

Advanced Transportation Planning and Traffic Engineering

1082 Chimney Rock Road

303-703-9112 Mobile: 303-594-4132 Email: john@atceng.com

Highlands Ranch, CO 80126

John M.W. Aldridge, PE Colorado Licensed Professional Engineer

March 18, 2018

Mr. Danny Eilts c/o Stephen Shainholtz O'Bryan Partnership, Inc. 620 Main Street Unit #8 PO Box 2773 Frisco, Colorado 80443

Re: Traffic Impact Study - Revised Crossroads at Lake Dillon

Dear Ms. Eilts:

Aldridge Transportation Consultants (ATC) is pleased to present this traffic impact study regarding the proposed development Crossroads at Lake Dillon in Dillon, Colorado.

ATC is professional service firm specializing in traffic engineering and transportation planning. ATC's principal, John M.W. Aldridge, is a Colorado licensed professional engineer. In the past 20 years, ATC has prepared over 1,000 traffic impact studies, designed over 100 traffic signals, and has provided expert witness testimony on engineering design and access issues on multi-million dollar interchange and highway projects in Kansas and Colorado.

ATC appreciates the opportunity to be of service. Please call if you have any questions. We can be reached at 303-703-9112.



Respectfully submitted, Aldridge Transportation Consultants, LLC

John M.W. Aldridge, PE Principal



1. Introduction/Project Description

This traffic impact study provides an analysis of the potential impact on traffic operations and safety of adjacent streets and intersections occasioned by the development of a new 122 room hotel with restaurant and conference center in Dillon, Colorado. The hotel is replacing a Conoco gas station that has 6 pumps, two repair bays, U-Haul rental center, and a towing and recovery operation. The site is located on the southwest corner of US-6 and Lake Dillon Dr. across from Tenderfoot St. The location and proposed site plan for the hotel is shown on the graphic below.





2. Existing Conditions

US-6 is a four-lane, divided, major arterial and state highway (SH-6F). It currently carries 18,000 AADT west of Lake Dillon Dr. and 13,000 AADT on the east side. The posted speed limit is 40 mph.

Lake Dillon Dr. is a two-lane, divided, minor arterial that currently carries approximately 5,000 ADT. The posted speed limit is 25 mph. It features angled parking spaces, landscaped median, and attached sidewalks.

Tenderfoot St. is a two-lane, undivided, collector street that currently carries approximately 700 ADT. It is posted at 25 mph. There are some angled parking spaces on the south side and a few parallel parking spaces on the north side just west of the intersection with Lake Dillon Dr.

The intersection of US-6 and Lake Dillon Dr. is a full-movement with turn lanes on all approaches. On the eastbound and northbound approaches, the right turn lanes are channelized with raised traffic islands. The southbound approach includes a short left and through lane. The northbound approach includes a dual left turn lane with the outside lane shared with the through movement. The traffic signal is actuated with protected/permissive left turn phasing on all approaches.

The intersection of Lake Dillon Dr. and Tenderfoot St. is two-way stop sign controlled. It features a short southbound left turn lane and a short northbound right turn lane. All movements from the eastbound approach from the site and the westbound approach from Tenderfoot St. are shared.

AM and PM peak hour turning movement counts at the Lake Dillon Dr. and Tenderfoot St. intersection were taken on Thursday October 5, 2017. Pedestrian and bike movements were also counted. The most significant pedestrian movement is across Lake Dillon Dr. on the north side of the intersection. 18 crossings were counted in the AM peak hour and 15 crossings were counted in the PM peak hour. Bike movements were minimal at no more than 3 per hour through the intersection. The count reports are attached for reference.



3. Proposed Conditions

The trip generation rates for a hotel are from the 9th Edition of the Institute of Transportation Engineer's Trip Generation Manual under Land Use Code 330 Resort Hotel. This type of hotel provides restaurants, cocktail lounges, retail shops, and guest services. As in this case, they cater to the tourist and vacation industry often providing a wide variety of recreational programs such as skiing and golf. The following table shows the trip generation for the average daily and AM/PM peak hours. Note that an average daily trip generation rate is not available.

	Trip Generation Worksheet														
					А	м	Р	M							
ITE CODE	LAND USE	Unit	QUANTITY	ADT	IN	Ουτ	IN	Ουτ							
330	Resort Hotel	Rooms	122	n/a	0.22	0.09	0.18	0.24							
					27	11	22	29							
	Total Trips				27	11	22	29							

The PM peak hour is the highest time of travel on the adjacent streets and at the intersections and therefore considered the design hour volume (DHV) for operations analysis and geometric design purposes.

The existing Conoco station has two access locations approximately 70 feet apart. The more active one is the north one opposite Tenderfoot St. This access currently generates more traffic than what the proposed hotel will. Note that the hotel will close the south access. Graphics from the Synchro operations model are attached that depict the existing AM and PM peak hour traffic volumes and the proposed AM and PM peak hour traffic volumes.



4. Operations Evaluation

ATC uses Synchro v.9 for operations analyses. The Synchro v.9 methodology is based on the Highway Capacity Manual 2010 (HCM). The Synchro HCM reports are attached for reference. LOS is letter rating from A to F. LOS A indicates free-flow traffic conditions and no delay at intersections. LOS F is heavy traffic congestion with significant delay. LOS is provided for the overall operations at signalized intersections. LOS D is generally the benchmark for acceptable signalized intersection operations during the weekday peak hours. The critical movement, not the overall, provides the LOS rating for unsignalized intersections. The critical movement is generally a left turn from the minor approach. Caution is advised when evaluating the LOS at unsignalized intersections particularly when LOS F shows. In cases of an LOS F, the HCM¹ suggests that other evaluation measures should be considered such as the volume over capacity ratio and 95th percentile queue length to make the most effective traffic control decision. LOS F at unsignalized intersections is often normal for the average weekday peak hour. The following table provides the critical movement LOS and seconds of delay.

Intersection	Existing AM/PM	New AM/PM
Lake Dillon/Tenderfoot	B/11.2 - B/13.1	B/12.6 - B/13.4

The existing intersection operates at LOS B/B in the AM/PM peak hours which is considered very good. It will continue to do so with the new trip generation from the hotel. There are no queuing issues on any of the approaches as the all the 95th percentile queue lengths are less than one vehicle.

The traffic signal controlled intersection of Lake Dillon Dr. and US-6 will not be affected and will continue to operate at its current level of service.

¹ Highway Capacity Manual 2010 page 19-40



5. Proposed Mitigation Measures

As shown on the site plan, the existing access locations to the Conoco gas station should be consolidated and configured as a standard 30-foot curb cut with crosswalk markings and ADA ramps. It should also be properly aligned with Tenderfoot St.

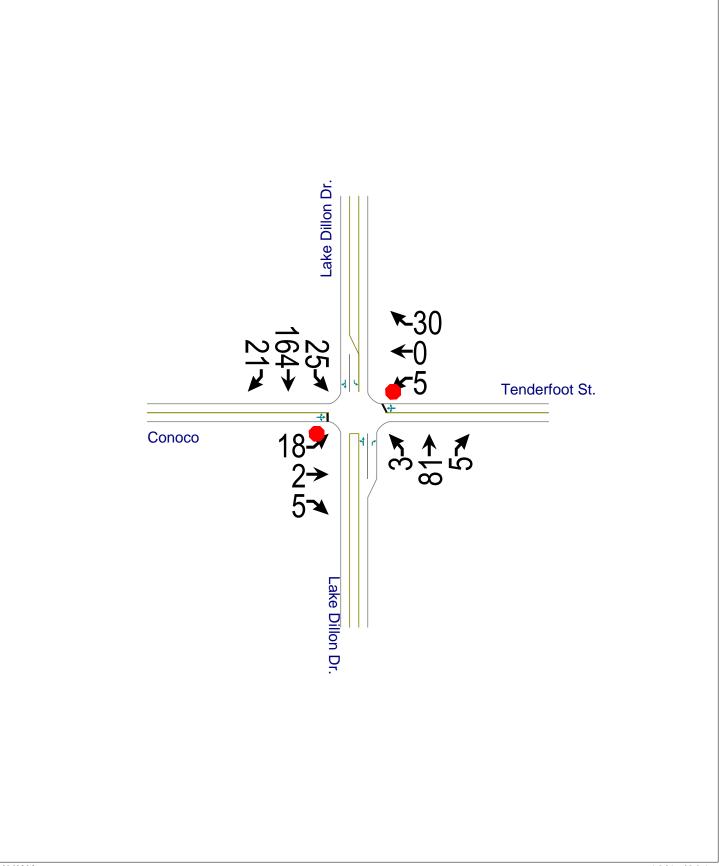
In addition, the sidewalks and trails should be reconfigured as necessary to conform to city standards and the 2017 Comprehensive Plan.

6. Conclusions/Recommendations

Based on the analysis herein it is my professional opinion that the traffic generated by the proposed Crossroads at Lake Dillon hotel can be integrated harmoniously into the traffic flow on the adjacent streets and intersections and maintain an acceptable level of service and safety.



APPENDIX



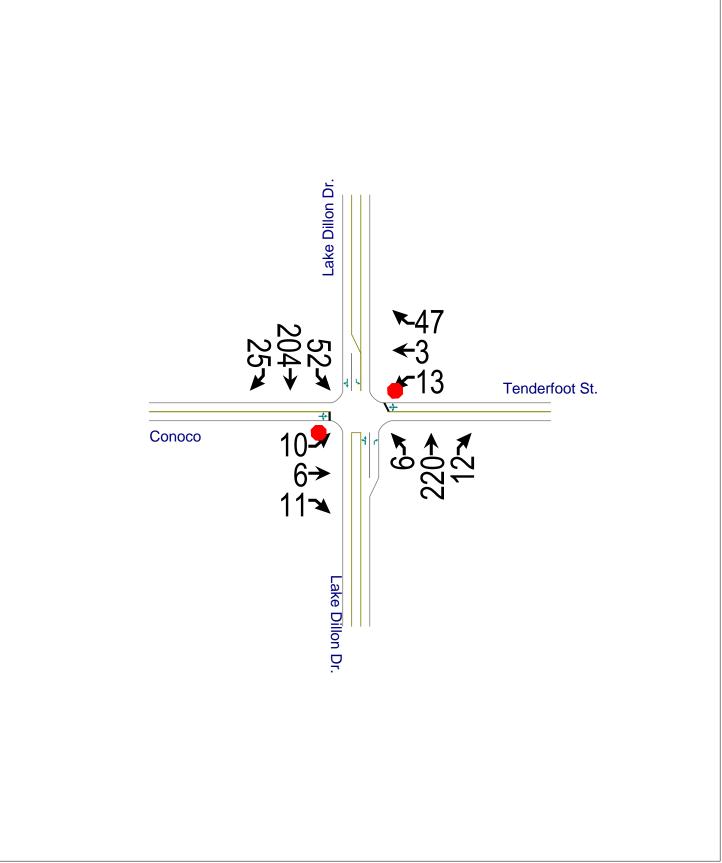
Intersection

Int Delay, s/veh

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
	EDL	EDI	EDK	VVDL	VVDI	VVDR	INDL	INDI	NDR	SDL	SDI	JDK
Lane Configurations		- 4 >			- 4 >			- सी	1	ሻ	- î÷	
Traffic Vol, veh/h	18	2	5	5	0	30	3	81	5	25	164	21
Future Vol, veh/h	18	2	5	5	0	30	3	81	5	25	164	21
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	-	-	-	-	-	-	-	-	60	50	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	20	2	5	5	0	33	3	88	5	27	178	23

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	355	339	190	343	350	88	201	0	0	88	0	0
Stage 1	244	244	-	95	95	-	-	-	-	-	-	-
Stage 2	111	95	-	248	255	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	600	582	852	611	574	970	1371	-	-	1508	-	-
Stage 1	760	704	-	912	816	-	-	-	-	-	-	-
Stage 2	894	816	-	756	696	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	571	570	852	596	563	970	1371	-	-	1508	-	-
Mov Cap-2 Maneuver	571	570	-	596	563	-	-	-	-	-	-	-
Stage 1	758	691	-	910	814	-	-	-	-	-	-	-
Stage 2	862	814	-	735	684	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	11.2			9.2			0.3			0.9		
HCM LOS	В			А								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1V	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1371	-	-	611	890	1508	-	-
HCM Lane V/C Ratio	0.002	-	-	0.044	0.043	0.018	-	-
HCM Control Delay (s)	7.6	0	-	11.2	9.2	7.4	-	-
HCM Lane LOS	А	А	-	В	А	Α	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0.1	-	-



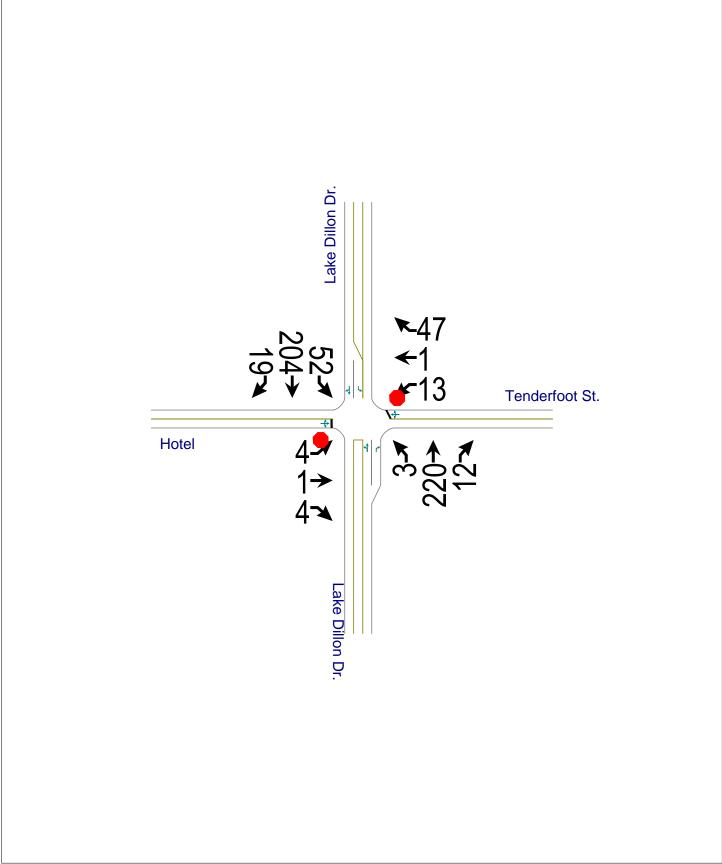
Intersection

Int Delay, s/veh

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
	EDL	EDI	EDK	VVDL	VVDI	VVDR	INDL	INDI	NDR	SDL	SDI	SDK
Lane Configurations		- 4 >			- 4 >			- सी	1	ሻ	- î≽	
Traffic Vol, veh/h	10	6	11	13	3	47	6	220	12	52	204	25
Future Vol, veh/h	10	6	11	13	3	47	6	220	12	52	204	25
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	-	-	-	-	-	-	-	-	60	50	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	7	12	14	3	51	7	239	13	57	222	27

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	627	600	235	610	614	239	249	0	0	239	0	0
Stage 1	348	348	-	252	252	-	-	-	-	-	-	-
Stage 2	279	252	-	358	362	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	396	415	804	407	407	800	1317	-	-	1328	-	-
Stage 1	668	634	-	752	698	-	-	-	-	-	-	-
Stage 2	728	698	-	660	625	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	355	395	804	381	387	800	1317	-	-	1328	-	-
Mov Cap-2 Maneuver	355	395	-	381	387	-	-	-	-	-	-	-
Stage 1	664	607	-	747	694	-	-	-	-	-	-	-
Stage 2	674	694	-	616	598	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	13.1			11.5			0.2			1.4		
HCM LOS	В			В								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	VBLn1	SBL	SBT	SBR
Capacity (veh/h)	1317	-	-	473	626	1328	-	-
HCM Lane V/C Ratio	0.005	-	-	0.062	0.109	0.043	-	-
HCM Control Delay (s)	7.7	0	-	13.1	11.5	7.8	-	-
HCM Lane LOS	А	А	-	В	В	Α	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.4	0.1	-	-



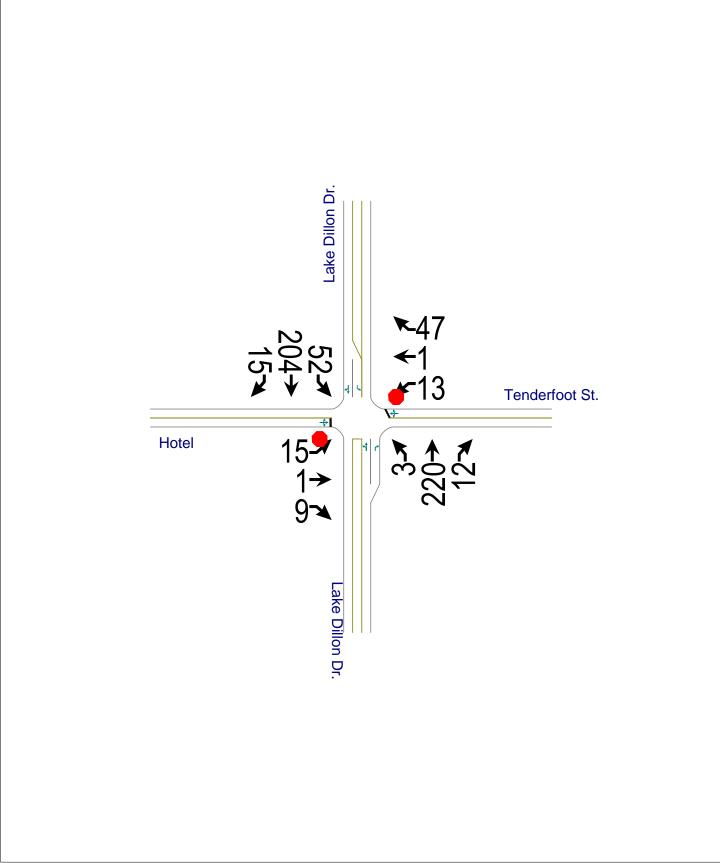
Intersection

Int Delay, s/veh

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
	LDL		LDIX	VUL			NDL				001	
Lane Configurations		- 4 >			- 4 >			- କ	- 7 -	ግ	ર્ન 👘	
Traffic Vol, veh/h	4	1	4	13	1	47	3	220	12	52	204	19
Future Vol, veh/h	4	1	4	13	1	47	3	220	12	52	204	19
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	-	-	-	-	-	-	-	-	60	50	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	1	4	14	1	51	3	239	13	57	222	21

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	617	591	232	594	601	239	242	0	0	239	0	0
Stage 1	345	345	-	246	246	-	-	-	-	-	-	-
Stage 2	272	246	-	348	355	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	402	420	807	417	414	800	1324	-	-	1328	-	-
Stage 1	671	636	-	758	703	-	-	-	-	-	-	-
Stage 2	734	703	-	668	630	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	362	401	807	399	395	800	1324	-	-	1328	-	-
Mov Cap-2 Maneuver	362	401	-	399	395	-	-	-	-	-	-	-
Stage 1	669	609	-	756	701	-	-	-	-	-	-	-
Stage 2	684	701	-	635	603	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	12.6			11.2			0.1			1.5		
HCM LOS	В			В								

Minor Lane/Major Mvmt	NBL	NBT	NBR E	BLn1V	VBLn1	SBL	SBT	SBR
Capacity (veh/h)	1324	-	-	486	650	1328	-	-
HCM Lane V/C Ratio	0.002	-	-	0.02	0.102	0.043	-	-
HCM Control Delay (s)	7.7	0	-	12.6	11.2	7.8	-	-
HCM Lane LOS	А	А	-	В	В	Α	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.3	0.1	-	-



Intersection

Int Delay, s/veh

Mayamant	EDI	ГРТ					NDI	NDT		CDI	ODT	CDD
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		- 4 >			- 4 >			- सी	1	ሻ	ef 👘	
Traffic Vol, veh/h	15	1	9	13	1	47	3	220	12	52	204	15
Future Vol, veh/h	15	1	9	13	1	47	3	220	12	52	204	15
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	-	-	-	-	-	-	-	-	60	50	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	16	1	10	14	1	51	3	239	13	57	222	16

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	615	589	230	594	597	239	238	0	0	239	0	0
Stage 1	343	343	-	246	246	-	-	-	-	-	-	-
Stage 2	272	246	-	348	351	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	403	421	809	417	416	800	1329	-	-	1328	-	-
Stage 1	672	637	-	758	703	-	-	-	-	-	-	-
Stage 2	734	703	-	668	632	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	363	402	809	397	397	800	1329	-	-	1328	-	-
Mov Cap-2 Maneuver	363	402	-	397	397	-	-	-	-	-	-	-
Stage 1	670	610	-	756	701	-	-	-	-	-	-	-
Stage 2	684	701	-	630	605	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	13.4			11.2			0.1			1.5		
HCM LOS	В			В								

Minor Lane/Major Mvmt	NBL	NBT	NBR E	BLn1V	VBLn1	SBL	SBT	SBR
Capacity (veh/h)	1329	-	-	455	649	1328	-	-
HCM Lane V/C Ratio	0.002	-	-	0.06	0.102	0.043	-	-
HCM Control Delay (s)	7.7	0	-	13.4	11.2	7.8	-	-
HCM Lane LOS	А	А	-	В	В	Α	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.3	0.1	-	-

