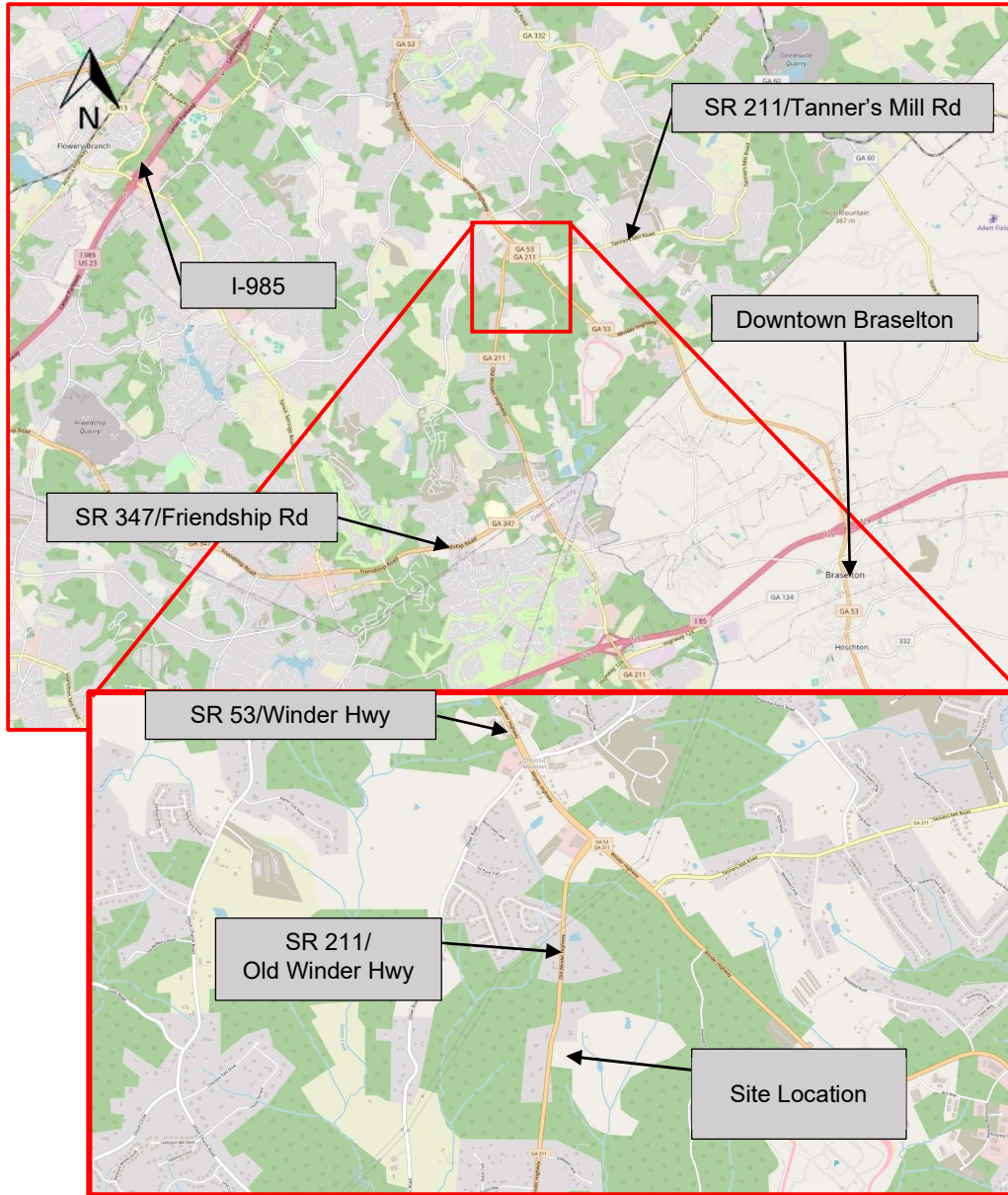
- Atlas Drive should be full-access, stop-sign controlled.
- Atlas Drive should be two lanes, one entry and one exit lane.
- Install a northbound right-turn storage lane on SR 211. Lane dimensions should meet GDOT minimum requirements.
- Install a southbound left-turn storage lane on SR 211. Lane dimensions should meet GDOT minimum requirements.

No other roadway improvements are recommended for this development.



## INTRODUCTION

A traffic impact study was conducted by Southeastern Engineering, Inc. for the proposed townhome development along SR 211/Old Winder Hwy south of SR 53/Winder Hwy in Hall County, GA. The development proposes adding a total of 105 townhomes and is expected to be completed in 2027. The site will be accessed by a single new driveway on SR 211. An overall location map of the site area is shown in **Figure 1**.



**Figure 1 Location Map**

This study will identify the potential impacts of the proposed development's traffic on the surrounding roadway network. The study includes the existing and future peak hour traffic operations and capacity analysis for the study intersections. As necessary, operational improvements will be identified and analyzed to mitigate the traffic impacts caused by the development. Based on the results of the analysis for the study intersections, recommendations will be made for intersection geometry and control methods.



## PROJECT DESCRIPTION

The townhouse development will have 105 townhomes, built on approximately 20 acres of land in Hall County, GA. The site will have one new driveway on SR 211 proposed as a full-access, stop-sign controlled approach. This study analyzes traffic impact upon the full built-out of the development, which is planned for 2027. The site plan is attached in **Appendix A**.

## Study Network

The traffic study analyzes traffic operations for the intersections in the vicinity of the development. Capacity analysis and level of service evaluations of the study intersections were conducted for the existing, no-build and build scenarios. An aerial of the study area is shown in **Figure 2**. The study intersections are listed below:

1. SR 53/Winder Hwy at SR 211/Old Winder Hwy– Traffic Signal
2. SR 211/Old Winder Hwy at Atlas Drive (*New Intersection*) – Minor-Street Stop-Control



Figure 2 Aerial of Study Area



## Roadway Conditions

The roadway network adjacent to the development was examined to review the roadway characteristics in the study area.

### SR 211/Old Winder Highway

SR 211/Old Winder Highway is an undivided two-lane roadway that is classified as a minor arterial. It has a posted speed limit of 45 mph north of Daylily Drive and 55 mph south of Daylily Drive. There is curb and gutter present as well as some sidewalk near its intersection with SR 53.

### SR 53/Winder Highway

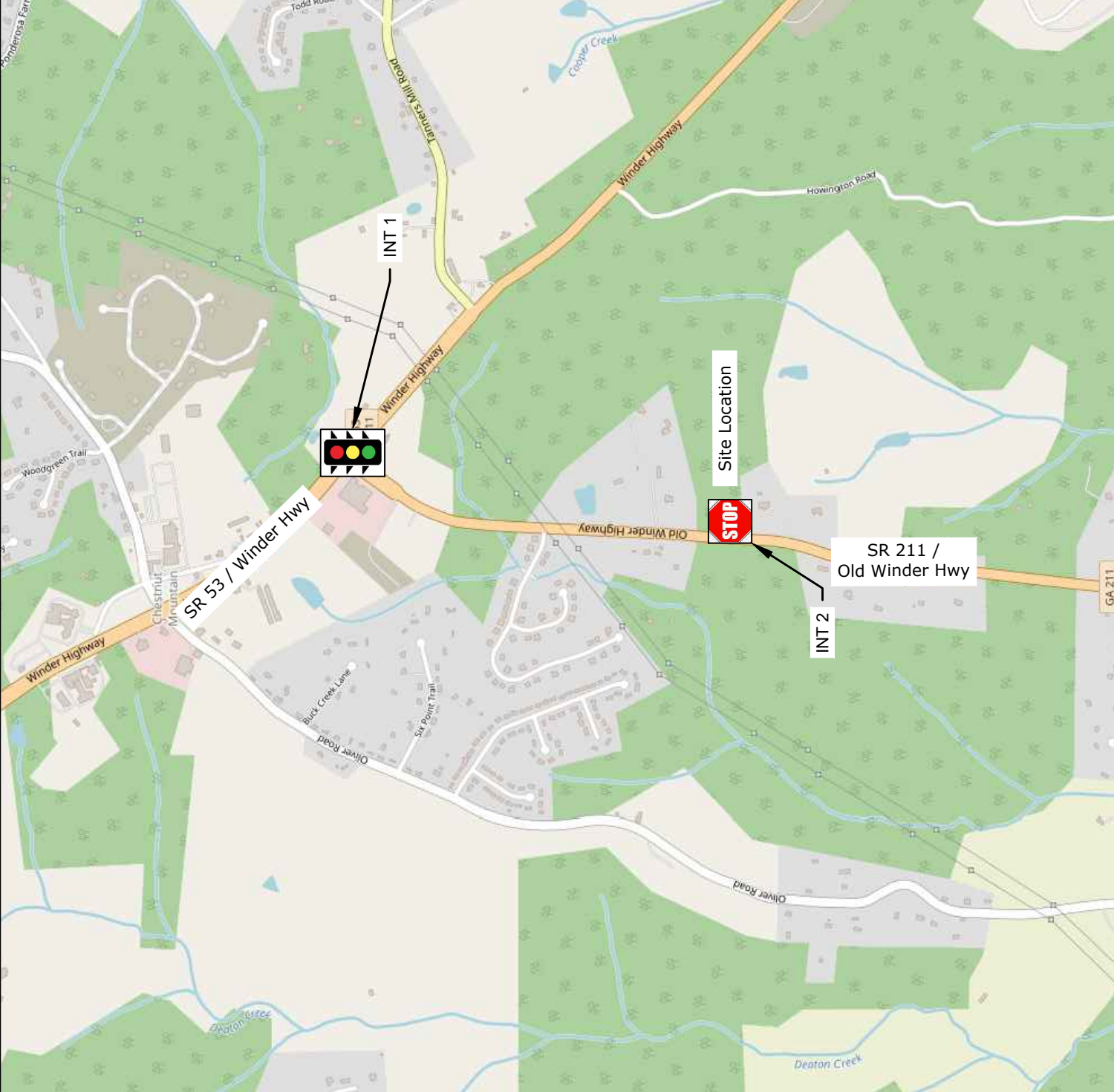
SR 53/Winder Highway is a four-lane median-divided roadway west of Tanners Mill Road and an undivided two-lane roadway east of Tanners Mill Road. It is classified as a minor arterial southeast of Old Winder Hwy and a principal arterial northeast of Old Winder Hwy. It has a posted speed limit of 45 mph. There is curb and gutter present along the roadway, as well as sidewalk in the study area.

## EXISTING TRAFFIC CONDITIONS

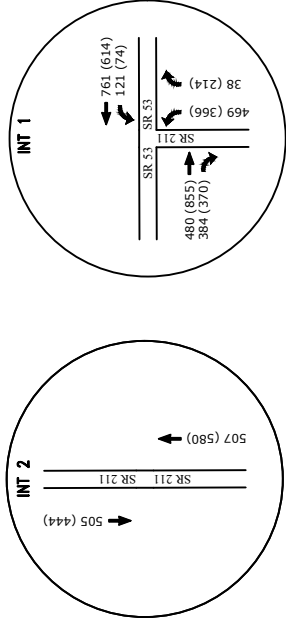
Existing traffic volumes at the study intersections were collected on Tuesday, January 30<sup>th</sup>, 2024. Peak hour turning movement counts were collected at the existing study intersections, and daily traffic volumes were collected on primary roadways near the development. Existing daily traffic volumes collected in the study area are summarized in **Table 1**, and detailed traffic counts are attached in **Appendix B**. The existing AM and PM peak hour traffic volumes for the study area are shown in **Figure 3**.

Table 1: Existing Traffic Volumes			
Location	Volume		Total
	Northbound	Southbound	
SR 211 / Old Winder Hwy south of Daylily Dr	6,211	5,986	12,197

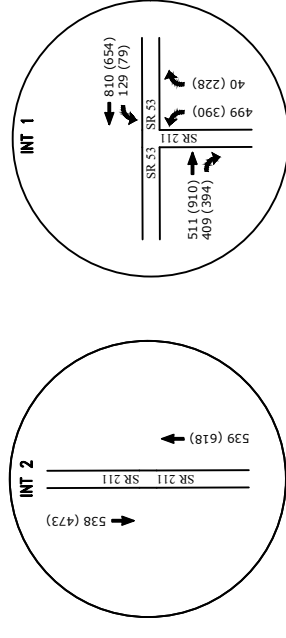




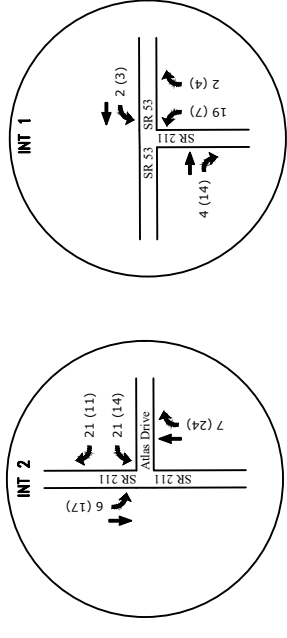
EXISTING CONDITION (2024)



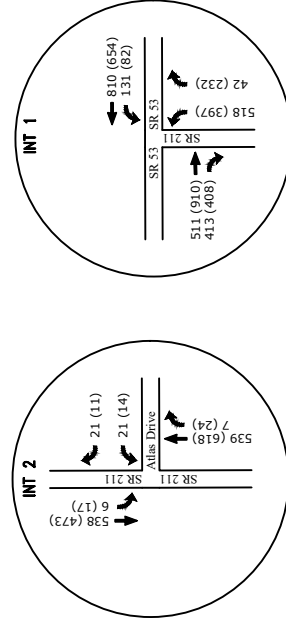
NO-BUILD CONDITION (2027)



SITE-GENERATED TRIPS



BUILD CONDITION (2027)



Legend: AM (PM)

FIGURE 3

**SEI**  
 SOUTHEASTERN ENGINEERING, INC.  
 2470 Seaside Plains  
 Marietta, Georgia  
 Tel: 770-321-3936  
 www.seengineering.com

PEAK HOUR TRIPS

REVISION DATES

DATE:

ATLAS TOWNHOMES

SHEET NO.



### Level of Service Methodology

Intersection capacity analyses were performed using the methodology outlined in the Highway Capacity Manual, 6<sup>th</sup> Edition (HCM). This methodology is the industry standard for the evaluation of intersection capacity and delay. To facilitate the analysis, computer software Synchro was used. This software conforms to the methodology of the HCM.

An analysis of peak hour traffic conditions was performed to determine the level of service (LOS) at the study intersections. LOS for an intersection is based on vehicular delay at the intersection and is a typical measure of effectiveness used to evaluate intersection operations. The HCM provides ranges of delay for each LOS definition, spanning from very minimal delays (LOS A) to high delays (LOS F). LOS F is considered unacceptable for most drivers.

For unsignalized intersections, where a stop sign controls side streets or minor streets, the criterion for evaluating traffic operations is the LOS for the controlled turning movements at the intersection. Methodology from the HCM to determine the delay and LOS for these turning movements is based on the following input data including intersection geometry, lane configuration, and turning movement volumes.

For the signalized intersections, LOS is based on the following input data: intersection geometry, lane configuration, turning movement volumes, traffic signal timing.

**Table 2** below indicates the relationship between delay and LOS for unsignalized and signalized intersections, respectively.

Level of Service	Control Delay Per Vehicle (sec)	
	Unsignalized Intersection	Signalized Intersection
A	≤10	≤10
B	>10 and ≤15	>10 and ≤20
C	>15 and ≤25	>20 and ≤35
D	>25 and ≤35	>35 and ≤55
E	>35 and ≤50	>55 and ≤80
F	>50	>80

### Existing Conditions Level of Service

The level of service for the existing condition was determined using Synchro 11. The existing intersection geometry, lane configuration, signal timings, and turning volumes were utilized for the analysis of the intersection. The results of the intersection capacity analysis are summarized in **Table 3**, and detailed Synchro reports are attached in **Appendix D**. The levels of service for all approaches at the existing intersection are acceptable in the existing conditions.

Intersection	Control Type	Approach	Delay (LOS)	
			AM	PM
SR 53 at SR 211	Signalized Intersection	EB	7 (A)	7 (A)
		WB	8 (A)	7 (A)
		NB	17 (B)	18 (B)
		<b>Overall</b>	<b>9 (A)</b>	<b>9 (A)</b>



## FUTURE CONDITIONS – WITHOUT THE PROPOSED DEVELOPMENT (NO-BUILD)

The impact of the proposed development on the roadway network was analyzed and evaluated in the future year (2027) without the proposed development (No-Build) to compare the future conditions with the proposed fully constructed development (Build).

### Growth Rate

Growth rate for the study area was calculated using annual volume statistics from GDOT’s Traffic Analysis & Data Application (TADA). The growth rate calculated using the GDOT’s historical traffic data is summarized in **Table 4**. Historical counts and calculations from all sources are attached in **Appendix C**.

Station ID	Location	5-Year Growth Rate	10-Year Growth Rate
139-0441	Spout Springs Rd n/o Iris Dr	3.4%	5.3%
135-0476	Thompson Mill Rd w/o Puckett Rd	2.3%	1.0%
139-8206	Union Circle e/o Spout Springs	9.7%	4.1%
139-7382	Ridge Rd s/o SR 347	8.3%	6.3%
139-0437	Spout Springs Rd n/o SR 347	2.6%	3.2%
<b>5 - Year and 10 - Year Average</b>		<b>5.2%</b>	<b>4.0%</b>
<b>Average Growth Rate</b>		<b>4.6%</b>	

Hall County census data obtained from the U.S. Census Bureau and the Georgia Governor’s Office of Planning and Budget was used to calculate a growth rate for the study area. County census data and estimated growth rate is shown in **Table 5**.

Geographic Area	Average 5-Year Growth Rate from 2020 to 2050						
	2020-2025	2025-2030	2030-2035	2035-2040	2040-2045	2045-2050	Average
Hall County	1.6%	1.4%	1.3%	1.1%	1.0%	1.0%	<b>1.2%</b>
Geographic Area	Average 10-Year Growth Rate from 2020 to 2050						
	2020-2030		2030-2040		2040-2050		Average
Hall County	1.3%		1.3%		1.1%		<b>1.3%</b>

Census data from the U.S. Census Bureau was used to calculate a growth rate for Hall County. Growth rate estimated using the U.S. Census Bureau data is shown in **Table 6**.

Geographic Area	2010 Census	2020 Census	2010 to 2020 Growth Rate
Hall County	179,684	203,136	1.23%

The overall project growth rate for this project was determined reviewing the different sources, and an average growth rate of 2.1% was utilized for the study to project future year traffic volumes.



### Future No-Build Traffic Volumes

The projected future 2027 background traffic volumes were calculated by applying the annual exponential growth rate over three years to the existing 2024 background traffic volumes. Future 2027 background traffic volume is shown in **Figure 3**.

### Future No-Build Conditions Level of Service

The methodology discussed previously was used to determine the level of service for the study intersections using the future 2027 background traffic volumes to determine operations at the study intersections. The intersection capacity analysis results for future no-build year (2027) are summarized in **Table 7** and detailed Synchro reports are attached in **Appendix D**. The existing intersection and all its approaches are expected to continue to operate similarly and at acceptable levels of service as they do in the existing year (2024) conditions.

Intersection	Control Type	Approach	Delay (LOS)	
			AM	PM
SR 53 at SR 211	Signalized Intersection	EB	7 (A)	8 (A)
		WB	8 (A)	8 (A)
		NB	19 (B)	21 (C)
		<b>Overall</b>	<b>10 (B)</b>	<b>11 (B)</b>

### PROPOSED DEVELOPMENT

The townhouse development will have 105 townhomes located along SR 211 in Hall County, GA. One new driveway on SR 211 is proposed as a full access, stop-controlled approach. This study analyzes traffic impact upon the full built-out of the development, which is planned for 2027.

### Trip Generation

The number of trips expected to be generated from the development were estimated based on the method defined in the Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition. The trip generation for the proposed development is summarized in **Table 8**. The trip generation report is attached in **Appendix E**.

Land Use (ITE Code)	Unit of Measure	Daily Traffic			AM Peak Hour			PM Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
Multi-Family Housing (Low-Rise) (220)	105 Units	374	374	748	13	42	55	41	25	66

### Trip Distribution and Assignment

The trips expected to be generated from the proposed development were distributed on the roadway network in the study area. The proposed distribution is based on historical counts and observed traffic patterns in the study area. **Figure 3** shows the development-generated trips in the network.

### Auxiliary Lane Analysis

The need for auxiliary lanes on SR 211 was evaluated at the driveway intersection based on the guidelines from GDOT’s *Regulations for Driveway and Encroachment Control*. Auxiliary lanes are used on approaches to intersections when the projected daily turning traffic volumes exceed minimum levels. Based on the GDOT manual a left-turn lane is recommended at an intersection if the threshold values as shown in **Table 9** are met.



**Table 9: Left-Turn Lane Requirements**

Posted Speed	2 Lane Routes		More than 2 Lanes on Main Road	
	ADT < 6,000	ADT ≥ 6,000	ADT < 10,000	ADT ≥ 10,000
35 MPH or Less	300 LTV a day	200 LTV a day	400 LTV a day	300 LTV a day
40 to 50 MPH	250 LTV a day	175 LTV a day	325 LTV a day	250 LTV a day
≥ 55 MPH	200 LTV a day	150 LTV a day	250 LTV a day	200 LTV a day

Based on the GDOT manual a right-turn lane is recommended at an intersection if the threshold values as shown in **Table 10** are met.

**Table 10: Right-Turn Lane Requirements**

Posted Speed	2 Lane Routes		More than 2 Lanes on Main Road	
	ADT < 6,000	ADT ≥ 6,000	ADT < 10,000	ADT ≥ 10,000
35 MPH or Less	200 RTV a day	100 RTV a day	200 RTV a day	100 RTV a day
40 to 50 MPH	150 RTV a day	75 RTV a day	150 RTV a day	75 RTV a day
55 to 60 MPH	100 RTV a day	50 RTV a day	100 RTV a day	50 RTV a day
≥65 MPH	Always	Always	Always	Always

SR 211 is a two-lane route, with an existing average daily traffic volume of approximately 12,195 vehicles per day (vpd) and has a posted speed limit of 55 miles per hour. Based on these characteristics, the threshold for a left-turn lane is 150 LTV per day, and a right-turn lane is set at 50 RTV per day. Based on the expected trip distribution, approximately 165 vpd will make a left-turn and approximately 210 vpd will make a right-turn onto Atlas Drive (new driveway). Therefore, both a right-turn and left-turn lane are recommended on SR 211 at the new driveway intersection, and will be included in the analysis.

**FUTURE CONDITIONS - WITH THE PROPOSED DEVELOPMENT (BUILD)**

To assess the impact of the proposed development, the site-generated trips were added to the future no-build background traffic, and the combined volumes were analyzed.

**Build Traffic Volumes**

The trips expected to be generated from the development were distributed on the roadway network in the study area. The proposed distribution is based on historical counts and traffic patterns in the area from the collected data. The total site generated trip distribution for peak hours is shown in **Figure 3**.

**Delay Analysis for Build Condition**

The level of service criteria discussed in the prior sections was applied to the study intersections to determine the impacts of 2027 background traffic volumes plus total site-generated volumes. All intersections were analyzed with existing controls and geometric configurations. The driveway was modeled with the auxiliary lanes on SR 211.

The results of the intersection capacity analysis for the future year with the development are summarized in **Table 11** and detailed Synchro reports are attached in **Appendix D**. The proposed development is expected to have a nominal impact on the existing signalized intersection of SR 53 at SR 211. The site driveway is expected to operate acceptably upon full build-out of the development.



Intersection	Control Type	Approach	Delay (LOS)	
			AM	PM
SR 53 at SR 211	Signalized Intersection	EB	8 (A)	8 (A)
		WB	8 (A)	8 (A)
		NB	19 (B)	21 (C)
		<b>Overall</b>	<b>11 (B)</b>	<b>11 (B)</b>
SR 211 at Atlas Drive	Minor-Street Stop-Control	WB	21 (C)	21 (C)

**Intersection Control Evaluation (ICE)**

GDOT policy 4A-5 states an intersection control evaluation (ICE) is required for a proposed driveway intersection on State Routes. Accordingly, ICE was performed on the new driveway intersection. The ICE process compares and scores the feasible intersection controls based on project cost, safety analysis, traffic operations, environmental impacts, and stakeholder posture. The higher the ICE score, the preferable the intersection control per the GDOT ICE tool.

An ICE waiver was provided for the new driveway on SR 211 because only one feasible alternative, the minor-street stop control with both right-turn and left-turn storage lanes on SR 211, was identified in Stage 1. The ICE tool and associated operational analysis reports are attached in **Appendix F**.

**Level of Service Comparison**

The results of the intersection capacity analysis for the no-build (2027) and build with the development are summarized in **Table 12** below for the study intersections. The site driveway is expected to operate acceptably upon full build out of the development. The impact of the development traffic on the existing intersection of SR 53 at SR 211 is nominal.

Intersection	Control Type	Approach	No-Build Conditions		Build Conditions	
			Delay (LOS)		Delay (LOS)	
			AM	PM	AM	PM
SR 53 at SR 211	Signalized	EB	7 (A)	8 (A)	8 (A)	8 (A)
		WB	8 (A)	8 (A)	8 (A)	8 (A)
		NB	19 (B)	21 (C)	19 (B)	21 (C)
		<b>Overall</b>	<b>10 (B)</b>	<b>11 (B)</b>	<b>11 (B)</b>	<b>11 (B)</b>
SR 211 at Atlas Drive	Minor-Street Stop-Control	WB			21 (C)	21 (C)



## CONCLUSION

Atlas Development Townhouse Project is a proposed residential development located along SR 211 in Hall County, GA. The site is approximately 20 acres and is located along the east side of SR 211, south of SR 53. The development will include 105 townhomes is expected to be constructed by 2027. The site will be accessed by a single driveway on SR 211. This study analyzed existing and future traffic operations and capacity analysis for the study intersections to determine if recommendations to the existing roadway network should be made to accommodate the new traffic and determine how the new driveway should be controlled.

Based on the analysis, the development driveway and the existing adjacent intersection are expected to operate acceptably in the future no-build and build scenarios. The proposed development will have a nominal impact on the existing intersection.

Based on the auxiliary lane analysis, both a left-turn lane and a right-turn lane are recommended on SR 211 at the driveway intersection.

The following is the recommended configuration at the development driveway:

### SR 211 at Atlas Drive

- Atlas Drive should be full-access, stop-sign controlled.
- Atlas Drive should be two lanes, one entry and one exit lane.
- Install a northbound right-turn storage lane on SR 211. Lane dimensions should meet GDOT minimum requirements.
- Install a southbound left-turn storage lane on SR 211. Lane dimensions should meet GDOT minimum requirements.

No other roadway improvements are recommended for this development.



## APPENDICES

- **Appendix A**
  - Site Plan
- **Appendix B**
  - Traffic Counts Summary Sheets
- **Appendix C**
  - Growth Rate Summary
- **Appendix D**
  - Synchro Reports
- **Appendix E**
  - Trip Generation Report
- **Appendix F**
  - ICE Tool Report



**Appendix A**  
**Site Plan**



**REED**  
PLANNING & DESIGN  
100 Old Dawson Village Rd  
Dawsonville, GA 30534  
Phone: 706-531-8428

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CERTIFICATION NO. 1639  
EXPIRES 10/27/2026

ATLAS DEVELOPMENT  
TOWNHOUSE PROJECT  
GA. HWY. 211 TRACT

PARCEL	-
LAND LOT	-
DISTRICT	-
CITY	-
COUNTY	HALL
STATE	GEORGIA

CONCEPT  
PLAN B

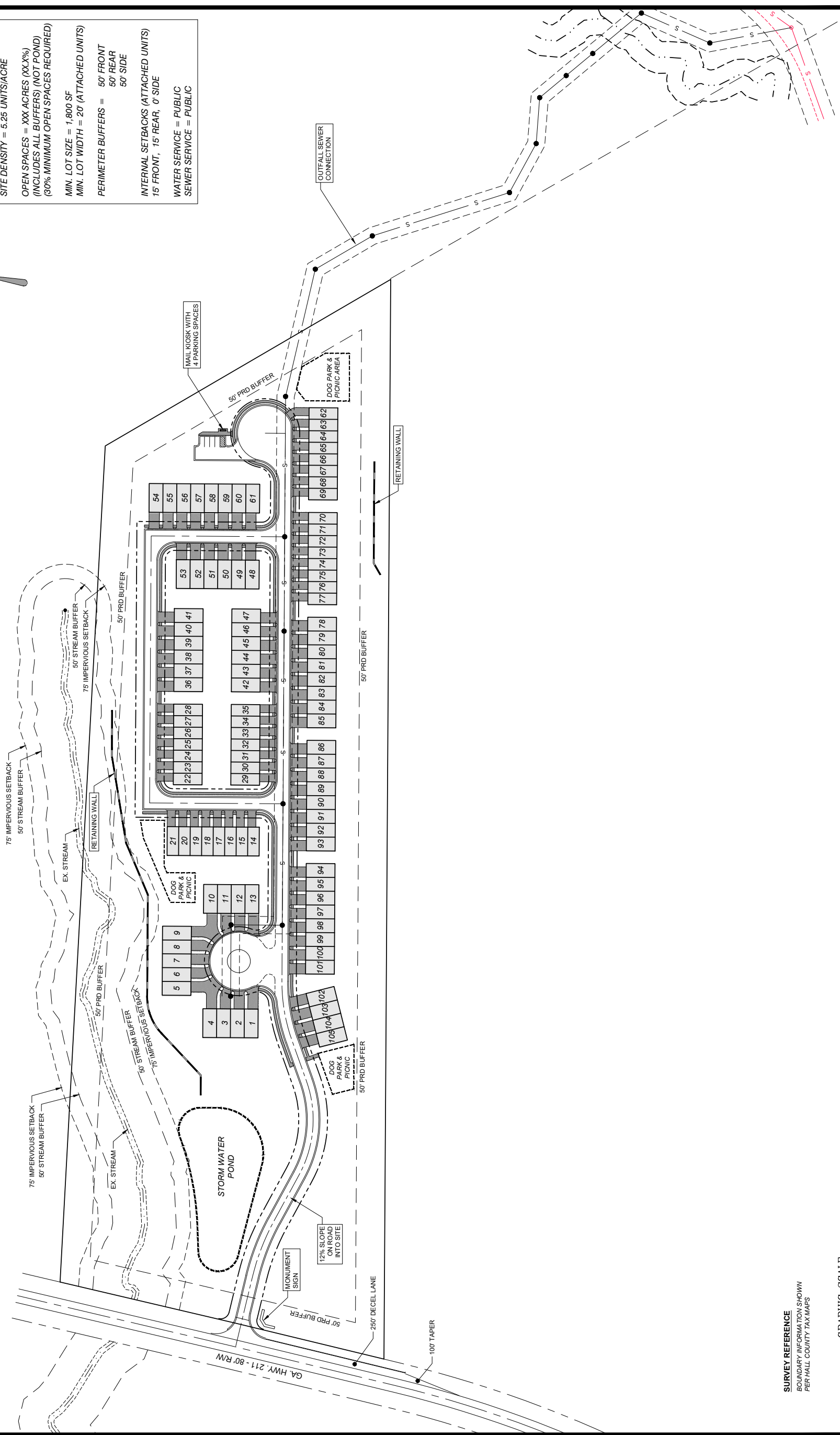
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23100-AD2	1-19-2024

DATE	NO	REVISION

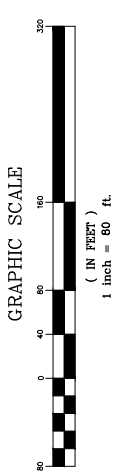
C-1.B

**SITE SUMMARY**

APPROXIMATE SITE AREA = 20.0 AC.  
PROPOSED ZONING = PRD  
USE = TOWNHOUSES (FEE SIMPLE)  
TOTAL UNITS = 105 LOTS  
- 38 UNITS (20' X 50')  
- 67 UNITS (24' X 50')  
SITE DENSITY = 5.25 UNITS/ACRE  
OPEN SPACES = XX ACRES (XX.X%)  
(INCLUDES ALL BUFFERS) (NOT POND)  
(30% MINIMUM OPEN SPACES REQUIRED)  
MIN. LOT SIZE = 1,800 SF  
MIN. LOT WIDTH = 20' (ATTACHED UNITS)  
PERIMETER BUFFERS = 50' FRONT  
50' REAR  
50' SIDE  
INTERNAL SETBACKS (ATTACHED UNITS)  
15' FRONT, 15' REAR, 0' SIDE  
WATER SERVICE = PUBLIC  
SEWER SERVICE = PUBLIC



**SURVEY REFERENCE**  
BOUNDARY INFORMATION SHOWN  
PER HALL COUNTY TAX MAPS



**Appendix B**  
**Traffic Counts Summary Sheets**

## **Turning Movement Counts**

**SR 53 / Winder Hwy at SR 211 / Old Winder Hwy**



[Click here for Map](#)

# Peak Hour Turning Movement Count

Hall County, GA



www.marrtraffic.com



Tuesday, January 30, 2024	
Period	0600 - 0800
Peak Hour	0700 - 0800

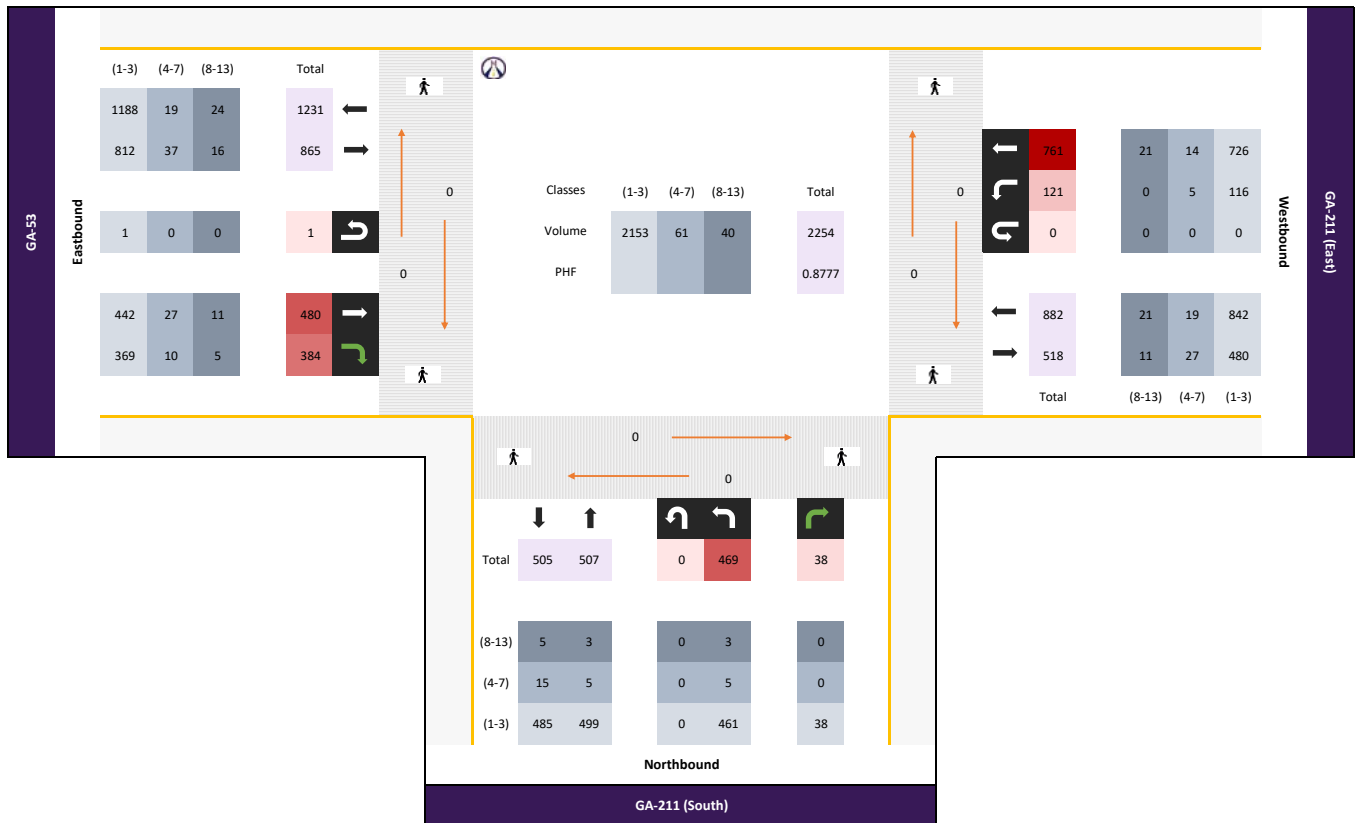
\* the Peak Hour Diagram does not include Bikes

**Session Parameters**

(Drop Down Menu)

Peak Hour

Volume







[Click here for Map](#)

# Peak Hour Turning Movement Count

Hall County, GA



www.marrtraffic.com



Tuesday, January 30, 2024	
Period	1600 - 1800
Peak Hour	1700 - 1800

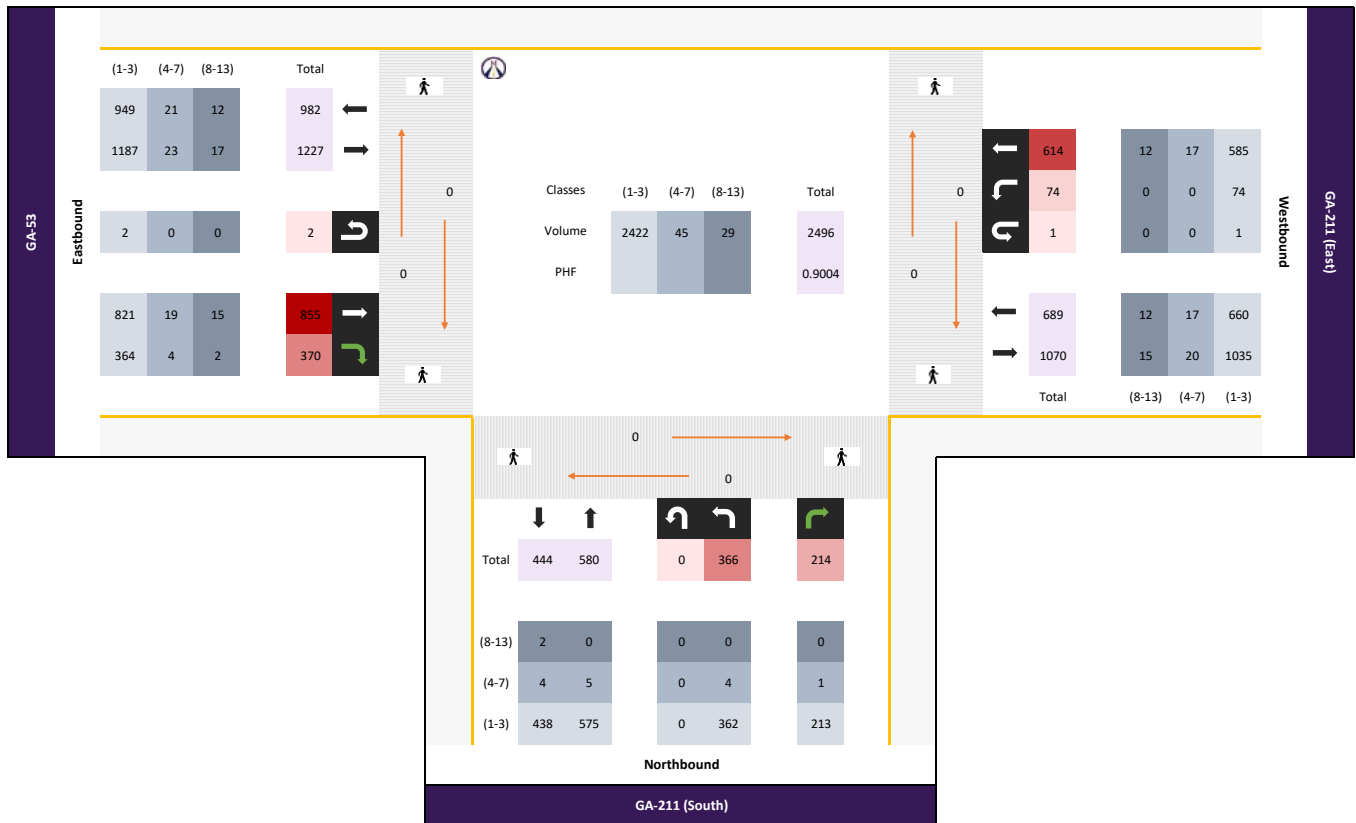
\* the Peak Hour Diagram does not include Bikes

**Session Parameters**

(Drop Down Menu)

Peak Hour

Volume





**24-Hour Classification Count  
SR 211 south of Daylily Dr.**









# Bi-Directional Class Count || Volume Summary 15min



Hall County, GA

**Site 1**  
GA-211 (East),  
south of Daylily Dr

**Date**  
Tuesday, January 30, 2024

**Weather**  
Fair  
47°F

**Lat/Long**  
34.161821°, -83.835738°

[Click here for Detailed Weather](#)

## 0000 - 2400 (Weekday 24h Session) (01-30-2024)

Volume Summary 15min

TIME	Volume Summary 15min		15min Total	60min Total
	NB	SB		
0000 - 0015	6	7	13	
0015 - 0030	7	7	14	
0030 - 0045	7	5	12	
0045 - 0100	4	3	7	46
0100 - 0115	4	6	10	
0115 - 0130	5	6	11	
0130 - 0145	4	6	10	
0145 - 0200	2	5	7	38
0200 - 0215	2	1	3	
0215 - 0230	7	6	13	
0230 - 0245	7	4	11	
0245 - 0300	7	9	16	43
0300 - 0315	5	3	8	
0315 - 0330	3	5	8	
0330 - 0345	5	3	8	
0345 - 0400	6	6	12	36
0400 - 0415	6	3	9	
0415 - 0430	12	9	21	
0430 - 0445	17	13	30	
0445 - 0500	16	19	35	95
0500 - 0515	18	20	38	
0515 - 0530	17	35	52	
0530 - 0545	36	42	78	
0545 - 0600	29	50	79	247
0600 - 0615	56	77	133	
0615 - 0630	78	99	177	
0630 - 0645	91	77	168	
0645 - 0700	101	69	170	648
0700 - 0715	109	97	206	
0715 - 0730	139	96	235	
0730 - 0745	148	135	283	
0745 - 0800	117	181	298	1022
0800 - 0815	100	136	236	
0815 - 0830	84	117	201	
0830 - 0845	117	96	213	
0845 - 0900	102	105	207	857
0900 - 0915	105	90	195	
0915 - 0930	100	71	171	
0930 - 0945	89	86	175	
0945 - 1000	84	88	172	713
1000 - 1015	84	81	165	
1015 - 1030	99	74	173	
1030 - 1045	90	70	160	
1045 - 1100	93	66	159	657
1100 - 1115	76	89	165	
1115 - 1130	81	79	160	
1130 - 1145	94	73	167	
1145 - 1200	64	74	138	630

Time	Volume Summary 15min		15min Total	60min Total
	NB	SB		
1200 - 1215	98	78	176	
1215 - 1230	91	67	158	
1230 - 1245	95	98	193	
1245 - 1300	63	92	155	682
1300 - 1315	86	83	169	
1315 - 1330	82	79	161	
1330 - 1345	85	83	168	
1345 - 1400	93	78	171	669
1400 - 1415	90	83	173	
1415 - 1430	90	97	187	
1430 - 1445	96	97	193	
1445 - 1500	102	111	213	766
1500 - 1515	104	129	233	
1515 - 1530	116	133	249	
1530 - 1545	109	119	228	
1545 - 1600	133	118	251	961
1600 - 1615	120	97	217	
1615 - 1630	122	110	232	
1630 - 1645	112	104	216	
1645 - 1700	124	124	248	913
1700 - 1715	145	82	227	
1715 - 1730	181	114	295	
1730 - 1745	137	111	248	
1745 - 1800	127	113	240	1010
1800 - 1815	108	99	207	
1815 - 1830	112	105	217	
1830 - 1845	100	83	183	
1845 - 1900	79	65	144	751
1900 - 1915	70	60	130	
1915 - 1930	87	78	165	
1930 - 1945	64	60	124	
1945 - 2000	45	59	104	523
2000 - 2015	37	72	109	
2015 - 2030	40	57	97	
2030 - 2045	65	53	118	
2045 - 2100	30	52	82	406
2100 - 2115	36	47	83	
2115 - 2130	29	38	67	
2130 - 2145	20	42	62	
2145 - 2200	37	23	60	272
2200 - 2215	23	14	37	
2215 - 2230	21	14	35	
2230 - 2245	18	11	29	
2245 - 2300	13	19	32	133
2300 - 2315	13	12	25	
2315 - 2330	13	9	22	
2330 - 2345	9	8	17	
2345 - 0000	8	7	15	79

Session Total	6211	5986	12197
Session Average	64.70	62.35	127.05
Session Percentage	50.92	49.08	

**Appendix C**  
**Growth Rate Summary**

Growth Rate Based on U.S Census Bureau			
Geographic Area	2010	2020	2010-2020
	Census	Census	Population % Change
Hall County	179,684	203,136	1.23%

GDOT Historical Growth Rate														
Location	Station ID	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	5 year	10 year
Spout Springs Rd n/o Iris Dr	139-0441		18816				16450				12434	5861	3.4%	5.3%
Thompson Mill Rd w/o Puckett Rd	135-0476			6367				5822					2.3%	1.0%
Union Circle e/o Spout Springs	139-8206	4488			3402				3390				9.7%	4.1%
Ridge Rd s/o SR 347	139-7382		8327			6560				5382	5122		8.3%	6.3%
Spout Springs Rd n/o SR 347	139-0437	11200				10100				8450			2.6%	3.2%
<b>5 &amp; 10 - Year Average</b>														
Weighted Average														
4.6%														

Growth Rate Based on Georgia Governor's Office of Planning and Budget Annual Population Projections							
Geographic Area	Average 5-Year Growth Rate From 2020-2050						
	2020-2025	2025-2030	2030-2035	2035-2040	2040-2045	2045-2050	Average
Hall County	1.6%	1.4%	1.3%	1.1%	1.0%	1.0%	1.2%
	<b>Average 10-Year Growth Rate From 2020-2050</b>						
	2020-2030	2030-2040	2040-2050				
1.3%	1.3%	1.1%					1.1%
<b>Average</b>							1.2%

Average Growth Rate	2.1%
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**Appendix D**  
**Synchro Reports**

**Synchro Reports**  
**Existing Year (2024)**



HCM 6th Signalized Intersection Summary  
 1: SR 211 & SR 53

AM Existing  
 02/06/2024



Movement	EBU	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations		↔↑	↔↑	↔↑	↔↑	↔↑	↔↑
Traffic Volume (veh/h)	1	480	384	121	761	469	38
Future Volume (veh/h)	1	480	384	121	761	469	38
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
Work Zone On Approach		No			No	No	
Adj Sat Flow, veh/h/ln		1781	1841	1841	1826	1870	1870
Adj Flow Rate, veh/h		545	436	138	865	533	43
Peak Hour Factor		0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %		8	4	4	5	2	2
Cap, veh/h		1754	808	397	1798	760	349
Arrive On Green		0.52	0.52	0.52	0.52	0.22	0.22
Sat Flow, veh/h		3474	1560	564	3561	3456	1585
Grp Volume(v), veh/h		545	436	138	865	533	43
Grp Sat Flow(s),veh/h/ln		1692	1560	564	1735	1728	1585
Q Serve(g_s), s		4.2	8.6	8.5	7.3	6.5	1.0
Cycle Q Clear(g_c), s		4.2	8.6	12.8	7.3	6.5	1.0
Prop In Lane			1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h		1754	808	397	1798	760	349
V/C Ratio(X)		0.31	0.54	0.35	0.48	0.70	0.12
Avail Cap(c_a), veh/h		5094	2347	954	5221	1432	657
HCM Platoon Ratio		1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)		1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh		6.3	7.4	10.0	7.1	16.5	14.3
Incr Delay (d2), s/veh		0.1	0.6	0.5	0.2	1.2	0.2
Initial Q Delay(d3),s/veh		0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln		0.8	1.7	0.7	1.5	2.1	0.3
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh		6.4	7.9	10.5	7.3	17.7	14.5
LnGrp LOS		A	A	B	A	B	B
Approach Vol, veh/h		981			1003	576	
Approach Delay, s/veh		7.1			7.7	17.4	
Approach LOS		A			A	B	
Timer - Assigned Phs		2				6	8
Phs Duration (G+Y+Rc), s		29.8				29.8	16.1
Change Period (Y+Rc), s		6.0				6.0	6.0
Max Green Setting (Gmax), s		69.0				69.0	19.0
Max Q Clear Time (g_c+I1), s		10.6				14.8	8.5
Green Ext Time (p_c), s		5.6				9.0	1.6
<b>Intersection Summary</b>							
HCM 6th Ctrl Delay			9.7				
HCM 6th LOS			A				
<b>Notes</b>							
User approved ignoring U-Turning movement.							

HCM 6th Signalized Intersection Summary  
1: SR 211 & SR 53

PM Existing  
02/12/2024



Movement	EBU	EBT	EBR	WBU	WBL	WBT	NBL	NBR
Lane Configurations		↑↑	↗		↖	↑↑	↖↗	↗
Traffic Volume (veh/h)	2	855	370	1	74	614	366	214
Future Volume (veh/h)	2	855	370	1	74	614	366	214
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
Work Zone On Approach		No			No	No		
Adj Sat Flow, veh/h/ln		1841	1870		1870	1826	1870	1870
Adj Flow Rate, veh/h		950	411		82	682	407	238
Peak Hour Factor		0.90	0.90		0.90	0.90	0.90	0.90
Percent Heavy Veh, %		4	2		2	5	2	2
Cap, veh/h		1853	840		295	1838	742	340
Arrive On Green		0.53	0.53		0.53	0.53	0.21	0.21
Sat Flow, veh/h		3589	1585		400	3561	3456	1585
Grp Volume(v), veh/h		950	411		82	682	407	238
Grp Sat Flow(s),veh/h/ln		1749	1585		400	1735	1728	1585
Q Serve(g_s), s		8.2	7.7		7.8	5.4	4.9	6.5
Cycle Q Clear(g_c), s		8.2	7.7		16.1	5.4	4.9	6.5
Prop In Lane			1.00		1.00		1.00	1.00
Lane Grp Cap(c), veh/h		1853	840		295	1838	742	340
V/C Ratio(X)		0.51	0.49		0.28	0.37	0.55	0.70
Avail Cap(c_a), veh/h		5288	2397		688	5245	1251	574
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		7.1	7.0		12.3	6.5	16.4	17.0
Incr Delay (d2), s/veh		0.2	0.4		0.5	0.1	0.6	2.6
Initial Q Delay(d3),s/veh		0.0	0.0		0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln		1.7	1.5		0.5	1.1	1.6	2.1
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh		7.3	7.5		12.8	6.6	17.0	19.6
LnGrp LOS		A	A		B	A	B	B
Approach Vol, veh/h		1361				764	645	
Approach Delay, s/veh		7.4				7.3	18.0	
Approach LOS		A				A	B	
Timer - Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		30.9				30.9		16.1
Change Period (Y+Rc), s		6.0				6.0		6.0
Max Green Setting (Gmax), s		71.0				71.0		17.0
Max Q Clear Time (g_c+I1), s		10.2				18.1		8.5
Green Ext Time (p_c), s		10.0				6.8		1.6

Intersection Summary

HCM 6th Ctrl Delay	9.8
HCM 6th LOS	A

Notes

User approved ignoring U-Turning movement.

**Synchro Reports**  
**No-Build Year (2027)**

HCM 6th Signalized Intersection Summary  
1: SR 211 & SR 53

AM No-Build  
02/06/2024



Movement	EBU	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations		↔↔	↗	↖	↕↕	↙↘	↗
Traffic Volume (veh/h)	1	511	409	129	810	499	40
Future Volume (veh/h)	1	511	409	129	810	499	40
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
Work Zone On Approach		No			No	No	
Adj Sat Flow, veh/h/ln		1781	1841	1841	1826	1870	1870
Adj Flow Rate, veh/h		581	465	147	920	567	45
Peak Hour Factor		0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %		8	4	4	5	2	2
Cap, veh/h		1835	846	379	1881	770	353
Arrive On Green		0.54	0.54	0.54	0.54	0.22	0.22
Sat Flow, veh/h		3474	1560	531	3561	3456	1585
Grp Volume(v), veh/h		581	465	147	920	567	45
Grp Sat Flow(s),veh/h/ln		1692	1560	531	1735	1728	1585
Q Serve(g_s), s		4.8	9.9	10.8	8.4	7.8	1.2
Cycle Q Clear(g_c), s		4.8	9.9	15.6	8.4	7.8	1.2
Prop In Lane			1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h		1835	846	379	1881	770	353
V/C Ratio(X)		0.32	0.55	0.39	0.49	0.74	0.13
Avail Cap(c_a), veh/h		4574	2108	808	4688	1286	590
HCM Platoon Ratio		1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)		1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh		6.5	7.6	10.8	7.3	18.5	15.9
Incr Delay (d2), s/veh		0.1	0.6	0.7	0.2	1.4	0.2
Initial Q Delay(d3),s/veh		0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln		1.0	2.1	0.9	1.9	2.7	0.4
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh		6.6	8.2	11.4	7.5	19.8	16.0
LnGrp LOS		A	A	B	A	B	B
Approach Vol, veh/h		1046			1067	612	
Approach Delay, s/veh		7.3			8.0	19.6	
Approach LOS		A			A	B	
Timer - Assigned Phs		2				6	8
Phs Duration (G+Y+Rc), s		33.7				33.7	17.4
Change Period (Y+Rc), s		6.0				6.0	6.0
Max Green Setting (Gmax), s		69.0				69.0	19.0
Max Q Clear Time (g_c+I1), s		11.9				17.6	9.8
Green Ext Time (p_c), s		6.1				10.0	1.6

Intersection Summary

HCM 6th Ctrl Delay	10.3
HCM 6th LOS	B

Notes

User approved ignoring U-Turning movement.

HCM 6th Signalized Intersection Summary  
1: SR 211 & SR 53

PM No-Build  
02/12/2024



Movement	EBU	EBT	EBR	WBU	WBL	WBT	NBL	NBR
Lane Configurations		↕↕	↗		↖	↕↕	↖↖	↗
Traffic Volume (veh/h)	2	910	394	1	79	654	390	228
Future Volume (veh/h)	2	910	394	1	79	654	390	228
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
Work Zone On Approach		No			No	No		
Adj Sat Flow, veh/h/ln		1841	1870		1870	1826	1870	1870
Adj Flow Rate, veh/h		1011	438		88	727	433	253
Peak Hour Factor		0.90	0.90		0.90	0.90	0.90	0.90
Percent Heavy Veh, %		4	2		2	5	2	2
Cap, veh/h		1951	884		275	1935	745	342
Arrive On Green		0.56	0.56		0.56	0.56	0.22	0.22
Sat Flow, veh/h		3589	1585		367	3561	3456	1585
Grp Volume(v), veh/h		1011	438		88	727	433	253
Grp Sat Flow(s),veh/h/ln		1749	1585		367	1735	1728	1585
Q Serve(g_s), s		9.5	8.9		10.4	6.2	5.9	7.9
Cycle Q Clear(g_c), s		9.5	8.9		19.9	6.2	5.9	7.9
Prop In Lane			1.00		1.00		1.00	1.00
Lane Grp Cap(c), veh/h		1951	884		275	1935	745	342
V/C Ratio(X)		0.52	0.50		0.32	0.38	0.58	0.74
Avail Cap(c_a), veh/h		4691	2126		563	4653	1110	509
HCM Platoon Ratio		1.00	1.00		1.00	1.00	1.00	1.00
Upstream Filter(l)		1.00	1.00		1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh		7.3	7.2		13.5	6.5	18.6	19.4
Incr Delay (d2), s/veh		0.2	0.4		0.7	0.1	0.7	3.2
Initial Q Delay(d3),s/veh		0.0	0.0		0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln		2.2	1.9		0.7	1.4	2.0	2.7
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh		7.5	7.6		14.1	6.7	19.3	22.5
LnGrp LOS		A	A		B	A	B	C
Approach Vol, veh/h		1449				815	686	
Approach Delay, s/veh		7.5				7.5	20.5	
Approach LOS		A				A	C	
Timer - Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		35.5				35.5		17.4
Change Period (Y+Rc), s		6.0				6.0		6.0
Max Green Setting (Gmax), s		71.0				71.0		17.0
Max Q Clear Time (g_c+I1), s		11.5				21.9		9.9
Green Ext Time (p_c), s		11.0				7.6		1.5
<b>Intersection Summary</b>								
HCM 6th Ctrl Delay			10.5					
HCM 6th LOS			B					
<b>Notes</b>								
User approved ignoring U-Turning movement.								

**Synchro Reports**  
**Build Year (2027)**

HCM 6th Signalized Intersection Summary  
1: SR 211 & SR 53

AM Build  
02/13/2024



Movement	EBU	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations		↔↑	↔↑	↔↑	↔↑	↔↑	↔↑
Traffic Volume (veh/h)	1	511	413	131	810	518	42
Future Volume (veh/h)	1	511	413	131	810	518	42
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
Work Zone On Approach		No			No	No	
Adj Sat Flow, veh/h/ln		1781	1841	1841	1826	1870	1870
Adj Flow Rate, veh/h		581	469	149	920	589	48
Peak Hour Factor		0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %		8	4	4	5	2	2
Cap, veh/h		1837	846	375	1882	787	361
Arrive On Green		0.54	0.54	0.54	0.54	0.23	0.23
Sat Flow, veh/h		3474	1560	529	3561	3456	1585
Grp Volume(v), veh/h		581	469	149	920	589	48
Grp Sat Flow(s),veh/h/ln		1692	1560	529	1735	1728	1585
Q Serve(g_s), s		5.0	10.3	11.3	8.6	8.3	1.3
Cycle Q Clear(g_c), s		5.0	10.3	16.3	8.6	8.3	1.3
Prop In Lane			1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h		1837	846	375	1882	787	361
V/C Ratio(X)		0.32	0.55	0.40	0.49	0.75	0.13
Avail Cap(c_a), veh/h		4469	2060	786	4581	1256	576
HCM Platoon Ratio		1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)		1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh		6.6	7.8	11.1	7.4	18.8	16.1
Incr Delay (d2), s/veh		0.1	0.6	0.7	0.2	1.5	0.2
Initial Q Delay(d3),s/veh		0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln		1.1	2.2	1.0	2.0	2.9	0.4
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh		6.7	8.4	11.8	7.6	20.2	16.2
LnGrp LOS		A	A	B	A	C	B
Approach Vol, veh/h		1050			1069	637	
Approach Delay, s/veh		7.5			8.2	19.9	
Approach LOS		A			A	B	
Timer - Assigned Phs		2			6	8	
Phs Duration (G+Y+Rc), s		34.4			34.4	17.9	
Change Period (Y+Rc), s		6.0			6.0	6.0	
Max Green Setting (Gmax), s		69.0			69.0	19.0	
Max Q Clear Time (g_c+I1), s		12.3			18.3	10.3	
Green Ext Time (p_c), s		6.1			10.1	1.6	
<b>Intersection Summary</b>							
HCM 6th Ctrl Delay			10.6				
HCM 6th LOS			B				

Notes

User approved ignoring U-Turning movement.

Intersection						
Int Delay, s/veh	0.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘↗		↑	↗↘	↘↗	↑
Traffic Vol, veh/h	21	21	539	7	6	538
Future Vol, veh/h	21	21	539	7	6	538
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	250	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	4
Mvmt Flow	24	24	613	8	7	611

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1238	613	0	0	621
Stage 1	613	-	-	-	-
Stage 2	625	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	194	492	-	-	960
Stage 1	541	-	-	-	-
Stage 2	534	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	193	492	-	-	960
Mov Cap-2 Maneuver	193	-	-	-	-
Stage 1	541	-	-	-	-
Stage 2	530	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.7	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	277	960
HCM Lane V/C Ratio	-	-	0.172	0.007
HCM Control Delay (s)	-	-	20.7	8.8
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	0.6	0



HCM 6th Signalized Intersection Summary  
1: SR 211 & SR 53

PM Build  
02/13/2024



Movement	EBU	EBT	EBR	WBU	WBL	WBT	NBL	NBR
Lane Configurations		↕↕	↗		↘	↕↕	↖↖	↗
Traffic Volume (veh/h)	2	910	408	1	82	654	397	232
Future Volume (veh/h)	2	910	408	1	82	654	397	232
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
Work Zone On Approach		No			No	No		
Adj Sat Flow, veh/h/ln		1841	1870		1870	1826	1870	1870
Adj Flow Rate, veh/h		1011	453		91	727	441	258
Peak Hour Factor		0.90	0.90		0.90	0.90	0.90	0.90
Percent Heavy Veh, %		4	2		2	5	2	2
Cap, veh/h		1969	893		272	1953	749	343
Arrive On Green		0.56	0.56		0.56	0.56	0.22	0.22
Sat Flow, veh/h		3589	1585		362	3561	3456	1585
Grp Volume(v), veh/h		1011	453		91	727	441	258
Grp Sat Flow(s),veh/h/ln		1749	1585		362	1735	1728	1585
Q Serve(g_s), s		9.7	9.5		11.2	6.3	6.2	8.3
Cycle Q Clear(g_c), s		9.7	9.5		20.9	6.3	6.2	8.3
Prop In Lane			1.00		1.00		1.00	1.00
Lane Grp Cap(c), veh/h		1969	893		272	1953	749	343
V/C Ratio(X)		0.51	0.51		0.33	0.37	0.59	0.75
Avail Cap(c_a), veh/h		4559	2066		540	4522	1079	495
HCM Platoon Ratio		1.00	1.00		1.00	1.00	1.00	1.00
Upstream Filter(l)		1.00	1.00		1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh		7.3	7.3		13.7	6.6	19.2	20.0
Incr Delay (d2), s/veh		0.2	0.4		0.7	0.1	0.7	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		2.2	2.0		0.7	1.4	2.2	2.9
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh		7.5	7.7		14.5	6.7	19.9	23.8
LnGrp LOS		A	A		B	A	B	C
Approach Vol, veh/h		1464				818	699	
Approach Delay, s/veh		7.6				7.6	21.3	
Approach LOS		A				A	C	
Timer - Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		36.7				36.7		17.8
Change Period (Y+Rc), s		6.0				6.0		6.0
Max Green Setting (Gmax), s		71.0				71.0		17.0
Max Q Clear Time (g_c+I1), s		11.7				22.9		10.3
Green Ext Time (p_c), s		11.1				7.8		1.5
<b>Intersection Summary</b>								
HCM 6th Ctrl Delay			10.8					
HCM 6th LOS			B					
<b>Notes</b>								
User approved ignoring U-Turning movement.								

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↑	↗	↖	↑
Traffic Vol, veh/h	14	11	618	24	17	473
Future Vol, veh/h	14	11	618	24	17	473
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	250	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	12	687	27	19	526

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1251	687	0	0	714	0
Stage 1	687	-	-	-	-	-
Stage 2	564	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	190	447	-	-	886	-
Stage 1	499	-	-	-	-	-
Stage 2	569	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	186	447	-	-	886	-
Mov Cap-2 Maneuver	186	-	-	-	-	-
Stage 1	499	-	-	-	-	-
Stage 2	557	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	21.2	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	250	886
HCM Lane V/C Ratio	-	-	0.111	0.021
HCM Control Delay (s)	-	-	21.2	9.2
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	0.4	0.1

**Appendix E**  
**Trip Generation Report**

# Multifamily Housing (Low-Rise) Not Close to Rail Transit (220)

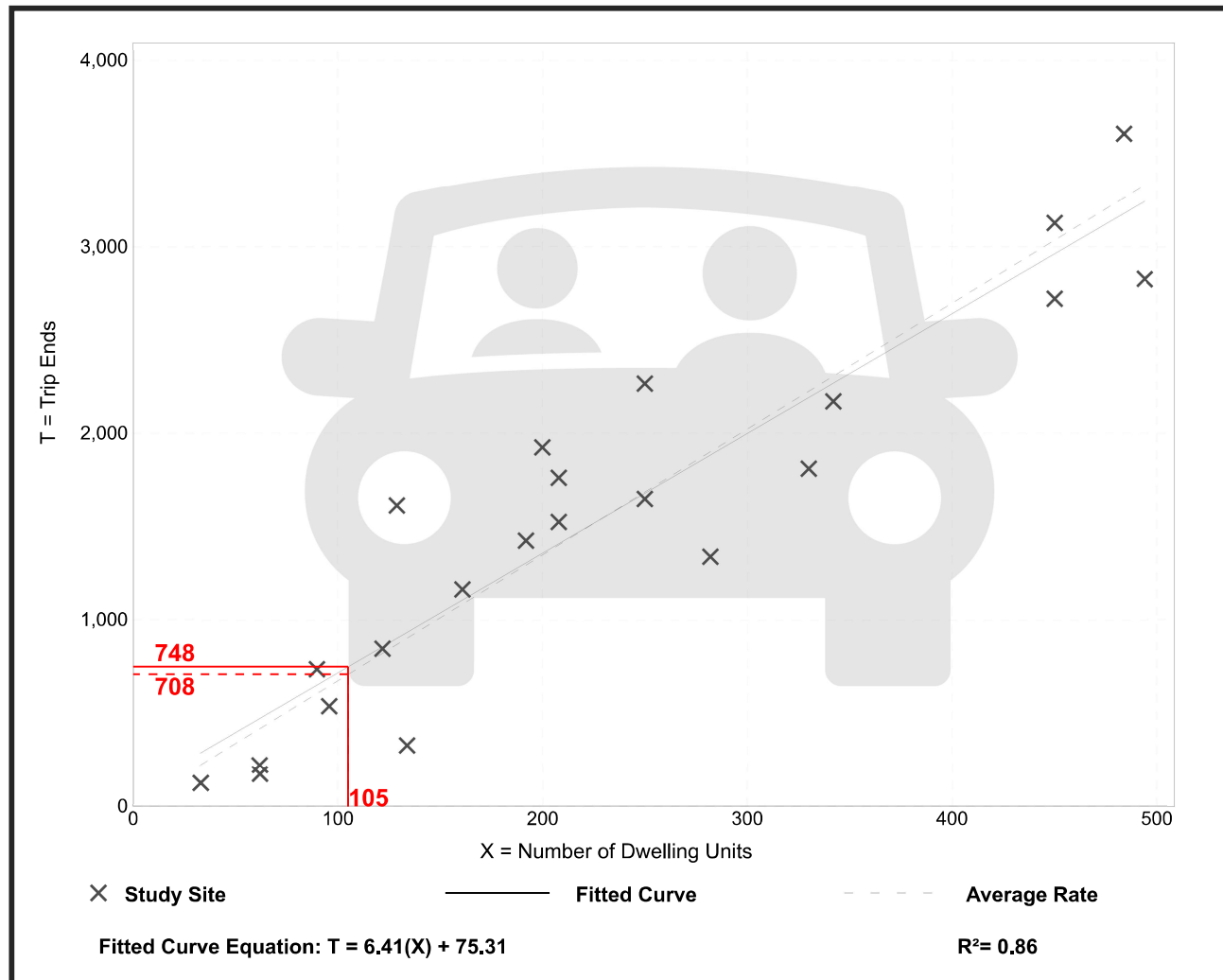
Vehicle Trip Ends vs: Dwelling Units  
On a: Weekday

Setting/Location: General Urban/Suburban  
Number of Studies: 22  
Avg. Num. of Dwelling Units: 229  
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
6.74	2.46 - 12.50	1.79

## Data Plot and Equation



## Multifamily Housing (Low-Rise) Not Close to Rail Transit (220)

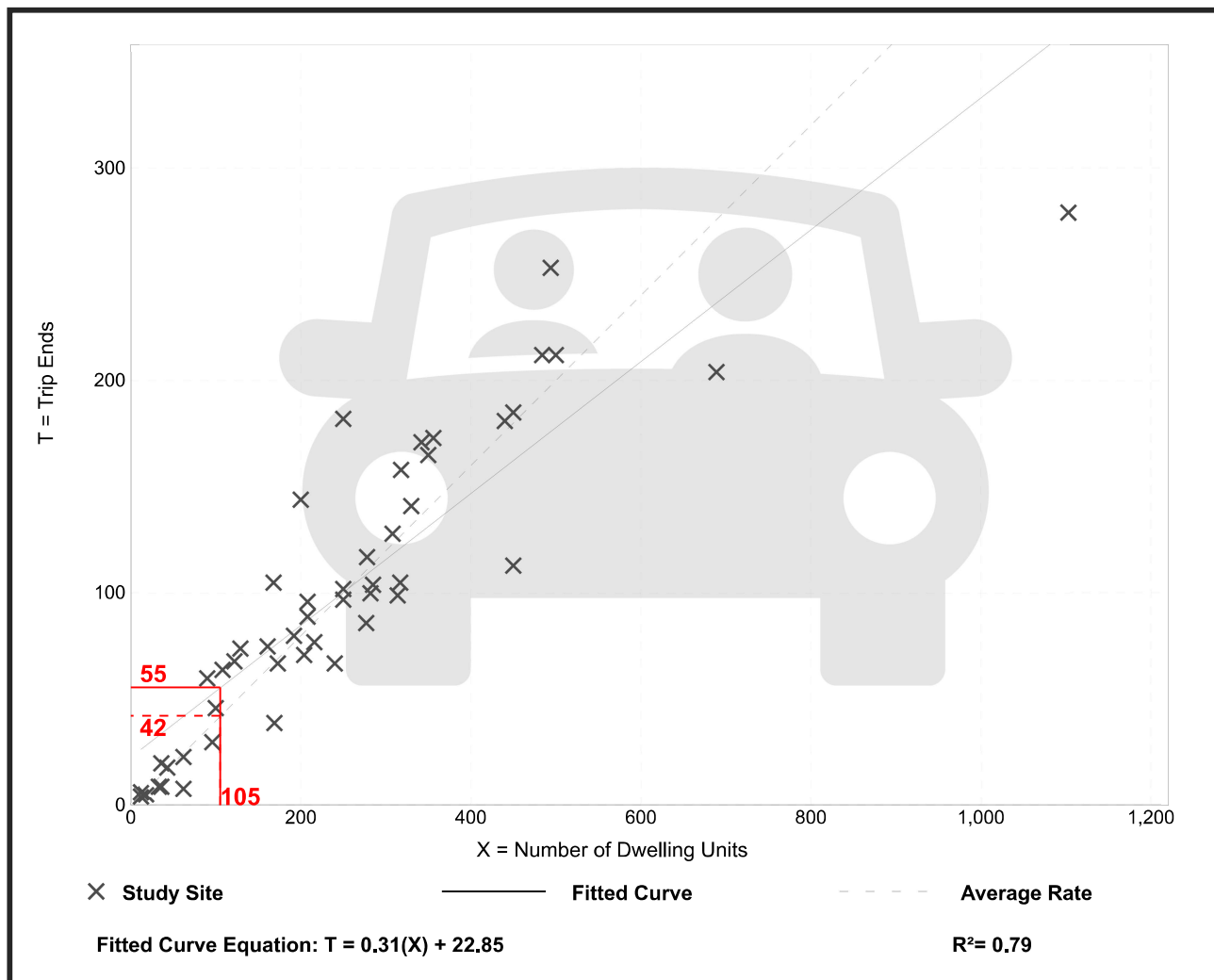
**Vehicle Trip Ends vs: Dwelling Units**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 7 and 9 a.m.**

**Setting/Location: General Urban/Suburban**  
 Number of Studies: 49  
 Avg. Num. of Dwelling Units: 249  
 Directional Distribution: 24% entering, 76% exiting

### Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.40	0.13 - 0.73	0.12

### Data Plot and Equation



# Multifamily Housing (Low-Rise) Not Close to Rail Transit (220)

**Vehicle Trip Ends vs: Dwelling Units**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 4 and 6 p.m.**

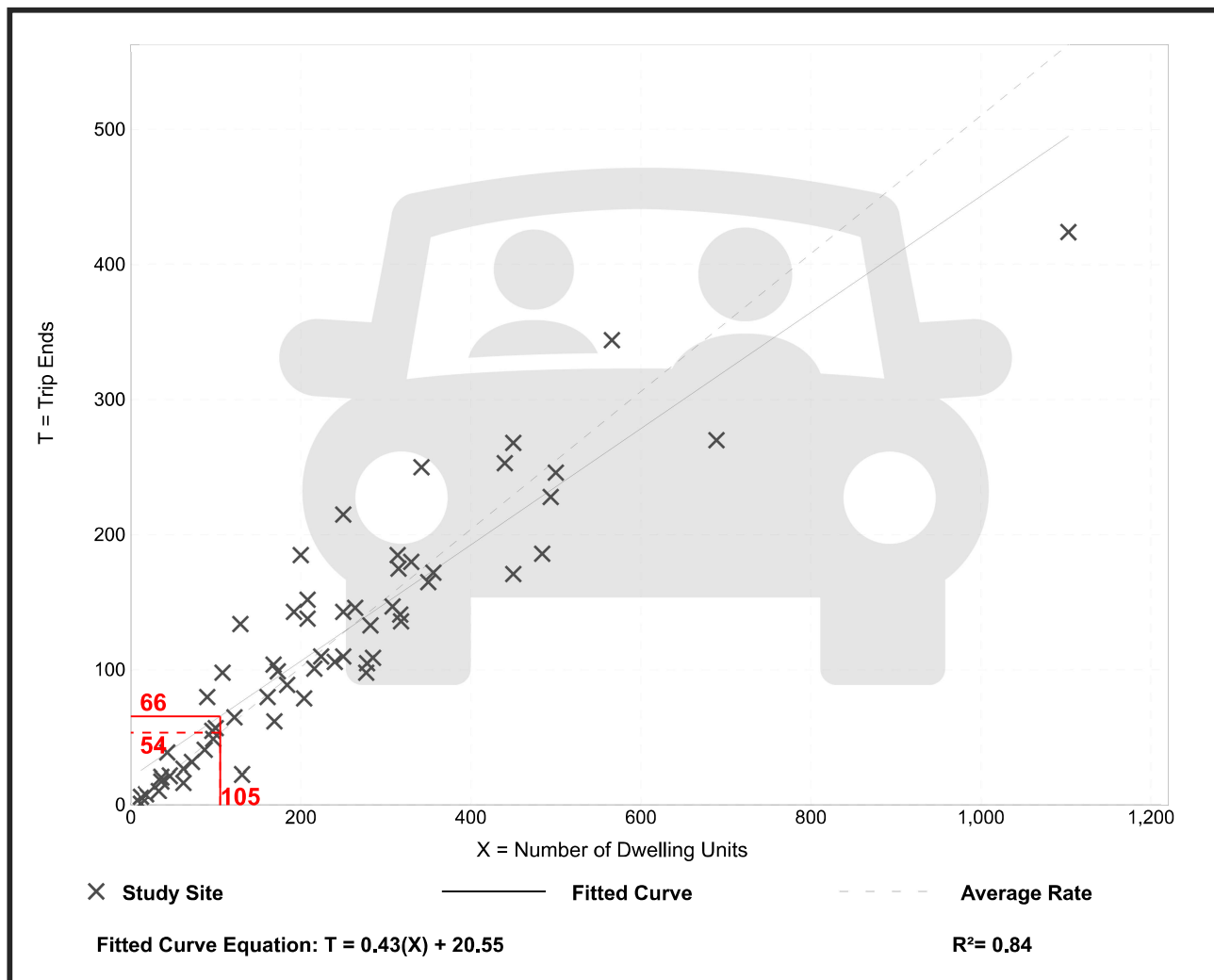
**Setting/Location: General Urban/Suburban**

Number of Studies: 59  
 Avg. Num. of Dwelling Units: 241  
 Directional Distribution: 63% entering, 37% exiting

## Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.51	0.08 - 1.04	0.15

## Data Plot and Equation



**Appendix F**  
**ICE Tool Report**

GDOT PI#:  Request By:   
 County:  GDOT District:   
 Major Road:  Road Class:  Speed Limit:   
 Crossing Road:  Road Class:  Speed Limit:   
 Major Rd Direction:  Area Type:   
 Intersection Control:  Project ID:   
 Prepared By:  Date:   
 Project Purpose:

Existing Data Year:   
 Project Opening Year:   
 Project Design Year:   
 Annual Growth Rate:   
 K Factor\*:

\* K Factor = Proportion of average annual daily traffic occurring in the highest one hour of the day

### 2027 OPENING YEAR VOLUMES

		544 (490) [13729]					
		(0)	(0)	(473)	(17)		
		0	0	538	6	WB Atlas Drive	
		Peds ↑		↓ Peds			
[0] (0) 0	(0)	0	↔		↔	0	(0)
	(0)	0	↔		↔	0	(0)
	(0)	0	↔		↔	21	(11)
	(0)	0	↔		↔	21	(14)
		2027 Intersection Daily Entering Volume (est):					
		14,103					
		42 (25) [748]					
		EB Atlas Drive		NB SR 211			
		0	539	7	0		
		(0)	(618)	(24)	(0)		
		546 (642) [13729]					

**LEGEND:**

- 000 = AM Peak Approach Volume
- (000) = PM Peak Approach Volume
- [000] = ADT Volume (Estimate)

### 2024 EXISTING YEAR VOLUMES

**APPROACH SPLITS:**  
 SR 211: 100%  
 Atlas Drive: 0%

		505 (444) [12197]					
		(0)	(0)	(444)	(0)		
		0	0	505	0	WB Atlas Drive	
		Peds ↑		↓ Peds			
[0] (0) 0	(0)	0	↔		↔	0	(0)
	(0)	0	↔		↔	0	(0)
	(0)	0	↔		↔	0	(0)
	(0)	0	↔		↔	0	(0)
		2024 Intersection Daily Entering Volume (est):					
		12,197					
		507 (580) [12197]					
		EB Atlas Drive		NB SR 211			
		0	507	0	0		
		(0)	(580)	(0)	(0)		

**PEAK HR % TRUCKS:**

EB	WB	NB	SB
1%	1%	2%	4%

### 2027 DESIGN YEAR VOLUMES

		544 (490) [13729]					
		(0)	(0)	(473)	(17)		
		0	0	538	6	WB Atlas Drive	
		Peds ↑		↓ Peds			
[0] (0) 0	(0)	0	↔		↔	21	(11)
	(0)	0	↔		↔	0	(0)
	(0)	0	↔		↔	21	(14)
	(0)	0	↔		↔	21	(14)
		2027 Intersection Daily Entering Volume (est):					
		14,103					
		42 (25) [748]					
		EB Atlas Drive		NB SR 211			
		0	539	7	0		
		(0)	(618)	(24)	(0)		
		546 (642) [13729]					

**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 PI #	N/A	<p><b>Note:</b> 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</p> <p style="font-size: small; text-align: center;">                     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 performance in operations for pedestrians and/or bicyclists?                      4. Does alternative improve (or preserve) traffic characteristics, delay, reliability, etc. ?                      5. Does alternative appear feasible given the site respect to other project factors?                      6. Does alternative appear feasible with respect to other project factors?                      7. Overall feasible alternative (select alternative for further evaluation in Stage 2)?                 </p>							
Project Location:	SR 211 @ Atlas Drive								
Existing Control:	New Intersection or Other								
Prepared by:	Dylan Fox, EIT - SEI								
Date:	2/6/2024	<p style="font-size: small;">Screening Decision Justification:</p>							
<p style="font-size: small;">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</p>									
<p><b>Intersection Alternative</b> (see "Intersections" tab for detailed description of intersection/interchange type)</p>									
Unsignalized Intersections	Conventional (Minor Stop)	Yes	No	No	Yes	Yes	Yes	Yes	Feasible solution to evaluate.
	Conventional (All-Way Stop)	No	Yes	Yes	No	No	No	No	Warrants not satisfied
	Mini Roundabout	No	Yes	No	No	No	No	No	Traffic pattern and turning volumes are not preferable
	Single Lane Roundabout	No	Yes	No	Yes	Yes	No	No	Traffic pattern and turning volumes are not preferable
	Multilane Roundabout	No	Yes	No	Yes	Yes	No	No	SR 211 is a single-lane facility
	RCUT (stop control)	Yes	No	Yes	Yes	No	No	No	No feasible u-turn location
	RIRO w/down stream U-Turn	Yes	No	Yes	Yes	No	No	No	No feasible u-turn location
	High-T (unsignalized)	Yes	No	Yes	No	No	No	No	Traffic pattern and turning volumes are not preferable
	Offset-T Intersections	No	No	No	No	No	No	No	Not feasible to offset. Intersection configuration is 3-legged.
	Diamond Interch (Stop Control)	No	No	No	No	No	No	No	Not an interchange, volumes do not warrant grade separation.
	Diamond Interch (RAB Control)	No	No	No	No	No	No	No	Not an interchange, volumes do not warrant grade separation.
	Add one LT Lane on SR 211	Yes	No	No	Yes	Yes	Yes	No	Turn lanes included in Conventional (Minor Stop)
	Add one RT Lane on SR 211								
	Other unsignalized (provide description):	No	No	No	No	No	No	No	N/A
Signalized Intersections	Traffic Signal	No	No	No	No	No	No	No	Traffic signal warrants not satisfied.
	Median U-Turn (Indirect Left)	No	No	No	No	No	No	No	Traffic signal warrants not satisfied.
	RCUT (signalized)	No	No	No	No	No	No	No	Traffic signal warrants not satisfied.
	Displaced Left Turn (CFI)	No	No	No	No	No	No	No	Traffic signal warrants not satisfied.
	Continuous Green-T	No	No	No	No	No	No	No	Traffic signal warrants not satisfied.
	Jughandle	No	No	No	No	No	No	No	Traffic signal warrants not satisfied.
	Quadrant Roadway	No	No	No	No	No	No	No	Traffic signal warrants not satisfied.
	Diamond Interch (Signal Control)	No	No	No	No	No	No	No	Traffic signal warrants not satisfied.
	Diverging Diamond	No	No	No	No	No	No	No	Traffic signal warrants not satisfied.
	Single Point Interchange	No	No	No	No	No	No	No	Traffic signal warrants not satisfied.
	No LT Lane Improvements	No	No	No	No	No	No	No	Traffic signal warrants not satisfied.
	No RT Lane Improvements								
Other Signalized (provide description):	No	No	No	No	No	No	No	Traffic signal warrants not satisfied.	

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



# GDOT INTERSECTION CONTROL EVALUATION (ICE) WAIVER FORM

ICE Version 2.3| Revised 11/13/2023

## Waiver Request - Level 2 / 3

In certain circumstances where an ICE would otherwise be required, an ICE may be waived based on appropriate evidence presented with a written request. Scenarios in which an ICE waiver request may be considered include:

- Proposed improvements do not substantially alter the character of the intersection, and are considered minor in nature, such as extending existing turn lane(s) or modifying signal phasing at an existing traffic signal
- The intersection consists of a public roadway intersecting a divided, multilane roadway where the access will be limited to a closed median with only right-in/right-out access that will operate acceptably; or
- The intersection is along an undivided, two-lane roadway that will not be widened and meets the following criteria:
  - Low risk in terms of exposure (total intersection entering volume less than 1,000 vehicles /day)
  - Latest 5 years of crash history is not indicative of a crash problem (no discernible crash patterns coupled with low crash frequency and severity)
  - Layout has no unusual or undesirable geometric features (such as restricted sight distance)
  - The proposed changes are not expected to adversely affect safety

If only one alternative is determined to be feasible from the ICE Stage 1, then a waiver may be submitted in lieu of completing ICE Stage 2. The waiver must clearly explain why there is no other feasible alternative. A Waiver Form should also be submitted to document an agreed upon decision to select a preferred alternative other than the highest scoring alternative in Stage 2.

ICE waiver forms with supporting documentation should be submitted for approval to the Office of Traffic Operations or District Engineer (depending on Waiver level). Questions regarding the waiver process should be routed to the State Traffic Engineer.

**Project Information:** Location: SR 211 @ Atlas Drive  
 County: Hall  
 GDOT District: 1 - Gainesville  
 Area Type: Suburb/Transition  
 Existing Intersection Control: New Intersection or Other

GDOT PI # (or N/A): N/A  
 Requested By: Atlas Development  
 Prepared By: Dylan Fox, EIT - SEI  
 Date: 2/6/2024  
 Waiver Request Type: Driveway Permit

### Traffic and Operations Data:<sup>1,2</sup>

Intersection meets signal/AWS warrants?	None	
Traffic Analysis Type:	Intersection Delay	
Existing Major Street Avg Daily Traffic (ADT):	12,197	
Existing Minor Street Avg Daily Traffic (ADT):	0	
Analysis Period:	AM Peak	PM Peak
2027 Opening Yr Peak Hour Intersection Delay:	20.7 sec	21.2 sec
2027 Opening Yr Peak Hour Intersection V/C:	0.17	0.11
2027 Design Yr Peak Hour Intersection Delay:	20.7 sec	21.2 sec
2027 Design Yr Peak Hour Intersection V/C:	0.17	0.11

Crash Data (Required): <sup>3</sup>						
Crash Data: Enter most recent 5 years of crash data	Crash Severity					Years:
	K*	A*	B*	C*	O	5
Angle	0	0	0	0	0	#DIV/0!
Head-On	0	0	0	0	0	#DIV/0!
Rear End	0	0	0	0	0	#DIV/0!
Sideswipe - same	0	0	0	0	0	#DIV/0!
Sideswipe - opposite	0	0	0	0	0	#DIV/0!
Not Collision w/Motor Veh	0	0	0	0	0	#DIV/0!
<b>TOTALS:</b>	0	0	0	0	0	0

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

**Description of Work / Justification for Waiver (Required):** Only one feasible alternative was identified in Stage 1. The minor-street stop control operates acceptably in both peak hours. Atlas Drive will be two lanes, one entry and one exit. The intersection meets the threshold for both a left-turn and right-turn auxiliary lane on SR 211, and they should be provided.

Proposed Intersection Control: Conventional (Minor Stop)

**REQUESTED BY:** Chris Maddox, PE, PTOE Date: 2/22/2024

Title: Traffic Engineer

**APPROVED BY:** \_\_\_\_\_ Date: \_\_\_\_\_

Name: \_\_\_\_\_

District Engineer or (Approved Delegate)

<sup>1</sup> Analysis data input on this worksheet is for proposed control & configuration on form, not the No-Build data shown on the top of Stage 2

<sup>2</sup> ADT's required if available (from data collected or nearest GDOT count station site); Capacity data optional unless needed to justify basis of the waiver request.

<sup>3</sup> Crash data (required for all existing intersections) must be entered here independent from Stage 2 worksheet inputs (not linked)

Intersection						
Int Delay, s/veh	0.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘↙		↑	↗↘	↘↙	↑
Traffic Vol, veh/h	21	21	539	7	6	538
Future Vol, veh/h	21	21	539	7	6	538
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	250	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	4
Mvmt Flow	24	24	613	8	7	611

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1238	613	0	0	621
Stage 1	613	-	-	-	-
Stage 2	625	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	194	492	-	-	960
Stage 1	541	-	-	-	-
Stage 2	534	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	193	492	-	-	960
Mov Cap-2 Maneuver	193	-	-	-	-
Stage 1	541	-	-	-	-
Stage 2	530	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.7	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	277	960
HCM Lane V/C Ratio	-	-	0.172	0.007
HCM Control Delay (s)	-	-	20.7	8.8
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	0.6	0

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↑	↗	↖	↑
Traffic Vol, veh/h	14	11	618	24	17	473
Future Vol, veh/h	14	11	618	24	17	473
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	250	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	12	687	27	19	526

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1251	687	0	0	714
Stage 1	687	-	-	-	-
Stage 2	564	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	190	447	-	-	886
Stage 1	499	-	-	-	-
Stage 2	569	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	186	447	-	-	886
Mov Cap-2 Maneuver	186	-	-	-	-
Stage 1	499	-	-	-	-
Stage 2	557	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	21.2	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	250	886
HCM Lane V/C Ratio	-	-	0.111	0.021
HCM Control Delay (s)	-	-	21.2	9.2
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	0.4	0.1