

APPENDIX F

Year 2018 Existing Synchro and HCS7 Files

(Synchro and HCS7 files located in electronic Appendix F folder)

APPENDIX F1

Year 2018 Existing Synchro AM Peak Hour

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↖	↗
Traffic Volume (vph)	0	490	200	150	480	0	0	0	0	100	0	370
Future Volume (vph)	0	490	200	150	480	0	0	0	0	100	0	370
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	0		215
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
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			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1792	1524	1719	1810	0	0	0	0	0	1656	1482
Flt Permitted				0.188							0.950	
Satd. Flow (perm)	0	1792	1524	340	1810	0	0	0	0	0	1656	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			245									219
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		839			431			976			921	
Travel Time (s)		19.1			9.8			22.2			20.9	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	6%	6%	6%	5%	5%	5%	1%	1%	1%	9%	9%	9%
Adj. Flow (vph)	0	628	256	192	615	0	0	0	0	128	0	474
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	628	256	192	615	0	0	0	0	0	128	474
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		30			18			0			0	
Link Offset(ft)		6			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	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	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	0.0
Detector 1 Queue (s)		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
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		20.0	20.0	7.0	20.0					10.0	10.0	10.0
Minimum Split (s)		26.5	26.5	13.5	26.5					16.0	16.0	16.0

7:00 am Baseline

Synchro 10 Report

Page 1

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		38.0	38.0	16.0	54.0					46.0	46.0	46.0
Total Split (%)		38.0%	38.0%	16.0%	54.0%					46.0%	46.0%	46.0%
Maximum Green (s)		31.5	31.5	9.5	47.5					40.0	40.0	40.0
Yellow Time (s)		4.5	4.5	4.5	4.5					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	2.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.5	-2.5	-2.5	-2.5						-2.0	-2.0
Total Lost Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lead/Lag		Lead	Lead	Lag								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	3.0
Recall Mode		Min	Min	None	Min					None	None	None
Act Effect Green (s)		34.6	34.6	50.2	50.2						24.0	24.0
Actuated g/C Ratio		0.42	0.42	0.61	0.61						0.29	0.29
v/c Ratio		0.84	0.33	0.48	0.56						0.27	0.81
Control Delay		36.1	4.7	24.0	14.3						22.6	25.0
Queue Delay		0.0	0.0	0.0	1.3						0.0	0.0
Total Delay		36.1	4.7	24.0	15.6						22.6	25.0
LOS		D	A	C	B						C	C
Approach Delay		27.0			17.6						24.5	
Approach LOS		C			B						C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 82.4

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 23.0

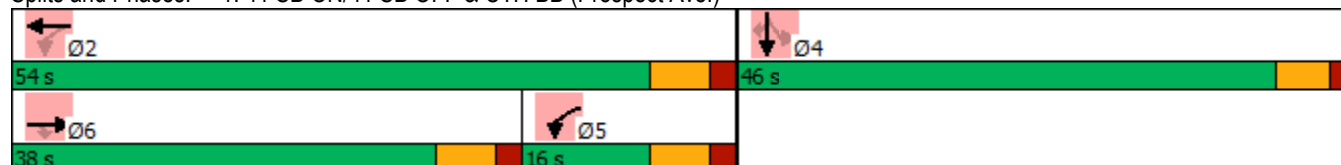
Intersection LOS: C

Intersection Capacity Utilization 58.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)



HCM 6th Signalized Intersection Summary

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

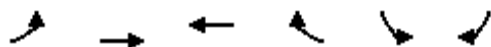
08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	490	200	150	480	0	0	0	0	100	0	370
Future Volume (veh/h)	0	490	200	150	480	0	0	0	0	100	0	370
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	0	1811	1811	1826	1826	0				1767	1767	1767
Adj Flow Rate, veh/h	0	628	256	192	615	0				128	0	474
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78				0.78	0.78	0.78
Percent Heavy Veh, %	0	6	6	5	5	0				9	9	9
Cap, veh/h	0	699	592	277	987	0				618	0	550
Arrive On Green	0.00	0.39	0.39	0.11	0.54	0.00				0.37	0.00	0.37
Sat Flow, veh/h	0	1811	1535	1739	1826	0				1682	0	1497
Grp Volume(v), veh/h	0	628	256	192	615	0				128	0	474
Grp Sat Flow(s),veh/h/ln	0	1811	1535	1739	1826	0				1682	0	1497
Q Serve(g_s), s	0.0	28.3	10.7	4.7	20.2	0.0				4.5	0.0	25.5
Cycle Q Clear(g_c), s	0.0	28.3	10.7	4.7	20.2	0.0				4.5	0.0	25.5
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	699	592	277	987	0				618	0	550
V/C Ratio(X)	0.00	0.90	0.43	0.69	0.62	0.00				0.21	0.00	0.86
Avail Cap(c_a), veh/h	0	709	601	328	1052	0				814	0	724
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	25.0	19.6	35.5	13.8	0.0				18.8	0.0	25.4
Incr Delay (d2), s/veh	0.0	14.5	0.7	4.9	1.3	0.0				0.2	0.0	8.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	14.3	3.8	4.1	7.9	0.0				1.7	0.0	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	39.6	20.3	40.4	15.1	0.0				19.0	0.0	33.7
LnGrp LOS	A	D	C	D	B	A				B	A	C
Approach Vol, veh/h		884			807						602	
Approach Delay, s/veh		34.0			21.1						30.6	
Approach LOS		C			C						C	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		50.9		35.9	13.4	37.5						
Change Period (Y+Rc), s		6.5		6.0	6.5	6.5						
Max Green Setting (Gmax), s		47.5		40.0	9.5	31.5						
Max Q Clear Time (g_c+I1), s		22.2		27.5	6.7	30.3						
Green Ext Time (p_c), s		4.6		2.4	0.2	0.7						
Intersection Summary												
HCM 6th Ctrl Delay			28.6									
HCM 6th LOS			C									

Lanes, Volumes, Timings

2: CTH BB (Prospect Ave.) & 41 NB ON

08/21/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	340	250	630	70	0	0
Future Volume (vph)	340	250	630	70	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			460	0	0
Storage Lanes	1			1	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		
Flt Protected	0.950					
Satd. Flow (prot)	1736	1827	1863	1583	0	0
Flt Permitted	0.228					
Satd. Flow (perm)	417	1827	1863	1583	0	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				85		
Link Speed (mph)		30	30		30	
Link Distance (ft)		431	560		977	
Travel Time (s)		9.8	12.7		22.2	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles (%)	4%	4%	2%	2%	1%	1%
Adj. Flow (vph)	415	305	768	85	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	415	305	768	85	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		18	30		0	
Link Offset(ft)		6	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
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	1		
Detector Template						
Leading Detector (ft)	50	50	50	50		
Trailing Detector (ft)	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0		
Detector 1 Size(ft)	50	50	50	50		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		
Turn Type	pm+pt	NA	NA	Perm		
Protected Phases	1	6	2			
Permitted Phases	6			2		
Detector Phase	1	6	2	2		
Switch Phase						
Minimum Initial (s)	5.0	20.0	20.0	20.0		
Minimum Split (s)	20.5	26.5	26.5	26.5		

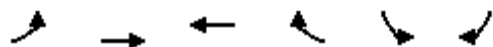
7:00 am Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings

2: CTH BB (Prospect Ave.) & 41 NB ON

08/21/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	38.0	100.0	30.0	30.0		
Total Split (%)	38.0%	100.0%	30.0%	30.0%		
Maximum Green (s)	31.5	93.5	23.5	23.5		
Yellow Time (s)	4.5	4.5	4.5	4.5		
All-Red Time (s)	2.0	2.0	2.0	2.0		
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5		
Total Lost Time (s)	4.0	4.0	4.0	4.0		
Lead/Lag	Lag		Lead	Lead		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	4.0	4.0	4.0		
Recall Mode	None	Min	Min	Min		
Act Effect Green (s)	43.3	47.3	26.1	26.1		
Actuated g/C Ratio	0.92	1.00	0.55	0.55		
v/c Ratio	0.56	0.17	0.75	0.09		
Control Delay	6.8	0.2	16.1	2.4		
Queue Delay	0.1	0.0	0.0	0.0		
Total Delay	6.8	0.2	16.1	2.4		
LOS	A	A	B	A		
Approach Delay		4.0	14.7			
Approach LOS		A	B			

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 47.3

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 9.8

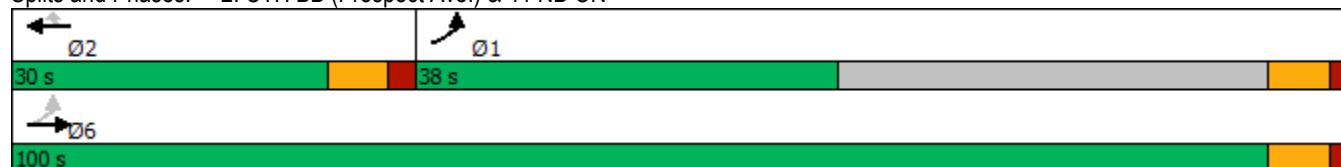
Intersection LOS: A

Intersection Capacity Utilization 58.7%

ICU Level of Service B

Analysis Period (min) 15

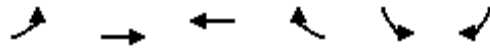
Splits and Phases: 2: CTH BB (Prospect Ave.) & 41 NB ON



HCM 6th Signalized Intersection Summary

2: CTH BB (Prospect Ave.) & 41 NB ON

08/21/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	340	250	630	70	0	0
Future Volume (veh/h)	340	250	630	70	0	0
Initial Q (Qb), veh	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00		
Work Zone On Approach		No	No			
Adj Sat Flow, veh/h/ln	1841	1841	1870	1870		
Adj Flow Rate, veh/h	415	305	768	85		
Peak Hour Factor	0.82	0.82	0.82	0.82		
Percent Heavy Veh, %	4	4	2	2		
Cap, veh/h	656	1647	1108	939		
Arrive On Green	0.20	0.89	0.59	0.59		
Sat Flow, veh/h	1753	1841	1870	1585		
Grp Volume(v), veh/h	415	305	768	85		
Grp Sat Flow(s), veh/h/ln	1753	1841	1870	1585		
Q Serve(g_s), s	0.7	0.8	10.8	0.9		
Cycle Q Clear(g_c), s	0.7	0.8	10.8	0.9		
Prop In Lane	1.00			1.00		
Lane Grp Cap(c), veh/h	656	1647	1108	939		
V/C Ratio(X)	0.63	0.19	0.69	0.09		
Avail Cap(c_a), veh/h	1879	4651	1280	1085		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	11.2	0.3	5.4	3.3		
Incr Delay (d2), s/veh	1.0	0.1	1.6	0.1		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	2.5	0.0	2.3	0.1		
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	12.2	0.3	7.0	3.4		
LnGrp LOS	B	A	A	A		
Approach Vol, veh/h		720	853			
Approach Delay, s/veh		7.2	6.6			
Approach LOS		A	A			
Timer - Assigned Phs	1	2			6	
Phs Duration (G+Y+Rc), s	11.5	26.5			38.0	
Change Period (Y+Rc), s	6.5	6.5			6.5	
Max Green Setting (Gmax), s	31.5	23.5			93.5	
Max Q Clear Time (g_c+I1), s	2.7	12.8			2.8	
Green Ext Time (p_c), s	1.9	4.5			2.1	
Intersection Summary						
HCM 6th Ctrl Delay			6.9			
HCM 6th LOS			A			

Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/21/2019

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	250	0	0	490	210	440
Future Volume (vph)	250	0	0	490	210	440
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	0		100	0
Storage Lanes		0	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	1845	0	0	1881	1770	1583
Flt Permitted					0.950	
Satd. Flow (perm)	1845	0	0	1881	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						524
Link Speed (mph)	30			30	30	
Link Distance (ft)	560			456	1100	
Travel Time (s)	12.7			10.4	25.0	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	3%	3%	1%	1%	2%	2%
Adj. Flow (vph)	298	0	0	583	250	524
Shared Lane Traffic (%)						
Lane Group Flow (vph)	298	0	0	583	250	524
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						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	1			1	1	1
Detector Template						
Leading Detector (ft)	50			50	50	50
Trailing Detector (ft)	0			0	0	0
Detector 1 Position(ft)	0			0	0	0
Detector 1 Size(ft)	50			50	50	50
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	0.0
Detector 1 Queue (s)	0.0			0.0	0.0	0.0
Detector 1 Delay (s)	0.0			0.0	0.0	0.0
Turn Type	NA			NA	Prot	Perm
Protected Phases	6			2	4	
Permitted Phases						4
Detector Phase	6			2	4	4
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	10.0
Minimum Split (s)	26.0			26.0	16.0	16.0

Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/21/2019

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Total Split (s)	59.0			59.0	41.0	41.0
Total Split (%)	59.0%			59.0%	41.0%	41.0%
Maximum Green (s)	53.0			53.0	35.0	35.0
Yellow Time (s)	4.0			4.0	4.0	4.0
All-Red Time (s)	2.0			2.0	2.0	2.0
Lost Time Adjust (s)	-2.0			-2.0	-2.0	-2.0
Total Lost Time (s)	4.0			4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0			4.0	3.0	3.0
Recall Mode	Min			Min	None	None
Walk Time (s)	5.0			5.0		
Flash Dont Walk (s)	11.0			11.0		
Pedestrian Calls (#/hr)	0			0		
Act Effct Green (s)	27.2			27.2	17.1	17.1
Actuated g/C Ratio	0.52			0.52	0.33	0.33
v/c Ratio	0.31			0.60	0.43	0.60
Control Delay	9.0			12.6	17.6	5.1
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	9.0			12.6	17.6	5.1
LOS	A			B	B	A
Approach Delay	9.0			12.6	9.2	
Approach LOS	A			B	A	

Intersection Summary

Area Type: Other
 Cycle Length: 100
 Actuated Cycle Length: 52.6
 Natural Cycle: 45
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.60
 Intersection Signal Delay: 10.4
 Intersection Capacity Utilization 50.6%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service A

Splits and Phases: 3: 41 NB OFF & CTH BB (Prospect Ave.)

← Ø2	↖ Ø4
59 s	41 s
→ Ø6	
59 s	

HCM 6th Signalized Intersection Summary 3: 41 NB OFF & CTH BB (Prospect Ave.)

08/21/2019

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↖	↗
Traffic Volume (veh/h)	250	0	0	490	210	440
Future Volume (veh/h)	250	0	0	490	210	440
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
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1856	0	0	1885	1870	1870
Adj Flow Rate, veh/h	298	0	0	583	250	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	0	0	1	2	2
Cap, veh/h	985	0	0	1001	492	
Arrive On Green	0.53	0.00	0.00	0.53	0.28	0.00
Sat Flow, veh/h	1856	0	0	1885	1781	1585
Grp Volume(v), veh/h	298	0	0	583	250	0
Grp Sat Flow(s),veh/h/ln	1856	0	0	1885	1781	1585
Q Serve(g_s), s	3.7	0.0	0.0	8.7	4.9	0.0
Cycle Q Clear(g_c), s	3.7	0.0	0.0	8.7	4.9	0.0
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	985	0	0	1001	492	
V/C Ratio(X)	0.30	0.00	0.00	0.58	0.51	
Avail Cap(c_a), veh/h	2463	0	0	2502	1591	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	5.4	0.0	0.0	6.6	12.6	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.8	0.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.0	0.0	2.3	1.7	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	5.7	0.0	0.0	7.4	13.4	0.0
LnGrp LOS	A	A	A	A	B	
Approach Vol, veh/h	298			583	250	A
Approach Delay, s/veh	5.7			7.4	13.4	
Approach LOS	A			A	B	
Timer - Assigned Phs	2		4		6	
Phs Duration (G+Y+Rc), s	26.0		15.4		26.0	
Change Period (Y+Rc), s	6.0		6.0		6.0	
Max Green Setting (Gmax), s	53.0		35.0		53.0	
Max Q Clear Time (g_c+I1), s	10.7		6.9		5.7	
Green Ext Time (p_c), s	4.6		1.0		2.0	
Intersection Summary						
HCM 6th Ctrl Delay			8.3			
HCM 6th LOS			A			

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (vph)	0	520	160	290	640	0	0	0	0	190	0	310
Future Volume (vph)	0	520	160	290	640	0	0	0	0	190	0	310
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		250	0		0	0			450		450
Storage Lanes	0		1	1		0	0			1		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	3539	0	0	0	0	1770	1681	2787
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	5085	1583	1770	3539	0	0	0	0	1770	1681	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			186									360
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			651			1026			1109	
Travel Time (s)		11.4			14.8			23.3			25.2	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	605	186	337	744	0	0	0	0	221	0	360
Shared Lane Traffic (%)										100%		
Lane Group Flow (vph)	0	605	186	337	744	0	0	0	0	0	221	360
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			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	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	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	0.0
Detector 1 Queue (s)		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
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		6		5	2						8	
Permitted Phases			6							8		8
Detector Phase		6	6	5	2					8	8	8
Switch Phase												
Minimum Initial (s)		3.0	3.0	5.0	5.0					7.0	7.0	7.0
Minimum Split (s)		9.0	9.0	10.0	11.0					13.0	13.0	13.0

7:00 am Baseline

Synchro 10 Report
Page 1

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/21/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)		36.0	36.0	41.0	77.0					23.0	23.0	23.0
Total Split (%)		36.0%	36.0%	41.0%	77.0%					23.0%	23.0%	23.0%
Maximum Green (s)		30.0	30.0	36.0	71.0					17.0	17.0	17.0
Yellow Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	-1.0	-2.0					-2.0	-2.0	-2.0
Total Lost Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
Lead/Lag		Lag	Lag	Lead								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		3.0	3.0	3.0	3.0					3.0	3.0	3.0
Recall Mode		Max	Max	C-Max	C-Max					Max	Max	Max
Act Effect Green (s)		32.0	32.0	37.0	73.0					19.0	19.0	19.0
Actuated g/C Ratio		0.32	0.32	0.37	0.73					0.19	0.19	0.19
v/c Ratio		0.37	0.29	0.52	0.29					0.69	0.44	0.44
Control Delay		27.1	5.1	43.0	5.5					50.4	5.6	5.6
Queue Delay		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Total Delay		27.1	5.1	43.0	5.5					50.4	5.6	5.6
LOS		C	A	D	A					D	A	A
Approach Delay		21.9			17.2					22.7		
Approach LOS		C			B					C		

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 45 (45%), Referenced to phase 2:WBT and 5:WBL, Start of Green

Natural Cycle: 40

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 20.0

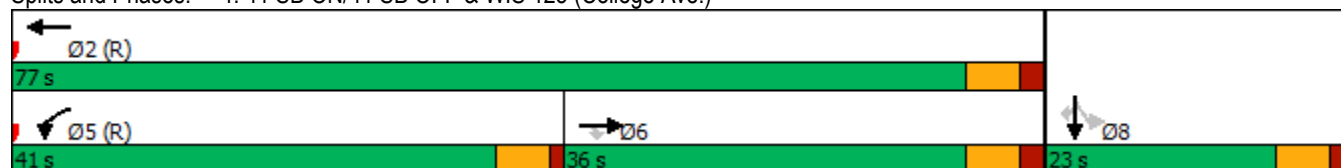
Intersection LOS: B

Intersection Capacity Utilization 41.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary 4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/21/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (veh/h)	0	520	160	290	640	0	0	0	0	190	0	310
Future Volume (veh/h)	0	520	160	290	640	0	0	0	0	190	0	310
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	605	0	337	744	0				221	0	0
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86				0.86	0.86	0.86
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	2382		398	2594	0				677	0	
Arrive On Green	0.00	0.15	0.00	0.22	0.73	0.00				0.19	0.00	0.00
Sat Flow, veh/h	0	5274	1585	1781	3647	0				3563	0	3170
Grp Volume(v), veh/h	0	605	0	337	744	0				221	0	0
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1777	0				1781	0	1585
Q Serve(g_s), s	0.0	10.4	0.0	18.1	7.1	0.0				5.4	0.0	0.0
Cycle Q Clear(g_c), s	0.0	10.4	0.0	18.1	7.1	0.0				5.4	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2382		398	2594	0				677	0	
V/C Ratio(X)	0.00	0.25		0.85	0.29	0.00				0.33	0.00	
Avail Cap(c_a), veh/h	0	2382		659	2594	0				677	0	
HCM Platoon Ratio	1.00	0.33	0.33	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.90	0.90	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	27.0	0.0	37.2	4.6	0.0				35.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	4.9	0.3	0.0				1.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.8	0.0	8.3	2.3	0.0				2.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	27.2	0.0	42.1	4.9	0.0				36.3	0.0	0.0
LnGrp LOS	A	C		D	A	A				D	A	
Approach Vol, veh/h		605	A		1081						221	A
Approach Delay, s/veh		27.2			16.5						36.3	
Approach LOS		C			B						D	
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		77.0			26.4	50.6		23.0				
Change Period (Y+Rc), s		6.0			5.0	6.0		6.0				
Max Green Setting (Gmax), s		71.0			36.0	30.0		17.0				
Max Q Clear Time (g_c+I1), s		9.1			20.1	12.4		7.4				
Green Ext Time (p_c), s		4.0			1.2	2.7		0.6				
Intersection Summary												
HCM 6th Ctrl Delay			22.2									
HCM 6th LOS			C									
Notes												
User approved volume balancing among the lanes for turning movement.												
Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	550	0	0	640	110	290	0	430	0	0	0
Future Volume (vph)	160	550	0	0	640	110	290	0	430	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	225		280	600		600	0		0
Storage Lanes	1		0	1		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950	0.950				
Satd. Flow (prot)	1787	3574	0	0	5085	1583	1681	1681	2787	0	0	0
Flt Permitted	0.242						0.950	0.950				
Satd. Flow (perm)	455	3574	0	0	5085	1583	1681	1681	2787	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						128			500			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		651			1111			1013			1111	
Travel Time (s)		14.8			25.3			23.0			25.3	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	186	640	0	0	744	128	337	0	500	0	0	0
Shared Lane Traffic (%)							50%					
Lane Group Flow (vph)	186	640	0	0	744	128	168	169	500	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			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	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	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	0.0			
Detector 1 Queue (s)	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			
Turn Type	pm+pt	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	3.0			4.0	4.0	4.0	4.0	4.0			
Minimum Split (s)	13.0	9.0			10.0	10.0	10.0	10.0	10.0			

7:00 am Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings
5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	35.0	72.0			37.0	37.0	28.0	28.0	28.0			
Total Split (%)	35.0%	72.0%			37.0%	37.0%	28.0%	28.0%	28.0%			
Maximum Green (s)	29.0	66.0			31.0	31.0	23.0	23.0	23.0			
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	2.0	2.0			2.0	2.0	1.0	1.0	1.0			
Lost Time Adjust (s)	-2.0	-2.0			-2.0	-2.0	-1.0	-1.0	-1.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Recall Mode	C-Max	Max			Max	Max	Max	Max	Max			
Act Effct Green (s)	68.0	68.0			33.0	33.0	24.0	24.0	24.0			
Actuated g/C Ratio	0.68	0.68			0.33	0.33	0.24	0.24	0.24			
v/c Ratio	0.26	0.26			0.44	0.21	0.42	0.42	0.48			
Control Delay	19.4	6.4			27.3	5.3	35.9	35.9	4.5			
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Total Delay	19.4	6.4			27.3	5.3	35.9	35.9	4.5			
LOS	B	A			C	A	D	D	A			
Approach Delay	9.3				24.1		17.2					
Approach LOS	A				C		B					

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 45 (45%), Referenced to phase 1:EBL, Start of Green

Natural Cycle: 40

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.48

Intersection Signal Delay: 17.0

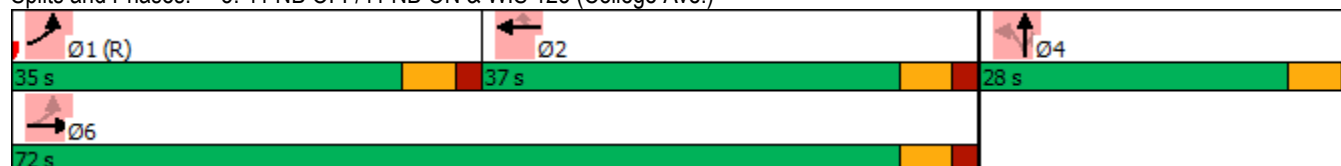
Intersection LOS: B

Intersection Capacity Utilization 41.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary

5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  				 			
Traffic Volume (veh/h)	160	550	0	0	640	110	290	0	430	0	0	0
Future Volume (veh/h)	160	550	0	0	640	110	290	0	430	0	0	0
Initial Q (Qb), veh	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			
Parking Bus, Adj	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					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	186	640	0	0	744	0	337	0	0			
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86			
Percent Heavy Veh, %	1	1	0	0	2	2	2	2	2			
Cap, veh/h	540	2436	0	0	2808		855	0				
Arrive On Green	0.09	0.68	0.00	0.00	0.18	0.00	0.24	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	5274	1585	3563	0	3170			
Grp Volume(v), veh/h	186	640	0	0	744	0	337	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	3.9	7.0	0.0	0.0	12.5	0.0	7.9	0.0	0.0			
Cycle Q Clear(g_c), s	3.9	7.0	0.0	0.0	12.5	0.0	7.9	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	540	2436	0	0	2808		855	0				
V/C Ratio(X)	0.34	0.26	0.00	0.00	0.26		0.39	0.00				
Avail Cap(c_a), veh/h	935	2436	0	0	2808		855	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.94	0.94	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	7.9	6.2	0.0	0.0	23.5	0.0	31.9	0.0	0.0			
Incr Delay (d2), s/veh	0.4	0.2	0.0	0.0	0.2	0.0	1.4	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	1.4	2.4	0.0	0.0	5.7	0.0	3.6	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.2	6.5	0.0	0.0	23.8	0.0	33.3	0.0	0.0			
LnGrp LOS	A	A	A	A	C		C	A				
Approach Vol, veh/h	826			744			A			337		
Approach Delay, s/veh	6.9			23.8			33.3			A		
Approach LOS	A			C			C					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	13.0	59.0		28.0		72.0						
Change Period (Y+Rc), s	6.0	6.0		5.0		6.0						
Max Green Setting (Gmax), s	29.0	31.0		23.0		66.0						
Max Q Clear Time (g_c+I1), s	5.9	14.5		9.9		9.0						
Green Ext Time (p_c), s	0.7	3.4		1.3		3.3						

Intersection Summary

HCM 6th Ctrl Delay 18.1

HCM 6th LOS B

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑						↑	↑
Traffic Volume (vph)	0	610	180	350	610	0	0	0	0	150	0	270
Future Volume (vph)	0	610	180	350	610	0	0	0	0	150	0	270
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	525		800	0		0	0		0	0		235
Storage Lanes	1		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	3539	0	0	0	0	0	1770	1583
Flt Permitted				0.201							0.950	
Satd. Flow (perm)	0	5085	1583	374	3539	0	0	0	0	0	1770	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			231									255
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1386			353			754			884	
Travel Time (s)		31.5			8.0			17.1			20.1	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	782	231	449	782	0	0	0	0	192	0	346
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	782	231	449	782	0	0	0	0	0	192	346
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			0			0	
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	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	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	0.0
Detector 1 Queue (s)		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
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		15.0	15.0	7.0	15.0					10.0	10.0	10.0
Minimum Split (s)		21.0	21.0	11.0	21.0					16.0	16.0	16.0

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)		34.0	34.0	40.0	74.0					26.0	26.0	26.0
Total Split (%)		34.0%	34.0%	40.0%	74.0%					26.0%	26.0%	26.0%
Maximum Green (s)		28.0	28.0	36.0	68.0					20.0	20.0	20.0
Yellow Time (s)		4.0	4.0	3.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	0.0	-2.0						-2.0	-2.0
Total Lost Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lead/Lag		Lag	Lag	Lead								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		4.0	4.0	2.0	4.0					3.0	3.0	3.0
Recall Mode		C-Max	C-Max	Max	C-Max					Min	Min	Min
Act Effect Green (s)		30.0	30.0	74.2	74.2						17.8	17.8
Actuated g/C Ratio		0.30	0.30	0.74	0.74						0.18	0.18
v/c Ratio		0.51	0.36	0.54	0.30						0.61	0.70
Control Delay		30.4	5.4	4.4	0.5						45.8	18.8
Queue Delay		0.0	0.0	0.7	0.3						0.0	0.0
Total Delay		30.4	5.4	5.1	0.8						45.8	18.8
LOS		C	A	A	A						D	B
Approach Delay		24.7			2.4						28.5	
Approach LOS		C			A						C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 49 (49%), Referenced to phase 2:WBTL and 6:EBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 15.5

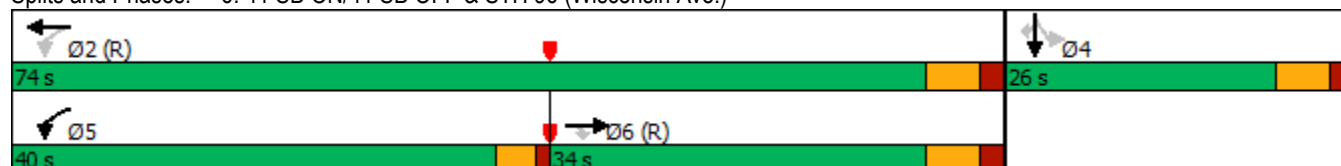
Intersection LOS: B

Intersection Capacity Utilization 50.2%

ICU Level of Service A

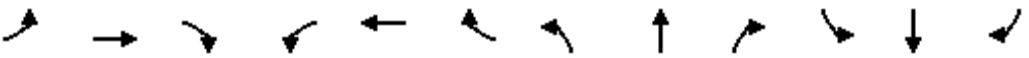
Analysis Period (min) 15

Splits and Phases: 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↗	↖	↑↑						↖	↗
Traffic Volume (veh/h)	0	610	180	350	610	0	0	0	0	150	0	270
Future Volume (veh/h)	0	610	180	350	610	0	0	0	0	150	0	270
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	782	0	449	782	0				192	0	346
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78				0.78	0.78	0.78
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	1532		819	2488	0				392	0	349
Arrive On Green	0.00	0.30	0.00	0.72	1.00	0.00				0.22	0.00	0.22
Sat Flow, veh/h	0	5274	1585	1781	3647	0				1781	0	1585
Grp Volume(v), veh/h	0	782	0	449	782	0				192	0	346
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1777	0				1781	0	1585
Q Serve(g_s), s	0.0	12.7	0.0	7.6	0.0	0.0				9.4	0.0	21.8
Cycle Q Clear(g_c), s	0.0	12.7	0.0	7.6	0.0	0.0				9.4	0.0	21.8
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1532		819	2488	0				392	0	349
V/C Ratio(X)	0.00	0.51		0.55	0.31	0.00				0.49	0.00	0.99
Avail Cap(c_a), veh/h	0	1532		819	2488	0				392	0	349
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.81	0.81	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	28.9	0.0	3.7	0.0	0.0				34.1	0.0	38.9
Incr Delay (d2), s/veh	0.0	1.2	0.0	2.1	0.3	0.0				0.9	0.0	46.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	5.3	0.0	1.9	0.1	0.0				4.1	0.0	21.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	30.1	0.0	5.9	0.3	0.0				35.0	0.0	84.9
LnGrp LOS	A	C		A	A	A				D	A	F
Approach Vol, veh/h		782	A		1231						538	
Approach Delay, s/veh		30.1			2.3						67.1	
Approach LOS		C			A						E	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		74.0		26.0	40.0	34.0						
Change Period (Y+Rc), s		6.0		6.0	4.0	6.0						
Max Green Setting (Gmax), s		68.0		20.0	36.0	28.0						
Max Q Clear Time (g_c+I1), s		2.0		23.8	9.6	14.7						
Green Ext Time (p_c), s		6.9		0.0	1.1	4.6						
Intersection Summary												
HCM 6th Ctrl Delay			24.5									
HCM 6th LOS			C									
Notes												
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	600	0	0	710	70	250	0	380	0	0	0
Future Volume (vph)	160	600	0	0	710	70	250	0	380	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	525		525	0		180	0		0
Storage Lanes	1		0	1		1	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950	0.950				
Satd. Flow (prot)	1770	3539	0	0	5085	1583	1681	1681	1583	0	0	0
Flt Permitted	0.164						0.950	0.950				
Satd. Flow (perm)	305	3539	0	0	5085	1583	1681	1681	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						86			275			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			1101			409			876	
Travel Time (s)		8.0			25.0			9.3			19.9	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	198	741	0	0	877	86	309	0	469	0	0	0
Shared Lane Traffic (%)							50%					
Lane Group Flow (vph)	198	741	0	0	877	86	154	155	469	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			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	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	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	0.0			
Detector 1 Queue (s)	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			
Turn Type	pm+pt	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	15.0			15.0	15.0	10.0	10.0	10.0			
Minimum Split (s)	11.0	21.0			21.0	21.0	16.0	16.0	16.0			

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	40.0	74.0			34.0	34.0	26.0	26.0	26.0			
Total Split (%)	40.0%	74.0%			34.0%	34.0%	26.0%	26.0%	26.0%			
Maximum Green (s)	36.0	68.0			28.0	28.0	20.0	20.0	20.0			
Yellow Time (s)	3.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	-2.0			-2.0	-2.0	-2.0	-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	2.0	4.0			4.0	4.0	3.0	3.0	3.0			
Recall Mode	Max	C-Max			C-Max	C-Max	Min	Min	Min			
Act Effct Green (s)	72.6	72.6			30.0	30.0	19.4	19.4	19.4			
Actuated g/C Ratio	0.73	0.73			0.30	0.30	0.19	0.19	0.19			
v/c Ratio	0.25	0.29			0.58	0.16	0.47	0.48	0.89			
Control Delay	1.2	2.2			31.4	6.6	40.0	40.1	35.6			
Queue Delay	0.0	0.5			0.0	0.0	0.0	0.0	0.0			
Total Delay	1.2	2.6			31.4	6.6	40.0	40.1	35.6			
LOS	A	A			C	A	D	D	D			
Approach Delay		2.3			29.2			37.4				
Approach LOS		A			C			D				

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 22.2

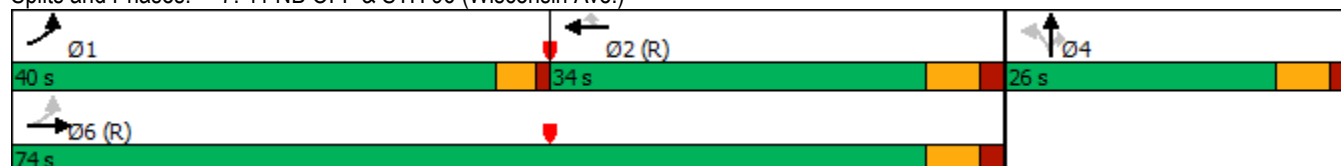
Intersection LOS: C

Intersection Capacity Utilization 50.2%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 7: 41 NB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  							
Traffic Volume (veh/h)	160	600	0	0	710	70	250	0	380	0	0	0
Future Volume (veh/h)	160	600	0	0	710	70	250	0	380	0	0	0
Initial Q (Qb), veh	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			
Parking Bus, Adj	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					
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	198	741	0	0	877	86	309	0	0			
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	854	2800	0	0	1980	615	471	0				
Arrive On Green	0.36	0.79	0.00	0.00	0.39	0.39	0.13	0.00	0.00			
Sat Flow, veh/h	1781	3647	0	0	5274	1585	3563	0	1585			
Grp Volume(v), veh/h	198	741	0	0	877	86	309	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	3.2	5.6	0.0	0.0	12.7	3.5	8.2	0.0	0.0			
Cycle Q Clear(g_c), s	3.2	5.6	0.0	0.0	12.7	3.5	8.2	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	854	2800	0	0	1980	615	471	0				
V/C Ratio(X)	0.23	0.26	0.00	0.00	0.44	0.14	0.66	0.00				
Avail Cap(c_a), veh/h	854	2800	0	0	1980	615	784	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.85	0.85	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	5.2	2.8	0.0	0.0	22.6	19.8	41.2	0.0	0.0			
Incr Delay (d2), s/veh	0.5	0.2	0.0	0.0	0.7	0.5	1.6	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	1.0	1.5	0.0	0.0	5.1	1.4	3.7	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	5.8	3.0	0.0	0.0	23.3	20.3	42.8	0.0	0.0			
LnGrp LOS	A	A	A	A	C	C	D	A				
Approach Vol, veh/h	939			963			309			A		
Approach Delay, s/veh	3.6			23.1			42.8					
Approach LOS	A			C			D					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	40.0	42.8		17.2		82.8						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	36.0	28.0		20.0		68.0						
Max Q Clear Time (g_c+I1), s	5.2	14.7		10.2		7.6						
Green Ext Time (p_c), s	0.4	5.6		1.0		6.4						

Intersection Summary

HCM 6th Ctrl Delay	17.6
HCM 6th LOS	B

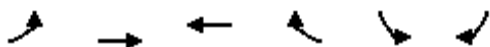
Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

08/21/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	160	1080	570	350	190	670
Future Volume (vph)	160	1080	570	350	190	670
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250			350	0	200
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1763	3539	3505	1568	1770	1583
Flt Permitted	0.181				0.950	
Satd. Flow (perm)	336	3539	3505	1568	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				461		299
Link Speed (mph)		30	30		30	
Link Distance (ft)		1990	1183		425	
Travel Time (s)		45.2	26.9		9.7	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	2%	2%	3%	3%	2%	2%
Bus Blockages (#/hr)	1	0	0	0	0	0
Adj. Flow (vph)	211	1421	750	461	250	882
Shared Lane Traffic (%)						
Lane Group Flow (vph)	211	1421	750	461	250	882
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	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						
Headway Factor	1.01	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
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
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	6			2		4
Detector Phase	1	6	2	2	4	4
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0	10.0	10.0

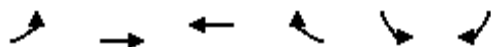
7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

8: Northland (CTH OO) & SB 41 OFF

08/21/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	12.0	26.0	26.0	26.0	16.0	16.0
Total Split (s)	15.0	45.0	45.0	45.0	40.0	40.0
Total Split (%)	15.0%	45.0%	45.0%	45.0%	40.0%	40.0%
Maximum Green (s)	10.0	39.0	39.0	39.0	34.0	34.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0	4.0
Recall Mode	None	Min	Min	Min	None	None
Act Effct Green (s)	44.1	44.1	29.5	29.5	36.1	36.1
Actuated g/C Ratio	0.50	0.50	0.33	0.33	0.41	0.41
v/c Ratio	0.62	0.80	0.64	0.56	0.35	1.07
Control Delay	20.7	22.5	27.5	4.8	20.9	71.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.7	22.5	27.5	4.8	20.9	71.6
LOS	C	C	C	A	C	E
Approach Delay		22.2	18.9		60.4	
Approach LOS		C	B		E	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 88.3

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.07

Intersection Signal Delay: 32.1

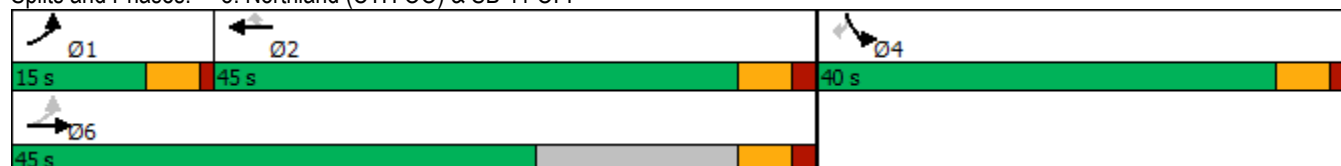
Intersection LOS: C

Intersection Capacity Utilization 64.8%

ICU Level of Service C

Analysis Period (min) 15

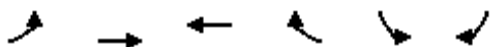
Splits and Phases: 8: Northland (CTH OO) & SB 41 OFF



HCM 6th Signalized Intersection Summary

8: Northland (CTH OO) & SB 41 OFF

08/21/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	160	1080	570	350	190	670
Future Volume (veh/h)	160	1080	570	350	190	670
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
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1856	1856	1870	1870
Adj Flow Rate, veh/h	211	1421	750	0	250	0
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Percent Heavy Veh, %	2	2	3	3	2	2
Cap, veh/h	553	2226	1442		400	
Arrive On Green	0.14	0.63	0.41	0.00	0.22	0.00
Sat Flow, veh/h	1781	3647	3618	1572	1781	1585
Grp Volume(v), veh/h	211	1421	750	0	250	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1763	1572	1781	1585
Q Serve(g_s), s	3.1	13.4	8.6	0.0	6.8	0.0
Cycle Q Clear(g_c), s	3.1	13.4	8.6	0.0	6.8	0.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	553	2226	1442		400	
V/C Ratio(X)	0.38	0.64	0.52		0.62	
Avail Cap(c_a), veh/h	662	2709	2687		1192	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	7.1	6.3	11.9	0.0	18.8	0.0
Incr Delay (d2), s/veh	0.4	0.5	0.3	0.0	2.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	3.3	2.9	0.0	2.8	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	7.5	6.7	12.2	0.0	21.1	0.0
LnGrp LOS	A	A	B		C	
Approach Vol, veh/h		1632	750	A	250	A
Approach Delay, s/veh		6.8	12.2		21.1	
Approach LOS		A	B		C	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	11.7	26.0		16.1		37.7
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	10.0	39.0		34.0		39.0
Max Q Clear Time (g_c+I1), s	5.1	10.6		8.8		15.4
Green Ext Time (p_c), s	0.3	3.9		1.5		12.3

Intersection Summary

HCM 6th Ctrl Delay	9.7
HCM 6th LOS	A

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	490	780	0	0	760	140	160	0	410	0	0	0
Future Volume (vph)	490	780	0	0	760	140	160	0	410	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	0		340	0		670	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1787	3574	0	0	3539	1583	0	1671	1495	0	0	0
Flt Permitted	0.111							0.950				
Satd. Flow (perm)	209	3574	0	0	3539	1583	0	1671	1495	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						184			149			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1183			2176			1467			1203	
Travel Time (s)		26.9			49.5			33.3			27.3	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	8%	8%	8%	1%	1%	1%
Adj. Flow (vph)	645	1026	0	0	1000	184	211	0	539	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	645	1026	0	0	1000	184	0	211	539	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
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	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	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	0.0			
Detector 1 Queue (s)	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			
Turn Type	pm+pt	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	20.0			20.0	20.0	10.0	10.0	10.0			
Minimum Split (s)	12.0	26.0			36.0	36.0	20.0	20.0	20.0			

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/21/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	25.0	40.0			40.0	40.0	25.0	25.0	25.0			
Total Split (%)	27.8%	44.4%			44.4%	44.4%	27.8%	27.8%	27.8%			
Maximum Green (s)	20.0	34.0			34.0	34.0	19.0	19.0	19.0			
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	-1.0	-2.0			-2.0	-2.0		-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0		4.0	4.0			
Lead/Lag	Lead				Lag				Lag			
Lead-Lag Optimize?	Yes				Yes				Yes			
Vehicle Extension (s)	3.0	3.0			4.0	4.0	4.0	4.0	4.0			
Recall Mode	None	Min			Min	Min	None	None	None			
Act Effct Green (s)	58.4	58.4			33.4	33.4		21.0	21.0			
Actuated g/C Ratio	0.67	0.67			0.38	0.38		0.24	0.24			
v/c Ratio	1.25	0.43			0.74	0.26		0.53	1.14			
Control Delay	150.4	7.4			27.1	3.8		35.2	111.3			
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0			
Total Delay	150.4	7.4			27.1	3.8		35.2	111.3			
LOS	F	A			C	A		D	F			
Approach Delay	62.6				23.5				89.9			
Approach LOS	E				C				F			

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 87.5

Natural Cycle: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.25

Intersection Signal Delay: 55.4

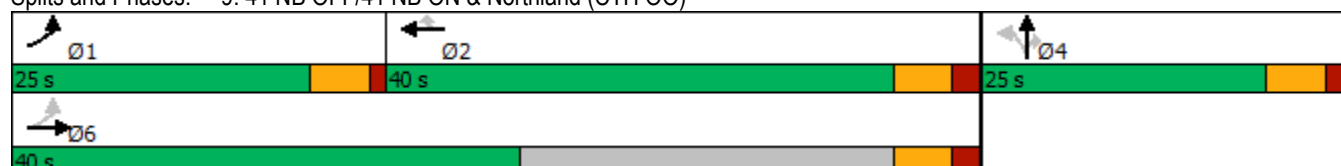
Intersection LOS: E

Intersection Capacity Utilization 67.0%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 9: 41 NB OFF/41 NB ON & Northland (CTH OO)



HCM 6th Signalized Intersection Summary

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (veh/h)	490	780	0	0	760	140	160	0	410	0	0	0
Future Volume (veh/h)	490	780	0	0	760	140	160	0	410	0	0	0
Initial Q (Qb), veh	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			
Parking Bus, Adj	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					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1781	1781	1781			
Adj Flow Rate, veh/h	645	1026	0	0	1000	0	211	0	0			
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76			
Percent Heavy Veh, %	1	1	0	0	2	2	8	8	8			
Cap, veh/h	672	2560	0	0	1347		302	0				
Arrive On Green	0.28	0.71	0.00	0.00	0.38	0.00	0.18	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	3647	1585	1697	0	1510			
Grp Volume(v), veh/h	645	1026	0	0	1000	0	211	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1777	1585	1697	0	1510			
Q Serve(g_s), s	19.2	8.5	0.0	0.0	18.1	0.0	8.7	0.0	0.0			
Cycle Q Clear(g_c), s	19.2	8.5	0.0	0.0	18.1	0.0	8.7	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	672	2560	0	0	1347		302	0				
V/C Ratio(X)	0.96	0.40	0.00	0.00	0.74		0.70	0.00				
Avail Cap(c_a), veh/h	672	2560	0	0	1717		478	0				
HCM Platoon Ratio	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	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	16.9	4.3	0.0	0.0	20.0	0.0	28.7	0.0	0.0			
Incr Delay (d2), s/veh	25.0	0.1	0.0	0.0	1.6	0.0	4.1	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	11.4	2.2	0.0	0.0	7.2	0.0	3.8	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	41.9	4.4	0.0	0.0	21.6	0.0	32.9	0.0	0.0			
LnGrp LOS	D	A	A	A	C		C	A				
Approach Vol, veh/h	1671			1000			A			211		
Approach Delay, s/veh	18.8			21.6			32.9			A		
Approach LOS	B			C			C					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	25.0	32.2		17.3		57.2						
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	20.0	34.0		19.0		34.0						
Max Q Clear Time (g_c+I1), s	21.2	20.1		10.7		10.5						
Green Ext Time (p_c), s	0.0	6.1		0.7		5.5						
Intersection Summary												
HCM 6th Ctrl Delay	20.8											
HCM 6th LOS	C											

Lanes, Volumes, Timings

15: SB 41 OFF

08/21/2019

						
Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr't						
Flt Protected						
Satd. Flow (prot)	0	1863	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	0	1863	0	1863	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	425			1098	985	
Travel Time (s)	9.7			25.0	22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 0.0%	ICU Level of Service A					
Analysis Period (min) 15						

Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	210	0	140	0	0	0	0	490	410	250	580	0
Future Volume (vph)	210	0	140	0	0	0	0	490	410	250	580	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	0		0	0		245	25		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3467	1881	1599	0	0	0	0	3539	1583	1787	3574	0
Flt Permitted	0.950									0.225		
Satd. Flow (perm)	3467	1881	1599	0	0	0	0	3539	1583	423	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			307						456			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1099			921			1164			506	
Travel Time (s)		25.0			20.9			26.5			11.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	233	0	156	0	0	0	0	544	456	278	644	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	233	0	156	0	0	0	0	544	456	278	644	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			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	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	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	0.0	
Detector 1 Queue (s)	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	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					15.0	15.0	7.0	15.0	
Minimum Split (s)	16.0	16.0	16.0					21.0	21.0	11.0	21.0	

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/21/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)	30.0	30.0	30.0					30.0	30.0	40.0	70.0	
Total Split (%)	30.0%	30.0%	30.0%					30.0%	30.0%	40.0%	70.0%	
Maximum Green (s)	24.0	24.0	24.0					24.0	24.0	36.0	64.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0					-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0					4.0	4.0	4.0	4.0	
Lead/Lag								Lag	Lag	Lead		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0					5.0	5.0	2.0	2.0	
Recall Mode	Min	Min	Min					C-Max	C-Max	Max	C-Max	
Act Effect Green (s)	14.3		14.3					26.0	26.0	77.7	77.7	
Actuated g/C Ratio	0.14		0.14					0.26	0.26	0.78	0.78	
v/c Ratio	0.47		0.32					0.59	0.61	0.28	0.23	
Control Delay	42.3		1.7					35.5	6.8	3.5	0.2	
Queue Delay	0.0		0.0					0.0	0.0	0.0	0.0	
Total Delay	42.3		1.7					35.5	6.8	3.5	0.2	
LOS	D		A					D	A	A	A	
Approach Delay		26.0						22.4			1.2	
Approach LOS		C						C			A	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 14.5

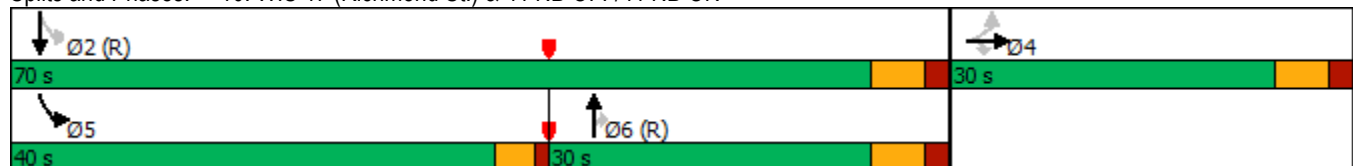
Intersection LOS: B

Intersection Capacity Utilization 58.8%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 							 			 	
Traffic Volume (veh/h)	210	0	140	0	0	0	0	490	410	250	580	0
Future Volume (veh/h)	210	0	140	0	0	0	0	490	410	250	580	0
Initial Q (Qb), veh	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
Parking Bus, Adj	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		
Adj Sat Flow, veh/h/ln	1885	1885	1885				0	1870	1870	1885	1885	0
Adj Flow Rate, veh/h	233	0	0				0	544	0	278	644	0
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	1	1	1				0	2	2	1	1	0
Cap, veh/h	418	226					0	1421		954	2865	0
Arrive On Green	0.12	0.00	0.00				0.00	0.40	0.00	0.12	0.26	0.00
Sat Flow, veh/h	3483	1885	1598				0	3647	1585	1795	3676	0
Grp Volume(v), veh/h	233	0	0				0	544	0	278	644	0
Grp Sat Flow(s),veh/h/ln	1742	1885	1598				0	1777	1585	1795	1791	0
Q Serve(g_s), s	6.3	0.0	0.0				0.0	10.8	0.0	5.4	14.1	0.0
Cycle Q Clear(g_c), s	6.3	0.0	0.0				0.0	10.8	0.0	5.4	14.1	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	418	226					0	1421		954	2865	0
V/C Ratio(X)	0.56	0.00					0.00	0.38		0.29	0.22	0.00
Avail Cap(c_a), veh/h	906	490					0	1421		954	2865	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.81	0.81	0.00
Uniform Delay (d), s/veh	41.5	0.0	0.0				0.0	21.3	0.0	6.9	12.5	0.0
Incr Delay (d2), s/veh	1.2	0.0	0.0				0.0	0.8	0.0	0.6	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.8	0.0	0.0				0.0	4.6	0.0	2.0	6.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.7	0.0	0.0				0.0	22.0	0.0	7.5	12.7	0.0
LnGrp LOS	D	A					A	C		A	B	A
Approach Vol, veh/h	233		A					544	A	922		
Approach Delay, s/veh	42.7							22.0		11.1		
Approach LOS	D							C		B		
Timer - Assigned Phs	2			4	5	6						
Phs Duration (G+Y+Rc), s	84.0			16.0	40.0	44.0						
Change Period (Y+Rc), s	6.0			6.0	4.0	6.0						
Max Green Setting (Gmax), s	64.0			24.0	36.0	24.0						
Max Q Clear Time (g_c+I1), s	16.1			8.3	7.4	12.8						
Green Ext Time (p_c), s	1.8			0.9	0.6	3.6						
Intersection Summary												
HCM 6th Ctrl Delay	18.9											
HCM 6th LOS	B											

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	280	0	190	340	360	0	0	550	350
Future Volume (vph)	0	0	0	280	0	190	340	360	0	0	550	350
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	100		100	25		0	0		250
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3433	1863	1583	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.225					
Satd. Flow (perm)	0	0	0	3433	1863	1583	423	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						487						402
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		909			1200			506			920	
Travel Time (s)		20.7			27.3			11.5			20.9	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	322	0	218	391	414	0	0	632	402
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	322	0	218	391	414	0	0	632	402
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			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	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	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	0.0
Detector 1 Queue (s)				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
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	15.0			15.0	15.0
Minimum Split (s)				16.0	16.0	16.0	11.0	21.0			21.0	21.0

7:00 am Baseline

Synchro 10 Report
Page 10

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/21/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	34.0	70.0			36.0	36.0
Total Split (%)				30.0%	30.0%	30.0%	34.0%	70.0%			36.0%	36.0%
Maximum Green (s)				24.0	24.0	24.0	30.0	64.0			30.0	30.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			5.0	5.0
Recall Mode				Min	Min	Min	Max	C-Max			C-Max	C-Max
Act Effect Green (s)				17.0		17.0	75.0	75.0			32.0	32.0
Actuated g/C Ratio				0.17		0.17	0.75	0.75			0.32	0.32
v/c Ratio				0.55		0.32	0.46	0.15			0.56	0.52
Control Delay				41.3		1.3	2.5	0.3			30.4	5.2
Queue Delay				0.0		0.0	0.0	0.0			0.0	0.0
Total Delay				41.3		1.3	2.5	0.3			30.4	5.2
LOS				D		A	A	A			C	A
Approach Delay					25.1			1.4			20.6	
Approach LOS					C			A			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 53 (53%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 15.1

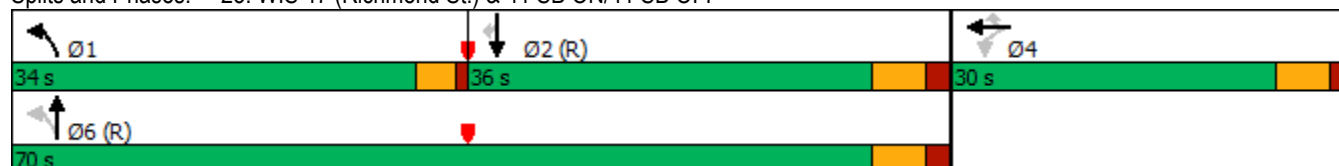
Intersection LOS: B

Intersection Capacity Utilization 58.8%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	280	0	190	340	360	0	0	550	350
Future Volume (veh/h)	0	0	0	280	0	190	340	360	0	0	550	350
Initial Q (Qb), veh				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
Parking Bus, Adj				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	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				322	0	0	391	414	0	0	632	0
Peak Hour Factor				0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				485	262		850	2793	0	0	1562	
Arrive On Green				0.14	0.00	0.00	0.60	1.00	0.00	0.00	0.44	0.00
Sat Flow, veh/h				3456	1870	1585	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				322	0	0	391	414	0	0	632	0
Grp Sat Flow(s),veh/h/ln				1728	1870	1585	1795	1791	0	0	1777	1585
Q Serve(g_s), s				8.8	0.0	0.0	5.7	0.0	0.0	0.0	12.1	0.0
Cycle Q Clear(g_c), s				8.8	0.0	0.0	5.7	0.0	0.0	0.0	12.1	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				485	262		850	2793	0	0	1562	
V/C Ratio(X)				0.66	0.00		0.46	0.15	0.00	0.00	0.40	
Avail Cap(c_a), veh/h				898	486		850	2793	0	0	1562	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	0.81	0.81	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				40.7	0.0	0.0	3.2	0.0	0.0	0.0	19.1	0.0
Incr Delay (d2), s/veh				1.6	0.0	0.0	1.5	0.1	0.0	0.0	0.8	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				3.8	0.0	0.0	1.4	0.0	0.0	0.0	5.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				42.3	0.0	0.0	4.6	0.1	0.0	0.0	19.9	0.0
LnGrp LOS				D	A		A	A	A	A	B	
Approach Vol, veh/h					322	A		805			632	A
Approach Delay, s/veh					42.3			2.3			19.9	
Approach LOS					D			A			B	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	34.0	48.0		18.0		82.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	30.0	30.0		24.0		64.0						
Max Q Clear Time (g_c+I1), s	7.7	14.1		10.8		2.0						
Green Ext Time (p_c), s	0.9	5.2		1.2		1.1						

Intersection Summary

HCM 6th Ctrl Delay	15.9
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	230	0	540	160	880	0	0	720	460
Future Volume (vph)	0	0	0	230	0	540	160	880	0	0	720	460
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	210		210	0		0	0		410
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3433	1863	1583	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.119					
Satd. Flow (perm)	0	0	0	3433	1863	1583	224	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						131						554
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		756			820			575			1156	
Travel Time (s)		17.2			18.6			13.1			26.3	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	277	0	651	193	1060	0	0	867	554
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	277	0	651	193	1060	0	0	867	554
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			18			28	
Link Offset(ft)		0			0			0			6	
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	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	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	0.0
Detector 1 Queue (s)				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
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	20.0			20.0	20.0
Minimum Split (s)				16.0	16.0	16.0	11.0	26.0			26.0	26.0

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	34.0	70.0			36.0	36.0
Total Split (%)				30.0%	30.0%	30.0%	34.0%	70.0%			36.0%	36.0%
Maximum Green (s)				24.0	24.0	24.0	30.0	64.0			30.0	30.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				4.0	4.0	4.0	2.0	2.0			4.0	4.0
Recall Mode				Max	Max	Max	Max	C-Min			C-Min	C-Min
Act Effect Green (s)				26.5		26.5	65.5	65.5			31.5	31.5
Actuated g/C Ratio				0.26		0.26	0.66	0.66			0.32	0.32
v/c Ratio				0.30		1.26	0.31	0.45			0.78	0.63
Control Delay				30.7		160.2	8.7	3.0			36.8	5.9
Queue Delay				0.0		0.0	0.0	0.2			0.0	0.0
Total Delay				30.7		160.2	8.7	3.2			36.8	5.9
LOS				C		F	A	A			D	A
Approach Delay					121.6			4.0			24.8	
Approach LOS					F			A			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 66 (66%), Referenced to phase 2:SBT and 6:NBTL, Start of 1st Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.26

Intersection Signal Delay: 42.5

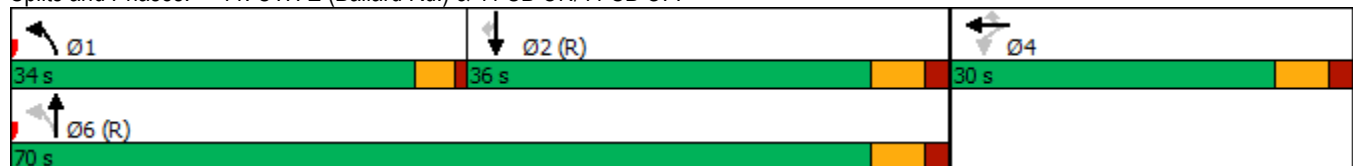
Intersection LOS: D

Intersection Capacity Utilization 77.5%

ICU Level of Service D

Analysis Period (min) 15

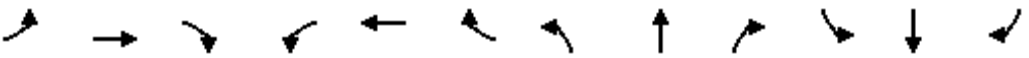
Splits and Phases: 11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔↔	↑	↗	↖	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	230	0	540	160	880	0	0	720	460
Future Volume (veh/h)	0	0	0	230	0	540	160	880	0	0	720	460
Initial Q (Qb), veh				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
Parking Bus, Adj				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	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				277	0	0	193	1060	0	0	867	0
Peak Hour Factor				0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				898	486		670	2364	0	0	1137	
Arrive On Green				0.26	0.00	0.00	0.10	0.22	0.00	0.00	0.43	0.00
Sat Flow, veh/h				3456	1870	1585	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				277	0	0	193	1060	0	0	867	0
Grp Sat Flow(s),veh/h/ln				1728	1870	1585	1795	1791	0	0	1777	1585
Q Serve(g_s), s				6.4	0.0	0.0	5.5	25.7	0.0	0.0	20.7	0.0
Cycle Q Clear(g_c), s				6.4	0.0	0.0	5.5	25.7	0.0	0.0	20.7	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				898	486		670	2364	0	0	1137	
V/C Ratio(X)				0.31	0.00		0.29	0.45	0.00	0.00	0.76	
Avail Cap(c_a), veh/h				898	486		670	2364	0	0	1137	
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.33	1.33
Upstream Filter(I)				1.00	0.00	0.00	0.74	0.74	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				29.8	0.0	0.0	15.8	23.3	0.0	0.0	25.5	0.0
Incr Delay (d2), s/veh				0.9	0.0	0.0	0.8	0.5	0.0	0.0	4.9	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.8	0.0	0.0	2.3	12.4	0.0	0.0	8.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				30.7	0.0	0.0	16.6	23.8	0.0	0.0	30.3	0.0
LnGrp LOS				C	A		B	C	A	A	C	
Approach Vol, veh/h					277	A		1253			867	A
Approach Delay, s/veh					30.7			22.7			30.3	
Approach LOS					C			C			C	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	34.0	36.0		30.0		70.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	30.0	30.0		24.0		64.0						
Max Q Clear Time (g_c+I1), s	7.5	22.7		8.4		27.7						
Green Ext Time (p_c), s	0.4	3.4		1.6		3.4						

Intersection Summary

HCM 6th Ctrl Delay	26.4
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	440	0	330	0	0	0	0	600	270	690	260	0
Future Volume (vph)	440	0	330	0	0	0	0	600	270	690	260	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	410		155	0		0	0		280	0		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	1863	1583	0	0	0	0	3574	1599	1787	3574	0
Flt Permitted	0.950									0.165		
Satd. Flow (perm)	3433	1863	1583	0	0	0	0	3574	1599	310	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			636						307			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		796			858			1043			575	
Travel Time (s)		18.1			19.5			23.7			13.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	500	0	375	0	0	0	0	682	307	784	295	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	500	0	375	0	0	0	0	682	307	784	295	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			28			18	
Link Offset(ft)		0			0			6			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	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	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	0.0	
Detector 1 Queue (s)	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	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	7.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.0	26.0	11.0	26.0	

7:00 am Baseline

Synchro 10 Report
Page 10

Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	26.0	26.0	26.0					36.0	36.0	38.0	74.0	
Total Split (%)	26.0%	26.0%	26.0%					36.0%	36.0%	38.0%	74.0%	
Maximum Green (s)	20.0	20.0	20.0					30.0	30.0	34.0	68.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0					-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0					4.0	4.0	4.0	4.0	
Lead/Lag								Lag	Lag	Lead		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	4.0	4.0	4.0					4.0	4.0	2.0	2.0	
Recall Mode	Max	Max	Max					C-Min	C-Min	Max	C-Min	
Act Effct Green (s)	25.3		25.3					28.7	28.7	66.7	66.7	
Actuated g/C Ratio	0.25		0.25					0.29	0.29	0.67	0.67	
v/c Ratio	0.58		0.43					0.66	0.45	1.11	0.12	
Control Delay	36.7		1.5					34.5	5.3	77.8	0.1	
Queue Delay	0.0		0.0					0.0	0.0	0.1	0.0	
Total Delay	36.7		1.5					34.5	5.3	77.9	0.1	
LOS	D		A					C	A	E	A	
Approach Delay		21.6						25.4			56.6	
Approach LOS		C						C			E	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 10 (10%), Referenced to phase 2:SBTL and 6:NBT, Start of 1st Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.11

Intersection Signal Delay: 35.7

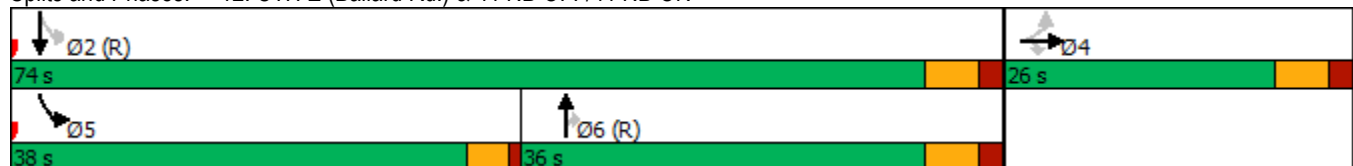
Intersection LOS: D

Intersection Capacity Utilization 77.5%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 							 			 	
Traffic Volume (veh/h)	440	0	330	0	0	0	0	600	270	690	260	0
Future Volume (veh/h)	440	0	330	0	0	0	0	600	270	690	260	0
Initial Q (Qb), veh	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
Parking Bus, Adj	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		
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1885	1885	1885	1885	0
Adj Flow Rate, veh/h	500	0	0				0	682	0	784	295	0
Peak Hour Factor	0.88	0.88	0.88				0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2				0	1	1	1	1	0
Cap, veh/h	760	411					0	1146		827	2507	0
Arrive On Green	0.22	0.00	0.00				0.00	0.64	0.00	0.57	1.00	0.00
Sat Flow, veh/h	3456	1870	1585				0	3676	1598	1795	3676	0
Grp Volume(v), veh/h	500	0	0				0	682	0	784	295	0
Grp Sat Flow(s),veh/h/ln	1728	1870	1585				0	1791	1598	1795	1791	0
Q Serve(g_s), s	13.2	0.0	0.0				0.0	11.1	0.0	34.0	0.0	0.0
Cycle Q Clear(g_c), s	13.2	0.0	0.0				0.0	11.1	0.0	34.0	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	760	411					0	1146		827	2507	0
V/C Ratio(X)	0.66	0.00					0.00	0.60		0.95	0.12	0.00
Avail Cap(c_a), veh/h	760	411					0	1146		827	2507	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	2.00	2.00	1.67	1.67	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.70	0.70	0.00
Uniform Delay (d), s/veh	35.6	0.0	0.0				0.0	14.2	0.0	9.8	0.0	0.0
Incr Delay (d2), s/veh	4.4	0.0	0.0				0.0	2.3	0.0	16.3	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.0	0.0	0.0				0.0	3.6	0.0	8.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.0	0.0	0.0				0.0	16.5	0.0	26.1	0.1	0.0
LnGrp LOS	D	A					A	B		C	A	A
Approach Vol, veh/h	500		A					682	A	1079		
Approach Delay, s/veh	40.0							16.5		19.0		
Approach LOS	D							B		B		
Timer - Assigned Phs	2			4	5	6						
Phs Duration (G+Y+Rc), s	74.0			26.0	38.0	36.0						
Change Period (Y+Rc), s	6.0			6.0	4.0	6.0						
Max Green Setting (Gmax), s	68.0			20.0	34.0	30.0						
Max Q Clear Time (g_c+I1), s	2.0			15.2	36.0	13.1						
Green Ext Time (p_c), s	0.8			1.4	0.0	4.4						
Intersection Summary												
HCM 6th Ctrl Delay	22.9											
HCM 6th LOS	C											

Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↗	↗	↕			↕	↗
Traffic Volume (vph)	0	0	0	120	0	40	320	210	0	0	150	230
Future Volume (vph)	0	0	0	120	0	40	320	210	0	0	150	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		120	550		0	0		75
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1787	1599	1787	3574	0	0	3505	1568
Flt Permitted					0.950		0.645					
Satd. Flow (perm)	0	0	0	0	1787	1599	1213	3574	0	0	3505	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						104						258
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		759			871			591			844	
Travel Time (s)		17.3			19.8			13.4			19.2	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Adj. Flow (vph)	0	0	0	135	0	45	360	236	0	0	169	258
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	135	45	360	236	0	0	169	258
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			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	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	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	0.0
Detector 1 Queue (s)				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
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					8		1	6			2	
Permitted Phases				8		8	6					2
Detector Phase				8	8	8	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	8.0	20.0			20.0	20.0
Minimum Split (s)				22.0	22.0	22.0	14.5	26.5			26.5	26.5

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/21/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	35.0	75.0			40.0	40.0
Total Split (%)				28.6%	28.6%	28.6%	33.3%	71.4%			38.1%	38.1%
Maximum Green (s)				24.0	24.0	24.0	28.5	68.5			33.5	33.5
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				1.5	1.5	1.5	2.0	2.0			2.0	2.0
Lost Time Adjust (s)					-2.0	-2.0	-2.5	-2.5			-2.5	-2.5
Total Lost Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lag				Lead	Lead
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	4.0	3.0			4.0	4.0
Recall Mode				None	None	None	None	Min			Min	Min
Act Effect Green (s)					12.8	12.8	37.7	38.7			22.9	22.9
Actuated g/C Ratio					0.24	0.24	0.69	0.71			0.42	0.42
v/c Ratio					0.32	0.10	0.38	0.09			0.11	0.32
Control Delay					21.4	1.0	6.8	4.1			11.7	3.3
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					21.4	1.0	6.8	4.1			11.7	3.3
LOS					C	A	A	A			B	A
Approach Delay					16.3			5.7			6.6	
Approach LOS					B			A			A	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 54.4

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.38

Intersection Signal Delay: 7.6

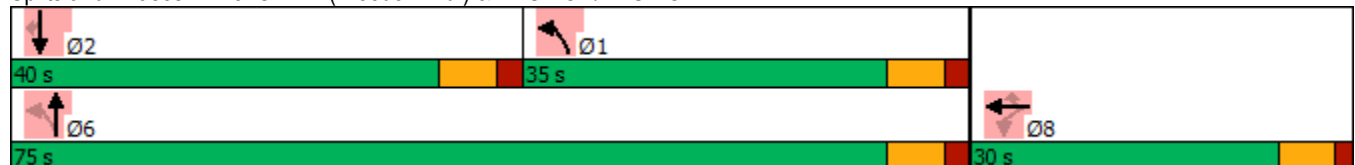
Intersection LOS: A

Intersection Capacity Utilization 52.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/21/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↶	↷	↶	↷			↷	↷
Traffic Volume (veh/h)	0	0	0	120	0	40	320	210	0	0	150	230
Future Volume (veh/h)	0	0	0	120	0	40	320	210	0	0	150	230
Initial Q (Qb), veh				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
Parking Bus, Adj				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	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1856	1856
Adj Flow Rate, veh/h				135	0	0	360	236	0	0	169	0
Peak Hour Factor				0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %				1	1	1	1	1	0	0	3	3
Cap, veh/h				347	0		826	2377	0	0	1423	
Arrive On Green				0.19	0.00	0.00	0.19	0.66	0.00	0.00	0.40	0.00
Sat Flow, veh/h				1795	0	1598	1795	3676	0	0	3618	1572
Grp Volume(v), veh/h				135	0	0	360	236	0	0	169	0
Grp Sat Flow(s),veh/h/ln				1795	0	1598	1795	1791	0	0	1763	1572
Q Serve(g_s), s				3.7	0.0	0.0	0.0	1.3	0.0	0.0	1.7	0.0
Cycle Q Clear(g_c), s				3.7	0.0	0.0	0.0	1.3	0.0	0.0	1.7	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				347	0		826	2377	0	0	1423	
V/C Ratio(X)				0.39	0.00		0.44	0.10	0.00	0.00	0.12	
Avail Cap(c_a), veh/h				837	0		1486	4561	0	0	2276	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				19.6	0.0	0.0	10.6	3.4	0.0	0.0	10.4	0.0
Incr Delay (d2), s/veh				0.7	0.0	0.0	0.5	0.0	0.0	0.0	0.1	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				1.5	0.0	0.0	2.7	0.3	0.0	0.0	0.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				20.3	0.0	0.0	11.1	3.4	0.0	0.0	10.5	0.0
LnGrp LOS				C	A		B	A	A	A	B	
Approach Vol, veh/h					135	A		596			169	A
Approach Delay, s/veh					20.3			8.1			10.5	
Approach LOS					C			A			B	
Timer - Assigned Phs	1	2				6		8				
Phs Duration (G+Y+Rc), s	14.5	26.5				41.0		14.8				
Change Period (Y+Rc), s	6.5	6.5				6.5		6.0				
Max Green Setting (Gmax), s	28.5	33.5				68.5		24.0				
Max Q Clear Time (g_c+I1), s	2.0	3.7				3.3		5.7				
Green Ext Time (p_c), s	2.4	1.1				1.1		0.4				

Intersection Summary

HCM 6th Ctrl Delay	10.4
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	0	170	0	0	0	0	440	180	40	230	0
Future Volume (vph)	90	0	170	0	0	0	0	440	180	40	230	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		265	0		0	0		75	75		0
Storage Lanes	0		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1736	1553	0	0	0	0	3471	1553	1736	3471	0
Flt Permitted		0.950								0.464		
Satd. Flow (perm)	0	1736	1553	0	0	0	0	3471	1553	848	3471	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			185						162			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		781			852			390			591	
Travel Time (s)		17.8			19.4			8.9			13.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	4%	4%	1%	1%	1%	4%	4%	4%	4%	4%	4%
Adj. Flow (vph)	98	0	185	0	0	0	0	478	196	43	250	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	98	185	0	0	0	0	478	196	43	250	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			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	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	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	0.0	
Detector 1 Queue (s)	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	
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	8.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.5	26.5	14.5	26.5	

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	20.0	20.0	20.0					40.0	40.0	45.0	85.0	
Total Split (%)	19.0%	19.0%	19.0%					38.1%	38.1%	42.9%	81.0%	
Maximum Green (s)	14.0	14.0	14.0					33.5	33.5	38.5	78.5	
Yellow Time (s)	4.5	4.5	4.5					4.5	4.5	4.5	4.5	
All-Red Time (s)	1.5	1.5	1.5					2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		-2.0	-2.0					-2.5	-2.5	-2.5	-2.5	
Total Lost Time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lead/Lag								Lead	Lead	Lag		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	4.0	4.0	4.0					3.0	3.0	4.0	3.0	
Recall Mode	None	None	None					Min	Min	None	Min	
Act Effct Green (s)		12.8	12.8					23.1	23.1	35.2	27.9	
Actuated g/C Ratio		0.26	0.26					0.47	0.47	0.72	0.57	
v/c Ratio		0.22	0.34					0.29	0.24	0.05	0.13	
Control Delay		17.9	5.8					10.2	4.4	3.7	4.8	
Queue Delay		0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay		17.9	5.8					10.2	4.4	3.7	4.8	
LOS		B	A					B	A	A	A	
Approach Delay		10.0						8.5			4.6	
Approach LOS		A						A			A	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 48.9

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.34

Intersection Signal Delay: 7.9

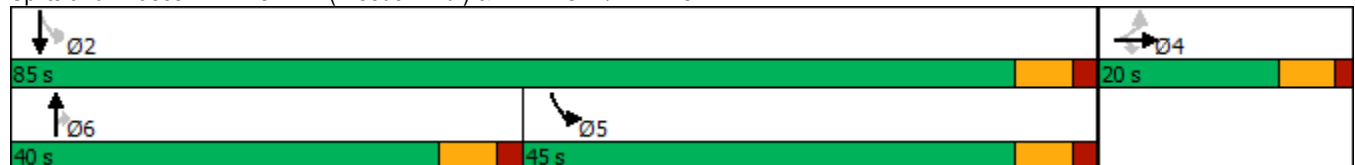
Intersection LOS: A

Intersection Capacity Utilization 52.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	90	0	170	0	0	0	0	440	180	40	230	0
Future Volume (veh/h)	90	0	170	0	0	0	0	440	180	40	230	0
Initial Q (Qb), veh	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
Parking Bus, Adj	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		
Adj Sat Flow, veh/h/ln	1841	1841	1841				0	1841	1841	1841	1841	0
Adj Flow Rate, veh/h	98	0	0				0	478	0	43	250	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	4	4	4				0	4	4	4	4	0
Cap, veh/h	312	0					0	1440		679	2362	0
Arrive On Green	0.18	0.00	0.00				0.00	0.41	0.00	0.19	0.68	0.00
Sat Flow, veh/h	1753	0	1560				0	3589	1560	1753	3589	0
Grp Volume(v), veh/h	98	0	0				0	478	0	43	250	0
Grp Sat Flow(s),veh/h/ln	1753	0	1560				0	1749	1560	1753	1749	0
Q Serve(g_s), s	2.7	0.0	0.0				0.0	5.1	0.0	0.0	1.4	0.0
Cycle Q Clear(g_c), s	2.7	0.0	0.0				0.0	5.1	0.0	0.0	1.4	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	312	0					0	1440		679	2362	0
V/C Ratio(X)	0.31	0.00					0.00	0.33		0.06	0.11	0.00
Avail Cap(c_a), veh/h	513	0					0	2304		1660	5184	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	19.5	0.0	0.0				0.0	11.0	0.0	9.4	3.1	0.0
Incr Delay (d2), s/veh	0.8	0.0	0.0				0.0	0.1	0.0	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	0.0				0.0	1.7	0.0	0.3	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.4	0.0	0.0				0.0	11.1	0.0	9.5	3.1	0.0
LnGrp LOS	C	A					A	B		A	A	A
Approach Vol, veh/h	98		A				478		A	293		
Approach Delay, s/veh	20.4						11.1			4.1		
Approach LOS	C						B			A		
Timer - Assigned Phs	2			4	5	6						
Phs Duration (G+Y+Rc), s	40.9			13.7	14.4	26.5						
Change Period (Y+Rc), s	6.5			6.0	6.5	6.5						
Max Green Setting (Gmax), s	78.5			14.0	38.5	33.5						
Max Q Clear Time (g_c+I1), s	3.4			4.7	2.0	7.1						
Green Ext Time (p_c), s	1.2			0.3	0.2	2.3						
Intersection Summary												
HCM 6th Ctrl Delay			9.8									
HCM 6th LOS			A									

Lanes, Volumes, Timings

19: CTH U (County Line Rd.) & 41 SB ON/41 SB OFF

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	80	0	50	60	80	0	0	200	40
Future Volume (vph)	0	0	0	80	0	50	60	80	0	0	200	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	100		0	0		0
Storage Lanes	0		0	0		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
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					0.948							0.850
Flt Protected					0.970		0.950					
Satd. Flow (prot)	0	0	0	0	1713	0	1787	1881	0	0	1863	1583
Flt Permitted					0.970		0.950					
Satd. Flow (perm)	0	0	0	0	1713	0	1787	1881	0	0	1863	1583
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1011			1061			775			328	
Travel Time (s)		23.0			24.1			17.6			7.5	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	94	0	59	71	94	0	0	235	47
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	153	0	71	94	0	0	235	47
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			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
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	31.4%											
Analysis Period (min)	15											
	ICU Level of Service A											

Intersection												
Int Delay, s/veh	4.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	80	0	50	60	80	0	0	200	40
Future Vol, veh/h	0	0	0	80	0	50	60	80	0	0	200	40
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	1	1	1	2	2	2	1	1	1	2	2	2
Mvmt Flow	0	0	0	94	0	59	71	94	0	0	235	47
Major/Minor				Minor1		Major1		Major2				
Conflicting Flow All				495	518	94	282	0	-	-	-	0
Stage 1				236	236	-	-	-	-	-	-	-
Stage 2				259	282	-	-	-	-	-	-	-
Critical Hdwy				6.42	6.52	6.22	4.11	-	-	-	-	-
Critical Hdwy Stg 1				5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy				3.518	4.018	3.318	2.209	-	-	-	-	-
Pot Cap-1 Maneuver				534	462	963	1286	-	0	0	-	-
Stage 1				803	710	-	-	-	0	0	-	-
Stage 2				784	678	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				505	0	963	1286	-	-	-	-	-
Mov Cap-2 Maneuver				505	0	-	-	-	-	-	-	-
Stage 1				759	0	-	-	-	-	-	-	-
Stage 2				784	0	-	-	-	-	-	-	-
Approach				WB		NB		SB				
HCM Control Delay, s				12.7		3.4		0				
HCM LOS				B								
Minor Lane/Major Mvmt		NBL	NBTWBLn1	SBT	SBR							
Capacity (veh/h)		1286	-	618	-	-						
HCM Lane V/C Ratio		0.055	-	0.247	-	-						
HCM Control Delay (s)		8	-	12.7	-	-						
HCM Lane LOS		A	-	B	-	-						
HCM 95th %tile Q(veh)		0.2	-	1	-	-						

Lanes, Volumes, Timings

20: CTH U (County Line Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	0	50	0	0	0	0	110	190	30	250	0
Future Volume (vph)	30	0	50	0	0	0	0	110	190	30	250	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	100		0
Storage Lanes	0		0	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
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		0.915							0.850			
Flt Protected		0.982								0.950		
Satd. Flow (prot)	0	1626	0	0	0	0	0	1863	1583	1787	1881	0
Flt Permitted		0.982								0.950		
Satd. Flow (perm)	0	1626	0	0	0	0	0	1863	1583	1787	1881	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1005			1114			374			775	
Travel Time (s)		22.8			25.3			8.5			17.6	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	34	0	57	0	0	0	0	125	216	34	284	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	91	0	0	0	0	0	125	216	34	284	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			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
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	31.4%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection

Int Delay, s/veh 1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕						↑	↗	↘	↑	
Traffic Vol, veh/h	30	0	50	0	0	0	0	110	190	30	250	0
Future Vol, veh/h	30	0	50	0	0	0	0	110	190	30	250	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	100	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	5	5	2	2	2	1	1	1
Mvmt Flow	34	0	57	0	0	0	0	125	216	34	284	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	585	693	284	-	0	0	341	0	0
Stage 1	352	352	-	-	-	-	-	-	-
Stage 2	233	341	-	-	-	-	-	-	-
Critical Hdwy	6.45	6.55	6.25	-	-	-	4.11	-	-
Critical Hdwy Stg 1	5.45	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.45	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	-	-	-	2.209	-	-
Pot Cap-1 Maneuver	468	363	748	0	-	-	1224	-	0
Stage 1	705	626	-	0	-	-	-	-	0
Stage 2	799	633	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	455	0	748	-	-	-	1224	-	-
Mov Cap-2 Maneuver	455	0	-	-	-	-	-	-	-
Stage 1	685	0	-	-	-	-	-	-	-
Stage 2	799	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12	0	0.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT
Capacity (veh/h)	-	-	603	1224	-
HCM Lane V/C Ratio	-	-	0.151	0.028	-
HCM Control Delay (s)	-	-	12	8	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.5	0.1	-

Lanes, Volumes, Timings

21: 41 SB ON/41 SB OFF & CTH S (Freedom Rd.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	320	90	100	100	0	0	0	0	40	0	120
Future Volume (vph)	0	320	90	100	100	0	0	0	0	40	0	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	250		0	0		0	0		100
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
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		0.850										0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		308			703			553			602	
Travel Time (s)		7.0			16.0			12.6			13.7	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	376	106	118	118	0	0	0	0	47	0	141
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	376	106	118	118	0	0	0	0	0	47	141
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
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
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	36.2%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	3.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↑	↗
Traffic Vol, veh/h	0	320	90	100	100	0	0	0	0	40	0	120
Future Vol, veh/h	0	320	90	100	100	0	0	0	0	40	0	120
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	250	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	1	1	1	1	1	1	2	2	2
Mvmt Flow	0	376	106	118	118	0	0	0	0	47	0	141
Major/Minor	Major1			Major2			Minor2					
Conflicting Flow All	-	0	0	482	0	0				783	836	118
Stage 1	-	-	-	-	-	-				354	354	-
Stage 2	-	-	-	-	-	-				429	482	-
Critical Hdwy	-	-	-	4.11	-	-				6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-				5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-				5.42	5.52	-
Follow-up Hdwy	-	-	-	2.209	-	-				3.518	4.018	3.318
Pot Cap-1 Maneuver	0	-	-	1086	-	0				362	303	934
Stage 1	0	-	-	-	-	0				710	630	-
Stage 2	0	-	-	-	-	0				657	553	-
Platoon blocked, %	-	-	-	-	-	-				-	-	-
Mov Cap-1 Maneuver	-	-	-	1086	-	-				323	0	934
Mov Cap-2 Maneuver	-	-	-	-	-	-				323	0	-
Stage 1	-	-	-	-	-	-				633	0	-
Stage 2	-	-	-	-	-	-				657	0	-
Approach	EB			WB			SB					
HCM Control Delay, s	0			4.4			11.6					
HCM LOS							B					
Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2						
Capacity (veh/h)	-	-	1086	-	323	934						
HCM Lane V/C Ratio	-	-	0.108	-	0.146	0.151						
HCM Control Delay (s)	-	-	8.7	-	18	9.5						
HCM Lane LOS	-	-	A	-	C	A						
HCM 95th %tile Q(veh)	-	-	0.4	-	0.5	0.5						

Lanes, Volumes, Timings

22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	270	90	0	0	150	100	50	0	70	0	0	0
Future Volume (vph)	270	90	0	0	150	100	50	0	70	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	325		0	0		300	0		100	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
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						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Flt Permitted	0.950							0.950				
Satd. Flow (perm)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		703			455			640			620	
Travel Time (s)		16.0			10.3			14.5			14.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	307	102	0	0	170	114	57	0	80	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	307	102	0	0	170	114	0	57	80	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
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
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	36.2%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	270	90	0	0	150	100	50	0	70	0	0	0
Future Vol, veh/h	270	90	0	0	150	100	50	0	70	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	325	-	-	-	-	300	-	-	100	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	1	1	2	2	2	5	5	5	5	5	5
Mvmt Flow	307	102	0	0	170	114	57	0	80	0	0	0

Major/Minor	Major1		Major2		Minor1					
Conflicting Flow All	284	0	-	-	-	0	943	1000	102	
Stage 1	-	-	-	-	-	-	716	716	-	
Stage 2	-	-	-	-	-	-	227	284	-	
Critical Hdwy	4.11	-	-	-	-	-	6.45	6.55	6.25	
Critical Hdwy Stg 1	-	-	-	-	-	-	5.45	5.55	-	
Critical Hdwy Stg 2	-	-	-	-	-	-	5.45	5.55	-	
Follow-up Hdwy	2.209	-	-	-	-	-	3.545	4.045	3.345	
Pot Cap-1 Maneuver	1284	-	0	0	-	-	288	240	945	
Stage 1	-	-	0	0	-	-	479	430	-	
Stage 2	-	-	0	0	-	-	804	671	-	
Platoon blocked, %	-	-	-	-	-	-	-	-	-	
Mov Cap-1 Maneuver	1284	-	-	-	-	-	219	0	945	
Mov Cap-2 Maneuver	-	-	-	-	-	-	219	0	-	
Stage 1	-	-	-	-	-	-	365	0	-	
Stage 2	-	-	-	-	-	-	804	0	-	

Approach	EB	WB	NB
HCM Control Delay, s	6.5	0	16.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	WBT	WBR
Capacity (veh/h)	219	945	1284	-	-	-
HCM Lane V/C Ratio	0.259	0.084	0.239	-	-	-
HCM Control Delay (s)	27.1	9.2	8.7	-	-	-
HCM Lane LOS	D	A	A	-	-	-
HCM 95th %tile Q(veh)	1	0.3	0.9	-	-	-

APPENDIX F2

Year 2018 Existing Synchro PM Peak Hour

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↖	↗
Traffic Volume (vph)	0	730	390	310	380	0	0	0	0	130	0	250
Future Volume (vph)	0	730	390	310	380	0	0	0	0	130	0	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	0		215
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
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			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1827	1553	1719	1810	0	0	0	0	0	1787	1599
Flt Permitted				0.105							0.950	
Satd. Flow (perm)	0	1827	1553	190	1810	0	0	0	0	0	1787	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			320									301
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		839			431			976			921	
Travel Time (s)		19.1			9.8			22.2			20.9	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	880	470	373	458	0	0	0	0	157	0	301
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	880	470	373	458	0	0	0	0	0	157	301
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		30			18			0			0	
Link Offset(ft)		6			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	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	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	0.0
Detector 1 Queue (s)		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
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		20.0	20.0	7.0	20.0					10.0	10.0	10.0
Minimum Split (s)		26.5	26.5	13.5	26.5					16.0	16.0	16.0

5:00 pm Baseline

Synchro 10 Report
Page 1

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		38.0	38.0	16.0	54.0					46.0	46.0	46.0
Total Split (%)		38.0%	38.0%	16.0%	54.0%					46.0%	46.0%	46.0%
Maximum Green (s)		31.5	31.5	9.5	47.5					40.0	40.0	40.0
Yellow Time (s)		4.5	4.5	4.5	4.5					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	2.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.5	-2.5	-2.5	-2.5						-2.0	-2.0
Total Lost Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lead/Lag		Lead	Lead	Lag								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	3.0
Recall Mode		Min	Min	None	Min					None	None	None
Act Effect Green (s)		34.1	34.1	50.1	50.1						14.2	14.2
Actuated g/C Ratio		0.47	0.47	0.69	0.69						0.20	0.20
v/c Ratio		1.02	0.52	0.97	0.37						0.45	0.54
Control Delay		59.0	6.8	65.8	5.9						29.8	7.3
Queue Delay		0.0	0.0	0.0	0.5						0.0	0.0
Total Delay		59.0	6.8	65.8	6.4						29.8	7.3
LOS		E	A	E	A						C	A
Approach Delay		40.9			33.0						15.0	
Approach LOS		D			C						B	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 72.3

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 33.9

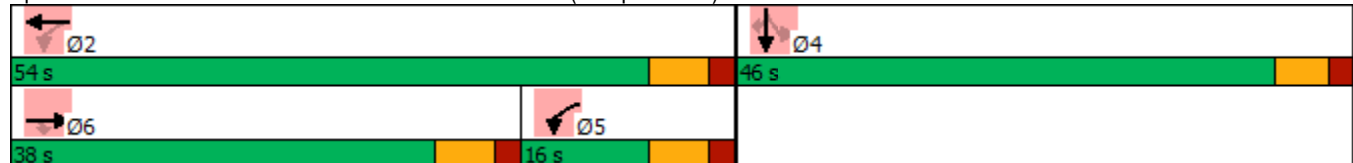
Intersection LOS: C

Intersection Capacity Utilization 73.9%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)



HCM 6th Signalized Intersection Summary

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

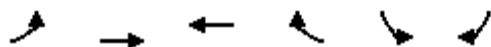
08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	730	390	310	380	0	0	0	0	130	0	250
Future Volume (veh/h)	0	730	390	310	380	0	0	0	0	130	0	250
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	0	1841	1841	1826	1826	0				1885	1885	1885
Adj Flow Rate, veh/h	0	880	470	373	458	0				157	0	301
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83				0.83	0.83	0.83
Percent Heavy Veh, %	0	4	4	5	5	0				1	1	1
Cap, veh/h	0	807	684	362	1178	0				452	0	402
Arrive On Green	0.00	0.44	0.44	0.15	0.65	0.00				0.25	0.00	0.25
Sat Flow, veh/h	0	1841	1560	1739	1826	0				1795	0	1598
Grp Volume(v), veh/h	0	880	470	373	458	0				157	0	301
Grp Sat Flow(s),veh/h/ln	0	1841	1560	1739	1826	0				1795	0	1598
Q Serve(g_s), s	0.0	34.0	18.8	12.0	9.2	0.0				5.6	0.0	13.5
Cycle Q Clear(g_c), s	0.0	34.0	18.8	12.0	9.2	0.0				5.6	0.0	13.5
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	807	684	362	1178	0				452	0	402
V/C Ratio(X)	0.00	1.09	0.69	1.03	0.39	0.00				0.35	0.00	0.75
Avail Cap(c_a), veh/h	0	807	684	362	1178	0				973	0	866
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	21.8	17.5	31.2	6.5	0.0				23.8	0.0	26.7
Incr Delay (d2), s/veh	0.0	59.0	3.2	55.2	0.3	0.0				0.5	0.0	2.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	26.5	6.8	12.0	3.0	0.0				2.3	0.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	80.7	20.7	86.5	6.8	0.0				24.2	0.0	29.5
LnGrp LOS	A	F	C	F	A	A				C	A	C
Approach Vol, veh/h		1350			831						458	
Approach Delay, s/veh		59.8			42.6						27.7	
Approach LOS		E			D						C	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		54.0		23.5	16.0	38.0						
Change Period (Y+Rc), s		6.5		6.0	6.5	6.5						
Max Green Setting (Gmax), s		47.5		40.0	9.5	31.5						
Max Q Clear Time (g_c+I1), s		11.2		15.5	14.0	36.0						
Green Ext Time (p_c), s		3.3		2.0	0.0	0.0						
Intersection Summary												
HCM 6th Ctrl Delay			48.8									
HCM 6th LOS			D									

Lanes, Volumes, Timings

2: CTH BB (Prospect Ave.) & 41 NB ON

08/21/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	500	360	690	140	0	0
Future Volume (vph)	500	360	690	140	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			460	0	0
Storage Lanes	1			1	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		
Flt Protected	0.950					
Satd. Flow (prot)	1770	1863	1845	1568	0	0
Flt Permitted	0.237					
Satd. Flow (perm)	441	1863	1845	1568	0	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				144		
Link Speed (mph)		30	30		30	
Link Distance (ft)		431	560		977	
Travel Time (s)		9.8	12.7		22.2	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	3%	3%	1%	1%
Adj. Flow (vph)	515	371	711	144	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	515	371	711	144	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		18	30		0	
Link Offset(ft)		6	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
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	1		
Detector Template						
Leading Detector (ft)	50	50	50	50		
Trailing Detector (ft)	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0		
Detector 1 Size(ft)	50	50	50	50		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		
Turn Type	pm+pt	NA	NA	Perm		
Protected Phases	1	6	2			
Permitted Phases	6			2		
Detector Phase	1	6	2	2		
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0		
Minimum Split (s)	13.5	26.5	26.5	26.5		

5:00 pm Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings

2: CTH BB (Prospect Ave.) & 41 NB ON

08/21/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	38.0	100.0	30.0	30.0		
Total Split (%)	38.0%	100.0%	30.0%	30.0%		
Maximum Green (s)	31.5	93.5	23.5	23.5		
Yellow Time (s)	4.5	4.5	4.5	4.5		
All-Red Time (s)	2.0	2.0	2.0	2.0		
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5		
Total Lost Time (s)	4.0	4.0	4.0	4.0		
Lead/Lag	Lag		Lead	Lead		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	4.0	4.0	4.0		
Recall Mode	None	Min	Min	Min		
Act Effect Green (s)	46.9	50.9	26.2	26.2		
Actuated g/C Ratio	0.92	1.00	0.51	0.51		
v/c Ratio	0.61	0.20	0.75	0.16		
Control Delay	7.9	0.2	18.6	2.7		
Queue Delay	0.1	0.0	0.0	0.0		
Total Delay	8.0	0.2	18.6	2.7		
LOS	A	A	B	A		
Approach Delay		4.7	15.9			
Approach LOS		A	B			

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 50.9

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 10.2

Intersection LOS: B

Intersection Capacity Utilization 73.9%

ICU Level of Service D

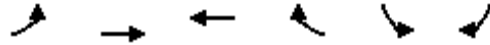
Analysis Period (min) 15

Splits and Phases: 2: CTH BB (Prospect Ave.) & 41 NB ON



HCM 6th Signalized Intersection Summary 2: CTH BB (Prospect Ave.) & 41 NB ON

08/21/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	500	360	690	140	0	0
Future Volume (veh/h)	500	360	690	140	0	0
Initial Q (Qb), veh	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00		
Work Zone On Approach		No	No			
Adj Sat Flow, veh/h/ln	1870	1870	1856	1856		
Adj Flow Rate, veh/h	515	371	711	144		
Peak Hour Factor	0.97	0.97	0.97	0.97		
Percent Heavy Veh, %	2	2	3	3		
Cap, veh/h	729	1686	1026	870		
Arrive On Green	0.25	0.90	0.55	0.55		
Sat Flow, veh/h	1781	1870	1856	1572		
Grp Volume(v), veh/h	515	371	711	144		
Grp Sat Flow(s),veh/h/ln	1781	1870	1856	1572		
Q Serve(g_s), s	3.3	1.0	11.3	1.8		
Cycle Q Clear(g_c), s	3.3	1.0	11.3	1.8		
Prop In Lane	1.00			1.00		
Lane Grp Cap(c), veh/h	729	1686	1026	870		
V/C Ratio(X)	0.71	0.22	0.69	0.17		
Avail Cap(c_a), veh/h	1772	4413	1186	1005		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	11.1	0.2	6.6	4.5		
Incr Delay (d2), s/veh	1.3	0.1	1.7	0.1		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	3.1	0.0	3.0	0.4		
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	12.3	0.3	8.3	4.6		
LnGrp LOS	B	A	A	A		
Approach Vol, veh/h		886	855			
Approach Delay, s/veh		7.3	7.7			
Approach LOS		A	A			
Timer - Assigned Phs	1	2			6	
Phs Duration (G+Y+Rc), s	14.2	26.5			40.7	
Change Period (Y+Rc), s	6.5	6.5			6.5	
Max Green Setting (Gmax), s	31.5	23.5			93.5	
Max Q Clear Time (g_c+I1), s	5.3	13.3			3.0	
Green Ext Time (p_c), s	2.4	4.3			2.6	
Intersection Summary						
HCM 6th Ctrl Delay			7.5			
HCM 6th LOS			A			

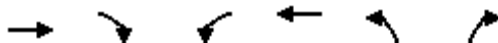
Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/21/2019

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	↗
Traffic Volume (vph)	360	0	0	630	200	400
Future Volume (vph)	360	0	0	630	200	400
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	0		100	0
Storage Lanes		0	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	1863	0	0	1845	1770	1583
Flt Permitted					0.950	
Satd. Flow (perm)	1863	0	0	1845	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						403
Link Speed (mph)	30			30	30	
Link Distance (ft)	560			456	1100	
Travel Time (s)	12.7			10.4	25.0	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	2%	2%	3%	3%	2%	2%
Adj. Flow (vph)	424	0	0	741	235	471
Shared Lane Traffic (%)						
Lane Group Flow (vph)	424	0	0	741	235	471
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						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	1			1	1	1
Detector Template						
Leading Detector (ft)	50			50	50	50
Trailing Detector (ft)	0			0	0	0
Detector 1 Position(ft)	0			0	0	0
Detector 1 Size(ft)	50			50	50	50
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	0.0
Detector 1 Queue (s)	0.0			0.0	0.0	0.0
Detector 1 Delay (s)	0.0			0.0	0.0	0.0
Turn Type	NA			NA	Prot	Perm
Protected Phases	6			2	4	
Permitted Phases						4
Detector Phase	6			2	4	4
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	10.0
Minimum Split (s)	26.0			26.0	16.0	16.0

Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/21/2019



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Total Split (s)	59.0			59.0	41.0	41.0
Total Split (%)	59.0%			59.0%	41.0%	41.0%
Maximum Green (s)	53.0			53.0	35.0	35.0
Yellow Time (s)	4.0			4.0	4.0	4.0
All-Red Time (s)	2.0			2.0	2.0	2.0
Lost Time Adjust (s)	-2.0			-2.0	-2.0	-2.0
Total Lost Time (s)	4.0			4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0			4.0	3.0	3.0
Recall Mode	Min			Min	None	None
Act Effect Green (s)	33.6			33.6	17.8	17.8
Actuated g/C Ratio	0.56			0.56	0.30	0.30
v/c Ratio	0.41			0.72	0.45	0.63
Control Delay	9.0			14.6	22.6	8.6
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	9.0			14.6	22.6	8.6
LOS	A			B	C	A
Approach Delay	9.0			14.6	13.2	
Approach LOS	A			B	B	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 60

Natural Cycle: 50

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 12.8

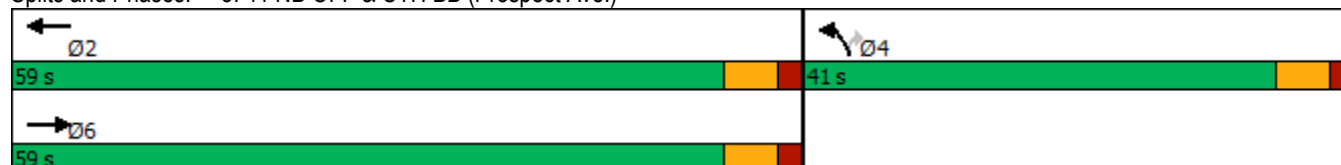
Intersection LOS: B

Intersection Capacity Utilization 50.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: 41 NB OFF & CTH BB (Prospect Ave.)



HCM 6th Signalized Intersection Summary 3: 41 NB OFF & CTH BB (Prospect Ave.)

08/21/2019

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	↗
Traffic Volume (veh/h)	360	0	0	630	200	400
Future Volume (veh/h)	360	0	0	630	200	400
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
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1856	1870	1870
Adj Flow Rate, veh/h	424	0	0	741	235	0
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	0	0	3	2	2
Cap, veh/h	1022	0	0	1014	474	
Arrive On Green	0.55	0.00	0.00	0.55	0.27	0.00
Sat Flow, veh/h	1870	0	0	1856	1781	1585
Grp Volume(v), veh/h	424	0	0	741	235	0
Grp Sat Flow(s),veh/h/ln	1870	0	0	1856	1781	1585
Q Serve(g_s), s	5.7	0.0	0.0	12.9	4.8	0.0
Cycle Q Clear(g_c), s	5.7	0.0	0.0	12.9	4.8	0.0
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	1022	0	0	1014	474	
V/C Ratio(X)	0.41	0.00	0.00	0.73	0.50	
Avail Cap(c_a), veh/h	2406	0	0	2386	1541	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	5.7	0.0	0.0	7.3	13.3	0.0
Incr Delay (d2), s/veh	0.4	0.0	0.0	1.5	0.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.0	0.0	3.5	1.7	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	6.1	0.0	0.0	8.8	14.1	0.0
LnGrp LOS	A	A	A	A	B	
Approach Vol, veh/h	424			741	235	A
Approach Delay, s/veh	6.1			8.8	14.1	
Approach LOS	A			A	B	
Timer - Assigned Phs	2		4		6	
Phs Duration (G+Y+Rc), s	27.4		15.4		27.4	
Change Period (Y+Rc), s	6.0		6.0		6.0	
Max Green Setting (Gmax), s	53.0		35.0		53.0	
Max Q Clear Time (g_c+I1), s	14.9		6.8		7.7	
Green Ext Time (p_c), s	6.5		0.9		3.0	
Intersection Summary						
HCM 6th Ctrl Delay			8.8			
HCM 6th LOS			A			

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (vph)	0	1300	590	440	1400	0	0	0	0	170	0	190
Future Volume (vph)	0	1300	590	440	1400	0	0	0	0	170	0	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		250	0		0	0		0	450		450
Storage Lanes	0		1	1		0	0		0	1		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1787	3574	0	0	0	0	1752	1665	2760
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	5085	1583	1787	3574	0	0	0	0	1752	1665	2760
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			497									134
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			651			1026			1109	
Travel Time (s)		11.4			14.8			23.3			25.2	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Adj. Flow (vph)	0	1354	615	458	1458	0	0	0	0	177	0	198
Shared Lane Traffic (%)										100%		
Lane Group Flow (vph)	0	1354	615	458	1458	0	0	0	0	0	177	198
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			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	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	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	0.0
Detector 1 Queue (s)		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
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		6		5	2						8	
Permitted Phases			6							8		8
Detector Phase		6	6	5	2					8	8	8
Switch Phase												
Minimum Initial (s)		3.0	3.0	4.0	5.0					5.0	5.0	5.0
Minimum Split (s)		9.0	9.0	10.0	10.0					11.0	11.0	11.0

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/21/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)		36.0	36.0	41.0	77.0					23.0	23.0	23.0
Total Split (%)		36.0%	36.0%	41.0%	77.0%					23.0%	23.0%	23.0%
Maximum Green (s)		30.0	30.0	36.0	72.0					17.0	17.0	17.0
Yellow Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	1.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	-1.0	-1.0					-2.0	-2.0	-2.0
Total Lost Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
Lead/Lag		Lag	Lag	Lead								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		3.0	3.0	3.0	3.0					3.0	3.0	3.0
Recall Mode		Max	Max	C-Max	C-Max					Max	Max	Max
Act Effect Green (s)		32.0	32.0	37.0	73.0					19.0	19.0	19.0
Actuated g/C Ratio		0.32	0.32	0.37	0.73					0.19	0.19	0.19
v/c Ratio		0.83	0.73	0.69	0.56					0.56	0.31	0.31
Control Delay		37.0	11.8	45.9	12.2					44.5	14.0	14.0
Queue Delay		0.0	0.0	0.0	0.1					0.0	0.0	0.0
Total Delay		37.0	11.8	45.9	12.2					44.5	14.0	14.0
LOS		D	B	D	B					D	B	B
Approach Delay		29.1			20.3					28.4		
Approach LOS		C			C					C		

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 30 (30%), Referenced to phase 2:WBT and 5:WBL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 25.1

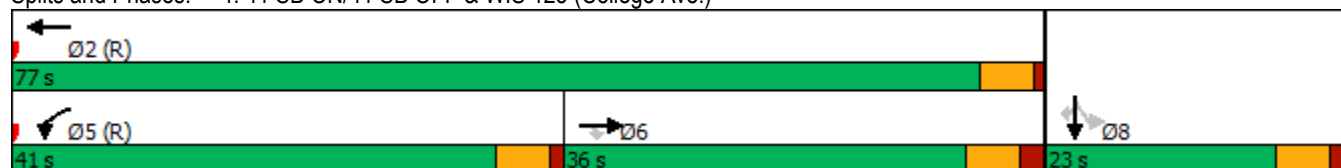
Intersection LOS: C

Intersection Capacity Utilization 77.4%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/21/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (veh/h)	0	1300	590	440	1400	0	0	0	0	170	0	190
Future Volume (veh/h)	0	1300	590	440	1400	0	0	0	0	170	0	190
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	0	1870	1870	1885	1885	0				1856	1856	1856
Adj Flow Rate, veh/h	0	1354	0	458	1458	0				177	0	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96				0.96	0.96	0.96
Percent Heavy Veh, %	0	2	2	1	1	0				3	3	3
Cap, veh/h	0	2496		971	3797	0				672	0	
Arrive On Green	0.00	0.16	0.00	0.54	1.00	0.00				0.19	0.00	0.00
Sat Flow, veh/h	0	5274	1585	1795	3676	0				3534	0	3145
Grp Volume(v), veh/h	0	1354	0	458	1458	0				177	0	0
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1795	1791	0				1767	0	1572
Q Serve(g_s), s	0.0	24.4	0.0	15.7	0.0	0.0				4.3	0.0	0.0
Cycle Q Clear(g_c), s	0.0	24.4	0.0	15.7	0.0	0.0				4.3	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2496		971	3797	0				672	0	
V/C Ratio(X)	0.00	0.54		0.47	0.38	0.00				0.26	0.00	
Avail Cap(c_a), veh/h	0	2496		971	3797	0				672	0	
HCM Platoon Ratio	1.00	0.33	0.33	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.30	0.30	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	31.7	0.0	14.1	0.0	0.0				34.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.9	0.0	0.1	0.1	0.0				1.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	11.3	0.0	6.1	0.0	0.0				1.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	32.5	0.0	14.2	0.1	0.0				35.5	0.0	0.0
LnGrp LOS	A	C		B	A	A				D	A	
Approach Vol, veh/h		1354	A		1916						177	A
Approach Delay, s/veh		32.5			3.5						35.5	
Approach LOS		C			A						D	
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		112.0			58.9	53.1		23.0				
Change Period (Y+Rc), s		* 6			5.0	6.0		6.0				
Max Green Setting (Gmax), s		* 72			36.0	30.0		17.0				
Max Q Clear Time (g_c+I1), s		2.0			17.7	26.4		6.3				
Green Ext Time (p_c), s		10.9			1.9	2.3		0.5				
Intersection Summary												
HCM 6th Ctrl Delay			16.5									
HCM 6th LOS			B									
Notes												
User approved volume balancing among the lanes for turning movement.												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												
Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings

5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	500	970	0	0	1350	270	490	0	490	0	0	0
Future Volume (vph)	500	970	0	0	1350	270	490	0	490	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	225		280	600		600	0		0
Storage Lanes	1		0	1		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950	0.950				
Satd. Flow (prot)	1787	3574	0	0	5085	1583	1681	1681	2787	0	0	0
Flt Permitted	0.125						0.950	0.950				
Satd. Flow (perm)	235	3574	0	0	5085	1583	1681	1681	2787	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						278			237			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		651			1111			1013			1111	
Travel Time (s)		14.8			25.3			23.0			25.3	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	515	1000	0	0	1392	278	505	0	505	0	0	0
Shared Lane Traffic (%)							50%					
Lane Group Flow (vph)	515	1000	0	0	1392	278	252	253	505	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			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	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	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	0.0			
Detector 1 Queue (s)	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			
Turn Type	pm+pt	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	3.0			4.0	4.0	4.0	4.0	4.0			
Minimum Split (s)	13.0	9.0			10.0	10.0	10.0	10.0	10.0			

5:00 pm Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings
5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	35.0	67.0			32.0	32.0	33.0	33.0	33.0			
Total Split (%)	35.0%	67.0%			32.0%	32.0%	33.0%	33.0%	33.0%			
Maximum Green (s)	29.0	61.0			26.0	26.0	28.0	28.0	28.0			
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	2.0	2.0			2.0	2.0	1.0	1.0	1.0			
Lost Time Adjust (s)	-2.0	-2.0			-2.0	-2.0	-1.0	-1.0	-1.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Recall Mode	C-Max	Max			Max	Max	Max	Max	Max			
Act Effct Green (s)	63.0	63.0			28.0	28.0	29.0	29.0	29.0			
Actuated g/C Ratio	0.63	0.63			0.28	0.28	0.29	0.29	0.29			
v/c Ratio	0.82	0.44			0.98	0.43	0.52	0.52	0.52			
Control Delay	47.0	26.2			55.6	5.8	34.2	34.3	17.3			
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Total Delay	47.0	26.2			55.6	5.8	34.2	34.3	17.3			
LOS	D	C			E	A	C	C	B			
Approach Delay	33.3				47.3		25.8					
Approach LOS	C				D		C					

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 30 (30%), Referenced to phase 1:EBL, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 37.1

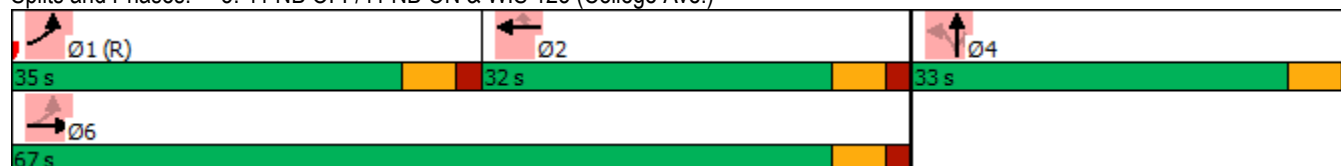
Intersection LOS: D

Intersection Capacity Utilization 77.4%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary

5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	500	970	0	0	1350	270	490	0	490	0	0	0
Future Volume (veh/h)	500	970	0	0	1350	270	490	0	490	0	0	0
Initial Q (Qb), veh	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			
Parking Bus, Adj	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					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	515	1000	0	0	1392	0	505	0	0			
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97			
Percent Heavy Veh, %	1	1	0	0	2	2	2	2	2			
Cap, veh/h	580	2257	0	0	1623		1033	0				
Arrive On Green	0.27	0.63	0.00	0.00	0.10	0.00	0.29	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	5274	1585	3563	0	3170			
Grp Volume(v), veh/h	515	1000	0	0	1392	0	505	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	22.1	14.3	0.0	0.0	26.8	0.0	11.7	0.0	0.0			
Cycle Q Clear(g_c), s	22.1	14.3	0.0	0.0	26.8	0.0	11.7	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	580	2257	0	0	1623		1033	0				
V/C Ratio(X)	0.89	0.44	0.00	0.00	0.86		0.49	0.00				
Avail Cap(c_a), veh/h	648	2257	0	0	1623		1033	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.44	0.44	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	25.6	9.5	0.0	0.0	42.5	0.0	29.4	0.0	0.0			
Incr Delay (d2), s/veh	6.5	0.3	0.0	0.0	6.1	0.0	1.7	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	12.5	5.2	0.0	0.0	13.1	0.0	5.2	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	32.1	9.8	0.0	0.0	48.6	0.0	31.0	0.0	0.0			
LnGrp LOS	C	A	A	A	D		C	A				
Approach Vol, veh/h	1515			1392			505			A		
Approach Delay, s/veh	17.4			48.6			31.0					
Approach LOS	B			D			C					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	31.2	35.8		33.0		67.0						
Change Period (Y+Rc), s	6.0	6.0		5.0		6.0						
Max Green Setting (Gmax), s	29.0	26.0		28.0		61.0						
Max Q Clear Time (g_c+I1), s	24.1	28.8		13.7		16.3						
Green Ext Time (p_c), s	1.1	0.0		2.1		5.8						

Intersection Summary

HCM 6th Ctrl Delay	32.1
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑						↑	↑
Traffic Volume (vph)	0	1480	360	560	1550	0	0	0	0	210	0	460
Future Volume (vph)	0	1480	360	560	1550	0	0	0	0	210	0	460
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	525		800	0		0	0		0	0		235
Storage Lanes	1		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	3539	0	0	0	0	0	1787	1599
Flt Permitted				0.125							0.950	
Satd. Flow (perm)	0	5085	1583	233	3539	0	0	0	0	0	1787	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			367									76
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1386			353			754			884	
Travel Time (s)		31.5			8.0			17.1			20.1	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	1510	367	571	1582	0	0	0	0	214	0	469
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1510	367	571	1582	0	0	0	0	0	214	469
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			0			0	
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	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	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	0.0
Detector 1 Queue (s)		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
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		15.0	15.0	7.0	15.0					10.0	10.0	10.0
Minimum Split (s)		21.0	21.0	11.0	21.0					16.0	16.0	16.0

5:00 pm Baseline

Synchro 10 Report
Page 1

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/21/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		34.0	34.0	40.0	74.0					26.0	26.0	26.0
Total Split (%)		34.0%	34.0%	40.0%	74.0%					26.0%	26.0%	26.0%
Maximum Green (s)		28.0	28.0	36.0	68.0					20.0	20.0	20.0
Yellow Time (s)		4.0	4.0	3.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	0.0	-2.0						-2.0	-2.0
Total Lost Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lead/Lag		Lag	Lag	Lead								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		4.0	4.0	2.0	4.0					3.0	3.0	3.0
Recall Mode		C-Max	C-Max	Max	C-Max					Min	Min	Min
Act Effect Green (s)		30.0	30.0	70.0	70.0						22.0	22.0
Actuated g/C Ratio		0.30	0.30	0.70	0.70						0.22	0.22
v/c Ratio		0.99	0.50	0.80	0.64						0.54	1.14
Control Delay		56.4	5.5	4.8	4.5						40.6	120.3
Queue Delay		27.3	0.0	28.2	22.7						0.0	0.0
Total Delay		83.7	5.5	33.0	27.2						40.6	120.3
LOS		F	A	C	C						D	F
Approach Delay		68.4			28.7						95.3	
Approach LOS		E			C						F	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 49 (49%), Referenced to phase 2:WBTL and 6:EBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.14

Intersection Signal Delay: 54.2

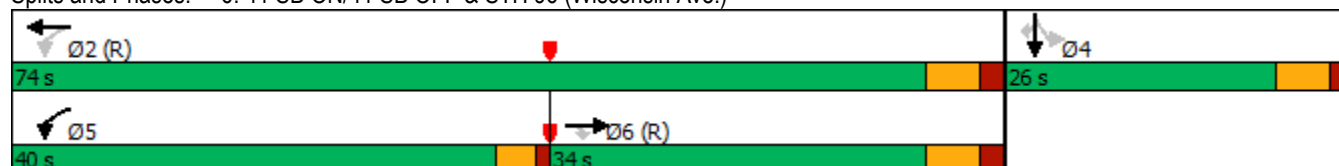
Intersection LOS: D

Intersection Capacity Utilization 91.6%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑						↑	↑
Traffic Volume (veh/h)	0	1480	360	560	1550	0	0	0	0	210	0	460
Future Volume (veh/h)	0	1480	360	560	1550	0	0	0	0	210	0	460
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1885	1885	1885
Adj Flow Rate, veh/h	0	1510	0	571	1582	0				214	0	469
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98				0.98	0.98	0.98
Percent Heavy Veh, %	0	2	2	2	2	0				1	1	1
Cap, veh/h	0	1532		713	2488	0				395	0	351
Arrive On Green	0.00	0.30	0.00	0.36	0.70	0.00				0.22	0.00	0.22
Sat Flow, veh/h	0	5274	1585	1781	3647	0				1795	0	1598
Grp Volume(v), veh/h	0	1510	0	571	1582	0				214	0	469
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1777	0				1795	0	1598
Q Serve(g_s), s	0.0	29.4	0.0	24.2	24.1	0.0				10.6	0.0	22.0
Cycle Q Clear(g_c), s	0.0	29.4	0.0	24.2	24.1	0.0				10.6	0.0	22.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1532		713	2488	0				395	0	351
V/C Ratio(X)	0.00	0.99		0.80	0.64	0.00				0.54	0.00	1.33
Avail Cap(c_a), veh/h	0	1532		713	2488	0				395	0	351
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.09	0.09	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	34.8	0.0	22.4	8.1	0.0				34.5	0.0	39.0
Incr Delay (d2), s/veh	0.0	19.8	0.0	0.9	0.1	0.0				1.5	0.0	168.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	14.6	0.0	11.7	7.8	0.0				4.7	0.0	33.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	54.6	0.0	23.3	8.2	0.0				36.0	0.0	207.7
LnGrp LOS	A	D		C	A	A				D	A	F
Approach Vol, veh/h		1510	A		2153						683	
Approach Delay, s/veh		54.6			12.2						153.9	
Approach LOS		D			B						F	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		74.0		26.0	40.0	34.0						
Change Period (Y+Rc), s		6.0		6.0	4.0	6.0						
Max Green Setting (Gmax), s		68.0		20.0	36.0	28.0						
Max Q Clear Time (g_c+I1), s		26.1		24.0	26.2	31.4						
Green Ext Time (p_c), s		18.9		0.0	1.2	0.0						
Intersection Summary												
HCM 6th Ctrl Delay			49.2									
HCM 6th LOS			D									
Notes												
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	680	1010	0	0	1730	300	380	0	480	0	0	0
Future Volume (vph)	680	1010	0	0	1730	300	380	0	480	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	525		525	0		180	0		0
Storage Lanes	1		0	1		1	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950	0.950				
Satd. Flow (prot)	1770	3539	0	0	5085	1583	1681	1681	1583	0	0	0
Flt Permitted	0.125						0.950	0.950				
Satd. Flow (perm)	233	3539	0	0	5085	1583	1681	1681	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						306			157			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			1101			409			876	
Travel Time (s)		8.0			25.0			9.3			19.9	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	694	1031	0	0	1765	306	388	0	490	0	0	0
Shared Lane Traffic (%)							50%					
Lane Group Flow (vph)	694	1031	0	0	1765	306	194	194	490	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			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	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	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	0.0			
Detector 1 Queue (s)	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			
Turn Type	pm+pt	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	15.0			15.0	15.0	10.0	10.0	10.0			
Minimum Split (s)	11.0	21.0			21.0	21.0	16.0	16.0	16.0			

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	40.0	74.0			34.0	34.0	26.0	26.0	26.0			
Total Split (%)	40.0%	74.0%			34.0%	34.0%	26.0%	26.0%	26.0%			
Maximum Green (s)	36.0	68.0			28.0	28.0	20.0	20.0	20.0			
Yellow Time (s)	3.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	-2.0			-2.0	-2.0	-2.0	-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	2.0	4.0			4.0	4.0	3.0	3.0	3.0			
Recall Mode	Max	C-Max			C-Max	C-Max	Min	Min	Min			
Act Effct Green (s)	70.0	70.0			30.0	30.0	22.0	22.0	22.0			
Actuated g/C Ratio	0.70	0.70			0.30	0.30	0.22	0.22	0.22			
v/c Ratio	0.97	0.42			1.16	0.44	0.53	0.53	1.04			
Control Delay	23.0	1.9			111.9	5.4	40.4	40.4	80.4			
Queue Delay	41.5	3.7			0.5	0.0	0.0	0.0	0.0			
Total Delay	64.5	5.6			112.3	5.4	40.4	40.4	80.4			
LOS	E	A			F	A	D	D	F			
Approach Delay	29.3				96.5		62.7					
Approach LOS	C				F		E					

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.16

Intersection Signal Delay: 65.4

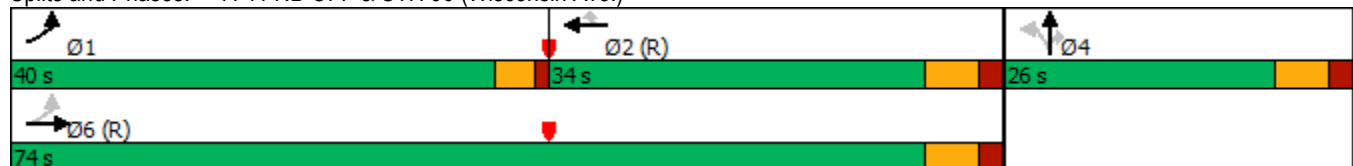
Intersection LOS: E

Intersection Capacity Utilization 91.6%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 7: 41 NB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  							
Traffic Volume (veh/h)	680	1010	0	0	1730	300	380	0	480	0	0	0
Future Volume (veh/h)	680	1010	0	0	1730	300	380	0	480	0	0	0
Initial Q (Qb), veh	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			
Parking Bus, Adj	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					
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	694	1031	0	0	1765	306	388	0	0			
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	715	2720	0	0	1866	579	550	0				
Arrive On Green	0.12	0.25	0.00	0.00	0.37	0.37	0.15	0.00	0.00			
Sat Flow, veh/h	1781	3647	0	0	5274	1585	3563	0	1585			
Grp Volume(v), veh/h	694	1031	0	0	1765	306	388	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	34.6	24.0	0.0	0.0	33.5	15.2	10.3	0.0	0.0			
Cycle Q Clear(g_c), s	34.6	24.0	0.0	0.0	33.5	15.2	10.3	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	715	2720	0	0	1866	579	550	0				
V/C Ratio(X)	0.97	0.38	0.00	0.00	0.95	0.53	0.71	0.00				
Avail Cap(c_a), veh/h	715	2720	0	0	1866	579	784	0				
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.11	0.11	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	38.7	17.7	0.0	0.0	30.8	24.9	40.1	0.0	0.0			
Incr Delay (d2), s/veh	6.2	0.0	0.0	0.0	11.4	3.4	1.7	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	19.7	11.3	0.0	0.0	15.2	6.1	4.6	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.8	17.8	0.0	0.0	42.2	28.4	41.8	0.0	0.0			
LnGrp LOS	D	B	A	A	D	C	D	A				
Approach Vol, veh/h	1725			2071			388			A		
Approach Delay, s/veh	28.7			40.1			41.8					
Approach LOS	C			D			D					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	40.0	40.6		19.4		80.6						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	36.0	28.0		20.0		68.0						
Max Q Clear Time (g_c+I1), s	36.6	35.5		12.3		26.0						
Green Ext Time (p_c), s	0.0	0.0		1.1		9.8						

Intersection Summary

HCM 6th Ctrl Delay	35.6
HCM 6th LOS	D

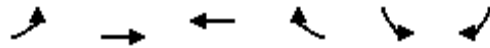
Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

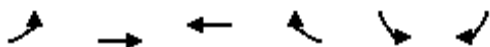
08/21/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	180	1480	1020	440	160	740
Future Volume (vph)	180	1480	1020	440	160	740
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250			350	0	200
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3574	1599	1752	1568
Flt Permitted	0.115				0.950	
Satd. Flow (perm)	214	3539	3574	1599	1752	1568
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				500		204
Link Speed (mph)		30	30		30	
Link Distance (ft)		1990	1183		425	
Travel Time (s)		45.2	26.9		9.7	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	1%	1%	3%	3%
Adj. Flow (vph)	205	1682	1159	500	182	841
Shared Lane Traffic (%)						
Lane Group Flow (vph)	205	1682	1159	500	182	841
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	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						
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	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
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
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	6			2		4
Detector Phase	1	6	2	2	4	4
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0	10.0	10.0
Minimum Split (s)	13.0	26.0	26.0	26.0	16.0	16.0

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

08/21/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	13.0	64.0	51.0	51.0	31.0	31.0
Total Split (%)	13.7%	67.4%	53.7%	53.7%	32.6%	32.6%
Maximum Green (s)	8.0	58.0	45.0	45.0	25.0	25.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag		Lag	
Lead-Lag Optimize?	Yes		Yes		Yes	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0	4.0
Recall Mode	None	C-Min	C-Min	C-Min	None	None
Act Effect Green (s)	58.1	58.1	45.1	45.1	28.9	28.9
Actuated g/C Ratio	0.61	0.61	0.47	0.47	0.30	0.30
v/c Ratio	0.74	0.78	0.68	0.49	0.34	1.36
Control Delay	29.4	16.6	11.8	6.2	28.8	195.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.4	16.6	11.8	6.2	28.8	195.6
LOS	C	B	B	A	C	F
Approach Delay	18.0		10.1		165.9	
Approach LOS	B		B		F	

Intersection Summary

Area Type: Other

Cycle Length: 95

Actuated Cycle Length: 95

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.36

Intersection Signal Delay: 48.2

Intersection LOS: D

Intersection Capacity Utilization 80.7%

ICU Level of Service D

Analysis Period (min) 15

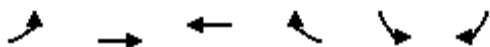
Splits and Phases: 8: Northland (CTH OO) & SB 41 OFF



HCM 6th Signalized Intersection Summary

8: Northland (CTH OO) & SB 41 OFF

08/21/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↱↱	↰↰	↰	↰	↰
Traffic Volume (veh/h)	180	1480	1020	440	160	740
Future Volume (veh/h)	180	1480	1020	440	160	740
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
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1885	1885	1856	1856
Adj Flow Rate, veh/h	205	1682	1159	0	182	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	1	1	3	3
Cap, veh/h	393	2731	2301		260	
Arrive On Green	0.11	1.00	0.21	0.00	0.15	0.00
Sat Flow, veh/h	1781	3647	3676	1598	1767	1572
Grp Volume(v), veh/h	205	1682	1159	0	182	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1791	1598	1767	1572
Q Serve(g_s), s	3.3	0.0	27.1	0.0	9.3	0.0
Cycle Q Clear(g_c), s	3.3	0.0	27.1	0.0	9.3	0.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	393	2731	2301		260	
V/C Ratio(X)	0.52	0.62	0.50		0.70	
Avail Cap(c_a), veh/h	412	2731	2301		502	
HCM Platoon Ratio	1.33	1.33	0.33	0.33	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.09	0.00	1.00	0.00
Uniform Delay (d), s/veh	10.9	0.0	24.1	0.0	38.5	0.0
Incr Delay (d2), s/veh	1.1	1.1	0.1	0.0	4.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.4	12.9	0.0	4.3	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	12.0	1.1	24.1	0.0	43.3	0.0
LnGrp LOS	B	A	C		D	
Approach Vol, veh/h		1887	1159	A	182	A
Approach Delay, s/veh		2.2	24.1		43.3	
Approach LOS		A	C		D	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	12.0	65.0		18.0		77.0
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	8.0	45.0		25.0		58.0
Max Q Clear Time (g_c+I1), s	5.3	29.1		11.3		2.0
Green Ext Time (p_c), s	0.2	5.6		0.8		23.5

Intersection Summary

HCM 6th Ctrl Delay	12.4
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	720	920	0	0	1220	280	240	0	750	0	0	0
Future Volume (vph)	720	920	0	0	1220	280	240	0	750	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	0		340	0		670	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1780	3574	0	0	3574	1599	0	1752	1568	0	0	0
Flt Permitted	0.125							0.950				
Satd. Flow (perm)	234	3574	0	0	3574	1599	0	1752	1568	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						304			441			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1183			2176			1467			1203	
Travel Time (s)		26.9			49.5			33.3			27.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	3%	3%	3%	1%	1%	1%
Bus Blockages (#/hr)	1	0	0	0	0	0	0	0	0	0	0	0
Adj. Flow (vph)	783	1000	0	0	1326	304	261	0	815	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	783	1000	0	0	1326	304	0	261	815	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.01	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	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	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	0.0			
Detector 1 Queue (s)	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			
Turn Type	pm+pt	NA			NA	Perm	Perm	NA	Free			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		Free			
Detector Phase	1	6			2	2	4	4				
Switch Phase												
Minimum Initial (s)	7.0	20.0			20.0	20.0	10.0	10.0				

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	12.0	26.0			26.0	26.0	20.0	20.0				
Total Split (s)	31.0	64.0			33.0	33.0	31.0	31.0				
Total Split (%)	32.6%	67.4%			34.7%	34.7%	32.6%	32.6%				
Maximum Green (s)	26.0	58.0			27.0	27.0	25.0	25.0				
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0				
Lost Time Adjust (s)	-1.0	-2.0			-2.0	-2.0		-2.0				
Total Lost Time (s)	4.0	4.0			4.0	4.0		4.0				
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			4.0	4.0	4.0	4.0				
Recall Mode	Min	C-Min			C-Min	C-Min	None	None				
Act Effect Green (s)	65.2	65.2			29.0	29.0		21.8	95.0			
Actuated g/C Ratio	0.69	0.69			0.31	0.31		0.23	1.00			
v/c Ratio	1.14	0.41			1.22	0.43		0.65	0.52			
Control Delay	96.3	2.6			136.6	5.2		40.5	1.2			
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0			
Total Delay	96.3	2.6			136.6	5.2		40.5	1.2			
LOS	F	A			F	A		D	A			
Approach Delay		43.7			112.1			10.8				
Approach LOS		D			F			B				

Intersection Summary

Area Type: Other

Cycle Length: 95

Actuated Cycle Length: 95

Offset: 54 (57%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.22

Intersection Signal Delay: 60.7

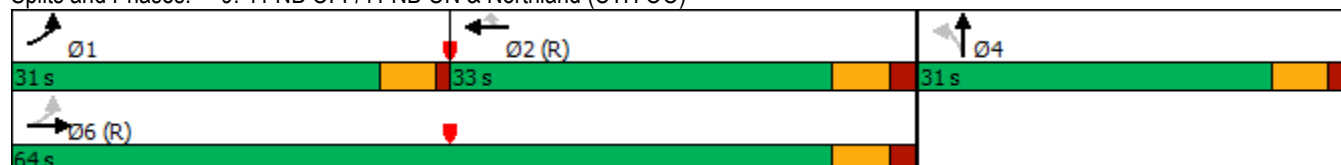
Intersection LOS: E

Intersection Capacity Utilization 96.9%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 9: 41 NB OFF/41 NB ON & Northland (CTH OO)



HCM 6th Signalized Intersection Summary

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	720	920	0	0	1220	280	240	0	750	0	0	0
Future Volume (veh/h)	720	920	0	0	1220	280	240	0	750	0	0	0
Initial Q (Qb), veh	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			
Parking Bus, Adj	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					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1885	1885	1856	1856	1856			
Adj Flow Rate, veh/h	783	1000	0	0	1326	0	261	0	0			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	1	1	0	0	1	1	3	3	3			
Cap, veh/h	594	2590	0	0	1421		341	0				
Arrive On Green	0.57	1.00	0.00	0.00	0.13	0.00	0.19	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	3676	1598	1767	0	1572			
Grp Volume(v), veh/h	783	1000	0	0	1326	0	261	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1791	1598	1767	0	1572			
Q Serve(g_s), s	27.0	0.0	0.0	0.0	34.8	0.0	13.3	0.0	0.0			
Cycle Q Clear(g_c), s	27.0	0.0	0.0	0.0	34.8	0.0	13.3	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	594	2590	0	0	1421		341	0				
V/C Ratio(X)	1.32	0.39	0.00	0.00	0.93		0.77	0.00				
Avail Cap(c_a), veh/h	594	2590	0	0	1421		502	0				
HCM Platoon Ratio	2.00	2.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.60	0.60	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	14.4	0.0	0.0	0.0	40.0	0.0	36.3	0.0	0.0			
Incr Delay (d2), s/veh	150.1	0.3	0.0	0.0	12.5	0.0	5.5	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	31.4	0.1	0.0	0.0	19.1	0.0	6.2	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	164.5	0.3	0.0	0.0	52.5	0.0	41.8	0.0	0.0			
LnGrp LOS	F	A	A	A	D		D	A				
Approach Vol, veh/h	1783			1326			261			A		
Approach Delay, s/veh	72.4			52.5			41.8					
Approach LOS	E			D			D					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	31.0	41.7		22.3		72.7						
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	26.0	27.0		25.0		58.0						
Max Q Clear Time (g_c+I1), s	29.0	36.8		15.3		2.0						
Green Ext Time (p_c), s	0.0	0.0		1.0		5.9						
Intersection Summary												
HCM 6th Ctrl Delay	62.2											
HCM 6th LOS	E											

Lanes, Volumes, Timings

15: SB 41 OFF

08/21/2019

	↑	↗	↘	↓	↙	↖
Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations		↗		↑		
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr t						
Flt Protected						
Satd. Flow (prot)	0	1863	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	0	1863	0	1863	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	425			1098	985	
Travel Time (s)	9.7			25.0	22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 0.0%	ICU Level of Service A					
Analysis Period (min) 15						

Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	360	0	250	0	0	0	0	810	500	240	960	0
Future Volume (vph)	360	0	250	0	0	0	0	810	500	240	960	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	0		0	0		245	25		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	1863	1583	0	0	0	0	3539	1583	1787	3574	0
Flt Permitted	0.950									0.143		
Satd. Flow (perm)	3433	1863	1583	0	0	0	0	3539	1583	269	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			139						538			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1099			921			1164			506	
Travel Time (s)		25.0			20.9			26.5			11.5	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	387	0	269	0	0	0	0	871	538	258	1032	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	387	0	269	0	0	0	0	871	538	258	1032	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			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	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	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	0.0	
Detector 1 Queue (s)	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	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					15.0	15.0	7.0	15.0	
Minimum Split (s)	16.0	16.0	16.0					21.0	21.0	11.0	21.0	

5:00 pm Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	30.0	30.0	30.0					30.0	30.0	40.0	70.0	
Total Split (%)	30.0%	30.0%	30.0%					30.0%	30.0%	40.0%	70.0%	
Maximum Green (s)	24.0	24.0	24.0					24.0	24.0	36.0	64.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0					-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0					4.0	4.0	4.0	4.0	
Lead/Lag								Lag	Lag	Lead		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0					5.0	5.0	2.0	2.0	
Recall Mode	Min	Min	Min					C-Max	C-Max	Max	C-Max	
Act Effct Green (s)	19.5		19.5					26.0	26.0	72.5	72.5	
Actuated g/C Ratio	0.20		0.20					0.26	0.26	0.72	0.72	
v/c Ratio	0.58		0.64					0.95	0.67	0.31	0.40	
Control Delay	39.5		24.1					56.4	7.3	9.5	0.4	
Queue Delay	0.0		0.0					0.0	0.0	0.0	0.1	
Total Delay	39.5		24.1					56.4	7.3	9.5	0.5	
LOS	D		C					E	A	A	A	
Approach Delay		33.2						37.7			2.3	
Approach LOS		C						D			A	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 23.2

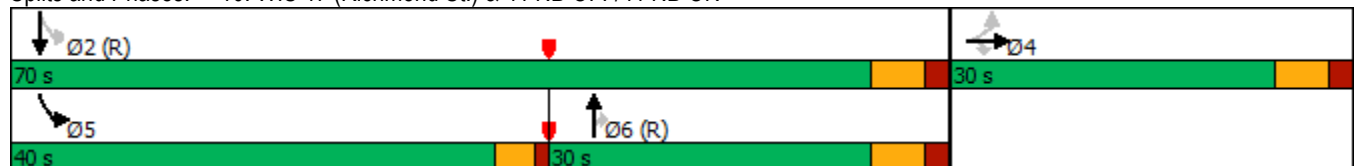
Intersection LOS: C

Intersection Capacity Utilization 64.5%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

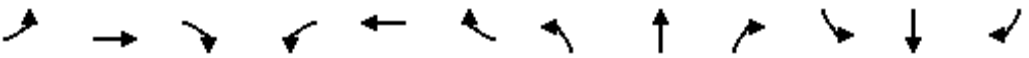
08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 							 			 	
Traffic Volume (veh/h)	360	0	250	0	0	0	0	810	500	240	960	0
Future Volume (veh/h)	360	0	250	0	0	0	0	810	500	240	960	0
Initial Q (Qb), veh	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
Parking Bus, Adj	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		
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1870	1870	1885	1885	0
Adj Flow Rate, veh/h	387	0	0				0	871	0	258	1032	0
Peak Hour Factor	0.93	0.93	0.93				0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2				0	2	2	1	1	0
Cap, veh/h	553	299					0	1280		803	2723	0
Arrive On Green	0.16	0.00	0.00				0.00	0.36	0.00	0.24	0.51	0.00
Sat Flow, veh/h	3456	1870	1585				0	3647	1585	1795	3676	0
Grp Volume(v), veh/h	387	0	0				0	871	0	258	1032	0
Grp Sat Flow(s),veh/h/ln	1728	1870	1585				0	1777	1585	1795	1791	0
Q Serve(g_s), s	10.6	0.0	0.0				0.0	20.8	0.0	5.3	17.5	0.0
Cycle Q Clear(g_c), s	10.6	0.0	0.0				0.0	20.8	0.0	5.3	17.5	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	553	299					0	1280		803	2723	0
V/C Ratio(X)	0.70	0.00					0.00	0.68		0.32	0.38	0.00
Avail Cap(c_a), veh/h	898	486					0	1280		803	2723	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.67	0.67	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.67	0.67	0.00
Uniform Delay (d), s/veh	39.7	0.0	0.0				0.0	27.1	0.0	11.0	10.2	0.0
Incr Delay (d2), s/veh	1.6	0.0	0.0				0.0	2.9	0.0	0.7	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.6	0.0	0.0				0.0	9.1	0.0	2.2	7.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	41.4	0.0	0.0				0.0	30.1	0.0	11.7	10.5	0.0
LnGrp LOS	D	A					A	C		B	B	A
Approach Vol, veh/h	387		A					871	A	1290		
Approach Delay, s/veh	41.4							30.1		10.7		
Approach LOS	D							C		B		
Timer - Assigned Phs	2			4	5	6						
Phs Duration (G+Y+Rc), s	80.0			20.0	40.0	40.0						
Change Period (Y+Rc), s	6.0			6.0	4.0	6.0						
Max Green Setting (Gmax), s	64.0			24.0	36.0	24.0						
Max Q Clear Time (g_c+I1), s	19.5			12.6	7.3	22.8						
Green Ext Time (p_c), s	3.3			1.4	0.6	0.8						
Intersection Summary												
HCM 6th Ctrl Delay			22.0									
HCM 6th LOS			C									

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	500	0	230	200	970	0	0	700	240
Future Volume (vph)	0	0	0	500	0	230	200	970	0	0	700	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	100		100	25		0	0		250
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3433	1863	1583	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.151					
Satd. Flow (perm)	0	0	0	3433	1863	1583	284	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						129						264
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		909			1200			506			920	
Travel Time (s)		20.7			27.3			11.5			20.9	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	549	0	253	220	1066	0	0	769	264
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	549	0	253	220	1066	0	0	769	264
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			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	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	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	0.0
Detector 1 Queue (s)				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
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	15.0			15.0	15.0
Minimum Split (s)				16.0	16.0	16.0	11.0	21.0			21.0	21.0

5:00 pm Baseline

Synchro 10 Report
Page 10

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/21/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	34.0	70.0			36.0	36.0
Total Split (%)				30.0%	30.0%	30.0%	34.0%	70.0%			36.0%	36.0%
Maximum Green (s)				24.0	24.0	24.0	30.0	64.0			30.0	30.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			5.0	5.0
Recall Mode				Min	Min	Min	Max	C-Max			C-Max	C-Max
Act Effect Green (s)				23.1		23.1	68.9	68.9			32.0	32.0
Actuated g/C Ratio				0.23		0.23	0.69	0.69			0.32	0.32
v/c Ratio				0.69		0.54	0.32	0.43			0.68	0.38
Control Delay				39.8		20.2	2.1	3.3			33.2	5.0
Queue Delay				0.0		0.0	0.0	0.6			0.0	0.0
Total Delay				39.8		20.2	2.1	3.9			33.2	5.0
LOS				D		C	A	A			C	A
Approach Delay					33.6			3.6			26.0	
Approach LOS					C			A			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 53 (53%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 18.7

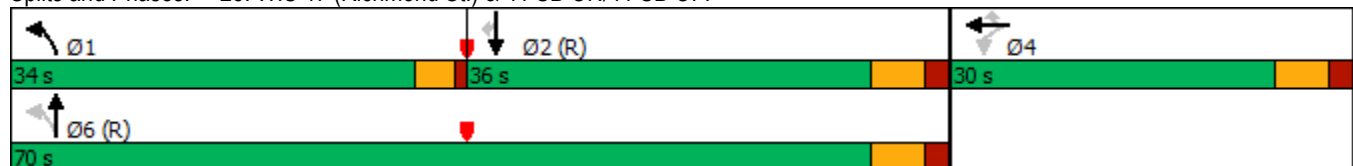
Intersection LOS: B

Intersection Capacity Utilization 64.5%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/21/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↰	↑	↱	↰	↑↑			↑↑	↱
Traffic Volume (veh/h)	0	0	0	500	0	230	200	970	0	0	700	240
Future Volume (veh/h)	0	0	0	500	0	230	200	970	0	0	700	240
Initial Q (Qb), veh				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
Parking Bus, Adj				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	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				549	0	0	220	1066	0	0	769	0
Peak Hour Factor				0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				711	385		739	2558	0	0	1330	
Arrive On Green				0.21	0.00	0.00	0.60	1.00	0.00	0.00	0.37	0.00
Sat Flow, veh/h				3456	1870	1585	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				549	0	0	220	1066	0	0	769	0
Grp Sat Flow(s),veh/h/ln				1728	1870	1585	1795	1791	0	0	1777	1585
Q Serve(g_s), s				15.0	0.0	0.0	3.0	0.0	0.0	0.0	17.3	0.0
Cycle Q Clear(g_c), s				15.0	0.0	0.0	3.0	0.0	0.0	0.0	17.3	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				711	385		739	2558	0	0	1330	
V/C Ratio(X)				0.77	0.00		0.30	0.42	0.00	0.00	0.58	
Avail Cap(c_a), veh/h				898	486		739	2558	0	0	1330	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	0.44	0.44	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				37.5	0.0	0.0	4.6	0.0	0.0	0.0	25.0	0.0
Incr Delay (d2), s/veh				3.2	0.0	0.0	0.5	0.2	0.0	0.0	1.8	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				6.6	0.0	0.0	0.9	0.1	0.0	0.0	7.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				40.7	0.0	0.0	5.1	0.2	0.0	0.0	26.8	0.0
LnGrp LOS				D	A		A	A	A	A	C	
Approach Vol, veh/h					549	A		1286			769	A
Approach Delay, s/veh					40.7			1.0			26.8	
Approach LOS					D			A			C	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	34.0	41.4		24.6		75.4						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	30.0	30.0		24.0		64.0						
Max Q Clear Time (g_c+I1), s	5.0	19.3		17.0		2.0						
Green Ext Time (p_c), s	0.5	5.0		1.6		3.4						

Intersection Summary

HCM 6th Ctrl Delay	17.0
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	230	0	410	430	980	0	0	960	540
Future Volume (vph)	0	0	0	230	0	410	430	980	0	0	960	540
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	210		210	0		0	0		410
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3467	1881	1599	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.099					
Satd. Flow (perm)	0	0	0	3467	1881	1599	186	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						137						547
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		756			820			575			1156	
Travel Time (s)		17.2			18.6			13.1			26.3	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	258	0	461	483	1101	0	0	1079	607
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	258	0	461	483	1101	0	0	1079	607
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			18			28	
Link Offset(ft)		0			0			0			6	
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	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	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	0.0
Detector 1 Queue (s)				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
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	20.0			20.0	20.0
Minimum Split (s)				16.0	16.0	16.0	11.0	26.0			26.0	26.0

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				26.0	26.0	26.0	31.0	74.0			43.0	43.0
Total Split (%)				26.0%	26.0%	26.0%	31.0%	74.0%			43.0%	43.0%
Maximum Green (s)				20.0	20.0	20.0	27.0	68.0			37.0	37.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				4.0	4.0	4.0	2.0	2.0			4.0	4.0
Recall Mode				Max	Max	Max	Max	C-Min			C-Min	C-Min
Act Effect Green (s)				22.5		22.5	69.5	69.5			38.5	38.5
Actuated g/C Ratio				0.22		0.22	0.70	0.70			0.38	0.38
v/c Ratio				0.33		0.99	0.86	0.44			0.79	0.64
Control Delay				34.1		68.3	20.2	6.5			32.3	6.7
Queue Delay				0.0		0.0	0.0	0.7			0.0	0.0
Total Delay				34.1		68.3	20.2	7.2			32.3	6.7
LOS				C		E	C	A			C	A
Approach Delay					56.0			11.1			23.1	
Approach LOS					E			B			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 69 (69%), Referenced to phase 2:SBT and 6:NBTL, Start of 1st Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 24.3

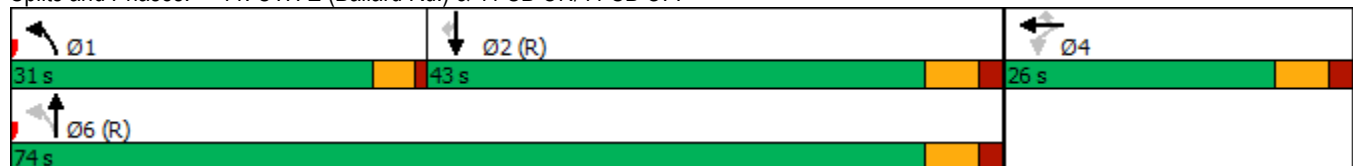
Intersection LOS: C

Intersection Capacity Utilization 76.4%

ICU Level of Service D

Analysis Period (min) 15

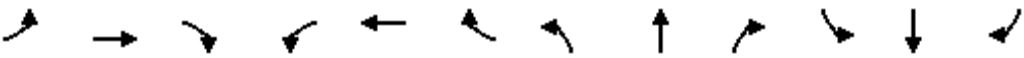
Splits and Phases: 11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔↔	↑	↗	↖	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	230	0	410	430	980	0	0	960	540
Future Volume (veh/h)	0	0	0	230	0	410	430	980	0	0	960	540
Initial Q (Qb), veh				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
Parking Bus, Adj				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	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				258	0	0	483	1101	0	0	1079	0
Peak Hour Factor				0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %				1	1	1	1	1	0	0	2	2
Cap, veh/h				766	415		623	2507	0	0	1386	
Arrive On Green				0.22	0.00	0.00	0.18	0.47	0.00	0.00	0.52	0.00
Sat Flow, veh/h				3483	1885	1598	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				258	0	0	483	1101	0	0	1079	0
Grp Sat Flow(s),veh/h/ln				1742	1885	1598	1795	1791	0	0	1777	1585
Q Serve(g_s), s				6.2	0.0	0.0	17.5	20.6	0.0	0.0	24.5	0.0
Cycle Q Clear(g_c), s				6.2	0.0	0.0	17.5	20.6	0.0	0.0	24.5	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				766	415		623	2507	0	0	1386	
V/C Ratio(X)				0.34	0.00		0.78	0.44	0.00	0.00	0.78	
Avail Cap(c_a), veh/h				766	415		623	2507	0	0	1386	
HCM Platoon Ratio				1.00	1.00	1.00	0.67	0.67	1.00	1.00	1.33	1.33
Upstream Filter(I)				1.00	0.00	0.00	0.31	0.31	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				32.9	0.0	0.0	24.0	13.4	0.0	0.0	20.6	0.0
Incr Delay (d2), s/veh				1.2	0.0	0.0	3.0	0.2	0.0	0.0	4.4	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.7	0.0	0.0	5.7	8.9	0.0	0.0	9.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				34.0	0.0	0.0	27.0	13.6	0.0	0.0	25.0	0.0
LnGrp LOS				C	A		C	B	A	A	C	
Approach Vol, veh/h					258	A		1584			1079	A
Approach Delay, s/veh					34.0			17.7			25.0	
Approach LOS					C			B			C	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	31.0	43.0		26.0		74.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	27.0	37.0		20.0		68.0						
Max Q Clear Time (g_c+I1), s	19.5	26.5		8.2		22.6						
Green Ext Time (p_c), s	0.8	5.5		1.2		3.6						

Intersection Summary

HCM 6th Ctrl Delay	21.8
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings
12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	340	0	150	0	0	0	0	1070	190	490	700	0
Future Volume (vph)	340	0	150	0	0	0	0	1070	190	490	700	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	410		155	0		0	0		280	0		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3467	1881	1599	0	0	0	0	3574	1599	1787	3574	0
Flt Permitted	0.950									0.121		
Satd. Flow (perm)	3467	1881	1599	0	0	0	0	3574	1599	228	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			278						202			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		796			858			1043			575	
Travel Time (s)		18.1			19.5			23.7			13.1	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	362	0	160	0	0	0	0	1138	202	521	745	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	362	0	160	0	0	0	0	1138	202	521	745	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			28			18	
Link Offset(ft)		0			0			6			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	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	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	0.0	
Detector 1 Queue (s)	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	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	7.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.0	26.0	11.0	26.0	

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/21/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	25.0	25.0	25.0					35.0	35.0	40.0	75.0	
Total Split (%)	25.0%	25.0%	25.0%					35.0%	35.0%	40.0%	75.0%	
Maximum Green (s)	19.0	19.0	19.0					29.0	29.0	36.0	69.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0					-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0					4.0	4.0	4.0	4.0	
Lead/Lag								Lag	Lag	Lead		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	4.0	4.0	4.0					4.0	4.0	2.0	2.0	
Recall Mode	Max	Max	Max					C-Min	C-Min	Max	C-Min	
Act Effect Green (s)	21.0		21.0					31.0	31.0	71.0	71.0	
Actuated g/C Ratio	0.21		0.21					0.31	0.31	0.71	0.71	
v/c Ratio	0.50		0.29					1.03	0.32	0.72	0.29	
Control Delay	37.6		1.3					69.4	5.2	14.3	0.3	
Queue Delay	0.0		0.0					0.0	0.0	0.1	0.0	
Total Delay	37.6		1.3					69.4	5.2	14.4	0.3	
LOS	D		A					E	A	B	A	
Approach Delay		26.5						59.7			6.1	
Approach LOS		C						E			A	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 5 (5%), Referenced to phase 2:SBTL and 6:NBT, Start of 1st Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.03

Intersection Signal Delay: 32.5

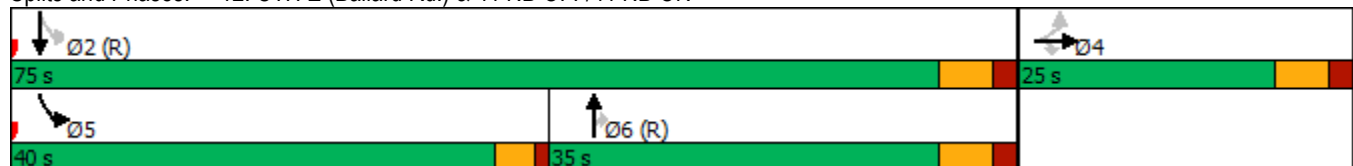
Intersection LOS: C

Intersection Capacity Utilization 76.4%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 							 			 	
Traffic Volume (veh/h)	340	0	150	0	0	0	0	1070	190	490	700	0
Future Volume (veh/h)	340	0	150	0	0	0	0	1070	190	490	700	0
Initial Q (Qb), veh	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
Parking Bus, Adj	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		
Adj Sat Flow, veh/h/ln	1885	1885	1885				0	1885	1885	1885	1885	0
Adj Flow Rate, veh/h	362	0	0				0	1138	0	521	745	0
Peak Hour Factor	0.94	0.94	0.94				0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	1	1	1				0	1	1	1	1	0
Cap, veh/h	731	396					0	1110		718	2543	0
Arrive On Green	0.21	0.00	0.00				0.00	0.62	0.00	0.12	0.23	0.00
Sat Flow, veh/h	3483	1885	1598				0	3676	1598	1795	3676	0
Grp Volume(v), veh/h	362	0	0				0	1138	0	521	745	0
Grp Sat Flow(s),veh/h/ln	1742	1885	1598				0	1791	1598	1795	1791	0
Q Serve(g_s), s	9.2	0.0	0.0				0.0	31.0	0.0	23.8	17.1	0.0
Cycle Q Clear(g_c), s	9.2	0.0	0.0				0.0	31.0	0.0	23.8	17.1	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	731	396					0	1110		718	2543	0
V/C Ratio(X)	0.49	0.00					0.00	1.02		0.73	0.29	0.00
Avail Cap(c_a), veh/h	731	396					0	1110		718	2543	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	2.00	2.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.65	0.65	0.00
Uniform Delay (d), s/veh	34.8	0.0	0.0				0.0	19.0	0.0	32.5	17.6	0.0
Incr Delay (d2), s/veh	2.4	0.0	0.0				0.0	33.5	0.0	4.2	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.1	0.0	0.0				0.0	12.1	0.0	14.2	8.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.2	0.0	0.0				0.0	52.5	0.0	36.7	17.8	0.0
LnGrp LOS	D	A					A	F		D	B	A
Approach Vol, veh/h	362			A			1138			A		
Approach Delay, s/veh	37.2						52.5			25.6		
Approach LOS	D						D			C		
Timer - Assigned Phs	2			4			5			6		
Phs Duration (G+Y+Rc), s	75.0			25.0			40.0			35.0		
Change Period (Y+Rc), s	6.0			6.0			4.0			6.0		
Max Green Setting (Gmax), s	69.0			19.0			36.0			29.0		
Max Q Clear Time (g_c+I1), s	19.1			11.2			25.8			33.0		
Green Ext Time (p_c), s	2.2			1.4			1.0			0.0		
Intersection Summary												
HCM 6th Ctrl Delay			38.2									
HCM 6th LOS			D									
Notes												

Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↶	↶	↶	↶↶			↶↶	↶
Traffic Volume (vph)	0	0	0	320	0	70	330	480	0	0	240	170
Future Volume (vph)	0	0	0	320	0	70	330	480	0	0	240	170
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		120	550		0	0		75
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1787	1599	1787	3574	0	0	3574	1599
Flt Permitted					0.950		0.573					
Satd. Flow (perm)	0	0	0	0	1787	1599	1078	3574	0	0	3574	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						104						202
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		759			871			591			844	
Travel Time (s)		17.3			19.8			13.4			19.2	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	0	0	381	0	83	393	571	0	0	286	202
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	381	83	393	571	0	0	286	202
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			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	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	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	0.0
Detector 1 Queue (s)				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
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					8		1	6			2	
Permitted Phases				8		8	6					2
Detector Phase				8	8	8	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	8.0	20.0			20.0	20.0
Minimum Split (s)				22.0	22.0	22.0	14.5	26.5			26.5	26.5

5:00 pm Baseline

Synchro 10 Report
Page 3

Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/21/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	35.0	75.0			40.0	40.0
Total Split (%)				28.6%	28.6%	28.6%	33.3%	71.4%			38.1%	38.1%
Maximum Green (s)				24.0	24.0	24.0	28.5	68.5			33.5	33.5
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				1.5	1.5	1.5	2.0	2.0			2.0	2.0
Lost Time Adjust (s)					-2.0	-2.0	-2.5	-2.5			-2.5	-2.5
Total Lost Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lag				Lead	Lead
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	4.0	3.0			4.0	4.0
Recall Mode				None	None	None	None	Min			Min	Min
Act Effect Green (s)					22.2	22.2	37.9	37.9			22.6	22.6
Actuated g/C Ratio					0.33	0.33	0.56	0.56			0.33	0.33
v/c Ratio					0.66	0.14	0.55	0.29			0.24	0.30
Control Delay					25.9	3.4	15.3	8.9			18.2	4.6
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					25.9	3.4	15.3	8.9			18.2	4.6
LOS					C	A	B	A			B	A
Approach Delay					21.8			11.5			12.6	
Approach LOS					C			B			B	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 68.1

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 14.3

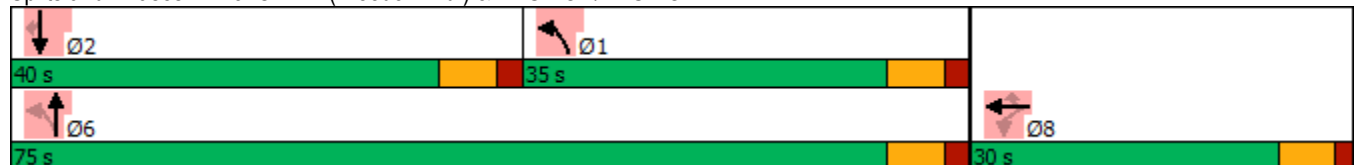
Intersection LOS: B

Intersection Capacity Utilization 62.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/21/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↶	↷	↶	↷			↷	↶
Traffic Volume (veh/h)	0	0	0	320	0	70	330	480	0	0	240	170
Future Volume (veh/h)	0	0	0	320	0	70	330	480	0	0	240	170
Initial Q (Qb), veh				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
Parking Bus, Adj				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	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1885	1885
Adj Flow Rate, veh/h				381	0	0	393	571	0	0	286	0
Peak Hour Factor				0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %				1	1	1	1	1	0	0	1	1
Cap, veh/h				498	0		676	2129	0	0	1294	
Arrive On Green				0.28	0.00	0.00	0.17	0.59	0.00	0.00	0.36	0.00
Sat Flow, veh/h				1795	0	1598	1795	3676	0	0	3676	1598
Grp Volume(v), veh/h				381	0	0	393	571	0	0	286	0
Grp Sat Flow(s),veh/h/ln				1795	0	1598	1795	1791	0	0	1791	1598
Q Serve(g_s), s				12.1	0.0	0.0	0.0	4.8	0.0	0.0	3.5	0.0
Cycle Q Clear(g_c), s				12.1	0.0	0.0	0.0	4.8	0.0	0.0	3.5	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				498	0		676	2129	0	0	1294	
V/C Ratio(X)				0.77	0.00		0.58	0.27	0.00	0.00	0.22	
Avail Cap(c_a), veh/h				750	0		1267	4085	0	0	2071	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				20.6	0.0	0.0	16.7	6.1	0.0	0.0	13.8	0.0
Incr Delay (d2), s/veh				2.6	0.0	0.0	1.1	0.1	0.0	0.0	0.1	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				5.0	0.0	0.0	4.7	1.4	0.0	0.0	1.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				23.3	0.0	0.0	17.9	6.2	0.0	0.0	13.9	0.0
LnGrp LOS				C	A		B	A	A	A	B	
Approach Vol, veh/h					381	A		964			286	A
Approach Delay, s/veh					23.3			10.9			13.9	
Approach LOS					C			B			B	
Timer - Assigned Phs	1	2				6		8				
Phs Duration (G+Y+Rc), s	14.5	26.5				41.0		21.3				
Change Period (Y+Rc), s	6.5	6.5				6.5		6.0				
Max Green Setting (Gmax), s	28.5	33.5				68.5		24.0				
Max Q Clear Time (g_c+I1), s	2.0	5.5				6.8		14.1				
Green Ext Time (p_c), s	2.7	1.9				2.9		1.2				

Intersection Summary

HCM 6th Ctrl Delay	14.3
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	380	0	350	0	0	0	0	430	130	60	500	0
Future Volume (vph)	380	0	350	0	0	0	0	430	130	60	500	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		265	0		0	0		75	75		0
Storage Lanes	0		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1752	1568	0	0	0	0	3438	1538	1752	3505	0
Flt Permitted		0.950								0.460		
Satd. Flow (perm)	0	1752	1568	0	0	0	0	3438	1538	849	3505	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			376						120			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		781			852			390			591	
Travel Time (s)		17.8			19.4			8.9			13.4	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	5%	5%	5%	3%	3%	3%
Adj. Flow (vph)	409	0	376	0	0	0	0	462	140	65	538	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	409	376	0	0	0	0	462	140	65	538	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			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	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	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	0.0	
Detector 1 Queue (s)	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	
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	8.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.5	26.5	14.5	26.5	

5:00 pm Baseline

Synchro 10 Report
Page 6

Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	20.0	20.0	20.0					40.0	40.0	45.0	85.0	
Total Split (%)	19.0%	19.0%	19.0%					38.1%	38.1%	42.9%	81.0%	
Maximum Green (s)	14.0	14.0	14.0					33.5	33.5	38.5	78.5	
Yellow Time (s)	4.5	4.5	4.5					4.5	4.5	4.5	4.5	
All-Red Time (s)	1.5	1.5	1.5					2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		-2.0	-2.0					-2.5	-2.5	-2.5	-2.5	
Total Lost Time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lead/Lag								Lead	Lead	Lag		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	4.0	4.0	4.0					3.0	3.0	4.0	3.0	
Recall Mode	None	None	None					Min	Min	None	Min	
Act Effct Green (s)		16.3	16.3					22.9	22.9	35.8	30.8	
Actuated g/C Ratio		0.30	0.30					0.41	0.41	0.65	0.56	
v/c Ratio		0.79	0.52					0.32	0.20	0.09	0.28	
Control Delay		34.9	5.4					13.2	5.0	5.3	6.5	
Queue Delay		0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay		34.9	5.4					13.2	5.0	5.3	6.5	
LOS		C	A					B	A	A	A	
Approach Delay		20.8						11.3			6.3	
Approach LOS		C						B			A	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 55.2

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 13.5

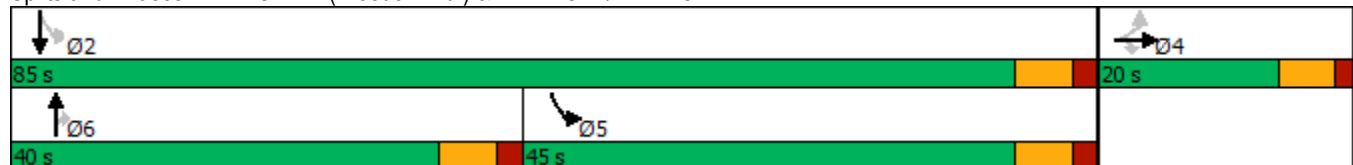
Intersection LOS: B

Intersection Capacity Utilization 62.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	380	0	350	0	0	0	0	430	130	60	500	0
Future Volume (veh/h)	380	0	350	0	0	0	0	430	130	60	500	0
Initial Q (Qb), veh	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
Parking Bus, Adj	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		
Adj Sat Flow, veh/h/ln	1856	1856	1856				0	1826	1826	1856	1856	0
Adj Flow Rate, veh/h	409	0	0				0	462	0	65	538	0
Peak Hour Factor	0.93	0.93	0.93				0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	3	3	3				0	5	5	3	3	0
Cap, veh/h	464	0					0	1280		605	2138	0
Arrive On Green	0.26	0.00	0.00				0.00	0.37	0.00	0.17	0.61	0.00
Sat Flow, veh/h	1767	0	1572				0	3561	1547	1767	3618	0
Grp Volume(v), veh/h	409	0	0				0	462	0	65	538	0
Grp Sat Flow(s),veh/h/ln	1767	0	1572				0	1735	1547	1767	1763	0
Q Serve(g_s), s	13.6	0.0	0.0				0.0	5.9	0.0	0.0	4.3	0.0
Cycle Q Clear(g_c), s	13.6	0.0	0.0				0.0	5.9	0.0	0.0	4.3	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	464	0					0	1280		605	2138	0
V/C Ratio(X)	0.88	0.00					0.00	0.36		0.11	0.25	0.00
Avail Cap(c_a), veh/h	464	0					0	2047		1489	4681	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	21.6	0.0	0.0				0.0	14.0	0.0	13.0	5.6	0.0
Incr Delay (d2), s/veh	18.2	0.0	0.0				0.0	0.2	0.0	0.1	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.5	0.0	0.0				0.0	2.1	0.0	0.6	1.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.8	0.0	0.0				0.0	14.2	0.0	13.1	5.6	0.0
LnGrp LOS	D	A					A	B		B	A	A
Approach Vol, veh/h	409		A				462		A	603		
Approach Delay, s/veh	39.8						14.2			6.4		
Approach LOS	D						B			A		
Timer - Assigned Phs	2			4	5	6						
Phs Duration (G+Y+Rc), s	41.0			20.0	14.5	26.5						
Change Period (Y+Rc), s	6.5			6.0	6.5	6.5						
Max Green Setting (Gmax), s	78.5			14.0	38.5	33.5						
Max Q Clear Time (g_c+I1), s	6.3			15.6	2.0	7.9						
Green Ext Time (p_c), s	2.7			0.0	0.3	2.2						
Intersection Summary												
HCM 6th Ctrl Delay			18.1									
HCM 6th LOS			B									

Lanes, Volumes, Timings

19: CTH U (County Line Rd.) & 41 SB ON/41 SB OFF

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	170	0	100	70	170	0	0	100	30
Future Volume (vph)	0	0	0	170	0	100	70	170	0	0	100	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	100		0	0		0
Storage Lanes	0		0	0		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
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					0.950							0.850
Flt Protected					0.970		0.950					
Satd. Flow (prot)	0	0	0	0	1684	0	1787	1881	0	0	1845	1568
Flt Permitted					0.970		0.950					
Satd. Flow (perm)	0	0	0	0	1684	0	1787	1881	0	0	1845	1568
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1011			1061			775			328	
Travel Time (s)		23.0			24.1			17.6			7.5	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	1%	1%	1%	3%	3%	3%
Parking (#/hr)			0									
Adj. Flow (vph)	0	0	0	193	0	114	80	193	0	0	114	34
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	307	0	80	193	0	0	114	34
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			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
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	34.7%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	8.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	170	0	100	70	170	0	0	100	30
Future Vol, veh/h	0	0	0	170	0	100	70	170	0	0	100	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	1	1	4	4	4	1	1	1	3	3	3
Mvmt Flow	0	0	0	193	0	114	80	193	0	0	114	34
Major/Minor				Minor1		Major1		Major2				
Conflicting Flow All				484	501	193	148	0	-	-	-	0
Stage 1				353	353	-	-	-	-	-	-	-
Stage 2				131	148	-	-	-	-	-	-	-
Critical Hdwy				6.44	6.54	6.24	4.11	-	-	-	-	-
Critical Hdwy Stg 1				5.44	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.44	5.54	-	-	-	-	-	-	-
Follow-up Hdwy				3.536	4.036	3.336	2.209	-	-	-	-	-
Pot Cap-1 Maneuver				538	469	843	1440	-	0	0	-	-
Stage 1				707	627	-	-	-	0	0	-	-
Stage 2				890	771	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				508	0	843	1440	-	-	-	-	-
Mov Cap-2 Maneuver				508	0	-	-	-	-	-	-	-
Stage 1				667	0	-	-	-	-	-	-	-
Stage 2				890	0	-	-	-	-	-	-	-
Approach				WB		NB		SB				
HCM Control Delay, s				17.3		2.2		0				
HCM LOS				C								
Minor Lane/Major Mvmt		NBL	NBTWBLn1	SBT	SBR							
Capacity (veh/h)		1440	-	596	-	-						
HCM Lane V/C Ratio		0.055	-	0.515	-	-						
HCM Control Delay (s)		7.6	-	17.3	-	-						
HCM Lane LOS		A	-	C	-	-						
HCM 95th %tile Q(veh)		0.2	-	2.9	-	-						

Lanes, Volumes, Timings

20: CTH U (County Line Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	0	50	0	0	0	0	180	100	40	230	0
Future Volume (vph)	60	0	50	0	0	0	0	180	100	40	230	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	100		0
Storage Lanes	0		0	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
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		0.939							0.850			
Flt Protected		0.973								0.950		
Satd. Flow (prot)	0	1719	0	0	0	0	0	1845	1568	1787	1881	0
Flt Permitted		0.973								0.950		
Satd. Flow (perm)	0	1719	0	0	0	0	0	1845	1568	1787	1881	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1005			1114			374			775	
Travel Time (s)		22.8			25.3			8.5			17.6	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	3%	3%	3%	1%	1%	1%
Adj. Flow (vph)	70	0	58	0	0	0	0	209	116	47	267	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	128	0	0	0	0	0	209	116	47	267	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			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
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	34.7%						ICU Level of Service A					
Analysis Period (min)	15											

HCM 6th TWSC
20: CTH U (County Line Rd.) & 41 NB OFF/41 NB ON

08/21/2019

Intersection													
Int Delay, s/veh	2.8												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↕						↑	↗	↘	↑		
Traffic Vol, veh/h	60	0	50	0	0	0	0	180	100	40	230	0	
Future Vol, veh/h	60	0	50	0	0	0	0	180	100	40	230	0	
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None	
Storage Length	-	-	-	-	-	-	-	-	0	100	-	-	
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-	
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-	
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86	
Heavy Vehicles, %	1	1	1	4	4	4	3	3	3	1	1	1	
Mvmt Flow	70	0	58	0	0	0	0	209	116	47	267	0	
Major/Minor	Minor2			Major1				Major2					
Conflicting Flow All	628	686	267					-	0	0	325	0	0
Stage 1	361	361	-					-	-	-	-	-	-
Stage 2	267	325	-					-	-	-	-	-	-
Critical Hdwy	6.41	6.51	6.21					-	-	-	4.11	-	-
Critical Hdwy Stg 1	5.41	5.51	-					-	-	-	-	-	-
Critical Hdwy Stg 2	5.41	5.51	-					-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309					-	-	-	2.209	-	-
Pot Cap-1 Maneuver	448	371	774					0	-	-	1240	-	0
Stage 1	707	628	-					0	-	-	-	-	0
Stage 2	780	651	-					0	-	-	-	-	0
Platoon blocked, %									-	-	-		
Mov Cap-1 Maneuver	431	0	774					-	-	-	1240	-	-
Mov Cap-2 Maneuver	431	0	-					-	-	-	-	-	-
Stage 1	680	0	-					-	-	-	-	-	-
Stage 2	780	0	-					-	-	-	-	-	-
Approach	EB			NB				SB					
HCM Control Delay, s	13.7			0				1.2					
HCM LOS	B												
Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT								
Capacity (veh/h)	-	-	540	1240	-								
HCM Lane V/C Ratio	-	-	0.237	0.038	-								
HCM Control Delay (s)	-	-	13.7	8	-								
HCM Lane LOS	-	-	B	A	-								
HCM 95th %tile Q(veh)	-	-	0.9	0.1	-								

Lanes, Volumes, Timings

21: 41 SB ON/41 SB OFF & CTH S (Freedom Rd.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	190	80	80	100	0	0	0	0	70	0	280
Future Volume (vph)	0	190	80	80	100	0	0	0	0	70	0	280
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	250		0	0		0	0		100
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
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		0.850										0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		308			703			553			602	
Travel Time (s)		7.0			16.0			12.6			13.7	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	224	94	94	118	0	0	0	0	82	0	329
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	224	94	94	118	0	0	0	0	0	82	329
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
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
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type: Unsignalized												
Intersection Capacity Utilization 29.7%				ICU Level of Service A								
Analysis Period (min) 15												

Intersection												
Int Delay, s/veh	5.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↘	↑						↖	↗
Traffic Vol, veh/h	0	190	80	80	100	0	0	0	0	70	0	280
Future Vol, veh/h	0	190	80	80	100	0	0	0	0	70	0	280
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	250	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	1	1	1	1	1	1	2	2	2
Mvmt Flow	0	224	94	94	118	0	0	0	0	82	0	329
Major/Minor	Major1			Major2			Minor2					
Conflicting Flow All	-	0	0	318	0	0		577	624	118		
Stage 1	-	-	-	-	-	-		306	306	-		
Stage 2	-	-	-	-	-	-		271	318	-		
Critical Hdwy	-	-	-	4.11	-	-		6.42	6.52	6.22		
Critical Hdwy Stg 1	-	-	-	-	-	-		5.42	5.52	-		
Critical Hdwy Stg 2	-	-	-	-	-	-		5.42	5.52	-		
Follow-up Hdwy	-	-	-	2.209	-	-		3.518	4.018	3.318		
Pot Cap-1 Maneuver	0	-	-	1248	-	0		478	402	934		
Stage 1	0	-	-	-	-	0		747	662	-		
Stage 2	0	-	-	-	-	0		775	654	-		
Platoon blocked, %	-	-	-	-	-	-						
Mov Cap-1 Maneuver	-	-	-	1248	-	-		442	0	934		
Mov Cap-2 Maneuver	-	-	-	-	-	-		442	0	-		
Stage 1	-	-	-	-	-	-		691	0	-		
Stage 2	-	-	-	-	-	-		775	0	-		
Approach	EB			WB			SB					
HCM Control Delay, s	0			3.6			11.7					
HCM LOS							B					
Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2						
Capacity (veh/h)	-	-	1248	-	442	934						
HCM Lane V/C Ratio	-	-	0.075	-	0.186	0.353						
HCM Control Delay (s)	-	-	8.1	-	15	10.9						
HCM Lane LOS	-	-	A	-	C	B						
HCM 95th %tile Q(veh)	-	-	0.2	-	0.7	1.6						

Lanes, Volumes, Timings

22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	110	0	0	120	130	60	0	90	0	0	0
Future Volume (vph)	150	110	0	0	120	130	60	0	90	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	325		0	0		300	0		100	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
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						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Flt Permitted	0.950							0.950				
Satd. Flow (perm)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		703			455			640			620	
Travel Time (s)		16.0			10.3			14.5			14.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	170	125	0	0	136	148	68	0	102	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	170	125	0	0	136	148	0	68	102	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
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
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	29.7%						ICU Level of Service A					
Analysis Period (min)	15											

HCM 6th TWSC
22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/21/2019

Intersection												
Int Delay, s/veh	4.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	150	110	0	0	120	130	60	0	90	0	0	0
Future Vol, veh/h	150	110	0	0	120	130	60	0	90	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	325	-	-	-	-	300	-	-	100	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	1	1	2	2	2	5	5	5	5	5	5
Mvmt Flow	170	125	0	0	136	148	68	0	102	0	0	0
Major/Minor	Major1			Major2			Minor1					
Conflicting Flow All	284	0	-	-	-	0	675	749	125			
Stage 1	-	-	-	-	-	-	465	465	-			
Stage 2	-	-	-	-	-	-	210	284	-			
Critical Hdwy	4.11	-	-	-	-	-	6.45	6.55	6.25			
Critical Hdwy Stg 1	-	-	-	-	-	-	5.45	5.55	-			
Critical Hdwy Stg 2	-	-	-	-	-	-	5.45	5.55	-			
Follow-up Hdwy	2.209	-	-	-	-	-	3.545	4.045	3.345			
Pot Cap-1 Maneuver	1284	-	0	0	-	-	415	337	918			
Stage 1	-	-	0	0	-	-	626	558	-			
Stage 2	-	-	0	0	-	-	818	671	-			
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1284	-	-	-	-	-	360	0	918			
Mov Cap-2 Maneuver	-	-	-	-	-	-	360	0	-			
Stage 1	-	-	-	-	-	-	543	0	-			
Stage 2	-	-	-	-	-	-	818	0	-			
Approach	EB			WB			NB					
HCM Control Delay, s	4.7			0			12.6					
HCM LOS							B					
Minor Lane/Major Mvmt	NBLn1 NBLn2		EBL	EBT	WBT	WBR						
Capacity (veh/h)	360 918		1284	-	-	-						
HCM Lane V/C Ratio	0.189 0.111		0.133	-	-	-						
HCM Control Delay (s)	17.3 9.4		8.2	-	-	-						
HCM Lane LOS	C A		A	-	-	-						
HCM 95th %tile Q(veh)	0.7 0.4		0.5	-	-	-						

APPENDIX F3

Year 2018 Existing HCS7 (Roundabouts) AM & PM Peak Hour

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2018
Time Analyzed	AM Existing
Project Description	I-41 Appleton

Site Information

Intersection	I-41 NB ramps & WIS 55
E/W Street Name	I-41 NB ramp
N/S Street Name	WIS 55
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	I-41 NB & WIS 55

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	2	0	0	0	2	0
Lane Assignment	LT								T				LT			
Volume (V), veh/h	0	30	0	260					0		450	110	0	20	210	
Percent Heavy Vehicles, %	0	7	0	7					0		5	5	0	4	4	
Flow Rate (V_{PCE}), pc/h	0	35	0	302					0		514	126	0	23	237	
Right-Turn Bypass	Yielding				None				Yielding				None			
Conflicting Lanes	2								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.0000	4.2000				4.2000	4.2000	4.2000	4.2000	4.2000	
Follow-Up Headway (s)		2.8000	2.8000				2.8000	2.8000	2.8000	2.8000	2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		35.00	302.00				308.40	205.60	126.00	23.40	236.60	
Entry Volume veh/h		32.71	282.24				293.71	195.81	120.00	22.50	227.50	
Circulating Flow (v_c), pc/h	260			549			58			0		
Exiting Flow (v_{ex}), pc/h	23			0			549			237		
Capacity (C_{PCE}), pc/h		1065.60	1069.28				1229.00	1229.00	1262.92	1285.71	1285.71	
Capacity (c), veh/h		995.89	999.32				1170.48	1170.48	1202.78	1236.26	1236.26	
v/c Ratio (x)		0.03	0.28				0.25	0.17	0.10	0.02	0.18	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.9	6.4				5.4	4.5	3.8	3.1	4.5	
Lane LOS		A	A				A	A	A	A	A	
95% Queue, veh		0.1	1.2				1.0	0.6	0.3	0.1	0.7	
Approach Delay, s/veh	6.2						4.8			4.4		
Approach LOS	A						A			A		
Intersection Delay, s/veh LOS	5.1						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2018
Time Analyzed	AM Existing
Project Description	I-41 Appleton

Site Information

Intersection	I-41 SB ramps & WIS 55
E/W Street Name	I-41 SB ramp
N/S Street Name	WIS 55
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.93
Jurisdiction	I-41 SB & WIS 55

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0
Lane Assignment							LT			L	T				T	
Volume (V), veh/h					0	80	0	40	0	270	210		0		150	90
Percent Heavy Vehicles, %					0	1	0	1	0	1	1		0		3	3
Flow Rate (V_{PCE}), pc/h					0	87	0	43	0	293	228		0		166	100
Right-Turn Bypass	None				Yielding				None				Yielding			
Conflicting Lanes					2				1				1			
Pedestrians Crossing, p/h					0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)					4.0000	4.2000	4.2000	4.2000			4.2000	4.2000
Follow-Up Headway (s)					2.8000	2.8000	2.8000	2.8000			2.8000	2.8000

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					87.00	43.00	293.00	228.00			166.00	100.00
Entry Volume veh/h					86.14	42.57	290.10	225.74			161.17	97.09
Circulating Flow (v_c), pc/h	253			521			0			380		
Exiting Flow (v_{ex}), pc/h	0			293			228			253		
Capacity (C_{PCE}), pc/h					882.53	1076.79	1285.71	1285.71			956.72	1023.70
Capacity (c), veh/h					873.79	1066.13	1272.98	1272.98			928.86	993.89
v/c Ratio (x)					0.10	0.04	0.23	0.18			0.17	0.10

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					5.1	3.7	4.8	4.3			5.6	4.5
Lane LOS					A	A	A	A			A	A
95% Queue, veh					0.3	0.1	0.9	0.6			0.6	0.3
Approach Delay, s/veh				4.6			4.6			5.2		
Approach LOS				A			A			A		
Intersection Delay, s/veh LOS	4.8						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2018
Time Analyzed	AM Existing
Project Description	I-41 Appleton

Site Information

Intersection	I-41 NB ramps & CTH J
E/W Street Name	I-41 NB ramp
N/S Street Name	CTH J
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.86
Jurisdiction	I-41 NB & CTH J

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
Lane Assignment	LTR								TR				LT			
Volume (V), veh/h	0	110	0	100					0		230	300	0	50	150	
Percent Heavy Vehicles, %	0	1	0	1					0		3	3	0	4	4	
Flow Rate (V_{PCE}), pc/h	0	129	0	117					0		275	359	0	60	181	
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.2000						4.2000			4.2000	
Follow-Up Headway (s)		2.8000						2.8000			2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		246.00						634.00			241.00	
Entry Volume veh/h		243.56						615.53			231.73	
Circulating Flow (v_c), pc/h	241			404			189			0		
Exiting Flow (v_{ex}), pc/h	419			0			404			298		
Capacity (C_{PCE}), pc/h		1065.95						1109.95			1285.71	
Capacity (c), veh/h		1055.40						1077.62			1236.26	
v/c Ratio (x)		0.23						0.57			0.19	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		5.6						10.5			4.5	
Lane LOS		A						B			A	
95% Queue, veh		0.9						3.8			0.7	
Approach Delay, s/veh	5.6						10.5			4.5		
Approach LOS	A						B			A		
Intersection Delay, s/veh LOS	8.2						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2018
Time Analyzed	AM Existing
Project Description	I-41 Appleton

Site Information

Intersection	I-41 SB ramps & CTH J
E/W Street Name	I-41 SB ramp
N/S Street Name	CTH J
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.88
Jurisdiction	I-41 SB & CTH J

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment							LTR				LT				TR	
Volume (V), veh/h					0	110	0	40	0	160	180		0		90	160
Percent Heavy Vehicles, %					0	9	0	9	0	1	1		0		17	17
Flow Rate (v_{pce}), pc/h					0	136	0	50	0	184	207		0		120	213
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes					1				1				1			
Pedestrians Crossing, p/h					0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)					4.2000			4.2000			4.2000	
Follow-Up Headway (s)					2.8000			2.8000			2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					186.00			391.00			333.00	
Entry Volume veh/h					170.64			387.13			284.62	
Circulating Flow (v_c), pc/h	256			391			0			320		
Exiting Flow (v_{ex}), pc/h	0			397			257			256		
Capacity (c_{pce}), pc/h					948.57			1285.71			1002.43	
Capacity (c), veh/h					870.25			1272.98			856.78	
v/c Ratio (x)					0.20			0.30			0.33	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					6.1			5.6			7.9	
Lane LOS					A			A			A	
95% Queue, veh					0.7			1.3			1.5	
Approach Delay, s/veh				6.1			5.6			7.9		
Approach LOS				A			A			A		
Intersection Delay, s/veh LOS	6.5						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2018
Time Analyzed	PM Existing
Project Description	I-41 Appleton

Site Information

Intersection	I-41 NB ramps & WIS 55
E/W Street Name	I-41 NB ramp
N/S Street Name	WIS 55
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	I-41 NB & WIS 55

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	2	0	0	0	2	0
Lane Assignment	LT								T				LT			
Volume (V), veh/h	0	60	0	360					0		520	100	0	20	280	
Percent Heavy Vehicles, %	0	7	0	7					0		5	5	0	4	4	
Flow Rate (V_{PCE}), pc/h	0	70	0	419					0		593	114	0	23	317	
Right-Turn Bypass	Yielding				None				Yielding				None			
Conflicting Lanes	2								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.0000	4.2000				4.2000	4.2000	4.2000	4.2000	4.2000	
Follow-Up Headway (s)		2.8000	2.8000				2.8000	2.8000	2.8000	2.8000	2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		70.00	419.00				444.75	148.25	114.00	23.80	316.20	
Entry Volume veh/h		65.42	391.59				423.57	141.19	108.57	22.88	304.04	
Circulating Flow (v_c), pc/h	340			663			93			0		
Exiting Flow (v_{ex}), pc/h	23			0			663			317		
Capacity (C_{PCE}), pc/h		1005.78	1004.77				1196.00	1196.00	1262.92	1285.71	1285.71	
Capacity (c), veh/h		939.98	939.04				1139.05	1139.05	1202.78	1236.26	1236.26	
v/c Ratio (x)		0.07	0.42				0.37	0.12	0.09	0.02	0.25	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.5	8.6				6.9	4.2	3.7	3.1	5.1	
Lane LOS		A	A				A	A	A	A	A	
95% Queue, veh		0.2	2.1				1.7	0.4	0.3	0.1	1.0	
Approach Delay, s/veh	8.0						5.8			4.9		
Approach LOS	A						A			A		
Intersection Delay, s/veh LOS	6.3						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2018
Time Analyzed	PM Existing
Project Description	I-41 Appleton

Site Information

Intersection	I-41 SB ramps & WIS 55
E/W Street Name	I-41 SB ramp
N/S Street Name	WIS 55
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.93
Jurisdiction	I-41 SB & WIS 55

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0
Lane Assignment							LT			L	T				T	
Volume (V), veh/h					0	160	0	30	0	390	190		0		140	50
Percent Heavy Vehicles, %					0	1	0	1	0	1	1		0		3	3
Flow Rate (V_{PCE}), pc/h					0	174	0	33	0	424	206		0		155	55
Right-Turn Bypass	None				Yielding				None				Yielding			
Conflicting Lanes					2				1				1			
Pedestrians Crossing, p/h					0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)					4.0000	4.2000	4.2000	4.2000			4.2000	4.2000
Follow-Up Headway (s)					2.8000	2.8000	2.8000	2.8000			2.8000	2.8000

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					174.00	33.00	424.00	206.00			155.00	55.00
Entry Volume veh/h					172.28	32.67	419.80	203.96			150.49	53.40
Circulating Flow (v_c), pc/h	329			630			0			598		
Exiting Flow (v_{ex}), pc/h	0			424			206			329		
Capacity (C_{PCE}), pc/h					815.72	1095.37	1285.71	1285.71			807.51	924.54
Capacity (c), veh/h					807.64	1084.52	1272.98	1272.98			783.99	897.61
v/c Ratio (x)					0.21	0.03	0.33	0.16			0.19	0.06

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					6.7	3.6	5.9	4.2			6.6	4.6
Lane LOS					A	A	A	A			A	A
95% Queue, veh					0.8	0.1	1.5	0.6			0.7	0.2
Approach Delay, s/veh				6.2			5.3			6.1		
Approach LOS				A			A			A		
Intersection Delay, s/veh LOS	5.6						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2018
Time Analyzed	PM Existing
Project Description	I-41 Appleton

Site Information

Intersection	I-41 NB ramps & CTH J
E/W Street Name	I-41 NB ramp
N/S Street Name	CTH J
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.90
Jurisdiction	I-41 NB & CTH J

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
Lane Assignment	LTR								TR				LT			
Volume (V), veh/h	0	100	0	260					0		170	190	0	60	380	
Percent Heavy Vehicles, %	0	1	0	1					0		2	2	0	3	3	
Flow Rate (V_{PCE}), pc/h	0	112	0	292					0		193	215	0	69	435	
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.2000						4.2000			4.2000	
Follow-Up Headway (s)		2.8000						2.8000			2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		404.00						408.00			504.00	
Entry Volume veh/h		400.00						400.00			489.32	
Circulating Flow (v_c), pc/h	504			305			181			0		
Exiting Flow (v_{ex}), pc/h	284			0			305			727		
Capacity (C_{PCE}), pc/h		868.76						1116.88			1285.71	
Capacity (c), veh/h		860.16						1094.98			1248.27	
v/c Ratio (x)		0.47						0.37			0.39	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		10.1						7.0			6.7	
Lane LOS		B						A			A	
95% Queue, veh		2.5						1.7			1.9	
Approach Delay, s/veh	10.1						7.0			6.7		
Approach LOS	B						A			A		
Intersection Delay, s/veh LOS	7.8						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2018
Time Analyzed	PM Existing
Project Description	I-41 Appleton

Site Information

Intersection	I-41 SB ramps & CTH J
E/W Street Name	I-41 SB ramp
N/S Street Name	CTH J
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.78
Jurisdiction	I-41 SB & CTH J

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment							LTR				LT				TR	
Volume (V), veh/h					0	280	0	70	0	100	170		0		160	160
Percent Heavy Vehicles, %					0	4	0	4	0	1	1		0		7	7
Flow Rate (v_{pce}), pc/h					0	373	0	93	0	129	220		0		219	219
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes					1				1				1			
Pedestrians Crossing, p/h					0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)					4.2000			4.2000			4.2000	
Follow-Up Headway (s)					2.8000			2.8000			2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					466.00			349.00			438.00	
Entry Volume veh/h					448.08			345.54			409.35	
Circulating Flow (v_c), pc/h	592			349			0			502		
Exiting Flow (v_{ex}), pc/h	0			348			313			592		
Capacity (c_{pce}), pc/h					980.07			1285.71			870.11	
Capacity (c), veh/h					942.38			1272.98			813.19	
v/c Ratio (x)					0.48			0.27			0.50	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					9.6			5.2			11.3	
Lane LOS					A			A			B	
95% Queue, veh					2.6			1.1			2.9	
Approach Delay, s/veh				9.6			5.2			11.3		
Approach LOS				A			A			B		
Intersection Delay, s/veh LOS	8.9						A					