MLK DRIVE CORRIDOR

The MLK Drive corridor experiences congestion during the AM and PM peak periods. **Appendix E** contains the detailed analyses and summary for the No Build condition. Locations with LOS E or LOS F are considered capacity deficient for the purposes of this evaluation. Note that the design period for MLK Drive corridor is the AM peak. All level of service results are for the AM peak hour, unless stated otherwise.

- **MLK Drive at I-90 WB ramp intersection**: LOS F on northbound and southbound approaches. Although the WB ramp approach shows acceptable level of service (LOS B), the high volumes result in a queue length of 1,539 feet. The length of the queue can extend onto mainline I-90 due in part to the capacity constraints of the single lane approach at MLK Drive.
- **MLK Drive at N. Marginal Road intersection**: LOS E on the eastbound approach of N. Marginal Road.
- **MLK Drive at I-90 EB ramp intersection:** LOS F on eastbound approach of the EB exit ramp.

The primary capacity constraint on the MLK Drive corridor is the southbound merge at the railroad bridge. Queues that form on both exit ramps are attributed in part to the capacity of the single southbound lane on MLK Drive south of the I-90 interchange. Two countermeasures are proposed to mitigate existing capacity constraints of MLK Drive. The metrics used to evaluate the various improvement alternatives are a combination of intersection LOS and 95th percentile queue lengths derived by SimTraffic software.

- **Alternative 1: Provide two southbound lanes on MLK Drive south of the interchange and widen WB exit ramp to two lanes**

  The first Build alternative includes continuation of two southbound lanes on MLK Drive south of the railroad overpass. Presently, the southbound lanes of MLK Drive merge to a single lane just north of the railroad overpass, resulting in a capacity constraint. Additionally, a second lane on the WB exit ramp is included in this alternative such that two lanes from the ramp can feed into two receiving lanes on MLK Drive and extend south of the RR overpass.

  The northbound left turn movement at the Broad Street intersection is to be prohibited during peak hours (7-9 AM and 3-7PM).

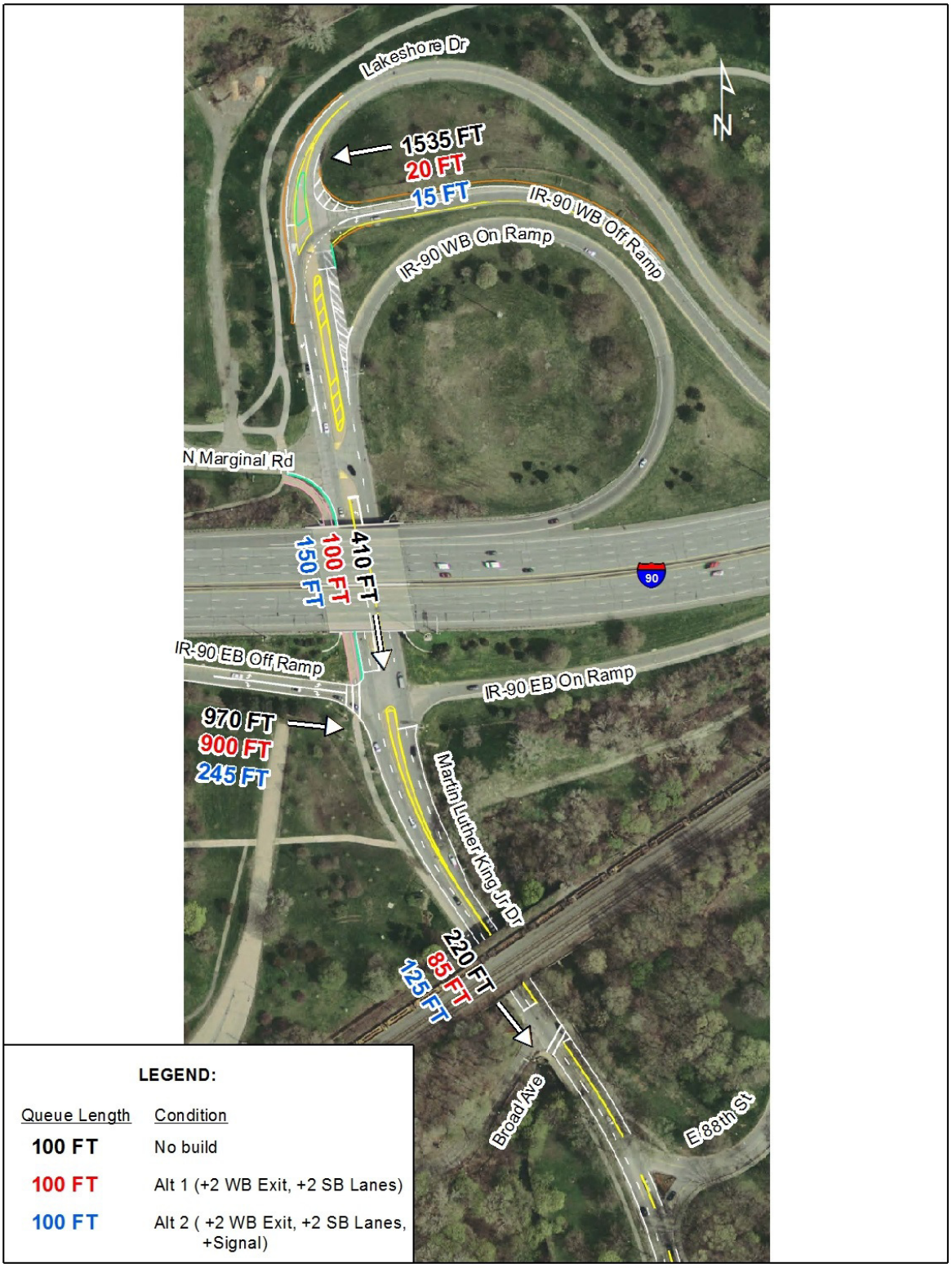
- **Alternative 2: Alternative 1 plus traffic signal at the EB ramp intersection**

  The second Build alternative includes improvements from Alternative 1 plus a traffic signal at the EB ramp intersection. This alternative was evaluated separately to discern the additional benefits of assigning right of way at the EB ramp intersection with a traffic signal. The addition of a traffic signal at the EB ramp intersection is expected to improve operations from LOS F to LOS B. Analyses included additional volumes resulting from modifications to the E. 72nd Street interchange.

The 95th percentile queue lengths for No Build (black), Alternative 1 (red), and Alternative 2 (blue) are graphically shown in **Figure 9.** Results show queues on the WB exit ramp are reduced-- 1,535 feet in the No Build condition to less than 100 feet with Alternative 1. Alternative 2 reduces queues on the EB exit ramp while still maintaining short queue lengths on southbound MLK Drive. The addition of a protected/permissive left turn phase may be considered in the AM peak period to minimize queue lengths of the SB left turn movement.

An interim improvement of only signalizing the EB I-90 ramp intersection without increasing southbound capacity on MLK Drive will increase delays to traffic exiting I-90 WB. In addition to the re-allocation of approach delays, the capacity of the traffic signal is expected to be adversely affected by the queues extending from the railroad bridge unless the second lane is extended on MLK Drive.

FIGURE 9: QUEUE LENGTH COMPARISON, AM PEAK HOUR



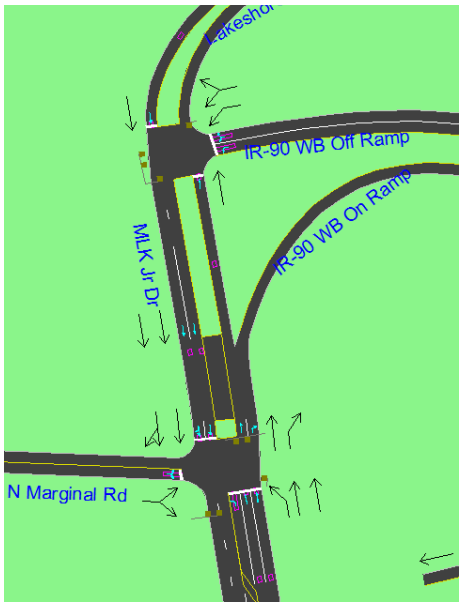
> Alternative 3: Signalize WB exit ramp

The WB I-90 exit ramp on MLK Drive also was evaluated with traffic signal control. The intersection configuration matches the existing condition, with the WB exit ramp forming the east leg of the signalized intersection. The N. Marginal Road approach is to be equipped with vehicle detection to force the traffic signal at the WB I-90 exit ramp to cycle and create gaps in the traffic flow during peak periods. With traffic signal control and lane geometry described below and shown in **Figure 10**, the intersection is expected to operate at LOS C or better during the AM and PM peak hours.

- 2 WB approach lanes on the WB exit ramp (L, LR)
- 1 EB approach lanes on N. Marginal (LR)
- 1 NB approach lane on MLK Drive (T)
- 1 SB approach lane on Lakeshore Blvd (T)

While levels of service are expected to be good, the queue length on the WB ramp approach is expected to be 325 feet. A signal warrant analysis must be conducted prior to recommending a traffic signal at this intersection.

FIGURE 10: ALTERNATIVE 3 - MLK CORRIDOR

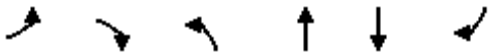


1: MLK Jr Dr/Lakeshore Blvd & IR-90 WB Off Ramp
2034 AM Build - 2 SB Lanes, 2 WB Exit Lanes, +EB & WB Signal

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	1230	100	120	0	0	100
Ideal Flow (vphpl)	1500	1500	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0			5.0
Lane Util. Factor	0.97		1.00			1.00
Frt	0.99		1.00			1.00
Flt Protected	0.96		1.00			1.00
Satd. Flow (prot)	2696		1863			1863
Flt Permitted	0.96		1.00			1.00
Satd. Flow (perm)	2696		1863			1863
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1337	109	130	0	0	109
RTOR Reduction (vph)	7	0	0	0	0	0
Lane Group Flow (vph)	1439	0	130	0	0	109
Turn Type	Prot		NA			NA
Protected Phases	8		4			6
Permitted Phases						
Actuated Green, G (s)	56.4		9.5			9.1
Effective Green, g (s)	56.4		9.5			9.1
Actuated g/C Ratio	0.63		0.11			0.10
Clearance Time (s)	5.0		5.0			5.0
Vehicle Extension (s)	3.0		3.0			3.0
Lane Grp Cap (vph)	1689		196			188
v/s Ratio Prot	c0.53		c0.07			c0.06
v/s Ratio Perm						
v/c Ratio	0.85		0.66			0.58
Uniform Delay, d1	13.5		38.7			38.6
Progression Factor	1.00		1.12			1.00
Incremental Delay, d2	5.7		8.1			4.3
Delay (s)	19.1		51.6			42.9
Level of Service	B		D			D
Approach Delay (s)	19.1		51.6			42.9
Approach LOS	B		D			D

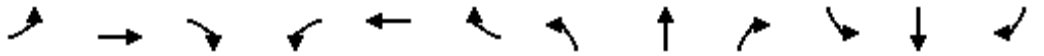
Intersection Summary			
HCM 2000 Control Delay	23.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	63.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

2: MLK Jr Dr & N Marginal Rd
2034 AM Build - 2 SB Lanes, 2 WB Exit Lanes, +EB & WB Signal



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	20	80	20	470	1180	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	0.95	0.95	
Frt	0.89		1.00	1.00	0.98	
Flt Protected	0.99		0.95	1.00	1.00	
Satd. Flow (prot)	1645		1770	3539	3479	
Flt Permitted	0.99		0.10	1.00	1.00	
Satd. Flow (perm)	1645		178	3539	3479	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	87	22	511	1283	163
RTOR Reduction (vph)	78	0	0	0	10	0
Lane Group Flow (vph)	31	0	22	511	1436	0
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	8	
Permitted Phases			2			
Actuated Green, G (s)	9.5		70.5	70.5	56.4	
Effective Green, g (s)	9.5		70.5	70.5	56.4	
Actuated g/C Ratio	0.11		0.78	0.78	0.63	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	173		139	2772	2180	
v/s Ratio Prot	c0.02			c0.14	c0.41	
v/s Ratio Perm			0.12			
v/c Ratio	0.18		0.16	0.18	0.66	
Uniform Delay, d1	36.7		2.4	2.5	10.7	
Progression Factor	1.00		0.62	0.79	0.33	
Incremental Delay, d2	0.5		2.1	0.1	1.0	
Delay (s)	37.2		3.6	2.1	4.5	
Level of Service	D		A	A	A	
Approach Delay (s)	37.2			2.1	4.5	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	51.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



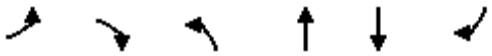
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	5	590	0	0	0	0	455	605	75	1180	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0					5.0		5.0	5.0	
Lane Util. Factor		0.95	0.95					0.95		1.00	0.95	
Frt		0.87	0.85					0.91		1.00	1.00	
Flt Protected		0.99	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1529	1504					3236		1770	3539	
Flt Permitted		0.99	1.00					1.00		0.20	1.00	
Satd. Flow (perm)		1529	1504					3236		365	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	5	641	0	0	0	0	495	658	82	1283	0
RTOR Reduction (vph)	0	39	39	0	0	0	0	223	0	0	0	0
Lane Group Flow (vph)	0	305	301	0	0	0	0	930	0	82	1283	0
Turn Type	Perm	NA	Perm					NA		Perm	NA	
Protected Phases		4						2			6	
Permitted Phases	4		4							6		
Actuated Green, G (s)		22.7	22.7					57.3		57.3	57.3	
Effective Green, g (s)		22.7	22.7					57.3		57.3	57.3	
Actuated g/C Ratio		0.25	0.25					0.64		0.64	0.64	
Clearance Time (s)		5.0	5.0					5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)		385	379					2060		232	2253	
v/s Ratio Prot								0.29			c0.36	
v/s Ratio Perm		0.20	c0.20							0.22		
v/c Ratio		0.79	0.79					0.45		0.35	0.57	
Uniform Delay, d1		31.4	31.5					8.3		7.7	9.3	
Progression Factor		1.00	1.00					1.00		0.89	1.01	
Incremental Delay, d2		10.7	10.9					0.7		3.2	0.8	
Delay (s)		42.1	42.4					9.1		10.0	10.2	
Level of Service		D	D					A		B	B	
Approach Delay (s)		42.3			0.0			9.1			10.2	
Approach LOS		D			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	16.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	65.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

1: MLK Jr Dr/Lakeshore Blvd & IR-90 WB Off Ramp
2034 PM Build - 2 SB Lanes, 2 WB Exit Lanes, +EB & WB Signal

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	565	75	75	0	0	130
Ideal Flow (vphpl)	1500	1500	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0			5.0
Lane Util. Factor	0.97		1.00			1.00
Frt	0.98		1.00			1.00
Flt Protected	0.96		1.00			1.00
Satd. Flow (prot)	2684		1863			1863
Flt Permitted	0.96		1.00			1.00
Satd. Flow (perm)	2684		1863			1863
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	614	82	82	0	0	141
RTOR Reduction (vph)	11	0	0	0	0	0
Lane Group Flow (vph)	685	0	82	0	0	141
Turn Type	Prot		NA			NA
Protected Phases	8		4			6
Permitted Phases						
Actuated Green, G (s)	56.6		8.6			9.8
Effective Green, g (s)	56.6		8.6			9.8
Actuated g/C Ratio	0.63		0.10			0.11
Clearance Time (s)	5.0		5.0			5.0
Vehicle Extension (s)	3.0		3.0			3.0
Lane Grp Cap (vph)	1687		178			202
v/s Ratio Prot	c0.26		c0.04			c0.08
v/s Ratio Perm						
v/c Ratio	0.41		0.46			0.70
Uniform Delay, d1	8.3		38.5			38.7
Progression Factor	1.00		0.93			1.00
Incremental Delay, d2	0.7		1.9			10.0
Delay (s)	9.0		37.5			48.7
Level of Service	A		D			D
Approach Delay (s)	9.0		37.5			48.7
Approach LOS	A		D			D

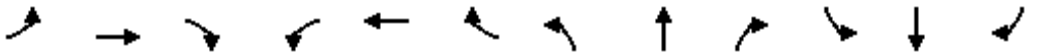
Intersection Summary			
HCM 2000 Control Delay	17.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	38.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	20	180	20	575	555	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	0.95	0.95	
Frt	0.88		1.00	1.00	0.97	
Flt Protected	0.99		0.95	1.00	1.00	
Satd. Flow (prot)	1628		1770	3539	3432	
Flt Permitted	0.99		0.27	1.00	1.00	
Satd. Flow (perm)	1628		497	3539	3432	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	196	22	625	603	152
RTOR Reduction (vph)	177	0	0	0	24	0
Lane Group Flow (vph)	41	0	22	625	731	0
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	8	
Permitted Phases			2			
Actuated Green, G (s)	8.6		71.4	71.4	56.6	
Effective Green, g (s)	8.6		71.4	71.4	56.6	
Actuated g/C Ratio	0.10		0.79	0.79	0.63	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	155		394	2807	2158	
v/s Ratio Prot	c0.03			c0.18	c0.21	
v/s Ratio Perm			0.04			
v/c Ratio	0.26		0.06	0.22	0.34	
Uniform Delay, d1	37.8		2.0	2.3	7.9	
Progression Factor	1.00		0.69	0.61	0.38	
Incremental Delay, d2	0.9		0.1	0.1	0.4	
Delay (s)	38.7		1.5	1.5	3.4	
Level of Service	D		A	A	A	
Approach Delay (s)	38.7			1.5	3.4	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	7.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	40.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

3: MLK Jr Dr & IR-90 EB Off Ramp/IR-90 EB On Ramp
2034 PM Build - 2 SB Lanes, 2 WB Exit Lanes, +EB & WB Signal



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	45	5	500	0	0	0	0	550	1255	190	545	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0					5.0		5.0	5.0	
Lane Util. Factor		0.95	0.95					0.95		1.00	0.95	
Frt		0.88	0.85					0.90		1.00	1.00	
Flt Protected		0.99	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1539	1504					3170		1770	3539	
Flt Permitted		0.99	1.00					1.00		0.07	1.00	
Satd. Flow (perm)		1539	1504					3170		125	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	5	543	0	0	0	0	598	1364	207	592	0
RTOR Reduction (vph)	0	195	258	0	0	0	0	282	0	0	0	0
Lane Group Flow (vph)	0	109	35	0	0	0	0	1680	0	207	592	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Actuated Green, G (s)		10.9	10.9					54.7		69.1	69.1	
Effective Green, g (s)		10.9	10.9					54.7		69.1	69.1	
Actuated g/C Ratio		0.12	0.12					0.61		0.77	0.77	
Clearance Time (s)		5.0	5.0					5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)		186	182					1926		267	2717	
v/s Ratio Prot								c0.53		c0.08	0.17	
v/s Ratio Perm		0.07	0.02							0.51		
v/c Ratio		0.59	0.19					1.08dr		0.78	0.22	
Uniform Delay, d1		37.4	35.6					14.7		26.8	2.9	
Progression Factor		1.00	1.00					1.00		1.66	0.70	
Incremental Delay, d2		4.6	0.5					5.8		12.3	0.2	
Delay (s)		42.1	36.1					20.5		56.6	2.2	
Level of Service		D	D					C		E	A	
Approach Delay (s)		39.1			0.0			20.5			16.3	
Approach LOS		D			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	22.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	91.8%	ICU Level of Service	F
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group