

August 29, 2022

City of Sedona
102 Roadrunner Drive
Sedona, AZ 86336

RE: *Traffic Statement, Sedona Uptown Parking Garage, Sedona, AZ*

This traffic statement is prepared to support the design of a new 272-space parking garage north of Forest Road and west of SR 89A, in *Sedona, AZ*. This Traffic Statement reviews proposed parking garage access, vehicle routing re-allocation, and capacity analysis.

SITE BACKGROUND

A new 272-space parking garage is proposed north of the existing portion of Forest Road. The garage is intended to alleviate congested parking lots throughout Uptown and provide a centralized parking area to reduce additional traffic in Uptown due to wandering to locate parking.

Forest Road currently extends west of SR 89A in Uptown. A separate project proposes to extend Forest Road to the south to connect to SR 89A west of SR 179/“Y” and SR 89A/Brewer Road roundabouts. The new roadway extension will provide additional access to SR 89A for visitors parking on Forest Road.

Adjacent to the proposed parking garage, Forest Road will consist of a three-lane section, one through lane in each direction and a center two-way left-turn lane. At the existing intersection with Forest Road east of the proposed garage, SR89A is a three-lane roadway with two travel lanes in the southbound direction and one in the northbound direction. The speed limit is 25 miles per hour adjacent to the Forest Road/SR89A intersection.

Figure 1 shows the location of the project.



Figure 1 – Project Location

VEHICLE ROUTE RE-ALLOCATION

Traffic Data Collection

Turning movement counts were collected Saturday, March 20, 2021 at the existing intersection of Forest Road and SR 89A as part of the Sedona Uptown VISSIM modeling project. As part of the modeling project the data was balanced regionally to provide a peak hour for the entire system.

Cellphone-based AirSage Mobility Data was utilized to estimate the number of trips that would divert to the new Forest Road connection as an alternate route to/from Uptown and west Sedona. In the peak hour it was estimated that **61 vehicles per hour (vph)** will utilize the new Forest Road connection to bypass the SR 179/"Y" and SR 89A/Brewer Road roundabouts. **34 vph** of these trips are from Uptown and **27 vph** of these trips are to Uptown. These trips were also reallocated in the network for existing volumes.

This balanced data was utilized as existing count data in this analysis. Existing data is summarized in **Figure 2**.

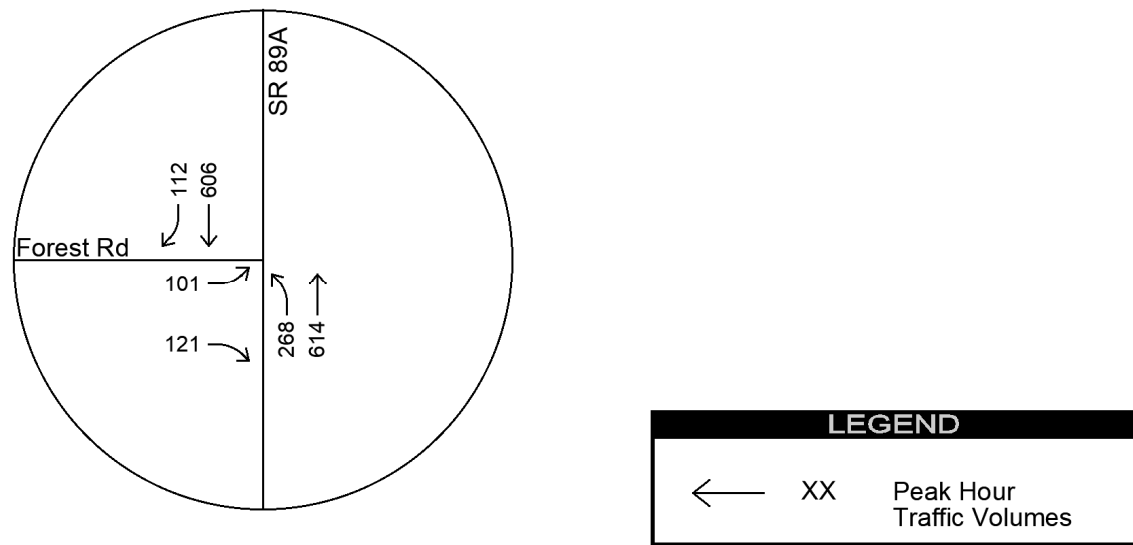


Figure 2 – 2021 No-Build Traffic Volumes

Parking Garage Trips

The parking garage is anticipated to generate minimal new trips to the Uptown area. Rather existing vehicles parking in lots throughout Uptown would now route to the 272-space parking garage instead of dispersed surface lots. In order to estimate the number of trips utilizing the new parking garage in an hour the following assumptions were made:

- The new parking garage is estimated to turnover approximately **100 vehicles per hour (vph)**.
- It is assumed that 50% of traffic (50 vph) will access the parking garage from Forest Road approaching from the west (using the new Forest Road connection), and 50% (50 vph) from the east on existing Forest Road.

From among the 50 trips that will utilize the existing intersection of Forest Road/SR 89A it is anticipated that 25% (12 trips) are diverted from parking on and south of Forest Road while 75% (38 trips) are diverted from existing parking all throughout Uptown.

The through traffic on Forest Road was estimated using balanced approach volumes at the Forest Road/SR 89A intersection. It is assumed that vehicles entering and exiting Forest Road between the intersection and the proposed parking garage are consistent enough that this is an acceptable method.

The parking garage is proposed with three access drives, two egress only (Driveway A and Driveway C) and one ingress only (Driveway B). Driveway A represents the westernmost egress and Driveway C represents the easternmost egress. Driveway B is the center ingress.

Based on the above distribution, intersection turning movement counts were developed and summarized in **Figure 3**.

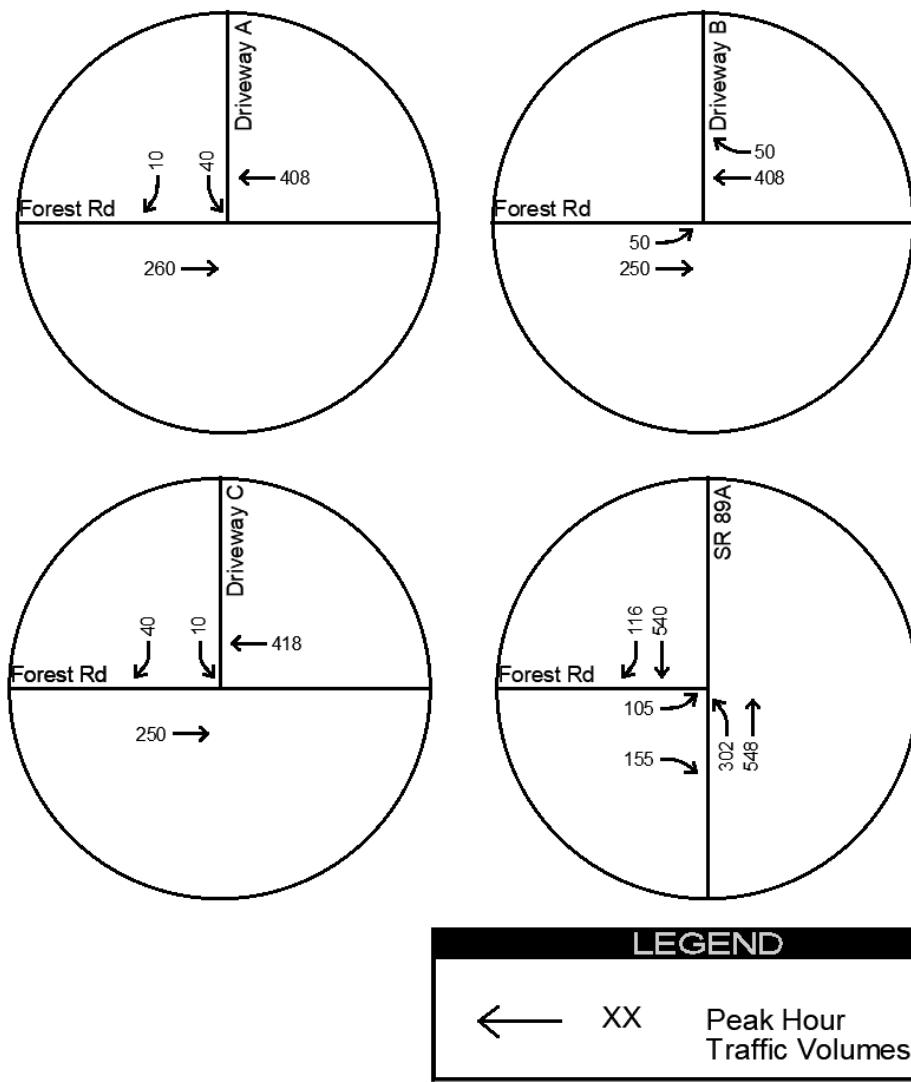


Figure 3 – 2021 Build Traffic Volumes

LEVEL OF SERVICE ANALYSIS

The LOS for the intersection of Forest Road and SR 89A was calculated using HCM 6th Edition methodology and Synchro 10 analysis software. **Table 1** summarizes the 2021 LOS results for both the no-build (not including the parking garage) and build (including the parking garage) scenarios. Both scenarios show the peak hour LOS. **Table 2** summarizes the 2021 LOS results for the parking garage access drives. Delay is rounded to the nearest whole second. LOS analysis worksheets are included in an attachment.

Table 1 – 2021 Forest Road and SR 89A LOS Analysis Summary

Scenario	EB Forest Road			NB SR 89A			SB SR89A			Total
	L	T	R	L	T	R	L	T	R	
No-Build	C/35		B/10	B/11	C/23			B/19	A/9	B/19
Build	C/35		B/10	B/11	C/20			B/17	A/9	B/17

Table 2 – 2021 Access Drive LOS Analysis Summary

Driveway	EB Forest Road			WB Forest Road			SB Driveway		
	L	T	R	L	T	R	L	T	R
Driveway A		-			-		B/13		B/11
Driveway B	A/9	-			-	-			
Driveway C		-			-		B/12		B/12

5-YEAR HORIZON

The 2018 City of Sedona TMP estimates that traffic volumes in the Uptown area have historically grown approximately 2% per year. To estimate a 5-year horizon, 2% annual growth for 5 years was applied to the traffic volumes throughout the network.

Based on the above traffic growth, future no-build 2026 intersection turning movement counts are summarized in **Figure 4** and future build 2026 volumes are summarized in **Figure 5**.

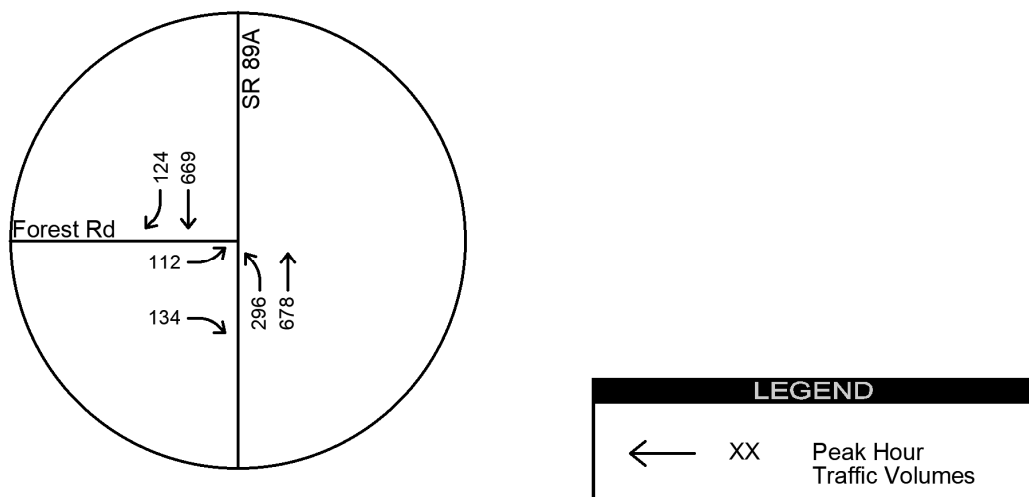


Figure 4 – 2026 No-Build Traffic Volumes

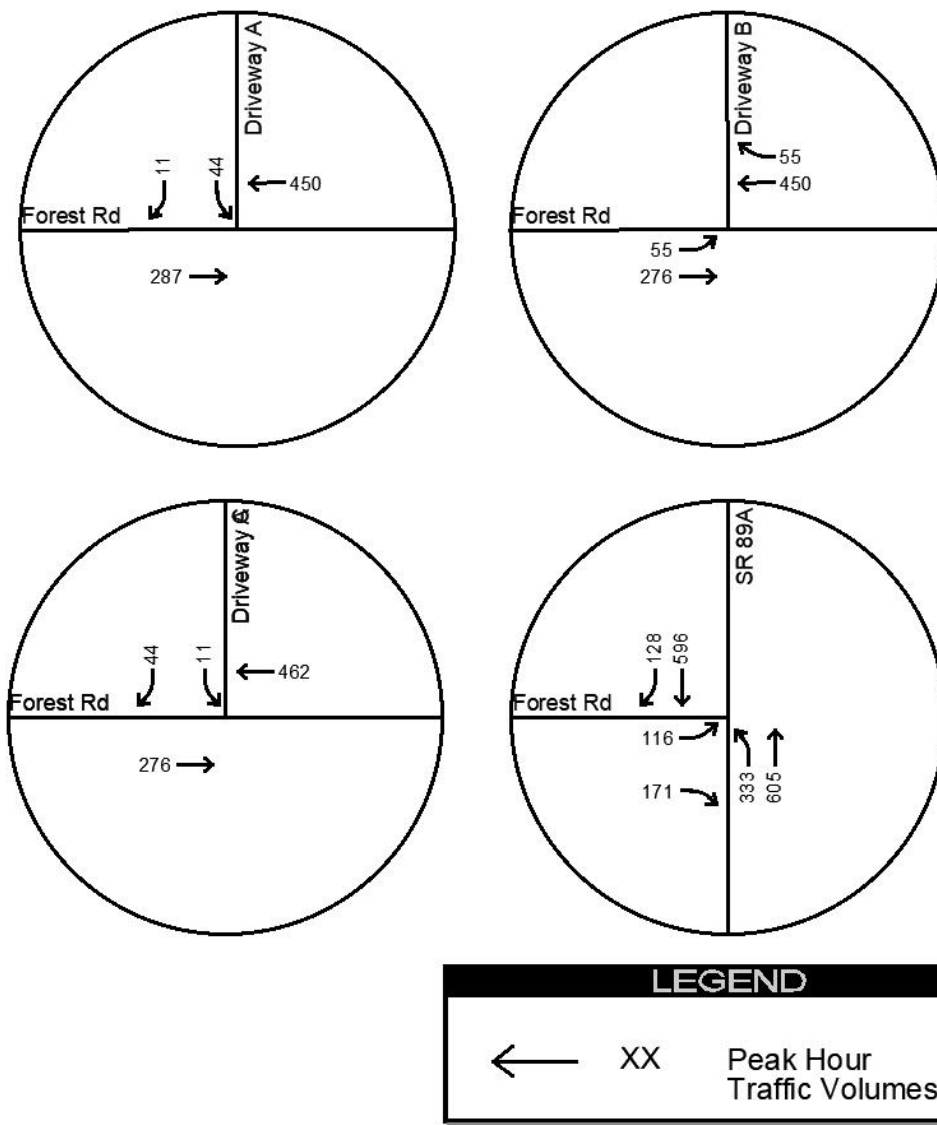


Figure 5 – 2026 Build Traffic Volumes

2026 LEVEL OF SERVICE ANALYSIS

Table 3 and Table 4 summarize the 2026 LOS results. Delay is rounded to the nearest whole second. LOS analysis worksheets are included in an attachment.

Table 3 – 2026 Forest Road and SR 89A LOS Analysis Summary

Scenario	EB Forest Road			NB SR 89A			SB SR89A			Total
	L	T	R	L	T	R	L	T	R	
No-Build	D/37		B/10	B/14	C/34			C/33	B/11	C/28
Build	D/38		B/10	B/15	C/27			C/23	B/11	C/22

Table 4 – 2026 Access Drive LOS Analysis Summary

Driveway	EB Forest Road			WB Forest Road			SB Driveway		
	L	T	R	L	T	R	L	T	R
Driveway A		-			-		B/14		B/12
Driveway B	A/9	-			-	-			
Driveway C		-			-		B/13		B/13

RIGHT TURN LANE ANALYSIS

A right turn lane warrant analysis was completed for the Forest Road parking garage entrance drive (Driveway B) using 2026 projected traffic volumes. The analysis presented in **Table 5** and based on criteria in **Figure 6** shows that a dedicated right turn lane on westbound Forest Road at the proposed entrance drive is not warranted.

Table 5 – Right Turn Lane Warrant Analysis

Analysis Period	Speed Limit	PM Peak Hour		Criteria Met?
		Major Road Volume (one direction)	Right-Turn Volumes	
2026	25	450	55	No

Peak Hour Traffic Volume on the Highway in Advancing Direction	Minimum Peak Hour Right-turn Traffic Volume				
	# of thru lanes per direction				
	1		2		3
	< 45 MPH Posted Speed	≥ 45 MPH Posted Speed	< 45 MPH Posted Speed	≥ 45 MPH Posted Speed	All Speeds
≤ 200					
201 – 300	-	30	-	-	-
301 – 400	-	19	-	55	-
401 – 500	85	14	-	30	-
501 – 600	58	12	140	25	-
601 – 700	27	9	80	18	-
701 – 800	20	8	53	15	-
801 – 900	12	7	40	12	-
901 – 1000	9	6	30	11	-
1001 – 1100	8	5	23	9	18
1101 – 1200	7	5	18	8	16
1201 – 1300	6	4	14	8	15
1301 – 1400	6	4	11	6	12
1400+	5	3	8	6	10

Figure 6 – ADOT TGP 245: Right Turn Lane Criteria

RECOMMENDATIONS

The proposed 272-space parking garage on Forest Road is anticipated to pull existing traffic parking throughout Uptown to the new centralized location, reducing circulating traffic and reallocating traffic through the Forest Road/SR 89A intersection. The parking garage is not anticipated to degrade the intersection LOS at Forest Road/SR 89A.

The parking garage also proposes three access driveways, two egress only and one ingress only. The proposed driveways are anticipated to accommodate the parking garage traffic. The ingress drive, Driveway B, does not meet ADOT TGP warrants for an exclusive right turn lane. It is recommended that a center two-way left turn lane be constructed to accommodate westbound left turn traffic into Driveway B.

Please let me know if you have any questions. I can be reached at 928-458-7121 or andrew.baird@kimley-horn.com.

Sincerely:

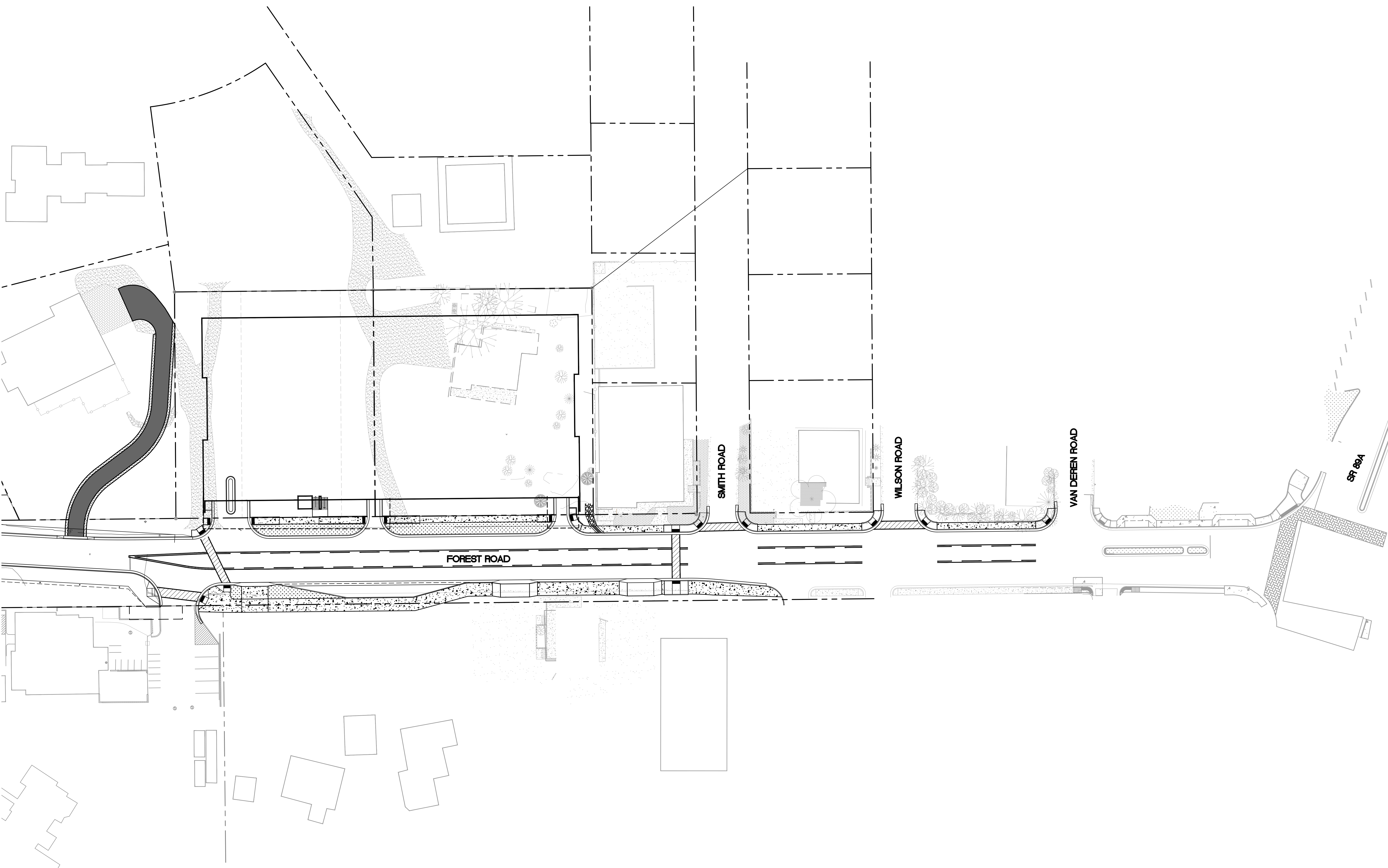


Andrew Baird, PE

Attachments

- Attachment 1 – Garage Site Plan*
- Attachment 2 – Synchro Reports*





Lanes, Volumes, Timings
1: SR-89A & Forest Road

09/20/2021



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	101	121	268	614	606	112
Future Volume (vph)	101	121	268	614	606	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100	0	0			50
Storage Lanes	1	1	1			1
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	3539	1583
Flt Permitted	0.950		0.369			
Satd. Flow (perm)	1770	1583	687	1863	3539	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		132				51
Link Speed (mph)	30			30	30	
Link Distance (ft)	270			2184	200	
Travel Time (s)	6.1			49.6	4.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	110	132	291	667	659	122
Shared Lane Traffic (%)						
Lane Group Flow (vph)	110	132	291	667	659	122
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane	Yes					
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Number of Detectors	1	1	1	2	2	1
Detector Template	Left	Right	Left	Thru	Thru	Right
Leading Detector (ft)	20	20	20	100	100	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	20	6	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)				94	94	
Detector 2 Size(ft)				6	6	
Detector 2 Type				Cl+Ex	Cl+Ex	
Detector 2 Channel						
Detector 2 Extend (s)				0.0	0.0	
Turn Type	Perm	Perm	pm+pt	NA	NA	Perm
Protected Phases			5	2	6	

Lanes, Volumes, Timings
1: SR-89A & Forest Road

09/20/2021



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Permitted Phases	4	4	2			6
Detector Phase	4	4	5	2	6	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	5.0	10.0	10.0	10.0
Minimum Split (s)	20.0	20.0	36.0	20.0	31.7	31.7
Total Split (s)	33.0	33.0	36.0	36.0	36.0	36.0
Total Split (%)	31.4%	31.4%	34.3%	34.3%	34.3%	34.3%
Maximum Green (s)	27.1	27.1	30.0	30.3	30.3	30.3
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.9	2.9	3.0	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	6.0	5.7	5.7	5.7
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	1.0	1.0	2.0	2.0	2.0	2.0
Recall Mode	None	None	None	Min	Ped	Ped
Walk Time (s)			8.0		7.0	7.0
Flash Dont Walk (s)			22.0		19.0	19.0
Pedestrian Calls (#/hr)			0		0	0
Act Effct Green (s)	8.4	8.4	38.2	30.5	30.5	30.5
Actuated g/C Ratio	0.13	0.13	0.59	0.47	0.47	0.47
v/c Ratio	0.48	0.41	0.54	0.76	0.39	0.16
Control Delay	34.5	10.1	11.3	23.0	12.8	7.9
Queue Delay	0.0	0.0	0.0	0.0	6.6	1.0
Total Delay	34.5	10.1	11.3	23.0	19.4	8.9
LOS	C	B	B	C	B	A
Approach Delay	21.2			19.5	17.8	
Approach LOS	C			B	B	

Intersection Summary

Area Type: Other
 Cycle Length: 105
 Actuated Cycle Length: 64.6
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.76
 Intersection Signal Delay: 19.0
 Intersection Capacity Utilization 52.1%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service A

Splits and Phases: 1: SR-89A & Forest Road



Lanes, Volumes, Timings
1: SR-89A & Forest Road

09/20/2021



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	105	155	302	548	540	116
Future Volume (vph)	105	155	302	548	540	116
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100	0	0			50
Storage Lanes	1	1	1			1
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	3539	1583
Flt Permitted	0.950		0.411			
Satd. Flow (perm)	1770	1583	766	1863	3539	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		168				59
Link Speed (mph)	30			30	30	
Link Distance (ft)	270			2184	200	
Travel Time (s)	6.1			49.6	4.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	114	168	328	596	587	126
Shared Lane Traffic (%)						
Lane Group Flow (vph)	114	168	328	596	587	126
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane	Yes					
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Number of Detectors	1	1	1	2	2	1
Detector Template	Left	Right	Left	Thru	Thru	Right
Leading Detector (ft)	20	20	20	100	100	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	20	6	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)				94	94	
Detector 2 Size(ft)				6	6	
Detector 2 Type				Cl+Ex	Cl+Ex	
Detector 2 Channel						
Detector 2 Extend (s)				0.0	0.0	
Turn Type	Perm	Perm	pm+pt	NA	NA	Perm
Protected Phases			5	2	6	

Lanes, Volumes, Timings
1: SR-89A & Forest Road

09/20/2021



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Permitted Phases	4	4	2			6
Detector Phase	4	4	5	2	6	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	5.0	10.0	10.0	10.0
Minimum Split (s)	20.0	20.0	36.0	20.0	31.7	31.7
Total Split (s)	33.0	33.0	36.0	36.0	36.0	36.0
Total Split (%)	31.4%	31.4%	34.3%	34.3%	34.3%	34.3%
Maximum Green (s)	27.1	27.1	30.0	30.3	30.3	30.3
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.9	2.9	3.0	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	6.0	5.7	5.7	5.7
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	1.0	1.0	2.0	2.0	2.0	2.0
Recall Mode	None	None	None	Min	Ped	Ped
Walk Time (s)			8.0		7.0	7.0
Flash Dont Walk (s)			22.0		19.0	19.0
Pedestrian Calls (#/hr)			0		0	0
Act Effct Green (s)	8.5	8.5	38.3	30.5	30.5	30.5
Actuated g/C Ratio	0.13	0.13	0.59	0.47	0.47	0.47
v/c Ratio	0.49	0.48	0.57	0.68	0.35	0.16
Control Delay	34.6	10.1	11.5	20.0	12.6	7.6
Queue Delay	0.0	0.0	0.0	0.0	4.0	1.0
Total Delay	34.6	10.1	11.5	20.0	16.6	8.5
LOS	C	B	B	C	B	A
Approach Delay	20.0			17.0	15.2	
Approach LOS	B			B	B	

Intersection Summary

Area Type: Other
 Cycle Length: 105
 Actuated Cycle Length: 64.8
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.68
 Intersection Signal Delay: 16.8
 Intersection LOS: B
 Intersection Capacity Utilization 52.2%
 ICU Level of Service A
 Analysis Period (min) 15

Splits and Phases: 1: SR-89A & Forest Road



HCM 6th TWSC
2: Forest Road & Driveway A

09/20/2021

Intersection						
Int Delay, s/veh	0.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↑	↑
Traffic Vol, veh/h	0	260	408	0	40	10
Future Vol, veh/h	0	260	408	0	40	10
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	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	0	289	453	0	44	11
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	-	0	-	0	742	453
Stage 1	-	-	-	-	453	-
Stage 2	-	-	-	-	289	-
Critical Hdwy	-	-	-	-	6.43	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	-	-	3.527	3.327
Pot Cap-1 Maneuver	0	-	-	0	382	605
Stage 1	0	-	-	0	638	-
Stage 2	0	-	-	0	758	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	382	605
Mov Cap-2 Maneuver	-	-	-	-	488	-
Stage 1	-	-	-	-	638	-
Stage 2	-	-	-	-	758	-
Approach	EB	WB	SB			
HCM Control Delay, s	0	0	12.7			
HCM LOS						B
Minor Lane/Major Mvmt	EBT	WBT	SBLn1	SBLn2		
Capacity (veh/h)	-	-	488	605		
HCM Lane V/C Ratio	-	-	0.091	0.018		
HCM Control Delay (s)	-	-	13.1	11.1		
HCM Lane LOS	-	-	B	B		
HCM 95th %tile Q(veh)	-	-	0.3	0.1		

HCM 6th TWSC
3: Forest Road & Driveway B

09/20/2021

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑	↗			↗
Traffic Vol, veh/h	50	250	408	50	0	0
Future Vol, veh/h	50	250	408	50	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	56	278	453	56	0	0

Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	509	0	-	0	-	481
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	4.13	-	-	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.227	-	-	-	-	3.327
Pot Cap-1 Maneuver	1051	-	-	-	0	583
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1051	-	-	-	-	583
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	1.4	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1051	-	-	-	-
HCM Lane V/C Ratio	0.053	-	-	-	-
HCM Control Delay (s)	8.6	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0.2	-	-	-	-

HCM 6th TWSC
4: Forest Road & Driveway C

09/20/2021

Intersection						
Int Delay, s/veh	0.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↓	
Traffic Vol, veh/h	0	250	418	0	10	40
Future Vol, veh/h	0	250	418	0	10	40
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	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	0	278	464	0	11	44

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	-	0	-	0	742 464
Stage 1	-	-	-	-	464 -
Stage 2	-	-	-	-	278 -
Critical Hdwy	-	-	-	-	6.43 6.23
Critical Hdwy Stg 1	-	-	-	-	5.43 -
Critical Hdwy Stg 2	-	-	-	-	5.43 -
Follow-up Hdwy	-	-	-	-	3.527 3.327
Pot Cap-1 Maneuver	0	-	-	0	382 596
Stage 1	0	-	-	0	631 -
Stage 2	0	-	-	0	767 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	382 596
Mov Cap-2 Maneuver	-	-	-	-	487 -
Stage 1	-	-	-	-	631 -
Stage 2	-	-	-	-	767 -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	12
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	570
HCM Lane V/C Ratio	-	-	0.097
HCM Control Delay (s)	-	-	12
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.3

Lanes, Volumes, Timings
1: SR-89A & Forest Road

09/20/2021



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	112	134	296	678	669	124
Future Volume (vph)	112	134	296	678	669	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100	0	0			50
Storage Lanes	1	1	1			1
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	3539	1583
Flt Permitted	0.950		0.322			
Satd. Flow (perm)	1770	1583	600	1863	3539	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		146				51
Link Speed (mph)	30			30	30	
Link Distance (ft)	270			2184	200	
Travel Time (s)	6.1			49.6	4.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	122	146	322	737	727	135
Shared Lane Traffic (%)						
Lane Group Flow (vph)	122	146	322	737	727	135
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane	Yes					
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Number of Detectors	1	1	1	2	2	1
Detector Template	Left	Right	Left	Thru	Thru	Right
Leading Detector (ft)	20	20	20	100	100	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	20	6	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)				94	94	
Detector 2 Size(ft)				6	6	
Detector 2 Type				Cl+Ex	Cl+Ex	
Detector 2 Channel						
Detector 2 Extend (s)				0.0	0.0	
Turn Type	Perm	Perm	pm+pt	NA	NA	Perm
Protected Phases			5	2	6	

Lanes, Volumes, Timings
1: SR-89A & Forest Road

09/20/2021



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Permitted Phases	4	4	2			6
Detector Phase	4	4	5	2	6	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	5.0	10.0	10.0	10.0
Minimum Split (s)	20.0	20.0	36.0	20.0	31.7	31.7
Total Split (s)	33.0	33.0	36.0	36.0	36.0	36.0
Total Split (%)	31.4%	31.4%	34.3%	34.3%	34.3%	34.3%
Maximum Green (s)	27.1	27.1	30.0	30.3	30.3	30.3
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.9	2.9	3.0	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	6.0	5.7	5.7	5.7
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	1.0	1.0	2.0	2.0	2.0	2.0
Recall Mode	None	None	None	Min	Ped	Ped
Walk Time (s)			8.0		7.0	7.0
Flash Dont Walk (s)			22.0		19.0	19.0
Pedestrian Calls (#/hr)			0		0	0
Act Effct Green (s)	8.9	8.9	40.9	30.6	30.6	30.6
Actuated g/C Ratio	0.13	0.13	0.60	0.45	0.45	0.45
v/c Ratio	0.53	0.44	0.59	0.88	0.46	0.18
Control Delay	37.3	10.2	14.2	33.5	15.3	9.7
Queue Delay	0.0	0.0	0.0	0.0	18.0	1.1
Total Delay	37.3	10.2	14.2	33.5	33.3	10.8
LOS	D	B	B	C	C	B
Approach Delay	22.5			27.7	29.8	
Approach LOS	C			C	C	

Intersection Summary

Area Type: Other
 Cycle Length: 105
 Actuated Cycle Length: 67.9
 Natural Cycle: 100
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.88
 Intersection Signal Delay: 27.9
 Intersection LOS: C
 Intersection Capacity Utilization 55.8%
 ICU Level of Service B
 Analysis Period (min) 15

Splits and Phases: 1: SR-89A & Forest Road



Lanes, Volumes, Timings
1: SR-89A & Forest Road

09/20/2021



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	116	171	333	605	596	128
Future Volume (vph)	116	171	333	605	596	128
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100	0	0			50
Storage Lanes	1	1	1			1
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	3539	1583
Flt Permitted	0.950		0.366			
Satd. Flow (perm)	1770	1583	682	1863	3539	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		186				59
Link Speed (mph)	30			30	30	
Link Distance (ft)	270			2184	200	
Travel Time (s)	6.1			49.6	4.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	126	186	362	658	648	139
Shared Lane Traffic (%)						
Lane Group Flow (vph)	126	186	362	658	648	139
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane	Yes					
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Number of Detectors	1	1	1	2	2	1
Detector Template	Left	Right	Left	Thru	Thru	Right
Leading Detector (ft)	20	20	20	100	100	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	20	6	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)				94	94	
Detector 2 Size(ft)				6	6	
Detector 2 Type				Cl+Ex	Cl+Ex	
Detector 2 Channel						
Detector 2 Extend (s)				0.0	0.0	
Turn Type	Perm	Perm	pm+pt	NA	NA	Perm
Protected Phases			5	2	6	

Lanes, Volumes, Timings
1: SR-89A & Forest Road

09/20/2021



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Permitted Phases	4	4	2			6
Detector Phase	4	4	5	2	6	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	5.0	10.0	10.0	10.0
Minimum Split (s)	20.0	20.0	36.0	20.0	31.7	31.7
Total Split (s)	33.0	33.0	36.0	36.0	36.0	36.0
Total Split (%)	31.4%	31.4%	34.3%	34.3%	34.3%	34.3%
Maximum Green (s)	27.1	27.1	30.0	30.3	30.3	30.3
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.9	2.9	3.0	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	6.0	5.7	5.7	5.7
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	1.0	1.0	2.0	2.0	2.0	2.0
Recall Mode	None	None	None	Min	Ped	Ped
Walk Time (s)			8.0		7.0	7.0
Flash Dont Walk (s)			22.0		19.0	19.0
Pedestrian Calls (#/hr)			0		0	0
Act Effct Green (s)	9.1	9.1	41.0	30.7	30.7	30.7
Actuated g/C Ratio	0.13	0.13	0.60	0.45	0.45	0.45
v/c Ratio	0.53	0.50	0.63	0.79	0.41	0.19
Control Delay	37.6	10.2	14.5	26.9	15.0	9.3
Queue Delay	0.0	0.0	0.0	0.0	7.7	1.1
Total Delay	37.6	10.2	14.5	26.9	22.7	10.5
LOS	D	B	B	C	C	B
Approach Delay	21.3			22.5	20.5	
Approach LOS	C			C	C	

Intersection Summary

Area Type: Other
 Cycle Length: 105
 Actuated Cycle Length: 68.2
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.79
 Intersection Signal Delay: 21.6
 Intersection Capacity Utilization 56.0%
 Analysis Period (min) 15
 Intersection LOS: C
 ICU Level of Service B

Splits and Phases: 1: SR-89A & Forest Road



HCM 6th TWSC
2: Forest Road & Driveway A

09/20/2021

Intersection						
Int Delay, s/veh	0.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↑	↑
Traffic Vol, veh/h	0	287	450	0	44	11
Future Vol, veh/h	0	287	450	0	44	11
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	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	0	319	500	0	49	12
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	-	0	-	0	819	500
Stage 1	-	-	-	-	500	-
Stage 2	-	-	-	-	319	-
Critical Hdwy	-	-	-	-	6.43	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	-	-	3.527	3.327
Pot Cap-1 Maneuver	0	-	-	0	344	569
Stage 1	0	-	-	0	607	-
Stage 2	0	-	-	0	735	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	344	569
Mov Cap-2 Maneuver	-	-	-	-	458	-
Stage 1	-	-	-	-	607	-
Stage 2	-	-	-	-	735	-
Approach	EB	WB	SB			
HCM Control Delay, s	0	0	13.3			
HCM LOS				B		
Minor Lane/Major Mvmt	EBT	WBT	SBLn1	SBLn2		
Capacity (veh/h)	-	-	458	569		
HCM Lane V/C Ratio	-	-	0.107	0.021		
HCM Control Delay (s)	-	-	13.8	11.5		
HCM Lane LOS	-	-	B	B		
HCM 95th %tile Q(veh)	-	-	0.4	0.1		

HCM 6th TWSC
3: Forest Road & Driveway B

09/20/2021

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↙	↑	↘			↗
Traffic Vol, veh/h	55	276	450	55	0	0
Future Vol, veh/h	55	276	450	55	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	61	307	500	61	0	0

Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	561	0	-	0	-	531
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	4.13	-	-	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.227	-	-	-	-	3.327
Pot Cap-1 Maneuver	1005	-	-	-	0	546
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	1005	-	-	-	-	546
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	1.5	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1005	-	-	-	-
HCM Lane V/C Ratio	0.061	-	-	-	-
HCM Control Delay (s)	8.8	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0.2	-	-	-	-

HCM 6th TWSC
4: Forest Road & Driveway C

09/20/2021

Intersection						
Int Delay, s/veh	0.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↓	
Traffic Vol, veh/h	0	276	462	0	11	44
Future Vol, veh/h	0	276	462	0	11	44
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	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	0	307	513	0	12	49

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	-	0	-	0	820 513
Stage 1	-	-	-	-	513 -
Stage 2	-	-	-	-	307 -
Critical Hdwy	-	-	-	-	6.43 6.23
Critical Hdwy Stg 1	-	-	-	-	5.43 -
Critical Hdwy Stg 2	-	-	-	-	5.43 -
Follow-up Hdwy	-	-	-	-	3.527 3.327
Pot Cap-1 Maneuver	0	-	-	0	343 559
Stage 1	0	-	-	0	599 -
Stage 2	0	-	-	0	744 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	343 559
Mov Cap-2 Maneuver	-	-	-	-	456 -
Stage 1	-	-	-	-	599 -
Stage 2	-	-	-	-	744 -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	12.6
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	535
HCM Lane V/C Ratio	-	-	0.114
HCM Control Delay (s)	-	-	12.6
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.4