

TRAFFIC IMPACT STUDY

Green Valley Ranch East
Filing 10

(Revised July 15, 2021)

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I. INTRODUCTION

Green Valley Ranch East Filing 10 consists of 109 single family units, to be developed within the Green Valley Ranch East master plan. As shown on **Figure 1**, the site is located in the southwest quadrant of the 48th Avenue/Tibet Road (future alignment) in Aurora, Colorado.

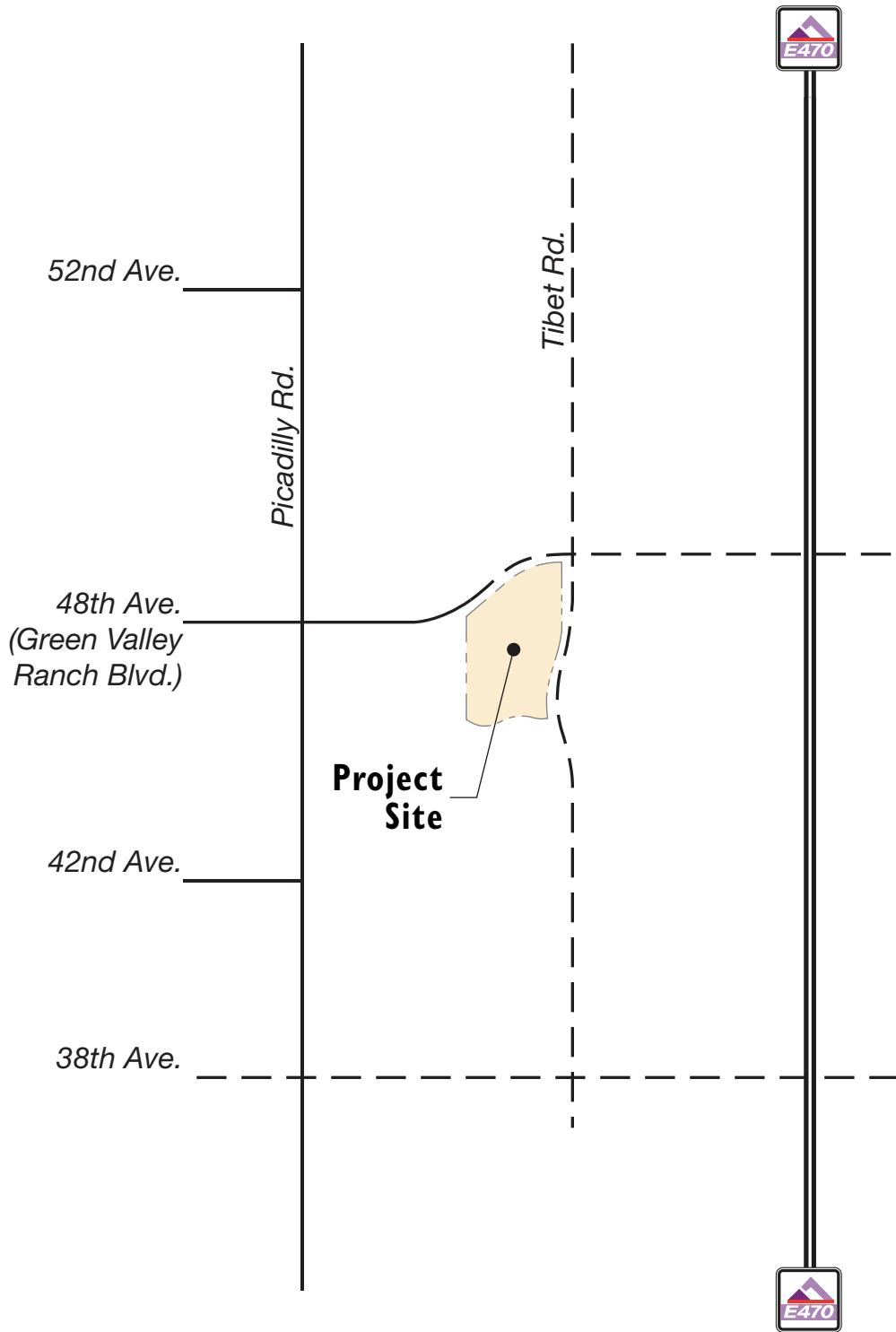
Figure 2 depicts the current site plan concept. As shown, Filing 10 would have vehicular access via two full-movement local street connections to Tibet Road (46th and 47th Avenues). No vehicular access is proposed to 48th Avenue; however, a pedestrian connection to 48th Avenue is proposed. No vehicular or non-motorized connection to the adjacent Fire Station site is envisioned.

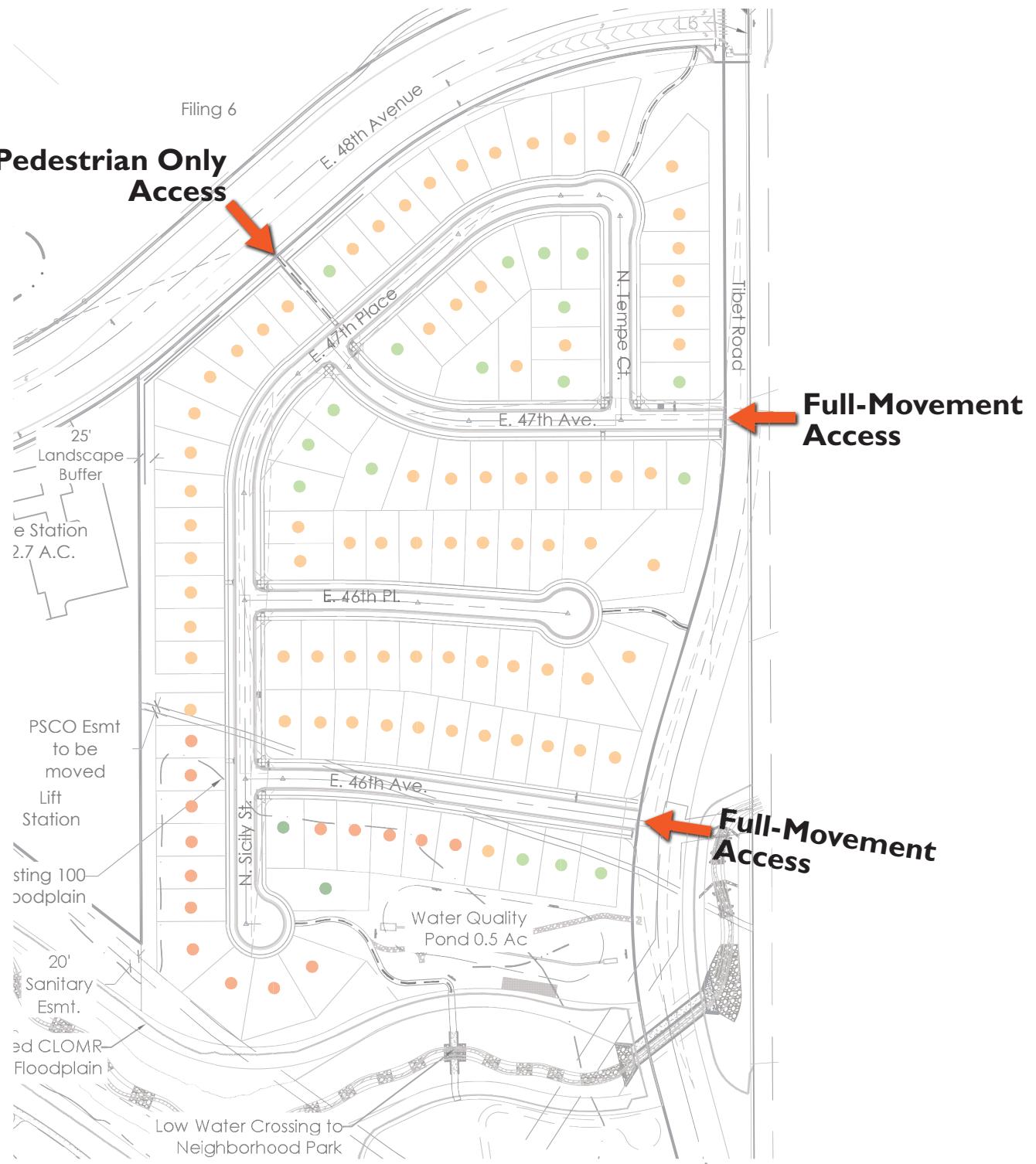
The current submittal for Filing 10 includes an initial 92 lots. However, there are two tracts that will be replatted for an additional 17 lots pending completion of the floodplain and LOMR process within the next year. Therefore, this traffic impact study addresses the full buildout of 109 lots as shown in **Figure 2** to ensure compliance with all City standards and to address the ultimate impacts in this area.

The traffic aspects of development in this area of Green Valley Ranch East have been addressed in two previous reports:

- *Transportation Analysis, Green Valley Ranch East, Felsburg Holt & Ullevig, July 2018.*
- *Green Valley Ranch East CSP 1, Active Adult Residential, Traffic Impact Study, Felsburg Holt & Ullevig, updated May 28, 2020.*

The current Filing 10 development proposal is in general conformance with the planning data previously used for the *Transportation Analysis, Green Valley Ranch East* report (the FDP report). The purpose of this current traffic study is to identify the potential impacts specific to Filing 10 to determine the resultant roadway and traffic control improvements required. Both Near-Term (approximate year 2023) and Long-Term (year 2040) planning horizons are evaluated.





II. PROPOSED FUTURE CONDITIONS

II.A. Trip Generation

As previously noted, Filing 10 would consist of 109 single family residential units, which is in general conformance with the planning data previously used for the FDP report. The trip generation analysis, summarized in **Table I**, was conducted using the fitted curve equations contained in *Trip Generation*, 10th Edition, Institute of Transportation Engineers (ITE), 2017.

Table I. Green Valley Ranch East Filing 10 Trip Generation Analysis

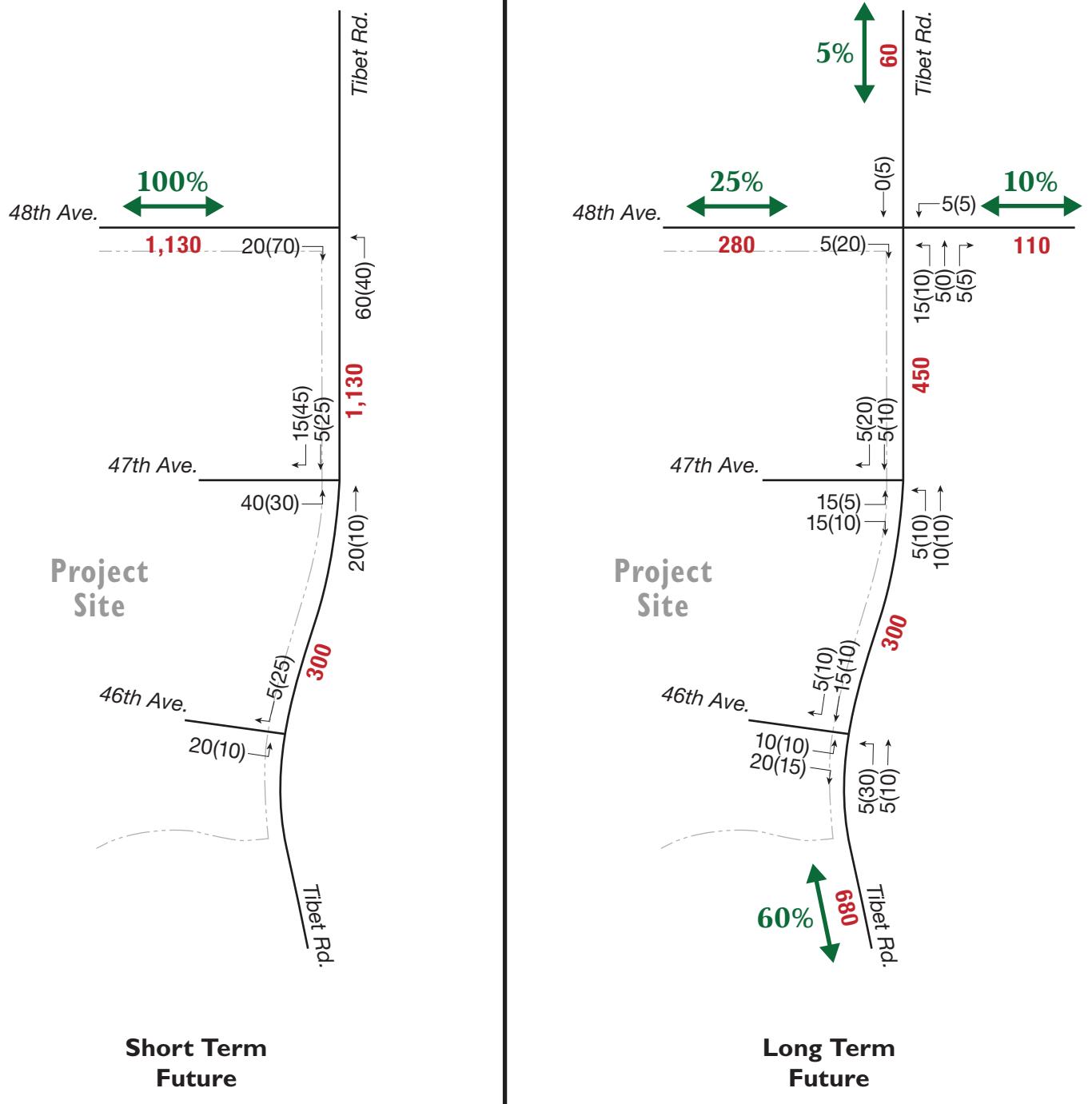
Land Use	Quantity	Daily	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Single Family Residential (I)	109 DU	1,130	20	60	80	70	40	110
I. ITE Land Use Code 210 Single Family Detached Housing. Fitted curve equations applied.								

As shown in the table, Filing 10 would have a trip generation potential of about 1,130 trips per day, with 80 AM peak hour trips and 110 PM peak hour trips.

II.B. Site Trip Distribution and Site-Generated Traffic Assignment

In the Near-Term Future, 48th Avenue would be completed to Tibet Road. Tibet Road would be constructed to provide two full-width lanes adjacent to Filing 10 to serve site ingress/egress movements. It is envisioned that Filing 6, immediately north of 48th Avenue, would also develop, and Tibet Road would be extended along the Filing 6 frontage as well. With this partial configuration, all Filing 10 site traffic would use Tibet Road to 48th Avenue to access the roadway system in the Near-Term Future.

In the Long-Term Future, the external roadway system would be completed, with Tibet Road constructed to its ultimate three-lane collector cross-section between 38th and 48th Avenues. 48th Avenue would be completed east to E-470 and beyond as a six-lane arterial, with an interchange at E-470. The traffic generated by Filing 10 would be distributed per travel patterns established by the FDP and CSP-I reports. **Figure 3** shows the trip distribution and resultant site-generated traffic assignments for both Near-Term and Long-Term Future scenarios.



LEGEND

- XXX(XXX) = AM(PM) Peak Hour Traffic Volumes
- XXXX = Daily Traffic Volumes
- XX% = Site Trip Distribution

III. FUTURE CONDITIONS

III.A. Background Traffic Conditions

For the Near-Term Future scenario (year 2023), background volumes were based on the estimated trip generation for Filing 6. As previously mentioned, it is anticipated that this nearby site would develop within this time frame. Current planning for Filing 6 would consist of approximately 146 Active Adult residential units. ITE Land Use Code 251, Senior Adult Housing data was used to generate the Near-Term Future background trips shown on **Figure 4**.

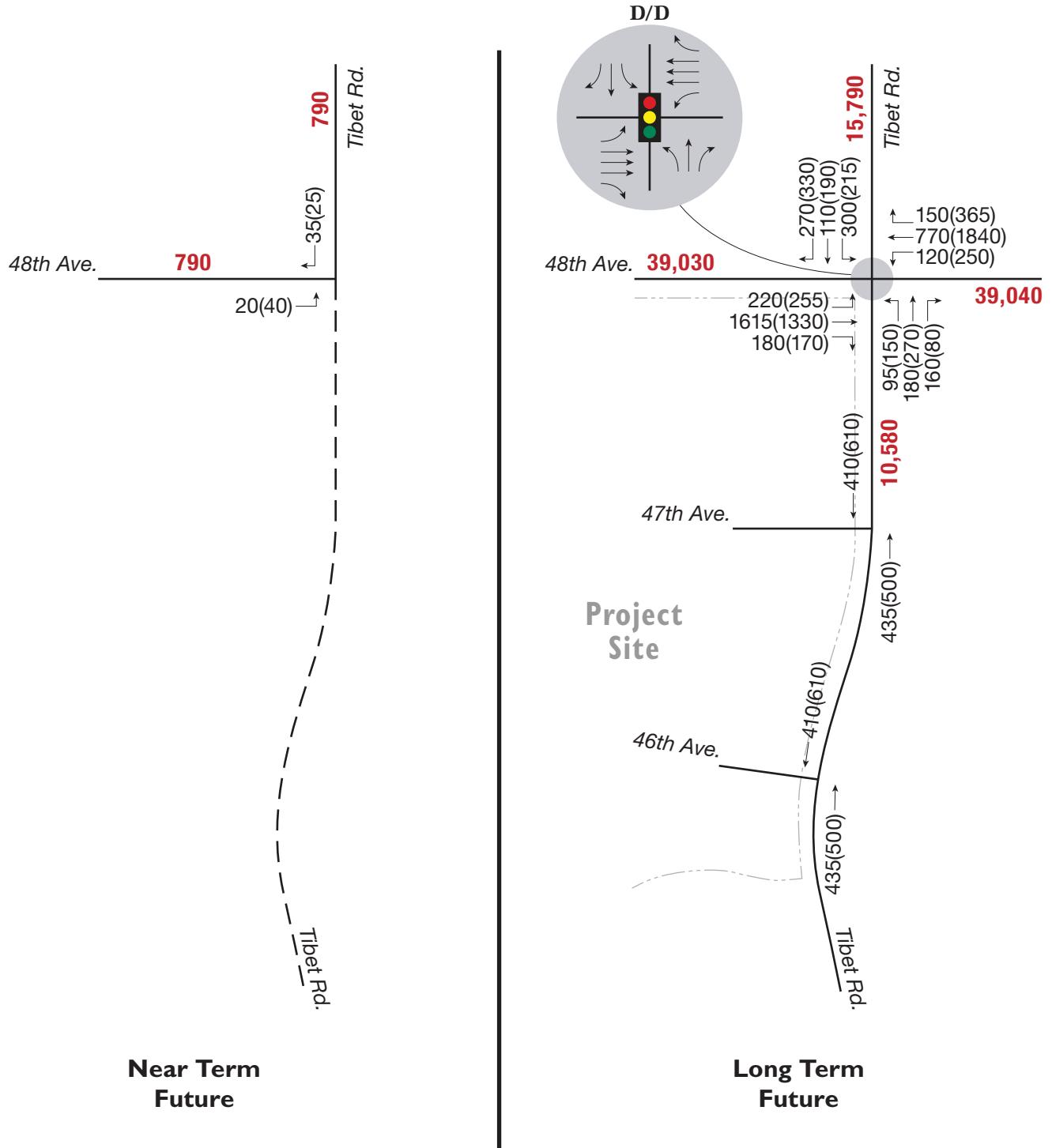
Figure 4 also illustrates the Long-Term Future background projections. These volumes are based on traffic projections contained in the 2020 CSP-I report. As shown, background volumes on Tibet Road would be approximately 10,580 to 15,790 VPD within the study area. 48th Avenue would experience approximately 39,000 VPD adjacent to the Filing 10 site.

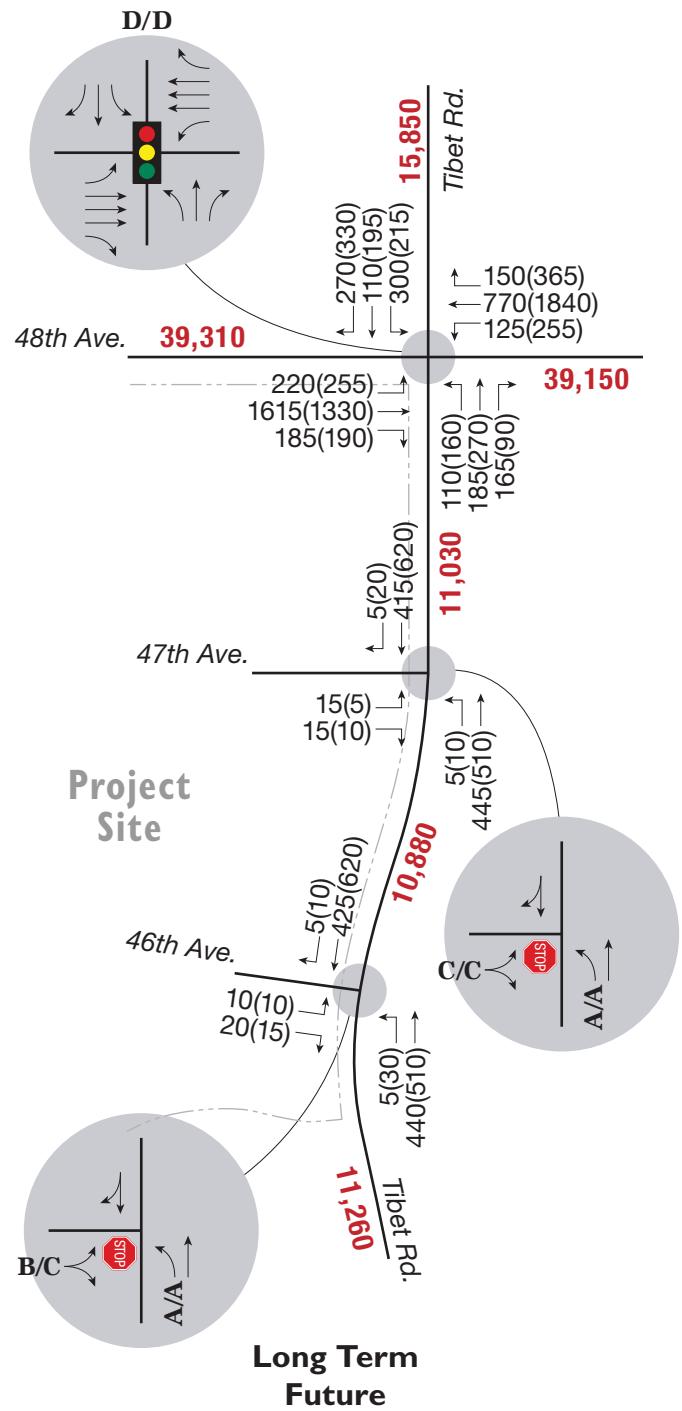
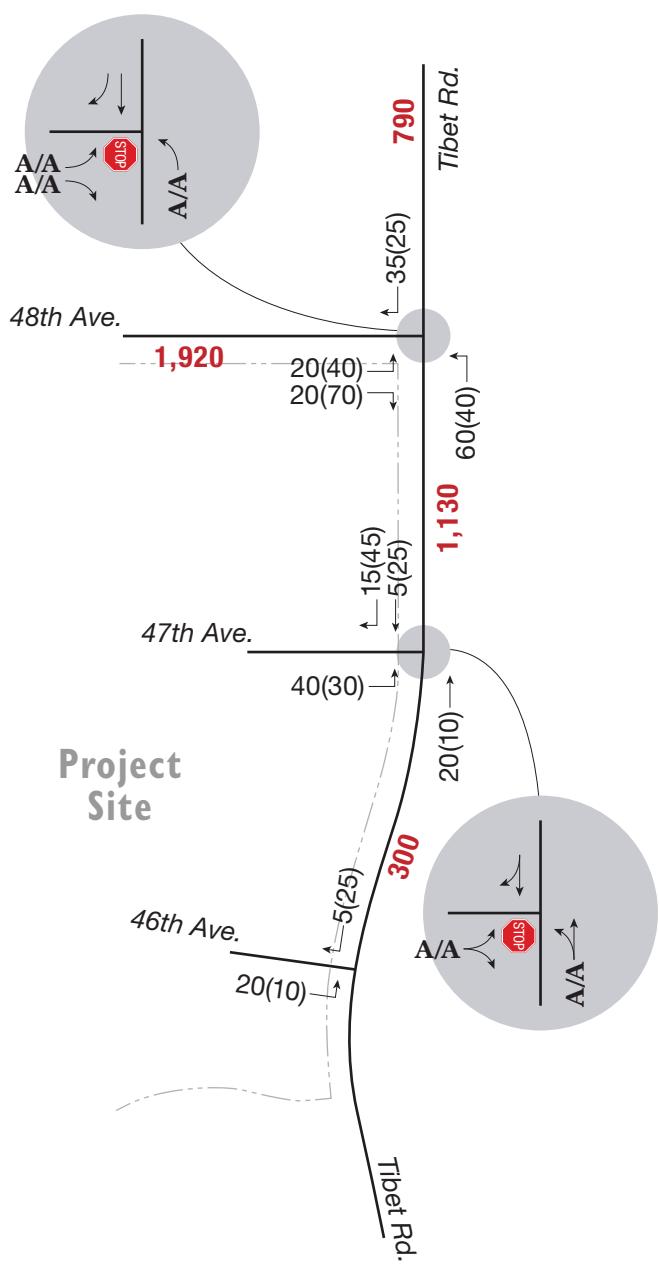
The Long-Term future peak hour background volumes were used as the basis for intersection LOS analyses, the results of which are graphically depicted on **Figure 4**. As shown, year 2040 background traffic operations at 48th Avenue/Tibet Road are projected to be generally acceptable (LOS D) during both peak hours. LOS worksheets are included in **Appendix A**.

III.B. Total Future Traffic Conditions

The site-generated traffic volumes (**Figure 3**) were added to the background traffic volumes (**Figure 4**) to produce the total traffic volumes illustrated on **Figure 5**; both Near-Term and Long-Term Future conditions are included. In the Near-Term Future, Tibet Road daily volumes would range between about 300 and 1,130 VPD within the study area. 48th Avenue is estimated to serve approximately 1,920 VPD in the vicinity of the site.

In the Long-Term Future, Tibet Road would carry between about 10,880 and 11,260 VPD adjacent to the Filing 10 site. 48th Avenue would carry approximately 39,310 VPD adjacent to the site. The Filing 10 development would represent six percent or less of the total volumes on Tibet Road and less than 3 percent of the 48th Avenue total traffic projections.





LEGEND

- XXX(XXX) = AM(PM) Peak Hour Traffic Volumes
- XXXX** = Daily Traffic Volumes
- X/X = AM/PM Peak Hour Intersection Level of Service
- = Stop Sign
- = Traffic Signal

IV. EVALUATION

IV.A. Level of Service

The Near-Term Future peak hour traffic volumes, intersection geometrics, and traffic were used as the basis for LOS analyses, the results of which are summarized on **Figure 5** (**Appendix B** contains LOS worksheets). As shown, traffic operations are projected to remain acceptable at the study area intersections in the projected year 2023. All study area intersections would be STOP-sign controlled in this scenario.

The Long-Term peak hour intersection operations are also shown on **Figure 5** (**Appendix C** contains LOS worksheets). As shown, study area traffic operations would continue to be acceptable. The intersection at 48th Avenue/Tibet Road would continue to function at LOS D during both peak hours under signalized traffic control. The STOP-sign controlled site accesses would operate at LOS C or better for all affected movements.

IV.B. Internal Traffic Control

Traffic control at the internal intersections within Filing 10 would be unsignalized, with STOP sign control on the minor approaches. **Figure 6** depicts the proposed internal traffic control. Given the limited continuity of the internal local streets, additional traffic calming measures are not envisioned within Filing 10.

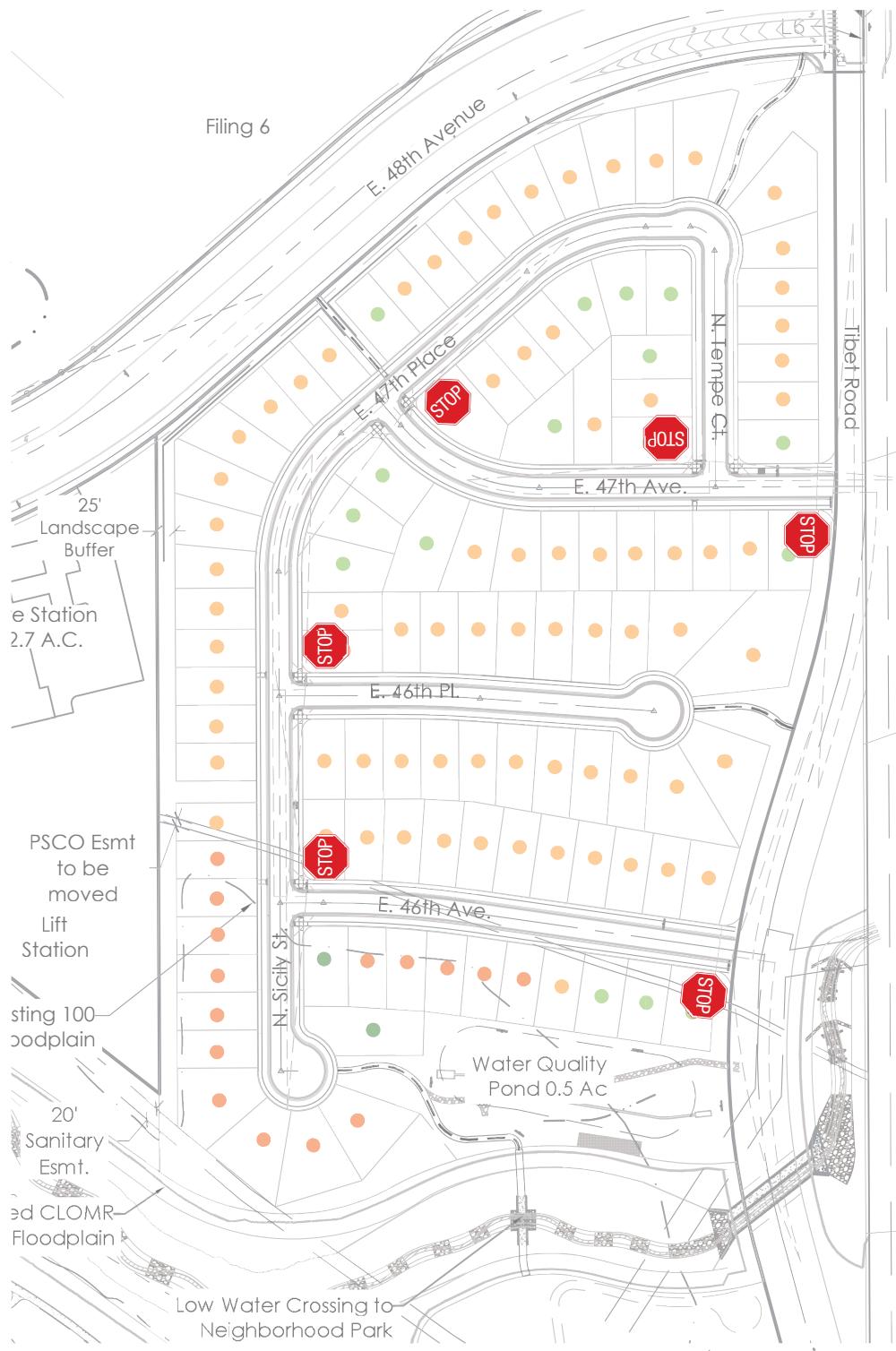
IV.C. Street Layout

The proposed street layout at Filing 10 was evaluated relative to Section 4.04.1 of the City's Roadway Design and Construction Standards. The site is bounded by 48th Avenue (an arterial) on the north and Tibet Road (A collector) on the east. The site plan (**Figure 2**) indicates two accesses along Tibet, which meets minimum requirements for emergency response. Typically, one connection to each perimeter road would be expected; however, because the spacing between Tibet Road and Rome Street (the nearest signal location to the west) is only about one-quarter mile, there is insufficient spacing to include a local connection from Filing 10 to 48th Avenue. Therefore, the proposed site plan is in general conformance with City standards.

IV.D. Auxiliary Lanes – Tibet Road at Filing 10 Accesses

The site access intersections along Tibet Road were evaluated relative to auxiliary lane criteria in the Colorado Department of Transportation's *State Highway Access Code*. The following criteria (for NR-B, Non-Rural Arterial, speed limit 40 MPH or less) apply to Tibet Road:

- Left-turn lanes are required where the associated volume exceeds 25 vehicles per hour. The left-turn lane is to consist of storage plus taper length. Based on this, the south site access warrants a left-turn lane on northbound Tibet Road, but the north site access does not meet the warrant. However, the ultimate cross-section of Tibet Road will have a center painted median area within which left-turn laneage can be accommodated within the pavement striping. Therefore, left-turn lanes should be provided at both site accesses, consisting of 50 feet of storage (sufficient for two passenger vehicles) and 120 feet of taper (assuming 35 MPH posted speed limit).
- Right-turn lanes are required where the associated volume exceeds 50 vehicles per hour. Because the associated right-turn volumes are well below this threshold, neither access warrants a right-turn lane.



LEGEND

= Stop Sign

IV.E. Queues

The 95th percentile maximum probable queue lengths for Long-Term Future conditions were extracted from the SYNCHRO LOS worksheets. The queue lengths are converted into feet (assuming a typical length of 25 feet per vehicle) and are summarized in **Table 2**. The table also provides CDOT storage requirements per the State Highway Access Code (SHAC). The recommended storage lengths consider both the CDOT criteria and the queueing projections.

Table 2. Queue Length Summary – Long Range Future

Intersection/Movement	95 % Queue Length (ft)		CDOT Storage Requirement (ft)	Recommended Storage (ft)
	AM Peak Hour	PM Peak Hour		
48th Ave/Tibet Road		Traffic Signal		
Northbound Left	150	75	160	160
Northbound Right	250	125	165	250
Southbound Left	325	175	300	325
Southbound Right	325	375	270	375
Eastbound Left	200	275	255	275
Eastbound Right	200	200	190	200
Westbound Left	150	250	255	255
Westbound Right	175	375	365	375
Tibet Road/North Site Access		STOP-Sign		
Northbound Left	0	0	40	50
Eastbound Left-Right	25	25	N/A	N/A
Tibet Road/South Site Access		STOP-Sign		
Northbound Left	0	0	40	50
Eastbound Left-Right	25	25	N/A	N/A

IV.F. Improvements

The roadway and intersection improvements that should be implemented within the study area include the following:

- Initially install STOP-sign control at 48th Avenue/Tibet Road (eastbound approach). When 48th Avenue is extended east, change the STOP-sign control to the northbound and southbound approaches. Periodically monitor traffic conditions, and install signalized traffic control, when warranted.
- Provide left-turn lanes on northbound Tibet Road at each site access within the painted center median area. Each lane should consist of 50 feet of storage and 120 feet of taper.
- Install STOP-sign control on the eastbound site access approaches at Tibet Road. These intersections would continue to operate acceptably through the Long-Term Future as unsignalized intersections.
- Install STOP-sign control at the site-internal intersections as previously depicted on **Figure 6**.

V. CONCLUSIONS AND RECOMMENDATIONS

Green Valley Ranch East Filing 10 consists of 109 single-family homes to be developed in the southwest quadrant of 48th Avenue/Tibet Road. Vehicular access would be via two local roadway connections onto Tibet Road.

The proposed Filing 10 residential development would have a trip generation potential of about 1,130 trips per day, with 80 AM peak hour trips and 110 PM peak hour trips. The potential impacts of the site-generated traffic were evaluated under both Near-Term and Long-Term Future scenarios. In general, the existing and planned roadway system would have sufficient reserve capacity to accommodate the projected increases. Specific to Filing 10, the following recommendations are made:

- Initially install STOP-sign control at 48th Avenue/Tibet Road (eastbound approach). When 48th Avenue is extended east, change the STOP-sign control to the northbound and southbound approaches. Periodically monitor traffic conditions, and install signalized traffic control, when warranted.
- Provide left-turn lanes on northbound Tibet Road at each site access. These lanes would be accommodated within the painted center median area. Each lane should consist of 50 feet of storage and 120 feet of taper. Right-turn lanes on southbound Tibet Road are not required at either site access, based on low projected right-turn volumes.
- Install STOP-sign control on the eastbound site access approaches at Tibet Road. These intersections would continue to operate acceptably through the Long-Term Future as unsignalized intersections.
- Install STOP-sign control at the site-internal intersections as depicted on **Figure 6**.

APPENDIX A. LONG TERM BACKGROUND LOS

HCM 6th Signalized Intersection Summary
2: Tibet Rd & 48th Ave

Long Term Background AM Peak Hour
04/07/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑	↑↑↑	↑	↑	↑	↑	↑	↑	↑
Traffic Volume (veh/h)	220	1615	180	120	770	160	95	180	160	300	110	270
Future Volume (veh/h)	220	1615	180	120	770	160	95	180	160	300	110	270
Initial Q (Q _b), 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
Work Zone On Approach	No		No		No		No		No	No		No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	239	1755	196	130	837	174	103	196	174	326	120	293
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	364	1956	607	186	1746	542	340	367	311	444	568	482
Arrive On Green	0.10	0.38	0.38	0.06	0.34	0.34	0.05	0.20	0.20	0.16	0.30	0.30
Sat Flow, veh/h	1781	5106	1585	1781	5106	1585	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	239	1755	196	130	837	174	103	196	174	326	120	293
Grp Sat Flow(s), veh/h/ln	1781	1702	1585	1781	1702	1585	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	10.2	38.8	10.4	5.6	15.5	9.7	5.6	11.3	11.9	16.9	5.7	18.9
Cycle Q Clear(g_c), s	10.2	38.8	10.4	5.6	15.5	9.7	5.6	11.3	11.9	16.9	5.7	18.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	364	1956	607	186	1746	542	340	367	311	444	568	482
V/C Ratio(X)	0.66	0.90	0.32	0.70	0.48	0.32	0.30	0.53	0.56	0.73	0.21	0.61
Avail Cap(c_a), veh/h	446	2000	621	207	1746	542	340	367	311	445	568	482
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(l)	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	22.6	34.8	26.1	29.6	31.1	29.2	36.2	43.3	43.6	30.2	31.1	35.7
Incr Delay (d2), s/veh	2.5	5.8	0.3	8.8	0.2	0.3	0.5	5.5	7.1	6.2	0.8	5.6
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 BackOfQ(95%), veh/ln	7.9	23.5	7.2	5.1	10.5	6.8	4.5	9.7	9.1	12.6	4.9	12.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	25.2	40.5	26.4	38.4	31.3	29.5	36.7	48.8	50.7	36.4	31.9	41.3
LnGrp LOS	C	D	C	D	C	C	D	D	D	D	C	D
Approach Vol, veh/h	2190				1141			473			739	
Approach Delay, s/veh	37.6				31.8			46.9			37.6	
Approach LOS		D			C			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+R _c), s	24.9	29.5	13.6	52.0	12.0	42.5	18.5	47.0				
Change Period (Y+R _c), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	19.0	21.0	9.0	47.0	6.0	34.0	18.0	38.0				
Max Q Clear Time (g _{c+l1}), s	18.9	13.9	7.6	40.8	7.6	20.9	12.2	17.5				
Green Ext Time (p _c), s	0.0	1.0	0.0	5.2	0.0	1.4	0.3	6.6				
Intersection Summary												
HCM 6th Ctrl Delay				37.1								
HCM 6th LOS				D								

Timings
2: Tibet Rd & 48th Ave

Long Term Background AM Peak Hour

04/05/2021

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑	↑↑↑	↑	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	220	1615	180	120	770	160	95	180	160	300	110	270
Future Volume (vph)	220	1615	180	120	770	160	95	180	160	300	110	270
Turn Type	pm+pt	NA	Perm									
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	12.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0
Total Split (s)	24.0	53.0	53.0	15.0	44.0	44.0	12.0	27.0	27.0	25.0	40.0	40.0
Total Split (%)	20.0%	44.2%	44.2%	12.5%	36.7%	36.7%	10.0%	22.5%	22.5%	20.8%	33.3%	33.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
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	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag									
Lead-Lag Optimize?	Yes											
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max						
Act Effect Green (s)	60.7	47.3	47.3	50.4	41.7	41.7	27.7	21.7	21.7	46.0	34.0	34.0
Actuated g/C Ratio	0.51	0.39	0.39	0.42	0.35	0.35	0.23	0.18	0.18	0.38	0.28	0.28
v/c Ratio	0.65	0.88	0.26	0.68	0.47	0.25	0.32	0.58	0.36	0.77	0.23	0.45
Control Delay	25.1	39.7	4.6	42.5	32.2	1.5	30.1	53.1	3.1	41.9	34.4	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.1	39.7	4.6	42.5	32.2	1.5	30.1	53.1	3.1	41.9	34.4	6.0
LOS	C	D	A	D	C	A	C	D	A	D	C	A
Approach Delay	35.0				28.7			29.7			26.4	
Approach LOS	C				C			C			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 31.5

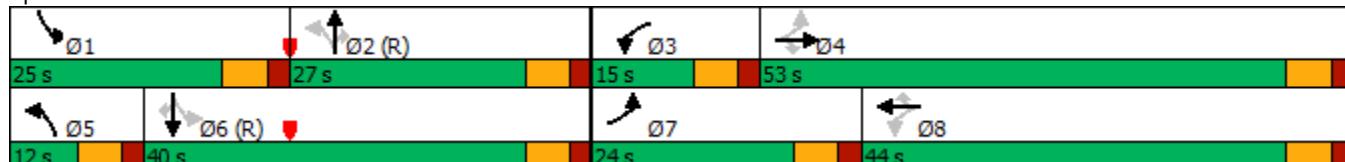
Intersection LOS: C

Intersection Capacity Utilization 83.9%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 2: Tibet Rd & 48th Ave



HCM 6th Signalized Intersection Summary
2: Tibet Rd & 48th Ave

Long Term Background PM Peak Hour
04/07/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑	↑↑↑	↑	↑	↑	↑	↑	↑	↑
Traffic Volume (veh/h)	255	1330	170	250	1840	365	150	270	80	215	190	330
Future Volume (veh/h)	255	1330	170	250	1840	365	150	270	80	215	190	330
Initial Q (Q _b), 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
Work Zone On Approach	No		No			No			No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	277	1446	185	272	2000	397	163	293	87	234	207	359
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	303	2082	646	313	1957	608	277	353	299	261	400	339
Arrive On Green	0.14	0.41	0.41	0.11	0.38	0.38	0.07	0.19	0.19	0.09	0.21	0.21
Sat Flow, veh/h	1781	5106	1585	1781	5106	1585	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	277	1446	185	272	2000	397	163	293	87	234	207	359
Grp Sat Flow(s), veh/h/ln	1781	1702	1585	1781	1702	1585	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	14.3	28.1	9.4	10.9	46.0	24.7	8.0	18.1	5.7	11.0	11.7	25.6
Cycle Q Clear(g_c), s	14.3	28.1	9.4	10.9	46.0	24.7	8.0	18.1	5.7	11.0	11.7	25.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	303	2082	646	313	1957	608	277	353	299	261	400	339
V/C Ratio(X)	0.91	0.69	0.29	0.87	1.02	0.65	0.59	0.83	0.29	0.90	0.52	1.06
Avail Cap(c_a), veh/h	312	2082	646	425	1957	608	277	353	299	261	400	339
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(l)	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	36.9	29.4	23.8	24.8	37.0	30.4	38.0	46.8	41.8	40.0	41.7	47.2
Incr Delay (d2), s/veh	29.6	1.0	0.2	13.5	26.0	2.5	3.3	19.8	2.5	30.1	4.7	65.7
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 BackOfQ(95%), veh/ln	11.0	17.1	6.4	9.5	31.8	14.9	7.5	15.6	4.4	7.0	10.0	23.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	66.5	30.4	24.1	38.3	63.0	33.0	41.2	66.7	44.2	70.1	46.5	112.9
LnGrp LOS	E	C	C	D	F	C	D	E	D	E	D	F
Approach Vol, veh/h		1908			2669			543			800	
Approach Delay, s/veh		35.0			56.1			55.4			83.2	
Approach LOS		C			E			E			F	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+R _c), s	17.0	28.6	19.4	54.9	14.0	31.6	22.4	52.0				
Change Period (Y+R _c), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	11.0	22.0	21.0	42.0	8.0	25.0	17.0	46.0				
Max Q Clear Time (g _c +l1), s	13.0	20.1	12.9	30.1	10.0	27.6	16.3	48.0				
Green Ext Time (p _c), s	0.0	0.4	0.5	8.0	0.0	0.0	0.1	0.0				
Intersection Summary												
HCM 6th Ctrl Delay			52.9									
HCM 6th LOS			D									

Timings
2: Tibet Rd & 48th Ave

Long Term Background PM Peak Hour

04/05/2021

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑		↑	↑↑↑		↑	↑		↑	↑	↑
Traffic Volume (vph)	255	1330	170	250	1840	365	150	270	80	215	190	330
Future Volume (vph)	255	1330	170	250	1840	365	150	270	80	215	190	330
Turn Type	pm+pt	NA	Perm									
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	12.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0
Total Split (s)	23.0	48.0	48.0	27.0	52.0	52.0	14.0	28.0	28.0	17.0	31.0	31.0
Total Split (%)	19.2%	40.0%	40.0%	22.5%	43.3%	43.3%	11.7%	23.3%	23.3%	14.2%	25.8%	25.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
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	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag									
Lead-Lag Optimize?	Yes											
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max						
Act Effect Green (s)	61.6	45.1	45.1	64.4	46.4	46.4	30.0	22.0	22.0	36.0	25.0	25.0
Actuated g/C Ratio	0.51	0.38	0.38	0.54	0.39	0.39	0.25	0.18	0.18	0.30	0.21	0.21
v/c Ratio	0.91	0.76	0.26	0.83	1.02	0.50	0.54	0.86	0.22	0.97	0.53	0.62
Control Delay	65.1	36.4	5.5	52.1	61.2	9.9	39.7	71.6	2.7	85.4	48.1	12.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	65.1	36.4	5.5	52.1	61.2	9.9	39.7	71.6	2.7	85.4	48.1	12.4
LOS	E	D	A	D	E	A	D	E	A	F	D	B
Approach Delay		37.6			52.7			51.0			43.0	
Approach LOS		D			D			D			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 115

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 46.3

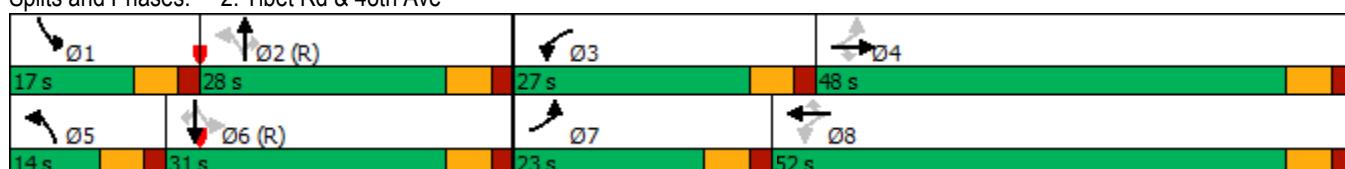
Intersection LOS: D

Intersection Capacity Utilization 95.8%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 2: Tibet Rd & 48th Ave



APPENDIX B. NEAR-TERM FUTURE TOTAL TRAFFIC LOS

Intersection						
Int Delay, s/veh	5.5					
Movement	EBL	EBC	NBL	NBT	SBT	SBR
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Vol, veh/h	20	20	60	5	5	35
Future Vol, veh/h	20	20	60	5	5	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	100	0	100	-	-	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	22	65	5	5	38
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	140	5	43	0	-	0
Stage 1	5	-	-	-	-	-
Stage 2	135	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	853	1078	1566	-	-	-
Stage 1	1018	-	-	-	-	-
Stage 2	891	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	817	1078	1566	-	-	-
Mov Cap-2 Maneuver	817	-	-	-	-	-
Stage 1	975	-	-	-	-	-
Stage 2	891	-	-	-	-	-
Approach	EB	NB	SB			
HCM Control Delay, s	9	6.8	0			
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1566	-	817	1078	-	-
HCM Lane V/C Ratio	0.042	-	0.027	0.02	-	-
HCM Control Delay (s)	7.4	-	9.5	8.4	-	-
HCM Lane LOS	A	-	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	0.1	-	-

Intersection						
Int Delay, s/veh	4.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		A	B		
Traffic Vol, veh/h	40	5	5	20	5	15
Future Vol, veh/h	40	5	5	20	5	15
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	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	43	5	5	22	5	16
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	45	13	21	0	-	0
Stage 1	13	-	-	-	-	-
Stage 2	32	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	965	1067	1595	-	-	-
Stage 1	1010	-	-	-	-	-
Stage 2	991	-	-	-	-	-
Platoon blocked, %		-	-	-	-	-
Mov Cap-1 Maneuver	962	1067	1595	-	-	-
Mov Cap-2 Maneuver	962	-	-	-	-	-
Stage 1	1007	-	-	-	-	-
Stage 2	991	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	8.9	1.5		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1595	-	973	-	-	
HCM Lane V/C Ratio	0.003	-	0.05	-	-	
HCM Control Delay (s)	7.3	0	8.9	-	-	
HCM Lane LOS	A	A	A	-	-	
HCM 95th %tile Q(veh)	0	-	0.2	-	-	

Intersection						
Int Delay, s/veh	5.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			A	B	
Traffic Vol, veh/h	20	5	5	5	5	5
Future Vol, veh/h	20	5	5	5	5	5
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	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	5	5	5	5	5
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	23	8	10	0	-	0
Stage 1	8	-	-	-	-	-
Stage 2	15	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	993	1074	1610	-	-	-
Stage 1	1015	-	-	-	-	-
Stage 2	1008	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	990	1074	1610	-	-	-
Mov Cap-2 Maneuver	990	-	-	-	-	-
Stage 1	1012	-	-	-	-	-
Stage 2	1008	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	8.7	3.6		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1610	-	1006	-	-	
HCM Lane V/C Ratio	0.003	-	0.027	-	-	
HCM Control Delay (s)	7.2	0	8.7	-	-	
HCM Lane LOS	A	A	A	-	-	
HCM 95th %tile Q(veh)	0	-	0.1	-	-	

Intersection						
Int Delay, s/veh	6.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Vol, veh/h	40	70	40	5	5	25
Future Vol, veh/h	40	70	40	5	5	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	100	0	100	-	-	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	43	76	43	5	5	27
Major/Minor						
Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	96	5	32	0	-	0
Stage 1	5	-	-	-	-	-
Stage 2	91	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	903	1078	1580	-	-	-
Stage 1	1018	-	-	-	-	-
Stage 2	933	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	879	1078	1580	-	-	-
Mov Cap-2 Maneuver	879	-	-	-	-	-
Stage 1	991	-	-	-	-	-
Stage 2	933	-	-	-	-	-
Approach						
Approach	EB	NB	SB			
HCM Control Delay, s	8.9	6.5	0			
HCM LOS	A					
Minor Lane/Major Mvmt						
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1580	-	879	1078	-	-
HCM Lane V/C Ratio	0.028	-	0.049	0.071	-	-
HCM Control Delay (s)	7.3	-	9.3	8.6	-	-
HCM Lane LOS	A	-	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	0.2	-	-

Intersection						
Int Delay, s/veh	2.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		A	B		
Traffic Vol, veh/h	30	5	5	10	25	45
Future Vol, veh/h	30	5	5	10	25	45
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	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	5	5	11	27	49
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	73	52	76	0	-	0
Stage 1	52	-	-	-	-	-
Stage 2	21	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	931	1016	1523	-	-	-
Stage 1	970	-	-	-	-	-
Stage 2	1002	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	928	1016	1523	-	-	-
Mov Cap-2 Maneuver	928	-	-	-	-	-
Stage 1	967	-	-	-	-	-
Stage 2	1002	-	-	-	-	-
Approach	EB	NB	SB			
HCM Control Delay, s	9	2.5	0			
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1523	-	940	-	-	
HCM Lane V/C Ratio	0.004	-	0.04	-	-	
HCM Control Delay (s)	7.4	0	9	-	-	
HCM Lane LOS	A	A	A	-	-	
HCM 95th %tile Q(veh)	0	-	0.1	-	-	

Intersection						
Int Delay, s/veh	3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			A	B	
Traffic Vol, veh/h	10	5	5	5	5	25
Future Vol, veh/h	10	5	5	5	5	25
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	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	5	5	5	5	27
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	34	19	32	0	-	0
Stage 1	19	-	-	-	-	-
Stage 2	15	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	979	1059	1580	-	-	-
Stage 1	1004	-	-	-	-	-
Stage 2	1008	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	976	1059	1580	-	-	-
Mov Cap-2 Maneuver	976	-	-	-	-	-
Stage 1	1001	-	-	-	-	-
Stage 2	1008	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	8.7	3.6		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1580	-	1002	-	-	
HCM Lane V/C Ratio	0.003	-	0.016	-	-	
HCM Control Delay (s)	7.3	0	8.7	-	-	
HCM Lane LOS	A	A	A	-	-	
HCM 95th %tile Q(veh)	0	-	0.1	-	-	

APPENDIX C. LONG-TERM FUTURE TOTAL TRAFFIC LOS

HCM 6th Signalized Intersection Summary
2: Tibet Rd & 48th Ave

Long Term Total AM Peak Hour
04/07/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑	↑↑↑	↑	↑	↑	↑	↑	↑	↑
Traffic Volume (veh/h)	220	1615	185	125	770	160	110	185	165	300	110	270
Future Volume (veh/h)	220	1615	185	125	770	160	110	185	165	300	110	270
Initial Q (Q _b), 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
Work Zone On Approach	No		No			No			No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	239	1755	201	136	837	174	120	201	179	326	120	293
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	366	1957	607	189	1757	545	337	362	307	438	564	478
Arrive On Green	0.10	0.38	0.38	0.07	0.34	0.34	0.05	0.19	0.19	0.16	0.30	0.30
Sat Flow, veh/h	1781	5106	1585	1781	5106	1585	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	239	1755	201	136	837	174	120	201	179	326	120	293
Grp Sat Flow(s), veh/h/ln	1781	1702	1585	1781	1702	1585	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	10.2	38.8	10.7	5.9	15.4	9.7	6.0	11.7	12.3	17.0	5.7	19.0
Cycle Q Clear(g_c), s	10.2	38.8	10.7	5.9	15.4	9.7	6.0	11.7	12.3	17.0	5.7	19.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	366	1957	607	189	1757	545	337	362	307	438	564	478
V/C Ratio(X)	0.65	0.90	0.33	0.72	0.48	0.32	0.36	0.56	0.58	0.74	0.21	0.61
Avail Cap(c_a), veh/h	447	2000	621	207	1757	545	337	362	307	439	564	478
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(l)	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	22.6	34.8	26.1	29.4	30.9	29.0	36.8	43.7	44.0	30.4	31.3	35.9
Incr Delay (d2), s/veh	2.5	5.8	0.3	10.3	0.2	0.3	0.6	6.0	7.9	6.7	0.9	5.8
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 BackOfQ(95%), veh/ln	7.9	23.5	7.4	5.4	10.5	6.8	5.3	10.0	9.4	12.7	4.9	12.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	25.0	40.5	26.5	39.7	31.1	29.3	37.5	49.7	51.9	37.2	32.1	41.7
LnGrp LOS	C	D	C	D	C	C	D	D	D	D	C	D
Approach Vol, veh/h		2195			1147			500			739	
Approach Delay, s/veh		37.6			31.8			47.6			38.1	
Approach LOS		D			C			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+R _c), s	25.0	29.2	13.8	52.0	12.0	42.2	18.5	47.3				
Change Period (Y+R _c), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	19.0	21.0	9.0	47.0	6.0	34.0	18.0	38.0				
Max Q Clear Time (g _{c+l1}), s	19.0	14.3	7.9	40.8	8.0	21.0	12.2	17.4				
Green Ext Time (p _c), s	0.0	1.0	0.0	5.2	0.0	1.4	0.3	6.6				
Intersection Summary												
HCM 6th Ctrl Delay		37.3										
HCM 6th LOS			D									

Timings
2: Tibet Rd & 48th Ave

Long Term Total AM Peak Hour

04/05/2021

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑	↑↑↑	↑	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	220	1615	185	125	770	160	110	185	165	300	110	270
Future Volume (vph)	220	1615	185	125	770	160	110	185	165	300	110	270
Turn Type	pm+pt	NA	Perm									
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	12.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0
Total Split (s)	24.0	53.0	53.0	15.0	44.0	44.0	12.0	27.0	27.0	25.0	40.0	40.0
Total Split (%)	20.0%	44.2%	44.2%	12.5%	36.7%	36.7%	10.0%	22.5%	22.5%	20.8%	33.3%	33.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
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	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag									
Lead-Lag Optimize?	Yes											
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max						
Act Effect Green (s)	60.7	47.3	47.3	50.4	41.7	41.7	27.7	21.7	21.7	46.0	34.0	34.0
Actuated g/C Ratio	0.51	0.39	0.39	0.42	0.35	0.35	0.23	0.18	0.18	0.38	0.28	0.28
v/c Ratio	0.65	0.88	0.27	0.71	0.47	0.25	0.38	0.60	0.37	0.78	0.23	0.45
Control Delay	25.2	39.8	4.9	45.2	32.2	1.5	32.0	53.7	3.4	42.4	34.4	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.2	39.8	4.9	45.2	32.2	1.5	32.0	53.7	3.4	42.4	34.4	6.0
LOS	C	D	A	D	C	A	C	D	A	D	C	A
Approach Delay		35.0			29.1			30.5			26.7	
Approach LOS		D			C			C			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 31.7

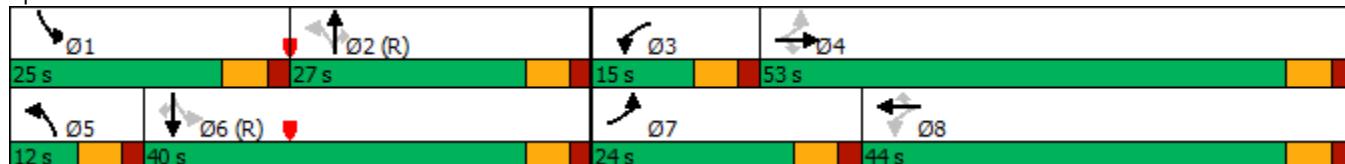
Intersection LOS: C

Intersection Capacity Utilization 84.5%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 2: Tibet Rd & 48th Ave



Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		T	↑	↑	
Traffic Vol, veh/h	15	15	5	445	415	5
Future Vol, veh/h	15	15	5	445	415	5
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	-	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	16	5	484	451	5
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	948	454	456	0	-	0
Stage 1	454	-	-	-	-	-
Stage 2	494	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	289	606	1105	-	-	-
Stage 1	640	-	-	-	-	-
Stage 2	613	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	288	606	1105	-	-	-
Mov Cap-2 Maneuver	288	-	-	-	-	-
Stage 1	637	-	-	-	-	-
Stage 2	613	-	-	-	-	-
Approach	EB	NB	SB			
HCM Control Delay, s	15.1	0.1	0			
HCM LOS	C					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1105	-	390	-	-	
HCM Lane V/C Ratio	0.005	-	0.084	-	-	
HCM Control Delay (s)	8.3	-	15.1	-	-	
HCM Lane LOS	A	-	C	-	-	
HCM 95th %tile Q(veh)	0	-	0.3	-	-	

Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		T	↑	R	
Traffic Vol, veh/h	10	20	5	440	425	5
Future Vol, veh/h	10	20	5	440	425	5
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	-	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	22	5	478	462	5
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	953	465	467	0	-	0
Stage 1	465	-	-	-	-	-
Stage 2	488	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	287	597	1094	-	-	-
Stage 1	632	-	-	-	-	-
Stage 2	617	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	286	597	1094	-	-	-
Mov Cap-2 Maneuver	286	-	-	-	-	-
Stage 1	629	-	-	-	-	-
Stage 2	617	-	-	-	-	-
Approach	EB	NB	SB			
HCM Control Delay, s	13.9	0.1	0			
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1094	-	438	-	-	
HCM Lane V/C Ratio	0.005	-	0.074	-	-	
HCM Control Delay (s)	8.3	-	13.9	-	-	
HCM Lane LOS	A	-	B	-	-	
HCM 95th %tile Q(veh)	0	-	0.2	-	-	

HCM 6th Signalized Intersection Summary
2: Tibet Rd & 48th Ave

Long Term Background PM Peak Hour
04/07/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑		↑	↑↑↑		↑	↑	↑	↑	↑	↑
Traffic Volume (veh/h)	255	1330	190	255	1840	365	160	270	90	215	195	330
Future Volume (veh/h)	255	1330	190	255	1840	365	160	270	90	215	195	330
Initial Q (Q _b), 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
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	277	1446	207	277	2000	397	174	293	98	234	212	359
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	303	2074	644	314	1957	608	274	353	299	261	400	555
Arrive On Green	0.14	0.41	0.41	0.11	0.38	0.38	0.07	0.19	0.19	0.09	0.21	0.21
Sat Flow, veh/h	1781	5106	1585	1781	5106	1585	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	277	1446	207	277	2000	397	174	293	98	234	212	359
Grp Sat Flow(s), veh/h/ln	1781	1702	1585	1781	1702	1585	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	14.3	28.2	10.7	11.1	46.0	24.7	8.0	18.1	6.4	11.0	12.1	22.8
Cycle Q Clear(g_c), s	14.3	28.2	10.7	11.1	46.0	24.7	8.0	18.1	6.4	11.0	12.1	22.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	303	2074	644	314	1957	608	274	353	299	261	400	555
V/C Ratio(X)	0.91	0.70	0.32	0.88	1.02	0.65	0.64	0.83	0.33	0.90	0.53	0.65
Avail Cap(c_a), veh/h	312	2074	644	424	1957	608	274	353	299	261	400	555
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(l)	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	36.9	29.5	24.3	24.9	37.0	30.4	38.9	46.8	42.1	40.0	41.8	32.8
Incr Delay (d2), s/veh	29.6	1.0	0.3	15.2	26.0	2.5	4.8	19.8	2.9	30.4	5.0	5.7
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 BackOfQ(95%), veh/ln	11.0	17.1	7.3	9.8	31.8	14.9	2.2	15.6	5.0	7.0	10.2	14.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	66.5	30.6	24.6	40.1	63.0	33.0	43.7	66.7	45.0	70.4	46.8	38.5
LnGrp LOS	E	C	C	D	F	C	D	E	D	E	D	D
Approach Vol, veh/h		1930				2674			565			805
Approach Delay, s/veh		35.1				56.2			55.8			50.0
Approach LOS		D				E			E			D
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+R _c), s	17.0	28.6	19.6	54.7	14.0	31.6	22.4	52.0				
Change Period (Y+R _c), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	11.0	22.0	21.0	42.0	8.0	25.0	17.0	46.0				
Max Q Clear Time (g _{c+l1}), s	13.0	20.1	13.1	30.2	10.0	24.8	16.3	48.0				
Green Ext Time (p _c), s	0.0	0.4	0.5	8.0	0.0	0.1	0.1	0.0				
Intersection Summary												
HCM 6th Ctrl Delay				48.5								
HCM 6th LOS				D								

Timings
2: Tibet Rd & 48th Ave

Long Term Total PM Peak Hour

04/05/2021

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑		↑	↑↑↑		↑	↑		↑	↑	
Traffic Volume (vph)	255	1330	190	255	1840	365	160	270	90	215	195	330
Future Volume (vph)	255	1330	190	255	1840	365	160	270	90	215	195	330
Turn Type	pm+pt	NA	Perm									
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	12.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0
Total Split (s)	23.0	48.0	48.0	27.0	52.0	52.0	14.0	28.0	28.0	17.0	31.0	31.0
Total Split (%)	19.2%	40.0%	40.0%	22.5%	43.3%	43.3%	11.7%	23.3%	23.3%	14.2%	25.8%	25.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
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	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag									
Lead-Lag Optimize?	Yes											
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max						
Act Effect Green (s)	61.4	44.8	44.8	64.6	46.4	46.4	30.0	22.0	22.0	36.0	25.0	25.0
Actuated g/C Ratio	0.51	0.37	0.37	0.54	0.39	0.39	0.25	0.18	0.18	0.30	0.21	0.21
v/c Ratio	0.91	0.76	0.29	0.84	1.02	0.50	0.59	0.86	0.24	0.97	0.55	0.62
Control Delay	65.5	36.7	5.4	52.8	61.2	9.9	41.8	71.6	4.1	85.4	48.5	12.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	65.5	36.7	5.4	52.8	61.2	9.9	41.8	71.6	4.1	85.4	48.5	12.8
LOS	E	D	A	D	E	A	D	E	A	F	D	B
Approach Delay		37.5			52.7			50.7			43.3	
Approach LOS		D			D			D			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 115

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 46.3

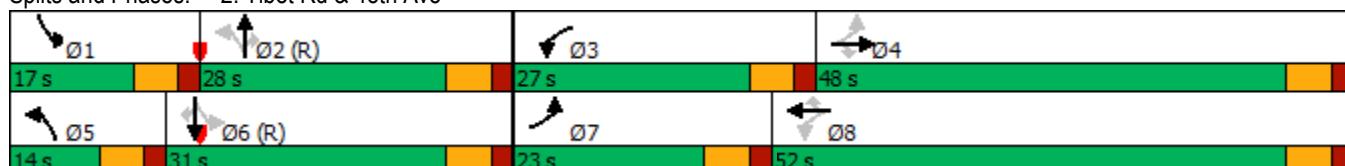
Intersection LOS: D

Intersection Capacity Utilization 95.8%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 2: Tibet Rd & 48th Ave



Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		T	↑	R	
Traffic Vol, veh/h	5	10	10	510	620	20
Future Vol, veh/h	5	10	10	510	620	20
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	-	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	11	11	554	674	22
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1261	685	696	0	-	0
Stage 1	685	-	-	-	-	-
Stage 2	576	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	188	448	900	-	-	-
Stage 1	500	-	-	-	-	-
Stage 2	562	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	186	448	900	-	-	-
Mov Cap-2 Maneuver	186	-	-	-	-	-
Stage 1	494	-	-	-	-	-
Stage 2	562	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	17.5	0.2		0		
HCM LOS	C					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	900	-	305	-	-	
HCM Lane V/C Ratio	0.012	-	0.053	-	-	
HCM Control Delay (s)	9	-	17.5	-	-	
HCM Lane LOS	A	-	C	-	-	
HCM 95th %tile Q(veh)	0	-	0.2	-	-	

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		T	↑	↑	
Traffic Vol, veh/h	10	15	30	510	620	10
Future Vol, veh/h	10	15	30	510	620	10
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	-	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	16	33	554	674	11
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1300	680	685	0	-	0
Stage 1	680	-	-	-	-	-
Stage 2	620	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	178	451	908	-	-	-
Stage 1	503	-	-	-	-	-
Stage 2	536	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	172	451	908	-	-	-
Mov Cap-2 Maneuver	172	-	-	-	-	-
Stage 1	485	-	-	-	-	-
Stage 2	536	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	19.6	0.5		0		
HCM LOS	C					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	908	-	274	-	-	
HCM Lane V/C Ratio	0.036	-	0.099	-	-	
HCM Control Delay (s)	9.1	-	19.6	-	-	
HCM Lane LOS	A	-	C	-	-	
HCM 95th %tile Q(veh)	0.1	-	0.3	-	-	