Traffic Impact Study Report

3902 Mud Lane Apartments

Louisville, Jefferson Co., KY

Prepared For:

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October 7, 2022

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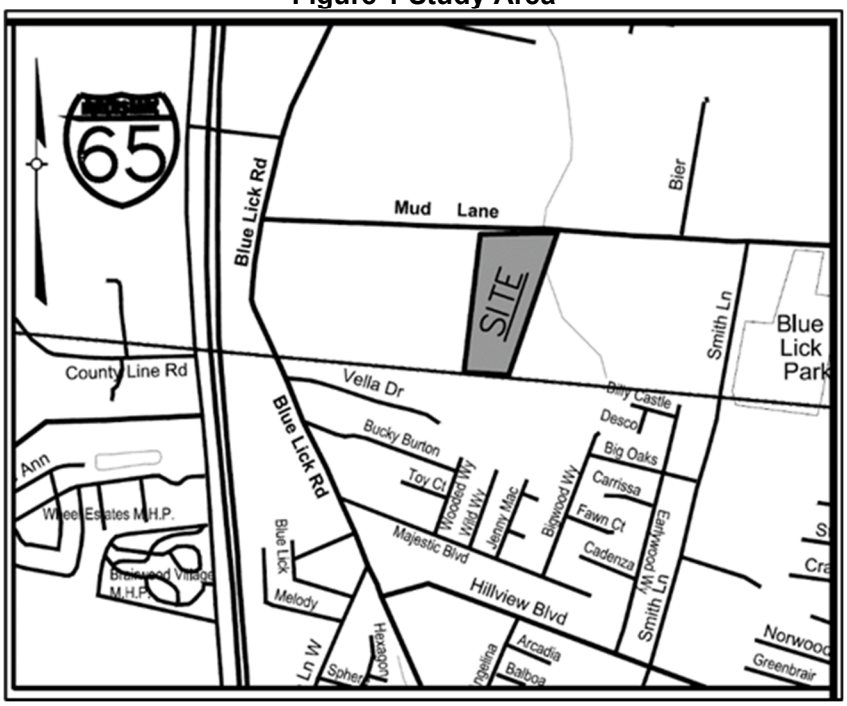
INTRODUCTION

This traffic study analyzes the potential traffic impact of a proposed multi-family residential development in Louisville, Jefferson County, KY. The development is to consist of 252 3-story multi-family units. The development is to be located on the south side of Mud Lane just west of Mud Creek (**Figure 1**). Two access points are to be located on Mud Lane. A proposed site plan is provided in **Appendix A**. The study will evaluate traffic operations at the proposed access points on Mud Lane, and the following intersections:

- Mud Lane at Preston Highway
- Mud Lane at Blue Lick Road

The scope of this study is based on a review of existing travel patterns in the area and discussions with Louisville Metro Planning and Design Services.

Figure 1 Study Area

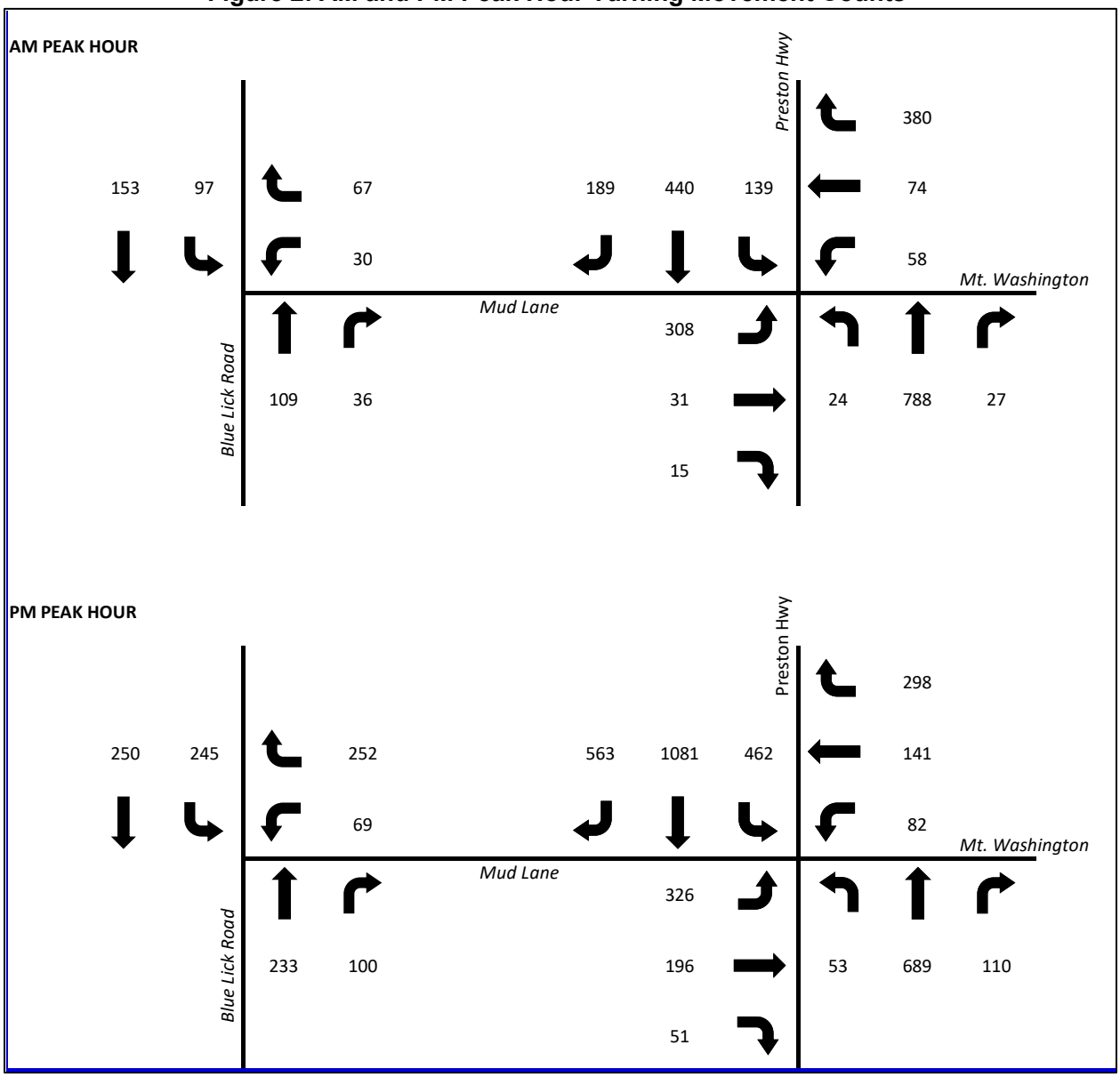


EXISTING CONDITIONS

Mud Lane is a two-lane roadway with a posted speed of 35 mph. East of Cody Lane Mud Lane is widened to a 3-lane section with a center left turn lane. Significant residential development to the south exists with access to the east of the proposed site, at Cody Lane and Brookley Drive. The intersection of Mud Lane at Blue Lick Road is a 'T' intersection with stop control on Mud Lane. The intersection of Mud Lane at Preston Highway is signal controlled and aligns with Mt. Washington Road to the east. Left and right auxiliary turn lanes are present on Mud Lane at the intersection.

AM and PM turning movement counts were collected on Thursday September 29, 2022 between 7-9 a.m. and 4-6 p.m. at the study intersections. Full turn movement count data is provided in **Appendix B**. AM and PM peak hour traffic volumes are summarized in **Figure 2.**

Figure 2: AM and PM Peak Hour Turning Movement Counts



TRIP GENERATION

Trip Generation was conducted in accordance with the ITE Trip Generation Web Based App, 11th edition. Trip Generation utilized **ITE Land Use Code 221Multi-family Housing (mid-rise)**. Based on this land use and the proposed 252 multi-family homes, the development is expected to generate 99 vehicles per hour during both the AM and PM peak hour of the adjacent street traffic,. **Table 1** summarizes the trip generation and **Appendix C** contains output from the ITE Trip Generation Manual. No reductions for pass-by trips or internal trip capture trips were made.

ITE Land Use Code	Land Use Description	Ind. Var. (X)	Ind. Var. Units	Entering/ Exiting	AM Trips Generated	PM Trips Generated
221	Multi-Family Residential (mid rise)	252	dwelling units	**Total**	**99**	**99**
				entering	23	60
				exiting	76	39

TRAFFIC FORECASTING

Historic traffic counts were available for Mud Lane at station 056283, which is immediately east of the proposed access and east of Cody Lane and Brookley Drive. Based on this data, historic traffic patterns indicate a growth rate of 2.5 percent per year on Mud Lane. Historic traffic counts on Preston Highway were also reviewed and identified a growth rate of -0.36, traffic volumes on Preston Highway were assumed to remain constant for future year analysis. **Appendix D** contains the historic traffic data and output from the KYTC Traffic forecasting spreadsheet. 2023 No Build and 2033 No Build traffic volumes are summarized in **Figures 3 and 4**.

Figure 3: AM and PM 2023 No Build Traffic

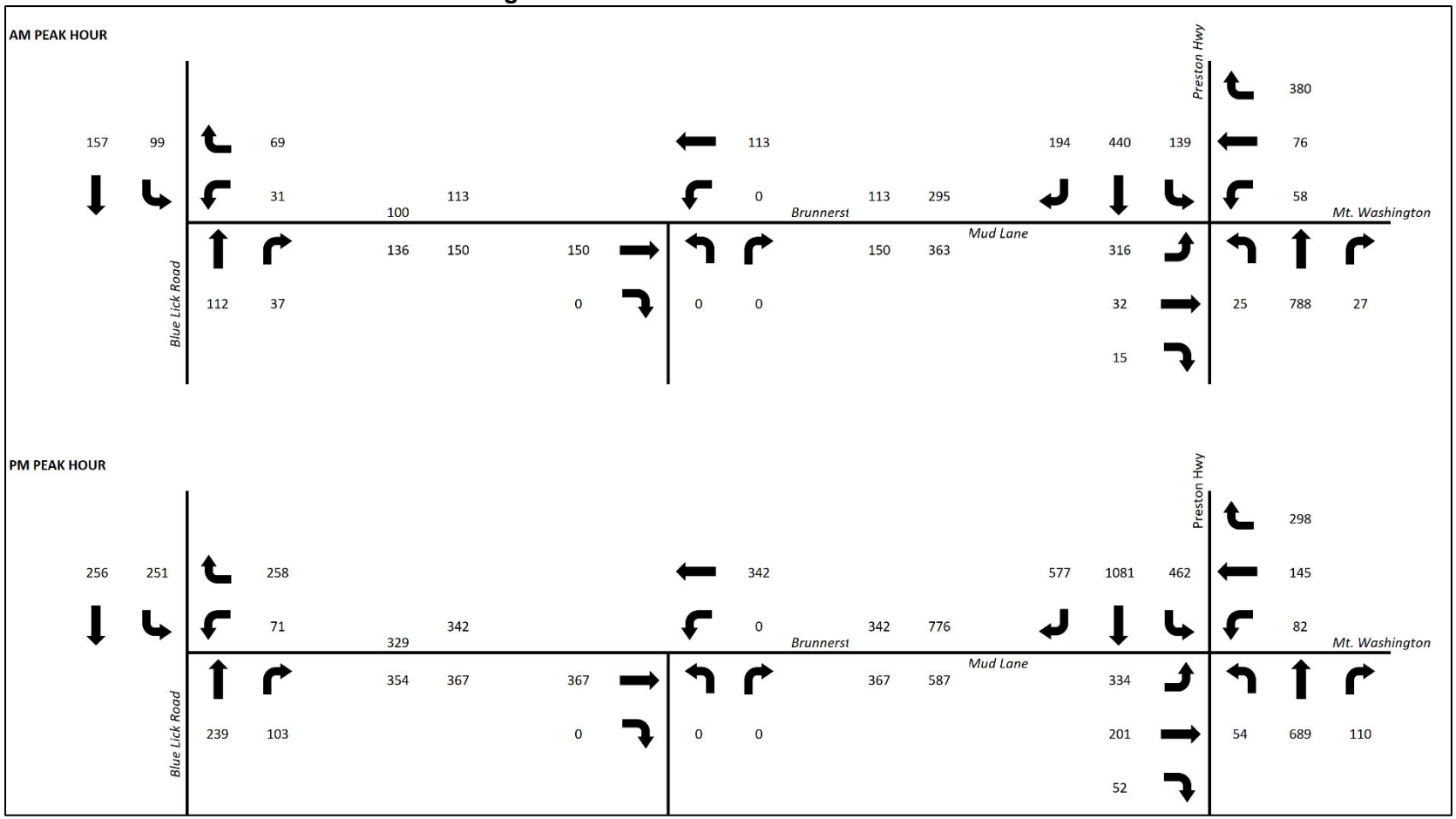
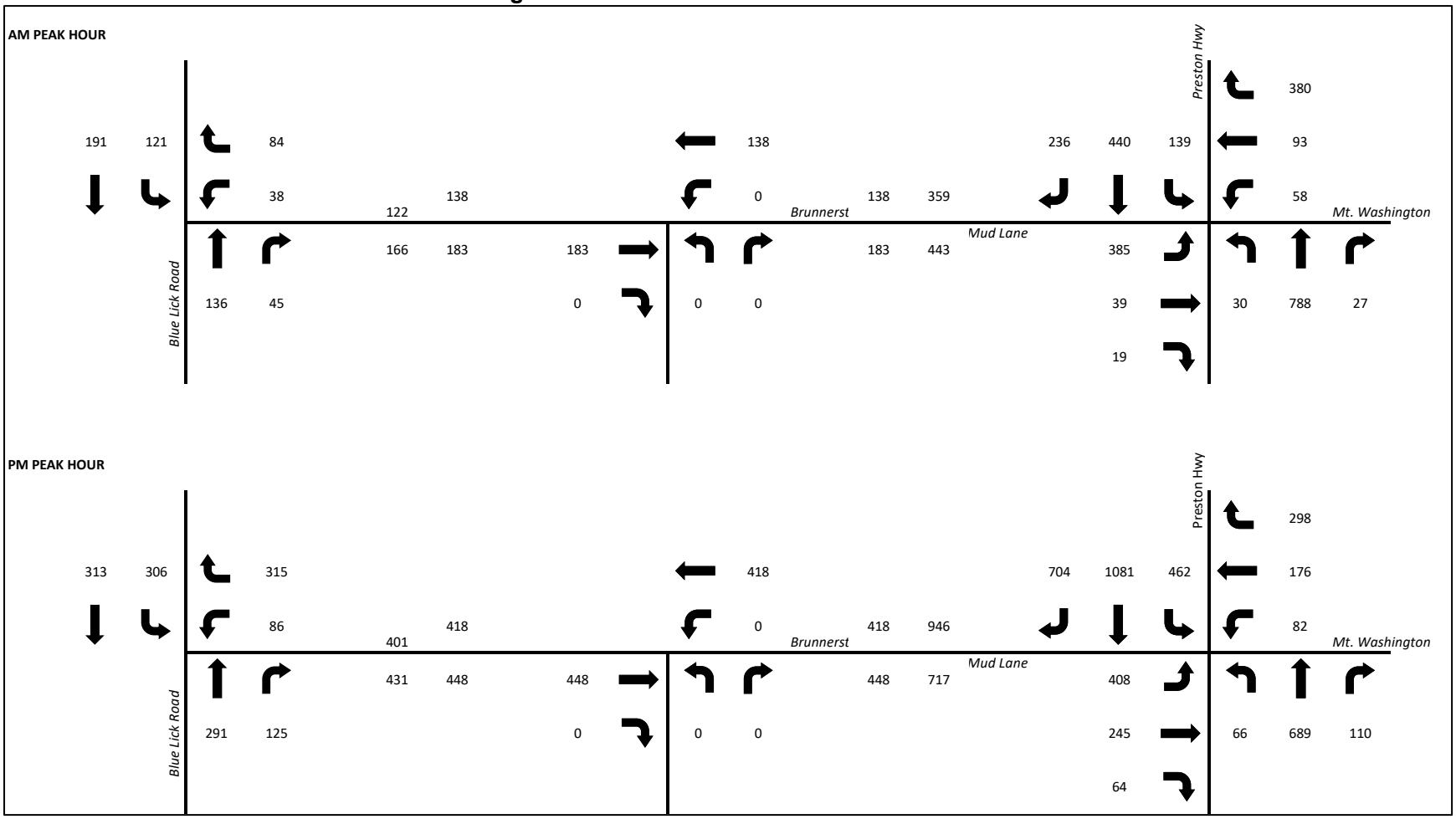


Figure 4: AM and PM 2033 No Build Traffic



TRIP DISTRIBUTION METHODOLOGY

Generated trips were distributed onto the roadway network based on recorded travel patterns on Mud Lane as identified through the traffic data collection detailed above. Existing traffic patterns indicated 80% of traffic was to/from the east (towards Preston Highway) during both the AM peak period, and 65 percent of traffic to/from the east during the PM peak period. Traffic destined to the west towards Blue Lick Road was assigned to the western access (Access Point 1) and the remaining traffic to the eastern access (Access Point 2) Trip distribution is shown in **Figure 5**. **Figures 6 and 7** show the final build traffic volumes for 2023 and 2033.

Figure 5: AM and PM Trip Distribution (entering / exiting)

Figure 6: AM and PM 2023 Build Traffic

Figure 7: AM and PM 2033 Build Traffic

CAPACITY ANALYSIS

Capacity analysis for the existing, no build and build scenarios was completed for the study intersection during the AM and PM peak hours using HCM methodologies as applied Synchro Capacity Software version 10. **Table 1** summarizes the LOS, and delay for the No Build and Build scenarios. Full capacity analysis output is provided in **Appendix E**.

Table 1: Capacity Analysis Summary (Opening Year 2023)

Intersection/Movement	AM Peak				PM Peak			
	No Build		Build		No Build		Build	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Mud Lane at Blue Lick Road								
Westbound	B	11.1	B	11.3	E	44	E	48.5
Southbound (Left Turn)	A	3.4	A	3.5	A	5.7	A	5.8
Mud Lane at Access 1								
Northbound	-	-	B	10.0	-	-	B	14.7
Westbound (Left Turn)	-	-	A	0.0	-	-	A	0
Mud Lane at Access 2								
Northbound	-	-	A	9.3	-	-	B	10.7
Westbound (Left Turn)	-	-	A	1.3	-	-	A	1.2
Mud Lane at Preston Highway								
Intersection	**D**	**39.8**	**D**	**41.7**	**D**	**53.9**	**E**	**55.7**
Eastbound	E	61.5	E	62.3	F	87.5	F	89
Westbound	E	58.3	E	59.1	E	71.3	E	73.9
Northbound	C	31.6	C	34.0	E	58.0	E	59.3
Southbound	C	26.3	C	27.4	D	38.7	D	40.3

Table 2: Capacity Analysis Summary (Design Year 2033)

Intersection/Movement	AM Peak				PM Peak			
	No Build		Build		No Build		Build	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Mud Lane at Blue Lick Road								
Westbound	B	12.2	B	12.5	F	214.5	F	238.4
Southbound (Left Turn)	A	3.6	A	3.6	A	6.6	A	6.7
Mud Lane at Access 1								
Northbound	-	-	B	10.4	-	-	C	17.1
Westbound (Left Turn)	-	-	A	0.0	-	-	A	0
Mud Lane at Access 2								
Northbound	-	-	A	9.5	-	-	B	11.3
Westbound (Left Turn)	-	-	A	1.1	-	-	A	1.1
Mud Lane at Preston Highway								
Intersection	**D**	**39**	**D**	**45.1**	**E**	**62.7**	**E**	**65.3**
Eastbound	E	66.6	E	63.8	F	92.4	F	100.1
Westbound	D	53.8	E	61.0	E	79.7	F	81.1
Northbound	C	29.4	D	38.7	E	70.3	E	73.5
Southbound	C	24.2	C	29.8	D	46.2	D	47

As can be seen from the capacity analysis, the proposed development and associated traffic have minimal impact on operations at the adjacent access points increasing average delay minimally. Within the scenarios evaluated, the most significant increases in delay are due to the high background growth rate assumed for Mud Lane Road. However, the proposed access points are shown to operate at acceptable levels of service (LOS A or B) with minimal delay.

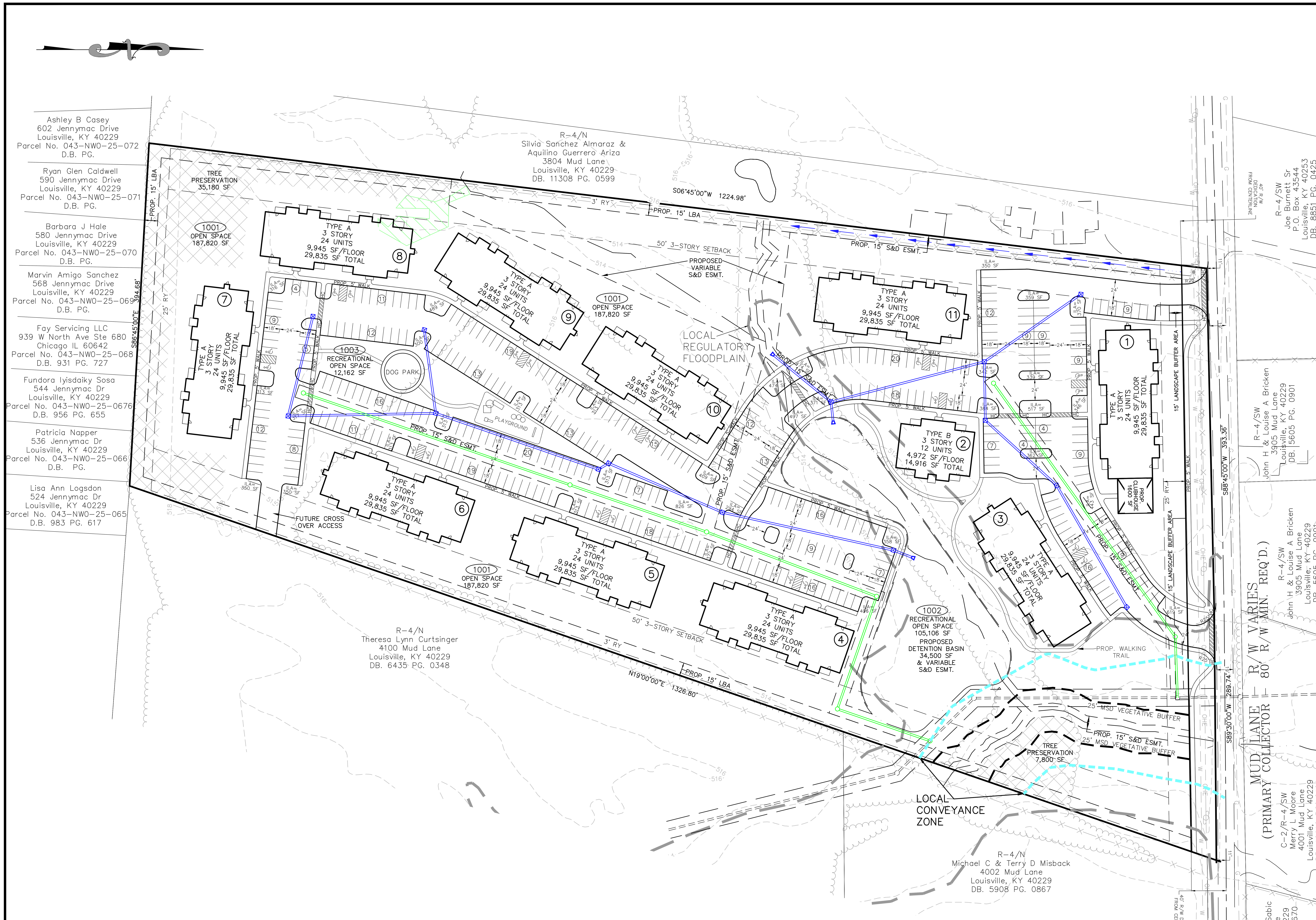
TURN LANE WARRANT ANALYSIS

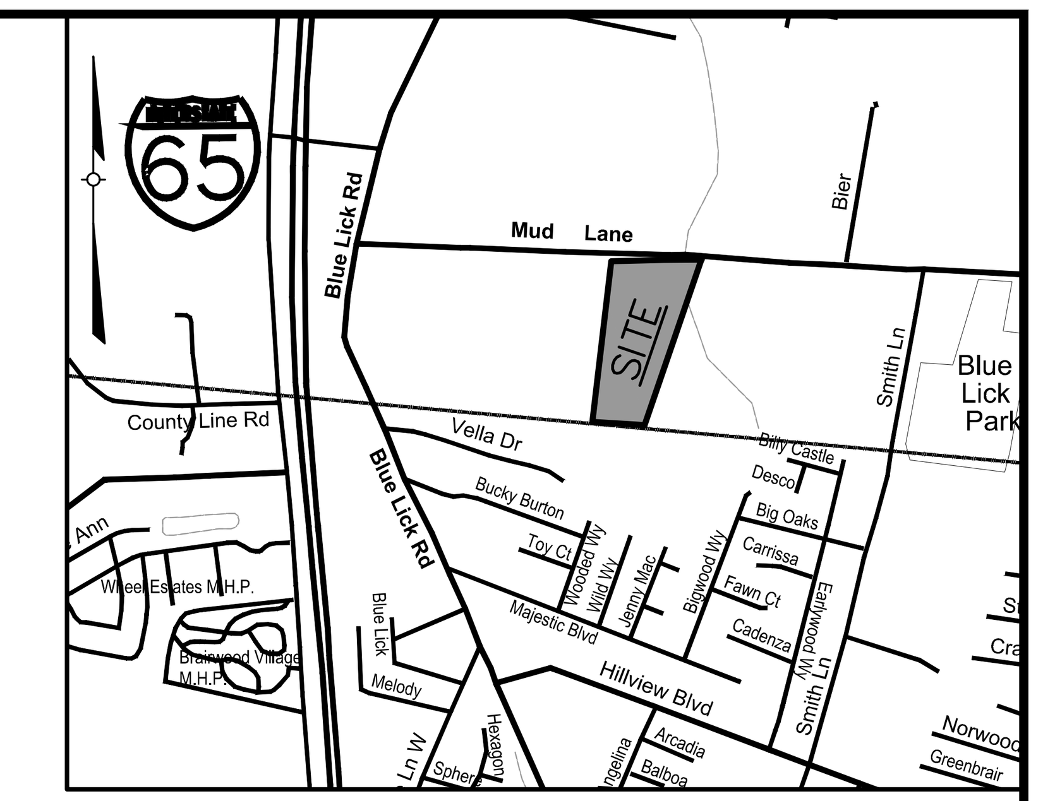
Auxiliary turn lane warrant analysis was conducted in accordance with KYTC Auxiliary Turn Lane policy, as applied by the Warrant Calcs Interactive excel spreadsheet provided on the KYTC Division of Design website. Based on this analysis, neither a left nor right turn lane is warranted at either access points; however it is noted that the left turn lane warrant is close to meeting warrants during the PM peak period of the design year. Output from the warrant analysis is provided in **Appendix F**.

RECOMMENDATIONS

No additional improvements beyond the proposed access improvements have been identified at this time.

APPENDIX A: DEVELOPMENT PLAN





LOCATION MAP

NOT TO SCALE

PROJECT DATA

TOTAL SITE AREA	= 15.26± Ac. (664,909 SF)
R/W DEDICATION AREA	= 0.47± Ac. (20,265 SF)
NET SITE AREA	= 14.79± Ac. (644,644 SF)
EXISTING ZONING	= R-4
PROPOSED ZONING	= R-6
FORM DISTRICT	= NEIGHBORHOOD
EXISTING USE	= UNDEVELOPED
PROPOSED USE	= MULTI-FAMILY RESIDENTIAL
NO. OF UNITS	= 252 UNITS
BUILDING HEIGHT	= 3 STORY (35' MAX. ALLOWED)
BUILDING AREA	= 313,266 SF
NET DENSITY	= 17.04 DU/Ac. (17.42 DU/Ac. MAX. ALLOWED)
GROSS DENSITY	= 16.51 DU/Ac. (17.42 DU/Ac. MAX. ALLOWED)

PARKING REQUIRED	MIN.	MAX.
1 SP/UNIT MIN.	= 252 SP	
2 SP/UNIT MAX.	=	504 SP

TOTAL PARKING PROVIDED	= 420 SPACES (22 HC SP INCLUDED)
OPEN SPACE REQUIRED	= 96,697 SF
OPEN SPACE PROVIDED	= 236,332 SF
RECREATIONAL OPEN SPACE REQUIRED	= 48,349 SF (50% OF REQUIRED)
RECREATIONAL OPEN SPACE PROVIDED	= 48,349 SF
TOTAL VEHICULAR USE AREA	= 144,158 SF
INTERIOR LANDSCAPE AREA REQUIRED	= 10,812 SF
INTERIOR LANDSCAPE AREA PROVIDED	= 13,315 SF
EXISTING IMPERVIOUS	= 0 SF
PROPOSED IMPERVIOUS	= 264,055 SF

GENERAL NOTES:

1. Parking areas and drive lanes to be a hard and durable surface.
2. An encroachment permit and bond will be required for all work done in the right-of-way.
3. No increase in drainage run off to state roadways.
4. There shall be no commercial signs in the right-of-way.
5. Site lighting shall not shine in the eyes of drivers. If it does it shall be re-aimed, shielded, or turned off.
6. Construction fencing shall be erected prior to any construction or grading activities preventing compaction of root systems of trees to be preserved. The fencing shall enclose the area beneath the drip line of the tree canopy and shall remain in place. No parking, material storage, or construction activities shall be permitted within the fenced area.
7. Mitigation measures for dust control shall be in place during construction to prevent fugitive particulate emissions from reaching existing roads and neighboring properties.
8. Compatible utilities shall be placed in a common trench unless otherwise required by appropriate agencies.
9. Wheel stops or curbing, at least six inches high and wide, shall be provided to prevent vehicles from overhanging abutting sidewalks, properties or public right-of-ways, to protect landscaped areas and adjacent properties. Wheel stops shall be located at least (3) feet from any adjacent wall, fence, property line, woody vegetation, walkway or structure.
10. Benchmark and topographical information shown hereon were derived from Lojic data. Boundary information was taken from deeds.
11. A site visit was conducted by Derek Triplett RLA on 3/17/22 and there was no evidence of karst features.
12. Street trees to be provided in all adjacent rights-of-way. Final location and type to be shown on the approved landscape plan.
13. Construction plans, bond, and permit are required by Metro Public Works prior to construction approval.

MSD NOTES:

1. All retail shops must have individual connections per MSD's fats, oils and grease policy.
2. Construction plans and documents shall comply with Louisville and Jefferson County Metropolitan Sewer District Design Manual and Standard Specifications and other local, state and federal ordinances.
3. Sanitary sewer service will be provided by lateral extension and subject to applicable fees. A Downstream Facilities Capacity request will be submitted to MSD.
4. No portion of the site is within the 100 year flood plain per FIRM Map No. 21111 C 0127 E dated December 5, 2006.
5. Drainage pattern depicted by arrows (⟹) is for conceptual purposes.
6. If the site has thru drainage an easement plat will be required prior to MSD granting construction plan approval.
7. On-site detention will be provided. Post-developed peak flows will be limited to pre-developed peak flows for 2,10,25, and 100 year storms or to the capacity of the down-stream system, whichever is more restrictive.
8. Any required fill in the floodplain shall be compensated on site at a ratio of 1.5:1.
9. All drainage, EPSC and Water Quality practices shown on this plan are for conceptual purposes only. Final design of these elements will be determined prior to construction plan approval and shall comply with all MS4 and MSD Design Manual requirements.
10. The final design of this project must meet all MS4 water quality regulations established by MSD. Site layout may change at the design phase due to proper sizing of Green Best Mgmt. Practices.
11. MSD drainage bond required prior to construction plan approval.
12. Run off volume impact fee required, calculation based on RFF x 1.5.
13. All rooftop drainage shall be directed to drain internal to the site.
14. Site may be subject to ACOE approval prior to MSD construction plan approval

DETENTION BASIN CALCULATIONS

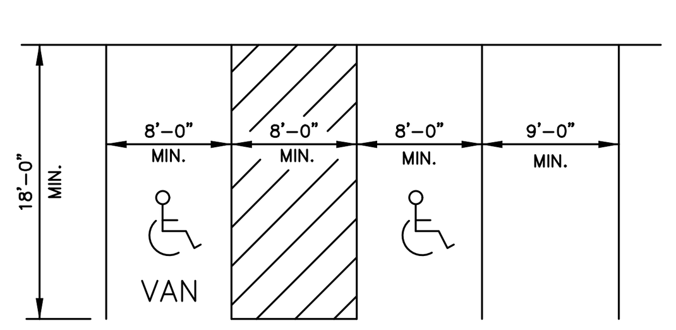
X = Δ CRA/12
ΔC = 0.53-0.23=0.30
A = 15.26 ACRES
R = 2.3 INCHES
X = (.30)(15.26)(2.3)/12 = .88 AC.-FT
REQUIRED X = 38,221 CU.FT.

PROVIDED BASIN = 34,500 SQ.FT.

TOTAL = 34,500 SQ.FT. @ APPROX. 1.5 FT. DEPTH
= 43,125 CU.FT. > 38,221 CU.FT.

LEGEND

=PROPOSED TREE PRESERVATION AREA
=PROPOSED STORM SEWER, CATCH BASIN
=PROPOSED SEWER AND MANHOLE
=PROPOSED DRAINAGE SWALE



24' MINIMUM WIDTH OF AISLEWAY

TYPICAL PARKING SPACE LAYOUT
NO SCALE

GRAPHIC SCALE
60 0 30 60 120 240
(IN FEET)
1 inch = 60 ft.

TREE CANOPY CALCULATIONS

TOTAL SITE AREA	=	664,909 S.F.
EXISTING TREE CANOPY AREA	=	33% (221,208 S.F.)
EXISTING TREE CANOPY TO BE REQUIRED	=	0% (0 S.F.)
EXISTING TREE CANOPY TO BE PRESERVED	=	6% (42,980 S.F.)
TOTAL TREE CANOPY AREA REQUIRED	=	35% (232,718 S.F.)
TOTAL TREE CANOPY AREA TO BE PROVIDED	=	35% (232,718 S.F.)

SITE ADDRESS:
3902 MUD LANE
LOUISVILLE, KY 40229
TAX BLOCK 0090, LOT 0040
D.B. 6834, PG. 0568

COUNCIL DISTRICT - 13
FIRE PROTECTION DISTRICT - OKOLONA
MUNICIPALITY - LOUISVILLE

CASE #22-ZONE-0079
WM# 12413

REVISIONS

NO.	DATE	DESCRIPTION	BY
1	8/1/822	REVISED PER AGENCY COMMENTS	JH

SURVEYOR'S SEAL

ENGINEER'S SEAL

PROJECT DATA
FILE NAME: 21234-DDDP
DATE: 2/7/22
SCALE: AS SHOWN
DRAWN BY: JH
CHECKED BY: TB

LD&D
LAND DESIGN & DEVELOPMENT, INC.
ENGINEERING • LAND SURVEYING • LANDSCAPE ARCHITECTURE

DETAILED DISTRICT DEVELOPMENT PLAN

HESTER
3902 MUD LANE APARTMENTS

OWNER/DEVELOPER
HUBERT L HESTER TRUST
3304 BROWNSBORO VISTA DR
LOUISVILLE, KY 40242

JOB NO. 21234

SHEET 1 OF 1

APPENDIX B: TRAFFIC DATA

Cummins Consulting Services, LLC
swcummins@ccsdata.com 859-361-2589
"2022 ... Data Collection simplified"

Sunny
Schools in Session

File Name : 2_Blue_Lick_Road_at_Mud_Lane_09-29-2022
Site Code : Thursday
Start Date : 9/29/2022
Page No : 1

Groups Printed- Cars - Buses - Trucks - Bicycles on Crosswalk - Pedestrians

	Blue Lick Road From North				Mud Lane From East				Blue Lick Road From South				
Start Time	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	18	30	0	48	7	9	0	16	26	5	0	31	95
07:15 AM	30	38	0	68	8	14	0	22	29	12	0	41	131
07:30 AM	27	41	0	68	8	19	0	27	22	7	0	29	124
07:45 AM	24	39	0	63	8	18	1	27	30	10	0	40	130
Total	99	148	0	247	31	60	1	92	107	34	0	141	480
08:00 AM	16	35	0	51	6	16	0	22	28	8	0	36	109
08:15 AM	17	30	0	47	8	17	0	25	18	3	0	21	93
08:30 AM	25	29	0	54	11	13	0	24	24	14	0	38	116
08:45 AM	27	21	0	48	16	10	0	26	27	10	0	37	111
Total	85	115	0	200	41	56	0	97	97	35	0	132	429
04:00 PM	46	49	0	95	14	53	0	67	34	28	0	62	224
04:15 PM	44	56	0	100	14	43	0	57	55	24	0	79	236
04:30 PM	58	53	0	111	13	50	0	63	68	16	0	84	258
04:45 PM	61	63	0	124	21	62	0	83	55	29	0	84	291
Total	209	221	0	430	62	208	0	270	212	97	0	309	1009
05:00 PM	65	71	0	136	20	74	0	94	59	30	0	89	319
05:15 PM	61	63	0	124	15	66	0	81	55	25	0	80	285
05:30 PM	46	49	0	95	13	71	0	84	27	25	0	52	231
05:45 PM	51	59	0	110	20	61	0	81	32	21	0	53	244
Total	223	242	0	465	68	272	0	340	173	101	0	274	1079
Grand Total	616	726	0	1342	202	596	1	799	589	267	0	856	2997
Apprch %	45.9	54.1	0		25.3	74.6	0.1		68.8	31.2	0		
Total %	20.6	24.2	0	44.8	6.7	19.9	0	26.7	19.7	8.9	0	28.6	
Cars	607	713	0	1320	196	587	0	783	578	263	0	841	2944
% Cars	98.5	98.2	0	98.4	97	98.5	0	98	98.1	98.5	0	98.2	98.2
Buses	1	3	0	4	0	1	0	1	0	1	0	1	6
% Buses	0.2	0.4	0	0.3	0	0.2	0	0.1	0	0.4	0	0.1	0.2
Trucks	8	10	0	18	6	8	0	14	11	3	0	14	46
% Trucks	1.3	1.4	0	1.3	3	1.3	0	1.8	1.9	1.1	0	1.6	1.5
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	1	1	0	0	0	0	1
% Pedestrians	0	0	0	0	0	0	100	0.1	0	0	0	0	0

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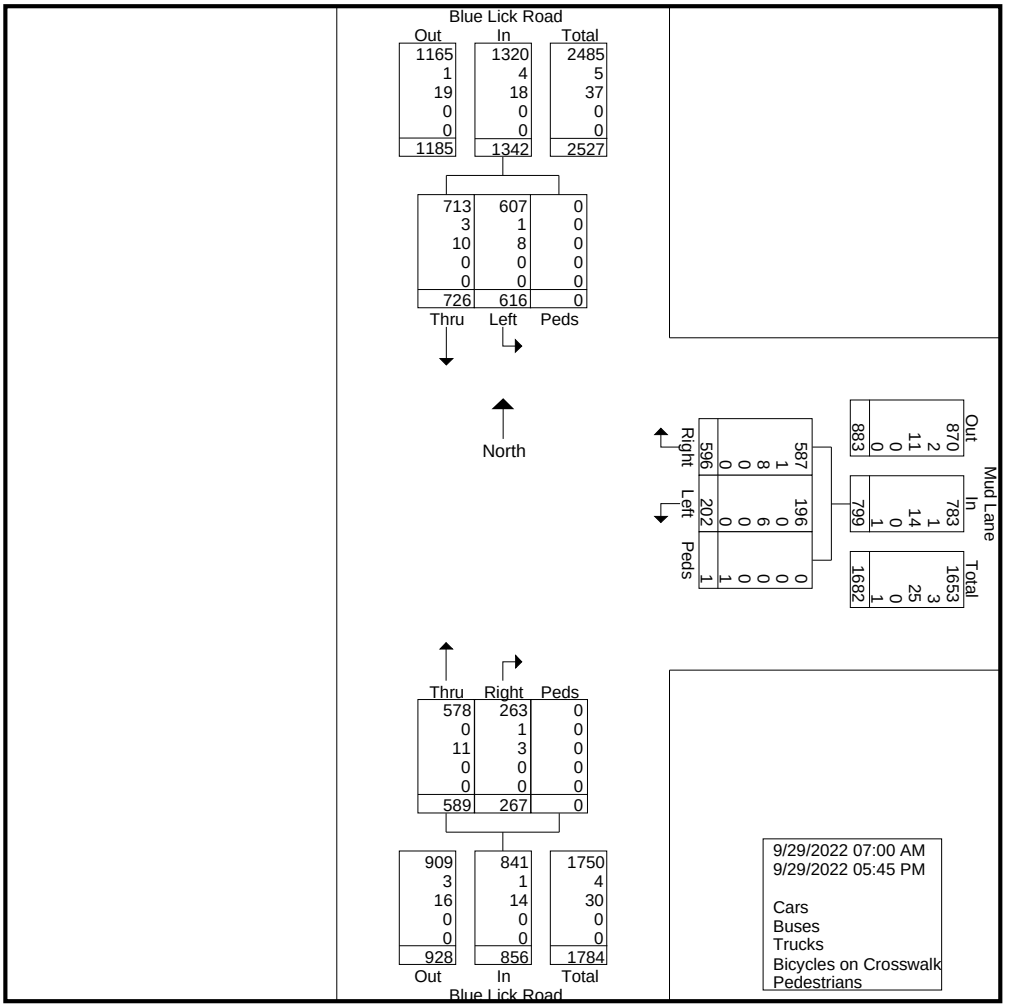
"2022 ... Data Collection simplified"

File Name : 2_Blue_Lick_Road_at_Mud_Lane_09-29-2022
Site Code : Thursday
Start Date : 9/29/2022
Page No : 2



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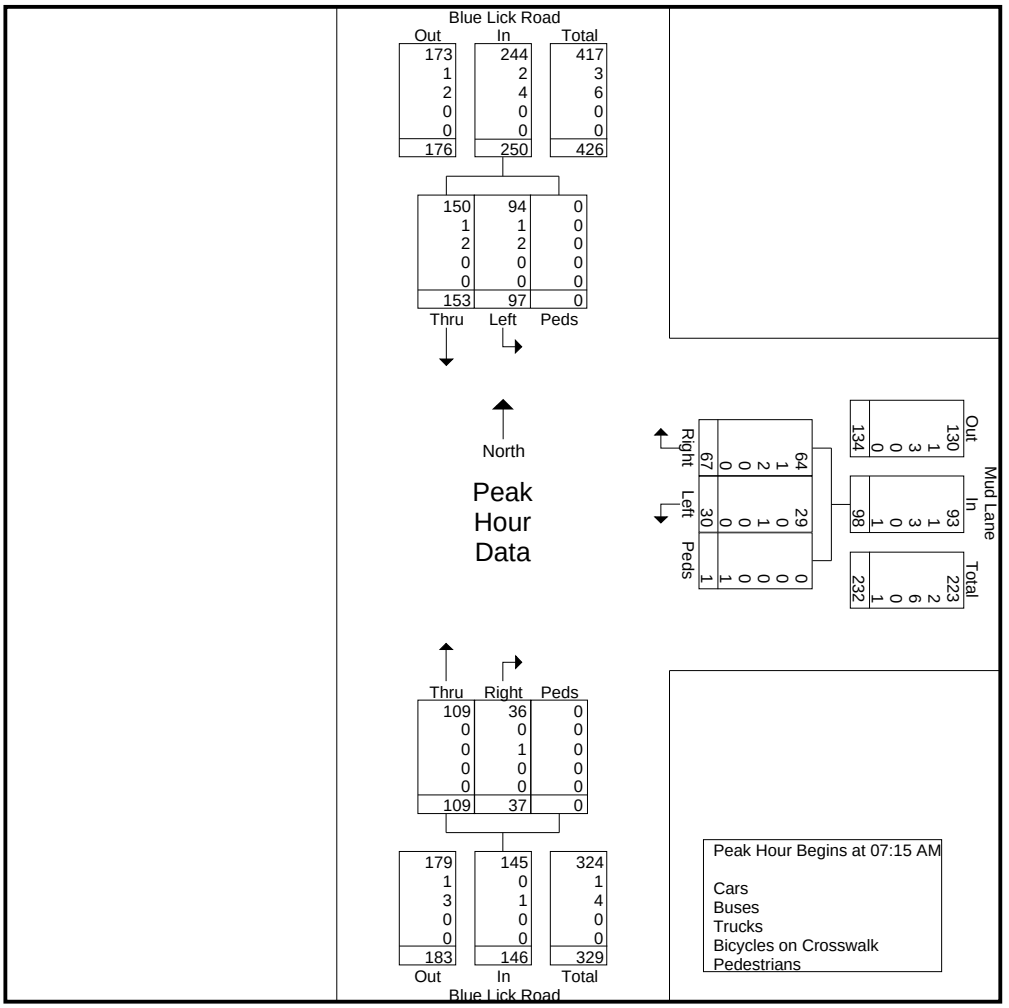
Page No : 3

	Blue Lick Road From North				Mud Lane From East				Blue Lick Road From South				
Start Time	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 12:30 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	**30**	38	0	**68**	**8**	14	0	22	29	**12**	0	**41**	**131**
07:30 AM	27	**41**	0	68	8	**19**	0	**27**	22	7	0	29	124
07:45 AM	24	39	0	63	8	18	**1**	27	**30**	10	0	40	130
08:00 AM	16	35	0	51	6	16	0	22	28	8	0	36	109
Total Volume	97	153	0	250	30	67	1	98	109	37	0	146	494
% App. Total	38.8	61.2	0		30.6	68.4	1		74.7	25.3	0		
PHF	.808	.933	.000	.919	.938	.882	.250	.907	.908	.771	.000	.890	.943
Cars	94	150	0	244	29	64	0	93	109	36	0	145	482
% Cars	96.9	98.0	0	97.6	96.7	95.5	0	94.9	100	97.3	0	99.3	97.6
Buses	1	1	0	2	0	1	0	1	0	0	0	0	3
% Buses	1.0	0.7	0	0.8	0	1.5	0	1.0	0	0	0	0	0.6
Trucks	2	2	0	4	1	2	0	3	0	1	0	1	8
% Trucks	2.1	1.3	0	1.6	3.3	3.0	0	3.1	0	2.7	0	0.7	1.6
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	1	1	0	0	0	0	1
% Pedestrians	0	0	0	0	0	0	100	1.0	0	0	0	0	0.2



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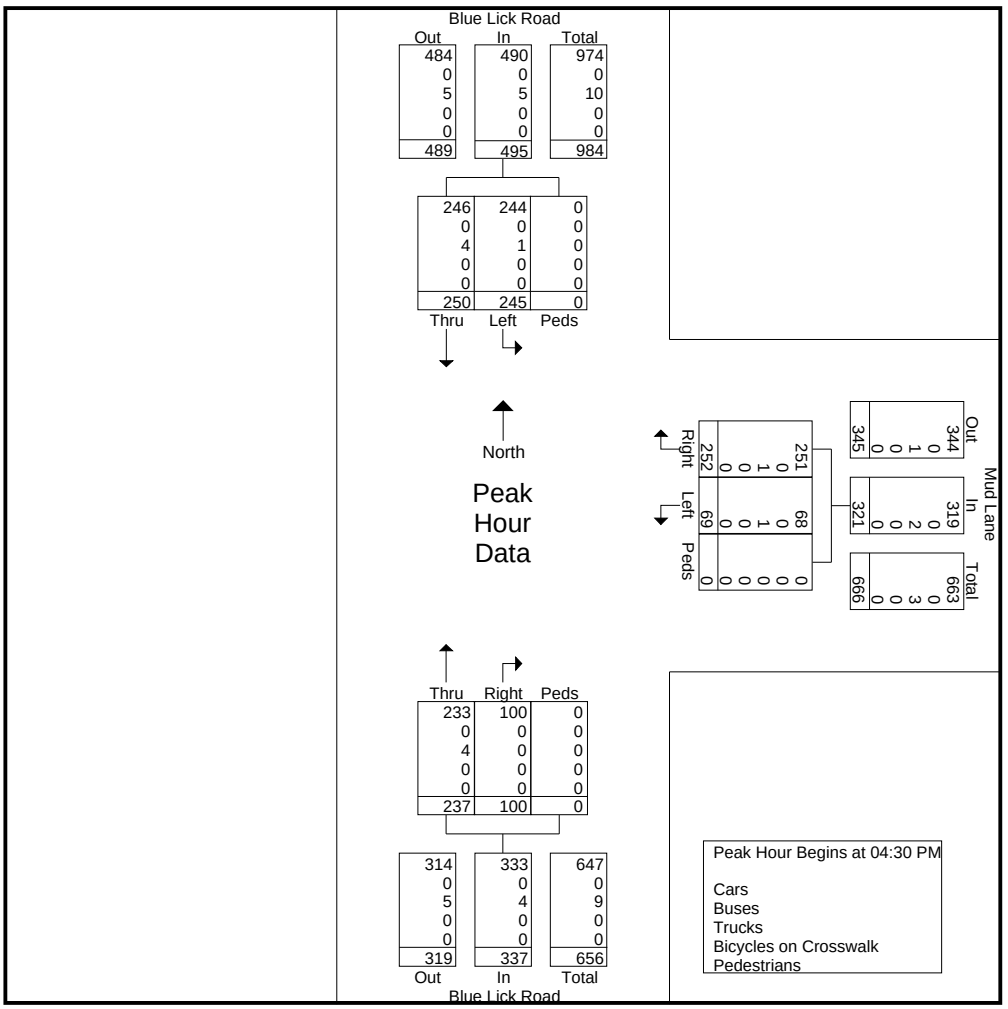
Site Code : Thursday
Start Date : 9/29/2022
Page No : 4

	Blue Lick Road From North				Mud Lane From East				Blue Lick Road From South				
Start Time	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:45 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	58	53	0	111	13	50	0	63	**68**	16	0	84	258
04:45 PM	61	63	0	124	**21**	62	0	83	55	29	0	84	291
05:00 PM	**65**	**71**	0	**136**	20	**74**	0	**94**	59	**30**	0	**89**	**319**
05:15 PM	61	63	0	124	15	66	0	81	55	25	0	80	285
Total Volume	245	250	0	495	69	252	0	321	237	100	0	337	1153
% App. Total	49.5	50.5	0		21.5	78.5	0		70.3	29.7	0		
PHF	.942	.880	.000	.910	.821	.851	.000	.854	.871	.833	.000	.947	.904
Cars	244	246	0	490	68	251	0	319	233	100	0	333	1142
% Cars	99.6	98.4	0	99.0	98.6	99.6	0	99.4	98.3	100	0	98.8	99.0
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Trucks	1	4	0	5	1	1	0	2	4	0	0	4	11
% Trucks	0.4	1.6	0	1.0	1.4	0.4	0	0.6	1.7	0	0	1.2	1.0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0



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Sunny
Schools in Session

File Name : 1_KY61_Preston_Hwy_at_Mud_Lane_09-29-2022
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Groups Printed- Cars - Buses - Trucks - Bicycles on Road - Peds

	KY61 - Preston Hwy From North					Mt Washington Road From East					KY61 - Preston Hwy From South					Mud Lane From West					
Start Time	**Left**	**Thru**	**Right**	**Peds**	**App. Total**	**Left**	**Thru**	**Right**	**Peds**	**App. Total**	**Left**	**Thru**	**Right**	**Peds**	**App. Total**	**Left**	**Thru**	**Right**	**Peds**	**App. Total**	**Int. Total**
07:00 AM	13	72	32	0	117	12	10	89	0	111	5	205	10	0	220	55	7	2	0	64	512
07:15 AM	33	98	41	0	172	8	13	104	0	125	8	238	9	0	255	91	7	1	0	99	651
07:30 AM	28	92	51	0	171	20	19	114	0	153	5	208	6	0	219	80	11	11	0	102	645
07:45 AM	39	121	53	0	213	10	15	76	0	101	9	212	8	0	229	58	6	1	0	65	608
Total	113	383	177	0	673	50	57	383	0	490	27	863	33	0	923	284	31	15	0	330	2416
08:00 AM	39	129	44	0	212	20	27	86	0	133	2	153	8	0	163	79	7	2	0	88	596
08:15 AM	24	122	57	0	203	19	21	79	0	119	9	172	12	0	193	50	9	13	0	72	587
08:30 AM	32	121	59	0	212	12	17	80	0	109	9	184	11	0	204	75	8	4	0	87	612
08:45 AM	26	128	46	0	200	15	14	74	0	103	15	164	12	0	191	65	14	7	0	86	580
Total	121	500	206	0	827	66	79	319	0	464	35	673	43	0	751	269	38	26	0	333	2375
04:00 PM	95	265	122	1	483	17	26	81	0	124	12	170	25	0	207	73	39	10	0	122	936
04:15 PM	88	283	125	0	496	26	38	81	0	145	18	195	15	0	228	94	35	12	0	141	1010
04:30 PM	80	236	120	0	436	23	38	69	0	130	13	183	23	0	219	81	44	14	0	139	924
04:45 PM	122	295	139	0	556	15	38	54	0	107	15	183	30	0	228	74	38	14	0	126	1017
Total	385	1079	506	1	1971	81	140	285	0	506	58	731	93	0	882	322	156	50	0	528	3887
05:00 PM	114	246	121	0	481	24	40	94	0	158	14	158	29	0	201	84	56	13	0	153	993
05:15 PM	107	286	149	0	542	25	21	71	0	117	15	188	23	1	227	78	46	11	0	135	1021
05:30 PM	119	254	154	0	527	18	42	79	0	139	11	168	29	0	208	90	56	13	0	159	1033
05:45 PM	96	222	130	0	448	14	37	65	0	116	12	170	35	1	218	92	60	10	0	162	944
Total	436	1008	554	0	1998	81	140	309	0	530	52	684	116	2	854	344	218	47	0	609	3991
Grand Total	1055	2970	1443	1	5469	278	416	1296	0	1990	172	2951	285	2	3410	1219	443	138	0	1800	12669
Apprch %	19.3	54.3	26.4	0		14	20.9	65.1	0		5	86.5	8.4	0.1		67.7	24.6	7.7	0		
Total %	8.3	23.4	11.4	0	43.2	2.2	3.3	10.2	0	15.7	1.4	23.3	2.2	0	26.9	9.6	3.5	1.1	0	14.2	
Cars	1044	2906	1414	0	5364	269	412	1278	0	1959	170	2879	276	2	3327	1203	436	137	0	1776	12426
% Cars	99	97.8	98	0	98.1	96.8	99	98.6	0	98.4	98.8	97.6	96.8	100	97.6	98.7	98.4	99.3	0	98.7	98.1
Buses	2	2	0	0	4	0	1	5	0	6	0	2	0	0	2	2	1	0	0	3	15
% Buses	0.2	0.1	0	0	0.1	0	0.2	0.4	0	0.3	0	0.1	0	0	0.1	0.2	0.2	0	0	0.2	0.1
Trucks	9	62	29	0	100	9	3	13	0	25	2	70	9	0	81	14	6	1	0	21	227
% Trucks	0.9	2.1	2	0	1.8	3.2	0.7	1	0	1.3	1.2	2.4	3.2	0	2.4	1.1	1.4	0.7	0	1.2	1.8
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peds	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Peds	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Site Code : Thursday
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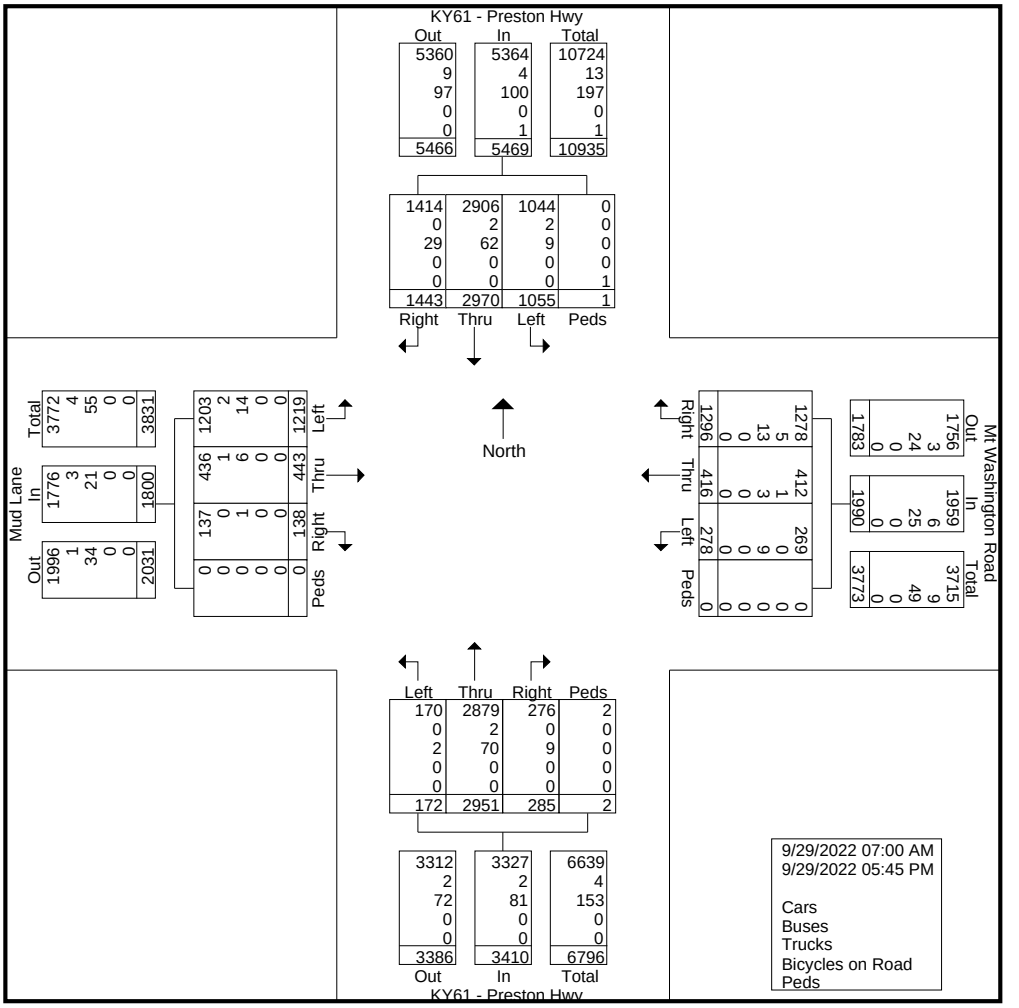

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"2022 ... Data Collection simplified"

File Name : 1_KY61_Preston_Hwy_at_Mud_Lane_09-29-2022
Site Code : Thursday
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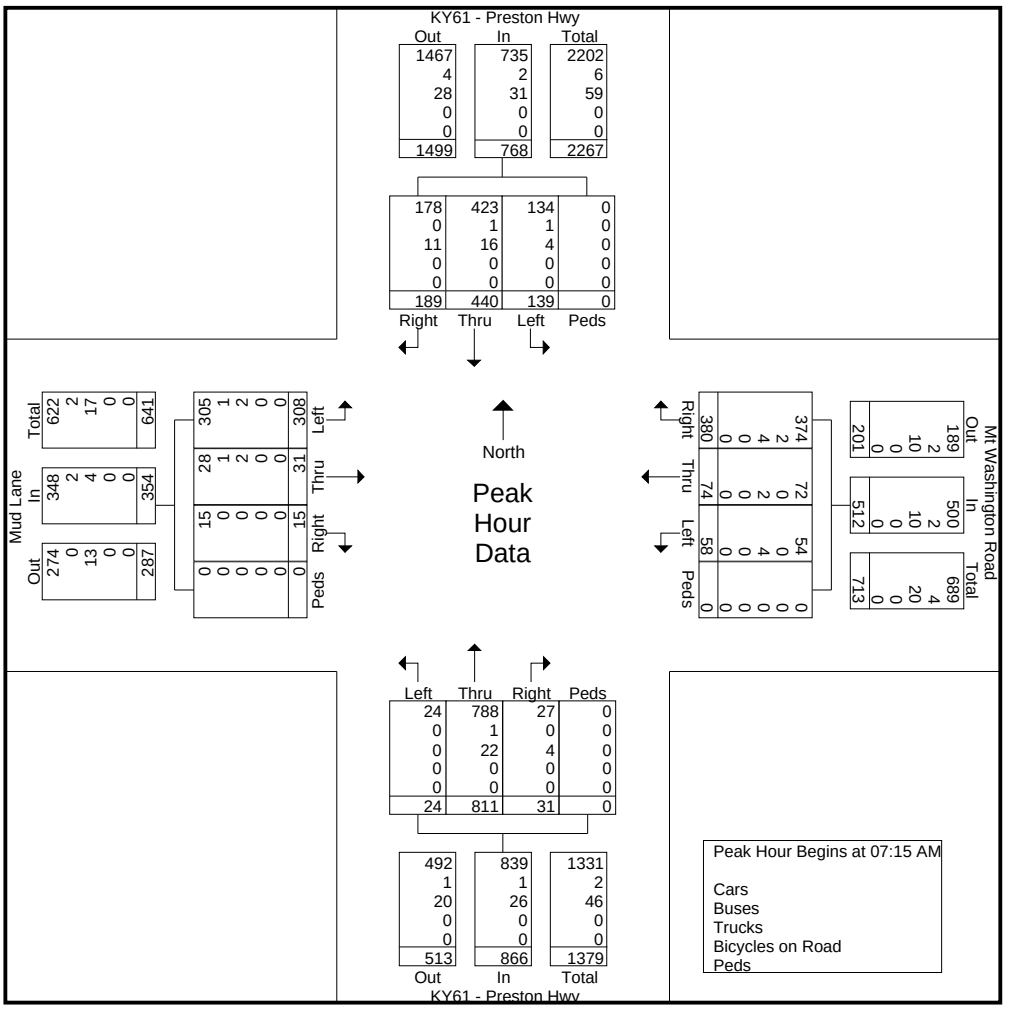
	KY61 - Preston Hwy From North					Mt Washington Road From East					KY61 - Preston Hwy From South					Mud Lane From West					
Start Time	**Left**	**Thru**	**Right**	**Peds**	**App. Total**	**Left**	**Thru**	**Right**	**Peds**	**App. Total**	**Left**	**Thru**	**Right**	**Peds**	**App. Total**	**Left**	**Thru**	**Right**	**Peds**	**App. Total**	**Int. Total**
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	33	98	41	0	172	8	13	104	0	125	8	**238**	**9**	0	**255**	**91**	7	1	0	99	**651**
07:30 AM	28	92	51	0	171	**20**	19	**114**	0	**153**	5	208	6	0	219	80	**11**	**11**	0	**102**	645
07:45 AM	**39**	121	**53**	0	**213**	10	15	76	0	101	**9**	212	8	0	229	58	6	1	0	65	608
08:00 AM	39	**129**	44	0	212	20	**27**	86	0	133	2	153	8	0	163	79	7	2	0	88	596
Total Volume	139	440	189	0	768	58	74	380	0	512	24	811	31	0	866	308	31	15	0	354	2500
% App. Total	18.1	57.3	24.6	0		11.3	14.5	74.2	0		2.8	93.6	3.6	0		87	8.8	4.2	0		
PHF	.891	.853	.892	.000	.901	.725	.685	.833	.000	.837	.667	.852	.861	.000	.849	.846	.705	.341	.000	.868	.960
Cars	134	423	178	0	735	54	72	374	0	500	24	788	27	0	839	305	28	15	0	348	2422
% Cars	96.4	96.1	94.2	0	95.7	93.1	97.3	98.4	0	97.7	100	97.2	87.1	0	96.9	99.0	90.3	100	0	98.3	96.9
Buses	1	1	0	0	2	0	0	2	0	2	0	1	0	0	1	1	1	0	0	2	7
% Buses	0.7	0.2	0	0	0.3	0	0	0.5	0	0.4	0	0.1	0	0	0.1	0.3	3.2	0	0	0.6	0.3
Trucks	4	16	11	0	31	4	2	4	0	10	0	22	4	0	26	2	2	0	0	4	71
% Trucks	2.9	3.6	5.8	0	4.0	6.9	2.7	1.1	0	2.0	0	2.7	12.9	0	3.0	0.6	6.5	0	0	1.1	2.8
Bicycles on Road																					
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



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File Name : 1_KY61_Preston_Hwy_at_Mud_Lane_09-29-2022
Site Code : Thursday
Start Date : 9/29/2022
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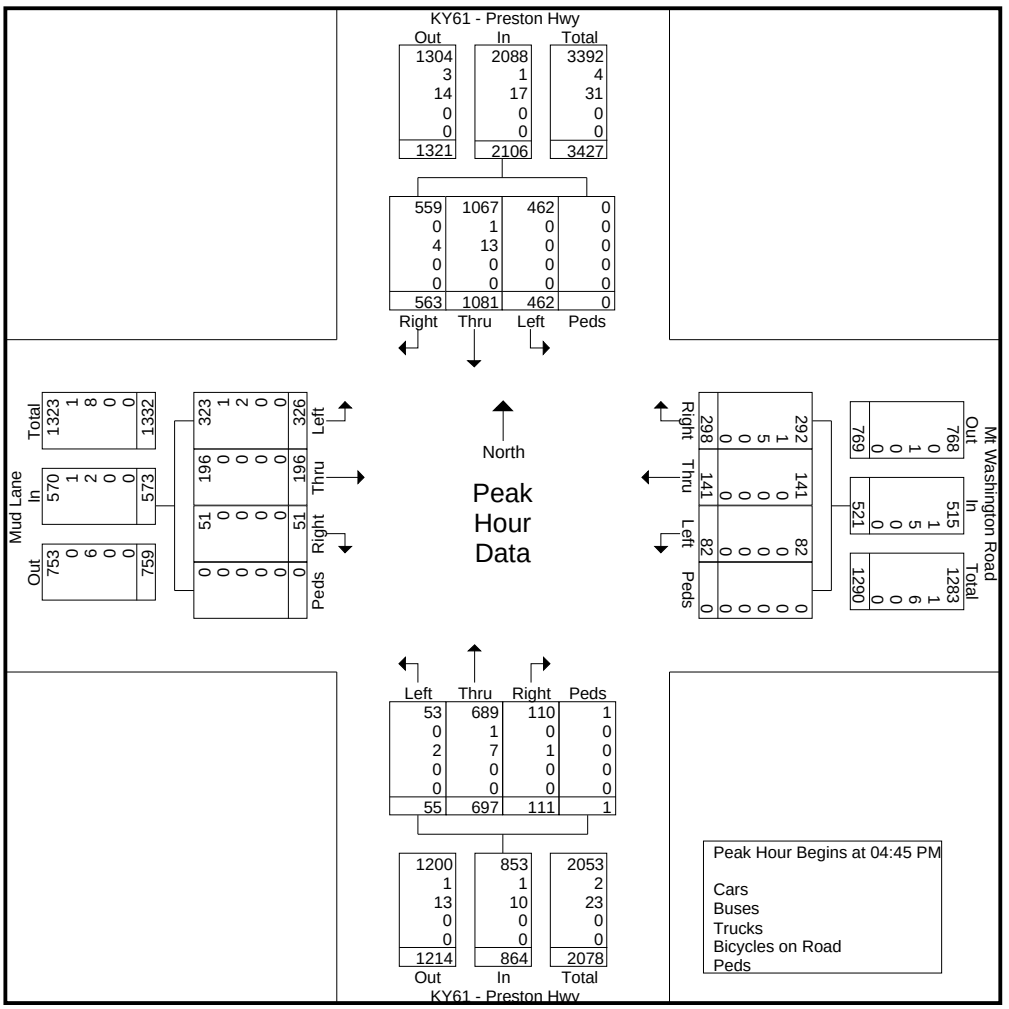
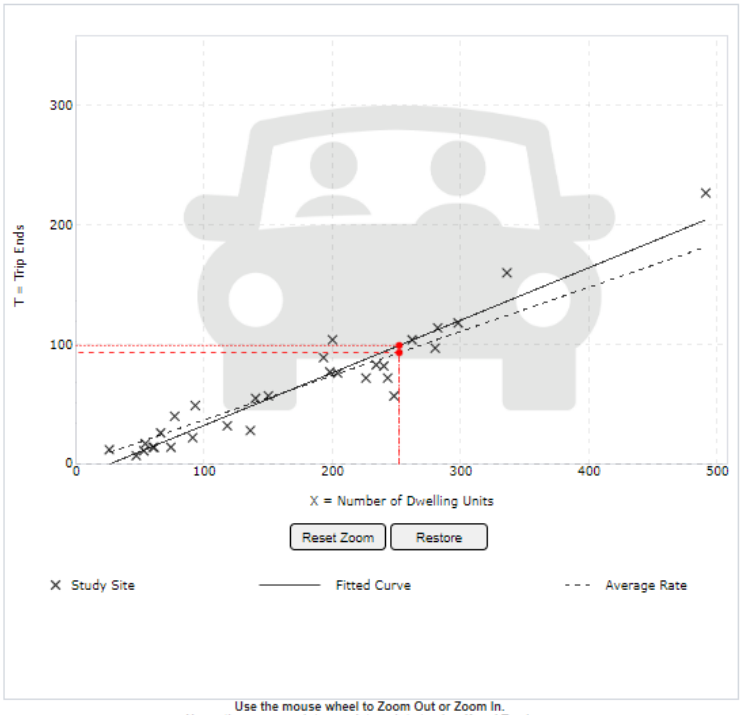
	KY61 - Preston Hwy From North					Mt Washington Road From East					KY61 - Preston Hwy From South					Mud Lane From West					
Start Time	**Left**	**Thru**	**Right**	**Peds**	**App. Total**	**Left**	**Thru**	**Right**	**Peds**	**App. Total**	**Left**	**Thru**	**Right**	**Peds**	**App. Total**	**Left**	**Thru**	**Right**	**Peds**	**App. Total**	**Int. Total**
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	**122**	**295**	139	0	**556**	15	38	54	0	107	**15**	183	**30**	0	**228**	74	38	**14**	0	126	1017
05:00 PM	114	246	121	0	481	24	40	**94**	0	**158**	14	158	29	0	201	84	**56**	13	0	153	993
05:15 PM	107	286	149	0	542	**25**	21	71	0	117	15	**188**	23	**1**	227	78	46	11	0	135	1021
05:30 PM	119	254	**154**	0	527	18	**42**	79	0	139	11	168	29	0	208	**90**	56	13	0	**159**	**1033**
Total Volume	462	1081	563	0	2106	82	141	298	0	521	55	697	111	1	864	326	196	51	0	573	4064
% App. Total	21.9	51.3	26.7	0		15.7	27.1	57.2	0		6.4	80.7	12.8	0.1		56.9	34.2	8.9	0		
PHF	.947	.916	.914	.000	.947	.820	.839	.793	.000	.824	.917	.927	.925	.250	.947	.906	.875	.911	.000	.901	.984
Cars	462	1067																			
% Cars	100	98.7	99.3	0	99.1	100	100	98.0	0	98.8	96.4	98.9	99.1	100	98.7	99.1	100	100	0	99.5	99.1
Buses	0	1	0	0	1	0	0	1	0	1	0	1	0	0	1	1	0	0	0	1	4
% Buses	0	0.1	0	0	0.0	0	0	0.3	0	0.2	0	0.1	0	0	0.1	0.3	0	0	0	0.2	0.1
Trucks	0	13	4	0	17	0	0	5	0	5	2	7	1	0	10	2	0	0	0	2	34
% Trucks	0	1.2	0.7	0	0.8	0	0	1.7	0	1.0	3.6	1.0	0.9	0	1.2	0.6	0	0	0	0.3	0.8
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



APPENDIX C: TRIP GENERATION DATA

ITE Land Use Code 221 Multi Family Housing (AM Peak)

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Multifamily Housing (Mid-Rise) - Not Close to Rail Transit (221) Click for Description and Data Plots

Independent Variable:
Dwelling Units

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
30

Avg. Num. of Dwelling Units:
173

Average Rate:
0.37

Range of Rates:
0.15 - 0.53

Standard Deviation:
0.09

Fitted Curve Equation:
T = 0.44(X) - 11.61

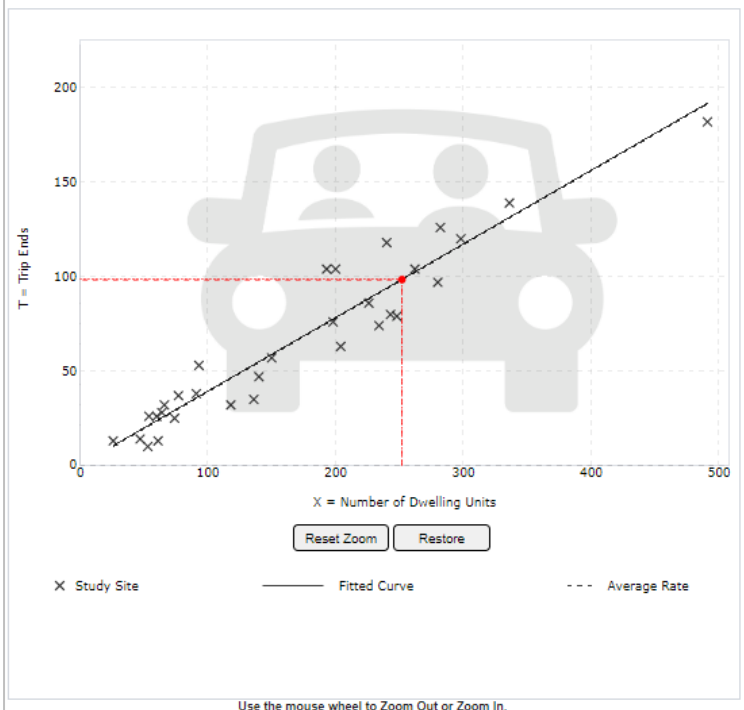
R^2:
0.91

Directional Distribution:
23% entering, 77% exiting

Calculated Trip Ends:
Average Rate: 93 (Total), 21 (Entry), 72 (Exit)
Fitted Curve: 99 (Total), 23 (Entry), 76 (Exit)

ITE Land Use Code 221 Multi Family Housing (PM Peak)

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Multifamily Housing (Mid-Rise) - Not Close to Rail Transit (221) Click for Description and Data Plots

Independent Variable:
Dwelling Units

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
31

Avg. Num. of Dwelling Units:
169

Average Rate:
0.39

Range of Rates:
0.19 - 0.57

Standard Deviation:
0.08

Fitted Curve Equation:
T = 0.39(X) + 0.34

R^2:
0.91

Directional Distribution:
61% entering, 39% exiting

Calculated Trip Ends:
Average Rate: 98 (Total), 60 (Entry), 38 (Exit)
Fitted Curve: 99 (Total), 60 (Entry), 39 (Exit)

APPENDIX D: TRAFFIC FORECASTING

Mud Lane Traffic Forecast

TIS Simplified Traffic Forecast

Count Year	2022	Number of Counts	4	
Opening Year	2023			
Design Year	2043	Growth Rate	2.58%	
Years Back	15			

KYTC Traffic Count Station #1		KYTC Traffic Count Station #2		KYTC Traffic Count Station #3	
STA ID	056283	STA ID	XXXXXX	STA ID	XXXXXX
Year	**AADT**	Paste Count Data Here		Paste Count Data Here	
2022					
2021					
2020					
2019	11937				
2018					
2017					
2016	13081				
2015					
2014					
2013	11609				
Year	**AADT**				
2012					
2011					
2010	9090				
2009					
2008					
2007	13500				
2006					
2005					
2004	8910				
2003					
Year	**AADT**				
2002					
2001	7360				

Mud Lane Historic Traffic Volumes

Print | Download Station Details

Historical Traffic Volume Summary

Station Details:

Sta ID:	056283
Sta Type:	Full Coverage
Map:	MapIt
District:	5
County:	Jefferson
Route:	056-CR-1003M -000
Route Desc:	MUD LN

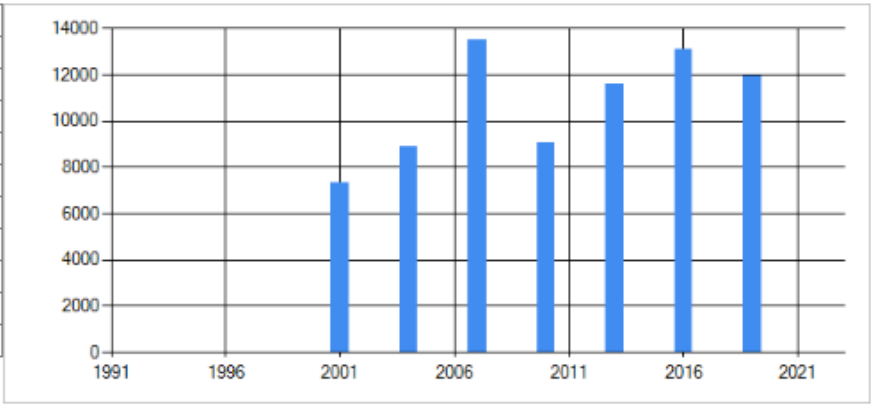
Begin MP:	0
Begin Desc:	KY 61 (PRESTON HIGHWAY)
End Mp:	2.0550
End Desc:	KY 1450 (BLUE LICK ROAD)
Impact Year:	
Year Added:	

Newest Count:

AADT:	11937
Year:	2019
% Single:	
% Combo:	
K Factor:	10.90
D Factor:	56

Definitions:
Sta. ID - Three digit county number + station number
MP - milepoint
Impact Year – year of significant change to traffic pattern within station segment
AADT – Annual Average Daily Traffic – the annualized average 24-hour volume of vehicles on a segment of roadway
% Single – single unit truck volume as a percentage of the AADT
% Combo – combination truck volume as a percentage of the AADT
K Factor – peak hour volume as a percentage of the AADT
D Factor – percentage of peak hour volume flowing in the peak direction

Year	AADT	Year	AADT	Year	AADT
2022		2012		2002	
2021		2011		2001	7360
2020		2010	9090	2000	
2019	11937	2009		1999	
2018		2008		1998	
2017		2007	13500	1997	
2016	13081	2006		1996	
2015		2005		1995	
2014		2004	8910	1994	
2013	11609	2003		1993	



Preston Hwy Traffic Forecast

TIS Simplified Traffic Forecast

Count Year	2022	Number of Counts	11
Opening Year	2023		
Design Year	2043	Growth Rate	-0.36%
Years Back	15		

KYTC Traffic Count Station #1		KYTC Traffic Count Station #2		KYTC Traffic Count Station #3	
STA ID	056283	STA ID	XXXXXX	STA ID	XXXXXX
Year	AADT	Paste Count Data Here		Paste Count Data Here	
2022					
2021	20507				
2020	19005				
2019	21190				
2018	20672				
2017	21183				
2016	21937				
2015	21659				
2014	22654				
2013	22275				
Year	AADT				
2012					
2011					
2010					
2009	18000				
2008	23100				
2007	23400				
2006	24000				
2005	21300				
2004	23600				
2003	24000				
Year	AADT				
2002	23600				
2001	23900				
2000	23500				
1999	22700				
1998	19900				
1997	20400				
1996	19700				
1995	18600				
1994	19500	1994		1994	
1993	10100	1993		1993	

Preston Highway Historic Traffic Volumes

Print | Download Station Details

Historical Traffic Volume Summary

Station Details:

Sta ID:	056P84
Sta Type:	Permanent (ATR)
Map:	MapIt
District:	5
County:	Jefferson
Route:	056-KY-0061 -000
Route Desc:	PRESTON HWY

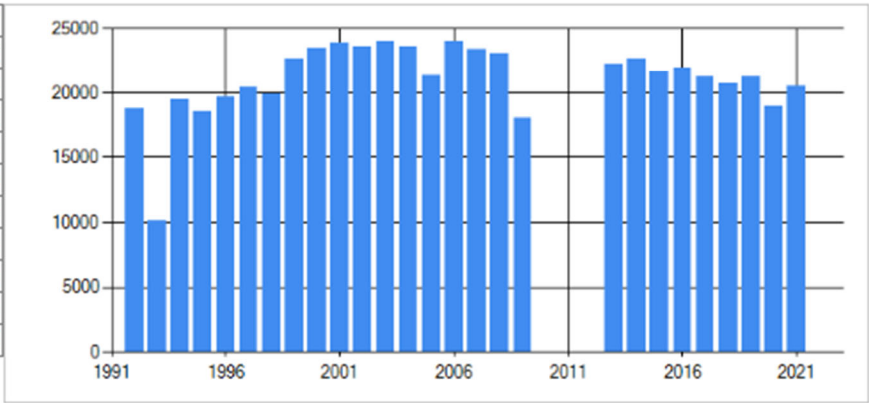
Begin MP:	0
Begin Desc:	BULLITT COUNTY LINE
End Mp:	0.6480
End Desc:	KY 2053/MUD LANE
Impact Year:	
Year Added:	1966

Newest Count:

AADT:	20507
Year:	2021
% Single:	
% Combo:	
K Factor:	10.20
D Factor:	53

Definitions:
Sta. ID - Three digit county number + station number
MP - milepoint
Impact Year – year of significant change to traffic pattern within station segment
AADT – Annual Average Daily Traffic – the annualized average 24-hour volume of vehicles on a segment of roadway
% Single – single unit truck volume as a percentage of the AADT
% Combo – combination truck volume as a percentage of the AADT
K Factor – peak hour volume as a percentage of the AADT
D Factor – percentage of peak hour volume flowing in the peak direction

Year	AADT	Year	AADT	Year	AADT
2022		2012		2002	23600
2021	20507	2011		2001	23900
2020	19005	2010		2000	23500
2019	21190	2009	18000	1999	22700
2018	20672	2008	23100	1998	19900
2017	21183	2007	23400	1997	20400
2016	21937	2006	24000	1996	19700
2015	21659	2005	21300	1995	18600
2014	22654	2004	23600	1994	19500
2013	22275	2003	24000	1993	10100

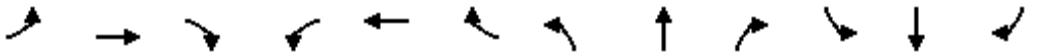


APPENDIX E: CAPACITY ANALYSIS OUTPUT

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	31	69	112	37	99	157
Future Volume (Veh/h)	31	69	112	37	99	157
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	34	75	122	40	108	171
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	529	142			162	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	529	142			162	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	92			92	
cM capacity (veh/h)	471	906			1417	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	109	162	279
Volume Left	34	0	108
Volume Right	75	40	0
cSH	703	1700	1417
Volume to Capacity	0.15	0.10	0.08
Queue Length 95th (ft)	14	0	6
Control Delay (s)	11.1	0.0	3.4
Lane LOS	B		A
Approach Delay (s)	11.1	0.0	3.4
Approach LOS	B		

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	37.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	316	32	15	58	76	380	25	788	27	139	440	194
Future Volume (vph)	316	32	15	58	76	380	25	788	27	139	440	194
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.96	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1681	1700	1583		1823	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	0.96	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1681	1700	1583		1823	1583	1770	3539	1583	1770	3539	1583
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)	343	35	16	63	83	413	27	857	29	151	478	211
RTOR Reduction (vph)	0	0	14	0	0	181	0	0	17	0	0	107
Lane Group Flow (vph)	189	189	2	0	146	232	27	857	12	151	478	104
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	18.2	18.2	18.2		22.4	22.4	3.8	49.3	49.3	14.7	60.2	60.2
Effective Green, g (s)	18.2	18.2	18.2		22.4	22.4	3.8	49.3	49.3	14.7	60.2	60.2
Actuated g/C Ratio	0.15	0.15	0.15		0.18	0.18	0.03	0.40	0.40	0.12	0.49	0.49
Clearance Time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	249	252	234		333	289	54	1423	636	212	1737	777
v/s Ratio Prot	c0.11	0.11			0.08		0.02	c0.24		c0.09	0.14	
v/s Ratio Perm			0.00			c0.15			0.01			0.07
v/c Ratio	0.76	0.75	0.01		0.44	0.80	0.50	0.60	0.02	0.71	0.28	0.13
Uniform Delay, d1	50.1	50.0	44.5		44.5	48.0	58.5	28.9	22.1	51.9	18.4	17.0
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	12.5	11.8	0.0		0.9	14.9	7.1	1.9	0.1	10.8	0.4	0.4
Delay (s)	62.6	61.8	44.5		45.4	62.9	65.6	30.8	22.1	62.7	18.8	17.3
Level of Service	E	E	D		D	E	E	C	C	E	B	B
Approach Delay (s)		61.5			58.3			31.6			26.3	
Approach LOS		E			E			C			C	

Intersection Summary			
HCM 2000 Control Delay	39.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	122.6	Sum of lost time (s)	18.0
Intersection Capacity Utilization	66.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	0	0
Future Volume (Veh/h)	0	0	0	0	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				760		
pX, platoon unblocked						
vC, conflicting volume			0		0	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		0	0
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1623		1023	1085

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	0	0	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	0.0
Approach LOS			A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	0	0
Future Volume (Veh/h)	0	0	0	0	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				682		
pX, platoon unblocked						
vC, conflicting volume			0		0	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		0	0
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1623		1023	1085

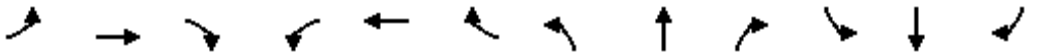
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	0	0	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	0.0
Approach LOS			A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	71	258	239	103	251	256
Future Volume (Veh/h)	71	258	239	103	251	256
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	77	280	260	112	273	278
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1140	316			372	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1140	316			372	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	55	61			77	
cM capacity (veh/h)	171	724			1186	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	357	372	551
Volume Left	77	0	273
Volume Right	280	112	0
cSH	427	1700	1186
Volume to Capacity	0.84	0.22	0.23
Queue Length 95th (ft)	200	0	22
Control Delay (s)	44.0	0.0	5.7
Lane LOS	E		A
Approach Delay (s)	44.0	0.0	5.7
Approach LOS	E		

Intersection Summary			
Average Delay	14.7		
Intersection Capacity Utilization	76.1%	ICU Level of Service	D
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	334	201	52	82	145	298	54	689	110	462	1081	577
Future Volume (vph)	334	201	52	82	145	298	54	689	110	462	1081	577
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.99	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1681	1747	1583		1830	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	0.99	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1681	1747	1583		1830	1583	1770	3539	1583	1770	3539	1583
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)	363	218	57	89	158	324	59	749	120	502	1175	627
RTOR Reduction (vph)	0	0	47	0	0	277	0	0	88	0	0	277
Lane Group Flow (vph)	287	294	10	0	247	47	59	749	32	502	1175	350
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	25.0	25.0	25.0		20.1	20.1	7.7	34.5	34.5	40.9	67.7	67.7
Effective Green, g (s)	25.0	25.0	25.0		20.1	20.1	7.7	34.5	34.5	40.9	67.7	67.7
Actuated g/C Ratio	0.18	0.18	0.18		0.15	0.15	0.06	0.25	0.25	0.30	0.49	0.49
Clearance Time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	303	315	285		265	229	98	881	394	522	1729	773
v/s Ratio Prot	c0.17	0.17			c0.13		0.03	c0.21		c0.28	0.33	
v/s Ratio Perm			0.01			0.03			0.02			0.22
v/c Ratio	0.95	0.93	0.04		0.93	0.21	0.60	0.85	0.08	0.96	0.68	0.45
Uniform Delay, d1	56.1	55.9	46.8		58.5	52.2	63.9	49.5	39.9	48.0	27.1	23.2
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	37.4	33.5	0.1		37.3	0.4	10.0	10.1	0.4	29.7	2.2	1.9
Delay (s)	93.5	89.5	46.9		95.8	52.6	73.9	59.6	40.3	77.8	29.3	25.2
Level of Service	F	F	D		F	D	E	E	D	E	C	C
Approach Delay (s)		87.5			71.3			58.0			38.7	
Approach LOS		F			E			E			D	

Intersection Summary			
HCM 2000 Control Delay	53.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	138.5	Sum of lost time (s)	18.0
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	0	0
Future Volume (Veh/h)	0	0	0	0	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				760		
pX, platoon unblocked						
vC, conflicting volume			0		0	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		0	0
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1623		1023	1085

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	0	0	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	0.0
Approach LOS			A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	0	0
Future Volume (Veh/h)	0	0	0	0	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				682		
pX, platoon unblocked						
vC, conflicting volume			0		0	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		0	0
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1623		1023	1085

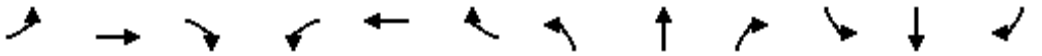
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	0	0	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	0.0
Approach LOS			A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	38	84	136	45	121	191
Future Volume (Veh/h)	38	84	136	45	121	191
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	41	91	148	49	132	208
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	644	172			197	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	644	172			197	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	90	90			90	
cM capacity (veh/h)	395	871			1376	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	132	197	340
Volume Left	41	0	132
Volume Right	91	49	0
cSH	634	1700	1376
Volume to Capacity	0.21	0.12	0.10
Queue Length 95th (ft)	19	0	8
Control Delay (s)	12.2	0.0	3.6
Lane LOS	B		A
Approach Delay (s)	12.2	0.0	3.6
Approach LOS	B		

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	43.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	385	39	19	58	93	380	30	788	27	139	440	236
Future Volume (vph)	385	39	19	58	93	380	30	788	27	139	440	236
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.96	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1681	1700	1583		1828	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	0.96	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1681	1700	1583		1828	1583	1770	3539	1583	1770	3539	1583
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)	418	42	21	63	101	413	33	857	29	151	478	257
RTOR Reduction (vph)	0	0	17	0	0	360	0	0	16	0	0	123
Lane Group Flow (vph)	230	230	4	0	164	53	33	857	13	151	478	134
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	21.3	21.3	21.3		16.5	16.5	5.0	55.4	55.4	16.3	66.7	66.7
Effective Green, g (s)	21.3	21.3	21.3		16.5	16.5	5.0	55.4	55.4	16.3	66.7	66.7
Actuated g/C Ratio	0.17	0.17	0.17		0.13	0.13	0.04	0.43	0.43	0.13	0.52	0.52
Clearance Time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	280	284	264		236	204	69	1537	687	226	1851	828
v/s Ratio Prot	c0.14	0.14			c0.09		0.02	c0.24		c0.09	0.14	
v/s Ratio Perm			0.00			0.03			0.01			0.08
v/c Ratio	0.82	0.81	0.01		0.69	0.26	0.48	0.56	0.02	0.67	0.26	0.16
Uniform Delay, d1	51.3	51.1	44.3		53.1	50.0	60.0	26.9	20.5	53.0	16.8	15.8
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	17.3	15.5	0.0		8.6	0.7	5.1	1.5	0.0	7.3	0.3	0.4
Delay (s)	68.6	66.7	44.3		61.7	50.7	65.1	28.4	20.6	60.3	17.1	16.3
Level of Service	E	E	D		E	D	E	C	C	E	B	B
Approach Delay (s)		66.6			53.8			29.4			24.2	
Approach LOS		E			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	39.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	127.5	Sum of lost time (s)	18.0
Intersection Capacity Utilization	68.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	0	0
Future Volume (Veh/h)	0	0	0	0	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				760		
pX, platoon unblocked						
vC, conflicting volume			0		0	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		0	0
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1623		1023	1085

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	0	0	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	0.0
Approach LOS			A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	0	0
Future Volume (Veh/h)	0	0	0	0	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				682		
pX, platoon unblocked						
vC, conflicting volume			0		0	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		0	0
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1623		1023	1085

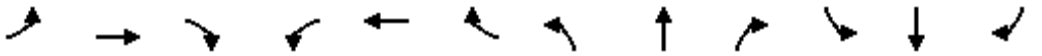
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	0	0	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	0.0
Approach LOS			A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	86	315	291	125	306	313
Future Volume (Veh/h)	86	315	291	125	306	313
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	93	342	316	136	333	340
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1390	384			452	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1390	384			452	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	15	48			70	
cM capacity (veh/h)	110	664			1109	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	435	452	673
Volume Left	93	0	333
Volume Right	342	136	0
cSH	319	1700	1109
Volume to Capacity	1.36	0.27	0.30
Queue Length 95th (ft)	548	0	32
Control Delay (s)	214.5	0.0	6.6
Lane LOS	F		A
Approach Delay (s)	214.5	0.0	6.6
Approach LOS	F		

Intersection Summary			
Average Delay	62.6		
Intersection Capacity Utilization	90.5%	ICU Level of Service	E
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	408	245	64	82	176	298	66	689	110	462	1081	704
Future Volume (vph)	408	245	64	82	176	298	66	689	110	462	1081	704
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.99	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1681	1747	1583		1834	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	0.99	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1681	1747	1583		1834	1583	1770	3539	1583	1770	3539	1583
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)	443	266	70	89	191	324	72	749	120	502	1175	765
RTOR Reduction (vph)	0	0	55	0	0	274	0	0	91	0	0	349
Lane Group Flow (vph)	350	359	15	0	280	50	72	749	29	502	1175	416
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	29.5	29.5	29.5		21.5	21.5	8.5	31.5	31.5	39.5	62.5	62.5
Effective Green, g (s)	29.5	29.5	29.5		21.5	21.5	8.5	31.5	31.5	39.5	62.5	62.5
Actuated g/C Ratio	0.21	0.21	0.21		0.15	0.15	0.06	0.22	0.22	0.28	0.45	0.45
Clearance Time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	354	368	333		281	243	107	796	356	499	1579	706
v/s Ratio Prot	c0.21	0.21			c0.15		0.04	c0.21		c0.28	0.33	
v/s Ratio Perm			0.01			0.03			0.02			0.26
v/c Ratio	0.99	0.98	0.04		1.00	0.20	0.67	0.94	0.08	1.01	0.74	0.59
Uniform Delay, d1	55.1	54.9	44.0		59.2	51.8	64.4	53.3	42.8	50.2	32.1	29.1
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	44.3	40.0	0.1		52.4	0.4	15.4	20.4	0.5	41.8	3.2	3.6
Delay (s)	99.4	94.9	44.1		111.6	52.2	79.8	73.7	43.3	92.0	35.3	32.7
Level of Service	F	F	D		F	D	E	E	D	F	D	C
Approach Delay (s)		92.4			79.7			70.3			46.2	
Approach LOS		F			E			E			D	

Intersection Summary			
HCM 2000 Control Delay	62.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	91.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	0	0
Future Volume (Veh/h)	0	0	0	0	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				760		
pX, platoon unblocked						
vC, conflicting volume			0		0	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		0	0
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1623		1023	1085

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	0	0	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	0.0
Approach LOS			A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	0	0
Future Volume (Veh/h)	0	0	0	0	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				682		
pX, platoon unblocked						
vC, conflicting volume			0		0	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		0	0
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1623		1023	1085

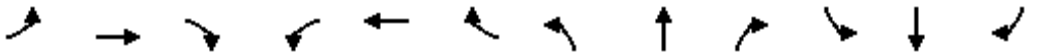
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	0	0	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	0.0
Approach LOS			A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	36	79	112	38	102	157
Future Volume (Veh/h)	36	79	112	38	102	157
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	39	86	122	41	111	171
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	536	142			163	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	536	142			163	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	92	90			92	
cM capacity (veh/h)	466	905			1416	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	125	163	282
Volume Left	39	0	111
Volume Right	86	41	0
cSH	700	1700	1416
Volume to Capacity	0.18	0.10	0.08
Queue Length 95th (ft)	16	0	6
Control Delay (s)	11.3	0.0	3.5
Lane LOS	B		A
Approach Delay (s)	11.3	0.0	3.5
Approach LOS	B		

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	39.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	369	37	18	58	81	380	27	788	27	139	440	206
Future Volume (vph)	369	37	18	58	81	380	27	788	27	139	440	206
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.96	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1681	1700	1583		1825	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	0.96	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1681	1700	1583		1825	1583	1770	3539	1583	1770	3539	1583
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)	401	40	20	63	88	413	29	857	29	151	478	224
RTOR Reduction (vph)	0	0	17	0	0	175	0	0	18	0	0	118
Lane Group Flow (vph)	221	220	3	0	151	238	29	857	11	151	478	106
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	20.4	20.4	20.4		22.8	22.8	3.8	47.2	47.2	14.8	58.2	58.2
Effective Green, g (s)	20.4	20.4	20.4		22.8	22.8	3.8	47.2	47.2	14.8	58.2	58.2
Actuated g/C Ratio	0.17	0.17	0.17		0.19	0.19	0.03	0.38	0.38	0.12	0.47	0.47
Clearance Time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	278	281	262		337	292	54	1355	606	212	1671	747
v/s Ratio Prot	c0.13	0.13			0.08		0.02	c0.24		c0.09	0.14	
v/s Ratio Perm			0.00			c0.15			0.01			0.07
v/c Ratio	0.79	0.78	0.01		0.45	0.81	0.54	0.63	0.02	0.71	0.29	0.14
Uniform Delay, d1	49.4	49.3	43.0		44.6	48.2	58.8	30.9	23.6	52.2	19.8	18.4
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	14.5	13.3	0.0		1.0	15.8	9.9	2.3	0.1	10.8	0.4	0.4
Delay (s)	63.8	62.5	43.0		45.6	64.0	68.7	33.2	23.7	62.9	20.3	18.8
Level of Service	E	E	D		D	E	E	C	C	E	C	B
Approach Delay (s)		62.3			59.1			34.0			27.4	
Approach LOS		E			E			C			C	

Intersection Summary			
HCM 2000 Control Delay	41.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	123.2	Sum of lost time (s)	18.0
Intersection Capacity Utilization	67.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	136	5	0	100	15	0
Future Volume (Veh/h)	136	5	0	100	15	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	148	5	0	109	16	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				760		
pX, platoon unblocked						
vC, conflicting volume			153		260	150
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			153		260	150
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		98	100
cM capacity (veh/h)			1428		729	896

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	153	109	16
Volume Left	0	0	16
Volume Right	5	0	0
cSH	1700	1428	729
Volume to Capacity	0.09	0.00	0.02
Queue Length 95th (ft)	0	0	2
Control Delay (s)	0.0	0.0	10.0
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.0
Approach LOS			B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	17.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	136	0	18	100	0	61
Future Volume (Veh/h)	136	0	18	100	0	61
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	148	0	20	109	0	66
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				682		
pX, platoon unblocked						
vC, conflicting volume			148		297	148
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			148		297	148
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	93
cM capacity (veh/h)			1434		685	899

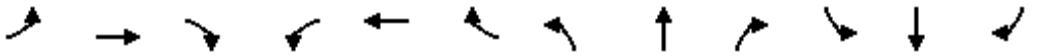
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	148	129	66
Volume Left	0	20	0
Volume Right	0	0	66
cSH	1700	1434	899
Volume to Capacity	0.09	0.01	0.07
Queue Length 95th (ft)	0	1	6
Control Delay (s)	0.0	1.3	9.3
Lane LOS		A	A
Approach Delay (s)	0.0	1.3	9.3
Approach LOS			A

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	27.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	72	263	239	106	258	256
Future Volume (Veh/h)	72	263	239	106	258	256
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	78	286	260	115	280	278
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1156	318			375	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1156	318			375	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	53	60			76	
cM capacity (veh/h)	166	723			1183	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	364	375	558
Volume Left	78	0	280
Volume Right	286	115	0
cSH	421	1700	1183
Volume to Capacity	0.87	0.22	0.24
Queue Length 95th (ft)	217	0	23
Control Delay (s)	48.5	0.0	5.8
Lane LOS	E		A
Approach Delay (s)	48.5	0.0	5.8
Approach LOS	E		

Intersection Summary			
Average Delay	16.1		
Intersection Capacity Utilization	77.0%	ICU Level of Service	D
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	348	210	54	82	152	298	57	689	110	462	1081	606
Future Volume (vph)	348	210	54	82	152	298	57	689	110	462	1081	606
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.99	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1681	1747	1583		1831	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	0.99	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1681	1747	1583		1831	1583	1770	3539	1583	1770	3539	1583
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)	378	228	59	89	165	324	62	749	120	502	1175	659
RTOR Reduction (vph)	0	0	48	0	0	277	0	0	88	0	0	290
Lane Group Flow (vph)	299	307	11	0	254	47	62	749	32	502	1175	369
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	26.0	26.0	26.0		20.4	20.4	7.9	34.4	34.4	40.7	67.2	67.2
Effective Green, g (s)	26.0	26.0	26.0		20.4	20.4	7.9	34.4	34.4	40.7	67.2	67.2
Actuated g/C Ratio	0.19	0.19	0.19		0.15	0.15	0.06	0.25	0.25	0.29	0.48	0.48
Clearance Time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	313	325	295		267	231	100	872	390	516	1704	762
v/s Ratio Prot	c0.18	0.18			c0.14		0.04	c0.21		c0.28	0.33	
v/s Ratio Perm			0.01			0.03			0.02			0.23
v/c Ratio	0.96	0.94	0.04		0.95	0.21	0.62	0.86	0.08	0.97	0.69	0.48
Uniform Delay, d1	56.2	56.0	46.5		59.1	52.4	64.3	50.2	40.4	48.9	28.1	24.4
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	38.7	35.3	0.1		41.7	0.4	10.9	10.7	0.4	32.5	2.3	2.2
Delay (s)	94.9	91.4	46.5		100.8	52.9	75.3	61.0	40.8	81.4	30.4	26.6
Level of Service	F	F	D		F	D	E	E	D	F	C	C
Approach Delay (s)		89.0			73.9			59.3			40.3	
Approach LOS		F			E			E			D	

Intersection Summary			
HCM 2000 Control Delay	55.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	139.5	Sum of lost time (s)	18.0
Intersection Capacity Utilization	87.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	354	9	0	329	6	0
Future Volume (Veh/h)	354	9	0	329	6	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	385	10	0	358	7	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				760		
pX, platoon unblocked						
vC, conflicting volume			395		748	390
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			395		748	390
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		98	100
cM capacity (veh/h)			1164		380	658

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	395	358	7
Volume Left	0	0	7
Volume Right	10	0	0
cSH	1700	1164	380
Volume to Capacity	0.23	0.00	0.02
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	0.0	14.7
Lane LOS			B
Approach Delay (s)	0.0	0.0	14.7
Approach LOS			B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	29.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	354	0	39	329	0	25
Future Volume (Veh/h)	354	0	39	329	0	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	385	0	42	358	0	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				682		
pX, platoon unblocked						
vC, conflicting volume			385		827	385
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			385		827	385
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		100	96
cM capacity (veh/h)			1173		329	663

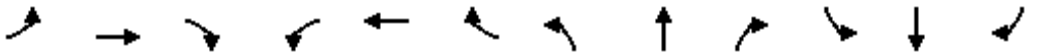
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	385	400	27
Volume Left	0	42	0
Volume Right	0	0	27
cSH	1700	1173	663
Volume to Capacity	0.23	0.04	0.04
Queue Length 95th (ft)	0	3	3
Control Delay (s)	0.0	1.2	10.7
Lane LOS		A	B
Approach Delay (s)	0.0	1.2	10.7
Approach LOS			B

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	51.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	43	94	136	46	124	191
Future Volume (Veh/h)	43	94	136	46	124	191
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	47	102	148	50	135	208
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	651	173			198	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	651	173			198	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	88	88			90	
cM capacity (veh/h)	391	871			1375	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	149	198	343
Volume Left	47	0	135
Volume Right	102	50	0
cSH	627	1700	1375
Volume to Capacity	0.24	0.12	0.10
Queue Length 95th (ft)	23	0	8
Control Delay (s)	12.5	0.0	3.6
Lane LOS	B		A
Approach Delay (s)	12.5	0.0	3.6
Approach LOS	B		

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	45.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	438	44	22	58	98	380	32	788	27	139	440	248
Future Volume (vph)	438	44	22	58	98	380	32	788	27	139	440	248
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.96	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1681	1700	1583		1829	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	0.96	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1681	1700	1583		1829	1583	1770	3539	1583	1770	3539	1583
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)	476	48	24	63	107	413	35	857	29	151	478	270
RTOR Reduction (vph)	0	0	19	0	0	159	0	0	19	0	0	149
Lane Group Flow (vph)	262	262	5	0	170	254	35	857	10	151	478	121
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	23.9	23.9	23.9		24.4	24.4	3.8	45.6	45.6	14.8	56.6	56.6
Effective Green, g (s)	23.9	23.9	23.9		24.4	24.4	3.8	45.6	45.6	14.8	56.6	56.6
Actuated g/C Ratio	0.19	0.19	0.19		0.19	0.19	0.03	0.36	0.36	0.12	0.45	0.45
Clearance Time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	317	320	298		352	304	53	1273	569	206	1580	707
v/s Ratio Prot	c0.16	0.15			0.09		0.02	c0.24		c0.09	0.14	
v/s Ratio Perm			0.00			c0.16			0.01			0.08
v/c Ratio	0.83	0.82	0.02		0.48	0.84	0.66	0.67	0.02	0.73	0.30	0.17
Uniform Delay, d1	49.4	49.3	41.8		45.5	49.2	60.8	34.3	26.1	54.0	22.4	21.0
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	16.0	14.9	0.0		1.0	17.7	26.8	2.9	0.1	12.6	0.5	0.5
Delay (s)	65.4	64.3	41.8		46.6	66.9	87.6	37.1	26.2	66.7	22.9	21.5
Level of Service	E	E	D		D	E	F	D	C	E	C	C
Approach Delay (s)		63.8			61.0			38.7			29.8	
Approach LOS		E			E			D			C	

Intersection Summary			
HCM 2000 Control Delay	45.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	126.7	Sum of lost time (s)	18.0
Intersection Capacity Utilization	69.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	166	5	0	122	15	0
Future Volume (Veh/h)	166	5	0	122	15	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	180	5	0	133	16	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				760		
pX, platoon unblocked						
vC, conflicting volume			185		316	182
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			185		316	182
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		98	100
cM capacity (veh/h)			1390		677	860

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	185	133	16
Volume Left	0	0	16
Volume Right	5	0	0
cSH	1700	1390	677
Volume to Capacity	0.11	0.00	0.02
Queue Length 95th (ft)	0	0	2
Control Delay (s)	0.0	0.0	10.4
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.4
Approach LOS			B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	19.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	166	0	18	122	0	61
Future Volume (Veh/h)	166	0	18	122	0	61
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	180	0	20	133	0	66
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				682		
pX, platoon unblocked						
vC, conflicting volume			180		353	180
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			180		353	180
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	92
cM capacity (veh/h)			1396		635	863

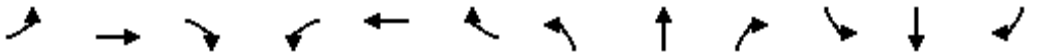
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	180	153	66
Volume Left	0	20	0
Volume Right	0	0	66
cSH	1700	1396	863
Volume to Capacity	0.11	0.01	0.08
Queue Length 95th (ft)	0	1	6
Control Delay (s)	0.0	1.1	9.5
Lane LOS		A	A
Approach Delay (s)	0.0	1.1	9.5
Approach LOS			A

Intersection Summary			
Average Delay		2.0	
Intersection Capacity Utilization		29.9%	ICU Level of Service A
Analysis Period (min)		15	

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	87	320	291	128	313	313
Future Volume (Veh/h)	87	320	291	128	313	313
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	95	348	316	139	340	340
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1406	386			455	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1406	386			455	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	11	47			69	
cM capacity (veh/h)	106	662			1106	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	443	455	680
Volume Left	95	0	340
Volume Right	348	139	0
cSH	312	1700	1106
Volume to Capacity	1.42	0.27	0.31
Queue Length 95th (ft)	586	0	33
Control Delay (s)	238.4	0.0	6.7
Lane LOS	F		A
Approach Delay (s)	238.4	0.0	6.7
Approach LOS	F		

Intersection Summary			
Average Delay	69.8		
Intersection Capacity Utilization	91.5%	ICU Level of Service	F
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	422	254	66	82	183	298	69	689	110	462	1081	733
Future Volume (vph)	422	254	66	82	183	298	69	689	110	462	1081	733
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.99	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1681	1747	1583		1834	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	0.99	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1681	1747	1583		1834	1583	1770	3539	1583	1770	3539	1583
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)	459	276	72	89	199	324	75	749	120	502	1175	797
RTOR Reduction (vph)	0	0	57	0	0	273	0	0	91	0	0	360
Lane Group Flow (vph)	363	372	15	0	288	51	75	749	29	502	1175	437
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	29.7	29.7	29.7		21.9	21.9	8.7	30.9	30.9	39.5	61.7	61.7
Effective Green, g (s)	29.7	29.7	29.7		21.9	21.9	8.7	30.9	30.9	39.5	61.7	61.7
Actuated g/C Ratio	0.21	0.21	0.21		0.16	0.16	0.06	0.22	0.22	0.28	0.44	0.44
Clearance Time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	356	370	335		286	247	109	781	349	499	1559	697
v/s Ratio Prot	c0.22	0.21			c0.16		0.04	c0.21		c0.28	0.33	
v/s Ratio Perm			0.01			0.03			0.02			0.28
v/c Ratio	1.02	1.01	0.05		1.01	0.21	0.69	0.96	0.08	1.01	0.75	0.63
Uniform Delay, d1	55.1	55.1	43.9		59.0	51.5	64.3	53.9	43.3	50.2	32.8	30.3
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	52.8	48.1	0.1		55.0	0.4	16.6	23.6	0.5	41.8	3.4	4.2
Delay (s)	107.9	103.3	43.9		114.1	51.9	80.9	77.6	43.8	92.0	36.2	34.5
Level of Service	F	F	D		F	D	F	E	D	F	D	C
Approach Delay (s)		100.1			81.1			73.5			47.0	
Approach LOS		F			F			E			D	

Intersection Summary			
HCM 2000 Control Delay	65.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	92.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	431	9	0	401	6	0
Future Volume (Veh/h)	431	9	0	401	6	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	468	10	0	436	7	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			478		909	473
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			478		909	473
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		98	100
cM capacity (veh/h)			1084		305	591

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	478	436	7
Volume Left	0	0	7
Volume Right	10	0	0
cSH	1700	1084	305
Volume to Capacity	0.28	0.00	0.02
Queue Length 95th (ft)	0	0	2
Control Delay (s)	0.0	0.0	17.1
Lane LOS			C
Approach Delay (s)	0.0	0.0	17.1
Approach LOS			C

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	33.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	431	0	39	401	0	25
Future Volume (Veh/h)	431	0	39	401	0	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	468	0	42	436	0	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				682		
pX, platoon unblocked						
vC, conflicting volume			468		988	468
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			468		988	468
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		100	95
cM capacity (veh/h)			1094		263	595

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	468	478	27
Volume Left	0	42	0
Volume Right	0	0	27
cSH	1700	1094	595
Volume to Capacity	0.28	0.04	0.05
Queue Length 95th (ft)	0	3	4
Control Delay (s)	0.0	1.1	11.3
Lane LOS		A	B
Approach Delay (s)	0.0	1.1	11.3
Approach LOS			B

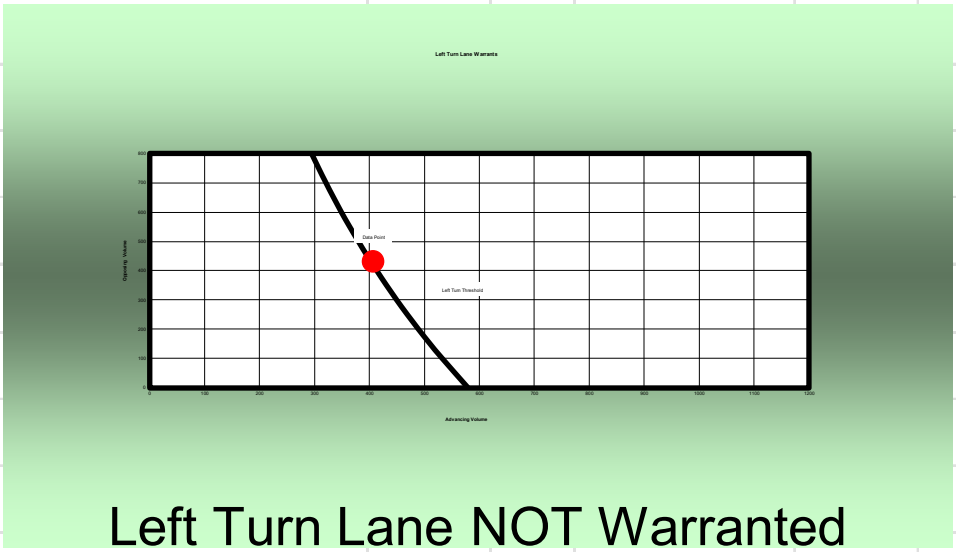
Intersection Summary			
Average Delay		0.9	
Intersection Capacity Utilization		59.3%	ICU Level of Service B
Analysis Period (min)		15	

APPENDIX F: AUXILLIARY TURN LANE WARRANTS

Access Point 2 (PM Peak)
Westbound Left Turn Lane Warrants

Input Fields

Left Turn Volume (vph)	39	Speed Limit (mph)	35
Advancing Volume (vph)	401	No. of through lanes	1
Opposing Volume (vph)	431	Percent Heavy Vehicles (decimal percent)	0.05



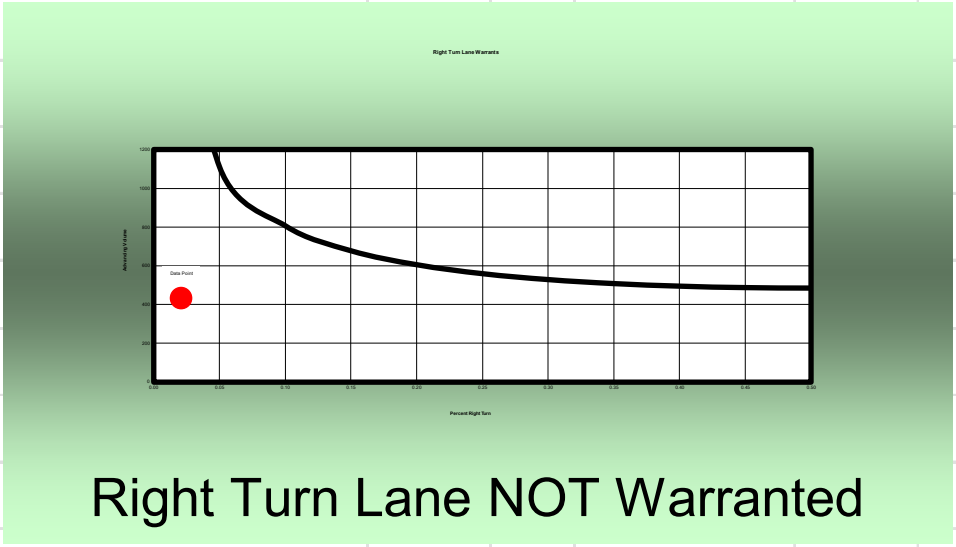
Left Turn Lane NOT Warranted

Note: This spreadsheet is intended to supplement the guidance provided in the Auxiliary Turn Lane policy outlined in the KYTC Highway Design Manual. This policy should be fully reviewed and understood prior to using this application.

Access Point 1 (PM Peak)
Eastbound Right Turn Lane Warrants

Input Fields

Right Turn Volume (vph)	9	Speed Limit (mph)	35
Advancing Volume (vph)	431		



Note: This spreadsheet is intended to supplement the guidance provided in the Auxiliary Turn Lane policy outlined in the KYTC Highway Design Manual. This policy should be fully reviewed and understood prior to using this application.