

MEMORANDUM

TO: John Nelson, City & Borough of Juneau Project Manager

FROM: Naomi Hobbs, P.E., DOWL Transportation Engineering Manager
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DATE: October 14, 2015

SUBJECT: Traffic Impact Analysis for Switzer Creek Subdivision

This technical memorandum was prepared to evaluate the traffic impacts the Switzer Creek Subdivision is expected to have on the intersection of Renninger Street and Glacier Highway. The proposed subdivision would be located east of Dzantik'i Heeni Middle School and access would be provided via Jackie Street, which is connected to Glacier Highway via Renninger Street. The project location is shown below in Figure 1.

Figure 1 – Project Location of Proposed Switzer Creek Subdivision





Existing Traffic Volumes

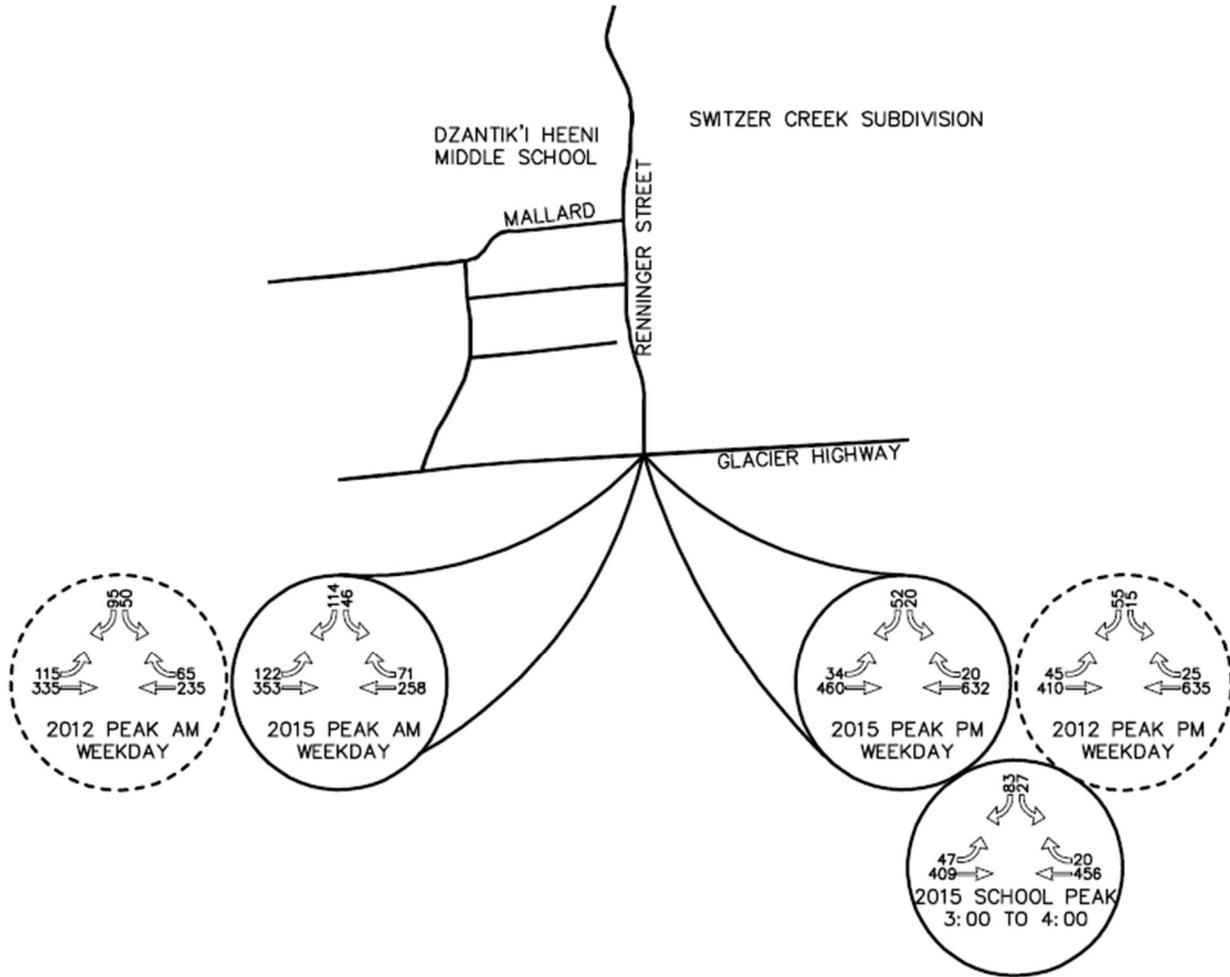
Existing traffic volumes were counted along Renninger Street and at the intersection of Renninger Street and Glacier Highway in order to gain a baseline understanding of study area traffic.

A pneumatic tube counter was installed on Renninger Street on Monday, May 11 and Tuesday, May 12, 2015. The tube counter was located south of the apartment complex entrance and approximately 200 feet north of Glacier Highway. The average daily traffic (ADT) on Renninger Street recorded by the tube counter was 1,740 vehicles per day. The calculated ADT directional distribution was 864 vehicles per day traveling northbound and 876 vehicles per day traveling southbound on Renninger Street.

Turning movement counts were collected for the intersection of Renninger Street and Glacier Highway on Monday, May 11, 2015. Morning count data were collected between 7 and 9 AM, with the AM peak hour occurring from 7:30 AM to 8:30 AM with 353 vehicles on Renninger Street. The AM peak hour on Renninger Street coincided with the AM peak hour of the overall intersection (including traffic on Glacier Highway). Afternoon data were collected between 2 and 6 PM. The afternoon peak hour on Renninger Street occurred from 3:00 PM to 4:00 PM with 177 vehicles on Renninger Street. The afternoon peak hour of the overall intersection (including traffic on Glacier Highway) occurred between 4:15 PM and 5:15 PM with 126 vehicles on Renninger Street. The AM and PM peak hours were determined by identifying the highest four consecutive fifteen minute intervals during each count period.

Traffic volumes from the 2015 turning movement counts are shown in Figure 2. This figure also shows volumes that were used in a 2012 analysis performed as part of Alaska DOT&PF's *Glacier Highway Bike and Pedestrian Improvement Project*. As shown, the data collected in 2015 is consistent with the data reported in the 2012 analysis. The AM and PM peak hours also occurred during the same time periods for both the 2012 and 2015 traffic counts.

Figure 2 – Peak Hour Turning Movement Counts



NOTES:

1. 2012 TURNING MOVEMENTS ARE FROM A 2012 TECHNICAL MEMORANDUM FROM KITTELSON & ASSOCIATES, INC. THE DATA WAS COLLECTED FOR DOT&PF AS PART OF THE GLACIER HIGHWAY BIKE & PEDESTRIAN IMPROVEMENTS PROJECT.
2. PEAK AM HOURS: FROM 12/6/2012 KAI MEMORANDUM – 7:30AM TO 8:30AM
FROM 5/11/2015 COUNTS – 7:30AM TO 8:30AM
3. PEAK PM HOURS: FROM 12/6/2012 KAI MEMORANDUM – 4:15PM TO 5:15PM
FROM 5/11/2015 COUNTS – 4:15PM TO 5:15PM
4. SCHOOL PEAK HOUR: FROM 5/11/2015 COUNTS – 3:00PM TO 4:00PM

Future Traffic Volume

As currently proposed, the subdivision would be constructed over a four year period, with an anticipated completion date in late 2019. The following steps were used to estimate total traffic volumes for a future 2032 scenario:

- The number of weekday daily, AM peak hour, and PM peak hour site generated trips were estimated based on rates provided in the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 9th Edition*. “Peak Hour of Adjacent Street” trip generation rates were used to estimate trip generation volumes for the subdivision. Assumptions regarding entering/exiting traffic were also based on information from the ITE *Trip Generation Manual*.
- A trip distribution pattern was derived through a review of existing traffic patterns.
- Site generated trips were added to the 2032 background traffic volumes to determine total traffic volumes for each analysis period.

Table 1 shows the estimated trip generation for the proposed development, and Figure 3 shows the site trip distribution percentages and resulting project trips once they are routed through the study intersection.

Table 1 – Trip Generation Calculations (Weekday, AM Peak Hour, and PM Peak Hour)

ITE Code	Land Use	Dwelling Units	Analysis Period	Trip Rate	Total Trips	% Entering	% Exiting	Trips Entering	Trips Exiting
230	Residential Condominium/ Townhouse	189	Weekday	5.81	1,098	50%	50%	549	549
			AM Peak Hour	0.44	83	17%	83%	14	69
			PM Peak Hour	0.52	98	67%	33%	66	32

In the 2012 traffic analysis performed as part of Alaska DOT&PF’s *Glacier Highway Bike and Pedestrian Improvement Project*, traffic volumes were projected by applying a 0.25% annual growth rate (AGR) to 2012 counts for 20 years and adding ITE trip generation data for anticipated development at the time of the study. This calculation resulted in the forecasted 2032 traffic volumes shown on the left side of **Figure** . The same methodology was used to estimate the revised 2032 volumes used in this updated analysis. Namely, a 0.25% AGR was applied to the 2015 peak hour counts for 17 years, and the estimated site generated trips were added based on the distribution shown in Figure 3. This calculation resulted in the forecasted 2032 traffic volumes shown on the right side of **Figure** .

Figure 3 – Site Trip Distribution and Project Trips

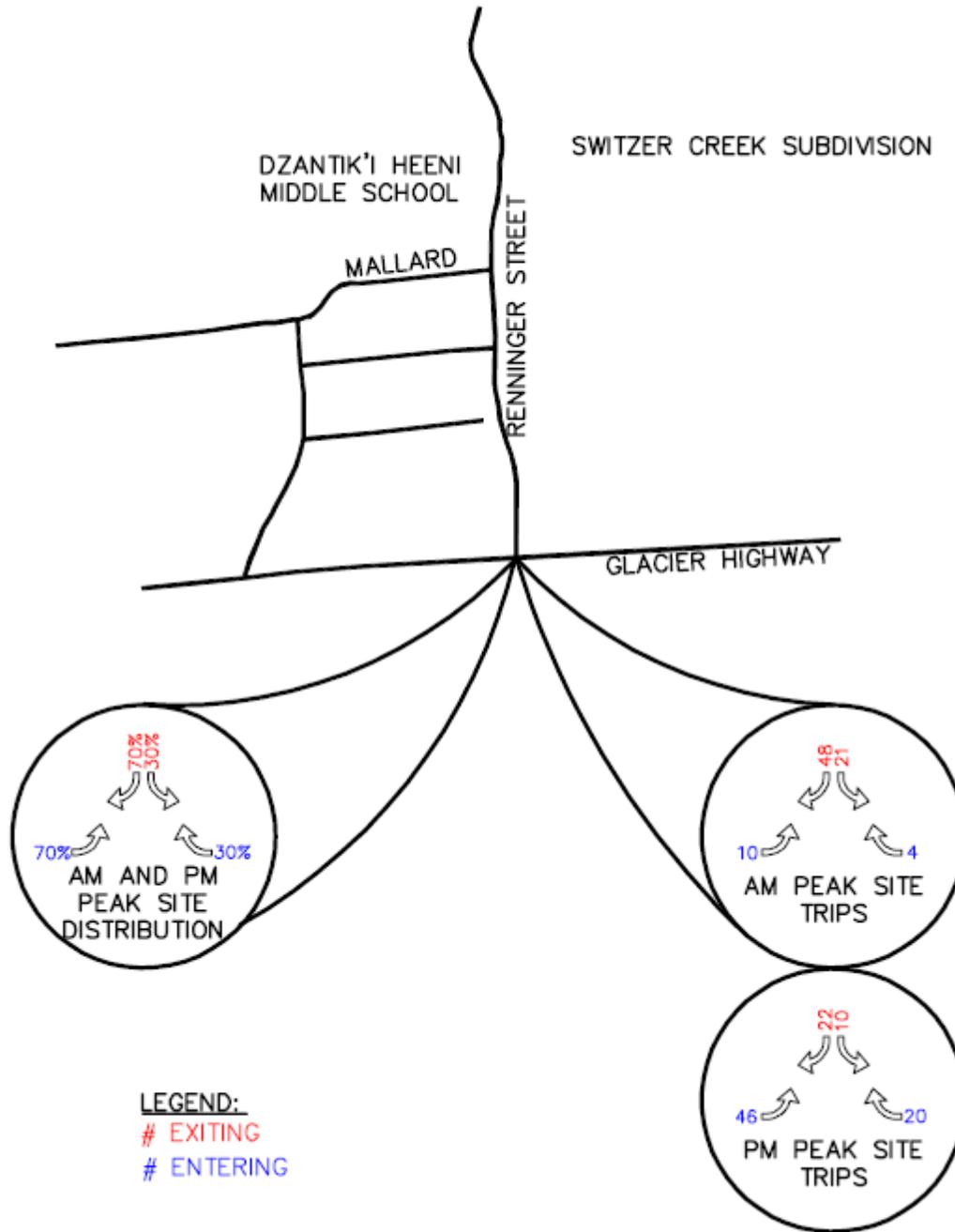
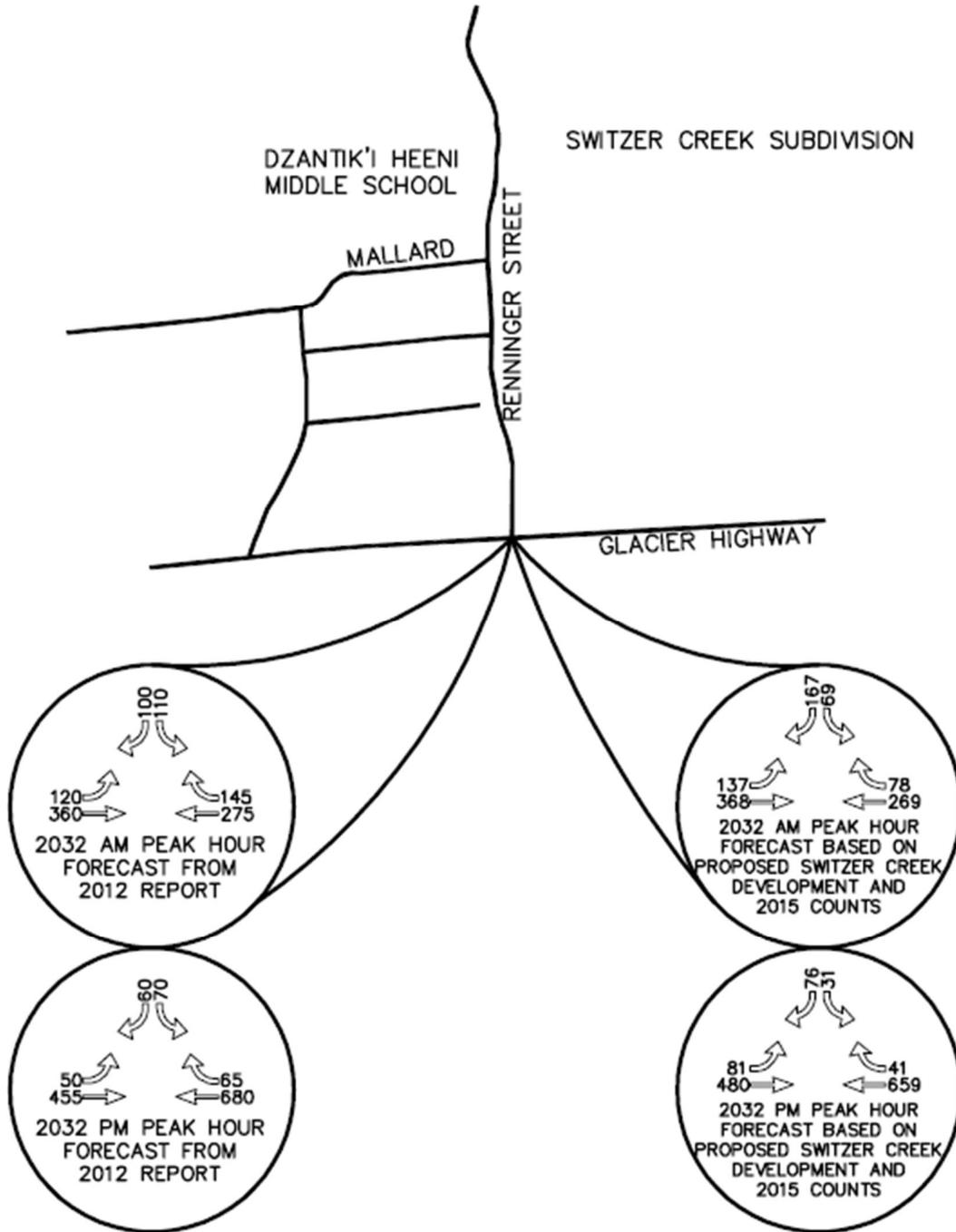


Figure 4 – 2032 Forecast Traffic Volumes



Future Intersection Operations

Intersection operations analysis was performed for the intersection of Renninger Street and Glacier Highway for the 2032 horizon year with the addition of Switzer Creek Subdivision project traffic. The analysis utilized Highway Capacity Manual 2010 (HCM2010) methodology for unsignalized intersections and assumes that drivers are able to use the two way left turn lane (TWLTL) on Glacier Highway to reduce delays in performing southbound left turn maneuvers from Renninger Street to Glacier Highway. The TWLTL provides a refuge for southbound left turning vehicles after completing their first turning movement across westbound traffic while waiting for a gap in eastbound traffic before merging.

Table 2 shows the resulting 2032 level of service (LOS) and volume-to-capacity (V/C) ratio for the study intersection. As shown, the intersection is expected to operate at LOS C for both the AM and PM peak hours. This meets the Alaska DOT&PF's applicable operating standard.

Table 2 – 2032 Forecast Traffic Operations (AM and PM Peak Hours)

Intersection	Jurisdiction	Operating Standard	AM Peak			PM Peak		
			LOS	Delay	V/C	LOS	Delay	V/C
Glacier Highway/ Renninger Street	AK DOT&PF	LOS C	A/C	17.2	0.46	A/C	20.1	0.33

LOS = Level of Service (Major/Minor Approaches)

Delay = Average Control Delay (Worst Movement)

V/C = Volume-to-Capacity Ratio (Worst Movement)

Conclusion

The data collected and analyzed in 2015 for the intersection of Renninger Street and Glacier Highway shows a high degree of correlation with the data presented in the 2012 *Glacier Highway Bike and Pedestrian Improvement Project*. Therefore, the analysis in the 2012 study is considered valid for the proposed Switzer Creek Subdivision. Since the 2012 study recommends a roundabout at Renninger Street and Glacier Highway that may not be constructed before the Switzer development is occupied, additional analysis was performed for the intersection using 2032 horizon year traffic volumes and existing lane configuration and control. This analysis indicates the intersection of Renninger Street and Glacier Highway is expected to operate at LOS C for both the 2032 AM and PM peak hours. Therefore, the intersection is expected to meet applicable operating standards under its existing geometry.



APPENDIX

Turn Movement Counts
(1) Glacier Highway and Renninger Street
 Collected on 5/11/2015

Annual Growth Rate (AGR) 0.25%
 Years 17

AM PHF = 0.94
 PM PHF = 0.91

15-min Interval	From North (Southbound)				From East (Westbound)				From South (Northbound)				From West (Eastbound)				Rolling Hourly Intersection Count
	Renninger Street				Glacier Highway				Glacier Highway				Glacier Highway				
	Left	Through	Right	Ped	Left	Through	Right	Ped	Left	Through	Right	Ped	Left	Through	Right	Ped	
7:00	4	0	2	5	0	30	2	3	0	0	0	0	5	56	0	1	747
7:15	4	0	5	4	0	56	5	2	0	0	0	0	8	85	0	3	887
7:30	8	0	16	3	0	74	9	1	0	0	0	0	23	98	0	1	964
7:45	6	0	26	0	0	70	20	1	0	0	0	0	24	111	0	1	894
8:00	13	0	24	1	0	61	25	2	0	0	0	0	39	77	0	0	793
8:15	19	0	48	4	0	53	17	2	0	0	0	0	36	67	0	0	
8:30	7	0	10	1	0	65	3	1	0	0	0	0	5	68	0	3	
8:45	3	0	4	2	0	79	3	1	0	0	0	0	5	62	0	7	
Existing 2015 AM Peak Hour Volumes	46	0	114	8	0	258	71	6	0	0	0	0	122	353	0	2	964
Forecast 2032 AM Peak Background Volumes	48	0	119	8	0	269	74	6	0	0	0	0	127	368	0	2	1005
AM Site Generated Volumes	21	0	48				4						10				83
Forecast 2032 AM Peak Hour Total Volumes	69	0	167	8	0	269	78	6	0	0	0	0	137	368	0	2	1088
14:00	5	0	5	3	0	121	4	1	0	0	0	0	10	119	0	8	1214
14:15	3	0	8	2	0	107	3	0	0	0	0	0	4	95	0	2	950
14:30	2	0	4	1	0	102	4	1	0	0	0	0	7	83	0	5	986
14:45	2	0	10	3	0	91	19	1	0	0	0	0	29	97	0	3	1023
15:00	16	0	37	12	0	106	8	1	0	0	0	0	26	87	0	4	1042
15:15	6	0	12	4	0	126	4	1	0	0	0	0	3	105	0	7	1033
15:30	2	0	17	1	0	124	1	1	0	0	0	0	9	86	0	4	1036
15:45	3	0	17	5	0	100	7	1	0	0	0	0	9	131	0	4	1120
16:00	10	0	12	5	0	125	6	4	0	0	0	0	9	109	0	0	1154
16:15	5	0	13	5	0	132	4	1	0	0	0	0	11	94	0	5	1218
16:30	8	0	19	8	0	169	5	2	0	0	0	0	11	111	0	2	1215
16:45	4	0	9	2	0	148	8	1	0	0	0	0	5	127	0	1	1139
17:00	3	0	11	2	0	183	3	1	0	0	0	0	7	128	0	1	1090
17:15	1	0	6	2	0	134	2	2	0	0	0	0	7	106	0	13	
17:30	2	0	2	12	0	126	4	4	0	0	0	0	4	109	0	6	
17:45	4	0	7	4	0	126	2	0	0	0	0	0	10	103	0	9	
Existing 2015 PM School Peak Hour Volumes	27	0	83	22	0	456	20	4	0	0	0	0	47	409	0	19	1042
Existing 2015 PM Peak Hour Volumes	20	0	52	17	0	632	20	5	0	0	0	0	34	460	0	9	1218
Forecast 2032 PM Peak Background Volumes	21	0	54	18	0	659	21	5	0	0	0	0	35	480	0	9	1270
PM Site Generated Volumes	10	0	22				20						46				98
Forecast 2032 PM Peak Hour Total Volumes	31	0	76	18	0	659	41	5	0	0	0	0	81	480	0	9	1368

Intersection

Int Delay, s/veh 4.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	137	368	269	78	69	167
Future Vol, veh/h	137	368	269	78	69	167
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	146	391	286	83	73	178

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	369	0	1011
Stage 1	-	-	328
Stage 2	-	-	683
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1190	-	265
Stage 1	-	-	730
Stage 2	-	-	502
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1190	-	232
Mov Cap-2 Maneuver	-	-	346
Stage 1	-	-	730
Stage 2	-	-	440

Approach	EB	WB	SB
HCM Control Delay, s	2.3	0	17.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1190	-	-	-	544
HCM Lane V/C Ratio	0.122	-	-	-	0.462
HCM Control Delay (s)	8.4	-	-	-	17.2
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.4	-	-	-	2.4

Intersection

Int Delay, s/veh 2.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	81	480	659	41	31	76
Future Vol, veh/h	81	480	659	41	31	76
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	89	527	724	45	34	84

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	769	0	1452
Stage 1	-	-	747
Stage 2	-	-	705
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	845	-	144
Stage 1	-	-	468
Stage 2	-	-	490
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	845	-	129
Mov Cap-2 Maneuver	-	-	265
Stage 1	-	-	468
Stage 2	-	-	438

Approach	EB	WB	SB
HCM Control Delay, s	1.4	0	20.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	845	-	-	-	355
HCM Lane V/C Ratio	0.105	-	-	-	0.331
HCM Control Delay (s)	9.8	-	-	-	20.1
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.4	-	-	-	1.4