

To: Ric Lowman, PE (City of Virginia Beach)
From: Scott Dunn, AICP, PTP
RE: Windsong Residential Development – Traffic Analysis
Date: April 17, 2019 (*revised 10/17/19*)
Copy: JP Hyland (Bonaventure Realty Group); Mark Richardson (TG)

Executive Summary

The proposed Windsong Apartment expansion will increase the number of units from 272 to 432. It was determined that the additional traffic generated by the project was not enough to warrant a City-mandated study. That being noted, citizens expressed concerns over the associated traffic. In response to these concerns, the developer collected traffic data along Pleasure House Road in the vicinity of the project to assess the impacts of the additional traffic on existing and proposed site entrances. For purposes of this analysis, the expansion was assumed to be complete in 2022.

Subsequently, in response to additional citizen feedback, the developer expanded the scope of study to the signalized US Route 60 (Shore Drive)/Pleasure House Road intersection. The analysis of this intersection was coordinated with City of Virginia Beach Traffic Engineer and deemed sufficient in scope given the additional traffic generated by the proposed apartments.

The operational analysis of US Route 60 (Shore Drive)/Pleasure House Road indicates that the intersection currently operates at a LOS D in the AM peak at a LOS E in the PM peak and will continue at the same LOS in the future (2022) with or without the Windsong expansion; an overall intersection delay increase of approximately two (2) seconds per vehicle was reported over background conditions.

Existing Conditions

Pleasure House Road is a two-lane undivided facility with a posted speed limit of 35 mph, that carries an annual average daily traffic (AADT) count of 8,500 vehicles, according to City data. Pleasure House Road is functionally classified as an urban major collector and serves as a north-south connection between Lookout Road to the north and US Route 60 to the south.

Existing Traffic Volumes

Existing AM and PM peak hour traffic counts were conducted on Tuesday, March 12, 2019 from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM at the US Route 60 (Shore Drive)/Pleasure House Road intersection. The AM peak hour was identified as 7:15 – 8:15 AM and the PM peak hour was identified as 4:30 – 5:30 PM. The existing lane use is shown on Figure 1. The raw traffic data is included in Appendix A and the peak hours are shown on Figure 2.

Existing Safety Information

Per provided City data, in terms of crash frequency, the US Route 60 (Shore Drive)/Pleasure House Road intersection ranks 56th out of 376 intersections in the City. The section of Pleasure House Road from US Route 60 (Shore Drive) to Lookout Road ranks 112th out of 289 roadway segments in the City.

Background Traffic Volumes

2022 Background traffic volumes (without the expansion of the Windsong Apartments) were developed based on a 1% annual growth in existing traffic over the three (3) year period for project buildout.

The 1% annual growth rate was compounded annually over the three (3) year period and was applied to all movements from the existing traffic counts. The resulting 2022 background traffic volumes are shown on Figure 3.

Trip Generation/Distribution

The proposed Windsong Residential Development will remove 56 existing units, leaving 216 units on site, and adding 216 mid-rise apartment units. The total development will include 432 apartment units, split evenly between low-rise and mid-rise units. However, as directed by the City, for purposes of this analysis all units were assumed to be low-rise units. Low-rise apartments generate more traffic than mid-rise apartments and therefore the analysis represents a conservative (worst case) analysis.

Using the number of dwelling units as the independent variable, the trip generation estimates for the proposed development were calculated and are presented in Table 1 below:

**Table 1:
 Site-Generated Traffic for Windsong Residential Development**

Land Use	ITE Code	AMOUNT	UNITS	ADT	WEEKDAY					
					AM PEAK HOUR			PM PEAK HOUR		
					IN	OUT	TOTAL	IN	OUT	TOTAL
Multifamily Housing (Low-Rise)	220	432	Dwelling Units	3,225	44	147	192	137	80	217
TOTAL				3,225	44	147	192	137	80	217

SOURCE: Institute of Transportation Engineers' *Trip Generation Manual* 10th Edition (2017)

It was assumed that 100% of the trips generated by the proposed development would be oriented to the south and the US Route 60 (Shore Drive)/Pleasure House Road intersection. The distribution of trips at that intersection was further based on the existing traffic counts/travel patterns in the area. It was therefore assumed that 30% of traffic would be oriented to the west on US Route 60 (Shore Drive), 20% to the east on US Route 60 (Shore Drive), and 50% to the south on Pleasure House Road.

The net increase in site-generated traffic was distributed per the directional split summarized above; the resulting AM and PM peak hour site-generated traffic is shown on Figure 4.

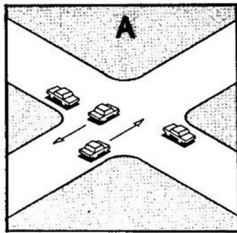
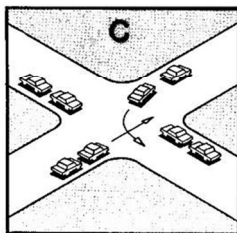
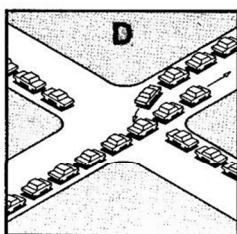
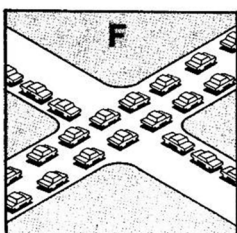
Projected Total Traffic

With respect to peak hour traffic, the 2022 background traffic volumes from Figure 3 were combined with the net increase in site-generated traffic estimates from Figure 4 to calculate the total traffic volumes shown on Figure 5.

Operational and Queuing Analysis

Capacity analysis allows traffic engineers to determine the impacts of traffic on the surrounding roadway network. The Transportation Research Board's (TRB) *Highway Capacity Manual* (HCM) methodologies govern how the capacity analyses are conducted and how the results are interpreted. There are six letter grades of Levels of Service (LOS) from A to F, with LOS A representing the best operating conditions and LOS F the worst operating conditions. Table 2 shows in detail how each of these levels of service are interpreted.

Table 2: Level of Service Definitions

Level of Service	Roadway Segments or Controlled Access Highways	Intersections	
A	Free flow, low traffic density.	No vehicle waits longer than one signal indication.	
B	Delay is not unreasonable, stable traffic flow.	On a rare occasion motorists wait through more than one signal indication.	
C	Stable condition, movements somewhat restricted due to higher volumes, but not objectionable for motorists.	Intermittently drivers wait through more than one signal indication, and occasionally backups may develop behind left turning vehicles, traffic flow still stable and acceptable.	
D	Movements more restricted, queues and delays may occur during short peaks, but lower demands occur often enough to permit clearing, thus preventing excessive backups.	Delays at intersections may become extensive with some, especially left-turning vehicles waiting two or more signal indications, but enough cycles with lower demand occur to permit periodic clearance, thus preventing excessive backups.	
E	Actual capacity of the roadway involves delay to all motorists due to congestion.	Very long queues may create lengthy delays, especially for left-turning vehicles.	
F	Forced flow with demand volumes greater than capacity resulting in complete congestion. Volumes drop to zero in extreme cases.	Backups from locations downstream restrict or prevent movement of vehicles out of approach creating a storage area during part or all of an hour.	

SOURCE: "A Policy on Design of Design of Urban Highways and Arterial Streets" - AASHTO, 1973 based upon material published in "Highway Capacity Manual", National Academy of Sciences, 1965.

For signalized and unsignalized intersections, level of service is defined in terms of **delay**, a measure of driver discomfort, frustration, fuel consumption and lost travel time. Table 3 summarizes the delay associated with each LOS category:

Table 3: Signalized and Unsignalized Intersection Level of Service Criteria

Signalized Intersections		Unsignalized Intersections	
Level of Service	Control Delay per Vehicle (sec/veh)	Level of Service	Average Control Delay (sec/veh)
A	≤ 10	A	0 to 10
B	> 10 to ≤ 20	B	> 10 to ≤ 15
C	> 20 to ≤ 35	C	> 15 to ≤ 25
D	> 35 to ≤ 55	D	> 25 to ≤ 35
E	> 55 to ≤ 80	E	> 35 to ≤ 50
F	> 80	F	> 50

*Source: Exhibit 16-2 and Exhibit 17-2 from
 TRB's "Highway Capacity Manual 2000"*

The existing lane use shown on Figure 1, the 2019 existing volumes shown on Figure 2, the background traffic volumes shown on Figure 3, and the estimated total volumes (background + site) shown on Figure 5 were used to perform a capacity analysis utilizing HCM 6th edition methodology for signalized intersections. The City provided the existing traffic signal timings for the intersection which were held for all analysis scenarios.

The results of the analysis are shown in Figure 6 and indicate the following:

2019 Existing Conditions

- The US Route 60 (Shore Drive)/Pleasure House Road intersection operates at an overall LOS D in the AM peak hour (39.7 seconds of delay per vehicle) and LOS E in the PM peak hour (58.5 seconds of delay per vehicle).

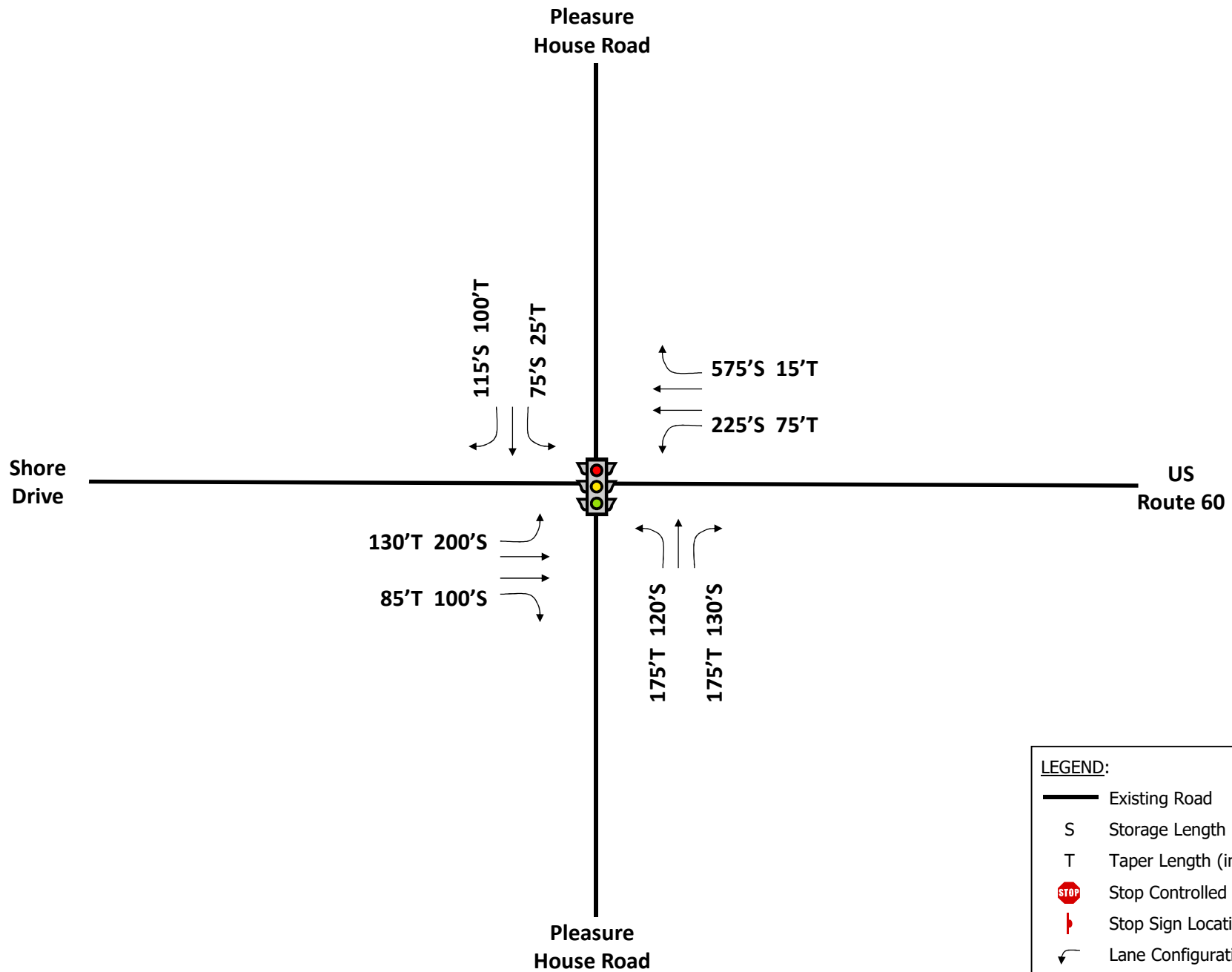
2022 Background Volume Conditions (without the addition of the site traffic)

- The US Route 60 (Shore Drive)/Pleasure House Road intersection continues to operate at an overall LOS D in the AM peak hour (40.3 seconds of delay per vehicle) and LOS E in the PM peak hour (59.6 seconds of delay per vehicle).

2022 Total Volume Conditions (with the addition of the site traffic)

- The US Route 60 (Shore Drive)/Pleasure House Road intersection continues to operate at an overall LOS D in the AM peak hour (42.3 seconds of delay per vehicle) and LOS E in the PM peak hour (61.5 seconds of delay per vehicle).
- When compared to Background conditions, the addition of the site traffic increases the delay at the intersection by 2.0 seconds/vehicle in the AM peak hour and 1.9 seconds per vehicle in the PM peak hour).

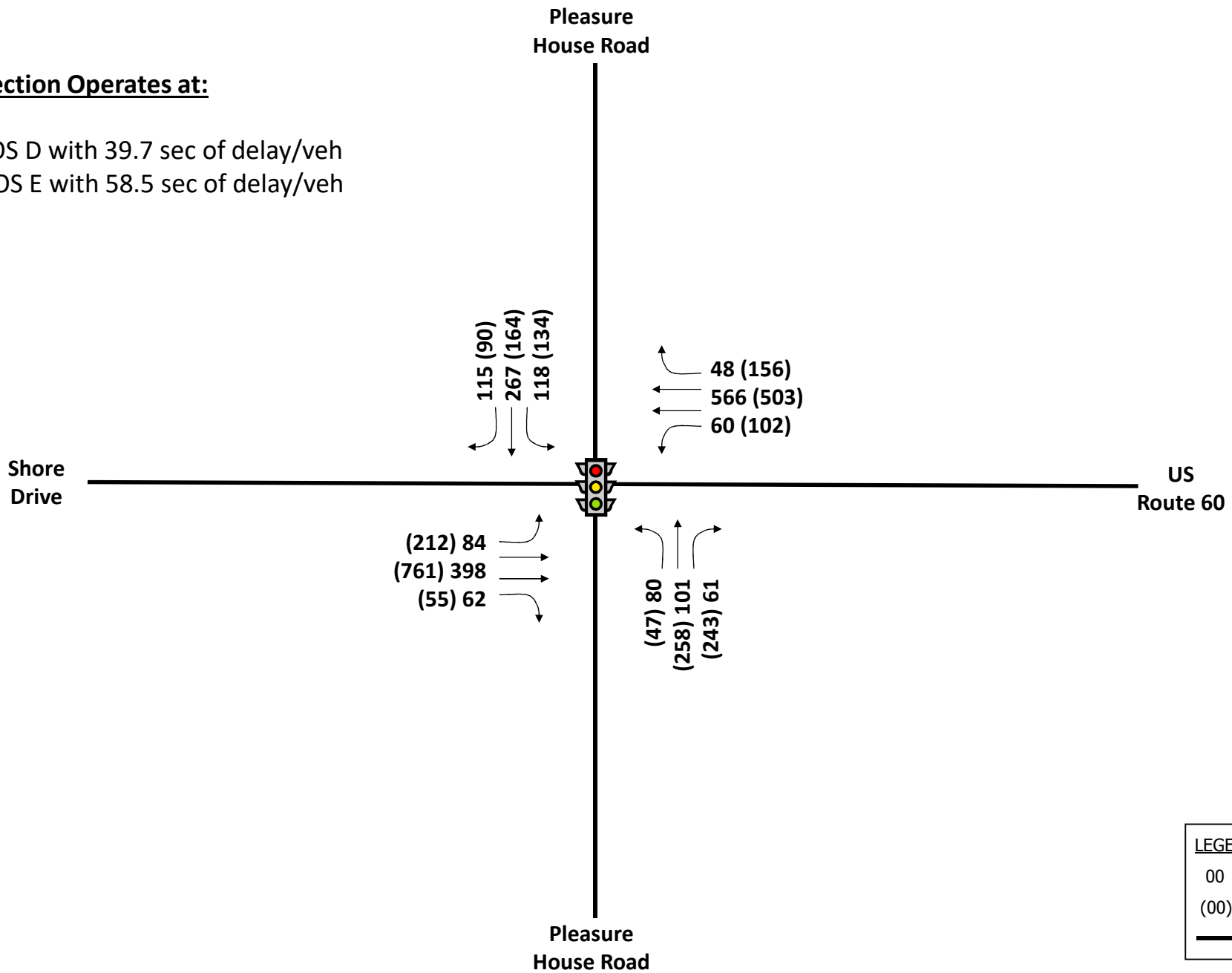
The corresponding SYNCHRO/SimTraffic outputs are included in Appendix B (2019 Existing Conditions), Appendix C (Background Traffic Volumes), and Appendix D (Total Volume Conditions).



Intersection Operates at:

AM: LOS D with 39.7 sec of delay/veh

PM: LOS E with 58.5 sec of delay/veh

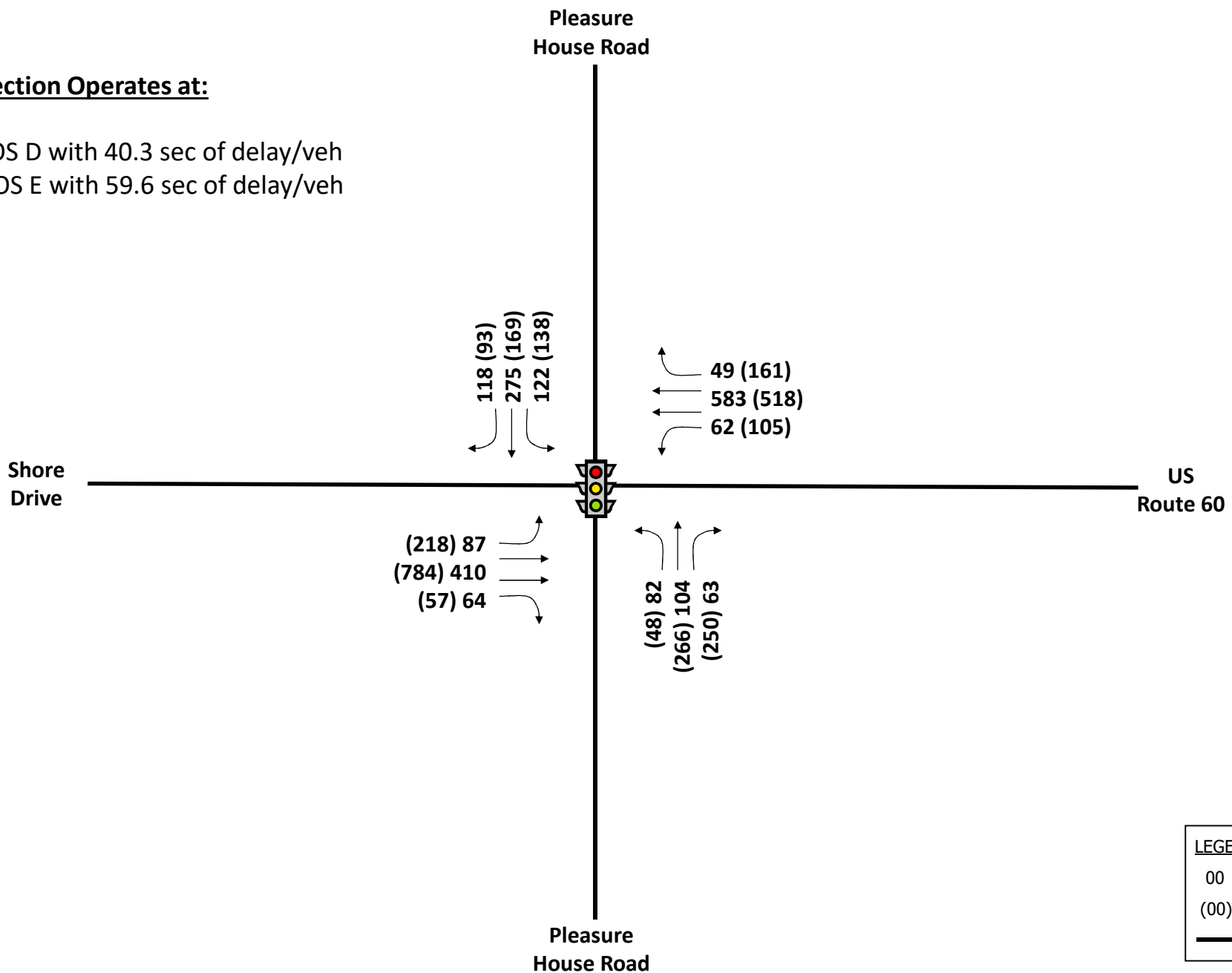


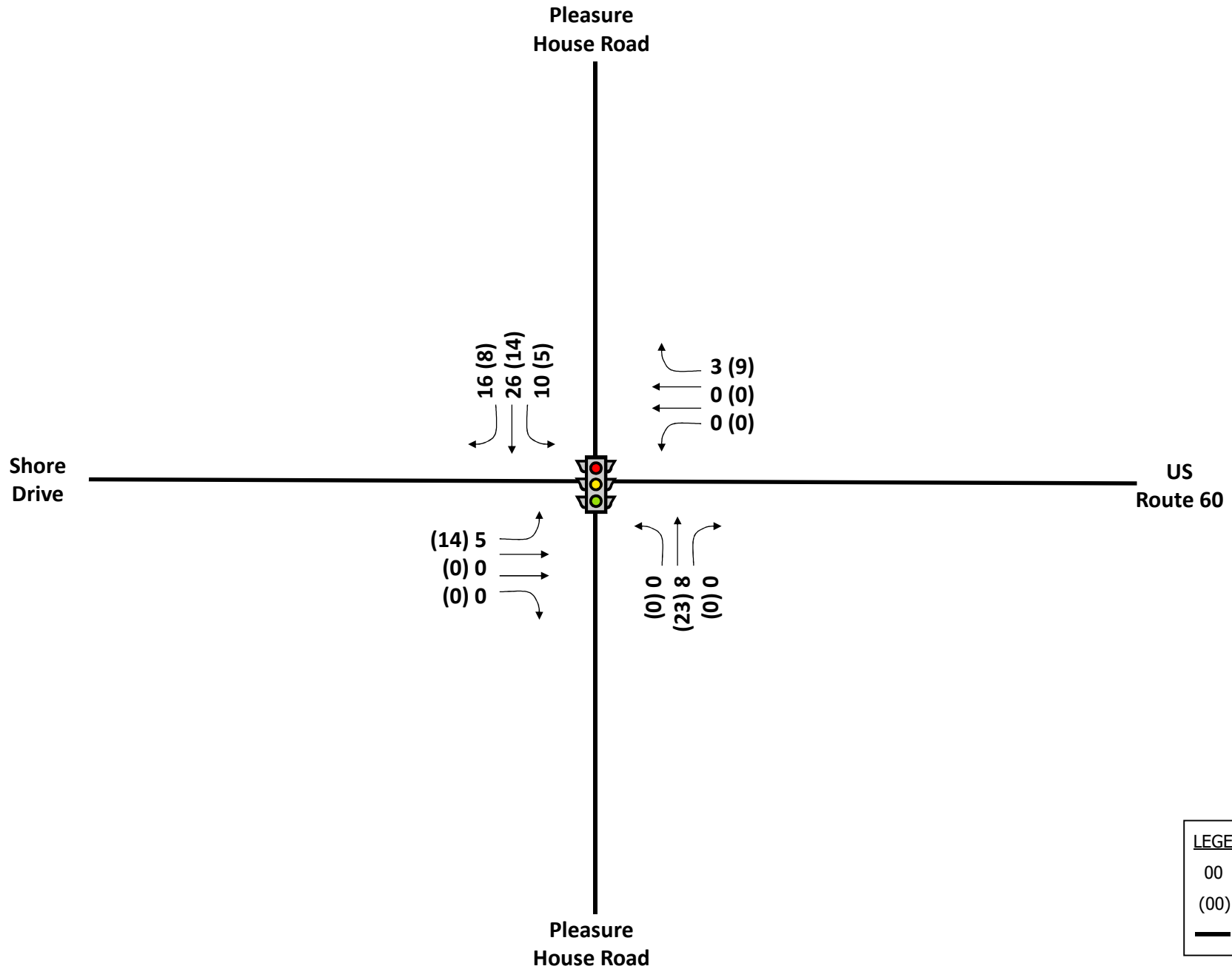
LEGEND:	
00	AM Peak Hour
(00)	PM Peak Hour
—	Existing Road

Intersection Operates at:

AM: LOS D with 40.3 sec of delay/veh

PM: LOS E with 59.6 sec of delay/veh

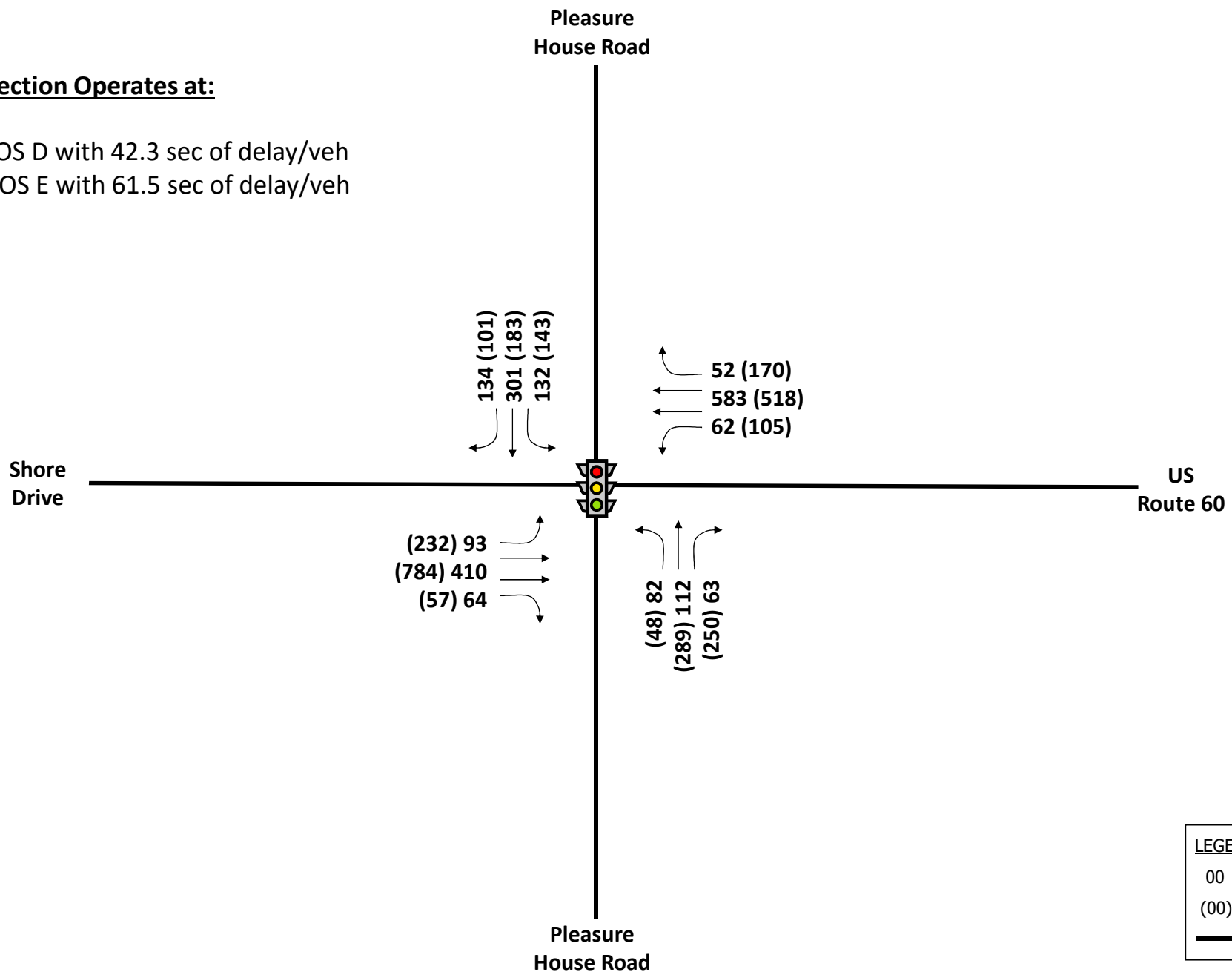




Intersection Operates at:

AM: LOS D with 42.3 sec of delay/veh

PM: LOS E with 61.5 sec of delay/veh



LEGEND:

00 AM Peak Hour

(00) PM Peak Hour

— Existing Road

2019 Existing Conditions

AM: LOS D with 39.7 sec of delay/veh
PM: LOS E with 58.5 sec of delay/veh

Intersection and Type of Control	Type of Control	Movement and Approach	Turn Lane Storage (ft)	AM PEAK HOUR			PM PEAK HOUR		
				Delay ¹ (sec/veh)	LOS ¹	SimTraffic Max Percentile Queue Length (ft)	Delay ¹ (sec/veh)	LOS ¹	SimTraffic Max Percentile Queue Length (ft)
1. Pleasure House Road (N-S) at Shore Drive (E-W)	Signal	EB Left	200	81.2	F	187	97.2	F	290
		EB Thru		21.3	C	172	37.3	D	508
		EB Right	100	19.7	B	126	29.2	C	168
		EB Approach		30.4	C	--	51.0	D	--
		WB Left	225	68.7	E	128	97.1	F	255
		WB Thru		24.7	C	227	42.5	D	305
		WB Right	575	20.5	C	57	42.0	D	123
		WB Approach		28.6	C	--	51.2	D	--
		NB Left	120	55.1	E	144	51.7	D	218
		NB Thru		59.9	E	165	62.3	E	496
		NB Right	130	56.0	E	72	80.2	F	242
		NB Approach		57.4	E	--	69.8	E	--
		SB Left	75	45.0	D	112	70.6	E	112
		SB Thru		66.6	E	495	86.3	F	518
		SB Right	115	44.0	D	190	68.2	E	190
		SB Approach		55.8	E	--	77.1	E	--
		Overall LOS		39.7	D	--	58.5	E	--

¹ Overall intersection LOS and delay reported for signalized intersections only.

† SYNCHRO does not provide level of service or delay for unsignalized movements with no conflicting volumes.

2022 Background Conditions (w/o Site)

AM: LOS D with 40.3 sec of delay/veh
PM: LOS E with 59.6 sec of delay/veh

Intersection and Type of Control	Type of Control	Movement and Approach	Turn Lane Storage (ft)	AM PEAK HOUR			PM PEAK HOUR		
				Delay ¹ (sec/veh)	LOS ¹	SimTraffic Max Percentile Queue Length (ft)	Delay ¹ (sec/veh)	LOS ¹	SimTraffic Max Percentile Queue Length (ft)
1. Pleasure House Road (N-S) at Shore Drive (E-W)	Signal	EB Left	200	82.1	F	174	98.0	F	290
		EB Thru		22.0	C	205	39.2	D	513
		EB Right	100	20.4	C	154	30.4	C	168
		EB Approach		31.2	C	--	52.5	D	--
		WB Left	225	68.4	E	139	98.0	F	254
		WB Thru		25.8	C	253	44.5	D	297
		WB Right	575	21.2	C	58	44.0	D	144
		WB Approach		29.5	C	--	53.0	D	--
		NB Left	120	54.8	D	164	51.0	D	230
		NB Thru		59.7	E	171	62.0	E	522
		NB Right	130	55.8	E	68	80.8	F	242
		NB Approach		57.2	E	--	69.9	E	--
		SB Left	75	44.7	D	113	70.6	E	113
		SB Thru		67.8	E	660	87.2	F	671
		SB Right	115	43.6	D	190	67.9	E	190
		SB Approach		56.3	E	--	77.4	E	--
		Overall LOS		40.3	D	--	59.6	E	--

¹ Overall intersection LOS and delay reported for signalized intersections only.

† SYNCHRO does not provide level of service or delay for unsignalized movements with no conflicting volumes.

2022 Total Conditions (with Site)

AM: LOS D with 42.3 sec of delay/veh
Increase (over Background) of 2.0 sec/veh

PM: LOS E with 61.5 sec of delay/veh
Increase (over Background) of 1.9 sec/veh

Intersection and Type of Control	Type of Control	Movement and Approach	Turn Lane Storage (ft)	AM PEAK HOUR			PM PEAK HOUR		
				Delay ¹ (sec/veh)	LOS ¹	SimTraffic Max Percentile Queue Length (ft)	Delay ¹ (sec/veh)	LOS ¹	SimTraffic Max Percentile Queue Length (ft)
1. Pleasure House Road (N-S) at Shore Drive (E-W)	Signal	EB Left	200	84.4	F	164	100.2	F	290
		EB Thru		23.5	C	205	40.5	D	515
		EB Right	100	21.8	C	156	31.3	C	168
		EB Approach		33.4	C	--	54.7	D	--
		WB Left	225	68.4	E	153	98.0	F	235
		WB Thru		27.9	C	259	47.1	D	294
		WB Right	575	23.0	C	57	47.3	D	172
		WB Approach		31.4	C	--	55.2	E	--
		NB Left	120	53.7	D	149	50.9	D	232
		NB Thru		59.4	E	202	65.3	E	553
		NB Right	130	54.6	D	63	80.3	F	242
		NB Approach		56.5	E	--	70.9	E	--
		SB Left	75	43.8	D	112	69.5	E	113
		SB Thru		72.1	E	949	89.7	F	642
		SB Right	115	42.9	D	190	67.0	E	190
		SB Approach		58.0	E	--	78.0	E	--
		Overall LOS		42.3	D	--	61.5	E	--

¹ Overall intersection LOS and delay reported for signalized intersections only.

† SYNCHRO does not provide level of service or delay for unsignalized movements with no conflicting volumes.

APPENDIX A

Traffic Count Data

Peggy Malone & Associates

904-992-8072

File Name : Pleasure House Rd. & Shore Dr. AM
 Site Code :
 Start Date : 3/12/2019
 Page No : 1

Groups Printed- Car

	Pleasure House Rd. Southbound					Shore Dr. Westbound					Pleasure House Rd. Northbound					Shore Dr. Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	31	55	12	0	98	8	63	12	1	84	5	11	33	0	49	7	48	6	3	64	295
07:15 AM	27	62	23	0	112	16	151	13	0	180	6	18	34	0	58	3	73	11	3	90	440
07:30 AM	55	66	25	0	146	10	125	13	0	148	14	15	24	0	53	7	85	9	0	101	448
07:45 AM	26	65	22	0	113	11	162	18	0	191	12	24	20	0	56	8	83	12	0	103	463
Total	139	248	82	0	469	45	501	56	1	603	37	68	111	0	216	25	289	38	6	358	1646
08:00 AM	25	59	41	1	126	9	105	17	0	131	11	16	17	0	44	14	91	22	1	128	429
08:15 AM	32	76	27	1	136	12	149	11	0	172	19	24	20	1	64	20	102	19	1	142	514
08:30 AM	31	62	27	0	120	14	137	12	0	163	18	31	19	0	68	13	113	25	0	151	502
08:45 AM	30	45	16	0	91	14	123	17	0	154	23	23	26	1	73	10	81	18	0	109	427
Total	118	242	111	2	473	49	514	57	0	620	71	94	82	2	249	57	387	84	2	530	1872
Grand Total	257	490	193	2	942	94	1015	113	1	1223	108	162	193	2	465	82	676	122	8	888	3518
Apprch %	27.3	52	20.5	0.2		7.7	83	9.2	0.1		23.2	34.8	41.5	0.4		9.2	76.1	13.7	0.9		
Total %	7.3	13.9	5.5	0.1	26.8	2.7	28.9	3.2	0	34.8	3.1	4.6	5.5	0.1	13.2	2.3	19.2	3.5	0.2	25.2	

	Pleasure House Rd. Southbound				Shore Dr. Westbound				Pleasure House Rd. Northbound				Shore Dr. Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	26	65	22	113	11	162	18	191	12	24	20	56	8	83	12	103	463
08:00 AM	25	59	41	125	9	105	17	131	11	16	17	44	14	91	22	127	427
08:15 AM	32	76	27	135	12	149	11	172	19	24	20	63	20	102	19	141	511
08:30 AM	31	62	27	120	14	137	12	163	18	31	19	68	13	113	25	151	502
Total Volume	114	262	117	493	46	553	58	657	60	95	76	231	55	389	78	522	1903
% App. Total	23.1	53.1	23.7		7	84.2	8.8		26	41.1	32.9		10.5	74.5	14.9		
PHF	.891	.862	.713	.913	.821	.853	.806	.860	.789	.766	.950	.849	.688	.861	.780	.864	.931

Peggy Malone & Associates

904-992-8072

File Name : Pleasure House Rd. & Shore Dr. AM
 Site Code :
 Start Date : 3/12/2019
 Page No : 1

Groups Printed- Truck

	Pleasure House Rd. Southbound					Shore Dr. Westbound					Pleasure House Rd. Northbound					Shore Dr. Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	0	1	1	0	2	1	0	0	0	1	1	2	0	0	3	0	0	0	0	0	6
07:15 AM	0	2	1	0	3	0	4	0	0	4	1	4	0	0	5	2	0	0	0	2	14
07:30 AM	0	1	1	0	2	0	2	0	0	2	0	3	0	0	3	2	0	0	0	2	9
07:45 AM	0	1	0	0	1	0	3	0	0	3	0	2	1	0	3	3	1	0	0	4	11
Total	0	5	3	0	8	1	9	0	0	10	2	11	1	0	14	7	1	0	0	8	40
08:00 AM	1	1	1	0	3	1	3	2	0	6	0	2	2	0	4	0	3	3	0	6	19
08:15 AM	0	2	0	0	2	0	2	0	0	2	1	2	1	0	4	3	1	2	0	6	14
08:30 AM	0	1	0	0	1	1	5	0	0	6	0	0	0	0	0	1	4	1	0	6	13
08:45 AM	0	1	3	0	4	1	0	0	0	1	1	0	0	0	1	4	3	2	0	9	15
Total	1	5	4	0	10	3	10	2	0	15	2	4	3	0	9	8	11	8	0	27	61
Grand Total	1	10	7	0	18	4	19	2	0	25	4	15	4	0	23	15	12	8	0	35	101
Apprch %	5.6	55.6	38.9	0		16	76	8	0		17.4	65.2	17.4	0		42.9	34.3	22.9	0		
Total %	1	9.9	6.9	0	17.8	4	18.8	2	0	24.8	4	14.9	4	0	22.8	14.9	11.9	7.9	0	34.7	

	Pleasure House Rd. Southbound				Shore Dr. Westbound				Pleasure House Rd. Northbound				Shore Dr. Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	1	1	1	3	1	3	2	6	0	2	2	4	0	3	3	6	19
08:15 AM	0	2	0	2	0	2	0	2	1	2	1	4	3	1	2	6	14
08:30 AM	0	1	0	1	1	5	0	6	0	0	0	0	1	4	1	6	13
08:45 AM	0	1	3	4	1	0	0	1	1	0	0	1	4	3	2	9	15
Total Volume	1	5	4	10	3	10	2	15	2	4	3	9	8	11	8	27	61
% App. Total	10	50	40		20	66.7	13.3		22.2	44.4	33.3		29.6	40.7	29.6		
PHF	.250	.625	.333	.625	.750	.500	.250	.625	.500	.500	.375	.563	.500	.688	.667	.750	.803

Peggy Malone & Associates

904-992-8072

File Name : Pleasure House Rd. & Shore Dr. AM
 Site Code :
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Groups Printed- Combined

	Pleasure House Rd. Southbound					Shore Dr. Westbound					Pleasure House Rd. Northbound					Shore Dr. Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	31	56	13	0	100	9	63	12	1	85	6	13	33	0	52	7	48	6	3	64	301
07:15 AM	27	64	24	0	115	16	155	13	0	184	7	22	34	0	63	5	73	11	3	92	454
07:30 AM	55	67	26	0	148	10	127	13	0	150	14	18	24	0	56	9	85	9	0	103	457
07:45 AM	26	66	22	0	114	11	165	18	0	194	12	26	21	0	59	11	84	12	0	107	474
Total	139	253	85	0	477	46	510	56	1	613	39	79	112	0	230	32	290	38	6	366	1686
08:00 AM	26	60	42	1	129	10	108	19	0	137	11	18	19	0	48	14	94	25	1	134	448
08:15 AM	32	78	27	1	138	12	151	11	0	174	20	26	21	1	68	23	103	21	1	148	528
08:30 AM	31	63	27	0	121	15	142	12	0	169	18	31	19	0	68	14	117	26	0	157	515
08:45 AM	30	46	19	0	95	15	123	17	0	155	24	23	26	1	74	14	84	20	0	118	442
Total	119	247	115	2	483	52	524	59	0	635	73	98	85	2	258	65	398	92	2	557	1933
Grand Total	258	500	200	2	960	98	1034	115	1	1248	112	177	197	2	488	97	688	130	8	923	3619
Apprch %	26.9	52.1	20.8	0.2		7.9	82.9	9.2	0.1		23	36.3	40.4	0.4		10.5	74.5	14.1	0.9		
Total %	7.1	13.8	5.5	0.1	26.5	2.7	28.6	3.2	0	34.5	3.1	4.9	5.4	0.1	13.5	2.7	19	3.6	0.2	25.5	

	Pleasure House Rd. Southbound				Shore Dr. Westbound				Pleasure House Rd. Northbound				Shore Dr. Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	26	66	22	114	11	165	18	194	12	26	21	59	11	84	12	107	474
08:00 AM	26	60	42	128	10	108	19	137	11	18	19	48	14	94	25	133	446
08:15 AM	32	78	27	137	12	151	11	174	20	26	21	67	23	103	21	147	525
08:30 AM	31	63	27	121	15	142	12	169	18	31	19	68	14	117	26	157	515
Total Volume	115	267	118	500	48	566	60	674	61	101	80	242	62	398	84	544	1960
% App. Total	23	53.4	23.6		7.1	84	8.9		25.2	41.7	33.1		11.4	73.2	15.4		
PHF	.898	.856	.702	.912	.800	.858	.789	.869	.763	.815	.952	.890	.674	.850	.808	.866	.933

Peggy Malone & Associates

904-992-8072

File Name : Pleasure House Rd. & Shore Dr. PM
 Site Code :
 Start Date : 3/12/2019
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Groups Printed- Car

	Pleasure House Rd. Southbound					Shore Dr. Westbound					Pleasure House Rd. Northbound					Shore Dr. Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
04:00 PM	15	38	30	0	83	31	102	23	0	156	48	62	16	0	126	11	140	43	1	195	560
04:15 PM	15	41	35	0	91	42	131	24	0	197	44	55	7	1	107	18	171	37	1	227	622
04:30 PM	20	40	34	1	95	32	105	24	0	161	46	65	13	3	127	8	209	50	2	269	652
04:45 PM	21	49	35	0	105	32	136	31	0	199	64	71	9	2	146	13	184	36	2	235	685
Total	71	168	134	1	374	137	474	102	0	713	202	253	45	6	506	50	704	166	6	926	2519
05:00 PM	24	33	34	0	91	50	129	36	0	215	75	50	11	0	136	14	166	56	0	236	678
05:15 PM	22	41	29	0	92	40	123	11	0	174	56	71	14	0	141	11	199	70	0	280	687
05:30 PM	14	37	31	0	82	38	131	24	0	193	61	73	7	0	141	9	138	39	0	186	602
05:45 PM	17	30	15	0	62	34	104	22	0	160	54	64	13	0	131	15	152	57	0	224	577
Total	77	141	109	0	327	162	487	93	0	742	246	258	45	0	549	49	655	222	0	926	2544
Grand Total	148	309	243	1	701	299	961	195	0	1455	448	511	90	6	1055	99	1359	388	6	1852	5063
Apprch %	21.1	44.1	34.7	0.1		20.5	66	13.4	0		42.5	48.4	8.5	0.6		5.3	73.4	21	0.3		
Total %	2.9	6.1	4.8	0	13.8	5.9	19	3.9	0	28.7	8.8	10.1	1.8	0.1	20.8	2	26.8	7.7	0.1	36.6	

	Pleasure House Rd. Southbound				Shore Dr. Westbound				Pleasure House Rd. Northbound				Shore Dr. Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	20	40	34	94	32	105	24	161	46	65	13	124	8	209	50	267	646
04:45 PM	21	49	35	105	32	136	31	199	64	71	9	144	13	184	36	233	681
05:00 PM	24	33	34	91	50	129	36	215	75	50	11	136	14	166	56	236	678
05:15 PM	22	41	29	92	40	123	11	174	56	71	14	141	11	199	70	280	687
Total Volume	87	163	132	382	154	493	102	749	241	257	47	545	46	758	212	1016	2692
% App. Total	22.8	42.7	34.6		20.6	65.8	13.6		44.2	47.2	8.6		4.5	74.6	20.9		
PHF	.906	.832	.943	.910	.770	.906	.708	.871	.803	.905	.839	.946	.821	.907	.757	.907	.980

Peggy Malone & Associates

904-992-8072

File Name : Pleasure House Rd. & Shore Dr. PM
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Groups Printed- Truck

	Pleasure House Rd. Southbound					Shore Dr. Westbound					Pleasure House Rd. Northbound					Shore Dr. Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
04:00 PM	0	1	0	0	1	0	3	0	0	3	0	1	0	0	1	0	1	0	0	1	6
04:15 PM	1	2	0	0	3	1	4	0	0	5	2	1	1	0	4	1	0	0	0	1	13
04:30 PM	1	0	1	0	2	1	2	0	0	3	1	1	0	0	2	2	0	0	0	2	9
04:45 PM	1	0	1	0	2	0	1	0	0	1	1	0	0	0	1	4	1	0	0	5	9
Total	3	3	2	0	8	2	10	0	0	12	4	3	1	0	8	7	2	0	0	9	37
05:00 PM	1	1	0	0	2	1	5	0	1	7	0	0	0	0	0	0	2	0	0	2	11
05:15 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	3	0	0	0	3	5
05:30 PM	0	0	1	0	1	1	1	0	0	2	1	0	0	0	1	1	0	0	0	1	5
05:45 PM	0	1	0	0	1	1	2	0	0	3	0	2	1	0	3	3	1	0	0	4	11
Total	1	2	1	0	4	3	10	0	1	14	1	2	1	0	4	7	3	0	0	10	32
Grand Total	4	5	3	0	12	5	20	0	1	26	5	5	2	0	12	14	5	0	0	19	69
Apprch %	33.3	41.7	25	0		19.2	76.9	0	3.8		41.7	41.7	16.7	0		73.7	26.3	0	0		
Total %	5.8	7.2	4.3	0	17.4	7.2	29	0	1.4	37.7	7.2	7.2	2.9	0	17.4	20.3	7.2	0	0	27.5	

	Pleasure House Rd. Southbound				Shore Dr. Westbound				Pleasure House Rd. Northbound				Shore Dr. Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	1	2	0	3	1	4	0	5	2	1	1	4	1	0	0	1	13
04:30 PM	1	0	1	2	1	2	0	3	1	1	0	2	2	0	0	2	9
04:45 PM	1	0	1	2	0	1	0	1	1	0	0	1	4	1	0	5	9
05:00 PM	1	1	0	2	1	5	0	6	0	0	0	0	0	2	0	2	10
Total Volume	4	3	2	9	3	12	0	15	4	2	1	7	7	3	0	10	41
% App. Total	44.4	33.3	22.2		20	80	0		57.1	28.6	14.3		70	30	0		
PHF	1.00	.375	.500	.750	.750	.600	.000	.625	.500	.500	.250	.438	.438	.375	.000	.500	.788

Peggy Malone & Associates

904-992-8072

File Name : Pleasure House Rd. & Shore Dr. PM
 Site Code :
 Start Date : 3/12/2019
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Groups Printed- Combined

	Pleasure House Rd. Southbound					Shore Dr. Westbound					Pleasure House Rd. Northbound					Shore Dr. Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
04:00 PM	15	39	30	0	84	31	105	23	0	159	48	63	16	0	127	11	141	43	1	196	566
04:15 PM	16	43	35	0	94	43	135	24	0	202	46	56	8	1	111	19	171	37	1	228	635
04:30 PM	21	40	35	1	97	33	107	24	0	164	47	66	13	3	129	10	209	50	2	271	661
04:45 PM	22	49	36	0	107	32	137	31	0	200	65	71	9	2	147	17	185	36	2	240	694
Total	74	171	136	1	382	139	484	102	0	725	206	256	46	6	514	57	706	166	6	935	2556
05:00 PM	25	34	34	0	93	51	134	36	1	222	75	50	11	0	136	14	168	56	0	238	689
05:15 PM	22	41	29	0	92	40	125	11	0	176	56	71	14	0	141	14	199	70	0	283	692
05:30 PM	14	37	32	0	83	39	132	24	0	195	62	73	7	0	142	10	138	39	0	187	607
05:45 PM	17	31	15	0	63	35	106	22	0	163	54	66	14	0	134	18	153	57	0	228	588
Total	78	143	110	0	331	165	497	93	1	756	247	260	46	0	553	56	658	222	0	936	2576
Grand Total	152	314	246	1	713	304	981	195	1	1481	453	516	92	6	1067	113	1364	388	6	1871	5132
Apprch %	21.3	44	34.5	0.1		20.5	66.2	13.2	0.1		42.5	48.4	8.6	0.6		6	72.9	20.7	0.3		
Total %	3	6.1	4.8	0	13.9	5.9	19.1	3.8	0	28.9	8.8	10.1	1.8	0.1	20.8	2.2	26.6	7.6	0.1	36.5	

	Pleasure House Rd. Southbound				Shore Dr. Westbound				Pleasure House Rd. Northbound				Shore Dr. Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	21	40	35	96	33	107	24	164	47	66	13	126	10	209	50	269	655
04:45 PM	22	49	36	107	32	137	31	200	65	71	9	145	17	185	36	238	690
05:00 PM	25	34	34	93	51	134	36	221	75	50	11	136	14	168	56	238	688
05:15 PM	22	41	29	92	40	125	11	176	56	71	14	141	14	199	70	283	692
Total Volume	90	164	134	388	156	503	102	761	243	258	47	548	55	761	212	1028	2725
% App. Total	23.2	42.3	34.5		20.5	66.1	13.4		44.3	47.1	8.6		5.4	74	20.6		
PHF	.900	.837	.931	.907	.765	.918	.708	.861	.810	.908	.839	.945	.809	.910	.757	.908	.984

APPENDIX B

2019 Existing Conditions Analysis Reports

HCM 6th Signalized Intersection Summary

3: Pleasure House Road & Shore Drive

04/15/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	84	398	62	60	566	48	80	101	61	118	267	115
Future Volume (veh/h)	84	398	62	60	566	48	80	101	61	118	267	115
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1752	1856	1707	1856	1870	1811	1841	1841	1856	1856	1870	1900
Adj Flow Rate, veh/h	104	468	93	76	658	60	84	123	80	169	310	128
Peak Hour Factor	0.81	0.85	0.67	0.79	0.86	0.80	0.95	0.82	0.76	0.70	0.86	0.90
Percent Heavy Veh, %	10	3	13	3	2	6	4	4	3	3	2	0
Cap, veh/h	127	1592	653	97	1531	661	157	165	141	331	350	301
Arrive On Green	0.08	0.45	0.45	0.06	0.43	0.43	0.09	0.09	0.09	0.19	0.19	0.19
Sat Flow, veh/h	1668	3526	1447	1767	3554	1535	1753	1841	1572	1767	1870	1610
Grp Volume(v), veh/h	104	468	93	76	658	60	84	123	80	169	310	128
Grp Sat Flow(s),veh/h/ln	1668	1763	1447	1767	1777	1535	1753	1841	1572	1767	1870	1610
Q Serve(g_s), s	7.4	10.1	4.5	5.1	15.5	2.8	5.5	7.8	5.9	10.3	19.4	8.4
Cycle Q Clear(g_c), s	7.4	10.1	4.5	5.1	15.5	2.8	5.5	7.8	5.9	10.3	19.4	8.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	127	1592	653	97	1531	661	157	165	141	331	350	301
V/C Ratio(X)	0.82	0.29	0.14	0.78	0.43	0.09	0.54	0.75	0.57	0.51	0.89	0.42
Avail Cap(c_a), veh/h	147	1592	653	215	1531	661	342	359	307	374	396	341
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	54.6	20.8	19.3	56.0	23.9	20.2	52.2	53.3	52.4	43.8	47.5	43.1
Incr Delay (d2), s/veh	26.5	0.5	0.5	12.7	0.9	0.3	2.8	6.6	3.6	1.2	19.1	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.0	4.2	1.6	2.6	6.6	1.0	2.5	3.9	2.4	4.6	10.8	3.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	81.2	21.3	19.7	68.7	24.7	20.5	55.1	59.9	56.0	45.0	66.6	44.0
LnGrp LOS	F	C	B	E	C	C	E	E	E	D	E	D
Approach Vol, veh/h	665			794			287			607		
Approach Delay, s/veh	30.4			28.6			57.4			55.8		
Approach LOS	C			C			E			E		
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.0	60.6		29.1	15.5	58.1		17.3				
Change Period (Y+Rc), s	6.4	6.4		6.6	6.4	6.4		6.6				
Max Green Setting (Gmax), s	14.6	30.6		25.4	10.6	34.6		23.4				
Max Q Clear Time (g_c+I1), s	7.1	12.1		21.4	9.4	17.5		9.8				
Green Ext Time (p_c), s	0.1	4.4		1.1	0.0	5.7		0.9				
Intersection Summary												
HCM 6th Ctrl Delay	39.7											
HCM 6th LOS	D											

Queuing and Blocking Report

Existing AM

04/15/2019

Intersection: 3: Pleasure House Road & Shore Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	187	172	161	126	128	227	222	57	144	165	72	112
Average Queue (ft)	82	95	83	28	52	131	122	20	64	75	24	82
95th Queue (ft)	157	154	145	81	102	205	204	48	122	136	57	144
Link Distance (ft)		1846	1846			1892	1892			1439		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	265			143	262			582	207		217	88
Storage Blk Time (%)	0		1	0		0				0		8
Queuing Penalty (veh)	0		1	0		0				0		28

Intersection: 3: Pleasure House Road & Shore Drive

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	495	190
Average Queue (ft)	247	89
95th Queue (ft)	446	213
Link Distance (ft)	1509	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		165
Storage Blk Time (%)	45	0
Queuing Penalty (veh)	103	0

Network Summary

Network wide Queuing Penalty: 132

HCM 6th Signalized Intersection Summary

3: Pleasure House Road & Shore Drive

03/15/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	212	761	55	102	503	156	47	258	243	134	164	90
Future Volume (veh/h)	212	761	55	102	503	156	47	258	243	134	164	90
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1707	1900	1870	1870	1870	1885	1870	1885	1870	1841
Adj Flow Rate, veh/h	279	836	68	144	547	203	56	284	300	144	195	100
Peak Hour Factor	0.76	0.91	0.81	0.71	0.92	0.77	0.84	0.91	0.81	0.93	0.84	0.90
Percent Heavy Veh, %	0	0	13	0	2	2	2	1	2	1	2	4
Cap, veh/h	300	1494	599	166	1207	538	375	397	334	218	227	189
Arrive On Green	0.17	0.41	0.41	0.09	0.34	0.34	0.21	0.21	0.21	0.12	0.12	0.12
Sat Flow, veh/h	1810	3610	1447	1810	3554	1585	1781	1885	1585	1795	1870	1560
Grp Volume(v), veh/h	279	836	68	144	547	203	56	284	300	144	195	100
Grp Sat Flow(s),veh/h/ln	1810	1805	1447	1810	1777	1585	1781	1885	1585	1795	1870	1560
Q Serve(g_s), s	24.3	28.3	4.6	12.6	19.2	15.5	4.1	22.4	29.5	12.3	16.4	9.6
Cycle Q Clear(g_c), s	24.3	28.3	4.6	12.6	19.2	15.5	4.1	22.4	29.5	12.3	16.4	9.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	300	1494	599	166	1207	538	375	397	334	218	227	189
V/C Ratio(X)	0.93	0.56	0.11	0.87	0.45	0.38	0.15	0.72	0.90	0.66	0.86	0.53
Avail Cap(c_a), veh/h	323	1494	599	210	1207	538	472	500	420	285	297	248
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	65.8	35.8	28.8	71.7	41.2	40.0	51.5	58.7	61.5	67.1	68.9	66.0
Incr Delay (d2), s/veh	31.4	1.5	0.4	25.4	1.2	2.0	0.2	3.6	18.7	3.5	17.4	2.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.8	12.8	1.7	7.0	8.7	6.4	1.9	11.1	13.6	5.8	8.9	4.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	97.2	37.3	29.2	97.1	42.5	42.0	51.7	62.3	80.2	70.6	86.3	68.2
LnGrp LOS	F	D	C	F	D	D	D	E	F	E	F	E
Approach Vol, veh/h		1183			894			640			439	
Approach Delay, s/veh		51.0			51.2			69.8			77.1	
Approach LOS		D			D			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	21.1	72.6		26.0	32.9	60.7		40.3				
Change Period (Y+Rc), s	6.4	6.4		6.6	6.4	6.4		6.6				
Max Green Setting (Gmax), s	18.6	47.6		25.4	28.6	37.6		42.4				
Max Q Clear Time (g_c+I1), s	14.6	30.3		18.4	26.3	21.2		31.5				
Green Ext Time (p_c), s	0.1	7.4		1.1	0.2	5.4		2.2				
Intersection Summary												
HCM 6th Ctrl Delay			58.5									
HCM 6th LOS			E									

Queuing and Blocking Report

Existing PM

03/15/2019

Intersection: 3: Pleasure House Road & Shore Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	290	508	484	168	255	305	294	123	218	496	242	112
Average Queue (ft)	205	254	243	51	102	166	158	52	53	229	126	93
95th Queue (ft)	321	430	400	159	195	261	255	102	157	407	264	140
Link Distance (ft)		1846	1846			1892	1892			1439		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	265			143	262			582	207		217	88
Storage Blk Time (%)	9	4	26	0	0	1				13	0	24
Queuing Penalty (veh)	36	10	15	0	1	1				39	1	61

Intersection: 3: Pleasure House Road & Shore Drive

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	518	190
Average Queue (ft)	243	74
95th Queue (ft)	448	190
Link Distance (ft)	1509	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		165
Storage Blk Time (%)	39	0
Queuing Penalty (veh)	88	0

Network Summary

Network wide Queuing Penalty: 252

APPENDIX C

Background Traffic Conditions Analysis Reports

HCM 6th Signalized Intersection Summary

3: Pleasure House Road & Shore Drive

10/17/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	87	410	64	62	583	49	82	104	63	122	275	118
Future Volume (veh/h)	87	410	64	62	583	49	82	104	63	122	275	118
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1752	1856	1707	1856	1870	1811	1841	1841	1856	1856	1870	1900
Adj Flow Rate, veh/h	107	482	96	78	678	61	86	127	83	174	320	131
Peak Hour Factor	0.81	0.85	0.67	0.79	0.86	0.80	0.95	0.82	0.76	0.70	0.86	0.90
Percent Heavy Veh, %	10	3	13	3	2	6	4	4	3	3	2	0
Cap, veh/h	130	1563	642	100	1500	648	161	169	144	339	359	309
Arrive On Green	0.08	0.44	0.44	0.06	0.42	0.42	0.09	0.09	0.09	0.19	0.19	0.19
Sat Flow, veh/h	1668	3526	1447	1767	3554	1535	1753	1841	1572	1767	1870	1610
Grp Volume(v), veh/h	107	482	96	78	678	61	86	127	83	174	320	131
Grp Sat Flow(s),veh/h/ln	1668	1763	1447	1767	1777	1535	1753	1841	1572	1767	1870	1610
Q Serve(g_s), s	7.6	10.6	4.7	5.2	16.4	2.9	5.6	8.1	6.1	10.6	20.0	8.6
Cycle Q Clear(g_c), s	7.6	10.6	4.7	5.2	16.4	2.9	5.6	8.1	6.1	10.6	20.0	8.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	130	1563	642	100	1500	648	161	169	144	339	359	309
V/C Ratio(X)	0.82	0.31	0.15	0.78	0.45	0.09	0.53	0.75	0.57	0.51	0.89	0.42
Avail Cap(c_a), veh/h	147	1563	642	215	1500	648	342	359	307	374	396	341
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	54.5	21.5	19.9	55.9	24.8	20.9	52.0	53.2	52.2	43.5	47.3	42.7
Incr Delay (d2), s/veh	27.6	0.5	0.5	12.5	1.0	0.3	2.7	6.6	3.6	1.2	20.5	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.2	4.4	1.7	2.7	7.0	1.1	2.6	4.0	2.5	4.7	11.2	3.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	82.1	22.0	20.4	68.4	25.8	21.2	54.8	59.7	55.8	44.7	67.8	43.6
LnGrp LOS	F	C	C	E	C	C	D	E	E	D	E	D
Approach Vol, veh/h	685			817			296			625		
Approach Delay, s/veh	31.2			29.5			57.2			56.3		
Approach LOS	C			C			E			E		
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.2	59.6		29.6	15.7	57.0		17.6				
Change Period (Y+Rc), s	6.4	6.4		6.6	6.4	6.4		6.6				
Max Green Setting (Gmax), s	14.6	30.6		25.4	10.6	34.6		23.4				
Max Q Clear Time (g_c+I1), s	7.2	12.6		22.0	9.6	18.4		10.1				
Green Ext Time (p_c), s	0.1	4.5		1.0	0.0	5.8		0.9				
Intersection Summary												
HCM 6th Ctrl Delay	40.3											
HCM 6th LOS	D											

Queuing and Blocking Report

Background AM

10/17/2019

Intersection: 3: Pleasure House Road & Shore Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	174	205	205	154	139	253	245	58	164	171	68	113
Average Queue (ft)	85	104	91	34	54	142	136	17	69	77	23	79
95th Queue (ft)	162	178	173	95	110	219	219	45	129	142	53	147
Link Distance (ft)		1846	1846			1892	1892			1439		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	265			143	262			582	207		217	88
Storage Blk Time (%)	1		1	0		0			0	0		7
Queuing Penalty (veh)	2		1	0		0			0	0		31

Intersection: 3: Pleasure House Road & Shore Drive

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	660	190
Average Queue (ft)	328	103
95th Queue (ft)	626	231
Link Distance (ft)	1509	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		165
Storage Blk Time (%)	51	0
Queuing Penalty (veh)	125	0

Network Summary

Network wide Queuing Penalty: 159

HCM 6th Signalized Intersection Summary

3: Pleasure House Road & Shore Drive

10/17/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	218	784	57	105	518	161	48	266	250	138	169	93
Future Volume (veh/h)	218	784	57	105	518	161	48	266	250	138	169	93
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1900	1900	1707	1900	1870	1870	1870	1885	1870	1885	1870	1841
Adj Flow Rate, veh/h	287	862	70	148	563	209	57	292	309	148	201	103
Peak Hour Factor	0.76	0.91	0.81	0.71	0.92	0.77	0.84	0.91	0.81	0.93	0.84	0.90
Percent Heavy Veh, %	0	0	13	0	2	2	2	1	2	1	2	4
Cap, veh/h	307	1455	583	170	1162	518	385	407	342	224	233	194
Arrive On Green	0.17	0.40	0.40	0.09	0.33	0.33	0.22	0.22	0.22	0.12	0.12	0.12
Sat Flow, veh/h	1810	3610	1447	1810	3554	1585	1781	1885	1585	1795	1870	1560
Grp Volume(v), veh/h	287	862	70	148	563	209	57	292	309	148	201	103
Grp Sat Flow(s),veh/h/ln	1810	1805	1447	1810	1777	1585	1781	1885	1585	1795	1870	1560
Q Serve(g_s), s	25.0	30.0	4.9	12.9	20.3	16.4	4.1	23.0	30.4	12.6	16.9	9.9
Cycle Q Clear(g_c), s	25.0	30.0	4.9	12.9	20.3	16.4	4.1	23.0	30.4	12.6	16.9	9.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	307	1455	583	170	1162	518	385	407	342	224	233	194
V/C Ratio(X)	0.93	0.59	0.12	0.87	0.48	0.40	0.15	0.72	0.90	0.66	0.86	0.53
Avail Cap(c_a), veh/h	323	1455	583	210	1162	518	472	500	420	285	297	248
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	65.5	37.4	29.9	71.5	43.0	41.7	50.8	58.2	61.1	66.8	68.7	65.6
Incr Delay (d2), s/veh	32.5	1.8	0.4	26.5	1.4	2.3	0.2	3.8	19.7	3.8	18.5	2.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	14.3	13.6	1.8	7.2	9.2	6.8	1.9	11.4	14.0	6.0	9.3	4.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	98.0	39.2	30.4	98.0	44.5	44.0	51.0	62.0	80.8	70.6	87.2	67.9
LnGrp LOS	F	D	C	F	D	D	D	E	F	E	F	E
Approach Vol, veh/h	1219			920			658			452		
Approach Delay, s/veh	52.5			53.0			69.9			77.4		
Approach LOS	D			D			E			E		
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	21.4	70.9		26.5	33.6	58.7		41.2				
Change Period (Y+Rc), s	6.4	6.4		6.6	6.4	6.4		6.6				
Max Green Setting (Gmax), s	18.6	47.6		25.4	28.6	37.6		42.4				
Max Q Clear Time (g_c+I1), s	14.9	32.0		18.9	27.0	22.3		32.4				
Green Ext Time (p_c), s	0.1	7.2		1.1	0.1	5.4		2.2				
Intersection Summary												
HCM 6th Ctrl Delay	59.6											
HCM 6th LOS	E											

Queuing and Blocking Report

Background PM

10/17/2019

Intersection: 3: Pleasure House Road & Shore Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	290	513	493	168	254	297	293	144	230	522	242	113
Average Queue (ft)	206	260	256	60	103	172	166	54	48	232	129	94
95th Queue (ft)	319	448	431	175	197	268	267	108	141	405	264	137
Link Distance (ft)		1846	1846			1892	1892			1439		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	265			143	262			582	207		217	88
Storage Blk Time (%)	10	5	27	0	0	1			0	12	0	29
Queuing Penalty (veh)	42	11	16	0	0	1			0	37	0	75

Intersection: 3: Pleasure House Road & Shore Drive

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	671	190
Average Queue (ft)	305	86
95th Queue (ft)	614	212
Link Distance (ft)	1509	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		165
Storage Blk Time (%)	41	0
Queuing Penalty (veh)	95	0

Network Summary

Network wide Queuing Penalty: 279

APPENDIX D

Total Traffic Conditions Analysis Reports

HCM 6th Signalized Intersection Summary

3: Pleasure House Road & Shore Drive

10/17/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	93	410	64	62	583	52	82	112	63	132	301	134
Future Volume (veh/h)	93	410	64	62	583	52	82	112	63	132	301	134
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1752	1856	1707	1856	1870	1811	1841	1841	1856	1856	1870	1900
Adj Flow Rate, veh/h	115	482	96	78	678	65	86	137	83	189	350	149
Peak Hour Factor	0.81	0.85	0.67	0.79	0.86	0.80	0.95	0.82	0.76	0.70	0.86	0.90
Percent Heavy Veh, %	10	3	13	3	2	6	4	4	3	3	2	0
Cap, veh/h	138	1500	616	100	1418	612	171	179	153	361	382	329
Arrive On Green	0.08	0.43	0.43	0.06	0.40	0.40	0.10	0.10	0.10	0.20	0.20	0.20
Sat Flow, veh/h	1668	3526	1447	1767	3554	1535	1753	1841	1572	1767	1870	1610
Grp Volume(v), veh/h	115	482	96	78	678	65	86	137	83	189	350	149
Grp Sat Flow(s),veh/h/ln	1668	1763	1447	1767	1777	1535	1753	1841	1572	1767	1870	1610
Q Serve(g_s), s	8.1	10.9	4.9	5.2	17.0	3.2	5.6	8.7	6.0	11.4	22.0	9.7
Cycle Q Clear(g_c), s	8.1	10.9	4.9	5.2	17.0	3.2	5.6	8.7	6.0	11.4	22.0	9.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	138	1500	616	100	1418	612	171	179	153	361	382	329
V/C Ratio(X)	0.83	0.32	0.16	0.78	0.48	0.11	0.50	0.76	0.54	0.52	0.92	0.45
Avail Cap(c_a), veh/h	147	1500	616	215	1418	612	342	359	307	374	396	341
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	54.2	22.9	21.2	55.9	26.8	22.6	51.4	52.8	51.6	42.6	46.8	41.9
Incr Delay (d2), s/veh	30.2	0.6	0.5	12.5	1.2	0.3	2.3	6.6	3.0	1.2	25.3	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.6	4.6	1.7	2.7	7.3	1.2	2.6	4.3	2.5	5.1	12.8	3.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	84.4	23.5	21.8	68.4	27.9	23.0	53.7	59.4	54.6	43.8	72.1	42.9
LnGrp LOS	F	C	C	E	C	C	D	E	D	D	E	D
Approach Vol, veh/h	693			821			306			688		
Approach Delay, s/veh	33.4			31.4			56.5			58.0		
Approach LOS	C			C			E			E		
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.2	57.5		31.1	16.3	54.3		18.3				
Change Period (Y+Rc), s	6.4	6.4		6.6	6.4	6.4		6.6				
Max Green Setting (Gmax), s	14.6	30.6		25.4	10.6	34.6		23.4				
Max Q Clear Time (g_c+I1), s	7.2	12.9		24.0	10.1	19.0		10.7				
Green Ext Time (p_c), s	0.1	4.4		0.5	0.0	5.6		1.0				
Intersection Summary												
HCM 6th Ctrl Delay	42.3											
HCM 6th LOS	D											

Queuing and Blocking Report

Total AM

10/17/2019

Intersection: 3: Pleasure House Road & Shore Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	164	205	190	156	153	259	254	57	149	202	63	112
Average Queue (ft)	81	103	91	35	52	147	139	19	63	85	25	83
95th Queue (ft)	145	169	163	102	112	225	221	46	123	160	50	146
Link Distance (ft)		1846	1846			1892	1892			1439		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	265			143	262			582	207		217	88
Storage Blk Time (%)			2	0		0				0		11
Queuing Penalty (veh)			2	0		0				0		48

Intersection: 3: Pleasure House Road & Shore Drive

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	949	190
Average Queue (ft)	499	116
95th Queue (ft)	937	241
Link Distance (ft)	1509	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		165
Storage Blk Time (%)	60	0
Queuing Penalty (veh)	161	0

Network Summary

Network wide Queuing Penalty: 212

HCM 6th Signalized Intersection Summary

3: Pleasure House Road & Shore Drive

10/17/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	232	784	57	105	518	170	48	289	250	143	183	101
Future Volume (veh/h)	232	784	57	105	518	170	48	289	250	143	183	101
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1900	1900	1707	1900	1870	1870	1870	1885	1870	1885	1870	1841
Adj Flow Rate, veh/h	305	862	70	148	563	221	57	318	309	154	218	112
Peak Hour Factor	0.76	0.91	0.81	0.71	0.92	0.77	0.84	0.91	0.81	0.93	0.84	0.90
Percent Heavy Veh, %	0	0	13	0	2	2	2	1	2	1	2	4
Cap, veh/h	323	1423	570	170	1099	490	386	408	343	239	249	207
Arrive On Green	0.18	0.39	0.39	0.09	0.31	0.31	0.22	0.22	0.22	0.13	0.13	0.13
Sat Flow, veh/h	1810	3610	1447	1810	3554	1585	1781	1885	1585	1795	1870	1560
Grp Volume(v), veh/h	305	862	70	148	563	221	57	318	309	154	218	112
Grp Sat Flow(s),veh/h/ln	1810	1805	1447	1810	1777	1585	1781	1885	1585	1795	1870	1560
Q Serve(g_s), s	26.6	30.4	4.9	12.9	20.8	17.9	4.1	25.4	30.4	13.0	18.3	10.7
Cycle Q Clear(g_c), s	26.6	30.4	4.9	12.9	20.8	17.9	4.1	25.4	30.4	13.0	18.3	10.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	323	1423	570	170	1099	490	386	408	343	239	249	207
V/C Ratio(X)	0.94	0.61	0.12	0.87	0.51	0.45	0.15	0.78	0.90	0.65	0.88	0.54
Avail Cap(c_a), veh/h	323	1423	570	210	1099	490	472	500	420	285	297	248
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	64.9	38.6	30.9	71.5	45.4	44.4	50.7	59.1	61.0	65.8	68.1	64.8
Incr Delay (d2), s/veh	35.3	1.9	0.4	26.5	1.7	3.0	0.2	6.3	19.3	3.7	21.6	2.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	15.4	13.9	1.8	7.2	9.5	7.5	1.9	12.8	14.0	6.2	10.2	4.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	100.2	40.5	31.3	98.0	47.1	47.3	50.9	65.3	80.3	69.5	89.7	67.0
LnGrp LOS	F	D	C	F	D	D	D	E	F	E	F	E
Approach Vol, veh/h	1237			932			684			484		
Approach Delay, s/veh	54.7			55.2			70.9			78.0		
Approach LOS	D			E			E			E		
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	21.4	69.5		27.9	35.0	55.9		41.3				
Change Period (Y+Rc), s	6.4	6.4		6.6	6.4	6.4		6.6				
Max Green Setting (Gmax), s	18.6	47.6		25.4	28.6	37.6		42.4				
Max Q Clear Time (g_c+I1), s	14.9	32.4		20.3	28.6	22.8		32.4				
Green Ext Time (p_c), s	0.1	7.1		1.0	0.0	5.3		2.3				
Intersection Summary												
HCM 6th Ctrl Delay	61.5											
HCM 6th LOS	E											

Queuing and Blocking Report

Total PM

10/17/2019

Intersection: 3: Pleasure House Road & Shore Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	290	515	487	168	235	294	288	172	232	553	242	113
Average Queue (ft)	213	261	256	57	105	176	172	64	61	266	143	96
95th Queue (ft)	323	434	414	169	193	264	264	130	181	466	283	140
Link Distance (ft)		1846	1846			1892	1892			1439		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	265			143	262			582	207		217	88
Storage Blk Time (%)	9	5	28	0	0	1			0	18	0	26
Queuing Penalty (veh)	38	12	17	0	0	1			0	54	1	75

Intersection: 3: Pleasure House Road & Shore Drive

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	642	190
Average Queue (ft)	320	91
95th Queue (ft)	648	218
Link Distance (ft)	1509	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		165
Storage Blk Time (%)	45	0
Queuing Penalty (veh)	111	0

Network Summary

Network wide Queuing Penalty: 309

