



CITY COUNCIL AGENDA ITEM REQUEST FORM

MEETING DATE: May 13, 2021

AGENDA PLACEMENT:

- PUBLIC HEARING
- CEREMONIAL
- UNFINISHED BUSINESS
- CONSENT
- INDIVIDUAL
- CLOSED

CAPTION:

Approval of a Traffic Impact Analysis pursuant to Municipal Code of Ordinances Chapter 78 *Subdivisions*, Article II *Subdivision Regulations*, for Leslie Road Subdivision. (Applicant)

BACKGROUND:

The subject property is a 3.038 acre tract of land located near the intersection of Leslie Road and Rainbow Ridge. The property is situated behind Tractor Supply Company and abuts properties owned by the Helotes Festival Association. The zoning designation of the property is Central Business District (B-4).

The City Engineer determined a Traffic Impact Analysis (TIA) Report was required. The TIA Report shows no impact on current and future traffic with no loss of level of service. Therefore, the City Engineer recommends approval of the TIA Report for Leslie Road Subdivision.

ATTACHMENTS:

- Attachment A – City Engineer Recommendation Letter
- Attachment B – Leslie Road Subdivision TIA Report

PREPARED BY: Celina Perez, City Secretary

DATE SUBMITTED: May 5, 2021

**OFFICIAL CITY ADMINISTRATION USE ONLY
DEVELOPMENT SERVICES DEPARTMENT ITEM BRIEFING**

COUNCIL ACTION TAKEN: APPROVED DENIED NO ACTION

COMMENTS: _____

COMPLETED BY:

DATE:



December 16, 2020

Ms. Belinda Parker
Development Services Specialist
City of Helotes
P.O. Box 507
Helotes, TX 78023

Re: Leslie Road Plat TIA Approval

Dear Ms. Parker,

We have reviewed the Leslie Road Traffic Impact Analysis Report submitted by Legacy Engineering Group on behalf of Bexar Engineers & Associates and recommend approval. The TIA shows that the proposed development has no impact on current and future traffic with no loss of Level of Service.

If you have any questions, please feel free to contact me at (210) 822-2232.

Very truly yours,

LNV, LLC
TBPE Firm No. F-366

A handwritten signature in blue ink, appearing to read "J. Arteritano", is written over a horizontal line.

Joseph T. Arteritano, PE
Senior Project Manager



City of Helotes
Development Services
Department
P.O. Box 507
12951 Bandera Road
Helotes, TX 78023
Phone (210) 695.8877
Fax (210) 695.2123

Application Date: 9/17/20

TRAFFIC IMPACT ANALYSIS (TIA) THRESHOLD WORKSHEET

CHAPTER 78, Subdivision Regulations

Project Name: Leslie Road Plat
 Location: 12042 Leslie Rd Helotes, Tx 78023
 Applicant: Jim Kidder Owner or Agent
 Address: 13327 Wind Ridge, Helotes Tx 78023 Phone Number: 214.317.5020

Permit Type (Check One): Zoning, N.C.B.: _____ POADP #: _____ Plat #: _____ Bldg. Plan #: _____ Other: _____

Box A (Original TIA) RESIDENTIAL DEVELOPMENT

Anticipated Land Use:	Number of Units:	Peak Hour (e.g.,5-6pm weekday):	Peak Hour Trip Rate:	Peak Hour Trips:	Trip Rate Source:
					ITE Code: Other:

Box B (Original TIA) NON RESIDENTIAL DEVELOPMENT

Anticipated Land Use:	Project Size:			Peak Hour: (e.g.,5-6pm weekday):	Peak Hour Trip Rate:	Peak Hour Trips:	Trip Rate Source:
	Acres:	GFA:	Other*:				
B-4	Retail GFA = 6005 sqft			5-6 pm weekends	1,000 GFA/3.81	22	ITE Code: 932/925
	Drinking Place GFA = 8432 sqft			9-10 pm weekends	1,000 GFA/11.36	95	Other:

TOTAL PHT = 117

Box C (Updated TIA) If property already has a TIA on file, complete Box C. If not, ignore Box C.

Peak Hour Trips Projected In <i>Current</i> TIA:	Peak Hour Trips (from Box A or B) Projected in <i>Updated</i> Development Plan:	Increase in Peak Hour Trips (if over 100 additional trips, a new TIA is required):

Box D (Information Regarding the Person/Agency Who Prepared the TIA)

Prepared By: Daniel Aguilar Date: 9/17/20
 Comments: TIA Calculation based off of 10th edition manual

Box E (Office Use Only, Do Not Write in the Box)

FEES: The City's Fee Schedule can be accessed online at www.helotes-tx.gov.

A traffic impact analysis is required. The consultant preparing the study must meet with City staff to discuss the scope and requirements of the study before beginning the study.

A traffic impact analysis is **not required**. The traffic generated by the proposed development does not exceed the threshold requirements.

The traffic impact analysis has been waived for the following reason (s):

Reviewed by: Date: 9/20/20

Note: GFA = Gross Floor Area (Bldg. Size) ITE = Institute of Transportation



Leslie Road Plat

Leslie Road & Rainbow Ridge

TRAFFIC IMPACT ANALYSIS

PREPARED FOR:

Jim Kidder

PREPARED BY:



City of Helotes

May 2021

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PROJECT DESCRIPTION

INTRODUCTION

Legacy Engineering Group, PLLC was retained to prepare a Traffic Impact Analysis for the proposed Leslie Road Plat development located along Leslie Road east of Rainbow Ridge in Helotes, Texas. A general project location map is shown in Figure 1 with a zoom-in of the study area.

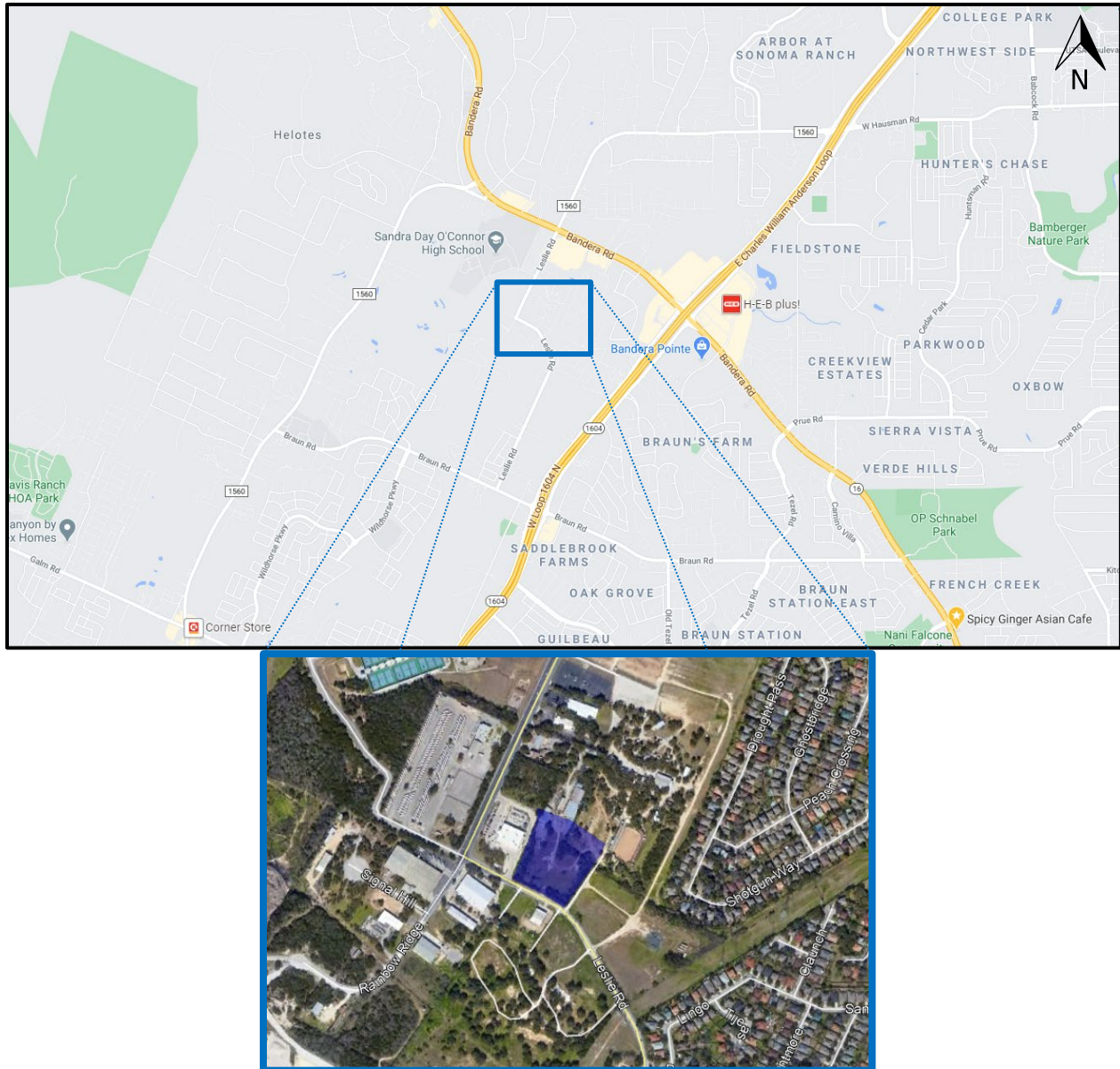


Figure 1 – Project Location Map

As per the Institute of Transportation Engineers (ITE) Trip Generation Manual (10th Edition), the proposed development will generate as many as 119 trips during the weekday PM peak hours.

In accordance with the City of Helotes requirements, a Traffic Impact Analysis (TIA) has been prepared for this project. Figure 2 shows the proposed site plan.

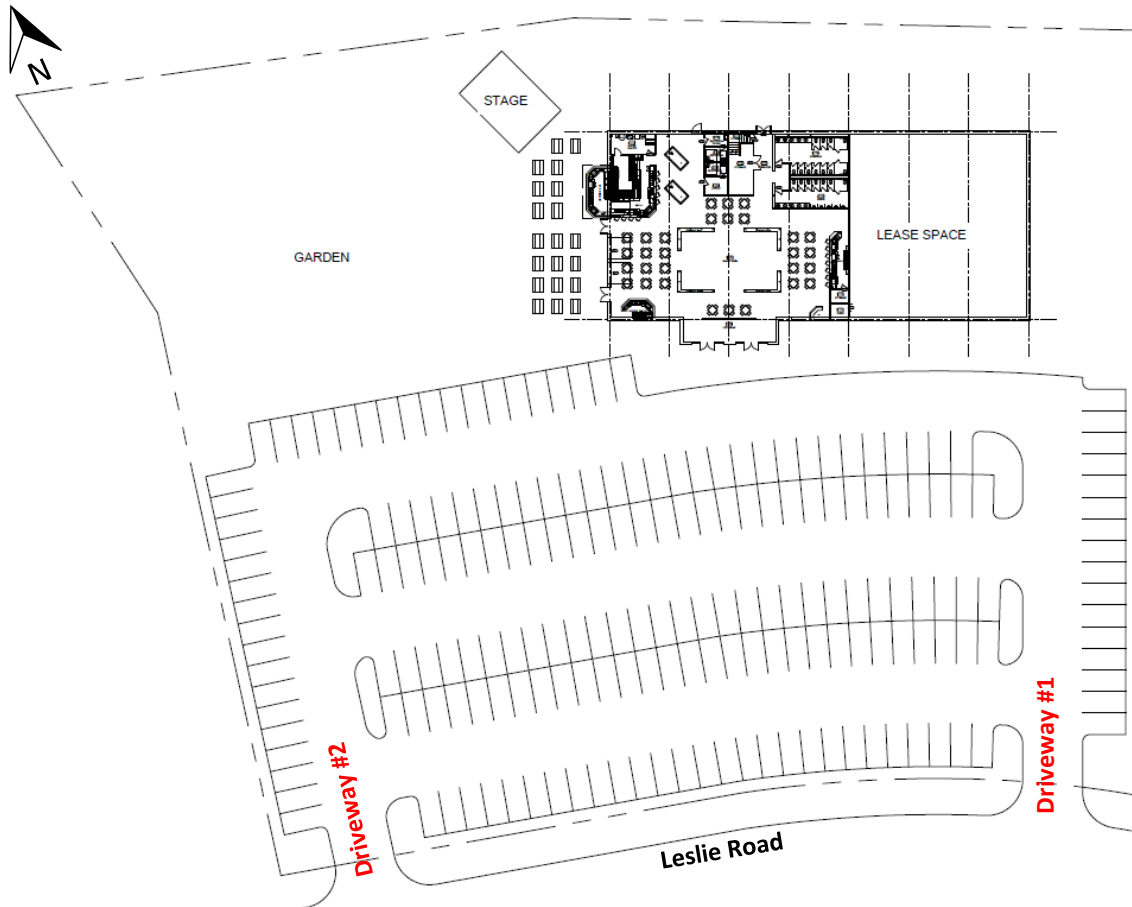


Figure 2 – Leslie Road Plat Site Plan

The proposed development will include up to 6,005 SF of Shopping Center (ITE Code: 820) space and 8,432 SF of Drinking Place (ITE Code: 925) with two proposed full-access driveways. Driveway #1 and Driveway #2 will be located along Leslie Road approximately 695 LF and 405 LF east of Rainbow Ridge, respectively. Both driveways will line up with the existing driveways on the opposite side of Leslie road.

PROJECT STUDY AREA

The proposed project study area is highlighted in Figure 3 (an aerial image taken in December 2018 obtained from Google Earth Pro) and includes the study intersections (Leslie Road & Rainbow Ridge, and the proposed site access locations).



Figure 3 – Aerial Image of Leslie Road Plat & Study Intersection

PHASE TIME-LINE

The proposed development is anticipated to be constructed in one phase over one year. Per the scoping documents, a full build-out year of 2021 (with a 2% growth rate per year) will be analyzed within the study. Using the TxDOT Traffic Count Database System (TCDS), the Average Annual Growth Rate (AAGR) was determined to be -0.005% utilizing the 2010 and 2015 data shown below, however **2% will be used**. Data was taken from Leslie Road, north of Braun Road.

- 2010 ~ 7,940 ADT
- 2015 ~ 7,938 ADT

Average Annual Growth Rate ~ -0.005%, **Proposed Growth Rate ~ 2%**

LOS analysis will be conducted in one phase as follows: 2021 – Full Build-Out

EXISTING CONDITIONS

EXISTING ROADWAYS

Leslie Road

Leslie Road is a two-lane roadway that extends in a general east-west direction adjacent to the proposed development. The existing speed limit is posted at 30 mph. In 2015, Leslie Road had an average annual daily traffic (AADT) of 7,938 north of Braun Road.

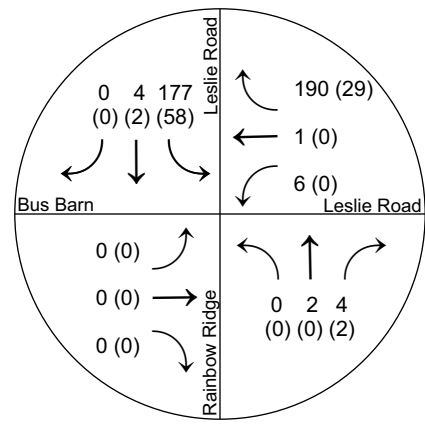


Figure 4 – Leslie Road Facing West Towards Rainbow Ridge

TRAFFIC DATA

Existing traffic data in the form of Turning Movement Counts (TMCs) was collected on Saturday November 21, 2020 at the intersection of Leslie Road and Rainbow Ridge. All traffic data can be found in the appendix.

The following traffic exhibit summarizes the existing volumes without the proposed development.

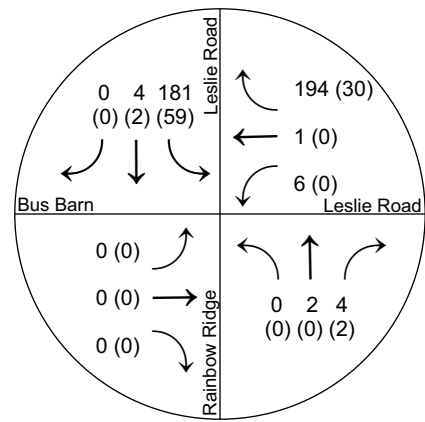


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 San Antonio, Texas 78230
 Phone: (210) 493-3700
 TBPE Firm No. F-20623

Leslie Road Plat
 Leslie Road & Rainbow Ridge
 Existing Traffic Volumes (2020)

LEGEND
 SAT 5 - 6 PM
 (SAT 9 - 10 PM)





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Leslie Road Plat
 Leslie Road & Rainbow Ridge
 Projected Traffic Volumes (2021)

LEGEND
 SAT 5 - 6 PM
 (SAT 9 - 10 PM)



INTERSECTIONS TO BE ANALYZED

The 3 total intersections to be analyzed are shown in Figure 5 and numbered as follows:

1. Leslie Road and Rainbow Ridge
2. Leslie Road and Driveway #1
3. Leslie Road and Driveway #2



Figure 5 – Aerial with Intersections to be Analyzed

ANALYSIS & IMPACT

TRIP GENERATION

The proposed development’s trip generation was calculated utilizing the ITE Trip Generation Manual (10th Edition). Trips were calculated using the total building square footage within the development. Table 1 shows the calculated trips. Due to the nature of the development, the entering and exiting trip generated volumes for the Shopping Center (ITE Code: 820) will be applied to the Saturday 5:00 – 6:00 PM peak period while the volumes generated by the Drinking Place (ITE Code: 925) will be applied to the Saturday 9:00 – 10:00 PM peak period.

Table 1 – Trip Generation

Proposed Leslie Road Plat Development							
Drinking Place (ITE Code: 925)							
1,000 SF GFA	8.432	Weekday 24 hrs		Weekday AM Peak		Weekday PM Peak	
Trips/1,000 SF GFA		N/A		N/A		11.36	
% Enter / % Exit		-	-	-	-	66%	34%
Total Trips		-		-		96	
Enter / Exit		-	-	-	-	63	33
Shopping Center (ITE Code: 820)							
1,000 SF GFA	6.005	Weekday 24 hrs		Weekday AM Peak		Weekday PM Peak	
Trips/1,000 SF GFA		37.75		0.94		3.81	
% Enter / % Exit		50%	50%	62%	38%	48%	52%
Total Trips		227		6		23	
Enter / Exit		114	113	4	2	11	12
Total Trips		227		6		119	
		114	113	4	2	74	45

TRIP DISTRIBUTION

The trip distribution for the proposed development was established based upon four factors:

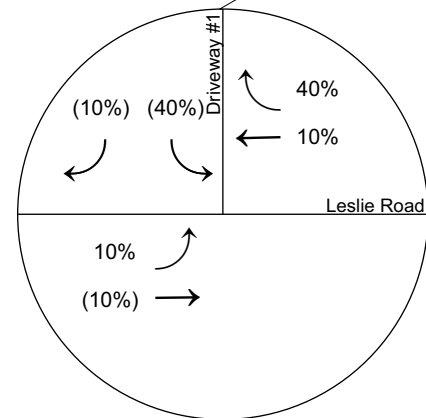
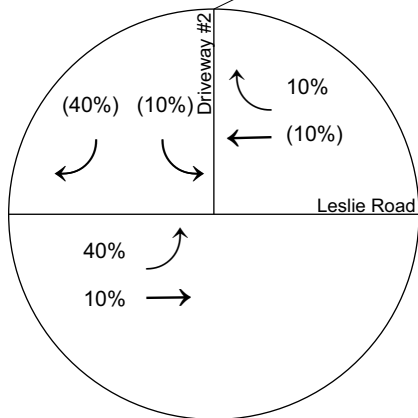
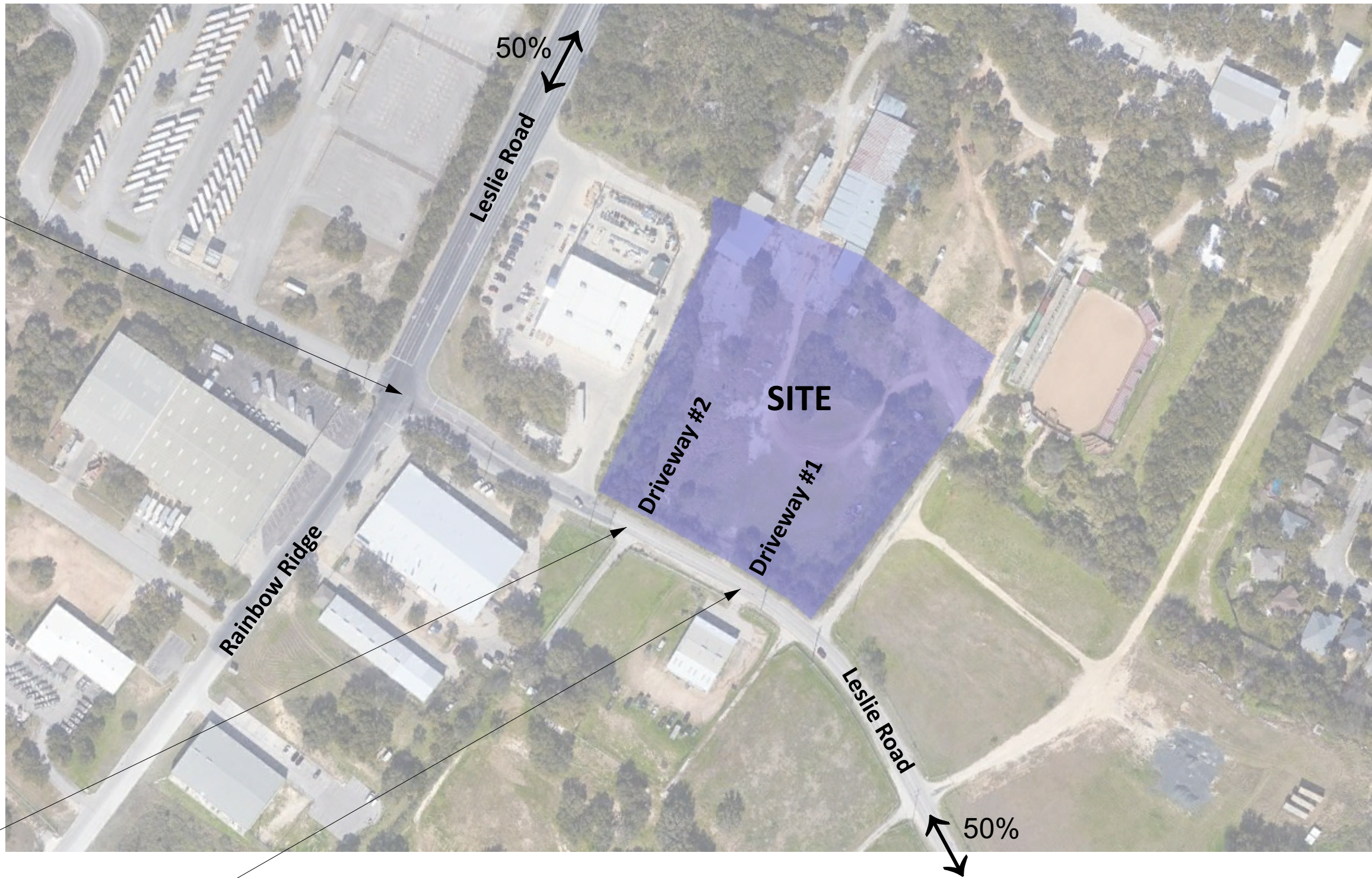
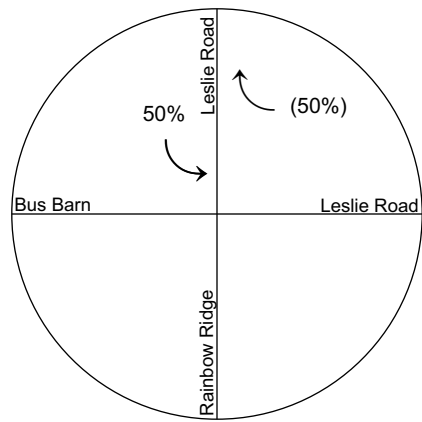
- 1) Traffic engineering judgment
- 2) Existing traffic data / travel patterns
- 3) Anticipated development circulation and driveway utilization
- 4) Existing travel demand patterns within the study area

The global trip distribution entailed distributing the development traffic in general directions (North, South, East, West) into and out of the development and network. Figure 6 shows the Trip Distribution for the proposed development.



Figure 6 – Trip Distribution for the Proposed Development

The following exhibits show the detailed trip distribution percentages and volumes for the proposed development as well as the Projected with Development exhibit.

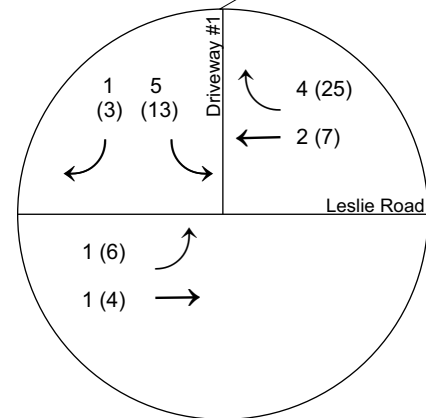
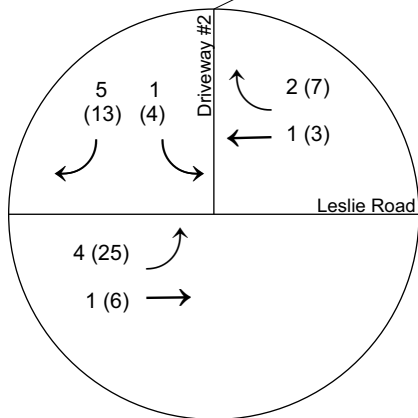
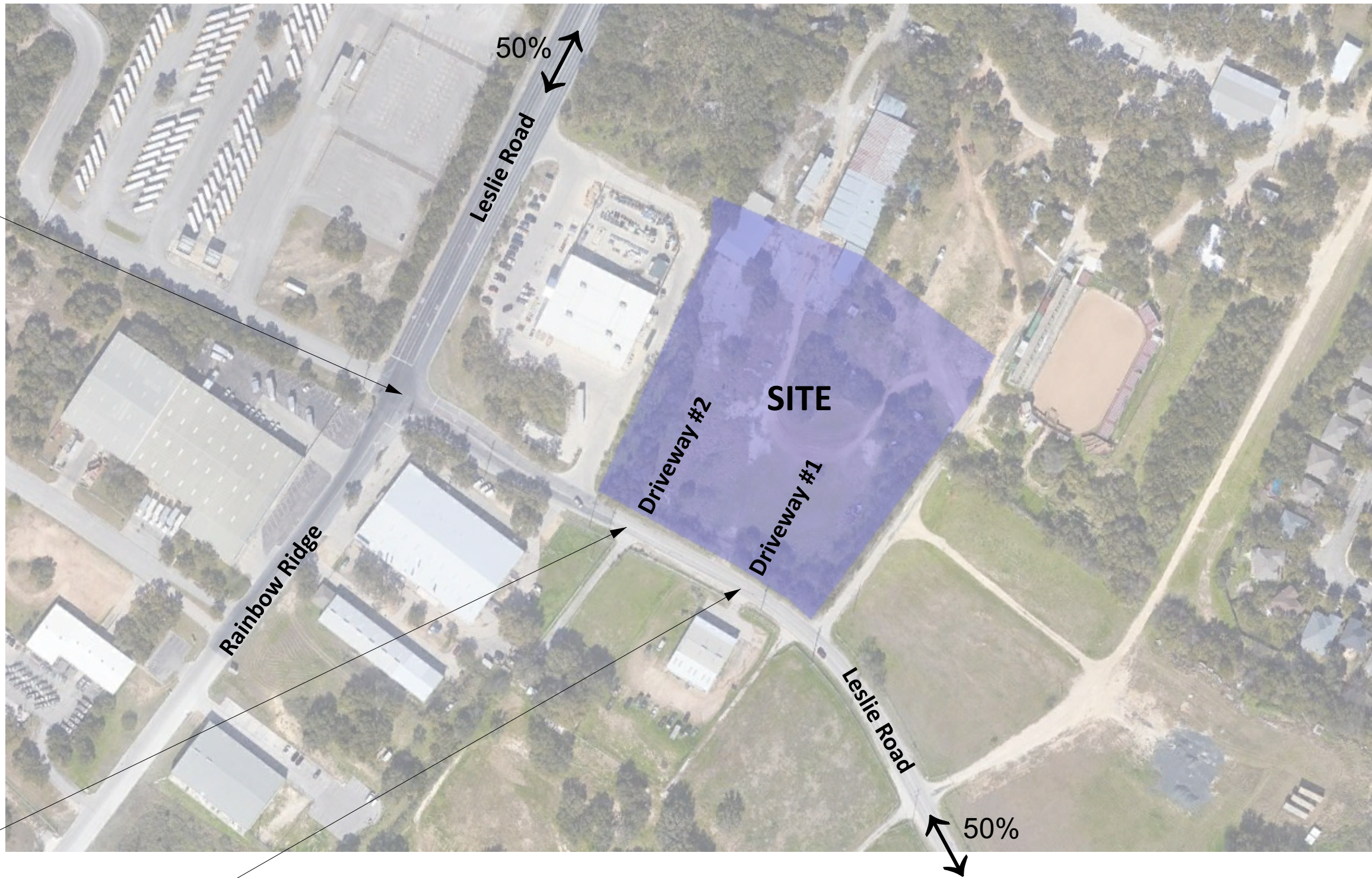
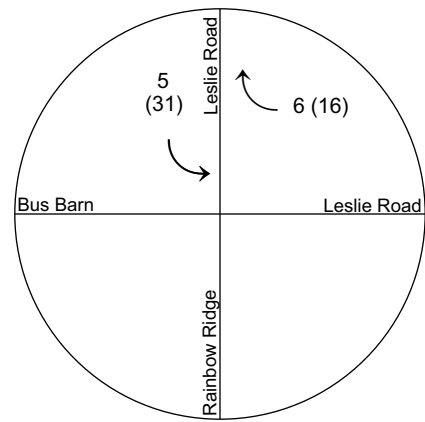


LEGEND
Enter
(Exit)



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Leslie Road Plat
Leslie Road & Rainbow Ridge
Trip Distribution (Percentages)

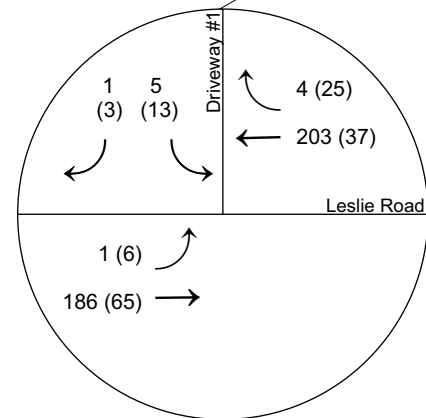
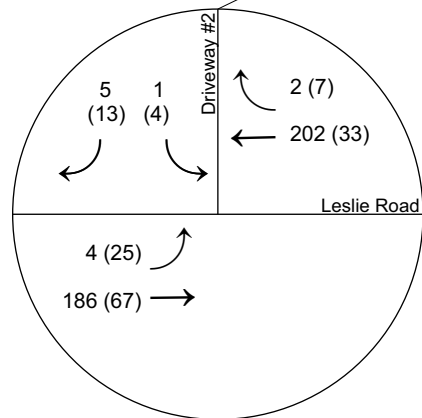
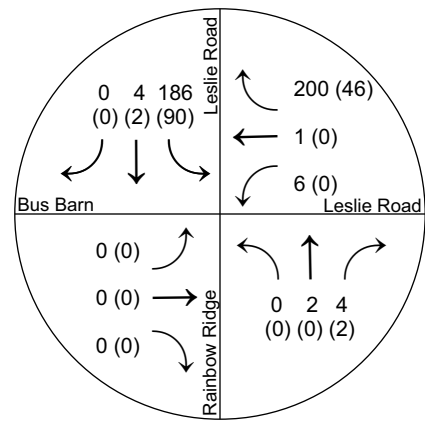


LEGEND
 SAT 5 - 6 PM - Shopping Center
 (SAT 9 - 10 PM) - Drinking Place



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Leslie Road Plat
 Leslie Road & Rainbow Ridge
 Trip Distribution (Volumes)



LEGEND
 SAT 5 - 6 PM
 (SAT 9 - 10 PM)



Legacy Engineering Group
 7800 IH-10 West, Suite 830
 San Antonio, Texas 78230
 Phone: (210) 493-3700
 TBPE Firm No. F-20623

Leslie Road Plat
 Leslie Road & Rainbow Ridge
 Projected with Development
 Traffic Volumes (2021)

LEVEL OF SERVICE ANALYSIS

The traffic simulation analysis was conducted using Synchro 11.0 Traffic Simulation Software. The analysis process involved the development of a base model, calibration of the base model, and an alternative comparison to the base model. Development of the base model involves the creation of a system network, also referred to as the link-node diagram. The network development includes link-node assignments, traffic control, traffic signalization, roadway geometry, lane designations & assignments, traffic volumes, and turning movements. As required by the City of Helotes, a traffic analysis was conducted for three scenarios which include Existing, Projected, and Projected with Development traffic conditions for the Saturday (5:00 – 6:00 PM) and Saturday (9:00 – 10:00 PM) peak periods. A screenshot of the Synchro Model created for this study can be seen in Figure 7.



Figure 7 – Synchro Model Screenshot

Based on criteria found in the *Highway Capacity Manual 2010 (HCM)*, the critical minor street approach is used to determine the Levels of Service (LOS) for Two-Way Stop Controlled (TWSC) intersections. For signalized intersections, the LOS is determined based on the measures of effectiveness obtained from the traffic simulation output and the average control delay in seconds per vehicle (sec/veh) from the model.

Table 2 shows the average control delay ranges with the corresponding LOS for both TWSC and signalized intersections.

Table 2 – Average Control Delay Ranges

Level of Service	Average Control Delay (sec/veh) Intersection (Signalized)	Average Control Delay (sec/veh) Per Approach (TWSC)
A	< 10	< 10
B	> 10 – <20	> 10 – <15
C	> 20 – <35	> 15 – <25
D	> 35 – <55	> 25 – <35
E	> 55 – <80	> 35 – <50
F	> 80	> 50

Tables 3 - 5 present a summary of the intersection and approach LOS values obtained from the traffic simulation. Please note that all LOS results are shown in detail within the Appendix (Synchro Output Reports).

Table 3 – Leslie Road and Rainbow Ridge LOS Results

Leslie Road & Rainbow Ridge	Intersection Analysis									
	Northbound Rainbow Ridge		Southbound Leslie Road		Eastbound Bus Barn		Westbound Leslie Road		Intersection Average	
	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS
Saturday 5:00 – 6:00 PM										
Existing (2020)	7.8	A	10.6	B	0.0	A	8.7	A	9.6	A
Projected (2021)	7.8	A	10.7	B	0.0	A	8.8	A	9.7	A
Proj. w/ Dev (2021)	7.9	A	10.9	B	0.0	A	8.9	A	9.8	A
Saturday 9:00 – 10:00 PM										
Existing (2020)	6.8	A	8.3	A	0.0	A	6.9	A	7.8	A
Projected (2021)	6.8	A	8.3	A	0.0	A	6.9	A	7.8	A
Proj. w/ Dev (2021)	6.9	A	8.7	A	0.0	A	7.1	A	8.1	A

Table 4 – Leslie Road and Driveway #1 LOS Results

Leslie Road & Driveway #1	Intersection Analysis									
	Northbound		Southbound Driveway #1		Eastbound Leslie Road		Westbound Leslie Road		Intersection Average	
	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS
Saturday 5:00 – 6:00 PM										
Proj. w/ Dev (2021)			10.9	B	0.0	A	0.0	A	0.2	A
Saturday 9:00 – 10:00 PM										
Proj. w/ Dev (2021)			9.2	A	0.6	A	0.0	A	1.3	A

Table 5 – Leslie Road and Driveway #2 LOS Results

Leslie Road & Driveway #2	Intersection Analysis									
	Northbound		Southbound Driveway #2		Eastbound Leslie Road		Westbound Leslie Road		Intersection Average	
	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS
Saturday 5:00 – 6:00 PM										
Proj. w/ Dev (2021)			9.7	A	0.2	A	0.0	A	0.2	A
Saturday 9:00 – 10:00 PM										
Proj. w/ Dev (2021)			8.8	A	2.0	A	0.0	A	2.2	A

OPERATIONAL CONSIDERATIONS

LOS ANALYSIS RESULTS

The results of the LOS analysis show that all analyzed intersections are expected to operate at acceptable LOS values during both Saturday peak periods for all scenarios analyzed.

DRIVEWAY TURN-LANE ANALYSIS

Industry standards require that a right or left-turn lane be constructed when daily entering turn volumes exceed 50 peak hour trips.

Neither Driveway #1 nor Driveway #2 are expected to exceed the 50 peak hour threshold for right or left-turn volumes during either peak period analyzed. Deceleration lanes are not recommended at this time.

ROUGH PROPORTIONALITY

The proposed development will have a Rough Proportionality "SUPPLY" of \$0 (total value of capacity/supply added to the thoroughfare system). Analysis shows that the proposed development will not have a significant impact to the surrounding roadway network, therefore roadway improvements were not proposed.

CONCLUSION & RECOMMENDATION

The primary purpose of this analysis was to assess the impacts of the proposed Leslie Road Plat development within the project study area. A total of three intersections were analyzed during the Saturday (5:00 – 6:00 PM) and Saturday (9:00 – 10:00 PM) peak periods in accordance with City of Helotes requirements.

The results of the LOS analysis show that all analyzed intersections are expected to operate at acceptable LOS values during both Saturday peak periods for all scenarios analyzed.

Industry standards require that a right or left-turn lane be constructed when daily entering turn volumes exceed 50 peak hour trips. Neither Driveway #1 nor Driveway #2 are expected to exceed the 50 peak hour threshold for right or left-turn volumes during either peak period analyzed. Deceleration lanes are not recommended at this time.

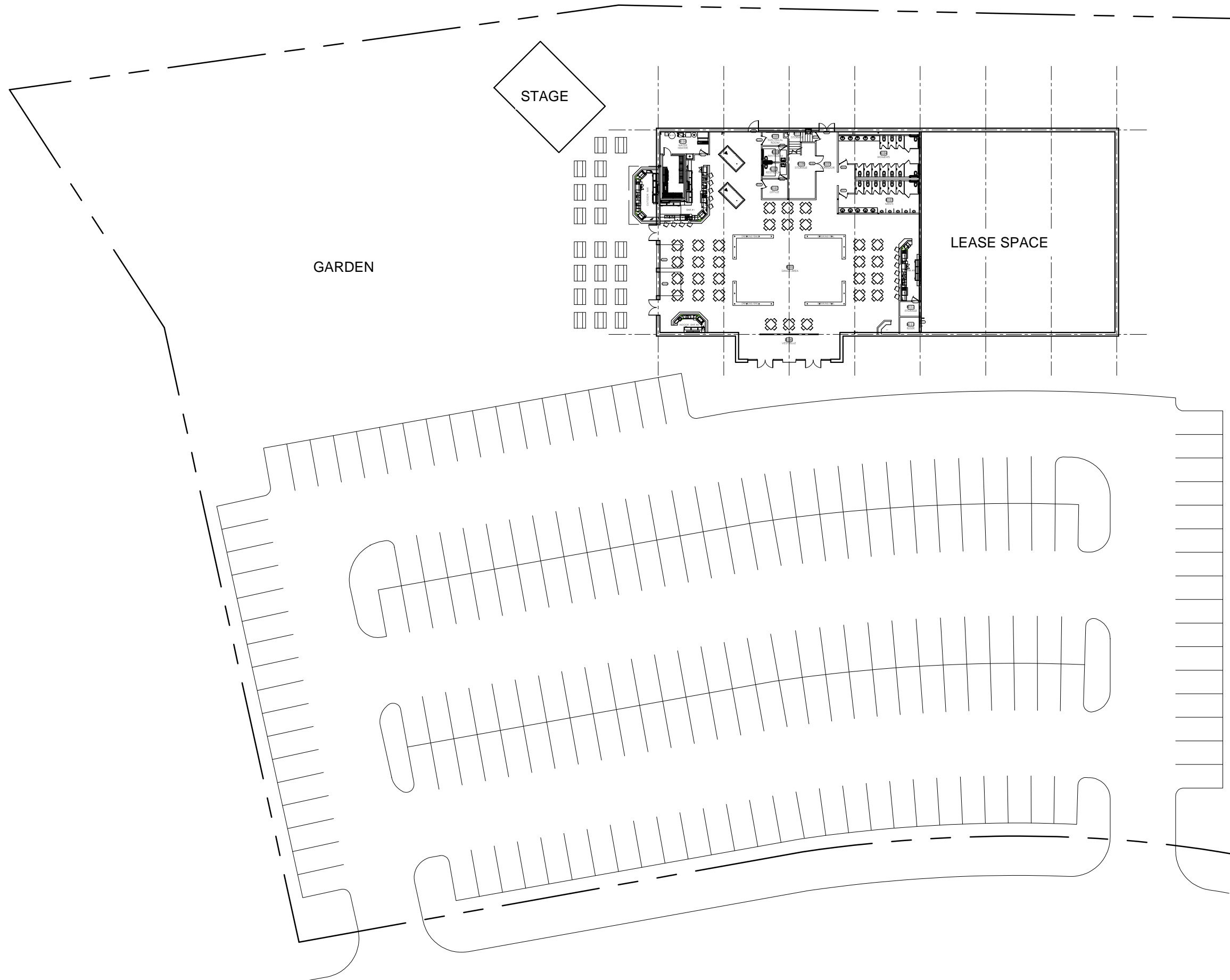


12/8/2020

A handwritten signature in blue ink, appearing to read "Oscar Michael Garza".

Oscar Michael Garza, PE, PTOE
Legacy Engineering Group, PLLC

APPENDIX A – SITE PLAN

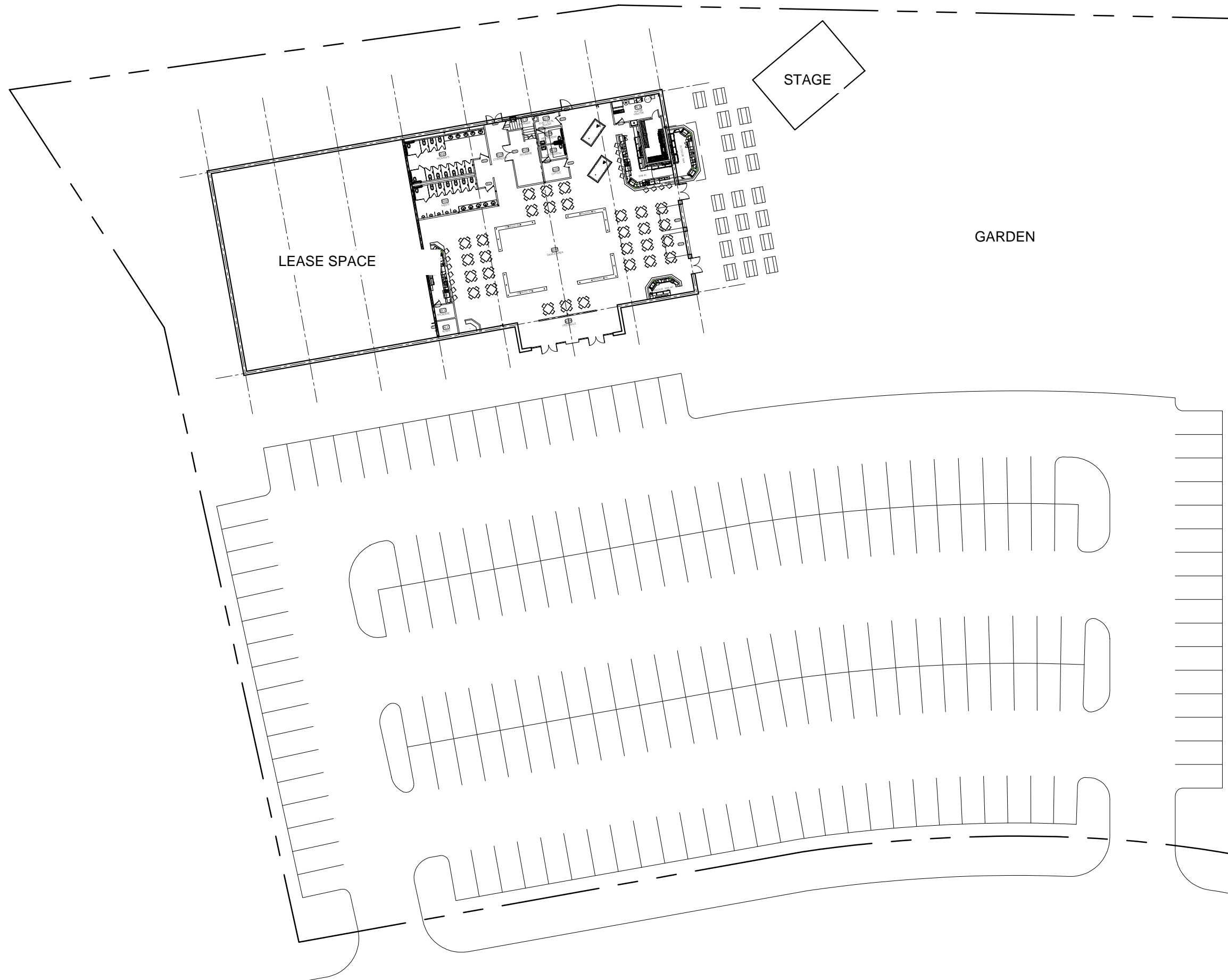


STAGE

GARDEN

LEASE SPACE

ADDITIONAL PARKING

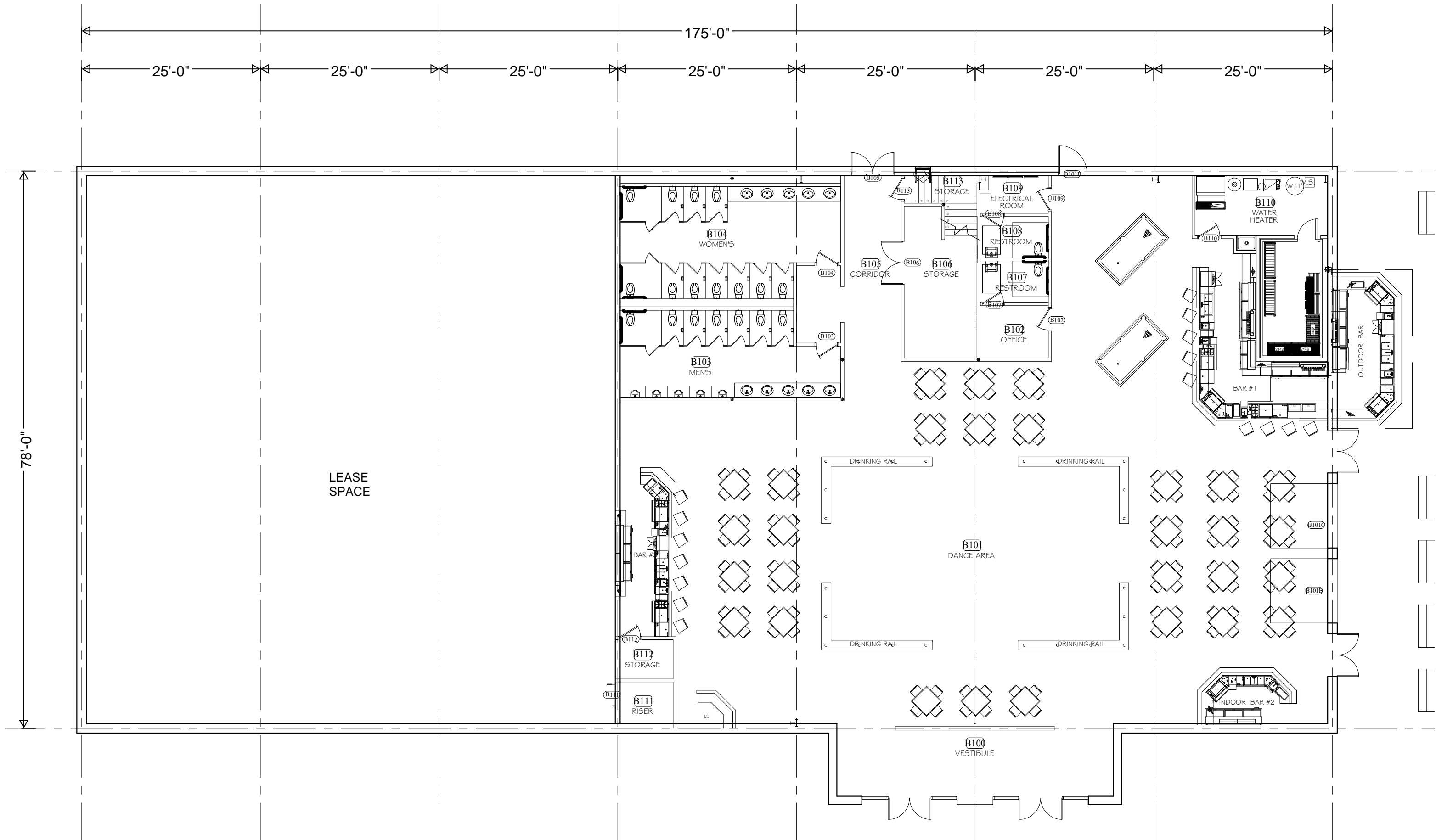


LEASE SPACE

STAGE

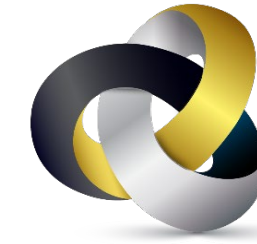
GARDEN

ADDITIONAL PARKING



APPENDIX B – TRAFFIC DATA


Leslie Road Plat



LEGACY
ENGINEERING GROUP

Job Name:	Leslie Road Plat		
N/S Road Name:	Leslie Road/Rainbow Ridge		
W/E Road Name:	Leslie Road/Bus Barn		
City, State - County:	Helotes, Texas - Bexar County		
Date:	Saturday, November 21, 2020		
Intersection Type:	Multi-Way Stop		
Time Period:	5:00 PM	-	6:00 PM
Peak Hour:	5:00 PM	-	6:00 PM

	Palo Alto Rd				Watson Rd				Palo Alto Rd				Watson Rd			
	SouthBound				WestBound				NorthBound				EastBound			
Start Time	Left	Thru	Right	U-Turns	Left	Thru	Right	U-Turns	Left	Thru	Right	U-Turns	Left	Thru	Right	U-Turns
5:00 - 5:15 PM	51	1	0	0	0	1	59	0	0	0	2	0	0	0	0	0
5:15 - 5:30 PM	47	1	0	0	1	0	40	0	0	0	1	0	0	0	0	0
5:30 - 5:45 PM	46	1	0	0	2	0	51	0	0	2	1	0	0	0	0	0
5:45 - 6:00 PM	33	1	0	0	3	0	40	0	0	0	0	0	0	0	0	0
																0
																0
																0
																0
Total	177	4	0	0	6	1	190	0	0	2	4	0	0	0	0	0
Peak Grand Total	181				197				6				0			
Peak Total	177	4	0	0	6	1	190	0	0	2	4	0	0	0	0	0
Peak Percent	98%	2%	0%	0%	3%	1%	96%	0%	0%	33%	67%	0%	0%	0%	0%	0%
Comments																

Leslie Road Plat																
Job Name:	Leslie Road Plat															
N/S Road Name:	Leslie Road/Rainbow Ridge															
W/E Road Name:	Leslie Road/Bus Barn															
City, State - County:	Helotes, Texas - Bexar County															
Date:	Saturday, November 21, 2020															
Intersection Type:	Multi-Way Stop															
Time Period:	9:00 PM	-														
Peak Hour:	9:00 PM	-							10:00 PM							
	Palo Alto Rd				Watson Rd				Palo Alto Rd				Watson Rd			
	SouthBound				WestBound				NorthBound				EastBound			
Start Time	<i>Left</i>	<i>Thru</i>	<i>Right</i>	<i>U-Turns</i>	<i>Left</i>	<i>Thru</i>	<i>Right</i>	<i>U-Turns</i>	<i>Left</i>	<i>Thru</i>	<i>Right</i>	<i>U-Turns</i>	<i>Left</i>	<i>Thru</i>	<i>Right</i>	<i>U-Turns</i>
9:00 - 9:15 PM	11	1	0	0	0	0	9	0	0	0	1	0	0	0	0	0
9:15 - 9:30 PM	15	1	0	0	0	0	8	0	0	0	1	0	0	0	0	0
9:30 - 9:45 PM	12	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0
9:45 - 10:00 PM	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
																0
																0
																0
Total	58	2	0	0	0	0	29	0	0	0	2	0	0	0	0	0
Peak Grand Total	60				29				2				0			
Peak Total	58	2	0	0	0	0	29	0	0	0	2	0	0	0	0	0
Peak Percent	97%	3%	0%	0%	0%	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%
Comments																

APPENDIX C – SYNCHRO OUTPUT REPORTS

HCM 2010 AWSC
 3: Rainbow Ridge & Bus Barn & Leslie Road

12/07/2020

Intersection	
Intersection Delay, s/veh	9.6
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕		↕		↕	↕	↕
Traffic Vol, veh/h	0	0	0	6	1	190	0	2	4	177	4	0
Future Vol, veh/h	0	0	0	6	1	190	0	2	4	177	4	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	7	1	207	0	2	4	192	4	0
Number of Lanes	0	1	0	0	1	1	0	2	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	2	1
HCM Control Delay	0	8.7	7.8	10.6
HCM LOS	-	A	A	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	0%	86%	0%	100%	0%	0%
Vol Thru, %	100%	14%	100%	14%	0%	0%	100%	100%
Vol Right, %	0%	86%	0%	0%	100%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	1	5	0	7	190	177	4	0
LT Vol	0	0	0	6	0	177	0	0
Through Vol	1	1	0	1	0	0	4	0
RT Vol	0	4	0	0	190	0	0	0
Lane Flow Rate	1	5	0	8	207	192	4	0
Geometry Grp	8	8	8	8	8	8	8	8
Degree of Util (X)	0.002	0.007	0	0.012	0.257	0.299	0.006	0
Departure Headway (Hd)	5.537	4.933	5.57	5.603	4.472	5.595	5.092	5.092
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	645	723	0	641	805	643	702	0
Service Time	3.282	2.678	3.311	3.32	2.189	3.33	2.828	2.828
HCM Lane V/C Ratio	0.002	0.007	0	0.012	0.257	0.299	0.006	0
HCM Control Delay	8.3	7.7	8.3	8.4	8.7	10.7	7.9	7.8
HCM Lane LOS	A	A	N	A	A	B	A	N
HCM 95th-tile Q	0	0	0	0	1	1.3	0	0

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Intersection	
Intersection Delay, s/veh	7.8
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕		↕		↕	↕	↕
Traffic Vol, veh/h	0	0	0	0	0	29	0	0	2	58	2	0
Future Vol, veh/h	0	0	0	0	0	29	0	0	2	58	2	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	32	0	0	2	63	2	0
Number of Lanes	0	1	0	0	1	1	0	2	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	2	1
HCM Control Delay	0	6.9	6.8	8.3
HCM LOS	-	A	A	A

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	0%	0%	0%	100%	0%	0%
Vol Thru, %	100%	0%	100%	100%	0%	0%	100%	100%
Vol Right, %	0%	100%	0%	0%	100%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	0	2	0	0	29	58	2	0
LT Vol	0	0	0	0	0	58	0	0
Through Vol	0	0	0	0	0	0	2	0
RT Vol	0	2	0	0	29	0	0	0
Lane Flow Rate	0	2	0	0	32	63	2	0
Geometry Grp	8	8	8	8	8	8	8	8
Degree of Util (X)	0	0.002	0	0	0.035	0.089	0.003	0
Departure Headway (Hd)	4.684	3.983	4.705	4.662	3.961	5.099	4.598	4.598
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	0	889	0	0	893	705	780	0
Service Time	2.451	1.75	2.489	2.434	1.733	2.814	2.314	2.314
HCM Lane V/C Ratio	0	0.002	0	0	0.036	0.089	0.003	0
HCM Control Delay	7.5	6.8	7.5	7.4	6.9	8.3	7.3	7.3
HCM Lane LOS	N	A	N	N	A	A	A	N
HCM 95th-tile Q	0	0	0	0	0.1	0.3	0	0

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Intersection	
Intersection Delay, s/veh	9.7
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↔			↕	↕		↕↔		↕	↕	↕
Traffic Vol, veh/h	0	0	0	6	1	194	0	2	4	181	4	0
Future Vol, veh/h	0	0	0	6	1	194	0	2	4	181	4	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	7	1	211	0	2	4	197	4	0
Number of Lanes	0	1	0	0	1	1	0	2	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	2	1
HCM Control Delay	0	8.8	7.8	10.7
HCM LOS	-	A	A	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	0%	86%	0%	100%	0%	0%
Vol Thru, %	100%	14%	100%	14%	0%	0%	100%	100%
Vol Right, %	0%	86%	0%	0%	100%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	1	5	0	7	194	181	4	0
LT Vol	0	0	0	6	0	181	0	0
Through Vol	1	1	0	1	0	0	4	0
RT Vol	0	4	0	0	194	0	0	0
Lane Flow Rate	1	5	0	8	211	197	4	0
Geometry Grp	8	8	8	8	8	8	8	8
Degree of Util (X)	0.002	0.007	0	0.012	0.263	0.306	0.006	0
Departure Headway (Hd)	5.559	4.954	5.595	5.62	4.489	5.607	5.105	5.105
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	642	720	0	639	803	641	700	0
Service Time	3.306	2.701	3.335	3.335	2.203	3.343	2.841	2.841
HCM Lane V/C Ratio	0.002	0.007	0	0.013	0.263	0.307	0.006	0
HCM Control Delay	8.3	7.7	8.3	8.4	8.8	10.8	7.9	7.8
HCM Lane LOS	A	A	N	A	A	B	A	N
HCM 95th-tile Q	0	0	0	0	1.1	1.3	0	0

Intersection	
Intersection Delay, s/veh	7.8
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕		↕		↕	↕	↕
Traffic Vol, veh/h	0	0	0	0	0	30	0	0	2	59	2	0
Future Vol, veh/h	0	0	0	0	0	30	0	0	2	59	2	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	33	0	0	2	64	2	0
Number of Lanes	0	1	0	0	1	1	0	2	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	2	1
HCM Control Delay	0	6.9	6.8	8.3
HCM LOS	-	A	A	A

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	0%	0%	0%	100%	0%	0%
Vol Thru, %	100%	0%	100%	100%	0%	0%	100%	100%
Vol Right, %	0%	100%	0%	0%	100%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	0	2	0	0	30	59	2	0
LT Vol	0	0	0	0	0	59	0	0
Through Vol	0	0	0	0	0	0	2	0
RT Vol	0	2	0	0	30	0	0	0
Lane Flow Rate	0	2	0	0	33	64	2	0
Geometry Grp	8	8	8	8	8	8	8	8
Degree of Util (X)	0	0.002	0	0	0.036	0.091	0.003	0
Departure Headway (Hd)	4.688	3.987	4.709	4.664	3.963	5.101	4.6	4.6
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	0	888	0	0	892	705	780	0
Service Time	2.456	1.755	2.495	2.438	1.737	2.816	2.316	2.316
HCM Lane V/C Ratio	0	0.002	0	0	0.037	0.091	0.003	0
HCM Control Delay	7.5	6.8	7.5	7.4	6.9	8.3	7.3	7.3
HCM Lane LOS	N	A	N	N	A	A	A	N
HCM 95th-tile Q	0	0	0	0	0.1	0.3	0	0

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Intersection	
Intersection Delay, s/veh	9.8
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕		↕		↕	↕	↕
Traffic Vol, veh/h	0	0	0	6	1	200	0	2	4	186	4	0
Future Vol, veh/h	0	0	0	6	1	200	0	2	4	186	4	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	7	1	217	0	2	4	202	4	0
Number of Lanes	0	1	0	0	1	1	0	2	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	2	1
HCM Control Delay	0	8.9	7.9	10.9
HCM LOS	-	A	A	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	0%	86%	0%	100%	0%	0%
Vol Thru, %	100%	14%	100%	14%	0%	0%	100%	100%
Vol Right, %	0%	86%	0%	0%	100%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	1	5	0	7	200	186	4	0
LT Vol	0	0	0	6	0	186	0	0
Through Vol	1	1	0	1	0	0	4	0
RT Vol	0	4	0	0	200	0	0	0
Lane Flow Rate	1	5	0	8	217	202	4	0
Geometry Grp	8	8	8	8	8	8	8	8
Degree of Util (X)	0.002	0.007	0	0.012	0.272	0.316	0.006	0
Departure Headway (Hd)	5.59	4.985	5.626	5.639	4.507	5.624	5.122	5.122
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	638	715	0	637	800	639	698	0
Service Time	3.341	2.736	3.371	3.355	2.224	3.363	2.86	2.86
HCM Lane V/C Ratio	0.002	0.007	0	0.013	0.271	0.316	0.006	0
HCM Control Delay	8.4	7.8	8.4	8.4	8.9	11	7.9	7.9
HCM Lane LOS	A	A	N	A	A	B	A	N
HCM 95th-tile Q	0	0	0	0	1.1	1.4	0	0

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	4	186	202	2	1	5
Future Vol, veh/h	4	186	202	2	1	5
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	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	202	220	2	1	5

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	222	0	-	0	431 221
Stage 1	-	-	-	-	221 -
Stage 2	-	-	-	-	210 -
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	1347	-	-	-	581 819
Stage 1	-	-	-	-	816 -
Stage 2	-	-	-	-	825 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1347	-	-	-	579 819
Mov Cap-2 Maneuver	-	-	-	-	579 -
Stage 1	-	-	-	-	814 -
Stage 2	-	-	-	-	825 -

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	9.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1347	-	-	-	766
HCM Lane V/C Ratio	0.003	-	-	-	0.009
HCM Control Delay (s)	7.7	0	-	-	9.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	1	186	203	4	5	1
Future Vol, veh/h	1	186	203	4	5	1
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	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	202	221	4	5	1

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	225	0	-	0	427 223
Stage 1	-	-	-	-	223 -
Stage 2	-	-	-	-	204 -
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	1344	-	-	-	584 817
Stage 1	-	-	-	-	814 -
Stage 2	-	-	-	-	830 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1344	-	-	-	583 817
Mov Cap-2 Maneuver	-	-	-	-	583 -
Stage 1	-	-	-	-	813 -
Stage 2	-	-	-	-	830 -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	10.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1344	-	-	-	612
HCM Lane V/C Ratio	0.001	-	-	-	0.011
HCM Control Delay (s)	7.7	0	-	-	10.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

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Intersection	
Intersection Delay, s/veh	8.1
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕		↕		↕	↕	↕
Traffic Vol, veh/h	0	0	0	0	0	46	0	0	2	90	2	0
Future Vol, veh/h	0	0	0	0	0	46	0	0	2	90	2	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	50	0	0	2	98	2	0
Number of Lanes	0	1	0	0	1	1	0	2	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	2	1
HCM Control Delay	0	7.1	6.9	8.7
HCM LOS	-	A	A	A

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	0%	0%	0%	100%	0%	0%
Vol Thru, %	100%	0%	100%	100%	0%	0%	100%	100%
Vol Right, %	0%	100%	0%	0%	100%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	0	2	0	0	46	90	2	0
LT Vol	0	0	0	0	0	90	0	0
Through Vol	0	0	0	0	0	0	2	0
RT Vol	0	2	0	0	46	0	0	0
Lane Flow Rate	0	2	0	0	50	98	2	0
Geometry Grp	8	8	8	8	8	8	8	8
Degree of Util (X)	0	0.003	0	0	0.058	0.14	0.003	0
Departure Headway (Hd)	4.875	4.173	4.93	4.842	4.141	5.134	4.633	4.633
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	0	862	0	0	870	698	772	0
Service Time	2.579	1.878	2.635	2.544	1.843	2.866	2.365	2.365
HCM Lane V/C Ratio	0	0.002	0	0	0.057	0.14	0.003	0
HCM Control Delay	7.6	6.9	7.6	7.5	7.1	8.7	7.4	7.4
HCM Lane LOS	N	A	N	N	A	A	A	N
HCM 95th-tile Q	0	0	0	0	0.2	0.5	0	0

Intersection						
Int Delay, s/veh	2.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	↷
Traffic Vol, veh/h	25	67	33	7	4	13
Future Vol, veh/h	25	67	33	7	4	13
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	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	27	73	36	8	4	14

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	44	0	-	0	167 40
Stage 1	-	-	-	-	40 -
Stage 2	-	-	-	-	127 -
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	1564	-	-	-	823 1031
Stage 1	-	-	-	-	982 -
Stage 2	-	-	-	-	899 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1564	-	-	-	808 1031
Mov Cap-2 Maneuver	-	-	-	-	808 -
Stage 1	-	-	-	-	964 -
Stage 2	-	-	-	-	899 -

Approach	EB	WB	SB
HCM Control Delay, s	2	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1564	-	-	-	968
HCM Lane V/C Ratio	0.017	-	-	-	0.019
HCM Control Delay (s)	7.3	0	-	-	8.8
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection						
Int Delay, s/veh	1.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	6	65	37	25	13	3
Future Vol, veh/h	6	65	37	25	13	3
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	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	71	40	27	14	3

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	67	0	-	0	139 54
Stage 1	-	-	-	-	54 -
Stage 2	-	-	-	-	85 -
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	1535	-	-	-	854 1013
Stage 1	-	-	-	-	969 -
Stage 2	-	-	-	-	938 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1535	-	-	-	850 1013
Mov Cap-2 Maneuver	-	-	-	-	850 -
Stage 1	-	-	-	-	964 -
Stage 2	-	-	-	-	938 -

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	9.2
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1535	-	-	-	876
HCM Lane V/C Ratio	0.004	-	-	-	0.02
HCM Control Delay (s)	7.4	0	-	-	9.2
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1