



Memorandum

To: Mr. Randall Morris
RM Strategies, Inc.
323 West Trotters Drive
Maitland, FL 32751

Date: May 25, 2017

From: Kok Wan Mah, P.E., PTOE
Senior Transportation Engineer
CC: Fabricio Ponce

Project #: 62962.00

Re: Deer Run CC Redevelopment – Qualitative Traffic
Assessment

Introduction

The following technical memorandum summarizes a Qualitative Traffic Assessment performed for the potential Deer Run Country Club redevelopment project in unincorporated Seminole County, Florida. The property is located at the existing Deer Run Country Club, bounded by Eagle Circle. The development proposes to convert the existing golf facility to a residential development and include a maximum of 251 single-family residential units and 184 townhomes constructed in a single phase. Access to the development will be on South Eagle Circle with a separate access street for each land use component.

The evaluation provided in this memorandum includes an assessment of:

- Trip generation estimates for the existing 18-hole golf course and proposed residential development program based on *ITE Trip Generation Manual, 9th Edition*,
- Distribution of project trips using the adopted CFRPM 6.1 transportation model.
- Planned and programmed improvements within the study area,
- Roadway segments within the area of influence, including reserved/committed trips,
- Intersection analysis of Red Bug Lake Road at Eagle Circle for AM and PM peak periods, and
- Field observations during the AM and PM peak periods at:
 - Eagle Circle @ South Eagle Circle
 - Eagle Circle @ Eagle Boulevard
 - Eagle Boulevard @ Dodd Road
 - Eagle Boulevard @ Tuskawilla Road

Trip Generation

The proposed development includes up to 251 single-family residential units and 184 townhome units. ITE Trip Generation Manual, 9th Edition was used to estimate the trip generation for this development and summarized in **Table 1**. As a residential development, no reduction was taken for internal capture or pass-by.

The trip generation for the existing 18-hole golf course is also shown to provide a comparison of the difference in trip generation between the existing land use and future development. Using the ITE trip generation rates, it is shown that the credit from the existing golf and country club reduces the overall

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impact by approximately **half**. Daily trips decrease from 1,093 to 450; AM peak-hour trips decrease from 84 to 47; PM peak-hour trips decrease from 99 to 46.

**Table 1 - Summary of Trip Generation
 Deer Run CC Redevelopment**

Land Use	ITE Code Intensity			Daily Trip Ends	AM Peak Period			PM Peak Period		
					In Trips	Out Trips	Total	In Trips	Out Trips	Total
Single Family	210	251	DU	2,449	46	139	185	152	89	241
Townhouse/Condo	230	184	DU	1,093	14	70	84	66	33	99
Total				1,093	14	70	84	66	33	99
Golf Course	430	18	Holes	643	29	8	37	27	26	53
Net Difference				450	-15	62	47	39	7	46

Project Distribution

The CFRPM 6.1 transportation model was used to determine the project distribution for the proposed project site. A traffic analysis zone (TAZ) was added to the model and the socioeconomic data for the project was provided as input. The approximate distribution shown by the model run includes:

- 18% to/from the north on SR 436
- 25% to/from the south on SR 436
- 12% to/from the east on Red Bug Lake Road
- 19% on Eagle Circle to/from Tuskawilla Road
- 18% use Eagle Run to Dodd Road then head east on Red Bug Lake Road, rather than south on Eagle Circle directly to Red Bug Lake Road
- Approximately 13% of project traffic stays within the Deer Run area, bounded by Red Bug Lake Road and Seminola Boulevard.

Planned and Programmed Improvements

There are no planned or programmed roadway capacity improvements shown in the MetroplanOrlando TIP or Seminole County CIP within the study area. There are other projects in the study area found in the Seminole County CIP that include constructing missing segments of sidewalks on Eagle Circle around Sterling Park Elementary School and a transit study on SR 436.

Roadway Capacity and Vested Trips

Seminole County maintains a concurrency database for roadways. Roadway segments within the study area were identified and summarized in **Table 2**, showing the available capacity remaining, less committed trips. Note that Eagle Circle and the segment of Dodd Road north of Red Bug Lake Road are not part of the roadway concurrency database.

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**Table 1 - Summary of Roadway Segment Capacity
Deer Run CC Redevelopment**

Roadway	From	To	LOS	Daily	Committed		Remaining		Vol/Cap
			Std.	Svc. Vol.	AADT	Trips	Total	Capacity	
SR 436	Lake Howell Road	Red Bug Lake Road	E	69,650	55,340	0	55,340	14,310	0.79
	Red Bug Lake Road	US 17-92	E	59,900	71,173	698	71,871	-11,971	1.20
Red Bug Lake Road	SR 436	Eagle Circle	E	63,840	36,649	92	36,741	27,099	0.58
	Eagle Circle	Dodd Road	E	42,560	35,231	543	35,774	6,786	0.84
	Dodd Road	Tuskawilla Road	E	42,560	32,271	804	33,075	9,485	0.78
Tuskawilla Road	East Lake Drive	Red Bug Lake Road	E	42,560	34,237	420	34,657	7,903	0.81

Intersection Analysis – Red Bug Lake Road at Eagle Circle

Turning movement volumes were collected at the intersection of Red Bug Lake Road at Eagle Circle on Tuesday, May 16, 2017 for both the morning and afternoon peak periods. An analysis was conducted using Synchro 9 for each of the peak periods to determine the operating conditions and critical movements. The Synchro analysis showed that the critical movements during the morning peak are southbound right turns and westbound through movement and during the PM peak are eastbound left turns. The eastbound and westbound left turns are protected, with dual left turn lanes in the eastbound approach. The northbound and southbound lefts are protected plus permissive. It should be noted; however, that although there are signal heads present for the northbound approach, the driveway at this location is gated and no vehicles were observed entering or exiting this approach. The southbound right turns also have a protected phase, concurrent with the eastbound left turn phase. For the purposes of this assessment, the intersection is analyzed as a T-intersection.

Analysis for this intersection was conducted using Synchro 9 for the existing AM and PM peak hours. The results of the analysis show that the intersection operates at level of service D during the AM peak and level of service B for the PM peak. A summary of the levels of service and delay are shown in **Table 3**.

**Table 3: Red Bug Lake Road at Eagle Circle
 Intersection Level of Service (Signalized)**

Movement	2018 AM Peak Hour					2018 PM Peak Hour				
	v/c ¹	Delay ² [sec/veh]	LOS ³	95 th Percentile Queue [feet]	Available Storage [feet]	v/c ¹	Delay ² [sec/veh]	LOS ³	95 th Percentile Queue [feet]	Available Storage [feet]
EBL	0.775	78.7	E	115	850	0.809	62.1	E	145	850
EBT	0.391	12.2	B	125	N/A	0.630	5.6	A	300	N/A
WBT	0.910	42.6	D	940	N/A	0.579	13.6	B	435	N/A
WBR	0.916	43.8	D	-	N/A	0.580	13.7	B	-	N/A
SBL	0.181	46.6	D	140	300	0.261	55.4	E	70	300
SBR	0.813	59.1	E	510	300	0.463	46.9	D	100	300
Overall		38.7	D	N/A	N/A		15.5	B	N/A	N/A

Notes:

- 1 Volume to Capacity Ratio
- 2 Average Delay in Seconds/Vehicle
- 3 Level of Service

Qualitative Assessment

A field review and observation for the study intersections was conducted by a registered professional engineer on Tuesday, May 16, 2017. The review was done between the hours of 7:00 am to 9:00 am and from 4:00 pm to 6:00 pm. The review included an assessment of the intersection operations, site lines, issues with signing, pavements markings and lighting, and queueing.

Eagle Circle at Eagle Circle South

This T-intersection is controlled by a stop sign on the minor street (Eagle Circle South). The posted speed limit is 30 miles per hour. The primary movements for both the morning and afternoon peak periods are the westbound lefts and northbound rights. This is due to the heavy school traffic from Sterling Park Elementary School, approximately 1,400 feet to the east. The westbound approach has an exclusive left turn lane and exclusive right turn lane. The left turn queue at times will block the right turn movements on this approach. During the arrival and departure times for Sterling Park Elementary School, queues would back up as crossing guards stopped traffic to allow students to cross safely. Outside of the arrival and dismissal times for the school, no other operational issues were observed. This period would last approximately 20 to 25 minutes in the morning and afternoon. There are no sight line issues at this location.

Eagle Circle at Eagle Boulevard

This location is another T-intersection where significant queues were observed due to the presence of the elementary school during arrival and dismissal times. This intersection is controlled by a stop



Figure 1- Eagle Circle at Eagle Circle South, looking northbound

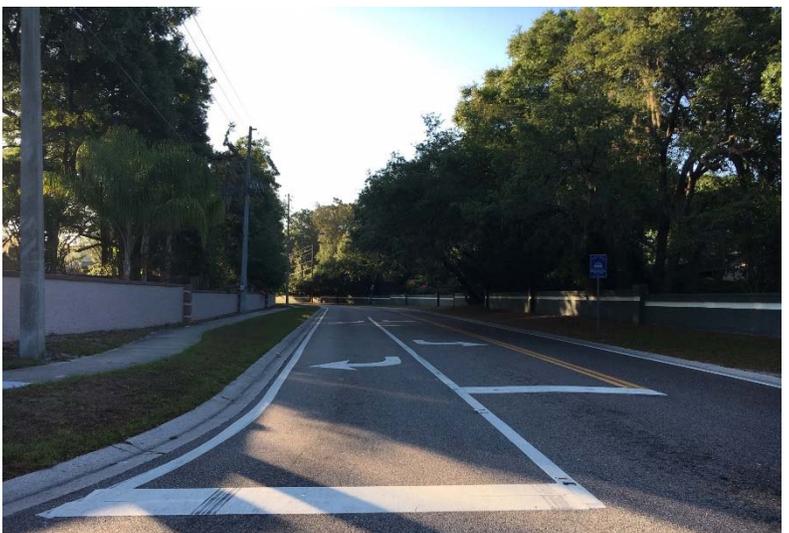


Figure 2- Eagle Circle at Eagle Blvd, looking west at staggered stop bar

sign on the minor street (Eagle Boulevard). The primary movements affected in the morning peak periods are the westbound left and northbound right. In the afternoon peak period, the primary movement are the northbound right turns. Crossing guards may stop traffic to allow students to cross and create queues during the school arrival and dismissal times. This condition only lasts about 15 to 20 minutes. Although school dismissal occurs prior to the afternoon peak hour of the roadway, it is expected that queues will quickly form during this time. There is a potential sight distance issue for the westbound left turn lane. The stop bar for the westbound left turns is staggered behind the right turn lane. This is done to provide adequate turning room for northbound right-turning trucks and buses, which may encroach in the opposing lane. However, vehicles sitting at the stop bar have sight lines to the left obstructed by a wall to a residential neighborhood. Vehicles are often seen inching forward at this location, often into the crosswalk before turning.

Dodd Road at Eagle Boulevard

This intersection is controlled by an all-way stop on each of the three legs. The maximum queue observed during the morning peak period was three vehicles on multiple approaches. In the afternoon, queues of four vehicles were observed at multiple lane groups. This condition is not uncommon for all-way stop controlled intersections. Traffic operations were satisfactory with no sight distance issues. An electrical power easement is present on the west side of Dodd Road, extending through the intersection.



Figure 3- Eagle Blvd at Dodd Road, looking south

Tuskawilla Road at Eagle Boulevard

This intersection is signalized. The AM peak period has a 95 second cycle length. The PM peak period uses a 120 second cycle length. The northbound and southbound lefts have a protected plus permissive phase. The eastbound and westbound lefts are only permissive. The primary movements during the AM peak period are the southbound throughs and eastbound lefts. The eastbound left has a short 50-foot turn lane due to the back-to-back left turn geometric condition with the upstream intersection at Ringwood Drive. Pedestrian actuated call buttons are present at all four corners. Traffic operations during the AM and PM peak-hour shows that



Figure 4- Tuskawilla Road at Eagle Blvd, aerial view

all queues clear within the cycle. Queues for each left turn do not exceed the storage with the exception of the eastbound left turns. Although the queues for the eastbound lefts was observed to exceed the storage during both the AM and PM peak hours, it was significantly more frequent and queues were longer in the PM peak hour. The left turns would often encroach on the adjacent westbound left turn storage at Ringwood Drive or block the eastbound through-right lane. Although this condition occurs during many of the cycles, the queues clear. No other significant operational issues were observed.

Findings and Recommendations

The information contained in this assessment provides a foundation for a full traffic study to be conducted should the project proceed forward. The next steps include coordination with Seminole County to determine the proper study area and submit a proposed transportation methodology statement for approval and traffic counts will need to be collected at study intersections.

After performing this preliminary assessment, the following conclusion were reached:

- Based on the trip generation estimate performed for the existing golf course, approximately 50 percent of the development could be accommodated without generating additional trips.
- There is one segment of SR 436 that is over capacity. This segment is backlogged and the project should have no financial responsibility to mitigate impacts at this location. Additionally, even with

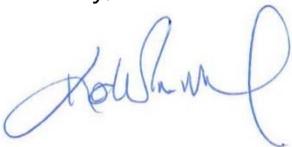
100% of project traffic on this segment, the significance of project traffic would be less than 5% of the adopted capacity.

- The existing traffic operations show some challenges that should be of note as the formal traffic study is conducted includes:
 - No significant traffic issues were observed at the Red Bug Lake Road and Eagle Circle intersection; however, there are some specific movements that operate at relatively high (greater than 0.80) volume-to-capacity ratios.
 - The 95th percentile queue at the Red Bug Lake Road and Eagle Circle intersection for the westbound through and southbound right movements are long during the AM peak-hour; however, they do not block the upstream intersections.
 - The 95th percentile queue at the Red Bug Lake Road and Eagle Circle intersection for the southbound right movements during the AM peak-hour exceeds the storage length available, blocking vehicles trying to make a southbound left turn movement.
 - Queues on some of the turning movements at the unsignalized intersections are significant during school arrival and departure periods.
 - The eastbound left queue at the intersection of Tuskawilla Road at Eagle Boulevard encroaches on the adjacent westbound left turn lane due to the short length of the storage. However, the queues clear during each cycle.

One additional issue that might develop with County staff is the timing of the traffic study. Given the proximity of Sterling Park Elementary School to the project and the travel patterns and congestion observed at the intersections near the school, the County may request that traffic counts should be conducted when school is in session to account for the impacts of the arrival and dismissal traffic from the school. With the school year nearly over, these counts cannot be collected until August.

As always, we appreciate the opportunity to provide this service to RM Strategies. If you have any questions, please do not hesitate to contact us.

Sincerely,



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<i>RKEY</i>	<i>Roadway Name</i>	<i>From</i>	<i>To</i>	
OXD50	Oxford Rd	S.R. 436	Fernwood Blvd	
				Current Traffic Count <u>9,638</u>
				Roadway Link Capacity <u>19,360</u>
				Committed Trips <u>170</u>
				Net Available Capacity <u>9,552</u>
PSP10	Palm Springs Dr	North St	S.R. 434	
				Current Traffic Count <u>8,037</u>
				Roadway Link Capacity <u>19,360</u>
				Committed Trips <u>0</u>
				Net Available Capacity <u>11,323</u>
PSP50	Palm Springs Dr	Central Parkway	North St	
				Current Traffic Count <u>17,744</u>
				Roadway Link Capacity <u>19,360</u>
				Committed Trips <u>21</u>
				Net Available Capacity <u>1,595</u>
PSP90	Palm Springs Dr	S.R. 436	Central Parkway	
				Current Traffic Count <u>25,795</u>
				Roadway Link Capacity <u>42,560</u>
				Committed Trips <u>0</u>
				Net Available Capacity <u>16,765</u>
RBL05	Red Bug Lake Rd	Eagle Cir	S.R. 436	
				Current Traffic Count <u>36,649</u>
				Roadway Link Capacity <u>63,840</u>
				Committed Trips <u>92</u>
				Net Available Capacity <u>27,099</u>
RBL20	Red Bug Lake Rd	Dodd Rd	Eagle Cir	
				Current Traffic Count <u>35,231</u>
				Roadway Link Capacity <u>42,560</u>
				Committed Trips <u>543</u>
				Net Available Capacity <u>6,786</u>
RBL30	Red Bug Lake Rd	Tuskawilla Rd	Dodd Rd	
				Current Traffic Count <u>32,271</u>
				Roadway Link Capacity <u>42,560</u>
				Committed Trips <u>804</u>
				Net Available Capacity <u>9,485</u>
RBL40	Red Bug Lake Rd	Slavia Rd	Tuskawilla Rd	
				Current Traffic Count <u>44,009</u>
				Roadway Link Capacity <u>63,840</u>
				Committed Trips <u>1,297</u>
				Net Available Capacity <u>18,534</u>
RBL50	Red Bug Lake Rd	S.R. 417	Slavia Rd	
				Current Traffic Count <u>34,591</u>
				Roadway Link Capacity <u>63,840</u>
				Committed Trips <u>1,329</u>
				Net Available Capacity <u>27,920</u>

<i>RKEY</i>	<i>Roadway Name</i>	<i>From</i>	<i>To</i>	
S3630	S.R. 436	I-4 East Ramp	Wymore/Douglas Rd	
			Current Traffic Count	<u>61,561</u>
			Roadway Link Capacity	<u>60,000</u>
			Committed Trips	<u>0</u>
			Net Available Capacity	<u>-1,561</u>
S3635	S.R. 436	Northlake Blvd	I-4 East Ramp	
			Current Traffic Count	<u>67,149</u>
			Roadway Link Capacity	<u>69,650</u>
			Committed Trips	<u>0</u>
			Net Available Capacity	<u>2,501</u>
S3640	S.R. 436	Palm Springs Blvd	Northlake Blvd	
			Current Traffic Count	<u>62,079</u>
			Roadway Link Capacity	<u>69,650</u>
			Committed Trips	<u>0</u>
			Net Available Capacity	<u>7,571</u>
S3645	S.R. 436	Maitland Av	Palm Springs Blvd	
			Current Traffic Count	<u>65,187</u>
			Roadway Link Capacity	<u>60,000</u>
			Committed Trips	<u>0</u>
			Net Available Capacity	<u>-5,187</u>
S3650	S.R. 436	C.R. 427	Maitland Av	
			Current Traffic Count	<u>52,898</u>
			Roadway Link Capacity	<u>60,000</u>
			Committed Trips	<u>260</u>
			Net Available Capacity	<u>6,842</u>
S3660	S.R. 436	U.S. 17-92	C.R. 427	
			Current Traffic Count	<u>50,726</u>
			Roadway Link Capacity	<u>60,000</u>
			Committed Trips	<u>267</u>
			Net Available Capacity	<u>9,007</u>
S3670	S.R. 436	Red Bug Lake Rd	U.S. 17-92	
			Current Traffic Count	<u>71,173</u>
			Roadway Link Capacity	<u>60,000</u>
			Committed Trips	<u>698</u>
			Net Available Capacity	<u>-11,871</u>
S3680	S.R. 436	Lake Howell Rd	Red Bug Lake Rd	
			Current Traffic Count	<u>55,340</u>
			Roadway Link Capacity	<u>69,650</u>
			Committed Trips	<u>0</u>
			Net Available Capacity	<u>14,310</u>
S3690	S.R. 436	Howell Branch Rd	Lake Howell Rd	
			Current Traffic Count	<u>55,340</u>
			Roadway Link Capacity	<u>60,000</u>
			Committed Trips	<u>193</u>
			Net Available Capacity	<u>4,467</u>

HCM 2010 Signalized Intersection Summary

3: Red Bug Lake Road & Eagle Circle

05/25/2017



Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations	↔↔	↑↑	↑↔		↔	↔		
Traffic Volume (veh/h)	169	894	1734	77	80	403		
Future Volume (veh/h)	169	894	1734	77	80	403		
Number	1	6	2	12	3	18		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1827	1845	1879	1900	1881	1863		
Adj Flow Rate, veh/h	172	912	1769	79	82	411		
Adj No. of Lanes	2	2	2	0	1	1		
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98		
Percent Heavy Veh, %	4	3	1	1	1	2		
Cap, veh/h	222	2330	1943	86	454	505		
Arrive On Green	0.07	0.66	0.56	0.56	0.25	0.25		
Sat Flow, veh/h	3375	3597	3576	155	1792	1583		
Grp Volume(v), veh/h	172	912	902	946	82	411		
Grp Sat Flow(s),veh/h/ln	1688	1752	1785	1852	1792	1583		
Q Serve(g_s), s	8.0	18.7	71.6	73.4	5.7	37.9		
Cycle Q Clear(g_c), s	8.0	18.7	71.6	73.4	5.7	37.9		
Prop In Lane	1.00			0.08	1.00	1.00		
Lane Grp Cap(c), veh/h	222	2330	996	1033	454	505		
V/C Ratio(X)	0.78	0.39	0.91	0.92	0.18	0.81		
Avail Cap(c_a), veh/h	606	2770	1017	1055	468	518		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	73.0	12.1	31.3	31.7	46.4	49.7		
Incr Delay (d2), s/veh	5.7	0.1	11.2	12.1	0.2	9.4		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	3.9	9.0	38.2	40.8	2.8	17.9		
LnGrp Delay(d),s/veh	78.7	12.2	42.6	43.8	46.6	59.1		
LnGrp LOS	E	B	D	D	D	E		
Approach Vol, veh/h		1084	1848		493			
Approach Delay, s/veh		22.7	43.2		57.0			
Approach LOS		C	D		E			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	16.9	95.1				112.0		46.7
Change Period (Y+Rc), s	6.5	6.5				6.5		6.5
Max Green Setting (Gmax), s	28.5	90.5				125.5		41.5
Max Q Clear Time (g_c+I1), s	10.0	75.4				20.7		39.9
Green Ext Time (p_c), s	0.5	13.2				52.7		0.3
Intersection Summary								
HCM 2010 Ctrl Delay			38.7					
HCM 2010 LOS			D					

HCM 2010 Signalized Intersection Summary

3: Red Bug Lake Road & Eagle Circle

05/25/2017



Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations								
Traffic Volume (veh/h)	268	1658	1178	72	44	142		
Future Volume (veh/h)	268	1658	1178	72	44	142		
Number	1	6	2	12	3	18		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1881	1881	1900	1900	1900		
Adj Flow Rate, veh/h	291	1802	1280	78	48	154		
Adj No. of Lanes	2	2	2	0	1	1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Percent Heavy Veh, %	2	1	1	1	0	0		
Cap, veh/h	360	2859	2212	135	184	333		
Arrive On Green	0.10	0.80	0.65	0.65	0.10	0.10		
Sat Flow, veh/h	3442	3668	3517	208	1810	1615		
Grp Volume(v), veh/h	291	1802	667	691	48	154		
Grp Sat Flow(s),veh/h/ln	1721	1787	1787	1844	1810	1615		
Q Serve(g_s), s	10.9	26.8	27.8	27.9	3.2	11.0		
Cycle Q Clear(g_c), s	10.9	26.8	27.8	27.9	3.2	11.0		
Prop In Lane	1.00			0.11	1.00	1.00		
Lane Grp Cap(c), veh/h	360	2859	1155	1192	184	333		
V/C Ratio(X)	0.81	0.63	0.58	0.58	0.26	0.46		
Avail Cap(c_a), veh/h	796	3943	1470	1517	295	432		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	57.8	5.3	13.2	13.2	54.7	45.9		
Incr Delay (d2), s/veh	4.4	0.2	0.5	0.4	0.7	1.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	5.4	13.1	13.7	14.3	1.7	5.0		
LnGrp Delay(d),s/veh	62.1	5.6	13.6	13.7	55.4	46.9		
LnGrp LOS	E	A	B	B	E	D		
Approach Vol, veh/h		2093	1358		202			
Approach Delay, s/veh		13.4	13.7		49.0			
Approach LOS		B	B		D			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	20.3	91.7				112.0		19.9
Change Period (Y+Rc), s	6.5	6.5				6.5		6.5
Max Green Setting (Gmax), s	30.5	108.5				145.5		21.5
Max Q Clear Time (g_c+I1), s	12.9	29.9				28.8		13.0
Green Ext Time (p_c), s	0.9	55.3				70.8		0.4
Intersection Summary								
HCM 2010 Ctrl Delay			15.5					
HCM 2010 LOS			B					