Report

5th Plain Creek Master Plan
Traffic Impact Study

June 30, 2013

H. Lee & Associates

5TH PLAIN CREEK MASTER PLAN
TRAFFIC IMPACT STUDY

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SECTION I
STUDY SUMMARY

INTRODUCTION

This traffic impact analysis has been prepared to assess transportation impacts related to the proposed removal of Urban Holding in the 5th Plain area in Clark County, Washington and the establishment of a master plan for this area pursuant to the County's Comprehensive Plan. The 5th Plain Creek Master Plan area is represented by Figure 1.

Project Description

The proposed 5th Plain Creek Master Plan area is approximately 379 acres. The current underlying zoning is R1-7.5. After deducting an estimate for roads and infrastructure and wetlands/habitat area, there is approximately 241 acres of total net developable area. The 5th Creek Master Plan area can be accessed by NE 88th Street, NE 78th Street, and NE 182nd Avenue.

Based on a density analysis conducted by Olson Engineering, a maximum of 1,364 single family residential units can be developed with the underlying R1-7.5 zoning. A maximum of 1,177 single family residential units can be developed with the proposed rezoning to a combination of R1-6, R1-7.5, R1-10 and R1-20 zones.

Scope of Traffic Impact Study

The scope of the traffic impact study was limited to the following intersections:

- NE 88th Street/NE Ward Road
- NE 78th Street/NE Ward Road
- NE Fourth Plain Road/NE 162nd Avenue
- NE Fourth Plain Road/NE 182nd Avenue

For purposes of this analysis, and in order to be overly conservative, the trip generation assumptions assume maximum build out of the area under the existing and proposed zoning. That does not always occur, and in fact in many cases the maximum density cannot and is not achieved. The remainder of this report presents the following analysis:

- Existing traffic conditions in the project study area.

- 2024 "Without Master Plan – Existing Zoning" condition to establish the future baseline condition for the traffic analysis. The 2024 "Without Master Plan – Existing Zoning" condition traffic volumes were derived from the 2024 RTC model. The "link" volumes from the 2024 RTC model were "post-processed" into turning movement volumes based on the NCHRP (National Cooperative Highway Research Program) 255 methodology.

- Trip generation for difference in build out between the proposed Master Plan and existing zoning.

- Trip distribution and assignment of the reduction in trips generated by the proposed Master Plan at the study area intersections.
- The reduction in P.M. peak hour traffic generated by the proposed Master Plan was assigned to the roadway network and subtracted from the 2024 "Without Master Plan" traffic volumes to develop the 2024 "Proposed Master Plan " traffic volumes. These volumes were used to determine the project traffic impacts for the proposed rezone.

SUMMARY OF FINDINGS

Findings

The following are the findings from the traffic analysis:

- With the build out of the 5th Plain Creek Master Plan area with the existing R1-7.5 zoning, the master plan area is expected to generated 12,985 net daily, 1,023 net A.M peak hour (259 in, 764 out), and 1,364 net P.M. peak hour trips (859 in, 505 out). Based on the proposed Master Plan, the 5th Plain Creek Master Plan area is expected to generate 11,205 net daily, 883 net A.M peak hour (224 in, 659 out), and 1,177 net P.M. peak hour (742 in, 435 out) trips. The proposed rezone would result in a decrease of 1,780 net daily, 140 net A.M. peak hour (35 in, 105 out), and 187 net P.M. peak hour (117 in, 70 out) trips.

- The NE Fourth Plain Road/NE 162nd Avenue and NE 78th Street/NE Ward Road signalized study intersections are projected to operate at acceptable levels of service in both the 2024 "Without Master Plan - Existing Zoning" and 2024 "Proposed Master Plan" conditions.

- Both of the unsignalized study area intersections at NE 88th Street/NE Ward Road and NE Fourth Plain Road/NE 182nd Avenue are projected to operate at LOS F in both the 2024 "Without Master Plan - Existing Zoning" and 2024 "Proposed Master Plan" conditions.

Recommendations

- Based on the traffic impact analysis documented in this report, the establishment of the 5th Plain Creek Master Plan will result in a reduction of future traffic impacts. However, the two unsignalized study area intersections at NE 88th Street/NE Ward Road and NE Fourth Plain Road/NE 182nd Avenue will require future improvements regardless of zoning scenarios. Those intersections should be further analyzed at the time of development review as is the normal course for all intersections within a certain geographic radius of a given development.

The NE 88th Street/NE Ward Road intersection will likely require signalization and the installation of a northbound right turn lane and a westbound left turn lane in both the 2024 “Without Master Plan - Existing Zoning” and 2024 “Proposed Master Plan” conditions.

The NE Fourth Plain Road/NE 182nd Avenue intersection will likely require signalization and the installation of a southbound left turn lane, eastbound left turn lane, and westbound right turn lane in both the 2024 “Without Master Plan - Existing Zoning” and 2024 “Proposed Master Plan” conditions.

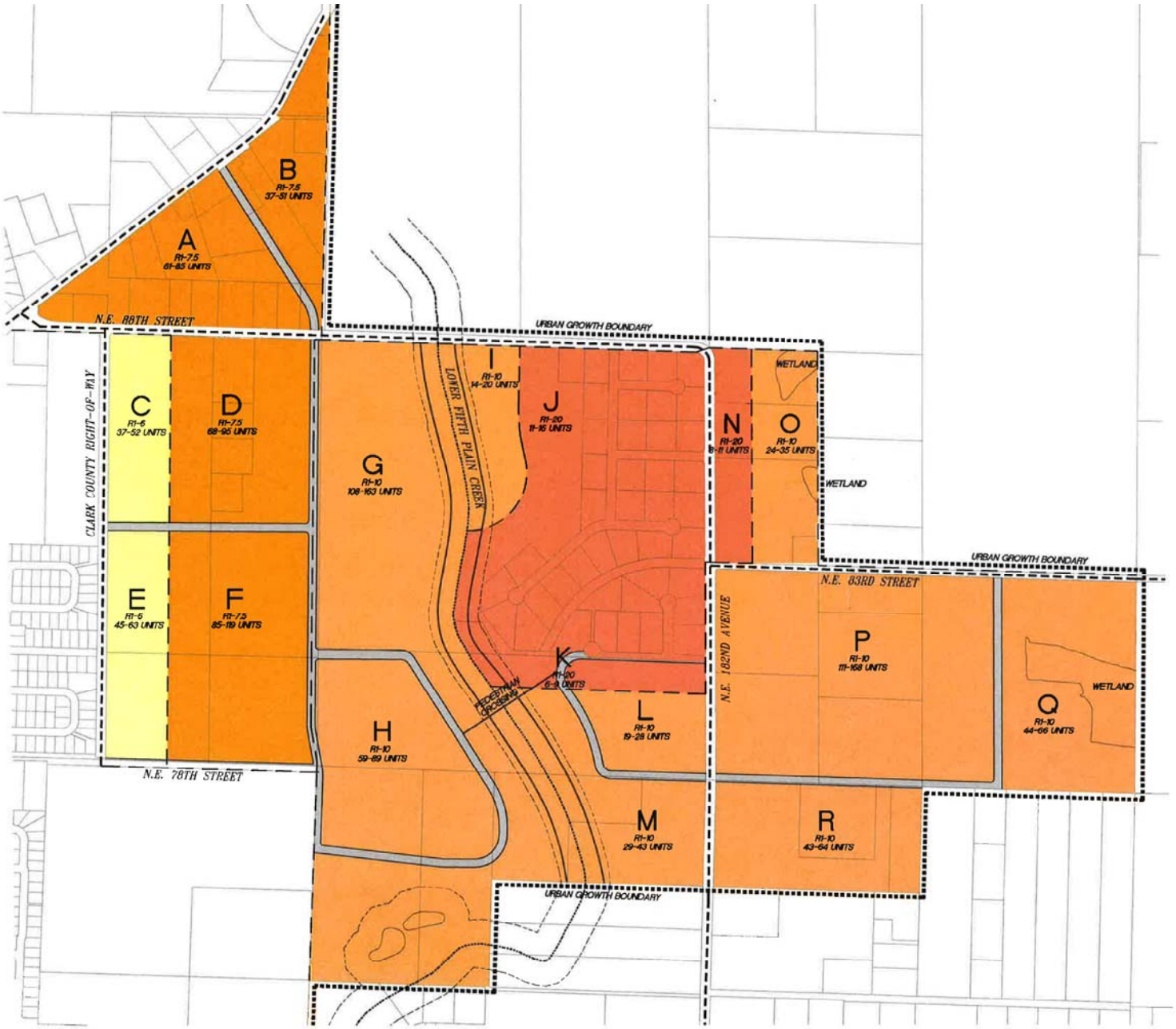


FIGURE 1
Site Vicinity Map and Site Boundaries

NOT TO SCALE

SECTION II
EXISTING CONDITIONS

SITE CONDITION

Rural residential, rural uses, and vacant properties exist within the 5th Plain Creek Master Plan area.

TRANSPORTATION FACILITIES

The following provides a description of the existing street system in the study area:

NE Fourth Plain Road: NE Fourth Plain Road is a four-lane principal arterial with additional turn lanes at major intersections west of NE 166th Avenue. Sidewalks exist on both sides of the roadway west of NE 162nd Avenue. East of NE 162nd Avenue, intermittent sidewalks exist only on the north side of the roadway. The posted speed limit is 50 mph. It should be noted that NE Fourth Plain Road is also a state route and is known as SR 500.

NE Ward Road: NE Ward Road is a four-lane principal arterial with additional turn lanes at major intersections south of NE 88th Street. North of NE 88th Street, NE Ward Road becomes a two-lane principal arterial. Bike lanes and sidewalks exist along both sides of the roadway south of NE 88th Street. The posted speed limit is 45 mph.

NE 88th Street/NE 182nd Avenue: NE 88th Street and NE 182nd Avenue is a two-lane rural major collector. There is no posted speed limit along these roadways so the statutory speed limit of 50 mph is assumed.

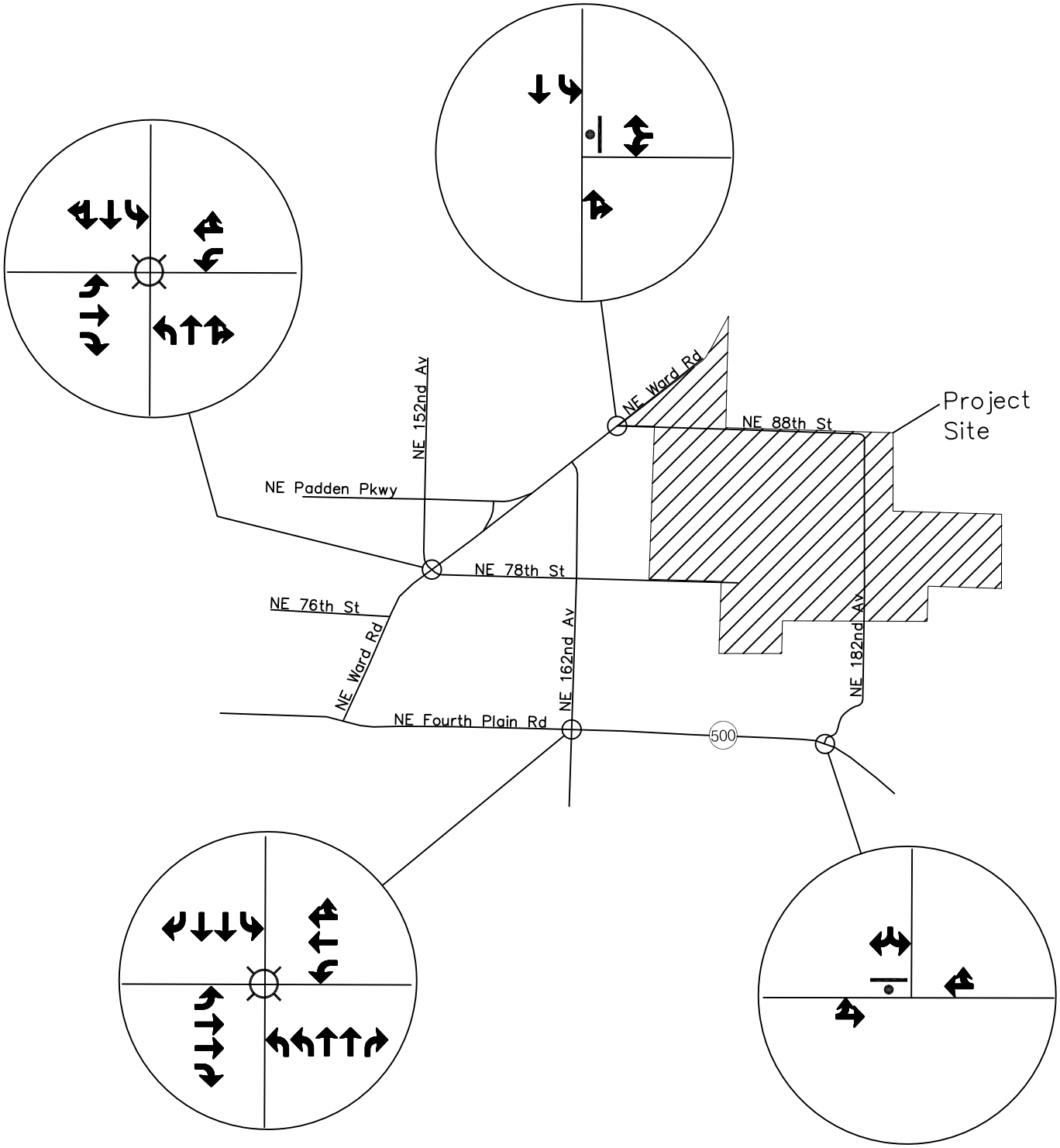
NE 78th Street/NE 152nd Avenue: NE 78th Street and NE 152nd Avenue is a two-lane collector. The posted speed limit is 35 mph. Intermittent sidewalks exist along both sides of the roadway.

NE 162nd Avenue: NE 162nd Avenue is a four-lane principal arterial with additional turn lanes at major intersections south of NE 88th Street. Bike lanes and sidewalks exist along both sides of the roadway. The posted speed limit is 40 mph.

As part of this study, levels of service were calculated at the following intersections:

- NE 88th Street/NE Ward Road
- NE 78th Street/NE Ward Road
- NE Fourth Plain Road/NE 162nd Avenue
- NE Fourth Plain Road/NE 182nd Avenue

Figure 2 shows the existing lane configuration and traffic control at the study area intersection. The NE Fourth Plain Road/NE 162nd Avenue and NE 78th Street/NE Ward Road intersections are signalized. The remaining study area intersections are unsignalized and stop-controlled.



LEGEND

- Lane Usage
- Traffic Signal
- Stop Sign

NOT TO SCALE

FIGURE 2
Existing Lane Configuration and Traffic Control

EXISTING TRAFFIC VOLUMES

P.M peak hour traffic volumes were obtained at the study area intersections by H. Lee & Associates in May and June 2013. Existing P.M. peak hour turning movement traffic volumes are presented in Figure 3. Appendix A contains the existing traffic counts.

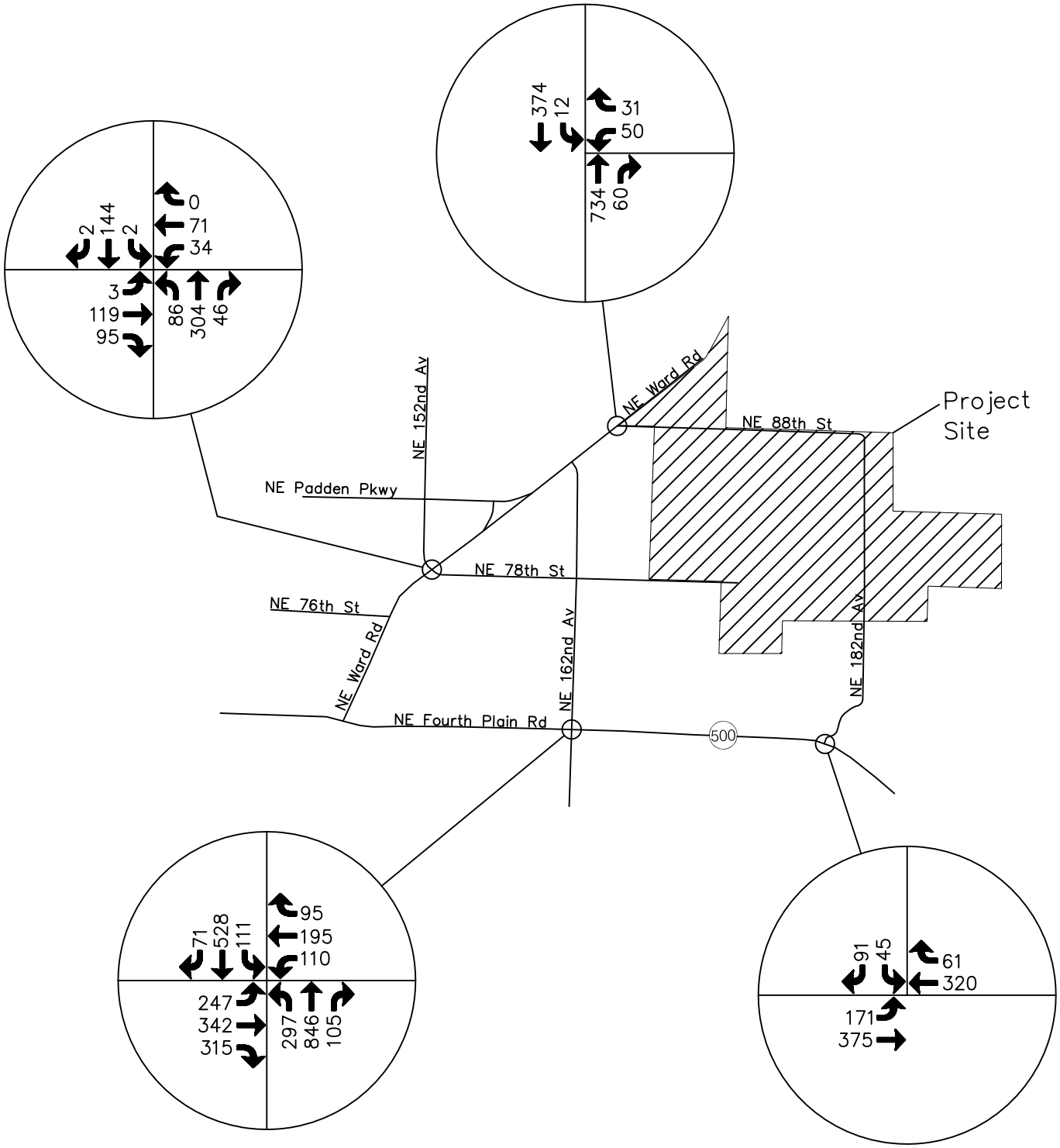
EXISTING LEVELS OF SERVICE

Peak hour traffic operations were analyzed at the study area intersection using the methodologies outlined in the 2010 Highway Capacity Manual (HCM). According to the HCM, there are six levels of service (LOS) by which the operational performance of an intersection may be described. These levels of service range between LOS "A" which indicates a relatively free-flowing condition and LOS "F" which indicates operational breakdown. For signalized intersections, LOS "D" is the minimum acceptable standard in Clark County. For unsignalized intersections LOS "E" is the minimum acceptable standard in Clark County, as long as signal warrants are not met. For unsignalized intersections, the level of service and delay reported is by approach or conflicting movement.

The existing P.M. peak hour level of service is summarized in Table 1 for the study area intersections. As indicated in Table 1, the study area intersections are currently operating at LOS D or better in the P.M. peak hour. Appendix B contains the level of service worksheets for the 2013 Existing Conditions.

Table 1. 2013 Existing Levels of Service

	P.M. Peak Hour	
Signalized Intersection	LOS	Average Delay (sec)
NE 78th Street/NE Ward Road	B	15.2
NE Fourth Plain Road/NE 162nd Avenue	C	26.9
Unsignalized Intersection		
NE 88th Street/NE Ward Road		
Westbound Approach	D	28.6
Southbound Left	A	9.6
NE Fourth Plain Road/NE 182nd Avenue		
Eastbound Left	A	8.8
Southbound Approach	D	25.4



LEGEND

128 PM Peak Hour Traffic Volume

NOT TO SCALE

FIGURE 3
2013 Existing
P.M. Peak Hour Traffic Volumes

EXISTING PUBLIC TRANSIT SERVICE

C-Tran provides public transit service in Clark County. There are two bus routes in the study area. Both Routes 44 and 72 provides bus service along NE Fourth Plain Road west of NE Ward Road and NE Ward Road between NE Fourth Plain Road and NE 152nd Avenue.

NON-MOTORIZED TRANSPORTATION

In the study area, bike lanes exist along NE Fourth Plain Road and NE Ward Road. Sidewalks generally exist adjacent to developed areas. Intermittent sidewalks exist in older neighborhoods.

PLANNED TRANSPORTATION IMPROVEMENTS

Based on a review of Clark County's Six-Year Transportation Improvement Program (TIP), 2013-2018, there are no reasonably funded roadway improvement projects affecting the immediate project study area.

The following unfunded Clark County TIP projects exist in the study area"

- VAST: Orchards TSO – 55th Avenue to NE Ward Road
  This project is a joint project between Clark County and WSDOT to modernize, upgrade, and interconnect traffic signals in the Orchards area of east Clark County. The design of the project is in progress and is expected to be completed in 2015. Any needed right-of-way acquisition will take place in 2014. Construction is expected to occur between 2015 and post 2018. The estimated cost is $4,560,000.

- Project Rank 66 – NE Ward Road from north of NE 172nd Avenue to NE Davis Road

- Project Rank 67 – NE Ward Road from NE 88th Street to NE 172nd Avenue

- Project Rank 84 – NE Ward Road at NE Davis Road

- Project Rank 103 – NE Ward Road from NE Davis Road to NE 119th Street

SECTION III
TRAFFIC IMPACT ANALYSIS

ANALYSIS METHODOLOGY

The P.M. peak hour traffic impacts generated by the proposed rezoning of the 5th Plain Creek Master Plan area were analyzed as follows:

- 2024 "Without Master Plan – Existing Zoning" condition to establish the future baseline condition for the traffic analysis. The 2024 "Without Master Plan – Existing Zoning" condition traffic volumes were derived from the 2024 RTC model. The "link" volumes from the 2024 RTC model were "post-processed" into turning movement volumes based on the NCHRP (National Cooperative Highway Research Program) 255 methodology.

- Trip generation for difference in build out between the proposed Master Plan and existing zoning.

- Trip distribution and assignment of the reduction in trips generated by the proposed Master Plan at the study area intersections.

- The reduction in P.M. peak hour traffic generated by the proposed rezone was assigned to the roadway network and subtracted from the 2024 "Without Master Plan" traffic volumes to develop the 2024 "Proposed Master Plan" traffic volumes. These volumes were used to determine the project traffic impacts for the proposed Master Plan.

A detailed discussion of the methodology summarized above and the analysis results are contained in the remainder of this section.

2024 "WITHOUT MASTER PLAN – EXISTING ZONING" TRAFFIC VOLUMES AND LEVELS OF SERVICE

The 2024 "Without Master Plan – Existing Zoning" condition was analyzed as the future baseline condition for the traffic analysis and to define a baseline by which project impacts could be determined. The 2024 "Without Master Plan – Existing Zoning" condition traffic volumes were derived from the 2024 RTC model. The "link" volumes from the 2024 RTC model were "post-processed" into turning movement volumes based on the NCHRP (National Cooperative Highway Research Program) 255 methodology. A software package called "TurnsW32" by Dowling Associates, Inc. was utilized to implement the NCHRP 255 methodology. Appendix C contains the traffic volume forecast from the RTC model as well as the worksheets from the "TurnsW32 software. Figure 4 shows the 2024 "Without Master Plan – Existing Zoning" P.M. peak hour traffic volumes.

Levels of service were calculated at the study area intersections with the 2024 "Without Rezone – Existing Zoning" P.M. peak hour traffic volumes shown in Figure 4 and the existing lane

configurations shown in Figure 2. The results of the 2024 "Without Master Plan – Existing Zoning" P.M. peak hour analysis are shown in Table 2. Appendix D contains the level of service worksheets for the 2024 "Without Master Plan" condition.

Table 2. 2024 "Without Master Plan – Existing Zoning" Levels of Service

	P.M. Peak Hour	
Signalized Intersection	LOS	Average Delay (sec)
NE 78th Street/NE Ward Road	D	47.1
NE Fourth Plain Road/NE 162nd Avenue	D	50.8
Unsignalized Intersection		
NE 88th Street/NE Ward Road		
Westbound Approach	F	>100
Southbound Left	C	18.2
NE Fourth Plain Road/NE 182nd Avenue		
Eastbound Left	B	13.4
Southbound Approach	F	>100

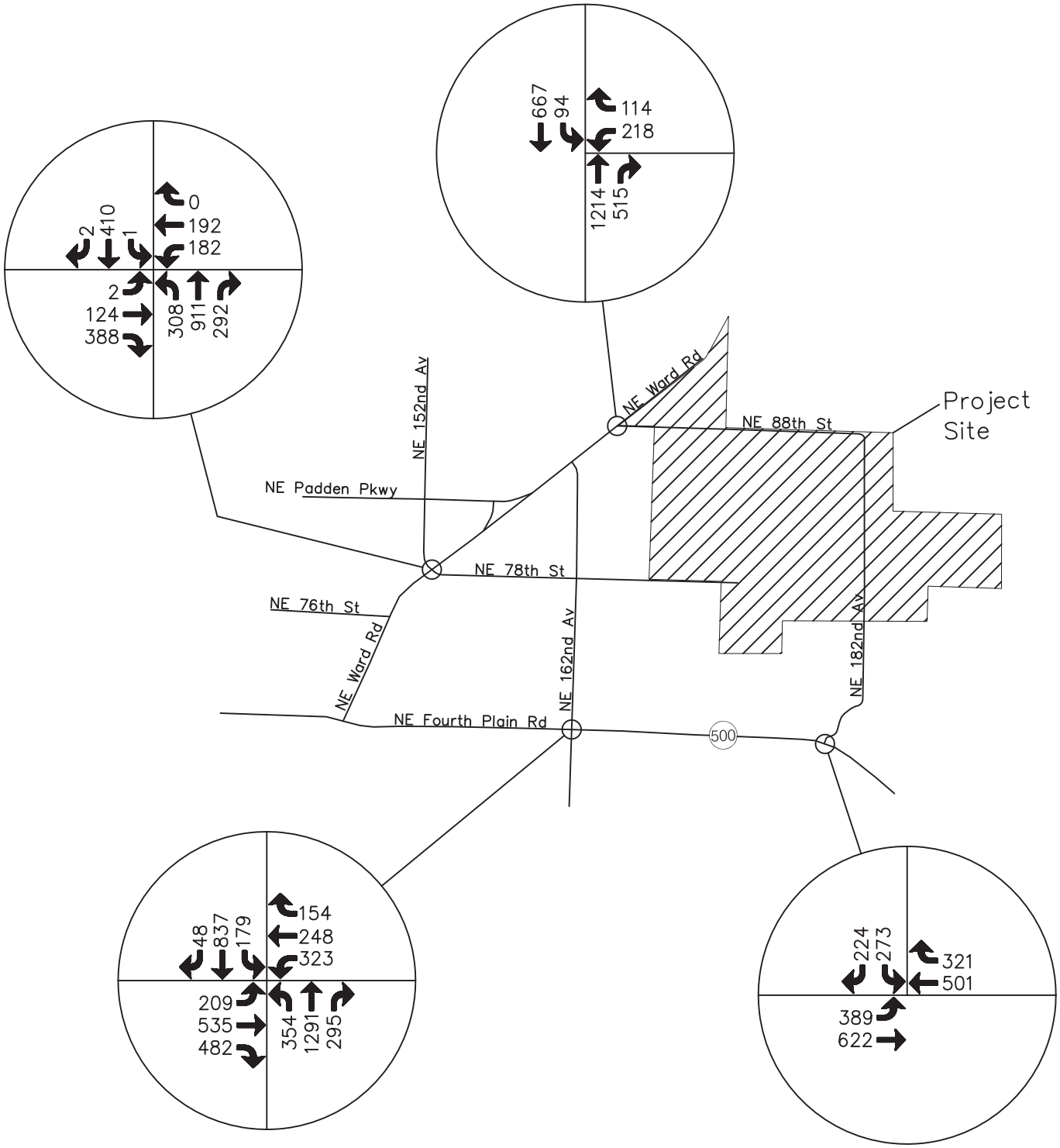
As shown in Table 2, the two signalized intersections at NE Fourth Plain Road/NE 162nd Avenue and NE 78th Street/NE Ward Road are projected to operate at acceptable levels of service in the 2024 "Without Master Plan - Existing Zoning" conditions. However, both of the unsignalized study area intersections at NE 88th Street/NE Ward Road and NE Fourth Plain Road/NE 182nd Avenue are projected to operate at LOS F in the 2024 "Without Master Plan - Existing Zoning" condition.

The NE 88th Street/NE Ward Road intersection will require signalization and the installation of a northbound right turn lane and a westbound left turn lane in the 2024 "Without Master Plan - Existing Zoning" condition to mitigation the intersection to LOS D or better.

The NE Fourth Plain Road/NE 182nd Avenue intersection will require signalization and the installation of a southbound left turn lane, eastbound left turn lane, and westbound right turn lane in the 2024 "Without Master Plan - Existing Zoning" condition to mitigate the intersection to LOS D or better. Table 3 summarizes the intersection level of service with the mitigation measures in place. Appendix D contains the level of service worksheets for the 2024 "Without Master Plan" with mitigation condition.

Table 3. 2024 "Without Master Plan – Existing Zoning" with Mitigation Levels of Service

	P.M. Peak Hour	
Signalized Intersection	LOS	Average Delay (sec)
NE 88th Street/NE Ward Road	C	26.3
NE Fourth Plain Road/NE 182nd Avenue	C	20.1



LEGEND

128 PM Peak Hour Traffic Volume

NOT TO SCALE

FIGURE 4
2024 "Without Master Plan"
P.M. Peak Hour Traffic Volumes

313017.0Figures.Dwg

DEVELOPMENT PLANS

As stated in the previous section, the proposed 5th Plain Creek Master Plan area is approximately 379 acres. The underlying zoning is R1-7.5. After deducting an estimate for roads and infrastructure and wetlands/habitat area, there is approximately 241 acres of total net developable area. The 5th Creek Master Plan area can be accessed by NE 88th Street, NE 78th Street, and NE 182nd Avenue.

Based on a density analysis conducted by Olson Engineering, a maximum of 1,364 single family residential units can be developed with the underlying R1-7.5 zoning. A maximum of 1,177 single family residential units can be developed with the proposed rezoning to a combination of R1-6, R1-7.5, R1-10 and R1-20 zones.

TRIP GENERATION

Estimates of daily, A.M. peak hour, and P.M. peak hour trips generated by the build out of the 5th Plain Creek Master Plan area with the existing and proposed zoning were developed from rates published in "Trip Generation, 9th Edition" (Institute of Transportation Engineers, 2012) and are shown in Table 4.

Table 4. Trip Generation Summary

			A.M. Peak			P.M. Peak		
Land Use	**Amount**	**Average Daily**	**In**	**Out**	**Total**	**In**	**Out**	**Total**
Existing Zoning – (Single Family – ITE Code 210)								
Rate per unit		9.52	0.19	0.56	0.75	0.63	0.37	1.00
Trips	1,364 units	12,985	259	764	1,023	859	505	1,364
Proposed Master Plan – (ITE Code 210)								
Rate per unit		9.52	0.19	0.56	0.75	0.63	0.37	1.00
Trips	1,177 units	11,205	224	659	883	742	435	1,177
Decreased Trips due to Rezone		**1,780**	**35**	**105**	**140**	**117**	**70**	**187**

As shown in Table 4, with the build out of the 5th Plain Creek Master Plan area with the existing R1-7.5 zoning, the master plan area is expected to generated 12,985 net daily, 1,023 net A.M peak hour (259 in, 764 out), and 1,364 net P.M. peak hour trips (859 in, 505 out). Based on the proposed Master Plan, the 5th Plain Creek Master Plan area is expected to generate 11,205 net daily, 883 net A.M peak hour (224 in, 659 out), and 1,177 net P.M. peak hour (742 in, 435 out) trips. The proposed Master Plan would result in a decrease of 1,780 net daily, 140 net A.M. peak hour (35 in, 105 out), and 187 net P.M. peak hour (117 in, 70 out) trips.

TRIP DISTRIBUTION AND ASSIGNMENT

A generalized trip distribution for the P.M. peak hour was developed from the existing traffic counts, locations of major employment centers, logical travel paths to and from major travel corridors, and RTC select zone model runs for the study area. Figure 5 shows the resulting trip distribution pattern and assignment of decreased trips generated by the rezone proposal. These decreased trips were subtracted from the 2024 "Without Master Plan - Existing Zoning" condition traffic volumes to derive the 2024 "With Proposed Master Plan " condition traffic volumes.

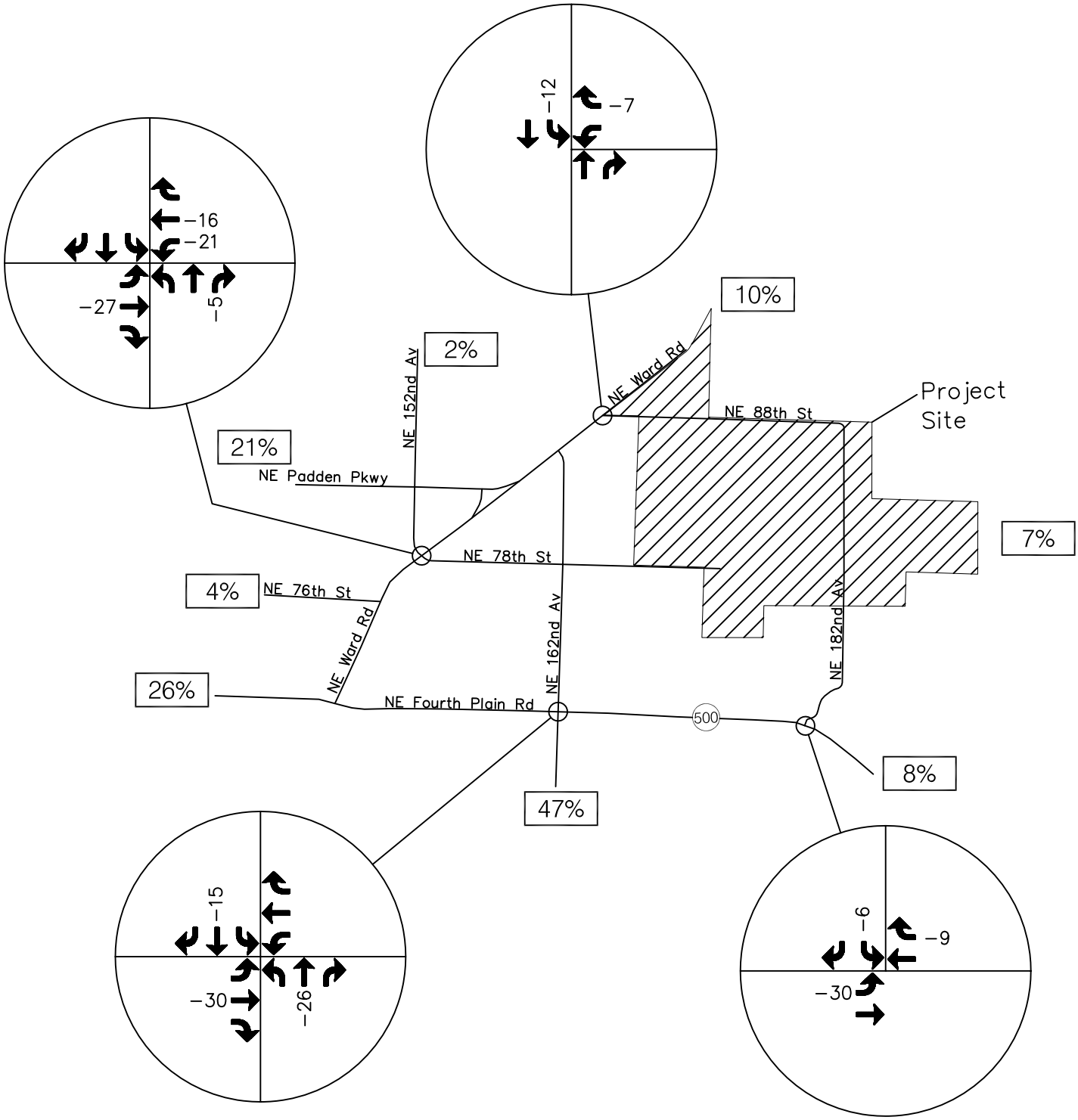
2024 "WITH PROPOSED ZONING" TRAFFIC VOLUMES AND LEVELS OF SERVICE

The traffic volumes shown in Figure 5 were subtracted from the traffic volumes shown in Figure 4 to arrive at the 2024 "With Proposed Master Plan " P.M. peak hour traffic volumes. Figure 6 shows these traffic volumes.

The results of the 2024 "With Proposed Master Plan" level of service analysis are shown in Table 5. In comparing the results of the 2024 "With Proposed Master Plan" condition with the 2024 "Without Master Plan – Existing Zoning" condition, the results are modestly better due to a decrease in projected traffic volumes. However, the two unsignalized study area intersections at NE 88th Street/NE Ward Road and NE Fourth Plain Road/NE 182nd Avenue are still projected to operate at LOS F in the 2024 "With Proposed Master Plan" condition. Appendix E contains the level of service worksheets for the 2024 "With Proposed Rezone" condition.

Table 5. 2024 "With Proposed Master Plan" Levels of Service

	P.M. Peak Hour	
Signalized Intersection	LOS	Average Delay (sec)
NE 78th Street/NE Ward Road	D	44.1
NE Fourth Plain Road/NE 162nd Avenue	D	49.8
Unsignalized Intersection		
NE 88th Street/NE Ward Road		
Westbound Approach	F	>100
Southbound Left	C	17.7
NE Fourth Plain Road/NE 182nd Avenue		
Eastbound Left	B	12.8
Southbound Approach	F	>100



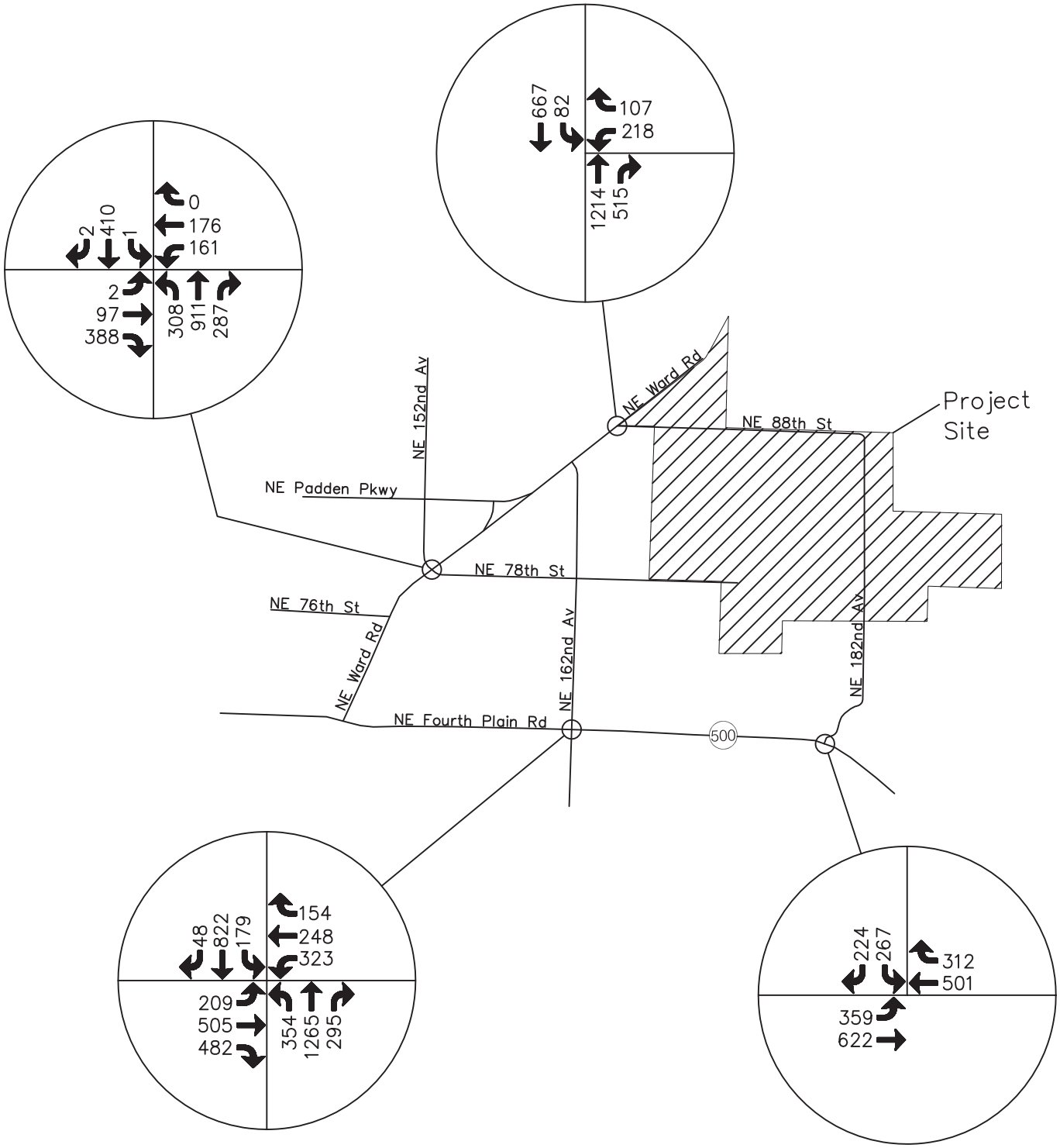
LEGEND

128 P.M. Peak Hour Traffic Volume

50% P.M. Peak Hour Trip Distribution

NOT TO SCALE

FIGURE 5
Trip Distribution and Assignment



LEGEND

128 PM Peak Hour Traffic Volume

NOT TO SCALE

FIGURE 6
2024 "With Proposed Master Plan"
P.M. Peak Hour Traffic Volumes

The NE 88th Street/NE Ward Road intersection will require signalization and the installation of a northbound right turn lane and a westbound left turn lane in the 2024 "With Proposed Master Plan " condition to mitigation the intersection to LOS D or better.

The NE Fourth Plain Road/NE 182nd Avenue intersection will require signalization and the installation of a southbound left turn lane, eastbound left turn lane, and westbound right turn lane in the 2024 "With Proposed Rezone" condition to mitigate the intersection to LOS D or better. Table 6 summarizes the intersection level of service with the mitigation measures in place. Appendix E contains the level of service worksheets for the 2024 "With Proposed Rezone" with mitigation condition.

Table 6. 2024 "With Proposed Rezone" with Mitigation Levels of Service

Signalized Intersection	P.M. Peak Hour	
	LOS	Average Delay (sec)
NE 88th Street/NE Ward Road	C	25.1
NE Fourth Plain Road/NE 182nd Avenue	B	18.5

CONCLUSIONS

The following are the findings and recommendations from the traffic analysis:

Findings

The following are the findings from the traffic analysis:

- With the build out of the 5th Plain Creek Master Plan area with the existing R1-7.5 zoning, the master plan area is expected to generated 12,985 net daily, 1,023 net A.M peak hour (259 in, 764 out), and 1,364 net P.M. peak hour trips (859 in, 505 out). Based on the proposed rezone, the 5th Plain Creek Master Plan area is expected to generate 11,205 net daily, 883 net A.M peak hour (224 in, 659 out), and 1,177 net P.M. peak hour (742 in, 435 out) trips. The proposed rezone would result in a decrease of 1,780 net daily, 140 net A.M. peak hour (35 in, 105 out), and 187 net P.M. peak hour (117 in, 70 out) trips.

- The NE Fourth Plain Road/NE 162nd Avenue and NE 78th Street/NE Ward Road signalized study intersections are projected to operate at acceptable levels of service in both the 2024 "Without Rezone - Existing Zoning" and 2024 "Proposed Zoning" conditions.

- Both of the unsignalized study area intersections at NE 88th Street/NE Ward Road and NE Fourth Plain Road/NE 182nd Avenue are projected to operate at LOS F in both the 2024 "Without Rezone - Existing Zoning" and 2024 "Proposed Zoning" conditions.

Recommendations

- Based on the traffic impact analysis documented in this report, the rezoning of the 5th Plain Creek Master Plan area will result in a reduction of future traffic impacts. However, the two unsignalized study area intersections at NE 88th Street/NE Ward Road and NE Fourth Plain Road/NE 182nd Avenue will require future improvements regardless zoning scenarios.

  The NE 88th Street/NE Ward Road intersection will require signalization and the installation of a northbound right turn lane and a westbound left turn lane in both the 2024 "Without Rezone - Existing Zoning" and 2024 "Proposed Zoning" conditions.

The NE Fourth Plain Road/NE 182nd Avenue intersection will require signalization and the installation of a southbound left turn lane, eastbound left turn lane, and westbound right turn lane in both the 2024 "Without Rezone - Existing Zoning" and 2024 "Proposed Zoning" conditions.

APPENDIX A

2013 EXISTING TRAFFIC COUNTS

Intersection: NE Ward Rd/NE 88th St Date: 5/30/13

PM Peak Hour Turning Movement Volumes

	SB				WB				NB				EB				
Time	SBR	SBT	SBL	Trucks	WBR	WBT	WBL	Trucks	NBR	NBT	NBL	Trucks	EBR	EBT	EBL	Trucks	Total
15 Minute Totals																	
4:00 - 4:15 PM	0	77	4	4	6	0	5	0	11	120	0	4	0	0	0	0	223
4:15 - 4:30 PM	0	87	3	0	4	0	7	0	10	148	0	2	0	0	0	0	259
4:30 - 4:45 PM	0	72	7	5	10	0	9	1	9	159	0	1	0	0	0	0	266
4:45 - 5:00 PM	0	96	3	4	10	0	12	0	17	196	0	3	0	0	0	0	334
5:00 - 5:15 PM	0	89	3	3	5	0	13	0	14	156	0	5	0	0	0	0	280
5:15 - 5:30 PM	0	105	3	1	7	0	13	1	12	186	0	2	0	0	0	0	326
5:30 - 5:45 PM	0	84	3	1	9	0	12	0	17	196	0	1	0	0	0	0	321
5:45 - 6:00 PM	0	74	6	0	5	0	7	1	14	163	0	4	0	0	0	0	269
Hourly Total by 15 minutes																	
4:00 - 5:00 PM	0	332	17	13	30	0	33	1	47	623	0	10	0	0	0	0	1,082
4:15 - 5:15 PM	0	344	16	12	29	0	41	1	50	659	0	11	0	0	0	0	1,139
4:30 - 5:30 PM	0	362	16	13	32	0	47	2	52	697	0	11	0	0	0	0	1,206
4:45 - 5:45 PM	0	374	12	9	31	0	50	1	60	734	0	11	0	0	0	0	1,261
5:00 - 6:00 PM	0	352	15	5	26	0	45	2	57	701	0	12	0	0	0	0	1,196
Peak Hour 4:45 - 5:45 PM	0	374	12	9	31	0	50	1	60	734	0	11	0	0	0	0	1,261
Peak Hour Factor		0.89				0.92				0.93				0.00			0.94
Percent Trucks		2%				1%				1%				0%			

Intersection: NE Ward Rd/NE 78th St Date: 4/9/13

PM Peak Hour Turning Movement Volumes

	SB				WB				NB				EB				
Time	SBR	SBT	SBL	Trucks	WBR	WBT	WBL	Trucks	NBR	NBT	NBL	Trucks	EBR	EBT	EBL	Trucks	Total
15 Minute Totals																	
4:00 - 4:15 PM	1	31	0	1	3	9	5	0	9	54	21	1	17	30	2	6	182
4:15 - 4:30 PM	2	40	0	0	0	19	8	2	4	60	16	0	21	22	2	4	194
4:30 - 4:45 PM	3	30	0	1	1	6	11	0	15	75	25	2	23	31	1	4	221
4:45 - 5:00 PM	1	31	0	0	0	19	9	1	7	71	19	0	23	21	1	0	202
5:00 - 5:15 PM	0	38	0	1	0	13	6	0	9	62	16	5	30	26	1	2	201
5:15 - 5:30 PM	0	45	1	0	0	15	4	1	11	74	18	2	18	22	0	0	208
5:30 - 5:45 PM	1	30	1	1	0	24	15	1	19	97	33	3	24	50	1	4	295
5:45 - 6:00 PM	0	21	0	0	0	7	4	0	14	81	21	1	22	28	0	2	198
Hourly Total by 15 minutes																	
4:00 - 5:00 PM	7	132	0	2	4	53	33	3	35	260	81	3	84	104	6	14	799
4:15 - 5:15 PM	6	139	0	2	1	57	34	3	35	268	76	7	97	100	5	10	818
4:30 - 5:30 PM	4	144	1	2	1	53	30	2	42	282	78	9	94	100	3	6	832
4:45 - 5:45 PM	2	144	2	2	0	71	34	3	46	304	86	10	95	119	3	6	906
5:00 - 6:00 PM	1	134	2	2	0	59	29	2	53	314	88	11	94	126	2	8	902
Peak Hour 4:45 - 5:45 PM	2	144	2	2	0	71	34	3	46	304	86	10	95	119	3	6	906
Peak Hour Factor		0.80				0.67				0.73				0.72			0.77
Percent Trucks		1%				3%				2%				3%			

Intersection: NE Fourth Plain Rd/NE 162nd Av Date: 5/30/13

PM Peak Hour Turning Movement Volumes

	SB				WB				NB				EB				
Time	SBR	SBT	SBL	Trucks	WBR	WBT	WBL	Trucks	NBR	NBT	NBL	Trucks	EBR	EBT	EBL	Trucks	Total
15 Minute Totals																	
4:00 - 4:15 PM	16	129	31	14	41	63	32	10	35	143	67	18	83	87	63	7	790
4:15 - 4:30 PM	17	103	26	5	22	51	50	12	27	146	70	8	72	69	57	7	710
4:30 - 4:45 PM	17	126	23	5	25	40	23	7	26	201	64	8	88	101	66	4	800
4:45 - 5:00 PM	16	118	30	4	41	62	33	2	24	207	66	4	90	84	59	2	830
5:00 - 5:15 PM	17	123	27	4	12	52	23	2	31	223	92	10	65	80	71	3	816
5:15 - 5:30 PM	21	161	31	3	17	41	31	6	24	215	75	6	72	77	51	3	816
5:30 - 5:45 PM	19	111	44	4	14	45	31	2	28	154	68	2	79	71	84	2	748
5:45 - 6:00 PM	23	131	29	2	17	39	19	1	32	155	64	5	83	95	72	3	759
Hourly Total by 15 minutes																	
4:00 - 5:00 PM	66	476	110	28	129	216	138	31	112	697	267	38	333	341	245	20	3,130
4:15 - 5:15 PM	67	470	106	18	100	205	129	23	108	777	292	30	315	334	253	16	3,156
4:30 - 5:30 PM	71	528	111	16	95	195	110	17	105	846	297	28	315	342	247	12	3,262
4:45 - 5:45 PM	73	513	132	15	84	200	118	12	107	799	301	22	306	312	265	10	3,210
5:00 - 6:00 PM	80	526	131	13	60	177	104	11	115	747	299	23	299	323	278	11	3,139
Peak Hour 4:30 - 5:30 PM	71	528	111	16	95	195	110	17	105	846	297	28	315	342	247	12	3,262
Peak Hour Factor		0.83				0.74				0.90				0.89			0.98
Percent Trucks		2%				4%				2%				1%			

Intersection: NE Fourth Plain Rd/NE 182nd Av Date: 6/4/13

PM Peak Hour Turning Movement Volumes

	SB				WB				NB				EB				
Time	SBR	SBT	SBL	Trucks	WBR	WBT	WBL	Trucks	NBR	NBT	NBL	Trucks	EBR	EBT	EBL	Trucks	Total
15 Minute Totals																	
4:00 - 4:15 PM	24	0	4	2	7	51	0	3	0	0	0	0	0	98	42	3	226
4:15 - 4:30 PM	26	0	4	1	17	70	0	2	0	0	0	0	0	87	35	1	239
4:30 - 4:45 PM	21	0	8	1	12	76	0	2	0	0	0	0	0	98	37	2	252
4:45 - 5:00 PM	30	0	11	0	10	58	0	1	0	0	0	0	0	88	32	2	229
5:00 - 5:15 PM	25	0	8	0	10	94	0	4	0	0	0	0	0	84	36	3	257
5:15 - 5:30 PM	26	0	14	0	22	71	0	0	0	0	0	0	0	118	49	2	300
5:30 - 5:45 PM	16	0	13	0	15	81	0	5	0	0	0	0	0	85	39	1	249
5:45 - 6:00 PM	24	0	10	0	14	74	0	0	0	0	0	0	0	88	47	0	257
Hourly Total by 15 minutes																	
4:00 - 5:00 PM	101	0	27	4	46	255	0	8	0	0	0	0	0	371	146	8	946
4:15 - 5:15 PM	102	0	31	2	49	298	0	9	0	0	0	0	0	357	140	8	977
4:30 - 5:30 PM	102	0	41	1	54	299	0	7	0	0	0	0	0	388	154	9	1,038
4:45 - 5:45 PM	97	0	46	0	57	304	0	10	0	0	0	0	0	375	156	8	1,035
5:00 - 6:00 PM	91	0	45	0	61	320	0	9	0	0	0	0	0	375	171	6	1,063
Peak Hour 5:00 - 6:00 PM	91	0	45	0	61	320	0	9	0	0	0	0	0	375	171	6	1,063
Peak Hour Factor		0.85				0.92				0.00				0.82			0.89
Percent Trucks		0%				2%				0%				1%			

APPENDIX B

2013 EXISTING LEVEL OF SERVICE

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	50	31	734	60	12	374
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.948		0.990			
Flt Protected	0.970				0.950	
Satd. Flow (prot)	1730	0	1862	0	1770	1863
Flt Permitted	0.970				0.950	
Satd. Flow (perm)	1730	0	1862	0	1770	1863
Link Speed (mph)	30		45			45
Link Distance (ft)	898		657			773
Travel Time (s)	20.4		10.0			11.7
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Adj. Flow (vph)	53	33	781	64	13	398
Shared Lane Traffic (%)						
Lane Group Flow (vph)	86	0	845	0	13	398
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 53.6%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Intersection Delay, s/veh	1.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	50	31	734	60	12	374
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	1	1	1	1	2	2
Mvmt Flow	53	33	781	64	13	398

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1236	813	0	0	845	0
Stage 1	813	-	-	-	-	-
Stage 2	423	-	-	-	-	-
Follow-up Headway	3.509	3.309	-	-	2.218	-
Pot Capacity-1 Maneuver	195	380	-	-	792	-
Stage 1	438	-	-	-	-	-
Stage 2	663	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	192	380	-	-	792	-
Mov Capacity-2 Maneuver	192	-	-	-	-	-
Stage 1	438	-	-	-	-	-
Stage 2	652	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	28.6	0	0.3
HCM LOS	D		

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	237	792	-
HCM Lane V/C Ratio	-	-	0.364	0.016	-
HCM Control Delay (s)	-	-	28.6	9.62	-
HCM Lane LOS			D	A	
HCM 95th %tile Q(veh)	-	-	1.581	0.049	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

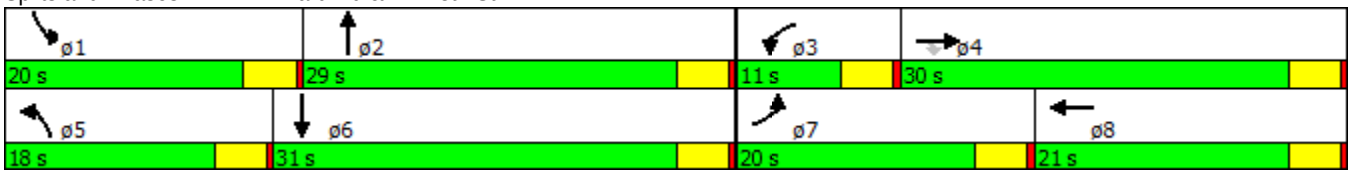
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	3	119	95	34	71	0	86	304	46	2	144	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850					0.980			0.998	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1845	1568	1752	1845	0	1770	3468	0	1787	3567	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1752	1845	1568	1752	1845	0	1770	3468	0	1787	3567	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			123					19			2	
Link Speed (mph)		35			25			45			45	
Link Distance (ft)		1098			1170			707			622	
Travel Time (s)		21.4			31.9			10.7			9.4	
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	4	155	123	44	92	0	112	395	60	3	187	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	4	155	123	44	92	0	112	455	0	3	190	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Detector Phase	7	4	4	3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	20.0	20.0	20.0	8.0	20.0		8.0	20.0		20.0	20.0	
Total Split (s)	20.0	30.0	30.0	11.0	21.0		18.0	29.0		20.0	31.0	
Total Split (%)	22.2%	33.3%	33.3%	12.2%	23.3%		20.0%	32.2%		22.2%	34.4%	
Maximum Green (s)	16.0	26.0	26.0	7.0	17.0		14.0	25.0		16.0	27.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	None		Min	Min	
Walk Time (s)	5.0	5.0	5.0		5.0			5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0	11.0		11.0			11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0		0			0		0	0	
Act Effct Green (s)	6.0	9.7	9.7	6.7	11.6		8.8	11.6		6.0	14.4	
Actuated g/C Ratio	0.14	0.22	0.22	0.15	0.27		0.20	0.27		0.14	0.33	
v/c Ratio	0.02	0.38	0.28	0.16	0.19		0.31	0.48		0.01	0.16	
Control Delay	22.7	19.6	6.4	22.3	14.8		20.2	16.0		22.5	16.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	22.7	19.6	6.4	22.3	14.8		20.2	16.0		22.5	16.7	
LOS	C	B	A	C	B		C	B		C	B	
Approach Delay		13.9			17.2			16.8			16.8	
Approach LOS		B			B			B			B	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 43.5
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.48
Intersection Signal Delay: 16.2 Intersection LOS: B
Intersection Capacity Utilization 31.8% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 2: NE Ward Rd & NE 78th St



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	4	155	123	44	92	112	455	3	190
v/c Ratio	0.02	0.38	0.28	0.16	0.19	0.31	0.48	0.01	0.16
Control Delay	22.7	19.6	6.4	22.3	14.8	20.2	16.0	22.5	16.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.7	19.6	6.4	22.3	14.8	20.2	16.0	22.5	16.7
Queue Length 50th (ft)	1	27	0	8	16	20	38	1	17
Queue Length 95th (ft)	8	77	23	34	49	61	86	6	48
Internal Link Dist (ft)		1018			1090		627		542
Turn Bay Length (ft)									
Base Capacity (vph)	685	1172	1041	299	802	605	2126	698	2355
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.13	0.12	0.15	0.11	0.19	0.21	0.00	0.08

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	3	119	95	34	71	0	86	304	46	2	144	2
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	184.5	184.5	184.5	184.5	184.5	190.0	186.3	186.3	190.0	188.1	188.1	190.0
Lanes	1	1	1	1	1	0	1	2	0	1	2	0
Cap, veh/h	177	361	307	69	247	0	146	776	117	186	986	16
Arrive On Green	0.10	0.20	0.20	0.04	0.13	0.00	0.08	0.25	0.25	0.10	0.27	0.27
Sat Flow, veh/h	1757	1845	1568	1757	1845	0	1774	3164	477	1792	3693	59
Grp Volume(v), veh/h	4	155	123	44	92	0	112	231	224	3	95	95
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	1845	0	1774	1863	1779	1792	1881	1871
Q Serve(g_s), s	0.1	2.8	2.6	0.9	1.7	0.0	2.4	4.1	4.2	0.1	1.5	1.5
Cycle Q Clear(g_c), s	0.1	2.8	2.6	0.9	1.7	0.0	2.4	4.1	4.2	0.1	1.5	1.5
Prop In Lane	1.00		1.00	1.00		0.00	1.00		0.27	1.00		0.03
Lane Grp Cap(c), veh/h	177	361	307	69	247	0	146	457	436	186	502	499
V/C Ratio(X)	0.02	0.43	0.40	0.64	0.37	0.00	0.77	0.51	0.51	0.02	0.19	0.19
Avail Cap(c_a), veh/h	731	1248	1061	320	816	0	646	1211	1157	746	1321	1314
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	15.6	13.6	13.5	18.2	15.2	0.0	17.3	12.5	12.5	15.5	10.9	10.9
Incr Delay (d2), s/veh	0.1	0.8	0.8	9.6	0.9	0.0	8.2	0.9	0.9	0.0	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.0	1.1	0.9	0.5	0.8	0.0	1.2	1.6	1.6	0.0	0.6	0.6
Lane Grp Delay (d), s/veh	15.6	14.4	14.3	27.8	16.1	0.0	25.4	13.4	13.5	15.5	11.1	11.1
Lane Grp LOS	B	B	B	C	B		C	B	B	B	B	B
Approach Vol, veh/h		282			136			567			193	
Approach Delay, s/veh		14.4			19.9			15.8			11.1	
Approach LOS		B			B			B			B	

Timer												
Assigned Phs	7	4		3	8		5	2		1	6	
Phs Duration (G+Y+Rc), s	7.9	11.5		5.5	9.1		7.2	13.4		8.0	14.3	
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Max Green Setting (Gmax), s	16.0	26.0		7.0	17.0		14.0	25.0		16.0	27.0	
Max Q Clear Time (g_c+I1), s	2.1	4.8		2.9	3.7		4.4	6.2		2.1	3.5	
Green Ext Time (p_c), s	0.0	1.7		0.0	1.5		0.2	3.3		0.0	3.4	

Intersection Summary			
HCM 2010 Ctrl Delay			15.2
HCM 2010 LOS			B

Notes

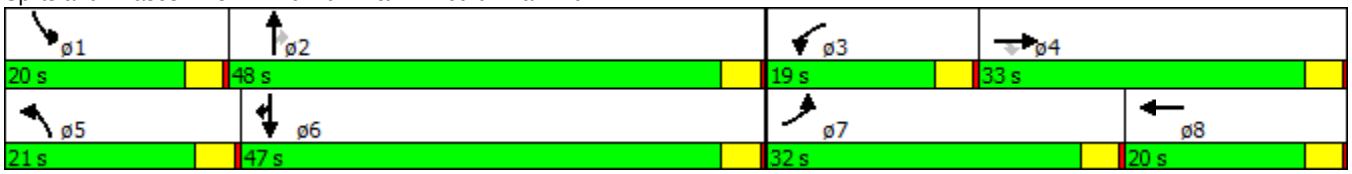
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	247	342	315	110	195	95	297	846	105	111	528	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.951				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1787	3574	1599	1736	3301	0	3433	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1787	3574	1599	1736	3301	0	3433	3539	1583	1770	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			321		57				118			118
Link Speed (mph)		50			50			40			40	
Link Distance (ft)		1389			1241			1395			1476	
Travel Time (s)		18.9			16.9			23.8			25.2	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	252	349	321	112	199	97	303	863	107	113	539	72
Shared Lane Traffic (%)												
Lane Group Flow (vph)	252	349	321	112	296	0	303	863	107	113	539	72
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	NA	Prot
Protected Phases	7	4		3	8		5	2		1	6	6
Permitted Phases			4						2			
Detector Phase	7	4	4	3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	8.0	20.0	20.0	8.0	20.0		8.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	32.0	33.0	33.0	19.0	20.0		21.0	48.0	48.0	20.0	47.0	47.0
Total Split (%)	26.7%	27.5%	27.5%	15.8%	16.7%		17.5%	40.0%	40.0%	16.7%	39.2%	39.2%
Maximum Green (s)	28.0	29.0	29.0	15.0	16.0		17.0	44.0	44.0	16.0	43.0	43.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
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
Recall Mode	None	None	None	None	None		None	Min	Min	Min	Min	Min
Walk Time (s)		5.0	5.0		5.0			5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)		11.0	11.0		11.0			11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0		0			0	0	0	0	0
Act Effct Green (s)	18.5	22.7	22.7	11.3	12.2		13.5	29.9	29.9	11.4	27.8	27.8
Actuated g/C Ratio	0.21	0.26	0.26	0.13	0.14		0.15	0.34	0.34	0.13	0.31	0.31
v/c Ratio	0.68	0.38	0.50	0.51	0.59		0.58	0.73	0.18	0.50	0.49	0.13
Control Delay	45.1	32.6	7.0	50.3	37.1		43.4	30.9	4.7	49.5	27.2	1.5
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.1	32.6	7.0	50.3	37.1		43.4	30.9	4.7	49.5	27.2	1.5
LOS	D	C	A	D	D		D	C	A	D	C	A
Approach Delay		27.1			40.7			31.7			28.1	
Approach LOS		C			D			C			C	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 89
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 30.7 Intersection LOS: C
Intersection Capacity Utilization 65.0% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 3: NE 162nd Av & NE Fourth Plain Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	252	349	321	112	296	303	863	107	113	539	72
v/c Ratio	0.68	0.38	0.50	0.51	0.59	0.58	0.73	0.18	0.50	0.49	0.13
Control Delay	45.1	32.6	7.0	50.3	37.1	43.4	30.9	4.7	49.5	27.2	1.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.1	32.6	7.0	50.3	37.1	43.4	30.9	4.7	49.5	27.2	1.5
Queue Length 50th (ft)	129	88	0	59	65	81	217	0	59	126	0
Queue Length 95th (ft)	265	166	73	143	141	163	364	31	143	215	7
Internal Link Dist (ft)		1309			1161		1315			1396	
Turn Bay Length (ft)											
Base Capacity (vph)	597	1237	763	311	677	697	1859	887	338	1817	870
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.28	0.42	0.36	0.44	0.43	0.46	0.12	0.33	0.30	0.08

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	247	342	315	110	195	95	297	846	105	111	528	71
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	188.1	188.1	188.1	182.7	182.7	190.0	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	1	2	1	1	2	0	2	2	1	1	2	1
Cap, veh/h	302	979	416	144	411	192	409	1356	576	159	1246	530
Arrive On Green	0.17	0.26	0.26	0.08	0.17	0.17	0.12	0.36	0.36	0.09	0.33	0.33
Sat Flow, veh/h	1792	3762	1599	1740	2357	1103	3442	3725	1583	1774	3725	1583
Grp Volume(v), veh/h	252	349	321	112	152	144	303	863	107	113	539	72
Grp Sat Flow(s),veh/h/ln	1792	1881	1599	1740	1827	1632	1721	1863	1583	1774	1863	1583
Q Serve(g_s), s	10.7	5.9	14.6	4.9	5.9	6.2	6.7	15.0	3.6	4.9	8.8	2.5
Cycle Q Clear(g_c), s	10.7	5.9	14.6	4.9	5.9	6.2	6.7	15.0	3.6	4.9	8.8	2.5
Prop In Lane	1.00		1.00	1.00		0.68	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	302	979	416	144	318	284	409	1356	576	159	1246	530
V/C Ratio(X)	0.84	0.36	0.77	0.78	0.48	0.50	0.74	0.64	0.19	0.71	0.43	0.14
Avail Cap(c_a), veh/h	640	1392	591	333	373	333	746	2091	889	362	2043	868
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	31.6	23.7	26.9	35.3	29.2	29.3	33.4	20.6	17.0	34.7	20.3	18.2
Incr Delay (d2), s/veh	6.1	0.2	4.0	8.8	1.1	1.4	2.7	0.5	0.2	5.8	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	5.0	2.6	5.6	2.4	2.6	2.5	2.9	6.4	1.2	2.4	3.9	0.9
Lane Grp Delay (d), s/veh	37.6	23.9	30.8	44.1	30.3	30.7	36.0	21.1	17.2	40.5	20.5	18.3
Lane Grp LOS	D	C	C	D	C	C	D	C	B	D	C	B
Approach Vol, veh/h		922			408			1273			724	
Approach Delay, s/veh		30.1			34.2			24.4			23.4	
Approach LOS		C			C			C			C	

Timer												
Assigned Phs	7	4		3	8		5	2		1	6	
Phs Duration (G+Y+Rc), s	17.2	24.4		10.5	17.7		13.3	32.5		11.0	30.2	
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Max Green Setting (Gmax), s	28.0	29.0		15.0	16.0		17.0	44.0		16.0	43.0	
Max Q Clear Time (g_c+I1), s	12.7	16.6		6.9	8.2		8.7	17.0		6.9	10.8	
Green Ext Time (p_c), s	0.6	3.8		0.1	2.9		0.7	11.5		0.2	12.3	

Intersection Summary	
HCM 2010 Ctrl Delay	26.9
HCM 2010 LOS	C

Notes

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	171	375	320	61	45	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.978		0.910	
Flt Protected		0.985			0.984	
Satd. Flow (prot)	0	1853	1822	0	1701	0
Flt Permitted		0.985			0.984	
Satd. Flow (perm)	0	1853	1822	0	1701	0
Link Speed (mph)		50	50		30	
Link Distance (ft)		623	614		1224	
Travel Time (s)		8.5	8.4		27.8	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	1%	2%	2%	0%	0%
Adj. Flow (vph)	192	421	360	69	51	102
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	613	429	0	153	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 67.8%		ICU Level of Service C	
Analysis Period (min) 15			

Intersection	
Intersection Delay, s/veh	4.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	171	375	320	61	45	91
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	1	1	2	2	0	0
Mvmt Flow	192	421	360	69	51	102

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	428	0	-	0	1200	394
Stage 1	-	-	-	-	394	-
Stage 2	-	-	-	-	806	-
Follow-up Headway	2.209	-	-	-	3.5	3.3
Pot Capacity-1 Maneuver	1137	-	-	-	206	659
Stage 1	-	-	-	-	686	-
Stage 2	-	-	-	-	443	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1137	-	-	-	161	659
Mov Capacity-2 Maneuver	-	-	-	-	161	-
Stage 1	-	-	-	-	686	-
Stage 2	-	-	-	-	346	-

Approach	EB	WB	SB
HCM Control Delay, s	2.8	0	25.4
HCM LOS			D

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1137	-	-	-	326
HCM Lane V/C Ratio	0.169	-	-	-	0.469
HCM Control Delay (s)	8.809	0	-	-	25.4
HCM Lane LOS	A	A			D
HCM 95th %tile Q(veh)	0.607	-	-	-	2.384

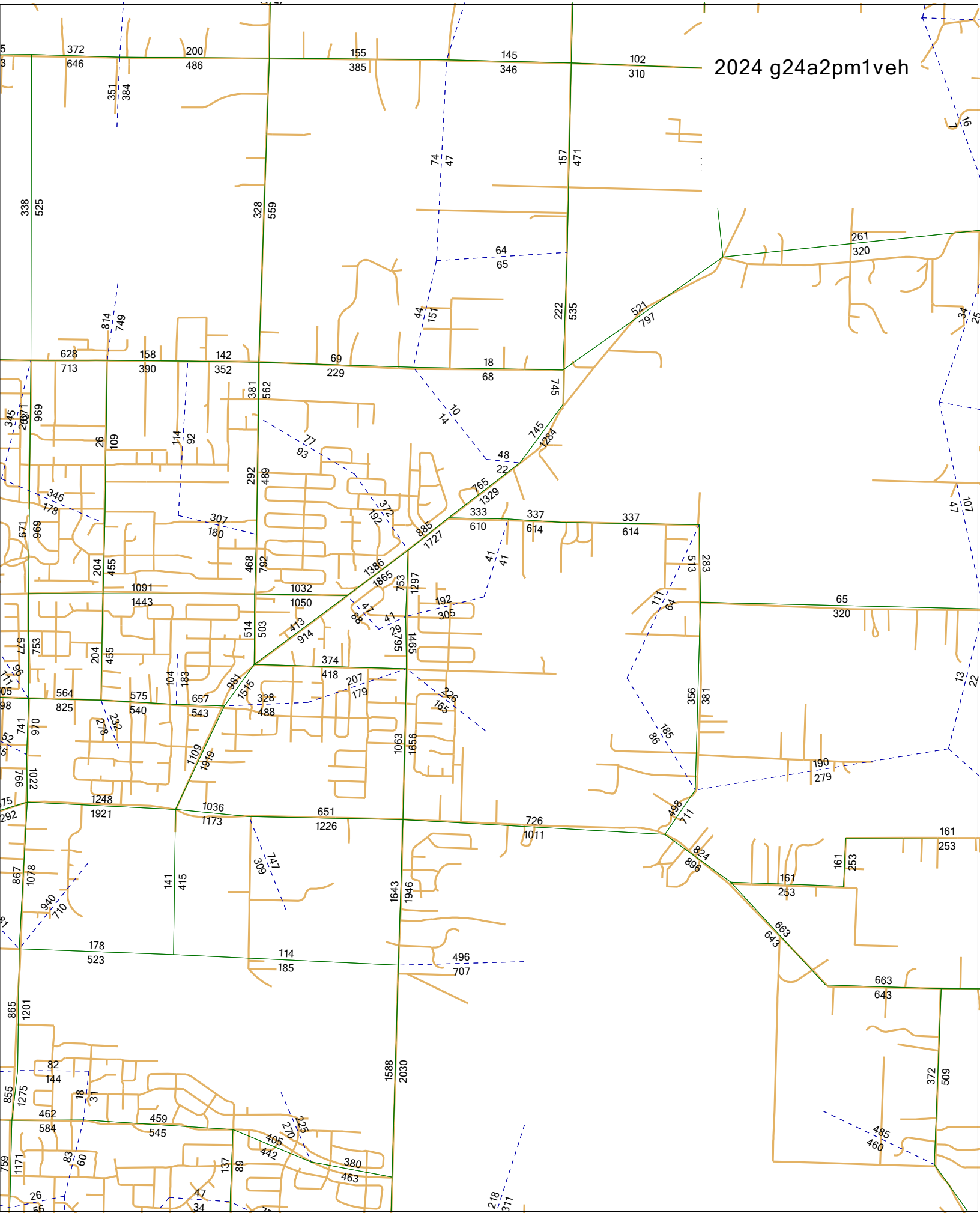
Notes

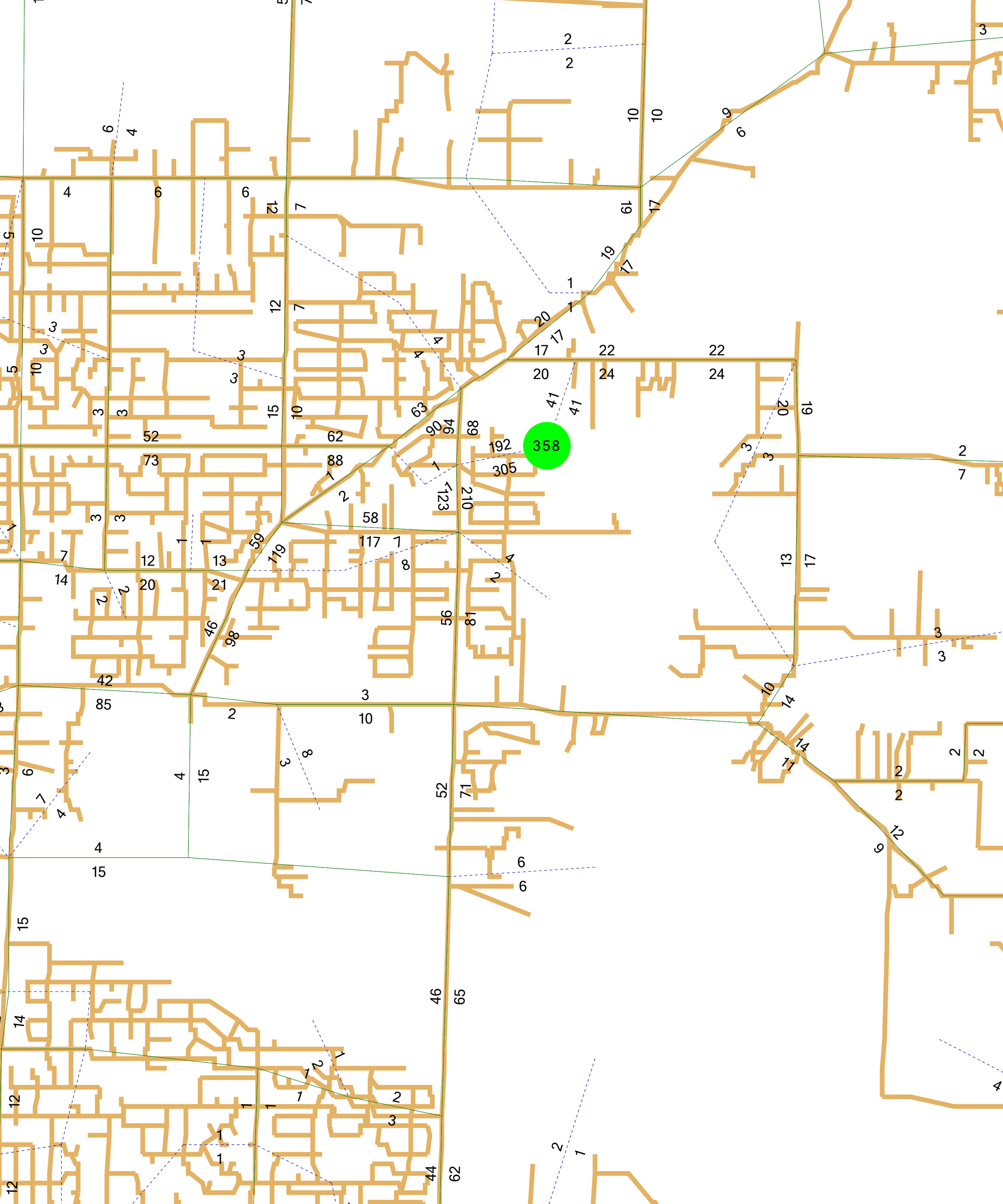
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

APPENDIX C

TRAFFIC FORECAST AND TRIP DISTRIBUTION DOCUMENTATION

2024 g24a2pm1veh

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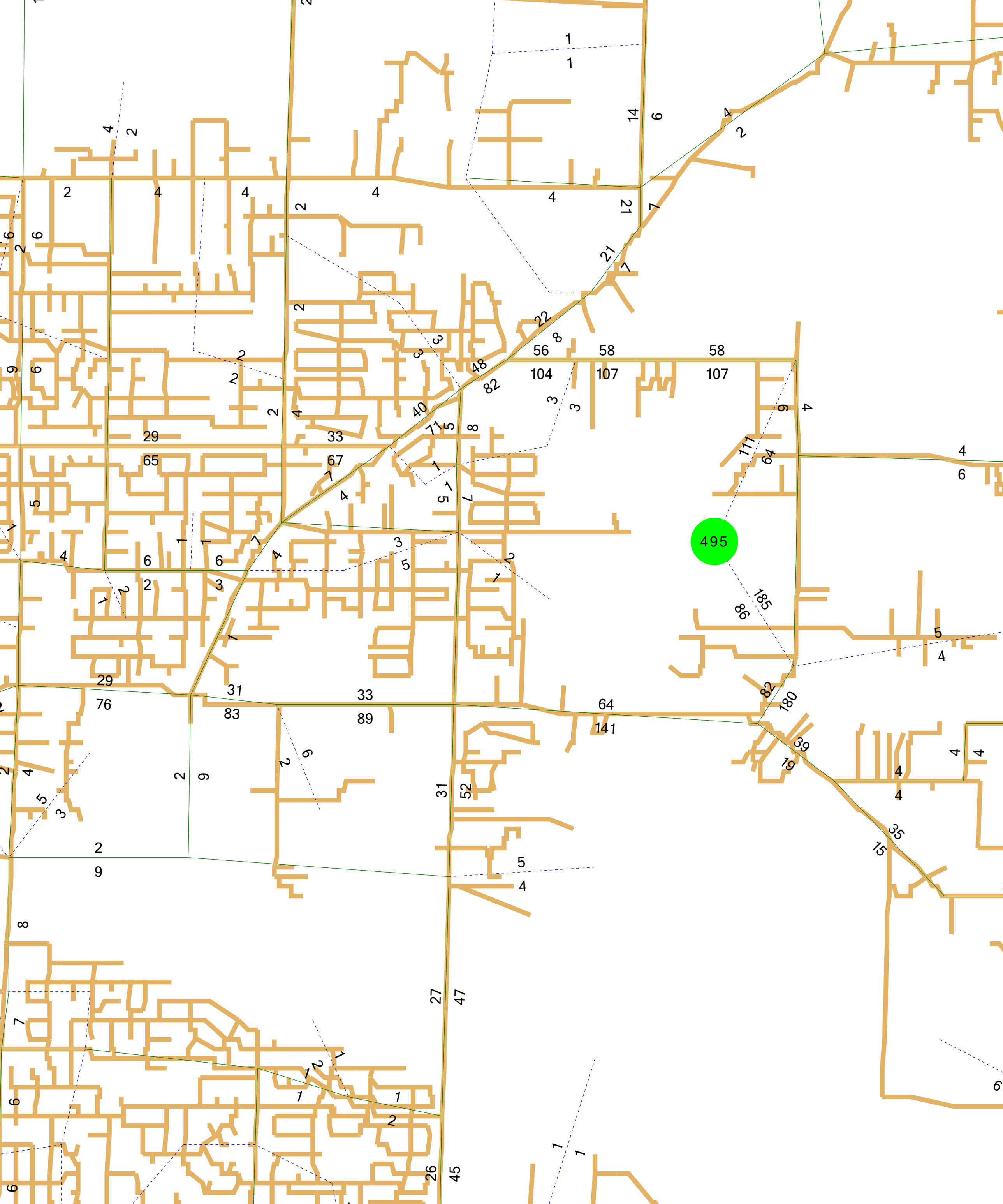
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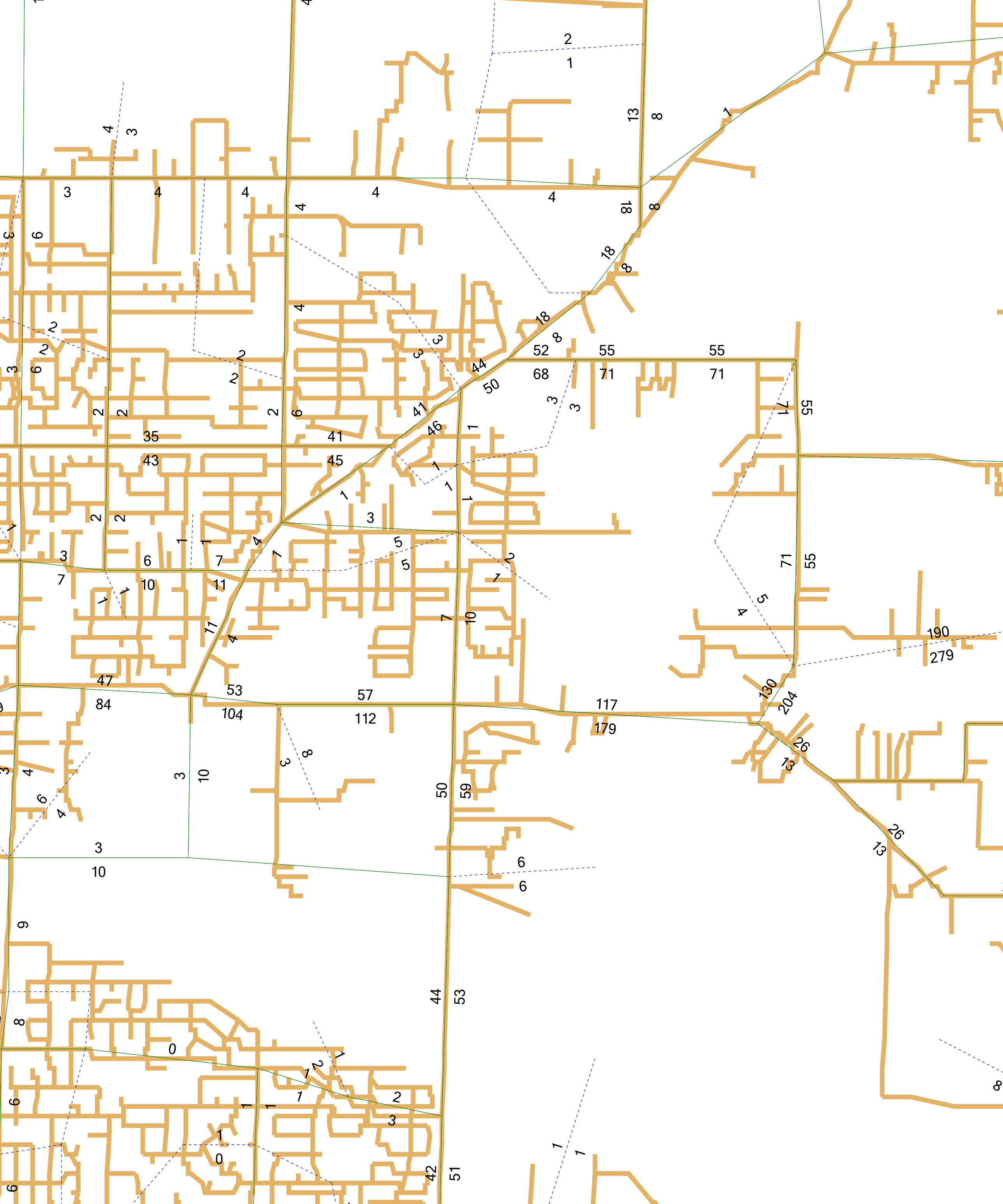

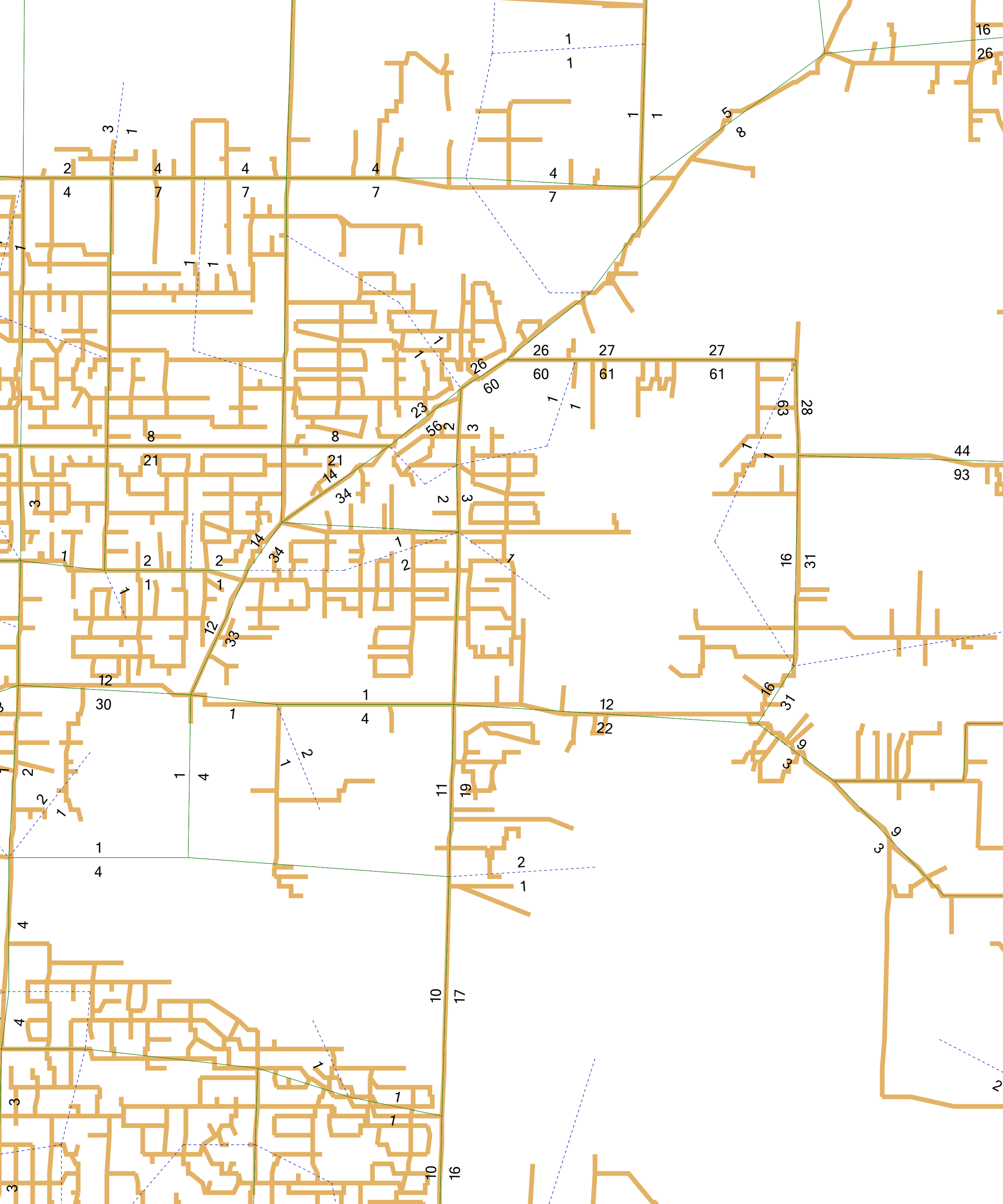

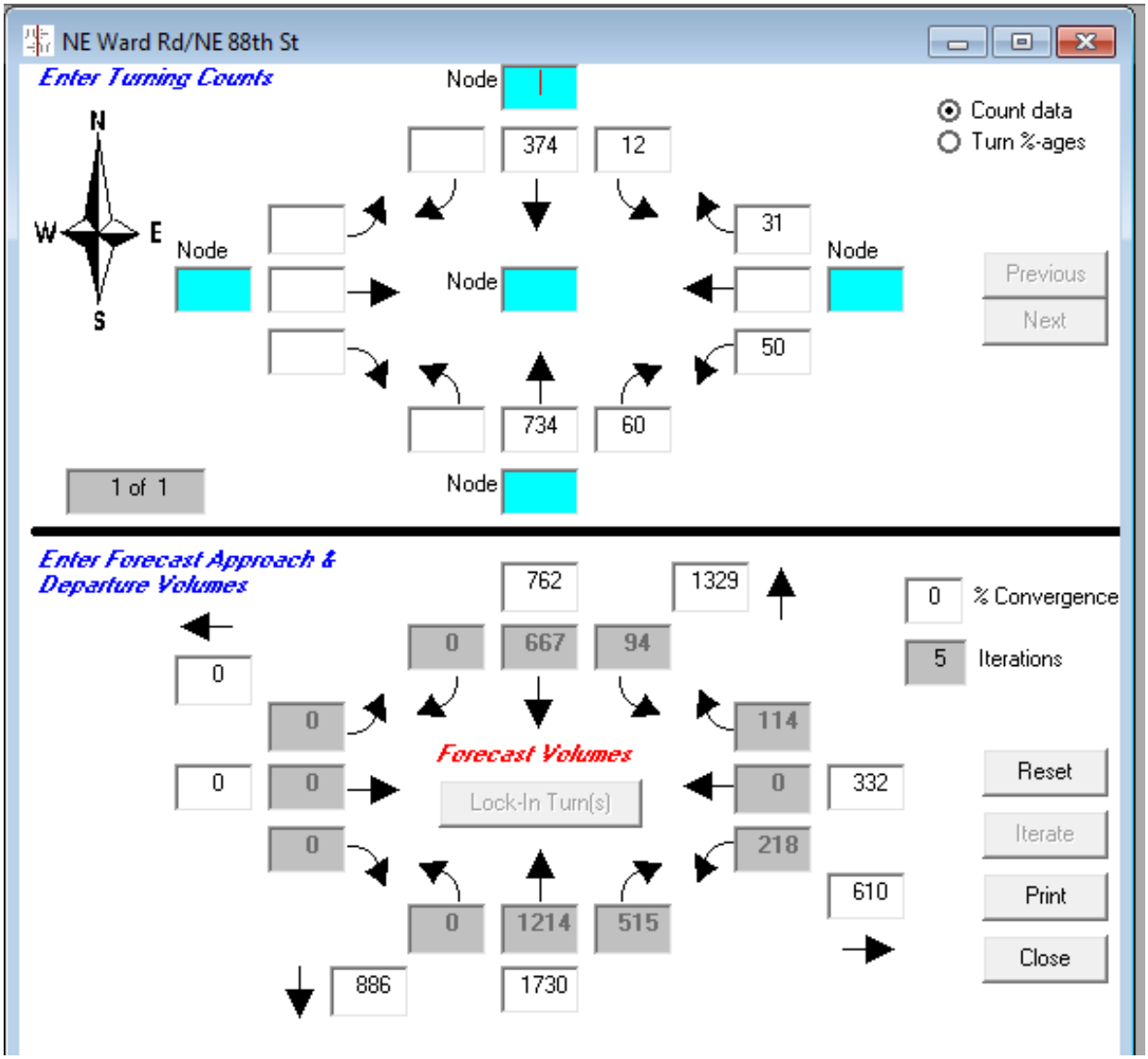
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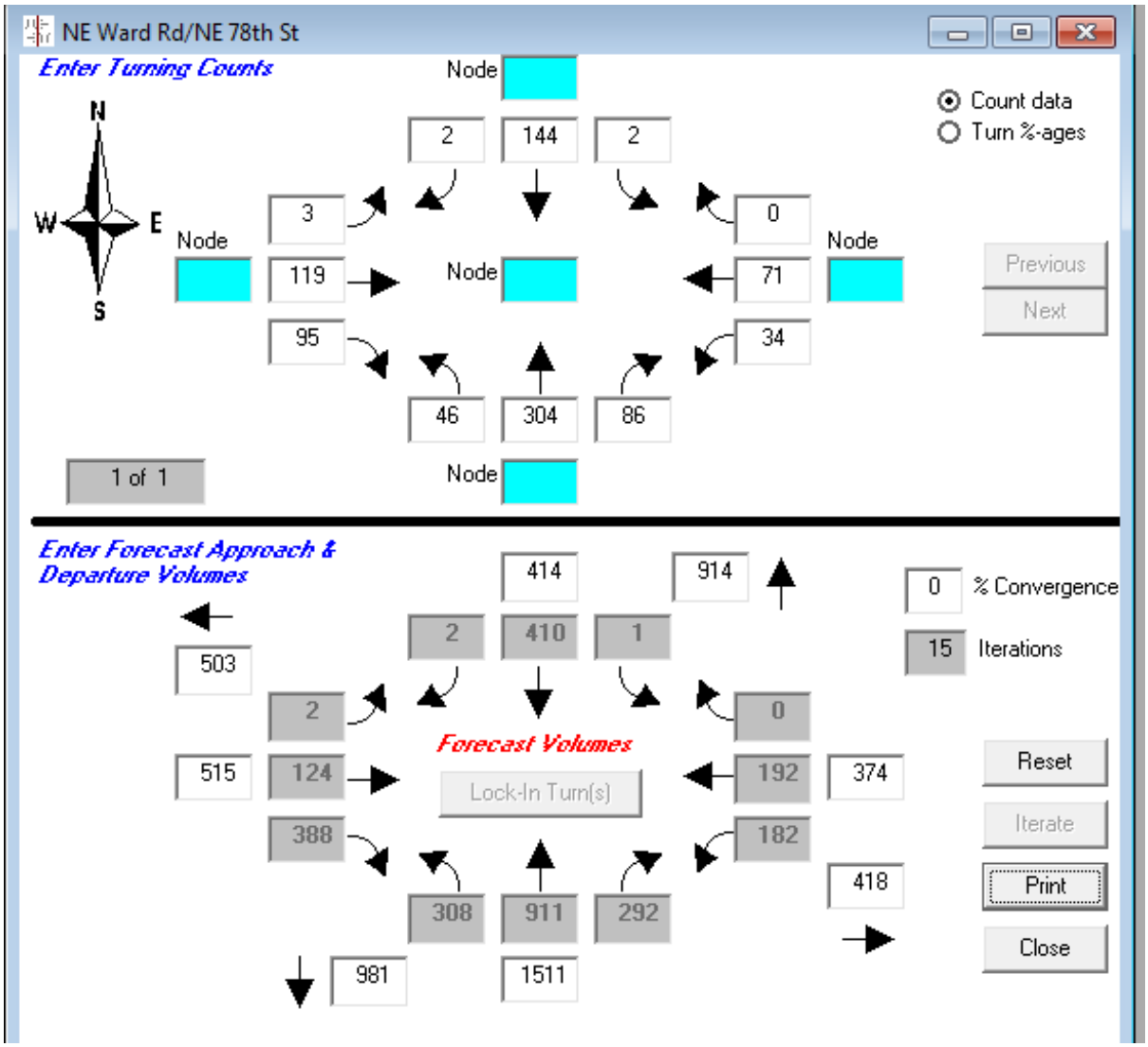
Enter Turning Counts
Node
374
12
31
50
734
60
Count data
Turn %-ages
Previous
Next
1 of 1
Enter Forecast Approach & Departure Volumes
762
1329
0
667
94
114
0
332
218
610
886
1730
1214
515
Forecast Volumes
Lock-In Turn(s)
% Convergence
Iterations
Reset
Iterate
Print
Close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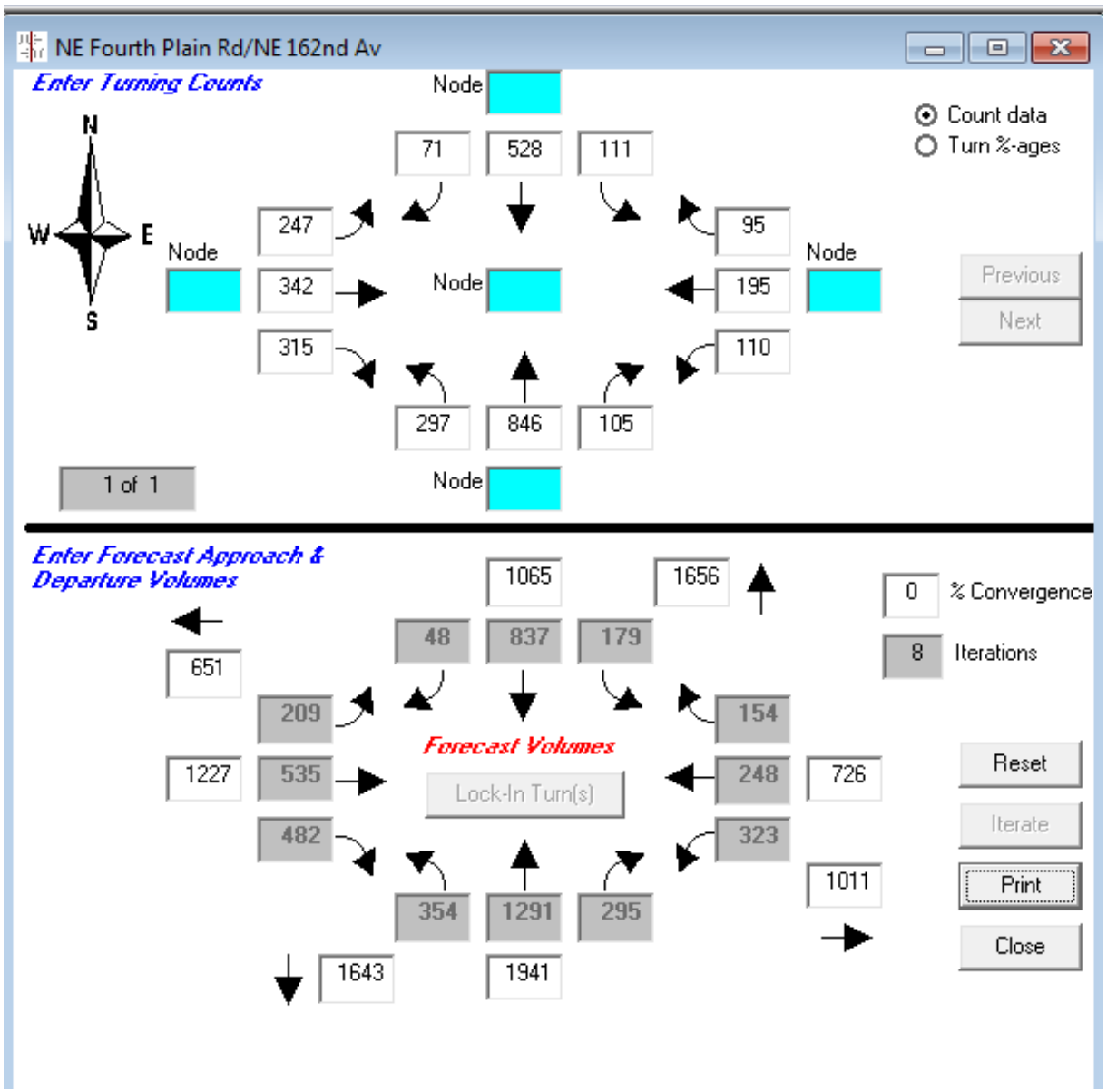
Enter Turning Counts
Node
Count data
Turn %-ages
N
W
E
S
2
144
2
3
0
Node
119
Node
71
Node
95
34
46
304
86
Previous
Next
1 of 1
Node
Enter Forecast Approach & Departure Volumes
414
914
0
% Convergence
503
2
410
1
15
Iterations
2
0
Forecast Volumes
515
124
Lock-In Turn(s)
192
374
Reset
388
182
Iterate
418
Print
308
911
292
Close
981
1511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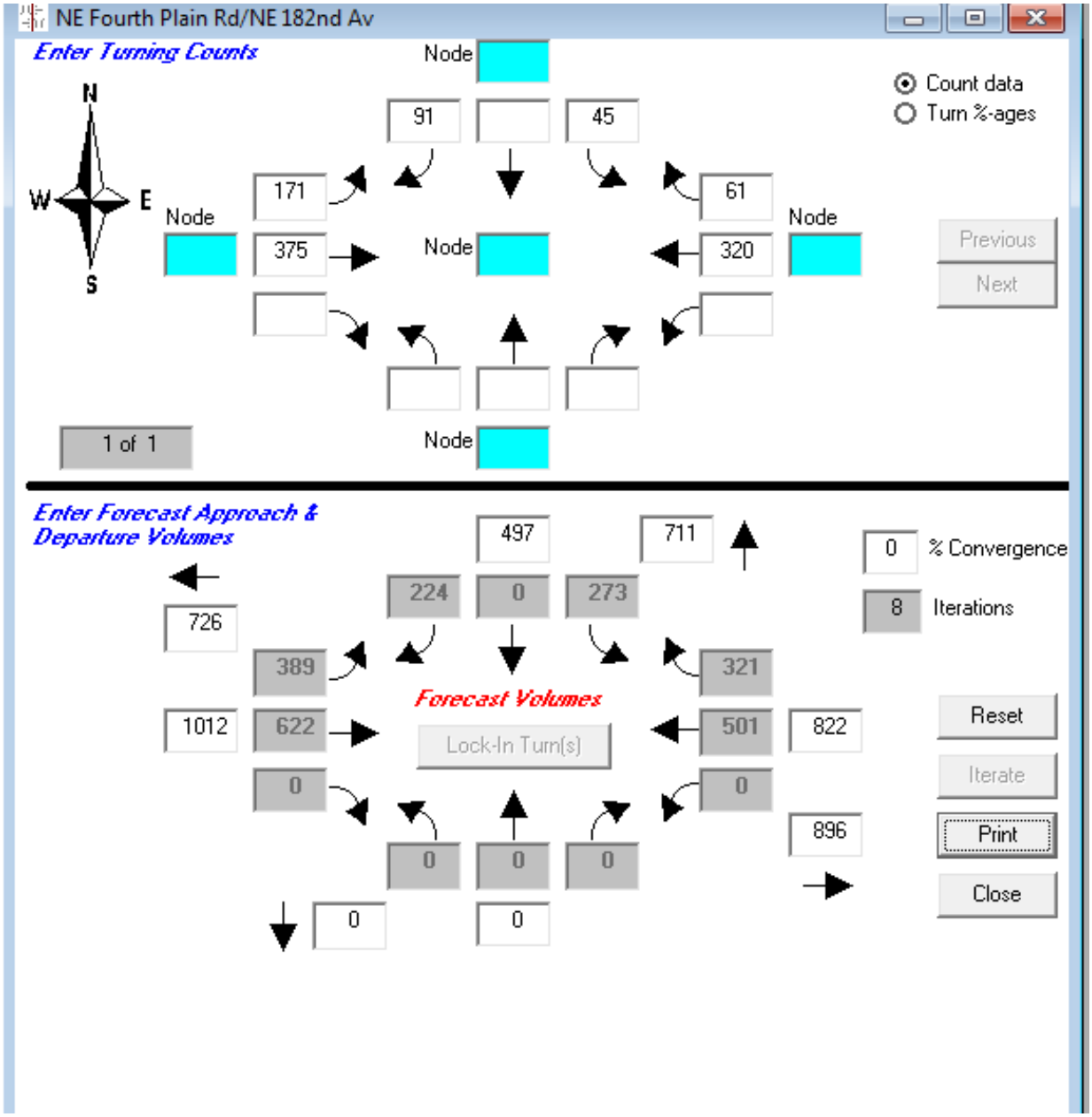
Enter Turning Counts
Node
Count data
Turn %-ages
N
W
E
S
71
528
111
247
95
Node
342
Node
195
Node
315
110
297
846
105
Previous
Next
1 of 1
Node
Enter Forecast Approach & Departure Volumes
1065
1656
0
% Convergence
48
837
179
8
Iterations
651
209
154
Forecast Volumes
1227
535
Lock-In Turn(s)
248
726
Reset
482
323
Iterate
1011
Print
354
1291
295
Close
1643
1941


NE Fourth Plain Rd/NE 182nd Av
Enter Turning Counts
Node
Count data
Turn %-ages
N
W
E
S
91
45
171
61
Node
375
Node
320
Node
Previous
Next
1 of 1
Node
Enter Forecast Approach & Departure Volumes
497
711
0
% Convergence
224
0
273
8
Iterations
726
389
321
Forecast Volumes
1012
622
Lock-In Turn(s)
501
822
Reset
0
0
Iterate
896
Print
0
0
0
Close
0
0

APPENDIX D

2024 “WITHOUT MASTER PLAN” LEVELS OF SERVICE

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	218	114	1214	515	94	667
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.954		0.960			
Flt Protected	0.968				0.950	
Satd. Flow (prot)	1737	0	1806	0	1770	1863
Flt Permitted	0.968				0.950	
Satd. Flow (perm)	1737	0	1806	0	1770	1863
Link Speed (mph)	30		45			45
Link Distance (ft)	898		657			773
Travel Time (s)	20.4		10.0			11.7
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Adj. Flow (vph)	218	114	1214	515	94	667
Shared Lane Traffic (%)						
Lane Group Flow (vph)	332	0	1729	0	94	667
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 121.0%		ICU Level of Service H	
Analysis Period (min) 15			

Intersection	
Intersection Delay, s/veh	388

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	218	114	1214	515	94	667
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	1	1	1	1	2	2
Mvmt Flow	218	114	1214	515	94	667

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2327	1472	0	0	1729	0
Stage 1	1472	-	-	-	-	-
Stage 2	855	-	-	-	-	-
Follow-up Headway	3.509	3.309	-	-	2.218	-
Pot Capacity-1 Maneuver	# 41	157	-	-	365	-
Stage 1	# 212	-	-	-	-	-
Stage 2	418	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	# 30	157	-	-	365	-
Mov Capacity-2 Maneuver	# 30	-	-	-	-	-
Stage 1	# 212	-	-	-	-	-
Stage 2	310	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	$ 3293.1	0	2.3
HCM LOS	F		

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	42	365	-
HCM Lane V/C Ratio	-	-	7.905	0.258	-
HCM Control Delay (s)	-	-	$ 3293.1	18.25	-
HCM Lane LOS			F	C	
HCM 95th %tile Q(veh)	-	-	39.409	1.01	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

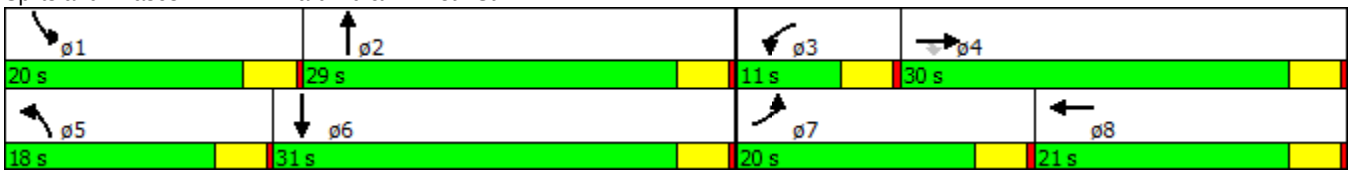
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	124	388	182	192	0	308	911	292	1	410	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850					0.964			0.999	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1845	1568	1752	1845	0	1770	3412	0	1787	3571	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1752	1845	1568	1752	1845	0	1770	3412	0	1787	3571	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			388					47			1	
Link Speed (mph)		35			25			45			45	
Link Distance (ft)		1098			1170			707			622	
Travel Time (s)		21.4			31.9			10.7			9.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	2	124	388	182	192	0	308	911	292	1	410	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	2	124	388	182	192	0	308	1203	0	1	412	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Detector Phase	7	4	4	3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	20.0	20.0	20.0	8.0	20.0		8.0	20.0		20.0	20.0	
Total Split (s)	20.0	30.0	30.0	11.0	21.0		18.0	29.0		20.0	31.0	
Total Split (%)	22.2%	33.3%	33.3%	12.2%	23.3%		20.0%	32.2%		22.2%	34.4%	
Maximum Green (s)	16.0	26.0	26.0	7.0	17.0		14.0	25.0		16.0	27.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	None		Min	Min	
Walk Time (s)	5.0	5.0	5.0		5.0			5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0	11.0		11.0			11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0		0			0		0	0	
Act Effct Green (s)	5.6	10.6	10.6	7.0	19.8		14.0	25.2		5.6	16.7	
Actuated g/C Ratio	0.09	0.16	0.16	0.11	0.31		0.22	0.39		0.09	0.26	
v/c Ratio	0.01	0.41	0.67	0.96	0.34		0.80	0.88		0.01	0.44	
Control Delay	29.0	28.1	9.3	89.7	20.3		43.1	28.1		29.0	22.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	29.0	28.1	9.3	89.7	20.3		43.1	28.1		29.0	22.3	
LOS	C	C	A	F	C		D	C		C	C	
Approach Delay		13.9			54.1			31.1			22.4	
Approach LOS		B			D			C			C	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 64.4
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 29.7 Intersection LOS: C
Intersection Capacity Utilization 67.8% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 2: NE Ward Rd & NE 78th St



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	2	124	388	182	192	308	1203	1	412
v/c Ratio	0.01	0.41	0.67	0.96	0.34	0.80	0.88	0.01	0.44
Control Delay	29.0	28.1	9.3	89.7	20.3	43.1	28.1	29.0	22.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.0	28.1	9.3	89.7	20.3	43.1	28.1	29.0	22.3
Queue Length 50th (ft)	1	44	0	72	54	114	214	0	70
Queue Length 95th (ft)	7	88	64	#205	127	#268	#395	5	121
Internal Link Dist (ft)		1018			1090		627		542
Turn Bay Length (ft)									
Base Capacity (vph)	436	746	865	190	566	385	1363	445	1501
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.17	0.45	0.96	0.34	0.80	0.88	0.00	0.27

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	2	124	388	182	192	0	308	911	292	1	410	2
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	184.5	184.5	184.5	184.5	184.5	190.0	186.3	186.3	190.0	188.1	188.1	190.0
Lanes	1	1	1	1	1	0	1	2	0	1	2	0
Cap, veh/h	95	520	442	167	596	0	338	950	304	97	805	4
Arrive On Green	0.05	0.28	0.28	0.10	0.32	0.00	0.19	0.35	0.35	0.05	0.22	0.22
Sat Flow, veh/h	1757	1845	1568	1757	1845	0	1774	2708	865	1792	3741	18
Grp Volume(v), veh/h	2	124	388	182	192	0	308	626	577	1	206	206
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	1845	0	1774	1863	1710	1792	1881	1878
Q Serve(g_s), s	0.1	3.8	17.4	7.0	5.8	0.0	12.5	24.2	24.3	0.0	7.1	7.1
Cycle Q Clear(g_c), s	0.1	3.8	17.4	7.0	5.8	0.0	12.5	24.2	24.3	0.0	7.1	7.1
Prop In Lane	1.00		1.00	1.00		0.00	1.00		0.51	1.00		0.01
Lane Grp Cap(c), veh/h	95	520	442	167	596	0	338	654	600	97	405	404
V/C Ratio(X)	0.02	0.24	0.88	1.09	0.32	0.00	0.91	0.96	0.96	0.01	0.51	0.51
Avail Cap(c_a), veh/h	382	652	554	167	596	0	338	654	600	390	690	689
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	32.9	20.3	25.2	33.3	18.8	0.0	29.2	23.3	23.4	32.9	25.5	25.5
Incr Delay (d2), s/veh	0.1	0.2	12.6	95.4	0.3	0.0	28.0	25.0	27.4	0.0	1.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.0	1.7	8.1	7.5	2.6	0.0	7.8	14.6	13.9	0.0	3.3	3.3
Lane Grp Delay (d), s/veh	33.0	20.6	37.7	128.7	19.1	0.0	57.2	48.4	50.8	33.0	26.5	26.5
Lane Grp LOS	C	C	D	F	B		E	D	D	C	C	C
Approach Vol, veh/h		514			374			1511			413	
Approach Delay, s/veh		33.6			72.4			51.1			26.5	
Approach LOS		C			E			D			C	

Timer												
Assigned Phs	7	4		3	8		5	2		1	6	
Phs Duration (G+Y+Rc), s	8.0	24.8		11.0	27.8		18.0	29.8		8.0	19.8	
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Max Green Setting (Gmax), s	16.0	26.0		7.0	17.0		14.0	25.0		16.0	27.0	
Max Q Clear Time (g_c+I1), s	2.1	19.4		9.0	7.8		14.5	26.3		2.0	9.1	
Green Ext Time (p_c), s	0.0	1.4		0.0	2.3		0.0	0.0		0.0	6.7	

Intersection Summary		
HCM 2010 Ctrl Delay		47.1
HCM 2010 LOS		D

Notes

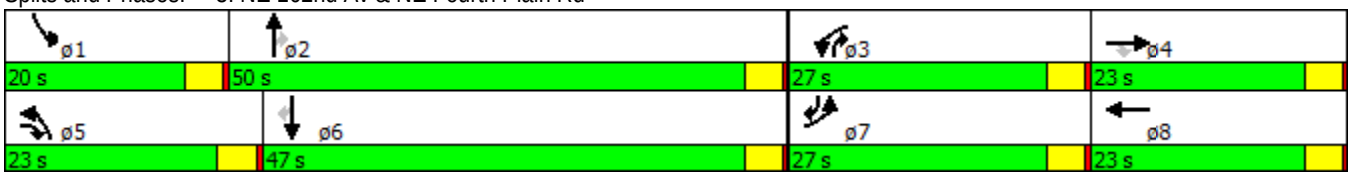
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	209	535	482	323	248	154	354	1291	295	179	837	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.943				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1787	3574	1599	1736	3273	0	3433	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1787	3574	1599	1736	3273	0	3433	3539	1583	1770	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			72		95				91			48
Link Speed (mph)		50			50			40			40	
Link Distance (ft)		1389			1241			1395			1476	
Travel Time (s)		18.9			16.9			23.8			25.2	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	209	535	482	323	248	154	354	1291	295	179	837	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	209	535	482	323	402	0	354	1291	295	179	837	48
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pm+ov	Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	7	4	5	3	8		5	2	3	1	6	7
Permitted Phases			4						2			6
Detector Phase	7	4	5	3	8		5	2	3	1	6	7
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	8.0	20.0	8.0	8.0	20.0		8.0	20.0	8.0	20.0	20.0	8.0
Total Split (s)	27.0	23.0	23.0	27.0	23.0		23.0	50.0	27.0	20.0	47.0	27.0
Total Split (%)	22.5%	19.2%	19.2%	22.5%	19.2%		19.2%	41.7%	22.5%	16.7%	39.2%	22.5%
Maximum Green (s)	23.0	19.0	19.0	23.0	19.0		19.0	46.0	23.0	16.0	43.0	23.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
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
Recall Mode	None	None	None	None	None		None	Min	None	None	Min	None
Walk Time (s)		5.0			5.0			5.0		5.0	5.0	
Flash Dont Walk (s)		11.0			11.0			11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0			0			0		0	0	
Act Effct Green (s)	18.5	19.0	40.0	23.0	23.6		17.0	45.4	72.5	14.9	43.3	65.8
Actuated g/C Ratio	0.16	0.16	0.34	0.19	0.20		0.14	0.38	0.61	0.13	0.37	0.56
v/c Ratio	0.75	0.93	0.82	0.96	0.55		0.72	0.95	0.29	0.80	0.65	0.05
Control Delay	64.6	73.9	43.0	87.8	36.8		57.2	51.1	8.2	76.7	34.3	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.6	73.9	43.0	87.8	36.8		57.2	51.1	8.2	76.7	34.3	3.2
LOS	E	E	D	F	D		E	D	A	E	C	A
Approach Delay		60.2			59.5			45.7			40.0	
Approach LOS		E			E			D			D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 118.4
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 50.1 Intersection LOS: D
Intersection Capacity Utilization 91.6% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 3: NE 162nd Av & NE Fourth Plain Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	209	535	482	323	402	354	1291	295	179	837	48
v/c Ratio	0.75	0.93	0.82	0.96	0.55	0.72	0.95	0.29	0.80	0.65	0.05
Control Delay	64.6	73.9	43.0	87.8	36.8	57.2	51.1	8.2	76.7	34.3	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.6	73.9	43.0	87.8	36.8	57.2	51.1	8.2	76.7	34.3	3.2
Queue Length 50th (ft)	156	218	289	251	114	134	505	67	136	284	0
Queue Length 95th (ft)	232	#327	#441	#436	175	186	#657	115	#245	355	16
Internal Link Dist (ft)		1309			1161		1315			1396	
Turn Bay Length (ft)											
Base Capacity (vph)	347	573	614	337	727	551	1375	1004	239	1302	960
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.93	0.79	0.96	0.55	0.64	0.94	0.29	0.75	0.64	0.05

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	209	535	482	323	248	154	354	1291	295	179	837	48
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	188.1	188.1	188.1	182.7	182.7	190.0	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	1	2	1	1	2	0	2	2	1	1	2	1
Cap, veh/h	240	614	458	344	486	291	423	1432	922	208	1411	812
Arrive On Green	0.13	0.16	0.16	0.20	0.23	0.23	0.12	0.38	0.38	0.12	0.38	0.38
Sat Flow, veh/h	1792	3762	1599	1740	2144	1283	3442	3725	1583	1774	3725	1583
Grp Volume(v), veh/h	209	535	482	323	210	192	354	1291	295	179	837	48
Grp Sat Flow(s),veh/h/ln	1792	1881	1599	1740	1827	1600	1721	1863	1583	1774	1863	1583
Q Serve(g_s), s	13.3	16.1	19.0	21.3	11.7	12.3	11.7	38.0	11.1	11.5	20.9	1.8
Cycle Q Clear(g_c), s	13.3	16.1	19.0	21.3	11.7	12.3	11.7	38.0	11.1	11.5	20.9	1.8
Prop In Lane	1.00		1.00	1.00		0.80	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	240	614	458	344	414	363	423	1432	922	208	1411	812
V/C Ratio(X)	0.87	0.87	1.05	0.94	0.51	0.53	0.84	0.90	0.32	0.86	0.59	0.06
Avail Cap(c_a), veh/h	354	614	458	344	414	363	562	1473	939	244	1411	812
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.4	47.5	41.5	46.0	39.3	39.5	49.9	33.7	12.5	50.4	29.0	14.2
Incr Delay (d2), s/veh	14.4	12.9	56.9	33.1	1.0	1.4	8.3	7.9	0.2	22.9	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	6.8	8.6	19.9	12.2	5.3	4.9	5.6	18.8	3.8	6.5	9.7	0.6
Lane Grp Delay (d), s/veh	63.8	60.4	98.4	79.1	40.3	41.0	58.2	41.6	12.7	73.3	29.6	14.3
Lane Grp LOS	E	E	F	E	D	D	E	D	B	E	C	B
Approach Vol, veh/h		1226			725			1940			1064	
Approach Delay, s/veh		75.9			57.8			40.2			36.3	
Approach LOS		E			E			D			D	

Timer												
Assigned Phs	7	4		3	8		5	2		1	6	
Phs Duration (G+Y+Rc), s	19.6	23.0		27.0	30.4		18.3	48.7		17.6	48.1	
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Max Green Setting (Gmax), s	23.0	19.0		23.0	19.0		19.0	46.0		16.0	43.0	
Max Q Clear Time (g_c+I1), s	15.3	21.0		23.3	14.3		13.7	40.0		13.5	22.9	
Green Ext Time (p_c), s	0.3	0.0		0.0	2.9		0.6	4.7		0.1	15.2	

Intersection Summary	
HCM 2010 Ctrl Delay	50.8
HCM 2010 LOS	D

Notes

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	389	622	501	321	273	224
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.947		0.939	
Flt Protected		0.981			0.973	
Satd. Flow (prot)	0	1845	1764	0	1736	0
Flt Permitted		0.981			0.973	
Satd. Flow (perm)	0	1845	1764	0	1736	0
Link Speed (mph)		50	50		30	
Link Distance (ft)		623	614		1224	
Travel Time (s)		8.5	8.4		27.8	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	1%	2%	2%	0%	0%
Adj. Flow (vph)	389	622	501	321	273	224
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1011	822	0	497	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 139.1%	ICU Level of Service H
Analysis Period (min) 15	

Intersection	
Intersection Delay, s/veh	1667.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	389	622	501	321	273	224
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	1	1	2	2	0	0
Mvmt Flow	389	622	501	321	273	224

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	822	0	-	0	2062	662
Stage 1	-	-	-	-	662	-
Stage 2	-	-	-	-	1400	-
Follow-up Headway	2.209	-	-	-	3.5	3.3
Pot Capacity-1 Maneuver	812	-	-	-	# 61	465
Stage 1	-	-	-	-	517	-
Stage 2	-	-	-	-	# 231	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	812	-	-	-	# 16	465
Mov Capacity-2 Maneuver	-	-	-	-	# 16	-
Stage 1	-	-	-	-	517	-
Stage 2	-	-	-	-	# 62	-

Approach	EB	WB	SB
HCM Control Delay, s	5.2	0	$ 7804.9
HCM LOS			F

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	812	-	-	-	28
HCM Lane V/C Ratio	0.479	-	-	-	17.75
HCM Control Delay (s)	13.442	0	-	-	$ 7804.9
HCM Lane LOS	B	A			F
HCM 95th %tile Q(veh)	2.628	-	-	-	61.648

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	218	114	1214	515	94	667
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1787	1599	1881	1599	1770	1863
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1787	1599	1881	1599	1770	1863
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		114		509		
Link Speed (mph)	30		45			45
Link Distance (ft)	898		657			773
Travel Time (s)	20.4		10.0			11.7
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Adj. Flow (vph)	218	114	1214	515	94	667
Shared Lane Traffic (%)						
Lane Group Flow (vph)	218	114	1214	515	94	667
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Number of Detectors	1	1	2	1	1	2
Detector Template	Left	Right	Thru	Right	Left	Thru
Leading Detector (ft)	20	20	100	20	20	100
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	6	20	20	6
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	NA	Perm	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Minimum Split (s)	20.0	20.0	20.0	20.0	8.0	20.0
Total Split (s)	20.0	20.0	61.0	61.0	9.0	70.0
Total Split (%)	22.2%	22.2%	67.8%	67.8%	10.0%	77.8%
Maximum Green (s)	16.0	16.0	57.0	57.0	5.0	66.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	Min	Min	None	Min
Walk Time (s)	5.0	5.0	5.0	5.0		5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0		11.0
Pedestrian Calls (#/hr)	0	0	0	0		0
Act Effct Green (s)	14.3	14.3	57.3	57.3	5.0	66.3
Actuated g/C Ratio	0.16	0.16	0.65	0.65	0.06	0.75
v/c Ratio	0.75	0.32	1.00	0.42	0.95	0.48
Control Delay	52.8	9.3	43.6	1.9	122.3	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.8	9.3	43.6	1.9	122.3	6.0
LOS	D	A	D	A	F	A
Approach Delay	37.8		31.1			20.4
Approach LOS	D		C			C

Intersection Summary	
Area Type: Other	
Cycle Length: 90	
Actuated Cycle Length: 88.6	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.00	
Intersection Signal Delay: 29.0	Intersection LOS: C
Intersection Capacity Utilization 91.2%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 1: NE Ward Rd & NE 88th St

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	218	114	1214	515	94	667
v/c Ratio	0.75	0.32	1.00	0.42	0.95	0.48
Control Delay	52.8	9.3	43.6	1.9	122.3	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.8	9.3	43.6	1.9	122.3	6.0
Queue Length 50th (ft)	117	0	~678	1	55	130
Queue Length 95th (ft)	#211	45	#983	35	#152	192
Internal Link Dist (ft)	818		577			693
Turn Bay Length (ft)						
Base Capacity (vph)	322	382	1215	1213	99	1393
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.30	1.00	0.42	0.95	0.48

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	218	114	1214	515	94	667
Number	3	18	2	12	1	6
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	188.1	188.1	188.1	188.1	186.3	186.3
Lanes	1	1	1	1	1	1
Cap, veh/h	261	233	1237	1052	102	1419
Arrive On Green	0.15	0.15	0.66	0.66	0.06	0.76
Sat Flow, veh/h	1792	1599	1881	1599	1774	1863
Grp Volume(v), veh/h	218	114	1214	515	94	667
Grp Sat Flow(s),veh/h/ln	1792	1599	1881	1599	1774	1863
Q Serve(g_s), s	10.2	5.7	53.9	14.1	4.6	11.5
Cycle Q Clear(g_c), s	10.2	5.7	53.9	14.1	4.6	11.5
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	261	233	1237	1052	102	1419
V/C Ratio(X)	0.83	0.49	0.98	0.49	0.92	0.47
Avail Cap(c_a), veh/h	331	296	1239	1053	102	1420
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.0	34.0	14.3	7.5	40.6	3.8
Incr Delay (d2), s/veh	13.6	1.6	21.1	0.4	63.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	5.6	2.4	27.1	4.4	3.8	3.4
Lane Grp Delay (d), s/veh	49.6	35.6	35.3	7.8	103.6	4.1
Lane Grp LOS	D	D	D	A	F	A
Approach Vol, veh/h	332		1729			761
Approach Delay, s/veh	44.8		27.2			16.4
Approach LOS	D		C			B

Timer					
Assigned Phs			2	1	6
Phs Duration (G+Y+Rc), s			60.9	9.0	69.9
Change Period (Y+Rc), s			4.0	4.0	4.0
Max Green Setting (Gmax), s			57.0	5.0	66.0
Max Q Clear Time (g_c+I1), s			55.9	6.6	13.5
Green Ext Time (p_c), s			1.0	0.0	29.9

Intersection Summary	
HCM 2010 Ctrl Delay	26.3
HCM 2010 LOS	C

Notes

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	389	622	501	321	273	224
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1787	1881	1863	1583	1805	1615
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1787	1881	1863	1583	1805	1615
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				321		224
Link Speed (mph)		50	50		30	
Link Distance (ft)		623	614		1224	
Travel Time (s)		8.5	8.4		27.8	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	1%	2%	2%	0%	0%
Adj. Flow (vph)	389	622	501	321	273	224
Shared Lane Traffic (%)						
Lane Group Flow (vph)	389	622	501	321	273	224
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (ft)	20	100	100	20	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	6	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	8.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	17.0	39.0	22.0	22.0	21.0	21.0
Total Split (%)	28.3%	65.0%	36.7%	36.7%	35.0%	35.0%
Maximum Green (s)	13.0	35.0	18.0	18.0	17.0	17.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	None	None	None	None
Walk Time (s)		5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)		11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0	0	0	0
Act Effct Green (s)	13.1	34.4	17.3	17.3	13.0	13.0
Actuated g/C Ratio	0.24	0.62	0.31	0.31	0.23	0.23
v/c Ratio	0.92	0.53	0.86	0.45	0.64	0.41
Control Delay	55.1	8.8	37.2	4.7	26.8	5.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.1	8.8	37.2	4.7	26.8	5.5
LOS	E	A	D	A	C	A
Approach Delay		26.6	24.5		17.2	
Approach LOS		C	C		B	

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 55.5	
Natural Cycle: 65	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.92	
Intersection Signal Delay: 23.9	Intersection LOS: C
Intersection Capacity Utilization 73.0%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 4: NE Fourth Plain Rd & NE 182nd Av

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	389	622	501	321	273	224
v/c Ratio	0.92	0.53	0.86	0.45	0.64	0.41
Control Delay	55.1	8.8	37.2	4.7	26.8	5.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.1	8.8	37.2	4.7	26.8	5.5
Queue Length 50th (ft)	130	101	155	0	83	0
Queue Length 95th (ft)	#298	204	#333	49	148	42
Internal Link Dist (ft)		543	534		1144	
Turn Bay Length (ft)						
Base Capacity (vph)	421	1193	608	733	556	652
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.92	0.52	0.82	0.44	0.49	0.34

Intersection Summary

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

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	389	622	501	321	273	224
Number	7	4	8	18	1	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	188.1	188.1	186.3	186.3	190.0	190.0
Lanes	1	1	1	1	1	1
Cap, veh/h	441	1218	605	514	362	323
Arrive On Green	0.25	0.65	0.32	0.32	0.20	0.20
Sat Flow, veh/h	1792	1881	1863	1583	1810	1615
Grp Volume(v), veh/h	389	622	501	321	273	224
Grp Sat Flow(s),veh/h/ln	1792	1881	1863	1583	1810	1615
Q Serve(g_s), s	11.0	9.1	13.0	9.0	7.5	6.8
Cycle Q Clear(g_c), s	11.0	9.1	13.0	9.0	7.5	6.8
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	441	1218	605	514	362	323
V/C Ratio(X)	0.88	0.51	0.83	0.62	0.75	0.69
Avail Cap(c_a), veh/h	444	1255	639	543	586	523
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.0	4.9	16.4	15.0	19.8	19.5
Incr Delay (d2), s/veh	18.2	0.3	8.5	2.1	3.2	2.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	6.2	2.0	6.2	3.1	3.4	0.2
Lane Grp Delay (d), s/veh	37.2	5.2	24.9	17.1	23.0	22.1
Lane Grp LOS	D	A	C	B	C	C
Approach Vol, veh/h		1011	822		497	
Approach Delay, s/veh		17.5	21.8		22.6	
Approach LOS		B	C		C	

Timer			
Assigned Phs	7	4	8
Phs Duration (G+Y+Rc), s	16.9	38.0	21.0
Change Period (Y+Rc), s	4.0	4.0	4.0
Max Green Setting (Gmax), s	13.0	35.0	18.0
Max Q Clear Time (g_c+I1), s	13.0	11.1	15.0
Green Ext Time (p_c), s	0.0	8.3	2.0

Intersection Summary	
HCM 2010 Ctrl Delay	20.1
HCM 2010 LOS	C

Notes

APPENDIX E

2024 “WITH PROPOSED MASTER PLAN” LEVELS OF SERVICE

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	218	107	1214	515	82	667
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.956		0.960			
Flt Protected	0.968				0.950	
Satd. Flow (prot)	1741	0	1806	0	1770	1863
Flt Permitted	0.968				0.950	
Satd. Flow (perm)	1741	0	1806	0	1770	1863
Link Speed (mph)	30		45			45
Link Distance (ft)	898		657			773
Travel Time (s)	20.4		10.0			11.7
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Adj. Flow (vph)	218	107	1214	515	82	667
Shared Lane Traffic (%)						
Lane Group Flow (vph)	325	0	1729	0	82	667
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 120.5%	ICU Level of Service H
Analysis Period (min) 15	

Intersection	
Intersection Delay, s/veh	345.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	218	107	1214	515	82	667
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	1	1	1	1	2	2
Mvmt Flow	218	107	1214	515	82	667

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2303	1472	0	0	1729	0
Stage 1	1472	-	-	-	-	-
Stage 2	831	-	-	-	-	-
Follow-up Headway	3.509	3.309	-	-	2.218	-
Pot Capacity-1 Maneuver	# 43	157	-	-	365	-
Stage 1	# 212	-	-	-	-	-
Stage 2	429	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	# 33	157	-	-	365	-
Mov Capacity-2 Maneuver	# 33	-	-	-	-	-
Stage 1	# 212	-	-	-	-	-
Stage 2	333	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	$ 2975	0	1.9
HCM LOS	F		

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	45	365	-
HCM Lane V/C Ratio	-	-	7.222	0.225	-
HCM Control Delay (s)	-	-	$ 2975	17.698	-
HCM Lane LOS			F	C	
HCM 95th %tile Q(veh)	-	-	38.191	0.849	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

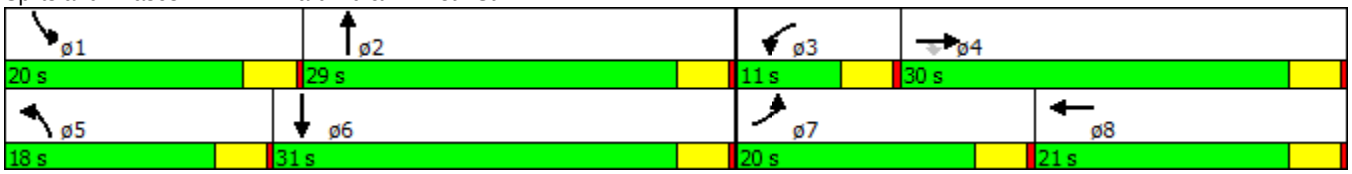
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	97	388	161	176	0	308	911	287	1	410	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850					0.964			0.999	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1845	1568	1752	1845	0	1770	3412	0	1787	3571	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1752	1845	1568	1752	1845	0	1770	3412	0	1787	3571	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			388					46			1	
Link Speed (mph)		35			25			45			45	
Link Distance (ft)		1098			1170			707			622	
Travel Time (s)		21.4			31.9			10.7			9.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	2	97	388	161	176	0	308	911	287	1	410	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	2	97	388	161	176	0	308	1198	0	1	412	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Detector Phase	7	4	4	3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	20.0	20.0	20.0	8.0	20.0		8.0	20.0		20.0	20.0	
Total Split (s)	20.0	30.0	30.0	11.0	21.0		18.0	29.0		20.0	31.0	
Total Split (%)	22.2%	33.3%	33.3%	12.2%	23.3%		20.0%	32.2%		22.2%	34.4%	
Maximum Green (s)	16.0	26.0	26.0	7.0	17.0		14.0	25.0		16.0	27.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	None		Min	Min	
Walk Time (s)	5.0	5.0	5.0		5.0			5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0	11.0		11.0			11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0		0			0		0	0	
Act Effct Green (s)	5.7	9.7	9.7	7.0	18.9		14.1	25.2		5.6	16.8	
Actuated g/C Ratio	0.09	0.15	0.15	0.11	0.30		0.22	0.40		0.09	0.26	
v/c Ratio	0.01	0.35	0.68	0.83	0.32		0.79	0.87		0.01	0.44	
Control Delay	29.0	27.2	9.8	65.8	20.3		41.7	26.6		29.0	21.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	29.0	27.2	9.8	65.8	20.3		41.7	26.6		29.0	21.9	
LOS	C	C	A	E	C		D	C		C	C	
Approach Delay		13.4			42.0			29.7			21.9	
Approach LOS		B			D			C			C	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 63.6
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 27.1 Intersection LOS: C
Intersection Capacity Utilization 63.3% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 2: NE Ward Rd & NE 78th St



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	2	97	388	161	176	308	1198	1	412
v/c Ratio	0.01	0.35	0.68	0.83	0.32	0.79	0.87	0.01	0.44
Control Delay	29.0	27.2	9.8	65.8	20.3	41.7	26.6	29.0	21.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.0	27.2	9.8	65.8	20.3	41.7	26.6	29.0	21.9
Queue Length 50th (ft)	1	34	0	60	49	109	200	0	67
Queue Length 95th (ft)	7	72	64	#180	117	#268	#393	5	121
Internal Link Dist (ft)		1018			1090		627		542
Turn Bay Length (ft)									
Base Capacity (vph)	442	757	872	193	549	391	1380	451	1522
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.13	0.44	0.83	0.32	0.79	0.87	0.00	0.27

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	2	97	388	161	176	0	308	911	287	1	410	2
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	184.5	184.5	184.5	184.5	184.5	190.0	186.3	186.3	190.0	188.1	188.1	190.0
Lanes	1	1	1	1	1	0	1	2	0	1	2	0
Cap, veh/h	96	519	441	167	594	0	338	956	300	98	805	4
Arrive On Green	0.05	0.28	0.28	0.10	0.32	0.00	0.19	0.35	0.35	0.05	0.22	0.22
Sat Flow, veh/h	1757	1845	1568	1757	1845	0	1774	2720	854	1792	3741	18
Grp Volume(v), veh/h	2	97	388	161	176	0	308	623	575	1	206	206
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	1845	0	1774	1863	1712	1792	1881	1878
Q Serve(g_s), s	0.1	2.9	17.4	6.7	5.3	0.0	12.5	23.9	24.1	0.0	7.1	7.1
Cycle Q Clear(g_c), s	0.1	2.9	17.4	6.7	5.3	0.0	12.5	23.9	24.1	0.0	7.1	7.1
Prop In Lane	1.00		1.00	1.00		0.00	1.00		0.50	1.00		0.01
Lane Grp Cap(c), veh/h	96	519	441	167	594	0	338	654	602	98	405	404
V/C Ratio(X)	0.02	0.19	0.88	0.96	0.30	0.00	0.91	0.95	0.96	0.01	0.51	0.51
Avail Cap(c_a), veh/h	383	653	555	167	594	0	338	654	602	390	691	690
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	32.9	20.0	25.2	33.1	18.7	0.0	29.1	23.2	23.3	32.9	25.4	25.4
Incr Delay (d2), s/veh	0.1	0.2	12.8	58.2	0.3	0.0	27.8	23.9	26.1	0.0	1.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.0	1.3	8.1	5.6	2.3	0.0	7.8	14.4	13.6	0.0	3.3	3.3
Lane Grp Delay (d), s/veh	33.0	20.2	38.0	91.3	18.9	0.0	56.9	47.1	49.4	32.9	26.4	26.4
Lane Grp LOS	C	C	D	F	B		E	D	D	C	C	C
Approach Vol, veh/h		487			337			1506			413	
Approach Delay, s/veh		34.5			53.5			50.0			26.4	
Approach LOS		C			D			D			C	

Timer												
Assigned Phs	7	4		3	8		5	2		1	6	
Phs Duration (G+Y+Rc), s	8.0	24.7		11.0	27.7		18.0	29.8		8.0	19.8	
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Max Green Setting (Gmax), s	16.0	26.0		7.0	17.0		14.0	25.0		16.0	27.0	
Max Q Clear Time (g_c+I1), s	2.1	19.4		8.7	7.3		14.5	26.1		2.0	9.1	
Green Ext Time (p_c), s	0.0	1.3		0.0	2.2		0.0	0.0		0.0	6.7	

Intersection Summary	
HCM 2010 Ctrl Delay	44.1
HCM 2010 LOS	D

Notes

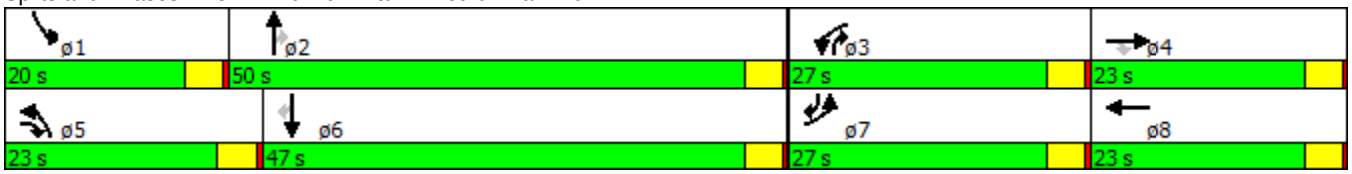
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	209	505	482	323	248	154	354	1265	295	179	822	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.943				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1787	3574	1599	1736	3273	0	3433	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1787	3574	1599	1736	3273	0	3433	3539	1583	1770	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			74		95				93			48
Link Speed (mph)		50			50			40			40	
Link Distance (ft)		1389			1241			1395			1476	
Travel Time (s)		18.9			16.9			23.8			25.2	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	209	505	482	323	248	154	354	1265	295	179	822	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	209	505	482	323	402	0	354	1265	295	179	822	48
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pm+ov	Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	7	4	5	3	8		5	2	3	1	6	7
Permitted Phases			4						2			6
Detector Phase	7	4	5	3	8		5	2	3	1	6	7
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	8.0	20.0	8.0	8.0	20.0		8.0	20.0	8.0	20.0	20.0	8.0
Total Split (s)	27.0	23.0	23.0	27.0	23.0		23.0	50.0	27.0	20.0	47.0	27.0
Total Split (%)	22.5%	19.2%	19.2%	22.5%	19.2%		19.2%	41.7%	22.5%	16.7%	39.2%	22.5%
Maximum Green (s)	23.0	19.0	19.0	23.0	19.0		19.0	46.0	23.0	16.0	43.0	23.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
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
Recall Mode	None	None	None	None	None		None	Min	None	None	Min	None
Walk Time (s)		5.0			5.0			5.0		5.0	5.0	
Flash Dont Walk (s)		11.0			11.0			11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0			0			0		0	0	
Act Effct Green (s)	18.4	18.6	39.5	23.0	23.3		16.9	44.7	71.8	14.8	42.6	65.0
Actuated g/C Ratio	0.16	0.16	0.34	0.20	0.20		0.14	0.38	0.61	0.13	0.36	0.55
v/c Ratio	0.75	0.89	0.82	0.95	0.55		0.72	0.94	0.29	0.80	0.64	0.05
Control Delay	64.0	68.0	42.8	85.0	36.7		56.7	49.0	8.1	75.8	34.0	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.0	68.0	42.8	85.0	36.7		56.7	49.0	8.1	75.8	34.0	3.2
LOS	E	E	D	F	D		E	D	A	E	C	A
Approach Delay		57.1			58.2			44.1			39.7	
Approach LOS		E			E			D			D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 117.2
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 48.5 Intersection LOS: D
Intersection Capacity Utilization 90.1% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 3: NE 162nd Av & NE Fourth Plain Rd



Queues
3: NE 162nd Av & NE Fourth Plain Rd

6/30/2013

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	209	505	482	323	402	354	1265	295	179	822	48
v/c Ratio	0.75	0.89	0.82	0.95	0.55	0.72	0.94	0.29	0.80	0.64	0.05
Control Delay	64.0	68.0	42.8	85.0	36.7	56.7	49.0	8.1	75.8	34.0	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.0	68.0	42.8	85.0	36.7	56.7	49.0	8.1	75.8	34.0	3.2
Queue Length 50th (ft)	156	204	287	251	114	134	489	66	136	277	0
Queue Length 95th (ft)	232	#299	#437	#436	175	186	#635	114	#245	347	16
Internal Link Dist (ft)		1309			1161		1315			1396	
Turn Bay Length (ft)											
Base Capacity (vph)	351	580	615	341	725	557	1391	1005	242	1317	960
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.87	0.78	0.95	0.55	0.64	0.91	0.29	0.74	0.62	0.05

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	209	505	482	323	248	154	354	1265	295	179	822	48
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	188.1	188.1	188.1	182.7	182.7	190.0	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	1	2	1	1	2	0	2	2	1	1	2	1
Cap, veh/h	240	615	458	344	487	292	423	1429	921	208	1408	811
Arrive On Green	0.13	0.16	0.16	0.20	0.23	0.23	0.12	0.38	0.38	0.12	0.38	0.38
Sat Flow, veh/h	1792	3762	1599	1740	2144	1283	3442	3725	1583	1774	3725	1583
Grp Volume(v), veh/h	209	505	482	323	210	192	354	1265	295	179	822	48
Grp Sat Flow(s),veh/h/ln	1792	1881	1599	1740	1827	1600	1721	1863	1583	1774	1863	1583
Q Serve(g_s), s	13.3	15.1	19.0	21.2	11.7	12.2	11.7	36.8	11.1	11.5	20.5	1.8
Cycle Q Clear(g_c), s	13.3	15.1	19.0	21.2	11.7	12.2	11.7	36.8	11.1	11.5	20.5	1.8
Prop In Lane	1.00		1.00	1.00		0.80	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	240	615	458	344	415	364	423	1429	921	208	1408	811
V/C Ratio(X)	0.87	0.82	1.05	0.94	0.51	0.53	0.84	0.89	0.32	0.86	0.58	0.06
Avail Cap(c_a), veh/h	355	615	458	344	415	364	563	1475	940	244	1408	811
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.3	46.9	41.5	45.9	39.2	39.4	49.8	33.4	12.5	50.4	28.8	14.3
Incr Delay (d2), s/veh	14.3	8.7	56.5	32.8	1.0	1.4	8.2	6.7	0.2	22.8	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	6.8	7.8	19.9	12.2	5.3	4.9	5.5	18.0	3.9	6.5	9.5	0.6
Lane Grp Delay (d), s/veh	63.6	55.6	98.0	78.6	40.2	40.8	58.0	40.1	12.7	73.2	29.5	14.3
Lane Grp LOS	E	E	F	E	D	D	E	D	B	E	C	B
Approach Vol, veh/h		1196			725			1914			1049	
Approach Delay, s/veh		74.1			57.5			39.2			36.2	
Approach LOS		E			E			D			D	

Timer												
Assigned Phs	7	4		3	8		5	2		1	6	
Phs Duration (G+Y+Rc), s	19.6	23.0		27.0	30.4		18.3	48.6		17.6	47.9	
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Max Green Setting (Gmax), s	23.0	19.0		23.0	19.0		19.0	46.0		16.0	43.0	
Max Q Clear Time (g_c+I1), s	15.3	21.0		23.2	14.2		13.7	38.8		13.5	22.5	
Green Ext Time (p_c), s	0.3	0.0		0.0	2.8		0.6	5.7		0.1	15.3	

Intersection Summary	
HCM 2010 Ctrl Delay	49.8
HCM 2010 LOS	D

Notes

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	359	622	501	312	273	218
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.948		0.940	
Flt Protected		0.982			0.973	
Satd. Flow (prot)	0	1847	1766	0	1738	0
Flt Permitted		0.982			0.973	
Satd. Flow (perm)	0	1847	1766	0	1738	0
Link Speed (mph)		50	50		30	
Link Distance (ft)		623	614		1224	
Travel Time (s)		8.5	8.4		27.8	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	1%	2%	2%	0%	0%
Adj. Flow (vph)	359	622	501	312	273	218
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	981	813	0	491	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 136.5%	ICU Level of Service H
Analysis Period (min) 15	

Intersection	
Intersection Delay, s/veh	1197.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	359	622	501	312	273	218
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	1	1	2	2	0	0
Mvmt Flow	359	622	501	312	273	218

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	813	0	-	0	1997	657
Stage 1	-	-	-	-	657	-
Stage 2	-	-	-	-	1340	-
Follow-up Headway	2.209	-	-	-	3.5	3.3
Pot Capacity-1 Maneuver	818	-	-	-	# 67	468
Stage 1	-	-	-	-	519	-
Stage 2	-	-	-	-	# 247	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	818	-	-	-	# 22	468
Mov Capacity-2 Maneuver	-	-	-	-	# 22	-
Stage 1	-	-	-	-	519	-
Stage 2	-	-	-	-	# 81	-

Approach	EB	WB	SB
HCM Control Delay, s	4.7	0	$ 5565
HCM LOS			F

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	818	-	-	-	38
HCM Lane V/C Ratio	0.439	-	-	-	12.921
HCM Control Delay (s)	12.797	0	-	-	$ 5565
HCM Lane LOS	B	A			F
HCM 95th %tile Q(veh)	2.258	-	-	-	59.709

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	218	107	1214	515	82	667
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1787	1599	1881	1599	1770	1863
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1787	1599	1881	1599	1770	1863
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		107		509		
Link Speed (mph)	30		45			45
Link Distance (ft)	898		657			773
Travel Time (s)	20.4		10.0			11.7
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Adj. Flow (vph)	218	107	1214	515	82	667
Shared Lane Traffic (%)						
Lane Group Flow (vph)	218	107	1214	515	82	667
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Number of Detectors	1	1	2	1	1	2
Detector Template	Left	Right	Thru	Right	Left	Thru
Leading Detector (ft)	20	20	100	20	20	100
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	6	20	20	6
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	NA	Perm	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Minimum Split (s)	20.0	20.0	20.0	20.0	8.0	20.0
Total Split (s)	20.0	20.0	61.0	61.0	9.0	70.0
Total Split (%)	22.2%	22.2%	67.8%	67.8%	10.0%	77.8%
Maximum Green (s)	16.0	16.0	57.0	57.0	5.0	66.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	Min	Min	None	Min
Walk Time (s)	5.0	5.0	5.0	5.0		5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0		11.0
Pedestrian Calls (#/hr)	0	0	0	0		0
Act Effct Green (s)	14.4	14.4	57.4	57.4	5.0	66.4
Actuated g/C Ratio	0.16	0.16	0.65	0.65	0.06	0.75
v/c Ratio	0.76	0.31	1.00	0.42	0.83	0.48
Control Delay	52.9	9.4	43.3	1.9	97.0	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.9	9.4	43.3	1.9	97.0	6.0
LOS	D	A	D	A	F	A
Approach Delay	38.5		31.0			16.0
Approach LOS	D		C			B

Intersection Summary	
Area Type: Other	
Cycle Length: 90	
Actuated Cycle Length: 88.8	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.00	
Intersection Signal Delay: 27.8	Intersection LOS: C
Intersection Capacity Utilization 86.9%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 1: NE Ward Rd & NE 88th St

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	218	107	1214	515	82	667
v/c Ratio	0.76	0.31	1.00	0.42	0.83	0.48
Control Delay	52.9	9.4	43.3	1.9	97.0	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.9	9.4	43.3	1.9	97.0	6.0
Queue Length 50th (ft)	117	0	~678	1	47	130
Queue Length 95th (ft)	#211	43	#983	35	#130	192
Internal Link Dist (ft)	818		577			693
Turn Bay Length (ft)						
Base Capacity (vph)	321	375	1216	1214	99	1394
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.29	1.00	0.42	0.83	0.48

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	218	107	1214	515	82	667
Number	3	18	2	12	1	6
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	188.1	188.1	188.1	188.1	186.3	186.3
Lanes	1	1	1	1	1	1
Cap, veh/h	261	233	1238	1052	102	1419
Arrive On Green	0.15	0.15	0.66	0.66	0.06	0.76
Sat Flow, veh/h	1792	1599	1881	1599	1774	1863
Grp Volume(v), veh/h	218	107	1214	515	82	667
Grp Sat Flow(s),veh/h/ln	1792	1599	1881	1599	1774	1863
Q Serve(g_s), s	10.2	5.3	53.9	14.1	4.0	11.5
Cycle Q Clear(g_c), s	10.2	5.3	53.9	14.1	4.0	11.5
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	261	233	1238	1052	102	1419
V/C Ratio(X)	0.83	0.46	0.98	0.49	0.80	0.47
Avail Cap(c_a), veh/h	331	296	1239	1053	102	1421
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.0	33.8	14.3	7.5	40.3	3.8
Incr Delay (d2), s/veh	13.7	1.4	21.0	0.4	34.8	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	5.6	2.2	27.1	4.4	2.7	3.4
Lane Grp Delay (d), s/veh	49.6	35.3	35.3	7.8	75.1	4.1
Lane Grp LOS	D	D	D	A	E	A
Approach Vol, veh/h	325		1729			749
Approach Delay, s/veh	44.9		27.1			11.8
Approach LOS	D		C			B

Timer					
Assigned Phs			2	1	6
Phs Duration (G+Y+Rc), s			60.9	9.0	69.9
Change Period (Y+Rc), s			4.0	4.0	4.0
Max Green Setting (Gmax), s			57.0	5.0	66.0
Max Q Clear Time (g_c+I1), s			55.9	6.0	13.5
Green Ext Time (p_c), s			1.1	0.0	29.9

Intersection Summary	
HCM 2010 Ctrl Delay	25.1
HCM 2010 LOS	C

Notes

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	359	622	501	312	273	218
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1787	1881	1863	1583	1805	1615
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1787	1881	1863	1583	1805	1615
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				312		218
Link Speed (mph)		50	50		30	
Link Distance (ft)		623	614		1224	
Travel Time (s)		8.5	8.4		27.8	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	1%	2%	2%	0%	0%
Adj. Flow (vph)	359	622	501	312	273	218
Shared Lane Traffic (%)						
Lane Group Flow (vph)	359	622	501	312	273	218
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (ft)	20	100	100	20	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	6	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	8.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	17.0	39.0	22.0	22.0	21.0	21.0
Total Split (%)	28.3%	65.0%	36.7%	36.7%	35.0%	35.0%
Maximum Green (s)	13.0	35.0	18.0	18.0	17.0	17.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	None	None	None	None
Walk Time (s)		5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)		11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0	0	0	0
Act Effct Green (s)	13.1	34.4	17.3	17.3	13.0	13.0
Actuated g/C Ratio	0.24	0.62	0.31	0.31	0.23	0.23
v/c Ratio	0.85	0.53	0.86	0.44	0.64	0.40
Control Delay	44.9	8.8	37.2	4.6	26.8	5.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.9	8.8	37.2	4.6	26.8	5.5
LOS	D	A	D	A	C	A
Approach Delay		22.0	24.7		17.3	
Approach LOS		C	C		B	

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 55.5	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.86	
Intersection Signal Delay: 21.9	Intersection LOS: C
Intersection Capacity Utilization 71.4%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 4: NE Fourth Plain Rd & NE 182nd Av

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	359	622	501	312	273	218
v/c Ratio	0.85	0.53	0.86	0.44	0.64	0.40
Control Delay	44.9	8.8	37.2	4.6	26.8	5.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.9	8.8	37.2	4.6	26.8	5.5
Queue Length 50th (ft)	117	101	155	0	83	0
Queue Length 95th (ft)	#270	204	#333	48	148	42
Internal Link Dist (ft)		543	534		1144	
Turn Bay Length (ft)						
Base Capacity (vph)	421	1194	608	727	556	648
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.85	0.52	0.82	0.43	0.49	0.34

Intersection Summary

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

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	359	622	501	312	273	218
Number	7	4	8	18	1	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	188.1	188.1	186.3	186.3	190.0	190.0
Lanes	1	1	1	1	1	1
Cap, veh/h	417	1207	615	523	365	326
Arrive On Green	0.23	0.64	0.33	0.33	0.20	0.20
Sat Flow, veh/h	1792	1881	1863	1583	1810	1615
Grp Volume(v), veh/h	359	622	501	312	273	218
Grp Sat Flow(s),veh/h/ln	1792	1881	1863	1583	1810	1615
Q Serve(g_s), s	9.8	9.0	12.6	8.4	7.2	6.4
Cycle Q Clear(g_c), s	9.8	9.0	12.6	8.4	7.2	6.4
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	417	1207	615	523	365	326
V/C Ratio(X)	0.86	0.52	0.81	0.60	0.75	0.67
Avail Cap(c_a), veh/h	457	1291	657	559	603	538
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.8	4.9	15.6	14.2	19.1	18.8
Incr Delay (d2), s/veh	14.4	0.3	7.4	1.6	3.1	2.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	5.3	2.0	5.7	2.7	3.3	5.7
Lane Grp Delay (d), s/veh	33.1	5.2	23.0	15.8	22.2	21.2
Lane Grp LOS	C	A	C	B	C	C
Approach Vol, veh/h		981	813		491	
Approach Delay, s/veh		15.4	20.3		21.8	
Approach LOS		B	C		C	

Timer			
Assigned Phs	7	4	8
Phs Duration (G+Y+Rc), s	15.9	36.7	20.8
Change Period (Y+Rc), s	4.0	4.0	4.0
Max Green Setting (Gmax), s	13.0	35.0	18.0
Max Q Clear Time (g_c+I1), s	11.8	11.0	14.6
Green Ext Time (p_c), s	0.1	8.3	2.3

Intersection Summary	
HCM 2010 Ctrl Delay	18.5
HCM 2010 LOS	B

Notes