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KAW VALLEY ENGINEERING, INC.

May 20, 2014

A14D6828

Batis Development Company
2933 SW Woodside Drive, Suite 200
Topeka, Kansas 66614

RE: WALGREENS
SW 29th STREET AND SW GAGE BOULEVARD
TOPEKA, KANSAS

On the behalf of Batis Development Company, Kaw Valley Engineering, Inc. (KVE) has reviewed the comments from Coder Engineering dated May 13, 2014 on the Traffic Impact Study for the proposed Walgreens on the northwest corner of 29th and Gage Boulevard. KVE is issuing an Addendum to the Traffic Impact Study dated April 17, 2014 in response to the comments.

EXISTING ROADWAY CONDITIONS AND TRAFFIC VOLUMES

KVE did not collect the 2014 ADT as part of the Traffic Impact Study for this project. During the due diligent phase of this project, Annual Average Daily Traffic (AADT) was obtained from the City of Topeka for 2011. The 2011 counts indicated that the AADT on 29th Street adjacent to the development was 12,565 Vehicles Per Day (VPD). The AADT on SW Gage Boulevard is 21,290 VPD. Assuming the peak hour counts fall within a typical range of 8 to 12% of the AADT, the 2014 AADT is similar to the 2011 AADT.

RECOMMENDED IMPROVEMENTS

Based upon the analysis results described above, the following improvements would be recommended to improve drivers' safety by limiting vehicular conflict points:

1. It is recommended that the developer and site designer consider limited access to the proposed Walgreens along SW Gage Boulevard by installing a properly designed 'pork chop' within the driveway to limit access to right in/right out.

2. Limiting traffic to right in and right out will cause a shift in traffic demand from the north driveway to the west driveway as illustrated on the Proposed AM and PM Peak Hour traffic volume diagram with Recommended Improvements (Figure 6). To document the impacts on the adjacent street network, the Capacity and Queuing analysis for the study intersections has been revaluated. The results of the capacity analysis for the proposed AM and PM peak hours are summarized in Table 8.

Table 8

Summary of Results: Capacity & Queuing Analysis							
Proposed Conditions with Recommended Improvements							
		AM Peak Hour			PM Peak Hour		
Intersection	Movement	LOS	Delay (sec/veh)	95% Queuing	LOS	Delay (sec/veh)	95% Queuing
SW 29th Street and SW Gage Boulevard	All Movements	D	43.5	-	D	53.2	-
	Eastbound Left			248			280
	Eastbound			197			307
	Westbound Left			161			313
	Westbound			297			412
	Northbound Left			81			188
	Northbound			396			316
	Southbound Left			187			326
	Southbound			169			177
North Driveway and SW Gage Boulevard	Eastbound Left	-	-	-	-	-	-
	Eastbound Right	B	10.6	2	B	12.4	4
	Northbound Left	-	-	-	-	-	-
West Driveway and SW 29th Street	Eastbound Left	A	8.6	0	B	10.1	2
	Southbound Left	C	19.1	3	E	45.3	34
	Southbound Right	B	10.1	1	A	9.5	2

The results of the analysis for proposed conditions indicate that a north driveway with limited access will have minimal impact on delay and queuing at the adjacent signalized intersection at 29th and Gage Boulevard. A small increase in average delay per vehicle should be expected at the west driveway, but the driveway should operate at a Level of Service E or better. The longest delay would be for the left turn movement.

As stated above, these improvements are recommended to improve drivers' safety by limiting vehicular conflict points on the adjacent public streets. The City has indicated that a full access at the north driveway would be supported and can be pursued by the developer.

If you have any questions regarding the findings in this study, don't hesitate to contact me at (913) 894-5150 or at wood@kveng.com.

Respectfully Submitted,
Kaw Valley Engineering, Inc.

David D. Wood, P.E.
Project Engineer

Attachments: City Comments
Figure 6-AM and PM Traffic Volume/Distribution Diagram with Recommended Improvements
Synchro Analysis

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	Job No. 057-13-002 (T)
Date 5-13-14	Sheet 1 of 2
Project 29th & Gage Walgreens	By TLC
Subject TIA and Plat Review	Ck'd

1. Plat should show a non-vehicular access easement (Access Control) from the corner of SW 29th & Gage west and north to the entrances.

2. The TIA should report what the AADT is on SW 29th St and on SW Gage Blvd.

3. The TIA provides capacity and queing analysis for all movements (left and right out) at both entrances. However the TIA recommends consideration of "Right in/Right Out Only" at the north entrance. Analysis of the entrance operation should be completed for the recommended configuration to access the impact additional exiting traffic will have on the operation of the west entrance.

4. The TIA recommends consideration of making the north entrance (SW Gage Blvd.) Right in/Right Out Only. The drawing show a left turn out being available.

5. Item 2 in the "Recommended Improvements" section discusses left turn conflicts associated with offset driveways to the south on SW 29th. The offset is not that deleterious in this instance as left turns will be seperated by the offset rather than caused to hook

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Job No. 057-13-002(T)

Date 5-13-14 Sheet 2 of —

Project 29th & Grace Walgreens By TCC

Subject TIA & Plat Review Ck'd

as would be the case if the driveways were offset in the other direction.

6. Reviewer could accept full access at north entrance.

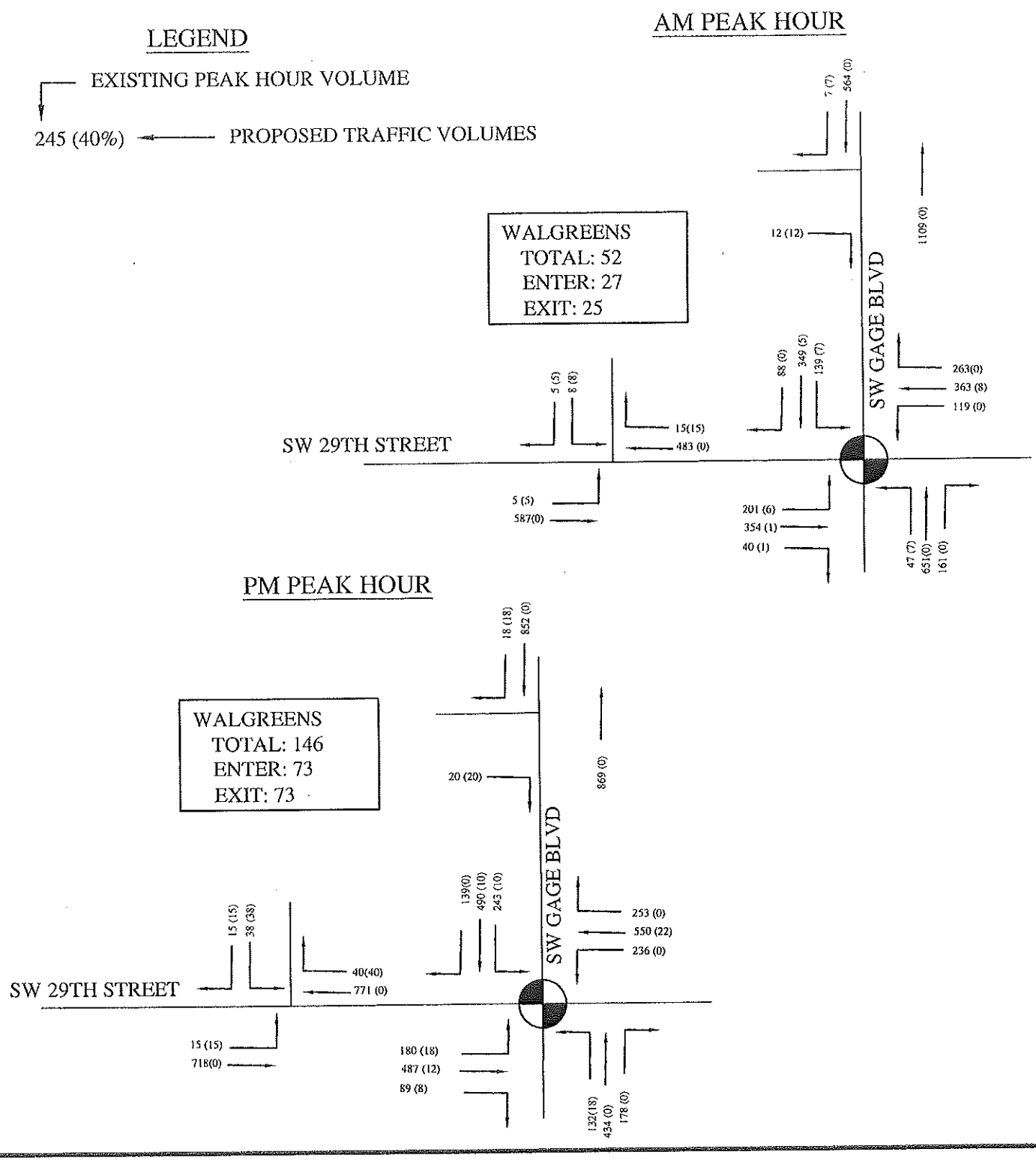

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FIGURE "6"
WALGREENS
TOPEKA, KANSAS
EXISTING PLUS PROPOSED CONDITIONS
AM AND PM TRAFFIC
VOLUME/DISTRIBUTION DIAGRAM
WITH RECOMMENDED IMPROVEMENTS
SCALE: N.T.S.
FIGURE-05.dwg

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	236	463	140	736	55	955	164	515
v/c Ratio	0.81	0.51	0.67	0.91	0.49	0.77	0.75	0.34
Control Delay	58.6	37.6	57.1	47.0	66.0	37.7	63.2	22.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.6	37.6	57.1	47.0	66.0	37.7	63.2	22.4
Queue Length 50th (ft)	174	153	104	241	42	343	122	135
Queue Length 95th (ft)	248	197	161	#297	81	396	#187	169
Internal Link Dist (ft)		238		639		456		209
Turn Bay Length (ft)								
Base Capacity (vph)	335	958	258	857	122	1245	246	1516
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.70	0.48	0.54	0.86	0.45	0.77	0.67	0.34

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	0.94		1.00	0.97		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3485		1770	3316		1770	3434		1770	3432	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3485		1770	3316		1770	3434		1770	3432	
Volume (vph)	201	354	40	119	363	263	47	651	161	139	349	88
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	236	416	47	140	427	309	55	766	189	164	411	104
RTOR Reduction (vph)	0	7	0	0	110	0	0	17	0	0	18	0
Lane Group Flow (vph)	236	456	0	140	626	0	55	938	0	164	497	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	18.8	29.4		13.5	24.1		6.0	41.6		14.0	49.6	
Effective Green, g (s)	18.8	29.4		13.5	24.1		6.0	41.6		14.0	49.6	
Actuated g/C Ratio	0.16	0.26		0.12	0.21		0.05	0.36		0.12	0.43	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	291	895		209	698		93	1248		216	1487	
v/s Ratio Prot	c0.13	0.13		0.08	c0.19		0.03	c0.27		c0.09	0.14	
v/s Ratio Perm												
v/c Ratio	0.81	0.51		0.67	0.90		0.59	0.75		0.76	0.33	
Uniform Delay, d1	46.1	36.4		48.4	44.0		53.1	31.9		48.6	21.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	15.6	0.5		7.9	14.2		9.7	4.2		14.2	0.6	
Delay (s)	61.7	36.8		56.3	58.2		62.7	36.1		62.8	22.1	
Level of Service	E	D		E	E		E	D		E	C	
Approach Delay (s)		45.2			57.9			37.6			31.9	
Approach LOS		D			E			D			C	

Intersection Summary			
HCM Average Control Delay	43.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	114.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	5	587	483	4	8	5
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	6	691	568	5	9	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)			318			
pX, platoon unblocked						
vC, conflicting volume	573				928	286
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	573				928	286
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				96	99
cM capacity (veh/h)	996				265	710

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	6	345	345	379	194	9	6
Volume Left	6	0	0	0	0	9	0
Volume Right	0	0	0	0	5	0	6
cSH	996	1700	1700	1700	1700	265	710
Volume to Capacity	0.01	0.20	0.20	0.22	0.11	0.04	0.01
Queue Length 95th (ft)	0	0	0	0	0	3	1
Control Delay (s)	8.6	0.0	0.0	0.0	0.0	19.1	10.1
Lane LOS	A					C	B
Approach Delay (s)	0.1			0.0		15.6	
Approach LOS						C	

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	26.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	12	0	1109	564	7
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	14	0	1305	664	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				289		
pX, platoon unblocked	0.77					
vC, conflicting volume	1320	336	672			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1117	336	672			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	100			
cM capacity (veh/h)	155	660	915			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	0	14	0	652	652	442	229
Volume Left	0	0	0	0	0	0	0
Volume Right	0	14	0	0	0	0	8
cSH	1700	660	1700	1700	1700	1700	1700
Volume to Capacity	0.05	0.02	0.00	0.38	0.38	0.26	0.13
Queue Length 95th (ft)	0	2	0	0	0	0	0
Control Delay (s)	0.0	10.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	B					
Approach Delay (s)	10.6		0.0			0.0	
Approach LOS	B						

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	34.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	20	0	869	852	18
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	24	0	1022	1002	21
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				268		
pX, platoon unblocked	0.82					
vC, conflicting volume	1524	512	1024			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1422	512	1024			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	95	100			
cM capacity (veh/h)	105	507	674			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	0	24	0	511	511	668	355
Volume Left	0	0	0	0	0	0	0
Volume Right	0	24	0	0	0	0	21
cSH	1700	507	1700	1700	1700	1700	1700
Volume to Capacity	0.20	0.05	0.00	0.30	0.30	0.39	0.21
Queue Length 95th (ft)	0	4	0	0	0	0	0
Control Delay (s)	0.0	12.4	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	B					
Approach Delay (s)	12.4		0.0			0.0	
Approach LOS	B						

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	34.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	212	678	278	945	155	731	286	505
v/c Ratio	0.90	0.80	0.87	0.93	0.76	0.80	0.88	0.44
Control Delay	84.5	49.5	66.0	51.2	67.2	46.2	67.8	28.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	84.5	49.5	66.0	51.2	67.2	46.2	67.8	28.4
Queue Length 50th (ft)	164	258	208	352	117	266	216	140
Queue Length 95th (ft)	#280	307	#313	#412	#188	316	#326	177
Internal Link Dist (ft)		257		639		456		188
Turn Bay Length (ft)								
Base Capacity (vph)	242	849	342	1042	224	914	344	1148
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.88	0.80	0.81	0.91	0.69	0.80	0.83	0.44

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	0.95		1.00	0.96		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3457		1770	3372		1770	3387		1770	3367	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3457		1770	3372		1770	3387		1770	3367	
Volume (vph)	180	487	89	236	550	253	132	444	178	243	290	139
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	212	573	105	278	647	298	155	522	209	286	341	164
RTOR Reduction (vph)	0	12	0	0	45	0	0	36	0	0	48	0
Lane Group Flow (vph)	212	666	0	278	900	0	155	695	0	286	457	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	15.6	28.1		21.1	33.6		13.5	30.3		21.5	38.3	
Effective Green, g (s)	15.6	28.1		21.1	33.6		13.5	30.3		21.5	38.3	
Actuated g/C Ratio	0.13	0.24		0.18	0.29		0.12	0.26		0.18	0.33	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	236	830		319	968		204	877		325	1102	
v/s Ratio Prot	0.12	0.19		c0.16	c0.27		0.09	c0.21		c0.16	0.14	
v/s Ratio Perm												
v/c Ratio	0.90	0.80		0.87	0.93		0.76	0.79		0.88	0.41	
Uniform Delay, d1	49.9	41.8		46.6	40.6		50.2	40.4		46.5	30.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	32.5	5.6		22.0	14.7		15.0	7.3		23.0	1.2	
Delay (s)	82.4	47.5		68.6	55.2		65.1	47.7		69.5	31.8	
Level of Service	F	D		E	E		E	D		E	C	
Approach Delay (s)		55.8			58.3			50.8			45.4	
Approach LOS		E			E			D			D	

Intersection Summary			
HCM Average Control Delay	53.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	117.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	78.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	15	718	771	40	38	15
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	18	845	907	47	45	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)			337			
pX, platoon unblocked	0.76				0.76	0.76
vC, conflicting volume	954				1388	477
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	626				1196	0
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				66	98
cM capacity (veh/h)	724				133	825

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	18	422	422	605	349	45	18
Volume Left	18	0	0	0	0	45	0
Volume Right	0	0	0	0	47	0	18
cSH	724	1700	1700	1700	1700	133	825
Volume to Capacity	0.02	0.25	0.25	0.36	0.21	0.34	0.02
Queue Length 95th (ft)	2	0	0	0	0	34	2
Control Delay (s)	10.1	0.0	0.0	0.0	0.0	45.3	9.5
Lane LOS	B					E	A
Approach Delay (s)	0.2			0.0		35.2	
Approach LOS						E	

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	32.6%	ICU Level of Service	A
Analysis Period (min)	15		