



March 29, 2022

Painted Prairie Improvement Authority
 c/o Mr. Chris Fellows
 5600 Greenwood Plaza Blvd, Ste 220
 Greenwood Village, Colorado 80111

**RE: Painted Prairie Phase V Traffic Conformance
 FHU Project No. 121320-01**

Dear Mr. Fellows:

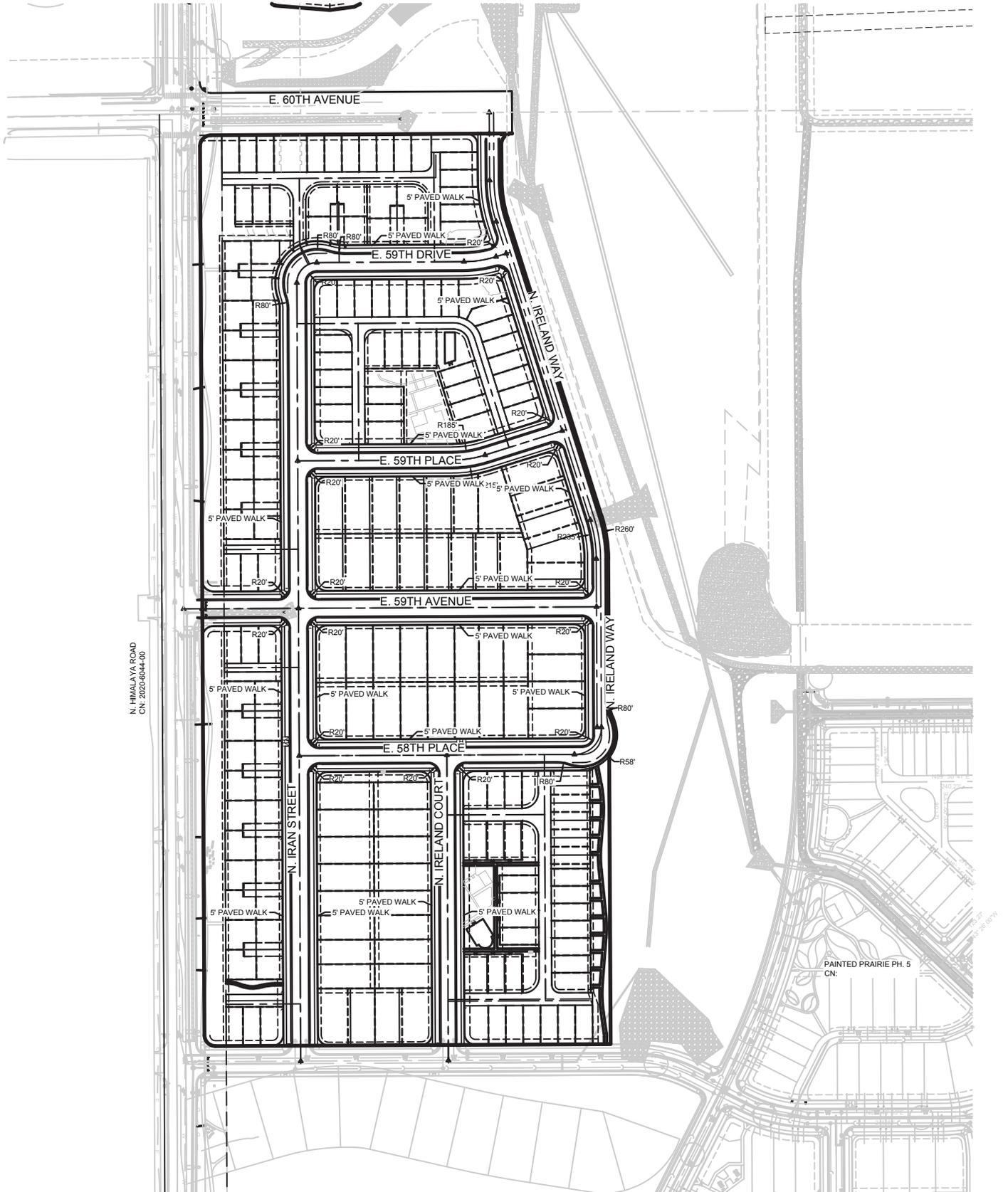
Felsburg Holt & Ullevig (FHU) prepared a traffic impact study for the Painted Prairie Master Plan in December 2019. Since that time, there has been continued development proposals within Painted Prairie including the current proposal for Phase V, which was referred to as PA-13 in the master study. The attached Site Plan shows the current plan for the development of 197 townhomes within Phase V site, which is located east of Himalaya Street between 60th Avenue and 57th Avenue. Site accesses to the external roadway network are proposed onto Himalaya at 59th Avenue and onto 57th Avenue via Iran Street and Ireland Street. The 59th Avenue location was previously assumed to be two separate full movement locations, intersections 21 and 22 in the *Painted Prairie Master Plan TIS*. Projected volumes remain low and this change should not have any negative operational impacts.

The currently proposed plan is an increase of 42 homes from the previously proposed 155 homes in the Master Plan, however it is a shift from single family detached to a multifamily unit which more than offsets the unit increase. **Table I** shows the estimated trip generation for the current proposed Phase V site and a comparison to what was projected in the master TIS.

Table I. Painted Prairie Phase V Site Trip Generation

Land Use (Trip Generation Category)	Quantity	Daily Vehicle Trips	AM Peak Hour Trips			PM Peak Hour Trips		
			In	Out	Total	In	Out	Total
Current Painted Prairie Phase V								
Multifamily Housing (Low-Rise) (#220)	197 DUs	1,448	21	70	91	68	40	108
2019 Painted Prairie Master TIS – PA-13								
Single Family Detached (#210)	155 DUs	1,556	29	86	115	97	58	155
Change from Previous Plan		-108	-8	-16	-24	-29	-18	-47
Percent Change		-7%			-21%			-30%

The comparison of trip generation indicates a decrease of 24 and 47 trips during the AM and PM peak hour respectively. These correspond to percentage decrease of 21 and 30 percent in those peak hours, but when compared with the trip generation estimate for the entire Painted Prairie Master Plan, they represent a 0.7 and 1.2 percent reduction respectively.



60th Avenue and Himalaya Street

The intersection of 60th Avenue and Himalaya Street, intersection 23 of the *Painted Prairie Master Plan TIS* is a critical intersection adjacent to Phase V. In that previous study, all four approaches were assumed to have exclusive left, through, and right-turn lanes. Given how both 60th Avenue west of the intersection and the western half of Himalaya was constructed for the adjacent “The Grove Neighborhood” development, it is no longer feasible to provide the exclusive right-turn lanes. There is also difficulty providing these lanes for the northbound and westbound approaches due to the proximity to the Highline Canal drainage to the east of the intersection.

Given the reduction of trips anticipated for Phase V and the removal of the connection of Iran Street to 60th Avenue on the south side of Phase IV, it is anticipated that volumes for the northbound right turn lane could drop to approximately 50 vph in the PM which is the State Highway Access Code (SHAC) criteria that initially determined the need for the lane. In the westbound direction, if the through and right were to be shared even under the likely conservative values presented in the *Painted Prairie Master Plan TIS*, the lane could be combined under the exemption for providing a right turn lane in the SHAC if the total lane volume is under 150 in the peak hour. Analysis of the intersection of 60th Avenue and Himalaya Street has been attached to this memo detailing that even utilizing the previously estimated volumes, which we now know to be conservative given reductions in traffic associated with Phase V, the intersection will operate acceptably at LOS C or better during the peak hours.

Conclusions

The study resulted in the following conclusions:

- The newly proposed Phase V site generates less traffic as compared to the previous proposal. These decreases are approximately 100 daily trips and 25 to 50 trips in the peak hours. This equates to a roughly 7 percent decrease in daily traffic and 20 to 30 percent during the peak hours. These also equate to approximately 1 percent as it relates to the entire Painted Prairie Master Plan.
- The site proposes to take access directly to Himalaya Street at 59th Avenue. The previously proposed access plan had two access points onto Himalaya Street. This access should be side-street stop controlled with a single-lane approaches as daily traffic on this roadway is anticipated to be 400 or fewer daily vehicles. A southbound left turn lane should be striped in the center of the 3-lane Himalaya Street cross-section, and a northbound left should be provided into the driveway access to The Parking Spot access point on the west side of Himalaya Street.
- The north/south roadways of Iran Street and Ireland Court through Phase V will provide access to the south of Phase V onto 57th Avenue and these intersections should be side-street stop-controlled with single lane approaches. Ireland Way will also intersect with 60th Avenue to the north and should be a side-street stop-controlled intersection with single lane approaches.
- Elements of the Traffic Calming Tool Box have not been applied within the Phase V site as volumes remain incredibly low and there is minimal need for traffic calming. The site has been laid out in a manner that no individual street provides a straight line connection through the phase so as to discourage any cut through traffic or speeding.
- The intersection of 60th Avenue and Himalaya Street needs to be modified to remove exclusive right-turn lanes due to physical constraints that were not fully understood at the time of the *Painted Prairie Master Plan TIS*. Analysis indicates that SHAC criteria will likely not be met or be a borderline condition to necessitate the need for exclusive right-turn lanes given the reductions in traffic expected as a result of changes in the Phase IV and V site plans. Operationally the intersection is projected to operate at LOS C or better during peak hours when through and right-turn lanes are combined into a shared lane.
- It is not anticipated that any additional off-site roadway improvements will be needed and that the Painted Prairie Phase V\ plan is in conformance with the previously assessed Master Plan.

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Mr. Chris Fellows
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Please let me know if you have any questions about this letter or need any additional information.


Philip Dunham, PE, PTOE
Transportation Engineer

Lanes, Volumes, Timings
23: Himalaya Rd & E 60th Ave/60th Ave

Painted Prairie
12/17/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	79	67	81	54	62	68	104	288	77	96	271	105
Future Volume (vph)	79	67	81	54	62	68	104	288	77	96	271	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		200	200		200	200		200	200		200
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	50			50			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.918			0.921			0.968			0.958	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1710	0	1770	1716	0	1770	1803	0	1770	1785	0
Flt Permitted	0.377			0.426			0.453			0.465		
Satd. Flow (perm)	702	1710	0	794	1716	0	844	1803	0	866	1785	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		49			42			14			20	
Link Speed (mph)		30			30			45			45	
Link Distance (ft)		600			1024			485			394	
Travel Time (s)		13.6			23.3			7.3			6.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	86	73	88	59	67	74	113	313	84	104	295	114
Shared Lane Traffic (%)												
Lane Group Flow (vph)	86	161	0	59	141	0	113	397	0	104	409	0
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right									
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru										
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex										
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		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		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA										
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		

Lanes, Volumes, Timings
23: Himalaya Rd & E 60th Ave/60th Ave

Painted Prairie
12/17/2021

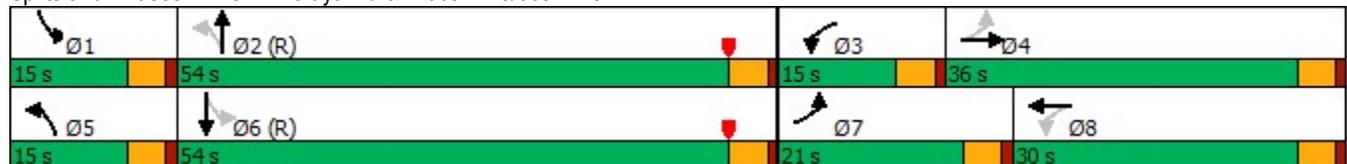


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	22.5		9.5	22.5		9.5	22.5		9.5	22.5	
Total Split (s)	21.0	36.0		15.0	30.0		15.0	54.0		15.0	54.0	
Total Split (%)	17.5%	30.0%		12.5%	25.0%		12.5%	45.0%		12.5%	45.0%	
Maximum Green (s)	16.5	31.5		10.5	25.5		10.5	49.5		10.5	49.5	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag	Lead	Lag										
Lead-Lag Optimize?	Yes	Yes										
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Min		None	C-Min	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	22.9	14.1		19.8	12.5		81.8	73.7		81.4	73.5	
Actuated g/C Ratio	0.19	0.12		0.16	0.10		0.68	0.61		0.68	0.61	
v/c Ratio	0.38	0.66		0.30	0.65		0.18	0.36		0.16	0.37	
Control Delay	41.2	47.3		38.8	49.5		3.7	9.0		8.9	15.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	41.2	47.3		38.8	49.5		3.7	9.0		8.9	15.0	
LOS	D	D		D	D		A	A		A	B	
Approach Delay		45.2			46.3			7.8			13.8	
Approach LOS		D			D			A			B	

Intersection Summary

Area Type: Other
 Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 80 (67%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
 Natural Cycle: 65
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.66
 Intersection Signal Delay: 21.4
 Intersection LOS: C
 Intersection Capacity Utilization 54.1%
 ICU Level of Service A
 Analysis Period (min) 15

Splits and Phases: 23: Himalaya Rd & E 60th Ave/60th Ave



Timings
23: Himalaya Rd & E 60th Ave/60th Ave



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↖	↗	↖	↗	↖	↗	↖	↗
Traffic Volume (vph)	79	67	54	62	104	288	96	271
Future Volume (vph)	79	67	54	62	104	288	96	271
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	9.5	22.5	9.5	22.5	9.5	22.5
Total Split (s)	21.0	36.0	15.0	30.0	15.0	54.0	15.0	54.0
Total Split (%)	17.5%	30.0%	12.5%	25.0%	12.5%	45.0%	12.5%	45.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes							
Recall Mode	None	None	None	None	None	C-Min	None	C-Min
Act Effct Green (s)	22.9	14.1	19.8	12.5	81.8	73.7	81.4	73.5
Actuated g/C Ratio	0.19	0.12	0.16	0.10	0.68	0.61	0.68	0.61
v/c Ratio	0.38	0.66	0.30	0.65	0.18	0.36	0.16	0.37
Control Delay	41.2	47.3	38.8	49.5	3.7	9.0	8.9	15.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.2	47.3	38.8	49.5	3.7	9.0	8.9	15.0
LOS	D	D	D	D	A	A	A	B
Approach Delay		45.2		46.3		7.8		13.8
Approach LOS		D		D		A		B

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 80 (67%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
 Natural Cycle: 65
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.66
 Intersection Signal Delay: 21.4
 Intersection Capacity Utilization 54.1%
 Analysis Period (min) 15

Intersection LOS: C
 ICU Level of Service A

Splits and Phases: 23: Himalaya Rd & E 60th Ave/60th Ave



HCM 6th Signalized Intersection Summary
 23: Himalaya Rd & E 60th Ave/60th Ave

Painted Prairie
 12/17/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	79	67	81	54	62	68	104	288	77	96	271	105
Future Volume (veh/h)	79	67	81	54	62	68	104	288	77	96	271	105
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	86	73	88	59	67	74	113	313	84	104	295	114
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	194	95	114	169	83	92	764	920	247	673	831	321
Arrive On Green	0.06	0.12	0.12	0.04	0.10	0.10	0.04	0.65	0.65	0.08	1.00	1.00
Sat Flow, veh/h	1781	772	931	1781	812	897	1781	1421	381	1781	1285	496
Grp Volume(v), veh/h	86	0	161	59	0	141	113	0	397	104	0	409
Grp Sat Flow(s),veh/h/ln	1781	0	1703	1781	0	1709	1781	0	1802	1781	0	1781
Q Serve(g_s), s	5.1	0.0	11.0	3.5	0.0	9.7	2.5	0.0	12.0	2.4	0.0	0.0
Cycle Q Clear(g_c), s	5.1	0.0	11.0	3.5	0.0	9.7	2.5	0.0	12.0	2.4	0.0	0.0
Prop In Lane	1.00		0.55	1.00		0.52	1.00		0.21	1.00		0.28
Lane Grp Cap(c), veh/h	194	0	209	169	0	175	764	0	1166	673	0	1152
V/C Ratio(X)	0.44	0.00	0.77	0.35	0.00	0.81	0.15	0.00	0.34	0.15	0.00	0.35
Avail Cap(c_a), veh/h	332	0	447	254	0	363	848	0	1166	757	0	1152
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	44.7	0.0	51.0	46.0	0.0	52.7	6.2	0.0	9.6	6.6	0.0	0.0
Incr Delay (d2), s/veh	1.6	0.0	6.0	1.2	0.0	8.5	0.1	0.0	0.8	0.1	0.0	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(95%),veh/ln	4.2	0.0	8.7	2.9	0.0	8.1	1.5	0.0	7.9	1.3	0.0	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.2	0.0	57.0	47.2	0.0	61.2	6.3	0.0	10.4	6.7	0.0	0.9
LnGrp LOS	D	A	E	D	A	E	A	A	B	A	A	A
Approach Vol, veh/h		247			200			510			513	
Approach Delay, s/veh		53.3			57.1			9.5			2.0	
Approach LOS		D			E			A			A	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	9.3	82.2	9.3	19.2	9.4	82.1	11.7	16.8				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	10.5	49.5	10.5	31.5	10.5	49.5	16.5	25.5				
Max Q Clear Time (g_c+I1), s	4.4	14.0	5.5	13.0	4.5	2.0	7.1	11.7				
Green Ext Time (p_c), s	0.1	2.4	0.0	0.8	0.1	2.6	0.1	0.6				
Intersection Summary												
HCM 6th Ctrl Delay			20.7									
HCM 6th LOS			C									