

To: Josh Shippy, Seattle Department of Transportation (SDOT)

From: Thaddeus Wozniak

Date: October 1, 2018

Subject: Updated Madison Street Corridor Bus Rapid Transit Project Vissim and Synchro results (based on the Project Development design as of March 20, 2018)

This technical memorandum details the updated and new results of the traffic operations analysis for the Madison Street Corridor Bus Rapid Transit (BRT) Project. The design analyzed in this memo is based on the Project Development design as of March 20, 2018 (hereafter referred to as the 2018 PD design). The revised results from the Synchro intersection operation and Vissim microsimulation analyses are based on changes made to the project design and traffic signal adjustments since previous analyses were conducted in March 2017 reflecting the Project Development design as of January 27, 2017 (hereafter referred to as the 2017 PD design).

The purpose of this analysis is to establish an understanding of anticipated changes in the levels of service for intersection operations and of expected travel times and speeds for general traffic as well as for the BRT service upon implementation of the project. As part of the updates, a revised build conditions analysis was conducted for the AM and PM peak hours and compared to the existing, no-build, and the 2017 PD Design¹.

The revised AM and PM peak hour analysis is based on the Synchro and Vissim models that were developed as part of prior analysis conducted in March 2017. The following updates were included to the design plans in the revised analysis.

- Intersection design modifications at 10th Avenue/Madison Street, 11th Avenue/Madison Street, and 14th Avenue/Madison Street intersections,
- Signal phasing changes at 9th Avenue/Spring Street, 12th Avenue/Madison Street, and 13th Avenue/Madison Street intersections,
- Green time adjustments at signalized intersections along Madison and Spring Streets to reduce BRT delays, and

¹ As a note, in order to simplify the various alternative names that have been used during the project analysis, for the purposes of this memo, existing conditions was used to represent 2016 conditions, including the traffic volumes and signal timings that were observed in the field. No-build conditions refer to year 2019 conditions where the project is not implemented, where build conditions would be when the project was implemented and also refer to 2019 conditions.

- Re-optimization of traffic signal offsets at all signalized intersections outside of downtown Seattle.

Traffic Operations Updates (Synchro)

Level of service (LOS) and delay results obtained from Synchro were updated for the AM and PM peak hour analysis under build conditions following inclusion of the Project Development design elements listed above.

As with the previously published Transportation Discipline Report, the intersection operations evaluated in Synchro used the 2010 Highway Capacity Manual (HCM) methodology, but used the 2000 HCM methodology when atypical geometric or signal design elements were included in the design. As with the previous traffic operations analysis done for the project, SDOT-established LOS standards within the City of Seattle were used for this analysis. LOS A, B, C, or D is considered acceptable, while heavily used or physically constrained intersections operating at LOS E or F may also be considered acceptable, as identified by SDOT on a case-by-case basis.

Travel Time Updates (Vissim)

Elements of the project design, such as changes to intersection geometry, signal phasing, and splits would impact the localized intersection queuing and the overall travel times along the project corridor. The Vissim software package was used to capture detailed operational analysis along the corridor and to accurately model traffic operations resulting from transit lanes, turning vehicle interaction, pedestrian crossing, transit signal priority, and queue jumps.

Estimates of vehicular and transit travel times, as well as transit travel time reliability, were also updated as part of the Project Development design updates listed above. Transit travel time comparisons were made for the entire corridor in the westbound direction and for portions of the corridor in the eastbound direction, since existing buses do not operate along the entire corridor - they operate between 3rd and 7th Avenues along Spring Street and between 9th Avenue and Martin Luther King Jr. Way along Madison Street.

AM Peak Hour Updates

Project Development design elements were applied to the Synchro and Vissim models that were created for the previous AM peak hour build analysis conducted in March 2017, which was based on the 2017 PD design. Following inclusion of the Project Development design elements as described and analyzed above, weekday AM peak hour analysis was conducted using the Synchro and Vissim software packages to understand the operations of the project during typical morning rush hour conditions.

Traffic Operations Analysis (Synchro)

Intersection LOS and delay estimates were obtained from the Synchro models for the AM peak hour under existing, no-build, and build conditions (for both 2017 and 2018 PD designs). **Table 1** below shows the results for the intersection operations during the weekday AM peak hour under existing, no-build, and build conditions. The delay values shown below are for signalized intersections along the corridor, with average vehicle delay value shown at each intersection during the AM peak hour.

A review shows that all signalized intersections operate at LOS D or better except for the intersection of Boren Avenue and Madison Street, which operates at LOS E under existing conditions and would operate at LOS E and F under no-build and build conditions, respectively. As noted previously, LOS E or F may be considered acceptable by SDOT on a case-by-case basis.

Compared to the 2017 PD design, the 2018 PD design results in considerable changes to the intersection LOS and delay values at the following intersections:

- **13th Avenue/Madison Street:** The LOS at this intersection worsened from LOS B to LOS C with the 2018 PD design. Primary contributing factors include the elimination of a dedicated pedestrian phase, the separation of northbound and southbound movements into distinct phases, and the increase in green times for the BRT approach.
- **14th Avenue/Madison Street:** The LOS at this intersection worsened from LOS B to LOS C with the 2018 PD design. Primary contributing factors include the addition of a permissive northbound left-turning movement at 14th Avenue and the increase in green times for the BRT approach.

Despite these changes, the above two intersections are expected to continue to operate at an acceptable LOS value.

Table 1 Summary of AM Peak Hour Conditions Delay and Level of Service

Intersection	Existing Conditions		2019 No-Build Conditions		2019 Build Conditions (2017 PD Design)		2019 Build Conditions (2018 PD Design)	
	Average Veh Delay (sec)	LOS	Average Veh Delay (sec)	LOS	Average Veh Delay (sec)	LOS	Average Veh Delay (sec)	LOS
1 st /Madison	7.9	A	23.1	C	29.5	C	29.5	C
2 nd /Madison	32.6	C	28.6	C	28.9	C	28.9	C
3 rd /Madison	14.6	B	14.6	B	17.6	B	17.9	B
4 th /Madison	38.3	D	38.4	D	20.7	C	22.9	C
5 th /Madison	10	B	11.1	B	31.4	C	31.4	B
6 th /Madison	19.3	B	13.3	B	35.4	D	35.1	D
7 th /Madison	22.9	C	16.9	B	15.8	B	17.5	B
8 th /Madison	12.6	B	13.7	B	15.1	B	13.9	B
9 th /Madison	13	B	9	A	27.1	C	27.2	C
Terry/Madison	6.6	A	5.8	A	7.5	A	7.2	A
Boren/Madison	69.7	E	72.5	E	92.6	F	93.4	F
Minor/Madison	11.1	B	8	A	11.1	B	10.2	B
Summit/Madison	8.8	A	5.3	A	12.1	B	12.1	B
Boylston/Madison	6.6	A	3.9	A	5.4	A	5.2	A
Broadway/Madison	31.2	C	27.2	C	33.5	C	33.8	C
10th/Madison*	-	-	-	-	-	-	0.6	A
11 th /Madison	3.3	A	3.2	A	5.4	A	6.1	A
12 th /Union/Madison	21.7	C	18.6	B	21.6	C	22.5	C

Intersection	Existing Conditions		2019 No-Build Conditions		2019 Build Conditions (2017 PD Design)		2019 Build Conditions (2018 PD Design)	
	Average Veh Delay (sec)	LOS	Average Veh Delay (sec)	LOS	Average Veh Delay (sec)	LOS	Average Veh Delay (sec)	LOS
13 th /Madison	17	B	15.6	B	18.7	B	26.9	C
14 th /Madison	17.4	B	17.4	B	19.4	B	26.9	C
14 th /Pike	27.4	C	20.1	C	11.6	B	12.6	B
15 th /Madison	1.8	A	1	A	7.1	A	7.1	A
Pine/Madison	4.8	A	4.2	A	11.0	B	12	B
17 th /Madison	6	A	5.8	A	10.6	B	11.1	B
18th/Madison*	-	-	-	-	-	-	0.3	A
19 th /Madison	14.2	B	14.5	B	20.5	C	24	C
20 th /Madison	3.3	A	3.6	A	6.1	A	4.7	A
Denny/22 nd /Madison	8.3	A	5.8	A	13.7	B	12.8	B
23 rd /Madison	30.3	C	26.3	C	27.6	C	33.4	C
John/Madison	27	C	20.6	C	27.4	C	22.6	C
28 th /Martin Luther King Jr/Madison	32.4	C	33.1	C	38.9	D	40.2	D
1 st /Spring	10.7	B	33.6	C	51.4	D	51.2	D
2 nd /Spring	22.9	C	25	C	22.1	C	25.9	C
3 rd /Spring	12.5	B	17.2	B	14.1	B	11.3	B
4 th /Spring	16.7	B	16.8	B	30.3	C	30.3	B
5 th /Spring	17.7	B	17.7	B	18.0	B	18.1	B
6 th /Spring	41.3	D	39.9	D	27.4	C	27.4	C
7 th /Spring	11.4	B	11.4	B	5.3	A	7.2	A
8 th /Spring*	11.6	B	13.5	B	6.9	A	7.6	A
9 th /Spring*	14.7	B	14.7	B	9.6	A	12.8	B

Notes:

* Intersections will be signalized in build conditions and are not currently signalized.

Intersections highlighted in bold operate at LOS E or F. LOS E or F may be considered acceptable as identified by SDOT on a case-by-case basis.

Travel Time Updates (Vissim)

The Vissim software package was used to conduct a detailed operational analysis along the corridor under existing and no-build conditions during the AM peak hour, and to understand the operational changes to the corridor should the project be implemented, particularly since the design would introduce many new transportation elements such as transit lanes, transit signal priority, and queue jumps that would substantially alter the way the corridor functions and performs.

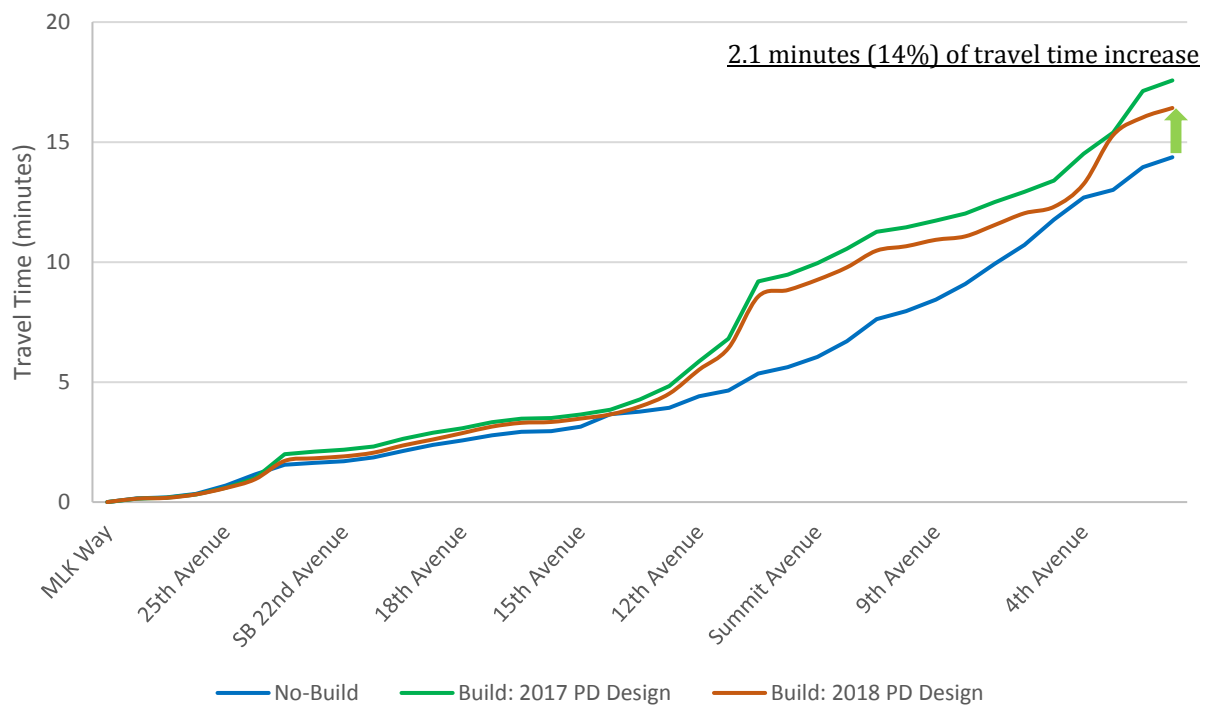
Estimates of vehicular and transit travel times, as well as transit travel time reliability, were calculated as part of this analysis. The graphs below show differences in travel times in each direction should the project be implemented.

Westbound Motor Vehicle Travel Time

Figure 1 shows the travel times for westbound motor vehicles under no-build and build conditions (for both 2017 and 2018 PD designs). The 2018 PD design would result in an increase in travel time of about 2.1 minutes relative to the no-build conditions, or a 14 percent increase, from approximately 14.4 to 16.5 minutes. This is the peak travel direction along Madison Street during the AM peak hour; with changes under build conditions like the travel lane reduction from two to one lane, it is expected to see vehicle travel times increase.

Compared to the 2017 PD design, the 2018 PD design would result in a decrease in travel time of about 1.1 minutes, or a 6.5 percent decrease, from 17.6 to 16.5 minutes. As shown in **Figure 1**, the cumulative travel time curves for the two build scenarios representing the 2017 and 2018 PD designs diverge somewhere between 12th Avenue/Madison Street and 9th Avenue/Madison Street intersections, indicating that the travel time improvement under the 2018 PD design is largely due to the operational changes implemented at the intersections located within that section.

Figure 1: Westbound Motor Vehicle Travel Times (AM Peak Hour)

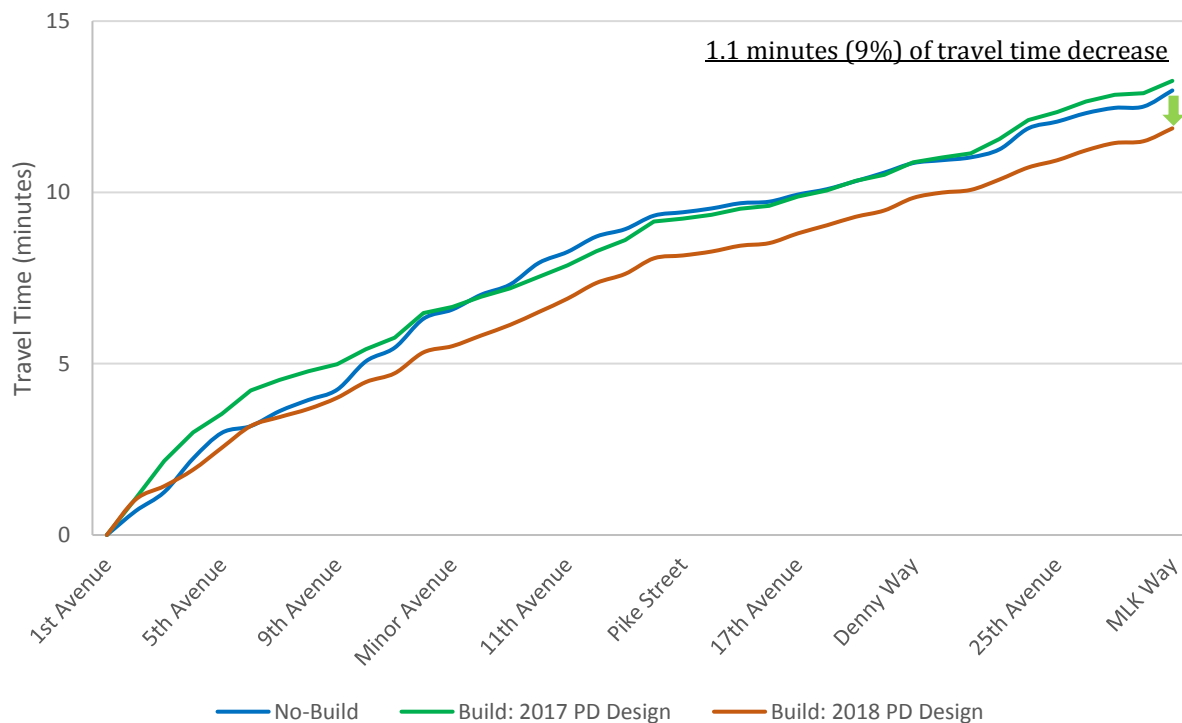


Eastbound Motor Vehicle Travel Time

Figure 2 shows the travel times for eastbound motor vehicles under no-build and build conditions (for both 2017 and 2018 PD designs). The 2018 PD design would result in a travel time decrease of about 1.1 minutes relative to no-build conditions, or a 9 percent decrease, from approximately 13.0 to 11.9 minutes. The through capacity would generally remain the same under build and existing conditions, as eastbound AM travel is currently served by one through lane on Madison Street and will continue to be served by one through lane under build conditions. As such, little to no change in vehicle travel times is expected. However, due to green time adjustments provided at multiple signalized intersections to reduce BRT delays, travel times for eastbound motor vehicles would also improve as illustrated by **Figure 2**.

Compared to the 2017 PD design, the 2018 PD design would result in a decrease in motor vehicle travel time of about 1.4 minutes, or a 10.5 percent decrease, from 13.3 to 11.9 minutes. This is largely due to the green time adjustments provided at 7th Avenue/Spring Street, 8th Avenue/Spring Street, and 9th Avenue/Spring Street intersections to improve the BRT performance.

Figure 2: Eastbound Motor Vehicle Travel Time (AM Peak Hour)

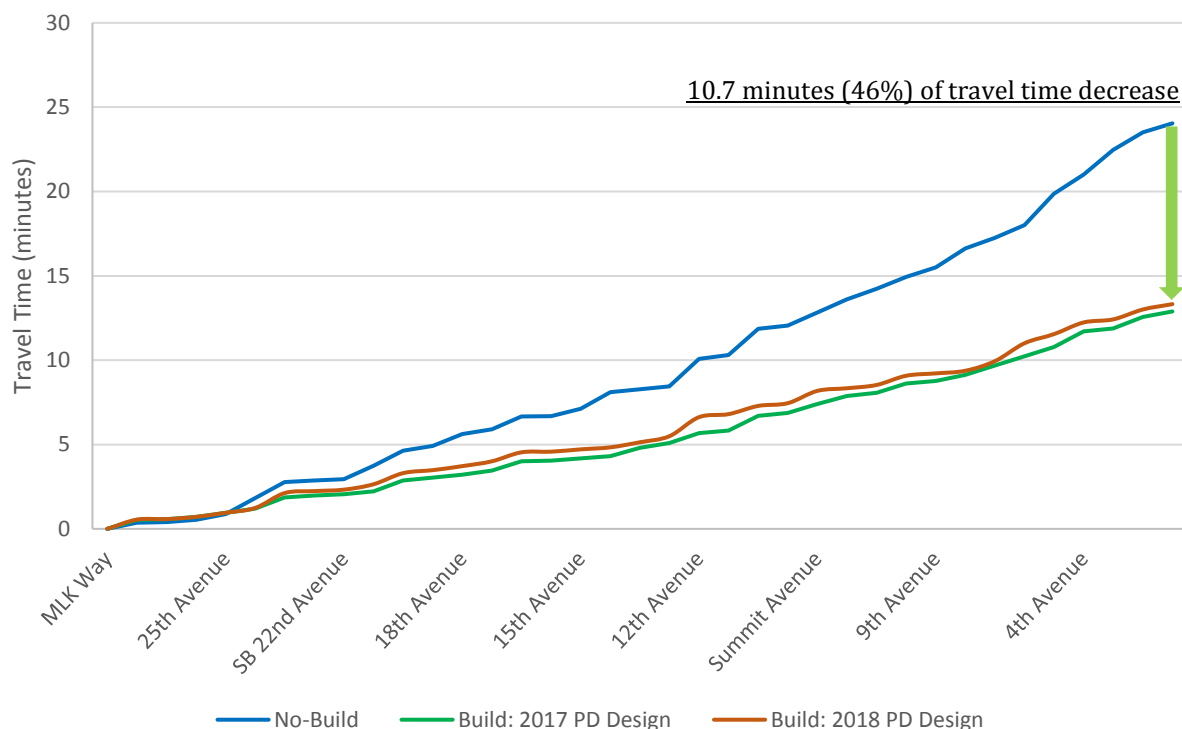


Westbound Transit Travel Time

Figure 3 shows the travel times for westbound transit under no-build and build conditions (for both 2017 and 2018 PD designs). Westbound buses travel along Madison Street for the entirety of the Vissim study area. The 2018 PD design would result in a decrease in travel time of about 10.7 minutes relative to the no-build conditions, or a 46 percent reduction, from approximately 24.0 to 13.3 minutes. Along with the provision of transit signal priority, the provision of the BRT-exclusive lane for most of the project corridor would allow transit to bypass major congestion points, resulting in a significant travel time reduction.

Compared to the 2017 PD design, the 2018 PD design would result in little to no changes in travel time for westbound transit although green times have been adjusted at multiple intersections along the BRT travel direction.

Figure 3: Westbound Transit Travel Time (AM Peak Hour)



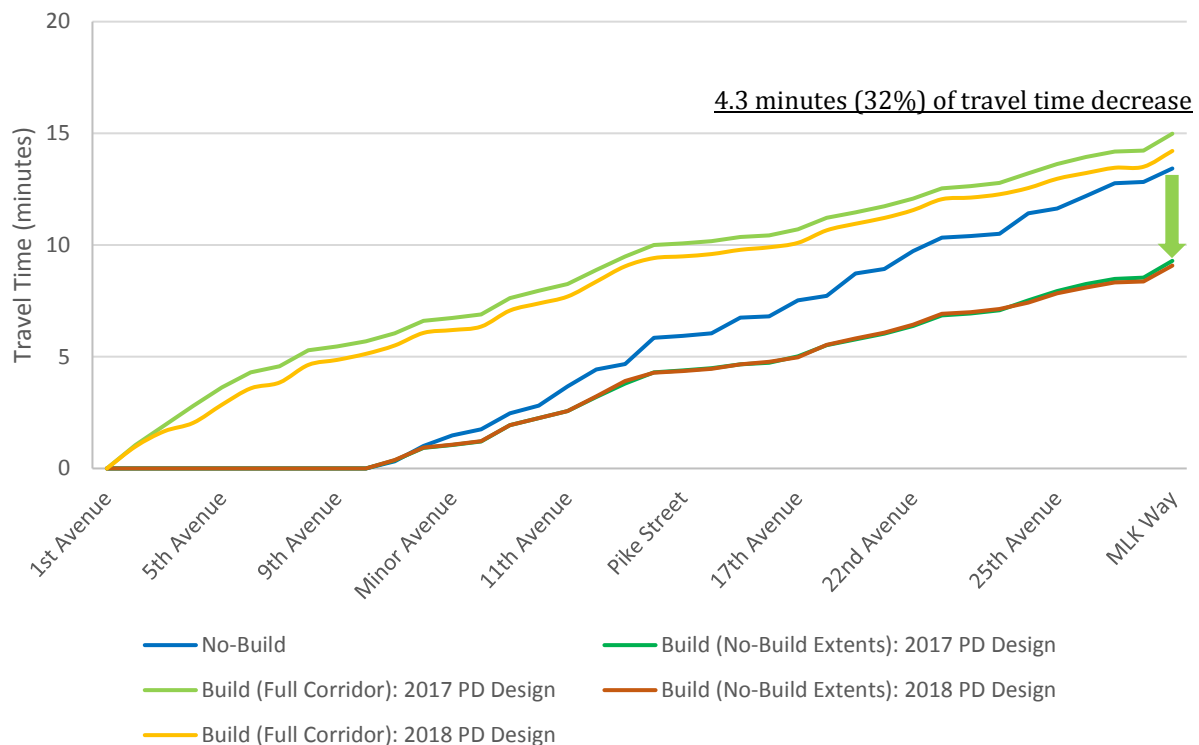
Eastbound Transit Travel Time

Figure 4 shows the travel times for eastbound transit under no-build and build conditions (for both 2017 and 2018 PD designs). Eastbound buses travel along Spring Street, turn southward onto 9th Avenue, turn onto Madison Street, and continue east. As previously noted, continuous eastbound no-build transit service is provided only for a portion of the Madison Street corridor, between 9th Avenue and Martin Luther King Jr. Way. As such, results for eastbound travel under build conditions were calculated for the entire corridor as well as for the no-build extents (from 9th Avenue to Martin Luther King Jr. Way). Within the no-build project extents, the 2018 PD design would result in a decrease in

travel time of about 4.3 minutes relative to the no-build conditions. This would constitute a 32 percent reduction, from approximately 13.4 minutes to 9.1 minutes.

Compared to the 2017 PD design, the 2018 PD design would result in little to no changes in transit travel time along the no-build project extents. However, the overall eastbound transit travel time from 1st Avenue/Spring Street intersection to the east terminus point would decrease by about 0.8 minutes, from 15.0 minutes with the 2017 PD design to 14.2 minutes with the 2018 PD design. These observations indicate that the operational improvements implemented within the downtown area, particularly from 6th to 9th Avenues, would result in more efficient eastbound transit operations.

Figure 4: Eastbound Transit Travel Time (AM Peak Hour)



Transit Travel Time Reliability

Table 2 shows the transit service reliability during the AM peak hour over the Vissim study area under no-build and build conditions. With the 2018 PD design, transit reliability is expected to have a standard deviation of less than 1.0; 0.3 in the eastbound direction from 9th Street to Martin Luther King Jr. Way, 0.4 in the eastbound direction along the entire corridor from 1st Street to Martin Luther King Jr. Way, and 0.2 in the westbound direction.

Transit reliability under build conditions with the 2018 PD design would improve compared to no-build conditions in both directions of travel, as shown by the decrease in standard deviation from 1.2 under no-build conditions to 0.2 under build conditions in the westbound direction, and from 0.8 to 0.3 in the eastbound direction, respectively.

Compared to the 2017 PD design, the 2018 PD design would result in little to no change in transit reliability in both directions of travel.

Table 2 Transit Travel Time Reliability (AM Peak Hour)

Scenario	Direction	Transit Travel Time (minutes)				
		Segment	Min.	Max.	Avg.	Std. Dev.
No-Build	Eastbound	9 th Avenue to Martin Luther King Jr. Way	14.1	16.1	15.1	0.8
	Westbound	Martin Luther King Jr, Way to 1 st Avenue	20.8	24.2	22.5	1.2
Build (2017 PD Design)	Eastbound	9 th Avenue to Martin Luther King Jr. Way	9.6	10.3	9.9	0.3
	Eastbound	1 st Avenue to Martin Luther King Jr. Way	15.2	16.0	15.6	0.3
	Westbound	Martin Luther King Jr, Way to 1 st Avenue	12.3	13.2	12.8	0.4
Build (2018 PD Design)	Eastbound	9 th Avenue to Martin Luther King Jr. Way	9.6	10.3	10.0	0.3
	Eastbound	1 st Avenue to Martin Luther King Jr. Way	14.6	15.5	15.1	0.4
	Westbound	Martin Luther King Jr, Way to 1 st Avenue	12.8	13.2	13.0	0.2

PM Peak Hour Updates

Project Development design elements were applied to the Synchro and Vissim models that were created for the previous PM peak hour build analysis conducted in March 2017, which was based on the 2017 PD design. Following inclusion of the 2018 PD design elements as described and analyzed earlier, weekday PM peak hour analysis was conducted using the Synchro and Vissim software packages to understand the study corridor operations during typical evening rush hour conditions.

Traffic Operations Analysis (Synchro)

Intersection LOS and delay estimates were obtained from the Synchro models for the PM peak hour under existing, no-build, and build conditions (for both 2017 and 2018 PD designs). **Table 3** below shows the results for the intersection operations during the PM peak hour under existing, no-build, and build conditions. The delays shown below are the conditions at signalized intersections along the corridor, with average vehicle delay shown at each intersection during the PM peak hour. A review shows that all signalized intersections operate at LOS D or better except for the intersections of 2nd Avenue/Spring Street and 6th Avenue/Spring Street which operate at LOS E or F. As noted previously, LOS E or F may be considered acceptable by SDOT on a case-by-case basis.

Compared to the 2017 PD design, the 2018 PD design results in considerable changes to the intersection LOS and delay values at the following intersections:

- **13th Avenue/Madison Street:** The LOS at this intersection worsened from LOS B to LOS C with the 2018 PD design. Primary contributing factors include the elimination of a dedicated pedestrian phase, the separation of northbound and southbound movements into distinct phases, and the increase in green times for the BRT approach.

- **28th Avenue/Martin Luther King Jr. Way/E Madison Street:** The LOS at this intersection improved from LOS C to LOS B with the 2018 PD design. Primary contributing factors include the conversion of the eastbound lanes from eastbound-left and eastbound through/right to eastbound through and eastbound right and the increase in the green times for the BRT approach.
- **9th Avenue/Spring Street:** The LOS at this intersection worsened from LOS B to LOS C with the 2018 PD design. Primary contributing factors include the addition of a dedicated bicycle phase to the signal cycle and the increase in green times for the BRT approach.

Despite these changes, the above three intersections are expected to continue to operate at an acceptable LOS.

Table 3 Summary of PM Peak Hour Build Conditions Delay and Level of Service

Intersection	Existing Conditions		2019 No-Build Conditions		2019 Build Conditions (2017 PD Design)		2019 Build Conditions (2018 PD Design)	
	Average Veh Delay (sec)	LOS	Average Veh Delay (sec)	LOS	Average Veh Delay (sec)	LOS	Average Veh Delay (sec)	LOS
1 st /Madison	8.6	A	28.8	C	25.5	C	25.6	C
2 nd /Madison	29.8	C	29.8	C	34.7	C	34.7	B
3 rd /Madison	14.2	B	14.2	B	14.0	B	14.4	B
4 th /Madison	23.3	C	23.3	C	25.5	C	26.0	C
5 th /Madison	11.4	B	11.4	B	30.6	C	30.6	A
6 th /Madison	15.8	B	15.8	B	19.6	B	22.3	C
7 th /Madison	17.1	B	17.1	B	13.7	B	14.9	B
8 th /Madison	9	A	9	A	16.8	B	16	B
9 th /Madison	9.2	A	9.2	A	20.6	C	19.8	B
Terry/Madison	5.1	A	5.1	A	2.5	A	3.1	A
Boren/Madison	40.4	D	41.1	D	39.1	D	40.1	D
Minor/Madison	11.3	B	8.8	A	13.9	B	13	B
Summit/Madison	7.5	A	4.9	A	10.3	B	10.3	B
Boylston/Madison	5.9	A	6.2	A	25.5	C	26	C
Broadway/Madison	19.4	B	25.7	C	26.0	C	25	C
10th/Madison*	-	-	-	-	-	-	0.5	A
11 th /Madison	8.9	A	9	A	12.6	B	19	B
12 th /Union/Madison	35.6	D	21	C	25.7	C	25	C
13 th /Madison	8	A	5.5	A	14.8	B	29.8	C
14 th /Madison	13.2	B	8.1	A	27.4	C	22.8	C
14 th /Pike	9.2	A	9.5	A	18.7	B	19.4	B
15 th /Madison	1	A	0.9	A	6.4	A	7.6	A
Pine/Madison	10	A	10.8	B	16.5	B	19.2	B
17 th /Madison	11.9	B	10.5	B	14.1	B	14.9	B

Intersection	Existing Conditions		2019 No-Build Conditions		2019 Build Conditions (2017 PD Design)		2019 Build Conditions (2018 PD Design)	
	Average Veh Delay (sec)	LOS	Average Veh Delay (sec)	LOS	Average Veh Delay (sec)	LOS	Average Veh Delay (sec)	LOS
18th/Madison*	-	-	-	-	-	-	0.4	A
19 th /Madison	17.8	B	15.8	B	23.6	C	27.7	C
20 th /Madison	7.1	A	8.5	A	12.2	B	12.5	B
Denny/22 nd /Madison	5.2	A	6.4	A	20.5	C	21.1	C
23 rd /Madison	36.3	D	27.6	C	27.4	C	29.3	C
John/Madison	30.2	C	22.9	C	22.4	C	19.8	B
28 th /Martin Luther King Jr/Madison	17.4	B	27.2	C	22.7	C	16.8	B
1 st /Spring	12	B	24.4	C	23.1	C	23.1	C
2nd/Spring	23.5	C	24	C	60.8	E	61.3	E
3 rd /Spring	12.5	B	11.9	B	6.2	A	8.8	A
4 th /Spring	24.5	C	24.5	C	31.3	C	31.3	B
5 th /Spring	25.5	C	25.5	C	15.3	B	15.4	B
6th/Spring	94.7	F	94.7	F	162.0	F	163.8	F
7 th /Spring	11.3	B	11.3	B	6.4	A	7.5	A
8 th /Spring*	13.7	(EB)	C	13.7	10.1	B	11	B
9 th /Spring*	15.1	(EB)	C	15.1	14.9	B	23.4	C

Notes:

* Intersections will be signalized in build conditions and are not currently signalized.

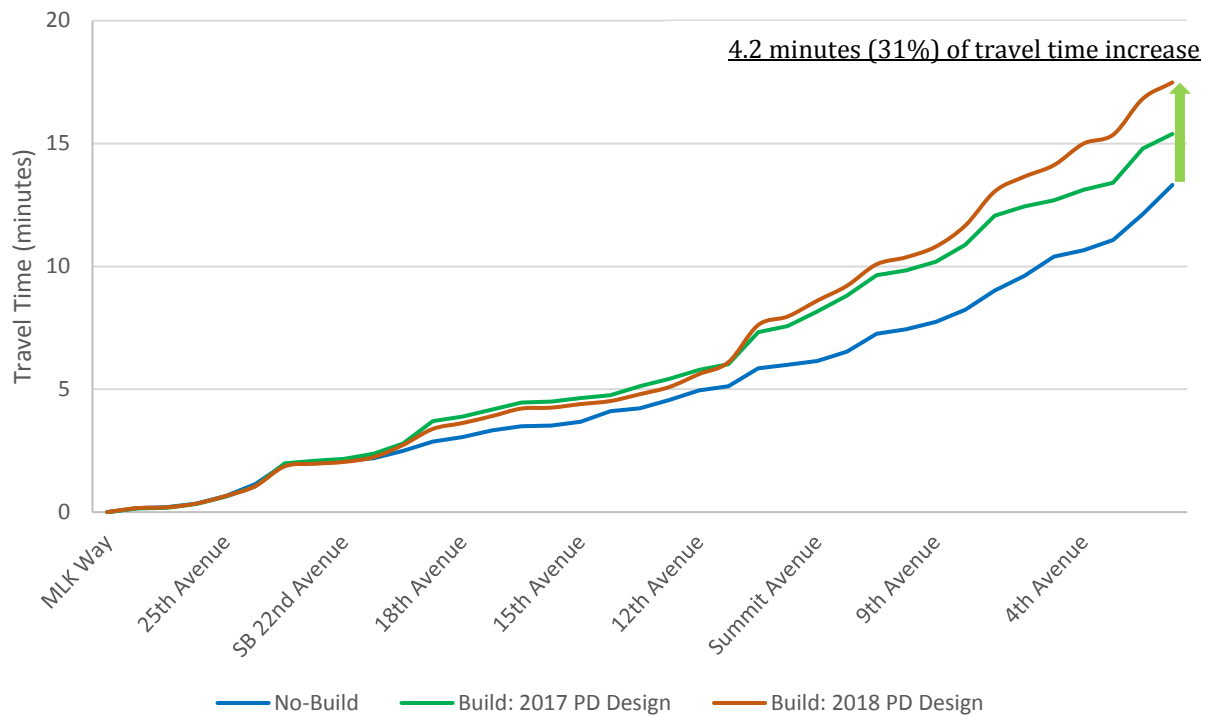
Intersections highlighted in bold operate at LOS E or F. LOS E or F may be considered acceptable as identified by SDOT on a case-by-case basis.

Westbound Motor Vehicle Travel Time

Figure 5 shows the travel times for westbound motor vehicles under the no-build and build conditions (for both 2017 and 2018 PD designs). The build conditions would result in a 4.2-minute travel time increase relative to the no-build conditions, or about a 31 percent increase, from approximately 13.3 minutes to 17.5 minutes. As mentioned earlier, with the westbound travel lane reduction from two to one lane under the build conditions, it is expected to see vehicle travel times increase.

Compared to the 2017 PD design, the 2018 PD design would result in an increase of about 2.1 minutes in travel time, or about a 13.7% increase, from about 15.4 to 17.5 minutes. **Figure 5** shows that the cumulative travel time curves for the two scenarios considered diverge somewhere within the downtown area. This can be explained by the fact that the green time extensions were only implemented at multiple intersections upstream of the downtown area, thereby increasing the flow to the downtown while keeping the signal capacity within the downtown area constant, which ultimately results in more congestion and longer travel times within that area under the 2018 PD design.

Figure 5: Westbound Motor Vehicle Travel Times (PM Peak Hour)

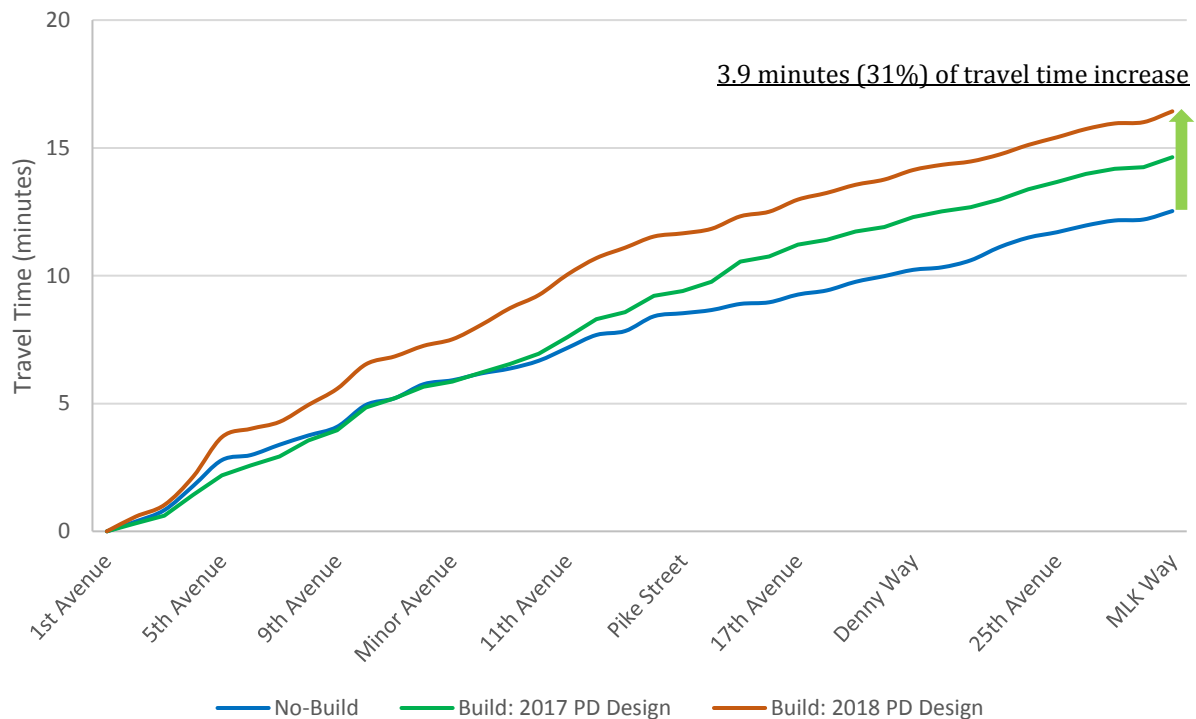


Eastbound Motor Vehicle Travel Time

Figure 6 shows the travel times for eastbound motor vehicles under the no-build and build conditions (for both 2017 and 2018 PD designs). The 2018 PD design would result in an increase in travel time of about 3.9 minutes relative to the no-build conditions, or a 31 percent increase, from approximately 12.5 to 16.4 minutes.

Compared to the 2017 PD design, the 2018 PD design would result in an increase of 1.8 minutes in travel time, or about a 12% increase, from approximately 14.6 minutes to 16.4 minutes.

Figure 6: Eastbound Motor Vehicle Travel Time (PM Peak Hour)

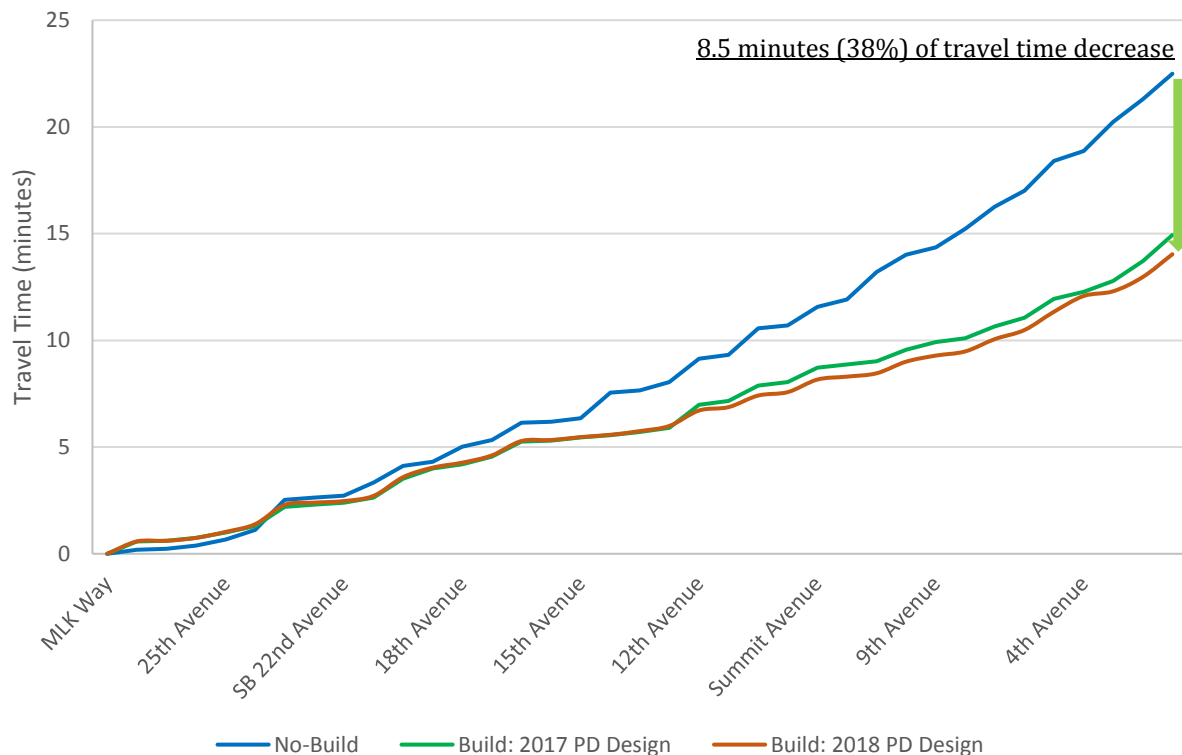


Westbound Transit Travel Time

Figure 7 shows the travel times for the westbound transit under the no-build and build conditions (for both 2017 and 2018 PD designs). Westbound buses travel along Madison Street for the entirety of the Vissim study area. The 2018 PD design would result in a decrease in travel time of about 8.5 minutes, or a 38 percent reduction, from approximately 22.5 minutes to 14.0 minutes.

Compared to the 2017 PD design, the 2018 PD design would result in a decrease of about 0.9 minutes in transit travel time, or about a 6% decrease, from approximately 14.9 to 14.0 minutes.

Figure 7: Westbound Transit Travel Time (PM Peak Hour)



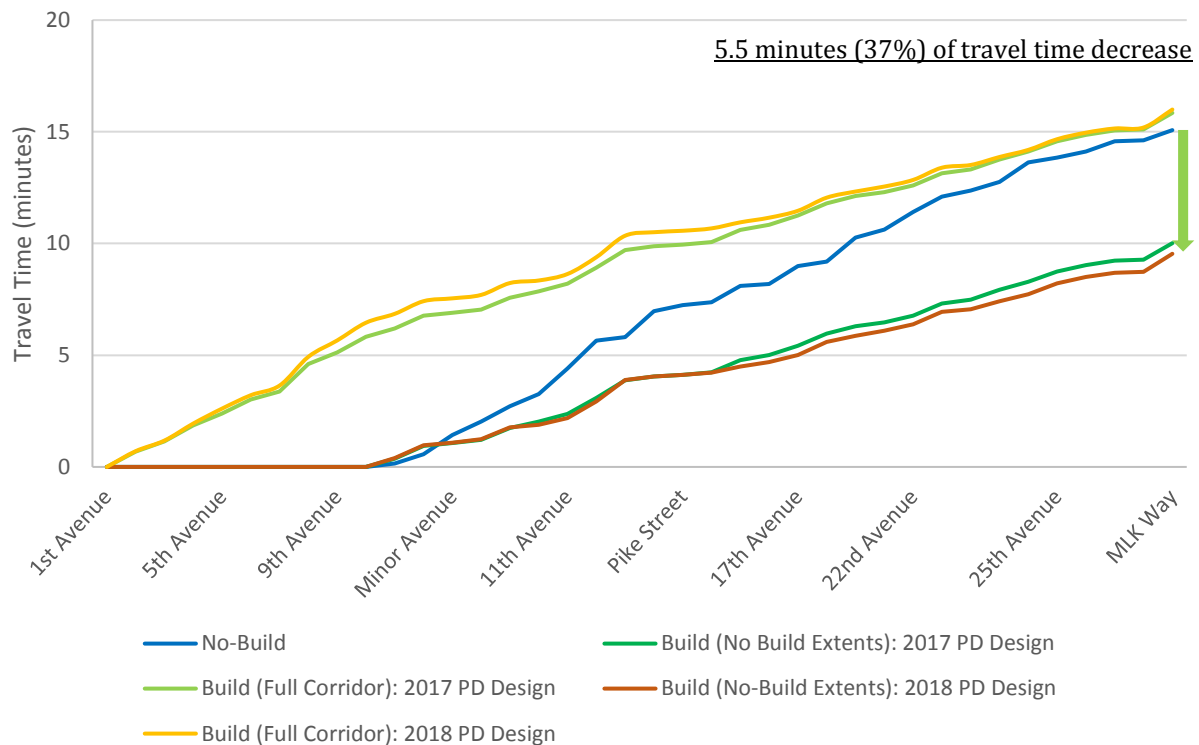
Eastbound Transit Travel Time

Figure 8 shows the travel times for the eastbound transit under the no-build and build conditions (for both 2017 and 2018 PD designs). Eastbound buses travel along Spring Street, turn southward onto 9th Avenue, then turn onto Madison Street and continue eastbound. As previously noted, continuous eastbound no-build transit service is only provided on a portion of the Madison corridor, between 9th Avenue and Martin Luther King Jr. Way. As such, eastbound build results were calculated for the entire corridor as well as for the no-build extents (from 9th Avenue to Martin Luther King Jr. Way).

Within the no-build extents, the 2018 PD design would result in a decrease of about 5.6 minutes in travel time relative to the no-build conditions, or a 37 percent reduction, from approximately 15.1 minutes to 9.5 minutes.

Compared to the 2017 PD design, the 2018 PD design would result in a decrease of about 0.5 minutes in transit travel time, or about a 5% decrease, from approximately 10.0 to 9.5 minutes along the no-build extents. There is little to no changes in travel time for eastbound transit when considering the entire corridor.

Figure 8: Eastbound Transit Travel Time (PM Peak Hour)



Transit Travel Time Reliability

Table 4 shows the transit service reliability over the entire Vissim study area for the no-build and build conditions (for both 2017 and 2018 PD designs). Reliability of transit service under the 2018 PD design is expected to have a standard deviation of less than 1.0; 0.6 in the eastbound direction from 9th Street to Martin Luther King Jr. Way, 0.7 in the eastbound direction along the entire corridor from 1st Street to Martin Luther King Jr. Way, and 0.8 in the westbound direction.

Transit reliability under build conditions with the 2018 PD design would improve compared to the no-build conditions in both directions of travel, as shown by the decrease in standard deviation from 1.2 under no-build conditions to 0.8 under build conditions in the westbound direction, and from 0.8 to 0.6 in the eastbound direction, respectively.

Compared to the 2017 PD design, the 2018 PD design would result in a less reliable service as shown by the increase in standard deviation from 0.7 to 0.8 in the westbound direction, 0.2 to 0.6 in the eastbound direction along the no-build extents, and 0.5 to 0.7 in the eastbound direction along the entire corridor.

Table 4 Transit Travel Time Reliability (PM Peak Hour)

Scenario	Direction	Transit Travel Time (minutes)				
		Segment	Min.	Max.	Avg.	Std. Dev.
No-Build	Eastbound	9th Avenue to Martin Luther King Jr. Way	14.1	16.1	15.1	0.8
	Westbound	Martin Luther King Jr, Way to 1st Avenue	20.8	24.2	22.5	1.2
Build (2017 PD Design)	Eastbound	9th Avenue to Martin Luther King Jr. Way	9.7	10.3	10.0	0.2
	Eastbound	1st Avenue to Martin Luther King Jr. Way	15.4	16.7	15.8	0.5
	Westbound	Martin Luther King Jr, Way to 1st Avenue	13.8	15.7	14.9	0.7
Build (2018 PD Design)	Eastbound	9th Avenue to Martin Luther King Jr. Way	9.7	11.2	10.1	0.6
	Eastbound	1st Avenue to Martin Luther King Jr. Way	15.6	17.2	16.2	0.7
	Westbound	Martin Luther King Jr, Way to 1st Avenue	12.5	14.4	13.3	0.8

AM Peak Hour Updates

Appendix A

Summary Tables (Synchro)

SDOT Madison Corridor BRT Study
Summary of Study Intersection Operations - AM Peak Hour Conditions

#	Study Intersection	Signalized	EXISTING (2015) CONDITIONS		2019 NO BUILD CONDITIONS		2019 BUILD CONDITIONS (January 2017 Design)		2019 BUILD CONDITIONS (March 2018 Design)	
			Weekday AM		Weekday AM		Weekday AM		Weekday AM	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	1st/Madison		7.9	A	23.1	C	29.5	C	29.5	C
2	2nd/Madison		32.6	C	28.6	C	28.9	C	28.9	C
3	3rd/Madison		14.6	B	14.6	B	17.6	B	17.9	B
4	4th/Madison		38.3	D	38.4	D	20.7	C	22.9	C
5	5th/Madison		10.0	B	11.1	B	31.4	C	31.4	B
6	6th/Madison		19.3	B	13.3	B	35.4	D	35.1	D
7	7th/Madison		22.9	C	16.9	B	15.8	B	17.5	B
8	8th/Madison		12.6	B	13.7	B	15.1	B	13.9	B
9	9th/Madison		13.0	B	9.0	A	27.1	C	27.2	C
10	Terry/Madison		6.6	A	5.8	A	7.5	A	7.2	A
11	Boren/Madison		69.7	E	72.5	E	92.6	F	93.4	F
12	Minor/Madison		11.1	B	8.0	A	11.1	B	10.2	B
13	Summit/Madison		8.8	A	5.3	A	12.1	B	12.1	B
14	Boylston/Madison		6.6	A	3.9	A	5.4	A	5.2	A
15	Broadway/Madison		31.2	C	27.2	C	33.5	C	33.8	C
16	Broadway Ct/Madison	U	14.1 (SB)	B	14.2 (SB)	B	12.4 (SB)	B	12.6 (SB)	B
17	10th/Madison (*signalized in build)	U	13.8 (SB)	B	14.0 (SB)	B	12.3 (SB)	B	0.6	A
19	11th/Madison		3.3	A	3.2	A	5.4	A	6.1	A
20	12th/Madison		21.7	C	18.6	B	21.6	C	22.5	C
22	13th/Madison		17.0	B	15.6	B	18.7	B	26.9	C
23	14th/Madison		17.4	B	17.4	B	19.4	B	26.9	C
24	Pike/Madison	U	11.3	B	13.2	B	9.6 (WB)	A	-	-
25	15th/Madison		1.8	A	1.0	A	7.1	A	7.1	A
26	16th/Madison	U	12.8 (NB)	B	12.9 (NB)	B	9.7 (NB)	A	9.6 (NB)	A
27	Pine/Madison		4.8	A	4.2	A	11.0	B	12.0	B
28	17th/Madison		6.0	A	5.8	A	10.6	B	11.1	B
29	18th/Madison (*signalized in build)	U	23.3 (SB)	C	24.0 (SB)	C	11.6 (SB)	B	0.3	A
30	19th/Madison		14.2	B	14.5	B	20.5	C	24.0	C
31	20th/Madison		3.3	A	3.6	A	6.1	A	4.7	A
32	Denny/22nd NB/Madison		8.3	A	5.8	A	13.7	B	12.8	B
33	22nd SB/Madison	U	12.9 (SB)	B	13.0 (SB)	B	11.5 (SB)	B	11.2 (SB)	B
34	23rd/Madison		30.3	C	26.3	C	27.6	C	33.4	C
35	John/Madison		27.0	C	20.6	C	27.4	C	22.6	C
36	25th/Madison	U	32.2 (NB)	D	33.7 (NB)	D	25.9 (NB)	D	23.4 (NB)	D
37	26th/Madison	U	13.8 (SB)	B	14.0 (SB)	B	12.6 (SB)	B	13.1 (SB)	B
38	27th NB/Madison	U	18.5 (NB)	C	19.0 (NB)	C	17.8 (NB)	C	12.9 (NB)	B
39	27th SB/Madison	U	12.8 (SB)	B	13.0 (SB)	B	11.3 (SB)	B	11.1 (SB)	B
40	28th/MLK/Madison		32.4	C	33.1	C	38.9	D	40.2	D
41	1st/Spring		10.7	B	33.6	C	51.4	D	51.2	D
42	2nd/Spring		22.9	C	25.0	C	22.1	C	25.9	C
43	3rd/Spring		12.5	B	17.2	B	14.1	B	11.3	B
44	4th/Spring		16.7	B	16.8	B	30.3	C	30.3	B
45	5th/Spring		17.7	B	17.7	B	18.0	B	18.1	B
46	6th/Spring		41.3	D	39.9	D	27.4	C	27.4	C
47	7th/Spring		11.4	B	11.4	B	5.3	A	7.2	A
48	8th/Spring (*signalized in build)	U	11.6 (EB)	B	13.5 (EB)	B	6.9	A	7.6	A
49	9th/Spring (*signalized in build)	U	14.7 (WB)	B	14.7 (WB)	B	9.6	A	12.8	B
50	14th/Pike		27.4	C	20.1	C	11.6	B	12.6	B

NOTES:

Bold pink represents intersection operating at LOS E or F.

Italicized red represents build condition intersection operating worse than the defined LOS impact threshold.

Appendix B

Summary Tables (Vissim)

Madison BRT**Travel Time Summary - AM Peak Hour Conditions**

#	Segment	Direction	Distance (ft)	Existing (2015)				2019 No Build				2019 Build - January 2017 Design				2019 Build - March 2018 Design			
				Travel Time (min)		Travel Speed (mph)		Travel Time (min)		Travel Speed (mph)		Travel Time (min)		Travel Speed (mph)		Travel Time (min)		Travel Speed (mph)	
				Car	Bus	Car	Bus	Car	Bus	Car	Bus	Car	BRT	Car	BRT	Car	BRT	Car	BRT
1	Spring Street (from 1st Avenue to 9th Avenue)	Eastbound	2,531	3.8	-	7	-	4.2	-	7	-	5.0	6.1	6	5	4.0	4.9	7	6
2	9th Street (from Spring Street to Madison Street)	Southbound	295	0.9	-	4	-	0.8	-	4	-	0.4	0.2	8	14	0.5	0.3	7	12
3	Madison Street (from 9th Avenue to 13th Avenue)	Eastbound	3,084	3.4	4.0	10	9	3.9	4.7	9	7	3.2	3.8	11	9	3.2	3.9	11	9
4	Madison Street (from 13th Avenue to 23rd Avenue)	Eastbound	3,839	2.7	5.8	16	7	2.3	5.8	19	7	3.0	3.3	15	13	2.8	3.2	16	14
5	Madison Street (from 23rd Avenue to MLK Way)	Eastbound	2,131	1.4	2.8	17	9	1.7	2.9	14	8	1.7	2.2	14	11	1.5	1.9	16	12
6	Study Corridor (from 1st Avenue to MLK Way)	Eastbound	11,880	12.1	-	11.1	-	13.0	-	10.4	-	13.2	15.7	10.2	8.6	11.9	14.2	11.3	9.5
7	Madison Street (from MLK Way to 23rd Avenue)	Westbound	2,152	1.6	3.1	15	8	1.5	2.8	16	9	2.0	1.9	12	13	1.7	2.1	14	12
8	Madison Street (from 23rd Avenue to 13th Avenue)	Westbound	3,849	2.7	5.4	17	8	2.4	5.7	18	8	2.8	3.2	15	14	2.8	3.4	16	13
9	Madison Street (from 13th Avenue to 6th Avenue)	Westbound	4,388	7.3	10.3	7	5	6.8	9.6	7	5	8.1	5.1	6	10	7.5	5.5	7	9
10	Madison Street (from 6th Avenue to 1st Avenue)	Westbound	1,569	3.5	5.5	5	3	3.7	6.0	5	3	4.6	2.6	4	7	4.4	2.3	4	8
11	Study Corridor (from MLK Way to 1st Avenue)	Westbound	11,958	15.0	24.2	9.0	5.6	14.4	24.0	9.5	5.7	17.6	12.8	7.7	10.6	16.4	13.3	8.3	10.2

Madison BRT**Transit Travel Time Reliability - AM Peak Hour Conditions****Existing Conditions**

Direction	Segment	Total					Bus Travel Time (minutes)			
		Run 1	Run 2	Run 3	Run 4	Run 5	Minimum	Maximum	Average	Standard Deviation
Eastbound	9th Avenue - MLK Way	900.72	914.12	963.55	928.78	875.86	14.6	16.1	15.3	0.5
Westbound	MLK Way - 1st Avenue	1235.00	1302.30	1289.86	1280.61	1231.44	20.5	21.7	21.1	0.5

2019 No Build Conditions

Direction	Segment	Total					Bus Travel Time (minutes)			
		Run 1	Run 2	Run 3	Run 4	Run 5	Minimum	Maximum	Average	Standard Deviation
Eastbound	9th Avenue - MLK Way	884.01	888.34	938.31	967.79	843.96	14.1	16.1	15.1	0.8
Westbound	MLK Way - 1st Avenue	1348.19	1358.30	1449.57	1343.38	1247.90	20.8	24.2	22.5	1.2

2019 Build Conditions - January 2017 Design

Direction	Segment	Total					BRT Travel Time (minutes)			
		Run 1	Run 2	Run 3	Run 4	Run 5	Minimum	Maximum	Average	Standard Deviation
Eastbound	9th Avenue - MLK Way	601.48	575.40	592.43	618.36	594.57	9.6	10.3	9.9	0.3
Eastbound	1st Ave - MLK Way	961.00	911.21	934.62	947.24	922.97	15.2	16.0	15.6	0.3
Westbound	MLK Way - 1st Avenue	793.79	738.47	776.73	744.53	776.93	12.3	13.2	12.8	0.4

2019 Build Conditions - March 2018 Design

Direction	Segment	Total					BRT Travel Time (minutes)			
		Run 1	Run 2	Run 3	Run 4	Run 5	Minimum	Maximum	Average	Standard Deviation
Eastbound	9th Avenue - MLK Way	609.52	576.78	593.41	617.80	610.68	9.6	10.3	10.0	0.3
Eastbound	1st Ave - MLK Way	903.57	873.70	907.95	922.61	930.05	14.6	15.5	15.1	0.4
Westbound	MLK Way - 1st Avenue	785.85	766.81	792.69	770.45	769.74	12.8	13.2	13.0	0.2

Appendix C

Synchro Outputs

HCM Signalized Intersection Capacity Analysis

1: 1st Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	67	139	106	41	645	0	0	306	93
Future Volume (vph)	0	0	0	67	139	106	41	645	0	0	306	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	10	10	10	10	10	10	10
Grade (%)		6%			-8%			0%			0%	
Total Lost time (s)				4.5	4.5			4.5			4.5	
Lane Util. Factor				1.00	0.95			0.91			0.95	
Frpb, ped/bikes				1.00	0.93			1.00			0.92	
Flpb, ped/bikes				0.80	1.00			0.99			1.00	
Frt				1.00	0.94			1.00			0.97	
Flt Protected				0.95	1.00			1.00			1.00	
Satd. Flow (prot)				1211	2635			4215			2547	
Flt Permitted				0.95	1.00			0.89			1.00	
Satd. Flow (perm)				1211	2635			3756			2547	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	73	151	115	45	701	0	0	333	101
RTOR Reduction (vph)	0	0	0	0	39	0	0	0	0	0	32	0
Lane Group Flow (vph)	0	0	0	73	227	0	0	746	0	0	402	0
Confl. Peds. (#/hr)	103		137	134		103	243		247	247		243
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	2%	2%	2%	6%	6%	6%
Turn Type				Perm	NA		Perm	NA			NA	
Protected Phases					2			1			1	
Permitted Phases				2			1					
Actuated Green, G (s)				31.5	31.5			49.5			49.5	
Effective Green, g (s)				31.5	31.5			49.5			49.5	
Actuated g/C Ratio				0.35	0.35			0.55			0.55	
Clearance Time (s)				4.5	4.5			4.5			4.5	
Lane Grp Cap (vph)				423	922			2065			1400	
v/s Ratio Prot					c0.09						0.16	
v/s Ratio Perm				0.06				c0.20				
v/c Ratio				0.17	0.25			0.36			0.29	
Uniform Delay, d1				20.2	20.8			11.4			10.8	
Progression Factor				0.41	0.25			1.00			0.17	
Incremental Delay, d2				0.6	0.5			0.5			0.5	
Delay (s)				8.9	5.7			11.9			2.3	
Level of Service				A	A			B			A	
Approach Delay (s)		0.0			6.4			11.9			2.3	
Approach LOS		A			A			B			A	
Intersection Summary												
HCM 2000 Control Delay			7.9									
HCM 2000 Volume to Capacity ratio			0.32									
Actuated Cycle Length (s)			90.0									
Intersection Capacity Utilization			55.6%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2010 Signalized Intersection Summary

2: 2nd Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					 						 	
Traffic Volume (veh/h)	0	0	0	300	293	0	0	0	0	0	950	93
Future Volume (veh/h)	0	0	0	300	293	0	0	0	0	0	950	93
Number				7	4	14				5	2	12
Initial Q (Qb), veh				0	0	0				0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00				1.00		0.90
Parking Bus, Adj				1.00	1.00	1.00				1.00	1.00	0.43
Adj Sat Flow, veh/h/ln				1778	1710	0				0	1555	1555
Adj Flow Rate, veh/h				345	337	0				0	979	96
Adj No. of Lanes				0	2	0				0	2	1
Peak Hour Factor				0.87	0.87	0.87				0.97	0.97	0.97
Percent Heavy Veh, %				4	4	0				0	10	10
Cap, veh/h				551	546	0				0	1674	279
Arrive On Green				0.12	0.12	0.00				0.00	0.19	0.18
Sat Flow, veh/h				1287	1568	0				0	3031	508
Grp Volume(v), veh/h				348	334	0				0	979	96
Grp Sat Flow(s),veh/h/ln				1299	1478	0				0	1477	508
Q Serve(g_s), s				23.3	19.3	0.0				0.0	27.2	14.9
Cycle Q Clear(g_c), s				23.3	19.3	0.0				0.0	27.2	14.9
Prop In Lane				0.99		0.00				0.00		1.00
Lane Grp Cap(c), veh/h				556	542	0				0	1674	279
V/C Ratio(X)				0.63	0.62	0.00				0.00	0.58	0.34
Avail Cap(c_a), veh/h				556	542	0				0	1674	279
HCM Platoon Ratio				0.33	0.33	1.00				1.00	0.33	0.33
Upstream Filter(I)				1.00	1.00	0.00				0.00	1.00	1.00
Uniform Delay (d), s/veh				35.3	33.5	0.0				0.0	26.9	22.7
Incr Delay (d2), s/veh				5.3	5.2	0.0				0.0	1.5	3.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				9.2	8.7	0.0				0.0	11.5	2.4
LnGrp Delay(d),s/veh				40.5	38.7	0.0				0.0	28.4	26.0
LnGrp LOS				D	D						C	C
Approach Vol, veh/h					682						1075	
Approach Delay, s/veh					39.6						28.2	
Approach LOS					D						C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		54.0		36.0								
Change Period (Y+Rc), s		4.5		4.5								
Max Green Setting (Gmax), s		49.5		31.5								
Max Q Clear Time (g_c+I1), s		0.0		0.0								
Green Ext Time (p_c), s		0.0		0.0								
Intersection Summary												
HCM 2010 Ctrl Delay			32.6									
HCM 2010 LOS			C									

HCM Signalized Intersection Capacity Analysis

3: 3rd Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	610	24	0	103	0	0	114	87
Future Volume (vph)	0	0	0	0	610	24	0	103	0	0	114	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	10	12	12	11	12
Grade (%)		10%			-15%			0%			-5%	
Total Lost time (s)					4.0			4.0			4.0	
Lane Util. Factor					0.95			0.95			0.95	
Frbp, ped/bikes					0.99			1.00			0.80	
Flpb, ped/bikes					1.00			1.00			1.00	
Frt					0.99			1.00			0.93	
Flt Protected					1.00			1.00			1.00	
Satd. Flow (prot)					2951			1535			1501	
Flt Permitted					1.00			1.00			1.00	
Satd. Flow (perm)					2951			1535			1501	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	663	26	0	112	0	0	120	92
RTOR Reduction (vph)	0	0	0	0	3	0	0	0	0	0	7	0
Lane Group Flow (vph)	0	0	0	0	686	0	0	112	0	0	205	0
Confl. Peds. (#/hr)	214		308	308		214	577		449	449		577
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	0%	73%	0%	0%	84%	10%
Bus Blockages (#/hr)	0	0	0	0	10	0	0	62	0	0	29	0
Parking (#/hr)					15							
Turn Type					NA			NA			NA	
Protected Phases					2			1			1	
Permitted Phases				2			1					
Actuated Green, G (s)					31.5			49.5			49.5	
Effective Green, g (s)					32.0			50.0			50.0	
Actuated g/C Ratio					0.36			0.56			0.56	
Clearance Time (s)					4.5			4.5			4.5	
Lane Grp Cap (vph)					1049			852			833	
v/s Ratio Prot					c0.23			0.07			c0.14	
v/s Ratio Perm												
v/c Ratio					0.65			0.13			0.25	
Uniform Delay, d1					24.3			9.6			10.3	
Progression Factor					0.57			1.00			1.48	
Incremental Delay, d2					1.0			0.3			0.7	
Delay (s)					15.0			9.9			15.9	
Level of Service					B			A			B	
Approach Delay (s)		0.0			15.0			9.9			15.9	
Approach LOS		A			B			A			B	
Intersection Summary												
HCM 2000 Control Delay			14.6		HCM 2000 Level of Service					B		
HCM 2000 Volume to Capacity ratio			0.40									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					8.0		
Intersection Capacity Utilization			39.1%		ICU Level of Service					A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: 4th Ave & Madison St



Movement	WBR	NBL	NBT	SWR	SWR2
Lane Configurations					
Traffic Volume (vph)	21	253	1252	500	318
Future Volume (vph)	21	253	1252	500	318
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Lane Width	12	12	10	13	12
Grade (%)			5%		
Total Lost time (s)	3.0		3.5	2.5	
Lane Util. Factor	1.00		0.91	0.88	
Frpb, ped/bikes	1.00		1.00	1.00	
Flpb, ped/bikes	1.00		0.94	1.00	
Frt	0.86		1.00	0.85	
Flt Protected	1.00		0.99	1.00	
Satd. Flow (prot)	1450		3361	2387	
Flt Permitted	1.00		0.99	1.00	
Satd. Flow (perm)	1450		3361	2387	
Peak-hour factor, PHF	0.92	0.98	0.98	0.92	0.92
Adj. Flow (vph)	23	258	1278	543	346
RTOR Reduction (vph)	0	0	31	85	0
Lane Group Flow (vph)	23	0	1505	804	0
Confl. Peds. (#/hr)		342			191
Heavy Vehicles (%)	2%	1%	13%	4%	4%
Bus Blockages (#/hr)	0	0	0	10	0
Parking (#/hr)			15	15	
Turn Type	custom	Perm	NA	Prot	
Protected Phases	1		2	4	
Permitted Phases	2	2			
Actuated Green, G (s)	50.5		48.5	27.5	
Effective Green, g (s)	50.5		49.5	29.5	
Actuated g/C Ratio	0.56		0.55	0.33	
Clearance Time (s)	3.0		4.5	4.5	
Vehicle Extension (s)	0.2		0.2	0.2	
Lane Grp Cap (vph)	861		1848	782	
v/s Ratio Prot	c0.00			c0.34	
v/s Ratio Perm	0.02		0.45		
v/c Ratio	0.03		0.81	1.03	
Uniform Delay, d1	8.8		16.5	30.2	
Progression Factor	1.00		0.92	1.19	
Incremental Delay, d2	0.0		4.1	36.2	
Delay (s)	8.8		19.2	72.1	
Level of Service	A		B	E	
Approach Delay (s)			19.2		
Approach LOS			B		
Intersection Summary					
HCM 2000 Control Delay			38.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.87		
Actuated Cycle Length (s)			90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization			78.5%	ICU Level of Service	D
Analysis Period (min)			15		

HCM Signalized Intersection Capacity Analysis

5: 5th Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	225	650	0	0	0	0	0	413	237
Future Volume (vph)	0	0	0	225	650	0	0	0	0	0	413	237
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	9	12
Grade (%)		10%			-10%			0%			0%	
Total Lost time (s)					4.5						4.5	
Lane Util. Factor					0.95						0.91	
Frpb, ped/bikes					1.00						0.87	
Flpb, ped/bikes					0.94						1.00	
Frt					1.00						0.95	
Flt Protected					0.99						1.00	
Satd. Flow (prot)					2820						3099	
Flt Permitted					0.99						1.00	
Satd. Flow (perm)					2820						3099	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	245	707	0	0	0	0	0	449	258
RTOR Reduction (vph)	0	0	0	0	38	0	0	0	0	0	50	0
Lane Group Flow (vph)	0	0	0	0	914	0	0	0	0	0	657	0
Confl. Peds. (#/hr)	152		157	157		152	369		101	101		369
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	5%	5%	5%
Parking (#/hr)					15						15	
Turn Type				Perm	NA						NA	
Protected Phases					2						1	
Permitted Phases				2								
Actuated Green, G (s)					46.5						34.5	
Effective Green, g (s)					46.5						34.5	
Actuated g/C Ratio					0.52						0.38	
Clearance Time (s)					4.5						4.5	
Lane Grp Cap (vph)					1457						1187	
v/s Ratio Prot											c0.21	
v/s Ratio Perm					0.32							
v/c Ratio					0.63						0.55	
Uniform Delay, d1					15.6						21.7	
Progression Factor					0.46						0.47	
Incremental Delay, d2					1.4						1.6	
Delay (s)					8.6						11.9	
Level of Service					A						B	
Approach Delay (s)		0.0			8.6			0.0			11.9	
Approach LOS		A			A			A			B	
Intersection Summary												
HCM 2000 Control Delay			10.0									A
HCM 2000 Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			90.0								9.0	
Intersection Capacity Utilization			56.1%								B	
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

6: 6th Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	900	1000	16	81	120	0	0	0
Future Volume (vph)	0	0	0	0	900	1000	16	81	120	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	10	9	12	12	12	12	12	12
Grade (%)		10%			-10%			5%			-5%	
Total Lost time (s)					4.5	4.5		4.5				
Lane Util. Factor					0.91	0.91		0.95				
Frpb, ped/bikes					0.94	0.82		0.99				
Flpb, ped/bikes					1.00	1.00		0.99				
Frt					0.95	0.85		0.92				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					2685	999		2313				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					2685	999		2313				
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.81	0.81	0.81	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	989	1099	20	100	148	0	0	0
RTOR Reduction (vph)	0	0	0	0	53	151	0	127	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	1387	497	0	141	0	0	0	0
Confl. Peds. (#/hr)	101		155	155		101	100		1	1		100
Confl. Bikes (#/hr)			3			26			2			3
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	11%	11%	11%	2%	2%	2%
Parking (#/hr)								15				
Turn Type					NA	Perm	Perm	NA				
Protected Phases					2			1				
Permitted Phases						2	1					
Actuated Green, G (s)					64.5	64.5		16.5				
Effective Green, g (s)					64.5	64.5		16.5				
Actuated g/C Ratio					0.72	0.72		0.18				
Clearance Time (s)					4.5	4.5		4.5				
Lane Grp Cap (vph)					1924	715		424				
v/s Ratio Prot					0.52							
v/s Ratio Perm						0.50		0.06				
v/c Ratio					0.72	0.69		0.33				
Uniform Delay, d1					7.5	7.2		32.0				
Progression Factor					0.69	5.16		1.00				
Incremental Delay, d2					1.6	4.1		2.1				
Delay (s)					6.8	41.3		34.0				
Level of Service					A	D		C				
Approach Delay (s)		0.0			17.5			34.0			0.0	
Approach LOS		A			B			C			A	
Intersection Summary												
HCM 2000 Control Delay			19.3									
HCM 2000 Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			90.0									
Intersection Capacity Utilization			71.9%									
Analysis Period (min)			15									
c Critical Lane Group												

7: I-5 CD NB Off-Ramp/7th Ave & Madison St

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HCM Signalized Intersection Capacity Analysis

8: 8th Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	371	38	56	871	13	26	175	62	28	60	16
Future Volume (vph)	38	371	38	56	871	13	26	175	62	28	60	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)	3.5	3.5		3.5	3.5			3.5			3.5	
Lane Util. Factor	1.00	1.00		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	0.94		1.00	0.99			0.96			0.97	
Flpb, ped/bikes	0.94	1.00		0.82	1.00			0.99			0.98	
Frt	1.00	0.99		1.00	1.00			0.97			0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.99	
Satd. Flow (prot)	1355	1416		1214	2919			1488			1552	
Flt Permitted	0.25	1.00		0.41	1.00			0.96			0.86	
Satd. Flow (perm)	358	1416		523	2919			1442			1349	
Peak-hour factor, PHF	0.84	0.84	0.84	0.93	0.93	0.93	0.89	0.89	0.89	0.79	0.79	0.79
Adj. Flow (vph)	45	442	45	60	937	14	29	197	70	35	76	20
RTOR Reduction (vph)	0	4	0	0	1	0	0	11	0	0	6	0
Lane Group Flow (vph)	45	483	0	60	950	0	0	285	0	0	125	0
Confl. Peds. (#/hr)	99		230	230		99	91		53	53		91
Heavy Vehicles (%)	5%	5%	5%	3%	3%	3%	5%	5%	5%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	62.5	62.5		62.5	62.5			28.5			28.5	
Effective Green, g (s)	63.5	63.5		63.5	63.5			29.5			29.5	
Actuated g/C Ratio	0.64	0.64		0.64	0.64			0.29			0.29	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Grp Cap (vph)	227	899		332	1853			425			397	
v/s Ratio Prot		c0.34			0.33							
v/s Ratio Perm	0.13			0.11				c0.20			0.09	
v/c Ratio	0.20	0.54		0.18	0.51			0.67			0.31	
Uniform Delay, d1	7.6	10.1		7.5	9.9			31.0			27.4	
Progression Factor	1.00	1.00		0.39	0.30			1.00			0.73	
Incremental Delay, d2	2.0	2.3		1.0	0.9			8.1			2.0	
Delay (s)	9.6	12.4		4.0	3.9			39.1			21.8	
Level of Service	A	B		A	A			D			C	
Approach Delay (s)		12.2			3.9			39.1			21.8	
Approach LOS		B			A			D			C	
Intersection Summary												
HCM 2000 Control Delay			12.6			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)				7.0		
Intersection Capacity Utilization			61.5%			ICU Level of Service				B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: 9th Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	392	16	38	844	33	22	95	58	19	48	74
Future Volume (vph)	56	392	16	38	844	33	22	95	58	19	48	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)	3.5	3.5		3.5	3.5			3.5			3.5	
Lane Util. Factor	1.00	1.00		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	0.98		1.00	0.99			0.94			0.94	
Flpb, ped/bikes	0.94	1.00		0.82	1.00			0.99			0.99	
Frt	1.00	0.99		1.00	0.99			0.96			0.93	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1384	1509		1218	2917			1460			1437	
Flt Permitted	0.25	1.00		0.41	1.00			0.95			0.94	
Satd. Flow (perm)	364	1509		524	2917			1398			1366	
Peak-hour factor, PHF	0.88	0.88	0.88	0.95	0.95	0.95	0.76	0.76	0.76	0.84	0.84	0.84
Adj. Flow (vph)	64	445	18	40	888	35	29	125	76	23	57	88
RTOR Reduction (vph)	0	2	0	0	3	0	0	18	0	0	40	0
Lane Group Flow (vph)	64	461	0	40	920	0	0	212	0	0	128	0
Confl. Peds. (#/hr)	108		179	179		108	67		59	59		67
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	4%	4%	4%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	58.5	58.5		58.5	58.5			32.5			32.5	
Effective Green, g (s)	59.5	59.5		59.5	59.5			33.5			33.5	
Actuated g/C Ratio	0.60	0.60		0.60	0.60			0.34			0.34	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Grp Cap (vph)	216	897		311	1735			468			457	
v/s Ratio Prot		0.31			c0.32							
v/s Ratio Perm	0.18			0.08				c0.15			0.09	
v/c Ratio	0.30	0.51		0.13	0.53			0.45			0.28	
Uniform Delay, d1	10.0	11.8		8.9	12.0			26.1			24.4	
Progression Factor	0.68	0.65		0.58	0.39			1.00			1.72	
Incremental Delay, d2	2.9	1.8		0.7	1.0			3.1			1.5	
Delay (s)	9.8	9.5		5.8	5.7			29.2			43.4	
Level of Service	A	A		A	A			C			D	
Approach Delay (s)		9.6			5.7			29.2			43.4	
Approach LOS		A			A			C			D	
Intersection Summary												
HCM 2000 Control Delay			13.0			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.50									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			7.0			
Intersection Capacity Utilization			59.0%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

10: Terry Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	426	21	8	898	14	23	11	30	9	12	17
Future Volume (vph)	12	426	21	8	898	14	23	11	30	9	12	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)	3.5	3.5		3.5	3.5			3.0			3.0	
Lane Util. Factor	1.00	1.00		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	0.98		1.00	0.99			0.92			0.97	
Flpb, ped/bikes	0.96	1.00		0.84	1.00			0.98			0.97	
Frt	1.00	0.99		1.00	1.00			0.94			0.94	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.99	
Satd. Flow (prot)	1354	1445		1228	2893			1393			1396	
Flt Permitted	0.22	1.00		0.40	1.00			0.91			0.95	
Satd. Flow (perm)	314	1445		514	2893			1285			1339	
Peak-hour factor, PHF	0.91	0.91	0.91	0.89	0.89	0.89	0.68	0.68	0.68	0.78	0.78	0.78
Adj. Flow (vph)	13	468	23	9	1009	16	34	16	44	12	15	22
RTOR Reduction (vph)	0	2	0	0	1	0	0	30	0	0	15	0
Lane Group Flow (vph)	13	489	0	9	1024	0	0	64	0	0	34	0
Confl. Peds. (#/hr)	96		158	158		96	33		56	56		33
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	2%	2%	2%	7%	7%	7%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	60.5	60.5		60.5	60.5			31.0			31.0	
Effective Green, g (s)	61.5	61.5		61.5	61.5			32.0			32.0	
Actuated g/C Ratio	0.62	0.62		0.62	0.62			0.32			0.32	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.0			4.0	
Lane Grp Cap (vph)	193	888		316	1779			411			428	
v/s Ratio Prot		0.34			c0.35							
v/s Ratio Perm	0.04			0.02				c0.05			0.03	
v/c Ratio	0.07	0.55		0.03	0.58			0.16			0.08	
Uniform Delay, d1	7.7	11.2		7.5	11.5			24.3			23.7	
Progression Factor	0.56	0.46		0.37	0.31			1.00			1.00	
Incremental Delay, d2	0.6	2.2		0.0	0.1			0.8			0.4	
Delay (s)	5.0	7.3		2.8	3.7			25.1			24.1	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		7.3			3.7			25.1			24.1	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			6.6			HCM 2000 Level of Service				A		
HCM 2000 Volume to Capacity ratio			0.43									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			6.5			
Intersection Capacity Utilization			49.8%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

11: Boren Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	63	380	29	63	796	61	64	716	59	201	577	77
Future Volume (vph)	63	380	29	63	796	61	64	716	59	201	577	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	12	9	9	12	9	9	12
Total Lost time (s)	4.0	3.5	4.5	4.0	3.5		4.0	3.5		4.0	3.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.66	1.00	0.99		1.00	0.96		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1404	1419	835	1404	2707		1419	2690		1406	2659	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1404	1419	835	1404	2707		1419	2690		1406	2659	
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.88	0.88	0.88	0.89	0.89	0.89
Adj. Flow (vph)	68	413	32	69	875	67	73	814	67	226	648	87
RTOR Reduction (vph)	0	0	22	0	5	0	0	6	0	0	10	0
Lane Group Flow (vph)	68	413	10	69	937	0	73	875	0	226	725	0
Confl. Peds. (#/hr)			284			104			174			110
Heavy Vehicles (%)	8%	8%	8%	8%	8%	8%	3%	3%	3%	4%	4%	4%
Bus Blockages (#/hr)	0	10	0	0	6	0	0	2	0	0	8	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									
Actuated Green, G (s)	6.4	30.5	30.5	6.4	30.5		6.5	28.7		16.4	38.6	
Effective Green, g (s)	6.9	31.5	30.5	6.9	31.5		7.0	29.7		16.9	39.6	
Actuated g/C Ratio	0.07	0.32	0.30	0.07	0.32		0.07	0.30		0.17	0.40	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lane Grp Cap (vph)	96	446	254	96	852		99	798		237	1052	
v/s Ratio Prot	0.05	c0.29		0.05	c0.35		0.05	c0.33		c0.16	0.27	
v/s Ratio Perm			0.01									
v/c Ratio	0.71	0.93	0.04	0.72	1.10		0.74	1.10		0.95	0.69	
Uniform Delay, d1	45.6	33.1	24.4	45.6	34.2		45.6	35.1		41.2	25.1	
Progression Factor	0.73	0.61	1.00	1.03	0.68		0.94	1.11		1.00	1.00	
Incremental Delay, d2	15.6	25.1	0.2	17.6	60.4		20.9	61.2		45.0	3.7	
Delay (s)	48.6	45.4	24.7	64.5	83.8		63.8	100.3		86.2	28.8	
Level of Service	D	D	C	E	F		E	F		F	C	
Approach Delay (s)		44.5			82.4			97.5			42.3	
Approach LOS		D			F			F			D	
Intersection Summary												
HCM 2000 Control Delay			69.7			HCM 2000 Level of Service				E		
HCM 2000 Volume to Capacity ratio			1.09									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)				15.0		
Intersection Capacity Utilization			81.6%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

12: Madison St & Minor Ave

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	513	110	54	846	12	30	37	39	18	34	44
Future Volume (vph)	16	513	110	54	846	12	30	37	39	18	34	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)	3.5	3.5	4.5	3.5	3.5			3.0			3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00	0.43	1.00	0.99			0.92			0.91	
Flpb, ped/bikes	0.91	1.00	1.00	0.86	1.00			0.96			0.98	
Frt	1.00	1.00	0.85	1.00	1.00			0.95			0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1307	1506	589	1256	2892			1322			1321	
Flt Permitted	0.28	1.00	1.00	0.35	1.00			0.90			0.94	
Satd. Flow (perm)	381	1506	589	466	2892			1204			1250	
Peak-hour factor, PHF	0.85	0.85	0.85	0.95	0.95	0.95	0.67	0.67	0.67	0.87	0.87	0.87
Adj. Flow (vph)	19	604	129	57	891	13	45	55	58	21	39	51
RTOR Reduction (vph)	0	0	29	0	1	0	0	21	0	0	30	0
Lane Group Flow (vph)	19	604	100	57	903	0	0	137	0	0	81	0
Confl. Peds. (#/hr)	125		242	242		125	110		75	75		110
Heavy Vehicles (%)	6%	6%	6%	4%	4%	4%	7%	7%	7%	7%	7%	7%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2		2	2			4		4			
Actuated Green, G (s)	66.5	66.5	66.5	66.5	66.5			25.0			25.0	
Effective Green, g (s)	67.5	67.5	66.5	67.5	67.5			26.0			26.0	
Actuated g/C Ratio	0.68	0.68	0.66	0.68	0.68			0.26			0.26	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5			4.0			4.0	
Lane Grp Cap (vph)	257	1016	391	314	1952			313			325	
v/s Ratio Prot		c0.40			0.31							
v/s Ratio Perm	0.05		0.17	0.12				c0.11			0.06	
v/c Ratio	0.07	0.59	0.26	0.18	0.46			0.44			0.25	
Uniform Delay, d1	5.6	8.8	6.8	6.0	7.7			30.9			29.3	
Progression Factor	0.30	0.25	0.00	1.79	1.38			1.00			1.00	
Incremental Delay, d2	0.2	1.1	0.6	1.2	0.7			4.4			1.8	
Delay (s)	1.9	3.3	0.7	11.9	11.3			35.3			31.1	
Level of Service	A	A	A	B	B			D			C	
Approach Delay (s)		2.8			11.3			35.3			31.1	
Approach LOS		A			B			D			C	
Intersection Summary												
HCM 2000 Control Delay			11.1			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.55									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			6.5			
Intersection Capacity Utilization			60.8%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

13: Swedish/Summit Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	427	114	23	839	15	24	6	16	7	10	37
Future Volume (vph)	31	427	114	23	839	15	24	6	16	7	10	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	12	12	12	12	12	12	12
Total Lost time (s)	3.5	3.5	4.5	3.5	3.5			3.0			3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00	0.51	1.00	0.99			0.94			0.94	
Flpb, ped/bikes	0.93	1.00	1.00	0.80	1.00			0.96			0.98	
Frt	1.00	1.00	0.85	1.00	1.00			0.95			0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.97			0.99	
Satd. Flow (prot)	1320	1492	647	1168	2892			1405			1313	
Flt Permitted	0.28	1.00	1.00	0.45	1.00			0.85			0.97	
Satd. Flow (perm)	388	1492	647	547	2892			1223			1284	
Peak-hour factor, PHF	0.89	0.89	0.89	0.92	0.92	0.92	0.64	0.64	0.64	0.80	0.80	0.80
Adj. Flow (vph)	35	480	128	25	912	16	38	9	25	9	12	46
RTOR Reduction (vph)	0	0	29	0	1	0	0	19	0	0	36	0
Lane Group Flow (vph)	35	480	99	25	927	0	0	53	0	0	32	0
Confl. Peds. (#/hr)	105		163	163		105	54		62	62		54
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	2%	2%	2%	8%	8%	8%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2		2	2			4			4		
Actuated Green, G (s)	71.5	71.5	71.5	71.5	71.5			20.0			20.0	
Effective Green, g (s)	72.5	72.5	71.5	72.5	72.5			21.0			21.0	
Actuated g/C Ratio	0.72	0.72	0.72	0.72	0.72			0.21			0.21	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5			4.0			4.0	
Lane Grp Cap (vph)	281	1081	462	396	2096			256			269	
v/s Ratio Prot		c0.32			0.32							
v/s Ratio Perm	0.09		0.15	0.05				c0.04			0.02	
v/c Ratio	0.12	0.44	0.21	0.06	0.44			0.21			0.12	
Uniform Delay, d1	4.2	5.6	4.8	4.0	5.6			32.6			32.0	
Progression Factor	0.85	0.97	0.94	0.90	1.16			1.00			1.00	
Incremental Delay, d2	0.7	1.1	0.9	0.3	0.6			1.8			0.9	
Delay (s)	4.3	6.5	5.4	3.9	7.1			34.5			32.9	
Level of Service	A	A	A	A	A			C			C	
Approach Delay (s)		6.2			7.0			34.5			32.9	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			8.8			HCM 2000 Level of Service				A		
HCM 2000 Volume to Capacity ratio			0.39									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			6.5			
Intersection Capacity Utilization			51.1%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

14: Madison St & Boylston Ave

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	396	32	34	819	21	15	30	9	8	10	13
Future Volume (vph)	25	396	32	34	819	21	15	30	9	8	10	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	9	12	12	12	12	12	12	12
Total Lost time (s)	3.5	3.5		3.5	3.5			3.0			3.0	
Lane Util. Factor	1.00	1.00		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	0.97		1.00	0.99			0.98			0.97	
Flpb, ped/bikes	0.93	1.00		0.82	1.00			0.98			0.98	
Frt	1.00	0.99		1.00	1.00			0.98			0.94	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1321	1434		1191	2783			1562			1433	
Flt Permitted	0.31	1.00		0.49	1.00			0.93			0.93	
Satd. Flow (perm)	436	1434		615	2783			1475			1352	
Peak-hour factor, PHF	0.93	0.93	0.93	0.94	0.94	0.94	0.85	0.85	0.85	0.93	0.93	0.93
Adj. Flow (vph)	27	426	34	36	871	22	18	35	11	9	11	14
RTOR Reduction (vph)	0	1	0	0	1	0	0	9	0	0	13	0
Lane Group Flow (vph)	27	459	0	36	892	0	0	55	0	0	21	0
Confl. Peds. (#/hr)	69		102	102		69	43		27	27		43
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	2%	2%	2%	6%	6%	6%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	85.0	85.0		85.0	85.0			6.5			6.5	
Effective Green, g (s)	86.0	86.0		86.0	86.0			7.5			7.5	
Actuated g/C Ratio	0.86	0.86		0.86	0.86			0.08			0.08	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.0			4.0	
Vehicle Extension (s)	0.2	0.2		0.2	0.2			0.2			0.2	
Lane Grp Cap (vph)	374	1233		528	2393			110			101	
v/s Ratio Prot		0.32			c0.32							
v/s Ratio Perm	0.06			0.06				c0.04			0.02	
v/c Ratio	0.07	0.37		0.07	0.37			0.50			0.21	
Uniform Delay, d1	1.0	1.4		1.0	1.4			44.4			43.5	
Progression Factor	1.58	1.72		2.39	2.83			1.00			1.00	
Incremental Delay, d2	0.3	0.8		0.2	0.4			1.3			0.4	
Delay (s)	2.0	3.3		2.7	4.5			45.7			43.8	
Level of Service	A	A		A	A			D			D	
Approach Delay (s)		3.2			4.4			45.7			43.8	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			6.6			HCM 2000 Level of Service				A		
HCM 2000 Volume to Capacity ratio			0.38									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			6.5			
Intersection Capacity Utilization			51.5%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

15: Broadway & Madison St/E Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	61	317	29	103	750	22	0	241	51	0	245	93
Future Volume (vph)	61	317	29	103	750	22	0	241	51	0	245	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	10	12	10	10	12	12	13	12	12	13	12
Grade (%)		-9%			8%			0%			0%	
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0	5.0		4.0	
Lane Util. Factor	1.00	1.00		1.00	0.95			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	1.00		0.96	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	0.99		1.00	1.00			1.00	0.85		0.96	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)	1658	1699		1484	3169			1870	1553		1726	
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (perm)	1658	1699		1484	3169			1870	1553		1726	
Peak-hour factor, PHF	0.89	0.89	0.89	0.95	0.95	0.95	0.79	0.79	0.79	0.78	0.78	0.78
Adj. Flow (vph)	69	356	33	108	789	23	0	305	65	0	314	119
RTOR Reduction (vph)	0	3	0	0	2	0	0	0	54	0	15	0
Lane Group Flow (vph)	69	386	0	108	811	0	0	305	11	0	418	0
Confl. Peds. (#/hr)			93			72			93			88
Heavy Vehicles (%)	10%	7%	0%	9%	1%	5%	0%	5%	4%	0%	4%	8%
Turn Type	Prot	NA		Prot	NA			NA	custom		NA	
Protected Phases	5	2		1	6			4 3	3 1		8	
Permitted Phases												
Actuated Green, G (s)	7.6	48.0		8.6	49.0			28.4	17.6		28.4	
Effective Green, g (s)	8.6	49.0		9.6	50.0			29.4	17.6		29.4	
Actuated g/C Ratio	0.09	0.49		0.10	0.50			0.29	0.18		0.29	
Clearance Time (s)	5.0	5.0		5.0	5.0						5.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0						2.0	
Lane Grp Cap (vph)	142	832		142	1584			549	273		507	
v/s Ratio Prot	0.04	0.23		c0.07	c0.26			0.16	0.01		c0.24	
v/s Ratio Perm												
v/c Ratio	0.49	0.46		0.76	0.51			0.56	0.04		0.82	
Uniform Delay, d1	43.6	16.8		44.1	16.8			29.8	34.2		32.9	
Progression Factor	0.62	1.58		0.94	1.29			1.00	1.00		1.00	
Incremental Delay, d2	0.9	1.8		18.9	1.2			0.7	0.0		10.0	
Delay (s)	28.1	28.4		60.5	22.8			30.5	34.2		42.9	
Level of Service	C	C		E	C			C	C		D	
Approach Delay (s)		28.3			27.2			31.1			42.9	
Approach LOS		C			C			C			D	
Intersection Summary												
HCM 2000 Control Delay			31.2			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.70									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			18.0			
Intersection Capacity Utilization			55.8%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2010 TWSC
16: E Madison St & BROADWAY CT

Intersection

Int Delay, s/veh 0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	364	853	0	1	8
Future Vol, veh/h	4	364	853	0	1	8
Conflicting Peds, #/hr	59	0	0	59	0	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	-8	5	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	379	889	0	1	8

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	948	0	1146
Stage 1	-	-	948
Stage 2	-	-	198
Critical Hdwy	4.14	-	6.84
Critical Hdwy Stg 1	-	-	5.84
Critical Hdwy Stg 2	-	-	5.84
Follow-up Hdwy	2.22	-	3.52
Pot Cap-1 Maneuver	720	-	193
Stage 1	-	-	337
Stage 2	-	-	816
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	719	-	173
Mov Cap-2 Maneuver	-	-	173
Stage 1	-	-	320
Stage 2	-	-	770

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	14.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	719	-	-	-	405
HCM Lane V/C Ratio	0.006	-	-	-	0.023
HCM Control Delay (s)	10	0	-	-	14.1
HCM Lane LOS	B	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

HCM 2010 TWSC
17: E Seneca St & 10TH AVE

Intersection

Int Delay, s/veh 0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	25	328	807	2	4	36
Future Vol, veh/h	25	328	807	2	4	36
Conflicting Peds, #/hr	39	0	0	39	1	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, %	-	-5	2	-	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	26	338	832	2	4	37

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	873	0	1094
Stage 1	-	-	872
Stage 2	-	-	222
Critical Hdwy	4.14	-	6.84
Critical Hdwy Stg 1	-	-	5.84
Critical Hdwy Stg 2	-	-	5.84
Follow-up Hdwy	2.22	-	3.52
Pot Cap-1 Maneuver	768	-	208
Stage 1	-	-	369
Stage 2	-	-	794
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	768	-	187
Mov Cap-2 Maneuver	-	-	187
Stage 1	-	-	357
Stage 2	-	-	736

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	13.8
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	768	-	-	-	450
HCM Lane V/C Ratio	0.034	-	-	-	0.092
HCM Control Delay (s)	9.8	0.2	-	-	13.8
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.3

HCM 2010 TWSC
18: E Seneca St & Madison St

Intersection

Int Delay, s/veh 0

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	5	0	809	14	0	332
Future Vol, veh/h	5	0	809	14	0	332
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	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	-2	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	0	879	15	0	361

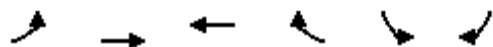
Major/Minor	Minor2		Major2		Major1	
Conflicting Flow All	1774	15	0	0	15	0
Stage 1	1774	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Critical Hdwy	6.52	6.22	4.12	-	4.12	-
Critical Hdwy Stg 1	5.52	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	4.018	3.318	2.218	-	2.218	-
Pot Cap-1 Maneuver	83	1065	-	-	1603	-
Stage 1	136	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %				-		-
Mov Cap-1 Maneuver	0	1065	-	-	1603	-
Mov Cap-2 Maneuver	0	-	-	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-

Approach	EB	WB	NE
HCM Control Delay, s			0
HCM LOS	-		

Minor Lane/Major Mvmt	NEL	NER	EBLn1	WBL	WBT
Capacity (veh/h)	1603	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	-
HCM Lane LOS	A	-	-	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

HCM Signalized Intersection Capacity Analysis

19: E Madison St & 11th Ave



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↑↑↑	
Traffic Volume (vph)	0	340	801	0	55	22
Future Volume (vph)	0	340	801	0	55	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	10	10	13	12	10	12
Grade (%)		0%	-4%		0%	
Total Lost time (s)		4.5	4.5		4.5	
Lane Util. Factor		0.95	0.95		0.97	
Frpb, ped/bikes		1.00	1.00		0.91	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	1.00		0.96	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		3336	3694		2799	
Flt Permitted		1.00	1.00		0.97	
Satd. Flow (perm)		3336	3694		2799	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	362	852	0	59	23
RTOR Reduction (vph)	0	0	0	0	22	0
Lane Group Flow (vph)	0	362	852	0	60	0
Confl. Peds. (#/hr)	29			29		63
Confl. Bikes (#/hr)				3		17
Heavy Vehicles (%)	1%	1%	3%	3%	4%	4%
Parking (#/hr)						0
Turn Type		NA	NA		Prot	
Protected Phases		2	2		4	
Permitted Phases						
Actuated Green, G (s)		85.4	85.4		5.6	
Effective Green, g (s)		85.4	85.4		5.6	
Actuated g/C Ratio		0.85	0.85		0.06	
Clearance Time (s)		4.5	4.5		4.5	
Vehicle Extension (s)		0.2	0.2		0.2	
Lane Grp Cap (vph)		2848	3154		156	
v/s Ratio Prot		0.11	c0.23		c0.02	
v/s Ratio Perm						
v/c Ratio		0.13	0.27		0.39	
Uniform Delay, d1		1.2	1.4		45.5	
Progression Factor		0.21	0.25		1.00	
Incremental Delay, d2		0.1	0.2		0.6	
Delay (s)		0.3	0.5		46.1	
Level of Service		A	A		D	
Approach Delay (s)		0.3	0.5		46.1	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay			3.3		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.28			
Actuated Cycle Length (s)			100.0		Sum of lost time (s)	9.0
Intersection Capacity Utilization			42.1%		ICU Level of Service	A
Analysis Period (min)			15			

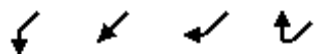
HCM Signalized Intersection Capacity Analysis

20: E Madison St & 12th Ave & Union St

												
Movement	NBL2	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	NEL2	NEL	NET	NER
Lane Configurations												
Traffic Volume (vph)	46	37	313	94	33	265	61	28	1	21	316	53
Future Volume (vph)	46	37	313	94	33	265	61	28	1	21	316	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	11	12	10	10	12	12	10	10	10	10
Grade (%)			0%			0%					4%	
Total Lost time (s)		4.5	4.5	4.5	4.5	4.5					4.5	
Lane Util. Factor		1.00	1.00	1.00	1.00	1.00					0.95	
Frpb, ped/bikes		1.00	1.00	1.00	1.00	0.91					0.98	
Flpb, ped/bikes		0.87	1.00	1.00	0.94	1.00					1.00	
Frt		1.00	1.00	0.85	1.00	0.96					0.98	
Flt Protected		0.95	1.00	1.00	0.95	1.00					1.00	
Satd. Flow (prot)		1451	1818	1599	1560	1377					3102	
Flt Permitted		0.33	1.00	1.00	0.39	1.00					0.87	
Satd. Flow (perm)		509	1818	1599	637	1377					2713	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	48	39	329	99	35	279	64	29	1	22	333	56
RTOR Reduction (vph)	0	0	0	66	0	3	0	0	0	0	12	0
Lane Group Flow (vph)	0	87	329	33	35	369	0	0	0	0	400	0
Confl. Peds. (#/hr)	66	59		76	76		66	59	59	112		111
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%	2%	2%	1%	1%	1%	1%
Parking (#/hr)						0						
Turn Type	Perm	Perm	NA	Prot	Perm	NA			Perm	Perm	NA	
Protected Phases			4	4		4					2	
Permitted Phases	4	4			4				2	2		
Actuated Green, G (s)		33.5	33.5	33.5	33.5	33.5					57.5	
Effective Green, g (s)		33.5	33.5	33.5	33.5	33.5					57.5	
Actuated g/C Ratio		0.34	0.34	0.34	0.34	0.34					0.58	
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5					4.5	
Vehicle Extension (s)		0.2	0.2	0.2	0.2	0.2					0.2	
Lane Grp Cap (vph)		170	609	535	213	461					1559	
v/s Ratio Prot			0.18	0.02		c0.27						
v/s Ratio Perm		0.17			0.05						0.15	
v/c Ratio		0.51	0.54	0.06	0.16	0.80					0.26	
Uniform Delay, d1		26.7	27.0	22.6	23.4	30.2					10.6	
Progression Factor		1.00	1.00	1.00	1.00	1.00					0.25	
Incremental Delay, d2		10.6	3.4	0.2	1.7	13.6					0.4	
Delay (s)		37.3	30.4	22.8	25.1	43.8					3.0	
Level of Service		D	C	C	C	D					A	
Approach Delay (s)			30.1			42.1					3.0	
Approach LOS			C			D					A	
Intersection Summary												
HCM 2000 Control Delay			21.7			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			9.0			
Intersection Capacity Utilization			86.7%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

20: E Madison St & 12th Ave & Union St



Movement	SWL	SWT	SWR	SWR2
Lane Configurations		↔↔		
Traffic Volume (vph)	76	694	200	12
Future Volume (vph)	76	694	200	12
Ideal Flow (vphpl)	1900	1900	1900	1900
Lane Width	12	11	12	12
Grade (%)		-8%		
Total Lost time (s)		4.5		
Lane Util. Factor		0.95		
Frpb, ped/bikes		0.90		
Flpb, ped/bikes		0.99		
Frt		0.97		
Flt Protected		1.00		
Satd. Flow (prot)		3064		
Flt Permitted		0.87		
Satd. Flow (perm)		2683		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95
Adj. Flow (vph)	80	731	211	13
RTOR Reduction (vph)	0	1	0	0
Lane Group Flow (vph)	0	1034	0	0
Confl. Peds. (#/hr)	111		59	112
Heavy Vehicles (%)	2%	2%	2%	2%
Parking (#/hr)				
Turn Type	Perm	NA		
Protected Phases		2		
Permitted Phases	2			
Actuated Green, G (s)		57.5		
Effective Green, g (s)		57.5		
Actuated g/C Ratio		0.58		
Clearance Time (s)		4.5		
Vehicle Extension (s)		0.2		
Lane Grp Cap (vph)		1542		
v/s Ratio Prot				
v/s Ratio Perm		c0.39		
v/c Ratio		0.67		
Uniform Delay, d1		14.7		
Progression Factor		1.00		
Incremental Delay, d2		2.3		
Delay (s)		17.0		
Level of Service		B		
Approach Delay (s)		17.0		
Approach LOS		B		
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

22: 13th Ave & E Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	293	0	0	680	1	277	42	4	5	0	25
Future Volume (vph)	18	293	0	0	680	1	277	42	4	5	0	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	12	11	12	16	16	12	12	13	12
Grade (%)		8%			-7%			0%			0%	
Total Lost time (s)		4.5			4.5		4.5	4.5			4.5	
Lane Util. Factor		0.95			0.95		0.95	0.95			1.00	
Frpb, ped/bikes		1.00			1.00		1.00	1.00			0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00			0.99	
Frt		1.00			1.00		1.00	1.00			0.89	
Flt Protected		1.00			1.00		0.95	0.97			0.99	
Satd. Flow (prot)		3180			3539		1865	1883			1666	
Flt Permitted		0.90			1.00		0.74	0.77			0.95	
Satd. Flow (perm)		2882			3539		1447	1498			1592	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	19	305	0	0	708	1	289	44	4	5	0	26
RTOR Reduction (vph)	0	0	0	0	0	0	0	1	0	0	22	0
Lane Group Flow (vph)	0	324	0	0	709	0	168	168	0	0	9	0
Confl. Peds. (#/hr)	50		52	52		50	1		35	35		1
Confl. Bikes (#/hr)			3			12			11			2
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	4%	4%	4%	1%	1%	1%
Parking (#/hr)									0			0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2						4			4		
Actuated Green, G (s)		76.8			76.8		14.2	14.2			14.2	
Effective Green, g (s)		76.8			76.8		14.2	14.2			14.2	
Actuated g/C Ratio		0.77			0.77		0.14	0.14			0.14	
Clearance Time (s)		4.5			4.5		4.5	4.5			4.5	
Vehicle Extension (s)		0.2			0.2		0.2	0.2			0.2	
Lane Grp Cap (vph)		2213			2717		205	212			226	
v/s Ratio Prot					c0.20							
v/s Ratio Perm		0.11					c0.12	0.11			0.01	
v/c Ratio		0.15			0.26		0.82	0.79			0.04	
Uniform Delay, d1		3.0			3.4		41.7	41.5			37.0	
Progression Factor		1.22			0.38		1.00	1.00			1.00	
Incremental Delay, d2		0.1			0.2		20.9	17.1			0.0	
Delay (s)		3.8			1.5		62.5	58.5			37.0	
Level of Service		A			A		E	E			D	
Approach Delay (s)		3.8			1.5			60.5			37.0	
Approach LOS		A			A			E			D	
Intersection Summary												
HCM 2000 Control Delay			17.0				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.35									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)			9.0		
Intersection Capacity Utilization			44.7%				ICU Level of Service			A		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

23: 14th Ave & E Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	284	7	46	654	0	10	223	88	3	79	17
Future Volume (vph)	1	284	7	46	654	0	10	223	88	3	79	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	12	16	12	12	16	12
Grade (%)		7%			-10%			0%			0%	
Total Lost time (s)		4.5			4.5			8.5			8.5	
Lane Util. Factor		1.00			0.95			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			0.97			0.98	
Flpb, ped/bikes		1.00			0.99			1.00			1.00	
Frt		1.00			1.00			0.96			0.98	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1741			3590			1975			1997	
Flt Permitted		1.00			0.91			0.99			0.97	
Satd. Flow (perm)		1739			3273			1952			1948	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1	302	7	49	696	0	11	237	94	3	84	18
RTOR Reduction (vph)	0	1	0	0	0	0	0	15	0	0	8	0
Lane Group Flow (vph)	0	309	0	0	745	0	0	327	0	0	97	0
Confl. Peds. (#/hr)	3		77	77		3	60		20	20		60
Confl. Bikes (#/hr)			2			12			26			9
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Parking (#/hr)									0			0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3			3		
Actuated Green, G (s)		56.1			56.1			18.9			18.9	
Effective Green, g (s)		56.1			56.1			18.9			18.9	
Actuated g/C Ratio		0.56			0.56			0.19			0.19	
Clearance Time (s)		4.5			4.5			8.5			8.5	
Vehicle Extension (s)		0.2			0.2			0.2			0.2	
Lane Grp Cap (vph)		975			1836			368			368	
v/s Ratio Prot												
v/s Ratio Perm		0.18			0.23			0.17			0.05	
v/c Ratio		0.32			0.41			0.89			0.26	
Uniform Delay, d1		11.7			12.5			39.5			34.6	
Progression Factor		0.87			0.13			1.00			0.05	
Incremental Delay, d2		0.9			0.6			21.6			0.1	
Delay (s)		11.1			2.2			61.1			1.9	
Level of Service		B			A			E			A	
Approach Delay (s)		11.1			2.2			61.1			1.9	
Approach LOS		B			A			E			A	
Intersection Summary												
HCM 2000 Control Delay			17.4			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.48									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			17.5			
Intersection Capacity Utilization			71.9%			ICU Level of Service			C			
Analysis Period (min)			15									

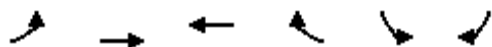
HCM Signalized Intersection Capacity Analysis

24: E Madison St & Pike St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations											 	
Traffic Volume (vph)	69	4	0	0	0	0	0	356	19	1	700	65
Future Volume (vph)	69	4	0	0	0	0	0	356	19	1	700	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	16	12	12	12	12	12	12	12	12	11	12
Grade (%)		6%			0%			10%			-10%	
Total Lost time (s)	4.5	4.5						4.5			4.5	
Lane Util. Factor	0.95	0.95						1.00			0.95	
Frt	1.00	1.00						0.99			0.99	
Flt Protected	0.95	0.96						1.00			1.00	
Satd. Flow (prot)	1522	1676						1757			3546	
Flt Permitted	0.95	0.96						1.00			0.95	
Satd. Flow (perm)	1522	1676						1757			3386	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	75	4	0	0	0	0	0	387	21	1	761	71
RTOR Reduction (vph)	0	0	0	0	0	0	0	2	0	0	6	0
Lane Group Flow (vph)	40	39	0	0	0	0	0	406	0	0	827	0
Parking (#/hr)		0							0			
Turn Type	Perm	NA						NA		Perm	NA	
Protected Phases		2 3						1			1	
Permitted Phases	2 3									1		
Actuated Green, G (s)	30.9	30.9						56.1			56.1	
Effective Green, g (s)	30.9	30.9						56.1			56.1	
Actuated g/C Ratio	0.31	0.31						0.56			0.56	
Clearance Time (s)								4.5			4.5	
Vehicle Extension (s)								0.2			0.2	
Lane Grp Cap (vph)	470	517						985			1899	
v/s Ratio Prot								0.23				
v/s Ratio Perm	c0.03	0.02									c0.24	
v/c Ratio	0.09	0.08						0.41			0.44	
Uniform Delay, d1	24.5	24.4						12.5			12.8	
Progression Factor	0.09	0.09						0.47			1.06	
Incremental Delay, d2	0.0	0.0						1.2			0.7	
Delay (s)	2.2	2.1						7.1			14.3	
Level of Service	A	A						A			B	
Approach Delay (s)		2.2			0.0			7.1			14.3	
Approach LOS		A			A			A			B	
Intersection Summary												
HCM 2000 Control Delay		11.3			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.33										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			17.5				
Intersection Capacity Utilization		35.5%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

25: E Madison St & 15th Ave



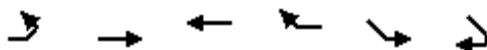
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Volume (vph)	82	333	664	6	0	102
Future Volume (vph)	82	333	664	6	0	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	12	12	16
Grade (%)		10%	-9%		0%	
Total Lost time (s)		4.5	4.5			4.0
Lane Util. Factor		0.95	0.95			1.00
Frpb, ped/bikes		1.00	1.00			0.99
Flpb, ped/bikes		1.00	1.00			1.00
Frt		1.00	1.00			0.86
Flt Protected		0.99	1.00			1.00
Satd. Flow (prot)		3245	3604			1752
Flt Permitted		0.71	1.00			1.00
Satd. Flow (perm)		2311	3604			1752
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	93	378	755	7	0	116
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	471	762	0	0	116
Confl. Peds. (#/hr)	38			38	54	
Confl. Bikes (#/hr)				14		2
Heavy Vehicles (%)	1%	1%	1%	1%	5%	5%
Parking (#/hr)				0		
Turn Type	Perm	NA	NA			Free
Protected Phases		2	2			
Permitted Phases	2					Free
Actuated Green, G (s)		81.1	81.1			100.0
Effective Green, g (s)		81.1	81.1			100.0
Actuated g/C Ratio		0.81	0.81			1.00
Clearance Time (s)		4.5	4.5			
Vehicle Extension (s)		0.2	0.2			
Lane Grp Cap (vph)		1874	2922			1752
v/s Ratio Prot			c0.21			
v/s Ratio Perm		0.20				c0.07
v/c Ratio		0.25	0.26			0.07
Uniform Delay, d1		2.2	2.3			0.0
Progression Factor		0.77	0.76			1.00
Incremental Delay, d2		0.3	0.2			0.1
Delay (s)		2.0	1.9			0.1
Level of Service		A	A			A
Approach Delay (s)		2.0	1.9		0.1	
Approach LOS		A	A		A	
Intersection Summary						
HCM 2000 Control Delay			1.8		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.24			
Actuated Cycle Length (s)			100.0		Sum of lost time (s)	7.5
Intersection Capacity Utilization			37.7%		ICU Level of Service	A
Analysis Period (min)			15			

HCM 2010 TWSC
26: 16TH AVE & E Madison St

Intersection						
Int Delay, s/veh	0.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑	
Traffic Vol, veh/h	331	1	0	671	9	22
Future Vol, veh/h	331	1	0	671	9	22
Conflicting Peds, #/hr	0	55	0	0	0	49
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	9	-	-	-9	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	368	1	0	746	10	24
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	796	288
Stage 1	-	-	-	-	423	-
Stage 2	-	-	-	-	373	-
Critical Hdwy	-	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	0	-	324	709
Stage 1	-	-	0	-	629	-
Stage 2	-	-	0	-	666	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	312	654
Mov Cap-2 Maneuver	-	-	-	-	312	-
Stage 1	-	-	-	-	605	-
Stage 2	-	-	-	-	666	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		12.8	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	496	-	-	-		
HCM Lane V/C Ratio	0.069	-	-	-		
HCM Control Delay (s)	12.8	-	-	-		
HCM Lane LOS	B	-	-	-		
HCM 95th %tile Q(veh)	0.2	-	-	-		

HCM Signalized Intersection Capacity Analysis

27: E Madison St & Pine St



Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↑↑	↑↑		↑	↑
Traffic Volume (vph)	22	331	666	159	70	5
Future Volume (vph)	22	331	666	159	70	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	11	11
Grade (%)		9%	-4%		0%	
Total Lost time (s)		4.5	4.5		4.5	4.5
Lane Util. Factor		0.95	0.95		1.00	1.00
Frpb, ped/bikes		1.00	0.98		1.00	0.87
Flpb, ped/bikes		1.00	1.00		1.00	1.00
Frt		1.00	0.97		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3171	3203		1678	1178
Flt Permitted		0.88	1.00		0.95	1.00
Satd. Flow (perm)		2794	3203		1678	1178
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	24	368	740	177	78	6
RTOR Reduction (vph)	0	0	10	0	0	6
Lane Group Flow (vph)	0	392	907	0	78	0
Confl. Peds. (#/hr)	62			62		49
Confl. Bikes (#/hr)				23		2
Heavy Vehicles (%)	1%	1%	2%	2%	4%	4%
Parking (#/hr)						0
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		2	2		4	
Permitted Phases	2					4
Actuated Green, G (s)		84.0	84.0		7.0	7.0
Effective Green, g (s)		84.0	84.0		7.0	7.0
Actuated g/C Ratio		0.84	0.84		0.07	0.07
Clearance Time (s)		4.5	4.5		4.5	4.5
Vehicle Extension (s)		0.2	0.2		0.2	0.2
Lane Grp Cap (vph)		2346	2690		117	82
v/s Ratio Prot			c0.28		c0.05	
v/s Ratio Perm		0.14				0.00
v/c Ratio		0.17	0.34		0.67	0.01
Uniform Delay, d1		1.5	1.8		45.4	43.3
Progression Factor		0.45	0.89		1.00	1.00
Incremental Delay, d2		0.2	0.3		10.6	0.0
Delay (s)		0.8	1.9		55.9	43.3
Level of Service		A	A		E	D
Approach Delay (s)		0.8	1.9		55.0	
Approach LOS		A	A		E	
Intersection Summary						
HCM 2000 Control Delay			4.8		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.36			
Actuated Cycle Length (s)			100.0		Sum of lost time (s)	9.0
Intersection Capacity Utilization			43.1%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

28: 17th Ave & E Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↔↔			↔			↔	
Traffic Volume (vph)	26	360	15	5	759	15	41	24	4	16	8	23
Future Volume (vph)	26	360	15	5	759	15	41	24	4	16	8	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	10	12	10	12	12	16	12
Grade (%)		4%			4%			0%			0%	
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			1.00			0.99			0.88	
Flpb, ped/bikes		1.00			1.00			0.89			0.95	
Frt		0.99			1.00			0.99			0.93	
Flt Protected		1.00			1.00			0.97			0.98	
Satd. Flow (prot)		3325			3325			1488			1648	
Flt Permitted		0.87			0.95			0.84			0.90	
Satd. Flow (perm)		2904			3168			1291			1505	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	29	400	17	6	843	17	46	27	4	18	9	26
RTOR Reduction (vph)	0	1	0	0	1	0	0	2	0	0	24	0
Lane Group Flow (vph)	0	445	0	0	865	0	0	75	0	0	29	0
Confl. Peds. (#/hr)	85		47	47		85	69		61	61		69
Confl. Bikes (#/hr)			4			19			21			9
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		81.4			81.4			9.6			9.6	
Effective Green, g (s)		81.4			81.4			9.6			9.6	
Actuated g/C Ratio		0.81			0.81			0.10			0.10	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		0.2			0.2			3.0			3.0	
Lane Grp Cap (vph)		2363			2578			123			144	
v/s Ratio Prot												
v/s Ratio Perm		0.15			0.27			0.06			0.02	
v/c Ratio		0.19			0.34			0.61			0.20	
Uniform Delay, d1		2.0			2.4			43.4			41.7	
Progression Factor		1.38			0.40			1.00			1.00	
Incremental Delay, d2		0.2			0.3			8.7			0.7	
Delay (s)		3.0			1.3			52.1			42.4	
Level of Service		A			A			D			D	
Approach Delay (s)		3.0			1.3			52.1			42.4	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			6.0			HCM 2000 Level of Service			A			
HCM 2000 Volume to Capacity ratio			0.38									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			44.6%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2010 TWSC
29: 18th Ave & E Madison St

Intersection												
Int Delay, s/veh	1.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↕↕			↕↕			↕↕			↕↕		
Traffic Vol, veh/h	16	360	4	10	766	8	8	10	18	5	8	15
Future Vol, veh/h	16	360	4	10	766	8	8	10	18	5	8	15
Conflicting Peds, #/hr	48	0	27	27	0	48	4	0	7	7	0	4
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-4	-	-	11	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	379	4	11	806	8	8	11	19	5	8	16
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	863	0	0	410	0	0	874	1326	226	1115	1324	459
Stage 1	-	-	-	-	-	-	442	442	-	880	880	-
Stage 2	-	-	-	-	-	-	432	884	-	235	444	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	775	-	-	1145	-	-	244	154	777	163	155	549
Stage 1	-	-	-	-	-	-	564	575	-	308	363	-
Stage 2	-	-	-	-	-	-	572	362	-	747	574	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	773	-	-	1139	-	-	213	137	758	136	137	518
Mov Cap-2 Maneuver	-	-	-	-	-	-	213	137	-	136	137	-
Stage 1	-	-	-	-	-	-	538	548	-	283	337	-
Stage 2	-	-	-	-	-	-	529	337	-	691	547	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.5			0.2			20.6			23.3		
HCM LOS							C			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	268	773	-	-	1139	-	-	226				
HCM Lane V/C Ratio	0.141	0.022	-	-	0.009	-	-	0.13				
HCM Control Delay (s)	20.6	9.8	0.1	-	8.2	0.1	-	23.3				
HCM Lane LOS	C	A	A	-	A	A	-	C				
HCM 95th %tile Q(veh)	0.5	0.1	-	-	0	-	-	0.4				

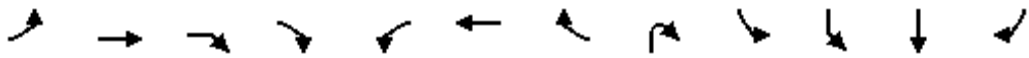
HCM Signalized Intersection Capacity Analysis

30: 19th Ave & E Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	49	333	16	33	692	19	28	158	59	21	72	98
Future Volume (vph)	49	333	16	33	692	19	28	158	59	21	72	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	12	16	12	12	16	12
Grade (%)		-11%			8%			0%			0%	
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			1.00			0.97			0.96	
Flpb, ped/bikes		0.99			1.00			1.00			1.00	
Frt		0.99			1.00			0.97			0.93	
Flt Protected		0.99			1.00			0.99			0.99	
Satd. Flow (prot)		3558			3270			1980			1832	
Flt Permitted		0.79			0.92			0.91			0.88	
Satd. Flow (perm)		2815			3004			1803			1622	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	54	370	18	37	769	21	31	176	66	23	80	109
RTOR Reduction (vph)	0	2	0	0	1	0	0	13	0	0	44	0
Lane Group Flow (vph)	0	440	0	0	826	0	0	260	0	0	168	0
Confl. Peds. (#/hr)	56		48	48		56	32		55	22		32
Confl. Bikes (#/hr)			3			11			24			14
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	4%	4%	4%
Parking (#/hr)									0			0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		72.0			72.0			19.0			19.0	
Effective Green, g (s)		72.0			72.0			19.0			19.0	
Actuated g/C Ratio		0.72			0.72			0.19			0.19	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		0.2			0.2			3.0			3.0	
Lane Grp Cap (vph)		2026			2162			342			308	
v/s Ratio Prot												
v/s Ratio Perm		0.16			0.27			0.14			0.10	
v/c Ratio		0.22			0.38			0.76			0.55	
Uniform Delay, d1		4.6			5.4			38.3			36.6	
Progression Factor		0.52			0.45			1.00			1.00	
Incremental Delay, d2		0.2			0.5			9.6			2.0	
Delay (s)		2.7			3.0			47.9			38.6	
Level of Service		A			A			D			D	
Approach Delay (s)		2.7			3.0			47.9			38.6	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			14.2			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.46									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			9.0			
Intersection Capacity Utilization			65.3%			ICU Level of Service			C			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

31: 20th Ave & E Olive St & E Madison St

												
Movement	EBL	EBT	EBR	EBR2	WBL	WBT	WBR	NBR2	SBL2	SBL	SBT	SBR
Lane Configurations		↔↔				↔↔		↔			↔	
Traffic Volume (vph)	2	366	38	7	15	695	2	23	1	1	2	13
Future Volume (vph)	2	366	38	7	15	695	2	23	1	1	2	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	10	12	12	12	12	13	12
Grade (%)		-8%				3%					0%	
Total Lost time (s)		4.5				4.5		4.0			4.5	
Lane Util. Factor		0.95				0.95		1.00			1.00	
Frpb, ped/bikes		0.99				1.00		0.98			0.95	
Flpb, ped/bikes		1.00				1.00		1.00			0.99	
Frt		0.98				1.00		0.86			0.90	
Flt Protected		1.00				1.00		1.00			0.99	
Satd. Flow (prot)		3608				3277		1431			1631	
Flt Permitted		0.95				0.94		1.00			0.99	
Satd. Flow (perm)		3441				3089		1431			1631	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	2	407	42	8	17	772	2	26	1	1	2	14
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	0	0	14	0
Lane Group Flow (vph)	0	458	0	0	0	791	0	26	0	0	4	0
Confl. Peds. (#/hr)	37			34	37		15	6	6	34		37
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Parking (#/hr)			0					0				0
Turn Type	Perm	NA			Perm	NA		Free	Perm	Perm	NA	
Protected Phases		2				2					4	
Permitted Phases	2				2			Free	4	4		
Actuated Green, G (s)		79.5				79.5		100.0			2.8	
Effective Green, g (s)		79.5				79.5		100.0			2.8	
Actuated g/C Ratio		0.80				0.80		1.00			0.03	
Clearance Time (s)		4.5				4.5					4.5	
Vehicle Extension (s)		0.2				0.2					2.0	
Lane Grp Cap (vph)		2735				2455		1431			45	
v/s Ratio Prot												
v/s Ratio Perm		0.13				c0.26		c0.02			0.00	
v/c Ratio		0.17				0.32		0.02			0.10	
Uniform Delay, d1		2.4				2.8		0.0			47.4	
Progression Factor		0.65				0.24		1.00			1.00	
Incremental Delay, d2		0.1				0.3		0.0			0.3	
Delay (s)		1.7				1.0		0.0			47.7	
Level of Service		A				A		A			D	
Approach Delay (s)		1.7				1.0					47.7	
Approach LOS		A				A					D	
Intersection Summary												
HCM 2000 Control Delay			3.3									
HCM 2000 Volume to Capacity ratio			0.30									
Actuated Cycle Length (s)			100.0								13.5	
Intersection Capacity Utilization			61.8%								B	
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

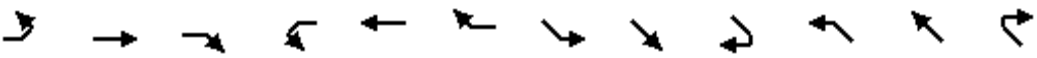
31: 20th Ave & E Olive St & E Madison St



Movement	NWL	NWR	NWR2
Lane Configurations			
Traffic Volume (vph)	26	3	10
Future Volume (vph)	26	3	10
Ideal Flow (vphpl)	1900	1900	1900
Lane Width	16	12	12
Grade (%)	0%		
Total Lost time (s)	4.5		
Lane Util. Factor	1.00		
Frpb, ped/bikes	0.98		
Flpb, ped/bikes	1.00		
Frt	0.96		
Flt Protected	0.97		
Satd. Flow (prot)	1924		
Flt Permitted	0.97		
Satd. Flow (perm)	1924		
Peak-hour factor, PHF	0.90	0.90	0.90
Adj. Flow (vph)	29	3	11
RTOR Reduction (vph)	41	0	0
Lane Group Flow (vph)	2	0	0
Confl. Peds. (#/hr)	6		9
Heavy Vehicles (%)	1%	1%	1%
Parking (#/hr)		0	0
Turn Type	Prot		
Protected Phases	1		
Permitted Phases			
Actuated Green, G (s)	4.2		
Effective Green, g (s)	4.2		
Actuated g/C Ratio	0.04		
Clearance Time (s)	4.5		
Vehicle Extension (s)	2.0		
Lane Grp Cap (vph)	80		
v/s Ratio Prot	0.00		
v/s Ratio Perm			
v/c Ratio	0.02		
Uniform Delay, d1	45.9		
Progression Factor	1.00		
Incremental Delay, d2	0.0		
Delay (s)	46.0		
Level of Service	D		
Approach Delay (s)	46.0		
Approach LOS	D		
Intersection Summary			

HCM Signalized Intersection Capacity Analysis

32: 22nd Ave/E Denny Way & E Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↔↔			↔↔			↔			↔	
Traffic Volume (vph)	2	333	17	23	682	9	6	4	6	21	16	76
Future Volume (vph)	2	333	17	23	682	9	6	4	6	21	16	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	12	10	12	12	12	12	12	11	12
Grade (%)		-3%			1%			0%			0%	
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			1.00			0.98			0.91	
Flpb, ped/bikes		1.00			1.00			0.97			0.99	
Frt		0.99			1.00			0.95			0.91	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		3696			3296			1696			1475	
Flt Permitted		0.95			0.94			0.80			0.93	
Satd. Flow (perm)		3524			3089			1378			1387	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	2	354	18	24	726	10	6	4	6	22	17	81
RTOR Reduction (vph)	0	2	0	0	0	0	0	5	0	0	74	0
Lane Group Flow (vph)	0	372	0	0	760	0	0	11	0	0	46	0
Confl. Peds. (#/hr)	25		41	41		25	68		19	19		68
Confl. Bikes (#/hr)			4			10			1			7
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	2%	2%	2%
Parking (#/hr)			0			0			0			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		82.5			82.5			8.5			8.5	
Effective Green, g (s)		82.5			82.5			8.5			8.5	
Actuated g/C Ratio		0.82			0.82			0.08			0.08	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		0.2			0.2			1.0			1.0	
Lane Grp Cap (vph)		2907			2548			117			117	
v/s Ratio Prot												
v/s Ratio Perm		0.11			0.25			0.01			0.03	
v/c Ratio		0.13			0.30			0.09			0.39	
Uniform Delay, d1		1.7			2.0			42.2			43.3	
Progression Factor		0.27			2.69			1.00			1.00	
Incremental Delay, d2		0.1			0.3			0.1			0.8	
Delay (s)		0.5			5.7			42.3			44.1	
Level of Service		A			A			D			D	
Approach Delay (s)		0.5			5.7			42.3			44.1	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			8.3									
HCM 2000 Volume to Capacity ratio			0.31									
Actuated Cycle Length (s)			100.0									
Intersection Capacity Utilization			59.4%									
Analysis Period (min)			15									
HCM 2000 Level of Service								A				
Sum of lost time (s)								9.0				
ICU Level of Service								B				

HCM 2010 TWSC
33: E Madison St & 22nd ave

Intersection

Int Delay, s/veh 0.3

Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	1	9	17	400	697	7
Future Vol, veh/h	1	9	17	400	697	7
Conflicting Peds, #/hr	10	5	44	0	0	44
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	-	-	-1	5	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	10	18	435	758	8

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1069	432	809	0	-	0
Stage 1	805	-	-	-	-	-
Stage 2	264	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	216	572	812	-	-	-
Stage 1	400	-	-	-	-	-
Stage 2	756	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	197	552	809	-	-	-
Mov Cap-2 Maneuver	197	-	-	-	-	-
Stage 1	388	-	-	-	-	-
Stage 2	712	-	-	-	-	-

Approach	SB	NE	SW
HCM Control Delay, s	12.9	0.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NEL	NET	SBLn1	SWT	SWR
Capacity (veh/h)	809	-	468	-	-
HCM Lane V/C Ratio	0.023	-	0.023	-	-
HCM Control Delay (s)	9.6	0.1	12.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-

HCM Signalized Intersection Capacity Analysis

34: E Madison St & 23rd Ave E

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		 			 						 	
Traffic Volume (vph)	0	719	55	0	266	268	184	204	20	17	440	15
Future Volume (vph)	0	719	55	0	266	268	184	204	20	17	440	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	9	9	10	10	10	10	16	10	9	10	10
Grade (%)		0%			0%			-5%			10%	
Total Lost time (s)		3.0			3.0		3.0	3.0		3.0	4.5	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	0.95	
Frpb, ped/bikes		0.99			0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.92		1.00	0.99		1.00	1.00	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3165			3039		1693	2123		1528	3120	
Flt Permitted		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		3165			3039		1693	2123		1528	3120	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	790	60	0	292	295	202	224	22	19	484	16
RTOR Reduction (vph)	0	6	0	0	196	0	0	3	0	0	2	0
Lane Group Flow (vph)	0	844	0	0	391	0	202	243	0	19	498	0
Confl. Peds. (#/hr)	5		26	26		5	16		25	25		16
Confl. Bikes (#/hr)						1						2
Heavy Vehicles (%)	2%	1%	1%	1%	1%	2%	2%	2%	2%	1%	2%	1%
Parking (#/hr)			0									0
Turn Type		NA			NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)		29.3			29.3		14.3	53.7		3.0	42.4	
Effective Green, g (s)		31.3			31.3		15.8	55.2		4.5	42.4	
Actuated g/C Ratio		0.31			0.31		0.16	0.55		0.04	0.42	
Clearance Time (s)		5.0			5.0		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		0.2			0.2		3.0	0.2		2.0	3.0	
Lane Grp Cap (vph)		990			951		267	1171		68	1322	
v/s Ratio Prot		c0.27			0.13		c0.12	0.11		0.01	c0.16	
v/s Ratio Perm												
v/c Ratio		0.85			0.41		0.76	0.21		0.28	0.38	
Uniform Delay, d1		32.2			27.1		40.3	11.3		46.2	19.7	
Progression Factor		1.00			1.00		0.84	1.10		1.00	1.03	
Incremental Delay, d2		6.9			0.1		11.5	0.4		0.7	0.7	
Delay (s)		39.1			27.2		45.3	12.9		46.9	20.9	
Level of Service		D			C		D	B		D	C	
Approach Delay (s)		39.1			27.2			27.5			21.9	
Approach LOS		D			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			30.3				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)			10.5		
Intersection Capacity Utilization			58.2%				ICU Level of Service			B		
Analysis Period (min)			15									

35: E Madison St & E JOHN ST

Synchro 9 Report
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HCM 2010 TWSC
36: E Madison St & 25th/25th Ave

Intersection												
Int Delay, s/veh	2.1											
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	15	26	7	7	5	8	13	322	1	2	624	16
Future Vol, veh/h	15	26	7	7	5	8	13	322	1	2	624	16
Conflicting Peds, #/hr	7	0	4	4	0	7	16	0	10	10	0	16
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	2	-	-	1	-	-	-10	-	-	14	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	2	2	2	2	2	2
Mvmt Flow	17	29	8	8	6	9	14	358	1	2	693	18
Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	1118	1129	372	1133	1121	725	727	0	0	369	0	0
Stage 1	397	397	-	723	723	-	-	-	-	-	-	-
Stage 2	721	732	-	410	398	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.9	6.4	7.3	6.7	6.3	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.5	5.9	-	6.3	5.7	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.9	-	6.3	5.7	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	164	181	665	171	195	420	876	-	-	1190	-	-
Stage 1	605	581	-	404	417	-	-	-	-	-	-	-
Stage 2	389	396	-	609	593	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	152	173	657	142	186	411	869	-	-	1185	-	-
Mov Cap-2 Maneuver	152	173	-	142	186	-	-	-	-	-	-	-
Stage 1	588	565	-	391	410	-	-	-	-	-	-	-
Stage 2	371	390	-	557	576	-	-	-	-	-	-	-
Approach	NB			SB			NE			SW		
HCM Control Delay, s	32.2			24.3			0.4			0		
HCM LOS	D			C								
Minor Lane/Major Mvmt	NEL	NET	NER	NBLn1	SBLn1	SWL	SWT	SWR				
Capacity (veh/h)	869	-	-	185	209	1185	-	-				
HCM Lane V/C Ratio	0.017	-	-	0.288	0.106	0.002	-	-				
HCM Control Delay (s)	9.2	0	-	32.2	24.3	8	0	-				
HCM Lane LOS	A	A	-	D	C	A	A	-				
HCM 95th %tile Q(veh)	0.1	-	-	1.1	0.4	0	-	-				

HCM 2010 TWSC
37: E Madison St & 26th Ave

Intersection						
Int Delay, s/veh	0.2					
Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	2	9	6	338	627	6
Future Vol, veh/h	2	9	6	338	627	6
Conflicting Peds, #/hr	0	0	10	0	0	10
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	-14	10	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	2	2	2	2
Mvmt Flow	2	10	7	367	682	7
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1075	695	698	0	-	0
Stage 1	695	-	-	-	-	-
Stage 2	380	-	-	-	-	-
Critical Hdwy	6.5	5.9	4.12	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	238	472	898	-	-	-
Stage 1	489	-	-	-	-	-
Stage 2	688	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	234	468	898	-	-	-
Mov Cap-2 Maneuver	234	-	-	-	-	-
Stage 1	480	-	-	-	-	-
Stage 2	681	-	-	-	-	-
Approach	SE	NE		SW		
HCM Control Delay, s	14.4	0.2		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NEL	NET	SELn1	SWT	SWR	
Capacity (veh/h)	898	-	396	-	-	
HCM Lane V/C Ratio	0.007	-	0.03	-	-	
HCM Control Delay (s)	9	0	14.4	-	-	
HCM Lane LOS	A	A	B	-	-	
HCM 95th %tile Q(veh)	0	-	0.1	-	-	

HCM 2010 TWSC
38: E Madison St & 27th

Intersection

Int Delay, s/veh 1.4

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	43	27	330	13	8	575
Future Vol, veh/h	43	27	330	13	8	575
Conflicting Peds, #/hr	4	0	0	19	19	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	-10	-	-	8
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	46	29	351	14	9	612

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1010	377	0	0	384	0
Stage 1	377	-	-	-	-	-
Stage 2	633	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.12	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.218	-
Pot Cap-1 Maneuver	268	674	-	-	1174	-
Stage 1	698	-	-	-	-	-
Stage 2	533	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	261	663	-	-	1174	-
Mov Cap-2 Maneuver	261	-	-	-	-	-
Stage 1	687	-	-	-	-	-
Stage 2	527	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	18.5	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NET	NERNWLn1	SWL	SWT
Capacity (veh/h)	-	-	341	1174
HCM Lane V/C Ratio	-	-	0.218	0.007
HCM Control Delay (s)	-	-	18.5	8.1
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	0.8	0

HCM 2010 TWSC
39: E Madison St & 27th Ave E

Intersection						
Int Delay, s/veh	0.4					
Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	0	14	23	334	569	9
Future Vol, veh/h	0	14	23	334	569	9
Conflicting Peds, #/hr	2	0	23	0	0	23
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	-8	4	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	0	15	24	355	605	10
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1039	633	638	0	-	0
Stage 1	633	-	-	-	-	-
Stage 2	406	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.13	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.227	-	-	-
Pot Cap-1 Maneuver	258	483	941	-	-	-
Stage 1	533	-	-	-	-	-
Stage 2	677	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	242	474	941	-	-	-
Mov Cap-2 Maneuver	372	-	-	-	-	-
Stage 1	523	-	-	-	-	-
Stage 2	647	-	-	-	-	-
Approach	SE	NE		SW		
HCM Control Delay, s	12.8	0.6		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NEL	NET	SELn1	SWT	SWR	
Capacity (veh/h)	941	-	474	-	-	
HCM Lane V/C Ratio	0.026	-	0.031	-	-	
HCM Control Delay (s)	8.9	-	12.8	-	-	
HCM Lane LOS	A	-	B	-	-	
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-	

HCM Signalized Intersection Capacity Analysis

40: E Madison St & MLK Jr Way E/28th Ave E

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	167	106	218	38	118	17	2	290	43	90	406	12
Future Volume (vph)	167	106	218	38	118	17	2	290	43	90	406	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	9	16	10	9	16	10
Grade (%)		2%			-1%			-4%			2%	
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.96			0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes		0.98			1.00		0.98	1.00		0.96	1.00	
Frt		0.94			0.99		1.00	0.98		1.00	1.00	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1599			1835		1569	2061		1477	2035	
Flt Permitted		0.80			0.84		0.38	1.00		0.46	1.00	
Satd. Flow (perm)		1300			1560		628	2061		716	2035	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	180	114	234	41	127	18	2	312	46	97	437	13
RTOR Reduction (vph)	0	0	0	0	0	0	0	4	0	0	1	0
Lane Group Flow (vph)	0	528	0	0	186	0	2	355	0	97	450	0
Confl. Peds. (#/hr)	38		20	20		38	25		34	34		25
Confl. Bikes (#/hr)			17			6			2			6
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	3%	3%	3%	4%	4%	4%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4			4			2			2		
Actuated Green, G (s)		41.0			41.0		50.0	50.0		50.0	50.0	
Effective Green, g (s)		41.0			41.0		50.0	50.0		50.0	50.0	
Actuated g/C Ratio		0.41			0.41		0.50	0.50		0.50	0.50	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		2.0			2.0		0.2	0.2		0.2	0.2	
Lane Grp Cap (vph)		533			639		314	1030		358	1017	
v/s Ratio Prot								0.17			c0.22	
v/s Ratio Perm		c0.41			0.12		0.00			0.14		
v/c Ratio		0.99			0.29		0.01	0.34		0.27	0.44	
Uniform Delay, d1		29.3			19.8		12.5	15.1		14.5	16.0	
Progression Factor		1.00			1.00		0.88	0.81		1.00	1.00	
Incremental Delay, d2		36.4			0.1		0.0	0.9		1.9	1.4	
Delay (s)		65.7			19.9		11.1	13.1		16.3	17.4	
Level of Service		E			B		B	B		B	B	
Approach Delay (s)		65.7			19.9			13.1			17.2	
Approach LOS		E			B			B			B	
Intersection Summary												
HCM 2000 Control Delay			32.4									HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			100.0							12.5		
Intersection Capacity Utilization			82.9%									ICU Level of Service E
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

41: 1st Ave & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑						↑↑↑			↑↑	
Traffic Volume (vph)	34	182	31	0	0	0	0	638	94	64	368	0
Future Volume (vph)	34	182	31	0	0	0	0	638	94	64	368	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	12	10	12	12	12	10	10	10	10	10	10
Grade (%)		9%			0%			3%			0%	
Total Lost time (s)		4.5						4.5			4.5	
Lane Util. Factor		0.95						0.91			0.95	
Frpb, ped/bikes		0.98						0.96			1.00	
Flpb, ped/bikes		0.99						1.00			0.99	
Frt		0.98						0.98			1.00	
Flt Protected		0.99						1.00			0.99	
Satd. Flow (prot)		2921						3799			2746	
Flt Permitted		0.99						1.00			0.75	
Satd. Flow (perm)		2921						3799			2071	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	198	34	0	0	0	0	693	102	70	400	0
RTOR Reduction (vph)	0	12	0	0	0	0	0	22	0	0	0	0
Lane Group Flow (vph)	0	257	0	0	0	0	0	773	0	0	470	0
Confl. Peds. (#/hr)	40		78	78		40	256		247	247		256
Confl. Bikes (#/hr)			1			5			12			28
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	6%	6%	6%	8%	8%	8%
Turn Type	Perm	NA						NA		Perm	NA	
Protected Phases		2						1			1	
Permitted Phases	2	2							1			
Actuated Green, G (s)		28.5						52.5			52.5	
Effective Green, g (s)		28.5						52.5			52.5	
Actuated g/C Ratio		0.32						0.58			0.58	
Clearance Time (s)		4.5						4.5			4.5	
Lane Grp Cap (vph)		924						2216			1208	
v/s Ratio Prot								0.20				
v/s Ratio Perm		0.09									c0.23	
v/c Ratio		0.28						0.35			0.39	
Uniform Delay, d1		23.0						9.8			10.1	
Progression Factor		1.00						0.57			1.00	
Incremental Delay, d2		0.7						0.4			0.9	
Delay (s)		23.8						6.0			11.1	
Level of Service		C						A			B	
Approach Delay (s)		23.8			0.0			6.0			11.1	
Approach LOS		C			A			A			B	
Intersection Summary												
HCM 2000 Control Delay		10.7						HCM 2000 Level of Service		B		
HCM 2000 Volume to Capacity ratio		0.35										
Actuated Cycle Length (s)		90.0						Sum of lost time (s)		9.0		
Intersection Capacity Utilization		56.7%						ICU Level of Service		B		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

42: 2nd Ave & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	243	51	0	0	0	0	0	0	280	1040	0
Future Volume (vph)	0	243	51	0	0	0	0	0	0	280	1040	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	10	10	10	10	10	10	10
Grade (%)		12%			0%			0%			0%	
Total Lost time (s)		4.0								4.0	4.0	
Lane Util. Factor		0.95								1.00	0.95	
Frpb, ped/bikes		0.96								1.00	1.00	
Flpb, ped/bikes		1.00								1.00	1.00	
Frt		0.97								1.00	1.00	
Flt Protected		1.00								0.95	1.00	
Satd. Flow (prot)		2588								1182	2163	
Flt Permitted		1.00								0.95	1.00	
Satd. Flow (perm)		2588								1182	2163	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	264	55	0	0	0	0	0	0	295	1095	0
RTOR Reduction (vph)	0	19	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	300	0	0	0	0	0	0	0	295	1095	0
Confl. Peds. (#/hr)	118		150	150		118	330		393	393		330
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	2%	2%	9%	9%	9%
Parking (#/hr)										10	69	69
Turn Type		NA								Prot	NA	
Protected Phases		2								3	1 4	
Permitted Phases												
Actuated Green, G (s)		19.5								24.5	61.5	
Effective Green, g (s)		20.0								25.0	62.0	
Actuated g/C Ratio		0.22								0.28	0.69	
Clearance Time (s)		4.5								4.5		
Lane Grp Cap (vph)		575								328	1490	
v/s Ratio Prot		c0.12								c0.25	c0.51	
v/s Ratio Perm												
v/c Ratio		0.52								0.90	0.73	
Uniform Delay, d1		30.8								31.3	8.8	
Progression Factor		0.69								1.00	1.00	
Incremental Delay, d2		3.2								29.6	3.3	
Delay (s)		24.6								60.9	12.1	
Level of Service		C								E	B	
Approach Delay (s)		24.6			0.0			0.0			22.4	
Approach LOS		C			A			A			C	
Intersection Summary												
HCM 2000 Control Delay			22.9				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			11.5		
Intersection Capacity Utilization			53.6%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

43: 3rd Ave & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	410	66	0	0	0	0	80	30	13	133	0
Future Volume (vph)	5	410	66	0	0	0	0	80	30	13	133	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	12	12	12	11	12	12	11	12
Grade (%)		10%			-10%			0%			0%	
Total Lost time (s)		4.0						4.0			4.0	
Lane Util. Factor		0.95						0.95			0.95	
Frpb, ped/bikes		0.96						0.89			1.00	
Flpb, ped/bikes		1.00						1.00			0.97	
Frt		0.98						0.96			1.00	
Flt Protected		1.00						1.00			1.00	
Satd. Flow (prot)		2403						1449			1565	
Flt Permitted		1.00						1.00			0.93	
Satd. Flow (perm)		2403						1449			1468	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.89	0.89	0.89	0.85	0.85	0.85
Adj. Flow (vph)	5	446	72	0	0	0	0	90	34	15	156	0
RTOR Reduction (vph)	0	14	0	0	0	0	0	5	0	0	0	0
Lane Group Flow (vph)	0	509	0	0	0	0	0	119	0	0	171	0
Confl. Peds. (#/hr)	351		235	235		351	699		388	388		699
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	85%	7%	50%	84%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	60	0	0	34	0
Parking (#/hr)		15										
Turn Type	Perm	NA						NA		Perm		NA
Protected Phases		2						1				1
Permitted Phases	2									1		
Actuated Green, G (s)		25.5						55.5				55.5
Effective Green, g (s)		26.0						56.0				56.0
Actuated g/C Ratio		0.29						0.62				0.62
Clearance Time (s)		4.5						4.5				4.5
Lane Grp Cap (vph)		694						901				913
v/s Ratio Prot								0.08				
v/s Ratio Perm		0.21										c0.12
v/c Ratio		0.73						0.13				0.19
Uniform Delay, d1		28.9						7.0				7.3
Progression Factor		0.28						2.57				1.00
Incremental Delay, d2		4.6						0.3				0.5
Delay (s)		12.6						18.3				7.7
Level of Service		B						B				A
Approach Delay (s)		12.6			0.0			18.3				7.7
Approach LOS		B			A			B				A
Intersection Summary												
HCM 2000 Control Delay		12.5			HCM 2000 Level of Service					B		
HCM 2000 Volume to Capacity ratio		0.36										
Actuated Cycle Length (s)		90.0			Sum of lost time (s)					8.0		
Intersection Capacity Utilization		38.7%			ICU Level of Service					A		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

44: 4th Ave & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑						↑↑↑	↑			
Traffic Volume (vph)	104	312	0	0	0	0	0	1434	134	0	0	0
Future Volume (vph)	104	312	0	0	0	0	0	1434	134	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	12	12	12	10	12	12	12	12
Grade (%)		15%			-5%			5%			0%	
Total Lost time (s)		4.5						5.5	5.5			
Lane Util. Factor		0.95						0.91	1.00			
Frpb, ped/bikes		1.00						1.00	0.60			
Flpb, ped/bikes		0.92						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		0.99						1.00	1.00			
Satd. Flow (prot)		2280						3604	816			
Flt Permitted		0.99						1.00	1.00			
Satd. Flow (perm)		2280						3604	816			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	113	339	0	0	0	0	0	1559	146	0	0	0
RTOR Reduction (vph)	0	14	0	0	0	0	0	0	6	0	0	0
Lane Group Flow (vph)	0	438	0	0	0	0	0	1559	140	0	0	0
Confl. Peds. (#/hr)	254		241	241		254	472		448	448		472
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	11%	5%	2%	2%	2%
Parking (#/hr)		15						15				
Turn Type	Perm	NA						NA	Perm			
Protected Phases		2						1				
Permitted Phases	2								1			
Actuated Green, G (s)		21.5						59.5	59.5			
Effective Green, g (s)		21.5						58.5	58.5			
Actuated g/C Ratio		0.24						0.65	0.65			
Clearance Time (s)		4.5						4.5	4.5			
Lane Grp Cap (vph)		544						2342	530			
v/s Ratio Prot								c0.43				
v/s Ratio Perm		0.19							0.17			
v/c Ratio		0.81						0.67	0.26			
Uniform Delay, d1		32.3						9.7	6.7			
Progression Factor		1.40						0.62	0.51			
Incremental Delay, d2		9.0						0.9	0.7			
Delay (s)		54.1						7.0	4.1			
Level of Service		D						A	A			
Approach Delay (s)		54.1			0.0			6.7			0.0	
Approach LOS		D			A			A			A	
Intersection Summary												
HCM 2000 Control Delay		16.7						HCM 2000 Level of Service	B			
HCM 2000 Volume to Capacity ratio		0.70										
Actuated Cycle Length (s)		90.0						Sum of lost time (s)	10.0			
Intersection Capacity Utilization		55.3%						ICU Level of Service	B			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

45: 5th Ave & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑									↑↑↑	
Traffic Volume (vph)	0	350	55	0	0	0	0	0	0	458	635	0
Future Volume (vph)	0	350	55	0	0	0	0	0	0	458	635	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	12	12	12	12	12	10	10	12
Grade (%)		15%			-5%			0%			0%	
Total Lost time (s)		3.5									3.5	
Lane Util. Factor		0.91									0.91	
Frpb, ped/bikes		0.98									1.00	
Flpb, ped/bikes		1.00									0.92	
Frt		0.98									1.00	
Flt Protected		1.00									0.98	
Satd. Flow (prot)		3353									3788	
Flt Permitted		1.00									0.98	
Satd. Flow (perm)		3353									3788	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	380	60	0	0	0	0	0	0	498	690	0
RTOR Reduction (vph)	0	24	0	0	0	0	0	0	0	0	32	0
Lane Group Flow (vph)	0	416	0	0	0	0	0	0	0	0	1156	0
Confl. Peds. (#/hr)	195		68	68		195	312		104	104		312
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	2%	2%	2%	4%	4%	4%
Parking (#/hr)		30										
Turn Type		NA								pm+pt	NA	
Protected Phases		2								3	1	
Permitted Phases										1		
Actuated Green, G (s)		33.0									47.0	
Effective Green, g (s)		34.5									48.5	
Actuated g/C Ratio		0.38									0.54	
Clearance Time (s)		5.0									5.0	
Lane Grp Cap (vph)		1285									2041	
v/s Ratio Prot		c0.12									c0.17	
v/s Ratio Perm											0.13	
v/c Ratio		0.32									0.57	
Uniform Delay, d1		19.5									13.8	
Progression Factor		1.27									1.00	
Incremental Delay, d2		0.5									1.1	
Delay (s)		25.2									14.9	
Level of Service		C									B	
Approach Delay (s)		25.2			0.0			0.0			14.9	
Approach LOS		C			A			A			B	
Intersection Summary												
HCM 2000 Control Delay			17.7				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.48									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			10.0		
Intersection Capacity Utilization			54.0%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

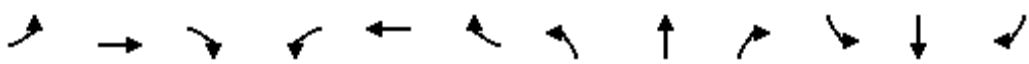
HCM Signalized Intersection Capacity Analysis

46: 6th Ave & I-5 CD SB On-Ramp & Spring St

						
Movement	EBL	EBT	EBR	NBT	NBR	NBR2
Lane Configurations		↑↑	↑	↑↑	↑	↑
Traffic Volume (vph)	119	183	487	473	7	538
Future Volume (vph)	119	183	487	473	7	538
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	10	11	10	11	12
Grade (%)		10%		5%		
Total Lost time (s)		4.5	4.5	4.5	4.5	
Lane Util. Factor		0.95	1.00	0.95	1.00	
Frpb, ped/bikes		1.00	0.97	1.00	0.88	
Flpb, ped/bikes		0.87	1.00	1.00	1.00	
Frt		1.00	0.85	1.00	0.85	
Flt Protected		0.98	1.00	1.00	1.00	
Satd. Flow (prot)		2147	1256	2927	1187	
Flt Permitted		0.98	1.00	1.00	1.00	
Satd. Flow (perm)		2147	1256	2927	1187	
Peak-hour factor, PHF	0.94	0.94	0.94	0.95	0.95	0.95
Adj. Flow (vph)	127	195	518	498	7	566
RTOR Reduction (vph)	0	46	0	0	0	0
Lane Group Flow (vph)	0	276	518	498	573	0
Confl. Peds. (#/hr)	292		4		34	4
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%
Bus Blockages (#/hr)	0	5	0	0	0	0
Parking (#/hr)		15				
Turn Type	Perm	NA	Perm	NA	Perm	
Protected Phases		4		2		
Permitted Phases	4		4		2	
Actuated Green, G (s)		38.5	38.5	42.5	42.5	
Effective Green, g (s)		38.5	38.5	42.5	42.5	
Actuated g/C Ratio		0.43	0.43	0.47	0.47	
Clearance Time (s)		4.5	4.5	4.5	4.5	
Lane Grp Cap (vph)		918	537	1382	560	
v/s Ratio Prot				0.17		
v/s Ratio Perm		0.13	c0.41		c0.48	
v/c Ratio		0.30	0.96	0.36	1.02	
Uniform Delay, d1		16.9	25.1	15.1	23.8	
Progression Factor		0.47	1.27	1.15	1.04	
Incremental Delay, d2		0.8	28.8	0.5	37.8	
Delay (s)		8.8	60.6	17.8	62.4	
Level of Service		A	E	B	E	
Approach Delay (s)		40.8		41.7		
Approach LOS		D		D		
Intersection Summary						
HCM 2000 Control Delay			41.3		HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.99			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	9.0
Intersection Capacity Utilization			81.9%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

47: 7th Ave/Hubbell PI & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕						↕			↕	
Traffic Volume (vph)	40	143	7	0	0	0	0	369	52	10	161	0
Future Volume (vph)	40	143	7	0	0	0	0	369	52	10	161	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5						4.5			4.5	
Lane Util. Factor		0.95						1.00			1.00	
Frpb, ped/bikes		1.00						0.99			1.00	
Flpb, ped/bikes		0.94						1.00			1.00	
Frt		0.99						0.98			1.00	
Flt Protected		0.99						1.00			1.00	
Satd. Flow (prot)		2923						1628			1668	
Flt Permitted		0.99						1.00			0.97	
Satd. Flow (perm)		2923						1628			1629	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	155	8	0	0	0	0	401	57	11	175	0
RTOR Reduction (vph)	0	5	0	0	0	0	0	9	0	0	0	0
Lane Group Flow (vph)	0	201	0	0	0	0	0	449	0	0	186	0
Confl. Peds. (#/hr)	145		22	22		145	3		74	74		3
Turn Type	Perm	NA						NA		Perm	NA	
Protected Phases		4						2			2	
Permitted Phases	4									2		
Actuated Green, G (s)		18.5						32.5			32.5	
Effective Green, g (s)		18.5						32.5			32.5	
Actuated g/C Ratio		0.31						0.54			0.54	
Clearance Time (s)		4.5						4.5			4.5	
Lane Grp Cap (vph)		901						881			882	
v/s Ratio Prot								c0.28				
v/s Ratio Perm		0.07									0.11	
v/c Ratio		0.22						0.51			0.21	
Uniform Delay, d1		15.4						8.7			7.1	
Progression Factor		1.00						1.00			1.00	
Incremental Delay, d2		0.6						2.1			0.5	
Delay (s)		16.0						10.8			7.7	
Level of Service		B						B			A	
Approach Delay (s)		16.0			0.0			10.8			7.7	
Approach LOS		B			A			B			A	
Intersection Summary												
HCM 2000 Control Delay		11.4						HCM 2000 Level of Service		B		
HCM 2000 Volume to Capacity ratio		0.41										
Actuated Cycle Length (s)		60.0						Sum of lost time (s)		9.0		
Intersection Capacity Utilization		46.1%						ICU Level of Service		A		
Analysis Period (min)		15										
c Critical Lane Group												

HCM 2010 TWSC
48: 8th Ave & Spring St

Intersection												
Int Delay, s/veh	4.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	52	97	41	0	0	0	0	210	16	18	64	0
Future Vol, veh/h	52	97	41	0	0	0	0	210	16	18	64	0
Conflicting Peds, #/hr	116	0	65	0	0	0	115	0	104	104	0	115
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	57	105	45	0	0	0	0	228	17	20	70	0
Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	462	459	135				-	0	0	350	0	0
Stage 1	109	109	-				-	-	-	-	-	-
Stage 2	353	350	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	558	499	914				0	-	-	1209	-	0
Stage 1	916	805	-				0	-	-	-	-	0
Stage 2	711	633	-				0	-	-	-	-	0
Platoon blocked, %								-	-			
Mov Cap-1 Maneuver	547	0	864				-	-	-	1092	-	-
Mov Cap-2 Maneuver	547	0	-				-	-	-	-	-	-
Stage 1	899	0	-				-	-	-	-	-	-
Stage 2	711	0	-				-	-	-	-	-	-
Approach	EB						NB			SB		
HCM Control Delay, s	11.6						0			1.8		
HCM LOS	B											
Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT						
Capacity (veh/h)	-	-	547	864	1092	-						
HCM Lane V/C Ratio	-	-	0.2	0.113	0.018	-						
HCM Control Delay (s)	-	-	13.2	9.7	8.4	0						
HCM Lane LOS	-	-	B	A	A	A						
HCM 95th %tile Q(veh)	-	-	0.7	0.4	0.1	-						

HCM 2010 TWSC
49: 9th Ave & Spring St

Intersection												
Int Delay, s/veh	4.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗		↕			↗			↕	
Traffic Vol, veh/h	50	43	42	6	0	32	0	172	4	7	93	0
Future Vol, veh/h	50	43	42	6	0	32	0	172	4	7	93	0
Conflicting Peds, #/hr	209	0	58	58	0	209	104	0	111	111	0	104
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	54	47	46	7	0	35	0	187	4	8	101	0
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	532	418	159	498	416	509	-	0	0	302	0	0
Stage 1	116	116	-	300	300	-	-	-	-	-	-	-
Stage 2	416	302	-	198	116	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	458	526	886	483	527	564	0	-	-	1259	-	0
Stage 1	889	800	-	709	666	-	0	-	-	-	-	0
Stage 2	614	664	-	804	800	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	345	474	843	363	474	423	-	-	-	1040	-	-
Mov Cap-2 Maneuver	345	474	-	363	474	-	-	-	-	-	-	-
Stage 1	889	794	-	709	604	-	-	-	-	-	-	-
Stage 2	465	603	-	676	794	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	11.5			14.7			0			0.6		
HCM LOS	B			B								
Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT					
Capacity (veh/h)	-	-	474	843	412	1040	-					
HCM Lane V/C Ratio	-	-	0.099	0.054	0.1	0.007	-					
HCM Control Delay (s)	-	-	13.4	9.5	14.7	8.5	0					
HCM Lane LOS	-	-	B	A	B	A	A					
HCM 95th %tile Q(veh)	-	-	0.3	0.2	0.3	0	-					

HCM Signalized Intersection Capacity Analysis

50: 14th Ave & Pike St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	71	16	0	61	4	59	165	0	2	86	7
Future Volume (vph)	4	71	16	0	61	4	59	165	0	2	86	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	16	12	12	16	12	12	16	12
Grade (%)		6%			-6%			0%			0%	
Total Lost time (s)	4.5	4.5			4.5			8.5			8.5	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00			0.99			1.00			0.99	
Flpb, ped/bikes	0.83	1.00			1.00			0.97			1.00	
Frt	1.00	0.97			0.99			1.00			0.99	
Flt Protected	0.95	1.00			1.00			0.99			1.00	
Satd. Flow (prot)	1429	1469			2134			2027			1857	
Flt Permitted	0.71	1.00			1.00			0.88			0.99	
Satd. Flow (perm)	1068	1469			2134			1818			1845	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	4	79	18	0	68	4	66	183	0	2	96	8
RTOR Reduction (vph)	0	8	0	0	1	0	0	0	0	0	3	0
Lane Group Flow (vph)	4	89	0	0	71	0	0	249	0	0	103	0
Confl. Peds. (#/hr)	63					63	43		19	19		43
Confl. Bikes (#/hr)			1			4			25			9
Parking (#/hr)		0									0	
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		2			4			3			3	
Permitted Phases	2						3			3		
Actuated Green, G (s)	7.5	7.5			68.1			18.9			18.9	
Effective Green, g (s)	7.5	7.5			68.1			18.9			18.9	
Actuated g/C Ratio	0.08	0.08			0.68			0.19			0.19	
Clearance Time (s)	4.5	4.5			4.5			8.5			8.5	
Vehicle Extension (s)	0.2	0.2			0.2			0.2			0.2	
Lane Grp Cap (vph)	80	110			1453			343			348	
v/s Ratio Prot		c0.06			c0.03							
v/s Ratio Perm	0.00							c0.14			0.06	
v/c Ratio	0.05	0.81			0.05			0.73			0.30	
Uniform Delay, d1	42.9	45.5			5.3			38.1			34.8	
Progression Factor	1.00	1.00			0.00			0.19			1.00	
Incremental Delay, d2	0.1	31.9			0.1			4.6			0.2	
Delay (s)	43.0	77.4			0.1			11.8			35.0	
Level of Service	D	E			A			B			D	
Approach Delay (s)		76.1			0.1			11.8			35.0	
Approach LOS		E			A			B			D	
Intersection Summary												
HCM 2000 Control Delay			27.1									
HCM 2000 Volume to Capacity ratio			0.27									
Actuated Cycle Length (s)			100.0									
Intersection Capacity Utilization			43.6%									
Analysis Period (min)			15									
c Critical Lane Group												

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HCM 2010 Signalized Intersection Summary

1: 1st Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	67	139	106	41	645	0	0	306	93
Future Volume (veh/h)	0	0	0	67	139	106	41	645	0	0	306	93
Number				3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.67	1.00		1.00	1.00		0.90
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1710	1710	1778	1676	1676	0	0	1613	1710
Adj Flow Rate, veh/h				73	151	115	45	701	0	0	333	101
Adj No. of Lanes				1	2	0	1	1	0	0	1	0
Peak Hour Factor				0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %				4	4	4	2	2	0	0	6	6
Cap, veh/h				335	337	200	133	1164	0	0	662	201
Arrive On Green				0.07	0.07	0.07	0.08	0.69	0.00	0.00	0.19	0.19
Sat Flow, veh/h				1629	1639	972	1597	1676	0	0	1157	351
Grp Volume(v), veh/h				73	149	117	45	701	0	0	0	434
Grp Sat Flow(s),veh/h/ln				1629	1625	986	1597	1676	0	0	0	1508
Q Serve(g_s), s				3.8	8.0	10.3	2.4	19.8	0.0	0.0	0.0	23.2
Cycle Q Clear(g_c), s				3.8	8.0	10.3	2.4	19.8	0.0	0.0	0.0	23.2
Prop In Lane				1.00		0.99	1.00		0.00	0.00		0.23
Lane Grp Cap(c), veh/h				335	334	203	133	1164	0	0	0	863
V/C Ratio(X)				0.22	0.45	0.58	0.34	0.60	0.00	0.00	0.00	0.50
Avail Cap(c_a), veh/h				335	334	203	133	1164	0	0	0	863
HCM Platoon Ratio				0.33	0.33	0.33	1.00	1.00	1.00	1.00	0.33	0.33
Upstream Filter(I)				1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh				35.1	37.0	38.1	38.9	7.2	0.0	0.0	0.0	25.0
Incr Delay (d2), s/veh				1.5	4.3	11.4	6.8	2.3	0.0	0.0	0.0	2.1
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				1.9	4.0	3.5	1.3	9.7	0.0	0.0	0.0	10.2
LnGrp Delay(d),s/veh				36.6	41.3	49.5	45.7	9.5	0.0	0.0	0.0	27.1
LnGrp LOS				D	D	D	D	A				C
Approach Vol, veh/h					339			746			434	
Approach Delay, s/veh					43.1			11.7			27.1	
Approach LOS					D			B			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		67.0			11.0	56.0		23.0				
Change Period (Y+Rc), s		4.5			3.5	4.5		4.5				
Max Green Setting (Gmax), s		62.5			7.5	51.5		18.5				
Max Q Clear Time (g_c+I1), s		0.0			4.4	0.0		0.0				
Green Ext Time (p_c), s		0.0			0.0	0.0		0.0				
Intersection Summary												
HCM 2010 Ctrl Delay				23.1								
HCM 2010 LOS				C								

HCM 2010 Signalized Intersection Summary

2: 2nd Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑						↑↑	↑
Traffic Volume (veh/h)	0	0	0	300	293	0	0	0	0	0	950	93
Future Volume (veh/h)	0	0	0	300	293	0	0	0	0	0	950	93
Number				7	4	14				5	2	12
Initial Q (Qb), veh				0	0	0				0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00				1.00		0.90
Parking Bus, Adj				1.00	1.00	1.00				1.00	1.00	0.43
Adj Sat Flow, veh/h/ln				1778	1710	0				0	1555	1555
Adj Flow Rate, veh/h				345	337	0				0	979	96
Adj No. of Lanes				0	2	0				0	2	1
Peak Hour Factor				0.87	0.87	0.87				0.97	0.97	0.97
Percent Heavy Veh, %				4	4	0				0	10	10
Cap, veh/h				551	546	0				0	1674	279
Arrive On Green				0.37	0.37	0.00				0.00	0.19	0.18
Sat Flow, veh/h				1287	1568	0				0	3031	508
Grp Volume(v), veh/h				348	334	0				0	979	96
Grp Sat Flow(s),veh/h/ln				1299	1478	0				0	1477	508
Q Serve(g_s), s				20.9	16.6	0.0				0.0	27.2	14.9
Cycle Q Clear(g_c), s				20.9	16.6	0.0				0.0	27.2	14.9
Prop In Lane				0.99		0.00				0.00		1.00
Lane Grp Cap(c), veh/h				556	542	0				0	1674	279
V/C Ratio(X)				0.63	0.62	0.00				0.00	0.58	0.34
Avail Cap(c_a), veh/h				556	542	0				0	1674	279
HCM Platoon Ratio				1.00	1.00	1.00				1.00	0.33	0.33
Upstream Filter(I)				1.00	1.00	0.00				0.00	1.00	1.00
Uniform Delay (d), s/veh				24.7	23.3	0.0				0.0	26.9	22.7
Incr Delay (d2), s/veh				5.3	5.2	0.0				0.0	1.5	3.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				8.3	7.5	0.0				0.0	11.5	2.4
LnGrp Delay(d),s/veh				29.9	28.5	0.0				0.0	28.4	26.0
LnGrp LOS				C	C						C	C
Approach Vol, veh/h					682						1075	
Approach Delay, s/veh					29.2						28.2	
Approach LOS					C						C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		54.0		36.0								
Change Period (Y+Rc), s		4.5		4.5								
Max Green Setting (Gmax), s		49.5		31.5								
Max Q Clear Time (g_c+I1), s		0.0		0.0								
Green Ext Time (p_c), s		0.0		0.0								
Intersection Summary												
HCM 2010 Ctrl Delay				28.6								
HCM 2010 LOS				C								

HCM Signalized Intersection Capacity Analysis

3: 3rd Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	610	24	0	103	0	0	114	87
Future Volume (vph)	0	0	0	0	610	24	0	103	0	0	114	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	10	12	12	11	12
Grade (%)		10%			-15%			0%			-5%	
Total Lost time (s)					4.0			4.0			4.0	
Lane Util. Factor					0.95			0.95			0.95	
Frpb, ped/bikes					0.99			1.00			0.80	
Flpb, ped/bikes					1.00			1.00			1.00	
Frt					0.99			1.00			0.93	
Flt Protected					1.00			1.00			1.00	
Satd. Flow (prot)					2951			1535			1501	
Flt Permitted					1.00			1.00			1.00	
Satd. Flow (perm)					2951			1535			1501	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	663	26	0	112	0	0	120	92
RTOR Reduction (vph)	0	0	0	0	3	0	0	0	0	0	7	0
Lane Group Flow (vph)	0	0	0	0	686	0	0	112	0	0	205	0
Confl. Peds. (#/hr)	214		308	308		214	577		449	499		577
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	0%	73%	0%	0%	84%	10%
Bus Blockages (#/hr)	0	0	0	0	10	0	0	62	0	0	29	0
Parking (#/hr)					15							
Turn Type					NA			NA			NA	
Protected Phases					2			1			1	
Permitted Phases												
Actuated Green, G (s)					31.5			49.5			49.5	
Effective Green, g (s)					32.0			50.0			50.0	
Actuated g/C Ratio					0.36			0.56			0.56	
Clearance Time (s)					4.5			4.5			4.5	
Lane Grp Cap (vph)					1049			852			833	
v/s Ratio Prot					c0.23			0.07			c0.14	
v/s Ratio Perm												
v/c Ratio					0.65			0.13			0.25	
Uniform Delay, d1					24.3			9.6			10.3	
Progression Factor					0.57			1.00			1.49	
Incremental Delay, d2					1.0			0.3			0.7	
Delay (s)					15.0			9.9			16.0	
Level of Service					B			A			B	
Approach Delay (s)		0.0			15.0			9.9			16.0	
Approach LOS		A			B			A			B	
Intersection Summary												
HCM 2000 Control Delay			14.6									
HCM 2000 Volume to Capacity ratio			0.40									
Actuated Cycle Length (s)			90.0									
Intersection Capacity Utilization			39.1%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: 4th Ave & Madison St



Movement	WBR	NBL	NBT	SWR	SWR2
Lane Configurations					
Traffic Volume (vph)	21	253	1252	500	318
Future Volume (vph)	21	253	1252	500	318
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Lane Width	12	12	10	13	12
Grade (%)			5%		
Total Lost time (s)	3.0		3.5	2.5	
Lane Util. Factor	1.00		0.91	0.88	
Frpb, ped/bikes	1.00		1.00	1.00	
Flpb, ped/bikes	1.00		0.94	1.00	
Frt	0.86		1.00	0.85	
Flt Protected	1.00		0.99	1.00	
Satd. Flow (prot)	1450		3361	2387	
Flt Permitted	1.00		0.99	1.00	
Satd. Flow (perm)	1450		3361	2387	
Peak-hour factor, PHF	0.92	0.98	0.98	0.92	0.92
Adj. Flow (vph)	23	258	1278	543	346
RTOR Reduction (vph)	0	0	31	85	0
Lane Group Flow (vph)	23	0	1505	804	0
Confl. Peds. (#/hr)		342			191
Heavy Vehicles (%)	2%	1%	13%	4%	4%
Bus Blockages (#/hr)	0	0	0	10	0
Parking (#/hr)			15	15	
Turn Type	custom	Perm	NA	Prot	
Protected Phases	1		2	4	
Permitted Phases	2	2			
Actuated Green, G (s)	50.5		48.5	27.5	
Effective Green, g (s)	50.5		49.5	29.5	
Actuated g/C Ratio	0.56		0.55	0.33	
Clearance Time (s)	3.0		4.5	4.5	
Vehicle Extension (s)	0.2		0.2	0.2	
Lane Grp Cap (vph)	861		1848	782	
v/s Ratio Prot	c0.00			c0.34	
v/s Ratio Perm	0.02		0.45		
v/c Ratio	0.03		0.81	1.03	
Uniform Delay, d1	8.8		16.5	30.2	
Progression Factor	1.00		0.92	1.19	
Incremental Delay, d2	0.0		4.1	36.2	
Delay (s)	8.8		19.2	72.3	
Level of Service	A		B	E	
Approach Delay (s)			19.2		
Approach LOS			B		
Intersection Summary					
HCM 2000 Control Delay			38.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.87		
Actuated Cycle Length (s)			90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization			78.5%	ICU Level of Service	D
Analysis Period (min)			15		

HCM Signalized Intersection Capacity Analysis

5: 5th Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑						↑↑↑	
Traffic Volume (vph)	0	0	0	225	650	0	0	0	0	0	413	237
Future Volume (vph)	0	0	0	225	650	0	0	0	0	0	413	237
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	9	12
Grade (%)		10%			-10%			0%			0%	
Total Lost time (s)					4.5						4.5	
Lane Util. Factor					0.95						0.91	
Frpb, ped/bikes					1.00						0.87	
Flpb, ped/bikes					0.94						1.00	
Frt					1.00						0.95	
Flt Protected					0.99						1.00	
Satd. Flow (prot)					2820						3099	
Flt Permitted					0.99						1.00	
Satd. Flow (perm)					2820						3099	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	245	707	0	0	0	0	0	449	258
RTOR Reduction (vph)	0	0	0	0	38	0	0	0	0	0	50	0
Lane Group Flow (vph)	0	0	0	0	914	0	0	0	0	0	657	0
Confl. Peds. (#/hr)	152		157	157		152	369		101	101		369
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	5%	5%	5%
Parking (#/hr)					15						15	
Turn Type				Perm	NA						NA	
Protected Phases					2						1	
Permitted Phases				2								
Actuated Green, G (s)					46.5						34.5	
Effective Green, g (s)					46.5						34.5	
Actuated g/C Ratio					0.52						0.38	
Clearance Time (s)					4.5						4.5	
Lane Grp Cap (vph)					1457						1187	
v/s Ratio Prot											c0.21	
v/s Ratio Perm					0.32							
v/c Ratio					0.63						0.55	
Uniform Delay, d1					15.6						21.7	
Progression Factor					0.58						0.47	
Incremental Delay, d2					1.4						1.6	
Delay (s)					10.5						11.9	
Level of Service					B						B	
Approach Delay (s)		0.0			10.5			0.0			11.9	
Approach LOS		A			B			A			B	
Intersection Summary												
HCM 2000 Control Delay			11.1								HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			90.0								Sum of lost time (s)	9.0
Intersection Capacity Utilization			56.1%								ICU Level of Service	B
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

6: 6th Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↗		↑↑				
Traffic Volume (vph)	0	0	0	0	900	1000	16	81	128	0	0	0
Future Volume (vph)	0	0	0	0	900	1000	16	81	128	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	10	9	12	12	12	12	12	12
Grade (%)		10%			-10%			5%			-5%	
Total Lost time (s)					4.0	4.0		4.0				
Lane Util. Factor					0.91	0.91		0.95				
Frpb, ped/bikes					0.94	0.82		0.98				
Flpb, ped/bikes					1.00	1.00		0.99				
Frt					0.95	0.85		0.91				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					2685	999		2307				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					2685	999		2307				
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.81	0.81	0.81	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	989	1099	20	100	158	0	0	0
RTOR Reduction (vph)	0	0	0	0	53	152	0	135	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	1387	496	0	143	0	0	0	0
Confl. Peds. (#/hr)	101		155	155		101	100		1	1		100
Confl. Bikes (#/hr)			3			26			2			3
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	11%	11%	11%	2%	2%	2%
Parking (#/hr)								15				
Turn Type					NA	Perm	Perm	NA				
Protected Phases					2			1				
Permitted Phases						2	1					
Actuated Green, G (s)					64.5	64.5		16.5				
Effective Green, g (s)					65.0	65.0		17.0				
Actuated g/C Ratio					0.72	0.72		0.19				
Clearance Time (s)					4.5	4.5		4.5				
Lane Grp Cap (vph)					1939	721		435				
v/s Ratio Prot					0.52							
v/s Ratio Perm						0.50		0.06				
v/c Ratio					0.72	0.69		0.33				
Uniform Delay, d1					7.2	6.9		31.6				
Progression Factor					1.00	1.00		1.00				
Incremental Delay, d2					2.3	5.3		2.0				
Delay (s)					9.5	12.2		33.6				
Level of Service					A	B		C				
Approach Delay (s)		0.0			10.3			33.6			0.0	
Approach LOS		A			B			C			A	
Intersection Summary												
HCM 2000 Control Delay			13.1		HCM 2000 Level of Service					B		
HCM 2000 Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					8.0		
Intersection Capacity Utilization			71.0%		ICU Level of Service					C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

7: I-5 CD NB Off-Ramp/7th Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					  							
Traffic Volume (vph)	2	118	0	0	883	9	895	407	338	3	0	150
Future Volume (vph)	2	118	0	0	883	9	895	407	338	3	0	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	10	12	12	12	12	12	12	12
Grade (%)		0%			0%			5%			-5%	
Total Lost time (s)		3.5			3.5		3.5	3.5	3.5	3.5		4.5
Lane Util. Factor		1.00			0.91		0.95	0.95	1.00	1.00		1.00
Frpb, ped/bikes		1.00			1.00		1.00	1.00	0.63	1.00		1.00
Flpb, ped/bikes		1.00			1.00		1.00	1.00	1.00	1.00		1.00
Frt		1.00			1.00		1.00	1.00	0.85	1.00		0.85
Flt Protected		1.00			1.00		0.95	0.98	1.00	0.95		1.00
Satd. Flow (prot)		1164			4251		1475	1524	876	1617		1446
Flt Permitted		0.99			1.00		0.95	0.98	1.00	0.23		1.00
Satd. Flow (perm)		1151			4251		1475	1524	876	383		1446
Peak-hour factor, PHF	0.87	0.87	0.87	0.88	0.88	0.88	0.95	0.95	0.95	0.72	0.72	0.72
Adj. Flow (vph)	2	136	0	0	1003	10	942	428	356	4	0	208
RTOR Reduction (vph)	0	0	0	0	1	0	0	0	25	0	0	7
Lane Group Flow (vph)	0	138	0	0	1012	0	678	692	331	4	0	201
Confl. Peds. (#/hr)	104		274	274		104	2		125	125		2
Confl. Bikes (#/hr)			2			9			22			
Heavy Vehicles (%)	13%	13%	13%	2%	2%	2%	2%	2%	2%	3%	3%	3%
Parking (#/hr)		15										
Turn Type	Perm	NA			NA		Split	NA	Perm	D.Pm		Prot
Protected Phases		1			1		2!	2				2!
Permitted Phases	1								2	2		
Actuated Green, G (s)		33.4			33.4		57.6	57.6	57.6	57.6		57.6
Effective Green, g (s)		34.4			34.4		58.6	58.6	58.6	58.6		57.6
Actuated g/C Ratio		0.34			0.34		0.59	0.59	0.59	0.59		0.58
Clearance Time (s)		4.5			4.5		4.5	4.5	4.5	4.5		4.5
Vehicle Extension (s)		3.0			3.0		5.0	5.0	5.0	5.0		5.0
Lane Grp Cap (vph)		395			1462		864	893	513	224		832
v/s Ratio Prot					c0.24		c0.46	0.45				0.14
v/s Ratio Perm		0.12							0.38	0.01		
v/c Ratio		0.35			0.69		0.78	0.77	0.64	0.02		0.24
Uniform Delay, d1		24.5			28.2		15.9	15.7	13.8	8.7		10.4
Progression Factor		1.00			0.31		1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2		2.4			2.3		5.5	5.0	3.8	0.1		0.3
Delay (s)		26.9			11.0		21.3	20.7	17.6	8.7		10.8
Level of Service		C			B		C	C	B	A		B
Approach Delay (s)		26.9			11.0			20.3			10.7	
Approach LOS		C			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			16.9				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.76									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			79.9%				ICU Level of Service			D		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

8: 8th Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	371	38	56	871	13	26	175	62	28	60	16
Future Volume (vph)	38	371	38	56	871	13	26	175	62	28	60	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)	3.5	3.5		3.5	3.5			3.5			3.5	
Lane Util. Factor	1.00	1.00		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	0.94		1.00	0.99			0.96			0.97	
Flpb, ped/bikes	1.00	1.00		0.85	1.00			0.99			0.98	
Frt	1.00	0.99		1.00	1.00			0.97			0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.99	
Satd. Flow (prot)	1444	1416		1249	2919			1488			1550	
Flt Permitted	0.24	1.00		0.39	1.00			0.97			0.88	
Satd. Flow (perm)	360	1416		509	2919			1443			1385	
Peak-hour factor, PHF	0.84	0.84	0.84	0.93	0.93	0.93	0.89	0.89	0.89	0.79	0.79	0.79
Adj. Flow (vph)	45	442	45	60	937	14	29	197	70	35	76	20
RTOR Reduction (vph)	0	4	0	0	1	0	0	11	0	0	7	0
Lane Group Flow (vph)	45	483	0	60	950	0	0	285	0	0	124	0
Confl. Peds. (#/hr)	99		230	230		99	91		53	53		91
Heavy Vehicles (%)	5%	5%	5%	3%	3%	3%	5%	5%	5%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	57.5	57.5		57.5	57.5			33.5			33.5	
Effective Green, g (s)	58.5	58.5		58.5	58.5			34.5			34.5	
Actuated g/C Ratio	0.58	0.58		0.58	0.58			0.34			0.34	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Grp Cap (vph)	210	828		297	1707			497			477	
v/s Ratio Prot		c0.34			0.33							
v/s Ratio Perm	0.13			0.12				c0.20			0.09	
v/c Ratio	0.21	0.58		0.20	0.56			0.57			0.26	
Uniform Delay, d1	9.8	13.1		9.8	12.8			26.7			23.6	
Progression Factor	0.95	1.04		0.40	0.32			1.00			1.26	
Incremental Delay, d2	2.0	2.6		1.3	1.1			4.7			1.3	
Delay (s)	11.4	16.2		5.2	5.2			31.5			31.0	
Level of Service	B	B		A	A			C			C	
Approach Delay (s)		15.8			5.2			31.5			31.0	
Approach LOS		B			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			13.7			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)				7.0		
Intersection Capacity Utilization			61.5%			ICU Level of Service				B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: 9th Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	392	16	38	844	33	22	95	58	19	48	74
Future Volume (vph)	56	392	16	38	844	33	22	95	58	19	48	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)	3.5	3.5		3.5	3.5			3.5			3.5	
Lane Util. Factor	1.00	1.00		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	0.98		1.00	0.99			0.94			0.94	
Flpb, ped/bikes	0.94	1.00		0.82	1.00			0.99			0.99	
Frt	1.00	0.99		1.00	0.99			0.96			0.93	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1384	1509		1218	2917			1460			1437	
Flt Permitted	0.25	1.00		0.41	1.00			0.95			0.94	
Satd. Flow (perm)	364	1509		524	2917			1398			1366	
Peak-hour factor, PHF	0.88	0.88	0.88	0.95	0.95	0.95	0.76	0.76	0.76	0.84	0.84	0.84
Adj. Flow (vph)	64	445	18	40	888	35	29	125	76	23	57	88
RTOR Reduction (vph)	0	2	0	0	3	0	0	18	0	0	40	0
Lane Group Flow (vph)	64	461	0	40	920	0	0	212	0	0	128	0
Confl. Peds. (#/hr)	108		179	179		108	67		59	59		67
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	4%	4%	4%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	58.5	58.5		58.5	58.5			32.5			32.5	
Effective Green, g (s)	59.5	59.5		59.5	59.5			33.5			33.5	
Actuated g/C Ratio	0.60	0.60		0.60	0.60			0.34			0.34	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Grp Cap (vph)	216	897		311	1735			468			457	
v/s Ratio Prot		0.31			c0.32							
v/s Ratio Perm	0.18			0.08				c0.15			0.09	
v/c Ratio	0.30	0.51		0.13	0.53			0.45			0.28	
Uniform Delay, d1	10.0	11.8		8.9	12.0			26.1			24.4	
Progression Factor	0.51	0.51		0.21	0.24			1.00			0.55	
Incremental Delay, d2	2.9	1.8		0.8	1.0			3.1			1.5	
Delay (s)	7.9	7.8		2.6	3.9			29.2			14.9	
Level of Service	A	A		A	A			C			B	
Approach Delay (s)		7.8			3.9			29.2			14.9	
Approach LOS		A			A			C			B	
Intersection Summary												
HCM 2000 Control Delay			9.0			HCM 2000 Level of Service				A		
HCM 2000 Volume to Capacity ratio			0.50									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)				7.0		
Intersection Capacity Utilization			59.0%			ICU Level of Service				B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

10: Terry Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	426	21	8	898	14	23	11	30	9	12	17
Future Volume (vph)	12	426	21	8	898	14	23	11	30	9	12	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)	3.5	3.5		3.5	3.5			3.0			3.0	
Lane Util. Factor	1.00	1.00		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	0.98		1.00	0.99			0.92			0.97	
Flpb, ped/bikes	0.95	1.00		0.81	1.00			0.98			0.97	
Frt	1.00	0.99		1.00	1.00			0.94			0.94	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.99	
Satd. Flow (prot)	1340	1445		1187	2893			1393			1397	
Flt Permitted	0.24	1.00		0.43	1.00			0.90			0.94	
Satd. Flow (perm)	340	1445		536	2893			1278			1334	
Peak-hour factor, PHF	0.91	0.91	0.91	0.89	0.89	0.89	0.68	0.68	0.68	0.78	0.78	0.78
Adj. Flow (vph)	13	468	23	9	1009	16	34	16	44	12	15	22
RTOR Reduction (vph)	0	2	0	0	1	0	0	32	0	0	17	0
Lane Group Flow (vph)	13	489	0	9	1024	0	0	62	0	0	32	0
Confl. Peds. (#/hr)	96		158	158		96	33		56	56		33
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	2%	2%	2%	7%	7%	7%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	68.5	68.5		68.5	68.5			23.0			23.0	
Effective Green, g (s)	69.5	69.5		69.5	69.5			24.0			24.0	
Actuated g/C Ratio	0.70	0.70		0.70	0.70			0.24			0.24	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.0			4.0	
Lane Grp Cap (vph)	236	1004		372	2010			306			320	
v/s Ratio Prot		0.34			c0.35							
v/s Ratio Perm	0.04			0.02				c0.05			0.02	
v/c Ratio	0.06	0.49		0.02	0.51			0.20			0.10	
Uniform Delay, d1	4.8	7.0		4.7	7.2			30.4			29.6	
Progression Factor	0.52	0.41		0.23	0.40			1.00			1.00	
Incremental Delay, d2	0.4	1.5		0.0	0.1			1.5			0.6	
Delay (s)	2.9	4.4		1.1	3.0			31.8			30.2	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		4.3			3.0			31.8			30.2	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			5.8			HCM 2000 Level of Service			A			
HCM 2000 Volume to Capacity ratio			0.43									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			6.5			
Intersection Capacity Utilization			49.8%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

11: Boren Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	63	380	29	63	796	61	64	716	59	201	577	77
Future Volume (vph)	63	380	29	63	796	61	64	716	59	201	577	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	12	9	9	12	9	9	12
Total Lost time (s)	4.0	3.5	4.5	4.0	3.5		4.0	3.5		4.0	3.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.66	1.00	0.99		1.00	0.96		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1404	1419	835	1404	2707		1419	2690		1406	2659	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1404	1419	835	1404	2707		1419	2690		1406	2659	
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.88	0.88	0.88	0.89	0.89	0.89
Adj. Flow (vph)	68	413	32	69	875	67	73	814	67	226	648	87
RTOR Reduction (vph)	0	0	22	0	5	0	0	6	0	0	10	0
Lane Group Flow (vph)	68	413	10	69	937	0	73	875	0	226	725	0
Confl. Peds. (#/hr)			284			104			174			110
Heavy Vehicles (%)	8%	8%	8%	8%	8%	8%	3%	3%	3%	4%	4%	4%
Bus Blockages (#/hr)	0	10	0	0	6	0	0	2	0	0	8	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									
Actuated Green, G (s)	5.2	30.5	30.5	5.2	30.5		5.9	30.9		15.4	40.4	
Effective Green, g (s)	5.7	31.5	30.5	5.7	31.5		6.4	31.9		15.9	41.4	
Actuated g/C Ratio	0.06	0.32	0.30	0.06	0.32		0.06	0.32		0.16	0.41	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lane Grp Cap (vph)	80	446	254	80	852		90	858		223	1100	
v/s Ratio Prot	0.05	c0.29		0.05	c0.35		0.05	c0.33		c0.16	0.27	
v/s Ratio Perm			0.01									
v/c Ratio	0.85	0.93	0.04	0.86	1.10		0.81	1.02		1.01	0.66	
Uniform Delay, d1	46.7	33.1	24.4	46.8	34.2		46.2	34.0		42.0	23.6	
Progression Factor	1.22	1.30	1.00	1.15	1.18		1.20	0.97		1.00	1.00	
Incremental Delay, d2	47.9	25.7	0.3	52.2	60.4		37.8	35.2		63.8	3.1	
Delay (s)	104.7	68.8	24.7	105.8	100.9		93.3	68.3		105.8	26.7	
Level of Service	F	E	C	F	F		F	E		F	C	
Approach Delay (s)		70.8			101.2			70.2			45.3	
Approach LOS		E			F			E			D	
Intersection Summary												
HCM 2000 Control Delay			72.5			HCM 2000 Level of Service				E		
HCM 2000 Volume to Capacity ratio			1.07									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)				15.0		
Intersection Capacity Utilization			81.6%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

12: Madison St & Minor Ave

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	513	110	54	846	12	30	37	39	18	34	44
Future Volume (vph)	16	513	110	54	846	12	30	37	39	18	34	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)	3.5	3.5	4.5	3.5	3.5			3.5			3.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00	0.43	1.00	0.99			0.92			0.91	
Flpb, ped/bikes	0.91	1.00	1.00	0.86	1.00			0.96			0.98	
Frt	1.00	1.00	0.85	1.00	1.00			0.95			0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1307	1506	589	1256	2892			1321			1320	
Flt Permitted	0.28	1.00	1.00	0.35	1.00			0.89			0.93	
Satd. Flow (perm)	381	1506	589	466	2892			1199			1246	
Peak-hour factor, PHF	0.85	0.85	0.85	0.95	0.95	0.95	0.67	0.67	0.67	0.87	0.87	0.87
Adj. Flow (vph)	19	604	129	57	891	13	45	55	58	21	39	51
RTOR Reduction (vph)	0	0	29	0	1	0	0	21	0	0	31	0
Lane Group Flow (vph)	19	604	100	57	903	0	0	137	0	0	80	0
Confl. Peds. (#/hr)	125		242	242		125	110		75	75		110
Heavy Vehicles (%)	6%	6%	6%	4%	4%	4%	7%	7%	7%	7%	7%	7%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2		2	2			4			4		
Actuated Green, G (s)	66.5	66.5	66.5	66.5	66.5			24.5			24.5	
Effective Green, g (s)	67.5	67.5	66.5	67.5	67.5			25.5			25.5	
Actuated g/C Ratio	0.68	0.68	0.66	0.68	0.68			0.26			0.26	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5			4.5			4.5	
Lane Grp Cap (vph)	257	1016	391	314	1952			305			317	
v/s Ratio Prot		c0.40			0.31							
v/s Ratio Perm	0.05		0.17	0.12				c0.11			0.06	
v/c Ratio	0.07	0.59	0.26	0.18	0.46			0.45			0.25	
Uniform Delay, d1	5.6	8.8	6.8	6.0	7.7			31.3			29.7	
Progression Factor	0.36	0.44	0.12	0.44	0.36			1.00			1.00	
Incremental Delay, d2	0.2	1.0	0.6	1.2	0.7			4.7			1.9	
Delay (s)	2.2	4.9	1.4	3.8	3.5			36.1			31.6	
Level of Service	A	A	A	A	A			D			C	
Approach Delay (s)		4.2			3.5			36.1			31.6	
Approach LOS		A			A			D			C	
Intersection Summary												
HCM 2000 Control Delay			8.0			HCM 2000 Level of Service				A		
HCM 2000 Volume to Capacity ratio			0.55									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)				7.0		
Intersection Capacity Utilization			60.8%			ICU Level of Service				B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

13: Swedish/Summit Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	427	114	23	839	15	24	6	16	7	10	37
Future Volume (vph)	31	427	114	23	839	15	24	6	16	7	10	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	12	12	12	12	12	12	12
Total Lost time (s)	3.5	3.5	4.5	3.5	3.5			3.0			3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00	0.51	1.00	0.99			0.94			0.94	
Flpb, ped/bikes	0.93	1.00	1.00	0.81	1.00			0.96			0.98	
Frt	1.00	1.00	0.85	1.00	1.00			0.95			0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.97			0.99	
Satd. Flow (prot)	1324	1492	647	1179	2892			1405			1313	
Flt Permitted	0.27	1.00	1.00	0.44	1.00			0.85			0.97	
Satd. Flow (perm)	381	1492	647	541	2892			1229			1285	
Peak-hour factor, PHF	0.89	0.89	0.89	0.92	0.92	0.92	0.64	0.64	0.64	0.80	0.80	0.80
Adj. Flow (vph)	35	480	128	25	912	16	38	9	25	9	12	46
RTOR Reduction (vph)	0	0	29	0	1	0	0	19	0	0	35	0
Lane Group Flow (vph)	35	480	99	25	927	0	0	53	0	0	33	0
Confl. Peds. (#/hr)	105		163	163		105	54		62	62		54
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	2%	2%	2%	8%	8%	8%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2		2	2			4			4		
Actuated Green, G (s)	68.5	68.5	68.5	68.5	68.5			23.0			23.0	
Effective Green, g (s)	69.5	69.5	68.5	69.5	69.5			24.0			24.0	
Actuated g/C Ratio	0.70	0.70	0.68	0.70	0.70			0.24			0.24	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5			4.0			4.0	
Lane Grp Cap (vph)	264	1036	443	375	2009			294			308	
v/s Ratio Prot		c0.32			0.32							
v/s Ratio Perm	0.09		0.15	0.05				c0.04			0.03	
v/c Ratio	0.13	0.46	0.22	0.07	0.46			0.18			0.11	
Uniform Delay, d1	5.1	6.9	5.9	4.9	6.8			30.2			29.6	
Progression Factor	0.31	0.25	0.07	0.43	0.39			1.00			1.00	
Incremental Delay, d2	0.9	1.2	1.0	0.3	0.7			1.3			0.7	
Delay (s)	2.4	3.0	1.4	2.4	3.4			31.5			30.3	
Level of Service	A	A	A	A	A			C			C	
Approach Delay (s)		2.6			3.4			31.5			30.3	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			5.3			HCM 2000 Level of Service			A			
HCM 2000 Volume to Capacity ratio			0.39									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			6.5			
Intersection Capacity Utilization			51.1%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

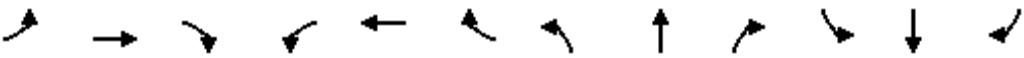
HCM Signalized Intersection Capacity Analysis

14: Madison St & Boylston Ave

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	396	32	34	819	21	15	30	9	8	10	13
Future Volume (vph)	25	396	32	34	819	21	15	30	9	8	10	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	9	12	12	12	12	12	12	12
Total Lost time (s)	3.5	3.5		3.5	3.5			3.0			3.0	
Lane Util. Factor	1.00	1.00		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	0.97		1.00	0.99			0.98			0.97	
Flpb, ped/bikes	0.93	1.00		0.82	1.00			0.98			0.98	
Frt	1.00	0.99		1.00	1.00			0.98			0.94	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1321	1434		1191	2783			1562			1433	
Flt Permitted	0.31	1.00		0.49	1.00			0.93			0.93	
Satd. Flow (perm)	436	1434		615	2783			1475			1352	
Peak-hour factor, PHF	0.93	0.93	0.93	0.94	0.94	0.94	0.85	0.85	0.85	0.93	0.93	0.93
Adj. Flow (vph)	27	426	34	36	871	22	18	35	11	9	11	14
RTOR Reduction (vph)	0	1	0	0	1	0	0	9	0	0	13	0
Lane Group Flow (vph)	27	459	0	36	892	0	0	55	0	0	21	0
Confl. Peds. (#/hr)	69		102	102		69	43		27	27		43
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	2%	2%	2%	6%	6%	6%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	85.0	85.0		85.0	85.0			6.5			6.5	
Effective Green, g (s)	86.0	86.0		86.0	86.0			7.5			7.5	
Actuated g/C Ratio	0.86	0.86		0.86	0.86			0.08			0.08	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.0			4.0	
Vehicle Extension (s)	0.2	0.2		0.2	0.2			0.2			0.2	
Lane Grp Cap (vph)	374	1233		528	2393			110			101	
v/s Ratio Prot		0.32			c0.32							
v/s Ratio Perm	0.06			0.06				c0.04			0.02	
v/c Ratio	0.07	0.37		0.07	0.37			0.50			0.21	
Uniform Delay, d1	1.0	1.4		1.0	1.4			44.4			43.5	
Progression Factor	0.31	0.21		0.40	0.43			1.00			1.00	
Incremental Delay, d2	0.3	0.8		0.2	0.4			1.3			0.4	
Delay (s)	0.7	1.1		0.6	1.0			45.7			43.8	
Level of Service	A	A		A	A			D			D	
Approach Delay (s)		1.1			1.0			45.7			43.8	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			3.9			HCM 2000 Level of Service				A		
HCM 2000 Volume to Capacity ratio			0.38									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			6.5			
Intersection Capacity Utilization			51.5%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

15: Broadway & Madison St/E Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	61	317	29	103	750	22	0	241	51	0	245	93
Future Volume (vph)	61	317	29	103	750	22	0	241	51	0	245	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	10	12	10	10	12	12	13	12	12	13	12
Grade (%)		-9%			8%			0%			0%	
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0	5.0		4.0	
Lane Util. Factor	1.00	1.00		1.00	0.95			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	1.00		0.96	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	0.99		1.00	1.00			1.00	0.85		0.96	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)	1658	1699		1484	3169			1870	1553		1726	
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (perm)	1658	1699		1484	3169			1870	1553		1726	
Peak-hour factor, PHF	0.89	0.89	0.89	0.95	0.95	0.95	0.79	0.79	0.79	0.78	0.78	0.78
Adj. Flow (vph)	69	356	33	108	789	23	0	305	65	0	314	119
RTOR Reduction (vph)	0	3	0	0	1	0	0	0	55	0	16	0
Lane Group Flow (vph)	69	386	0	108	811	0	0	305	10	0	417	0
Confl. Peds. (#/hr)			93			72			93			88
Heavy Vehicles (%)	10%	7%	0%	9%	1%	5%	0%	5%	4%	0%	4%	8%
Turn Type	Prot	NA		Prot	NA			NA	custom		NA	
Protected Phases	5	2		1	6			4 3	3 1		8	
Permitted Phases												
Actuated Green, G (s)	6.7	45.7		11.0	50.0			28.3	16.0		28.3	
Effective Green, g (s)	7.7	46.7		12.0	51.0			29.3	16.0		29.3	
Actuated g/C Ratio	0.08	0.47		0.12	0.51			0.29	0.16		0.29	
Clearance Time (s)	5.0	5.0		5.0	5.0						5.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0						2.0	
Lane Grp Cap (vph)	127	793		178	1616			547	248		505	
v/s Ratio Prot	0.04	0.23		c0.07	c0.26			0.16	0.01		c0.24	
v/s Ratio Perm												
v/c Ratio	0.54	0.49		0.61	0.50			0.56	0.04		0.83	
Uniform Delay, d1	44.5	18.4		41.8	16.1			29.9	35.5		33.0	
Progression Factor	1.03	1.13		1.17	0.78			1.00	1.00		1.00	
Incremental Delay, d2	2.4	2.0		3.9	1.1			0.7	0.0		10.2	
Delay (s)	48.4	22.8		52.9	13.7			30.6	35.5		43.1	
Level of Service	D	C		D	B			C	D		D	
Approach Delay (s)		26.7			18.3			31.4			43.1	
Approach LOS		C			B			C			D	
Intersection Summary												
HCM 2000 Control Delay			27.2			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.68									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			18.0			
Intersection Capacity Utilization			55.8%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2010 TWSC
16: E Madison St & BROADWAY CT

Intersection

Int Delay, s/veh 0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	371	867	0	1	8
Future Vol, veh/h	4	371	867	0	1	8
Conflicting Peds, #/hr	59	0	0	59	0	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	-8	5	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	386	903	0	1	8

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	962	0	1164
Stage 1	-	-	962
Stage 2	-	-	202
Critical Hdwy	4.14	-	6.84
Critical Hdwy Stg 1	-	-	5.84
Critical Hdwy Stg 2	-	-	5.84
Follow-up Hdwy	2.22	-	3.52
Pot Cap-1 Maneuver	711	-	188
Stage 1	-	-	331
Stage 2	-	-	812
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	710	-	169
Mov Cap-2 Maneuver	-	-	169
Stage 1	-	-	315
Stage 2	-	-	767

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	14.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	710	-	-	-	399
HCM Lane V/C Ratio	0.006	-	-	-	0.023
HCM Control Delay (s)	10.1	0	-	-	14.2
HCM Lane LOS	B	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

HCM 2010 TWSC
17: E Seneca St & 10TH AVE

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	26	335	823	2	4	37
Future Vol, veh/h	26	335	823	2	4	37
Conflicting Peds, #/hr	39	0	0	39	1	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, %	-	-5	2	-	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	27	345	848	2	4	38
Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	890	0	-	0	1115	464
Stage 1	-	-	-	-	888	-
Stage 2	-	-	-	-	227	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	757	-	-	-	202	545
Stage 1	-	-	-	-	362	-
Stage 2	-	-	-	-	789	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	757	-	-	-	181	527
Mov Cap-2 Maneuver	-	-	-	-	181	-
Stage 1	-	-	-	-	350	-
Stage 2	-	-	-	-	730	-
Approach	EB		WB		SB	
HCM Control Delay, s	0.9		0		14	
HCM LOS					B	
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	757	-	-	-	444	
HCM Lane V/C Ratio	0.035	-	-	-	0.095	
HCM Control Delay (s)	9.9	0.2	-	-	14	
HCM Lane LOS	A	A	-	-	B	
HCM 95th %tile Q(veh)	0.1	-	-	-	0.3	

HCM 2010 TWSC
18: E Seneca St & Madison St

Intersection

Int Delay, s/veh 0

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	5	0	825	14	0	339
Future Vol, veh/h	5	0	825	14	0	339
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	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	-2	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	0	897	15	0	368

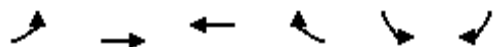
Major/Minor	Minor2		Major2		Major1	
Conflicting Flow All	1809	15	0	0	15	0
Stage 1	1809	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Critical Hdwy	6.52	6.22	4.12	-	4.12	-
Critical Hdwy Stg 1	5.52	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	4.018	3.318	2.218	-	2.218	-
Pot Cap-1 Maneuver	79	1065	-	-	1603	-
Stage 1	130	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %				-		-
Mov Cap-1 Maneuver	0	1065	-	-	1603	-
Mov Cap-2 Maneuver	0	-	-	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-

Approach	EB	WB	NE
HCM Control Delay, s			0
HCM LOS	-		

Minor Lane/Major Mvmt	NEL	NER	EBLn1	WBL	WBT
Capacity (veh/h)	1603	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	-
HCM Lane LOS	A	-	-	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

HCM Signalized Intersection Capacity Analysis

19: E Madison St & 11th Ave



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↑↑↑	
Traffic Volume (vph)	0	347	817	0	56	22
Future Volume (vph)	0	347	817	0	56	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	10	10	13	12	10	12
Grade (%)		0%	-4%		0%	
Total Lost time (s)		4.5	4.5		4.5	
Lane Util. Factor		0.95	0.95		0.97	
Frpb, ped/bikes		1.00	1.00		0.92	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	1.00		0.96	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		3336	3694		2803	
Flt Permitted		1.00	1.00		0.97	
Satd. Flow (perm)		3336	3694		2803	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	369	869	0	60	23
RTOR Reduction (vph)	0	0	0	0	22	0
Lane Group Flow (vph)	0	369	869	0	61	0
Confl. Peds. (#/hr)	29			29		63
Confl. Bikes (#/hr)				3		17
Heavy Vehicles (%)	1%	1%	3%	3%	4%	4%
Parking (#/hr)						0
Turn Type		NA	NA		Prot	
Protected Phases		2	2		4	
Permitted Phases						
Actuated Green, G (s)		85.4	85.4		5.6	
Effective Green, g (s)		85.4	85.4		5.6	
Actuated g/C Ratio		0.85	0.85		0.06	
Clearance Time (s)		4.5	4.5		4.5	
Vehicle Extension (s)		0.2	0.2		0.2	
Lane Grp Cap (vph)		2848	3154		156	
v/s Ratio Prot		0.11	c0.24		c0.02	
v/s Ratio Perm						
v/c Ratio		0.13	0.28		0.39	
Uniform Delay, d1		1.2	1.4		45.6	
Progression Factor		0.19	0.15		1.00	
Incremental Delay, d2		0.1	0.1		0.6	
Delay (s)		0.3	0.4		46.2	
Level of Service		A	A		D	
Approach Delay (s)		0.3	0.4		46.2	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay			3.2		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.28			
Actuated Cycle Length (s)			100.0		Sum of lost time (s)	9.0
Intersection Capacity Utilization			42.5%		ICU Level of Service	A
Analysis Period (min)			15			

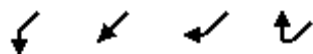
HCM Signalized Intersection Capacity Analysis

20: E Madison St & 12th Ave & Union St

												
Movement	NBL2	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	NEL2	NEL	NET	NER
Lane Configurations												
Traffic Volume (vph)	47	38	319	96	34	270	62	29	1	21	322	54
Future Volume (vph)	47	38	319	96	34	270	62	29	1	21	322	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	11	12	10	10	12	12	12	10	10	12
Grade (%)			0%			0%					4%	
Total Lost time (s)		4.5	4.5	4.5	4.5	4.5					4.5	
Lane Util. Factor		1.00	1.00	1.00	1.00	1.00					0.95	
Frpb, ped/bikes		1.00	1.00	1.00	1.00	0.91					0.98	
Flpb, ped/bikes		0.87	1.00	1.00	0.94	1.00					1.00	
Frt		1.00	1.00	0.85	1.00	0.96					0.98	
Flt Protected		0.95	1.00	1.00	0.95	1.00					1.00	
Satd. Flow (prot)		1446	1818	1599	1559	1375					3104	
Flt Permitted		0.37	1.00	1.00	0.42	1.00					0.87	
Satd. Flow (perm)		563	1818	1599	687	1375					2709	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	49	40	336	101	36	284	65	31	1	22	339	57
RTOR Reduction (vph)	0	0	0	62	0	3	0	0	0	0	12	0
Lane Group Flow (vph)	0	89	336	39	36	377	0	0	0	0	407	0
Confl. Peds. (#/hr)	66	59		76	76		66	59	59	112		111
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%	2%	2%	1%	1%	1%	1%
Parking (#/hr)						0						
Turn Type	Perm	Perm	NA	Prot	Perm	NA			Perm	Perm	NA	
Protected Phases			4	4		4					2	
Permitted Phases	4	4			4				2	2		
Actuated Green, G (s)		38.5	38.5	38.5	38.5	38.5					52.5	
Effective Green, g (s)		38.5	38.5	38.5	38.5	38.5					52.5	
Actuated g/C Ratio		0.38	0.38	0.38	0.38	0.38					0.52	
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5					4.5	
Vehicle Extension (s)		0.2	0.2	0.2	0.2	0.2					0.2	
Lane Grp Cap (vph)		216	699	615	264	529					1422	
v/s Ratio Prot			0.18	0.02		c0.27						
v/s Ratio Perm		0.16			0.05						0.15	
v/c Ratio		0.41	0.48	0.06	0.14	0.71					0.29	
Uniform Delay, d1		22.5	23.2	19.4	20.0	26.1					13.3	
Progression Factor		1.00	1.00	1.00	1.00	1.00					1.41	
Incremental Delay, d2		5.7	2.4	0.2	1.1	7.9					0.5	
Delay (s)		28.2	25.6	19.6	21.0	34.0					19.2	
Level of Service		C	C	B	C	C					B	
Approach Delay (s)			24.9			32.9					19.2	
Approach LOS			C			C					B	
Intersection Summary												
HCM 2000 Control Delay			18.6			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			9.0			
Intersection Capacity Utilization			87.7%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

20: E Madison St & 12th Ave & Union St



Movement	SWL	SWT	SWR	SWR2
Lane Configurations		↔↔		
Traffic Volume (vph)	78	708	204	12
Future Volume (vph)	78	708	204	12
Ideal Flow (vphpl)	1900	1900	1900	1900
Lane Width	12	11	12	12
Grade (%)		-8%		
Total Lost time (s)		4.5		
Lane Util. Factor		0.95		
Frpb, ped/bikes		0.90		
Flpb, ped/bikes		0.99		
Frt		0.97		
Flt Protected		1.00		
Satd. Flow (prot)		3066		
Flt Permitted		0.87		
Satd. Flow (perm)		2676		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95
Adj. Flow (vph)	82	745	215	13
RTOR Reduction (vph)	0	1	0	0
Lane Group Flow (vph)	0	1054	0	0
Confl. Peds. (#/hr)	111		59	112
Heavy Vehicles (%)	2%	2%	2%	2%
Parking (#/hr)				
Turn Type	Perm	NA		
Protected Phases		2		
Permitted Phases	2			
Actuated Green, G (s)		52.5		
Effective Green, g (s)		52.5		
Actuated g/C Ratio		0.52		
Clearance Time (s)		4.5		
Vehicle Extension (s)		0.2		
Lane Grp Cap (vph)		1404		
v/s Ratio Prot				
v/s Ratio Perm		c0.39		
v/c Ratio		0.75		
Uniform Delay, d1		18.6		
Progression Factor		0.32		
Incremental Delay, d2		3.7		
Delay (s)		9.6		
Level of Service		A		
Approach Delay (s)		9.6		
Approach LOS		A		
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

22: 13th Ave & E Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	299	0	0	694	1	283	43	4	5	0	26
Future Volume (vph)	18	299	0	0	694	1	283	43	4	5	0	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	12	11	12	16	16	12	12	13	12
Grade (%)		8%			-7%			0%			0%	
Total Lost time (s)		4.5			4.5		4.5	4.5			4.5	
Lane Util. Factor		0.95			0.95		0.95	0.95			1.00	
Frpb, ped/bikes		1.00			1.00		1.00	1.00			0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00			0.99	
Frt		1.00			1.00		1.00	1.00			0.89	
Flt Protected		1.00			1.00		0.95	0.97			0.99	
Satd. Flow (prot)		3180			3539		1865	1883			1666	
Flt Permitted		0.90			1.00		0.74	0.77			0.95	
Satd. Flow (perm)		2882			3539		1446	1497			1595	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	19	311	0	0	723	1	295	45	4	5	0	27
RTOR Reduction (vph)	0	0	0	0	0	0	0	1	0	0	23	0
Lane Group Flow (vph)	0	330	0	0	724	0	171	172	0	0	9	0
Confl. Peds. (#/hr)	50		52	52		50	1		35	35		1
Confl. Bikes (#/hr)			3			12			11			2
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	4%	4%	4%	1%	1%	1%
Parking (#/hr)									0			0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2						4			4		
Actuated Green, G (s)		76.4			76.4		14.6	14.6			14.6	
Effective Green, g (s)		76.4			76.4		14.6	14.6			14.6	
Actuated g/C Ratio		0.76			0.76		0.15	0.15			0.15	
Clearance Time (s)		4.5			4.5		4.5	4.5			4.5	
Vehicle Extension (s)		0.2			0.2		0.2	0.2			0.2	
Lane Grp Cap (vph)		2201			2703		211	218			232	
v/s Ratio Prot					c0.20							
v/s Ratio Perm		0.11					c0.12	0.12			0.01	
v/c Ratio		0.15			0.27		0.81	0.79			0.04	
Uniform Delay, d1		3.1			3.5		41.4	41.2			36.7	
Progression Factor		0.41			0.10		1.00	1.00			1.00	
Incremental Delay, d2		0.1			0.2		19.5	15.9			0.0	
Delay (s)		1.4			0.6		60.9	57.1			36.7	
Level of Service		A			A		E	E			D	
Approach Delay (s)		1.4			0.6			59.0			36.7	
Approach LOS		A			A			E			D	
Intersection Summary												
HCM 2000 Control Delay			15.6				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.35									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)			9.0		
Intersection Capacity Utilization			45.0%				ICU Level of Service			A		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

23: 14th Ave & E Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	290	7	47	667	0	10	227	90	3	81	17
Future Volume (vph)	1	290	7	47	667	0	10	227	90	3	81	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	12	16	12	12	16	12
Grade (%)		7%			-10%			0%			0%	
Total Lost time (s)		4.5			4.5			8.5			8.5	
Lane Util. Factor		1.00			0.95			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			0.97			0.98	
Flpb, ped/bikes		1.00			0.99			1.00			1.00	
Frt		1.00			1.00			0.96			0.98	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1741			3592			1976			1998	
Flt Permitted		1.00			0.91			0.99			0.98	
Satd. Flow (perm)		1739			3268			1954			1959	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1	309	7	50	710	0	11	241	96	3	86	18
RTOR Reduction (vph)	0	1	0	0	0	0	0	15	0	0	8	0
Lane Group Flow (vph)	0	316	0	0	760	0	0	333	0	0	99	0
Confl. Peds. (#/hr)	3		77	77		3	60		20	20		60
Confl. Bikes (#/hr)			2			12			26			9
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Parking (#/hr)									0			0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3			3		
Actuated Green, G (s)		48.9			48.9			19.8			19.8	
Effective Green, g (s)		48.9			48.9			19.8			19.8	
Actuated g/C Ratio		0.49			0.49			0.20			0.20	
Clearance Time (s)		4.5			4.5			8.5			8.5	
Vehicle Extension (s)		0.2			0.2			0.2			0.2	
Lane Grp Cap (vph)		850			1598			386			387	
v/s Ratio Prot												
v/s Ratio Perm		0.18			c0.23			c0.17			0.05	
v/c Ratio		0.37			0.48			0.86			0.26	
Uniform Delay, d1		16.0			17.0			38.8			33.9	
Progression Factor		0.87			0.11			1.00			0.08	
Incremental Delay, d2		1.2			0.9			17.1			0.1	
Delay (s)		15.1			2.8			55.9			2.8	
Level of Service		B			A			E			A	
Approach Delay (s)		15.1			2.8			55.9			2.8	
Approach LOS		B			A			E			A	
Intersection Summary												
HCM 2000 Control Delay			17.4			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.49									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			17.5			
Intersection Capacity Utilization			72.7%			ICU Level of Service			C			
Analysis Period (min)			15									

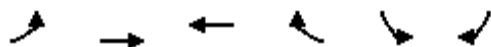
HCM Signalized Intersection Capacity Analysis

24: E Madison St & Pike St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	70	4	0	0	0	0	0	363	19	1	714	66
Future Volume (vph)	70	4	0	0	0	0	0	363	19	1	714	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	16	12	12	12	12	12	12	12	12	11	12
Grade (%)		6%			0%			10%			-10%	
Total Lost time (s)	4.5	4.5						4.5			4.5	
Lane Util. Factor	0.95	0.95						1.00			0.95	
Frt	1.00	1.00						0.99			0.99	
Flt Protected	0.95	0.96						1.00			1.00	
Satd. Flow (prot)	1522	1675						1758			3546	
Flt Permitted	0.95	0.96						1.00			0.95	
Satd. Flow (perm)	1522	1675						1758			3386	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	4	0	0	0	0	0	395	21	1	776	72
RTOR Reduction (vph)	0	0	0	0	0	0	0	2	0	0	6	0
Lane Group Flow (vph)	40	40	0	0	0	0	0	414	0	0	843	0
Parking (#/hr)		0							0			
Turn Type	Perm	NA						NA		Perm	NA	
Protected Phases		2 3						1			1	
Permitted Phases	2 3									1		
Actuated Green, G (s)	38.1	38.1						48.9			48.9	
Effective Green, g (s)	38.1	38.1						48.9			48.9	
Actuated g/C Ratio	0.38	0.38						0.49			0.49	
Clearance Time (s)								4.5			4.5	
Vehicle Extension (s)								0.2			0.2	
Lane Grp Cap (vph)	579	638						859			1655	
v/s Ratio Prot								0.24				
v/s Ratio Perm	c0.03	0.02									c0.25	
v/c Ratio	0.07	0.06						0.48			0.51	
Uniform Delay, d1	19.7	19.6						17.1			17.4	
Progression Factor	0.08	0.08						0.37			0.91	
Incremental Delay, d2	0.0	0.0						1.8			1.1	
Delay (s)	1.5	1.5						8.0			16.9	
Level of Service	A	A						A			B	
Approach Delay (s)		1.5			0.0			8.0			16.9	
Approach LOS		A			A			A			B	
Intersection Summary												
HCM 2000 Control Delay		13.2			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.33										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			17.5				
Intersection Capacity Utilization		35.9%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

25: E Madison St & 15th Ave



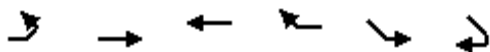
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔↔	↔↔			↔↔
Traffic Volume (vph)	84	340	677	6	0	104
Future Volume (vph)	84	340	677	6	0	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	12	12	16
Grade (%)		10%	-9%		0%	
Total Lost time (s)		4.5	4.5			4.0
Lane Util. Factor		0.95	0.95			1.00
Frpb, ped/bikes		1.00	1.00			0.99
Flpb, ped/bikes		1.00	1.00			1.00
Frt		1.00	1.00			0.86
Flt Protected		0.99	1.00			1.00
Satd. Flow (prot)		3245	3604			1752
Flt Permitted		0.70	1.00			1.00
Satd. Flow (perm)		2295	3604			1752
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	95	386	769	7	0	118
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	481	776	0	0	118
Confl. Peds. (#/hr)	38			38	54	
Confl. Bikes (#/hr)				14		2
Heavy Vehicles (%)	1%	1%	1%	1%	5%	5%
Parking (#/hr)				0		
Turn Type	Perm	NA	NA			Free
Protected Phases		2	2			
Permitted Phases	2					Free
Actuated Green, G (s)		81.1	81.1			100.0
Effective Green, g (s)		81.1	81.1			100.0
Actuated g/C Ratio		0.81	0.81			1.00
Clearance Time (s)		4.5	4.5			
Vehicle Extension (s)		0.2	0.2			
Lane Grp Cap (vph)		1861	2922			1752
v/s Ratio Prot			c0.22			
v/s Ratio Perm		0.21				c0.07
v/c Ratio		0.26	0.27			0.07
Uniform Delay, d1		2.3	2.3			0.0
Progression Factor		0.10	0.53			1.00
Incremental Delay, d2		0.3	0.2			0.1
Delay (s)		0.5	1.4			0.1
Level of Service		A	A			A
Approach Delay (s)		0.5	1.4		0.1	
Approach LOS		A	A		A	
Intersection Summary						
HCM 2000 Control Delay			1.0		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.24			
Actuated Cycle Length (s)			100.0		Sum of lost time (s)	7.5
Intersection Capacity Utilization			38.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM 2010 TWSC
26: 16TH AVE & E Madison St

Intersection						
Int Delay, s/veh	0.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑	
Traffic Vol, veh/h	338	1	0	685	9	22
Future Vol, veh/h	338	1	0	685	9	22
Conflicting Peds, #/hr	0	55	0	0	0	49
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	9	-	-	-9	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	376	1	0	761	10	24
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	812	292
Stage 1	-	-	-	-	431	-
Stage 2	-	-	-	-	381	-
Critical Hdwy	-	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	0	-	317	704
Stage 1	-	-	0	-	623	-
Stage 2	-	-	0	-	660	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	305	649
Mov Cap-2 Maneuver	-	-	-	-	305	-
Stage 1	-	-	-	-	599	-
Stage 2	-	-	-	-	660	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		12.9	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	489	-	-	-		
HCM Lane V/C Ratio	0.07	-	-	-		
HCM Control Delay (s)	12.9	-	-	-		
HCM Lane LOS	B	-	-	-		
HCM 95th %tile Q(veh)	0.2	-	-	-		

HCM Signalized Intersection Capacity Analysis

27: E Madison St & Pine St



Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↑↑	↑↑		↵	↵
Traffic Volume (vph)	22	338	679	162	71	5
Future Volume (vph)	22	338	679	162	71	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	11	11
Grade (%)		9%	-4%		0%	
Total Lost time (s)		4.5	4.5		4.5	4.5
Lane Util. Factor		0.95	0.95		1.00	1.00
Frpb, ped/bikes		1.00	0.98		1.00	0.87
Flpb, ped/bikes		1.00	1.00		1.00	1.00
Frt		1.00	0.97		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3172	3204		1678	1178
Flt Permitted		0.88	1.00		0.95	1.00
Satd. Flow (perm)		2793	3204		1678	1178
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	24	376	754	180	79	6
RTOR Reduction (vph)	0	0	11	0	0	6
Lane Group Flow (vph)	0	400	923	0	79	0
Confl. Peds. (#/hr)	62			62		49
Confl. Bikes (#/hr)				23		2
Heavy Vehicles (%)	1%	1%	2%	2%	4%	4%
Parking (#/hr)						0
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		2	2		4	
Permitted Phases	2					4
Actuated Green, G (s)		84.0	84.0		7.0	7.0
Effective Green, g (s)		84.0	84.0		7.0	7.0
Actuated g/C Ratio		0.84	0.84		0.07	0.07
Clearance Time (s)		4.5	4.5		4.5	4.5
Vehicle Extension (s)		0.2	0.2		0.2	0.2
Lane Grp Cap (vph)		2346	2691		117	82
v/s Ratio Prot			c0.29		c0.05	
v/s Ratio Perm		0.14				0.00
v/c Ratio		0.17	0.34		0.68	0.01
Uniform Delay, d1		1.5	1.8		45.4	43.3
Progression Factor		0.33	0.42		1.00	1.00
Incremental Delay, d2		0.2	0.3		11.4	0.0
Delay (s)		0.7	1.1		56.8	43.3
Level of Service		A	A		E	D
Approach Delay (s)		0.7	1.1		55.9	
Approach LOS		A	A		E	
Intersection Summary						
HCM 2000 Control Delay			4.2		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.37			
Actuated Cycle Length (s)			100.0		Sum of lost time (s)	9.0
Intersection Capacity Utilization			43.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

28: 17th Ave & E Madison St

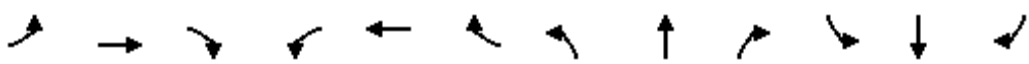
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	367	15	5	774	15	42	24	4	16	8	23
Future Volume (vph)	27	367	15	5	774	15	42	24	4	16	8	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	10	12	10	12	12	16	12
Grade (%)		4%			4%			0%			0%	
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			1.00			0.99			0.88	
Flpb, ped/bikes		1.00			1.00			0.89			0.95	
Frt		0.99			1.00			0.99			0.93	
Flt Protected		1.00			1.00			0.97			0.98	
Satd. Flow (prot)		3326			3325			1486			1648	
Flt Permitted		0.87			0.95			0.84			0.90	
Satd. Flow (perm)		2891			3169			1289			1504	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	30	408	17	6	860	17	47	27	4	18	9	26
RTOR Reduction (vph)	0	1	0	0	1	0	0	3	0	0	24	0
Lane Group Flow (vph)	0	454	0	0	882	0	0	75	0	0	29	0
Confl. Peds. (#/hr)	85		47	47		85	69		61	61		69
Confl. Bikes (#/hr)			4			19			21			9
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		81.4			81.4			9.6			9.6	
Effective Green, g (s)		81.4			81.4			9.6			9.6	
Actuated g/C Ratio		0.81			0.81			0.10			0.10	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		0.2			0.2			3.0			3.0	
Lane Grp Cap (vph)		2353			2579			123			144	
v/s Ratio Prot												
v/s Ratio Perm		0.16			0.28			0.06			0.02	
v/c Ratio		0.19			0.34			0.61			0.20	
Uniform Delay, d1		2.1			2.4			43.4			41.7	
Progression Factor		0.44			0.68			1.00			1.00	
Incremental Delay, d2		0.2			0.3			8.7			0.7	
Delay (s)		1.1			2.0			52.1			42.4	
Level of Service		A			A			D			D	
Approach Delay (s)		1.1			2.0			52.1			42.4	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			5.8									
HCM 2000 Volume to Capacity ratio			0.38									
Actuated Cycle Length (s)			100.0									
Intersection Capacity Utilization			45.7%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2010 TWSC
29: 18th Ave & E Madison St

Intersection												
Int Delay, s/veh	1.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	367	4	10	781	8	8	10	18	5	8	15
Future Vol, veh/h	16	367	4	10	781	8	8	10	18	5	8	15
Conflicting Peds, #/hr	48	0	27	27	0	48	4	0	7	7	0	4
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-4	-	-	11	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	386	4	11	822	8	8	11	19	5	8	16
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	879	0	0	418	0	0	889	1349	229	1134	1346	467
Stage 1	-	-	-	-	-	-	449	449	-	895	895	-
Stage 2	-	-	-	-	-	-	440	900	-	239	451	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	764	-	-	1138	-	-	238	149	774	157	150	542
Stage 1	-	-	-	-	-	-	559	571	-	302	357	-
Stage 2	-	-	-	-	-	-	566	355	-	743	569	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	762	-	-	1132	-	-	207	132	755	131	133	512
Mov Cap-2 Maneuver	-	-	-	-	-	-	207	132	-	131	133	-
Stage 1	-	-	-	-	-	-	533	544	-	278	332	-
Stage 2	-	-	-	-	-	-	523	330	-	686	542	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.5			0.2			21.2			24		
HCM LOS							C			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	260	762	-	-	1132	-	-	219				
HCM Lane V/C Ratio	0.146	0.022	-	-	0.009	-	-	0.135				
HCM Control Delay (s)	21.2	9.8	0.1	-	8.2	0.1	-	24				
HCM Lane LOS	C	A	A	-	A	A	-	C				
HCM 95th %tile Q(veh)	0.5	0.1	-	-	0	-	-	0.5				

HCM Signalized Intersection Capacity Analysis

30: 19th Ave & E Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↔↔			↔			↔	
Traffic Volume (vph)	50	340	16	34	706	19	29	161	60	21	73	100
Future Volume (vph)	50	340	16	34	706	19	29	161	60	21	73	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	12	16	12	12	16	12
Grade (%)		-11%			8%			0%			0%	
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			1.00			0.97			0.96	
Flpb, ped/bikes		0.99			1.00			1.00			1.00	
Frt		0.99			1.00			0.97			0.93	
Flt Protected		0.99			1.00			0.99			0.99	
Satd. Flow (prot)		3559			3271			1980			1832	
Flt Permitted		0.78			0.91			0.90			0.88	
Satd. Flow (perm)		2791			2999			1798			1625	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	56	378	18	38	784	21	32	179	67	23	81	111
RTOR Reduction (vph)	0	2	0	0	1	0	0	14	0	0	47	0
Lane Group Flow (vph)	0	450	0	0	842	0	0	264	0	0	168	0
Confl. Peds. (#/hr)	56		48	48		56	32		55	22		32
Confl. Bikes (#/hr)			3			11			24			14
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	4%	4%	4%
Parking (#/hr)									0			0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		71.7			71.7			19.3			19.3	
Effective Green, g (s)		71.7			71.7			19.3			19.3	
Actuated g/C Ratio		0.72			0.72			0.19			0.19	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		0.2			0.2			3.0			3.0	
Lane Grp Cap (vph)		2001			2150			347			313	
v/s Ratio Prot												
v/s Ratio Perm		0.16			c0.28			c0.15			0.10	
v/c Ratio		0.22			0.39			0.76			0.54	
Uniform Delay, d1		4.8			5.6			38.2			36.3	
Progression Factor		0.74			0.49			1.00			1.00	
Incremental Delay, d2		0.3			0.5			9.5			1.8	
Delay (s)		3.8			3.3			47.7			38.1	
Level of Service		A			A			D			D	
Approach Delay (s)		3.8			3.3			47.7			38.1	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			14.5			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			9.0			
Intersection Capacity Utilization			66.2%			ICU Level of Service			C			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

31: 20th Ave & E Olive St & E Madison St

												
Movement	EBL	EBT	EBR	EBR2	WBL	WBT	WBR	NBR2	SBL2	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	373	39	7	15	709	2	23	1	1	2	13
Future Volume (vph)	2	373	39	7	15	709	2	23	1	1	2	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	10	12	12	12	12	13	12
Grade (%)		-8%				3%					0%	
Total Lost time (s)		4.5				4.5		4.0			4.5	
Lane Util. Factor		0.95				0.95		1.00			1.00	
Frpb, ped/bikes		0.99				1.00		0.98			0.95	
Flpb, ped/bikes		1.00				1.00		1.00			0.99	
Frt		0.98				1.00		0.86			0.90	
Flt Protected		1.00				1.00		1.00			0.99	
Satd. Flow (prot)		3608				3277		1431			1631	
Flt Permitted		0.95				0.94		1.00			0.99	
Satd. Flow (perm)		3441				3089		1431			1631	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	2	414	43	8	17	788	2	26	1	1	2	14
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	0	0	14	0
Lane Group Flow (vph)	0	466	0	0	0	807	0	26	0	0	4	0
Confl. Peds. (#/hr)	37			34	37		15	6	6	34		37
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Parking (#/hr)			0					0				0
Turn Type	Perm	NA			Perm	NA		Free	Perm	Perm	NA	
Protected Phases		2				2					4	
Permitted Phases	2				2			Free	4	4		
Actuated Green, G (s)		79.5				79.5		100.0			2.8	
Effective Green, g (s)		79.5				79.5		100.0			2.8	
Actuated g/C Ratio		0.80				0.80		1.00			0.03	
Clearance Time (s)		4.5				4.5					4.5	
Vehicle Extension (s)		0.2				0.2					2.0	
Lane Grp Cap (vph)		2735				2455		1431			45	
v/s Ratio Prot												
v/s Ratio Perm		0.14				c0.26		c0.02			0.00	
v/c Ratio		0.17				0.33		0.02			0.10	
Uniform Delay, d1		2.4				2.8		0.0			47.4	
Progression Factor		0.87				0.31		1.00			1.00	
Incremental Delay, d2		0.1				0.3		0.0			0.3	
Delay (s)		2.2				1.2		0.0			47.7	
Level of Service		A				A		A			D	
Approach Delay (s)		2.2				1.2					47.7	
Approach LOS		A				A					D	
Intersection Summary												
HCM 2000 Control Delay			3.6		HCM 2000 Level of Service				A			
HCM 2000 Volume to Capacity ratio			0.31									
Actuated Cycle Length (s)			100.0		Sum of lost time (s)				13.5			
Intersection Capacity Utilization			62.2%		ICU Level of Service				B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

31: 20th Ave & E Olive St & E Madison St



Movement	NWL	NWR	NWR2
Lane Configurations			
Traffic Volume (vph)	27	3	10
Future Volume (vph)	27	3	10
Ideal Flow (vphpl)	1900	1900	1900
Lane Width	16	12	12
Grade (%)	0%		
Total Lost time (s)	4.5		
Lane Util. Factor	1.00		
Frpb, ped/bikes	0.98		
Flpb, ped/bikes	1.00		
Frt	0.96		
Flt Protected	0.97		
Satd. Flow (prot)	1926		
Flt Permitted	0.97		
Satd. Flow (perm)	1926		
Peak-hour factor, PHF	0.90	0.90	0.90
Adj. Flow (vph)	30	3	11
RTOR Reduction (vph)	42	0	0
Lane Group Flow (vph)	2	0	0
Confl. Peds. (#/hr)	6		9
Heavy Vehicles (%)	1%	1%	1%
Parking (#/hr)		0	0
Turn Type	Prot		
Protected Phases	1		
Permitted Phases			
Actuated Green, G (s)	4.2		
Effective Green, g (s)	4.2		
Actuated g/C Ratio	0.04		
Clearance Time (s)	4.5		
Vehicle Extension (s)	2.0		
Lane Grp Cap (vph)	80		
v/s Ratio Prot	0.00		
v/s Ratio Perm			
v/c Ratio	0.02		
Uniform Delay, d1	45.9		
Progression Factor	1.00		
Incremental Delay, d2	0.0		
Delay (s)	46.0		
Level of Service	D		
Approach Delay (s)	46.0		
Approach LOS	D		
Intersection Summary			

HCM Signalized Intersection Capacity Analysis

32: 22nd Ave/E Denny Way & E Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	2	340	17	23	696	9	6	4	6	21	16	78
Future Volume (vph)	2	340	17	23	696	9	6	4	6	21	16	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	12	10	12	12	12	12	12	11	12
Grade (%)		-3%			1%			0%			0%	
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			1.00			0.98			0.91	
Flpb, ped/bikes		1.00			1.00			0.97			0.99	
Frt		0.99			1.00			0.95			0.91	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		3698			3297			1696			1473	
Flt Permitted		0.95			0.94			0.79			0.93	
Satd. Flow (perm)		3525			3090			1364			1387	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	2	362	18	24	740	10	6	4	6	22	17	83
RTOR Reduction (vph)	0	2	0	0	0	0	0	5	0	0	76	0
Lane Group Flow (vph)	0	380	0	0	774	0	0	11	0	0	46	0
Confl. Peds. (#/hr)	25		41	41		25	68		19	19		68
Confl. Bikes (#/hr)			4			10			1			7
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	2%	2%	2%
Parking (#/hr)			0			0			0			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		82.5			82.5			8.5			8.5	
Effective Green, g (s)		82.5			82.5			8.5			8.5	
Actuated g/C Ratio		0.82			0.82			0.08			0.08	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		0.2			0.2			1.0			1.0	
Lane Grp Cap (vph)		2908			2549			115			117	
v/s Ratio Prot												
v/s Ratio Perm		0.11			0.25			0.01			0.03	
v/c Ratio		0.13			0.30			0.09			0.39	
Uniform Delay, d1		1.7			2.0			42.2			43.3	
Progression Factor		1.00			0.36			1.00			1.00	
Incremental Delay, d2		0.1			0.3			0.1			0.8	
Delay (s)		1.8			1.0			42.3			44.1	
Level of Service		A			A			D			D	
Approach Delay (s)		1.8			1.0			42.3			44.1	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			5.8				HCM 2000 Level of Service			A		
HCM 2000 Volume to Capacity ratio			0.31									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)			9.0		
Intersection Capacity Utilization			59.8%				ICU Level of Service			B		
Analysis Period (min)			15									

HCM 2010 TWSC
33: E Madison St & 22nd ave

Intersection						
Int Delay, s/veh	0.3					
Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	1	9	17	408	711	7
Future Vol, veh/h	1	9	17	408	711	7
Conflicting Peds, #/hr	10	5	44	0	0	44
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	-	-	-1	5	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	10	18	443	773	8
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1090	439	824	0	-	0
Stage 1	821	-	-	-	-	-
Stage 2	269	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	210	566	802	-	-	-
Stage 1	393	-	-	-	-	-
Stage 2	752	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	191	546	799	-	-	-
Mov Cap-2 Maneuver	191	-	-	-	-	-
Stage 1	381	-	-	-	-	-
Stage 2	707	-	-	-	-	-
Approach	SB	NE		SW		
HCM Control Delay, s	13	0.5		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NEL	NET	SBLn1	SWT	SWR	
Capacity (veh/h)	799	-	460	-	-	
HCM Lane V/C Ratio	0.023	-	0.024	-	-	
HCM Control Delay (s)	9.6	0.1	13	-	-	
HCM Lane LOS	A	A	B	-	-	
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-	

HCM Signalized Intersection Capacity Analysis

34: E Madison St & 23rd Ave E

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		 			 						 	
Traffic Volume (vph)	0	733	56	0	271	273	188	208	20	17	449	15
Future Volume (vph)	0	733	56	0	271	273	188	208	20	17	449	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	9	9	10	10	10	10	16	10	9	10	10
Grade (%)		0%			0%			-5%			10%	
Total Lost time (s)		3.0			3.0		3.0	3.0		3.0	4.5	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	0.95	
Frpb, ped/bikes		0.99			0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.92		1.00	0.99		1.00	1.00	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3164			3039		1693	2124		1528	3121	
Flt Permitted		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		3164			3039		1693	2124		1528	3121	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	805	62	0	298	300	207	229	22	19	493	16
RTOR Reduction (vph)	0	6	0	0	202	0	0	3	0	0	2	0
Lane Group Flow (vph)	0	861	0	0	396	0	207	248	0	19	507	0
Confl. Peds. (#/hr)	5		26	26		5	16		25	25		16
Confl. Bikes (#/hr)						1						2
Heavy Vehicles (%)	2%	1%	1%	1%	1%	2%	2%	2%	2%	1%	2%	1%
Parking (#/hr)			0									0
Turn Type		NA			NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)		30.6			30.6		16.2	52.5		2.9	39.2	
Effective Green, g (s)		32.6			32.6		17.7	54.0		4.4	39.2	
Actuated g/C Ratio		0.33			0.33		0.18	0.54		0.04	0.39	
Clearance Time (s)		5.0			5.0		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		0.2			0.2		2.0	0.2		2.0	0.2	
Lane Grp Cap (vph)		1031			990		299	1146		67	1223	
v/s Ratio Prot		c0.27			0.13		c0.12	0.12		0.01	c0.16	
v/s Ratio Perm												
v/c Ratio		0.84			0.40		0.69	0.22		0.28	0.41	
Uniform Delay, d1		31.2			26.1		38.6	12.0		46.3	22.1	
Progression Factor		1.00			1.00		0.84	1.05		1.51	0.34	
Incremental Delay, d2		5.7			0.1		5.5	0.4		0.7	0.8	
Delay (s)		36.9			26.2		38.0	13.1		70.4	8.4	
Level of Service		D			C		D	B		E	A	
Approach Delay (s)		36.9			26.2			24.4			10.6	
Approach LOS		D			C			C			B	
Intersection Summary												
HCM 2000 Control Delay			26.3				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.62									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)			10.5		
Intersection Capacity Utilization			58.9%				ICU Level of Service			B		
Analysis Period (min)			15									

35: E Madison St & E JOHN ST

2019 No-Build Conditions AM
CDM Smith

HCM 2010 TWSC
36: E Madison St & 25th/25th Ave

Intersection

Int Delay, s/veh 2.1

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	15	27	7	7	5	8	13	328	1	2	637	16
Future Vol, veh/h	15	27	7	7	5	8	13	328	1	2	637	16
Conflicting Peds, #/hr	7	0	4	4	0	7	16	0	10	10	0	16
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	2	-	-	1	-	-	-10	-	-	14	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	2	2	2	2	2	2
Mvmt Flow	17	30	8	8	6	9	14	364	1	2	708	18

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	1139	1150	379	1154	1141	740	742	0	0	376	0	0
Stage 1	404	404	-	737	737	-	-	-	-	-	-	-
Stage 2	735	746	-	417	404	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.9	6.4	7.3	6.7	6.3	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.5	5.9	-	6.3	5.7	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.9	-	6.3	5.7	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	159	176	658	165	190	412	865	-	-	1182	-	-
Stage 1	600	576	-	397	410	-	-	-	-	-	-	-
Stage 2	382	390	-	603	589	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	147	168	650	136	182	403	858	-	-	1177	-	-
Mov Cap-2 Maneuver	147	168	-	136	182	-	-	-	-	-	-	-
Stage 1	583	560	-	384	403	-	-	-	-	-	-	-
Stage 2	364	384	-	550	572	-	-	-	-	-	-	-

Approach	NB	SB	NE	SW
HCM Control Delay, s	33.7	25	0.4	0
HCM LOS	D	D		

Minor Lane/Major Mvmt	NEL	NET	NER	NBLn1	SBLn1	SWL	SWT	SWR
Capacity (veh/h)	858	-	-	179	202	1177	-	-
HCM Lane V/C Ratio	0.017	-	-	0.304	0.11	0.002	-	-
HCM Control Delay (s)	9.3	0	-	33.7	25	8.1	0	-
HCM Lane LOS	A	A	-	D	D	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.2	0.4	0	-	-

HCM 2010 TWSC
37: E Madison St & 26th Ave

Intersection

Int Delay, s/veh 0.2

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	2	9	6	345	640	6
Future Vol, veh/h	2	9	6	345	640	6
Conflicting Peds, #/hr	0	0	10	0	0	10
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	-14	10	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	2	2	2	2
Mvmt Flow	2	10	7	375	696	7

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1097	709	712	0	-	0
Stage 1	709	-	-	-	-	-
Stage 2	388	-	-	-	-	-
Critical Hdwy	5.8	5.9	4.12	-	-	-
Critical Hdwy Stg 1	4.8	-	-	-	-	-
Critical Hdwy Stg 2	4.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	286	464	888	-	-	-
Stage 1	553	-	-	-	-	-
Stage 2	736	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	278	460	888	-	-	-
Mov Cap-2 Maneuver	278	-	-	-	-	-
Stage 1	548	-	-	-	-	-
Stage 2	723	-	-	-	-	-

Approach	SE	NE	SW
HCM Control Delay, s	14	0.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NEL	NET	SELn1	SWT	SWR
Capacity (veh/h)	888	-	411	-	-
HCM Lane V/C Ratio	0.007	-	0.029	-	-
HCM Control Delay (s)	9.1	0	14	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

HCM 2010 TWSC
38: E Madison St & 27th

Intersection						
Int Delay, s/veh	1.4					
Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	44	28	337	13	8	587
Future Vol, veh/h	44	28	337	13	8	587
Conflicting Peds, #/hr	4	0	0	19	19	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	-10	-	-	8
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	47	30	359	14	9	624
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1029	384	0	0	391	0
Stage 1	384	-	-	-	-	-
Stage 2	645	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.12	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.218	-
Pot Cap-1 Maneuver	261	668	-	-	1168	-
Stage 1	693	-	-	-	-	-
Stage 2	526	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	254	657	-	-	1168	-
Mov Cap-2 Maneuver	254	-	-	-	-	-
Stage 1	682	-	-	-	-	-
Stage 2	520	-	-	-	-	-
Approach	NW		NE		SW	
HCM Control Delay, s	19		0		0.1	
HCM LOS	C					
Minor Lane/Major Mvmt	NET	NERNWLn1	SWL	SWT		
Capacity (veh/h)	-	-	334	1168	-	
HCM Lane V/C Ratio	-	-	0.229	0.007	-	
HCM Control Delay (s)	-	-	19	8.1	-	
HCM Lane LOS	-	-	C	A	-	
HCM 95th %tile Q(veh)	-	-	0.9	0	-	

HCM 2010 TWSC
39: E Madison St & 27th Ave E

Intersection

Int Delay, s/veh 0.4

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	0	14	23	341	580	9
Future Vol, veh/h	0	14	23	341	580	9
Conflicting Peds, #/hr	2	0	23	0	0	23
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	-8	4	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	0	15	24	363	617	10

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1059	645	650	0	-	0
Stage 1	645	-	-	-	-	-
Stage 2	414	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.13	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.227	-	-	-
Pot Cap-1 Maneuver	251	476	931	-	-	-
Stage 1	526	-	-	-	-	-
Stage 2	671	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	235	467	931	-	-	-
Mov Cap-2 Maneuver	366	-	-	-	-	-
Stage 1	516	-	-	-	-	-
Stage 2	641	-	-	-	-	-

Approach	SE	NE	SW
HCM Control Delay, s	13	0.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NEL	NET	SELn1	SWT	SWR
Capacity (veh/h)	931	-	467	-	-
HCM Lane V/C Ratio	0.026	-	0.032	-	-
HCM Control Delay (s)	9	-	13	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-

HCM Signalized Intersection Capacity Analysis

40: E Madison St & MLK Jr Way E/28th Ave E

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	170	108	222	39	120	17	2	296	44	92	414	12
Future Volume (vph)	170	108	222	39	120	17	2	296	44	92	414	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	9	16	10	9	16	10
Grade (%)		2%			-1%			-4%			2%	
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.96			0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes		0.98			1.00		0.98	1.00		0.96	1.00	
Frt		0.94			0.99		1.00	0.98		1.00	1.00	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1599			1836		1570	2061		1479	2036	
Flt Permitted		0.80			0.84		0.37	1.00		0.45	1.00	
Satd. Flow (perm)		1298			1552		614	2061		704	2036	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	183	116	239	42	129	18	2	318	47	99	445	13
RTOR Reduction (vph)	0	0	0	0	0	0	0	4	0	0	1	0
Lane Group Flow (vph)	0	538	0	0	189	0	2	361	0	99	457	0
Confl. Peds. (#/hr)	38		20	20		38	25		34	34		25
Confl. Bikes (#/hr)			17			6			2			6
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	3%	3%	3%	4%	4%	4%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4			4			2			2		
Actuated Green, G (s)		41.4			41.4		49.6	49.6		49.6	49.6	
Effective Green, g (s)		41.4			41.4		49.6	49.6		49.6	49.6	
Actuated g/C Ratio		0.41			0.41		0.50	0.50		0.50	0.50	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		2.0			2.0		0.2	0.2		0.2	0.2	
Lane Grp Cap (vph)		537			642		304	1022		349	1009	
v/s Ratio Prot								0.18			c0.22	
v/s Ratio Perm		c0.41			0.12		0.00			0.14		
v/c Ratio		1.00			0.29		0.01	0.35		0.28	0.45	
Uniform Delay, d1		29.3			19.6		12.7	15.4		14.8	16.4	
Progression Factor		1.00			1.00		0.59	0.67		1.00	1.00	
Incremental Delay, d2		39.3			0.1		0.0	0.9		2.0	1.5	
Delay (s)		68.6			19.6		7.5	11.3		16.8	17.9	
Level of Service		E			B		A	B		B	B	
Approach Delay (s)		68.6			19.6			11.3			17.7	
Approach LOS		E			B			B			B	
Intersection Summary												
HCM 2000 Control Delay			33.1									HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			100.0							12.5		
Intersection Capacity Utilization			84.0%									ICU Level of Service E
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

41: 1st Ave & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	182	31	0	0	0	0	638	94	64	368	0
Future Volume (vph)	34	182	31	0	0	0	0	638	94	64	368	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	12	10	12	12	12	10	10	10	10	10	10
Grade (%)		9%			0%			3%			0%	
Total Lost time (s)		4.5						4.5		4.5	4.5	
Lane Util. Factor		0.95						1.00		1.00	1.00	
Frpb, ped/bikes		0.97						0.96		1.00	1.00	
Flpb, ped/bikes		0.99						1.00		1.00	1.00	
Frt		0.98						0.98		1.00	1.00	
Flt Protected		0.99						1.00		0.95	1.00	
Satd. Flow (prot)		2873						1394		1404	1478	
Flt Permitted		0.99						1.00		0.95	1.00	
Satd. Flow (perm)		2873						1394		1404	1478	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	198	34	0	0	0	0	693	102	70	400	0
RTOR Reduction (vph)	0	13	0	0	0	0	0	6	0	0	0	0
Lane Group Flow (vph)	0	256	0	0	0	0	0	789	0	70	400	0
Confl. Peds. (#/hr)	40		78	78		40	256		247	247		256
Confl. Bikes (#/hr)			1			5			12			28
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	6%	6%	6%	8%	8%	8%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						9		2	6	
Permitted Phases	4	4										
Actuated Green, G (s)		18.1						50.5		7.9	62.9	
Effective Green, g (s)		18.1						50.5		7.9	62.9	
Actuated g/C Ratio		0.20						0.56		0.09	0.70	
Clearance Time (s)		4.5						4.5		4.5	4.5	
Lane Grp Cap (vph)		577						782		123	1032	
v/s Ratio Prot								c0.57		c0.05	0.27	
v/s Ratio Perm		0.09										
v/c Ratio		0.44						1.01		0.57	0.39	
Uniform Delay, d1		31.5						19.8		39.4	5.6	
Progression Factor		1.00						0.71		1.00	1.00	
Incremental Delay, d2		2.5						30.9		17.7	1.1	
Delay (s)		34.0						44.9		57.1	6.7	
Level of Service		C						D		E	A	
Approach Delay (s)		34.0			0.0			44.9			14.2	
Approach LOS		C			A			D			B	
Intersection Summary												
HCM 2000 Control Delay			33.6					HCM 2000 Level of Service		C		
HCM 2000 Volume to Capacity ratio			0.83									
Actuated Cycle Length (s)			90.0					Sum of lost time (s)		13.5		
Intersection Capacity Utilization			76.8%					ICU Level of Service		D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

42: 2nd Ave & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑								↵	↑↑	
Traffic Volume (vph)	0	243	51	0	0	0	0	0	0	280	1040	0
Future Volume (vph)	0	243	51	0	0	0	0	0	0	280	1040	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	10	10	10	10	10	10	10
Grade (%)		12%			0%			0%			0%	
Total Lost time (s)		4.0								4.0	4.0	
Lane Util. Factor		0.95								1.00	0.95	
Frpb, ped/bikes		0.96								1.00	1.00	
Flpb, ped/bikes		1.00								1.00	1.00	
Frt		0.97								1.00	1.00	
Flt Protected		1.00								0.95	1.00	
Satd. Flow (prot)		2588								1182	2163	
Flt Permitted		1.00								0.95	1.00	
Satd. Flow (perm)		2588								1182	2163	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	264	55	0	0	0	0	0	0	295	1095	0
RTOR Reduction (vph)	0	19	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	300	0	0	0	0	0	0	0	295	1095	0
Confl. Peds. (#/hr)	118		150	150		118	330		393	393		330
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	2%	2%	9%	9%	9%
Parking (#/hr)										10	69	69
Turn Type		NA								Prot	NA	
Protected Phases		2								3	1 4	
Permitted Phases												
Actuated Green, G (s)		19.5								24.5	61.5	
Effective Green, g (s)		20.0								25.0	62.0	
Actuated g/C Ratio		0.22								0.28	0.69	
Clearance Time (s)		4.5								4.5		
Lane Grp Cap (vph)		575								328	1490	
v/s Ratio Prot		c0.12								c0.25	c0.51	
v/s Ratio Perm												
v/c Ratio		0.52								0.90	0.73	
Uniform Delay, d1		30.8								31.3	8.8	
Progression Factor		1.09								1.00	1.00	
Incremental Delay, d2		2.6								29.6	3.3	
Delay (s)		36.1								60.9	12.1	
Level of Service		D								E	B	
Approach Delay (s)		36.1			0.0			0.0			22.4	
Approach LOS		D			A			A			C	
Intersection Summary												
HCM 2000 Control Delay			25.0				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			11.5		
Intersection Capacity Utilization			53.6%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

43: 3rd Ave & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	410	66	0	0	0	0	80	30	13	133	0
Future Volume (vph)	5	410	66	0	0	0	0	80	30	13	133	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	12	12	12	11	12	12	11	12
Grade (%)		10%			-10%			0%			0%	
Total Lost time (s)		4.0						4.0			4.0	
Lane Util. Factor		0.95						0.95			0.95	
Frpb, ped/bikes		0.96						0.89			1.00	
Flpb, ped/bikes		1.00						1.00			0.97	
Frt		0.98						0.96			1.00	
Flt Protected		1.00						1.00			1.00	
Satd. Flow (prot)		2403						1449			1565	
Flt Permitted		1.00						1.00			0.93	
Satd. Flow (perm)		2403						1449			1468	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.89	0.89	0.89	0.85	0.85	0.85
Adj. Flow (vph)	5	446	72	0	0	0	0	90	34	15	156	0
RTOR Reduction (vph)	0	14	0	0	0	0	0	5	0	0	0	0
Lane Group Flow (vph)	0	509	0	0	0	0	0	119	0	0	171	0
Confl. Peds. (#/hr)	351		235	235		351	699		388	388		699
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	85%	7%	50%	84%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	60	0	0	34	0
Parking (#/hr)		15										
Turn Type	Perm	NA						NA		Perm	NA	
Protected Phases		2						1			1	
Permitted Phases	2									1		
Actuated Green, G (s)		25.5						55.5			55.5	
Effective Green, g (s)		26.0						56.0			56.0	
Actuated g/C Ratio		0.29						0.62			0.62	
Clearance Time (s)		4.5						4.5			4.5	
Lane Grp Cap (vph)		694						901			913	
v/s Ratio Prot								0.08				
v/s Ratio Perm		0.21									c0.12	
v/c Ratio		0.73						0.13			0.19	
Uniform Delay, d1		28.9						7.0			7.3	
Progression Factor		0.54						2.57			1.00	
Incremental Delay, d2		4.6						0.3			0.5	
Delay (s)		20.1						18.3			7.7	
Level of Service		C						B			A	
Approach Delay (s)		20.1			0.0			18.3			7.7	
Approach LOS		C			A			B			A	
Intersection Summary												
HCM 2000 Control Delay			17.2									
HCM 2000 Volume to Capacity ratio			0.36									
Actuated Cycle Length (s)			90.0									
Intersection Capacity Utilization			38.7%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

44: 4th Ave & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	104	312	0	0	0	0	0	1434	134	0	0	0
Future Volume (vph)	104	312	0	0	0	0	0	1434	134	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	12	12	12	10	12	12	12	12
Grade (%)		15%			-5%			5%			0%	
Total Lost time (s)		4.5						5.5	5.5			
Lane Util. Factor		0.95						0.91	1.00			
Frpb, ped/bikes		1.00						1.00	0.60			
Flpb, ped/bikes		0.92						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		0.99						1.00	1.00			
Satd. Flow (prot)		2280						3604	816			
Flt Permitted		0.99						1.00	1.00			
Satd. Flow (perm)		2280						3604	816			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	113	339	0	0	0	0	0	1559	146	0	0	0
RTOR Reduction (vph)	0	14	0	0	0	0	0	0	6	0	0	0
Lane Group Flow (vph)	0	438	0	0	0	0	0	1559	140	0	0	0
Confl. Peds. (#/hr)	254		241	241		254	472		448	448		472
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	11%	5%	2%	2%	2%
Parking (#/hr)		15						15				
Turn Type	Perm	NA						NA	Perm			
Protected Phases		2						1				
Permitted Phases	2								1			
Actuated Green, G (s)		21.5						59.5	59.5			
Effective Green, g (s)		21.5						58.5	58.5			
Actuated g/C Ratio		0.24						0.65	0.65			
Clearance Time (s)		4.5						4.5	4.5			
Lane Grp Cap (vph)		544						2342	530			
v/s Ratio Prot								c0.43				
v/s Ratio Perm		0.19							0.17			
v/c Ratio		0.81						0.67	0.26			
Uniform Delay, d1		32.3						9.7	6.7			
Progression Factor		1.42						0.62	0.51			
Incremental Delay, d2		9.0						0.9	0.7			
Delay (s)		54.9						7.0	4.1			
Level of Service		D						A	A			
Approach Delay (s)		54.9			0.0			6.7			0.0	
Approach LOS		D			A			A			A	
Intersection Summary												
HCM 2000 Control Delay		16.8			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.70										
Actuated Cycle Length (s)		90.0			Sum of lost time (s)			10.0				
Intersection Capacity Utilization		55.3%			ICU Level of Service			B				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

45: 5th Ave & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	350	55	0	0	0	0	0	0	458	635	0
Future Volume (vph)	0	350	55	0	0	0	0	0	0	458	635	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	12	12	12	12	12	10	10	12
Grade (%)		15%			-5%			0%			0%	
Total Lost time (s)		3.5									3.5	
Lane Util. Factor		0.91									0.91	
Frpb, ped/bikes		0.98									1.00	
Flpb, ped/bikes		1.00									0.92	
Frt		0.98									1.00	
Flt Protected		1.00									0.98	
Satd. Flow (prot)		3353									3788	
Flt Permitted		1.00									0.98	
Satd. Flow (perm)		3353									3788	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	380	60	0	0	0	0	0	0	498	690	0
RTOR Reduction (vph)	0	24	0	0	0	0	0	0	0	0	32	0
Lane Group Flow (vph)	0	416	0	0	0	0	0	0	0	0	1156	0
Confl. Peds. (#/hr)	195		68	68		195	312		104	104		312
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	2%	2%	2%	4%	4%	4%
Parking (#/hr)		30										
Turn Type		NA								custom	NA	
Protected Phases		2								3	1 4	
Permitted Phases										4		
Actuated Green, G (s)		33.0									47.0	
Effective Green, g (s)		34.5									48.5	
Actuated g/C Ratio		0.38									0.54	
Clearance Time (s)		5.0										
Lane Grp Cap (vph)		1285									2041	
v/s Ratio Prot		c0.12									c0.17	
v/s Ratio Perm											0.13	
v/c Ratio		0.32									0.57	
Uniform Delay, d1		19.5									13.8	
Progression Factor		1.27									1.00	
Incremental Delay, d2		0.5									1.1	
Delay (s)		25.2									14.9	
Level of Service		C									B	
Approach Delay (s)		25.2			0.0			0.0			14.9	
Approach LOS		C			A			A			B	
Intersection Summary												
HCM 2000 Control Delay			17.7				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			8.5		
Intersection Capacity Utilization			54.0%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

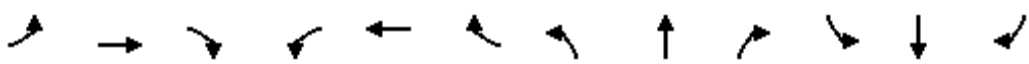
HCM Signalized Intersection Capacity Analysis

46: 6th Ave & I-5 CD SB On-Ramp & Spring St

						
Movement	EBL	EBT	EBR	NBT	NBR	NBR2
Lane Configurations		 		 		
Traffic Volume (vph)	119	183	487	473	7	538
Future Volume (vph)	119	183	487	473	7	538
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	10	11	10	11	12
Grade (%)		10%		5%		
Total Lost time (s)		4.5	4.5	4.5	4.5	
Lane Util. Factor		0.95	1.00	0.95	1.00	
Frpb, ped/bikes		1.00	0.97	1.00	0.88	
Flpb, ped/bikes		0.87	1.00	1.00	1.00	
Frt		1.00	0.85	1.00	0.85	
Flt Protected		0.98	1.00	1.00	1.00	
Satd. Flow (prot)		2147	1256	2957	1199	
Flt Permitted		0.98	1.00	1.00	1.00	
Satd. Flow (perm)		2147	1256	2957	1199	
Peak-hour factor, PHF	0.94	0.94	0.94	0.95	0.95	0.95
Adj. Flow (vph)	127	195	518	498	7	566
RTOR Reduction (vph)	0	46	0	0	0	0
Lane Group Flow (vph)	0	276	518	498	573	0
Confl. Peds. (#/hr)	292		4		34	4
Heavy Vehicles (%)	3%	3%	3%	0%	0%	0%
Bus Blockages (#/hr)	0	5	0	0	0	0
Parking (#/hr)		15				
Turn Type	Perm	NA	Perm	NA	Perm	
Protected Phases		4		2		
Permitted Phases	4		4		2	
Actuated Green, G (s)		38.5	38.5	42.5	42.5	
Effective Green, g (s)		38.5	38.5	42.5	42.5	
Actuated g/C Ratio		0.43	0.43	0.47	0.47	
Clearance Time (s)		4.5	4.5	4.5	4.5	
Lane Grp Cap (vph)		918	537	1396	566	
v/s Ratio Prot				0.17		
v/s Ratio Perm		0.13	c0.41		c0.48	
v/c Ratio		0.30	0.96	0.36	1.01	
Uniform Delay, d1		16.9	25.1	15.1	23.8	
Progression Factor		0.47	1.27	1.08	1.01	
Incremental Delay, d2		0.8	28.8	0.5	34.8	
Delay (s)		8.8	60.6	16.8	58.9	
Level of Service		A	E	B	E	
Approach Delay (s)		40.8		39.3		
Approach LOS		D		D		
Intersection Summary						
HCM 2000 Control Delay			39.9		HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.99			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	9.0
Intersection Capacity Utilization			81.9%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

47: 7th Ave/Hubbell PI & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔						↔			↔	
Traffic Volume (vph)	40	143	7	0	0	0	0	369	52	10	161	0
Future Volume (vph)	40	143	7	0	0	0	0	369	52	10	161	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5						4.5			4.5	
Lane Util. Factor		0.95						1.00			1.00	
Frpb, ped/bikes		1.00						0.99			1.00	
Flpb, ped/bikes		0.94						1.00			1.00	
Frt		0.99						0.98			1.00	
Flt Protected		0.99						1.00			1.00	
Satd. Flow (prot)		2923						1628			1668	
Flt Permitted		0.99						1.00			0.97	
Satd. Flow (perm)		2923						1628			1629	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	155	8	0	0	0	0	401	57	11	175	0
RTOR Reduction (vph)	0	5	0	0	0	0	0	9	0	0	0	0
Lane Group Flow (vph)	0	201	0	0	0	0	0	449	0	0	186	0
Confl. Peds. (#/hr)	145		22	22		145	3		74	74		3
Turn Type	Perm	NA						NA		Perm	NA	
Protected Phases		4						2			2	
Permitted Phases	4									2		
Actuated Green, G (s)		18.5						32.5			32.5	
Effective Green, g (s)		18.5						32.5			32.5	
Actuated g/C Ratio		0.31						0.54			0.54	
Clearance Time (s)		4.5						4.5			4.5	
Lane Grp Cap (vph)		901						881			882	
v/s Ratio Prot								c0.28				
v/s Ratio Perm		0.07									0.11	
v/c Ratio		0.22						0.51			0.21	
Uniform Delay, d1		15.4						8.7			7.1	
Progression Factor		1.00						1.00			1.00	
Incremental Delay, d2		0.6						2.1			0.5	
Delay (s)		16.0						10.8			7.7	
Level of Service		B						B			A	
Approach Delay (s)		16.0			0.0			10.8			7.7	
Approach LOS		B			A			B			A	
Intersection Summary												
HCM 2000 Control Delay		11.4						HCM 2000 Level of Service		B		
HCM 2000 Volume to Capacity ratio		0.41										
Actuated Cycle Length (s)		60.0						Sum of lost time (s)		9.0		
Intersection Capacity Utilization		46.1%						ICU Level of Service		A		
Analysis Period (min)		15										
c Critical Lane Group												

HCM 2010 TWSC
48: 8th Ave & Spring St

Intersection												
Int Delay, s/veh	5.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	52	97	41	0	0	0	0	210	16	18	64	0
Future Vol, veh/h	52	97	41	0	0	0	0	210	16	18	64	0
Conflicting Peds, #/hr	116	0	65	0	0	0	115	0	104	104	0	115
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	57	105	45	0	0	0	0	228	17	20	70	0
Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	462	459	135				-	0	0	350	0	0
Stage 1	109	109	-				-	-	-	-	-	-
Stage 2	353	350	-				-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	510	499	914				0	-	-	1209	-	0
Stage 1	896	805	-				0	-	-	-	-	0
Stage 2	664	633	-				0	-	-	-	-	0
Platoon blocked, %								-	-			
Mov Cap-1 Maneuver	454	490	864				-	-	-	1092	-	-
Mov Cap-2 Maneuver	454	490	-				-	-	-	-	-	-
Stage 1	896	790	-				-	-	-	-	-	-
Stage 2	600	633	-				-	-	-	-	-	-
Approach	EB						NB			SB		
HCM Control Delay, s	13.5						0			1.8		
HCM LOS	B											
Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT						
Capacity (veh/h)	-	-	471	611	1092	-						
HCM Lane V/C Ratio	-	-	0.232	0.159	0.018	-						
HCM Control Delay (s)	-	-	14.9	12	8.4	0						
HCM Lane LOS	-	-	B	B	A	A						
HCM 95th %tile Q(veh)	-	-	0.9	0.6	0.1	-						

HCM 2010 TWSC
49: 9th Ave & Spring St

Intersection												
Int Delay, s/veh	4.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗		↕			↗			↕	
Traffic Vol, veh/h	50	43	42	6	0	32	0	172	4	7	93	0
Future Vol, veh/h	50	43	42	6	0	32	0	172	4	7	93	0
Conflicting Peds, #/hr	209	0	58	58	0	209	104	0	111	111	0	104
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	54	47	46	7	0	35	0	187	4	8	101	0
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	532	418	159	498	416	509	-	0	0	302	0	0
Stage 1	116	116	-	300	300	-	-	-	-	-	-	-
Stage 2	416	302	-	198	116	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	458	526	886	483	527	564	0	-	-	1259	-	0
Stage 1	889	800	-	709	666	-	0	-	-	-	-	0
Stage 2	614	664	-	804	800	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	345	474	843	363	474	423	-	-	-	1040	-	-
Mov Cap-2 Maneuver	345	474	-	363	474	-	-	-	-	-	-	-
Stage 1	889	794	-	709	604	-	-	-	-	-	-	-
Stage 2	465	603	-	676	794	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	11.5			14.7			0			0.6		
HCM LOS	B			B								
Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT					
Capacity (veh/h)	-	-	474	843	412	1040	-					
HCM Lane V/C Ratio	-	-	0.099	0.054	0.1	0.007	-					
HCM Control Delay (s)	-	-	13.4	9.5	14.7	8.5	0					
HCM Lane LOS	-	-	B	A	B	A	A					
HCM 95th %tile Q(veh)	-	-	0.3	0.2	0.3	0	-					

HCM Signalized Intersection Capacity Analysis

50: 14th Ave & Pike St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	72	16	0	62	4	60	168	0	2	88	7
Future Volume (vph)	4	72	16	0	62	4	60	168	0	2	88	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	16	12	12	16	12	12	16	12
Grade (%)		6%			-6%			0%			0%	
Total Lost time (s)	4.5	4.5			4.5			8.5			8.5	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00			0.99			1.00			0.99	
Flpb, ped/bikes	0.83	1.00			1.00			0.97			1.00	
Frt	1.00	0.97			0.99			1.00			0.99	
Flt Protected	0.95	1.00			1.00			0.99			1.00	
Satd. Flow (prot)	1429	1470			2134			2028			1858	
Flt Permitted	0.71	1.00			1.00			0.88			0.99	
Satd. Flow (perm)	1067	1470			2134			1818			1845	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	4	80	18	0	69	4	67	187	0	2	98	8
RTOR Reduction (vph)	0	8	0	0	1	0	0	0	0	0	3	0
Lane Group Flow (vph)	4	90	0	0	72	0	0	254	0	0	105	0
Confl. Peds. (#/hr)	63					63	43		19	19		43
Confl. Bikes (#/hr)			1			4			25			9
Parking (#/hr)		0									0	
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		2			4			3			3	
Permitted Phases	2						3			3		
Actuated Green, G (s)	13.8	13.8			67.2			19.8			19.8	
Effective Green, g (s)	13.8	13.8			67.2			19.8			19.8	
Actuated g/C Ratio	0.14	0.14			0.67			0.20			0.20	
Clearance Time (s)	4.5	4.5			4.5			8.5			8.5	
Vehicle Extension (s)	0.2	0.2			0.2			0.2			0.2	
Lane Grp Cap (vph)	147	202			1434			359			365	
v/s Ratio Prot		c0.06			c0.03							
v/s Ratio Perm	0.00							c0.14			0.06	
v/c Ratio	0.03	0.45			0.05			0.71			0.29	
Uniform Delay, d1	37.3	39.6			5.6			37.4			34.1	
Progression Factor	1.00	1.00			0.00			0.14			1.00	
Incremental Delay, d2	0.3	7.0			0.1			4.2			0.2	
Delay (s)	37.6	46.6			0.1			9.5			34.3	
Level of Service	D	D			A			A			C	
Approach Delay (s)		46.2			0.1			9.5			34.3	
Approach LOS		D			A			A			C	
Intersection Summary												
HCM 2000 Control Delay			20.2									
HCM 2000 Volume to Capacity ratio			0.27									
Actuated Cycle Length (s)			100.0									
Intersection Capacity Utilization			43.8%									
Analysis Period (min)			15									
c Critical Lane Group												

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HCM Signalized Intersection Capacity Analysis

1: 1st Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	92	143	107	41	645	0	0	306	93
Future Volume (vph)	0	0	0	92	143	107	41	645	0	0	306	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	14	11	15	10	11	10	10	11	10
Grade (%)		6%			-8%			0%			0%	
Total Lost time (s)					4.5	4.5	4.5	4.5			4.5	
Lane Util. Factor					0.95	1.00	1.00	1.00			1.00	
Frpb, ped/bikes					1.00	1.00	1.00	1.00			0.92	
Flpb, ped/bikes					0.87	1.00	1.00	1.00			1.00	
Frt					1.00	0.85	1.00	1.00			0.97	
Flt Protected					0.98	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					2676	1599	1486	1621			1393	
Flt Permitted					0.98	1.00	0.95	1.00			1.00	
Satd. Flow (perm)					2676	1599	1486	1621			1393	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	100	155	116	45	701	0	0	333	101
RTOR Reduction (vph)	0	0	0	0	0	104	0	0	0	0	12	0
Lane Group Flow (vph)	0	0	0	0	255	12	45	701	0	0	422	0
Confl. Peds. (#/hr)	103		137	134		103	243		247	247		243
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	2%	2%	2%	6%	6%	6%
Turn Type				Perm	NA	custom	Prot	NA			NA	
Protected Phases					8	3	5	2			6	
Permitted Phases				8								
Actuated Green, G (s)					32.0	9.5	7.5	49.0			37.0	
Effective Green, g (s)					32.0	9.5	7.5	49.0			37.0	
Actuated g/C Ratio					0.36	0.11	0.08	0.54			0.41	
Clearance Time (s)					4.5	4.5	4.5	4.5			4.5	
Lane Grp Cap (vph)					951	168	123	882			572	
v/s Ratio Prot						0.01	0.03	c0.43			0.30	
v/s Ratio Perm					0.10							
v/c Ratio					0.27	0.07	0.37	0.79			0.74	
Uniform Delay, d1					20.7	36.3	39.0	16.5			22.4	
Progression Factor					0.39	3.07	1.00	1.00			0.87	
Incremental Delay, d2					0.5	0.6	8.2	7.3			7.7	
Delay (s)					8.6	112.1	47.2	23.8			27.2	
Level of Service					A	F	D	C			C	
Approach Delay (s)		0.0			41.0			25.2			27.2	
Approach LOS		A			D			C			C	
Intersection Summary												
HCM 2000 Control Delay			29.5									
HCM 2000 Volume to Capacity ratio			0.66									
Actuated Cycle Length (s)			90.0									
Intersection Capacity Utilization			60.2%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2010 Signalized Intersection Summary

2: 2nd Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑						↑↑	↑
Traffic Volume (veh/h)	0	0	0	300	291	0	0	0	0	0	950	93
Future Volume (veh/h)	0	0	0	300	291	0	0	0	0	0	950	93
Number				7	4	14				5	2	12
Initial Q (Qb), veh				0	0	0				0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00				1.00		0.87
Parking Bus, Adj				1.00	1.00	1.00				1.00	1.00	0.43
Adj Sat Flow, veh/h/ln				1778	1710	0				0	1555	1555
Adj Flow Rate, veh/h				345	334	0				0	979	96
Adj No. of Lanes				0	2	0				0	2	1
Peak Hour Factor				0.87	0.87	0.87				0.97	0.97	0.97
Percent Heavy Veh, %				4	4	0				0	10	10
Cap, veh/h				523	513	0				0	1739	281
Arrive On Green				0.34	0.34	0.00				0.00	0.19	0.19
Sat Flow, veh/h				1287	1568	0				0	3031	491
Grp Volume(v), veh/h				348	331	0				0	979	96
Grp Sat Flow(s),veh/h/ln				1299	1478	0				0	1477	491
Q Serve(g_s), s				21.6	17.0	0.0				0.0	27.0	15.3
Cycle Q Clear(g_c), s				21.6	17.0	0.0				0.0	27.0	15.3
Prop In Lane				0.99		0.00				0.00		1.00
Lane Grp Cap(c), veh/h				527	509	0				0	1739	281
V/C Ratio(X)				0.66	0.65	0.00				0.00	0.56	0.34
Avail Cap(c_a), veh/h				527	509	0				0	1739	281
HCM Platoon Ratio				1.00	1.00	1.00				1.00	0.33	0.33
Upstream Filter(I)				1.00	1.00	0.00				0.00	1.00	1.00
Uniform Delay (d), s/veh				26.4	24.9	0.0				0.0	25.8	21.8
Incr Delay (d2), s/veh				6.4	6.3	0.0				0.0	1.3	3.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				8.7	7.8	0.0				0.0	11.3	2.3
LnGrp Delay(d),s/veh				32.8	31.2	0.0				0.0	27.1	25.1
LnGrp LOS				C	C						C	C
Approach Vol, veh/h					679						1075	
Approach Delay, s/veh					32.0						26.9	
Approach LOS					C						C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		56.0		34.0								
Change Period (Y+Rc), s		4.5		4.5								
Max Green Setting (Gmax), s		51.5		29.5								
Max Q Clear Time (g_c+I1), s		0.0		0.0								
Green Ext Time (p_c), s		0.0		0.0								
Intersection Summary												
HCM 2010 Ctrl Delay				28.9								
HCM 2010 LOS				C								

HCM Signalized Intersection Capacity Analysis

3: 3rd Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↑		↑↑			↑↑	
Traffic Volume (vph)	0	0	0	0	538	24	0	103	0	0	114	87
Future Volume (vph)	0	0	0	0	538	24	0	103	0	0	114	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	10	11	12	10	12	12	11	12
Grade (%)		10%			-15%			0%			-5%	
Total Lost time (s)					4.0	4.5		4.0			4.0	
Lane Util. Factor					0.95	1.00		0.95			0.95	
Frpb, ped/bikes					1.00	0.74		1.00			0.80	
Flpb, ped/bikes					1.00	1.00		1.00			1.00	
Frt					1.00	0.85		1.00			0.93	
Flt Protected					1.00	1.00		1.00			1.00	
Satd. Flow (prot)					2803	1071		1535			1501	
Flt Permitted					1.00	1.00		1.00			1.00	
Satd. Flow (perm)					2803	1071		1535			1501	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	585	26	0	112	0	0	120	92
RTOR Reduction (vph)	0	0	0	0	0	10	0	0	0	0	60	0
Lane Group Flow (vph)	0	0	0	0	585	16	0	112	0	0	152	0
Confl. Peds. (#/hr)	214		308	308		214	577		449	499		577
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	0%	73%	0%	0%	84%	10%
Bus Blockages (#/hr)	0	0	0	0	10	0	0	62	0	0	29	0
Parking (#/hr)					15							
Turn Type					NA	custom		NA			NA	
Protected Phases					4	7		2			2	
Permitted Phases						8						
Actuated Green, G (s)					50.0	45.5		31.0			31.0	
Effective Green, g (s)					50.5	45.5		31.5			31.5	
Actuated g/C Ratio					0.56	0.51		0.35			0.35	
Clearance Time (s)					4.5	4.5		4.5			4.5	
Lane Grp Cap (vph)					1572	595		537			525	
v/s Ratio Prot					c0.21	0.00		0.07			c0.10	
v/s Ratio Perm						0.01						
v/c Ratio					0.37	0.03		0.21			0.29	
Uniform Delay, d1					11.0	11.2		20.5			21.2	
Progression Factor					0.77	0.71		1.00			1.85	
Incremental Delay, d2					0.6	0.1		0.9			1.4	
Delay (s)					9.0	7.9		21.4			40.5	
Level of Service					A	A		C			D	
Approach Delay (s)		0.0			9.0			21.4			40.5	
Approach LOS		A			A			C			D	
Intersection Summary												
HCM 2000 Control Delay			17.6				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.36									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)		13.0			
Intersection Capacity Utilization			35.7%				ICU Level of Service		A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: 4th Ave & Madison St



Movement	WBR	NBL	NBT	SWR	SWR2
Lane Configurations					
Traffic Volume (vph)	21	253	1252	295	382
Future Volume (vph)	21	253	1252	295	382
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Lane Width	12	12	10	11	12
Grade (%)			5%		
Total Lost time (s)	3.5		3.5	2.5	4.5
Lane Util. Factor	1.00		0.91	0.88	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00
Frt	0.86		1.00	0.85	0.85
Flt Protected	1.00		0.99	1.00	1.00
Satd. Flow (prot)	1450		3685	2299	1511
Flt Permitted	1.00		0.99	1.00	1.00
Satd. Flow (perm)	1450		3685	2299	1511
Peak-hour factor, PHF	0.92	0.98	0.98	0.92	0.92
Adj. Flow (vph)	23	258	1278	321	415
RTOR Reduction (vph)	0	0	45	0	54
Lane Group Flow (vph)	23	0	1491	321	361
Confl. Peds. (#/hr)		342			191
Heavy Vehicles (%)	2%	1%	9%	1%	1%
Bus Blockages (#/hr)	0	0	0	10	0
Parking (#/hr)			15	15	
Turn Type	Prot	Split	NA	Prot	custom
Protected Phases	1	2	2	4	7
Permitted Phases	1				8
Actuated Green, G (s)	2.2		49.8	25.5	25.5
Effective Green, g (s)	2.2		50.8	27.5	25.5
Actuated g/C Ratio	0.02		0.56	0.31	0.28
Clearance Time (s)	3.5		4.5	4.5	4.5
Vehicle Extension (s)	3.0		0.2	0.2	0.2
Lane Grp Cap (vph)	35		2079	702	428
v/s Ratio Prot	c0.02		c0.40	0.14	c0.24
v/s Ratio Perm					
v/c Ratio	0.66		0.72	0.46	0.84
Uniform Delay, d1	43.5		14.3	25.2	30.4
Progression Factor	1.00		0.91	1.35	0.48
Incremental Delay, d2	36.6		2.2	1.8	11.8
Delay (s)	80.2		15.2	35.8	26.4
Level of Service	F		B	D	C
Approach Delay (s)			15.2		
Approach LOS			B		
Intersection Summary					
HCM 2000 Control Delay			20.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.79		
Actuated Cycle Length (s)			90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization			80.3%	ICU Level of Service	D
Analysis Period (min)			15		

HCM 2010 Signalized Intersection Summary 5: 5th Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑						↑↑↑	
Traffic Volume (veh/h)	0	0	0	225	488	0	0	0	0	0	413	237
Future Volume (veh/h)	0	0	0	225	488	0	0	0	0	0	413	237
Number				7	4	14				5	2	12
Initial Q (Qb), veh				0	0	0				0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00				1.00		0.82
Parking Bus, Adj				1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1796	1760	0				0	1563	1710
Adj Flow Rate, veh/h				245	530	0				0	449	258
Adj No. of Lanes				0	2	0				0	3	0
Peak Hour Factor				0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %				2	2	0				0	5	5
Cap, veh/h				529	1048	0				0	1122	431
Arrive On Green				0.17	0.17	0.00				0.00	0.13	0.13
Sat Flow, veh/h				917	2152	0				0	2986	1093
Grp Volume(v), veh/h				392	383	0				0	449	258
Grp Sat Flow(s),veh/h/ln				1467	1522	0				0	1423	1093
Q Serve(g_s), s				22.0	20.6	0.0				0.0	13.0	20.0
Cycle Q Clear(g_c), s				22.0	20.6	0.0				0.0	13.0	20.0
Prop In Lane				0.62		0.00				0.00		1.00
Lane Grp Cap(c), veh/h				807	769	0				0	1122	431
V/C Ratio(X)				0.49	0.50	0.00				0.00	0.40	0.60
Avail Cap(c_a), veh/h				807	769	0				0	1122	431
HCM Platoon Ratio				0.33	0.33	1.00				1.00	0.33	0.33
Upstream Filter(I)				1.00	1.00	0.00				0.00	1.00	1.00
Uniform Delay (d), s/veh				27.7	27.1	0.0				0.0	29.4	32.4
Incr Delay (d2), s/veh				2.1	2.3	0.0				0.0	1.1	6.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				9.4	9.2	0.0				0.0	5.3	6.8
LnGrp Delay(d),s/veh				29.8	29.4	0.0				0.0	30.4	38.5
LnGrp LOS				C	C						C	D
Approach Vol, veh/h					775						707	
Approach Delay, s/veh					29.6						33.4	
Approach LOS					C						C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		40.0		50.0								
Change Period (Y+Rc), s		4.5		4.5								
Max Green Setting (Gmax), s		35.5		45.5								
Max Q Clear Time (g_c+I1), s		0.0		0.0								
Green Ext Time (p_c), s		0.0		0.0								
Intersection Summary												
HCM 2010 Ctrl Delay				31.4								
HCM 2010 LOS				C								

HCM Signalized Intersection Capacity Analysis

6: 6th Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	738	1000	16	81	128	0	0	0
Future Volume (vph)	0	0	0	0	738	1000	16	81	128	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	10	10	12	12	12	12	12	12
Grade (%)		10%			-10%			5%			-5%	
Total Lost time (s)					3.0	3.0		4.0				
Lane Util. Factor					1.00	0.88		0.95				
Frpb, ped/bikes					1.00	1.00		0.99				
Flpb, ped/bikes					1.00	1.00		0.99				
Frt					1.00	0.85		0.91				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					1643	2458		2315				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					1643	2458		2315				
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.81	0.81	0.81	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	811	1099	20	100	158	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	456	0	106	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	811	643	0	172	0	0	0	0
Confl. Peds. (#/hr)	101		155	155		101	100		1	1		100
Confl. Bikes (#/hr)			3			26			2			3
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	11%	11%	11%	2%	2%	2%
Parking (#/hr)								15				
Turn Type					NA	custom	Perm	NA				
Protected Phases					4	7		2				
Permitted Phases						8	2					
Actuated Green, G (s)					49.8	49.8		32.2				
Effective Green, g (s)					50.3	50.3		32.7				
Actuated g/C Ratio					0.56	0.56		0.36				
Clearance Time (s)					3.5	3.5		4.5				
Vehicle Extension (s)					3.0	3.0		0.2				
Lane Grp Cap (vph)					918	1373		841				
v/s Ratio Prot					0.49	0.26						
v/s Ratio Perm								0.07				
v/c Ratio					0.88	0.47		0.20				
Uniform Delay, d1					17.3	11.9		19.7				
Progression Factor					0.68	4.28		1.00				
Incremental Delay, d2					7.8	0.2		0.6				
Delay (s)					19.5	51.0		20.3				
Level of Service					B	D		C				
Approach Delay (s)		0.0			37.6			20.3			0.0	
Approach LOS		A			D			C			A	
Intersection Summary												
HCM 2000 Control Delay			35.4				HCM 2000 Level of Service			D		
HCM 2000 Volume to Capacity ratio			0.67									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)		14.0			
Intersection Capacity Utilization			66.5%				ICU Level of Service		C			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

7: I-5 CD NB Off-Ramp/7th Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑↑↑		↑	↑	↑	↑		↑
Traffic Volume (vph)	0	118	0	0	721	0	895	407	338	3	0	150
Future Volume (vph)	0	118	0	0	721	0	895	407	338	3	0	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	10	12	12	12	12	12	12	12
Grade (%)		0%			0%			5%			-5%	
Total Lost time (s)		3.5			3.5		3.5	3.5	3.5	3.5		4.5
Lane Util. Factor		1.00			0.91		0.95	0.95	1.00	1.00		1.00
Frpb, ped/bikes		1.00			1.00		1.00	1.00	0.66	1.00		0.99
Flpb, ped/bikes		1.00			1.00		1.00	1.00	1.00	1.00		1.00
Frt		1.00			1.00		1.00	1.00	0.85	1.00		0.85
Flt Protected		1.00			1.00		0.95	0.98	1.00	0.95		1.00
Satd. Flow (prot)		1207			4272		1471	1522	924	1617		1425
Flt Permitted		1.00			1.00		0.95	0.98	1.00	0.25		1.00
Satd. Flow (perm)		1207			4272		1471	1522	924	432		1425
Peak-hour factor, PHF	0.87	0.87	0.87	0.88	0.88	0.88	0.95	0.95	0.95	0.72	0.72	0.72
Adj. Flow (vph)	0	136	0	0	819	0	942	428	356	4	0	208
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	12	0	0	7
Lane Group Flow (vph)	0	136	0	0	819	0	678	692	344	4	0	201
Confl. Peds. (#/hr)	104		274	274		104	2		125	125		2
Confl. Bikes (#/hr)			2			9			22			
Heavy Vehicles (%)	13%	13%	13%	2%	2%	2%	2%	2%	2%	3%	3%	3%
Parking (#/hr)		15										
Turn Type		NA			NA		Perm	NA	Perm	D.Pm		Perm
Protected Phases		6			2			4				
Permitted Phases							4		4	4		4
Actuated Green, G (s)		25.8			25.8		55.2	55.2	55.2	55.2		55.2
Effective Green, g (s)		26.8			26.8		56.2	56.2	56.2	56.2		55.2
Actuated g/C Ratio		0.30			0.30		0.62	0.62	0.62	0.62		0.61
Clearance Time (s)		4.5			4.5		4.5	4.5	4.5	4.5		4.5
Vehicle Extension (s)		3.0			5.0		5.0	5.0	5.0	5.0		5.0
Lane Grp Cap (vph)		359			1272		918	950	576	269		874
v/s Ratio Prot		0.11			0.19							
v/s Ratio Perm							0.46	0.45	0.37	0.01		0.14
v/c Ratio		0.38			0.64		0.74	0.73	0.60	0.01		0.23
Uniform Delay, d1		25.0			27.5		11.8	11.6	10.1	6.4		7.8
Progression Factor		0.65			0.64		1.00	1.00	1.00	0.78		0.71
Incremental Delay, d2		2.9			2.3		3.8	3.5	2.5	0.0		0.3
Delay (s)		19.2			19.9		15.6	15.1	12.6	5.1		5.8
Level of Service		B			B		B	B	B	A		A
Approach Delay (s)		19.2			19.9			14.8			5.8	
Approach LOS		B			B			B			A	
Intersection Summary												
HCM 2000 Control Delay			15.8				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.71									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			7.0		
Intersection Capacity Utilization			76.1%				ICU Level of Service			D		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

8: 8th Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			↱			↰			↱	
Traffic Volume (vph)	0	371	38	0	709	13	26	175	62	28	60	16
Future Volume (vph)	0	371	38	0	709	13	26	175	62	28	60	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	12	10	12	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5			3.5			3.5	
Lane Util. Factor		1.00			0.95			1.00			1.00	
Frpb, ped/bikes		0.95			0.99			0.96			0.98	
Flpb, ped/bikes		1.00			1.00			0.99			0.98	
Frt		0.99			1.00			0.97			0.98	
Flt Protected		1.00			1.00			1.00			0.99	
Satd. Flow (prot)		1471			3124			1495			1555	
Flt Permitted		1.00			1.00			0.97			0.87	
Satd. Flow (perm)		1471			3124			1451			1377	
Peak-hour factor, PHF	0.84	0.84	0.84	0.93	0.93	0.93	0.89	0.89	0.89	0.79	0.79	0.79
Adj. Flow (vph)	0	442	45	0	762	14	29	197	70	35	76	20
RTOR Reduction (vph)	0	4	0	0	1	0	0	12	0	0	7	0
Lane Group Flow (vph)	0	483	0	0	775	0	0	284	0	0	124	0
Confl. Peds. (#/hr)	99		230	230		99	91		53	53		91
Heavy Vehicles (%)	5%	5%	5%	3%	3%	3%	5%	5%	5%	2%	2%	2%
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases							4			8		
Actuated Green, G (s)		49.5			49.5			31.5			31.5	
Effective Green, g (s)		50.5			50.5			32.5			32.5	
Actuated g/C Ratio		0.56			0.56			0.36			0.36	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		825			1752			523			497	
v/s Ratio Prot		c0.33			0.25							
v/s Ratio Perm								c0.20			0.09	
v/c Ratio		0.59			0.44			0.54			0.25	
Uniform Delay, d1		12.9			11.5			22.8			20.2	
Progression Factor		0.93			0.88			1.00			0.81	
Incremental Delay, d2		2.6			0.5			4.0			1.2	
Delay (s)		14.7			10.6			26.9			17.5	
Level of Service		B			B			C			B	
Approach Delay (s)		14.7			10.6			26.9			17.5	
Approach LOS		B			B			C			B	
Intersection Summary												
HCM 2000 Control Delay		15.1			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.57										
Actuated Cycle Length (s)		90.0			Sum of lost time (s)			7.0				
Intersection Capacity Utilization		50.1%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: 9th Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↶			↶			↶↷		↶	↶	
Traffic Volume (vph)	0	392	16	0	670	33	45	101	58	19	54	74
Future Volume (vph)	0	392	16	0	670	33	45	101	58	19	54	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	15	12	10	11	12	12	12	12	11	11	12
Total Lost time (s)		3.5			3.5			3.5		2.5	3.5	
Lane Util. Factor		1.00			1.00			1.00		1.00	1.00	
Frpb, ped/bikes		0.98			0.98			0.96		1.00	0.94	
Flpb, ped/bikes		1.00			1.00			0.98		0.97	1.00	
Frt		0.99			0.99			0.96		1.00	0.91	
Flt Protected		1.00			1.00			0.99		0.95	1.00	
Satd. Flow (prot)		1781			1586			1469		1494	1390	
Flt Permitted		1.00			1.00			0.91		0.49	1.00	
Satd. Flow (perm)		1781			1586			1345		764	1390	
Peak-hour factor, PHF	0.88	0.88	0.88	0.95	0.95	0.95	0.76	0.76	0.76	0.84	0.84	0.84
Adj. Flow (vph)	0	445	18	0	705	35	59	133	76	23	64	88
RTOR Reduction (vph)	0	2	0	0	2	0	0	14	0	0	48	0
Lane Group Flow (vph)	0	461	0	0	738	0	0	254	0	23	104	0
Confl. Peds. (#/hr)	108		179	179		108	67		59	59		67
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	4%	4%	4%	2%	2%	2%
Turn Type		NA			NA		Perm	NA		pm+pt	NA	
Protected Phases		6			2			4		3	8	
Permitted Phases							4			8		
Actuated Green, G (s)		41.2			41.2			29.6		40.8	39.8	
Effective Green, g (s)		42.2			42.2			30.6		41.8	40.8	
Actuated g/C Ratio		0.47			0.47			0.34		0.46	0.45	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		0.2			0.2			0.2			0.2	
Lane Grp Cap (vph)		835			743			457		397	630	
v/s Ratio Prot		0.26			c0.47					0.00	c0.07	
v/s Ratio Perm								c0.19		0.02		
v/c Ratio		0.55			0.99			0.56		0.06	0.16	
Uniform Delay, d1		17.1			23.8			24.2		14.0	14.5	
Progression Factor		0.56			0.66			1.00		0.67	0.37	
Incremental Delay, d2		2.2			25.2			4.8		0.0	0.6	
Delay (s)		11.7			40.9			29.0		9.4	5.9	
Level of Service		B			D			C		A	A	
Approach Delay (s)		11.7			40.9			29.0			6.4	
Approach LOS		B			D			C			A	
Intersection Summary												
HCM 2000 Control Delay			27.1				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)		12.0			
Intersection Capacity Utilization			83.4%				ICU Level of Service		E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

10: Terry Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			↰				↰			↰
Traffic Volume (vph)	0	226	200	0	747	0	0	0	64	0	0	38
Future Volume (vph)	0	226	200	0	747	0	0	0	64	0	0	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5				4.5			4.5
Lane Util. Factor		1.00			1.00				1.00			1.00
Frpb, ped/bikes		0.76			1.00				0.80			0.88
Flpb, ped/bikes		1.00			1.00				1.00			1.00
Frt		0.94			1.00				0.86			0.86
Flt Protected		1.00			1.00				1.00			1.00
Satd. Flow (prot)		1099			1535				1165			1211
Flt Permitted		1.00			1.00				1.00			1.00
Satd. Flow (perm)		1099			1535				1165			1211
Peak-hour factor, PHF	0.91	0.91	0.91	0.89	0.89	0.89	0.68	0.68	0.68	0.78	0.78	0.78
Adj. Flow (vph)	0	248	220	0	839	0	0	0	94	0	0	49
RTOR Reduction (vph)	0	36	0	0	0	0	0	0	29	0	0	15
Lane Group Flow (vph)	0	432	0	0	839	0	0	0	65	0	0	34
Confl. Peds. (#/hr)	96		158	158		96	33		56	56		33
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	2%	2%	2%	7%	7%	7%
Turn Type		NA			NA				Perm			Perm
Protected Phases		6			2							
Permitted Phases									6			2
Actuated Green, G (s)		62.5			62.5				62.5			62.5
Effective Green, g (s)		63.5			63.5				62.5			62.5
Actuated g/C Ratio		0.71			0.71				0.69			0.69
Clearance Time (s)		4.5			4.5				4.5			4.5
Lane Grp Cap (vph)		775			1083				809			840
v/s Ratio Prot		0.39			0.55							
v/s Ratio Perm									0.06			0.03
v/c Ratio		0.56			0.77				0.08			0.04
Uniform Delay, d1		6.4			8.6				4.5			4.3
Progression Factor		0.73			0.88				1.00			1.00
Incremental Delay, d2		2.6			0.5				0.2			0.1
Delay (s)		7.3			8.1				4.6			4.4
Level of Service		A			A				A			A
Approach Delay (s)		7.3			8.1			4.6			4.4	
Approach LOS		A			A			A			A	
Intersection Summary												
HCM 2000 Control Delay			7.5			HCM 2000 Level of Service			A			
HCM 2000 Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			7.0			
Intersection Capacity Utilization			60.5%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

11: Boren Ave & Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	63	171	6	63	670	14	12	722	33	119	583	77
Future Volume (vph)	63	171	6	63	670	14	12	722	33	119	583	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	10	9	10	12	9	9	12	9	9	12
Total Lost time (s)	4.0	3.5		4.0	3.5		4.0	3.5		4.0	3.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.98		1.00	0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1354	1394		1354	1433		1419	2753		1406	2630	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1354	1394		1354	1433		1419	2753		1406	2630	
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.88	0.88	0.88	0.89	0.89	0.89
Adj. Flow (vph)	68	186	7	69	736	15	14	820	38	134	655	87
RTOR Reduction (vph)	0	1	0	0	1	0	0	4	0	0	10	0
Lane Group Flow (vph)	68	192	0	69	750	0	14	854	0	134	732	0
Confl. Peds. (#/hr)			284			104			174			110
Heavy Vehicles (%)	8%	8%	8%	8%	8%	8%	3%	3%	3%	4%	4%	4%
Bus Blockages (#/hr)	0	10	0	0	6	0	0	2	0	0	8	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	5.2	32.8		6.9	34.5		1.2	25.8		6.5	31.1	
Effective Green, g (s)	5.7	33.8		7.4	35.5		1.7	26.8		7.0	32.1	
Actuated g/C Ratio	0.06	0.38		0.08	0.39		0.02	0.30		0.08	0.36	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lane Grp Cap (vph)	85	523		111	565		26	819		109	938	
v/s Ratio Prot	c0.05	0.14		0.05	c0.52		0.01	c0.31		c0.10	0.28	
v/s Ratio Perm												
v/c Ratio	0.80	0.37		0.62	1.33		0.54	1.04		1.23	0.78	
Uniform Delay, d1	41.6	20.3		39.9	27.2		43.8	31.6		41.5	25.8	
Progression Factor	1.15	0.98		1.26	0.75		1.00	1.00		1.12	0.94	
Incremental Delay, d2	35.5	1.8		5.9	157.0		10.3	43.3		158.0	6.1	
Delay (s)	83.3	21.8		56.4	177.3		54.1	74.9		204.3	30.3	
Level of Service	F	C		E	F		D	E		F	C	
Approach Delay (s)		37.9			167.2			74.6			56.9	
Approach LOS		D			F			E			E	
Intersection Summary												
HCM 2000 Control Delay			92.6			HCM 2000 Level of Service			F			
HCM 2000 Volume to Capacity ratio			1.18									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			15.0			
Intersection Capacity Utilization			88.7%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

12: Madison St & Minor Ave

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	309	14	0	695	1	22	37	39	18	34	44
Future Volume (vph)	0	309	14	0	695	1	22	37	39	18	34	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	11	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5			3.5			3.5	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.98			1.00			0.92			0.87	
Flpb, ped/bikes		1.00			1.00			0.95			0.98	
Frt		0.99			1.00			0.95			0.94	
Flt Protected		1.00			1.00			0.99			0.99	
Satd. Flow (prot)		1462			1588			1311			1257	
Flt Permitted		1.00			1.00			0.92			0.93	
Satd. Flow (perm)		1462			1588			1219			1186	
Peak-hour factor, PHF	0.85	0.85	0.85	0.95	0.95	0.95	0.67	0.67	0.67	0.87	0.87	0.87
Adj. Flow (vph)	0	364	16	0	732	1	33	55	58	21	39	51
RTOR Reduction (vph)	0	2	0	0	0	0	0	26	0	0	34	0
Lane Group Flow (vph)	0	378	0	0	733	0	0	120	0	0	77	0
Confl. Peds. (#/hr)	125		242	242		125	110		75	75		110
Heavy Vehicles (%)	6%	6%	6%	4%	4%	4%	7%	7%	7%	7%	7%	7%
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)		61.5			61.5			19.5			19.5	
Effective Green, g (s)		62.5			62.5			20.5			20.5	
Actuated g/C Ratio		0.69			0.69			0.23			0.23	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		1015			1102			277			270	
v/s Ratio Prot		0.26			c0.46							
v/s Ratio Perm								c0.10			0.06	
v/c Ratio		0.37			0.67			0.43			0.29	
Uniform Delay, d1		5.7			7.8			29.8			28.7	
Progression Factor		0.57			0.58			1.00			1.00	
Incremental Delay, d2		0.7			2.5			4.9			2.6	
Delay (s)		3.9			7.0			34.6			31.3	
Level of Service		A			A			C			C	
Approach Delay (s)		3.9			7.0			34.6			31.3	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay		11.1										
HCM 2000 Volume to Capacity ratio		0.61										
Actuated Cycle Length (s)		90.0										
Intersection Capacity Utilization		62.4%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

13: Swedish/Summit Ave & Madison St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			↰			↰	↰		↰	
Traffic Volume (vph)	0	223	114	0	638	8	27	6	16	7	10	37
Future Volume (vph)	0	223	114	0	638	8	27	6	16	7	10	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	10	10	10	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5			3.0	4.0		3.0	
Lane Util. Factor		1.00			1.00			1.00	1.00		1.00	
Frpb, ped/bikes		0.85			1.00			1.00	0.84		0.90	
Flpb, ped/bikes		1.00			1.00			0.91	1.00		0.98	
Frt		0.95			1.00			1.00	0.85		0.91	
Flt Protected		1.00			1.00			0.96	1.00		0.99	
Satd. Flow (prot)		1254			1526			1466	1191		1265	
Flt Permitted		1.00			1.00			0.79	1.00		0.97	
Satd. Flow (perm)		1254			1526			1203	1191		1241	
Peak-hour factor, PHF	0.89	0.89	0.89	0.92	0.92	0.92	0.64	0.64	0.64	0.80	0.80	0.80
Adj. Flow (vph)	0	251	128	0	693	9	42	9	25	9	12	46
RTOR Reduction (vph)	0	20	0	0	1	0	0	0	19	0	35	0
Lane Group Flow (vph)	0	359	0	0	701	0	0	51	6	0	33	0
Confl. Peds. (#/hr)	105		163	163		105	54		62	62		54
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	2%	2%	2%	8%	8%	8%
Turn Type		NA			NA		Perm	NA	Perm	Perm	NA	
Protected Phases		6			2			4			4	
Permitted Phases							4		4	4		
Actuated Green, G (s)		61.5			61.5			20.0	20.0		20.0	
Effective Green, g (s)		62.5			62.5			21.0	20.0		21.0	
Actuated g/C Ratio		0.69			0.69			0.23	0.22		0.23	
Clearance Time (s)		4.5			4.5			4.0	4.0		4.0	
Lane Grp Cap (vph)		870			1059			280	264		289	
v/s Ratio Prot		0.29			c0.46							
v/s Ratio Perm								c0.04	0.00		0.03	
v/c Ratio		0.41			0.66			0.18	0.02		0.11	
Uniform Delay, d1		5.9			7.8			27.6	27.4		27.2	
Progression Factor		1.43			0.93			1.00	1.00		1.00	
Incremental Delay, d2		1.4			2.8			1.4	0.1		0.8	
Delay (s)		9.8			10.0			29.1	27.5		28.0	
Level of Service		A			A			C	C		C	
Approach Delay (s)		9.8			10.0			28.5			28.0	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			12.1				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.54									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)		6.5			
Intersection Capacity Utilization			64.9%				ICU Level of Service		C			
Analysis Period (min)			15									
c Critical Lane Group												

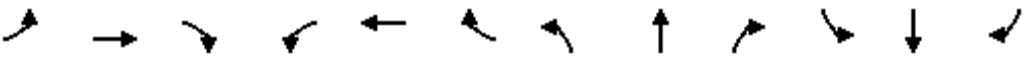
HCM Signalized Intersection Capacity Analysis

14: Madison St & Boylston Ave

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	192	32	0	618	86	2	30	9	8	10	13
Future Volume (vph)	0	192	32	0	618	86	2	30	9	8	10	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5			3.0			3.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frbp, ped/bikes		0.95			0.97			0.98			0.95	
Flpb, ped/bikes		1.00			1.00			1.00			0.99	
Frt		0.98			0.98			0.97			0.94	
Flt Protected		1.00			1.00			1.00			0.99	
Satd. Flow (prot)		1392			1466			1584			1408	
Flt Permitted		1.00			1.00			0.99			0.95	
Satd. Flow (perm)		1392			1466			1568			1356	
Peak-hour factor, PHF	0.93	0.93	0.93	0.94	0.94	0.94	0.85	0.85	0.85	0.93	0.93	0.93
Adj. Flow (vph)	0	206	34	0	657	91	2	35	11	9	11	14
RTOR Reduction (vph)	0	3	0	0	3	0	0	10	0	0	13	0
Lane Group Flow (vph)	0	237	0	0	745	0	0	38	0	0	21	0
Confl. Peds. (#/hr)	69		102	102		69	43		27	27		43
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	2%	2%	2%	6%	6%	6%
Turn Type		NA			NA		Perm		NA		Perm	
Protected Phases		6			2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)		75.7			75.7			5.8			5.8	
Effective Green, g (s)		76.7			76.7			6.8			6.8	
Actuated g/C Ratio		0.85			0.85			0.08			0.08	
Clearance Time (s)		4.5			4.5			4.0			4.0	
Vehicle Extension (s)		0.2			0.2			0.2			0.2	
Lane Grp Cap (vph)		1186			1249			118			102	
v/s Ratio Prot		0.17			c0.51							
v/s Ratio Perm								c0.02			0.02	
v/c Ratio		0.20			0.60			0.32			0.21	
Uniform Delay, d1		1.2			2.0			39.4			39.1	
Progression Factor		0.20			0.97			1.00			1.00	
Incremental Delay, d2		0.4			1.2			0.6			0.4	
Delay (s)		0.6			3.1			40.0			39.4	
Level of Service		A			A			D			D	
Approach Delay (s)		0.6			3.1			40.0			39.4	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			5.4		HCM 2000 Level of Service					A		
HCM 2000 Volume to Capacity ratio			0.57									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					6.5		
Intersection Capacity Utilization			62.9%		ICU Level of Service					B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

15: Broadway & Madison St/E Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	113	29	96	449	44	0	241	36	0	245	243
Future Volume (vph)	75	113	29	96	449	44	0	241	36	0	245	243
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	12	9	10	12	12	13	12	12	13	12
Grade (%)		-9%			8%			0%			0%	
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0	5.0		4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	0.97		1.00	0.99			1.00	1.00		0.89	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	0.97		1.00	0.99			1.00	0.85		0.93	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)	1543	1656		1431	1642			1870	1553		1543	
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (perm)	1543	1656		1431	1642			1870	1553		1543	
Peak-hour factor, PHF	0.89	0.89	0.89	0.95	0.95	0.95	0.79	0.79	0.79	0.78	0.78	0.78
Adj. Flow (vph)	84	127	33	101	473	46	0	305	46	0	314	312
RTOR Reduction (vph)	0	9	0	0	4	0	0	0	31	0	41	0
Lane Group Flow (vph)	84	151	0	101	515	0	0	305	15	0	585	0
Confl. Peds. (#/hr)			93			72			93			88
Heavy Vehicles (%)	10%	7%	0%	9%	1%	5%	0%	5%	4%	0%	4%	8%
Turn Type	Prot	NA		Prot	NA			NA	custom		NA	
Protected Phases	5	2		1	6			3 4	1 3		8	
Permitted Phases												
Actuated Green, G (s)	4.8	30.2		9.0	34.4			35.8	29.8		35.8	
Effective Green, g (s)	5.8	31.2		10.0	35.4			36.8	29.8		36.8	
Actuated g/C Ratio	0.06	0.35		0.11	0.39			0.41	0.33		0.41	
Clearance Time (s)	5.0	5.0		5.0	5.0						5.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0						2.0	
Lane Grp Cap (vph)	99	574		159	645			764	514		630	
v/s Ratio Prot	c0.05	0.09		c0.07	c0.31			0.16	0.01		c0.38	
v/s Ratio Perm												
v/c Ratio	0.85	0.26		0.64	0.80			0.40	0.03		0.93	
Uniform Delay, d1	41.7	21.1		38.3	24.2			18.8	20.3		25.3	
Progression Factor	1.12	0.73		1.27	0.49			1.00	1.00		1.00	
Incremental Delay, d2	43.8	1.1		5.8	9.7			0.1	0.0		19.6	
Delay (s)	90.5	16.5		54.4	21.4			18.9	20.3		45.0	
Level of Service	F	B		D	C			B	C		D	
Approach Delay (s)		42.0			26.8			19.1			45.0	
Approach LOS		D			C			B			D	
Intersection Summary												
HCM 2000 Control Delay			33.5			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.94									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			18.0			
Intersection Capacity Utilization			71.5%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2010 TWSC
16: E Madison St & BROADWAY CT

Intersection

Int Delay, s/veh 0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Vol, veh/h	0	147	558	0	0	8
Future Vol, veh/h	0	147	558	0	0	8
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, %	-	-8	5	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	160	607	0	0	9

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	- 0	- 0	- 607
Stage 1	- -	- -	- -
Stage 2	- -	- -	- -
Critical Hdwy	- -	- -	- 6.22
Critical Hdwy Stg 1	- -	- -	- -
Critical Hdwy Stg 2	- -	- -	- -
Follow-up Hdwy	- -	- -	- 3.318
Pot Cap-1 Maneuver	0 -	- -	0 496
Stage 1	0 -	- -	0 -
Stage 2	0 -	- -	0 -
Platoon blocked, %	- -	- -	- -
Mov Cap-1 Maneuver	- -	- -	- 496
Mov Cap-2 Maneuver	- -	- -	- -
Stage 1	- -	- -	- -
Stage 2	- -	- -	- -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	12.4
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	496
HCM Lane V/C Ratio	-	-	-	0.018
HCM Control Delay (s)	-	-	-	12.4
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0.1

HCM 2010 TWSC
17: E Seneca St & 10TH AVE

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Vol, veh/h	0	131	484	45	0	37
Future Vol, veh/h	0	131	484	45	0	37
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, %	-	-5	2	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	142	526	49	0	40
Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	551
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	-	0	534
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	534
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		SB	
HCM Control Delay, s	0		0		12.3	
HCM LOS					B	
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1		
Capacity (veh/h)	-	-	-	534		
HCM Lane V/C Ratio	-	-	-	0.075		
HCM Control Delay (s)	-	-	-	12.3		
HCM Lane LOS	-	-	-	B		
HCM 95th %tile Q(veh)	-	-	-	0.2		

HCM 2010 TWSC
18: E Seneca St & Madison St

Intersection

Int Delay, s/veh 0

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	0	0	529	14	0	135
Future Vol, veh/h	0	0	529	14	0	135
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	-2	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	575	15	0	147

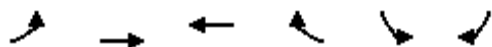
Major/Minor	Minor2	Major2	Major1
Conflicting Flow All	- 15	0 0	- 0
Stage 1	- -	- -	- -
Stage 2	- -	- -	- -
Critical Hdwy	- 6.22	4.12 -	- -
Critical Hdwy Stg 1	- -	- -	- -
Critical Hdwy Stg 2	- -	- -	- -
Follow-up Hdwy	- 3.318	2.218 -	- -
Pot Cap-1 Maneuver	0 1065	- -	0 -
Stage 1	0 -	- -	0 -
Stage 2	0 -	- -	0 -
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	0 1065	- -	- -
Mov Cap-2 Maneuver	0 -	- -	- -
Stage 1	0 -	- -	- -
Stage 2	0 -	- -	- -

Approach	EB	WB	NE
HCM Control Delay, s	0		0
HCM LOS	A		

Minor Lane/Major Mvmt	NER EBLn1	WBL	WBT
Capacity (veh/h)	- -	- -	- -
HCM Lane V/C Ratio	- -	- -	- -
HCM Control Delay (s)	- 0	- -	- -
HCM Lane LOS	- A	- -	- -
HCM 95th %tile Q(veh)	- -	- -	- -

HCM Signalized Intersection Capacity Analysis

19: E Madison St & 11th Ave



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	↗
Traffic Volume (vph)	0	143	521	0	56	22
Future Volume (vph)	0	143	521	0	56	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	12	10	12
Grade (%)		0%	-4%		0%	
Total Lost time (s)		5.5	5.5		4.5	4.5
Lane Util. Factor		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	1.00		1.00	0.74
Flpb, ped/bikes		1.00	1.00		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		1818	1819		1620	1031
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		1818	1819		1620	1031
Peak-hour factor, PHF	0.90	0.90	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	159	592	0	64	25
RTOR Reduction (vph)	0	0	0	0	0	23
Lane Group Flow (vph)	0	159	592	0	64	2
Confl. Peds. (#/hr)	23			38		61
Confl. Bikes (#/hr)				3		17
Heavy Vehicles (%)	1%	1%	3%	3%	4%	4%
Parking (#/hr)						0
Turn Type		NA	NA		Prot	Perm
Protected Phases		2	6		4	
Permitted Phases						4
Actuated Green, G (s)		73.7	73.7		6.3	6.3
Effective Green, g (s)		73.7	73.7		6.3	6.3
Actuated g/C Ratio		0.82	0.82		0.07	0.07
Clearance Time (s)		5.5	5.5		4.5	4.5
Vehicle Extension (s)		0.2	0.2		0.2	0.2
Lane Grp Cap (vph)		1488	1489		113	72
v/s Ratio Prot		0.09	c0.33		c0.04	
v/s Ratio Perm						0.00
v/c Ratio		0.11	0.40		0.57	0.02
Uniform Delay, d1		1.6	2.2		40.5	39.0
Progression Factor		0.73	0.10		1.00	1.00
Incremental Delay, d2		0.1	0.6		3.8	0.0
Delay (s)		1.3	0.8		44.4	39.0
Level of Service		A	A		D	D
Approach Delay (s)		1.3	0.8		42.9	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay			5.4		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.41			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			48.1%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

20: E Madison St & 12th Ave & Union St

								
Movement	NBT	NBR	SBT	SBR	NEL	NET	NER	SWT
Lane Configurations								
Traffic Volume (vph)	362	96	270	29	22	118	54	557
Future Volume (vph)	362	96	270	29	22	118	54	557
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	10	12	9	10	12	11
Grade (%)	0%		0%			4%		-8%
Total Lost time (s)	5.0	5.0	5.0		4.0	5.0		5.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00		1.00
Frpb, ped/bikes	1.00	0.87	0.98		1.00	0.96		1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00		1.00
Frt	1.00	0.85	0.99		1.00	0.95		1.00
Flt Protected	1.00	1.00	1.00		0.95	1.00		1.00
Satd. Flow (prot)	1818	1397	1506		1576	1581		1873
Flt Permitted	1.00	1.00	1.00		0.95	1.00		1.00
Satd. Flow (perm)	1818	1397	1506		1576	1581		1873
Peak-hour factor, PHF	0.96	0.96	0.86	0.86	0.96	0.96	0.96	0.92
Adj. Flow (vph)	377	100	314	34	23	123	56	605
RTOR Reduction (vph)	0	68	0	0	0	0	0	0
Lane Group Flow (vph)	377	32	348	0	23	179	0	605
Confl. Peds. (#/hr)		41		96	27		45	
Heavy Vehicles (%)	1%	1%	2%	2%	1%	1%	1%	2%
Parking (#/hr)			0					
Turn Type	NA	Perm	NA		Prot	NA		NA
Protected Phases	4		8		1	6		2
Permitted Phases		4						
Actuated Green, G (s)	29.0	29.0	29.0		2.8	51.0		44.2
Effective Green, g (s)	29.0	29.0	29.0		2.8	51.0		44.2
Actuated g/C Ratio	0.32	0.32	0.32		0.03	0.57		0.49
Clearance Time (s)	5.0	5.0	5.0		4.0	5.0		5.0
Vehicle Extension (s)	0.2	0.2	0.2		0.2	0.2		0.2
Lane Grp Cap (vph)	585	450	485		49	895		919
v/s Ratio Prot	0.21		c0.23		c0.01	0.11		c0.32
v/s Ratio Perm		0.02						
v/c Ratio	0.64	0.07	0.72		0.47	0.20		0.66
Uniform Delay, d1	26.1	21.2	26.9		42.9	9.5		17.2
Progression Factor	1.00	1.00	1.00		0.62	1.16		0.40
Incremental Delay, d2	5.4	0.3	8.8		2.6	0.5		3.2
Delay (s)	31.5	21.5	35.7		29.2	11.6		10.0
Level of Service	C	C	D		C	B		A
Approach Delay (s)	29.4		35.7			13.6		10.0
Approach LOS	C		D			B		A
Intersection Summary								
HCM 2000 Control Delay			21.6		HCM 2000 Level of Service			C
HCM 2000 Volume to Capacity ratio			0.67					
Actuated Cycle Length (s)			90.0		Sum of lost time (s)			14.0
Intersection Capacity Utilization			56.7%		ICU Level of Service			B
Analysis Period (min)			15					
c Critical Lane Group								

HCM Signalized Intersection Capacity Analysis

22: 13th Ave & E Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	61	0	0	282	13	250	76	4	22	0	26
Future Volume (vph)	0	61	0	0	282	13	250	76	4	22	0	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	16	16	12	12	13	12
Grade (%)		8%			-7%			0%			0%	
Total Lost time (s)		4.5			4.5		4.5	4.5			4.5	
Lane Util. Factor		1.00			1.00		1.00	1.00			1.00	
Frpb, ped/bikes		1.00			0.99		1.00	0.99			0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00			0.97	
Frt		1.00			0.99		1.00	0.99			0.93	
Flt Protected		1.00			1.00		0.95	1.00			0.98	
Satd. Flow (prot)		1746			1842		1964	2043			1683	
Flt Permitted		1.00			1.00		0.72	1.00			0.88	
Satd. Flow (perm)		1746			1842		1492	2043			1518	
Peak-hour factor, PHF	0.90	0.90	0.90	0.95	0.95	0.95	0.87	0.87	0.87	0.89	0.89	0.89
Adj. Flow (vph)	0	68	0	0	297	14	287	87	5	25	0	29
RTOR Reduction (vph)	0	0	0	0	2	0	0	3	0	0	35	0
Lane Group Flow (vph)	0	68	0	0	309	0	287	89	0	0	19	0
Confl. Peds. (#/hr)	28		29	29		28	1		52	52		1
Confl. Bikes (#/hr)												6
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	4%	4%	4%	1%	1%	1%
Parking (#/hr)									0			0
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)		28.0			28.0		31.5	31.5			31.5	
Effective Green, g (s)		28.0			28.0		31.5	31.5			31.5	
Actuated g/C Ratio		0.31			0.31		0.35	0.35			0.35	
Clearance Time (s)		4.5			4.5		4.5	4.5			4.5	
Lane Grp Cap (vph)		543			573		522	715			531	
v/s Ratio Prot		0.04			0.17			0.04				
v/s Ratio Perm							0.19				0.01	
v/c Ratio		0.13			0.54		0.55	0.13			0.04	
Uniform Delay, d1		22.2			25.7		23.5	19.9			19.3	
Progression Factor		0.82			0.26		1.00	1.00			1.00	
Incremental Delay, d2		0.5			3.3		4.1	0.4			0.1	
Delay (s)		18.7			9.9		27.7	20.2			19.4	
Level of Service		B			A		C	C			B	
Approach Delay (s)		18.7			9.9			25.9			19.4	
Approach LOS		B			A			C			B	
Intersection Summary												
HCM 2000 Control Delay		18.7			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.42										
Actuated Cycle Length (s)		90.0			Sum of lost time (s)			12.5				
Intersection Capacity Utilization		43.8%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

23: 14th Ave & E Madison St

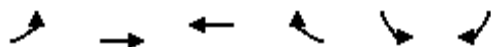
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	69	24	0	255	0	19	227	90	92	115	17
Future Volume (vph)	0	69	24	0	255	0	19	227	90	92	115	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	12	16	12	12	16	12
Grade (%)		7%			-10%			0%			0%	
Total Lost time (s)		4.5			4.5			4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00			1.00		1.00	1.00	
Frpb, ped/bikes		0.98			1.00			0.99		1.00	0.98	
Flpb, ped/bikes		1.00			1.00			1.00		0.99	1.00	
Frt		0.97			1.00			0.96		1.00	0.98	
Flt Protected		1.00			1.00			1.00		0.95	1.00	
Satd. Flow (prot)		1662			1909			2015		1736	2019	
Flt Permitted		1.00			1.00			0.98		0.40	1.00	
Satd. Flow (perm)		1662			1909			1981		725	2019	
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.85	0.85	0.85	0.86	0.86	0.86
Adj. Flow (vph)	0	75	26	0	280	0	22	267	106	107	134	20
RTOR Reduction (vph)	0	14	0	0	0	0	0	14	0	0	6	0
Lane Group Flow (vph)	0	87	0	0	280	0	0	381	0	107	148	0
Confl. Peds. (#/hr)	3		31	31		3	37		10	10		37
Confl. Bikes (#/hr)			7			3			1			1
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Parking (#/hr)									0			0
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases		1			1			3			3	
Permitted Phases							3			3		
Actuated Green, G (s)		30.5			30.5			33.5		33.5	33.5	
Effective Green, g (s)		30.5			30.5			33.5		33.5	33.5	
Actuated g/C Ratio		0.34			0.34			0.37		0.37	0.37	
Clearance Time (s)		4.5			4.5			4.5		4.5	4.5	
Lane Grp Cap (vph)		563			646			737		269	751	
v/s Ratio Prot		0.05			c0.15						0.07	
v/s Ratio Perm								c0.19		0.15		
v/c Ratio		0.15			0.43			0.52		0.40	0.20	
Uniform Delay, d1		20.8			23.1			22.0		20.8	19.1	
Progression Factor		0.32			0.63			1.00		0.89	0.84	
Incremental Delay, d2		0.6			2.1			2.6		4.3	0.6	
Delay (s)		7.3			16.6			24.5		22.9	16.7	
Level of Service		A			B			C		C	B	
Approach Delay (s)		7.3			16.6			24.5			19.3	
Approach LOS		A			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			19.4				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.40									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			13.5		
Intersection Capacity Utilization			57.6%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2010 TWSC
24: E Madison St & Pike St

Intersection												
Int Delay, s/veh	0.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations						↗		↘			↘	
Traffic Vol, veh/h	0	0	0	0	0	4	0	227	23	0	255	190
Future Vol, veh/h	0	0	0	0	0	4	0	227	23	0	255	190
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	6	-	-	0	-	-	10	-	-	-10	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	4	0	247	25	0	277	207
Major/Minor	Minor1			Major1			Major2					
Conflicting Flow All				-	-	259	-	0	0	-	-	0
Stage 1				-	-	-	-	-	-	-	-	-
Stage 2				-	-	-	-	-	-	-	-	-
Critical Hdwy				-	-	6.22	-	-	-	-	-	-
Critical Hdwy Stg 1				-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2				-	-	-	-	-	-	-	-	-
Follow-up Hdwy				-	-	3.318	-	-	-	-	-	-
Pot Cap-1 Maneuver				0	0	780	0	-	-	0	-	-
Stage 1				0	0	-	0	-	-	0	-	-
Stage 2				0	0	-	0	-	-	0	-	-
Platoon blocked, %							-			-		
Mov Cap-1 Maneuver				-	0	780	-	-	-	-	-	-
Mov Cap-2 Maneuver				-	0	-	-	-	-	-	-	-
Stage 1				-	0	-	-	-	-	-	-	-
Stage 2				-	0	-	-	-	-	-	-	-
Approach	WB			NE			SW					
HCM Control Delay, s	9.6			0			0					
HCM LOS	A											
Minor Lane/Major Mvmt	NET	NER	WBLn1	SWT	SWR							
Capacity (veh/h)	-	-	780	-	-							
HCM Lane V/C Ratio	-	-	0.006	-	-							
HCM Control Delay (s)	-	-	9.6	-	-							
HCM Lane LOS	-	-	A	-	-							
HCM 95th %tile Q(veh)	-	-	0	-	-							

HCM Signalized Intersection Capacity Analysis

25: E Madison St & 15th Ave



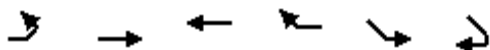
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Volume (vph)	0	227	294	6	0	104
Future Volume (vph)	0	227	294	6	0	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	10	12	12	16
Grade (%)		10%	-9%		0%	
Total Lost time (s)		4.5	4.5			4.5
Lane Util. Factor		1.00	1.00			1.00
Frpb, ped/bikes		1.00	1.00			1.00
Flpb, ped/bikes		1.00	1.00			1.00
Frt		1.00	1.00			0.86
Flt Protected		1.00	1.00			1.00
Satd. Flow (prot)		1728	1824			1774
Flt Permitted		1.00	1.00			1.00
Satd. Flow (perm)		1728	1824			1774
Peak-hour factor, PHF	0.93	0.93	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	244	346	7	0	122
RTOR Reduction (vph)	0	0	0	0	0	105
Lane Group Flow (vph)	0	244	353	0	0	17
Confl. Peds. (#/hr)	59			59	47	1
Confl. Bikes (#/hr)				2		
Heavy Vehicles (%)	1%	1%	1%	1%	5%	5%
Parking (#/hr)				0		
Turn Type		NA	NA			Prot
Protected Phases		2	6			4
Permitted Phases						
Actuated Green, G (s)		68.8	68.8			12.2
Effective Green, g (s)		68.8	68.8			12.2
Actuated g/C Ratio		0.76	0.76			0.14
Clearance Time (s)		4.5	4.5			4.5
Vehicle Extension (s)		0.2	0.2			0.2
Lane Grp Cap (vph)		1320	1394			240
v/s Ratio Prot		0.14	c0.19			c0.01
v/s Ratio Perm						
v/c Ratio		0.18	0.25			0.07
Uniform Delay, d1		2.9	3.1			33.9
Progression Factor		0.25	0.49			1.00
Incremental Delay, d2		0.3	0.4			0.0
Delay (s)		1.0	2.0			34.0
Level of Service		A	A			C
Approach Delay (s)		1.0	2.0		34.0	
Approach LOS		A	A		C	
Intersection Summary						
HCM 2000 Control Delay			7.1		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.25			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	16.0
Intersection Capacity Utilization			30.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM 2010 TWSC
26: 16TH AVE & E Madison St

Intersection						
Int Delay, s/veh	0.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	225	0	0	302	0	22
Future Vol, veh/h	225	0	0	302	0	22
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, %	9	-	-	-9	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	245	0	0	328	0	24
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	245
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	-	-	0	-	0	794
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	794
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		9.7	
HCM LOS					A	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	794	-	-	-		
HCM Lane V/C Ratio	0.03	-	-	-		
HCM Control Delay (s)	9.7	-	-	-		
HCM Lane LOS	A	-	-	-		
HCM 95th %tile Q(veh)	0.1	-	-	-		

HCM Signalized Intersection Capacity Analysis

27: E Madison St & Pine St



Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↑	↑	↑	↑	↑
Traffic Volume (vph)	0	247	321	212	171	0
Future Volume (vph)	0	247	321	212	171	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	11	11	11
Grade (%)		9%	-4%		0%	
Total Lost time (s)		4.5	4.5	4.5	4.5	
Lane Util. Factor		1.00	1.00	1.00	1.00	
Frpb, ped/bikes		1.00	1.00	0.91	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00	
Frt		1.00	1.00	0.85	1.00	
Flt Protected		1.00	1.00	1.00	0.95	
Satd. Flow (prot)		1737	1837	1413	1678	
Flt Permitted		1.00	1.00	1.00	0.95	
Satd. Flow (perm)		1737	1837	1413	1678	
Peak-hour factor, PHF	0.95	0.95	0.94	0.94	0.90	0.90
Adj. Flow (vph)	0	260	341	226	190	0
RTOR Reduction (vph)	0	0	0	56	0	0
Lane Group Flow (vph)	0	260	341	170	190	0
Confl. Peds. (#/hr)	62			62	1	43
Confl. Bikes (#/hr)				3		8
Heavy Vehicles (%)	1%	1%	2%	2%	4%	4%
Parking (#/hr)						0
Turn Type		NA	NA	Perm	Prot	Perm
Protected Phases		2	2		4	
Permitted Phases				2		4
Actuated Green, G (s)		67.8	67.8	67.8	13.2	
Effective Green, g (s)		67.8	67.8	67.8	13.2	
Actuated g/C Ratio		0.75	0.75	0.75	0.15	
Clearance Time (s)		4.5	4.5	4.5	4.5	
Vehicle Extension (s)		0.2	0.2	0.2	0.2	
Lane Grp Cap (vph)		1308	1383	1064	246	
v/s Ratio Prot		0.15	c0.19		c0.11	
v/s Ratio Perm				0.12		
v/c Ratio		0.20	0.25	0.16	0.77	
Uniform Delay, d1		3.2	3.4	3.1	37.0	
Progression Factor		0.11	0.85	0.59	1.00	
Incremental Delay, d2		0.3	0.4	0.3	12.8	
Delay (s)		0.7	3.3	2.1	49.8	
Level of Service		A	A	A	D	
Approach Delay (s)		0.7	2.8		49.8	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay			11.0		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.33			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	9.0
Intersection Capacity Utilization			34.9%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

28: 17th Ave & E Madison St

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	0	334	64	0	437	26	96	29	4	16	12	23	
Future Volume (vph)	0	334	64	0	437	26	96	29	4	16	12	23	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	12	11	11	12	11	11	12	10	12	12	16	12	
Grade (%)		4%			4%			0%			0%		
Total Lost time (s)		4.5	4.5		4.5	4.5		4.5			4.5		
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00			1.00		
Frpb, ped/bikes		1.00	0.87		1.00	0.76		0.99			0.84		
Flpb, ped/bikes		1.00	1.00		1.00	1.00		0.78			0.94		
Frt		1.00	0.85		1.00	0.85		1.00			0.94		
Flt Protected		1.00	1.00		1.00	1.00		0.96			0.98		
Satd. Flow (prot)		1782	1325		1765	1141		1307			1563		
Flt Permitted		1.00	1.00		1.00	1.00		0.78			0.90		
Satd. Flow (perm)		1782	1325		1765	1141		1055			1424		
Peak-hour factor, PHF	0.92	0.92	0.92	0.96	0.96	0.96	0.80	0.80	0.80	0.93	0.93	0.93	
Adj. Flow (vph)	0	363	70	0	455	27	120	36	5	17	13	25	
RTOR Reduction (vph)	0	0	22	0	0	8	0	2	0	0	20	0	
Lane Group Flow (vph)	0	363	48	0	455	19	0	159	0	0	35	0	
Confl. Peds. (#/hr)	95		44	44		95	120		113	113		120	
Confl. Bikes (#/hr)			17			23			3			11	
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	1%	1%	1%	
Turn Type		NA	Perm		NA	Perm	Perm	NA		Perm	NA		
Protected Phases		2			2			4			4		
Permitted Phases			2			2	4			4			
Actuated Green, G (s)		61.9	61.9		61.9	61.9		19.1			19.1		
Effective Green, g (s)		61.9	61.9		61.9	61.9		19.1			19.1		
Actuated g/C Ratio		0.69	0.69		0.69	0.69		0.21			0.21		
Clearance Time (s)		4.5	4.5		4.5	4.5		4.5			4.5		
Vehicle Extension (s)		0.2	0.2		0.2	0.2		3.0			3.0		
Lane Grp Cap (vph)		1225	911		1213	784		223			302		
v/s Ratio Prot		0.20			c0.26								
v/s Ratio Perm			0.04			0.02		c0.15			0.02		
v/c Ratio		0.30	0.05		0.38	0.02		0.71			0.12		
Uniform Delay, d1		5.5	4.6		5.9	4.5		32.9			28.6		
Progression Factor		0.55	0.45		0.57	0.10		1.00			1.00		
Incremental Delay, d2		0.6	0.1		0.8	0.1		10.4			0.2		
Delay (s)		3.7	2.2		4.2	0.5		43.3			28.8		
Level of Service		A	A		A	A		D			C		
Approach Delay (s)		3.4			4.0			43.3			28.8		
Approach LOS		A			A			D			C		
Intersection Summary													
HCM 2000 Control Delay			10.6									HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.47										
Actuated Cycle Length (s)			90.0							12.5			
Intersection Capacity Utilization			44.7%							A			
Analysis Period (min)			15										
c Critical Lane Group													

HCM 2010 TWSC
29: 18th Ave & E Madison St

Intersection												
Int Delay, s/veh	0.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗		↑	↗			↗			↗
Traffic Vol, veh/h	0	324	14	0	452	0	0	0	36	0	0	28
Future Vol, veh/h	0	324	14	0	452	0	0	0	36	0	0	28
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	120	-	-	0	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-4	-	-	11	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	352	15	0	491	0	0	0	39	0	0	30
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	352	-	-	491
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.22	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.318	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	692	0	0	578
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	692	-	-	578
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0			10.5			11.6		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1						
Capacity (veh/h)	692	-	-	-	-	578						
HCM Lane V/C Ratio	0.057	-	-	-	-	0.053						
HCM Control Delay (s)	10.5	-	-	-	-	11.6						
HCM Lane LOS	B	-	-	-	-	B						
HCM 95th %tile Q(veh)	0.2	-	-	-	-	0.2						

HCM Signalized Intersection Capacity Analysis

30: 19th Ave & E Madison St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↔↔			↔			↔	
Traffic Volume (vph)	50	271	26	134	356	7	29	166	110	57	77	100
Future Volume (vph)	50	271	26	134	356	7	29	166	110	57	77	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	12	16	12	12	16	12
Grade (%)		-11%			8%			0%			0%	
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			1.00			0.99			0.99	
Flpb, ped/bikes		1.00			0.98			1.00			1.00	
Frt		0.99			1.00			0.95			0.94	
Flt Protected		0.99			0.99			1.00			0.99	
Satd. Flow (prot)		3527			3205			2006			1899	
Flt Permitted		0.83			0.74			0.93			0.62	
Satd. Flow (perm)		2937			2414			1873			1193	
Peak-hour factor, PHF	0.99	0.99	0.99	0.98	0.98	0.98	0.86	0.86	0.86	0.91	0.91	0.91
Adj. Flow (vph)	51	274	26	137	363	7	34	193	128	63	85	110
RTOR Reduction (vph)	0	5	0	0	1	0	0	28	0	0	37	0
Lane Group Flow (vph)	0	346	0	0	506	0	0	327	0	0	221	0
Confl. Peds. (#/hr)	26		40	40		26	7		2	2		7
Confl. Bikes (#/hr)			8			4			1			12
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	4%	4%	4%
Parking (#/hr)									0			0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		57.2			57.2			20.8			20.8	
Effective Green, g (s)		57.2			57.2			20.8			20.8	
Actuated g/C Ratio		0.64			0.64			0.23			0.23	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		0.2			0.2			3.0			3.0	
Lane Grp Cap (vph)		1866			1534			432			275	
v/s Ratio Prot												
v/s Ratio Perm		0.12			0.21			0.17			0.19	
v/c Ratio		0.19			0.33			0.76			0.80	
Uniform Delay, d1		6.8			7.6			32.3			32.7	
Progression Factor		0.62			0.47			1.00			1.00	
Incremental Delay, d2		0.2			0.6			7.4			15.5	
Delay (s)		4.4			4.1			39.7			48.2	
Level of Service		A			A			D			D	
Approach Delay (s)		4.4			4.1			39.7			48.2	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			20.5									
HCM 2000 Volume to Capacity ratio			0.46									
Actuated Cycle Length (s)			90.0									
Intersection Capacity Utilization			69.8%									
Analysis Period (min)			15									
HCM 2000 Level of Service				C								
Sum of lost time (s)				12.0								
ICU Level of Service				C								

HCM Signalized Intersection Capacity Analysis

31: 20th Ave & E Olive St & E Madison St



Movement	EBT	EBR	WBT	NBR2	SBT	SBR	NWL	NWR
Lane Configurations	↑↑		↑↑	↑	↔		↔	
Traffic Volume (vph)	354	46	484	16	2	13	37	3
Future Volume (vph)	354	46	484	16	2	13	37	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	12	16	12
Grade (%)	-8%		3%		0%		0%	
Total Lost time (s)	4.5		4.5	4.0	4.5		4.5	
Lane Util. Factor	0.95		0.95	1.00	1.00		1.00	
Frpb, ped/bikes	0.99		1.00	1.00	0.98		0.98	
Flpb, ped/bikes	1.00		1.00	1.00	1.00		1.00	
Frt	0.98		1.00	0.86	0.88		0.99	
Flt Protected	1.00		1.00	1.00	1.00		0.96	
Satd. Flow (prot)	3634		3521	1465	1682		1968	
Flt Permitted	1.00		1.00	1.00	1.00		0.96	
Satd. Flow (perm)	3634		3521	1465	1682		1968	
Peak-hour factor, PHF	0.97	0.97	0.94	0.79	0.59	0.59	0.82	0.82
Adj. Flow (vph)	365	47	515	20	3	22	45	4
RTOR Reduction (vph)	0	0	0	0	21	0	0	0
Lane Group Flow (vph)	412	0	515	20	4	0	49	0
Confl. Peds. (#/hr)		10				7		29
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%
Parking (#/hr)		0		0		0		0
Turn Type	NA		NA	Free	NA		Prot	
Protected Phases	2		2		4		1	
Permitted Phases				Free				
Actuated Green, G (s)	69.0		69.0	90.0	2.8		4.7	
Effective Green, g (s)	69.0		69.0	90.0	2.8		4.7	
Actuated g/C Ratio	0.77		0.77	1.00	0.03		0.05	
Clearance Time (s)	4.5		4.5		4.5		4.5	
Vehicle Extension (s)	0.2		0.2		2.0		2.0	
Lane Grp Cap (vph)	2786		2699	1465	52		102	
v/s Ratio Prot	0.11		c0.15		c0.00		c0.02	
v/s Ratio Perm				0.01				
v/c Ratio	0.15		0.19	0.01	0.07		0.48	
Uniform Delay, d1	2.8		2.9	0.0	42.3		41.5	
Progression Factor	1.01		1.22	1.00	1.00		1.00	
Incremental Delay, d2	0.1		0.1	0.0	0.2		1.3	
Delay (s)	2.9		3.7	0.0	42.5		42.8	
Level of Service	A		A	A	D		D	
Approach Delay (s)	2.9		3.7		42.5		42.8	
Approach LOS	A		A		D		D	
Intersection Summary								
HCM 2000 Control Delay			6.1		HCM 2000 Level of Service		A	
HCM 2000 Volume to Capacity ratio			0.20					
Actuated Cycle Length (s)			90.0		Sum of lost time (s)		13.5	
Intersection Capacity Utilization			37.2%		ICU Level of Service		A	
Analysis Period (min)			15					
c Critical Lane Group								

HCM Signalized Intersection Capacity Analysis

32: 22nd Ave/E Denny Way & E Madison St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	0	331	3	0	446	39	56	4	6	37	0	78
Future Volume (vph)	0	331	3	0	446	39	56	4	6	37	0	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	12	12	12	12	11	12
Grade (%)		-3%			1%			0%			0%	
Total Lost time (s)		4.5	4.5		4.5			4.5			4.5	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.92		1.00			0.99			0.92	
Flpb, ped/bikes		1.00	1.00		1.00			0.95			1.00	
Frt		1.00	0.85		0.99			0.99			0.91	
Flt Protected		1.00	1.00		1.00			0.96			0.98	
Satd. Flow (prot)		1846	1341		1786			1702			1485	
Flt Permitted		1.00	1.00		1.00			0.53			0.89	
Satd. Flow (perm)		1846	1341		1786			949			1346	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.64	0.64	0.64	0.77	0.77	0.77
Adj. Flow (vph)	0	372	3	0	501	44	88	6	9	48	0	101
RTOR Reduction (vph)	0	0	1	0	2	0	0	4	0	0	88	0
Lane Group Flow (vph)	0	372	2	0	543	0	0	99	0	0	61	0
Confl. Peds. (#/hr)	2		25	25		2	39		4	4		39
Confl. Bikes (#/hr)			1						10			2
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	2%	2%	2%
Parking (#/hr)			0			0			0			
Turn Type		NA	Perm		NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases			2				4			4		
Actuated Green, G (s)		69.8	69.8		69.8			11.2			11.2	
Effective Green, g (s)		69.8	69.8		69.8			11.2			11.2	
Actuated g/C Ratio		0.78	0.78		0.78			0.12			0.12	
Clearance Time (s)		4.5	4.5		4.5			4.5			4.5	
Vehicle Extension (s)		0.2	0.2		0.2			1.0			1.0	
Lane Grp Cap (vph)		1431	1040		1385			118			167	
v/s Ratio Prot		0.20			c0.30							
v/s Ratio Perm			0.00					c0.10			0.05	
v/c Ratio		0.26	0.00		0.39			0.84			0.36	
Uniform Delay, d1		2.8	2.3		3.3			38.5			36.1	
Progression Factor		0.85	1.00		0.77			1.00			1.00	
Incremental Delay, d2		0.4	0.0		0.8			36.2			0.5	
Delay (s)		2.8	2.3		3.3			74.7			36.6	
Level of Service		A	A		A			E			D	
Approach Delay (s)		2.8			3.3			74.7			36.6	
Approach LOS		A			A			E			D	
Intersection Summary												
HCM 2000 Control Delay			13.7				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.45									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			9.0		
Intersection Capacity Utilization			47.8%				ICU Level of Service			A		
Analysis Period (min)			15									

HCM 2010 TWSC
33: E Madison St & 22nd ave

Intersection

Int Delay, s/veh 0.1

Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	0	9	0	429	461	7
Future Vol, veh/h	0	9	0	429	461	7
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	-	-	-1	5	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	10	0	466	501	8

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	505	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	-	-
Pot Cap-1 Maneuver	0	567	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	567	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	SB	NE	SW
HCM Control Delay, s	11.5	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NET SBLn1	SWT	SWR
Capacity (veh/h)	- 567	-	-
HCM Lane V/C Ratio	- 0.017	-	-
HCM Control Delay (s)	- 11.5	-	-
HCM Lane LOS	- B	-	-
HCM 95th %tile Q(veh)	- 0.1	-	-

HCM 2010 Signalized Intersection Summary

34: E Madison St & 23rd Ave E

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	0	733	56	0	271	273	188	199	20	117	214	0
Future Volume (veh/h)	0	733	56	0	271	273	188	199	20	117	214	0
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	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Adj Sat Flow, veh/h/ln	0	1806	1824	0	1881	1863	1909	1986	1948	1787	1770	1805
Adj Flow Rate, veh/h	0	843	81	0	298	297	204	216	0	183	233	0
Adj No. of Lanes	0	2	0	0	1	1	1	1	0	1	2	0
Peak Hour Factor	0.92	0.87	0.69	0.25	0.91	0.92	0.92	0.92	0.92	0.64	0.92	0.46
Percent Heavy Veh, %	0	1	1	0	1	2	2	2	2	1	2	2
Cap, veh/h	0	1234	119	0	773	616	270	681	0	249	1034	0
Arrive On Green	0.00	0.41	0.40	0.00	0.41	0.39	0.15	0.34	0.00	0.05	0.11	0.00
Sat Flow, veh/h	0	3092	288	0	1881	1583	1818	1986	0	1702	3278	0
Grp Volume(v), veh/h	0	482	442	0	298	297	204	216	0	183	233	0
Grp Sat Flow(s),veh/h/ln	0	1716	1574	0	1881	1583	1818	1986	0	1702	1597	0
Q Serve(g_s), s	0.0	20.7	20.7	0.0	10.0	12.7	9.7	7.2	0.0	9.5	6.0	0.0
Cycle Q Clear(g_c), s	0.0	20.7	20.7	0.0	10.0	12.7	9.7	7.2	0.0	9.5	6.0	0.0
Prop In Lane	0.00		0.18	0.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	0	705	647	0	773	616	270	681	0	249	1034	0
V/C Ratio(X)	0.00	0.68	0.68	0.00	0.39	0.48	0.76	0.32	0.00	0.74	0.23	0.00
Avail Cap(c_a), veh/h	0	705	647	0	773	616	424	681	0	397	1034	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	0.00	1.00	1.00	0.00	0.40	0.40	1.00	1.00	0.00	0.62	0.62	0.00
Uniform Delay (d), s/veh	0.0	21.7	21.8	0.0	18.5	20.7	36.7	21.8	0.0	41.1	29.9	0.0
Incr Delay (d2), s/veh	0.0	5.3	5.8	0.0	0.6	1.1	1.6	1.2	0.0	1.0	0.3	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 BackOfQ(50%),veh/ln	0.0	10.8	10.0	0.0	5.3	12.1	5.0	4.2	0.0	4.6	2.7	0.0
LnGrp Delay(d),s/veh	0.0	27.0	27.6	0.0	19.1	21.8	38.4	23.0	0.0	42.1	30.2	0.0
LnGrp LOS		C	C		B	C	D	C		D	C	
Approach Vol, veh/h		924			595			420			416	
Approach Delay, s/veh		27.3			20.5			30.5			35.4	
Approach LOS		C			C			C			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	16.2	33.8		40.0	16.4	33.6		40.0				
Change Period (Y+Rc), s	4.5	4.5		5.0	4.5	4.5		5.0				
Max Green Setting (Gmax), s	19.5	21.5		35.0	19.5	21.5		35.0				
Max Q Clear Time (g_c+I1), s	11.5	9.2		22.7	11.7	8.0		14.7				
Green Ext Time (p_c), s	0.2	0.3		0.3	0.3	0.3		0.3				
Intersection Summary												
HCM 2010 Ctrl Delay				27.6								
HCM 2010 LOS				C								

35: E Madison St & E JOHN ST

Synchro 9 Report
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HCM 2010 TWSC
36: E Madison St & 25th/25th Ave

Intersection												
Int Delay, s/veh	2.5											
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	15	27	7	7	5	8	13	319	1	2	487	16
Future Vol, veh/h	15	27	7	7	5	8	13	319	1	2	487	16
Conflicting Peds, #/hr	6	0	3	3	0	6	23	0	36	36	0	23
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	2	-	-	1	-	-	-10	-	-	14	-
Peak Hour Factor	71	71	71	75	75	75	98	98	98	96	96	96
Heavy Vehicles, %	0	0	0	0	0	0	2	2	2	2	2	2
Mvmt Flow	21	38	10	9	7	11	13	326	1	2	507	17
Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	923	940	365	922	932	545	547	0	0	363	0	0
Stage 1	389	389	-	543	543	-	-	-	-	-	-	-
Stage 2	534	551	-	379	389	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.9	6.4	7.3	6.7	6.3	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.5	5.9	-	6.3	5.7	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.9	-	6.3	5.7	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	228	239	671	240	255	534	1022	-	-	1196	-	-
Stage 1	612	586	-	512	507	-	-	-	-	-	-	-
Stage 2	503	488	-	634	599	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	208	223	649	198	238	520	1016	-	-	1192	-	-
Mov Cap-2 Maneuver	208	223	-	198	238	-	-	-	-	-	-	-
Stage 1	584	559	-	494	496	-	-	-	-	-	-	-
Stage 2	482	478	-	571	572	-	-	-	-	-	-	-
Approach	NB			SB			NE			SW		
HCM Control Delay, s	25.9			19.3			0.3			0		
HCM LOS	D			C								
Minor Lane/Major Mvmt	NEL	NET	NER	NBLn1	SBLn1	SWL	SWT	SWR				
Capacity (veh/h)	1016	-	-	240	279	1192	-	-				
HCM Lane V/C Ratio	0.013	-	-	0.288	0.096	0.002	-	-				
HCM Control Delay (s)	8.6	0	-	25.9	19.3	8	0	-				
HCM Lane LOS	A	A	-	D	C	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	1.1	0.3	0	-	-				

HCM 2010 TWSC
37: E Madison St & 26th Ave

Intersection						
Int Delay, s/veh	0.3					
Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	2	9	6	336	490	6
Future Vol, veh/h	2	9	6	336	490	6
Conflicting Peds, #/hr	3	0	27	0	0	27
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	-14	10	-
Peak Hour Factor	50	50	92	92	95	95
Heavy Vehicles, %	0	0	2	2	2	2
Mvmt Flow	4	18	7	365	516	6
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	927	546	549	0	-	0
Stage 1	546	-	-	-	-	-
Stage 2	381	-	-	-	-	-
Critical Hdwy	5.8	5.9	4.12	-	-	-
Critical Hdwy Stg 1	4.8	-	-	-	-	-
Critical Hdwy Stg 2	4.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	351	567	1021	-	-	-
Stage 1	640	-	-	-	-	-
Stage 2	741	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	332	554	1021	-	-	-
Mov Cap-2 Maneuver	332	-	-	-	-	-
Stage 1	626	-	-	-	-	-
Stage 2	718	-	-	-	-	-
Approach	SE	NE		SW		
HCM Control Delay, s	12.6	0.1		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NEL	NET	SELn1	SWT	SWR	
Capacity (veh/h)	1021	-	494	-	-	
HCM Lane V/C Ratio	0.006	-	0.045	-	-	
HCM Control Delay (s)	8.5	0	12.6	-	-	
HCM Lane LOS	A	A	B	-	-	
HCM 95th %tile Q(veh)	0	-	0.1	-	-	

HCM 2010 TWSC
38: E Madison St & 27th

Intersection						
Int Delay, s/veh	2.1					
Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	44	28	328	13	8	437
Future Vol, veh/h	44	28	328	13	8	437
Conflicting Peds, #/hr	4	0	0	31	31	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	-10	-	-	8
Peak Hour Factor	65	65	93	93	96	96
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	68	43	353	14	8	455
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	867	391	0	0	398	0
Stage 1	391	-	-	-	-	-
Stage 2	476	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.12	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.218	-
Pot Cap-1 Maneuver	326	662	-	-	1161	-
Stage 1	688	-	-	-	-	-
Stage 2	629	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	314	645	-	-	1161	-
Mov Cap-2 Maneuver	314	-	-	-	-	-
Stage 1	670	-	-	-	-	-
Stage 2	622	-	-	-	-	-
Approach	NW		NE		SW	
HCM Control Delay, s	17.8		0		0.1	
HCM LOS	C					
Minor Lane/Major Mvmt	NET	NERNWLn1	SWL	SWT		
Capacity (veh/h)	-	- 392	1161	-		
HCM Lane V/C Ratio	-	- 0.283	0.007	-		
HCM Control Delay (s)	-	- 17.8	8.1	-		
HCM Lane LOS	-	- C	A	-		
HCM 95th %tile Q(veh)	-	- 1.1	0	-		

HCM 2010 TWSC
39: E Madison St & 27th Ave E

Intersection

Int Delay, s/veh 0.4

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	0	14	23	332	430	9
Future Vol, veh/h	0	14	23	332	430	9
Conflicting Peds, #/hr	19	0	19	0	0	19
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	-8	4	-
Peak Hour Factor	82	82	93	93	96	96
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	0	17	25	357	448	9

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	897	472	476	0	-	0
Stage 1	472	-	-	-	-	-
Stage 2	425	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.13	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.227	-	-	-
Pot Cap-1 Maneuver	313	596	1081	-	-	-
Stage 1	632	-	-	-	-	-
Stage 2	664	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	296	587	1081	-	-	-
Mov Cap-2 Maneuver	423	-	-	-	-	-
Stage 1	622	-	-	-	-	-
Stage 2	638	-	-	-	-	-

Approach	SE	NE	SW
HCM Control Delay, s	11.3	0.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NEL	NET	SELn1	SWT	SWR
Capacity (veh/h)	1081	-	587	-	-
HCM Lane V/C Ratio	0.023	-	0.029	-	-
HCM Control Delay (s)	8.4	-	11.3	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-

HCM Signalized Intersection Capacity Analysis

40: E Madison St & MLK Jr Way E/28th Ave E

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	170	108	222	39	120	17	0	287	44	92	264	12
Future Volume (vph)	170	108	222	39	120	17	0	287	44	92	264	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	11	10	9	16	10
Grade (%)		2%			-1%			-4%			2%	
Total Lost time (s)		4.5			4.5			4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00			1.00		1.00	1.00	
Frpb, ped/bikes		0.95			0.99			0.98		1.00	1.00	
Flpb, ped/bikes		0.99			0.99			1.00		0.92	1.00	
Frt		0.94			0.99			0.98		1.00	0.99	
Flt Protected		0.98			0.99			1.00		0.95	1.00	
Satd. Flow (prot)		1593			1837			1740		1421	2027	
Flt Permitted		0.81			0.84			1.00		0.47	1.00	
Satd. Flow (perm)		1305			1558			1740		708	2027	
Peak-hour factor, PHF	0.91	0.91	0.91	0.95	0.95	0.95	0.95	0.95	0.95	0.94	0.94	0.94
Adj. Flow (vph)	187	119	244	41	126	18	0	302	46	98	281	13
RTOR Reduction (vph)	0	0	0	0	0	0	0	4	0	0	1	0
Lane Group Flow (vph)	0	550	0	0	185	0	0	344	0	98	293	0
Confl. Peds. (#/hr)	26		36	36		26	32		64	64		32
Confl. Bikes (#/hr)			9			15			6			5
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	3%	3%	3%	4%	4%	4%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4			4			2			2		
Actuated Green, G (s)		36.3			36.3			44.7		44.7	44.7	
Effective Green, g (s)		36.3			36.3			44.7		44.7	44.7	
Actuated g/C Ratio		0.40			0.40			0.50		0.50	0.50	
Clearance Time (s)		4.5			4.5			4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)		526			628			864		351	1006	
v/s Ratio Prot								c0.20			0.14	
v/s Ratio Perm		c0.42			0.12					0.14		
v/c Ratio		1.05			0.29			0.40		0.28	0.29	
Uniform Delay, d1		26.9			18.2			14.2		13.2	13.3	
Progression Factor		1.00			1.00			0.94		1.00	1.00	
Incremental Delay, d2		51.7			0.3			1.3		2.0	0.7	
Delay (s)		78.5			18.4			14.6		15.2	14.1	
Level of Service		E			B			B		B	B	
Approach Delay (s)		78.5			18.4			14.6			14.3	
Approach LOS		E			B			B			B	
Intersection Summary												
HCM 2000 Control Delay			38.9		HCM 2000 Level of Service					D		
HCM 2000 Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					13.5		
Intersection Capacity Utilization			81.3%		ICU Level of Service					D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

41: 1st Ave & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	243	54	0	0	0	0	638	94	64	368	0
Future Volume (vph)	28	243	54	0	0	0	0	638	94	64	368	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	12	10	12	12	12	10	11	10	10	11	10
Grade (%)		9%			0%			3%			0%	
Total Lost time (s)		4.5						4.5		4.5	4.5	
Lane Util. Factor		0.95						1.00		1.00	1.00	
Frpb, ped/bikes		0.96						0.96		1.00	1.00	
Flpb, ped/bikes		0.99						1.00		1.00	1.00	
Frt		0.97						0.98		1.00	1.00	
Flt Protected		1.00						1.00		0.95	1.00	
Satd. Flow (prot)		2852						1444		1404	1531	
Flt Permitted		1.00						1.00		0.95	1.00	
Satd. Flow (perm)		2852						1444		1404	1531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	30	264	59	0	0	0	0	693	102	70	400	0
RTOR Reduction (vph)	0	18	0	0	0	0	0	6	0	0	0	0
Lane Group Flow (vph)	0	335	0	0	0	0	0	789	0	70	400	0
Confl. Peds. (#/hr)	40		78	78		40	256		247	247		256
Confl. Bikes (#/hr)			1			5			12			28
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	6%	6%	6%	8%	8%	8%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						9		2	6	
Permitted Phases	4	4										
Actuated Green, G (s)		18.0						43.5		15.0	63.0	
Effective Green, g (s)		18.0						43.5		15.0	63.0	
Actuated g/C Ratio		0.20						0.48		0.17	0.70	
Clearance Time (s)		4.5						4.5		4.5	4.5	
Vehicle Extension (s)		0.2						0.2		0.2	0.2	
Lane Grp Cap (vph)		570						697		234	1071	
v/s Ratio Prot								c0.55		0.05	c0.26	
v/s Ratio Perm		0.12										
v/c Ratio		0.59						1.13		0.30	0.37	
Uniform Delay, d1		32.6						23.2		32.9	5.5	
Progression Factor		1.00						0.43		1.00	1.00	
Incremental Delay, d2		4.4						71.6		3.2	1.0	
Delay (s)		37.0						81.7		36.1	6.5	
Level of Service		D						F		D	A	
Approach Delay (s)		37.0			0.0			81.7			10.9	
Approach LOS		D			A			F			B	
Intersection Summary												
HCM 2000 Control Delay			51.4									HCM 2000 Level of Service D
HCM 2000 Volume to Capacity ratio			0.91									
Actuated Cycle Length (s)			90.0							17.0		
Intersection Capacity Utilization			75.1%									ICU Level of Service D
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

42: 2nd Ave & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑							↑	↑↑	
Traffic Volume (vph)	0	242	51	0	0	0	0	0	0	280	1040	0
Future Volume (vph)	0	242	51	0	0	0	0	0	0	280	1040	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	10	10	10	10	10	10	10
Grade (%)		12%			0%			0%			0%	
Total Lost time (s)		3.5	4.0							3.5	4.0	
Lane Util. Factor		0.95	1.00							1.00	0.95	
Frpb, ped/bikes		1.00	0.84							1.00	1.00	
Flpb, ped/bikes		1.00	1.00							1.00	1.00	
Frt		1.00	0.85							1.00	1.00	
Flt Protected		1.00	1.00							0.95	1.00	
Satd. Flow (prot)		2767	1041							1182	2163	
Flt Permitted		1.00	1.00							0.95	1.00	
Satd. Flow (perm)		2767	1041							1182	2163	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	263	55	0	0	0	0	0	0	295	1095	0
RTOR Reduction (vph)	0	0	42	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	263	13	0	0	0	0	0	0	295	1095	0
Confl. Peds. (#/hr)	118		150	150		118	330		393	393		330
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	2%	2%	9%	9%	9%
Parking (#/hr)										10	69	69
Turn Type		NA	custom							Prot	NA	
Protected Phases		4	7							5	2	
Permitted Phases			8									
Actuated Green, G (s)		24.6	20.6							33.0	56.9	
Effective Green, g (s)		25.1	20.6							33.5	57.4	
Actuated g/C Ratio		0.28	0.23							0.37	0.64	
Clearance Time (s)		4.0	4.0							4.0	4.5	
Lane Grp Cap (vph)		771	284							439	1379	
v/s Ratio Prot		c0.10	0.00							0.25	c0.51	
v/s Ratio Perm			0.01									
v/c Ratio		0.34	0.04							0.67	0.79	
Uniform Delay, d1		25.9	27.0							23.7	12.0	
Progression Factor		1.05	1.79							1.00	1.00	
Incremental Delay, d2		0.9	0.2							8.0	4.8	
Delay (s)		27.9	48.7							31.6	16.7	
Level of Service		C	D							C	B	
Approach Delay (s)		31.5			0.0			0.0			19.9	
Approach LOS		C			A			A			B	
Intersection Summary												
HCM 2000 Control Delay			22.1				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			15.0		
Intersection Capacity Utilization			49.2%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

43: 3rd Ave & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	353	66	0	0	0	0	80	30	13	133	0
Future Volume (vph)	7	353	66	0	0	0	0	80	30	13	133	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	12	12	12	11	12	12	11	12
Grade (%)		10%			-10%			0%			0%	
Total Lost time (s)		4.0	4.5					4.0			4.0	
Lane Util. Factor		0.95	1.00					0.95			0.95	
Frpb, ped/bikes		1.00	0.85					0.89			1.00	
Flpb, ped/bikes		0.99	1.00					1.00			0.97	
Frt		1.00	0.85					0.96			1.00	
Flt Protected		1.00	1.00					1.00			1.00	
Satd. Flow (prot)		2555	1149					1449			1565	
Flt Permitted		1.00	1.00					1.00			0.93	
Satd. Flow (perm)		2555	1149					1449			1465	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.89	0.89	0.89	0.85	0.85	0.85
Adj. Flow (vph)	8	384	72	0	0	0	0	90	34	15	156	0
RTOR Reduction (vph)	0	0	14	0	0	0	0	22	0	0	0	0
Lane Group Flow (vph)	0	392	59	0	0	0	0	102	0	0	171	0
Confl. Peds. (#/hr)	351		235	235		351	699		388	388		399
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	85%	7%	50%	84%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	60	0	0	34	0
Parking (#/hr)		15										
Turn Type	Perm	NA	custom					NA		Perm	NA	
Protected Phases		4	7					2			2	
Permitted Phases	4		8							2		
Actuated Green, G (s)		49.5	45.0					31.5			31.5	
Effective Green, g (s)		50.0	45.0					32.0			32.0	
Actuated g/C Ratio		0.56	0.50					0.36			0.36	
Clearance Time (s)		4.5	4.5					4.5			4.5	
Lane Grp Cap (vph)		1419	631					515			520	
v/s Ratio Prot			0.02					0.07				
v/s Ratio Perm		0.15	0.03								c0.12	
v/c Ratio		0.28	0.09					0.20			0.33	
Uniform Delay, d1		10.5	11.8					20.1			21.2	
Progression Factor		0.63	0.42					1.43			1.00	
Incremental Delay, d2		0.4	0.3					0.9			1.7	
Delay (s)		7.0	5.2					29.6			22.9	
Level of Service		A	A					C			C	
Approach Delay (s)		6.7			0.0			29.6			22.9	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			14.1					HCM 2000 Level of Service			B	
HCM 2000 Volume to Capacity ratio			0.32									
Actuated Cycle Length (s)			90.0					Sum of lost time (s)		13.0		
Intersection Capacity Utilization			33.6%					ICU Level of Service		A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2010 Signalized Intersection Summary

44: 4th Ave & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	104	288	0	0	0	0	0	1434	134	0	0	0
Future Volume (veh/h)	104	288	0	0	0	0	0	1434	134	0	0	0
Number	7	4	14				5	2	12			
Initial Q (Qb), veh	0	0	0				0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		0.88			
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1582	1551	0				0	1502	1588			
Adj Flow Rate, veh/h	113	313	0				0	1559	146			
Adj No. of Lanes	0	2	0				0	3	1			
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92			
Percent Heavy Veh, %	2	2	0				0	11	5			
Cap, veh/h	250	633	0				0	2392	693			
Arrive On Green	0.10	0.10	0.00				0.00	0.19	0.19			
Sat Flow, veh/h	621	2142	0				0	4236	1189			
Grp Volume(v), veh/h	225	201	0				0	1559	146			
Grp Sat Flow(s),veh/h/ln	1352	1341	0				0	1367	1189			
Q Serve(g_s), s	12.1	12.7	0.0				0.0	31.6	9.3			
Cycle Q Clear(g_c), s	14.1	12.7	0.0				0.0	31.6	9.3			
Prop In Lane	0.50		0.00				0.00		1.00			
Lane Grp Cap(c), veh/h	473	410	0				0	2392	693			
V/C Ratio(X)	0.48	0.49	0.00				0.00	0.65	0.21			
Avail Cap(c_a), veh/h	473	410	0				0	2392	693			
HCM Platoon Ratio	0.33	0.33	1.00				1.00	0.33	0.33			
Upstream Filter(I)	1.00	1.00	0.00				0.00	1.00	1.00			
Uniform Delay (d), s/veh	34.3	33.8	0.0				0.0	27.9	18.9			
Incr Delay (d2), s/veh	3.4	4.1	0.0				0.0	1.4	0.7			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	5.8	5.2	0.0				0.0	12.3	3.2			
LnGrp Delay(d),s/veh	37.7	38.0	0.0				0.0	29.3	19.6			
LnGrp LOS	D	D						C	B			
Approach Vol, veh/h		426						1705				
Approach Delay, s/veh		37.8						28.5				
Approach LOS		D						C				
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		58.0		32.0								
Change Period (Y+Rc), s		4.5		4.5								
Max Green Setting (Gmax), s		53.5		27.5								
Max Q Clear Time (g_c+l1), s		0.0		0.0								
Green Ext Time (p_c), s		0.0		0.0								
Intersection Summary												
HCM 2010 Ctrl Delay			30.3									
HCM 2010 LOS			C									

HCM Signalized Intersection Capacity Analysis

45: 5th Ave & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗								↖↑↑	
Traffic Volume (vph)	0	382	55	0	0	0	0	0	0	458	635	0
Future Volume (vph)	0	382	55	0	0	0	0	0	0	458	635	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	10	12	12	12	12	12	12	10	10	12
Grade (%)		15%			-5%			0%			0%	
Total Lost time (s)		2.0	3.5								2.5	
Lane Util. Factor		0.95	1.00								0.91	
Frpb, ped/bikes		1.00	0.91								1.00	
Flpb, ped/bikes		1.00	1.00								0.93	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								0.98	
Satd. Flow (prot)		2398	1074								3826	
Flt Permitted		1.00	1.00								0.98	
Satd. Flow (perm)		2398	1074								3826	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	415	60	0	0	0	0	0	0	498	690	0
RTOR Reduction (vph)	0	0	46	0	0	0	0	0	0	0	19	0
Lane Group Flow (vph)	0	415	14	0	0	0	0	0	0	0	1169	0
Confl. Peds. (#/hr)	195		68	68		195	312		104	104		312
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	2%	2%	2%	4%	4%	4%
Parking (#/hr)		30										
Turn Type		NA	custom							Prot	NA	
Protected Phases		4	7							5	2	
Permitted Phases			8									
Actuated Green, G (s)		25.5	21.5								57.0	
Effective Green, g (s)		27.0	21.5								58.5	
Actuated g/C Ratio		0.30	0.24								0.65	
Clearance Time (s)		3.5	3.5								4.0	
Lane Grp Cap (vph)		719	256								2486	
v/s Ratio Prot		c0.17	0.00								c0.20	
v/s Ratio Perm			0.01								0.11	
v/c Ratio		0.58	0.06								0.47	
Uniform Delay, d1		26.7	26.4								7.9	
Progression Factor		1.32	2.41								1.00	
Incremental Delay, d2		3.0	0.4								0.6	
Delay (s)		38.2	64.0								8.6	
Level of Service		D	E								A	
Approach Delay (s)		41.4			0.0			0.0			8.6	
Approach LOS		D			A			A			A	
Intersection Summary												
HCM 2000 Control Delay			18.0		HCM 2000 Level of Service					B		
HCM 2000 Volume to Capacity ratio			0.56									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					13.0		
Intersection Capacity Utilization			56.5%		ICU Level of Service					B		
Analysis Period (min)			15									
c Critical Lane Group												

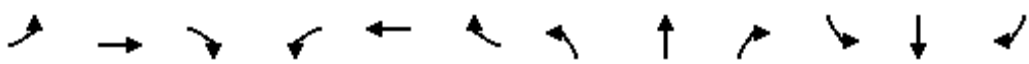
HCM Signalized Intersection Capacity Analysis

46: 6th Ave & I-5 CD SB On-Ramp & Spring St

						
Movement	EBL	EBT	EBR	NBT	NBR	NBR2
Lane Configurations				 		
Traffic Volume (vph)	119	175	487	473	7	538
Future Volume (vph)	119	175	487	473	7	538
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	10	11	12
Grade (%)		10%		5%		
Total Lost time (s)		4.5	4.5	4.5		4.5
Lane Util. Factor		1.00	1.00	0.95		1.00
Frpb, ped/bikes		1.00	1.00	1.00		1.00
Flpb, ped/bikes		0.86	1.00	1.00		1.00
Frt		1.00	0.85	1.00		0.85
Flt Protected		0.98	1.00	1.00		1.00
Satd. Flow (prot)		1006	1251	2918		1403
Flt Permitted		0.98	1.00	1.00		1.00
Satd. Flow (perm)		1006	1251	2918		1403
Peak-hour factor, PHF	0.94	0.94	0.94	0.95	0.95	0.95
Adj. Flow (vph)	127	186	518	498	7	566
RTOR Reduction (vph)	0	61	0	0	0	0
Lane Group Flow (vph)	0	252	518	505	0	566
Confl. Peds. (#/hr)	292		4		34	4
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%
Bus Blockages (#/hr)	0	5	0	0	0	0
Parking (#/hr)		15				
Turn Type	Perm	NA	Prot	NA		custom
Protected Phases		4	4	2		2
Permitted Phases	4					3 9
Actuated Green, G (s)		36.5	36.5	44.5		44.5
Effective Green, g (s)		36.5	36.5	44.5		44.5
Actuated g/C Ratio		0.41	0.41	0.49		0.49
Clearance Time (s)		4.5	4.5	4.5		4.5
Vehicle Extension (s)		0.2	0.2	0.2		0.2
Lane Grp Cap (vph)		407	507	1442		693
v/s Ratio Prot			c0.41	0.17		c0.40
v/s Ratio Perm		0.25				
v/c Ratio		0.62	1.02	0.35		0.82
Uniform Delay, d1		21.2	26.8	13.9		19.3
Progression Factor		0.53	0.72	0.61		0.64
Incremental Delay, d2		5.7	42.3	0.6		6.1
Delay (s)		17.0	61.5	9.0		18.5
Level of Service		B	E	A		B
Approach Delay (s)		44.7		14.0		
Approach LOS		D		B		
Intersection Summary						
HCM 2000 Control Delay			27.4		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.99			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	16.0
Intersection Capacity Utilization			78.9%		ICU Level of Service	D
Analysis Period (min)			15			

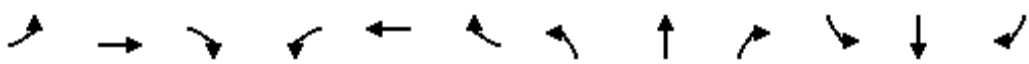
HCM Signalized Intersection Capacity Analysis

47: 7th Ave/Hubbell PI & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔						↔			↔	
Traffic Volume (vph)	25	126	8	0	0	0	0	369	52	10	161	0
Future Volume (vph)	25	126	8	0	0	0	0	369	52	10	161	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	14	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.5						4.5			4.5	
Lane Util. Factor		0.95						1.00			1.00	
Frpb, ped/bikes		1.00						0.98			1.00	
Flpb, ped/bikes		0.93						1.00			1.00	
Frt		0.99						0.98			1.00	
Flt Protected		0.99						1.00			1.00	
Satd. Flow (prot)		3104						1619			1666	
Flt Permitted		0.99						1.00			0.97	
Satd. Flow (perm)		3104						1619			1627	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	27	137	9	0	0	0	0	401	57	11	175	0
RTOR Reduction (vph)	0	5	0	0	0	0	0	6	0	0	0	0
Lane Group Flow (vph)	0	169	0	0	0	0	0	452	0	0	186	0
Confl. Peds. (#/hr)	145		22	22		145	3		74	74		3
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	0%
Turn Type	Perm	NA						NA		Perm	NA	
Protected Phases		2						4			4	
Permitted Phases	2									4		
Actuated Green, G (s)		22.5						58.5			58.5	
Effective Green, g (s)		22.5						58.5			58.5	
Actuated g/C Ratio		0.25						0.65			0.65	
Clearance Time (s)		4.5						4.5			4.5	
Lane Grp Cap (vph)		776						1052			1057	
v/s Ratio Prot								c0.28				
v/s Ratio Perm		0.05									0.11	
v/c Ratio		0.22						0.43			0.18	
Uniform Delay, d1		26.8						7.7			6.2	
Progression Factor		0.43						0.16			1.00	
Incremental Delay, d2		0.5						1.0			0.4	
Delay (s)		12.0						2.2			6.6	
Level of Service		B						A			A	
Approach Delay (s)		12.0			0.0			2.2			6.6	
Approach LOS		B			A			A			A	
Intersection Summary												
HCM 2000 Control Delay		5.3										
HCM 2000 Volume to Capacity ratio		0.37										
Actuated Cycle Length (s)		90.0										
Intersection Capacity Utilization		46.1%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

48: 8th Ave & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔						↔			↔	
Traffic Volume (vph)	0	135	12	0	0	0	0	210	16	18	64	0
Future Volume (vph)	0	135	12	0	0	0	0	210	16	18	64	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5						4.5			4.5	
Lane Util. Factor		0.95						1.00			1.00	
Frpb, ped/bikes		0.98						0.99			1.00	
Flpb, ped/bikes		1.00						1.00			0.97	
Frt		0.99						0.99			1.00	
Flt Protected		1.00						1.00			0.99	
Satd. Flow (prot)		3435						1820			1791	
Flt Permitted		1.00						1.00			0.92	
Satd. Flow (perm)		3435						1820			1673	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	147	13	0	0	0	0	228	17	20	70	0
RTOR Reduction (vph)	0	7	0	0	0	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	153	0	0	0	0	0	242	0	0	90	0
Confl. Peds. (#/hr)	116		65					115	104	104		115
Confl. Bikes (#/hr)			5						13			2
Turn Type		NA						NA		Perm	NA	
Protected Phases		2						4			4	
Permitted Phases	2									4		
Actuated Green, G (s)		30.5						50.5			50.5	
Effective Green, g (s)		30.5						50.5			50.5	
Actuated g/C Ratio		0.34						0.56			0.56	
Clearance Time (s)		4.5						4.5			4.5	
Lane Grp Cap (vph)		1164						1021			938	
v/s Ratio Prot		c0.04						c0.13				
v/s Ratio Perm											0.05	
v/c Ratio		0.13						0.24			0.10	
Uniform Delay, d1		20.6						10.0			9.2	
Progression Factor		0.58						0.22			1.00	
Incremental Delay, d2		0.2						0.5			0.2	
Delay (s)		12.1						2.6			9.4	
Level of Service		B						A			A	
Approach Delay (s)		12.1			0.0			2.6			9.4	
Approach LOS		B			A			A			A	
Intersection Summary												
HCM 2000 Control Delay		6.9										
HCM 2000 Volume to Capacity ratio		0.20										
Actuated Cycle Length (s)		90.0										
Intersection Capacity Utilization		39.0%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

49: 9th Ave & Spring St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	43	42	6	0	32	0	172	4	7	93	0
Future Volume (vph)	50	43	42	6	0	32	0	172	4	7	93	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	11	12	12	12	12
Total Lost time (s)	4.5	4.5			4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frpb, ped/bikes	1.00	0.90			0.55			0.99			1.00	
Flpb, ped/bikes	0.50	1.00			0.97			1.00			0.98	
Frt	1.00	0.93			0.89			1.00			1.00	
Flt Protected	0.95	1.00			0.99			1.00			1.00	
Satd. Flow (prot)	893	1560			885			1782			1823	
Flt Permitted	0.73	1.00			0.97			1.00			0.98	
Satd. Flow (perm)	686	1560			867			1782			1796	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	47	46	7	0	35	0	187	4	8	101	0
RTOR Reduction (vph)	0	26	0	0	20	0	0	1	0	0	0	0
Lane Group Flow (vph)	54	67	0	0	22	0	0	190	0	0	109	0
Confl. Peds. (#/hr)	209		58	58		209	104		111	111		104
Confl. Bikes (#/hr)			4			1			4			3
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2						4		
Actuated Green, G (s)	39.5	39.5			39.5			41.5			41.5	
Effective Green, g (s)	39.5	39.5			39.5			41.5			41.5	
Actuated g/C Ratio	0.44	0.44			0.44			0.46			0.46	
Clearance Time (s)	4.5	4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)	301	684			380			821			828	
v/s Ratio Prot		0.04						c0.11				
v/s Ratio Perm	c0.08				0.03						0.06	
v/c Ratio	0.18	0.10			0.06			0.23			0.13	
Uniform Delay, d1	15.4	14.8			14.5			14.6			13.9	
Progression Factor	0.58	0.40			1.00			0.47			1.00	
Incremental Delay, d2	1.3	0.3			0.3			0.5			0.3	
Delay (s)	10.1	6.2			14.8			7.4			14.2	
Level of Service	B	A			B			A			B	
Approach Delay (s)		7.6			14.8			7.4			14.2	
Approach LOS		A			B			A			B	
Intersection Summary												
HCM 2000 Control Delay		9.6			HCM 2000 Level of Service			A				
HCM 2000 Volume to Capacity ratio		0.21										
Actuated Cycle Length (s)		90.0			Sum of lost time (s)			9.0				
Intersection Capacity Utilization		34.4%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

50: 14th Ave & Pike St

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	0	88	48	138	4	60	168	0	0	88	7
Future Volume (vph)	4	0	88	48	138	4	60	168	0	0	88	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	16	12	12	16	12	12	16	12
Grade (%)		6%			-6%			0%			0%	
Total Lost time (s)	4.5		4.5		4.5			4.5			4.5	
Lane Util. Factor	1.00		1.00		1.00			1.00			1.00	
Frt	1.00		0.85		1.00			1.00			0.99	
Flt Protected	0.95		1.00		0.99			0.99			1.00	
Satd. Flow (prot)	1717		1536		2142			2084			1880	
Flt Permitted	0.63		1.00		0.99			0.90			1.00	
Satd. Flow (perm)	1136		1536		2142			1897			1880	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	0	96	52	150	4	65	183	0	0	96	8
RTOR Reduction (vph)	0	0	83	0	1	0	0	0	0	0	3	0
Lane Group Flow (vph)	4	0	13	0	205	0	0	248	0	0	101	0
Parking (#/hr)		0									0	
Turn Type	Perm		Perm	Perm	NA		Perm	NA			NA	
Protected Phases					4			3			3	
Permitted Phases	2		2	4			3					
Actuated Green, G (s)	12.5		12.5		47.5			33.5			33.5	
Effective Green, g (s)	12.5		12.5		47.5			33.5			33.5	
Actuated g/C Ratio	0.14		0.14		0.53			0.37			0.37	
Clearance Time (s)	4.5		4.5		4.5			4.5			4.5	
Lane Grp Cap (vph)	157		213		1130			706			699	
v/s Ratio Prot											0.05	
v/s Ratio Perm	0.00		0.01		0.10			0.13				
v/c Ratio	0.03		0.06		0.18			0.35			0.14	
Uniform Delay, d1	33.5		33.7		11.1			20.4			18.7	
Progression Factor	1.00		1.00		0.53			0.13			1.00	
Incremental Delay, d2	0.3		0.6		0.3			1.2			0.4	
Delay (s)	33.8		34.2		6.2			3.7			19.2	
Level of Service	C		C		A			A			B	
Approach Delay (s)		34.2			6.2			3.7			19.2	
Approach LOS		C			A			A			B	
Intersection Summary												
HCM 2000 Control Delay			11.6									HCM 2000 Level of Service B
HCM 2000 Volume to Capacity ratio			0.27									
Actuated Cycle Length (s)			90.0									Sum of lost time (s) 13.5
Intersection Capacity Utilization			43.2%									ICU Level of Service A
Analysis Period (min)			15									
c Critical Lane Group												

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HCM Signalized Intersection Capacity Analysis

1: 1st Ave & Madison St

03/28/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	92	143	107	41	645	0	0	306	93
Future Volume (vph)	0	0	0	92	143	107	41	645	0	0	306	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	14	11	15	10	11	10	10	11	10
Grade (%)		6%			-8%			0%			0%	
Total Lost time (s)					4.5	4.5	4.5	4.5			4.5	
Lane Util. Factor					0.95	1.00	1.00	1.00			1.00	
Frpb, ped/bikes					1.00	1.00	1.00	1.00			0.92	
Flpb, ped/bikes					0.87	1.00	1.00	1.00			1.00	
Frt					1.00	0.85	1.00	1.00			0.97	
Flt Protected					0.98	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					2676	1599	1486	1621			1393	
Flt Permitted					0.98	1.00	0.95	1.00			1.00	
Satd. Flow (perm)					2676	1599	1486	1621			1393	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	100	155	116	45	701	0	0	333	101
RTOR Reduction (vph)	0	0	0	0	0	104	0	0	0	0	12	0
Lane Group Flow (vph)	0	0	0	0	255	12	45	701	0	0	422	0
Confl. Peds. (#/hr)	103		137	134		103	243		247	247		243
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	2%	2%	2%	6%	6%	6%
Turn Type				Perm	NA	custom	Prot	NA			NA	
Protected Phases					8	3	5	2			6	
Permitted Phases				8								
Actuated Green, G (s)					32.0	9.5	7.5	49.0			37.0	
Effective Green, g (s)					32.0	9.5	7.5	49.0			37.0	
Actuated g/C Ratio					0.36	0.11	0.08	0.54			0.41	
Clearance Time (s)					4.5	4.5	4.5	4.5			4.5	
Lane Grp Cap (vph)					951	168	123	882			572	
v/s Ratio Prot						0.01	0.03	c0.43			0.30	
v/s Ratio Perm					0.10							
v/c Ratio					0.27	0.07	0.37	0.79			0.74	
Uniform Delay, d1					20.7	36.3	39.0	16.5			22.4	
Progression Factor					0.39	2.66	1.00	1.00			0.95	
Incremental Delay, d2					0.5	0.6	8.2	7.3			7.7	
Delay (s)					8.5	97.2	47.2	23.8			29.0	
Level of Service					A	F	D	C			C	
Approach Delay (s)		0.0			36.2			25.2			29.0	
Approach LOS		A			D			C			C	
Intersection Summary												
HCM 2000 Control Delay			28.9		HCM 2000 Level of Service						C	
HCM 2000 Volume to Capacity ratio			0.66									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					18.0		
Intersection Capacity Utilization			60.2%		ICU Level of Service					B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2010 Signalized Intersection Summary

2: 2nd Ave & Madison St

05/23/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	300	291	0	0	0	0	0	950	93
Future Volume (veh/h)	0	0	0	300	291	0	0	0	0	0	950	93
Number				7	4	14				5	2	12
Initial Q (Qb), veh				0	0	0				0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00				1.00		0.87
Parking Bus, Adj				1.00	1.00	1.00				1.00	1.00	0.43
Adj Sat Flow, veh/h/ln				1778	1710	0				0	1555	1555
Adj Flow Rate, veh/h				345	334	0				0	979	96
Adj No. of Lanes				0	2	0				0	2	1
Peak Hour Factor				0.87	0.87	0.87				0.97	0.97	0.97
Percent Heavy Veh, %				4	4	0				0	10	10
Cap, veh/h				523	513	0				0	1739	281
Arrive On Green				0.34	0.34	0.00				0.00	0.19	0.19
Sat Flow, veh/h				1287	1568	0				0	3031	491
Grp Volume(v), veh/h				348	331	0				0	979	96
Grp Sat Flow(s),veh/h/ln				1299	1478	0				0	1477	491
Q Serve(g_s), s				21.6	17.0	0.0				0.0	27.0	15.3
Cycle Q Clear(g_c), s				21.6	17.0	0.0				0.0	27.0	15.3
Prop In Lane				0.99		0.00				0.00		1.00
Lane Grp Cap(c), veh/h				527	509	0				0	1739	281
V/C Ratio(X)				0.66	0.65	0.00				0.00	0.56	0.34
Avail Cap(c_a), veh/h				527	509	0				0	1739	281
HCM Platoon Ratio				1.00	1.00	1.00				1.00	0.33	0.33
Upstream Filter(I)				1.00	1.00	0.00				0.00	1.00	1.00
Uniform Delay (d), s/veh				26.4	24.9	0.0				0.0	25.8	21.8
Incr Delay (d2), s/veh				6.4	6.3	0.0				0.0	1.3	3.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				8.7	7.8	0.0				0.0	11.3	2.3
LnGrp Delay(d),s/veh				32.8	31.2	0.0				0.0	27.1	25.1
LnGrp LOS				C	C						C	C
Approach Vol, veh/h					679						1075	
Approach Delay, s/veh					32.0						26.9	
Approach LOS					C						C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		56.0		34.0								
Change Period (Y+Rc), s		4.5		4.5								
Max Green Setting (Gmax), s		51.5		29.5								
Max Q Clear Time (g_c+I1), s		0.0		0.0								
Green Ext Time (p_c), s		0.0		0.0								
Intersection Summary												
HCM 2010 Ctrl Delay				28.9								
HCM 2010 LOS				C								

HCM Signalized Intersection Capacity Analysis

3: 3rd Ave & Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↗		↑↑			↑↑	
Traffic Volume (vph)	0	0	0	0	538	24	0	103	0	0	114	87
Future Volume (vph)	0	0	0	0	538	24	0	103	0	0	114	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	10	11	12	10	12	12	11	12
Grade (%)		10%			-15%			0%			-5%	
Total Lost time (s)					4.0	4.5		4.0			4.0	
Lane Util. Factor					0.95	1.00		0.95			0.95	
Frpb, ped/bikes					1.00	0.74		1.00			0.80	
Flpb, ped/bikes					1.00	1.00		1.00			1.00	
Frt					1.00	0.85		1.00			0.93	
Flt Protected					1.00	1.00		1.00			1.00	
Satd. Flow (prot)					2803	1071		1535			1501	
Flt Permitted					1.00	1.00		1.00			1.00	
Satd. Flow (perm)					2803	1071		1535			1501	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	585	26	0	112	0	0	120	92
RTOR Reduction (vph)	0	0	0	0	0	10	0	0	0	0	60	0
Lane Group Flow (vph)	0	0	0	0	585	16	0	112	0	0	152	0
Confl. Peds. (#/hr)	214		308	308		214	577		449	499		577
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	0%	73%	0%	0%	84%	10%
Bus Blockages (#/hr)	0	0	0	0	10	0	0	62	0	0	29	0
Parking (#/hr)					15							
Turn Type					NA	custom		NA			NA	
Protected Phases					4	7		2			2	
Permitted Phases						8						
Actuated Green, G (s)					50.0	45.5		31.0			31.0	
Effective Green, g (s)					50.5	45.5		31.5			31.5	
Actuated g/C Ratio					0.56	0.51		0.35			0.35	
Clearance Time (s)					4.5	4.5		4.5			4.5	
Lane Grp Cap (vph)					1572	595		537			525	
v/s Ratio Prot					c0.21	0.00		0.07			c0.10	
v/s Ratio Perm						0.01						
v/c Ratio					0.37	0.03		0.21			0.29	
Uniform Delay, d1					11.0	11.2		20.5			21.2	
Progression Factor					0.61	0.63		1.00			0.40	
Incremental Delay, d2					0.6	0.1		0.9			1.4	
Delay (s)					7.2	7.1		21.4			9.7	
Level of Service					A	A		C			A	
Approach Delay (s)		0.0			7.2			21.4			9.7	
Approach LOS		A			A			C			A	
Intersection Summary												
HCM 2000 Control Delay			9.5		HCM 2000 Level of Service						A	
HCM 2000 Volume to Capacity ratio			0.36									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)						13.0	
Intersection Capacity Utilization			35.7%		ICU Level of Service						A	
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: 4th Ave & Madison St

03/24/2018



Movement	WBR	NBL	NBT	SWR	SWR2
Lane Configurations	↰		↰↰↰	↰↰	↰
Traffic Volume (vph)	21	253	1252	295	382
Future Volume (vph)	21	253	1252	295	382
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Lane Width	12	12	10	11	12
Grade (%)			5%		
Total Lost time (s)	3.5		3.5	2.5	4.5
Lane Util. Factor	1.00		0.91	0.88	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00
Frt	0.86		1.00	0.85	0.85
Flt Protected	1.00		0.99	1.00	1.00
Satd. Flow (prot)	1450		3685	2299	1511
Flt Permitted	1.00		0.99	1.00	1.00
Satd. Flow (perm)	1450		3685	2299	1511
Peak-hour factor, PHF	0.92	0.98	0.98	0.92	0.92
Adj. Flow (vph)	23	258	1278	321	415
RTOR Reduction (vph)	0	0	50	0	54
Lane Group Flow (vph)	23	0	1486	321	361
Confl. Peds. (#/hr)		342			191
Heavy Vehicles (%)	2%	1%	9%	1%	1%
Bus Blockages (#/hr)	0	0	0	10	0
Parking (#/hr)			15	15	
Turn Type	Prot	Split	NA	Prot	custom
Protected Phases	1	2	2	4	7
Permitted Phases	1				8
Actuated Green, G (s)	2.2		49.8	25.5	25.5
Effective Green, g (s)	2.2		50.8	27.5	25.5
Actuated g/C Ratio	0.02		0.56	0.31	0.28
Clearance Time (s)	3.5		4.5	4.5	4.5
Vehicle Extension (s)	3.0		0.2	0.2	0.2
Lane Grp Cap (vph)	35		2079	702	428
v/s Ratio Prot	c0.02		c0.40	0.14	c0.24
v/s Ratio Perm					
v/c Ratio	0.66		0.71	0.46	0.84
Uniform Delay, d1	43.5		14.3	25.2	30.4
Progression Factor	1.00		0.90	0.70	1.20
Incremental Delay, d2	36.6		2.1	1.8	11.8
Delay (s)	80.2		15.1	19.4	48.2
Level of Service	F		B	B	D
Approach Delay (s)			15.1		
Approach LOS			B		
Intersection Summary					
HCM 2000 Control Delay			22.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.79		
Actuated Cycle Length (s)			90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization			80.3%	ICU Level of Service	D
Analysis Period (min)			15		

c Critical Lane Group

HCM 2010 Signalized Intersection Summary

5: 5th Ave & Madison St

05/23/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	225	488	0	0	0	0	0	413	237
Future Volume (veh/h)	0	0	0	225	488	0	0	0	0	0	413	237
Number				7	4	14				5	2	12
Initial Q (Qb), veh				0	0	0				0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00				1.00		0.82
Parking Bus, Adj				1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1796	1760	0				0	1563	1710
Adj Flow Rate, veh/h				245	530	0				0	449	258
Adj No. of Lanes				0	2	0				0	3	0
Peak Hour Factor				0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %				2	2	0				0	5	5
Cap, veh/h				529	1048	0				0	1122	431
Arrive On Green				0.17	0.17	0.00				0.00	0.13	0.13
Sat Flow, veh/h				917	2152	0				0	2986	1093
Grp Volume(v), veh/h				392	383	0				0	449	258
Grp Sat Flow(s),veh/h/ln				1467	1522	0				0	1423	1093
Q Serve(g_s), s				22.0	20.6	0.0				0.0	13.0	20.0
Cycle Q Clear(g_c), s				22.0	20.6	0.0				0.0	13.0	20.0
Prop In Lane				0.62		0.00				0.00		1.00
Lane Grp Cap(c), veh/h				807	769	0				0	1122	431
V/C Ratio(X)				0.49	0.50	0.00				0.00	0.40	0.60
Avail Cap(c_a), veh/h				807	769	0				0	1122	431
HCM Platoon Ratio				0.33	0.33	1.00				1.00	0.33	0.33
Upstream Filter(I)				1.00	1.00	0.00				0.00	1.00	1.00
Uniform Delay (d), s/veh				27.7	27.1	0.0				0.0	29.4	32.4
Incr Delay (d2), s/veh				2.1	2.3	0.0				0.0	1.1	6.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				9.4	9.2	0.0				0.0	5.3	6.8
LnGrp Delay(d),s/veh				29.8	29.4	0.0				0.0	30.4	38.5
LnGrp LOS				C	C						C	D
Approach Vol, veh/h					775						707	
Approach Delay, s/veh					29.6						33.4	
Approach LOS					C						C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		40.0		50.0								
Change Period (Y+Rc), s		4.5		4.5								
Max Green Setting (Gmax), s		35.5		45.5								
Max Q Clear Time (g_c+I1), s		0.0		0.0								
Green Ext Time (p_c), s		0.0		0.0								
Intersection Summary												
HCM 2010 Ctrl Delay				31.4								
HCM 2010 LOS				C								

HCM Signalized Intersection Capacity Analysis

6: 6th Ave & Madison St

03/24/2018

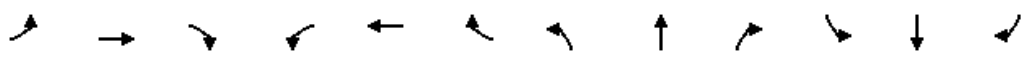
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑	↑↑		↑↑				
Traffic Volume (vph)	0	0	0	0	738	1000	16	81	128	0	0	0
Future Volume (vph)	0	0	0	0	738	1000	16	81	128	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	10	10	12	12	12	12	12	12
Grade (%)		10%			-10%			5%			-5%	
Total Lost time (s)					3.0	3.0		4.0				
Lane Util. Factor					1.00	0.88		0.95				
Frpb, ped/bikes					1.00	1.00		0.99				
Flpb, ped/bikes					1.00	1.00		0.99				
Frt					1.00	0.85		0.91				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					1643	2458		2315				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					1643	2458		2315				
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.81	0.81	0.81	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	811	1099	20	100	158	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	456	0	106	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	811	643	0	172	0	0	0	0
Confl. Peds. (#/hr)	101		155	155		101	100		1	1		100
Confl. Bikes (#/hr)			3			26			2			3
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	11%	11%	11%	2%	2%	2%
Parking (#/hr)								15				
Turn Type					NA	custom	Perm	NA				
Protected Phases					4	7		2				
Permitted Phases						8	2					
Actuated Green, G (s)					49.8	49.8		32.2				
Effective Green, g (s)					50.3	50.3		32.7				
Actuated g/C Ratio					0.56	0.56		0.36				
Clearance Time (s)					3.5	3.5		4.5				
Vehicle Extension (s)					3.0	3.0		0.2				
Lane Grp Cap (vph)					918	1373		841				
v/s Ratio Prot					c0.49	0.26						
v/s Ratio Perm								0.07				
v/c Ratio					0.88	0.47		0.20				
Uniform Delay, d1					17.3	11.9		19.7				
Progression Factor					0.58	6.73		1.00				
Incremental Delay, d2					7.1	0.2		0.6				
Delay (s)					17.1	80.0		20.3				
Level of Service					B	F		C				
Approach Delay (s)		0.0			53.3			20.3			0.0	
Approach LOS		A			D			C			A	
Intersection Summary												
HCM 2000 Control Delay			49.1		HCM 2000 Level of Service					D		
HCM 2000 Volume to Capacity ratio			0.67									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					14.0		
Intersection Capacity Utilization			66.5%		ICU Level of Service					C		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

7: I-5 CD NB Off-Ramp/7th Ave & Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑↑↑		↑	↑	↑	↑		↑
Traffic Volume (vph)	0	118	0	0	721	0	895	407	338	3	0	150
Future Volume (vph)	0	118	0	0	721	0	895	407	338	3	0	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	10	12	12	12	12	12	12	12
Grade (%)		0%			0%			5%			-5%	
Total Lost time (s)		3.5			3.5		3.5	3.5	3.5	3.5		4.5
Lane Util. Factor		1.00			0.91		0.95	0.95	1.00	1.00		1.00
Frpb, ped/bikes		1.00			1.00		1.00	1.00	0.66	1.00		0.99
Flpb, ped/bikes		1.00			1.00		1.00	1.00	1.00	1.00		1.00
Frt		1.00			1.00		1.00	1.00	0.85	1.00		0.85
Flt Protected		1.00			1.00		0.95	0.98	1.00	0.95		1.00
Satd. Flow (prot)		1207			4272		1471	1522	921	1617		1425
Flt Permitted		1.00			1.00		0.95	0.98	1.00	0.19		1.00
Satd. Flow (perm)		1207			4272		1471	1522	921	316		1425
Peak-hour factor, PHF	0.87	0.87	0.87	0.88	0.88	0.88	0.95	0.95	0.95	0.72	0.72	0.72
Adj. Flow (vph)	0	136	0	0	819	0	942	428	356	4	0	208
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	45	0	0	13
Lane Group Flow (vph)	0	136	0	0	819	0	678	692	311	4	0	195
Confl. Peds. (#/hr)	104		274	274		104	2		125	125		2
Confl. Bikes (#/hr)			2			9			22			
Heavy Vehicles (%)	13%	13%	13%	2%	2%	2%	2%	2%	2%	3%	3%	3%
Parking (#/hr)		15										
Turn Type		NA			NA		Perm	NA	Perm	D.Pm		Perm
Protected Phases		6			2			4				
Permitted Phases							4		4	4		4
Actuated Green, G (s)		34.0			34.0		47.0	47.0	47.0	47.0		47.0
Effective Green, g (s)		35.0			35.0		48.0	48.0	48.0	48.0		47.0
Actuated g/C Ratio		0.39			0.39		0.53	0.53	0.53	0.53		0.52
Clearance Time (s)		4.5			4.5		4.5	4.5	4.5	4.5		4.5
Vehicle Extension (s)		3.0			5.0		5.0	5.0	5.0	5.0		5.0
Lane Grp Cap (vph)		469			1661		784	811	491	168		744
v/s Ratio Prot		0.11			c0.19							
v/s Ratio Perm							c0.46	0.45	0.34	0.01		0.14
v/c Ratio		0.29			0.49		0.86	0.85	0.63	0.02		0.26
Uniform Delay, d1		18.9			20.8		18.2	18.0	14.8	9.9		11.9
Progression Factor		0.56			0.58		1.00	1.00	1.00	0.52		0.42
Incremental Delay, d2		1.5			1.0		10.6	9.5	3.7	0.1		0.4
Delay (s)		12.2			13.0		28.8	27.5	18.5	5.3		5.4
Level of Service		B			B		C	C	B	A		A
Approach Delay (s)		12.2			13.0			26.2			5.4	
Approach LOS		B			B			C			A	
Intersection Summary												
HCM 2000 Control Delay			20.2				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.71									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			7.0		
Intersection Capacity Utilization			76.1%				ICU Level of Service			D		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

8: 8th Ave & Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	371	38	0	709	13	26	175	62	28	60	16
Future Volume (vph)	0	371	38	0	709	13	26	175	62	28	60	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	12	10	12	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5			3.5			3.5	
Lane Util. Factor		1.00			0.95			1.00			1.00	
Frpb, ped/bikes		0.95			0.99			0.96			0.98	
Flpb, ped/bikes		1.00			1.00			0.99			0.98	
Frt		0.99			1.00			0.97			0.98	
Flt Protected		1.00			1.00			1.00			0.99	
Satd. Flow (prot)		1471			3124			1496			1558	
Flt Permitted		1.00			1.00			0.96			0.81	
Satd. Flow (perm)		1471			3124			1448			1280	
Peak-hour factor, PHF	0.84	0.84	0.84	0.93	0.93	0.93	0.89	0.89	0.89	0.79	0.79	0.79
Adj. Flow (vph)	0	442	45	0	762	14	29	197	70	35	76	20
RTOR Reduction (vph)	0	4	0	0	1	0	0	13	0	0	8	0
Lane Group Flow (vph)	0	483	0	0	775	0	0	283	0	0	124	0
Confl. Peds. (#/hr)	99		230	230		99	91		53	53		91
Heavy Vehicles (%)	5%	5%	5%	3%	3%	3%	5%	5%	5%	2%	2%	2%
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases							4			8		
Actuated Green, G (s)		59.5			59.5			21.5			21.5	
Effective Green, g (s)		60.5			60.5			22.5			22.5	
Actuated g/C Ratio		0.67			0.67			0.25			0.25	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		988			2100			362			320	
v/s Ratio Prot		c0.33			0.25							
v/s Ratio Perm								c0.20			0.10	
v/c Ratio		0.49			0.37			0.78			0.39	
Uniform Delay, d1		7.2			6.4			31.5			28.0	
Progression Factor		1.12			0.37			1.00			0.73	
Incremental Delay, d2		1.5			0.3			15.4			3.5	
Delay (s)		9.5			2.6			46.9			23.8	
Level of Service		A			A			D			C	
Approach Delay (s)		9.5			2.6			46.9			23.8	
Approach LOS		A			A			D			C	
Intersection Summary												
HCM 2000 Control Delay			14.0				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.57									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			7.0		
Intersection Capacity Utilization			50.1%				ICU Level of Service			A		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

9: 9th Ave & Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	392	16	0	670	33	45	101	58	19	54	74
Future Volume (vph)	0	392	16	0	670	33	45	101	58	19	54	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	15	12	10	11	12	12	12	12	11	11	12
Total Lost time (s)		3.5			3.5			3.5		2.5	3.5	
Lane Util. Factor		1.00			1.00			1.00		1.00	1.00	
Frpb, ped/bikes		0.98			0.98			0.96		1.00	0.94	
Flpb, ped/bikes		1.00			1.00			0.98		0.97	1.00	
Frt		0.99			0.99			0.96		1.00	0.91	
Flt Protected		1.00			1.00			0.99		0.95	1.00	
Satd. Flow (prot)		1781			1586			1470		1487	1390	
Flt Permitted		1.00			1.00			0.91		0.51	1.00	
Satd. Flow (perm)		1781			1586			1346		798	1390	
Peak-hour factor, PHF	0.88	0.88	0.88	0.95	0.95	0.95	0.76	0.76	0.76	0.84	0.84	0.84
Adj. Flow (vph)	0	445	18	0	705	35	59	133	76	23	64	88
RTOR Reduction (vph)	0	2	0	0	2	0	0	14	0	0	48	0
Lane Group Flow (vph)	0	461	0	0	738	0	0	254	0	23	104	0
Confl. Peds. (#/hr)	108		179	179		108	67		59	59		67
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	4%	4%	4%	2%	2%	2%
Turn Type		NA			NA		Perm	NA		pm+pt	NA	
Protected Phases		6			2			4		3 9	8	
Permitted Phases							4			8		
Actuated Green, G (s)		41.2			41.2			29.6		40.8	39.8	
Effective Green, g (s)		42.2			42.2			30.6		41.8	40.8	
Actuated g/C Ratio		0.47			0.47			0.34		0.46	0.45	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		0.2			0.2			0.2			0.2	
Lane Grp Cap (vph)		835			743			457		410	630	
v/s Ratio Prot		0.26			c0.47					0.00	c0.07	
v/s Ratio Perm								c0.19		0.02		
v/c Ratio		0.55			0.99			0.56		0.06	0.16	
Uniform Delay, d1		17.1			23.8			24.2		19.2	14.5	
Progression Factor		0.56			0.58			1.00		0.53	0.23	
Incremental Delay, d2		2.3			25.2			4.8		0.0	0.6	
Delay (s)		11.8			39.1			29.0		10.3	3.8	
Level of Service		B			D			C		B	A	
Approach Delay (s)		11.8			39.1			29.0			4.7	
Approach LOS		B			D			C			A	
Intersection Summary												
HCM 2000 Control Delay			26.1				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			83.4%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

10: Terry Ave & Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	226	200	0	747	0	0	0	64	0	0	38
Future Volume (vph)	0	226	200	0	747	0	0	0	64	0	0	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5				4.5			4.5
Lane Util. Factor		1.00			1.00				1.00			1.00
Frpb, ped/bikes		0.76			1.00				0.80			0.88
Flpb, ped/bikes		1.00			1.00				1.00			1.00
Frt		0.94			1.00				0.86			0.86
Flt Protected		1.00			1.00				1.00			1.00
Satd. Flow (prot)		1099			1535				1165			1211
Flt Permitted		1.00			1.00				1.00			1.00
Satd. Flow (perm)		1099			1535				1165			1211
Peak-hour factor, PHF	0.91	0.91	0.91	0.89	0.89	0.89	0.68	0.68	0.68	0.78	0.78	0.78
Adj. Flow (vph)	0	248	220	0	839	0	0	0	94	0	0	49
RTOR Reduction (vph)	0	36	0	0	0	0	0	0	29	0	0	15
Lane Group Flow (vph)	0	432	0	0	839	0	0	0	65	0	0	34
Confl. Peds. (#/hr)	96		158	158		96	33		56	56		33
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	2%	2%	2%	7%	7%	7%
Turn Type		NA			NA				Perm			Perm
Protected Phases		6			2							
Permitted Phases									6			2
Actuated Green, G (s)		62.5			62.5				62.5			62.5
Effective Green, g (s)		63.5			63.5				62.5			62.5
Actuated g/C Ratio		0.71			0.71				0.69			0.69
Clearance Time (s)		4.5			4.5				4.5			4.5
Lane Grp Cap (vph)		775			1083				809			840
v/s Ratio Prot		0.39			c0.55							
v/s Ratio Perm									0.06			0.03
v/c Ratio		0.56			0.77				0.08			0.04
Uniform Delay, d1		6.4			8.6				4.5			4.3
Progression Factor		0.86			0.92				1.00			1.00
Incremental Delay, d2		2.6			0.5				0.2			0.1
Delay (s)		8.1			8.4				4.6			4.4
Level of Service		A			A				A			A
Approach Delay (s)		8.1			8.4			4.6			4.4	
Approach LOS		A			A			A			A	
Intersection Summary												
HCM 2000 Control Delay			7.9			HCM 2000 Level of Service			A			
HCM 2000 Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			7.0			
Intersection Capacity Utilization			60.5%			ICU Level of Service			B			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

11: Boren Ave & Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	63	171	6	63	670	14	12	722	33	119	583	77
Future Volume (vph)	63	171	6	63	670	14	12	722	33	119	583	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	10	9	10	12	9	9	12	9	9	12
Total Lost time (s)	4.0	3.5		4.0	3.5		4.0	3.5		4.0	3.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.98		1.00	0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frft	1.00	0.99		1.00	1.00		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1354	1394		1354	1433		1419	2753		1406	2630	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1354	1394		1354	1433		1419	2753		1406	2630	
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.88	0.88	0.88	0.89	0.89	0.89
Adj. Flow (vph)	68	186	7	69	736	15	14	820	38	134	655	87
RTOR Reduction (vph)	0	1	0	0	1	0	0	4	0	0	10	0
Lane Group Flow (vph)	68	192	0	69	750	0	14	854	0	134	732	0
Confl. Peds. (#/hr)			284			104			174			110
Heavy Vehicles (%)	8%	8%	8%	8%	8%	8%	3%	3%	3%	4%	4%	4%
Bus Blockages (#/hr)	0	10	0	0	6	0	0	2	0	0	8	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	5.2	32.8		6.9	34.5		1.2	25.8		6.5	31.1	
Effective Green, g (s)	5.7	33.8		7.4	35.5		1.7	26.8		7.0	32.1	
Actuated g/C Ratio	0.06	0.38		0.08	0.39		0.02	0.30		0.08	0.36	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lane Grp Cap (vph)	85	523		111	565		26	819		109	938	
v/s Ratio Prot	c0.05	0.14		0.05	c0.52		0.01	c0.31		c0.10	0.28	
v/s Ratio Perm												
v/c Ratio	0.80	0.37		0.62	1.33		0.54	1.04		1.23	0.78	
Uniform Delay, d1	41.6	20.3		39.9	27.2		43.8	31.6		41.5	25.8	
Progression Factor	1.18	1.02		1.25	0.84		1.00	1.00		1.14	0.94	
Incremental Delay, d2	35.5	1.8		5.9	157.1		10.3	43.3		158.0	6.1	
Delay (s)	84.4	22.6		56.0	180.1		54.1	74.9		205.1	30.3	
Level of Service	F	C		E	F		D	E		F	C	
Approach Delay (s)		38.7			169.7			74.6			57.0	
Approach LOS		D			F			E			E	
Intersection Summary												
HCM 2000 Control Delay			93.4			HCM 2000 Level of Service			F			
HCM 2000 Volume to Capacity ratio			1.18									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			15.0			
Intersection Capacity Utilization			88.7%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

12: Madison St & Minor Ave

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	309	14	0	695	1	22	37	39	18	34	44
Future Volume (vph)	0	309	14	0	695	1	22	37	39	18	34	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	11	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5			3.5			3.5	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.98			1.00			0.92			0.87	
Flpb, ped/bikes		1.00			1.00			0.95			0.98	
Frt		0.99			1.00			0.95			0.94	
Flt Protected		1.00			1.00			0.99			0.99	
Satd. Flow (prot)		1462			1588			1311			1257	
Flt Permitted		1.00			1.00			0.92			0.93	
Satd. Flow (perm)		1462			1588			1218			1185	
Peak-hour factor, PHF	0.85	0.85	0.85	0.95	0.95	0.95	0.67	0.67	0.67	0.87	0.87	0.87
Adj. Flow (vph)	0	364	16	0	732	1	33	55	58	21	39	51
RTOR Reduction (vph)	0	2	0	0	0	0	0	27	0	0	34	0
Lane Group Flow (vph)	0	378	0	0	733	0	0	119	0	0	77	0
Confl. Peds. (#/hr)	125		242	242		125	110		75	75		110
Heavy Vehicles (%)	6%	6%	6%	4%	4%	4%	7%	7%	7%	7%	7%	7%
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)		62.5			62.5			18.5			18.5	
Effective Green, g (s)		63.5			63.5			19.5			19.5	
Actuated g/C Ratio		0.71			0.71			0.22			0.22	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		1031			1120			263			256	
v/s Ratio Prot		0.26			c0.46							
v/s Ratio Perm								c0.10			0.07	
v/c Ratio		0.37			0.65			0.45			0.30	
Uniform Delay, d1		5.3			7.2			30.6			29.5	
Progression Factor		0.58			0.35			1.00			1.00	
Incremental Delay, d2		0.7			2.4			5.6			3.0	
Delay (s)		3.8			4.9			36.2			32.6	
Level of Service		A			A			D			C	
Approach Delay (s)		3.8			4.9			36.2			32.6	
Approach LOS		A			A			D			C	
Intersection Summary												
HCM 2000 Control Delay			10.2			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			7.0			
Intersection Capacity Utilization			62.4%			ICU Level of Service			B			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

13: Swedish/Summit Ave & Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	223	114	0	638	8	27	6	16	7	10	37
Future Volume (vph)	0	223	114	0	638	8	27	6	16	7	10	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	10	10	10	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5			3.0	4.0		3.0	
Lane Util. Factor		1.00			1.00			1.00	1.00		1.00	
Frpb, ped/bikes		0.85			1.00			1.00	0.84		0.90	
Flpb, ped/bikes		1.00			1.00			0.91	1.00		0.98	
Frt		0.95			1.00			1.00	0.85		0.91	
Flt Protected		1.00			1.00			0.96	1.00		0.99	
Satd. Flow (prot)		1254			1526			1466	1191		1265	
Flt Permitted		1.00			1.00			0.79	1.00		0.97	
Satd. Flow (perm)		1254			1526			1203	1191		1241	
Peak-hour factor, PHF	0.89	0.89	0.89	0.92	0.92	0.92	0.64	0.64	0.64	0.80	0.80	0.80
Adj. Flow (vph)	0	251	128	0	693	9	42	9	25	9	12	46
RTOR Reduction (vph)	0	20	0	0	1	0	0	0	19	0	35	0
Lane Group Flow (vph)	0	359	0	0	701	0	0	51	6	0	33	0
Confl. Peds. (#/hr)	105		163	163		105	54		62	62		54
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	2%	2%	2%	8%	8%	8%
Turn Type		NA			NA		Perm	NA	Perm	Perm	NA	
Protected Phases		6			2			4			4	
Permitted Phases							4		4	4		
Actuated Green, G (s)		61.5			61.5			20.0	20.0		20.0	
Effective Green, g (s)		62.5			62.5			21.0	20.0		21.0	
Actuated g/C Ratio		0.69			0.69			0.23	0.22		0.23	
Clearance Time (s)		4.5			4.5			4.0	4.0		4.0	
Lane Grp Cap (vph)		870			1059			280	264		289	
v/s Ratio Prot		0.29			c0.46							
v/s Ratio Perm								c0.04	0.00		0.03	
v/c Ratio		0.41			0.66			0.18	0.02		0.11	
Uniform Delay, d1		5.9			7.8			27.6	27.4		27.2	
Progression Factor		1.37			0.95			1.00	1.00		1.00	
Incremental Delay, d2		1.4			2.8			1.4	0.1		0.8	
Delay (s)		9.4			10.2			29.1	27.5		28.0	
Level of Service		A			B			C	C		C	
Approach Delay (s)		9.4			10.2			28.5			28.0	
Approach LOS		A			B			C			C	
Intersection Summary												
HCM 2000 Control Delay			12.1			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.54									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			6.5			
Intersection Capacity Utilization			64.9%			ICU Level of Service			C			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

14: Madison St & Boylston Ave

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	192	32	0	618	86	2	30	9	8	10	13
Future Volume (vph)	0	192	32	0	618	86	2	30	9	8	10	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5			3.0			3.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.95			0.97			0.98			0.95	
Flpb, ped/bikes		1.00			1.00			1.00			0.99	
Frt		0.98			0.98			0.97			0.94	
Flt Protected		1.00			1.00			1.00			0.99	
Satd. Flow (prot)		1392			1466			1584			1408	
Flt Permitted		1.00			1.00			0.99			0.95	
Satd. Flow (perm)		1392			1466			1568			1356	
Peak-hour factor, PHF	0.93	0.93	0.93	0.94	0.94	0.94	0.85	0.85	0.85	0.93	0.93	0.93
Adj. Flow (vph)	0	206	34	0	657	91	2	35	11	9	11	14
RTOR Reduction (vph)	0	3	0	0	3	0	0	10	0	0	13	0
Lane Group Flow (vph)	0	237	0	0	745	0	0	38	0	0	21	0
Confl. Peds. (#/hr)	69		102	102		69	43		27	27		43
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	2%	2%	2%	6%	6%	6%
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)		75.7			75.7			5.8			5.8	
Effective Green, g (s)		76.7			76.7			6.8			6.8	
Actuated g/C Ratio		0.85			0.85			0.08			0.08	
Clearance Time (s)		4.5			4.5			4.0			4.0	
Vehicle Extension (s)		0.2			0.2			0.2			0.2	
Lane Grp Cap (vph)		1186			1249			118			102	
v/s Ratio Prot		0.17			c0.51							
v/s Ratio Perm								c0.02			0.02	
v/c Ratio		0.20			0.60			0.32			0.21	
Uniform Delay, d1		1.2			2.0			39.4			39.1	
Progression Factor		0.16			0.91			1.00			1.00	
Incremental Delay, d2		0.4			1.1			0.6			0.4	
Delay (s)		0.5			3.0			40.0			39.4	
Level of Service		A			A			D			D	
Approach Delay (s)		0.5			3.0			40.0			39.4	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			5.2				HCM 2000 Level of Service			A		
HCM 2000 Volume to Capacity ratio			0.57									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			6.5		
Intersection Capacity Utilization			62.9%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

15: Broadway & Madison St/E Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	113	29	96	449	44	0	241	36	0	245	243
Future Volume (vph)	75	113	29	96	449	44	0	241	36	0	245	243
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	12	9	10	12	12	13	12	12	13	12
Grade (%)		-9%			8%			0%			0%	
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0	5.0		4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	0.97		1.00	0.99			1.00	1.00		0.89	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	0.97		1.00	0.99			1.00	0.85		0.93	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)	1543	1656		1431	1642			1870	1553		1543	
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (perm)	1543	1656		1431	1642			1870	1553		1543	
Peak-hour factor, PHF	0.89	0.89	0.89	0.95	0.95	0.95	0.79	0.79	0.79	0.78	0.78	0.78
Adj. Flow (vph)	84	127	33	101	473	46	0	305	46	0	314	312
RTOR Reduction (vph)	0	10	0	0	4	0	0	0	31	0	41	0
Lane Group Flow (vph)	84	150	0	101	515	0	0	305	15	0	585	0
Confl. Peds. (#/hr)			93			72			93			88
Heavy Vehicles (%)	10%	7%	0%	9%	1%	5%	0%	5%	4%	0%	4%	8%
Turn Type	Prot	NA		Prot	NA			NA	custom		NA	
Protected Phases	5	2		1	6			3 4	1 3		8	
Permitted Phases												
Actuated Green, G (s)	4.8	30.6		9.0	34.8			35.4	29.3		35.4	
Effective Green, g (s)	5.8	31.6		10.0	35.8			36.4	29.3		36.4	
Actuated g/C Ratio	0.06	0.35		0.11	0.40			0.40	0.33		0.40	
Clearance Time (s)	5.0	5.0		5.0	5.0						5.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0						2.0	
Lane Grp Cap (vph)	99	581		159	653			756	505		624	
v/s Ratio Prot	c0.05	0.09		c0.07	c0.31			0.16	0.01		c0.38	
v/s Ratio Perm												
v/c Ratio	0.85	0.26		0.64	0.79			0.40	0.03		0.94	
Uniform Delay, d1	41.7	20.8		38.3	23.8			19.1	20.7		25.7	
Progression Factor	1.08	0.81		1.30	0.42			1.00	1.00		1.00	
Incremental Delay, d2	43.8	1.1		5.7	9.0			0.1	0.0		21.4	
Delay (s)	88.7	18.0		55.6	19.1			19.2	20.7		47.1	
Level of Service	F	B		E	B			B	C		D	
Approach Delay (s)		42.3			25.0			19.4			47.1	
Approach LOS		D			C			B			D	
Intersection Summary												
HCM 2000 Control Delay			33.8			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.94									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			18.0			
Intersection Capacity Utilization			71.5%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

Intersection

Int Delay, s/veh 0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Vol, veh/h	0	147	586	0	0	8
Future Vol, veh/h	0	147	586	0	0	8
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, %	-	-8	5	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	160	637	0	0	9

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	-	0	- 0 - 637
Stage 1	-	-	- - -
Stage 2	-	-	- - -
Critical Hdwy	-	-	- - 6.22
Critical Hdwy Stg 1	-	-	- - -
Critical Hdwy Stg 2	-	-	- - -
Follow-up Hdwy	-	-	- - 3.318
Pot Cap-1 Maneuver	0	-	- 0 0 477
Stage 1	0	-	- 0 0 -
Stage 2	0	-	- 0 0 -
Platoon blocked, %	-	-	
Mov Cap-1 Maneuver	-	-	- - 477
Mov Cap-2 Maneuver	-	-	- - -
Stage 1	-	-	- - -
Stage 2	-	-	- - -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	12.7
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	477
HCM Lane V/C Ratio	-	-	0.018
HCM Control Delay (s)	-	-	12.7
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.1

HCM 2010 Signalized Intersection Summary

17: E Seneca St & 10TH AVE

05/23/2018

								
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations								
Traffic Volume (veh/h)	0	131	549	0	0	37		
Future Volume (veh/h)	0	131	549	0	0	37		
Number	5	2	6	16	7	14		
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	0	1909	1844	0	0	1863		
Adj Flow Rate, veh/h	0	142	597	0	0	40		
Adj No. of Lanes	0	1	1	0	0	1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Percent Heavy Veh, %	0	2	2	0	0	2		
Cap, veh/h	0	1803	1742	0	0	0		
Arrive On Green	0.00	1.00	0.94	0.00	0.00	0.00		
Sat Flow, veh/h	0	1909	1844	0	0			
Grp Volume(v), veh/h	0	142	597	0	0.0			
Grp Sat Flow(s),veh/h/ln	0	1909	1844	0				
Q Serve(g_s), s	0.0	0.0	2.4	0.0				
Cycle Q Clear(g_c), s	0.0	0.0	2.4	0.0				
Prop In Lane	0.00			0.00				
Lane Grp Cap(c), veh/h	0	1803	1742	0				
V/C Ratio(X)	0.00	0.08	0.34	0.00				
Avail Cap(c_a), veh/h	0	1803	1742	0				
HCM Platoon Ratio	1.00	2.00	1.00	1.00				
Upstream Filter(I)	0.00	1.00	1.00	0.00				
Uniform Delay (d), s/veh	0.0	0.0	0.2	0.0				
Incr Delay (d2), s/veh	0.0	0.1	0.5	0.0				
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0				
%ile BackOfQ(50%),veh/ln	0.0	0.0	1.3	0.0				
LnGrp Delay(d),s/veh	0.0	0.1	0.7	0.0				
LnGrp LOS		A	A					
Approach Vol, veh/h		142	597					
Approach Delay, s/veh		0.1	0.7					
Approach LOS		A	A					
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		
Phs Duration (G+Y+Rc), s		90.0				90.0		
Change Period (Y+Rc), s		5.0				5.0		
Max Green Setting (Gmax), s		62.0				62.0		
Max Q Clear Time (g_c+I1), s		2.0				4.4		
Green Ext Time (p_c), s		5.8				5.8		
Intersection Summary								
HCM 2010 Ctrl Delay			0.6					
HCM 2010 LOS			A					

Intersection												
Int Delay, s/veh	4.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Traffic Vol, veh/h	0	0	0	0	0	14	0	0	0	5	10	0
Future Vol, veh/h	0	0	0	0	0	14	0	0	0	5	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	15	0	0	0	5	11	0
Major/Minor	Major1			Major2			Minor2					
Conflicting Flow All	15	0	0	0	0	0				8	8	8
Stage 1	-	-	-	-	-	-				8	8	-
Stage 2	-	-	-	-	-	-				0	0	-
Critical Hdwy	4.12	-	-	4.12	-	-				6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-				5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-				5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-				3.518	4.018	3.318
Pot Cap-1 Maneuver	1603	-	-	-	-	-				1013	887	1074
Stage 1	-	-	-	-	-	-				1015	889	-
Stage 2	-	-	-	-	-	-				-	-	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1603	-	-	-	-	-				1013	0	1074
Mov Cap-2 Maneuver	-	-	-	-	-	-				1013	0	-
Stage 1	-	-	-	-	-	-				1015	0	-
Stage 2	-	-	-	-	-	-				-	0	-
Approach	EB			WB			SB					
HCM Control Delay, s	0			0			8.6					
HCM LOS							A					
Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1					
Capacity (veh/h)	1603	-	-	-	-	-	1013					
HCM Lane V/C Ratio	-	-	-	-	-	-	0.016					
HCM Control Delay (s)	0	-	-	0	-	-	8.6					
HCM Lane LOS	A	-	-	A	-	-	A					
HCM 95th %tile Q(veh)	0	-	-	-	-	-	0					

Intersection

Int Delay, s/veh 0

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations		↗		↖		↗
Traffic Vol, veh/h	0	0	594	59	0	135
Future Vol, veh/h	0	0	594	59	0	135
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	-2	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	646	64	0	147

Major/Minor	Minor2	Major2	Major1
Conflicting Flow All	-	64	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	6.22	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	3.318	2.218
Pot Cap-1 Maneuver	0	1000	-
Stage 1	0	-	-
Stage 2	0	-	-
Platoon blocked, %			-
Mov Cap-1 Maneuver	0	1000	-
Mov Cap-2 Maneuver	0	-	-
Stage 1	0	-	-
Stage 2	0	-	-

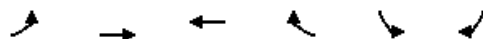
Approach	EB	WB	NE
HCM Control Delay, s	0		0
HCM LOS	A		

Minor Lane/Major Mvmt	NER EBLn1	WBL	WBT
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	-	0	-
HCM Lane LOS	-	A	-
HCM 95th %tile Q(veh)	-	-	-

HCM Signalized Intersection Capacity Analysis

19: E Madison St & 11th Ave

03/24/2018



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↑	↑
Traffic Volume (vph)	0	143	586	0	56	22
Future Volume (vph)	0	143	586	0	56	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	12	10	12
Grade (%)		0%	-4%		0%	
Total Lost time (s)		5.5	5.5		4.5	
Lane Util. Factor		1.00	1.00		1.00	
Frpb, ped/bikes		1.00	1.00		0.93	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	1.00		0.96	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		1818	1819		1470	
Flt Permitted		1.00	1.00		0.97	
Satd. Flow (perm)		1818	1819		1470	
Peak-hour factor, PHF	0.90	0.90	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	159	666	0	64	25
RTOR Reduction (vph)	0	0	0	0	18	0
Lane Group Flow (vph)	0	159	666	0	71	0
Confl. Peds. (#/hr)	23			38		61
Confl. Bikes (#/hr)				3		17
Heavy Vehicles (%)	1%	1%	3%	3%	4%	4%
Parking (#/hr)						0
Turn Type		NA	NA		Prot	
Protected Phases		2	6		3	
Permitted Phases						
Actuated Green, G (s)		73.1	73.1		6.9	
Effective Green, g (s)		73.1	73.1		6.9	
Actuated g/C Ratio		0.81	0.81		0.08	
Clearance Time (s)		5.5	5.5		4.5	
Vehicle Extension (s)		0.2	0.2		0.2	
Lane Grp Cap (vph)		1476	1477		112	
v/s Ratio Prot		0.09	c0.37		c0.05	
v/s Ratio Perm						
v/c Ratio		0.11	0.45		0.64	
Uniform Delay, d1		1.7	2.5		40.3	
Progression Factor		0.44	0.39		1.00	
Incremental Delay, d2		0.1	0.7		8.5	
Delay (s)		0.9	1.7		48.8	
Level of Service		A	A		D	
Approach Delay (s)		0.9	1.7		48.8	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay			6.1		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.47			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			51.5%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

20: E Madison St & 12th Ave & Union St

03/24/2018

	↑	↗	↓	↘	↖	↗	↘	↖
Movement	NBT	NBR	SBT	SBR	NEL	NET	NER	SWT
Lane Configurations	↑	↗	↘		↖	↗		↑
Traffic Volume (vph)	362	96	270	29	22	118	54	557
Future Volume (vph)	362	96	270	29	22	118	54	557
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	10	12	9	10	12	11
Grade (%)	0%		0%			4%		-8%
Total Lost time (s)	5.0	3.5	5.0		4.0	5.0		5.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00		1.00
Frpb, ped/bikes	1.00	0.90	0.98		1.00	0.96		1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00		1.00
Frt	1.00	0.85	0.99		1.00	0.95		1.00
Flt Protected	1.00	1.00	1.00		0.95	1.00		1.00
Satd. Flow (prot)	1818	1433	1506		1576	1581		1873
Flt Permitted	1.00	1.00	1.00		0.95	1.00		1.00
Satd. Flow (perm)	1818	1433	1506		1576	1581		1873
Peak-hour factor, PHF	0.96	0.96	0.86	0.86	0.96	0.96	0.96	0.92
Adj. Flow (vph)	377	100	314	34	23	123	56	605
RTOR Reduction (vph)	0	65	0	0	0	0	0	0
Lane Group Flow (vph)	377	35	348	0	23	179	0	605
Confl. Peds. (#/hr)		41		96	27		45	
Heavy Vehicles (%)	1%	1%	2%	2%	1%	1%	1%	2%
Parking (#/hr)			0					
Turn Type	NA	custom	NA		Prot	NA		NA
Protected Phases	4	3	8		1	6		2
Permitted Phases		4						
Actuated Green, G (s)	26.0	31.7	35.2		2.8	44.8		38.0
Effective Green, g (s)	26.0	31.7	35.2		2.8	44.8		38.0
Actuated g/C Ratio	0.29	0.35	0.39		0.03	0.50		0.42
Clearance Time (s)	5.0	3.5	5.0		4.0	5.0		5.0
Vehicle Extension (s)	0.2	3.0	0.2		0.2	0.2		0.2
Lane Grp Cap (vph)	525	560	589		49	786		790
v/s Ratio Prot	c0.21	0.00	c0.23		c0.01	0.11		c0.32
v/s Ratio Perm		0.02						
v/c Ratio	0.72	0.06	0.59		0.47	0.23		0.77
Uniform Delay, d1	28.7	19.3	21.7		42.9	12.8		22.2
Progression Factor	1.00	1.00	1.00		0.71	1.03		0.46
Incremental Delay, d2	8.2	0.0	4.3		2.6	0.7		5.9
Delay (s)	36.9	19.4	26.0		32.8	13.8		16.2
Level of Service	D	B	C		C	B		B
Approach Delay (s)	33.2		26.0			16.0		16.2
Approach LOS	C		C			B		B
Intersection Summary								
HCM 2000 Control Delay			23.2		HCM 2000 Level of Service			C
HCM 2000 Volume to Capacity ratio			0.73					
Actuated Cycle Length (s)			90.0		Sum of lost time (s)			17.5
Intersection Capacity Utilization			56.7%		ICU Level of Service			B
Analysis Period (min)			15					
c Critical Lane Group								

HCM Signalized Intersection Capacity Analysis

22: 13th Ave & E Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	61	0	0	282	13	250	76	4	22	0	26
Future Volume (vph)	0	61	0	0	282	13	250	76	4	22	0	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	16	16	12	12	13	12
Grade (%)		8%			-7%			0%			0%	
Total Lost time (s)		4.5			4.5			3.5			4.5	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		1.00			0.99			1.00			0.98	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			1.00			0.93	
Flt Protected		1.00			1.00			0.96			0.98	
Satd. Flow (prot)		1746			1842			1987			1732	
Flt Permitted		1.00			1.00			0.96			0.98	
Satd. Flow (perm)		1746			1842			1987			1732	
Peak-hour factor, PHF	0.90	0.90	0.90	0.95	0.95	0.95	0.87	0.87	0.87	0.89	0.89	0.89
Adj. Flow (vph)	0	68	0	0	297	14	287	87	5	25	0	29
RTOR Reduction (vph)	0	0	0	0	2	0	0	1	0	0	41	0
Lane Group Flow (vph)	0	68	0	0	309	0	0	378	0	0	13	0
Confl. Peds. (#/hr)	28		29	29		28	1		52	52		1
Confl. Bikes (#/hr)												6
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	4%	4%	4%	1%	1%	1%
Parking (#/hr)									0			0
Turn Type		NA			NA		Split	NA		Split	NA	
Protected Phases		6			2		3	3		4	4	
Permitted Phases												
Actuated Green, G (s)		35.8			35.8			20.7			21.0	
Effective Green, g (s)		35.8			35.8			20.7			21.0	
Actuated g/C Ratio		0.40			0.40			0.23			0.23	
Clearance Time (s)		4.5			4.5			3.5			4.5	
Vehicle Extension (s)		0.2			0.2			3.0			0.2	
Lane Grp Cap (vph)		694			732			457			404	
v/s Ratio Prot		0.04			c0.17			c0.19			c0.01	
v/s Ratio Perm												
v/c Ratio		0.10			0.42			0.83			0.03	
Uniform Delay, d1		17.0			19.6			33.0			26.6	
Progression Factor		0.76			0.33			1.00			1.00	
Incremental Delay, d2		0.3			1.7			11.7			0.1	
Delay (s)		13.2			8.2			44.7			26.8	
Level of Service		B			A			D			C	
Approach Delay (s)		13.2			8.2			44.7			26.8	
Approach LOS		B			A			D			C	
Intersection Summary												
HCM 2000 Control Delay			26.9			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.42									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			12.5			
Intersection Capacity Utilization			47.6%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

23: 14th Ave & E Madison St

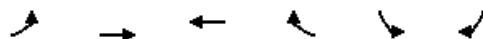
03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	69	24	0	255	0	19	227	90	92	115	17
Future Volume (vph)	0	69	24	0	255	0	19	227	90	92	115	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	12	16	12	12	16	12
Grade (%)		7%			-10%			0%			0%	
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.98			1.00		1.00	0.99		1.00	0.98	
Flpb, ped/bikes		1.00			1.00		0.92	1.00		0.99	1.00	
Frt		0.97			1.00		1.00	0.96		1.00	0.98	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1668			1909		1653	2014		1735	2019	
Flt Permitted		1.00			1.00		0.62	1.00		0.26	1.00	
Satd. Flow (perm)		1668			1909		1071	2014		478	2019	
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.85	0.85	0.85	0.86	0.86	0.86
Adj. Flow (vph)	0	75	26	0	280	0	22	267	106	107	134	20
RTOR Reduction (vph)	0	14	0	0	0	0	0	16	0	0	6	0
Lane Group Flow (vph)	0	87	0	0	280	0	22	357	0	107	148	0
Confl. Peds. (#/hr)	3		31	31		3	37		10	10		37
Confl. Bikes (#/hr)			7			3			1			1
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Parking (#/hr)									0			0
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases		1			1			3			3	
Permitted Phases							3			3		
Actuated Green, G (s)		39.5			39.5		24.5	24.5		24.5	24.5	
Effective Green, g (s)		39.5			39.5		24.5	24.5		24.5	24.5	
Actuated g/C Ratio		0.44			0.44		0.27	0.27		0.27	0.27	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)		732			837		291	548		130	549	
v/s Ratio Prot		0.05			c0.15			0.18			0.07	
v/s Ratio Perm							0.02			c0.22		
v/c Ratio		0.12			0.33		0.08	0.65		0.82	0.27	
Uniform Delay, d1		14.9			16.6		24.3	29.0		30.7	25.7	
Progression Factor		0.38			0.68		1.00	1.00		0.81	0.75	
Incremental Delay, d2		0.3			1.1		0.5	5.9		41.7	1.2	
Delay (s)		6.1			12.3		24.8	34.9		66.6	20.4	
Level of Service		A			B		C	C		E	C	
Approach Delay (s)		6.1			12.3			34.3			39.4	
Approach LOS		A			B			C			D	
Intersection Summary												
HCM 2000 Control Delay			26.9				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.44									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			13.5		
Intersection Capacity Utilization			48.2%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

25: E Madison St & 15th Ave

03/24/2018



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↗
Traffic Volume (vph)	0	227	294	0	0	104
Future Volume (vph)	0	227	294	0	0	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	10	12	12	16
Grade (%)		10%	-9%		0%	
Total Lost time (s)		4.5	4.5			4.5
Lane Util. Factor		1.00	1.00			1.00
Frpb, ped/bikes		1.00	1.00			1.00
Flpb, ped/bikes		1.00	1.00			1.00
Frt		1.00	1.00			0.86
Flt Protected		1.00	1.00			1.00
Satd. Flow (prot)		1728	1835			1774
Flt Permitted		1.00	1.00			1.00
Satd. Flow (perm)		1728	1835			1774
Peak-hour factor, PHF	0.93	0.93	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	244	346	0	0	122
RTOR Reduction (vph)	0	0	0	0	0	105
Lane Group Flow (vph)	0	244	346	0	0	17
Confl. Peds. (#/hr)	59			59	47	1
Confl. Bikes (#/hr)				2		
Heavy Vehicles (%)	1%	1%	1%	1%	5%	5%
Parking (#/hr)				0		
Turn Type		NA	NA			Prot
Protected Phases		2	6			4
Permitted Phases						
Actuated Green, G (s)		68.8	68.8			12.2
Effective Green, g (s)		68.8	68.8			12.2
Actuated g/C Ratio		0.76	0.76			0.14
Clearance Time (s)		4.5	4.5			4.5
Vehicle Extension (s)		0.2	0.2			0.2
Lane Grp Cap (vph)		1320	1402			240
v/s Ratio Prot		0.14	c0.19			c0.01
v/s Ratio Perm						
v/c Ratio		0.18	0.25			0.07
Uniform Delay, d1		2.9	3.1			33.9
Progression Factor		0.33	0.60			1.00
Incremental Delay, d2		0.3	0.4			0.0
Delay (s)		1.2	2.2			34.0
Level of Service		A	A			C
Approach Delay (s)		1.2	2.2		34.0	
Approach LOS		A	A		C	
Intersection Summary						
HCM 2000 Control Delay			7.3		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.24			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	16.0
Intersection Capacity Utilization			29.9%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group

Intersection						
Int Delay, s/veh	0.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑		↗
Traffic Vol, veh/h	225	0	0	302	0	22
Future Vol, veh/h	225	0	0	302	0	22
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, %	9	-	-	-9	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	245	0	0	328	0	24
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	-	245
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	-	0	0	-	0	794
Stage 1	-	0	0	-	0	-
Stage 2	-	0	0	-	0	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	-	794
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		9.7	
HCM LOS					A	
Minor Lane/Major Mvmt	NBLn1	EBT	WBT			
Capacity (veh/h)	794	-	-			
HCM Lane V/C Ratio	0.03	-	-			
HCM Control Delay (s)	9.7	-	-			
HCM Lane LOS	A	-	-			
HCM 95th %tile Q(veh)	0.1	-	-			

HCM Signalized Intersection Capacity Analysis

27: E Madison St & Pine St

03/25/2018

						
Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Volume (vph)	0	247	321	218	171	0
Future Volume (vph)	0	247	321	218	171	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	11	11	11
Grade (%)		9%	-4%		0%	
Total Lost time (s)		4.5	4.5	4.5	4.5	
Lane Util. Factor		1.00	1.00	1.00	1.00	
Frpb, ped/bikes		1.00	1.00	0.91	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00	
Frt		1.00	1.00	0.85	1.00	
Flt Protected		1.00	1.00	1.00	0.95	
Satd. Flow (prot)		1737	1837	1413	1678	
Flt Permitted		1.00	1.00	1.00	0.95	
Satd. Flow (perm)		1737	1837	1413	1678	
Peak-hour factor, PHF	0.95	0.95	0.94	0.94	0.90	0.90
Adj. Flow (vph)	0	260	341	232	190	0
RTOR Reduction (vph)	0	0	0	57	0	0
Lane Group Flow (vph)	0	260	341	175	190	0
Confl. Peds. (#/hr)	62			62	1	43
Confl. Bikes (#/hr)				3		8
Heavy Vehicles (%)	1%	1%	2%	2%	4%	4%
Parking (#/hr)						0
Turn Type		NA	NA	Perm	Prot	Perm
Protected Phases		2	2		4	
Permitted Phases				2		4
Actuated Green, G (s)		68.0	68.0	68.0	13.0	
Effective Green, g (s)		68.0	68.0	68.0	13.0	
Actuated g/C Ratio		0.76	0.76	0.76	0.14	
Clearance Time (s)		4.5	4.5	4.5	4.5	
Vehicle Extension (s)		0.2	0.2	0.2	0.2	
Lane Grp Cap (vph)		1312	1387	1067	242	
v/s Ratio Prot		0.15	c0.19		c0.11	
v/s Ratio Perm				0.12		
v/c Ratio		0.20	0.25	0.16	0.79	
Uniform Delay, d1		3.2	3.3	3.1	37.2	
Progression Factor		0.13	1.06	2.06	1.00	
Incremental Delay, d2		0.3	0.4	0.3	14.2	
Delay (s)		0.7	3.9	6.6	51.4	
Level of Service		A	A	A	D	
Approach Delay (s)		0.7	5.0		51.4	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay			12.5		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.33			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	9.0
Intersection Capacity Utilization			34.9%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

28: 17th Ave & E Madison St

03/25/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	334	64	0	437	26	96	29	4	16	12	23
Future Volume (vph)	0	334	64	0	437	26	96	29	4	16	12	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	12	11	11	12	10	12	12	16	12
Grade (%)		4%			4%			0%			0%	
Total Lost time (s)		4.5	4.5		4.5	4.5		4.5			4.5	
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00			1.00	
Frpb, ped/bikes		1.00	0.87		1.00	0.76		0.99			0.84	
Flpb, ped/bikes		1.00	1.00		1.00	1.00		0.78			0.94	
Frt		1.00	0.85		1.00	0.85		1.00			0.94	
Flt Protected		1.00	1.00		1.00	1.00		0.96			0.98	
Satd. Flow (prot)		1782	1325		1765	1142		1308			1563	
Flt Permitted		1.00	1.00		1.00	1.00		0.79			0.91	
Satd. Flow (perm)		1782	1325		1765	1142		1066			1442	
Peak-hour factor, PHF	0.92	0.92	0.92	0.96	0.96	0.96	0.80	0.80	0.80	0.93	0.93	0.93
Adj. Flow (vph)	0	363	70	0	455	27	120	36	5	17	13	25
RTOR Reduction (vph)	0	0	21	0	0	8	0	2	0	0	20	0
Lane Group Flow (vph)	0	363	49	0	455	19	0	159	0	0	35	0
Confl. Peds. (#/hr)	95		44	44		95	120		113	113		120
Confl. Bikes (#/hr)			17			23			3			11
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Turn Type		NA	Perm		NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases			2			2	4			4		
Actuated Green, G (s)		63.6	63.6		63.6	63.6		17.4			17.4	
Effective Green, g (s)		63.6	63.6		63.6	63.6		17.4			17.4	
Actuated g/C Ratio		0.71	0.71		0.71	0.71		0.19			0.19	
Clearance Time (s)		4.5	4.5		4.5	4.5		4.5			4.5	
Vehicle Extension (s)		0.2	0.2		0.2	0.2		3.0			3.0	
Lane Grp Cap (vph)		1259	936		1247	807		206			278	
v/s Ratio Prot		0.20			c0.26							
v/s Ratio Perm			0.04			0.02		c0.15			0.02	
v/c Ratio		0.29	0.05		0.36	0.02		0.77			0.13	
Uniform Delay, d1		4.9	4.0		5.2	3.9		34.4			30.0	
Progression Factor		0.35	0.15		0.58	0.05		1.00			1.00	
Incremental Delay, d2		0.6	0.1		0.8	0.1		16.4			0.2	
Delay (s)		2.3	0.7		3.8	0.3		50.8			30.2	
Level of Service		A	A		A	A		D			C	
Approach Delay (s)		2.0			3.6			50.8			30.2	
Approach LOS		A			A			D			C	
Intersection Summary												
HCM 2000 Control Delay			11.0				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			12.5		
Intersection Capacity Utilization			44.7%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

29: 18th Ave & E Madison St

03/25/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	324	14	0	452	0	0	0	36	0	0	28
Future Volume (vph)	0	324	14	0	452	0	0	0	36	0	0	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	12	11	12	12	10	12	12	16	12
Grade (%)		-4%			11%			0%			0%	
Total Lost time (s)		4.5	4.5		4.5				4.5			4.5
Lane Util. Factor		1.00	1.00		1.00				1.00			1.00
Frt		1.00	0.85		1.00				0.86			0.86
Flt Protected		1.00	1.00		1.00				1.00			1.00
Satd. Flow (prot)		1837	1561		1702				1611			1611
Flt Permitted		1.00	1.00		1.00				1.00			1.00
Satd. Flow (perm)		1837	1561		1702				1611			1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	352	15	0	491	0	0	0	39	0	0	30
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	352	15	0	491	0	0	0	39	0	0	30
Turn Type		NA	Perm		NA	Perm			Perm			Perm
Protected Phases		2			2							
Permitted Phases			2			2			2			2
Actuated Green, G (s)		90.0	90.0		90.0				90.0			90.0
Effective Green, g (s)		90.0	90.0		90.0				90.0			90.0
Actuated g/C Ratio		1.00	1.00		1.00				1.00			1.00
Clearance Time (s)		4.5	4.5		4.5				4.5			4.5
Vehicle Extension (s)		3.0	3.0		3.0				3.0			3.0
Lane Grp Cap (vph)		1837	1561		1702				1611			1611
v/s Ratio Prot		0.19			c0.29							
v/s Ratio Perm			0.01						0.02			0.02
v/c Ratio		0.19	0.01		0.29				0.02			0.02
Uniform Delay, d1		0.0	0.0		0.0				0.0			0.0
Progression Factor		1.00	1.00		1.00				1.00			1.00
Incremental Delay, d2		0.2	0.0		0.4				0.0			0.0
Delay (s)		0.2	0.0		0.4				0.0			0.0
Level of Service		A	A		A				A			A
Approach Delay (s)		0.2			0.4			0.0			0.0	
Approach LOS		A			A			A			A	
Intersection Summary												
HCM 2000 Control Delay			0.3		HCM 2000 Level of Service				A			
HCM 2000 Volume to Capacity ratio			0.32									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)				8.5			
Intersection Capacity Utilization			34.6%		ICU Level of Service				A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

30: 19th Ave & E Madison St

03/25/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	271	26	134	356	7	29	166	110	57	77	100
Future Volume (vph)	50	271	26	134	356	7	29	166	110	57	77	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	12	16	12	12	16	12
Grade (%)		-11%			8%			0%			0%	
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			1.00			0.99			0.99	
Flpb, ped/bikes		1.00			0.98			1.00			1.00	
Frt		0.99			1.00			0.95			0.94	
Flt Protected		0.99			0.99			1.00			0.99	
Satd. Flow (prot)		3527			3205			2006			1899	
Flt Permitted		0.83			0.74			0.92			0.60	
Satd. Flow (perm)		2938			2415			1862			1149	
Peak-hour factor, PHF	0.99	0.99	0.99	0.98	0.98	0.98	0.86	0.86	0.86	0.91	0.91	0.91
Adj. Flow (vph)	51	274	26	137	363	7	34	193	128	63	85	110
RTOR Reduction (vph)	0	6	0	0	1	0	0	24	0	0	32	0
Lane Group Flow (vph)	0	345	0	0	506	0	0	331	0	0	226	0
Confl. Peds. (#/hr)	26		40	40		26	7		2	2		7
Confl. Bikes (#/hr)			8			4			1			12
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	4%	4%	4%
Parking (#/hr)									0			0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		58.0			58.0			20.0			20.0	
Effective Green, g (s)		58.0			58.0			20.0			20.0	
Actuated g/C Ratio		0.64			0.64			0.22			0.22	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		0.2			0.2			3.0			3.0	
Lane Grp Cap (vph)		1893			1556			413			255	
v/s Ratio Prot												
v/s Ratio Perm		0.12			c0.21			0.18			c0.20	
v/c Ratio		0.18			0.33			0.80			0.89	
Uniform Delay, d1		6.4			7.2			33.1			33.9	
Progression Factor		0.50			0.48			1.00			1.00	
Incremental Delay, d2		0.2			0.6			10.7			28.6	
Delay (s)		3.4			4.0			43.8			62.5	
Level of Service		A			A			D			E	
Approach Delay (s)		3.4			4.0			43.8			62.5	
Approach LOS		A			A			D			E	
Intersection Summary												
HCM 2000 Control Delay			23.7			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			69.8%			ICU Level of Service			C			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

31: 20th Ave & E Olive St & E Madison St

03/25/2018

	→	↘	←	↙	↓	↗	↖	↗
Movement	EBT	EBR	WBT	NBR2	SBT	SBR	NWL	NWR
Lane Configurations	↕↕		↕↕	↗	↕↕		↖↖	
Traffic Volume (vph)	354	46	484	16	2	13	37	3
Future Volume (vph)	354	46	484	16	2	13	37	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	12	16	12
Grade (%)	-8%		3%		0%		0%	
Total Lost time (s)	4.5		4.5	4.0	4.5		4.5	
Lane Util. Factor	0.95		0.95	1.00	1.00		1.00	
Frpb, ped/bikes	0.99		1.00	1.00	0.98		0.98	
Flpb, ped/bikes	1.00		1.00	1.00	1.00		1.00	
Frt	0.98		1.00	0.86	0.88		0.99	
Flt Protected	1.00		1.00	1.00	1.00		0.96	
Satd. Flow (prot)	3634		3521	1465	1682		1968	
Flt Permitted	1.00		1.00	1.00	1.00		0.96	
Satd. Flow (perm)	3634		3521	1465	1682		1968	
Peak-hour factor, PHF	0.97	0.97	0.94	0.79	0.59	0.59	0.82	0.82
Adj. Flow (vph)	365	47	515	20	3	22	45	4
RTOR Reduction (vph)	0	0	0	0	21	0	0	0
Lane Group Flow (vph)	412	0	515	20	4	0	49	0
Confl. Peds. (#/hr)		10				7		29
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%
Parking (#/hr)		0		0		0		0
Turn Type	NA		NA	Free	NA		Prot	
Protected Phases	2		2		4		1	
Permitted Phases				Free				
Actuated Green, G (s)	69.0		69.0	90.0	2.8		4.7	
Effective Green, g (s)	69.0		69.0	90.0	2.8		4.7	
Actuated g/C Ratio	0.77		0.77	1.00	0.03		0.05	
Clearance Time (s)	4.5		4.5		4.5		4.5	
Vehicle Extension (s)	0.2		0.2		2.0		2.0	
Lane Grp Cap (vph)	2786		2699	1465	52		102	
v/s Ratio Prot	0.11		c0.15		c0.00		c0.02	
v/s Ratio Perm				0.01				
v/c Ratio	0.15		0.19	0.01	0.07		0.48	
Uniform Delay, d1	2.8		2.9	0.0	42.3		41.5	
Progression Factor	0.77		0.97	1.00	1.00		1.00	
Incremental Delay, d2	0.1		0.1	0.0	0.2		1.3	
Delay (s)	2.2		2.9	0.0	42.5		42.8	
Level of Service	A		A	A	D		D	
Approach Delay (s)	2.2		2.9		42.5		42.8	
Approach LOS	A		A		D		D	
Intersection Summary								
HCM 2000 Control Delay			5.5		HCM 2000 Level of Service		A	
HCM 2000 Volume to Capacity ratio			0.20					
Actuated Cycle Length (s)			90.0		Sum of lost time (s)		13.5	
Intersection Capacity Utilization			37.2%		ICU Level of Service		A	
Analysis Period (min)			15					
c Critical Lane Group								

HCM Signalized Intersection Capacity Analysis

32: 22nd Ave/E Denny Way & E Madison St

03/25/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	0	331	3	0	446	46	56	4	6	37	0	78
Future Volume (vph)	0	331	3	0	446	46	56	4	6	37	0	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	12	12	12	12	11	12
Grade (%)		-3%			1%			0%			0%	
Total Lost time (s)		4.5	4.5		4.5			4.5			4.5	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.92		1.00			1.00			0.92	
Flpb, ped/bikes		1.00	1.00		1.00			0.95			1.00	
Frt		1.00	0.85		0.99			0.99			0.91	
Flt Protected		1.00	1.00		1.00			0.96			0.98	
Satd. Flow (prot)		1846	1341		1782			1702			1485	
Flt Permitted		1.00	1.00		1.00			0.54			0.89	
Satd. Flow (perm)		1846	1341		1782			963			1343	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.64	0.64	0.64	0.77	0.77	0.77
Adj. Flow (vph)	0	372	3	0	501	52	88	6	9	48	0	101
RTOR Reduction (vph)	0	0	1	0	3	0	0	4	0	0	88	0
Lane Group Flow (vph)	0	372	2	0	550	0	0	99	0	0	61	0
Confl. Peds. (#/hr)	2		25	25		2	39		4	4		39
Confl. Bikes (#/hr)			1						10			2
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	2%	2%	2%
Parking (#/hr)			0			0			0			
Turn Type		NA	Perm		NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases			2				4			4		
Actuated Green, G (s)		69.3	69.3		69.3			11.7			11.7	
Effective Green, g (s)		69.3	69.3		69.3			11.7			11.7	
Actuated g/C Ratio		0.77	0.77		0.77			0.13			0.13	
Clearance Time (s)		4.5	4.5		4.5			4.5			4.5	
Vehicle Extension (s)		0.2	0.2		0.2			1.0			1.0	
Lane Grp Cap (vph)		1421	1032		1372			125			174	
v/s Ratio Prot		0.20			c0.31							
v/s Ratio Perm			0.00					c0.10			0.05	
v/c Ratio		0.26	0.00		0.40			0.79			0.35	
Uniform Delay, d1		3.0	2.4		3.4			38.0			35.7	
Progression Factor		1.41	1.00		0.50			1.00			1.00	
Incremental Delay, d2		0.4	0.0		0.8			25.5			0.4	
Delay (s)		4.6	2.4		2.5			63.4			36.1	
Level of Service		A	A		A			E			D	
Approach Delay (s)		4.6			2.5			63.4			36.1	
Approach LOS		A			A			E			D	
Intersection Summary												
HCM 2000 Control Delay			12.8			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.46									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			9.0			
Intersection Capacity Utilization			48.3%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group

Intersection						
Int Delay, s/veh	0.1					
Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations		↗		↑	↑	
Traffic Vol, veh/h	0	9	0	429	461	0
Future Vol, veh/h	0	9	0	429	461	0
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	-	-	-1	5	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	10	0	466	501	0
Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	-	501	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	-	-
Pot Cap-1 Maneuver	0	570	0	-	-	0
Stage 1	0	-	0	-	-	0
Stage 2	0	-	0	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	-	570	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	SB	NE	SW			
HCM Control Delay, s	11.4	0	0			
HCM LOS	B					
Minor Lane/Major Mvmt	NET	SBLn1	SWT			
Capacity (veh/h)	-	570	-			
HCM Lane V/C Ratio	-	0.017	-			
HCM Control Delay (s)	-	11.4	-			
HCM Lane LOS	-	B	-			
HCM 95th %tile Q(veh)	-	0.1	-			

HCM 2010 Signalized Intersection Summary

34: E Madison St & 23rd Ave E

05/23/2018

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	0	733	56	0	271	273	188	199	20	117	214	0
Future Volume (veh/h)	0	733	56	0	271	273	188	199	20	117	214	0
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	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1806	1824	0	1881	1863	1909	1986	1948	1787	1770	0
Adj Flow Rate, veh/h	0	843	81	0	298	297	204	216	0	183	233	0
Adj No. of Lanes	0	2	0	0	1	1	1	1	0	1	1	0
Peak Hour Factor	0.92	0.87	0.69	0.25	0.91	0.92	0.92	0.92	0.92	0.64	0.92	0.46
Percent Heavy Veh, %	0	1	1	0	1	2	2	2	2	1	2	0
Cap, veh/h	0	967	93	0	606	475	269	872	0	236	731	0
Arrive On Green	0.00	0.32	0.31	0.00	0.32	0.30	0.15	0.44	0.00	0.28	0.83	0.00
Sat Flow, veh/h	0	3091	288	0	1881	1583	1818	1986	0	1702	1770	0
Grp Volume(v), veh/h	0	482	442	0	298	297	204	216	0	183	233	0
Grp Sat Flow(s),veh/h/ln	0	1716	1574	0	1881	1583	1818	1986	0	1702	1770	0
Q Serve(g_s), s	0.0	23.8	23.8	0.0	11.5	14.5	9.7	6.2	0.0	8.9	2.8	0.0
Cycle Q Clear(g_c), s	0.0	23.8	23.8	0.0	11.5	14.5	9.7	6.2	0.0	8.9	2.8	0.0
Prop In Lane	0.00		0.18	0.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	0	553	507	0	606	475	269	872	0	236	731	0
V/C Ratio(X)	0.00	0.87	0.87	0.00	0.49	0.63	0.76	0.25	0.00	0.77	0.32	0.00
Avail Cap(c_a), veh/h	0	553	507	0	606	475	384	872	0	359	731	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	0.40	0.40	1.00	1.00	0.00	0.93	0.93	0.00
Uniform Delay (d), s/veh	0.0	28.7	28.8	0.0	24.6	27.1	36.8	15.9	0.0	31.2	4.8	0.0
Incr Delay (d2), s/veh	0.0	17.1	18.3	0.0	1.2	2.5	2.8	0.7	0.0	2.3	1.1	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 BackOfQ(50%),veh/ln	0.0	13.9	12.9	0.0	6.2	6.7	5.1	3.5	0.0	4.3	1.5	0.0
LnGrp Delay(d),s/veh	0.0	45.8	47.2	0.0	25.7	29.7	39.6	16.6	0.0	33.5	5.9	0.0
LnGrp LOS		D	D		C	C	D	B		C	A	
Approach Vol, veh/h		924			595			420			416	
Approach Delay, s/veh		46.5			27.7			27.8			18.1	
Approach LOS		D			C			C			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	15.5	42.5		32.0	16.3	41.7		32.0				
Change Period (Y+Rc), s	4.5	4.5		5.0	4.5	4.5		5.0				
Max Green Setting (Gmax), s	17.5	31.5		27.0	17.5	31.5		27.0				
Max Q Clear Time (g_c+I1), s	10.9	8.2		25.8	11.7	4.8		16.5				
Green Ext Time (p_c), s	0.2	0.2		0.1	0.2	0.2		0.3				
Intersection Summary												
HCM 2010 Ctrl Delay				33.4								
HCM 2010 LOS				C								

HCM Signalized Intersection Capacity Analysis

35: E Madison St & E JOHN ST

03/25/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	114	80	10	0	199	1	0	239	5	0	310	215
Future Volume (vph)	114	80	10	0	199	1	0	239	5	0	310	215
Ideal Flow (vphpl)	1900	1900	1900	1750	1750	1750	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	10	12	11	12	12	12	12
Grade (%)		-15%			0%			-10%			10%	
Total Lost time (s)		2.5			2.5			2.5	4.5		2.5	4.5
Lane Util. Factor		1.00			1.00			1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00			1.00			1.00	0.89		1.00	0.84
Flpb, ped/bikes		1.00			1.00			1.00	1.00		1.00	1.00
Frt		0.99			1.00			1.00	0.85		1.00	0.85
Flt Protected		0.97			1.00			1.00	1.00		1.00	1.00
Satd. Flow (prot)		1803			1632			1929	1361		1736	1116
Flt Permitted		0.97			1.00			1.00	1.00		1.00	1.00
Satd. Flow (perm)		1803			1632			1929	1361		1736	1116
Peak-hour factor, PHF	0.83	0.83	0.83	0.72	0.72	0.72	0.91	0.91	0.91	0.95	0.95	0.95
Adj. Flow (vph)	137	96	12	0	276	1	0	263	5	0	326	226
RTOR Reduction (vph)	0	2	0	0	0	0	0	0	3	0	0	0
Lane Group Flow (vph)	0	243	0	0	277	0	0	263	2	0	326	226
Confl. Peds. (#/hr)	9					9	40		26	26		40
Confl. Bikes (#/hr)			7									6
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	4%	4%	4%
Parking (#/hr)			0						0			0
Turn Type	Split	NA			NA			NA	Perm		NA	Perm
Protected Phases	3	3		4	4			2			2	
Permitted Phases		3						2	2			2
Actuated Green, G (s)		15.8			17.0			40.7	40.7		40.7	40.7
Effective Green, g (s)		18.8			20.0			43.7	41.7		43.7	41.7
Actuated g/C Ratio		0.21			0.22			0.49	0.46		0.49	0.46
Clearance Time (s)		5.5			5.5			5.5	5.5		5.5	5.5
Vehicle Extension (s)		2.0			2.0			0.2	0.2		0.2	0.2
Lane Grp Cap (vph)		376			362			936	630		842	517
v/s Ratio Prot		c0.13			c0.17			0.14			0.19	
v/s Ratio Perm									0.00			c0.20
v/c Ratio		0.65			0.77			0.28	0.00		0.39	0.44
Uniform Delay, d1		32.6			32.8			13.8	13.0		14.7	16.3
Progression Factor		1.00			1.00			0.61	1.00		0.82	0.83
Incremental Delay, d2		2.8			8.4			0.7	0.0		1.2	2.5
Delay (s)		35.4			41.2			9.1	13.0		13.3	15.9
Level of Service		D			D			A	B		B	B
Approach Delay (s)		35.4			41.2			9.2			14.4	
Approach LOS		D			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			22.7				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.55									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			7.5		
Intersection Capacity Utilization			49.6%				ICU Level of Service			A		
Analysis Period (min)			15									

c Critical Lane Group

Intersection												
Int Delay, s/veh	2.5											
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	15	27	7	7	5	8	13	319	1	2	487	16
Future Vol, veh/h	15	27	7	7	5	8	13	319	1	2	487	16
Conflicting Peds, #/hr	6	0	3	3	0	6	23	0	36	36	0	23
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	2	-	-	1	-	-	-10	-	-	14	-
Peak Hour Factor	71	71	71	75	75	75	98	98	98	96	96	96
Heavy Vehicles, %	0	0	0	0	0	0	2	2	2	2	2	2
Mvmt Flow	21	38	10	9	7	11	13	326	1	2	507	17

Major/Minor	Minor1		Minor2		Major1		Major2					
Conflicting Flow All	923	940	365	922	932	545	547	0	0	363	0	0
Stage 1	389	389	-	543	543	-	-	-	-	-	-	-
Stage 2	534	551	-	379	389	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.9	6.4	7.3	6.7	6.3	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.5	5.9	-	6.3	5.7	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.9	-	6.3	5.7	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	228	239	671	240	255	534	1022	-	-	1196	-	-
Stage 1	612	586	-	512	507	-	-	-	-	-	-	-
Stage 2	503	488	-	634	599	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	208	223	649	198	238	520	1016	-	-	1192	-	-
Mov Cap-2 Maneuver	208	223	-	198	238	-	-	-	-	-	-	-
Stage 1	584	559	-	494	496	-	-	-	-	-	-	-
Stage 2	482	478	-	571	572	-	-	-	-	-	-	-

Approach	NB		SB		NE		SW	
HCM Control Delay, s	25.9		19.3		0.3		0	
HCM LOS	D		C					

Minor Lane/Major Mvmt	NEL	NET	NER	NBLn1	SBLn1	SWL	SWT	SWR
Capacity (veh/h)	1016	-	-	240	279	1192	-	-
HCM Lane V/C Ratio	0.013	-	-	0.288	0.096	0.002	-	-
HCM Control Delay (s)	8.6	0	-	25.9	19.3	8	0	-
HCM Lane LOS	A	A	-	D	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.1	0.3	0	-	-

Intersection

Int Delay, s/veh 0.3

Movement SEL SER NEL NET SWT SWR

Lane Configurations	↔↔			↔↔	↔↔	
Traffic Vol, veh/h	2	9	6	336	490	6
Future Vol, veh/h	2	9	6	336	490	6
Conflicting Peds, #/hr	3	0	27	0	0	27
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	-14	10	-
Peak Hour Factor	50	50	92	92	95	95
Heavy Vehicles, %	0	0	2	2	2	2
Mvmt Flow	4	18	7	365	516	6

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	927	546	549	0	-	0
Stage 1	546	-	-	-	-	-
Stage 2	381	-	-	-	-	-
Critical Hdwy	5.8	5.9	4.12	-	-	-
Critical Hdwy Stg 1	4.8	-	-	-	-	-
Critical Hdwy Stg 2	4.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	351	567	1021	-	-	-
Stage 1	640	-	-	-	-	-
Stage 2	741	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	332	554	1021	-	-	-
Mov Cap-2 Maneuver	332	-	-	-	-	-
Stage 1	626	-	-	-	-	-
Stage 2	718	-	-	-	-	-

Approach SE NE SW

HCM Control Delay, s	12.6	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt NEL NET SELn1 SWT SWR

Capacity (veh/h)	1021	-	494	-	-
HCM Lane V/C Ratio	0.006	-	0.045	-	-
HCM Control Delay (s)	8.5	0	12.6	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection

Int Delay, s/veh 2.1

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	44	28	328	13	8	437
Future Vol, veh/h	44	28	328	13	8	437
Conflicting Peds, #/hr	4	0	0	31	31	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	-10	-	-	8
Peak Hour Factor	65	65	93	93	96	96
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	68	43	353	14	8	455

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	867	391	0
Stage 1	391	-	-
Stage 2	476	-	-
Critical Hdwy	6.4	6.2	-
Critical Hdwy Stg 1	5.4	-	-
Critical Hdwy Stg 2	5.4	-	-
Follow-up Hdwy	3.5	3.3	-
Pot Cap-1 Maneuver	326	662	-
Stage 1	688	-	-
Stage 2	629	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	314	645	-
Mov Cap-2 Maneuver	314	-	-
Stage 1	670	-	-
Stage 2	622	-	-

Approach	NW	NE	SW
HCM Control Delay, s	17.8	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NET	NERNWLn1	SWL	SWT
Capacity (veh/h)	-	-	392	1161
HCM Lane V/C Ratio	-	-	0.283	0.007
HCM Control Delay (s)	-	-	17.8	8.1
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	1.1	0

Intersection						
Int Delay, s/veh	0.4					
Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations	↔↔		↔	↑	↔	
Traffic Vol, veh/h	0	14	23	332	430	9
Future Vol, veh/h	0	14	23	332	430	9
Conflicting Peds, #/hr	19	0	19	0	0	19
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	-8	4	-
Peak Hour Factor	82	82	93	93	96	96
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	0	17	25	357	448	9
Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	897	472	476	0	-	0
Stage 1	472	-	-	-	-	-
Stage 2	425	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.13	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.227	-	-	-
Pot Cap-1 Maneuver	313	596	1081	-	-	-
Stage 1	632	-	-	-	-	-
Stage 2	664	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	296	587	1081	-	-	-
Mov Cap-2 Maneuver	423	-	-	-	-	-
Stage 1	622	-	-	-	-	-
Stage 2	638	-	-	-	-	-
Approach	SE	NE	SW			
HCM Control Delay, s	11.3	0.5	0			
HCM LOS	B					
Minor Lane/Major Mvmt	NEL	NET SELn1	SWT	SWR		
Capacity (veh/h)	1081	- 587	-	-		
HCM Lane V/C Ratio	0.023	- 0.029	-	-		
HCM Control Delay (s)	8.4	- 11.3	-	-		
HCM Lane LOS	A	- B	-	-		
HCM 95th %tile Q(veh)	0.1	- 0.1	-	-		

HCM Signalized Intersection Capacity Analysis

40: E Madison St & MLK Jr Way E/28th Ave E

03/25/2018

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	170	108	222	39	120	17	0	287	44	92	264	12
Future Volume (vph)	170	108	222	39	120	17	0	287	44	92	264	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	10	11	10	9	16	10
Grade (%)		2%			-1%			-4%			2%	
Total Lost time (s)		4.5			4.5			4.5	4.5	4.5	4.5	
Lane Util. Factor		1.00			1.00			1.00	1.00	1.00	1.00	
Frpb, ped/bikes		0.95			0.99			1.00	0.82	1.00	1.00	
Flpb, ped/bikes		0.99			1.00			1.00	1.00	0.91	1.00	
Frt		0.94			0.99			1.00	0.85	1.00	0.99	
Flt Protected		0.98			0.99			1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1593			1837			1819	1223	1404	2027	
Flt Permitted		0.80			0.84			1.00	1.00	0.52	1.00	
Satd. Flow (perm)		1304			1556			1819	1223	765	2027	
Peak-hour factor, PHF	0.91	0.91	0.91	0.95	0.95	0.95	0.95	0.95	0.95	0.94	0.94	0.94
Adj. Flow (vph)	187	119	244	41	126	18	0	302	46	98	281	13
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	23	0	1	0
Lane Group Flow (vph)	0	550	0	0	185	0	0	302	23	98	293	0
Confl. Peds. (#/hr)	26		36	36		26	32		64	64		32
Confl. Bikes (#/hr)			9			15			6			5
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	3%	3%	3%	4%	4%	4%
Turn Type	Perm	NA		Perm	NA			NA	Perm	Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4			4					2	2		
Actuated Green, G (s)		36.0			36.0			45.0	45.0	45.0	45.0	
Effective Green, g (s)		36.0			36.0			45.0	45.0	45.0	45.0	
Actuated g/C Ratio		0.40			0.40			0.50	0.50	0.50	0.50	
Clearance Time (s)		4.5			4.5			4.5	4.5	4.5	4.5	
Vehicle Extension (s)		2.0			2.0			0.2	0.2	0.2	0.2	
Lane Grp Cap (vph)		521			622			909	611	382	1013	
v/s Ratio Prot								c0.17			0.14	
v/s Ratio Perm		c0.42			0.12				0.02	0.13		
v/c Ratio		1.06			0.30			0.33	0.04	0.26	0.29	
Uniform Delay, d1		27.0			18.4			13.5	11.5	12.9	13.2	
Progression Factor		1.00			1.00			0.86	2.57	1.00	1.00	
Incremental Delay, d2		54.9			0.1			1.0	0.1	1.6	0.7	
Delay (s)		81.9			18.5			12.6	29.6	14.5	13.9	
Level of Service		F			B			B	C	B	B	
Approach Delay (s)		81.9			18.5			14.8			14.0	
Approach LOS		F			B			B			B	
Intersection Summary												
HCM 2000 Control Delay			40.1		HCM 2000 Level of Service					D		
HCM 2000 Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					13.5		
Intersection Capacity Utilization			78.1%		ICU Level of Service					D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

41: 1st Ave & Spring St

03/25/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 						 		 	 	
Traffic Volume (vph)	28	243	54	0	0	0	0	638	94	64	368	0
Future Volume (vph)	28	243	54	0	0	0	0	638	94	64	368	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	12	10	12	12	12	10	11	10	10	11	10
Grade (%)		9%			0%			3%			0%	
Total Lost time (s)		4.5						4.5		4.5	4.5	
Lane Util. Factor		0.95						1.00		1.00	1.00	
Frpb, ped/bikes		0.96						0.96		1.00	1.00	
Flpb, ped/bikes		0.99						1.00		1.00	1.00	
Frt		0.97						0.98		1.00	1.00	
Flt Protected		1.00						1.00		0.95	1.00	
Satd. Flow (prot)		2852						1444		1404	1531	
Flt Permitted		1.00						1.00		0.95	1.00	
Satd. Flow (perm)		2852						1444		1404	1531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	30	264	59	0	0	0	0	693	102	70	400	0
RTOR Reduction (vph)	0	18	0	0	0	0	0	6	0	0	0	0
Lane Group Flow (vph)	0	335	0	0	0	0	0	789	0	70	400	0
Confl. Peds. (#/hr)	40		78	78		40	256		247	247		256
Confl. Bikes (#/hr)			1			5			12			28
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	6%	6%	6%	8%	8%	8%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						9		2	6	
Permitted Phases	4	4										
Actuated Green, G (s)		18.0						43.5		15.0	63.0	
Effective Green, g (s)		18.0						43.5		15.0	63.0	
Actuated g/C Ratio		0.20						0.48		0.17	0.70	
Clearance Time (s)		4.5						4.5		4.5	4.5	
Vehicle Extension (s)		0.2						0.2		0.2	0.2	
Lane Grp Cap (vph)		570						697		234	1071	
v/s Ratio Prot								c0.55		0.05	c0.26	
v/s Ratio Perm		0.12										
v/c Ratio		0.59						1.13		0.30	0.37	
Uniform Delay, d1		32.6						23.2		32.9	5.5	
Progression Factor		1.00						0.57		1.00	1.00	
Incremental Delay, d2		4.4						71.6		3.2	1.0	
Delay (s)		37.0						84.9		36.1	6.5	
Level of Service		D						F		D	A	
Approach Delay (s)		37.0			0.0			84.9			10.9	
Approach LOS		D			A			F			B	
Intersection Summary												
HCM 2000 Control Delay			52.9					HCM 2000 Level of Service		D		
HCM 2000 Volume to Capacity ratio			0.91									
Actuated Cycle Length (s)			90.0					Sum of lost time (s)		17.0		
Intersection Capacity Utilization			75.1%					ICU Level of Service		D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

42: 2nd Ave & Spring St

03/25/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑							↑	↑↑	
Traffic Volume (vph)	0	242	51	0	0	0	0	0	0	280	1040	0
Future Volume (vph)	0	242	51	0	0	0	0	0	0	280	1040	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	10	10	10	10	10	10	10
Grade (%)		12%			0%			0%			0%	
Total Lost time (s)		3.5	4.0							3.5	4.0	
Lane Util. Factor		0.95	1.00							1.00	0.95	
Frpb, ped/bikes		1.00	0.83							1.00	1.00	
Flpb, ped/bikes		1.00	1.00							1.00	1.00	
Frt		1.00	0.85							1.00	1.00	
Flt Protected		1.00	1.00							0.95	1.00	
Satd. Flow (prot)		2767	1023							1182	2163	
Flt Permitted		1.00	1.00							0.95	1.00	
Satd. Flow (perm)		2767	1023							1182	2163	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	263	55	0	0	0	0	0	0	295	1095	0
RTOR Reduction (vph)	0	0	40	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	263	15	0	0	0	0	0	0	295	1095	0
Confl. Peds. (#/hr)	118		150	150		118	330		393	393		330
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	2%	2%	9%	9%	9%
Parking (#/hr)										10	69	69
Turn Type		NA	Perm							Prot	NA	
Protected Phases		4								5	2	
Permitted Phases			4									
Actuated Green, G (s)		24.6	24.6							33.0	56.9	
Effective Green, g (s)		25.1	24.6							33.5	57.4	
Actuated g/C Ratio		0.28	0.27							0.37	0.64	
Clearance Time (s)		4.0	4.0							4.0	4.5	
Lane Grp Cap (vph)		771	279							439	1379	
v/s Ratio Prot		c0.10								0.25	c0.51	
v/s Ratio Perm			0.01									
v/c Ratio		0.34	0.05							0.67	0.79	
Uniform Delay, d1		25.9	24.1							23.7	12.0	
Progression Factor		0.79	0.98							1.00	1.00	
Incremental Delay, d2		0.9	0.3							8.0	4.8	
Delay (s)		21.2	23.8							31.6	16.7	
Level of Service		C	C							C	B	
Approach Delay (s)		21.7			0.0			0.0			19.9	
Approach LOS		C			A			A			B	
Intersection Summary												
HCM 2000 Control Delay			20.2				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.68									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			10.5		
Intersection Capacity Utilization			49.2%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

43: 3rd Ave & Spring St

03/25/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑					↑↑			↑↑	
Traffic Volume (vph)	7	353	66	0	0	0	0	80	30	13	133	0
Future Volume (vph)	7	353	66	0	0	0	0	80	30	13	133	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	12	12	12	11	12	12	11	12
Grade (%)		10%			-10%			0%			0%	
Total Lost time (s)		4.0	4.5					4.0			4.0	
Lane Util. Factor		0.95	1.00					0.95			0.95	
Frpb, ped/bikes		1.00	0.67					0.89			1.00	
Flpb, ped/bikes		0.99	1.00					1.00			0.97	
Frt		1.00	0.85					0.96			1.00	
Flt Protected		1.00	1.00					1.00			1.00	
Satd. Flow (prot)		2555	907					1449			1565	
Flt Permitted		1.00	1.00					1.00			0.93	
Satd. Flow (perm)		2555	907					1449			1465	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.89	0.89	0.89	0.85	0.85	0.85
Adj. Flow (vph)	8	384	72	0	0	0	0	90	34	15	156	0
RTOR Reduction (vph)	0	0	12	0	0	0	0	22	0	0	0	0
Lane Group Flow (vph)	0	392	60	0	0	0	0	102	0	0	171	0
Confl. Peds. (#/hr)	351		235	235		351	699		388	388		399
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	85%	7%	50%	84%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	60	0	0	34	0
Parking (#/hr)		15										
Turn Type	Perm	NA	Perm					NA		Perm	NA	
Protected Phases		4						2			2	
Permitted Phases	4		4							2		
Actuated Green, G (s)		49.5	49.5					31.5			31.5	
Effective Green, g (s)		50.0	49.5					32.0			32.0	
Actuated g/C Ratio		0.56	0.55					0.36			0.36	
Clearance Time (s)		4.5	4.5					4.5			4.5	
Lane Grp Cap (vph)		1419	498					515			520	
v/s Ratio Prot								0.07				
v/s Ratio Perm		0.15	0.07								0.12	
v/c Ratio		0.28	0.12					0.20			0.33	
Uniform Delay, d1		10.5	9.8					20.1			21.2	
Progression Factor		0.25	0.20					0.20			1.00	
Incremental Delay, d2		0.4	0.4					0.9			1.7	
Delay (s)		3.1	2.3					4.9			22.9	
Level of Service		A	A					A			C	
Approach Delay (s)		3.0			0.0			4.9			22.9	
Approach LOS		A			A			A			C	
Intersection Summary												
HCM 2000 Control Delay			7.7									
HCM 2000 Volume to Capacity ratio			0.30									
Actuated Cycle Length (s)			90.0								8.0	
Intersection Capacity Utilization			33.6%								A	
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2010 Signalized Intersection Summary

44: 4th Ave & Spring St

05/23/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	104	288	0	0	0	0	0	1434	134	0	0	0
Future Volume (veh/h)	104	288	0	0	0	0	0	1434	134	0	0	0
Number	7	4	14				5	2	12			
Initial Q (Qb), veh	0	0	0				0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		0.88			
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1582	1551	0				0	1502	1588			
Adj Flow Rate, veh/h	113	313	0				0	1559	146			
Adj No. of Lanes	0	2	0				0	3	1			
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92			
Percent Heavy Veh, %	2	2	0				0	11	5			
Cap, veh/h	250	633	0				0	2392	693			
Arrive On Green	0.10	0.10	0.00				0.00	0.19	0.19			
Sat Flow, veh/h	621	2142	0				0	4236	1189			
Grp Volume(v), veh/h	225	201	0				0	1559	146			
Grp Sat Flow(s),veh/h/ln	1352	1341	0				0	1367	1189			
Q Serve(g_s), s	12.1	12.7	0.0				0.0	31.6	9.3			
Cycle Q Clear(g_c), s	14.1	12.7	0.0				0.0	31.6	9.3			
Prop In Lane	0.50		0.00				0.00		1.00			
Lane Grp Cap(c), veh/h	473	410	0				0	2392	693			
V/C Ratio(X)	0.48	0.49	0.00				0.00	0.65	0.21			
Avail Cap(c_a), veh/h	473	410	0				0	2392	693			
HCM Platoon Ratio	0.33	0.33	1.00				1.00	0.33	0.33			
Upstream Filter(l)	1.00	1.00	0.00				0.00	1.00	1.00			
Uniform Delay (d), s/veh	34.3	33.8	0.0				0.0	27.9	18.9			
Incr Delay (d2), s/veh	3.4	4.1	0.0				0.0	1.4	0.7			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	5.8	5.2	0.0				0.0	12.3	3.2			
LnGrp Delay(d),s/veh	37.7	38.0	0.0				0.0	29.3	19.6			
LnGrp LOS	D	D						C	B			
Approach Vol, veh/h		426						1705				
Approach Delay, s/veh		37.8						28.5				
Approach LOS		D						C				
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		58.0		32.0								
Change Period (Y+Rc), s		4.5		4.5								
Max Green Setting (Gmax), s		53.5		27.5								
Max Q Clear Time (g_c+l1), s		0.0		0.0								
Green Ext Time (p_c), s		0.0		0.0								
Intersection Summary												
HCM 2010 Ctrl Delay			30.3									
HCM 2010 LOS			C									

HCM Signalized Intersection Capacity Analysis

45: 5th Ave & Spring St

03/25/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑								↑↑↑	
Traffic Volume (vph)	0	382	55	0	0	0	0	0	0	458	635	0
Future Volume (vph)	0	382	55	0	0	0	0	0	0	458	635	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	10	12	12	12	12	12	12	10	10	12
Grade (%)		15%			-5%			0%			0%	
Total Lost time (s)		2.0	3.5								2.5	
Lane Util. Factor		0.95	1.00								0.91	
Frpb, ped/bikes		1.00	0.91								1.00	
Flpb, ped/bikes		1.00	1.00								0.93	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								0.98	
Satd. Flow (prot)		2398	1074								3826	
Flt Permitted		1.00	1.00								0.98	
Satd. Flow (perm)		2398	1074								3826	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	415	60	0	0	0	0	0	0	498	690	0
RTOR Reduction (vph)	0	0	46	0	0	0	0	0	0	0	19	0
Lane Group Flow (vph)	0	415	14	0	0	0	0	0	0	0	1169	0
Confl. Peds. (#/hr)	195		68	68		195	312		104	104		312
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	2%	2%	2%	4%	4%	4%
Parking (#/hr)		30										
Turn Type		NA	custom							Prot	NA	
Protected Phases		4	7							5	2	
Permitted Phases			8									
Actuated Green, G (s)		25.5	21.5								57.0	
Effective Green, g (s)		27.0	21.5								58.5	
Actuated g/C Ratio		0.30	0.24								0.65	
Clearance Time (s)		3.5	3.5								4.0	
Lane Grp Cap (vph)		719	256								2486	
v/s Ratio Prot		c0.17	0.00								c0.20	
v/s Ratio Perm			0.01								0.11	
v/c Ratio		0.58	0.06								0.47	
Uniform Delay, d1		26.7	26.4								7.9	
Progression Factor		1.10	1.74								1.00	
Incremental Delay, d2		3.0	0.4								0.6	
Delay (s)		32.2	46.4								8.6	
Level of Service		C	D								A	
Approach Delay (s)		34.0			0.0			0.0			8.6	
Approach LOS		C			A			A			A	
Intersection Summary												
HCM 2000 Control Delay			15.8				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.56									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			13.0		
Intersection Capacity Utilization			56.5%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

46: 6th Ave & I-5 CD SB On-Ramp & Spring St

03/25/2018

						
Movement	EBL	EBT	EBR	NBT	NBR	NBR2
Lane Configurations						
Traffic Volume (vph)	119	175	487	473	7	538
Future Volume (vph)	119	175	487	473	7	538
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	10	11	12
Grade (%)		10%		5%		
Total Lost time (s)		4.5	4.5	4.5		4.5
Lane Util. Factor		1.00	1.00	0.95		1.00
Frpb, ped/bikes		1.00	1.00	1.00		1.00
Flpb, ped/bikes		0.86	1.00	1.00		1.00
Frt		1.00	0.85	1.00		0.85
Flt Protected		0.98	1.00	1.00		1.00
Satd. Flow (prot)		1006	1251	2918		1403
Flt Permitted		0.98	1.00	1.00		1.00
Satd. Flow (perm)		1006	1251	2918		1403
Peak-hour factor, PHF	0.94	0.94	0.94	0.95	0.95	0.95
Adj. Flow (vph)	127	186	518	498	7	566
RTOR Reduction (vph)	0	61	0	0	0	0
Lane Group Flow (vph)	0	252	518	505	0	566
Confl. Peds. (#/hr)	292		4		34	4
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%
Bus Blockages (#/hr)	0	5	0	0	0	0
Parking (#/hr)		15				
Turn Type	Perm	NA	Prot	NA	custom	
Protected Phases		4	4	2		2
Permitted Phases	4					3 9
Actuated Green, G (s)		36.5	36.5	44.5		44.5
Effective Green, g (s)		36.5	36.5	44.5		44.5
Actuated g/C Ratio		0.41	0.41	0.49		0.49
Clearance Time (s)		4.5	4.5	4.5		4.5
Vehicle Extension (s)		0.2	0.2	0.2		0.2
Lane Grp Cap (vph)		407	507	1442		693
v/s Ratio Prot			c0.41	0.17		c0.40
v/s Ratio Perm		0.25				
v/c Ratio		0.62	1.02	0.35		0.82
Uniform Delay, d1		21.2	26.8	13.9		19.3
Progression Factor		0.64	0.74	0.71		0.64
Incremental Delay, d2		5.7	42.3	0.6		6.1
Delay (s)		19.4	62.1	10.4		18.5
Level of Service		B	E	B		B
Approach Delay (s)		46.0		14.7		
Approach LOS		D		B		
Intersection Summary						
HCM 2000 Control Delay			28.4	HCM 2000 Level of Service		C
HCM 2000 Volume to Capacity ratio			0.99			
Actuated Cycle Length (s)			90.0	Sum of lost time (s)		16.0
Intersection Capacity Utilization			78.9%	ICU Level of Service		D
Analysis Period (min)			15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

47: 7th Ave/Hubbell PI & Spring St

03/25/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	126	8	0	0	0	0	369	52	10	161	0
Future Volume (vph)	25	126	8	0	0	0	0	369	52	10	161	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	14	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.5						4.5			4.5	
Lane Util. Factor		0.95						1.00			1.00	
Frpb, ped/bikes		1.00						0.98			1.00	
Flpb, ped/bikes		0.93						1.00			1.00	
Frt		0.99						0.98			1.00	
Flt Protected		0.99						1.00			1.00	
Satd. Flow (prot)		3104						1619			1667	
Flt Permitted		0.99						1.00			0.97	
Satd. Flow (perm)		3104						1619			1626	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	27	137	9	0	0	0	0	401	57	11	175	0
RTOR Reduction (vph)	0	5	0	0	0	0	0	6	0	0	0	0
Lane Group Flow (vph)	0	168	0	0	0	0	0	452	0	0	186	0
Confl. Peds. (#/hr)	145		22	22		145	3		74	74		3
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	0%
Turn Type	Perm	NA						NA		Perm	NA	
Protected Phases		2						4			4	
Permitted Phases	2									4		
Actuated Green, G (s)		31.5						49.5			49.5	
Effective Green, g (s)		31.5						49.5			49.5	
Actuated g/C Ratio		0.35						0.55			0.55	
Clearance Time (s)		4.5						4.5			4.5	
Lane Grp Cap (vph)		1086						890			894	
v/s Ratio Prot								c0.28				
v/s Ratio Perm		0.05									0.11	
v/c Ratio		0.16						0.51			0.21	
Uniform Delay, d1		20.1						12.6			10.3	
Progression Factor		0.37						0.44			1.00	
Incremental Delay, d2		0.2						1.2			0.5	
Delay (s)		7.7						6.8			10.8	
Level of Service		A						A			B	
Approach Delay (s)		7.7			0.0			6.8			10.8	
Approach LOS		A			A			A			B	
Intersection Summary												
HCM 2000 Control Delay		7.9										
HCM 2000 Volume to Capacity ratio		0.37										
Actuated Cycle Length (s)		90.0										
Intersection Capacity Utilization		46.1%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

48: 8th Ave & Spring St

03/25/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	135	12	0	0	0	0	210	16	18	64	0
Future Volume (vph)	0	135	12	0	0	0	0	210	16	18	64	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5						4.5			4.5	
Lane Util. Factor		0.95						1.00			1.00	
Frpb, ped/bikes		0.98						0.99			1.00	
Flpb, ped/bikes		1.00						1.00			0.97	
Frt		0.99						0.99			1.00	
Flt Protected		1.00						1.00			0.99	
Satd. Flow (prot)		3435						1820			1794	
Flt Permitted		1.00						1.00			0.92	
Satd. Flow (perm)		3435						1820			1670	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	147	13	0	0	0	0	228	17	20	70	0
RTOR Reduction (vph)	0	7	0	0	0	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	153	0	0	0	0	0	242	0	0	90	0
Confl. Peds. (#/hr)	116		65				115		104	104		115
Confl. Bikes (#/hr)			5						13			2
Turn Type		NA						NA		Perm	NA	
Protected Phases		2						4			4	
Permitted Phases	2									4		
Actuated Green, G (s)		40.5						40.5			40.5	
Effective Green, g (s)		40.5						40.5			40.5	
Actuated g/C Ratio		0.45						0.45			0.45	
Clearance Time (s)		4.5						4.5			4.5	
Lane Grp Cap (vph)		1545						819			751	
v/s Ratio Prot		c0.04						c0.13				
v/s Ratio Perm											0.05	
v/c Ratio		0.10						0.30			0.12	
Uniform Delay, d1		14.2						15.7			14.4	
Progression Factor		0.46						0.22			1.00	
Incremental Delay, d2		0.1						0.7			0.3	
Delay (s)		6.6						4.1			14.7	
Level of Service		A						A			B	
Approach Delay (s)		6.6			0.0			4.1			14.7	
Approach LOS		A			A			A			B	
Intersection Summary												
HCM 2000 Control Delay		6.8										
HCM 2000 Volume to Capacity ratio		0.20										
Actuated Cycle Length (s)		90.0										
Intersection Capacity Utilization		39.0%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

49: 9th Ave & Spring St

03/25/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	43	42	6	0	32	0	172	4	7	93	0
Future Volume (vph)	50	43	42	6	0	32	0	172	4	7	93	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	11	12	12	12	12
Total Lost time (s)	4.5	4.5			4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frpb, ped/bikes	1.00	0.90			0.55			0.99			1.00	
Flpb, ped/bikes	0.50	1.00			0.97			1.00			0.98	
Frt	1.00	0.93			0.89			1.00			1.00	
Flt Protected	0.95	1.00			0.99			1.00			1.00	
Satd. Flow (prot)	893	1560			885			1782			1824	
Flt Permitted	0.73	1.00			0.97			1.00			0.98	
Satd. Flow (perm)	686	1560			867			1782			1794	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	47	46	7	0	35	0	187	4	8	101	0
RTOR Reduction (vph)	0	26	0	0	24	0	0	1	0	0	0	0
Lane Group Flow (vph)	54	67	0	0	18	0	0	190	0	0	109	0
Confl. Peds. (#/hr)	209		58	58		209	104		111	111		104
Confl. Bikes (#/hr)			4			1			4			3
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2						4		
Actuated Green, G (s)	39.5	39.5			39.5			30.0			30.0	
Effective Green, g (s)	39.5	39.5			39.5			30.0			30.0	
Actuated g/C Ratio	0.44	0.44			0.44			0.33			0.33	
Clearance Time (s)	4.5	4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)	301	684			380			594			598	
v/s Ratio Prot		0.04						c0.11				
v/s Ratio Perm	c0.08				0.02						0.06	
v/c Ratio	0.18	0.10			0.05			0.32			0.18	
Uniform Delay, d1	15.4	14.8			14.5			22.4			21.3	
Progression Factor	0.60	0.44			1.00			0.46			1.00	
Incremental Delay, d2	1.3	0.3			0.2			1.2			0.7	
Delay (s)	10.5	6.8			14.7			11.4			22.0	
Level of Service	B	A			B			B			C	
Approach Delay (s)		8.1			14.7			11.4			22.0	
Approach LOS		A			B			B			C	
Intersection Summary												
HCM 2000 Control Delay			13.1				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.22									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			13.5		
Intersection Capacity Utilization			34.4%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

50: 14th Ave & Pike St

03/25/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	0	88	48	138	4	60	168	0	0	88	7
Future Volume (vph)	4	0	88	48	138	4	60	168	0	0	88	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	16	12	12	16	12	12	16	12
Grade (%)		6%			-6%			0%			0%	
Total Lost time (s)	4.5		4.5		4.5			4.5			4.5	
Lane Util. Factor	1.00		1.00		1.00			1.00			1.00	
Frt	1.00		0.85		1.00			1.00			0.99	
Flt Protected	0.95		1.00		0.99			0.99			1.00	
Satd. Flow (prot)	1717		1536		2142			2084			1880	
Flt Permitted	0.63		1.00		0.99			0.89			1.00	
Satd. Flow (perm)	1136		1536		2142			1884			1880	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	0	96	52	150	4	65	183	0	0	96	8
RTOR Reduction (vph)	0	0	83	0	1	0	0	0	0	0	4	0
Lane Group Flow (vph)	4	0	13	0	205	0	0	248	0	0	100	0
Parking (#/hr)		0									0	
Turn Type	Perm		Perm	Perm	NA		Perm	NA			NA	
Protected Phases					4			3			3	
Permitted Phases	2		2	4			3					
Actuated Green, G (s)	12.5		12.5		56.5			24.5			24.5	
Effective Green, g (s)	12.5		12.5		56.5			24.5			24.5	
Actuated g/C Ratio	0.14		0.14		0.63			0.27			0.27	
Clearance Time (s)	4.5		4.5		4.5			4.5			4.5	
Lane Grp Cap (vph)	157		213		1344			512			511	
v/s Ratio Prot											0.05	
v/s Ratio Perm	0.00		0.01		0.10			0.13				
v/c Ratio	0.03		0.06		0.15			0.48			0.20	
Uniform Delay, d1	33.5		33.7		6.9			27.5			25.2	
Progression Factor	1.00		1.00		0.49			0.13			1.00	
Incremental Delay, d2	0.3		0.6		0.2			2.4			0.9	
Delay (s)	33.8		34.2		3.7			6.0			26.0	
Level of Service	C		C		A			A			C	
Approach Delay (s)		34.2			3.7			6.0			26.0	
Approach LOS		C			A			A			C	
Intersection Summary												
HCM 2000 Control Delay			12.7									
HCM 2000 Volume to Capacity ratio			0.27									
Actuated Cycle Length (s)			90.0									
Intersection Capacity Utilization			43.2%									
Analysis Period (min)			15									
c Critical Lane Group												

PM Peak Hour Updates

Appendix D

Summary Tables (Synchro)

SDOT Madison Corridor BRT Study
Summary of Study Intersection Operations - PM Peak Hour Conditions

#	Study Intersection	Signalized	EXISTING (2015) CONDITIONS		2019 NO BUILD CONDITIONS		2019 BUILD CONDITIONS (January 2017 Design)		2019 BUILD CONDITIONS (March 2018 Design)	
			Weekday PM		Weekday PM		Weekday PM		Weekday PM	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	1st/Madison		8.6	A	28.8	C	25.5	C	25.6	C
2	2nd/Madison		29.8	C	29.8	C	34.7	C	34.7	B
3	3rd/Madison		14.2	B	14.2	B	14.0	B	14.4	B
4	4th/Madison		23.3	C	23.3	C	25.5	C	26.0	C
5	5th/Madison		11.4	B	11.4	B	30.6	C	30.6	A
6	6th/Madison		15.8	B	15.8	B	19.6	B	22.3	C
7	7th/Madison		17.1	B	17.1	B	13.7	B	14.9	B
8	8th/Madison		9.0	A	9.0	A	16.8	B	16.0	B
9	9th/Madison		9.2	A	9.2	A	20.6	C	19.8	B
10	Terry/Madison		5.1	A	5.1	A	2.5	A	3.1	A
11	Boren/Madison		40.4	D	41.1	D	39.1	D	40.1	D
12	Minor/Madison		11.3	B	8.8	A	13.9	B	13.0	B
13	Summit/Madison		7.5	A	4.9	A	10.3	B	10.3	B
14	Boylston/Madison		5.9	A	6.2	A	25.5	C	26.0	C
15	Broadway/Madison		19.4	B	25.7	C	26.0	C	25.0	C
16	Broadway Ct/Madison	U	15.7 (SB)	C	16.0 (SB)	C	10.0 (SB)	B	10 (SB)	B
17	10th/Madison (*signalized in build)	U	10.3 (SB)	B	10.4 (SB)	B	10.2 (SB)	B	0.5	A
19	11th/Madison		8.9	A	9.0	A	12.6	B	19.0	B
20	12th/Madison		35.6	D	21.0	C	25.7	C	25.0	C
22	13th/Madison		8.0	A	5.5	A	14.8	B	29.8	C
23	14th/Madison		13.2	B	8.1	A	27.4	C	22.8	C
24	Pike/Madison	U	7.2	A	7.6	A	11.9 (WB)	B	-	-
25	15th/Madison		1.0	A	0.9	A	6.4	A	7.6	A
26	16th/Madison	U	13.4 (NB)	B	13.6 (NB)	B	11.9 (NB)	B	11.7 (NB)	B
27	Pine/Madison		10.0	A	10.8	B	16.5	B	19.2	B
28	17th/Madison		11.9	B	10.5	B	14.1	B	14.9	B
29	18th/Madison (*signalized in build)	U	36.6 (NB)	E	38.4 (NB)	E	19.8 (NB)	C	0.4	A
30	19th/Madison		17.8	B	15.8	B	23.6	C	27.7	C
31	20th/Madison		7.1	A	8.5	A	12.2	B	12.5	B
32	Denny/22nd NB/Madison		5.2	A	6.4	A	20.5	C	21.1	C
33	22nd SB/Madison	U	10.0 (SB)	B	10.1 (SB)	B	10.2 (SB)	B	9.8 (SB)	A
34	23rd/Madison		36.3	D	27.6	C	27.4	C	29.3	C
35	John/Madison		30.2	C	22.9	C	22.4	C	19.8	B
36	25th/Madison	U	39.3 (SB)	E	42.1 (SB)	E	41.8 (SB)	E	30.6 (SB)	D
37	26th/Madison	U	13.2 (SB)	B	13.3 (SB)	B	13.1 (SB)	B	13.1 (SB)	B
38	27th NB/Madison	U	14.8 (NB)	B	15.0 (NB)	C	13.5 (NB)	B	11.9 (NB)	B
39	27th SB/Madison	U	12.2 (SB)	B	12.3 (SB)	B	12.3 (SB)	B	11.8 (SB)	B
40	28th/MLK/Madison		17.4	B	27.2	C	22.7	C	16.8	B
41	1st/Spring		12.0	B	24.4	C	23.1	C	23.1	C
42	2nd/Spring		23.5	C	24.0	C	60.8	E	61.3	E
43	3rd/Spring		12.5	B	11.9	B	6.2	A	8.8	A
44	4th/Spring		24.5	C	24.5	C	31.3	C	31.3	B
45	5th/Spring		25.5	C	25.5	C	15.3	B	15.4	B
46	6th/Spring		94.7	F	94.7	F	162.0	F	163.8	F
47	7th/Spring		11.3	B	11.3	B	6.4	A	7.5	A
48	8th/Spring (*signalized in build)	U	13.7 (EB)	C	13.7 (EB)	B	10.1	B	11.0	B
49	9th/Spring (*signalized in build)	U	15.1 (EB)	C	15.1 (WB)	C	14.9	B	23.4	C
50	14th/Pike		9.2	A	9.5	A	18.7	B	19.4	B

NOTES:

Bold pink represents intersection operating at LOS E or F.

Italicized red represents build condition intersection operating worse than the defined LOS impact threshold.

Appendix E

Summary Tables (Vissim)

Travel Time Summary - PM Peak Hour Conditions

#	Segment	Direction	Distance (ft)	Existing (2015)				2019 No Build				2019 Build - January 2017 Design				2019 Build - March 2018 Design			
				Travel Time (min)		Travel Speed (mph)		Travel Time (min)		Travel Speed (mph)		Travel Time (min)		Travel Speed (mph)		Travel Time (min)		Travel Speed (mph)	
				Car	Bus	Car	Bus	Car	Bus	Car	Bus	Car	BRT	Car	BRT	Car	BRT	Car	BRT
1	Spring Street (from 1st Avenue to 9th Avenue)	Eastbound	2,531	4.3	-	7	-	4.1	-	7	-	4.0	5.1	7	6	5.6	5.7	5	5
2	9th Street (from Spring Street to Madison Street)	Southbound	295	0.8	-	4	-	0.9	-	4	-	0.9	0.7	4	5	1.0	0.8	4	4
3	Madison Street (from 9th Avenue to 13th Avenue)	Eastbound	3,084	2.9	5.9	12	6	2.9	5.8	12	6	3.6	3.9	10	9	4.5	3.9	8	9
4	Madison Street (from 13th Avenue to 23rd Avenue)	Eastbound	3,839	3.2	7.0	13	6	3.3	7.0	13	6	4.4	4.0	10	11	3.6	3.5	12	12
5	Madison Street (from 23rd Avenue to MLK Way)	Eastbound	2,131	1.4	2.4	17	10	1.4	2.3	17	10	1.7	2.1	15	12	1.7	2.1	14	11
6	Study Corridor (from 1st Avenue to MLK Way)	Eastbound	11,880	12.8	-	10.6	-	12.5	-	10.8	-	14.5	15.8	9.3	8.5	16.3	16.0	8.3	8.4
7	Madison Street (from MLK Way to 23rd Avenue)	Westbound	2,152	1.8	2.7	14	9	1.9	2.5	13	10	2.0	2.2	12	11	1.9	2.3	13	11
8	Madison Street (from 23rd Avenue to 13th Avenue)	Westbound	3,849	2.6	5.6	17	8	2.6	5.5	17	8	3.4	3.7	13	12	3.2	3.7	14	12
9	Madison Street (from 13th Avenue to 6th Avenue)	Westbound	4,388	4.6	8.3	11	6	5.1	9.0	10	6	7.0	5.2	7	10	8.6	4.5	6	11
10	Madison Street (from 6th Avenue to 1st Avenue)	Westbound	1,569	2.7	4.5	7	4	3.7	5.5	5	3	3.0	3.9	6	5	3.8	3.6	5	5
11	Study Corridor (from MLK Way to 1st Avenue)	Westbound	11,958	11.7	21.1	11.6	6.4	13.3	22.5	10.2	6.0	15.4	14.9	8.8	9.1	17.5	14.0	7.8	9.7

Madison BRT**Transit Travel Time Reliability - PM Peak Hour Conditions****Existing Conditions**

Direction	Segment	Total					Bus Travel Time (minutes)			
		Run 1	Run 2	Run 3	Run 4	Run 5	Minimum	Maximum	Average	Standard Deviation
Eastbound	9th Avenue - MLK Way	900.72	914.12	963.55	928.78	875.86	14.6	16.1	15.3	0.5
Westbound	MLK Way - 1st Avenue	1235.00	1302.30	1289.86	1280.61	1231.44	20.5	21.7	21.1	0.5

2019 No Build Conditions

Direction	Segment	Total					Bus Travel Time (minutes)			
		Run 1	Run 2	Run 3	Run 4	Run 5	Minimum	Maximum	Average	Standard Deviation
Eastbound	9th Avenue - MLK Way	884.01	888.34	938.31	967.79	843.96	14.1	16.1	15.1	0.8
Westbound	MLK Way - 1st Avenue	1348.19	1358.30	1449.57	1343.38	1247.90	20.8	24.2	22.5	1.2

2019 Build Conditions - January 2017 Design

Direction	Segment	Total					BRT Travel Time (minutes)			
		Run 1	Run 2	Run 3	Run 4	Run 5	Minimum	Maximum	Average	Standard Deviation
Eastbound	9th Avenue - MLK Way	599.76	583.42	617.68	607.32	596.23	9.7	10.3	10.0	0.2
Eastbound	1st Avenue - MLK Way	926.52	929.66	949.98	947.75	999.31	15.4	16.7	15.8	0.5
Westbound	MLK Way - 1st Avenue	911.59	901.69	826.58	940.21	900.58	13.8	15.7	14.9	0.7

2019 Build Conditions - March 2018 Design

Direction	Segment	Total					BRT Travel Time (minutes)			
		Run 1	Run 2	Run 3	Run 4	Run 5	Minimum	Maximum	Average	Standard Deviation
Eastbound	9th Avenue - MLK Way	587.81	579.59	589.82	598.23	669.48	9.7	11.2	10.1	0.6
Eastbound	1st Avenue - MLK Way	954.70	933.88	948.69	999.20	1033.86	15.6	17.2	16.2	0.7
Westbound	MLK Way - 1st Avenue	826.87	761.69	752.97	864.92	772.70	12.5	14.4	13.3	0.8

Appendix F

Synchro Outputs

HCM Signalized Intersection Capacity Analysis

1: 1st Ave & Madison St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	70	226	146	24	512	0	0	510	130
Future Volume (vph)	0	0	0	70	226	146	24	512	0	0	510	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	10	10	10	10	10	10	10
Grade (%)		6%			-8%			0%			0%	
Total Lost time (s)				4.5	4.5			4.5			4.5	
Lane Util. Factor				1.00	0.95			0.91			0.95	
Frpb, ped/bikes				1.00	0.88			1.00			0.93	
Flpb, ped/bikes				0.77	1.00			1.00			1.00	
Frt				1.00	0.94			1.00			0.97	
Flt Protected				0.95	1.00			1.00			1.00	
Satd. Flow (prot)				1173	2602			4287			2713	
Flt Permitted				0.95	1.00			0.89			1.00	
Satd. Flow (perm)				1173	2602			3836			2713	
Peak-hour factor, PHF	0.25	0.25	0.25	0.85	0.85	0.85	0.92	0.92	0.92	0.89	0.89	0.89
Adj. Flow (vph)	0	0	0	82	266	172	26	557	0	0	573	146
RTOR Reduction (vph)	0	0	0	0	12	0	0	0	0	0	25	0
Lane Group Flow (vph)	0	0	0	82	426	0	0	583	0	0	694	0
Confl. Peds. (#/hr)	226		156	156		226	276		553	553		276
Heavy Vehicles (%)	0%	0%	0%	3%	0%	0%	0%	1%	0%	0%	1%	0%
Turn Type				Perm	NA		Perm	NA			NA	
Protected Phases					2			1			1	
Permitted Phases				2			1					
Actuated Green, G (s)				31.5	31.5			49.5			49.5	
Effective Green, g (s)				31.5	31.5			49.5			49.5	
Actuated g/C Ratio				0.35	0.35			0.55			0.55	
Clearance Time (s)				4.5	4.5			4.5			4.5	
Lane Grp Cap (vph)				410	910			2109			1492	
v/s Ratio Prot					c0.16						c0.26	
v/s Ratio Perm				0.07				0.15				
v/c Ratio				0.20	0.47			0.28			0.47	
Uniform Delay, d1				20.4	22.7			10.7			12.2	
Progression Factor				0.49	0.39			1.00			0.36	
Incremental Delay, d2				0.9	1.4			0.3			0.9	
Delay (s)				10.8	10.3			11.1			5.4	
Level of Service				B	B			B			A	
Approach Delay (s)		0.0			10.4			11.1			5.4	
Approach LOS		A			B			B			A	
Intersection Summary												
HCM 2000 Control Delay			8.6									
HCM 2000 Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			90.0									
Intersection Capacity Utilization			53.8%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2010 Signalized Intersection Summary

2: 2nd Ave & Madison St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	180	343	0	0	0	0	0	1220	60
Future Volume (veh/h)	0	0	0	180	343	0	0	0	0	0	1220	60
Number				7	4	14				5	2	12
Initial Q (Qb), veh				0	0	0				0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00				1.00		0.90
Parking Bus, Adj				1.00	1.00	1.00				1.00	1.00	0.43
Adj Sat Flow, veh/h/ln				1778	1727	0				0	1569	1569
Adj Flow Rate, veh/h				191	365	0				0	1284	63
Adj No. of Lanes				0	2	0				0	2	1
Peak Hour Factor				0.94	0.94	0.94				0.95	0.95	0.95
Percent Heavy Veh, %				3	3	0				0	9	9
Cap, veh/h				327	550	0				0	1954	327
Arrive On Green				0.28	0.28	0.00				0.00	0.22	0.21
Sat Flow, veh/h				939	2059	0				0	3059	513
Grp Volume(v), veh/h				290	266	0				0	1284	63
Grp Sat Flow(s),veh/h/ln				1427	1493	0				0	1490	513
Q Serve(g_s), s				16.6	14.1	0.0				0.0	35.4	9.1
Cycle Q Clear(g_c), s				16.6	14.1	0.0				0.0	35.4	9.1
Prop In Lane				0.66		0.00				0.00		1.00
Lane Grp Cap(c), veh/h				463	415	0				0	1954	327
V/C Ratio(X)				0.63	0.64	0.00				0.00	0.66	0.19
Avail Cap(c_a), veh/h				463	415	0				0	1954	327
HCM Platoon Ratio				1.00	1.00	1.00				1.00	0.33	0.33
Upstream Filter(I)				1.00	1.00	0.00				0.00	1.00	1.00
Uniform Delay (d), s/veh				29.5	28.6	0.0				0.0	26.0	16.4
Incr Delay (d2), s/veh				6.3	7.4	0.0				0.0	1.7	1.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				7.3	6.6	0.0				0.0	15.1	1.4
LnGrp Delay(d),s/veh				35.8	36.0	0.0				0.0	27.8	17.7
LnGrp LOS				D	D						C	B
Approach Vol, veh/h					556						1347	
Approach Delay, s/veh					35.9						27.3	
Approach LOS					D						C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		62.0		28.0								
Change Period (Y+Rc), s		4.5		4.5								
Max Green Setting (Gmax), s		57.5		23.5								
Max Q Clear Time (g_c+I1), s		0.0		0.0								
Green Ext Time (p_c), s		0.0		0.0								
Intersection Summary												
HCM 2010 Ctrl Delay				29.8								
HCM 2010 LOS				C								

HCM Signalized Intersection Capacity Analysis

3: 3rd Ave & Madison St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑			↑↑			↑↑	
Traffic Volume (vph)	0	0	0	0	470	60	0	134	0	0	135	56
Future Volume (vph)	0	0	0	0	470	60	0	134	0	0	135	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	10	12	12	11	12
Grade (%)		10%			-15%			0%			-5%	
Total Lost time (s)					4.0			4.0			4.0	
Lane Util. Factor					0.95			0.95			0.95	
Frpb, ped/bikes					0.96			1.00			0.87	
Flpb, ped/bikes					1.00			1.00			1.00	
Frt					0.98			1.00			0.96	
Flt Protected					1.00			1.00			1.00	
Satd. Flow (prot)					2901			1468			1559	
Flt Permitted					1.00			1.00			1.00	
Satd. Flow (perm)					2901			1468			1559	
Peak-hour factor, PHF	0.25	0.25	0.25	0.91	0.91	0.91	0.93	0.93	0.93	0.87	0.87	0.87
Adj. Flow (vph)	0	0	0	0	516	66	0	144	0	0	155	64
RTOR Reduction (vph)	0	0	0	0	11	0	0	0	0	0	9	0
Lane Group Flow (vph)	0	0	0	0	571	0	0	144	0	0	210	0
Confl. Peds. (#/hr)	244		457	457		244	588		499	499		588
Heavy Vehicles (%)	0%	0%	0%	9%	2%	2%	0%	81%	0%	0%	82%	11%
Bus Blockages (#/hr)	0	0	0	0	10	0	0	62	0	0	29	0
Parking (#/hr)					15							
Turn Type					NA			NA			NA	
Protected Phases					2			1			1	
Permitted Phases												
Actuated Green, G (s)					30.5			50.5			50.5	
Effective Green, g (s)					31.0			51.0			51.0	
Actuated g/C Ratio					0.34			0.57			0.57	
Clearance Time (s)					4.5			4.5			4.5	
Lane Grp Cap (vph)					999			831			883	
v/s Ratio Prot					c0.20			0.10			c0.13	
v/s Ratio Perm												
v/c Ratio					0.57			0.17			0.24	
Uniform Delay, d1					24.1			9.4			9.8	
Progression Factor					0.42			1.00			2.47	
Incremental Delay, d2					1.2			0.5			0.6	
Delay (s)					11.4			9.8			24.7	
Level of Service					B			A			C	
Approach Delay (s)		0.0			11.4			9.8			24.7	
Approach LOS		A			B			A			C	
Intersection Summary												
HCM 2000 Control Delay			14.2									
HCM 2000 Volume to Capacity ratio			0.36									
Actuated Cycle Length (s)			90.0									
Intersection Capacity Utilization			36.7%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: 4th Ave & Madison St

7/29/2016



Movement	WBR	NBL	NBT	SWR	SWR2
Lane Configurations	↰		↱↱↱	↰↰	
Traffic Volume (vph)	38	116	1081	400	215
Future Volume (vph)	38	116	1081	400	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Lane Width	12	12	10	13	12
Grade (%)			5%		
Total Lost time (s)	3.0		3.5	2.5	
Lane Util. Factor	1.00		0.91	0.88	
Frpb, ped/bikes	1.00		1.00	1.00	
Flpb, ped/bikes	1.00		0.96	1.00	
Frt	0.86		1.00	0.85	
Flt Protected	1.00		1.00	1.00	
Satd. Flow (prot)	1450		3534	2458	
Flt Permitted	1.00		1.00	1.00	
Satd. Flow (perm)	1450		3534	2458	
Peak-hour factor, PHF	0.92	0.97	0.97	0.84	0.84
Adj. Flow (vph)	41	120	1114	476	256
RTOR Reduction (vph)	0	0	24	64	0
Lane Group Flow (vph)	41	0	1210	668	0
Confl. Peds. (#/hr)		487			361
Heavy Vehicles (%)	2%	1%	9%	1%	1%
Bus Blockages (#/hr)	0	0	0	10	0
Parking (#/hr)			15	15	
Turn Type	custom	Perm	NA	Prot	
Protected Phases	1		2	4	
Permitted Phases	2	2			
Actuated Green, G (s)	52.5		49.5	25.5	
Effective Green, g (s)	52.5		50.5	27.5	
Actuated g/C Ratio	0.58		0.56	0.31	
Clearance Time (s)	3.0		4.5	4.5	
Vehicle Extension (s)	0.2		0.2	0.2	
Lane Grp Cap (vph)	894		1982	751	
v/s Ratio Prot	c0.00			c0.27	
v/s Ratio Perm	0.03		0.34		
v/c Ratio	0.05		0.61	0.89	
Uniform Delay, d1	8.0		13.2	29.8	
Progression Factor	1.00		1.00	0.84	
Incremental Delay, d2	0.0		1.4	13.7	
Delay (s)	8.0		14.6	38.7	
Level of Service	A		B	D	
Approach Delay (s)			14.6		
Approach LOS			B		
Intersection Summary					
HCM 2000 Control Delay			23.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.68		
Actuated Cycle Length (s)			90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization			63.9%	ICU Level of Service	B
Analysis Period (min)			15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

5: 5th Ave & Madison St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					 						  	
Traffic Volume (vph)	0	0	0	296	487	0	0	0	0	0	870	100
Future Volume (vph)	0	0	0	296	487	0	0	0	0	0	870	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	9	12
Grade (%)		10%			-10%			0%			0%	
Total Lost time (s)					4.5						4.5	
Lane Util. Factor					0.95						0.91	
Frpb, ped/bikes					1.00						0.97	
Flpb, ped/bikes					0.88						1.00	
Frt					1.00						0.98	
Flt Protected					0.98						1.00	
Satd. Flow (prot)					2646						3654	
Flt Permitted					0.98						1.00	
Satd. Flow (perm)					2646						3654	
Peak-hour factor, PHF	0.25	0.25	0.25	0.96	0.96	0.96	0.25	0.25	0.25	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	308	507	0	0	0	0	0	897	103
RTOR Reduction (vph)	0	0	0	0	10	0	0	0	0	0	15	0
Lane Group Flow (vph)	0	0	0	0	805	0	0	0	0	0	985	0
Confl. Peds. (#/hr)	228		242	242		228	311		184	184		311
Heavy Vehicles (%)	0%	0%	0%	1%	2%	0%	0%	0%	0%	0%	3%	2%
Parking (#/hr)					15						15	
Turn Type				Perm	NA						NA	
Protected Phases					2						1	
Permitted Phases				2								
Actuated Green, G (s)					42.5						38.5	
Effective Green, g (s)					42.5						38.5	
Actuated g/C Ratio					0.47						0.43	
Clearance Time (s)					4.5						4.5	
Lane Grp Cap (vph)					1249						1563	
v/s Ratio Prot											c0.27	
v/s Ratio Perm					0.30							
v/c Ratio					0.64						0.63	
Uniform Delay, d1					18.0						20.2	
Progression Factor					0.72						0.36	
Incremental Delay, d2					2.1						1.3	
Delay (s)					15.0						8.5	
Level of Service					B						A	
Approach Delay (s)		0.0			15.0			0.0			8.5	
Approach LOS		A			B			A			A	
Intersection Summary												
HCM 2000 Control Delay			11.4		HCM 2000 Level of Service					B		
HCM 2000 Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)				9.0			
Intersection Capacity Utilization			57.3%		ICU Level of Service				B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

6: 6th Ave & Madison St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	746	809	26	150	173	0	0	0
Future Volume (vph)	0	0	0	0	746	809	26	150	173	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	10	9	12	12	12	12	12	12
Grade (%)		10%			-10%			5%			-5%	
Total Lost time (s)					3.5	3.5		4.0				
Lane Util. Factor					0.91	0.91		0.95				
Frpb, ped/bikes					0.92	0.76		0.99				
Flpb, ped/bikes					1.00	1.00		0.98				
Frt					0.95	0.85		0.93				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					2664	936		2479				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					2664	936		2479				
Peak-hour factor, PHF	0.25	0.25	0.25	0.97	0.97	0.97	0.85	0.85	0.85	0.25	0.25	0.25
Adj. Flow (vph)	0	0	0	0	769	834	31	176	204	0	0	0
RTOR Reduction (vph)	0	0	0	0	51	130	0	163	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	1060	362	0	248	0	0	0	0
Confl. Peds. (#/hr)	137		316	316		137	178			1		178
Confl. Bikes (#/hr)			3			26			2			3
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%	12%	1%	5%	0%	0%	0%
Parking (#/hr)								15				
Turn Type					NA	Perm	Perm	NA				
Protected Phases					2			1				
Permitted Phases						2	1					
Actuated Green, G (s)					61.0	61.0		20.5				
Effective Green, g (s)					61.5	61.5		21.0				
Actuated g/C Ratio					0.68	0.68		0.23				
Clearance Time (s)					4.0	4.0		4.5				
Lane Grp Cap (vph)					1820	639		578				
v/s Ratio Prot					c0.40							
v/s Ratio Perm						0.39		0.10				
v/c Ratio					0.58	0.57		0.43				
Uniform Delay, d1					7.5	7.4		29.4				
Progression Factor					1.03	2.01		1.00				
Incremental Delay, d2					1.2	3.3		2.3				
Delay (s)					9.0	18.0		31.7				
Level of Service					A	B		C				
Approach Delay (s)		0.0			11.8			31.7			0.0	
Approach LOS		A			B			C			A	
Intersection Summary												
HCM 2000 Control Delay			15.8		HCM 2000 Level of Service					B		
HCM 2000 Volume to Capacity ratio			0.54									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					7.5		
Intersection Capacity Utilization			62.2%		ICU Level of Service					B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

7: I-5 CD NB Off-Ramp/7th Ave & Madison St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					  							
Traffic Volume (vph)	2	174	0	0	742	3	488	276	423	7	0	348
Future Volume (vph)	2	174	0	0	742	3	488	276	423	7	0	348
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	10	12	12	12	12	12	12	12
Grade (%)		0%			0%			5%			-5%	
Total Lost time (s)		3.5			3.5		3.5	3.5	3.5	3.5		4.5
Lane Util. Factor		1.00			0.91		0.95	0.95	1.00	1.00		1.00
Frpb, ped/bikes		1.00			1.00		1.00	1.00	0.90	1.00		1.00
Flpb, ped/bikes		1.00			1.00		1.00	1.00	1.00	0.97		1.00
Frt		1.00			1.00		1.00	1.00	0.85	1.00		0.85
Flt Protected		1.00			1.00		0.95	0.99	1.00	0.95		1.00
Satd. Flow (prot)		1253			4264		1505	1561	1258	1612		1475
Flt Permitted		1.00			1.00		0.95	0.99	1.00	0.36		1.00
Satd. Flow (perm)		1248			4264		1505	1561	1258	619		1475
Peak-hour factor, PHF	0.81	0.81	0.81	0.94	0.94	0.94	0.94	0.94	0.94	0.90	0.90	0.90
Adj. Flow (vph)	2	215	0	0	789	3	519	294	450	8	0	387
RTOR Reduction (vph)	0	0	0	0	1	0	0	0	28	0	0	24
Lane Group Flow (vph)	0	217	0	0	791	0	400	413	422	8	0	363
Confl. Peds. (#/hr)	114		364	364		114	1		56	56		
Confl. Bikes (#/hr)			2			9			22			
Heavy Vehicles (%)	0%	5%	0%	0%	2%	0%	0%	0%	1%	0%	0%	1%
Parking (#/hr)		15										
Turn Type	Perm	NA			NA		Split	NA	Perm	D.Pm		Prot
Protected Phases		1			1		2!	2				2!
Permitted Phases	1								2	2		
Actuated Green, G (s)		40.3			40.3		40.7	40.7	40.7	40.7		40.7
Effective Green, g (s)		41.3			41.3		41.7	41.7	41.7	41.7		40.7
Actuated g/C Ratio		0.46			0.46		0.46	0.46	0.46	0.46		0.45
Clearance Time (s)		4.5			4.5		4.5	4.5	4.5	4.5		4.5
Vehicle Extension (s)		3.0			3.0		5.0	5.0	5.0	5.0		5.0
Lane Grp Cap (vph)		572			1956		697	723	582	286		667
v/s Ratio Prot					c0.19		0.27	0.26				0.25
v/s Ratio Perm		0.17							c0.34	0.01		
v/c Ratio		0.38			0.40		0.57	0.57	0.72	0.03		0.54
Uniform Delay, d1		16.0			16.2		17.7	17.6	19.5	13.1		17.9
Progression Factor		0.94			0.54		1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2		1.7			0.6		1.8	1.7	5.4	0.1		1.6
Delay (s)		16.6			9.3		19.5	19.4	25.0	13.2		19.5
Level of Service		B			A		B	B	C	B		B
Approach Delay (s)		16.6			9.3			21.4			19.4	
Approach LOS		B			A			C			B	
Intersection Summary												
HCM 2000 Control Delay			17.1			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.57									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)				8.0		
Intersection Capacity Utilization			73.5%			ICU Level of Service				D		
Analysis Period (min)			15									

! Phase conflict between lane groups.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

8: 8th Ave & Madison St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	506	18	47	693	16	23	105	46	19	43	70
Future Volume (vph)	47	506	18	47	693	16	23	105	46	19	43	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)	3.5	3.5		3.5	3.5			3.5			3.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	0.98		1.00	0.99			0.96			0.96	
Flpb, ped/bikes	0.83	1.00		0.79	1.00			0.99			0.99	
Frt	1.00	0.99		1.00	1.00			0.96			0.93	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1265	2898		1193	2925			1547			1500	
Flt Permitted	0.36	1.00		0.42	1.00			0.96			0.95	
Satd. Flow (perm)	477	2898		523	2925			1487			1432	
Peak-hour factor, PHF	0.89	0.89	0.89	0.99	0.99	0.99	0.93	0.93	0.93	0.80	0.80	0.80
Adj. Flow (vph)	53	569	20	47	700	16	25	113	49	24	54	88
RTOR Reduction (vph)	0	3	0	0	2	0	0	14	0	0	45	0
Lane Group Flow (vph)	53	586	0	47	714	0	0	173	0	0	121	0
Confl. Peds. (#/hr)	165		269	169		165	69		96	96		36
Heavy Vehicles (%)	0%	2%	0%	0%	2%	6%	4%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	62.5	62.5		62.5	62.5			18.5			18.5	
Effective Green, g (s)	63.5	63.5		63.5	63.5			19.5			19.5	
Actuated g/C Ratio	0.71	0.71		0.71	0.71			0.22			0.22	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Grp Cap (vph)	336	2044		369	2063			322			310	
v/s Ratio Prot		0.20			c0.24							
v/s Ratio Perm	0.11			0.09				c0.12			0.08	
v/c Ratio	0.16	0.29		0.13	0.35			0.54			0.39	
Uniform Delay, d1	4.4	4.9		4.3	5.2			31.2			30.2	
Progression Factor	0.36	0.45		0.38	0.33			1.00			1.00	
Incremental Delay, d2	0.8	0.3		0.7	0.4			6.3			3.6	
Delay (s)	2.4	2.5		2.3	2.1			37.5			33.8	
Level of Service	A	A		A	A			D			C	
Approach Delay (s)		2.5			2.2			37.5			33.8	
Approach LOS		A			A			D			C	
Intersection Summary												
HCM 2000 Control Delay			9.0			HCM 2000 Level of Service			A			
HCM 2000 Volume to Capacity ratio			0.39									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			7.0			
Intersection Capacity Utilization			53.3%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

9: 9th Ave & Madison St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	533	11	63	669	29	23	98	40	41	83	50
Future Volume (vph)	15	533	11	63	669	29	23	98	40	41	83	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)	3.5	3.5		3.5	3.5			3.5			3.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.98			0.98			0.95	
Flpb, ped/bikes	0.89	1.00		0.80	1.00			0.98			0.99	
Frt	1.00	1.00		1.00	0.99			0.97			0.96	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1344	2931		1143	2909			1460			1517	
Flt Permitted	0.34	1.00		0.39	1.00			0.94			0.90	
Satd. Flow (perm)	483	2931		468	2909			1385			1387	
Peak-hour factor, PHF	0.88	0.88	0.88	0.97	0.97	0.97	0.81	0.81	0.81	0.87	0.87	0.87
Adj. Flow (vph)	17	606	12	65	690	30	28	121	49	47	95	57
RTOR Reduction (vph)	0	1	0	0	3	0	0	13	0	0	16	0
Lane Group Flow (vph)	17	618	0	65	717	0	0	185	0	0	183	0
Confl. Peds. (#/hr)	132		249	249		132	128		63	63		128
Heavy Vehicles (%)	0%	2%	0%	6%	2%	0%	0%	9%	10%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	55.5	55.5		55.5	55.5			25.5			25.5	
Effective Green, g (s)	56.5	56.5		56.5	56.5			26.5			26.5	
Actuated g/C Ratio	0.63	0.63		0.63	0.63			0.29			0.29	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Grp Cap (vph)	303	1840		293	1826			407			408	
v/s Ratio Prot		0.21			c0.25							
v/s Ratio Perm	0.04			0.14				c0.13			0.13	
v/c Ratio	0.06	0.34		0.22	0.39			0.45			0.45	
Uniform Delay, d1	6.5	7.9		7.2	8.3			25.9			25.8	
Progression Factor	0.88	0.69		0.15	0.12			1.00			1.00	
Incremental Delay, d2	0.3	0.5		1.6	0.6			3.6			3.5	
Delay (s)	6.0	5.9		2.7	1.6			29.5			29.3	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		5.9			1.6			29.5			29.3	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			9.2			HCM 2000 Level of Service			A			
HCM 2000 Volume to Capacity ratio			0.41									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			7.0			
Intersection Capacity Utilization			57.1%			ICU Level of Service			B			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

10: Terry Ave & Madison St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	590	11	21	680	19	16	20	27	13	14	18
Future Volume (vph)	20	590	11	21	680	19	16	20	27	13	14	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)	3.5	3.5		3.5	3.5			3.0			3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99			0.94			0.96	
Flpb, ped/bikes	0.87	1.00		0.81	1.00			0.98			0.97	
Frt	1.00	1.00		1.00	1.00			0.94			0.95	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1256	2930		1221	2923			1460			1483	
Flt Permitted	0.32	1.00		0.38	1.00			0.94			0.93	
Satd. Flow (perm)	423	2930		493	2923			1393			1406	
Peak-hour factor, PHF	0.95	0.95	0.95	0.90	0.90	0.90	0.83	0.83	0.83	0.75	0.75	0.75
Adj. Flow (vph)	21	621	12	23	756	21	19	24	33	17	19	24
RTOR Reduction (vph)	0	1	0	0	2	0	0	23	0	0	17	0
Lane Group Flow (vph)	21	632	0	23	775	0	0	53	0	0	43	0
Confl. Peds. (#/hr)	152		226	226		152	59		91	91		59
Heavy Vehicles (%)	5%	2%	9%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	56.5	56.5		56.5	56.5			25.0			25.0	
Effective Green, g (s)	57.5	57.5		57.5	57.5			26.0			26.0	
Actuated g/C Ratio	0.64	0.64		0.64	0.64			0.29			0.29	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.0			4.0	
Lane Grp Cap (vph)	270	1871		314	1867			402			406	
v/s Ratio Prot		0.22			c0.27							
v/s Ratio Perm	0.05			0.05				c0.04			0.03	
v/c Ratio	0.08	0.34		0.07	0.42			0.13			0.11	
Uniform Delay, d1	6.2	7.5		6.2	8.0			23.6			23.5	
Progression Factor	0.61	0.59		0.27	0.22			1.00			1.00	
Incremental Delay, d2	0.5	0.5		0.2	0.3			0.7			0.5	
Delay (s)	4.3	4.8		1.9	2.0			24.3			24.0	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		4.8			2.0			24.3			24.0	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			5.1			HCM 2000 Level of Service			A			
HCM 2000 Volume to Capacity ratio			0.33									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			6.5			
Intersection Capacity Utilization			43.4%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

11: Boren Ave & Madison St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	64	521	22	54	568	67	83	518	32	187	672	82
Future Volume (vph)	64	521	22	54	568	67	83	518	32	187	672	82
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	12	9	9	12	9	9	12
Total Lost time (s)	4.0	3.5		4.0	3.5		4.0	3.5		4.0	3.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.97		1.00	0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1486	2854		1516	2806		1433	2784		1462	2714	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1486	2854		1516	2806		1433	2784		1462	2714	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.84	0.84	0.84	0.90	0.90	0.90
Adj. Flow (vph)	74	599	25	62	653	77	99	617	38	208	747	91
RTOR Reduction (vph)	0	4	0	0	10	0	0	5	0	0	10	0
Lane Group Flow (vph)	74	620	0	62	720	0	99	650	0	208	828	0
Confl. Peds. (#/hr)	183		335	335		183	144		160	160		144
Heavy Vehicles (%)	2%	2%	4%	0%	2%	0%	2%	2%	6%	0%	2%	1%
Bus Blockages (#/hr)	0	10	0	0	6	0	0	2	0	0	8	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	6.2	24.5		5.5	23.8		6.7	26.7		15.3	35.3	
Effective Green, g (s)	6.7	25.5		6.0	24.8		7.2	27.7		15.8	36.3	
Actuated g/C Ratio	0.07	0.28		0.07	0.28		0.08	0.31		0.18	0.40	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lane Grp Cap (vph)	110	808		101	773		114	856		256	1094	
v/s Ratio Prot	c0.05	0.22		0.04	c0.26		0.07	c0.23		0.14	c0.31	
v/s Ratio Perm												
v/c Ratio	0.67	0.77		0.61	0.93		0.87	0.76		0.81	0.76	
Uniform Delay, d1	40.6	29.5		40.9	31.8		40.9	28.1		35.7	23.1	
Progression Factor	1.38	1.17		0.86	0.96		1.00	1.00		0.97	0.95	
Incremental Delay, d2	11.6	6.7		7.2	18.8		44.5	6.3		16.0	4.7	
Delay (s)	67.4	41.2		42.4	49.2		85.4	34.4		50.5	26.5	
Level of Service	E	D		D	D		F	C		D	C	
Approach Delay (s)		44.0			48.6			41.1			31.3	
Approach LOS		D			D			D			C	
Intersection Summary												
HCM 2000 Control Delay			40.4			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			15.0			
Intersection Capacity Utilization			67.5%			ICU Level of Service			C			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

12: Madison St & Minor Ave

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	701	26	18	621	14	48	76	59	17	32	39
Future Volume (vph)	26	701	26	18	621	14	48	76	59	17	32	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)	3.5	3.5		3.5	3.5			3.5			3.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	0.98		1.00	0.99			0.96			0.92	
Flpb, ped/bikes	0.84	1.00		0.86	1.00			0.97			0.99	
Frt	1.00	0.99		1.00	1.00			0.96			0.94	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1266	2903		1306	2932			1497			1452	
Flt Permitted	0.38	1.00		0.31	1.00			0.91			0.93	
Satd. Flow (perm)	500	2903		430	2932			1375			1367	
Peak-hour factor, PHF	0.89	0.89	0.89	0.95	0.95	0.95	0.83	0.83	0.83	0.76	0.76	0.76
Adj. Flow (vph)	29	788	29	19	654	15	58	92	71	22	42	51
RTOR Reduction (vph)	0	3	0	0	2	0	0	19	0	0	32	0
Lane Group Flow (vph)	29	814	0	19	667	0	0	202	0	0	83	0
Confl. Peds. (#/hr)	157		212	212		157	110		81	81		110
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	60.5	60.5		60.5	60.5			20.5			20.5	
Effective Green, g (s)	61.5	61.5		61.5	61.5			21.5			21.5	
Actuated g/C Ratio	0.68	0.68		0.68	0.68			0.24			0.24	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Grp Cap (vph)	341	1983		293	2003			328			326	
v/s Ratio Prot		c0.28			0.23							
v/s Ratio Perm	0.06			0.04				c0.15			0.06	
v/c Ratio	0.09	0.41		0.06	0.33			0.62			0.25	
Uniform Delay, d1	4.8	6.3		4.7	5.8			30.6			27.8	
Progression Factor	0.15	0.11		1.63	1.97			1.00			1.00	
Incremental Delay, d2	0.3	0.4		0.4	0.4			8.4			1.9	
Delay (s)	1.0	1.0		8.1	12.0			39.0			29.6	
Level of Service	A	A		A	B			D			C	
Approach Delay (s)		1.0			11.9			39.0			29.6	
Approach LOS		A			B			D			C	
Intersection Summary												
HCM 2000 Control Delay			11.3			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.46									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			7.0			
Intersection Capacity Utilization			49.6%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

13: Swedish/Summit Ave & Madison St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	22	740	15	4	587	10	34	12	19	14	1	34
Future Volume (vph)	22	740	15	4	587	10	34	12	19	14	1	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	12	12	12	12	12	12	12
Total Lost time (s)	3.5	3.5		3.5	3.5			3.0			3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			0.96			0.92	
Flpb, ped/bikes	0.90	1.00		0.90	1.00			0.96			0.97	
Frt	1.00	1.00		1.00	1.00			0.96			0.91	
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.99	
Satd. Flow (prot)	1358	2945		1361	2953			1461			1367	
Flt Permitted	0.40	1.00		0.33	1.00			0.84			0.92	
Satd. Flow (perm)	571	2945		474	2953			1260			1281	
Peak-hour factor, PHF	0.97	0.97	0.97	0.96	0.96	0.96	0.63	0.63	0.63	0.77	0.77	0.77
Adj. Flow (vph)	23	763	15	4	611	10	54	19	30	18	1	44
RTOR Reduction (vph)	0	2	0	0	1	0	0	16	0	0	34	0
Lane Group Flow (vph)	23	776	0	4	620	0	0	87	0	0	29	0
Confl. Peds. (#/hr)	101		132	132		101	69		102	102		69
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	61.5	61.5		61.5	61.5			20.0			20.0	
Effective Green, g (s)	62.5	62.5		62.5	62.5			21.0			21.0	
Actuated g/C Ratio	0.69	0.69		0.69	0.69			0.23			0.23	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.0			4.0	
Lane Grp Cap (vph)	396	2045		329	2050			294			298	
v/s Ratio Prot		c0.26			0.21							
v/s Ratio Perm	0.04			0.01				c0.07			0.02	
v/c Ratio	0.06	0.38		0.01	0.30			0.30			0.10	
Uniform Delay, d1	4.4	5.7		4.2	5.3			28.4			27.1	
Progression Factor	1.14	1.14		0.35	0.37			1.00			1.00	
Incremental Delay, d2	0.3	0.5		0.1	0.4			2.5			0.7	
Delay (s)	5.2	7.0		1.6	2.3			31.0			27.7	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		6.9			2.3			31.0			27.7	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			7.5			HCM 2000 Level of Service			A			
HCM 2000 Volume to Capacity ratio			0.36									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			6.5			
Intersection Capacity Utilization			45.9%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

14: Madison St & Boylston Ave

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	720	25	7	556	16	39	57	39	18	10	24
Future Volume (vph)	20	720	25	7	556	16	39	57	39	18	10	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	9	12	12	12	12	12	12	12
Total Lost time (s)	3.5	3.5		3.5	3.5			3.0			3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99			0.98			0.96	
Flpb, ped/bikes	0.88	1.00		0.90	1.00			0.98			0.99	
Frt	1.00	1.00		1.00	1.00			0.96			0.94	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.98	
Satd. Flow (prot)	1334	2918		1365	2832			1566			1499	
Flt Permitted	0.42	1.00		0.33	1.00			0.92			0.83	
Satd. Flow (perm)	591	2918		476	2832			1457			1267	
Peak-hour factor, PHF	0.91	0.91	0.91	0.95	0.95	0.95	0.89	0.89	0.89	0.81	0.81	0.81
Adj. Flow (vph)	22	791	27	7	585	17	44	64	44	22	12	30
RTOR Reduction (vph)	0	1	0	0	1	0	0	21	0	0	26	0
Lane Group Flow (vph)	22	817	0	7	601	0	0	131	0	0	38	0
Confl. Peds. (#/hr)	88		106	106		88	52		30	30		52
Heavy Vehicles (%)	0%	2%	8%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	70.1	70.1		70.1	70.1			11.4			11.4	
Effective Green, g (s)	71.1	71.1		71.1	71.1			12.4			12.4	
Actuated g/C Ratio	0.79	0.79		0.79	0.79			0.14			0.14	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.0			4.0	
Vehicle Extension (s)	0.2	0.2		0.2	0.2			0.2			0.2	
Lane Grp Cap (vph)	466	2305		376	2237			200			174	
v/s Ratio Prot		c0.28			0.21							
v/s Ratio Perm	0.04			0.01				c0.09			0.03	
v/c Ratio	0.05	0.35		0.02	0.27			0.66			0.22	
Uniform Delay, d1	2.1	2.8		2.0	2.5			36.8			34.5	
Progression Factor	0.25	0.18		0.07	0.13			1.00			1.00	
Incremental Delay, d2	0.2	0.4		0.1	0.3			5.8			0.2	
Delay (s)	0.7	0.9		0.2	0.6			42.6			34.7	
Level of Service	A	A		A	A			D			C	
Approach Delay (s)		0.9			0.6			42.6			34.7	
Approach LOS		A			A			D			C	
Intersection Summary												
HCM 2000 Control Delay			5.9			HCM 2000 Level of Service			A			
HCM 2000 Volume to Capacity ratio			0.40									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			6.5			
Intersection Capacity Utilization			44.1%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

15: Broadway & Madison St/E Madison St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	107	661	23	66	475	29	0	312	129	0	265	92
Future Volume (vph)	107	661	23	66	475	29	0	312	129	0	265	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	10	12	10	10	12	12	13	12	12	13	12
Grade (%)		-9%			8%			0%			0%	
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0	5.0		4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99			1.00	1.00		0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	0.99		1.00	0.99			1.00	0.85		0.97	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)	1770	3426		1526	3118			1925	1583		1799	
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (perm)	1770	3426		1526	3118			1925	1583		1799	
Peak-hour factor, PHF	0.97	0.97	0.97	0.94	0.94	0.94	0.94	0.94	0.94	0.88	0.88	0.88
Adj. Flow (vph)	110	681	24	70	505	31	0	332	137	0	301	105
RTOR Reduction (vph)	0	2	0	0	4	0	0	0	97	0	17	0
Lane Group Flow (vph)	110	703	0	70	532	0	0	332	40	0	389	0
Confl. Peds. (#/hr)	98		62	62		62	62		62	62		62
Heavy Vehicles (%)	3%	2%	0%	6%	2%	7%	0%	2%	2%	0%	2%	5%
Turn Type	Prot	NA		Prot	NA			NA	custom		NA	
Protected Phases	5	2		1	6			4 3	3 1		8	
Permitted Phases												
Actuated Green, G (s)	9.1	39.5		8.7	39.1			26.8	26.4		26.8	
Effective Green, g (s)	10.1	40.5		9.7	40.1			27.8	26.4		27.8	
Actuated g/C Ratio	0.11	0.45		0.11	0.45			0.31	0.29		0.31	
Clearance Time (s)	5.0	5.0		5.0	5.0						5.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0						2.0	
Lane Grp Cap (vph)	198	1541		164	1389			594	464		555	
v/s Ratio Prot	c0.06	c0.21		0.05	0.17			0.17	0.03		c0.22	
v/s Ratio Perm												
v/c Ratio	0.56	0.46		0.43	0.38			0.56	0.09		0.70	
Uniform Delay, d1	37.8	17.1		37.6	16.7			26.0	23.1		27.4	
Progression Factor	0.78	0.33		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	1.8	0.9		0.7	0.8			0.7	0.0		3.3	
Delay (s)	31.2	6.6		38.2	17.5			26.6	23.1		30.7	
Level of Service	C	A		D	B			C	C		C	
Approach Delay (s)		9.9			19.9			25.6			30.7	
Approach LOS		A			B			C			C	
Intersection Summary												
HCM 2000 Control Delay			19.4			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)				18.0		
Intersection Capacity Utilization			54.2%			ICU Level of Service				A		
Analysis Period (min)			15									
c Critical Lane Group												

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↑	↕↑		↕↑	
Traffic Vol, veh/h	14	776	570	5	8	12
Future Vol, veh/h	14	776	570	5	8	12
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, %	-	-8	5	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	843	620	5	9	13
Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	625	0	-	0	1074	313
Stage 1	-	-	-	-	622	-
Stage 2	-	-	-	-	452	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	952	-	-	-	215	683
Stage 1	-	-	-	-	498	-
Stage 2	-	-	-	-	608	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	952	-	-	-	209	683
Mov Cap-2 Maneuver	-	-	-	-	209	-
Stage 1	-	-	-	-	498	-
Stage 2	-	-	-	-	590	-
Approach	EB		WB		SB	
HCM Control Delay, s	0.3		0		15.7	
HCM LOS					C	
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	952	-	-	-	358	
HCM Lane V/C Ratio	0.016	-	-	-	0.061	
HCM Control Delay (s)	8.8	0.1	-	-	15.7	
HCM Lane LOS	A	A	-	-	C	
HCM 95th %tile Q(veh)	0	-	-	-	0.2	

Intersection

Int Delay, s/veh 0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↑	↕↑		↕↑	
Traffic Vol, veh/h	10	774	570	0	0	10
Future Vol, veh/h	10	774	570	0	0	10
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, %	-	-5	2	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	841	620	0	0	11

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	620	0	1062
Stage 1	-	-	620
Stage 2	-	-	442
Critical Hdwy	4.14	-	6.84
Critical Hdwy Stg 1	-	-	5.84
Critical Hdwy Stg 2	-	-	5.84
Follow-up Hdwy	2.22	-	3.52
Pot Cap-1 Maneuver	956	-	219
Stage 1	-	-	499
Stage 2	-	-	615
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	956	-	214
Mov Cap-2 Maneuver	-	-	214
Stage 1	-	-	499
Stage 2	-	-	601

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	10.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	956	-	-	-	686
HCM Lane V/C Ratio	0.011	-	-	-	0.016
HCM Control Delay (s)	8.8	0.1	-	-	10.3
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection

Int Delay, s/veh 0

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	5	0	570	14	0	774
Future Vol, veh/h	5	0	570	14	0	774
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	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	-2	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	0	620	15	0	841

Major/Minor	Minor2		Major2		Major1	
Conflicting Flow All	1254	15	0	0	15	0
Stage 1	1254	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Critical Hdwy	6.52	6.22	4.12	-	4.12	-
Critical Hdwy Stg 1	5.52	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	4.018	3.318	2.218	-	2.218	-
Pot Cap-1 Maneuver	172	1065	-	-	1603	-
Stage 1	243	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %				-		-
Mov Cap-1 Maneuver	0	1065	-	-	1603	-
Mov Cap-2 Maneuver	0	-	-	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-

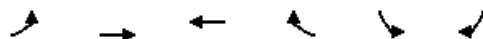
Approach	EB	WB	NE
HCM Control Delay, s			0
HCM LOS	-		

Minor Lane/Major Mvmt	NEL	NER	EBLn1	WBL	WBT
Capacity (veh/h)	1603	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	-
HCM Lane LOS	A	-	-	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

HCM Signalized Intersection Capacity Analysis

19: E Madison St & 11th Ave

7/29/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↑↑	
Traffic Volume (vph)	0	774	572	0	206	12
Future Volume (vph)	0	774	572	0	206	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	13	13	12	10	12
Grade (%)		0%	-4%		0%	
Total Lost time (s)		5.5	5.5		4.5	
Lane Util. Factor		0.95	0.95		0.97	
Frpb, ped/bikes		1.00	1.00		0.99	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	1.00		0.99	
Flt Protected		1.00	1.00		0.95	
Satd. Flow (prot)		3693	3694		3087	
Flt Permitted		1.00	1.00		0.95	
Satd. Flow (perm)		3693	3694		3087	
Peak-hour factor, PHF	0.90	0.90	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	860	650	0	234	14
RTOR Reduction (vph)	0	0	0	0	5	0
Lane Group Flow (vph)	0	860	650	0	243	0
Confl. Peds. (#/hr)	23			38		61
Confl. Bikes (#/hr)				3		17
Heavy Vehicles (%)	1%	1%	3%	3%	4%	4%
Parking (#/hr)						0
Turn Type		NA	NA		Prot	
Protected Phases		6	2		4	
Permitted Phases						
Actuated Green, G (s)		79.3	79.3		10.7	
Effective Green, g (s)		79.3	79.3		10.7	
Actuated g/C Ratio		0.79	0.79		0.11	
Clearance Time (s)		5.5	5.5		4.5	
Vehicle Extension (s)		0.2	0.2		0.2	
Lane Grp Cap (vph)		2928	2929		330	
v/s Ratio Prot		c0.23	0.18		c0.08	
v/s Ratio Perm						
v/c Ratio		0.29	0.22		0.74	
Uniform Delay, d1		2.8	2.6		43.3	
Progression Factor		1.00	0.20		1.00	
Incremental Delay, d2		0.3	0.1		7.1	
Delay (s)		3.0	0.7		50.4	
Level of Service		A	A		D	
Approach Delay (s)		3.0	0.7		50.4	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay			8.9		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.35			
Actuated Cycle Length (s)			100.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			42.2%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

20: E Madison St & 12th Ave & Union St

7/29/2016

												
Movement	NBL2	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	NEL2	NEL	NET	NER
Lane Configurations												
Traffic Volume (vph)	27	79	397	69	54	377	61	22	1	29	839	108
Future Volume (vph)	27	79	397	69	54	377	61	22	1	29	839	108
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	11	12	10	10	12	12	12	12	15	12
Grade (%)			0%			0%					4%	
Total Lost time (s)		5.0	5.0	5.0	5.5	5.5					5.5	
Lane Util. Factor		1.00	1.00	1.00	1.00	1.00					0.95	
Frpb, ped/bikes		1.00	1.00	1.00	1.00	0.94					0.99	
Flpb, ped/bikes		0.92	1.00	1.00	0.97	1.00					1.00	
Frt		1.00	1.00	0.85	1.00	0.97					0.98	
Flt Protected		0.95	1.00	1.00	0.95	1.00					1.00	
Satd. Flow (prot)		1537	1818	1599	1608	1429					3745	
Flt Permitted		0.24	1.00	1.00	0.36	1.00					0.91	
Satd. Flow (perm)		391	1818	1599	606	1429					3421	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.86	0.86	0.86	0.86	0.96	0.96	0.96	0.96
Adj. Flow (vph)	28	82	414	72	63	438	71	26	1	30	874	112
RTOR Reduction (vph)	0	0	0	42	0	2	0	0	0	0	10	0
Lane Group Flow (vph)	0	110	414	30	63	533	0	0	0	0	1008	0
Confl. Peds. (#/hr)	96	34		41	41		96	34	34	27		45
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%	2%	2%	1%	1%	1%	1%
Parking (#/hr)						0						
Turn Type	Perm	Perm	NA	Prot	Perm	NA			Perm	Perm	NA	
Protected Phases			4	4		8					6	
Permitted Phases	4	4			8				6	6		
Actuated Green, G (s)		41.0	41.0	41.0	40.5	40.5					48.5	
Effective Green, g (s)		41.0	41.0	41.0	40.5	40.5					48.5	
Actuated g/C Ratio		0.41	0.41	0.41	0.40	0.40					0.48	
Clearance Time (s)		5.0	5.0	5.0	5.5	5.5					5.5	
Lane Grp Cap (vph)		160	745	655	245	578					1659	
v/s Ratio Prot			0.23	0.02		c0.37						
v/s Ratio Perm		0.28			0.10						c0.29	
v/c Ratio		0.69	0.56	0.05	0.26	0.92					0.61	
Uniform Delay, d1		24.2	22.5	17.7	19.8	28.3					18.8	
Progression Factor		1.00	1.00	1.00	1.81	1.70					1.17	
Incremental Delay, d2		21.5	3.0	0.1	2.5	22.1					1.6	
Delay (s)		45.7	25.5	17.9	38.2	70.2					23.6	
Level of Service		D	C	B	D	E					C	
Approach Delay (s)			28.3			66.9					23.6	
Approach LOS			C			E					C	
Intersection Summary												
HCM 2000 Control Delay			35.6			HCM 2000 Level of Service			D			
HCM 2000 Volume to Capacity ratio			0.75									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			94.3%			ICU Level of Service			F			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

20: E Madison St & 12th Ave & Union St

7/29/2016



Movement	SWL	SWT	SWR	SWR2
Lane Configurations		LT		
Traffic Volume (vph)	37	464	124	32
Future Volume (vph)	37	464	124	32
Ideal Flow (vphpl)	1900	1900	1900	1900
Lane Width	12	11	12	12
Grade (%)		-8%		
Total Lost time (s)		5.5		
Lane Util. Factor		0.95		
Frpb, ped/bikes		0.96		
Flpb, ped/bikes		1.00		
Frt		0.96		
Flt Protected		1.00		
Satd. Flow (prot)		3282		
Flt Permitted		0.81		
Satd. Flow (perm)		2681		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	504	135	35
RTOR Reduction (vph)	0	4	0	0
Lane Group Flow (vph)	0	710	0	0
Confl. Peds. (#/hr)	45		34	27
Heavy Vehicles (%)	2%	2%	2%	2%
Parking (#/hr)				
Turn Type	Perm	NA		
Protected Phases		2		
Permitted Phases	2			
Actuated Green, G (s)		48.5		
Effective Green, g (s)		48.5		
Actuated g/C Ratio		0.48		
Clearance Time (s)		5.5		
Lane Grp Cap (vph)		1300		
v/s Ratio Prot				
v/s Ratio Perm		0.27		
v/c Ratio		0.55		
Uniform Delay, d1		18.0		
Progression Factor		1.72		
Incremental Delay, d2		1.6		
Delay (s)		32.7		
Level of Service		C		
Approach Delay (s)		32.7		
Approach LOS		C		
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

22: 13th Ave & E Madison St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	707	0	0	447	4	122	42	9	9	0	23
Future Volume (vph)	25	707	0	0	447	4	122	42	9	9	0	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	11	12	16	16	12	12	13	12
Grade (%)		8%			-7%			0%			0%	
Total Lost time (s)		4.5			4.5		4.5	4.5			4.5	
Lane Util. Factor		0.95			0.95		0.95	0.95			1.00	
Frpb, ped/bikes		1.00			1.00		1.00	0.99			0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00			0.98	
Frt		1.00			1.00		1.00	0.98			0.90	
Flt Protected		1.00			1.00		0.95	0.98			0.99	
Satd. Flow (prot)		3191			3533		1865	1876			1667	
Flt Permitted		0.93			1.00		0.73	0.88			0.94	
Satd. Flow (perm)		2962			3533		1440	1688			1584	
Peak-hour factor, PHF	0.90	0.90	0.90	0.95	0.95	0.95	0.87	0.87	0.87	0.89	0.89	0.89
Adj. Flow (vph)	28	786	0	0	471	4	140	48	10	10	0	26
RTOR Reduction (vph)	0	0	0	0	1	0	0	4	0	0	19	0
Lane Group Flow (vph)	0	814	0	0	474	0	98	96	0	0	17	0
Confl. Peds. (#/hr)	28		29	29		28	1		52	52		1
Confl. Bikes (#/hr)												6
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	4%	4%	4%	1%	1%	1%
Parking (#/hr)									0			0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			4	
Permitted Phases	6						4			4		
Actuated Green, G (s)		63.5			63.5		27.5	27.5			27.5	
Effective Green, g (s)		63.5			63.5		27.5	27.5			27.5	
Actuated g/C Ratio		0.64			0.64		0.28	0.28			0.28	
Clearance Time (s)		4.5			4.5		4.5	4.5			4.5	
Lane Grp Cap (vph)		1880			2243		396	464			435	
v/s Ratio Prot					0.13							
v/s Ratio Perm		0.27					0.07	0.06			0.01	
v/c Ratio		0.43			0.21		0.25	0.21			0.04	
Uniform Delay, d1		9.2			7.7		28.2	27.9			26.6	
Progression Factor		0.34			1.11		0.68	0.67			1.00	
Incremental Delay, d2		0.6			0.2		1.5	1.0			0.2	
Delay (s)		3.8			8.8		20.7	19.6			26.7	
Level of Service		A			A		C	B			C	
Approach Delay (s)		3.8			8.8			20.2			26.7	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			8.0				HCM 2000 Level of Service			A		
HCM 2000 Volume to Capacity ratio			0.38									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)			9.0		
Intersection Capacity Utilization			57.4%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

23: 14th Ave & E Madison St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	672	51	58	459	0	14	215	53	2	169	12
Future Volume (vph)	0	672	51	58	459	0	14	215	53	2	169	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	12	16	12	12	16	12
Grade (%)		7%			-10%			0%			0%	
Total Lost time (s)		4.5			4.5			8.5			4.5	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			1.00			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			1.00			0.97			0.99	
Flt Protected		1.00			0.99			1.00			1.00	
Satd. Flow (prot)		3275			3600			2058			2061	
Flt Permitted		1.00			0.76			0.98			1.00	
Satd. Flow (perm)		3275			2737			2020			2058	
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.85	0.85	0.85	0.86	0.86	0.86
Adj. Flow (vph)	0	730	55	64	504	0	16	253	62	2	197	14
RTOR Reduction (vph)	0	5	0	0	0	0	0	8	0	0	3	0
Lane Group Flow (vph)	0	780	0	0	568	0	0	323	0	0	210	0
Confl. Peds. (#/hr)	3		31	31		3	37		10	10		37
Confl. Bikes (#/hr)			7			3			1			1
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Parking (#/hr)									0			0
Turn Type		NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		1			1			3			6	
Permitted Phases	1			1			3			6		
Actuated Green, G (s)		46.5			46.5			40.5			44.5	
Effective Green, g (s)		46.5			46.5			40.5			44.5	
Actuated g/C Ratio		0.46			0.46			0.40			0.44	
Clearance Time (s)		4.5			4.5			8.5			4.5	
Lane Grp Cap (vph)		1522			1272			818			915	
v/s Ratio Prot		c0.24										
v/s Ratio Perm					0.21			c0.16			0.10	
v/c Ratio		0.51			0.45			0.39			0.23	
Uniform Delay, d1		18.8			18.1			21.1			17.2	
Progression Factor		0.88			0.13			0.88			0.69	
Incremental Delay, d2		1.1			1.1			1.4			0.6	
Delay (s)		17.7			3.3			19.9			12.4	
Level of Service		B			A			B			B	
Approach Delay (s)		17.7			3.3			19.9			12.4	
Approach LOS		B			A			B			B	
Intersection Summary												
HCM 2000 Control Delay			13.2			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.46									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			13.0			
Intersection Capacity Utilization			74.5%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

24: E Madison St & Pike St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations								 			 	
Traffic Volume (vph)	25	4	0	0	0	0	0	708	19	1	537	36
Future Volume (vph)	25	4	0	0	0	0	0	708	19	1	537	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	16	12	12	12	12	12	12	12	12	11	12
Grade (%)		6%			0%			10%			-10%	
Total Lost time (s)	4.5	4.5						4.5			4.5	
Lane Util. Factor	0.95	0.95						0.95			0.95	
Frt	1.00	1.00						1.00			0.99	
Flt Protected	0.95	0.96						1.00			1.00	
Satd. Flow (prot)	1522	1688						3349			3558	
Flt Permitted	0.95	0.96						1.00			0.95	
Satd. Flow (perm)	1522	1688						3349			3396	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	27	4	0	0	0	0	0	770	21	1	584	39
RTOR Reduction (vph)	0	0	0	0	0	0	0	2	0	0	5	0
Lane Group Flow (vph)	15	16	0	0	0	0	0	789	0	0	619	0
Parking (#/hr)		0							0			
Turn Type	Perm	NA						NA		Perm	NA	
Protected Phases		6						1			1	
Permitted Phases	6									1		
Actuated Green, G (s)	44.5	44.5						46.5			46.5	
Effective Green, g (s)	44.5	44.5						46.5			46.5	
Actuated g/C Ratio	0.44	0.44						0.46			0.46	
Clearance Time (s)	4.5	4.5						4.5			4.5	
Lane Grp Cap (vph)	677	751						1557			1579	
v/s Ratio Prot								c0.24				
v/s Ratio Perm	c0.01	0.01									0.18	
v/c Ratio	0.02	0.02						0.51			0.39	
Uniform Delay, d1	15.6	15.5						18.7			17.5	
Progression Factor	1.41	1.40						0.13			0.60	
Incremental Delay, d2	0.1	0.1						1.0			0.7	
Delay (s)	21.9	21.9						3.5			11.3	
Level of Service	C	C						A			B	
Approach Delay (s)		21.9			0.0			3.5			11.3	
Approach LOS		C			A			A			B	
Intersection Summary												
HCM 2000 Control Delay		7.2						HCM 2000 Level of Service		A		
HCM 2000 Volume to Capacity ratio		0.28										
Actuated Cycle Length (s)		100.0						Sum of lost time (s)		13.0		
Intersection Capacity Utilization		33.5%						ICU Level of Service		A		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

25: E Madison St & 15th Ave

7/29/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔↔	↔↔			↔
Traffic Volume (vph)	63	670	479	13	0	125
Future Volume (vph)	63	670	479	13	0	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	12	12	16
Grade (%)		10%	-9%		0%	
Total Lost time (s)		4.5	4.5			4.0
Lane Util. Factor		0.95	0.95			1.00
Frpb, ped/bikes		1.00	1.00			0.99
Flpb, ped/bikes		1.00	1.00			1.00
Frt		1.00	1.00			0.86
Flt Protected		1.00	1.00			1.00
Satd. Flow (prot)		3264	3591			1752
Flt Permitted		0.84	1.00			1.00
Satd. Flow (perm)		2769	3591			1752
Peak-hour factor, PHF	0.93	0.93	0.85	0.85	0.85	0.85
Adj. Flow (vph)	68	720	564	15	0	147
RTOR Reduction (vph)	0	0	1	0	0	0
Lane Group Flow (vph)	0	788	578	0	0	147
Confl. Peds. (#/hr)	59			59	47	1
Confl. Bikes (#/hr)				2		
Heavy Vehicles (%)	1%	1%	1%	1%	5%	5%
Parking (#/hr)				0		
Turn Type	Perm	NA	NA			Free
Protected Phases		2	6			
Permitted Phases	2					Free
Actuated Green, G (s)		80.0	80.0			100.0
Effective Green, g (s)		80.0	80.0			100.0
Actuated g/C Ratio		0.80	0.80			1.00
Clearance Time (s)		4.5	4.5			
Vehicle Extension (s)		0.2	0.2			
Lane Grp Cap (vph)		2215	2872			1752
v/s Ratio Prot			0.16			
v/s Ratio Perm		c0.28				c0.08
v/c Ratio		0.36	0.20			0.08
Uniform Delay, d1		2.8	2.4			0.0
Progression Factor		0.18	0.47			1.00
Incremental Delay, d2		0.4	0.2			0.1
Delay (s)		0.9	1.3			0.1
Level of Service		A	A			A
Approach Delay (s)		0.9	1.3		0.1	
Approach LOS		A	A		A	
Intersection Summary						
HCM 2000 Control Delay			1.0		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.34			
Actuated Cycle Length (s)			100.0		Sum of lost time (s)	12.0
Intersection Capacity Utilization			48.6%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑	
Traffic Vol, veh/h	670	5	0	493	5	15
Future Vol, veh/h	670	5	0	493	5	15
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, %	9	-	-	-9	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	728	5	0	536	5	16
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	999	367
Stage 1	-	-	-	-	731	-
Stage 2	-	-	-	-	268	-
Critical Hdwy	-	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	0	-	240	630
Stage 1	-	-	0	-	437	-
Stage 2	-	-	0	-	753	-
Platoon blocked, %	-	-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	240	630
Mov Cap-2 Maneuver	-	-	-	-	240	-
Stage 1	-	-	-	-	437	-
Stage 2	-	-	-	-	753	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		13.4	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	448	-	-	-		
HCM Lane V/C Ratio	0.049	-	-	-		
HCM Control Delay (s)	13.4	-	-	-		
HCM Lane LOS	B	-	-	-		
HCM 95th %tile Q(veh)	0.2	-	-	-		

HCM Signalized Intersection Capacity Analysis

27: E Madison St & Pine St

7/29/2016

						
Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		 	 			
Traffic Volume (vph)	16	669	488	197	230	5
Future Volume (vph)	16	669	488	197	230	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	11	11
Grade (%)		9%	-4%		0%	
Total Lost time (s)		4.5	4.5		4.5	4.5
Lane Util. Factor		0.95	0.95		1.00	1.00
Frpb, ped/bikes		1.00	0.97		1.00	0.88
Flpb, ped/bikes		1.00	1.00		1.00	1.00
Frt		1.00	0.96		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3180	3127		1678	1193
Flt Permitted		0.93	1.00		0.95	1.00
Satd. Flow (perm)		2967	3127		1678	1193
Peak-hour factor, PHF	0.95	0.95	0.94	0.94	0.90	0.90
Adj. Flow (vph)	17	704	519	210	256	6
RTOR Reduction (vph)	0	0	28	0	0	5
Lane Group Flow (vph)	0	721	701	0	256	1
Confl. Peds. (#/hr)	62			62	1	43
Confl. Bikes (#/hr)				3		8
Heavy Vehicles (%)	1%	1%	2%	2%	4%	4%
Parking (#/hr)						0
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		2	2		4	
Permitted Phases	2					4
Actuated Green, G (s)		72.6	72.6		18.4	18.4
Effective Green, g (s)		72.6	72.6		18.4	18.4
Actuated g/C Ratio		0.73	0.73		0.18	0.18
Clearance Time (s)		4.5	4.5		4.5	4.5
Vehicle Extension (s)		0.2	0.2		0.2	0.2
Lane Grp Cap (vph)		2154	2270		308	219
v/s Ratio Prot			0.22		c0.15	
v/s Ratio Perm		c0.24				0.00
v/c Ratio		0.33	0.31		0.83	0.01
Uniform Delay, d1		5.0	4.8		39.3	33.3
Progression Factor		0.13	0.45		1.00	1.00
Incremental Delay, d2		0.4	0.3		16.4	0.0
Delay (s)		1.0	2.5		55.7	33.3
Level of Service		A	A		E	C
Approach Delay (s)		1.0	2.5		55.2	
Approach LOS		A	A		E	
Intersection Summary						
HCM 2000 Control Delay			10.0		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.43			
Actuated Cycle Length (s)			100.0		Sum of lost time (s)	9.0
Intersection Capacity Utilization			50.2%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

28: 17th Ave & E Madison St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	76	800	41	16	577	50	47	32	11	57	51	56
Future Volume (vph)	76	800	41	16	577	50	47	32	11	57	51	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	10	12	10	12	12	16	12
Grade (%)		4%			4%			0%			0%	
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			0.98			0.97			0.91	
Flpb, ped/bikes		0.99			1.00			0.93			0.94	
Frt		0.99			0.99			0.98			0.95	
Flt Protected		1.00			1.00			0.97			0.98	
Satd. Flow (prot)		3304			3241			1523			1723	
Flt Permitted		0.82			0.92			0.63			0.83	
Satd. Flow (perm)		2726			2986			988			1455	
Peak-hour factor, PHF	0.92	0.92	0.92	0.96	0.96	0.96	0.80	0.80	0.80	0.93	0.93	0.93
Adj. Flow (vph)	83	870	45	17	601	52	59	40	14	61	55	60
RTOR Reduction (vph)	0	3	0	0	5	0	0	6	0	0	20	0
Lane Group Flow (vph)	0	995	0	0	665	0	0	107	0	0	156	0
Confl. Peds. (#/hr)	95		44	44		95	120		113	113		120
Confl. Bikes (#/hr)			17			23			3			11
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		76.1			76.1			14.9			14.9	
Effective Green, g (s)		76.1			76.1			14.9			14.9	
Actuated g/C Ratio		0.76			0.76			0.15			0.15	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		0.2			0.2			3.0			3.0	
Lane Grp Cap (vph)		2074			2272			147			216	
v/s Ratio Prot												
v/s Ratio Perm		c0.37			0.22			c0.11			0.11	
v/c Ratio		0.48			0.29			0.73			0.72	
Uniform Delay, d1		4.5			3.7			40.6			40.6	
Progression Factor		0.82			1.26			1.00			1.00	
Incremental Delay, d2		0.8			0.3			16.4			11.2	
Delay (s)		4.4			5.0			57.0			51.8	
Level of Service		A			A			E			D	
Approach Delay (s)		4.4			5.0			57.0			51.8	
Approach LOS		A			A			E			D	
Intersection Summary												
HCM 2000 Control Delay			11.9				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.52									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)			9.0		
Intersection Capacity Utilization			68.0%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

Intersection												
Int Delay, s/veh	0.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↔↔			↔			↔	
Traffic Vol, veh/h	14	882	40	2	615	3	9	2	5	4	2	19
Future Vol, veh/h	14	882	40	2	615	3	9	2	5	4	2	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-4	-	-	11	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	15	959	43	2	668	3	10	2	5	4	2	21
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	672	0	0	1002	0	0	1351	1687	501	1185	1707	336
Stage 1	-	-	-	-	-	-	1011	1011	-	674	674	-
Stage 2	-	-	-	-	-	-	340	676	-	511	1033	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	915	-	-	687	-	-	109	93	515	144	90	660
Stage 1	-	-	-	-	-	-	257	315	-	410	452	-
Stage 2	-	-	-	-	-	-	648	451	-	514	308	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	915	-	-	687	-	-	100	89	515	135	86	660
Mov Cap-2 Maneuver	-	-	-	-	-	-	100	89	-	135	86	-
Stage 1	-	-	-	-	-	-	247	303	-	395	450	-
Stage 2	-	-	-	-	-	-	622	449	-	486	297	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.3			0			36.6			17.9		
HCM LOS							E			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	131	915	-	-	687	-	-	306				
HCM Lane V/C Ratio	0.133	0.017	-	-	0.003	-	-	0.089				
HCM Control Delay (s)	36.6	9	0.2	-	10.3	0	-	17.9				
HCM Lane LOS	E	A	A	-	B	A	-	C				
HCM 95th %tile Q(veh)	0.4	0.1	-	-	0	-	-	0.3				

HCM Signalized Intersection Capacity Analysis

30: 19th Ave & E Madison St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	108	751	32	3	543	21	23	137	19	23	113	54
Future Volume (vph)	108	751	32	3	543	21	23	137	19	23	113	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	12	16	12	12	16	12
Grade (%)		-11%			8%			0%			0%	
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			1.00			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.96	
Flt Protected		0.99			1.00			0.99			0.99	
Satd. Flow (prot)		3571			3286			2083			1956	
Flt Permitted		0.78			0.95			0.85			0.87	
Satd. Flow (perm)		2812			3129			1778			1704	
Peak-hour factor, PHF	0.99	0.99	0.99	0.98	0.98	0.98	0.86	0.86	0.86	0.91	0.91	0.91
Adj. Flow (vph)	109	759	32	3	554	21	27	159	22	25	124	59
RTOR Reduction (vph)	0	1	0	0	2	0	0	6	0	0	19	0
Lane Group Flow (vph)	0	899	0	0	576	0	0	202	0	0	189	0
Confl. Peds. (#/hr)	26		40	40		26	7		2	2		7
Confl. Bikes (#/hr)			8			4			1			12
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	4%	4%	4%
Parking (#/hr)									0			0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		72.3			72.3			15.7			15.7	
Effective Green, g (s)		72.3			72.3			15.7			15.7	
Actuated g/C Ratio		0.72			0.72			0.16			0.16	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		0.2			0.2			3.0			3.0	
Lane Grp Cap (vph)		2033			2262			279			267	
v/s Ratio Prot												
v/s Ratio Perm		c0.32			0.18			c0.11			0.11	
v/c Ratio		0.44			0.25			0.72			0.71	
Uniform Delay, d1		5.6			4.7			40.1			40.0	
Progression Factor		1.55			1.80			1.00			1.00	
Incremental Delay, d2		0.6			0.3			9.0			8.4	
Delay (s)		9.4			8.7			49.1			48.3	
Level of Service		A			A			D			D	
Approach Delay (s)		9.4			8.7			49.1			48.3	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			17.8			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.49									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			69.9%			ICU Level of Service			C			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

31: 20th Ave & E Olive St & E Madison St

7/29/2016

												
Movement	EBL	EBT	EBR	EBR2	WBL	WBT	WBR	NBR2	SBL2	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	707	121	10	4	500	6	22	1	2	2	14
Future Volume (vph)	9	707	121	10	4	500	6	22	1	2	2	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	10	12	12	12	12	13	12
Grade (%)		-8%				3%					0%	
Total Lost time (s)		4.5				4.5		4.0			4.5	
Lane Util. Factor		0.95				0.95		1.00			1.00	
Frpb, ped/bikes		0.99				1.00		1.00			0.98	
Flpb, ped/bikes		1.00				1.00		1.00			0.99	
Frt		0.98				1.00		0.86			0.90	
Flt Protected		1.00				1.00		1.00			0.99	
Satd. Flow (prot)		3597				3275		1465			1692	
Flt Permitted		0.95				0.95		1.00			0.99	
Satd. Flow (perm)		3418				3115		1465			1692	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.94	0.94	0.94	0.79	0.59	0.59	0.59	0.59
Adj. Flow (vph)	9	729	125	10	4	532	6	28	2	3	3	24
RTOR Reduction (vph)	0	1	0	0	0	1	0	0	0	0	23	0
Lane Group Flow (vph)	0	872	0	0	0	541	0	28	0	0	9	0
Confl. Peds. (#/hr)	29		10	2	2		29		12	10		7
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Parking (#/hr)			0					0				0
Turn Type	Perm	NA			Perm	NA		Free	Perm	Perm	NA	
Protected Phases		2				2					4	
Permitted Phases	2				2			Free	4	4		
Actuated Green, G (s)		74.1				74.1		100.0			4.3	
Effective Green, g (s)		74.1				74.1		100.0			4.3	
Actuated g/C Ratio		0.74				0.74		1.00			0.04	
Clearance Time (s)		4.5				4.5					4.5	
Vehicle Extension (s)		0.2				0.2					2.0	
Lane Grp Cap (vph)		2532				2308		1465			72	
v/s Ratio Prot												
v/s Ratio Perm		0.26				0.17		0.02			0.01	
v/c Ratio		0.34				0.23		0.02			0.13	
Uniform Delay, d1		4.5				4.1		0.0			46.0	
Progression Factor		0.57				0.98		1.00			1.00	
Incremental Delay, d2		0.3				0.2		0.0			0.3	
Delay (s)		2.9				4.2		0.0			46.3	
Level of Service		A				A		A			D	
Approach Delay (s)		2.9				4.2					46.3	
Approach LOS		A				A					D	
Intersection Summary												
HCM 2000 Control Delay		7.1				HCM 2000 Level of Service		A				
HCM 2000 Volume to Capacity ratio		0.33										
Actuated Cycle Length (s)		100.0				Sum of lost time (s)		13.5				
Intersection Capacity Utilization		55.9%				ICU Level of Service		B				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

31: 20th Ave & E Olive St & E Madison St

7/29/2016



Movement	NWL	NWR	NWR2
Lane Configurations			
Traffic Volume (vph)	85	4	3
Future Volume (vph)	85	4	3
Ideal Flow (vphpl)	1900	1900	1900
Lane Width	16	12	12
Grade (%)	0%		
Total Lost time (s)	4.5		
Lane Util. Factor	1.00		
Frpb, ped/bikes	0.99		
Flpb, ped/bikes	1.00		
Frt	0.99		
Flt Protected	0.96		
Satd. Flow (prot)	1990		
Flt Permitted	0.96		
Satd. Flow (perm)	1990		
Peak-hour factor, PHF	0.82	0.82	0.82
Adj. Flow (vph)	104	5	4
RTOR Reduction (vph)	60	0	0
Lane Group Flow (vph)	53	0	0
Confl. Peds. (#/hr)		29	12
Heavy Vehicles (%)	1%	1%	1%
Parking (#/hr)		0	0
Turn Type	Prot		
Protected Phases	1		
Permitted Phases			
Actuated Green, G (s)	8.1		
Effective Green, g (s)	8.1		
Actuated g/C Ratio	0.08		
Clearance Time (s)	4.5		
Vehicle Extension (s)	2.0		
Lane Grp Cap (vph)	161		
v/s Ratio Prot	c0.03		
v/s Ratio Perm			
v/c Ratio	0.33		
Uniform Delay, d1	43.4		
Progression Factor	1.00		
Incremental Delay, d2	0.4		
Delay (s)	43.8		
Level of Service	D		
Approach Delay (s)	43.8		
Approach LOS	D		
Intersection Summary			

HCM Signalized Intersection Capacity Analysis

32: 22nd Ave/E Denny Way & E Madison St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	3	702	37	18	483	19	10	25	1	22	20	26
Future Volume (vph)	3	702	37	18	483	19	10	25	1	22	20	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	12	10	12	12	12	12	12	11	12
Grade (%)		-3%			1%			0%			0%	
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			1.00			0.97	
Flpb, ped/bikes		1.00			1.00			0.99			1.00	
Frt		0.99			0.99			1.00			0.95	
Flt Protected		1.00			1.00			0.99			0.98	
Satd. Flow (prot)		3703			3290			1838			1630	
Flt Permitted		0.95			0.92			0.83			0.91	
Satd. Flow (perm)		3533			3017			1554			1500	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.64	0.64	0.64	0.77	0.77	0.77
Adj. Flow (vph)	3	789	42	20	543	21	16	39	2	29	26	34
RTOR Reduction (vph)	0	2	0	0	1	0	0	2	0	0	29	0
Lane Group Flow (vph)	0	832	0	0	583	0	0	55	0	0	60	0
Confl. Peds. (#/hr)	2		25	25		2	39		4	4		39
Confl. Bikes (#/hr)			1						10			2
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	2%	2%	2%
Parking (#/hr)			0			0			0			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		83.8			83.8			7.2			7.2	
Effective Green, g (s)		83.8			83.8			7.2			7.2	
Actuated g/C Ratio		0.84			0.84			0.07			0.07	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		0.2			0.2			1.0			1.0	
Lane Grp Cap (vph)		2960			2528			111			108	
v/s Ratio Prot												
v/s Ratio Perm		c0.24			0.19			0.04			c0.04	
v/c Ratio		0.28			0.23			0.50			0.56	
Uniform Delay, d1		1.7			1.6			44.7			44.9	
Progression Factor		0.10			0.73			1.00			1.00	
Incremental Delay, d2		0.2			0.2			1.3			3.5	
Delay (s)		0.4			1.4			45.9			48.4	
Level of Service		A			A			D			D	
Approach Delay (s)		0.4			1.4			45.9			48.4	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			5.2			HCM 2000 Level of Service			A			
HCM 2000 Volume to Capacity ratio			0.30									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			9.0			
Intersection Capacity Utilization			48.6%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group

Intersection						
Int Delay, s/veh	0.4					
Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	0	12	24	714	489	10
Future Vol, veh/h	0	12	24	714	489	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	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	-1	5	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	13	26	776	532	11
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	977	271	542	0	-	0
Stage 1	537	-	-	-	-	-
Stage 2	440	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	248	727	1023	-	-	-
Stage 1	550	-	-	-	-	-
Stage 2	616	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	237	727	1023	-	-	-
Mov Cap-2 Maneuver	237	-	-	-	-	-
Stage 1	550	-	-	-	-	-
Stage 2	588	-	-	-	-	-
Approach	SB	NE		SW		
HCM Control Delay, s	10	0.5		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NEL	NET	SBLn1	SWT	SWR	
Capacity (veh/h)	1023	-	727	-	-	
HCM Lane V/C Ratio	0.026	-	0.018	-	-	
HCM Control Delay (s)	8.6	0.2	10	-	-	
HCM Lane LOS	A	A	B	-	-	
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-	

HCM Signalized Intersection Capacity Analysis

34: E Madison St & 23rd Ave E

7/29/2016

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	0	575	33	0	624	114	190	529	33	59	350	11
Future Volume (vph)	0	575	33	0	624	114	190	529	33	59	350	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	9	9	10	10	10	10	16	10	9	10	10
Grade (%)		0%			0%			-5%			10%	
Total Lost time (s)		3.0			3.0		3.0	3.0		3.0	4.5	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	0.95	
Frpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.98		1.00	0.99		1.00	0.99	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3179			3254		1693	2145		1528	3109	
Flt Permitted		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		3179			3254		1693	2145		1528	3109	
Peak-hour factor, PHF	0.92	0.87	0.69	0.25	0.91	0.92	0.92	0.92	0.92	0.64	0.92	0.46
Adj. Flow (vph)	0	661	48	0	686	124	207	575	36	92	380	24
RTOR Reduction (vph)	0	5	0	0	15	0	0	2	0	0	4	0
Lane Group Flow (vph)	0	704	0	0	796	0	207	609	0	92	400	0
Confl. Peds. (#/hr)			2	2								3
Heavy Vehicles (%)	2%	1%	1%	1%	1%	2%	2%	2%	2%	1%	2%	1%
Parking (#/hr)			0									0
Turn Type		NA			NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)		40.0			40.0		17.5	36.8		9.2	28.5	
Effective Green, g (s)		42.0			42.0		19.0	38.3		10.7	28.5	
Actuated g/C Ratio		0.42			0.42		0.19	0.38		0.11	0.28	
Clearance Time (s)		5.0			5.0		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		0.2			0.2		3.0	0.2		2.0	3.0	
Lane Grp Cap (vph)		1335			1366		321	821		163	886	
v/s Ratio Prot		0.22			c0.24		0.12	c0.28		c0.06	0.13	
v/s Ratio Perm												
v/c Ratio		0.53			0.58		0.64	0.74		0.56	0.45	
Uniform Delay, d1		21.6			22.3		37.4	26.6		42.4	29.3	
Progression Factor		0.87			1.96		1.32	0.88		1.35	1.45	
Incremental Delay, d2		1.3			1.2		4.3	5.9		2.3	1.5	
Delay (s)		20.1			44.8		53.7	29.2		59.4	44.1	
Level of Service		C			D		D	C		E	D	
Approach Delay (s)		20.1			44.8			35.4			46.9	
Approach LOS		C			D			D			D	
Intersection Summary												
HCM 2000 Control Delay			36.3				HCM 2000 Level of Service			D		
HCM 2000 Volume to Capacity ratio			0.66									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)			10.5		
Intersection Capacity Utilization			66.6%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

35: E Madison St & E JOHN ST

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	137	140	10	0	127	6	22	447	6	3	345	206
Future Volume (vph)	137	140	10	0	127	6	22	447	6	3	345	206
Ideal Flow (vphpl)	1900	1900	1900	1750	1750	1750	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	10	12	16	12	12	16	12
Grade (%)		-15%			0%			-10%			10%	
Total Lost time (s)		2.5	5.5		2.5			2.5			2.5	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.98		1.00			1.00			0.94	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		0.99			1.00			0.95	
Flt Protected		0.98	1.00		1.00			1.00			1.00	
Satd. Flow (prot)		1824	1503		1621			2248			1746	
Flt Permitted		0.98	1.00		1.00			0.96			1.00	
Satd. Flow (perm)		1824	1503		1621			2171			1744	
Peak-hour factor, PHF	0.83	0.83	0.83	0.72	0.72	0.72	0.91	0.91	0.91	0.95	0.95	0.95
Adj. Flow (vph)	165	169	12	0	176	8	24	491	7	3	363	217
RTOR Reduction (vph)	0	0	9	0	2	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	334	3	0	182	0	0	521	0	0	583	0
Confl. Peds. (#/hr)	9					9	40		26	26		40
Confl. Bikes (#/hr)			7									6
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	4%	4%	4%
Parking (#/hr)			0						0			0
Turn Type	Split	NA	Perm		NA		Perm	NA		Perm	NA	
Protected Phases	3	3		4	4			2			2	
Permitted Phases		3	3				2	2		2		
Actuated Green, G (s)		22.1	22.1		14.8			46.6			46.6	
Effective Green, g (s)		25.1	22.1		17.8			49.6			49.6	
Actuated g/C Ratio		0.25	0.22		0.18			0.50			0.50	
Clearance Time (s)		5.5	5.5		5.5			5.5			5.5	
Vehicle Extension (s)		2.0	2.0		2.0			0.2			0.2	
Lane Grp Cap (vph)		457	332		288			1076			865	
v/s Ratio Prot		c0.18			c0.11							
v/s Ratio Perm			0.00					0.24			c0.33	
v/c Ratio		0.73	0.01		0.63			0.48			0.67	
Uniform Delay, d1		34.4	30.4		38.1			16.7			19.1	
Progression Factor		1.34	1.00		1.00			0.91			1.28	
Incremental Delay, d2		2.9	0.0		3.3			1.1			4.0	
Delay (s)		48.9	30.4		41.4			16.2			28.4	
Level of Service		D	C		D			B			C	
Approach Delay (s)		48.2			41.4			16.2			28.4	
Approach LOS		D			D			B			C	
Intersection Summary												
HCM 2000 Control Delay			30.2				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.68									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)		7.5			
Intersection Capacity Utilization			73.8%				ICU Level of Service		D			
Analysis Period (min)			15									

c Critical Lane Group

Intersection												
Int Delay, s/veh	3.9											
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	21	14	15	26	10	25	511	10	10	490	13
Future Vol, veh/h	5	21	14	15	26	10	25	511	10	10	490	13
Conflicting Peds, #/hr	6	0	3	3	0	6	23	0	36	36	0	23
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	2	-	-	1	-	-	-10	-	-	14	-
Peak Hour Factor	71	71	71	75	75	75	98	98	98	96	96	96
Heavy Vehicles, %	0	0	0	0	0	0	2	2	2	2	2	2
Mvmt Flow	7	30	20	20	35	13	26	521	10	10	510	14
Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	1182	1182	566	1166	1180	546	547	0	0	568	0	0
Stage 1	614	614	-	561	561	-	-	-	-	-	-	-
Stage 2	568	568	-	605	619	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.9	6.4	7.3	6.7	6.3	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.5	5.9	-	6.3	5.7	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.9	-	6.3	5.7	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	147	168	511	162	180	533	1022	-	-	1004	-	-
Stage 1	451	454	-	500	498	-	-	-	-	-	-	-
Stage 2	480	478	-	472	467	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	111	152	494	125	163	519	1015	-	-	1001	-	-
Mov Cap-2 Maneuver	111	152	-	125	163	-	-	-	-	-	-	-
Stage 1	422	425	-	473	482	-	-	-	-	-	-	-
Stage 2	425	462	-	405	437	-	-	-	-	-	-	-
Approach	NB			SB			NE			SW		
HCM Control Delay, s	31.9			39.3			0.4			0.2		
HCM LOS	D			E								
Minor Lane/Major Mvmt	NEL	NET	NER	NBLn1	SBLn1	SWL	SWT	SWR				
Capacity (veh/h)	1015	-	-	189	171	1001	-	-				
HCM Lane V/C Ratio	0.025	-	-	0.298	0.398	0.01	-	-				
HCM Control Delay (s)	8.6	0	-	31.9	39.3	8.6	0	-				
HCM Lane LOS	A	A	-	D	E	A	A	-				
HCM 95th %tile Q(veh)	0.1	-	-	1.2	1.7	0	-	-				

Intersection						
Int Delay, s/veh	0.5					
Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	2	14	20	503	507	3
Future Vol, veh/h	2	14	20	503	507	3
Conflicting Peds, #/hr	3	0	27	0	0	27
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	-14	10	-
Peak Hour Factor	50	50	92	92	95	95
Heavy Vehicles, %	0	0	2	2	2	2
Mvmt Flow	4	28	22	547	534	3
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1155	562	564	0	-	0
Stage 1	562	-	-	-	-	-
Stage 2	593	-	-	-	-	-
Critical Hdwy	5.8	5.9	4.12	-	-	-
Critical Hdwy Stg 1	4.8	-	-	-	-	-
Critical Hdwy Stg 2	4.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	266	556	1008	-	-	-
Stage 1	631	-	-	-	-	-
Stage 2	614	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	246	543	1008	-	-	-
Mov Cap-2 Maneuver	246	-	-	-	-	-
Stage 1	617	-	-	-	-	-
Stage 2	582	-	-	-	-	-
Approach	SE	NE		SW		
HCM Control Delay, s	13.2	0.3		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NEL	NET	SELn1	SWT	SWR	
Capacity (veh/h)	1008	-	472	-	-	
HCM Lane V/C Ratio	0.022	-	0.068	-	-	
HCM Control Delay (s)	8.7	0	13.2	-	-	
HCM Lane LOS	A	A	B	-	-	
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-	

Intersection						
Int Delay, s/veh	0.7					
Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	7	24	451	43	8	492
Future Vol, veh/h	7	24	451	43	8	492
Conflicting Peds, #/hr	4	0	0	31	31	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	-10	-	-	8
Peak Hour Factor	65	65	93	93	96	96
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	11	37	485	46	8	513
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1072	539	0	0	562	0
Stage 1	539	-	-	-	-	-
Stage 2	533	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.12	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.218	-
Pot Cap-1 Maneuver	246	546	-	-	1009	-
Stage 1	589	-	-	-	-	-
Stage 2	593	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	237	532	-	-	1009	-
Mov Cap-2 Maneuver	237	-	-	-	-	-
Stage 1	574	-	-	-	-	-
Stage 2	586	-	-	-	-	-
Approach	NW		NE		SW	
HCM Control Delay, s	14.8		0		0.1	
HCM LOS	B					
Minor Lane/Major Mvmt	NET	NERNWLn1	SWL	SWT		
Capacity (veh/h)	-	-	415	1009	-	
HCM Lane V/C Ratio	-	-	0.115	0.008	-	
HCM Control Delay (s)	-	-	14.8	8.6	-	
HCM Lane LOS	-	-	B	A	-	
HCM 95th %tile Q(veh)	-	-	0.4	0	-	

HCM Unsignalized Intersection Capacity Analysis

39: E Madison St & 27th Ave E

7/29/2016

						
Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (veh/h)	2	21	16	459	479	10
Future Volume (Veh/h)	2	21	16	459	479	10
Sign Control	Stop			Free	Free	
Grade	0%			-8%	4%	
Peak Hour Factor	0.82	0.82	0.93	0.93	0.96	0.96
Hourly flow rate (vph)	2	26	17	494	499	10
Pedestrians	19				19	
Lane Width (ft)	12.0				16.0	
Walking Speed (ft/s)	4.0				4.0	
Percent Blockage	2				2	
Right turn flare (veh)						
Median type				TWLTL	TWLTL	
Median storage (veh)				2	2	
Upstream signal (ft)					293	
pX, platoon unblocked	0.88	0.88	0.88			
vC, conflicting volume	1070	523	528			
vC1, stage 1 conf vol	523					
vC2, stage 2 conf vol	547					
vCu, unblocked vol	1012	392	398			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	95	98			
cM capacity (veh/h)	449	574	1003			
Direction, Lane #	SE 1	NE 1	NE 2	SW 1		
Volume Total	28	17	494	509		
Volume Left	2	17	0	0		
Volume Right	26	0	0	10		
cSH	563	1003	1700	1700		
Volume to Capacity	0.05	0.02	0.29	0.30		
Queue Length 95th (ft)	4	1	0	0		
Control Delay (s)	11.7	8.7	0.0	0.0		
Lane LOS	B	A				
Approach Delay (s)	11.7	0.3		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			35.9%	ICU Level of Service		A
Analysis Period (min)			15			

Intersection

Int Delay, s/veh 0.5

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	2	21	16	459	479	10
Future Vol, veh/h	2	21	16	459	479	10
Conflicting Peds, #/hr	19	0	19	0	0	19
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	-8	4	-
Peak Hour Factor	82	82	93	93	96	96
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	2	26	17	494	499	10

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1070	523	528	0	-	0
Stage 1	523	-	-	-	-	-
Stage 2	547	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.13	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.227	-	-	-
Pot Cap-1 Maneuver	247	558	1034	-	-	-
Stage 1	599	-	-	-	-	-
Stage 2	584	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	235	549	1034	-	-	-
Mov Cap-2 Maneuver	371	-	-	-	-	-
Stage 1	590	-	-	-	-	-
Stage 2	565	-	-	-	-	-

Approach	SE	NE	SW
HCM Control Delay, s	12.2	0.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NEL	NET	SELn1	SWT	SWR
Capacity (veh/h)	1034	-	527	-	-
HCM Lane V/C Ratio	0.017	-	0.053	-	-
HCM Control Delay (s)	8.5	-	12.2	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-

HCM 2010 Signalized Intersection Summary
40: E Madison St & MLK Jr Way E/28th Ave E

7/29/2016

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	132	98	183	56	210	11	8	394	54	121	353	21
Future Volume (veh/h)	132	98	183	56	210	11	8	394	54	121	353	21
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)	0.99		0.92	1.00		0.92	0.99		0.92	0.97		0.92
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	1881	1844	1881	1910	1910	1910	1806	1957	1938	1736	1881	1881
Adj Flow Rate, veh/h	145	108	201	59	221	12	8	415	57	129	376	22
Adj No. of Lanes	0	1	0	0	1	0	1	1	0	1	1	0
Peak Hour Factor	0.91	0.91	0.91	0.95	0.95	0.95	0.95	0.95	0.95	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	0	0	0	3	3	3	4	4	4
Cap, veh/h	198	137	229	130	465	24	481	924	127	533	972	57
Arrive On Green	0.37	0.37	0.37	0.37	0.37	0.37	1.00	1.00	1.00	0.56	0.56	0.56
Sat Flow, veh/h	401	366	610	231	1242	63	944	1664	229	830	1750	102
Grp Volume(v), veh/h	454	0	0	292	0	0	8	0	472	129	0	398
Grp Sat Flow(s),veh/h/ln	1378	0	0	1536	0	0	944	0	1893	830	0	1853
Q Serve(g_s), s	17.7	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	8.2	0.0	12.2
Cycle Q Clear(g_c), s	30.8	0.0	0.0	13.1	0.0	0.0	12.4	0.0	0.0	8.2	0.0	12.2
Prop In Lane	0.32		0.44	0.20		0.04	1.00		0.12	1.00		0.06
Lane Grp Cap(c), veh/h	564	0	0	619	0	0	481	0	1051	533	0	1029
V/C Ratio(X)	0.81	0.00	0.00	0.47	0.00	0.00	0.02	0.00	0.45	0.24	0.00	0.39
Avail Cap(c_a), veh/h	703	0	0	784	0	0	481	0	1051	533	0	1029
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	29.2	0.0	0.0	23.3	0.0	0.0	1.4	0.0	0.0	11.7	0.0	12.6
Incr Delay (d2), s/veh	5.5	0.0	0.0	0.6	0.0	0.0	0.1	0.0	1.4	1.1	0.0	1.1
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 BackOfQ(50%),veh/ln	12.5	0.0	0.0	6.2	0.0	0.0	0.1	0.0	0.4	2.0	0.0	6.5
LnGrp Delay(d),s/veh	34.7	0.0	0.0	23.9	0.0	0.0	1.4	0.0	1.4	12.8	0.0	13.7
LnGrp LOS	C			C			A		A	B		B
Approach Vol, veh/h	454				292				480		527	
Approach Delay, s/veh	34.7				23.9				1.4		13.5	
Approach LOS	C				C				A		B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2		4		6		8					
Phs Duration (G+Y+Rc), s	59.0		41.0		59.0		41.0					
Change Period (Y+Rc), s	3.5		3.5		3.5		3.5					
Max Green Setting (Gmax), s	45.5		47.5		45.5		47.5					
Max Q Clear Time (g_c+I1), s	14.4		32.8		14.2		15.1					
Green Ext Time (p_c), s	7.7		4.7		7.7		6.2					
Intersection Summary												
HCM 2010 Ctrl Delay			17.4									
HCM 2010 LOS			B									

HCM Signalized Intersection Capacity Analysis

41: 1st Ave & Spring St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 						  			 	
Traffic Volume (vph)	56	214	44	0	0	0	0	576	77	81	590	0
Future Volume (vph)	56	214	44	0	0	0	0	576	77	81	590	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	12	10	12	12	12	10	10	10	10	10	10
Grade (%)		9%			0%			3%			0%	
Total Lost time (s)		4.5						4.5			4.5	
Lane Util. Factor		0.95						0.91			0.95	
Frpb, ped/bikes		0.95						0.95			1.00	
Flpb, ped/bikes		0.98						1.00			0.98	
Frt		0.98						0.98			1.00	
Flt Protected		0.99						1.00			0.99	
Satd. Flow (prot)		2789						3967			2929	
Flt Permitted		0.99						1.00			0.78	
Satd. Flow (perm)		2789						3967			2287	
Peak-hour factor, PHF	0.88	0.88	0.88	0.25	0.25	0.25	0.95	0.95	0.95	0.93	0.93	0.93
Adj. Flow (vph)	64	243	50	0	0	0	0	606	81	87	634	0
RTOR Reduction (vph)	0	14	0	0	0	0	0	7	0	0	0	0
Lane Group Flow (vph)	0	343	0	0	0	0	0	680	0	0	721	0
Confl. Peds. (#/hr)	90		309	309		90	502		488	488		502
Confl. Bikes (#/hr)			1			5			12			28
Heavy Vehicles (%)	2%	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	0%
Turn Type	Perm	NA						NA		Perm	NA	
Protected Phases		2						1			1	
Permitted Phases	2	2								1		
Actuated Green, G (s)		25.5						55.5			55.5	
Effective Green, g (s)		25.5						55.5			55.5	
Actuated g/C Ratio		0.28						0.62			0.62	
Clearance Time (s)		4.5						4.5			4.5	
Lane Grp Cap (vph)		790						2446			1410	
v/s Ratio Prot								0.17				
v/s Ratio Perm		0.12									c0.32	
v/c Ratio		0.43						0.28			0.51	
Uniform Delay, d1		26.4						8.0			9.7	
Progression Factor		1.00						0.57			1.00	
Incremental Delay, d2		1.7						0.3			1.3	
Delay (s)		28.1						4.8			11.0	
Level of Service		C						A			B	
Approach Delay (s)		28.1			0.0			4.8			11.0	
Approach LOS		C			A			A			B	
Intersection Summary												
HCM 2000 Control Delay			12.0		HCM 2000 Level of Service					B		
HCM 2000 Volume to Capacity ratio			0.49									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					9.0		
Intersection Capacity Utilization			62.4%		ICU Level of Service					B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

42: 2nd Ave & Spring St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑								↑	↑↑	
Traffic Volume (vph)	0	350	80	0	0	0	0	0	0	210	1200	0
Future Volume (vph)	0	350	80	0	0	0	0	0	0	210	1200	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	10	10	10	10	10	10	10
Grade (%)		12%			0%			0%			0%	
Total Lost time (s)		4.0								4.0	4.0	
Lane Util. Factor		0.95								1.00	0.95	
Frpb, ped/bikes		0.95								1.00	1.00	
Flpb, ped/bikes		1.00								1.00	1.00	
Frt		0.97								1.00	1.00	
Flt Protected		1.00								0.95	1.00	
Satd. Flow (prot)		2578								1204	2203	
Flt Permitted		1.00								0.95	1.00	
Satd. Flow (perm)		2578								1204	2203	
Peak-hour factor, PHF	0.92	0.92	0.92	0.25	0.25	0.25	0.25	0.25	0.25	0.97	0.97	0.97
Adj. Flow (vph)	0	380	87	0	0	0	0	0	0	216	1237	0
RTOR Reduction (vph)	0	18	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	449	0	0	0	0	0	0	0	216	1237	0
Confl. Peds. (#/hr)	200		178	178		200	340		348	348		340
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	7%	7%	7%
Parking (#/hr)										10	69	69
Turn Type		NA								Prot	NA	
Protected Phases		2								3	1 4	
Permitted Phases												
Actuated Green, G (s)		20.5								20.5	60.5	
Effective Green, g (s)		21.0								21.0	61.0	
Actuated g/C Ratio		0.23								0.23	0.68	
Clearance Time (s)		4.5								4.5		
Lane Grp Cap (vph)		601								280	1493	
v/s Ratio Prot		c0.17								0.18	c0.56	
v/s Ratio Perm												
v/c Ratio		0.75								0.77	0.83	
Uniform Delay, d1		32.0								32.3	10.7	
Progression Factor		0.71								1.00	1.00	
Incremental Delay, d2		7.8								18.4	5.4	
Delay (s)		30.4								50.7	16.1	
Level of Service		C								D	B	
Approach Delay (s)		30.4			0.0			0.0			21.2	
Approach LOS		C			A			A			C	
Intersection Summary												
HCM 2000 Control Delay			23.5				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)		11.5			
Intersection Capacity Utilization			58.5%				ICU Level of Service		B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

43: 3rd Ave & Spring St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	600	28	0	0	0	0	111	65	15	148	0
Future Volume (vph)	5	600	28	0	0	0	0	111	65	15	148	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	12	12	12	11	12	12	11	12
Grade (%)		10%			-10%			0%			0%	
Total Lost time (s)		4.0						4.0			4.0	
Lane Util. Factor		0.95						0.95			0.95	
Frpb, ped/bikes		0.99						0.86			1.00	
Flpb, ped/bikes		1.00						1.00			0.97	
Frt		0.99						0.94			1.00	
Flt Protected		1.00						1.00			1.00	
Satd. Flow (prot)		2543						1443			1726	
Flt Permitted		1.00						1.00			0.93	
Satd. Flow (perm)		2543						1443			1605	
Peak-hour factor, PHF	0.97	0.97	0.97	0.25	0.25	0.25	0.80	0.80	0.80	0.91	0.91	0.91
Adj. Flow (vph)	5	619	29	0	0	0	0	139	81	16	163	0
RTOR Reduction (vph)	0	4	0	0	0	0	0	15	0	0	0	0
Lane Group Flow (vph)	0	649	0	0	0	0	0	205	0	0	179	0
Confl. Peds. (#/hr)	396		213	213		396	650		405	405		650
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	87%	0%	40%	67%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	60	0	0	34	0
Parking (#/hr)		15										
Turn Type	Perm	NA						NA		Perm	NA	
Protected Phases		2						1			1	
Permitted Phases	2									1		
Actuated Green, G (s)		35.5						45.5			45.5	
Effective Green, g (s)		36.0						46.0			46.0	
Actuated g/C Ratio		0.40						0.51			0.51	
Clearance Time (s)		4.5						4.5			4.5	
Lane Grp Cap (vph)		1017						737			820	
v/s Ratio Prot								c0.14				
v/s Ratio Perm		0.26									0.11	
v/c Ratio		0.64						0.28			0.22	
Uniform Delay, d1		21.8						12.5			12.1	
Progression Factor		0.36						1.51			1.00	
Incremental Delay, d2		2.2						0.9			0.6	
Delay (s)		10.0						19.8			12.7	
Level of Service		B						B			B	
Approach Delay (s)		10.0			0.0			19.8			12.7	
Approach LOS		B			A			B			B	
Intersection Summary												
HCM 2000 Control Delay			12.5					HCM 2000 Level of Service			B	
HCM 2000 Volume to Capacity ratio			0.44									
Actuated Cycle Length (s)			90.0					Sum of lost time (s)			8.0	
Intersection Capacity Utilization			47.4%					ICU Level of Service			A	
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

44: 4th Ave & Spring St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 						  				
Traffic Volume (vph)	200	530	0	0	0	0	0	1216	92	0	0	0
Future Volume (vph)	200	530	0	0	0	0	0	1216	92	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	12	12	12	10	12	12	12	12
Grade (%)		15%			-5%			5%			0%	
Total Lost time (s)		4.5						5.5	5.5			
Lane Util. Factor		0.95						0.91	1.00			
Frpb, ped/bikes		1.00						1.00	0.59			
Flpb, ped/bikes		0.91						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		0.99						1.00	1.00			
Satd. Flow (prot)		2273						3704	818			
Flt Permitted		0.99						1.00	1.00			
Satd. Flow (perm)		2273						3704	818			
Peak-hour factor, PHF	0.96	0.96	0.96	0.25	0.25	0.25	0.95	0.95	0.95	0.25	0.25	0.25
Adj. Flow (vph)	208	552	0	0	0	0	0	1280	97	0	0	0
RTOR Reduction (vph)	0	11	0	0	0	0	0	0	9	0	0	0
Lane Group Flow (vph)	0	749	0	0	0	0	0	1280	88	0	0	0
Confl. Peds. (#/hr)	315		294	294		315	452		497	497		452
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	8%	2%	0%	0%	0%
Parking (#/hr)		15						15				
Turn Type	Perm	NA						NA	Perm			
Protected Phases		2						1				
Permitted Phases	2								1			
Actuated Green, G (s)		34.5						46.5	46.5			
Effective Green, g (s)		34.5						45.5	45.5			
Actuated g/C Ratio		0.38						0.51	0.51			
Clearance Time (s)		4.5						4.5	4.5			
Lane Grp Cap (vph)		871						1872	413			
v/s Ratio Prot								c0.35				
v/s Ratio Perm		0.33							0.11			
v/c Ratio		0.86						0.68	0.21			
Uniform Delay, d1		25.5						16.8	12.3			
Progression Factor		1.53						0.60	0.48			
Incremental Delay, d2		9.3						1.6	0.9			
Delay (s)		48.2						11.7	6.8			
Level of Service		D						B	A			
Approach Delay (s)		48.2			0.0			11.4			0.0	
Approach LOS		D			A			B			A	
Intersection Summary												
HCM 2000 Control Delay		24.5						HCM 2000 Level of Service	C			
HCM 2000 Volume to Capacity ratio		0.76										
Actuated Cycle Length (s)		90.0						Sum of lost time (s)	10.0			
Intersection Capacity Utilization		60.5%						ICU Level of Service	B			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

45: 5th Ave & Spring St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑									↑↑↑	
Traffic Volume (vph)	0	605	55	0	0	0	0	0	0	527	919	0
Future Volume (vph)	0	605	55	0	0	0	0	0	0	527	919	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	12	12	12	12	12	10	10	12
Grade (%)		15%			-5%			0%			0%	
Total Lost time (s)		3.5									3.5	
Lane Util. Factor		0.91									0.91	
Frpb, ped/bikes		0.98									1.00	
Flpb, ped/bikes		1.00									0.89	
Frt		0.99									1.00	
Flt Protected		1.00									0.98	
Satd. Flow (prot)		3503									3713	
Flt Permitted		1.00									0.98	
Satd. Flow (perm)		3503									3713	
Peak-hour factor, PHF	0.90	0.90	0.90	0.25	0.25	0.25	0.25	0.25	0.25	0.93	0.93	0.93
Adj. Flow (vph)	0	672	61	0	0	0	0	0	0	567	988	0
RTOR Reduction (vph)	0	5	0	0	0	0	0	0	0	0	13	0
Lane Group Flow (vph)	0	728	0	0	0	0	0	0	0	0	1542	0
Confl. Peds. (#/hr)	210		133	133		210	392		208	208		392
Heavy Vehicles (%)	0%	2%	2%	0%	0%	0%	0%	0%	0%	1%	3%	0%
Parking (#/hr)		30										
Turn Type		NA								custom	NA	
Protected Phases		2								3	1 4	
Permitted Phases										4		
Actuated Green, G (s)		35.0									45.0	
Effective Green, g (s)		36.5									46.5	
Actuated g/C Ratio		0.41									0.52	
Clearance Time (s)		5.0										
Lane Grp Cap (vph)		1420									1918	
v/s Ratio Prot		c0.21									c0.22	
v/s Ratio Perm											0.20	
v/c Ratio		0.51									0.80	
Uniform Delay, d1		20.1									18.0	
Progression Factor		1.63									1.00	
Incremental Delay, d2		1.0									3.7	
Delay (s)		33.8									21.7	
Level of Service		C									C	
Approach Delay (s)		33.8			0.0			0.0			21.7	
Approach LOS		C			A			A			C	
Intersection Summary												
HCM 2000 Control Delay			25.5				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)		8.5			
Intersection Capacity Utilization			60.7%				ICU Level of Service		B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

46: 6th Ave & I-5 CD SB On-Ramp & Spring St

7/29/2016

						
Movement	EBL	EBT	EBR	NBT	NBR	NBR2
Lane Configurations		 		 		
Traffic Volume (vph)	192	189	750	335	10	610
Future Volume (vph)	192	189	750	335	10	610
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	10	11	10	11	12
Grade (%)		10%		5%		
Total Lost time (s)		4.5	4.5	4.5	4.5	
Lane Util. Factor		0.95	1.00	0.95	1.00	
Frpb, ped/bikes		1.00	1.00	1.00	1.00	
Flpb, ped/bikes		0.84	1.00	1.00	1.00	
Frt		1.00	0.85	1.00	0.85	
Flt Protected		0.98	1.00	1.00	1.00	
Satd. Flow (prot)		2114	1322	2927	1357	
Flt Permitted		0.98	1.00	1.00	1.00	
Satd. Flow (perm)		2114	1322	2927	1357	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	206	203	806	360	11	656
RTOR Reduction (vph)	0	85	0	0	0	0
Lane Group Flow (vph)	0	324	806	360	667	0
Confl. Peds. (#/hr)	224					
Heavy Vehicles (%)	1%	1%	1%	1%	0%	1%
Bus Blockages (#/hr)	0	5	0	0	0	0
Parking (#/hr)		15				
Turn Type	Perm	NA	Perm	NA	Perm	
Protected Phases		4		2		
Permitted Phases	4		4		2	
Actuated Green, G (s)		42.5	42.5	38.5	38.5	
Effective Green, g (s)		42.5	42.5	38.5	38.5	
Actuated g/C Ratio		0.47	0.47	0.43	0.43	
Clearance Time (s)		4.5	4.5	4.5	4.5	
Lane Grp Cap (vph)		998	624	1252	580	
v/s Ratio Prot				0.12		
v/s Ratio Perm		0.15	c0.61		c0.49	
v/c Ratio		0.32	1.29	0.29	1.15	
Uniform Delay, d1		14.8	23.8	16.8	25.8	
Progression Factor		0.09	1.13	0.96	0.90	
Incremental Delay, d2		0.7	140.2	0.5	83.0	
Delay (s)		2.1	166.9	16.5	106.2	
Level of Service		A	F	B	F	
Approach Delay (s)		111.5		74.8		
Approach LOS		F		E		
Intersection Summary						
HCM 2000 Control Delay			94.7		HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio			1.22			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	9.0
Intersection Capacity Utilization			101.8%		ICU Level of Service	G
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

47: 7th Ave/Hubbell PI & Spring St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	137	19	0	0	0	0	256	23	6	328	0
Future Volume (vph)	42	137	19	0	0	0	0	256	23	6	328	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5						4.5			4.5	
Lane Util. Factor		0.95						1.00			1.00	
Frpb, ped/bikes		0.99						1.00			1.00	
Flpb, ped/bikes		0.92						1.00			1.00	
Frt		0.98						0.99			1.00	
Flt Protected		0.99						1.00			1.00	
Satd. Flow (prot)		2760						1688			1675	
Flt Permitted		0.99						1.00			0.99	
Satd. Flow (perm)		2760						1688			1668	
Peak-hour factor, PHF	0.87	0.92	0.87	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.85	0.85
Adj. Flow (vph)	48	149	22	0	0	0	0	278	25	7	386	0
RTOR Reduction (vph)	0	14	0	0	0	0	0	5	0	0	0	0
Lane Group Flow (vph)	0	205	0	0	0	0	0	298	0	0	393	0
Confl. Peds. (#/hr)	166		20					4				4
Heavy Vehicles (%)	17%	2%	0%	2%	2%	2%	0%	0%	2%	2%	2%	0%
Turn Type	Perm	NA						NA		Perm	NA	
Protected Phases		4						2			2	
Permitted Phases	4									2		
Actuated Green, G (s)		19.5						31.5			31.5	
Effective Green, g (s)		19.5						31.5			31.5	
Actuated g/C Ratio		0.32						0.52			0.52	
Clearance Time (s)		4.5						4.5			4.5	
Lane Grp Cap (vph)		897						886			875	
v/s Ratio Prot								0.18				
v/s Ratio Perm		0.07									c0.24	
v/c Ratio		0.23						0.34			0.45	
Uniform Delay, d1		14.8						8.2			8.9	
Progression Factor		1.00						1.00			1.00	
Incremental Delay, d2		0.6						1.0			1.7	
Delay (s)		15.4						9.2			10.5	
Level of Service		B						A			B	
Approach Delay (s)		15.4			0.0			9.2			10.5	
Approach LOS		B			A			A			B	
Intersection Summary												
HCM 2000 Control Delay		11.3										
HCM 2000 Volume to Capacity ratio		0.36										
Actuated Cycle Length (s)		60.0										
Intersection Capacity Utilization		43.7%										
Analysis Period (min)		15										
c Critical Lane Group												

Intersection												
Int Delay, s/veh	5.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔						↔			↔	
Traffic Vol, veh/h	67	113	18	0	0	0	0	143	19	37	178	0
Future Vol, veh/h	67	113	18	0	0	0	0	143	19	37	178	0
Conflicting Peds, #/hr	116	0	65	0	0	0	115	0	104	104	0	115
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	73	123	20	0	0	0	0	155	21	40	193	0
Major/Minor	Minor2			Major1			Major2					
Conflicting Flow All	556	554	258				-	0	0	280	0	0
Stage 1	274	274	-				-	-	-	-	-	-
Stage 2	282	280	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	492	440	781				0	-	-	1283	-	0
Stage 1	772	683	-				0	-	-	-	-	0
Stage 2	766	679	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	473	0	739				-	-	-	1159	-	-
Mov Cap-2 Maneuver	473	0	-				-	-	-	-	-	
Stage 1	742	0	-				-	-	-	-	-	-
Stage 2	766	0	-				-	-	-	-	-	-
Approach	EB			NB			SB					
HCM Control Delay, s	13.7			0			1.4					
HCM LOS	B											
Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT						
Capacity (veh/h)	-	-	473	739	1159	-						
HCM Lane V/C Ratio	-	-	0.284	0.11	0.035	-						
HCM Control Delay (s)	-	-	15.6	10.5	8.2	0						
HCM Lane LOS	-	-	C	B	A	A						
HCM 95th %tile Q(veh)	-	-	1.2	0.4	0.1	-						

Intersection												
Int Delay, s/veh	5.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗		↕			↗			↕	
Traffic Vol, veh/h	47	70	62	10	0	30	0	145	9	8	126	0
Future Vol, veh/h	47	70	62	10	0	30	0	145	9	8	126	0
Conflicting Peds, #/hr	209	0	58	58	0	209	104	0	111	111	0	104
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	51	76	67	11	0	33	0	158	10	9	137	0
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	542	432	195	524	428	483	-	0	0	278	0	0
Stage 1	154	154	-	274	274	-	-	-	-	-	-	-
Stage 2	388	278	-	250	154	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	451	516	846	464	519	584	0	-	-	1285	-	0
Stage 1	848	770	-	732	683	-	0	-	-	-	-	0
Stage 2	636	680	-	754	770	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	342	464	805	319	467	438	-	-	-	1061	-	-
Mov Cap-2 Maneuver	342	464	-	319	467	-	-	-	-	-	-	
Stage 1	848	763	-	732	620	-	-	-	-	-	-	-
Stage 2	486	617	-	587	763	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	12.2			15.1			0			0.5		
HCM LOS	B			C								
Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT					
Capacity (veh/h)	-	-	464	805	401	1061	-					
HCM Lane V/C Ratio	-	-	0.164	0.084	0.108	0.008	-					
HCM Control Delay (s)	-	-	14.3	9.9	15.1	8.4	0					
HCM Lane LOS	-	-	B	A	C	A	A					
HCM 95th %tile Q(veh)	-	-	0.6	0.3	0.4	0	-					

HCM Signalized Intersection Capacity Analysis

50: 14th Ave & Pike St

7/29/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	25	85	0	31	5	140	69	0	4	98	10
Future Volume (vph)	5	25	85	0	31	5	140	69	0	4	98	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	16	12	12	16	12	12	16	12
Grade (%)		6%			-6%			0%			0%	
Total Lost time (s)	4.5	4.5			4.5			4.5			8.5	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frt	1.00	0.88			0.98			1.00			0.99	
Flt Protected	0.95	1.00			1.00			0.97			1.00	
Satd. Flow (prot)	1717	1342			2137			2043			1874	
Flt Permitted	0.73	1.00			1.00			0.73			0.99	
Satd. Flow (perm)	1322	1342			2137			1542			1859	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	27	92	0	34	5	152	75	0	4	107	11
RTOR Reduction (vph)	0	49	0	0	3	0	0	0	0	0	4	0
Lane Group Flow (vph)	5	70	0	0	36	0	0	227	0	0	118	0
Parking (#/hr)		0									0	
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		4			4			6			3	
Permitted Phases	4						6			3		
Actuated Green, G (s)	46.5	46.5			46.5			44.5			40.5	
Effective Green, g (s)	46.5	46.5			46.5			44.5			40.5	
Actuated g/C Ratio	0.46	0.46			0.46			0.44			0.40	
Clearance Time (s)	4.5	4.5			4.5			4.5			8.5	
Lane Grp Cap (vph)	614	624			993			686			752	
v/s Ratio Prot		c0.05			0.02							
v/s Ratio Perm	0.00							c0.15			0.06	
v/c Ratio	0.01	0.11			0.04			0.33			0.16	
Uniform Delay, d1	14.4	15.1			14.6			18.1			18.9	
Progression Factor	1.00	1.00			0.04			0.03			1.00	
Incremental Delay, d2	0.0	0.4			0.1			1.2			0.4	
Delay (s)	14.4	15.5			0.7			1.8			19.4	
Level of Service	B	B			A			A			B	
Approach Delay (s)		15.4			0.7			1.8			19.4	
Approach LOS		B			A			A			B	
Intersection Summary												
HCM 2000 Control Delay			9.2									
HCM 2000 Volume to Capacity ratio			0.23									
Actuated Cycle Length (s)			100.0									
Intersection Capacity Utilization			32.1%									
Analysis Period (min)			15									
c Critical Lane Group												

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HCM Signalized Intersection Capacity Analysis

51: 15th Ave E & E DENNY WAY/E Denny Wy

9/7/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	12	11	72	27	104	10	236	22	57	249	11
Future Volume (vph)	12	12	11	72	27	104	10	236	22	57	249	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	10	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5			4.5	4.5		4.5	
Lane Util. Factor		1.00			1.00			1.00	1.00		1.00	
Frpb, ped/bikes		0.97			0.94			1.00	0.80		0.99	
Flpb, ped/bikes		0.98			0.97			1.00	1.00		0.98	
Frt		0.96			0.93			1.00	0.85		1.00	
Flt Protected		0.98			0.98			1.00	1.00		0.99	
Satd. Flow (prot)		1695			1444			1633	1122		1751	
Flt Permitted		0.87			0.86			0.99	1.00		0.90	
Satd. Flow (perm)		1492			1267			1612	1122		1599	
Peak-hour factor, PHF	0.55	0.55	0.55	0.91	0.91	0.91	0.85	0.85	0.85	0.93	0.93	0.93
Adj. Flow (vph)	22	22	20	79	30	114	12	278	26	61	268	12
RTOR Reduction (vph)	0	16	0	0	68	0	0	0	8	0	1	0
Lane Group Flow (vph)	0	48	0	0	155	0	0	290	18	0	340	0
Confl. Peds. (#/hr)	52		50	50		52	111		100	100		111
Confl. Bikes (#/hr)			3			1			12			6
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	4%	4%	4%	4%	4%	4%
Parking (#/hr)			0					0	0			0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			4			2			6	
Permitted Phases	4			4			2		2	6		
Actuated Green, G (s)		13.8			13.8			47.2	47.2		47.2	
Effective Green, g (s)		13.8			13.8			47.2	47.2		47.2	
Actuated g/C Ratio		0.20			0.20			0.67	0.67		0.67	
Clearance Time (s)		4.5			4.5			4.5	4.5		4.5	
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		294			249			1086	756		1078	
v/s Ratio Prot												
v/s Ratio Perm		0.03			c0.12			0.18	0.02		c0.21	
v/c Ratio		0.16			0.62			0.27	0.02		0.32	
Uniform Delay, d1		23.3			25.7			4.5	3.8		4.7	
Progression Factor		1.00			1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.3			4.8			0.6	0.1		0.8	
Delay (s)		23.6			30.5			5.1	3.8		5.5	
Level of Service		C			C			A	A		A	
Approach Delay (s)		23.6			30.5			5.0			5.5	
Approach LOS		C			C			A			A	
Intersection Summary												
HCM 2000 Control Delay			12.5			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.38									
Actuated Cycle Length (s)			70.0			Sum of lost time (s)			9.0			
Intersection Capacity Utilization			62.8%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

Intersection												
Int Delay, s/veh	1.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	7	1	13	7	30	9	6	262	3	9	173	8
Future Vol, veh/h	7	1	13	7	30	9	6	262	3	9	173	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	8	1	14	8	33	10	7	285	3	10	188	9
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	533	513	192	519	515	286	197	0	0	288	0	0
Stage 1	212	212	-	299	299	-	-	-	-	-	-	-
Stage 2	321	301	-	220	216	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	458	465	850	467	464	753	1376	-	-	1274	-	-
Stage 1	790	727	-	710	666	-	-	-	-	-	-	-
Stage 2	691	665	-	782	724	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	423	458	850	453	457	753	1376	-	-	1274	-	-
Mov Cap-2 Maneuver	423	458	-	453	457	-	-	-	-	-	-	-
Stage 1	785	720	-	706	662	-	-	-	-	-	-	-
Stage 2	645	661	-	761	717	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	11.1			13.1			0.2			0.4		
HCM LOS	B			B								
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	1376	-	-	617	494	1274	-	-				
HCM Lane V/C Ratio	0.005	-	-	0.037	0.101	0.008	-	-				
HCM Control Delay (s)	7.6	0	-	11.1	13.1	7.8	0	-				
HCM Lane LOS	A	A	-	B	B	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	0.1	0.3	0	-	-				

HCM Signalized Intersection Capacity Analysis

53: Broadway & E Pine St

9/7/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	242	61	59	304	94	0	464	124	0	466	79
Future Volume (vph)	42	242	61	59	304	94	0	464	124	0	466	79
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	15	12	11	16	12	11	12	11	11	12	12
Grade (%)		5%			-2%			0%			0%	
Total Lost time (s)	3.5	6.0		3.5	6.0			4.5			4.5	3.5
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Frpb, ped/bikes	1.00	0.87		1.00	0.80			0.79			1.00	0.46
Flpb, ped/bikes	1.00	1.00		0.90	1.00			1.00			1.00	1.00
Frt	1.00	0.97		1.00	0.96			0.97			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	1.00
Satd. Flow (prot)	1620	1630		1548	1626			1423			1845	719
Flt Permitted	0.15	1.00		0.38	1.00			1.00			1.00	1.00
Satd. Flow (perm)	252	1630		612	1626			1423			1845	719
Peak-hour factor, PHF	0.50	0.96	0.85	0.87	0.93	0.76	0.86	0.89	0.78	0.94	0.95	0.73
Adj. Flow (vph)	84	252	72	68	327	124	0	521	159	0	491	108
RTOR Reduction (vph)	0	10	0	0	13	0	0	10	0	0	0	13
Lane Group Flow (vph)	84	314	0	68	438	0	0	670	0	0	491	95
Confl. Peds. (#/hr)	559		311	311		559	396		448	448		396
Heavy Vehicles (%)	5%	5%	5%	3%	3%	3%	2%	2%	2%	3%	3%	3%
Parking (#/hr)						0			0			
Turn Type	pm+pt	NA		pm+pt	NA			NA			NA	pm+ov
Protected Phases	7	4		3	8			2			6	7
Permitted Phases	4			8								6
Actuated Green, G (s)	34.4	27.1		31.6	25.7			46.0			53.0	60.3
Effective Green, g (s)	34.4	27.1		31.6	25.7			46.0			53.0	60.3
Actuated g/C Ratio	0.34	0.27		0.32	0.26			0.46			0.53	0.60
Clearance Time (s)	3.5	6.0		3.5	6.0			4.5			4.5	3.5
Vehicle Extension (s)	2.0	0.2		2.0	0.2			0.2			0.2	2.0
Lane Grp Cap (vph)	186	441		248	417			654			977	433
v/s Ratio Prot	c0.03	0.19		0.02	c0.27			c0.47			c0.27	0.02
v/s Ratio Perm	0.12			0.07								0.12
v/c Ratio	0.45	0.71		0.27	1.05			1.02			0.50	0.22
Uniform Delay, d1	24.9	32.9		24.9	37.1			27.0			15.1	9.1
Progression Factor	1.14	1.14		1.00	1.00			1.61			1.00	1.00
Incremental Delay, d2	0.6	9.0		0.2	57.6			29.9			1.8	0.1
Delay (s)	29.0	46.5		25.1	94.8			73.5			16.9	9.2
Level of Service	C	D		C	F			E			B	A
Approach Delay (s)		42.9			85.6			73.5			15.5	
Approach LOS		D			F			E			B	
Intersection Summary												
HCM 2000 Control Delay			54.9			HCM 2000 Level of Service			D			
HCM 2000 Volume to Capacity ratio			0.96									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			17.0			
Intersection Capacity Utilization			74.4%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

54: Broadway & E James Way/E James St

9/7/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	212	472	31	28	346	88	25	392	18	59	419	50
Future Volume (vph)	212	472	31	28	346	88	25	392	18	59	419	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	10	11	16	10	11	10	10	11	10
Grade (%)		6%			12%			0%			0%	
Total Lost time (s)		5.5			5.5		5.5	5.5		5.5	5.5	5.5
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes		1.00			0.96		1.00	0.95		1.00	1.00	1.00
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	1.00
Frt		0.99			0.97		1.00	0.99		1.00	1.00	0.85
Flt Protected		0.99			1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		3249			2998		1652	1686		1652	1801	1478
Flt Permitted		0.99			1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		3249			2998		1652	1686		1652	1801	1478
Peak-hour factor, PHF	0.92	0.92	0.92	0.64	0.92	0.85	0.92	0.56	0.25	0.92	0.92	0.92
Adj. Flow (vph)	230	513	34	44	376	104	27	700	72	64	455	54
RTOR Reduction (vph)	0	3	0	0	23	0	0	3	0	0	0	25
Lane Group Flow (vph)	0	774	0	0	501	0	27	769	0	64	455	29
Confl. Peds. (#/hr)				80		80			80	80		
Parking (#/hr)						0			0			
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	pm+ov
Protected Phases	4	4		3	3		5	2		1	6	4
Permitted Phases												6
Actuated Green, G (s)		19.5			20.9		3.9	16.4		6.0	33.7	53.2
Effective Green, g (s)		19.5			20.9		3.9	16.4		6.0	33.7	53.2
Actuated g/C Ratio		0.20			0.21		0.04	0.16		0.06	0.34	0.53
Clearance Time (s)		5.5			5.5		5.5	5.5		5.5	5.5	5.5
Vehicle Extension (s)		2.0			2.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		633			626		64	276		99	606	786
v/s Ratio Prot		c0.24			c0.17		0.02	c0.46		c0.04	c0.25	0.01
v/s Ratio Perm												0.01
v/c Ratio		1.22			0.80		0.42	2.78		0.65	0.75	0.04
Uniform Delay, d1		40.2			37.6		46.9	41.8		46.0	29.4	11.2
Progression Factor		1.00			1.04		0.93	1.09		1.16	0.80	0.12
Incremental Delay, d2		113.8			6.8		1.6	813.2		10.1	8.1	0.0
Delay (s)		154.1			45.9		45.4	858.9		63.6	31.8	1.4
Level of Service		F			D		D	F		E	C	A
Approach Delay (s)		154.1			45.9			831.4			32.5	
Approach LOS		F			D			F			C	
Intersection Summary												
HCM 2000 Control Delay		309.2					HCM 2000 Level of Service			F		
HCM 2000 Volume to Capacity ratio		1.36										
Actuated Cycle Length (s)		100.0					Sum of lost time (s)		25.5			
Intersection Capacity Utilization		85.1%					ICU Level of Service		E			
Analysis Period (min)		15										
c Critical Lane Group												

Intersection												
Int Delay, s/veh	1.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	347	9	14	257	3	13	5	13	10	1	7
Future Vol, veh/h	1	347	9	14	257	3	13	5	13	10	1	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	14	-	-	-14	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	377	10	15	279	3	14	5	14	11	1	8
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	283	0	0	387	0	0	700	697	382	705	700	281
Stage 1	-	-	-	-	-	-	384	384	-	311	311	-
Stage 2	-	-	-	-	-	-	316	313	-	394	389	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1279	-	-	1171	-	-	354	365	665	351	363	758
Stage 1	-	-	-	-	-	-	639	611	-	699	658	-
Stage 2	-	-	-	-	-	-	695	657	-	631	608	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1279	-	-	1171	-	-	345	359	665	335	357	758
Mov Cap-2 Maneuver	-	-	-	-	-	-	345	359	-	335	357	
Stage 1	-	-	-	-	-	-	638	610	-	698	648	-
Stage 2	-	-	-	-	-	-	677	647	-	611	607	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0.4			13.9			13.8		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	436	1279	-	-	1171	-	-	430				
HCM Lane V/C Ratio	0.077	0.001	-	-	0.013	-	-	0.046				
HCM Control Delay (s)	13.9	7.8	0	-	8.1	0	-	13.8				
HCM Lane LOS	B	A	A	-	A	A	-	B				
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1				

Intersection												
Int Delay, s/veh	32.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	43	404	7	12	317	128	7	62	15	75	58	35
Future Vol, veh/h	43	404	7	12	317	128	7	62	15	75	58	35
Conflicting Peds, #/hr	36	0	67	67	0	36	5	0	23	23	0	5
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	40	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-12	-	-	8	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	87	87	87	80	80	80	88	88	88
Heavy Vehicles, %	1	1	1	3	3	3	1	1	1	1	1	1
Mvmt Flow	45	421	7	14	364	147	9	78	19	85	66	40
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	547	0	0	495	0	0	1104	1156	514	1087	1087	479
Stage 1	-	-	-	-	-	-	581	581	-	502	502	-
Stage 2	-	-	-	-	-	-	523	575	-	585	585	-
Critical Hdwy	4.11	-	-	4.13	-	-	7.11	6.51	6.21	7.11	6.51	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	6.11	5.51	-	6.11	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.11	5.51	-	6.11	5.51	-
Follow-up Hdwy	2.209	-	-	2.227	-	-	3.509	4.009	3.309	3.509	4.009	3.309
Pot Cap-1 Maneuver	1027	-	-	1064	-	-	189	197	562	194	217	589
Stage 1	-	-	-	-	-	-	501	501	-	553	544	-
Stage 2	-	-	-	-	-	-	539	504	-	499	499	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1023	-	-	1044	-	-	115	170	520	110	187	567
Mov Cap-2 Maneuver	-	-	-	-	-	-	115	170	-	110	187	
Stage 1	-	-	-	-	-	-	452	452	-	511	519	-
Stage 2	-	-	-	-	-	-	430	481	-	374	450	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.8			0.2			47.3			192.3		
HCM LOS							E			F		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	185	1023	-	-	1044	-	-	159				
HCM Lane V/C Ratio	0.568	0.044	-	-	0.013	-	-	1.201				
HCM Control Delay (s)	47.3	8.7	-	-	8.5	-	-	192.3				
HCM Lane LOS	E	A	-	-	A	-	-	F				
HCM 95th %tile Q(veh)	3	0.1	-	-	0	-	-	10.7				

HCM Signalized Intersection Capacity Analysis

57: 23rd Ave & E UNION ST

9/7/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	57	340	180	54	282	128	141	629	61	143	627	27
Future Volume (vph)	57	340	180	54	282	128	141	629	61	143	627	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	10	10	12	10	10	12	10
Grade (%)		-4%			3%			0%			0%	
Total Lost time (s)	3.0	3.0		3.0	2.5		3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.96		1.00	0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.95		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1685	3053		1611	2980		1668	1849		1652	1848	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1685	3053		1611	2980		1668	1849		1652	1848	
Peak-hour factor, PHF	0.99	0.99	0.99	0.95	0.95	0.95	0.92	0.92	0.92	0.96	0.96	0.96
Adj. Flow (vph)	58	343	182	57	297	135	153	684	66	149	653	28
RTOR Reduction (vph)	0	68	0	0	52	0	0	3	0	0	1	0
Lane Group Flow (vph)	58	457	0	57	380	0	153	747	0	149	680	0
Confl. Peds. (#/hr)	23		33	33		23	16		22	22		16
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	1%	1%	1%	2%	2%	2%
Parking (#/hr)			0			0			0			0
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	7	4		3	8		2	2		1	1	
Permitted Phases												
Actuated Green, G (s)	4.0	18.4		4.0	18.9		30.5	30.5		29.1	29.1	
Effective Green, g (s)	5.5	19.9		5.5	20.4		32.0	32.0		30.6	30.6	
Actuated g/C Ratio	0.06	0.20		0.06	0.20		0.32	0.32		0.31	0.31	
Clearance Time (s)	4.5	4.5		4.5	4.0		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	2.0	0.2		2.0	0.2		0.2	0.2		0.2	0.2	
Lane Grp Cap (vph)	92	607		88	607		533	591		505	565	
v/s Ratio Prot	0.03	c0.15		c0.04	0.13		0.09	c0.40		0.09	c0.37	
v/s Ratio Perm												
v/c Ratio	0.63	0.75		0.65	0.63		0.29	1.26		0.30	1.20	
Uniform Delay, d1	46.3	37.7		46.3	36.3		25.5	34.0		26.5	34.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	9.9	8.4		11.6	4.8		1.4	131.6		1.5	107.3	
Delay (s)	56.1	46.1		57.9	41.2		26.8	165.6		28.0	142.0	
Level of Service	E	D		E	D		C	F		C	F	
Approach Delay (s)		47.1			43.1			142.1			121.6	
Approach LOS		D			D			F			F	
Intersection Summary												
HCM 2000 Control Delay			99.0			HCM 2000 Level of Service			F			
HCM 2000 Volume to Capacity ratio			1.09									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			79.0%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

58: 23rd Ave & E CHERRY ST

9/7/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	74	234	50	59	128	94	55	571	103	99	681	47
Future Volume (vph)	74	234	50	59	128	94	55	571	103	99	681	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	10	10	12	10	10	12	10
Grade (%)		-6%			0%			0%			0%	
Total Lost time (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			0.97		1.00	0.99		1.00	1.00	
Flpb, ped/bikes		0.99			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.95		1.00	0.98		1.00	0.99	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3248			3006		1478	1620		1636	1823	
Flt Permitted		0.69			0.61		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		2273			1840		1478	1620		1636	1823	
Peak-hour factor, PHF	0.78	0.78	0.78	0.94	0.94	0.94	0.92	0.92	0.92	0.93	0.93	0.93
Adj. Flow (vph)	95	300	64	63	136	100	60	621	112	106	732	51
RTOR Reduction (vph)	0	13	0	0	63	0	0	6	0	0	3	0
Lane Group Flow (vph)	0	446	0	0	236	0	60	727	0	106	780	0
Confl. Peds. (#/hr)	21		9	9		21	11		12	12		11
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	14%	14%	14%	3%	3%	3%
Parking (#/hr)						0			0			0
Turn Type	Perm	NA		Perm	NA		Split	NA		Split	NA	
Protected Phases		4			4		2	2		1	1	
Permitted Phases	4			4								
Actuated Green, G (s)		15.5			15.5		35.5	35.5		35.5	35.5	
Effective Green, g (s)		17.0			17.0		37.0	37.0		37.0	37.0	
Actuated g/C Ratio		0.17			0.17		0.37	0.37		0.37	0.37	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)		386			312		546	599		605	674	
v/s Ratio Prot							0.04	c0.45		0.06	c0.43	
v/s Ratio Perm		c0.20			0.13							
v/c Ratio		1.15			0.76		0.11	1.21		0.18	1.16	
Uniform Delay, d1		41.5			39.5		20.7	31.5		21.2	31.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		95.1			15.7		0.4	110.7		0.6	87.1	
Delay (s)		136.6			55.2		21.1	142.2		21.9	118.6	
Level of Service		F			E		C	F		C	F	
Approach Delay (s)		136.6			55.2			133.1			107.0	
Approach LOS		F			E			F			F	
Intersection Summary												
HCM 2000 Control Delay			114.7			HCM 2000 Level of Service				F		
HCM 2000 Volume to Capacity ratio			1.18									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)				9.0		
Intersection Capacity Utilization			85.4%			ICU Level of Service				E		
Analysis Period (min)			15									
c Critical Lane Group												

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HCM Signalized Intersection Capacity Analysis

1: 1st Ave & Madison St

03/09/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	80	302	104	42	307	0	0	241	107
Future Volume (vph)	0	0	0	80	302	104	42	307	0	0	241	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	14	11	15	10	11	10	10	11	10
Grade (%)		6%			-8%			0%			0%	
Total Lost time (s)					4.5	4.5	4.5	4.5			4.5	
Lane Util. Factor					0.95	1.00	1.00	1.00			1.00	
Frbp, ped/bikes					1.00	1.00	1.00	1.00			0.89	
Flpb, ped/bikes					0.92	1.00	1.00	1.00			1.00	
Frt					1.00	0.85	1.00	1.00			0.96	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					2950	1663	1516	1637			1407	
Flt Permitted					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (perm)					2950	1663	1516	1637			1407	
Peak-hour factor, PHF	0.25	0.25	0.25	0.85	0.85	0.85	0.92	0.92	0.92	0.89	0.89	0.89
Adj. Flow (vph)	0	0	0	94	355	122	46	334	0	0	271	120
RTOR Reduction (vph)	0	0	0	0	0	109	0	0	0	0	18	0
Lane Group Flow (vph)	0	0	0	0	449	13	46	334	0	0	373	0
Confl. Peds. (#/hr)	226		156	156		226	276		553	553		276
Heavy Vehicles (%)	0%	0%	0%	3%	0%	0%	0%	1%	0%	0%	1%	0%
Turn Type				Perm	NA	custom	Prot	NA			NA	
Protected Phases					8	3	5	2			6	
Permitted Phases				8								
Actuated Green, G (s)					32.0	9.5	7.5	49.0			37.0	
Effective Green, g (s)					32.0	9.5	7.5	49.0			37.0	
Actuated g/C Ratio					0.36	0.11	0.08	0.54			0.41	
Clearance Time (s)					4.5	4.5	4.5	4.5			4.5	
Lane Grp Cap (vph)					1048	175	126	891			578	
v/s Ratio Prot						0.01	0.03	c0.20			c0.27	
v/s Ratio Perm					0.15							
v/c Ratio					0.43	0.07	0.37	0.37			0.65	
Uniform Delay, d1					22.0	36.3	39.0	11.7			21.2	
Progression Factor					0.36	3.43	1.00	1.00			0.77	
Incremental Delay, d2					1.0	0.6	8.0	1.2			5.3	
Delay (s)					9.0	125.2	47.0	12.9			21.7	
Level of Service					A	F	D	B			C	
Approach Delay (s)		0.0			33.8			17.1			21.7	
Approach LOS		A			C			B			C	
Intersection Summary												
HCM 2000 Control Delay			25.5		HCM 2000 Level of Service						C	
HCM 2000 Volume to Capacity ratio			0.57									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)						18.0	
Intersection Capacity Utilization			54.5%		ICU Level of Service						A	
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2010 Signalized Intersection Summary

2: 2nd Ave & Madison St

03/09/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	186	341	0	0	0	0	0	1456	105
Future Volume (veh/h)	0	0	0	186	341	0	0	0	0	0	1456	105
Number				5	2	12				7	4	14
Initial Q (Qb), veh				0	0	0				0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00				1.00		0.82
Parking Bus, Adj				1.00	1.00	1.00				1.00	1.00	0.43
Adj Sat Flow, veh/h/ln				1778	1727	0				0	1569	1569
Adj Flow Rate, veh/h				198	363	0				0	1533	111
Adj No. of Lanes				0	2	0				0	2	1
Peak Hour Factor				0.94	0.94	0.94				0.95	0.95	0.95
Percent Heavy Veh, %				3	3	0				0	9	9
Cap, veh/h				300	479	0				0	2053	313
Arrive On Green				0.08	0.08	0.00				0.00	0.23	0.22
Sat Flow, veh/h				955	2038	0				0	3059	466
Grp Volume(v), veh/h				295	266	0				0	1533	111
Grp Sat Flow(s),veh/h/ln				1422	1493	0				0	1490	466
Q Serve(g_s), s				18.4	15.7	0.0				0.0	43.1	18.1
Cycle Q Clear(g_c), s				18.4	15.7	0.0				0.0	43.1	18.1
Prop In Lane				0.67		0.00				0.00		1.00
Lane Grp Cap(c), veh/h				414	365	0				0	2053	313
V/C Ratio(X)				0.71	0.73	0.00				0.00	0.75	0.35
Avail Cap(c_a), veh/h				414	365	0				0	2053	313
HCM Platoon Ratio				0.33	0.33	1.00				1.00	0.33	0.33
Upstream Filter(I)				1.00	1.00	0.00				0.00	1.00	1.00
Uniform Delay (d), s/veh				39.7	38.5	0.0				0.0	27.5	18.5
Incr Delay (d2), s/veh				9.9	12.1	0.0				0.0	2.5	3.1
Initial Q Delay(d3),s/veh				0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				8.4	7.7	0.0				0.0	18.5	2.6
LnGrp Delay(d),s/veh				49.7	50.6	0.0				0.0	30.0	21.6
LnGrp LOS				D	D						C	C
Approach Vol, veh/h					561						1644	
Approach Delay, s/veh					50.1						29.4	
Approach LOS					D						C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		25.0		65.0								
Change Period (Y+Rc), s		4.5		4.5								
Max Green Setting (Gmax), s		20.5		60.5								
Max Q Clear Time (g_c+I1), s		0.0		0.0								
Green Ext Time (p_c), s		0.0		0.0								
Intersection Summary												
HCM 2010 Ctrl Delay				34.7								
HCM 2010 LOS				C								

HCM Signalized Intersection Capacity Analysis

3: 3rd Ave & Madison St

03/09/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↑		↑↑			↑↑	
Traffic Volume (vph)	0	0	0	0	405	10	0	20	0	0	0	77
Future Volume (vph)	0	0	0	0	405	10	0	20	0	0	0	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	10	11	12	10	12	12	11	12
Grade (%)		10%			-15%			0%			-5%	
Total Lost time (s)					4.0	4.5		4.0			4.0	
Lane Util. Factor					0.95	1.00		0.95			0.95	
Frpb, ped/bikes					1.00	0.84		1.00			0.55	
Flpb, ped/bikes					1.00	1.00		1.00			1.00	
Frt					1.00	0.85		1.00			0.85	
Flt Protected					1.00	1.00		1.00			1.00	
Satd. Flow (prot)					2858	1248		1468			1266	
Flt Permitted					1.00	1.00		1.00			1.00	
Satd. Flow (perm)					2858	1248		1468			1266	
Peak-hour factor, PHF	0.25	0.25	0.25	0.91	0.91	0.91	0.93	0.93	0.93	0.87	0.87	0.87
Adj. Flow (vph)	0	0	0	0	445	11	0	22	0	0	0	89
RTOR Reduction (vph)	0	0	0	0	0	5	0	0	0	0	58	0
Lane Group Flow (vph)	0	0	0	0	445	6	0	22	0	0	31	0
Confl. Peds. (#/hr)	244		457	457		244	588		499	499		588
Heavy Vehicles (%)	0%	0%	0%	9%	2%	2%	0%	81%	0%	0%	82%	11%
Bus Blockages (#/hr)	0	0	0	0	10	0	0	62	0	0	29	0
Parking (#/hr)					15							
Turn Type					NA	custom		NA			NA	
Protected Phases					6	2		4			4	
Permitted Phases						1						
Actuated Green, G (s)					50.5	46.0		30.5			30.5	
Effective Green, g (s)					51.0	46.0		31.0			31.0	
Actuated g/C Ratio					0.57	0.51		0.34			0.34	
Clearance Time (s)					4.5	4.5		4.5			4.5	
Lane Grp Cap (vph)					1619	700		505			436	
v/s Ratio Prot					c0.16	0.00		0.01			c0.02	
v/s Ratio Perm						0.00						
v/c Ratio					0.27	0.01		0.04			0.07	
Uniform Delay, d1					10.0	10.8		19.6			19.8	
Progression Factor					0.93	1.59		1.00			1.69	
Incremental Delay, d2					0.3	0.0		0.2			0.3	
Delay (s)					9.7	17.2		19.8			33.9	
Level of Service					A	B		B			C	
Approach Delay (s)		0.0			9.9			19.8			33.9	
Approach LOS		A			A			B			C	
Intersection Summary												
HCM 2000 Control Delay			14.0				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.21									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			13.0		
Intersection Capacity Utilization			34.8%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: 4th Ave & Madison St

03/09/2017



Movement	WBR	NBL	NBT	SWR	SWR2
Lane Configurations	←	←	↑↑↑	←←←	←←←
Traffic Volume (vph)	38	133	961	273	412
Future Volume (vph)	38	133	961	273	412
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Lane Width	12	12	10	11	12
Grade (%)			5%		
Total Lost time (s)	3.5		3.5	1.0	
Lane Util. Factor	1.00		0.91	0.76	
Frpb, ped/bikes	1.00		1.00	1.00	
Flpb, ped/bikes	1.00		1.00	1.00	
Frt	0.86		1.00	0.85	
Flt Protected	1.00		0.99	1.00	
Satd. Flow (prot)	1450		3681	3094	
Flt Permitted	1.00		0.99	1.00	
Satd. Flow (perm)	1450		3681	3094	
Peak-hour factor, PHF	0.92	0.97	0.97	0.84	0.84
Adj. Flow (vph)	41	137	991	325	490
RTOR Reduction (vph)	0	0	28	62	0
Lane Group Flow (vph)	41	0	1100	754	0
Confl. Peds. (#/hr)		487			361
Heavy Vehicles (%)	2%	1%	9%	1%	1%
Bus Blockages (#/hr)	0	0	0	10	0
Parking (#/hr)			15	15	
Turn Type	custom	Split	NA	Prot	
Protected Phases	3	4	4	6	
Permitted Phases	4				
Actuated Green, G (s)	32.0		29.4	47.0	
Effective Green, g (s)	32.0		30.4	49.0	
Actuated g/C Ratio	0.36		0.34	0.54	
Clearance Time (s)	3.5		4.5	3.0	
Vehicle Extension (s)	0.2		0.2	0.2	
Lane Grp Cap (vph)	571		1243	1684	
v/s Ratio Prot	c0.00		c0.30	c0.24	
v/s Ratio Perm	0.03				
v/c Ratio	0.07		0.89	0.45	
Uniform Delay, d1	19.2		28.2	12.3	
Progression Factor	1.00		1.00	0.67	
Incremental Delay, d2	0.0		9.4	0.8	
Delay (s)	19.2		37.6	9.1	
Level of Service	B		D	A	
Approach Delay (s)			37.6		
Approach LOS			D		
Intersection Summary					
HCM 2000 Control Delay		25.5		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio		0.59			
Actuated Cycle Length (s)		90.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization		54.7%		ICU Level of Service	A
Analysis Period (min)		15			

HCM 2010 Signalized Intersection Summary

5: 5th Ave & Madison St

03/09/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	246	531	0	0	0	0	0	501	127
Future Volume (veh/h)	0	0	0	246	531	0	0	0	0	0	501	127
Number				5	2	12				7	4	14
Initial Q (Qb), veh				0	0	0				0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00				1.00		0.66
Parking Bus, Adj				1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1796	1766	0				0	1597	1710
Adj Flow Rate, veh/h				256	553	0				0	516	131
Adj No. of Lanes				0	2	0				0	3	0
Peak Hour Factor				0.96	0.96	0.96				0.97	0.97	0.97
Percent Heavy Veh, %				2	2	0				0	3	3
Cap, veh/h				594	1186	0				0	1050	240
Arrive On Green				0.19	0.19	0.00				0.00	0.11	0.11
Sat Flow, veh/h				924	2154	0				0	3346	731
Grp Volume(v), veh/h				407	402	0				0	463	184
Grp Sat Flow(s),veh/h/ln				1471	1527	0				0	1453	1027
Q Serve(g_s), s				22.3	21.0	0.0				0.0	13.5	15.3
Cycle Q Clear(g_c), s				22.3	21.0	0.0				0.0	13.5	15.3
Prop In Lane				0.63		0.00				0.00		0.71
Lane Grp Cap(c), veh/h				907	874	0				0	953	337
V/C Ratio(X)				0.45	0.46	0.00				0.00	0.49	0.55
Avail Cap(c_a), veh/h				907	874	0				0	953	337
HCM Platoon Ratio				0.33	0.33	1.00				1.00	0.33	0.33
Upstream Filter(I)				1.00	1.00	0.00				0.00	1.00	1.00
Uniform Delay (d), s/veh				24.6	24.1	0.0				0.0	33.0	33.8
Incr Delay (d2), s/veh				1.6	1.7	0.0				0.0	1.8	6.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				9.5	9.3	0.0				0.0	5.7	4.9
LnGrp Delay(d),s/veh				26.3	25.9	0.0				0.0	34.8	40.0
LnGrp LOS				C	C						C	D
Approach Vol, veh/h					809						647	
Approach Delay, s/veh					26.1						36.3	
Approach LOS					C						D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		56.0		34.0								
Change Period (Y+Rc), s		4.5		4.5								
Max Green Setting (Gmax), s		51.5		29.5								
Max Q Clear Time (g_c+I1), s		0.0		0.0								
Green Ext Time (p_c), s		0.0		0.0								
Intersection Summary												
HCM 2010 Ctrl Delay				30.6								
HCM 2010 LOS				C								

HCM Signalized Intersection Capacity Analysis

6: 6th Ave & Madison St

03/09/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑	↑↑		↑↑				
Traffic Volume (vph)	0	0	0	0	714	707	39	146	190	0	0	0
Future Volume (vph)	0	0	0	0	714	707	39	146	190	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	10	10	12	12	12	12	12	12
Grade (%)		10%			-10%			5%			-5%	
Total Lost time (s)					3.5	4.0		4.0				
Lane Util. Factor					1.00	0.88		0.95				
Frpb, ped/bikes					1.00	1.00		0.99				
Flpb, ped/bikes					1.00	1.00		0.97				
Frt					1.00	0.85		0.92				
Flt Protected					1.00	1.00		0.99				
Satd. Flow (prot)					1659	2482		2450				
Flt Permitted					1.00	1.00		0.99				
Satd. Flow (perm)					1659	2482		2450				
Peak-hour factor, PHF	0.25	0.25	0.25	0.97	0.97	0.97	0.85	0.85	0.85	0.25	0.25	0.25
Adj. Flow (vph)	0	0	0	0	736	729	46	172	224	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	436	0	186	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	736	293	0	256	0	0	0	0
Confl. Peds. (#/hr)	137		316	316		137	178			1		178
Confl. Bikes (#/hr)			3			26			2			3
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%	12%	1%	5%	0%	0%	0%
Parking (#/hr)								15				
Turn Type					NA	custom	Perm	NA				
Protected Phases					6	1		4				
Permitted Phases							4					
Actuated Green, G (s)					63.0	23.7		18.5				
Effective Green, g (s)					63.5	24.2		19.0				
Actuated g/C Ratio					0.71	0.27		0.21				
Clearance Time (s)					4.0	4.5		4.5				
Vehicle Extension (s)					0.2	0.2		0.2				
Lane Grp Cap (vph)					1170	667		517				
v/s Ratio Prot					0.44	0.12						
v/s Ratio Perm								0.10				
v/c Ratio					0.63	0.44		0.49				
Uniform Delay, d1					7.0	27.3		31.3				
Progression Factor					0.61	0.79		1.00				
Incremental Delay, d2					2.3	2.0		3.4				
Delay (s)					6.6	23.5		34.6				
Level of Service					A	C		C				
Approach Delay (s)		0.0			15.0			34.6			0.0	
Approach LOS		A			B			C			A	
Intersection Summary												
HCM 2000 Control Delay			19.6		HCM 2000 Level of Service					B		
HCM 2000 Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					14.5		
Intersection Capacity Utilization			64.3%		ICU Level of Service					C		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

7: I-5 CD NB Off-Ramp/7th Ave & Madison St

03/09/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑↑↑		↖	↗	↗	↖		↖
Traffic Volume (vph)	0	190	0	0	653	1	553	419	199	12	0	215
Future Volume (vph)	0	190	0	0	653	1	553	419	199	12	0	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	10	12	12	12	12	12	12	12
Grade (%)		0%			0%			5%			-5%	
Total Lost time (s)		3.5			3.5		3.5	3.5	3.5	3.5		4.5
Lane Util. Factor		1.00			0.91		0.95	0.95	1.00	1.00		1.00
Frpb, ped/bikes		1.00			1.00		1.00	1.00	0.83	1.00		1.00
Flpb, ped/bikes		1.00			1.00		1.00	1.00	1.00	0.96		1.00
Frt		1.00			1.00		1.00	1.00	0.85	1.00		0.85
Flt Protected		1.00			1.00		0.95	0.99	1.00	0.95		1.00
Satd. Flow (prot)		1299			4269		1502	1571	1163	1604		1475
Flt Permitted		1.00			1.00		0.95	0.99	1.00	0.29		1.00
Satd. Flow (perm)		1299			4269		1502	1571	1163	492		1475
Peak-hour factor, PHF	0.81	0.81	0.81	0.94	0.94	0.94	0.94	0.94	0.94	0.90	0.90	0.90
Adj. Flow (vph)	0	235	0	0	695	1	588	446	212	13	0	239
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	13	0	0	17
Lane Group Flow (vph)	0	235	0	0	696	0	506	528	199	13	0	222
Confl. Peds. (#/hr)	114		364	364		114	1		56	56		
Confl. Bikes (#/hr)			2			9			22			
Heavy Vehicles (%)	0%	5%	0%	0%	2%	0%	0%	0%	1%	0%	0%	1%
Parking (#/hr)		15										
Turn Type		NA			NA		Perm	NA	Perm	D.Pm		Perm
Protected Phases		6			2			4				
Permitted Phases							4		4	4		4
Actuated Green, G (s)		36.6			36.6		44.4	44.4	44.4	44.4		44.4
Effective Green, g (s)		37.6			37.6		45.4	45.4	45.4	45.4		44.4
Actuated g/C Ratio		0.42			0.42		0.50	0.50	0.50	0.50		0.49
Clearance Time (s)		4.5			4.5		4.5	4.5	4.5	4.5		4.5
Vehicle Extension (s)		3.0			5.0		5.0	5.0	5.0	5.0		5.0
Lane Grp Cap (vph)		542			1783		757	792	586	248		727
v/s Ratio Prot		c0.18			0.16							
v/s Ratio Perm							c0.34	0.34	0.17	0.03		0.15
v/c Ratio		0.43			0.39		0.67	0.67	0.34	0.05		0.31
Uniform Delay, d1		18.6			18.2		16.7	16.7	13.3	11.4		13.6
Progression Factor		0.46			0.42		1.00	1.00	1.00	0.51		0.47
Incremental Delay, d2		2.0			0.6		3.0	2.8	0.7	0.2		0.5
Delay (s)		10.7			8.3		19.6	19.5	14.1	6.0		6.9
Level of Service		B			A		B	B	B	A		A
Approach Delay (s)		10.7			8.3			18.6			6.9	
Approach LOS		B			A			B			A	
Intersection Summary												
HCM 2000 Control Delay			13.7				HCM 2000 Level of Service		B			
HCM 2000 Volume to Capacity ratio			0.56									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)		7.0			
Intersection Capacity Utilization			69.5%				ICU Level of Service		C			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

8: 8th Ave & Madison St

03/09/2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↶			↶↷			↶↷			↶↷	
Traffic Volume (vph)	0	392	9	0	605	15	7	203	32	10	146	42
Future Volume (vph)	0	392	9	0	605	15	7	203	32	10	146	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	12	10	12	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5			3.5			3.5	
Lane Util. Factor		1.00			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			0.99			0.96			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			0.99	
Frt		1.00			1.00			0.98			0.97	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1595			3130			1613			1622	
Flt Permitted		1.00			1.00			0.99			0.98	
Satd. Flow (perm)		1595			3130			1601			1595	
Peak-hour factor, PHF	0.89	0.89	0.89	0.99	0.99	0.99	0.93	0.93	0.93	0.80	0.80	0.80
Adj. Flow (vph)	0	440	10	0	611	15	8	218	34	12	182	52
RTOR Reduction (vph)	0	1	0	0	2	0	0	6	0	0	11	0
Lane Group Flow (vph)	0	449	0	0	624	0	0	254	0	0	238	0
Confl. Peds. (#/hr)	165		269	169		165	69		96	96		36
Heavy Vehicles (%)	0%	2%	0%	0%	2%	6%	4%	0%	0%	0%	0%	0%
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases							4			8		
Actuated Green, G (s)		50.5			50.5			30.5			30.5	
Effective Green, g (s)		51.5			51.5			31.5			31.5	
Actuated g/C Ratio		0.57			0.57			0.35			0.35	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		912			1791			560			558	
v/s Ratio Prot		c0.28			0.20							
v/s Ratio Perm								c0.16			0.15	
v/c Ratio		0.49			0.35			0.45			0.43	
Uniform Delay, d1		11.5			10.3			22.6			22.3	
Progression Factor		0.51			1.88			1.00			0.68	
Incremental Delay, d2		1.8			0.3			2.6			2.3	
Delay (s)		7.6			19.7			25.2			17.5	
Level of Service		A			B			C			B	
Approach Delay (s)		7.6			19.7			25.2			17.5	
Approach LOS		A			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			16.8									HCM 2000 Level of Service B
HCM 2000 Volume to Capacity ratio			0.48									
Actuated Cycle Length (s)			90.0									Sum of lost time (s) 7.0
Intersection Capacity Utilization			47.8%									ICU Level of Service A
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: 9th Ave & Madison St

03/09/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			↰			↕		↰	↰	
Traffic Volume (vph)	0	411	23	0	608	8	7	57	5	44	415	5
Future Volume (vph)	0	411	23	0	608	8	7	57	5	44	415	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	15	12	10	11	12	12	12	12	11	11	12
Total Lost time (s)		3.5			3.5			3.5		2.5	3.5	
Lane Util. Factor		1.00			1.00			1.00		1.00	1.00	
Frpb, ped/bikes		0.97			1.00			0.99		1.00	1.00	
Flpb, ped/bikes		1.00			1.00			0.99		0.93	1.00	
Frt		0.99			1.00			0.99		1.00	1.00	
Flt Protected		1.00			1.00			0.99		0.95	1.00	
Satd. Flow (prot)		1780			1610			1528		1454	1646	
Flt Permitted		1.00			1.00			0.95		0.66	1.00	
Satd. Flow (perm)		1780			1610			1457		1014	1646	
Peak-hour factor, PHF	0.88	0.88	0.88	0.97	0.97	0.97	0.81	0.81	0.81	0.87	0.87	0.87
Adj. Flow (vph)	0	467	26	0	627	8	9	70	6	51	477	6
RTOR Reduction (vph)	0	3	0	0	1	0	0	3	0	0	1	0
Lane Group Flow (vph)	0	490	0	0	634	0	0	82	0	51	482	0
Confl. Peds. (#/hr)	132		249	249		132	128		63	63		128
Heavy Vehicles (%)	0%	2%	0%	6%	2%	0%	0%	9%	10%	0%	0%	0%
Turn Type		NA			NA		Perm	NA		pm+pt	NA	
Protected Phases		6			2			4		3	9	8
Permitted Phases							4			8		
Actuated Green, G (s)		42.4			42.4			26.6		39.6	38.6	
Effective Green, g (s)		43.4			43.4			27.6		40.6	39.6	
Actuated g/C Ratio		0.48			0.48			0.31		0.45	0.44	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		0.2			0.2			0.2			0.2	
Lane Grp Cap (vph)		858			776			446		491	724	
v/s Ratio Prot		0.28			c0.39					0.01	c0.29	
v/s Ratio Perm								0.06		0.04		
v/c Ratio		0.57			0.82			0.18		0.10	0.67	
Uniform Delay, d1		16.7			19.9			22.9		14.2	20.0	
Progression Factor		0.93			0.76			1.00		0.74	0.74	
Incremental Delay, d2		2.5			8.7			0.9		0.0	4.7	
Delay (s)		18.0			23.9			23.8		10.5	19.5	
Level of Service		B			C			C		B	B	
Approach Delay (s)		18.0			23.9			23.8			18.6	
Approach LOS		B			C			C			B	
Intersection Summary												
HCM 2000 Control Delay			20.6									
HCM 2000 Volume to Capacity ratio			0.79									
Actuated Cycle Length (s)			90.0							12.0		
Intersection Capacity Utilization			67.5%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

10: Terry Ave & Madison St

03/09/2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			↰				↱			↱
Traffic Volume (vph)	0	450	10	0	477	11	0	0	21	0	0	139
Future Volume (vph)	0	450	10	0	477	11	0	0	21	0	0	139
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5				4.5			4.5
Lane Util. Factor		1.00			1.00				1.00			1.00
Frpb, ped/bikes		0.99			0.99				0.69			0.79
Flpb, ped/bikes		1.00			1.00				1.00			1.00
Frt		1.00			1.00				0.86			0.86
Flt Protected		1.00			1.00				1.00			1.00
Satd. Flow (prot)		1593			1543				1026			1175
Flt Permitted		1.00			1.00				1.00			1.00
Satd. Flow (perm)		1593			1543				1026			1175
Peak-hour factor, PHF	0.95	0.95	0.95	0.90	0.90	0.90	0.83	0.83	0.83	0.75	0.75	0.75
Adj. Flow (vph)	0	474	11	0	530	12	0	0	25	0	0	185
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	8	0	0	57
Lane Group Flow (vph)	0	484	0	0	541	0	0	0	17	0	0	128
Confl. Peds. (#/hr)	152		226	226		152	59		91	91		59
Heavy Vehicles (%)	5%	2%	9%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type		NA			NA				Perm			Perm
Protected Phases		6			2							
Permitted Phases									6			2
Actuated Green, G (s)		62.5			62.5				62.5			62.5
Effective Green, g (s)		63.5			63.5				62.5			62.5
Actuated g/C Ratio		0.71			0.71				0.69			0.69
Clearance Time (s)		4.5			4.5				4.5			4.5
Lane Grp Cap (vph)		1123			1088				712			815
v/s Ratio Prot		0.30			0.35							
v/s Ratio Perm									0.02			0.11
v/c Ratio		0.43			0.50				0.02			0.16
Uniform Delay, d1		5.6			6.0				4.3			4.7
Progression Factor		0.09			0.26				1.00			1.00
Incremental Delay, d2		1.1			0.8				0.1			0.4
Delay (s)		1.6			2.3				4.3			5.1
Level of Service		A			A				A			A
Approach Delay (s)		1.6			2.3			4.3			5.1	
Approach LOS		A			A			A			A	
Intersection Summary												
HCM 2000 Control Delay			2.5			HCM 2000 Level of Service			A			
HCM 2000 Volume to Capacity ratio			0.38									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			7.0			
Intersection Capacity Utilization			49.9%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

11: Boren Ave & Madison St

03/09/2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	456	4	30	436	10	17	755	2	42	830	35
Future Volume (vph)	11	456	4	30	436	10	17	755	2	42	830	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	10	9	10	12	9	9	12	9	9	12
Total Lost time (s)	4.0	3.5		4.0	3.5		4.0	3.5		4.0	3.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1433	1495		1462	1513		1433	2851		1462	2765	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1433	1495		1462	1513		1433	2851		1462	2765	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.84	0.84	0.84	0.90	0.90	0.90
Adj. Flow (vph)	13	524	5	34	501	11	20	899	2	47	922	39
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	0	0	3	0
Lane Group Flow (vph)	13	528	0	34	511	0	20	901	0	47	958	0
Confl. Peds. (#/hr)	183		335	335		183	144		160	160		144
Heavy Vehicles (%)	2%	2%	4%	0%	2%	0%	2%	2%	6%	0%	2%	1%
Bus Blockages (#/hr)	0	10	0	0	6	0	0	2	0	0	8	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	1.2	30.3		3.7	32.8		2.4	34.1		3.9	35.6	
Effective Green, g (s)	1.7	31.3		4.2	33.8		2.9	35.1		4.4	36.6	
Actuated g/C Ratio	0.02	0.35		0.05	0.38		0.03	0.39		0.05	0.41	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lane Grp Cap (vph)	27	519		68	568		46	1111		71	1124	
v/s Ratio Prot	0.01	c0.35		c0.02	0.34		0.01	0.32		c0.03	c0.35	
v/s Ratio Perm												
v/c Ratio	0.48	1.02		0.50	0.90		0.43	0.81		0.66	0.85	
Uniform Delay, d1	43.7	29.4		41.9	26.5		42.7	24.5		42.1	24.2	
Progression Factor	1.41	0.66		1.23	0.89		1.00	1.00		0.97	0.94	
Incremental Delay, d2	4.6	43.0		1.9	18.1		2.4	6.5		15.7	7.8	
Delay (s)	66.1	62.2		53.5	41.8		45.1	31.0		56.4	30.6	
Level of Service	E	E		D	D		D	C		E	C	
Approach Delay (s)		62.3			42.6			31.3			31.8	
Approach LOS		E			D			C			C	
Intersection Summary												
HCM 2000 Control Delay			39.1			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.90									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			15.0			
Intersection Capacity Utilization			68.9%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

12: Madison St & Minor Ave

03/09/2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			↰			↰↱			↰↱	
Traffic Volume (vph)	0	481	19	0	420	5	6	145	1	1	234	50
Future Volume (vph)	0	481	19	0	420	5	6	145	1	1	234	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	11	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5			3.5			3.5	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.98			0.99			1.00			0.95	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			1.00			1.00			0.98	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1527			1610			1697			1584	
Flt Permitted		1.00			1.00			0.99			1.00	
Satd. Flow (perm)		1527			1610			1675			1583	
Peak-hour factor, PHF	0.89	0.89	0.89	0.95	0.95	0.95	0.83	0.83	0.83	0.76	0.76	0.76
Adj. Flow (vph)	0	540	21	0	442	5	7	175	1	1	308	66
RTOR Reduction (vph)	0	2	0	0	0	0	0	0	0	0	8	0
Lane Group Flow (vph)	0	559	0	0	447	0	0	183	0	0	367	0
Confl. Peds. (#/hr)	157		212	212		157	110		81	81		110
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)		49.5			49.5			31.5			31.5	
Effective Green, g (s)		50.5			50.5			32.5			32.5	
Actuated g/C Ratio		0.56			0.56			0.36			0.36	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		856			903			604			571	
v/s Ratio Prot		c0.37			0.28							
v/s Ratio Perm								0.11			c0.23	
v/c Ratio		0.65			0.49			0.30			0.64	
Uniform Delay, d1		13.7			12.0			20.6			23.9	
Progression Factor		0.30			0.65			1.00			1.00	
Incremental Delay, d2		0.4			1.8			1.3			5.5	
Delay (s)		4.4			9.6			21.9			29.4	
Level of Service		A			A			C			C	
Approach Delay (s)		4.4			9.6			21.9			29.4	
Approach LOS		A			A			C			C	

Intersection Summary

HCM 2000 Control Delay	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	54.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

13: Swedish/Summit Ave & Madison St

03/09/2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			↰			↰	↰		↰	
Traffic Volume (vph)	0	466	17	0	344	41	12	23	51	7	28	69
Future Volume (vph)	0	466	17	0	344	41	12	23	51	7	28	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	10	10	10	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5			3.0	4.0		3.0	
Lane Util. Factor		1.00			1.00			1.00	1.00		1.00	
Frpb, ped/bikes		0.99			0.97			1.00	0.74		0.88	
Flpb, ped/bikes		1.00			1.00			0.96	1.00		0.99	
Frt		1.00			0.99			1.00	0.85		0.91	
Flt Protected		1.00			1.00			0.98	1.00		1.00	
Satd. Flow (prot)		1593			1499			1615	1080		1344	
Flt Permitted		1.00			1.00			0.91	1.00		0.99	
Satd. Flow (perm)		1593			1499			1493	1080		1332	
Peak-hour factor, PHF	0.97	0.97	0.97	0.96	0.96	0.96	0.63	0.63	0.63	0.77	0.77	0.77
Adj. Flow (vph)	0	480	18	0	358	43	19	37	81	9	36	90
RTOR Reduction (vph)	0	1	0	0	5	0	0	0	58	0	63	0
Lane Group Flow (vph)	0	497	0	0	396	0	0	56	23	0	72	0
Confl. Peds. (#/hr)	101		132	132		101	69		102	102		69
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type		NA			NA		Perm	NA	Perm	Perm	NA	
Protected Phases		6			2			4			4	
Permitted Phases							4		4	4		
Actuated Green, G (s)		55.5			55.5			26.0	26.0		26.0	
Effective Green, g (s)		56.5			56.5			27.0	26.0		27.0	
Actuated g/C Ratio		0.63			0.63			0.30	0.29		0.30	
Clearance Time (s)		4.5			4.5			4.0	4.0		4.0	
Lane Grp Cap (vph)		1000			941			447	312		399	
v/s Ratio Prot		c0.31			0.26							
v/s Ratio Perm								0.04	0.02		c0.05	
v/c Ratio		0.50			0.42			0.13	0.07		0.18	
Uniform Delay, d1		9.1			8.5			22.9	23.3		23.3	
Progression Factor		0.00			1.28			1.00	1.00		1.00	
Incremental Delay, d2		1.3			1.3			0.6	0.5		1.0	
Delay (s)		1.3			12.2			23.5	23.7		24.3	
Level of Service		A			B			C	C		C	
Approach Delay (s)		1.3			12.2			23.6			24.3	
Approach LOS		A			B			C			C	

Intersection Summary

HCM 2000 Control Delay	10.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.5
Intersection Capacity Utilization	70.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

14: Madison St & Boylston Ave

03/09/2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↶			↶			↶↷			↶↷	
Traffic Volume (vph)	0	520	4	0	348	5	6	158	11	74	35	31
Future Volume (vph)	0	520	4	0	348	5	6	158	11	74	35	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5			3.0			3.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			0.99			0.97	
Flpb, ped/bikes		1.00			1.00			1.00			0.98	
Frt		1.00			1.00			0.99			0.97	
Flt Protected		1.00			1.00			1.00			0.97	
Satd. Flow (prot)		1559			1556			1679			1534	
Flt Permitted		1.00			1.00			0.99			0.51	
Satd. Flow (perm)		1559			1556			1667			805	
Peak-hour factor, PHF	0.91	0.91	0.91	0.95	0.95	0.95	0.89	0.89	0.89	0.81	0.81	0.81
Adj. Flow (vph)	0	571	4	0	366	5	7	178	12	91	43	38
RTOR Reduction (vph)	0	0	0	0	0	0	0	3	0	0	13	0
Lane Group Flow (vph)	0	575	0	0	371	0	0	194	0	0	159	0
Confl. Peds. (#/hr)	88		106	106		88	52		30	30		52
Heavy Vehicles (%)	0%	2%	8%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)		66.1			66.1			15.4			15.4	
Effective Green, g (s)		67.1			67.1			16.4			16.4	
Actuated g/C Ratio		0.75			0.75			0.18			0.18	
Clearance Time (s)		4.5			4.5			4.0			4.0	
Vehicle Extension (s)		0.2			0.2			0.2			0.2	
Lane Grp Cap (vph)		1162			1160			303			146	
v/s Ratio Prot		c0.37			0.24							
v/s Ratio Perm								0.12			c0.20	
v/c Ratio		0.49			0.32			0.64			1.09	
Uniform Delay, d1		4.6			3.8			34.1			36.8	
Progression Factor		0.15			0.88			1.00			1.00	
Incremental Delay, d2		1.4			0.7			3.2			100.1	
Delay (s)		2.0			4.0			37.3			136.9	
Level of Service		A			A			D			F	
Approach Delay (s)		2.0			4.0			37.3			136.9	
Approach LOS		A			A			D			F	
Intersection Summary												
HCM 2000 Control Delay			25.5									
HCM 2000 Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			90.0									
Intersection Capacity Utilization			69.3%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

15: Broadway & Madison St/E Madison St

03/09/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	147	432	26	46	226	43	0	182	120	0	229	113
Future Volume (vph)	147	432	26	46	226	43	0	182	120	0	229	113
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	12	9	10	12	12	13	12	12	13	12
Grade (%)		-9%			8%			0%			0%	
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0	5.0		4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	1.00		0.95	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	0.99		1.00	0.98			1.00	0.85		0.96	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)	1648	1794		1471	1593			1925	1583		1727	
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (perm)	1648	1794		1471	1593			1925	1583		1727	
Peak-hour factor, PHF	0.97	0.97	0.97	0.94	0.94	0.94	0.94	0.94	0.94	0.88	0.88	0.88
Adj. Flow (vph)	152	445	27	49	240	46	0	194	128	0	260	128
RTOR Reduction (vph)	0	2	0	0	6	0	0	0	102	0	22	0
Lane Group Flow (vph)	152	470	0	49	280	0	0	194	26	0	366	0
Confl. Peds. (#/hr)	98		62	62		62	62		62	62		62
Heavy Vehicles (%)	3%	2%	0%	6%	2%	7%	0%	2%	2%	0%	2%	5%
Turn Type	Prot	NA		Prot	NA			NA	custom		NA	
Protected Phases	5	2		1	6			3 4	1 3		8	
Permitted Phases												
Actuated Green, G (s)	12.0	44.6		6.4	39.0			24.0	18.6		24.0	
Effective Green, g (s)	13.0	45.6		7.4	40.0			25.0	18.6		25.0	
Actuated g/C Ratio	0.14	0.51		0.08	0.44			0.28	0.21		0.28	
Clearance Time (s)	5.0	5.0		5.0	5.0						5.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0						2.0	
Lane Grp Cap (vph)	238	908		120	708			534	327		479	
v/s Ratio Prot	c0.09	c0.26		0.03	0.18			0.10	0.02		c0.21	
v/s Ratio Perm												
v/c Ratio	0.64	0.52		0.41	0.40			0.36	0.08		0.76	
Uniform Delay, d1	36.3	14.8		39.2	16.8			26.1	28.8		29.8	
Progression Factor	1.30	0.40		0.93	1.42			1.00	1.00		1.00	
Incremental Delay, d2	3.6	1.8		0.8	1.6			0.2	0.0		6.4	
Delay (s)	50.6	7.8		37.5	25.6			26.3	28.8		36.2	
Level of Service	D	A		D	C			C	C		D	
Approach Delay (s)		18.2			27.3			27.3			36.2	
Approach LOS		B			C			C			D	
Intersection Summary												
HCM 2000 Control Delay			26.0			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			18.0			
Intersection Capacity Utilization			59.2%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

Intersection

Int Delay, s/veh 0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Vol, veh/h	0	558	285	10	0	10
Future Vol, veh/h	0	558	285	10	0	10
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, %	-	-8	5	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	607	310	11	0	11

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	- 0	- 0	- 315
Stage 1	- -	- -	- -
Stage 2	- -	- -	- -
Critical Hdwy	- -	- -	- 6.22
Critical Hdwy Stg 1	- -	- -	- -
Critical Hdwy Stg 2	- -	- -	- -
Follow-up Hdwy	- -	- -	- 3.318
Pot Cap-1 Maneuver	0 -	- -	0 725
Stage 1	0 -	- -	0 -
Stage 2	0 -	- -	0 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	- -	- -	- 725
Mov Cap-2 Maneuver	- -	- -	- -
Stage 1	- -	- -	- -
Stage 2	- -	- -	- -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	10
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	725
HCM Lane V/C Ratio	-	-	-	0.015
HCM Control Delay (s)	-	-	-	10
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0

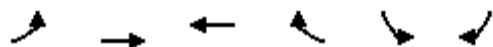
Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Vol, veh/h	0	558	280	58	0	15
Future Vol, veh/h	0	558	280	58	0	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	-5	2	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	607	304	63	0	16
Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	336
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	-	0	706
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	706
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		SB	
HCM Control Delay, s	0		0		10.2	
HCM LOS					B	
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1		
Capacity (veh/h)	-	-	-	706		
HCM Lane V/C Ratio	-	-	-	0.023		
HCM Control Delay (s)	-	-	-	10.2		
HCM Lane LOS	-	-	-	B		
HCM 95th %tile Q(veh)	-	-	-	0.1		

Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	0	0	274	5	0	558
Future Vol, veh/h	0	0	274	5	0	558
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	-2	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	298	5	0	607
Major/Minor	Minor2		Major2		Major1	
Conflicting Flow All	-	5	0	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	4.12	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	0	1078	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %				-		-
Mov Cap-1 Maneuver	-	1078	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NE	
HCM Control Delay, s	0				0	
HCM LOS	A					
Minor Lane/Major Mvmt	NER	EBLn1	WBL	WBT		
Capacity (veh/h)	-	-	-	-		
HCM Lane V/C Ratio	-	-	-	-		
HCM Control Delay (s)	-	0	-	-		
HCM Lane LOS	-	A	-	-		
HCM 95th %tile Q(veh)	-	-	-	-		

HCM Signalized Intersection Capacity Analysis

19: E Madison St & 11th Ave

03/09/2017



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↵	↵
Traffic Volume (vph)	0	558	174	0	141	113
Future Volume (vph)	0	558	174	0	141	113
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	12	10	12
Grade (%)		0%	-4%		0%	
Total Lost time (s)		5.5	5.5		4.5	4.5
Lane Util. Factor		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	1.00		1.00	0.77
Flpb, ped/bikes		1.00	1.00		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		1818	1819		1620	1080
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		1818	1819		1620	1080
Peak-hour factor, PHF	0.90	0.90	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	620	198	0	160	128
RTOR Reduction (vph)	0	0	0	0	0	111
Lane Group Flow (vph)	0	620	198	0	160	17
Confl. Peds. (#/hr)	23			38		61
Confl. Bikes (#/hr)				3		17
Heavy Vehicles (%)	1%	1%	3%	3%	4%	4%
Parking (#/hr)						0
Turn Type		NA	NA		Prot	Perm
Protected Phases		2	6		4	
Permitted Phases						4
Actuated Green, G (s)		68.1	68.1		11.9	11.9
Effective Green, g (s)		68.1	68.1		11.9	11.9
Actuated g/C Ratio		0.76	0.76		0.13	0.13
Clearance Time (s)		5.5	5.5		4.5	4.5
Vehicle Extension (s)		0.2	0.2		0.2	0.2
Lane Grp Cap (vph)		1375	1376		214	142
v/s Ratio Prot		c0.34	0.11		c0.10	
v/s Ratio Perm						0.02
v/c Ratio		0.45	0.14		0.75	0.12
Uniform Delay, d1		4.0	3.0		37.6	34.4
Progression Factor		0.30	0.28		1.00	1.00
Incremental Delay, d2		1.0	0.2		11.7	0.1
Delay (s)		2.2	1.0		49.3	34.6
Level of Service		A	A		D	C
Approach Delay (s)		2.2	1.0		42.8	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay			12.6		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.49			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			50.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

20: E Madison St & 12th Ave & Union St

03/09/2017

	↑	↗	↓	↘	↖	↗	↘	↖
Movement	NBT	NBR	SBT	SBR	NEL	NET	NER	SWT
Lane Configurations	↑	↗	↘		↖	↗		↑
Traffic Volume (vph)	346	77	407	33	75	526	98	230
Future Volume (vph)	346	77	407	33	75	526	98	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	10	12	9	10	12	11
Grade (%)	0%		0%			4%		-8%
Total Lost time (s)	5.0	5.0	5.0		4.0	5.0		5.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00		1.00
Frpb, ped/bikes	1.00	0.87	0.98		1.00	0.98		1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00		1.00
Frt	1.00	0.85	0.99		1.00	0.98		1.00
Flt Protected	1.00	1.00	1.00		0.95	1.00		1.00
Satd. Flow (prot)	1818	1397	1520		1576	1650		1873
Flt Permitted	1.00	1.00	1.00		0.95	1.00		1.00
Satd. Flow (perm)	1818	1397	1520		1576	1650		1873
Peak-hour factor, PHF	0.96	0.96	0.86	0.86	0.96	0.96	0.96	0.92
Adj. Flow (vph)	360	80	473	38	78	548	102	250
RTOR Reduction (vph)	0	47	0	0	0	0	0	0
Lane Group Flow (vph)	360	33	511	0	78	650	0	250
Confl. Peds. (#/hr)		41		96	27		45	
Heavy Vehicles (%)	1%	1%	2%	2%	1%	1%	1%	2%
Parking (#/hr)			0					
Turn Type	NA	Perm	NA		Prot	NA		NA
Protected Phases	4		8		1	6		2
Permitted Phases		4						
Actuated Green, G (s)	37.0	37.0	37.0		6.7	43.0		32.3
Effective Green, g (s)	37.0	37.0	37.0		6.7	43.0		32.3
Actuated g/C Ratio	0.41	0.41	0.41		0.07	0.48		0.36
Clearance Time (s)	5.0	5.0	5.0		4.0	5.0		5.0
Vehicle Extension (s)	0.2	0.2	0.2		0.2	0.2		0.2
Lane Grp Cap (vph)	747	574	624		117	788		672
v/s Ratio Prot	0.20		c0.34		0.05	c0.39		0.13
v/s Ratio Perm		0.02						
v/c Ratio	0.48	0.06	0.82		0.67	0.82		0.37
Uniform Delay, d1	19.5	16.0	23.5		40.6	20.3		21.3
Progression Factor	1.00	1.00	1.00		1.20	0.55		0.87
Incremental Delay, d2	2.2	0.2	11.4		9.7	8.8		1.6
Delay (s)	21.7	16.2	35.0		58.4	20.0		20.1
Level of Service	C	B	C		E	B		C
Approach Delay (s)	20.7		35.0			24.1		20.1
Approach LOS	C		C			C		C
Intersection Summary								
HCM 2000 Control Delay			25.7		HCM 2000 Level of Service			C
HCM 2000 Volume to Capacity ratio			0.86					
Actuated Cycle Length (s)			90.0		Sum of lost time (s)			14.0
Intersection Capacity Utilization			66.4%		ICU Level of Service			C
Analysis Period (min)			15					
c Critical Lane Group								

HCM Signalized Intersection Capacity Analysis

22: 13th Ave & E Madison St

03/09/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑		↑	↑			↑	
Traffic Volume (vph)	0	384	0	0	75	3	116	161	63	152	0	39
Future Volume (vph)	0	384	0	0	75	3	116	161	63	152	0	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	16	16	12	12	13	12
Grade (%)		8%			-7%			0%			0%	
Total Lost time (s)		4.5			4.5		4.5	4.5			4.5	
Lane Util. Factor		1.00			1.00		1.00	1.00			1.00	
Frpb, ped/bikes		1.00			1.00		1.00	0.98			0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00			0.97	
Frt		1.00			1.00		1.00	0.96			0.97	
Flt Protected		1.00			1.00		0.95	1.00			0.96	
Satd. Flow (prot)		1746			1846		1966	1947			1763	
Flt Permitted		1.00			1.00		0.64	1.00			0.61	
Satd. Flow (perm)		1746			1846		1322	1947			1121	
Peak-hour factor, PHF	0.90	0.90	0.90	0.95	0.95	0.95	0.87	0.87	0.87	0.89	0.89	0.89
Adj. Flow (vph)	0	427	0	0	79	3	133	185	72	171	0	44
RTOR Reduction (vph)	0	0	0	0	1	0	0	10	0	0	27	0
Lane Group Flow (vph)	0	427	0	0	81	0	133	247	0	0	188	0
Confl. Peds. (#/hr)	28		29	29		28	1		52	52		1
Confl. Bikes (#/hr)												6
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	4%	4%	4%	1%	1%	1%
Parking (#/hr)									0			0
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)		31.0			31.0		50.0	50.0			50.0	
Effective Green, g (s)		31.0			31.0		50.0	50.0			50.0	
Actuated g/C Ratio		0.34			0.34		0.56	0.56			0.56	
Clearance Time (s)		4.5			4.5		4.5	4.5			4.5	
Vehicle Extension (s)		0.2			0.2		2.0	2.0			2.0	
Lane Grp Cap (vph)		601			635		734	1081			622	
v/s Ratio Prot		c0.24			0.04			0.13				
v/s Ratio Perm							0.10				c0.17	
v/c Ratio		0.71			0.13		0.18	0.23			0.30	
Uniform Delay, d1		25.6			20.2		9.9	10.2			10.7	
Progression Factor		0.51			0.91		1.03	1.03			1.00	
Incremental Delay, d2		5.9			0.3		0.5	0.5			1.2	
Delay (s)		19.0			18.7		10.7	11.0			11.9	
Level of Service		B			B		B	B			B	
Approach Delay (s)		19.0			18.7			10.9			11.9	
Approach LOS		B			B			B			B	
Intersection Summary												
HCM 2000 Control Delay			14.8				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.48									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)		12.5			
Intersection Capacity Utilization			55.7%				ICU Level of Service			B		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

23: 14th Ave & E Madison St

03/09/2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↶			↷			↶↷		↶	↷	
Traffic Volume (vph)	0	461	99	0	11	0	48	267	68	137	380	6
Future Volume (vph)	0	461	99	0	11	0	48	267	68	137	380	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	12	16	12	12	16	12
Grade (%)		7%			-10%			0%			0%	
Total Lost time (s)		4.5			4.5			4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00			1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00			0.99		1.00	1.00	
Flpb, ped/bikes		1.00			1.00			1.00		0.99	1.00	
Frt		0.98			1.00			0.98		1.00	1.00	
Flt Protected		1.00			1.00			0.99		0.95	1.00	
Satd. Flow (prot)		1694			1909			2043		1739	2082	
Flt Permitted		1.00			1.00			0.69		0.36	1.00	
Satd. Flow (perm)		1694			1909			1412		664	2082	
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.85	0.85	0.85	0.86	0.86	0.86
Adj. Flow (vph)	0	501	108	0	12	0	56	314	80	159	442	7
RTOR Reduction (vph)	0	9	0	0	0	0	0	9	0	0	1	0
Lane Group Flow (vph)	0	600	0	0	12	0	0	441	0	159	448	0
Confl. Peds. (#/hr)	3		31	31		3	37		10	10		37
Confl. Bikes (#/hr)			7			3			1			1
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Parking (#/hr)									0			0
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases		1			1			3			3	
Permitted Phases							3			3		
Actuated Green, G (s)		36.7			36.7			32.5		32.5	32.5	
Effective Green, g (s)		36.7			36.7			32.5		32.5	32.5	
Actuated g/C Ratio		0.41			0.41			0.36		0.36	0.36	
Clearance Time (s)		4.5			4.5			4.5		4.5	4.5	
Lane Grp Cap (vph)		690			778			509		239	751	
v/s Ratio Prot		c0.35			0.01						0.22	
v/s Ratio Perm								c0.31		0.24		
v/c Ratio		0.87			0.02			0.87		0.67	0.60	
Uniform Delay, d1		24.5			15.9			26.7		24.2	23.4	
Progression Factor		0.60			0.82			1.00		0.45	0.42	
Incremental Delay, d2		12.0			0.0			17.7		12.2	3.1	
Delay (s)		26.8			13.0			44.5		23.2	12.9	
Level of Service		C			B			D		C	B	
Approach Delay (s)		26.8			13.0			44.5			15.6	
Approach LOS		C			B			D			B	

Intersection Summary

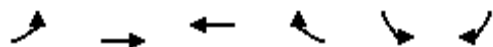
HCM 2000 Control Delay	27.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	83.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Intersection												
Int Delay, s/veh	0.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations						↗		↘			↗	
Traffic Vol, veh/h	0	0	0	0	0	9	0	438	148	0	14	143
Future Vol, veh/h	0	0	0	0	0	9	0	438	148	0	14	143
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	6	-	-	0	-	-	10	-	-	-10	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	10	0	476	161	0	15	155
Major/Minor	Minor1			Major1			Major2					
Conflicting Flow All				-	-	557	-	0	0	-	-	0
Stage 1				-	-	-	-	-	-	-	-	-
Stage 2				-	-	-	-	-	-	-	-	-
Critical Hdwy				-	-	6.22	-	-	-	-	-	-
Critical Hdwy Stg 1				-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2				-	-	-	-	-	-	-	-	-
Follow-up Hdwy				-	-	3.318	-	-	-	-	-	-
Pot Cap-1 Maneuver				0	0	530	0	-	-	0	-	-
Stage 1				0	0	-	0	-	-	0	-	-
Stage 2				0	0	-	0	-	-	0	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver				-	0	530	-	-	-	-	-	-
Mov Cap-2 Maneuver				-	0	-	-	-	-	-	-	-
Stage 1				-	0	-	-	-	-	-	-	-
Stage 2				-	0	-	-	-	-	-	-	-
Approach	WB			NE			SW					
HCM Control Delay, s				11.9			0			0		
HCM LOS				B								
Minor Lane/Major Mvmt	NET	NER	WBLn1	SWT	SWR							
Capacity (veh/h)	-	-	530	-	-							
HCM Lane V/C Ratio	-	-	0.018	-	-							
HCM Control Delay (s)	-	-	11.9	-	-							
HCM Lane LOS	-	-	B	-	-							
HCM 95th %tile O(veh)	-	-	0.1	-	-							

HCM Signalized Intersection Capacity Analysis

25: E Madison St & 15th Ave

03/09/2017



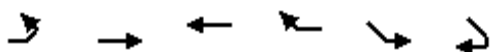
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Volume (vph)	0	447	79	0	0	78
Future Volume (vph)	0	447	79	0	0	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	10	12	12	16
Grade (%)		10%	-9%		0%	
Total Lost time (s)		4.5	4.5			4.5
Lane Util. Factor		1.00	1.00			1.00
Frpb, ped/bikes		1.00	1.00			1.00
Flpb, ped/bikes		1.00	1.00			1.00
Frt		1.00	1.00			0.86
Flt Protected		1.00	1.00			1.00
Satd. Flow (prot)		1728	1835			1774
Flt Permitted		1.00	1.00			1.00
Satd. Flow (perm)		1728	1835			1774
Peak-hour factor, PHF	0.93	0.93	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	481	93	0	0	92
RTOR Reduction (vph)	0	0	0	0	0	81
Lane Group Flow (vph)	0	481	93	0	0	11
Confl. Peds. (#/hr)	59			59	47	1
Confl. Bikes (#/hr)				2		
Heavy Vehicles (%)	1%	1%	1%	1%	5%	5%
Parking (#/hr)				0		
Turn Type		NA	NA			Prot
Protected Phases		2	6			4
Permitted Phases						
Actuated Green, G (s)		70.2	70.2			10.8
Effective Green, g (s)		70.2	70.2			10.8
Actuated g/C Ratio		0.78	0.78			0.12
Clearance Time (s)		4.5	4.5			4.5
Vehicle Extension (s)		0.2	0.2			0.2
Lane Grp Cap (vph)		1347	1431			212
v/s Ratio Prot		c0.28	0.05			c0.01
v/s Ratio Perm						
v/c Ratio		0.36	0.06			0.05
Uniform Delay, d1		3.0	2.3			35.1
Progression Factor		0.38	1.23			1.00
Incremental Delay, d2		0.4	0.1			0.0
Delay (s)		1.6	2.9			35.1
Level of Service		A	A			D
Approach Delay (s)		1.6	2.9		35.1	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay			6.4		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.35			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	16.0
Intersection Capacity Utilization			33.7%		ICU Level of Service	A
Analysis Period (min)			15			

Intersection						
Int Delay, s/veh	1.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	447	0	0	79	0	56
Future Vol, veh/h	447	0	0	79	0	56
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, %	9	-	-	-9	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	486	0	0	86	0	61
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	486
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	-	-	0	-	0	581
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	581
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		11.9	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	581	-	-	-		
HCM Lane V/C Ratio	0.105	-	-	-		
HCM Control Delay (s)	11.9	-	-	-		
HCM Lane LOS	B	-	-	-		
HCM 95th %tile Q(veh)	0.3	-	-	-		

HCM Signalized Intersection Capacity Analysis

27: E Madison St & Pine St

03/09/2017



Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↑	↑	↑	↑	↑
Traffic Volume (vph)	0	503	77	346	358	2
Future Volume (vph)	0	503	77	346	358	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	11	11	11
Grade (%)		9%	-4%		0%	
Total Lost time (s)		4.5	4.5	4.5	4.5	4.5
Lane Util. Factor		1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes		1.00	1.00	0.91	1.00	0.83
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		1737	1837	1413	1678	1115
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		1737	1837	1413	1678	1115
Peak-hour factor, PHF	0.95	0.95	0.94	0.94	0.90	0.90
Adj. Flow (vph)	0	529	82	368	398	2
RTOR Reduction (vph)	0	0	0	139	0	1
Lane Group Flow (vph)	0	529	82	229	398	1
Confl. Peds. (#/hr)	62			62	1	43
Confl. Bikes (#/hr)				3		8
Heavy Vehicles (%)	1%	1%	2%	2%	4%	4%
Parking (#/hr)						0
Turn Type		NA	NA	Perm	Prot	Perm
Protected Phases		2	2		4	
Permitted Phases				2		4
Actuated Green, G (s)		56.0	56.0	56.0	25.0	25.0
Effective Green, g (s)		56.0	56.0	56.0	25.0	25.0
Actuated g/C Ratio		0.62	0.62	0.62	0.28	0.28
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)		0.2	0.2	0.2	0.2	0.2
Lane Grp Cap (vph)		1080	1143	879	466	309
v/s Ratio Prot		c0.30	0.04		c0.24	
v/s Ratio Perm				0.16		0.00
v/c Ratio		0.49	0.07	0.26	0.85	0.00
Uniform Delay, d1		9.2	6.7	7.7	30.8	23.5
Progression Factor		0.39	0.84	0.55	1.00	1.00
Incremental Delay, d2		1.5	0.1	0.7	13.7	0.0
Delay (s)		5.1	5.7	4.9	44.4	23.5
Level of Service		A	A	A	D	C
Approach Delay (s)		5.1	5.1		44.3	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay			16.5		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.60			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	9.0
Intersection Capacity Utilization			53.8%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

28: 17th Ave & E Madison St

03/09/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗		↑	↗		↕			↕	
Traffic Volume (vph)	0	769	92	0	310	5	109	29	1	101	17	4
Future Volume (vph)	0	769	92	0	310	5	109	29	1	101	17	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	12	11	11	12	10	12	12	16	12
Grade (%)		4%			4%			0%			0%	
Total Lost time (s)		4.5	4.5		4.5	4.5		4.5			4.5	
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00			1.00	
Frpb, ped/bikes		1.00	0.87		1.00	0.76		1.00			0.99	
Flpb, ped/bikes		1.00	1.00		1.00	1.00		0.82			0.84	
Frt		1.00	0.85		1.00	0.85		1.00			1.00	
Flt Protected		1.00	1.00		1.00	1.00		0.96			0.96	
Satd. Flow (prot)		1782	1325		1765	1141		1384			1703	
Flt Permitted		1.00	1.00		1.00	1.00		0.73			0.71	
Satd. Flow (perm)		1782	1325		1765	1141		1050			1253	
Peak-hour factor, PHF	0.92	0.92	0.92	0.96	0.96	0.96	0.80	0.80	0.80	0.93	0.93	0.93
Adj. Flow (vph)	0	836	100	0	323	5	136	36	1	109	18	4
RTOR Reduction (vph)	0	0	20	0	0	2	0	0	0	0	2	0
Lane Group Flow (vph)	0	836	80	0	323	3	0	173	0	0	129	0
Confl. Peds. (#/hr)	95		44	44		95	120		113	113		120
Confl. Bikes (#/hr)			17			23			3			11
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Turn Type		NA	Perm		NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases			2			2	4			4		
Actuated Green, G (s)		60.5	60.5		60.5	60.5		20.5			20.5	
Effective Green, g (s)		60.5	60.5		60.5	60.5		20.5			20.5	
Actuated g/C Ratio		0.67	0.67		0.67	0.67		0.23			0.23	
Clearance Time (s)		4.5	4.5		4.5	4.5		4.5			4.5	
Vehicle Extension (s)		0.2	0.2		0.2	0.2		3.0			3.0	
Lane Grp Cap (vph)		1197	890		1186	767		239			285	
v/s Ratio Prot		c0.47			0.18							
v/s Ratio Perm			0.06			0.00		c0.16			0.10	
v/c Ratio		0.70	0.09		0.27	0.00		0.72			0.45	
Uniform Delay, d1		9.1	5.1		5.9	4.8		32.1			29.9	
Progression Factor		0.84	0.96		0.59	1.00		1.00			1.00	
Incremental Delay, d2		2.9	0.2		0.5	0.0		10.4			1.2	
Delay (s)		10.5	5.1		4.0	4.9		42.5			31.1	
Level of Service		B	A		A	A		D			C	
Approach Delay (s)		10.0			4.0			42.5			31.1	
Approach LOS		A			A			D			C	
Intersection Summary												
HCM 2000 Control Delay			14.1				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			12.5		
Intersection Capacity Utilization			62.0%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

Intersection												
Int Delay, s/veh	1.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗		↑	↗			↗			↗
Traffic Vol, veh/h	0	758	113	0	288	122	0	0	120	0	0	21
Future Vol, veh/h	0	758	113	0	288	122	0	0	120	0	0	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	103	-	-	0	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-4	-	-	11	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	824	123	0	313	133	0	0	130	0	0	23
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	824	-	-	313
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.22	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.318	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	373	0	0	727
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	373	-	-	727
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0			19.8			10.1		
HCM LOS							C			B		
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1						
Capacity (veh/h)	373	-	-	-	-	727						
HCM Lane V/C Ratio	0.35	-	-	-	-	0.031						
HCM Control Delay (s)	19.8	-	-	-	-	10.1						
HCM Lane LOS	C	-	-	-	-	B						
HCM 95th %tile Q(veh)	1.5	-	-	-	-	0.1						

HCM Signalized Intersection Capacity Analysis

30: 19th Ave & E Madison St

03/09/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	539	51	183	195	3	77	114	69	9	197	139
Future Volume (vph)	285	539	51	183	195	3	77	114	69	9	197	139
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	12	16	12	12	16	12
Grade (%)		-11%			8%			0%			0%	
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			1.00			1.00			0.99	
Flpb, ped/bikes		0.99			0.99			1.00			1.00	
Frt		0.99			1.00			0.96			0.95	
Flt Protected		0.98			0.98			0.99			1.00	
Satd. Flow (prot)		3482			3194			2015			1929	
Flt Permitted		0.70			0.53			0.54			0.99	
Satd. Flow (perm)		2492			1736			1109			1908	
Peak-hour factor, PHF	0.99	0.99	0.99	0.98	0.98	0.98	0.86	0.86	0.86	0.91	0.91	0.91
Adj. Flow (vph)	288	544	52	187	199	3	90	133	80	10	216	153
RTOR Reduction (vph)	0	4	0	0	0	0	0	16	0	0	31	0
Lane Group Flow (vph)	0	880	0	0	389	0	0	287	0	0	348	0
Confl. Peds. (#/hr)	26		40	40		26	7		2	2		7
Confl. Bikes (#/hr)			8			4			1			12
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	4%	4%	4%
Parking (#/hr)									0			0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		54.3			54.3			23.7			23.7	
Effective Green, g (s)		54.3			54.3			23.7			23.7	
Actuated g/C Ratio		0.60			0.60			0.26			0.26	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		0.2			0.2			3.0			3.0	
Lane Grp Cap (vph)		1503			1047			292			502	
v/s Ratio Prot												
v/s Ratio Perm		c0.35			0.22			c0.26			0.18	
v/c Ratio		0.59			0.37			0.98			0.69	
Uniform Delay, d1		10.9			9.1			32.9			29.9	
Progression Factor		0.54			0.60			1.00			1.00	
Incremental Delay, d2		1.4			1.0			47.5			4.1	
Delay (s)		7.3			6.5			80.4			34.0	
Level of Service		A			A			F			C	
Approach Delay (s)		7.3			6.5			80.4			34.0	
Approach LOS		A			A			F			C	
Intersection Summary												
HCM 2000 Control Delay			23.6			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.71									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			93.3%			ICU Level of Service			F			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

31: 20th Ave & E Olive St & E Madison St

03/09/2017



Movement	EBT	EBR	EBR2	WBT	NBR2	SBT	SBR	NWL	NWR	NWR2
Lane Configurations	↑↑			↑↑	↑	↑		↑↑		
Traffic Volume (vph)	593	14	3	278	22	10	84	40	15	66
Future Volume (vph)	593	14	3	278	22	10	84	40	15	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	13	12	16	12	12
Grade (%)	-8%			3%		0%		0%		
Total Lost time (s)	4.5			4.5	4.0	4.5		4.5		
Lane Util. Factor	0.95			0.95	1.00	1.00		1.00		
Frpb, ped/bikes	1.00			1.00	1.00	0.98		0.91		
Flpb, ped/bikes	1.00			1.00	1.00	1.00		1.00		
Frt	1.00			1.00	0.86	0.88		0.91		
Flt Protected	1.00			1.00	1.00	1.00		0.98		
Satd. Flow (prot)	3697			3521	1465	1678		1731		
Flt Permitted	1.00			1.00	1.00	1.00		0.98		
Satd. Flow (perm)	3697			3521	1465	1678		1731		
Peak-hour factor, PHF	0.97	0.97	0.97	0.94	0.79	0.59	0.59	0.82	0.82	0.82
Adj. Flow (vph)	611	14	3	296	28	17	142	49	18	80
RTOR Reduction (vph)	0	0	0	0	0	129	0	66	0	0
Lane Group Flow (vph)	628	0	0	296	28	30	0	81	0	0
Confl. Peds. (#/hr)		10	2				7		29	12
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Parking (#/hr)		0			0		0		0	0
Turn Type	NA			NA	Free	NA		Prot		
Protected Phases	2			2		4		1		
Permitted Phases					Free					
Actuated Green, G (s)	59.9			59.9	90.0	8.1		8.5		
Effective Green, g (s)	59.9			59.9	90.0	8.1		8.5		
Actuated g/C Ratio	0.67			0.67	1.00	0.09		0.09		
Clearance Time (s)	4.5			4.5		4.5		4.5		
Vehicle Extension (s)	0.2			0.2		2.0		2.0		
Lane Grp Cap (vph)	2460			2343	1465	151		163		
v/s Ratio Prot	c0.17			0.08		c0.02		c0.05		
v/s Ratio Perm					0.02					
v/c Ratio	0.26			0.13	0.02	0.20		0.50		
Uniform Delay, d1	6.1			5.5	0.0	37.9		38.7		
Progression Factor	0.30			1.33	1.00	1.00		1.00		
Incremental Delay, d2	0.2			0.1	0.0	0.2		0.9		
Delay (s)	2.0			7.4	0.0	38.2		39.6		
Level of Service	A			A	A	D		D		
Approach Delay (s)	2.0			7.4		38.2		39.6		
Approach LOS	A			A		D		D		

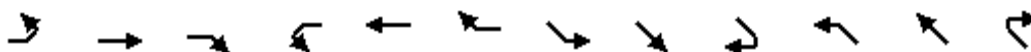
Intersection Summary

HCM 2000 Control Delay	12.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	46.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

32: 22nd Ave/E Denny Way & E Madison St

03/09/2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↑	↗		↖			↕			↕	
Traffic Volume (vph)	0	622	38	0	288	26	43	124	0	4	81	87
Future Volume (vph)	0	622	38	0	288	26	43	124	0	4	81	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	12	12	12	12	11	12
Grade (%)		-3%			1%			0%			0%	
Total Lost time (s)		4.5	4.5		4.5			4.5			4.5	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.92		1.00			1.00			0.94	
Flpb, ped/bikes		1.00	1.00		1.00			0.99			1.00	
Frt		1.00	0.85		0.99			1.00			0.93	
Flt Protected		1.00	1.00		1.00			0.99			1.00	
Satd. Flow (prot)		1846	1341		1786			1853			1583	
Flt Permitted		1.00	1.00		1.00			0.71			0.99	
Satd. Flow (perm)		1846	1341		1786			1333			1575	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.64	0.64	0.64	0.77	0.77	0.77
Adj. Flow (vph)	0	699	43	0	324	29	67	194	0	5	105	113
RTOR Reduction (vph)	0	0	13	0	3	0	0	0	0	0	46	0
Lane Group Flow (vph)	0	699	30	0	350	0	0	261	0	0	177	0
Confl. Peds. (#/hr)	2		25	25		2	39		4	4		39
Confl. Bikes (#/hr)			1						10			2
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	2%	2%	2%
Parking (#/hr)			0			0			0			
Turn Type		NA	Perm		NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases			2				4			4		
Actuated Green, G (s)		62.6	62.6		62.6			18.4			18.4	
Effective Green, g (s)		62.6	62.6		62.6			18.4			18.4	
Actuated g/C Ratio		0.70	0.70		0.70			0.20			0.20	
Clearance Time (s)		4.5	4.5		4.5			4.5			4.5	
Vehicle Extension (s)		0.2	0.2		0.2			1.0			1.0	
Lane Grp Cap (vph)		1283	932		1242			272			322	
v/s Ratio Prot		c0.38			0.20							
v/s Ratio Perm			0.02					c0.20			0.11	
v/c Ratio		0.54	0.03		0.28			0.96			0.55	
Uniform Delay, d1		6.7	4.3		5.2			35.4			32.1	
Progression Factor		0.31	0.12		1.00			1.00			1.00	
Incremental Delay, d2		1.6	0.1		0.5			42.7			1.0	
Delay (s)		3.7	0.6		5.7			78.1			33.1	
Level of Service		A	A		A			E			C	
Approach Delay (s)		3.5			5.7			78.1			33.1	
Approach LOS		A			A			E			C	
Intersection Summary												
HCM 2000 Control Delay			20.5									
HCM 2000 Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			90.0									
Intersection Capacity Utilization			69.1%									
Analysis Period (min)			15									
HCM 2000 Level of Service				C								
Sum of lost time (s)				9.0								
ICU Level of Service				C								

Intersection

Int Delay, s/veh 0.5

Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	0	53	0	751	264	11
Future Vol, veh/h	0	53	0	751	264	11
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	-	-	-1	5	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	58	0	816	287	12

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	293	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	-	-
Pot Cap-1 Maneuver	0	746	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	746	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	SB	NE	SW
HCM Control Delay, s	10.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NET SBLn1	SWT	SWR
Capacity (veh/h)	- 746	-	-
HCM Lane V/C Ratio	- 0.077	-	-
HCM Control Delay (s)	- 10.2	-	-
HCM Lane LOS	- B	-	-
HCM 95th %tile Q(veh)	- 0.2	-	-

HCM 2010 Signalized Intersection Summary

34: E Madison St & 23rd Ave E

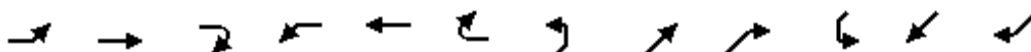
03/09/2017

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	0	609	32	0	617	75	270	419	61	100	202	0
Future Volume (veh/h)	0	609	32	0	617	75	270	419	61	100	202	0
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	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1806	1824	0	1881	1863	1909	1986	1948	1787	1770	0
Adj Flow Rate, veh/h	0	700	46	0	678	82	293	455	0	156	220	0
Adj No. of Lanes	0	2	0	0	1	1	1	1	0	1	1	0
Peak Hour Factor	0.92	0.87	0.69	0.25	0.91	0.92	0.92	0.92	0.92	0.64	0.92	0.46
Percent Heavy Veh, %	0	1	1	0	1	2	2	2	2	1	2	0
Cap, veh/h	0	1378	91	0	836	669	355	662	0	208	431	0
Arrive On Green	0.00	0.44	0.43	0.00	0.44	0.42	0.20	0.33	0.00	0.24	0.49	0.00
Sat Flow, veh/h	0	3191	204	0	1881	1583	1818	1986	0	1702	1770	0
Grp Volume(v), veh/h	0	387	359	0	678	82	293	455	0	156	220	0
Grp Sat Flow(s),veh/h/ln	0	1716	1589	0	1881	1583	1818	1986	0	1702	1770	0
Q Serve(g_s), s	0.0	14.6	14.6	0.0	28.2	2.8	13.9	17.8	0.0	7.6	7.6	0.0
Cycle Q Clear(g_c), s	0.0	14.6	14.6	0.0	28.2	2.8	13.9	17.8	0.0	7.6	7.6	0.0
Prop In Lane	0.00		0.13	0.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	0	763	706	0	836	669	355	662	0	208	431	0
V/C Ratio(X)	0.00	0.51	0.51	0.00	0.81	0.12	0.82	0.69	0.00	0.75	0.51	0.00
Avail Cap(c_a), veh/h	0	763	706	0	836	669	404	662	0	244	431	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	0.40	0.40	1.00	1.00	0.00	0.64	0.64	0.00
Uniform Delay (d), s/veh	0.0	17.9	18.0	0.0	21.7	15.8	34.7	25.9	0.0	32.7	19.4	0.0
Incr Delay (d2), s/veh	0.0	2.4	2.6	0.0	3.6	0.2	10.4	5.7	0.0	5.4	2.8	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 BackOfQ(50%),veh/ln	0.0	7.4	6.9	0.0	15.3	3.2	8.0	10.8	0.0	3.9	4.0	0.0
LnGrp Delay(d),s/veh	0.0	20.3	20.6	0.0	25.3	16.0	45.1	31.7	0.0	38.1	22.2	0.0
LnGrp LOS		C	C		C	B	D	C		D	C	
Approach Vol, veh/h		746			760			748			376	
Approach Delay, s/veh		20.5			24.3			36.9			28.8	
Approach LOS		C			C			D			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	14.0	33.0		43.0	20.6	26.4		43.0				
Change Period (Y+Rc), s	4.5	4.5		5.0	4.5	4.5		5.0				
Max Green Setting (Gmax), s	11.4	26.6		38.0	18.5	19.5		38.0				
Max Q Clear Time (g_c+I1), s	9.6	19.8		16.6	15.9	9.6		30.2				
Green Ext Time (p_c), s	0.1	0.2		0.3	0.2	0.3		0.3				
Intersection Summary												
HCM 2010 Ctrl Delay				27.4								
HCM 2010 LOS				C								

HCM Signalized Intersection Capacity Analysis

35: E Madison St & E JOHN ST

03/09/2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↰	↱		↰			↰			↰	
Traffic Volume (vph)	140	143	10	0	130	6	22	388	6	3	302	210
Future Volume (vph)	140	143	10	0	130	6	22	388	6	3	302	210
Ideal Flow (vphpl)	1900	1900	1900	1750	1750	1750	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	10	12	11	12	12	12	12
Grade (%)		-15%			0%			-10%			10%	
Total Lost time (s)		2.5	5.5		2.5			2.5			2.5	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.97		1.00			1.00			0.93	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		0.99			1.00			0.94	
Flt Protected		0.98	1.00		1.00			1.00			1.00	
Satd. Flow (prot)		1824	1482		1621			1916			1533	
Flt Permitted		0.98	1.00		1.00			0.96			1.00	
Satd. Flow (perm)		1824	1482		1621			1848			1530	
Peak-hour factor, PHF	0.83	0.83	0.83	0.72	0.72	0.72	0.91	0.91	0.91	0.95	0.95	0.95
Adj. Flow (vph)	169	172	12	0	181	8	24	426	7	3	318	221
RTOR Reduction (vph)	0	0	10	0	2	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	341	2	0	187	0	0	456	0	0	542	0
Confl. Peds. (#/hr)	9					9	40		26	26		40
Confl. Bikes (#/hr)			7									6
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	4%	4%	4%
Parking (#/hr)			0						0			0
Turn Type	Split	NA	Perm		NA		Perm	NA		Perm	NA	
Protected Phases	3	3		4	4			2			2	
Permitted Phases		3	3				2	2		2		
Actuated Green, G (s)		18.5	18.5		13.9			41.1			41.1	
Effective Green, g (s)		21.5	18.5		16.9			44.1			44.1	
Actuated g/C Ratio		0.24	0.21		0.19			0.49			0.49	
Clearance Time (s)		5.5	5.5		5.5			5.5			5.5	
Vehicle Extension (s)		2.0	2.0		2.0			0.2			0.2	
Lane Grp Cap (vph)		435	304		304			905			749	
v/s Ratio Prot		c0.19			c0.12							
v/s Ratio Perm			0.00					0.25			c0.35	
v/c Ratio		0.78	0.01		0.62			0.50			0.72	
Uniform Delay, d1		32.1	28.4		33.6			15.5			18.1	
Progression Factor		1.00	1.00		1.00			0.18			0.89	
Incremental Delay, d2		8.3	0.0		2.6			1.2			5.6	
Delay (s)		40.4	28.5		36.2			4.0			21.7	
Level of Service		D	C		D			A			C	
Approach Delay (s)		40.0			36.2			4.0			21.7	
Approach LOS		D			D			A			C	
Intersection Summary												
HCM 2000 Control Delay			22.4									
HCM 2000 Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			90.0									
Intersection Capacity Utilization			71.0%									
Analysis Period (min)			15									
HCM 2000 Level of Service								C				
Sum of lost time (s)								7.5				
ICU Level of Service								C				

Intersection												
Int Delay, s/veh	4.3											
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	5	21	14	15	27	10	39	478	10	10	500	13
Future Vol, veh/h	5	21	14	15	27	10	39	478	10	10	500	13
Conflicting Peds, #/hr	6	0	3	3	0	6	23	0	36	36	0	23
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	2	-	-	1	-	-	-10	-	-	14	-
Peak Hour Factor	71	71	71	75	75	75	98	98	98	96	96	96
Heavy Vehicles, %	0	0	0	0	0	0	2	2	2	2	2	2
Mvmt Flow	7	30	20	20	36	13	40	488	10	10	521	14
Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	1187	1186	532	1171	1185	557	557	0	0	534	0	0
Stage 1	608	608	-	571	571	-	-	-	-	-	-	-
Stage 2	579	578	-	600	614	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.9	6.4	7.3	6.7	6.3	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.5	5.9	-	6.3	5.7	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.9	-	6.3	5.7	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	146	167	535	160	178	526	1014	-	-	1034	-	-
Stage 1	454	457	-	493	492	-	-	-	-	-	-	-
Stage 2	473	473	-	475	470	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	107	148	517	121	158	513	1008	-	-	1031	-	-
Mov Cap-2 Maneuver	107	148	-	121	158	-	-	-	-	-	-	-
Stage 1	416	419	-	457	476	-	-	-	-	-	-	-
Stage 2	417	457	-	400	431	-	-	-	-	-	-	-
Approach	NB			SB			NE			SW		
HCM Control Delay, s	32.8			41.8			0.6			0.2		
HCM LOS	D			E								
Minor Lane/Major Mvmt	NEL	NET	NER	NBLn1	SBLn1	SWL	SWT	SWR				
Capacity (veh/h)	1008	-	-	185	165	1031	-	-				
HCM Lane V/C Ratio	0.039	-	-	0.305	0.42	0.01	-	-				
HCM Control Delay (s)	8.7	0	-	32.8	41.8	8.5	0	-				
HCM Lane LOS	A	A	-	D	E	A	A	-				
HCM 95th %tile Q(veh)	0.1	-	-	1.2	1.9	0	-	-				

Intersection

Int Delay, s/veh 0.7

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	2	14	30	410	517	3
Future Vol, veh/h	2	14	30	410	517	3
Conflicting Peds, #/hr	3	0	27	0	0	27
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	-14	10	-
Peak Hour Factor	50	50	92	92	95	95
Heavy Vehicles, %	0	0	2	2	2	2
Mvmt Flow	4	28	33	446	544	3

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1087	573	574	0	-	0
Stage 1	573	-	-	-	-	-
Stage 2	514	-	-	-	-	-
Critical Hdwy	5.8	5.9	4.12	-	-	-
Critical Hdwy Stg 1	4.8	-	-	-	-	-
Critical Hdwy Stg 2	4.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	289	548	999	-	-	-
Stage 1	625	-	-	-	-	-
Stage 2	659	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	264	536	999	-	-	-
Mov Cap-2 Maneuver	264	-	-	-	-	-
Stage 1	611	-	-	-	-	-
Stage 2	616	-	-	-	-	-

Approach	SE	NE	SW
HCM Control Delay, s	13.1	0.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NEL	NET	SELn1	SWT	SWR
Capacity (veh/h)	999	-	475	-	-
HCM Lane V/C Ratio	0.033	-	0.067	-	-
HCM Control Delay (s)	8.7	0	13.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-

Intersection

Int Delay, s/veh 0.7

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	7	24	357	44	8	502
Future Vol, veh/h	7	24	357	44	8	502
Conflicting Peds, #/hr	4	0	0	31	31	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	-10	-	-	8
Peak Hour Factor	65	65	93	93	96	96
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	11	37	384	47	8	523

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	983	439	0	0	462	0
Stage 1	439	-	-	-	-	-
Stage 2	544	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.12	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.218	-
Pot Cap-1 Maneuver	278	622	-	-	1099	-
Stage 1	654	-	-	-	-	-
Stage 2	586	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	268	606	-	-	1099	-
Mov Cap-2 Maneuver	268	-	-	-	-	-
Stage 1	637	-	-	-	-	-
Stage 2	579	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	13.5	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NERNWLn1	SWL	SWT
Capacity (veh/h)	-	-	472	1099
HCM Lane V/C Ratio	-	-	0.101	0.008
HCM Control Delay (s)	-	-	13.5	8.3
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.3	0

Intersection						
Int Delay, s/veh	0.6					
Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	2	21	24	357	489	10
Future Vol, veh/h	2	21	24	357	489	10
Conflicting Peds, #/hr	19	0	19	0	0	19
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	-8	4	-
Peak Hour Factor	82	82	93	93	96	96
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	2	26	26	384	509	10
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	988	534	539	0	-	0
Stage 1	534	-	-	-	-	-
Stage 2	454	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.13	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.227	-	-	-
Pot Cap-1 Maneuver	276	550	1024	-	-	-
Stage 1	592	-	-	-	-	-
Stage 2	644	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	261	541	1024	-	-	-
Mov Cap-2 Maneuver	393	-	-	-	-	-
Stage 1	583	-	-	-	-	-
Stage 2	618	-	-	-	-	-
Approach	SE	NE		SW		
HCM Control Delay, s	12.3	0.5		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NEL	NET	SELn1	SWT	SWR	
Capacity (veh/h)	1024	-	524	-	-	
HCM Lane V/C Ratio	0.025	-	0.054	-	-	
HCM Control Delay (s)	8.6	-	12.3	-	-	
HCM Lane LOS	A	-	B	-	-	
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-	

HCM Signalized Intersection Capacity Analysis

40: E Madison St & MLK Jr Way E/28th Ave E

03/09/2017

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	135	100	187	57	214	11	12	287	55	123	360	21
Future Volume (vph)	135	100	187	57	214	11	12	287	55	123	360	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	9	9	12	12	12	10	11	10	9	16	10
Grade (%)		2%			-1%			-4%			2%	
Total Lost time (s)		4.5	4.5		4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.88		1.00		1.00	0.97		1.00	0.99	
Flpb, ped/bikes		0.98	1.00		0.99		0.96	1.00		0.92	1.00	
Frt		1.00	0.85		0.99		1.00	0.98		1.00	0.99	
Flt Protected		0.97	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1586	1244		1853		1605	1723		1416	2022	
Flt Permitted		0.56	1.00		0.84		0.46	1.00		0.50	1.00	
Satd. Flow (perm)		918	1244		1569		785	1723		744	2022	
Peak-hour factor, PHF	0.91	0.91	0.91	0.95	0.95	0.95	0.95	0.95	0.95	0.94	0.94	0.94
Adj. Flow (vph)	148	110	205	60	225	12	13	302	58	131	383	22
RTOR Reduction (vph)	0	0	0	0	0	0	0	4	0	0	1	0
Lane Group Flow (vph)	0	258	205	0	297	0	13	356	0	131	404	0
Confl. Peds. (#/hr)	26		36	36		26	32		64	64		32
Confl. Bikes (#/hr)			9			15			6			5
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	3%	3%	3%	4%	4%	4%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4		4	4			2			2		
Actuated Green, G (s)		27.4	27.4		27.4		53.6	53.6		53.6	53.6	
Effective Green, g (s)		27.4	27.4		27.4		53.6	53.6		53.6	53.6	
Actuated g/C Ratio		0.30	0.30		0.30		0.60	0.60		0.60	0.60	
Clearance Time (s)		4.5	4.5		4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		279	378		477		467	1026		443	1204	
v/s Ratio Prot								c0.21				0.20
v/s Ratio Perm		c0.28	0.16		0.19		0.02			0.18		
v/c Ratio		0.92	0.54		0.62		0.03	0.35		0.30	0.34	
Uniform Delay, d1		30.3	26.1		26.9		7.5	9.3		8.9	9.2	
Progression Factor		1.00	1.00		1.00		0.33	0.33		1.00	1.00	
Incremental Delay, d2		34.3	1.6		2.5		0.1	0.8		1.7	0.8	
Delay (s)		64.6	27.7		29.4		2.6	3.9		10.6	10.0	
Level of Service		E	C		C		A	A		B	A	
Approach Delay (s)		48.3			29.4			3.9			10.1	
Approach LOS		D			C			A			B	
Intersection Summary												
HCM 2000 Control Delay			22.7									HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio			0.57									
Actuated Cycle Length (s)			90.0							13.5		
Intersection Capacity Utilization			67.4%									ICU Level of Service C
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

41: 1st Ave & Spring St

03/09/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕						↕		↕	↕	
Traffic Volume (vph)	91	220	16	0	0	0	0	321	106	82	332	0
Future Volume (vph)	91	220	16	0	0	0	0	321	106	82	332	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	12	10	12	12	12	10	11	10	10	11	10
Grade (%)		9%			0%			3%			0%	
Total Lost time (s)		4.5						4.5		4.5	4.5	
Lane Util. Factor		0.95						1.00		1.00	1.00	
Frpb, ped/bikes		0.97						0.90		1.00	1.00	
Flpb, ped/bikes		0.94						1.00		1.00	1.00	
Frt		0.99						0.97		1.00	1.00	
Flt Protected		0.99						1.00		0.95	1.00	
Satd. Flow (prot)		2755						1395		1501	1637	
Flt Permitted		0.99						1.00		0.95	1.00	
Satd. Flow (perm)		2755						1395		1501	1637	
Peak-hour factor, PHF	0.88	0.88	0.88	0.25	0.25	0.25	0.95	0.95	0.95	0.93	0.93	0.93
Adj. Flow (vph)	103	250	18	0	0	0	0	338	112	88	357	0
RTOR Reduction (vph)	0	4	0	0	0	0	0	13	0	0	0	0
Lane Group Flow (vph)	0	367	0	0	0	0	0	437	0	88	357	0
Confl. Peds. (#/hr)	90		309	309		90	502		488	488		502
Confl. Bikes (#/hr)			1			5			12			28
Heavy Vehicles (%)	2%	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						9		2	6	
Permitted Phases	4	4										
Actuated Green, G (s)		19.5						37.5		19.5	61.5	
Effective Green, g (s)		19.5						37.5		19.5	61.5	
Actuated g/C Ratio		0.22						0.42		0.22	0.68	
Clearance Time (s)		4.5						4.5		4.5	4.5	
Vehicle Extension (s)		0.2						0.2		0.2	0.2	
Lane Grp Cap (vph)		596						581		325	1118	
v/s Ratio Prot								c0.31		0.06	c0.22	
v/s Ratio Perm		0.13										
v/c Ratio		0.62						0.75		0.27	0.32	
Uniform Delay, d1		31.9						22.3		29.3	5.8	
Progression Factor		1.00						0.69		1.00	1.00	
Incremental Delay, d2		4.7						8.2		2.0	0.8	
Delay (s)		36.6						23.5		31.4	6.5	
Level of Service		D						C		C	A	
Approach Delay (s)		36.6			0.0			23.5			11.4	
Approach LOS		D			A			C			B	
Intersection Summary												
HCM 2000 Control Delay			23.1									HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			90.0							17.0		
Intersection Capacity Utilization			59.7%									ICU Level of Service B
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

42: 2nd Ave & Spring St

03/09/2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑							↑	↑↑	
Traffic Volume (vph)	0	348	112	0	0	0	0	0	0	126	1449	0
Future Volume (vph)	0	348	112	0	0	0	0	0	0	126	1449	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	10	10	10	10	10	10	10
Grade (%)		12%			0%			0%			0%	
Total Lost time (s)		4.0	4.0							3.5	4.0	
Lane Util. Factor		0.95	1.00							1.00	0.95	
Frpb, ped/bikes		1.00	0.78							1.00	1.00	
Flpb, ped/bikes		1.00	1.00							1.00	1.00	
Frt		1.00	0.85							1.00	1.00	
Flt Protected		1.00	1.00							0.95	1.00	
Satd. Flow (prot)		2795	976							1204	2203	
Flt Permitted		1.00	1.00							0.95	1.00	
Satd. Flow (perm)		2795	976							1204	2203	
Peak-hour factor, PHF	0.92	0.92	0.92	0.25	0.25	0.25	0.25	0.25	0.25	0.97	0.97	0.97
Adj. Flow (vph)	0	378	122	0	0	0	0	0	0	130	1494	0
RTOR Reduction (vph)	0	0	46	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	378	76	0	0	0	0	0	0	130	1494	0
Confl. Peds. (#/hr)	200		178	178		200	340		348	348		340
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	7%	7%	7%
Parking (#/hr)										10	69	69
Turn Type		NA	custom							Prot	NA	
Protected Phases		2 5	5							4	1	
Permitted Phases			2									
Actuated Green, G (s)		27.0	22.5							32.5	54.5	
Effective Green, g (s)		27.5	22.5							33.0	55.0	
Actuated g/C Ratio		0.31	0.25							0.37	0.61	
Clearance Time (s)			4.0							4.0	4.5	
Lane Grp Cap (vph)		854	244							441	1346	
v/s Ratio Prot		c0.14	0.02							0.11	c0.68	
v/s Ratio Perm			0.06									
v/c Ratio		0.44	0.31							0.29	1.11	
Uniform Delay, d1		25.1	27.5							20.2	17.5	
Progression Factor		0.73	0.59							1.00	1.00	
Incremental Delay, d2		1.4	2.9							1.7	60.5	
Delay (s)		19.7	19.0							21.9	78.0	
Level of Service		B	B							C	E	
Approach Delay (s)		19.5			0.0			0.0			73.5	
Approach LOS		B			A			A			E	
Intersection Summary												
HCM 2000 Control Delay			60.8									HCM 2000 Level of Service E
HCM 2000 Volume to Capacity ratio			0.98									
Actuated Cycle Length (s)			90.0							15.0		
Intersection Capacity Utilization			66.4%									ICU Level of Service C
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

43: 3rd Ave & Spring St

03/09/2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕	↗					↕↕			↕↕	
Traffic Volume (vph)	5	529	18	0	0	0	0	0	30	0	55	0
Future Volume (vph)	5	529	18	0	0	0	0	0	30	0	55	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	12	12	12	11	12	12	11	12
Grade (%)		10%			-10%			0%			0%	
Total Lost time (s)		4.0	4.5					4.0			4.0	
Lane Util. Factor		0.95	1.00					0.95			0.95	
Frpb, ped/bikes		1.00	0.87					0.61			1.00	
Flpb, ped/bikes		1.00	1.00					1.00			1.00	
Frt		1.00	0.85					0.85			1.00	
Flt Protected		1.00	1.00					1.00			1.00	
Satd. Flow (prot)		2593	1200					1433			1753	
Flt Permitted		1.00	1.00					1.00			1.00	
Satd. Flow (perm)		2593	1200					1433			1753	
Peak-hour factor, PHF	0.97	0.97	0.97	0.25	0.25	0.25	0.80	0.80	0.80	0.91	0.91	0.91
Adj. Flow (vph)	5	545	19	0	0	0	0	0	38	0	60	0
RTOR Reduction (vph)	0	0	8	0	0	0	0	27	0	0	0	0
Lane Group Flow (vph)	0	550	11	0	0	0	0	11	0	0	60	0
Confl. Peds. (#/hr)	396		213	213		396	650		405	405		650
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	87%	0%	40%	67%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	60	0	0	34	0
Parking (#/hr)		15										
Turn Type	Perm	NA	custom					NA			NA	
Protected Phases		2	6					4			4	
Permitted Phases	2		5							4		
Actuated Green, G (s)		56.5	52.0					24.5			24.5	
Effective Green, g (s)		57.0	52.0					25.0			25.0	
Actuated g/C Ratio		0.63	0.58					0.28			0.28	
Clearance Time (s)		4.5	4.5					4.5			4.5	
Lane Grp Cap (vph)		1642	753					398			486	
v/s Ratio Prot			0.01					0.01			c0.03	
v/s Ratio Perm		0.21	0.00									
v/c Ratio		0.33	0.02					0.03			0.12	
Uniform Delay, d1		7.7	8.1					23.6			24.3	
Progression Factor		0.33	0.31					1.00			1.00	
Incremental Delay, d2		0.5	0.0					0.1			0.5	
Delay (s)		3.1	2.6					23.8			24.8	
Level of Service		A	A					C			C	
Approach Delay (s)		3.1			0.0			23.8			24.8	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			6.2									
HCM 2000 Volume to Capacity ratio			0.29									
Actuated Cycle Length (s)			90.0									
Intersection Capacity Utilization			38.9%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2010 Signalized Intersection Summary

44: 4th Ave & Spring St

03/09/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	112	412	0	0	0	0	0	1274	99	0	0	0
Future Volume (veh/h)	112	412	0	0	0	0	0	1274	99	0	0	0
Number	5	2	12				7	4	14			
Initial Q (Qb), veh	0	0	0				0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		0.77			
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1582	1569	0				0	1544	1635			
Adj Flow Rate, veh/h	117	429	0				0	1341	104			
Adj No. of Lanes	0	2	0				0	3	1			
Peak Hour Factor	0.96	0.96	0.96				0.95	0.95	0.95			
Percent Heavy Veh, %	1	1	0				0	8	2			
Cap, veh/h	249	835	0				0	2177	550			
Arrive On Green	0.12	0.12	0.00				0.00	0.17	0.17			
Sat Flow, veh/h	519	2313	0				0	4353	1065			
Grp Volume(v), veh/h	286	260	0				0	1341	104			
Grp Sat Flow(s),veh/h/ln	1404	1357	0				0	1405	1065			
Q Serve(g_s), s	14.2	16.1	0.0				0.0	26.5	7.5			
Cycle Q Clear(g_c), s	17.1	16.1	0.0				0.0	26.5	7.5			
Prop In Lane	0.41		0.00				0.00		1.00			
Lane Grp Cap(c), veh/h	579	505	0				0	2177	550			
V/C Ratio(X)	0.49	0.51	0.00				0.00	0.62	0.19			
Avail Cap(c_a), veh/h	579	505	0				0	2177	550			
HCM Platoon Ratio	0.33	0.33	1.00				1.00	0.33	0.33			
Upstream Filter(l)	1.00	1.00	0.00				0.00	1.00	1.00			
Uniform Delay (d), s/veh	32.1	31.9	0.0				0.0	29.0	21.2			
Incr Delay (d2), s/veh	3.0	3.7	0.0				0.0	1.3	0.8			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	7.2	6.6	0.0				0.0	10.6	2.3			
LnGrp Delay(d),s/veh	35.1	35.6	0.0				0.0	30.4	21.9			
LnGrp LOS	D	D						C	C			
Approach Vol, veh/h		546						1445				
Approach Delay, s/veh		35.3						29.8				
Approach LOS		D						C				
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		38.0		52.0								
Change Period (Y+Rc), s		4.5		4.5								
Max Green Setting (Gmax), s		33.5		47.5								
Max Q Clear Time (g_c+l1), s		0.0		0.0								
Green Ext Time (p_c), s		0.0		0.0								
Intersection Summary												
HCM 2010 Ctrl Delay			31.3									
HCM 2010 LOS			C									

HCM Signalized Intersection Capacity Analysis

45: 5th Ave & Spring St

03/09/2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗								↖↑↑	
Traffic Volume (vph)	0	501	84	0	0	0	0	0	0	499	546	0
Future Volume (vph)	0	501	84	0	0	0	0	0	0	499	546	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	10	12	12	12	12	12	12	10	10	12
Grade (%)		15%			-5%			0%			0%	
Total Lost time (s)		3.5	5.0								2.5	
Lane Util. Factor		0.95	1.00								0.91	
Frpb, ped/bikes		1.00	0.75								1.00	
Flpb, ped/bikes		1.00	1.00								0.86	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								0.98	
Satd. Flow (prot)		2492	927								3575	
Flt Permitted		1.00	1.00								0.98	
Satd. Flow (perm)		2492	927								3575	
Peak-hour factor, PHF	0.90	0.90	0.90	0.25	0.25	0.25	0.25	0.25	0.25	0.93	0.93	0.93
Adj. Flow (vph)	0	557	93	0	0	0	0	0	0	537	587	0
RTOR Reduction (vph)	0	0	32	0	0	0	0	0	0	0	26	0
Lane Group Flow (vph)	0	557	61	0	0	0	0	0	0	0	1098	0
Confl. Peds. (#/hr)	210		133	133		210	392		208	208		392
Heavy Vehicles (%)	0%	2%	2%	0%	0%	0%	0%	0%	0%	1%	3%	0%
Parking (#/hr)		30										
Turn Type		NA	Perm							custom	NA	
Protected Phases		2								3	8	
Permitted Phases			2							4		
Actuated Green, G (s)		38.0	38.0								43.0	
Effective Green, g (s)		39.5	38.0								44.5	
Actuated g/C Ratio		0.44	0.42								0.49	
Clearance Time (s)		5.0	5.0								4.0	
Lane Grp Cap (vph)		1093	391								1767	
v/s Ratio Prot		c0.22									c0.16	
v/s Ratio Perm			0.07								0.14	
v/c Ratio		0.51	0.16								0.62	
Uniform Delay, d1		18.2	16.1								16.6	
Progression Factor		0.48	0.49								1.00	
Incremental Delay, d2		1.5	0.8								1.7	
Delay (s)		10.3	8.7								18.3	
Level of Service		B	A								B	
Approach Delay (s)		10.1			0.0			0.0			18.3	
Approach LOS		B			A			A			B	
Intersection Summary												
HCM 2000 Control Delay			15.3	HCM 2000 Level of Service					B			
HCM 2000 Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			90.0	Sum of lost time (s)					9.0			
Intersection Capacity Utilization			59.4%	ICU Level of Service					B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

46: 6th Ave & I-5 CD SB On-Ramp & Spring St

03/09/2017



Movement	EBL	EBT	EBR	NBT	NBR2
Lane Configurations		↰	↱	↰↱	↱
Traffic Volume (vph)	70	151	777	141	712
Future Volume (vph)	70	151	777	141	712
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Lane Width	12	10	10	10	12
Grade (%)		10%		5%	
Total Lost time (s)		4.5	4.5	4.5	4.5
Lane Util. Factor		1.00	1.00	0.95	1.00
Frpb, ped/bikes		1.00	1.00	1.00	1.00
Flpb, ped/bikes		0.90	1.00	1.00	1.00
Frt		1.00	0.85	1.00	0.85
Flt Protected		0.98	1.00	1.00	1.00
Satd. Flow (prot)		1075	1276	2927	1403
Flt Permitted		0.98	1.00	1.00	1.00
Satd. Flow (perm)		1075	1276	2927	1403
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	75	162	835	152	766
RTOR Reduction (vph)	0	45	0	0	0
Lane Group Flow (vph)	0	192	835	152	766
Confl. Peds. (#/hr)	224				
Heavy Vehicles (%)	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	5	0	0	0
Parking (#/hr)		15			
Turn Type	Perm	NA	Prot	NA	custom
Protected Phases		2	2	4	4
Permitted Phases	2				1 9
Actuated Green, G (s)		50.5	50.5	30.5	30.5
Effective Green, g (s)		50.5	50.5	30.5	30.5
Actuated g/C Ratio		0.56	0.56	0.34	0.34
Clearance Time (s)		4.5	4.5	4.5	4.5
Vehicle Extension (s)		0.2	0.2	0.2	0.2
Lane Grp Cap (vph)		603	715	991	475
v/s Ratio Prot			c0.65	0.05	c0.55
v/s Ratio Perm		0.18			
v/c Ratio		0.32	1.17	0.15	1.61
Uniform Delay, d1		10.6	19.8	20.7	29.8
Progression Factor		0.52	0.57	0.77	0.80
Incremental Delay, d2		1.2	88.2	0.3	283.2
Delay (s)		6.7	99.5	16.3	307.0
Level of Service		A	F	B	F
Approach Delay (s)		79.0		258.9	
Approach LOS		E		F	
Intersection Summary					
HCM 2000 Control Delay		162.0		HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio		1.46			
Actuated Cycle Length (s)		90.0		Sum of lost time (s)	16.0
Intersection Capacity Utilization		109.9%		ICU Level of Service	H
Analysis Period (min)		15			

HCM Signalized Intersection Capacity Analysis

47: 7th Ave/Hubbell PI & Spring St

03/09/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	119	12	0	0	0	0	315	105	0	215	0
Future Volume (vph)	38	119	12	0	0	0	0	315	105	0	215	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	14	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.5						4.5			4.5	
Lane Util. Factor		0.95						1.00			1.00	
Frpb, ped/bikes		0.99						1.00			1.00	
Flpb, ped/bikes		0.88						1.00			1.00	
Frt		0.99						0.97			1.00	
Flt Protected		0.99						1.00			1.00	
Satd. Flow (prot)		2821						1644			1676	
Flt Permitted		0.99						1.00			1.00	
Satd. Flow (perm)		2821						1644			1676	
Peak-hour factor, PHF	0.87	0.92	0.87	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.85	0.85
Adj. Flow (vph)	44	129	14	0	0	0	0	342	114	0	253	0
RTOR Reduction (vph)	0	7	0	0	0	0	0	13	0	0	0	0
Lane Group Flow (vph)	0	180	0	0	0	0	0	443	0	0	253	0
Confl. Peds. (#/hr)	166		20				4					4
Heavy Vehicles (%)	17%	2%	0%	2%	2%	2%	0%	0%	2%	2%	2%	0%
Turn Type	Perm	NA						NA			NA	
Protected Phases		2						4			4	
Permitted Phases	2									4		
Actuated Green, G (s)		24.5						56.5			56.5	
Effective Green, g (s)		24.5						56.5			56.5	
Actuated g/C Ratio		0.27						0.63			0.63	
Clearance Time (s)		4.5						4.5			4.5	
Lane Grp Cap (vph)		767						1032			1052	
v/s Ratio Prot								c0.27			0.15	
v/s Ratio Perm		0.06										
v/c Ratio		0.24						0.43			0.24	
Uniform Delay, d1		25.5						8.5			7.3	
Progression Factor		0.49						0.20			1.00	
Incremental Delay, d2		0.7						1.1			0.5	
Delay (s)		13.2						2.8			7.9	
Level of Service		B						A			A	
Approach Delay (s)		13.2			0.0			2.8			7.9	
Approach LOS		B			A			A			A	
Intersection Summary												
HCM 2000 Control Delay		6.4										
HCM 2000 Volume to Capacity ratio		0.37										
Actuated Cycle Length (s)		90.0										
Intersection Capacity Utilization		45.5%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

48: 8th Ave & Spring St

03/09/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	72	140	12	0	0	0	0	201	17	105	186	0
Future Volume (vph)	72	140	12	0	0	0	0	201	17	105	186	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5						4.5			4.5	
Lane Util. Factor		0.95						1.00			1.00	
Frpb, ped/bikes		0.99						0.98			1.00	
Flpb, ped/bikes		0.89						1.00			0.95	
Frt		0.99						0.99			1.00	
Flt Protected		0.98						1.00			0.98	
Satd. Flow (prot)		3034						1816			1744	
Flt Permitted		0.98						1.00			0.81	
Satd. Flow (perm)		3034						1816			1433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	78	152	13	0	0	0	0	218	18	114	202	0
RTOR Reduction (vph)	0	5	0	0	0	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	238	0	0	0	0	0	233	0	0	316	0
Confl. Peds. (#/hr)	116		65					115		104	104	115
Confl. Bikes (#/hr)			5							13		2
Turn Type	Perm	NA						NA		Perm	NA	
Protected Phases		2						4			4	
Permitted Phases	2									4		
Actuated Green, G (s)		27.5						53.5			53.5	
Effective Green, g (s)		27.5						53.5			53.5	
Actuated g/C Ratio		0.31						0.59			0.59	
Clearance Time (s)		4.5						4.5			4.5	
Lane Grp Cap (vph)		927						1079			851	
v/s Ratio Prot								0.13				
v/s Ratio Perm		0.08									c0.22	
v/c Ratio		0.26						0.22			0.37	
Uniform Delay, d1		23.5						8.5			9.5	
Progression Factor		0.62						0.43			1.00	
Incremental Delay, d2		0.6						0.4			1.2	
Delay (s)		15.2						4.1			10.7	
Level of Service		B						A			B	
Approach Delay (s)		15.2			0.0			4.1			10.7	
Approach LOS		B			A			A			B	
Intersection Summary												
HCM 2000 Control Delay		10.1						HCM 2000 Level of Service		B		
HCM 2000 Volume to Capacity ratio		0.33										
Actuated Cycle Length (s)		90.0						Sum of lost time (s)		9.0		
Intersection Capacity Utilization		51.8%						ICU Level of Service		A		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

49: 9th Ave & Spring St

03/09/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	60	162	131	0	10	0	64	1	1	171	0
Future Volume (vph)	40	60	162	131	0	10	0	64	1	1	171	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	11	12	12	12	12
Total Lost time (s)	4.5	4.5			4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frpb, ped/bikes	1.00	0.86			0.96			1.00			1.00	
Flpb, ped/bikes	0.59	1.00			0.89			1.00			1.00	
Frt	1.00	0.89			0.99			1.00			1.00	
Flt Protected	0.95	1.00			0.96			1.00			1.00	
Satd. Flow (prot)	1053	1425			1511			1788			1859	
Flt Permitted	0.67	1.00			0.61			1.00			1.00	
Satd. Flow (perm)	745	1425			959			1788			1859	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	65	176	142	0	11	0	70	1	1	186	0
RTOR Reduction (vph)	0	79	0	0	8	0	0	1	0	0	0	0
Lane Group Flow (vph)	43	162	0	0	145	0	0	70	0	0	187	0
Confl. Peds. (#/hr)	209		58	58		209	104		111	111		104
Confl. Bikes (#/hr)			4			1			4			3
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2						4		
Actuated Green, G (s)	49.5	49.5			49.5			31.5			31.5	
Effective Green, g (s)	49.5	49.5			49.5			31.5			31.5	
Actuated g/C Ratio	0.55	0.55			0.55			0.35			0.35	
Clearance Time (s)	4.5	4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)	409	783			527			625			650	
v/s Ratio Prot		0.11						0.04				
v/s Ratio Perm	0.06				0.15						0.10	
v/c Ratio	0.11	0.21			0.27			0.11			0.29	
Uniform Delay, d1	9.7	10.3			10.7			19.8			21.1	
Progression Factor	0.71	0.44			1.00			1.97			1.00	
Incremental Delay, d2	0.5	0.6			1.3			0.4			1.1	
Delay (s)	7.3	5.1			12.0			39.3			22.3	
Level of Service	A	A			B			D			C	
Approach Delay (s)		5.5			12.0			39.3			22.3	
Approach LOS		A			B			D			C	
Intersection Summary												
HCM 2000 Control Delay			14.9									
HCM 2000 Volume to Capacity ratio			0.28									
Actuated Cycle Length (s)			90.0									
Intersection Capacity Utilization			52.6%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

50: 14th Ave & Pike St

03/09/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	0	114	45	95	2	2	267	0	0	363	1
Future Volume (vph)	4	0	114	45	95	2	2	267	0	0	363	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	16	12	12	16	12	12	16	12
Grade (%)		6%			-6%			0%			0%	
Total Lost time (s)	4.5		4.5		4.5			4.5			4.5	
Lane Util. Factor	1.00		1.00		1.00			1.00			1.00	
Frt	1.00		0.85		1.00			1.00			1.00	
Flt Protected	0.95		1.00		0.98			1.00			1.00	
Satd. Flow (prot)	1717		1536		2137			2110			1899	
Flt Permitted	0.66		1.00		0.98			1.00			1.00	
Satd. Flow (perm)	1191		1536		2137			2107			1899	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	0	124	49	103	2	2	290	0	0	395	1
RTOR Reduction (vph)	0	0	114	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	4	0	10	0	154	0	0	292	0	0	396	0
Parking (#/hr)		0									0	
Turn Type	Perm		Perm	Perm	NA		Perm	NA			NA	
Protected Phases					4			3			3	
Permitted Phases	2		2	4			3					
Actuated Green, G (s)	7.3		7.3		48.5			32.5			32.5	
Effective Green, g (s)	7.3		7.3		48.5			32.5			32.5	
Actuated g/C Ratio	0.08		0.08		0.54			0.36			0.36	
Clearance Time (s)	4.5		4.5		4.5			4.5			4.5	
Lane Grp Cap (vph)	96		124		1151			760			685	
v/s Ratio Prot											c0.21	
v/s Ratio Perm	0.00		0.01		0.07			0.14				
v/c Ratio	0.04		0.08		0.13			0.38			0.58	
Uniform Delay, d1	38.1		38.2		10.3			21.3			23.2	
Progression Factor	1.00		1.00		0.76			0.18			1.00	
Incremental Delay, d2	0.8		1.3		0.2			0.7			3.5	
Delay (s)	38.9		39.5		8.0			4.4			26.7	
Level of Service	D		D		A			A			C	
Approach Delay (s)		39.5			8.0			4.4			26.7	
Approach LOS		D			A			A			C	
Intersection Summary												
HCM 2000 Control Delay			18.7									HCM 2000 Level of Service B
HCM 2000 Volume to Capacity ratio			0.33									
Actuated Cycle Length (s)			90.0								13.5	Sum of lost time (s)
Intersection Capacity Utilization			45.1%								A	ICU Level of Service
Analysis Period (min)			15									
c Critical Lane Group												

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HCM Signalized Intersection Capacity Analysis

1: 1st Ave & Madison St

03/28/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	80	302	104	42	307	0	0	241	107
Future Volume (vph)	0	0	0	80	302	104	42	307	0	0	241	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	14	11	15	10	11	10	10	11	10
Grade (%)		6%			-8%			0%			0%	
Total Lost time (s)					4.5	4.5	4.5	4.5			4.5	
Lane Util. Factor					0.95	1.00	1.00	1.00			1.00	
Frpb, ped/bikes					1.00	1.00	1.00	1.00			0.89	
Flpb, ped/bikes					0.92	1.00	1.00	1.00			1.00	
Frt					1.00	0.85	1.00	1.00			0.96	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					2950	1663	1516	1637			1407	
Flt Permitted					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (perm)					2950	1663	1516	1637			1407	
Peak-hour factor, PHF	0.25	0.25	0.25	0.85	0.85	0.85	0.92	0.92	0.92	0.89	0.89	0.89
Adj. Flow (vph)	0	0	0	94	355	122	46	334	0	0	271	120
RTOR Reduction (vph)	0	0	0	0	0	109	0	0	0	0	18	0
Lane Group Flow (vph)	0	0	0	0	449	13	46	334	0	0	373	0
Confl. Peds. (#/hr)	226		156	156		226	276		553	553		276
Heavy Vehicles (%)	0%	0%	0%	3%	0%	0%	0%	1%	0%	0%	1%	0%
Turn Type				Perm	NA	custom	Prot	NA			NA	
Protected Phases					8	3	5	2			6	
Permitted Phases				8								
Actuated Green, G (s)					32.0	9.5	7.5	49.0			37.0	
Effective Green, g (s)					32.0	9.5	7.5	49.0			37.0	
Actuated g/C Ratio					0.36	0.11	0.08	0.54			0.41	
Clearance Time (s)					4.5	4.5	4.5	4.5			4.5	
Lane Grp Cap (vph)					1048	175	126	891			578	
v/s Ratio Prot						0.01	0.03	c0.20			c0.27	
v/s Ratio Perm					0.15							
v/c Ratio					0.43	0.07	0.37	0.37			0.65	
Uniform Delay, d1					22.0	36.3	39.0	11.7			21.2	
Progression Factor					0.37	2.31	1.00	1.00			0.84	
Incremental Delay, d2					1.0	0.6	8.0	1.2			5.3	
Delay (s)					9.3	84.6	47.0	12.9			23.1	
Level of Service					A	F	D	B			C	
Approach Delay (s)		0.0			25.3			17.1			23.1	
Approach LOS		A			C			B			C	
Intersection Summary												
HCM 2000 Control Delay			22.3		HCM 2000 Level of Service						C	
HCM 2000 Volume to Capacity ratio			0.57									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)						18.0	
Intersection Capacity Utilization			54.5%		ICU Level of Service						A	
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2010 Signalized Intersection Summary

2: 2nd Ave & Madison St

05/23/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	186	341	0	0	0	0	0	1456	105
Future Volume (veh/h)	0	0	0	186	341	0	0	0	0	0	1456	105
Number				5	2	12				7	4	14
Initial Q (Qb), veh				0	0	0				0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00				1.00		0.82
Parking Bus, Adj				1.00	1.00	1.00				1.00	1.00	0.43
Adj Sat Flow, veh/h/ln				1778	1727	0				0	1569	1569
Adj Flow Rate, veh/h				198	363	0				0	1533	111
Adj No. of Lanes				0	2	0				0	2	1
Peak Hour Factor				0.94	0.94	0.94				0.95	0.95	0.95
Percent Heavy Veh, %				3	3	0				0	9	9
Cap, veh/h				300	479	0				0	2053	313
Arrive On Green				0.08	0.08	0.00				0.00	0.23	0.22
Sat Flow, veh/h				955	2038	0				0	3059	466
Grp Volume(v), veh/h				295	266	0				0	1533	111
Grp Sat Flow(s),veh/h/ln				1422	1493	0				0	1490	466
Q Serve(g_s), s				18.4	15.7	0.0				0.0	43.1	18.1
Cycle Q Clear(g_c), s				18.4	15.7	0.0				0.0	43.1	18.1
Prop In Lane				0.67		0.00				0.00		1.00
Lane Grp Cap(c), veh/h				414	365	0				0	2053	313
V/C Ratio(X)				0.71	0.73	0.00				0.00	0.75	0.35
Avail Cap(c_a), veh/h				414	365	0				0	2053	313
HCM Platoon Ratio				0.33	0.33	1.00				1.00	0.33	0.33
Upstream Filter(I)				1.00	1.00	0.00				0.00	1.00	1.00
Uniform Delay (d), s/veh				39.7	38.5	0.0				0.0	27.5	18.5
Incr Delay (d2), s/veh				9.9	12.1	0.0				0.0	2.5	3.1
Initial Q Delay(d3),s/veh				0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				8.4	7.7	0.0				0.0	18.5	2.6
LnGrp Delay(d),s/veh				49.7	50.6	0.0				0.0	30.0	21.6
LnGrp LOS				D	D						C	C
Approach Vol, veh/h					561						1644	
Approach Delay, s/veh					50.1						29.4	
Approach LOS					D						C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		25.0		65.0								
Change Period (Y+Rc), s		4.5		4.5								
Max Green Setting (Gmax), s		20.5		60.5								
Max Q Clear Time (g_c+I1), s		0.0		0.0								
Green Ext Time (p_c), s		0.0		0.0								
Intersection Summary												
HCM 2010 Ctrl Delay				34.7								
HCM 2010 LOS				C								

HCM Signalized Intersection Capacity Analysis

3: 3rd Ave & Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↗		↑↑			↑↗	
Traffic Volume (vph)	0	0	0	0	405	10	0	20	0	0	0	77
Future Volume (vph)	0	0	0	0	405	10	0	20	0	0	0	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	10	11	12	10	12	12	11	12
Grade (%)		10%			-15%			0%			-5%	
Total Lost time (s)					4.0	4.5		4.0			4.0	
Lane Util. Factor					0.95	1.00		0.95			0.95	
Frpb, ped/bikes					1.00	0.84		1.00			0.55	
Flpb, ped/bikes					1.00	1.00		1.00			1.00	
Frt					1.00	0.85		1.00			0.85	
Flt Protected					1.00	1.00		1.00			1.00	
Satd. Flow (prot)					2858	1248		1468			1266	
Flt Permitted					1.00	1.00		1.00			1.00	
Satd. Flow (perm)					2858	1248		1468			1266	
Peak-hour factor, PHF	0.25	0.25	0.25	0.91	0.91	0.91	0.93	0.93	0.93	0.87	0.87	0.87
Adj. Flow (vph)	0	0	0	0	445	11	0	22	0	0	0	89
RTOR Reduction (vph)	0	0	0	0	0	5	0	0	0	0	58	0
Lane Group Flow (vph)	0	0	0	0	445	6	0	22	0	0	31	0
Confl. Peds. (#/hr)	244		457	457		244	588		499	499		588
Heavy Vehicles (%)	0%	0%	0%	9%	2%	2%	0%	81%	0%	0%	82%	11%
Bus Blockages (#/hr)	0	0	0	0	10	0	0	62	0	0	29	0
Parking (#/hr)					15							
Turn Type					NA	custom		NA			NA	
Protected Phases					6	2		4			4	
Permitted Phases						1						
Actuated Green, G (s)					50.5	46.0		30.5			30.5	
Effective Green, g (s)					51.0	46.0		31.0			31.0	
Actuated g/C Ratio					0.57	0.51		0.34			0.34	
Clearance Time (s)					4.5	4.5		4.5			4.5	
Lane Grp Cap (vph)					1619	700		505			436	
v/s Ratio Prot					c0.16	0.00		0.01			c0.02	
v/s Ratio Perm						0.00						
v/c Ratio					0.27	0.01		0.04			0.07	
Uniform Delay, d1					10.0	10.8		19.6			19.8	
Progression Factor					1.01	1.00		1.00			0.17	
Incremental Delay, d2					0.3	0.0		0.2			0.3	
Delay (s)					10.5	10.8		19.8			3.7	
Level of Service					B	B		B			A	
Approach Delay (s)		0.0			10.5			19.8			3.7	
Approach LOS		A			B			B			A	
Intersection Summary												
HCM 2000 Control Delay			9.8		HCM 2000 Level of Service						A	
HCM 2000 Volume to Capacity ratio			0.21									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)						13.0	
Intersection Capacity Utilization			34.8%		ICU Level of Service						A	
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: 4th Ave & Madison St

03/24/2018



Movement	WBR	NBL	NBT	SWR	SWR2
Lane Configurations	↰		↱↱↱	↰↰↰	
Traffic Volume (vph)	38	133	961	273	412
Future Volume (vph)	38	133	961	273	412
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Lane Width	12	12	10	11	12
Grade (%)			5%		
Total Lost time (s)	3.5		3.5	1.0	
Lane Util. Factor	1.00		0.91	0.76	
Frpb, ped/bikes	1.00		1.00	1.00	
Flpb, ped/bikes	1.00		1.00	1.00	
Frt	0.86		1.00	0.85	
Flt Protected	1.00		0.99	1.00	
Satd. Flow (prot)	1450		3681	3094	
Flt Permitted	1.00		0.99	1.00	
Satd. Flow (perm)	1450		3681	3094	
Peak-hour factor, PHF	0.92	0.97	0.97	0.84	0.84
Adj. Flow (vph)	41	137	991	325	490
RTOR Reduction (vph)	0	0	28	62	0
Lane Group Flow (vph)	41	0	1100	754	0
Confl. Peds. (#/hr)		487			361
Heavy Vehicles (%)	2%	1%	9%	1%	1%
Bus Blockages (#/hr)	0	0	0	10	0
Parking (#/hr)			15	15	
Turn Type	custom	Split	NA	Prot	
Protected Phases	3	4	4	6	
Permitted Phases	4				
Actuated Green, G (s)	32.0		29.3	47.0	
Effective Green, g (s)	32.0		30.3	49.0	
Actuated g/C Ratio	0.36		0.34	0.54	
Clearance Time (s)	3.5		4.5	3.0	
Vehicle Extension (s)	0.2		0.2	0.2	
Lane Grp Cap (vph)	515		1239	1684	
v/s Ratio Prot	c0.00		c0.30	c0.24	
v/s Ratio Perm	0.03				
v/c Ratio	0.08		0.89	0.45	
Uniform Delay, d1	19.2		28.2	12.3	
Progression Factor	1.00		1.00	0.88	
Incremental Delay, d2	0.0		9.7	0.8	
Delay (s)	19.3		37.9	11.7	
Level of Service	B		D	B	
Approach Delay (s)			37.9		
Approach LOS			D		
Intersection Summary					
HCM 2000 Control Delay		26.8		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio		0.59			
Actuated Cycle Length (s)		90.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization		54.7%		ICU Level of Service	A
Analysis Period (min)		15			

c Critical Lane Group

HCM 2010 Signalized Intersection Summary

5: 5th Ave & Madison St

05/23/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	246	531	0	0	0	0	0	501	127
Future Volume (veh/h)	0	0	0	246	531	0	0	0	0	0	501	127
Number				5	2	12				7	4	14
Initial Q (Qb), veh				0	0	0				0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00				1.00		0.66
Parking Bus, Adj				1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1796	1766	0				0	1597	1710
Adj Flow Rate, veh/h				256	553	0				0	516	131
Adj No. of Lanes				0	2	0				0	3	0
Peak Hour Factor				0.96	0.96	0.96				0.97	0.97	0.97
Percent Heavy Veh, %				2	2	0				0	3	3
Cap, veh/h				594	1186	0				0	1050	240
Arrive On Green				0.19	0.19	0.00				0.00	0.11	0.11
Sat Flow, veh/h				924	2154	0				0	3346	731
Grp Volume(v), veh/h				407	402	0				0	463	184
Grp Sat Flow(s),veh/h/ln				1471	1527	0				0	1453	1027
Q Serve(g_s), s				22.3	21.0	0.0				0.0	13.5	15.3
Cycle Q Clear(g_c), s				22.3	21.0	0.0				0.0	13.5	15.3
Prop In Lane				0.63		0.00				0.00		0.71
Lane Grp Cap(c), veh/h				907	874	0				0	953	337
V/C Ratio(X)				0.45	0.46	0.00				0.00	0.49	0.55
Avail Cap(c_a), veh/h				907	874	0				0	953	337
HCM Platoon Ratio				0.33	0.33	1.00				1.00	0.33	0.33
Upstream Filter(I)				1.00	1.00	0.00				0.00	1.00	1.00
Uniform Delay (d), s/veh				24.6	24.1	0.0				0.0	33.0	33.8
Incr Delay (d2), s/veh				1.6	1.7	0.0				0.0	1.8	6.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				9.5	9.3	0.0				0.0	5.7	4.9
LnGrp Delay(d),s/veh				26.3	25.9	0.0				0.0	34.8	40.0
LnGrp LOS				C	C						C	D
Approach Vol, veh/h					809						647	
Approach Delay, s/veh					26.1						36.3	
Approach LOS					C						D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		56.0		34.0								
Change Period (Y+Rc), s		4.5		4.5								
Max Green Setting (Gmax), s		51.5		29.5								
Max Q Clear Time (g_c+I1), s		0.0		0.0								
Green Ext Time (p_c), s		0.0		0.0								
Intersection Summary												
HCM 2010 Ctrl Delay				30.6								
HCM 2010 LOS				C								

HCM Signalized Intersection Capacity Analysis

6: 6th Ave & Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						 		 				
Traffic Volume (vph)	0	0	0	0	714	707	39	146	190	0	0	0
Future Volume (vph)	0	0	0	0	714	707	39	146	190	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	10	10	12	12	12	12	12	12
Grade (%)		10%			-10%			5%			-5%	
Total Lost time (s)					3.5	4.0		4.0				
Lane Util. Factor					1.00	0.88		0.95				
Frpb, ped/bikes					1.00	1.00		0.99				
Flpb, ped/bikes					1.00	1.00		0.97				
Frt					1.00	0.85		0.92				
Flt Protected					1.00	1.00		0.99				
Satd. Flow (prot)					1659	2482		2450				
Flt Permitted					1.00	1.00		0.99				
Satd. Flow (perm)					1659	2482		2450				
Peak-hour factor, PHF	0.25	0.25	0.25	0.97	0.97	0.97	0.85	0.85	0.85	0.25	0.25	0.25
Adj. Flow (vph)	0	0	0	0	736	729	46	172	224	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	436	0	186	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	736	293	0	256	0	0	0	0
Confl. Peds. (#/hr)	137		316	316		137	178			1		178
Confl. Bikes (#/hr)			3			26			2			3
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%	12%	1%	5%	0%	0%	0%
Parking (#/hr)								15				
Turn Type					NA	custom	Perm	NA				
Protected Phases					6	1		4				
Permitted Phases							4					
Actuated Green, G (s)					63.0	23.7		18.5				
Effective Green, g (s)					63.5	24.2		19.0				
Actuated g/C Ratio					0.71	0.27		0.21				
Clearance Time (s)					4.0	4.5		4.5				
Vehicle Extension (s)					0.2	0.2		0.2				
Lane Grp Cap (vph)					1170	667		517				
v/s Ratio Prot					0.44	0.12						
v/s Ratio Perm								0.10				
v/c Ratio					0.63	0.44		0.49				
Uniform Delay, d1					7.0	27.3		31.3				
Progression Factor					0.36	1.82		1.00				
Incremental Delay, d2					2.2	1.9		3.4				
Delay (s)					4.7	51.6		34.6				
Level of Service					A	D		C				
Approach Delay (s)		0.0			28.0			34.6			0.0	
Approach LOS		A			C			C			A	
Intersection Summary												
HCM 2000 Control Delay			29.5		HCM 2000 Level of Service					C		
HCM 2000 Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					14.5		
Intersection Capacity Utilization			64.3%		ICU Level of Service					C		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

7: I-5 CD NB Off-Ramp/7th Ave & Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					  							
Traffic Volume (vph)	0	190	0	0	653	1	553	419	199	12	0	215
Future Volume (vph)	0	190	0	0	653	1	553	419	199	12	0	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	10	12	12	12	12	12	12	12
Grade (%)		0%			0%			5%			-5%	
Total Lost time (s)		3.5			3.5		3.5	3.5	3.5	3.5		4.5
Lane Util. Factor		1.00			0.91		0.95	0.95	1.00	1.00		1.00
Frpb, ped/bikes		1.00			1.00		1.00	1.00	0.83	1.00		1.00
Flpb, ped/bikes		1.00			1.00		1.00	1.00	1.00	1.00		1.00
Frt		1.00			1.00		1.00	1.00	0.85	1.00		0.85
Flt Protected		1.00			1.00		0.95	0.99	1.00	0.95		1.00
Satd. Flow (prot)		1299			4269		1502	1571	1160	1665		1475
Flt Permitted		1.00			1.00		0.95	0.99	1.00	0.24		1.00
Satd. Flow (perm)		1299			4269		1502	1571	1160	414		1475
Peak-hour factor, PHF	0.81	0.81	0.81	0.94	0.94	0.94	0.94	0.94	0.94	0.90	0.90	0.90
Adj. Flow (vph)	0	235	0	0	695	1	588	446	212	13	0	239
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	36	0	0	43
Lane Group Flow (vph)	0	235	0	0	696	0	506	528	176	13	0	196
Confl. Peds. (#/hr)	114		364	364		114	1		56	56		
Confl. Bikes (#/hr)			2			9			22			
Heavy Vehicles (%)	0%	5%	0%	0%	2%	0%	0%	0%	1%	0%	0%	1%
Parking (#/hr)		15										
Turn Type		NA			NA		Perm	NA	Perm	D.Pm		Perm
Protected Phases		6			2			4				
Permitted Phases							4		4	4		4
Actuated Green, G (s)		42.5			42.5		38.5	38.5	38.5	38.5		38.5
Effective Green, g (s)		43.5			43.5		39.5	39.5	39.5	39.5		38.5
Actuated g/C Ratio		0.48			0.48		0.44	0.44	0.44	0.44		0.43
Clearance Time (s)		4.5			4.5		4.5	4.5	4.5	4.5		4.5
Vehicle Extension (s)		3.0			5.0		5.0	5.0	5.0	5.0		5.0
Lane Grp Cap (vph)		627			2063		659	689	509	181		630
v/s Ratio Prot		c0.18			0.16							
v/s Ratio Perm							c0.34	0.34	0.15	0.03		0.13
v/c Ratio		0.37			0.34		0.77	0.77	0.35	0.07		0.31
Uniform Delay, d1		14.7			14.4		21.4	21.3	16.7	14.6		17.0
Progression Factor		0.73			0.59		1.00	1.00	1.00	0.52		0.32
Incremental Delay, d2		1.4			0.4		6.3	6.0	0.9	0.3		0.6
Delay (s)		12.0			8.8		27.7	27.3	17.6	7.9		6.1
Level of Service		B			A		C	C	B	A		A
Approach Delay (s)		12.0			8.8			25.8			6.2	
Approach LOS		B			A			C			A	
Intersection Summary												
HCM 2000 Control Delay			17.6				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.56									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			7.0		
Intersection Capacity Utilization			69.5%				ICU Level of Service			C		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

8: 8th Ave & Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	392	9	0	605	15	7	203	32	10	146	42
Future Volume (vph)	0	392	9	0	605	15	7	203	32	10	146	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	12	10	12	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5			3.5			3.5	
Lane Util. Factor		1.00			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			0.99			0.96			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			0.99	
Frt		1.00			1.00			0.98			0.97	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1595			3130			1614			1623	
Flt Permitted		1.00			1.00			0.99			0.98	
Satd. Flow (perm)		1595			3130			1598			1598	
Peak-hour factor, PHF	0.89	0.89	0.89	0.99	0.99	0.99	0.93	0.93	0.93	0.80	0.80	0.80
Adj. Flow (vph)	0	440	10	0	611	15	8	218	34	12	182	52
RTOR Reduction (vph)	0	1	0	0	2	0	0	6	0	0	11	0
Lane Group Flow (vph)	0	449	0	0	624	0	0	254	0	0	238	0
Confl. Peds. (#/hr)	165		269	169		165	69		96	96		36
Heavy Vehicles (%)	0%	2%	0%	0%	2%	6%	4%	0%	0%	0%	0%	0%
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases							4			8		
Actuated Green, G (s)		60.5			60.5			20.5			20.5	
Effective Green, g (s)		61.5			61.5			21.5			21.5	
Actuated g/C Ratio		0.68			0.68			0.24			0.24	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		1089			2138			381			381	
v/s Ratio Prot		c0.28			0.20							
v/s Ratio Perm								c0.16			0.15	
v/c Ratio		0.41			0.29			0.67			0.63	
Uniform Delay, d1		6.3			5.6			31.0			30.6	
Progression Factor		0.51			2.31			1.00			0.59	
Incremental Delay, d2		1.1			0.2			8.9			7.1	
Delay (s)		4.3			13.3			39.9			25.2	
Level of Service		A			B			D			C	
Approach Delay (s)		4.3			13.3			39.9			25.2	
Approach LOS		A			B			D			C	
Intersection Summary												
HCM 2000 Control Delay			17.0				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.48									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			7.0		
Intersection Capacity Utilization			47.8%				ICU Level of Service			A		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

9: 9th Ave & Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	411	23	0	608	8	7	57	5	44	415	5
Future Volume (vph)	0	411	23	0	608	8	7	57	5	44	415	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	15	12	10	11	12	12	12	12	11	11	12
Total Lost time (s)		3.5			3.5			3.5		2.5	3.5	
Lane Util. Factor		1.00			1.00			1.00		1.00	1.00	
Frpb, ped/bikes		0.97			1.00			0.99		1.00	1.00	
Flpb, ped/bikes		1.00			1.00			0.99		0.93	1.00	
Frt		0.99			1.00			0.99		1.00	1.00	
Flt Protected		1.00			1.00			0.99		0.95	1.00	
Satd. Flow (prot)		1780			1610			1528		1454	1646	
Flt Permitted		1.00			1.00			0.95		0.66	1.00	
Satd. Flow (perm)		1780			1610			1457		1014	1646	
Peak-hour factor, PHF	0.88	0.88	0.88	0.97	0.97	0.97	0.81	0.81	0.81	0.87	0.87	0.87
Adj. Flow (vph)	0	467	26	0	627	8	9	70	6	51	477	6
RTOR Reduction (vph)	0	3	0	0	1	0	0	3	0	0	1	0
Lane Group Flow (vph)	0	490	0	0	634	0	0	82	0	51	482	0
Confl. Peds. (#/hr)	132		249	249		132	128		63	63		128
Heavy Vehicles (%)	0%	2%	0%	6%	2%	0%	0%	9%	10%	0%	0%	0%
Turn Type		NA			NA		Perm	NA		pm+pt	NA	
Protected Phases		6			2			4		3 9	8	
Permitted Phases							4			8		
Actuated Green, G (s)		42.4			42.4			26.6		39.6	38.6	
Effective Green, g (s)		43.4			43.4			27.6		40.6	39.6	
Actuated g/C Ratio		0.48			0.48			0.31		0.45	0.44	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		0.2			0.2			0.2			0.2	
Lane Grp Cap (vph)		858			776			446		491	724	
v/s Ratio Prot		0.28			c0.39					0.01	c0.29	
v/s Ratio Perm								0.06		0.04		
v/c Ratio		0.57			0.82			0.18		0.10	0.67	
Uniform Delay, d1		16.7			19.9			22.9		14.2	20.0	
Progression Factor		0.90			0.66			1.00		0.82	0.78	
Incremental Delay, d2		2.5			8.7			0.9		0.0	4.7	
Delay (s)		17.5			21.8			23.8		11.7	20.3	
Level of Service		B			C			C		B	C	
Approach Delay (s)		17.5			21.8			23.8			19.4	
Approach LOS		B			C			C			B	
Intersection Summary												
HCM 2000 Control Delay			19.9				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.79									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			67.5%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

10: Terry Ave & Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	450	10	0	477	11	0	0	21	0	0	139
Future Volume (vph)	0	450	10	0	477	11	0	0	21	0	0	139
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5				4.5			4.5
Lane Util. Factor		1.00			1.00				1.00			1.00
Frpb, ped/bikes		0.99			0.99				0.69			0.79
Flpb, ped/bikes		1.00			1.00				1.00			1.00
Frt		1.00			1.00				0.86			0.86
Flt Protected		1.00			1.00				1.00			1.00
Satd. Flow (prot)		1593			1543				1026			1175
Flt Permitted		1.00			1.00				1.00			1.00
Satd. Flow (perm)		1593			1543				1026			1175
Peak-hour factor, PHF	0.95	0.95	0.95	0.90	0.90	0.90	0.83	0.83	0.83	0.75	0.75	0.75
Adj. Flow (vph)	0	474	11	0	530	12	0	0	25	0	0	185
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	8	0	0	57
Lane Group Flow (vph)	0	484	0	0	541	0	0	0	17	0	0	128
Confl. Peds. (#/hr)	152		226	226		152	59		91	91		59
Heavy Vehicles (%)	5%	2%	9%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type		NA			NA				Perm			Perm
Protected Phases		6			2							
Permitted Phases									6			2
Actuated Green, G (s)		62.5			62.5				62.5			62.5
Effective Green, g (s)		63.5			63.5				62.5			62.5
Actuated g/C Ratio		0.71			0.71				0.69			0.69
Clearance Time (s)		4.5			4.5				4.5			4.5
Lane Grp Cap (vph)		1123			1088				712			815
v/s Ratio Prot		0.30			0.35							
v/s Ratio Perm									0.02			0.11
v/c Ratio		0.43			0.50				0.02			0.16
Uniform Delay, d1		5.6			6.0				4.3			4.7
Progression Factor		0.27			0.34				1.00			1.00
Incremental Delay, d2		1.1			0.8				0.1			0.4
Delay (s)		2.6			2.8				4.3			5.1
Level of Service		A			A				A			A
Approach Delay (s)		2.6			2.8			4.3			5.1	
Approach LOS		A			A			A			A	
Intersection Summary												
HCM 2000 Control Delay			3.1			HCM 2000 Level of Service			A			
HCM 2000 Volume to Capacity ratio			0.38									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			7.0			
Intersection Capacity Utilization			49.9%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

11: Boren Ave & Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	456	4	30	436	10	17	755	2	42	830	35
Future Volume (vph)	11	456	4	30	436	10	17	755	2	42	830	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	10	9	10	12	9	9	12	9	9	12
Total Lost time (s)	4.0	3.5		4.0	3.5		4.0	3.5		4.0	3.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1433	1495		1462	1513		1433	2851		1462	2765	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1433	1495		1462	1513		1433	2851		1462	2765	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.84	0.84	0.84	0.90	0.90	0.90
Adj. Flow (vph)	13	524	5	34	501	11	20	899	2	47	922	39
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	0	0	3	0
Lane Group Flow (vph)	13	528	0	34	511	0	20	901	0	47	958	0
Confl. Peds. (#/hr)	183		335	335		183	144		160	160		144
Heavy Vehicles (%)	2%	2%	4%	0%	2%	0%	2%	2%	6%	0%	2%	1%
Bus Blockages (#/hr)	0	10	0	0	6	0	0	2	0	0	8	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	1.2	30.3		3.7	32.8		2.4	34.1		3.9	35.6	
Effective Green, g (s)	1.7	31.3		4.2	33.8		2.9	35.1		4.4	36.6	
Actuated g/C Ratio	0.02	0.35		0.05	0.38		0.03	0.39		0.05	0.41	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lane Grp Cap (vph)	27	519		68	568		46	1111		71	1124	
v/s Ratio Prot	0.01	c0.35		c0.02	0.34		0.01	0.32		c0.03	c0.35	
v/s Ratio Perm												
v/c Ratio	0.48	1.02		0.50	0.90		0.43	0.81		0.66	0.85	
Uniform Delay, d1	43.7	29.4		41.9	26.5		42.7	24.5		42.1	24.2	
Progression Factor	1.25	0.76		1.17	0.83		1.00	1.00		0.97	0.94	
Incremental Delay, d2	4.6	43.0		1.9	18.4		2.4	6.5		15.7	7.8	
Delay (s)	59.4	65.2		51.1	40.4		45.1	31.0		56.4	30.5	
Level of Service	E	E		D	D		D	C		E	C	
Approach Delay (s)		65.0			41.0			31.3			31.8	
Approach LOS		E			D			C			C	
Intersection Summary												
HCM 2000 Control Delay			39.3			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.90									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			15.0			
Intersection Capacity Utilization			68.9%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

12: Madison St & Minor Ave

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	481	19	0	420	5	6	145	1	1	234	50
Future Volume (vph)	0	481	19	0	420	5	6	145	1	1	234	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	11	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5			3.5			3.5	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.98			0.99			1.00			0.95	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			1.00			1.00			0.98	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1527			1610			1698			1584	
Flt Permitted		1.00			1.00			0.99			1.00	
Satd. Flow (perm)		1527			1610			1679			1583	
Peak-hour factor, PHF	0.89	0.89	0.89	0.95	0.95	0.95	0.83	0.83	0.83	0.76	0.76	0.76
Adj. Flow (vph)	0	540	21	0	442	5	7	175	1	1	308	66
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	0	0	9	0
Lane Group Flow (vph)	0	560	0	0	447	0	0	183	0	0	366	0
Confl. Peds. (#/hr)	157		212	212		157	110		81	81		110
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)		57.5			57.5			23.5			23.5	
Effective Green, g (s)		58.5			58.5			24.5			24.5	
Actuated g/C Ratio		0.65			0.65			0.27			0.27	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		992			1046			457			430	
v/s Ratio Prot		c0.37			0.28							
v/s Ratio Perm								0.11			c0.23	
v/c Ratio		0.56			0.43			0.40			0.85	
Uniform Delay, d1		8.7			7.6			26.8			31.0	
Progression Factor		0.25			0.66			1.00			1.00	
Incremental Delay, d2		0.2			1.2			2.6			18.8	
Delay (s)		2.4			6.2			29.4			49.8	
Level of Service		A			A			C			D	
Approach Delay (s)		2.4			6.2			29.4			49.8	
Approach LOS		A			A			C			D	
Intersection Summary												
HCM 2000 Control Delay			18.0				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			7.0		
Intersection Capacity Utilization			54.9%				ICU Level of Service			A		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

13: Swedish/Summit Ave & Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	466	17	0	344	41	12	23	51	7	28	69
Future Volume (vph)	0	466	17	0	344	41	12	23	51	7	28	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	10	10	10	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5			3.0	4.0		3.0	
Lane Util. Factor		1.00			1.00			1.00	1.00		1.00	
Frpb, ped/bikes		0.99			0.97			1.00	0.74		0.88	
Flpb, ped/bikes		1.00			1.00			0.96	1.00		0.99	
Frt		1.00			0.99			1.00	0.85		0.91	
Flt Protected		1.00			1.00			0.98	1.00		1.00	
Satd. Flow (prot)		1593			1499			1617	1080		1344	
Flt Permitted		1.00			1.00			0.90	1.00		0.99	
Satd. Flow (perm)		1593			1499			1486	1080		1331	
Peak-hour factor, PHF	0.97	0.97	0.97	0.96	0.96	0.96	0.63	0.63	0.63	0.77	0.77	0.77
Adj. Flow (vph)	0	480	18	0	358	43	19	37	81	9	36	90
RTOR Reduction (vph)	0	2	0	0	5	0	0	0	62	0	68	0
Lane Group Flow (vph)	0	496	0	0	396	0	0	56	19	0	67	0
Confl. Peds. (#/hr)	101		132	132		101	69		102	102		69
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type		NA			NA		Perm	NA	Perm	Perm	NA	
Protected Phases		6			2			4			4	
Permitted Phases							4		4	4		
Actuated Green, G (s)		60.5			60.5			21.0	21.0		21.0	
Effective Green, g (s)		61.5			61.5			22.0	21.0		22.0	
Actuated g/C Ratio		0.68			0.68			0.24	0.23		0.24	
Clearance Time (s)		4.5			4.5			4.0	4.0		4.0	
Lane Grp Cap (vph)		1088			1024			363	252		325	
v/s Ratio Prot		c0.31			0.26							
v/s Ratio Perm								0.04	0.02		c0.05	
v/c Ratio		0.46			0.39			0.15	0.07		0.21	
Uniform Delay, d1		6.6			6.1			26.7	26.9		27.1	
Progression Factor		0.00			1.44			1.00	1.00		1.00	
Incremental Delay, d2		1.2			1.0			0.9	0.6		1.4	
Delay (s)		1.2			9.9			27.6	27.5		28.5	
Level of Service		A			A			C	C		C	
Approach Delay (s)		1.2			9.9			27.5			28.5	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			10.4			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.39									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			6.5			
Intersection Capacity Utilization			70.3%			ICU Level of Service			C			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

14: Madison St & Boylston Ave

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	520	4	0	348	5	6	158	11	74	35	31
Future Volume (vph)	0	520	4	0	348	5	6	158	11	74	35	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	12	12	12	12	12	12	12
Total Lost time (s)		3.5			3.5			3.0			3.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			0.99			0.97	
Flpb, ped/bikes		1.00			1.00			1.00			0.98	
Frt		1.00			1.00			0.99			0.97	
Flt Protected		1.00			1.00			1.00			0.97	
Satd. Flow (prot)		1559			1556			1679			1533	
Flt Permitted		1.00			1.00			0.99			0.53	
Satd. Flow (perm)		1559			1556			1665			836	
Peak-hour factor, PHF	0.91	0.91	0.91	0.95	0.95	0.95	0.89	0.89	0.89	0.81	0.81	0.81
Adj. Flow (vph)	0	571	4	0	366	5	7	178	12	91	43	38
RTOR Reduction (vph)	0	0	0	0	1	0	0	2	0	0	12	0
Lane Group Flow (vph)	0	575	0	0	370	0	0	195	0	0	160	0
Confl. Peds. (#/hr)	88		106	106		88	52		30	30		52
Heavy Vehicles (%)	0%	2%	8%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)		65.5			65.5			16.0			16.0	
Effective Green, g (s)		66.5			66.5			17.0			17.0	
Actuated g/C Ratio		0.74			0.74			0.19			0.19	
Clearance Time (s)		4.5			4.5			4.0			4.0	
Vehicle Extension (s)		0.2			0.2			0.2			0.2	
Lane Grp Cap (vph)		1151			1149			314			157	
v/s Ratio Prot		c0.37			0.24							
v/s Ratio Perm								0.12			c0.19	
v/c Ratio		0.50			0.32			0.62			1.02	
Uniform Delay, d1		4.9			4.0			33.5			36.5	
Progression Factor		0.20			0.95			1.00			1.00	
Incremental Delay, d2		1.4			0.7			2.6			76.6	
Delay (s)		2.4			4.5			36.1			113.1	
Level of Service		A			A			D			F	
Approach Delay (s)		2.4			4.5			36.1			113.1	
Approach LOS		A			A			D			F	
Intersection Summary												
HCM 2000 Control Delay			22.5				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			6.5		
Intersection Capacity Utilization			69.3%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

15: Broadway & Madison St/E Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	147	432	26	46	226	43	0	182	120	0	265	113
Future Volume (vph)	147	432	26	46	226	43	0	182	120	0	265	113
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	12	9	10	12	12	13	12	12	13	12
Grade (%)		-9%			8%			0%			0%	
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0	5.0		4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	1.00		0.95	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	0.99		1.00	0.98			1.00	0.85		0.96	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)	1648	1794		1471	1593			1925	1583		1746	
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (perm)	1648	1794		1471	1593			1925	1583		1746	
Peak-hour factor, PHF	0.97	0.97	0.97	0.94	0.94	0.94	0.94	0.94	0.94	0.88	0.88	0.88
Adj. Flow (vph)	152	445	27	49	240	46	0	194	128	0	301	128
RTOR Reduction (vph)	0	2	0	0	7	0	0	0	100	0	19	0
Lane Group Flow (vph)	152	470	0	49	279	0	0	194	28	0	410	0
Confl. Peds. (#/hr)	98		62	62		62	62		62	62		62
Heavy Vehicles (%)	3%	2%	0%	6%	2%	7%	0%	2%	2%	0%	2%	5%
Turn Type	Prot	NA		Prot	NA			NA	custom		NA	
Protected Phases	5	2		1	6			3 4	1 3		8	
Permitted Phases												
Actuated Green, G (s)	8.0	43.9		5.8	41.7			25.3	19.4		25.3	
Effective Green, g (s)	9.0	44.9		6.8	42.7			26.3	19.4		26.3	
Actuated g/C Ratio	0.10	0.50		0.08	0.47			0.29	0.22		0.29	
Clearance Time (s)	5.0	5.0		5.0	5.0						5.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0						2.0	
Lane Grp Cap (vph)	164	895		111	755			562	341		510	
v/s Ratio Prot	c0.09	c0.26		0.03	0.18			0.10	0.02		c0.23	
v/s Ratio Perm												
v/c Ratio	0.93	0.53		0.44	0.37			0.35	0.08		0.80	
Uniform Delay, d1	40.2	15.3		39.8	15.1			25.1	28.2		29.5	
Progression Factor	1.27	0.55		1.16	0.60			1.00	1.00		1.00	
Incremental Delay, d2	43.5	1.9		1.0	1.4			0.1	0.0		8.4	
Delay (s)	94.4	10.3		47.3	10.5			25.2	28.2		37.9	
Level of Service	F	B		D	B			C	C		D	
Approach Delay (s)		30.8			15.9			26.4			37.9	
Approach LOS		C			B			C			D	
Intersection Summary												
HCM 2000 Control Delay			28.8			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			18.0			
Intersection Capacity Utilization			60.9%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

Intersection

Int Delay, s/veh 0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Vol, veh/h	0	558	285	0	0	10
Future Vol, veh/h	0	558	285	0	0	10
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, %	-	-8	5	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	607	310	0	0	11

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	-	0	- 0 - 310
Stage 1	-	-	- - -
Stage 2	-	-	- - -
Critical Hdwy	-	-	- - 6.22
Critical Hdwy Stg 1	-	-	- - -
Critical Hdwy Stg 2	-	-	- - -
Follow-up Hdwy	-	-	- - 3.318
Pot Cap-1 Maneuver	0	-	- 0 0 730
Stage 1	0	-	- 0 0 -
Stage 2	0	-	- 0 0 -
Platoon blocked, %	-	-	
Mov Cap-1 Maneuver	-	-	- - 730
Mov Cap-2 Maneuver	-	-	- - -
Stage 1	-	-	- - -
Stage 2	-	-	- - -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	10
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	730
HCM Lane V/C Ratio	-	-	0.015
HCM Control Delay (s)	-	-	10
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0

HCM 2010 Signalized Intersection Summary

17: E Seneca St & 10TH AVE

05/23/2018

								
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations								
Traffic Volume (veh/h)	0	558	280	0	0	15		
Future Volume (veh/h)	0	558	280	0	0	15		
Number	5	2	6	16	7	14		
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	0	1909	1844	0	0	1863		
Adj Flow Rate, veh/h	0	607	304	0	0	16		
Adj No. of Lanes	0	1	1	0	0	1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Percent Heavy Veh, %	0	2	2	0	0	2		
Cap, veh/h	0	1803	1742	0	0	0		
Arrive On Green	0.00	1.00	0.94	0.00	0.00	0.00		
Sat Flow, veh/h	0	1909	1844	0	0			
Grp Volume(v), veh/h	0	607	304	0	0.0			
Grp Sat Flow(s),veh/h/ln	0	1909	1844	0				
Q Serve(g_s), s	0.0	0.0	1.0	0.0				
Cycle Q Clear(g_c), s	0.0	0.0	1.0	0.0				
Prop In Lane	0.00			0.00				
Lane Grp Cap(c), veh/h	0	1803	1742	0				
V/C Ratio(X)	0.00	0.34	0.17	0.00				
Avail Cap(c_a), veh/h	0	1803	1742	0				
HCM Platoon Ratio	1.00	2.00	1.00	1.00				
Upstream Filter(l)	0.00	1.00	1.00	0.00				
Uniform Delay (d), s/veh	0.0	0.0	0.2	0.0				
Incr Delay (d2), s/veh	0.0	0.5	0.2	0.0				
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0				
%ile BackOfQ(50%),veh/ln	0.0	0.3	0.5	0.0				
LnGrp Delay(d),s/veh	0.0	0.5	0.4	0.0				
LnGrp LOS		A	A					
Approach Vol, veh/h		607	304					
Approach Delay, s/veh		0.5	0.4					
Approach LOS		A	A					
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		
Phs Duration (G+Y+Rc), s		90.0				90.0		
Change Period (Y+Rc), s		5.0				5.0		
Max Green Setting (Gmax), s		57.0				57.0		
Max Q Clear Time (g_c+l1), s		2.0				3.0		
Green Ext Time (p_c), s		7.4				7.4		
Intersection Summary								
HCM 2010 Ctrl Delay			0.5					
HCM 2010 LOS			A					

Intersection												
Int Delay, s/veh	4.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Traffic Vol, veh/h	0	0	0	0	0	14	0	0	0	5	10	0
Future Vol, veh/h	0	0	0	0	0	14	0	0	0	5	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	15	0	0	0	5	11	0
Major/Minor	Major1			Major2			Minor2					
Conflicting Flow All	15	0	0	0	0	0				8	8	8
Stage 1	-	-	-	-	-	-				8	8	-
Stage 2	-	-	-	-	-	-				0	0	-
Critical Hdwy	4.12	-	-	4.12	-	-				6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-				5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-				5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-				3.518	4.018	3.318
Pot Cap-1 Maneuver	1603	-	-	-	-	-				1013	887	1074
Stage 1	-	-	-	-	-	-				1015	889	-
Stage 2	-	-	-	-	-	-				-	-	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1603	-	-	-	-	-				1013	0	1074
Mov Cap-2 Maneuver	-	-	-	-	-	-				1013	0	-
Stage 1	-	-	-	-	-	-				1015	0	-
Stage 2	-	-	-	-	-	-				-	0	-
Approach	EB			WB			SB					
HCM Control Delay, s	0			0			8.6					
HCM LOS							A					
Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1					
Capacity (veh/h)	1603	-	-	-	-	-	1013					
HCM Lane V/C Ratio	-	-	-	-	-	-	0.016					
HCM Control Delay (s)	0	-	-	0	-	-	8.6					
HCM Lane LOS	A	-	-	A	-	-	A					
HCM 95th %tile Q(veh)	0	-	-	-	-	-	0					

Intersection

Int Delay, s/veh 0

Movement EBT EBR WBL WBT NEL NER

Lane Configurations						
Traffic Vol, veh/h	0	0	274	73	0	558
Future Vol, veh/h	0	0	274	73	0	558
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	-2	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	298	79	0	607

Major/Minor Minor2 Major2 Major1

Conflicting Flow All	-	79	0	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	4.12	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	0	981	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %				-		-
Mov Cap-1 Maneuver	0	981	-	-	-	-
Mov Cap-2 Maneuver	0	-	-	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-

Approach EB WB NE

HCM Control Delay, s	0		0
HCM LOS	A		

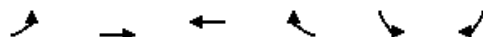
Minor Lane/Major Mvmt NER EBLn1 WBL WBT

Capacity (veh/h)	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-
HCM Control Delay (s)	-	0	-	-
HCM Lane LOS	-	A	-	-
HCM 95th %tile Q(veh)	-	-	-	-

HCM Signalized Intersection Capacity Analysis

19: E Madison St & 11th Ave

03/24/2018



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↑	↑
Traffic Volume (vph)	0	558	174	0	141	113
Future Volume (vph)	0	558	174	0	141	113
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	12	10	12
Grade (%)		0%	-4%		0%	
Total Lost time (s)		5.5	5.5		4.5	
Lane Util. Factor		1.00	1.00		1.00	
Frpb, ped/bikes		1.00	1.00		0.90	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	1.00		0.94	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		1818	1819		1409	
Flt Permitted		1.00	1.00		0.97	
Satd. Flow (perm)		1818	1819		1409	
Peak-hour factor, PHF	0.90	0.90	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	620	198	0	160	128
RTOR Reduction (vph)	0	0	0	0	32	0
Lane Group Flow (vph)	0	620	198	0	256	0
Confl. Peds. (#/hr)	23			38		61
Confl. Bikes (#/hr)				3		17
Heavy Vehicles (%)	1%	1%	3%	3%	4%	4%
Parking (#/hr)						0
Turn Type		NA	NA		Prot	
Protected Phases		2	6		4	
Permitted Phases						
Actuated Green, G (s)		63.5	63.5		16.5	
Effective Green, g (s)		63.5	63.5		16.5	
Actuated g/C Ratio		0.71	0.71		0.18	
Clearance Time (s)		5.5	5.5		4.5	
Vehicle Extension (s)		0.2	0.2		0.2	
Lane Grp Cap (vph)		1282	1283		258	
v/s Ratio Prot		c0.34	0.11		c0.18	
v/s Ratio Perm						
v/c Ratio		0.48	0.15		0.99	
Uniform Delay, d1		5.9	4.4		36.7	
Progression Factor		0.47	0.30		1.00	
Incremental Delay, d2		1.3	0.2		53.7	
Delay (s)		4.0	1.6		90.4	
Level of Service		A	A		F	
Approach Delay (s)		4.0	1.6		90.4	
Approach LOS		A	A		F	
Intersection Summary						
HCM 2000 Control Delay			26.1		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.59			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			54.5%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

20: E Madison St & 12th Ave & Union St

03/24/2018

	↑	↗	↓	↘	↖	↗	↘	↖
Movement	NBT	NBR	SBT	SBR	NEL	NET	NER	SWT
Lane Configurations	↑	↗	↘		↖	↗		↑
Traffic Volume (vph)	346	77	407	33	75	526	98	230
Future Volume (vph)	346	77	407	33	75	526	98	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	10	12	9	10	12	11
Grade (%)	0%		0%			4%		-8%
Total Lost time (s)	5.0	3.5	5.0		4.0	5.0		5.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00		1.00
Frpb, ped/bikes	1.00	0.90	0.98		1.00	0.98		1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00		1.00
Frt	1.00	0.85	0.99		1.00	0.98		1.00
Flt Protected	1.00	1.00	1.00		0.95	1.00		1.00
Satd. Flow (prot)	1818	1433	1520		1576	1650		1873
Flt Permitted	1.00	1.00	1.00		0.95	1.00		1.00
Satd. Flow (perm)	1818	1433	1520		1576	1650		1873
Peak-hour factor, PHF	0.96	0.96	0.86	0.86	0.96	0.96	0.96	0.92
Adj. Flow (vph)	360	80	473	38	78	548	102	250
RTOR Reduction (vph)	0	52	0	0	0	0	0	0
Lane Group Flow (vph)	360	28	511	0	78	650	0	250
Confl. Peds. (#/hr)		41		96	27		45	
Heavy Vehicles (%)	1%	1%	2%	2%	1%	1%	1%	2%
Parking (#/hr)			0					
Turn Type	NA	custom	NA		Prot	NA		NA
Protected Phases	4	3	8		1	6		2
Permitted Phases		4						
Actuated Green, G (s)	26.0	31.7	35.2		8.4	44.8		32.4
Effective Green, g (s)	26.0	31.7	35.2		8.4	44.8		32.4
Actuated g/C Ratio	0.29	0.35	0.39		0.09	0.50		0.36
Clearance Time (s)	5.0	3.5	5.0		4.0	5.0		5.0
Vehicle Extension (s)	0.2	3.0	0.2		0.2	0.2		0.2
Lane Grp Cap (vph)	525	560	594		147	821		674
v/s Ratio Prot	0.20	0.00	c0.34		0.05	c0.39		0.13
v/s Ratio Perm		0.02						
v/c Ratio	0.69	0.05	0.86		0.53	0.79		0.37
Uniform Delay, d1	28.4	19.2	25.1		38.9	18.7		21.3
Progression Factor	1.00	1.00	1.00		0.71	0.50		0.35
Incremental Delay, d2	7.1	0.0	15.1		1.5	6.3		1.5
Delay (s)	35.5	19.3	40.2		29.2	15.7		9.0
Level of Service	D	B	D		C	B		A
Approach Delay (s)	32.5		40.2			17.1		9.0
Approach LOS	C		D			B		A
Intersection Summary								
HCM 2000 Control Delay			25.7		HCM 2000 Level of Service			C
HCM 2000 Volume to Capacity ratio			0.91					
Actuated Cycle Length (s)			90.0		Sum of lost time (s)		17.5	
Intersection Capacity Utilization			66.4%		ICU Level of Service			C
Analysis Period (min)			15					
c Critical Lane Group								

HCM Signalized Intersection Capacity Analysis

22: 13th Ave & E Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	384	0	0	75	3	116	161	63	152	0	39
Future Volume (vph)	0	384	0	0	75	3	116	161	63	152	0	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	16	16	12	12	13	12
Grade (%)		8%			-7%			0%			0%	
Total Lost time (s)		4.5			4.5			3.5			4.5	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			0.97			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		1.00			1.00			0.98			0.97	
Flt Protected		1.00			1.00			0.98			0.96	
Satd. Flow (prot)		1746			1846			1925			1806	
Flt Permitted		1.00			1.00			0.98			0.96	
Satd. Flow (perm)		1746			1846			1925			1806	
Peak-hour factor, PHF	0.90	0.90	0.90	0.95	0.95	0.95	0.87	0.87	0.87	0.89	0.89	0.89
Adj. Flow (vph)	0	427	0	0	79	3	133	185	72	171	0	44
RTOR Reduction (vph)	0	0	0	0	1	0	0	9	0	0	47	0
Lane Group Flow (vph)	0	427	0	0	81	0	0	381	0	0	168	0
Confl. Peds. (#/hr)	28		29	29		28	1		52	52		1
Confl. Bikes (#/hr)												6
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	4%	4%	4%	1%	1%	1%
Parking (#/hr)									0			0
Turn Type		NA			NA		Split	NA		Split	NA	
Protected Phases		6			2		3	3		4	4	
Permitted Phases												
Actuated Green, G (s)		35.4			35.4			21.1			21.0	
Effective Green, g (s)		35.4			35.4			21.1			21.0	
Actuated g/C Ratio		0.39			0.39			0.23			0.23	
Clearance Time (s)		4.5			4.5			3.5			4.5	
Vehicle Extension (s)		0.2			0.2			3.0			2.0	
Lane Grp Cap (vph)		686			726			451			421	
v/s Ratio Prot		c0.24			0.04			c0.20			c0.09	
v/s Ratio Perm												
v/c Ratio		0.62			0.11			0.84			0.40	
Uniform Delay, d1		21.9			17.3			32.9			29.2	
Progression Factor		0.54			1.06			1.01			1.00	
Incremental Delay, d2		3.7			0.3			13.5			2.8	
Delay (s)		15.6			18.6			46.9			32.0	
Level of Service		B			B			D			C	
Approach Delay (s)		15.6			18.6			46.9			32.0	
Approach LOS		B			B			D			C	
Intersection Summary												
HCM 2000 Control Delay			29.9			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.62									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			12.5			
Intersection Capacity Utilization			50.2%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

23: 14th Ave & E Madison St

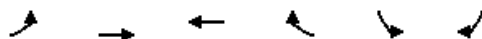
03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	461	99	0	11	0	48	267	68	137	380	6
Future Volume (vph)	0	461	99	0	11	0	48	267	68	137	380	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	12	16	12	12	16	12
Grade (%)		7%			-10%			0%			0%	
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00		1.00	0.99		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		0.97	1.00		0.99	1.00	
Frt		0.98			1.00		1.00	0.97		1.00	1.00	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1694			1909		1735	2047		1735	2082	
Flt Permitted		1.00			1.00		0.26	1.00		0.33	1.00	
Satd. Flow (perm)		1694			1909		483	2047		602	2082	
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.85	0.85	0.85	0.86	0.86	0.86
Adj. Flow (vph)	0	501	108	0	12	0	56	314	80	159	442	7
RTOR Reduction (vph)	0	9	0	0	0	0	0	10	0	0	1	0
Lane Group Flow (vph)	0	600	0	0	12	0	56	384	0	159	448	0
Confl. Peds. (#/hr)	3		31	31		3	37		10	10		37
Confl. Bikes (#/hr)			7			3			1			1
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Parking (#/hr)									0			0
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases		1			1			3			3	
Permitted Phases							3			3		
Actuated Green, G (s)		37.5			37.5		31.5	31.5		31.5	31.5	
Effective Green, g (s)		37.5			37.5		31.5	31.5		31.5	31.5	
Actuated g/C Ratio		0.42			0.42		0.35	0.35		0.35	0.35	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)		705			795		169	716		210	728	
v/s Ratio Prot		c0.35			0.01			0.19			0.22	
v/s Ratio Perm							0.12			c0.26		
v/c Ratio		0.85			0.02		0.33	0.54		0.76	0.62	
Uniform Delay, d1		23.7			15.4		21.5	23.4		25.9	24.2	
Progression Factor		0.61			1.12		1.00	1.00		0.46	0.42	
Incremental Delay, d2		10.2			0.0		5.2	2.9		19.8	3.4	
Delay (s)		24.6			17.3		26.7	26.3		31.7	13.5	
Level of Service		C			B		C	C		C	B	
Approach Delay (s)		24.6			17.3			26.3			18.2	
Approach LOS		C			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			22.7				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			13.5		
Intersection Capacity Utilization			68.3%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

25: E Madison St & 15th Ave

03/24/2018



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↗
Traffic Volume (vph)	0	447	79	0	0	78
Future Volume (vph)	0	447	79	0	0	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	10	12	12	16
Grade (%)		10%	-9%		0%	
Total Lost time (s)		4.5	4.5			4.5
Lane Util. Factor		1.00	1.00			1.00
Frpb, ped/bikes		1.00	1.00			1.00
Flpb, ped/bikes		1.00	1.00			1.00
Frt		1.00	1.00			0.86
Flt Protected		1.00	1.00			1.00
Satd. Flow (prot)		1728	1835			1774
Flt Permitted		1.00	1.00			1.00
Satd. Flow (perm)		1728	1835			1774
Peak-hour factor, PHF	0.93	0.93	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	481	93	0	0	92
RTOR Reduction (vph)	0	0	0	0	0	81
Lane Group Flow (vph)	0	481	93	0	0	11
Confl. Peds. (#/hr)	59			59	47	1
Confl. Bikes (#/hr)				2		
Heavy Vehicles (%)	1%	1%	1%	1%	5%	5%
Parking (#/hr)				0		
Turn Type		NA	NA			Prot
Protected Phases		2	6			4
Permitted Phases						
Actuated Green, G (s)		70.2	70.2			10.8
Effective Green, g (s)		70.2	70.2			10.8
Actuated g/C Ratio		0.78	0.78			0.12
Clearance Time (s)		4.5	4.5			4.5
Vehicle Extension (s)		0.2	0.2			0.2
Lane Grp Cap (vph)		1347	1431			212
v/s Ratio Prot		c0.28	0.05			c0.01
v/s Ratio Perm						
v/c Ratio		0.36	0.06			0.05
Uniform Delay, d1		3.0	2.3			35.1
Progression Factor		0.82	0.43			1.00
Incremental Delay, d2		0.4	0.1			0.0
Delay (s)		2.9	1.1			35.1
Level of Service		A	A			D
Approach Delay (s)		2.9	1.1		35.1	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay			7.1		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.35			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	16.0
Intersection Capacity Utilization			33.7%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group

Intersection

Int Delay, s/veh 1.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑		↑
Traffic Vol, veh/h	447	0	0	79	0	56
Future Vol, veh/h	447	0	0	79	0	56
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, %	9	-	-	-9	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	486	0	0	86	0	61

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	-	- 486
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	- 6.22
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	- 3.318
Pot Cap-1 Maneuver	-	0	0 - 581
Stage 1	-	0	0 -
Stage 2	-	0	0 -
Platoon blocked, %	-		-
Mov Cap-1 Maneuver	-	-	- 581
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	11.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
Capacity (veh/h)	581	-	-
HCM Lane V/C Ratio	0.105	-	-
HCM Control Delay (s)	11.9	-	-
HCM Lane LOS	B	-	-
HCM 95th %tile Q(veh)	0.3	-	-

HCM Signalized Intersection Capacity Analysis

27: E Madison St & Pine St

03/24/2018

						
Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Volume (vph)	0	503	77	346	358	2
Future Volume (vph)	0	503	77	346	358	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	11	11	11
Grade (%)		9%	-4%		0%	
Total Lost time (s)		4.5	4.5	4.5	4.5	4.5
Lane Util. Factor		1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes		1.00	1.00	0.91	1.00	0.82
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		1737	1837	1413	1678	1114
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		1737	1837	1413	1678	1114
Peak-hour factor, PHF	0.95	0.95	0.94	0.94	0.90	0.90
Adj. Flow (vph)	0	529	82	368	398	2
RTOR Reduction (vph)	0	0	0	134	0	1
Lane Group Flow (vph)	0	529	82	234	398	1
Confl. Peds. (#/hr)	62			62	1	43
Confl. Bikes (#/hr)				3		8
Heavy Vehicles (%)	1%	1%	2%	2%	4%	4%
Parking (#/hr)						0
Turn Type		NA	NA	Perm	Prot	Perm
Protected Phases		2	2		4	
Permitted Phases				2		4
Actuated Green, G (s)		57.3	57.3	57.3	23.7	23.7
Effective Green, g (s)		57.3	57.3	57.3	23.7	23.7
Actuated g/C Ratio		0.64	0.64	0.64	0.26	0.26
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)		0.2	0.2	0.2	0.2	0.2
Lane Grp Cap (vph)		1105	1169	899	441	293
v/s Ratio Prot		c0.30	0.04		c0.24	
v/s Ratio Perm				0.17		0.00
v/c Ratio		0.48	0.07	0.26	0.90	0.00
Uniform Delay, d1		8.5	6.2	7.1	32.0	24.4
Progression Factor		0.31	0.94	1.02	1.00	1.00
Incremental Delay, d2		1.4	0.1	0.7	21.0	0.0
Delay (s)		4.1	6.0	7.9	53.0	24.4
Level of Service		A	A	A	D	C
Approach Delay (s)		4.1	7.6		52.9	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay			19.4		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.60			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	9.0
Intersection Capacity Utilization			53.8%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

28: 17th Ave & E Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	769	92	0	310	5	109	29	1	101	17	4
Future Volume (vph)	0	769	92	0	310	5	109	29	1	101	17	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	12	11	11	12	10	12	12	16	12
Grade (%)		4%			4%			0%			0%	
Total Lost time (s)		4.5	4.5		4.5	4.5		4.5			4.5	
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00			1.00	
Frpb, ped/bikes		1.00	0.88		1.00	0.76		1.00			0.99	
Flpb, ped/bikes		1.00	1.00		1.00	1.00		0.82			0.85	
Frt		1.00	0.85		1.00	0.85		1.00			1.00	
Flt Protected		1.00	1.00		1.00	1.00		0.96			0.96	
Satd. Flow (prot)		1782	1326		1765	1142		1389			1711	
Flt Permitted		1.00	1.00		1.00	1.00		0.75			0.73	
Satd. Flow (perm)		1782	1326		1765	1142		1076			1294	
Peak-hour factor, PHF	0.92	0.92	0.92	0.96	0.96	0.96	0.80	0.80	0.80	0.93	0.93	0.93
Adj. Flow (vph)	0	836	100	0	323	5	136	36	1	109	18	4
RTOR Reduction (vph)	0	0	18	0	0	1	0	0	0	0	2	0
Lane Group Flow (vph)	0	836	82	0	323	4	0	173	0	0	129	0
Confl. Peds. (#/hr)	95		44	44		95	120		113	113		120
Confl. Bikes (#/hr)			17			23			3			11
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Turn Type		NA	Perm		NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases			2			2	4			4		
Actuated Green, G (s)		64.4	64.4		64.4	64.4		16.6			16.6	
Effective Green, g (s)		64.4	64.4		64.4	64.4		16.6			16.6	
Actuated g/C Ratio		0.72	0.72		0.72	0.72		0.18			0.18	
Clearance Time (s)		4.5	4.5		4.5	4.5		4.5			4.5	
Vehicle Extension (s)		0.2	0.2		0.2	0.2		3.0			3.0	
Lane Grp Cap (vph)		1275	948		1262	817		198			238	
v/s Ratio Prot		c0.47			0.18							
v/s Ratio Perm			0.06			0.00		c0.16			0.10	
v/c Ratio		0.66	0.09		0.26	0.00		0.87			0.54	
Uniform Delay, d1		6.9	3.9		4.5	3.7		35.7			33.3	
Progression Factor		0.71	0.77		0.52	1.00		1.00			1.00	
Incremental Delay, d2		2.2	0.1		0.5	0.0		31.9			2.5	
Delay (s)		7.0	3.1		2.8	3.7		67.6			35.8	
Level of Service		A	A		A	A		E			D	
Approach Delay (s)		6.6			2.8			67.6			35.8	
Approach LOS		A			A			E			D	
Intersection Summary												
HCM 2000 Control Delay			15.0				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			12.5		
Intersection Capacity Utilization			62.0%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

29: 18th Ave & E Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	758	113	0	288	122	0	0	120	0	0	21
Future Volume (vph)	0	758	113	0	288	122	0	0	120	0	0	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	12	11	12	12	10	12	12	16	12
Grade (%)		-4%			11%			0%			0%	
Total Lost time (s)		4.5	4.5		4.5	4.5			4.5			4.5
Lane Util. Factor		1.00	1.00		1.00	1.00			1.00			1.00
Frt		1.00	0.85		1.00	0.85			0.86			0.86
Flt Protected		1.00	1.00		1.00	1.00			1.00			1.00
Satd. Flow (prot)		1837	1561		1702	1496			1611			1611
Flt Permitted		1.00	1.00		1.00	1.00			1.00			1.00
Satd. Flow (perm)		1837	1561		1702	1496			1611			1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	824	123	0	313	133	0	0	130	0	0	23
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	824	123	0	313	133	0	0	130	0	0	23
Turn Type		NA	Perm		NA	Perm			Perm			Perm
Protected Phases		2			2							
Permitted Phases			2			2			2			2
Actuated Green, G (s)		90.0	90.0		90.0	90.0			90.0			90.0
Effective Green, g (s)		90.0	90.0		90.0	90.0			90.0			90.0
Actuated g/C Ratio		1.00	1.00		1.00	1.00			1.00			1.00
Clearance Time (s)		4.5	4.5		4.5	4.5			4.5			4.5
Vehicle Extension (s)		3.0	3.0		3.0	3.0			3.0			3.0
Lane Grp Cap (vph)		1837	1561		1702	1496			1611			1611
v/s Ratio Prot		c0.45			0.18							
v/s Ratio Perm			0.08			0.09			0.08			0.01
v/c Ratio		0.45	0.08		0.18	0.09			0.08			0.01
Uniform Delay, d1		0.0	0.0		0.0	0.0			0.0			0.0
Progression Factor		1.00	1.00		1.00	1.00			1.00			1.00
Incremental Delay, d2		0.6	0.1		0.2	0.1			0.1			0.0
Delay (s)		0.6	0.1		0.2	0.1			0.1			0.0
Level of Service		A	A		A	A			A			A
Approach Delay (s)		0.5			0.2			0.1			0.0	
Approach LOS		A			A			A			A	
Intersection Summary												
HCM 2000 Control Delay			0.4				HCM 2000 Level of Service			A		
HCM 2000 Volume to Capacity ratio			0.50									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			8.5		
Intersection Capacity Utilization			54.8%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

30: 19th Ave & E Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	539	51	183	195	3	77	114	69	9	197	139
Future Volume (vph)	285	539	51	183	195	3	77	114	69	9	197	139
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	12	16	12	12	16	12
Grade (%)		-11%			8%			0%			0%	
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			1.00			1.00			0.99	
Flpb, ped/bikes		0.99			0.99			1.00			1.00	
Frt		0.99			1.00			0.96			0.95	
Flt Protected		0.98			0.98			0.99			1.00	
Satd. Flow (prot)		3482			3194			2015			1929	
Flt Permitted		0.70			0.53			0.53			0.99	
Satd. Flow (perm)		2492			1738			1083			1909	
Peak-hour factor, PHF	0.99	0.99	0.99	0.98	0.98	0.98	0.86	0.86	0.86	0.91	0.91	0.91
Adj. Flow (vph)	288	544	52	187	199	3	90	133	80	10	216	153
RTOR Reduction (vph)	0	5	0	0	1	0	0	14	0	0	27	0
Lane Group Flow (vph)	0	879	0	0	388	0	0	289	0	0	352	0
Confl. Peds. (#/hr)	26		40	40		26	7		2	2		7
Confl. Bikes (#/hr)			8			4			1			12
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	4%	4%	4%
Parking (#/hr)									0			0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		55.0			55.0			23.0			23.0	
Effective Green, g (s)		55.0			55.0			23.0			23.0	
Actuated g/C Ratio		0.61			0.61			0.26			0.26	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		0.2			0.2			3.0			3.0	
Lane Grp Cap (vph)		1522			1062			276			487	
v/s Ratio Prot												
v/s Ratio Perm		c0.35			0.22			c0.27			0.18	
v/c Ratio		0.58			0.37			1.05			0.72	
Uniform Delay, d1		10.5			8.8			33.5			30.6	
Progression Factor		0.68			0.58			1.00			1.00	
Incremental Delay, d2		1.5			1.0			66.9			5.3	
Delay (s)		8.6			6.1			100.4			35.9	
Level of Service		A			A			F			D	
Approach Delay (s)		8.6			6.1			100.4			35.9	
Approach LOS		A			A			F			D	
Intersection Summary												
HCM 2000 Control Delay			27.6				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.71									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)		12.0			
Intersection Capacity Utilization			93.3%				ICU Level of Service		F			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

31: 20th Ave & E Olive St & E Madison St

03/24/2018

	→	↘	↙	←	↖	↓	↗	↘	↙	↻
Movement	EBT	EBR	EBR2	WBT	NBR2	SBT	SBR	NWL	NWR	NWR2
Lane Configurations	↔			↔	↗	↔		↘		
Traffic Volume (vph)	593	14	3	278	22	10	84	40	15	66
Future Volume (vph)	593	14	3	278	22	10	84	40	15	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	13	12	16	12	12
Grade (%)	-8%			3%		0%		0%		
Total Lost time (s)	4.5			4.5	4.0	4.5		4.5		
Lane Util. Factor	0.95			0.95	1.00	1.00		1.00		
Frpb, ped/bikes	1.00			1.00	1.00	0.98		0.91		
Flpb, ped/bikes	1.00			1.00	1.00	1.00		1.00		
Frt	1.00			1.00	0.86	0.88		0.91		
Flt Protected	1.00			1.00	1.00	1.00		0.98		
Satd. Flow (prot)	3697			3521	1465	1678		1731		
Flt Permitted	1.00			1.00	1.00	1.00		0.98		
Satd. Flow (perm)	3697			3521	1465	1678		1731		
Peak-hour factor, PHF	0.97	0.97	0.97	0.94	0.79	0.59	0.59	0.82	0.82	0.82
Adj. Flow (vph)	611	14	3	296	28	17	142	49	18	80
RTOR Reduction (vph)	0	0	0	0	0	129	0	66	0	0
Lane Group Flow (vph)	628	0	0	296	28	30	0	81	0	0
Confl. Peds. (#/hr)		10	2				7		29	12
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Parking (#/hr)		0			0		0		0	0
Turn Type	NA			NA	Free	NA		Prot		
Protected Phases	2			2		4		1		
Permitted Phases					Free					
Actuated Green, G (s)	59.9			59.9	90.0	8.1		8.5		
Effective Green, g (s)	59.9			59.9	90.0	8.1		8.5		
Actuated g/C Ratio	0.67			0.67	1.00	0.09		0.09		
Clearance Time (s)	4.5			4.5		4.5		4.5		
Vehicle Extension (s)	0.2			0.2		2.0		2.0		
Lane Grp Cap (vph)	2460			2343	1465	151		163		
v/s Ratio Prot	c0.17			0.08		c0.02		c0.05		
v/s Ratio Perm					0.02					
v/c Ratio	0.26			0.13	0.02	0.20		0.50		
Uniform Delay, d1	6.1			5.5	0.0	37.9		38.7		
Progression Factor	0.41			1.23	1.00	1.00		1.00		
Incremental Delay, d2	0.2			0.1	0.0	0.2		0.9		
Delay (s)	2.7			6.9	0.0	38.2		39.6		
Level of Service	A			A	A	D		D		
Approach Delay (s)	2.7			6.9		38.2		39.6		
Approach LOS	A			A		D		D		
Intersection Summary										
HCM 2000 Control Delay			12.4			HCM 2000 Level of Service		B		
HCM 2000 Volume to Capacity ratio			0.28							
Actuated Cycle Length (s)			90.0			Sum of lost time (s)		13.5		
Intersection Capacity Utilization			46.0%			ICU Level of Service		A		
Analysis Period (min)			15							
c Critical Lane Group										

HCM Signalized Intersection Capacity Analysis

32: 22nd Ave/E Denny Way & E Madison St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	0	622	38	0	288	26	43	124	0	4	81	87
Future Volume (vph)	0	622	38	0	288	26	43	124	0	4	81	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	12	12	11	12	12	12	12	12	11	12
Grade (%)		-3%			1%			0%			0%	
Total Lost time (s)		4.5	4.5		4.5			4.5			4.5	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.92		1.00			1.00			0.94	
Flpb, ped/bikes		1.00	1.00		1.00			0.99			1.00	
Frt		1.00	0.85		0.99			1.00			0.93	
Flt Protected		1.00	1.00		1.00			0.99			1.00	
Satd. Flow (prot)		1846	1341		1786			1853			1583	
Flt Permitted		1.00	1.00		1.00			0.71			0.99	
Satd. Flow (perm)		1846	1341		1786			1333			1575	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.64	0.64	0.64	0.77	0.77	0.77
Adj. Flow (vph)	0	699	43	0	324	29	67	194	0	5	105	113
RTOR Reduction (vph)	0	0	13	0	3	0	0	0	0	0	42	0
Lane Group Flow (vph)	0	699	30	0	350	0	0	261	0	0	181	0
Confl. Peds. (#/hr)	2		25	25		2	39		4	4		39
Confl. Bikes (#/hr)			1						10			2
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	2%	2%	2%
Parking (#/hr)			0			0			0			
Turn Type		NA	Perm		NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases			2				4			4		
Actuated Green, G (s)		62.6	62.6		62.6			18.4			18.4	
Effective Green, g (s)		62.6	62.6		62.6			18.4			18.4	
Actuated g/C Ratio		0.70	0.70		0.70			0.20			0.20	
Clearance Time (s)		4.5	4.5		4.5			4.5			4.5	
Vehicle Extension (s)		0.2	0.2		0.2			1.0			1.0	
Lane Grp Cap (vph)		1283	932		1242			272			322	
v/s Ratio Prot		c0.38			0.20							
v/s Ratio Perm			0.02					c0.20			0.11	
v/c Ratio		0.54	0.03		0.28			0.96			0.56	
Uniform Delay, d1		6.7	4.3		5.2			35.4			32.2	
Progression Factor		0.36	0.15		1.27			1.00			1.00	
Incremental Delay, d2		1.6	0.1		0.5			42.7			1.3	
Delay (s)		4.1	0.7		7.1			78.1			33.5	
Level of Service		A	A		A			E			C	
Approach Delay (s)		3.9			7.1			78.1			33.5	
Approach LOS		A			A			E			C	
Intersection Summary												
HCM 2000 Control Delay			21.1				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)		9.0			
Intersection Capacity Utilization			69.1%				ICU Level of Service		C			
Analysis Period (min)			15									

c Critical Lane Group

Intersection

Int Delay, s/veh 0.5

Movement SBL SBR NEL NET SWT SWR

Lane Configurations		↗		↑	↑	
Traffic Vol, veh/h	0	53	0	751	264	0
Future Vol, veh/h	0	53	0	751	264	0
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	-	-	-1	5	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	58	0	816	287	0

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	-	287	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	-	-
Pot Cap-1 Maneuver	0	752	0	-	-	0
Stage 1	0	-	0	-	-	0
Stage 2	0	-	0	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	-	752	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach SB NE SW

HCM Control Delay, s	10.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt NET SBLn1 SWT

Capacity (veh/h)	-	752	-
HCM Lane V/C Ratio	-	0.077	-
HCM Control Delay (s)	-	10.2	-
HCM Lane LOS	-	B	-
HCM 95th %tile Q(veh)	-	0.2	-

HCM 2010 Signalized Intersection Summary

34: E Madison St & 23rd Ave E

05/23/2018

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	0	609	32	0	617	75	270	419	61	100	202	0
Future Volume (veh/h)	0	609	32	0	617	75	270	419	61	100	202	0
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	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1806	1824	0	1881	1863	1909	1986	1948	1787	1770	0
Adj Flow Rate, veh/h	0	700	46	0	678	82	293	455	0	156	220	0
Adj No. of Lanes	0	2	0	0	1	1	1	1	0	1	1	0
Peak Hour Factor	0.92	0.87	0.69	0.25	0.91	0.92	0.92	0.92	0.92	0.64	0.92	0.46
Percent Heavy Veh, %	0	1	1	0	1	2	2	2	2	1	2	0
Cap, veh/h	0	1244	82	0	755	600	355	748	0	208	507	0
Arrive On Green	0.00	0.40	0.39	0.00	0.40	0.38	0.20	0.38	0.00	0.24	0.57	0.00
Sat Flow, veh/h	0	3191	204	0	1881	1583	1818	1986	0	1702	1770	0
Grp Volume(v), veh/h	0	387	359	0	678	82	293	455	0	156	220	0
Grp Sat Flow(s),veh/h/ln	0	1716	1589	0	1881	1583	1818	1986	0	1702	1770	0
Q Serve(g_s), s	0.0	15.7	15.8	0.0	30.4	3.1	13.9	16.7	0.0	7.6	6.4	0.0
Cycle Q Clear(g_c), s	0.0	15.7	15.8	0.0	30.4	3.1	13.9	16.7	0.0	7.6	6.4	0.0
Prop In Lane	0.00		0.13	0.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	0	688	637	0	755	600	355	748	0	208	507	0
V/C Ratio(X)	0.00	0.56	0.56	0.00	0.90	0.14	0.82	0.61	0.00	0.75	0.43	0.00
Avail Cap(c_a), veh/h	0	688	637	0	755	600	404	748	0	244	507	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	0.40	0.40	1.00	1.00	0.00	0.93	0.93	0.00
Uniform Delay (d), s/veh	0.0	20.8	20.9	0.0	25.2	18.3	34.7	22.7	0.0	32.7	15.0	0.0
Incr Delay (d2), s/veh	0.0	3.3	3.6	0.0	7.3	0.2	10.4	3.7	0.0	7.7	2.5	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 BackOfQ(50%),veh/ln	0.0	8.1	7.5	0.0	17.2	1.4	8.0	9.9	0.0	4.0	3.4	0.0
LnGrp Delay(d),s/veh	0.0	24.2	24.5	0.0	32.6	18.5	45.1	26.3	0.0	40.4	17.5	0.0
LnGrp LOS		C	C		C	B	D	C		D	B	
Approach Vol, veh/h		746			760			748			376	
Approach Delay, s/veh		24.3			31.1			33.7			27.0	
Approach LOS		C			C			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	14.0	36.9		39.1	20.6	30.3		39.1				
Change Period (Y+Rc), s	4.5	4.5		5.0	4.5	4.5		5.0				
Max Green Setting (Gmax), s	11.4	30.5		34.1	18.5	23.4		34.1				
Max Q Clear Time (g_c+I1), s	9.6	18.7		17.8	15.9	8.4		32.4				
Green Ext Time (p_c), s	0.1	0.3		0.3	0.2	0.3		0.2				
Intersection Summary												
HCM 2010 Ctrl Delay				29.3								
HCM 2010 LOS				C								

HCM Signalized Intersection Capacity Analysis

35: E Madison St & E JOHN ST

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	140	143	10	0	130	6	22	388	6	3	302	210
Future Volume (vph)	140	143	10	0	130	6	22	388	6	3	302	210
Ideal Flow (vphpl)	1900	1900	1900	1750	1750	1750	1900	1900	1900	1900	1900	1900
Lane Width	10	10	12	10	10	10	12	11	12	12	12	12
Grade (%)		-15%			0%			-10%			10%	
Total Lost time (s)		2.5			2.5			2.5	4.5		2.5	4.5
Lane Util. Factor		1.00			1.00			1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00			1.00			1.00	0.89		1.00	0.84
Flpb, ped/bikes		1.00			1.00			1.00	1.00		1.00	1.00
Frt		1.00			0.99			1.00	0.85		1.00	0.85
Flt Protected		0.98			1.00			1.00	1.00		1.00	1.00
Satd. Flow (prot)		1815			1621			1917	1361		1734	1116
Flt Permitted		0.98			1.00			0.97	1.00		1.00	1.00
Satd. Flow (perm)		1815			1621			1872	1361		1730	1116
Peak-hour factor, PHF	0.83	0.83	0.83	0.72	0.72	0.72	0.91	0.91	0.91	0.95	0.95	0.95
Adj. Flow (vph)	169	172	12	0	181	8	24	426	7	3	318	221
RTOR Reduction (vph)	0	2	0	0	2	0	0	0	4	0	0	0
Lane Group Flow (vph)	0	351	0	0	187	0	0	450	3	0	321	221
Confl. Peds. (#/hr)	9						9	40		26	26	40
Confl. Bikes (#/hr)			7									6
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	4%	4%	4%
Parking (#/hr)			0						0			0
Turn Type	Split	NA			NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	3	3		4	4			2			2	
Permitted Phases		3					2	2	2	2		2
Actuated Green, G (s)		18.7			13.9			40.9	40.9		40.9	40.9
Effective Green, g (s)		21.7			16.9			43.9	41.9		43.9	41.9
Actuated g/C Ratio		0.24			0.19			0.49	0.47		0.49	0.47
Clearance Time (s)		5.5			5.5			5.5	5.5		5.5	5.5
Vehicle Extension (s)		2.0			2.0			0.2	0.2		0.2	0.2
Lane Grp Cap (vph)		437			304			913	633		843	519
v/s Ratio Prot		c0.19			c0.12							
v/s Ratio Perm								c0.24	0.00		0.19	0.20
v/c Ratio		0.80			0.62			0.49	0.01		0.38	0.43
Uniform Delay, d1		32.2			33.6			15.5	12.9		14.5	16.0
Progression Factor		1.00			1.00			0.20	1.00		0.79	0.80
Incremental Delay, d2		9.8			2.6			1.3	0.0		1.1	2.1
Delay (s)		41.9			36.2			4.5	12.9		12.5	15.0
Level of Service		D			D			A	B		B	B
Approach Delay (s)		41.9			36.2			4.6			13.5	
Approach LOS		D			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			20.2				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			7.5		
Intersection Capacity Utilization			73.8%				ICU Level of Service			D		
Analysis Period (min)			15									

c Critical Lane Group

Intersection												
Int Delay, s/veh	4.3											
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	21	14	15	27	10	39	478	10	10	500	13
Future Vol, veh/h	5	21	14	15	27	10	39	478	10	10	500	13
Conflicting Peds, #/hr	6	0	3	3	0	6	23	0	36	36	0	23
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	2	-	-	1	-	-	-10	-	-	14	-
Peak Hour Factor	71	71	71	75	75	75	98	98	98	96	96	96
Heavy Vehicles, %	0	0	0	0	0	0	2	2	2	2	2	2
Mvmt Flow	7	30	20	20	36	13	40	488	10	10	521	14

Major/Minor	Minor1		Minor2		Major1		Major2					
Conflicting Flow All	1187	1186	532	1171	1185	557	557	0	0	534	0	0
Stage 1	608	608	-	571	571	-	-	-	-	-	-	-
Stage 2	579	578	-	600	614	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.9	6.4	7.3	6.7	6.3	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.5	5.9	-	6.3	5.7	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.9	-	6.3	5.7	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	146	167	535	160	178	526	1014	-	-	1034	-	-
Stage 1	454	457	-	493	492	-	-	-	-	-	-	-
Stage 2	473	473	-	475	470	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	107	148	517	121	158	513	1008	-	-	1031	-	-
Mov Cap-2 Maneuver	107	148	-	121	158	-	-	-	-	-	-	-
Stage 1	416	419	-	457	476	-	-	-	-	-	-	-
Stage 2	417	457	-	400	431	-	-	-	-	-	-	-

Approach	NB	SB	NE	SW
HCM Control Delay, s	32.8	41.8	0.6	0.2
HCM LOS	D	E		

Minor Lane/Major Mvmt	NEL	NET	NER	NBLn1	SBLn1	SWL	SWT	SWR
Capacity (veh/h)	1008	-	-	185	165	1031	-	-
HCM Lane V/C Ratio	0.039	-	-	0.305	0.42	0.01	-	-
HCM Control Delay (s)	8.7	0	-	32.8	41.8	8.5	0	-
HCM Lane LOS	A	A	-	D	E	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.2	1.9	0	-	-

Intersection

Int Delay, s/veh 0.7

Movement SEL SER NEL NET SWT SWR

Lane Configurations	W			W	W	
Traffic Vol, veh/h	2	14	30	410	517	3
Future Vol, veh/h	2	14	30	410	517	3
Conflicting Peds, #/hr	3	0	27	0	0	27
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	-14	10	-
Peak Hour Factor	50	50	92	92	95	95
Heavy Vehicles, %	0	0	2	2	2	2
Mvmt Flow	4	28	33	446	544	3

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	1087	573	574	0	-	0
Stage 1	573	-	-	-	-	-
Stage 2	514	-	-	-	-	-
Critical Hdwy	5.8	5.9	4.12	-	-	-
Critical Hdwy Stg 1	4.8	-	-	-	-	-
Critical Hdwy Stg 2	4.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	289	548	999	-	-	-
Stage 1	625	-	-	-	-	-
Stage 2	659	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	264	536	999	-	-	-
Mov Cap-2 Maneuver	264	-	-	-	-	-
Stage 1	611	-	-	-	-	-
Stage 2	616	-	-	-	-	-

Approach SE NE SW

HCM Control Delay, s	13.1	0.6	0
HCM LOS	B		

Minor Lane/Major Mvmt NEL NET SELn1 SWT SWR

Capacity (veh/h)	999	-	475	-	-
HCM Lane V/C Ratio	0.033	-	0.067	-	-
HCM Control Delay (s)	8.7	0	13.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-

Intersection

Int Delay, s/veh 0.7

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	7	24	357	44	8	502
Future Vol, veh/h	7	24	357	44	8	502
Conflicting Peds, #/hr	4	0	0	31	31	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	-10	-	-	8
Peak Hour Factor	65	65	93	93	96	96
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	11	37	384	47	8	523

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	983	439	0
Stage 1	439	-	-
Stage 2	544	-	-
Critical Hdwy	6.4	6.2	-
Critical Hdwy Stg 1	5.4	-	-
Critical Hdwy Stg 2	5.4	-	-
Follow-up Hdwy	3.5	3.3	-
Pot Cap-1 Maneuver	278	622	-
Stage 1	654	-	-
Stage 2	586	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	268	606	-
Mov Cap-2 Maneuver	268	-	-
Stage 1	637	-	-
Stage 2	579	-	-

Approach	NW	NE	SW
HCM Control Delay, s	13.5	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NERNWLn1	SWL	SWT
Capacity (veh/h)	-	-	472	1099
HCM Lane V/C Ratio	-	-	0.101	0.008
HCM Control Delay (s)	-	-	13.5	8.3
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.3	0

Intersection

Int Delay, s/veh 0.6

Movement SEL SER NEL NET SWT SWR

Lane Configurations	↔↔		↔	↑	↔	
Traffic Vol, veh/h	2	21	24	357	489	10
Future Vol, veh/h	2	21	24	357	489	10
Conflicting Peds, #/hr	19	0	19	0	0	19
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	-8	4	-
Peak Hour Factor	82	82	93	93	96	96
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	2	26	26	384	509	10

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	988	534	539	0	-	0
Stage 1	534	-	-	-	-	-
Stage 2	454	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.13	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.227	-	-	-
Pot Cap-1 Maneuver	276	550	1024	-	-	-
Stage 1	592	-	-	-	-	-
Stage 2	644	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	261	541	1024	-	-	-
Mov Cap-2 Maneuver	393	-	-	-	-	-
Stage 1	583	-	-	-	-	-
Stage 2	618	-	-	-	-	-

Approach SE NE SW

HCM Control Delay, s	12.3	0.5	0
HCM LOS	B		

Minor Lane/Major Mvmt NEL NET SELn1 SWT SWR

Capacity (veh/h)	1024	-	524	-	-
HCM Lane V/C Ratio	0.025	-	0.054	-	-
HCM Control Delay (s)	8.6	-	12.3	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-

HCM Signalized Intersection Capacity Analysis

40: E Madison St & MLK Jr Way E/28th Ave E

03/24/2018

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	135	100	187	57	214	11	0	287	55	123	360	21
Future Volume (vph)	135	100	187	57	214	11	0	287	55	123	360	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	9	9	12	12	12	10	11	10	9	16	10
Grade (%)		2%			-1%			-4%			2%	
Total Lost time (s)		4.5			4.5			4.5	4.5	4.5	4.5	
Lane Util. Factor		1.00			1.00			1.00	1.00	1.00	1.00	
Frpb, ped/bikes		0.95			1.00			1.00	0.82	1.00	0.99	
Flpb, ped/bikes		0.99			1.00			1.00	1.00	0.90	1.00	
Frt		0.94			0.99			1.00	0.85	1.00	0.99	
Flt Protected		0.98			0.99			1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1442			1863			1819	1224	1396	2022	
Flt Permitted		0.69			0.80			1.00	1.00	0.55	1.00	
Satd. Flow (perm)		1006			1501			1819	1224	803	2022	
Peak-hour factor, PHF	0.91	0.91	0.91	0.95	0.95	0.95	0.95	0.95	0.95	0.94	0.94	0.94
Adj. Flow (vph)	148	110	205	60	225	12	0	302	58	131	383	22
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	23	0	2	0
Lane Group Flow (vph)	0	463	0	0	297	0	0	302	35	131	403	0
Confl. Peds. (#/hr)	26		36	36		26	32		64	64		32
Confl. Bikes (#/hr)			9			15			6			5
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	3%	3%	3%	4%	4%	4%
Turn Type	Perm	NA		Perm	NA			NA	Perm	Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4			4					2	2		
Actuated Green, G (s)		27.0			27.0			54.0	54.0	54.0	54.0	
Effective Green, g (s)		27.0			27.0			54.0	54.0	54.0	54.0	
Actuated g/C Ratio		0.30			0.30			0.60	0.60	0.60	0.60	
Clearance Time (s)		4.5			4.5			4.5	4.5	4.5	4.5	
Vehicle Extension (s)		3.0			3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		301			450			1091	734	481	1213	
v/s Ratio Prot								0.17			c0.20	
v/s Ratio Perm		c0.46			0.20				0.03	0.16		
v/c Ratio		1.54			0.66			0.28	0.05	0.27	0.33	
Uniform Delay, d1		31.5			27.5			8.6	7.4	8.6	9.0	
Progression Factor		1.00			1.00			0.57	0.51	1.00	1.00	
Incremental Delay, d2		258.2			3.6			0.6	0.1	1.4	0.7	
Delay (s)		289.7			31.1			5.5	3.9	10.0	9.7	
Level of Service		F			C			A	A	B	A	
Approach Delay (s)		289.7			31.1			5.3			9.8	
Approach LOS		F			C			A			A	
Intersection Summary												
HCM 2000 Control Delay			90.9		HCM 2000 Level of Service					F		
HCM 2000 Volume to Capacity ratio			0.78									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					13.5		
Intersection Capacity Utilization			73.8%		ICU Level of Service					D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

41: 1st Ave & Spring St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 						 		 	 	
Traffic Volume (vph)	91	220	16	0	0	0	0	321	106	82	332	0
Future Volume (vph)	91	220	16	0	0	0	0	321	106	82	332	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	12	10	12	12	12	10	11	10	10	11	10
Grade (%)		9%			0%			3%			0%	
Total Lost time (s)		4.5						4.5		4.5	4.5	
Lane Util. Factor		0.95						1.00		1.00	1.00	
Frpb, ped/bikes		0.97						0.90		1.00	1.00	
Flpb, ped/bikes		0.94						1.00		1.00	1.00	
Frt		0.99						0.97		1.00	1.00	
Flt Protected		0.99						1.00		0.95	1.00	
Satd. Flow (prot)		2755						1395		1501	1637	
Flt Permitted		0.99						1.00		0.95	1.00	
Satd. Flow (perm)		2755						1395		1501	1637	
Peak-hour factor, PHF	0.88	0.88	0.88	0.25	0.25	0.25	0.95	0.95	0.95	0.93	0.93	0.93
Adj. Flow (vph)	103	250	18	0	0	0	0	338	112	88	357	0
RTOR Reduction (vph)	0	4	0	0	0	0	0	13	0	0	0	0
Lane Group Flow (vph)	0	367	0	0	0	0	0	437	0	88	357	0
Confl. Peds. (#/hr)	90		309	309		90	502		488	488		502
Confl. Bikes (#/hr)			1			5			12			28
Heavy Vehicles (%)	2%	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						9		2	6	
Permitted Phases	4	4										
Actuated Green, G (s)		19.5						37.5		19.5	61.5	
Effective Green, g (s)		19.5						37.5		19.5	61.5	
Actuated g/C Ratio		0.22						0.42		0.22	0.68	
Clearance Time (s)		4.5						4.5		4.5	4.5	
Vehicle Extension (s)		0.2						0.2		0.2	0.2	
Lane Grp Cap (vph)		596						581		325	1118	
v/s Ratio Prot								c0.31		0.06	c0.22	
v/s Ratio Perm		0.13										
v/c Ratio		0.62						0.75		0.27	0.32	
Uniform Delay, d1		31.9						22.3		29.3	5.8	
Progression Factor		1.00						0.64		1.00	1.00	
Incremental Delay, d2		4.7						8.2		2.0	0.8	
Delay (s)		36.6						22.5		31.4	6.5	
Level of Service		D						C		C	A	
Approach Delay (s)		36.6			0.0			22.5			11.4	
Approach LOS		D			A			C			B	
Intersection Summary												
HCM 2000 Control Delay			22.7									
HCM 2000 Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			90.0							17.0		
Intersection Capacity Utilization			59.7%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

42: 2nd Ave & Spring St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑							↑	↑↑	
Traffic Volume (vph)	0	348	112	0	0	0	0	0	0	126	1449	0
Future Volume (vph)	0	348	112	0	0	0	0	0	0	126	1449	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	10	10	10	10	10	10	10
Grade (%)		12%			0%			0%			0%	
Total Lost time (s)		4.0	4.0							3.5	4.0	
Lane Util. Factor		0.95	1.00							1.00	0.95	
Frpb, ped/bikes		1.00	0.78							1.00	1.00	
Flpb, ped/bikes		1.00	1.00							1.00	1.00	
Frt		1.00	0.85							1.00	1.00	
Flt Protected		1.00	1.00							0.95	1.00	
Satd. Flow (prot)		2795	976							1204	2203	
Flt Permitted		1.00	1.00							0.95	1.00	
Satd. Flow (perm)		2795	976							1204	2203	
Peak-hour factor, PHF	0.92	0.92	0.92	0.25	0.25	0.25	0.25	0.25	0.25	0.97	0.97	0.97
Adj. Flow (vph)	0	378	122	0	0	0	0	0	0	130	1494	0
RTOR Reduction (vph)	0	0	46	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	378	76	0	0	0	0	0	0	130	1494	0
Confl. Peds. (#/hr)	200		178	178		200	340		348	348		340
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	7%	7%	7%
Parking (#/hr)										10	69	69
Turn Type		NA	custom							Prot	NA	
Protected Phases		2 5	5							4	1	
Permitted Phases			2									
Actuated Green, G (s)		26.5	22.5							32.5	54.5	
Effective Green, g (s)		23.5	22.5							33.0	55.0	
Actuated g/C Ratio		0.26	0.25							0.37	0.61	
Clearance Time (s)			4.0							4.0	4.5	
Lane Grp Cap (vph)		729	287							441	1346	
v/s Ratio Prot		c0.14	0.01							0.11	c0.68	
v/s Ratio Perm			0.06									
v/c Ratio		0.52	0.27							0.29	1.11	
Uniform Delay, d1		28.4	27.1							20.2	17.5	
Progression Factor		0.69	0.51							1.00	1.00	
Incremental Delay, d2		2.3	1.9							1.7	60.5	
Delay (s)		21.8	15.7							21.9	78.0	
Level of Service		C	B							C	E	
Approach Delay (s)		20.3			0.0			0.0			73.5	
Approach LOS		C			A			A			E	
Intersection Summary												
HCM 2000 Control Delay			61.0				HCM 2000 Level of Service			E		
HCM 2000 Volume to Capacity ratio			0.98									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			15.0		
Intersection Capacity Utilization			66.4%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

43: 3rd Ave & Spring St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	529	18	0	0	0	0	0	30	0	55	0
Future Volume (vph)	5	529	18	0	0	0	0	0	30	0	55	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	12	12	12	11	12	12	11	12
Grade (%)		10%			-10%			0%			0%	
Total Lost time (s)		4.0	4.5					4.0			4.0	
Lane Util. Factor		0.95	1.00					0.95			0.95	
Frpb, ped/bikes		1.00	0.87					0.61			1.00	
Flpb, ped/bikes		1.00	1.00					1.00			1.00	
Frt		1.00	0.85					0.85			1.00	
Flt Protected		1.00	1.00					1.00			1.00	
Satd. Flow (prot)		2593	1200					1433			1753	
Flt Permitted		1.00	1.00					1.00			1.00	
Satd. Flow (perm)		2593	1200					1433			1753	
Peak-hour factor, PHF	0.97	0.97	0.97	0.25	0.25	0.25	0.80	0.80	0.80	0.91	0.91	0.91
Adj. Flow (vph)	5	545	19	0	0	0	0	0	38	0	60	0
RTOR Reduction (vph)	0	0	8	0	0	0	0	27	0	0	0	0
Lane Group Flow (vph)	0	550	11	0	0	0	0	11	0	0	60	0
Confl. Peds. (#/hr)	396		213	213		396	650		405	405		650
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	87%	0%	40%	67%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	60	0	0	34	0
Parking (#/hr)		15										
Turn Type	Perm	NA	custom					NA			NA	
Protected Phases		2	6					4			4	
Permitted Phases	2		5							4		
Actuated Green, G (s)		56.5	52.0					24.5			24.5	
Effective Green, g (s)		57.0	52.0					25.0			25.0	
Actuated g/C Ratio		0.63	0.58					0.28			0.28	
Clearance Time (s)		4.5	4.5					4.5			4.5	
Lane Grp Cap (vph)		1642	753					398			486	
v/s Ratio Prot			0.01					0.01			c0.03	
v/s Ratio Perm		0.21	0.00									
v/c Ratio		0.33	0.02					0.03			0.12	
Uniform Delay, d1		7.7	8.1					23.6			24.3	
Progression Factor		0.39	0.49					1.00			1.00	
Incremental Delay, d2		0.5	0.0					0.1			0.5	
Delay (s)		3.5	4.0					23.8			24.8	
Level of Service		A	A					C			C	
Approach Delay (s)		3.5			0.0			23.8			24.8	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			6.6									
HCM 2000 Volume to Capacity ratio			0.29									
Actuated Cycle Length (s)			90.0									
Intersection Capacity Utilization			38.9%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2010 Signalized Intersection Summary

44: 4th Ave & Spring St

05/23/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	112	412	0	0	0	0	0	1274	99	0	0	0
Future Volume (veh/h)	112	412	0	0	0	0	0	1274	99	0	0	0
Number	5	2	12				7	4	14			
Initial Q (Qb), veh	0	0	0				0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		0.77			
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1582	1569	0				0	1544	1635			
Adj Flow Rate, veh/h	117	429	0				0	1341	104			
Adj No. of Lanes	0	2	0				0	3	1			
Peak Hour Factor	0.96	0.96	0.96				0.95	0.95	0.95			
Percent Heavy Veh, %	1	1	0				0	8	2			
Cap, veh/h	249	835	0				0	2177	550			
Arrive On Green	0.12	0.12	0.00				0.00	0.17	0.17			
Sat Flow, veh/h	519	2313	0				0	4353	1065			
Grp Volume(v), veh/h	286	260	0				0	1341	104			
Grp Sat Flow(s),veh/h/ln	1404	1357	0				0	1405	1065			
Q Serve(g_s), s	14.2	16.1	0.0				0.0	26.5	7.5			
Cycle Q Clear(g_c), s	17.1	16.1	0.0				0.0	26.5	7.5			
Prop In Lane	0.41		0.00				0.00		1.00			
Lane Grp Cap(c), veh/h	579	505	0				0	2177	550			
V/C Ratio(X)	0.49	0.51	0.00				0.00	0.62	0.19			
Avail Cap(c_a), veh/h	579	505	0				0	2177	550			
HCM Platoon Ratio	0.33	0.33	1.00				1.00	0.33	0.33			
Upstream Filter(l)	1.00	1.00	0.00				0.00	1.00	1.00			
Uniform Delay (d), s/veh	32.1	31.9	0.0				0.0	29.0	21.2			
Incr Delay (d2), s/veh	3.0	3.7	0.0				0.0	1.3	0.8			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	7.2	6.6	0.0				0.0	10.6	2.3			
LnGrp Delay(d),s/veh	35.1	35.6	0.0				0.0	30.4	21.9			
LnGrp LOS	D	D						C	C			
Approach Vol, veh/h		546						1445				
Approach Delay, s/veh		35.3						29.8				
Approach LOS		D						C				
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		38.0		52.0								
Change Period (Y+Rc), s		4.5		4.5								
Max Green Setting (Gmax), s		33.5		47.5								
Max Q Clear Time (g_c+l1), s		0.0		0.0								
Green Ext Time (p_c), s		0.0		0.0								
Intersection Summary												
HCM 2010 Ctrl Delay			31.3									
HCM 2010 LOS			C									

HCM Signalized Intersection Capacity Analysis

45: 5th Ave & Spring St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑								↑↑↑	
Traffic Volume (vph)	0	501	84	0	0	0	0	0	0	499	546	0
Future Volume (vph)	0	501	84	0	0	0	0	0	0	499	546	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	10	12	12	12	12	12	12	10	10	12
Grade (%)		15%			-5%			0%			0%	
Total Lost time (s)		3.5	5.0								2.5	
Lane Util. Factor		0.95	1.00								0.91	
Frpb, ped/bikes		1.00	0.75								1.00	
Flpb, ped/bikes		1.00	1.00								0.86	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								0.98	
Satd. Flow (prot)		2492	927								3575	
Flt Permitted		1.00	1.00								0.98	
Satd. Flow (perm)		2492	927								3575	
Peak-hour factor, PHF	0.90	0.90	0.90	0.25	0.25	0.25	0.25	0.25	0.25	0.93	0.93	0.93
Adj. Flow (vph)	0	557	93	0	0	0	0	0	0	537	587	0
RTOR Reduction (vph)	0	0	32	0	0	0	0	0	0	0	26	0
Lane Group Flow (vph)	0	557	61	0	0	0	0	0	0	0	1098	0
Confl. Peds. (#/hr)	210		133	133		210	392		208	208		392
Heavy Vehicles (%)	0%	2%	2%	0%	0%	0%	0%	0%	0%	1%	3%	0%
Parking (#/hr)		30										
Turn Type		NA	Perm							custom	NA	
Protected Phases		2								3	8	
Permitted Phases			2							4		
Actuated Green, G (s)		38.0	38.0								43.0	
Effective Green, g (s)		39.5	38.0								44.5	
Actuated g/C Ratio		0.44	0.42								0.49	
Clearance Time (s)		5.0	5.0								4.0	
Lane Grp Cap (vph)		1093	391								1767	
v/s Ratio Prot		c0.22									c0.16	
v/s Ratio Perm			0.07								0.14	
v/c Ratio		0.51	0.16								0.62	
Uniform Delay, d1		18.2	16.1								16.6	
Progression Factor		0.38	0.19								1.00	
Incremental Delay, d2		1.5	0.8								1.7	
Delay (s)		8.4	3.9								18.3	
Level of Service		A	A								B	
Approach Delay (s)		7.7			0.0			0.0			18.3	
Approach LOS		A			A			A			B	
Intersection Summary												
HCM 2000 Control Delay			14.4				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			9.0		
Intersection Capacity Utilization			59.4%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

46: 6th Ave & I-5 CD SB On-Ramp & Spring St

03/24/2018

					
Movement	EBL	EBT	EBR	NBT	NBR2
Lane Configurations					
Traffic Volume (vph)	70	151	777	141	712
Future Volume (vph)	70	151	777	141	712
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Lane Width	12	10	10	10	12
Grade (%)		10%		5%	
Total Lost time (s)		4.5	4.5	4.5	4.5
Lane Util. Factor		1.00	1.00	0.95	1.00
Frpb, ped/bikes		1.00	1.00	1.00	1.00
Flpb, ped/bikes		0.90	1.00	1.00	1.00
Frt		1.00	0.85	1.00	0.85
Flt Protected		0.98	1.00	1.00	1.00
Satd. Flow (prot)		1075	1276	2927	1403
Flt Permitted		0.98	1.00	1.00	1.00
Satd. Flow (perm)		1075	1276	2927	1403
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	75	162	835	152	766
RTOR Reduction (vph)	0	45	0	0	0
Lane Group Flow (vph)	0	192	835	152	766
Confl. Peds. (#/hr)	224				
Heavy Vehicles (%)	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	5	0	0	0
Parking (#/hr)		15			
Turn Type	Perm	NA	Prot	NA	custom
Protected Phases		2	2	4	4
Permitted Phases	2				1 9
Actuated Green, G (s)		50.5	50.5	30.5	30.5
Effective Green, g (s)		50.5	50.5	30.5	30.5
Actuated g/C Ratio		0.56	0.56	0.34	0.34
Clearance Time (s)		4.5	4.5	4.5	4.5
Vehicle Extension (s)		0.2	0.2	0.2	0.2
Lane Grp Cap (vph)		603	715	991	475
v/s Ratio Prot			c0.65	0.05	c0.55
v/s Ratio Perm		0.18			
v/c Ratio		0.32	1.17	0.15	1.61
Uniform Delay, d1		10.6	19.8	20.7	29.8
Progression Factor		0.51	0.62	0.69	0.72
Incremental Delay, d2		1.2	88.2	0.3	283.2
Delay (s)		6.6	100.5	14.6	304.6
Level of Service		A	F	B	F
Approach Delay (s)		79.7		256.6	
Approach LOS		E		F	
Intersection Summary					
HCM 2000 Control Delay		161.3		HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio		1.46			
Actuated Cycle Length (s)		90.0		Sum of lost time (s)	16.0
Intersection Capacity Utilization		109.9%		ICU Level of Service	H
Analysis Period (min)		15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

47: 7th Ave/Hubbell PI & Spring St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	119	12	0	0	0	0	315	105	0	215	0
Future Volume (vph)	38	119	12	0	0	0	0	315	105	0	215	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	14	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.5						4.5			4.5	
Lane Util. Factor		0.95						1.00			1.00	
Frpb, ped/bikes		0.99						1.00			1.00	
Flpb, ped/bikes		0.88						1.00			1.00	
Frt		0.99						0.97			1.00	
Flt Protected		0.99						1.00			1.00	
Satd. Flow (prot)		2821						1644			1676	
Flt Permitted		0.99						1.00			1.00	
Satd. Flow (perm)		2821						1644			1676	
Peak-hour factor, PHF	0.87	0.92	0.87	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.85	0.85
Adj. Flow (vph)	44	129	14	0	0	0	0	342	114	0	253	0
RTOR Reduction (vph)	0	7	0	0	0	0	0	13	0	0	0	0
Lane Group Flow (vph)	0	180	0	0	0	0	0	443	0	0	253	0
Confl. Peds. (#/hr)	166		20					4				4
Heavy Vehicles (%)	17%	2%	0%	2%	2%	2%	0%	0%	2%	2%	2%	0%
Turn Type	Perm	NA						NA			NA	
Protected Phases		2						4			4	
Permitted Phases	2									4		
Actuated Green, G (s)		33.5						47.5			47.5	
Effective Green, g (s)		33.5						47.5			47.5	
Actuated g/C Ratio		0.37						0.53			0.53	
Clearance Time (s)		4.5						4.5			4.5	
Lane Grp Cap (vph)		1050						867			884	
v/s Ratio Prot								c0.27			0.15	
v/s Ratio Perm		0.06										
v/c Ratio		0.17						0.51			0.29	
Uniform Delay, d1		18.9						13.7			11.8	
Progression Factor		0.43						0.16			1.00	
Incremental Delay, d2		0.3						1.5			0.8	
Delay (s)		8.5						3.7			12.6	
Level of Service		A						A			B	
Approach Delay (s)		8.5			0.0			3.7			12.6	
Approach LOS		A			A			A			B	
Intersection Summary												
HCM 2000 Control Delay		7.2										
HCM 2000 Volume to Capacity ratio		0.37										
Actuated Cycle Length (s)		90.0										
Intersection Capacity Utilization		45.5%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

48: 8th Ave & Spring St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	72	140	12	0	0	0	0	201	17	105	186	0
Future Volume (vph)	72	140	12	0	0	0	0	201	17	105	186	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5						4.5			4.5	
Lane Util. Factor		0.95						1.00			1.00	
Frpb, ped/bikes		0.99						0.98			1.00	
Flpb, ped/bikes		0.89						1.00			0.96	
Frt		0.99						0.99			1.00	
Flt Protected		0.98						1.00			0.98	
Satd. Flow (prot)		3034						1816			1748	
Flt Permitted		0.98						1.00			0.80	
Satd. Flow (perm)		3034						1816			1429	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	78	152	13	0	0	0	0	218	18	114	202	0
RTOR Reduction (vph)	0	5	0	0	0	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	238	0	0	0	0	0	233	0	0	316	0
Confl. Peds. (#/hr)	116		65				115		104	104		115
Confl. Bikes (#/hr)			5						13			2
Turn Type	Perm	NA						NA		Perm	NA	
Protected Phases		2						4			4	
Permitted Phases	2									4		
Actuated Green, G (s)		37.5						43.5			43.5	
Effective Green, g (s)		37.5						43.5			43.5	
Actuated g/C Ratio		0.42						0.48			0.48	
Clearance Time (s)		4.5						4.5			4.5	
Lane Grp Cap (vph)		1264						877			690	
v/s Ratio Prot								0.13				
v/s Ratio Perm		0.08									c0.22	
v/c Ratio		0.19						0.27			0.46	
Uniform Delay, d1		16.6						13.8			15.4	
Progression Factor		0.95						0.17			1.00	
Incremental Delay, d2		0.3						0.6			2.2	
Delay (s)		16.1						3.0			17.6	
Level of Service		B						A			B	
Approach Delay (s)		16.1			0.0			3.0			17.6	
Approach LOS		B			A			A			B	
Intersection Summary												
HCM 2000 Control Delay		12.8						HCM 2000 Level of Service		B		
HCM 2000 Volume to Capacity ratio		0.33										
Actuated Cycle Length (s)		90.0						Sum of lost time (s)		9.0		
Intersection Capacity Utilization		51.8%						ICU Level of Service		A		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

49: 9th Ave & Spring St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	60	162	131	0	10	0	64	1	1	171	0
Future Volume (vph)	40	60	162	131	0	10	0	64	1	1	171	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	11	12	12	12	12
Total Lost time (s)	4.5	4.5			4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frpb, ped/bikes	1.00	0.86			0.96			1.00			1.00	
Flpb, ped/bikes	0.61	1.00			0.90			1.00			1.00	
Frt	1.00	0.89			0.99			1.00			1.00	
Flt Protected	0.95	1.00			0.96			1.00			1.00	
Satd. Flow (prot)	1078	1425			1517			1788			1859	
Flt Permitted	0.68	1.00			0.59			1.00			1.00	
Satd. Flow (perm)	768	1425			935			1788			1859	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	65	176	142	0	11	0	70	1	1	186	0
RTOR Reduction (vph)	0	92	0	0	38	0	0	1	0	0	0	0
Lane Group Flow (vph)	43	149	0	0	115	0	0	70	0	0	187	0
Confl. Peds. (#/hr)	209		58	58		209	104		111	111		104
Confl. Bikes (#/hr)			4			1			4			3
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2						4		
Actuated Green, G (s)	43.0	43.0			43.0			26.5			26.5	
Effective Green, g (s)	43.0	43.0			43.0			26.5			26.5	
Actuated g/C Ratio	0.48	0.48			0.48			0.29			0.29	
Clearance Time (s)	4.5	4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)	366	680			446			526			547	
v/s Ratio Prot		0.10						0.04				
v/s Ratio Perm	0.06				c0.12						0.10	
v/c Ratio	0.12	0.22			0.26			0.13			0.34	
Uniform Delay, d1	13.0	13.7			14.0			23.3			24.9	
Progression Factor	1.29	2.19			1.00			0.23			1.00	
Incremental Delay, d2	0.6	0.7			1.4			0.5			1.7	
Delay (s)	17.4	30.7			15.4			5.8			26.6	
Level of Service	B	C			B			A			C	
Approach Delay (s)		28.7			15.4			5.8			26.6	
Approach LOS		C			B			A			C	
Intersection Summary												
HCM 2000 Control Delay			22.9				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.26									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)		13.5			
Intersection Capacity Utilization			52.6%				ICU Level of Service		A			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

50: 14th Ave & Pike St

03/24/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	0	114	45	95	2	2	267	0	0	363	1
Future Volume (vph)	4	0	114	45	95	2	2	267	0	0	363	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	16	12	12	16	12	12	16	12
Grade (%)		6%			-6%			0%			0%	
Total Lost time (s)	4.5		4.5		4.5			4.5			4.5	
Lane Util. Factor	1.00		1.00		1.00			1.00			1.00	
Frt	1.00		0.85		1.00			1.00			1.00	
Flt Protected	0.95		1.00		0.98			1.00			1.00	
Satd. Flow (prot)	1717		1536		2137			2110			1899	
Flt Permitted	0.66		1.00		0.98			1.00			1.00	
Satd. Flow (perm)	1191		1536		2137			2107			1899	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	0	124	49	103	2	2	290	0	0	395	1
RTOR Reduction (vph)	0	0	114	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	4	0	10	0	154	0	0	292	0	0	396	0
Parking (#/hr)		0									0	
Turn Type	Perm		Perm	Perm	NA		Perm	NA			NA	
Protected Phases					4			3			3	
Permitted Phases	2		2	4			3					
Actuated Green, G (s)	7.5		7.5		49.5			31.5			31.5	
Effective Green, g (s)	7.5		7.5		49.5			31.5			31.5	
Actuated g/C Ratio	0.08		0.08		0.55			0.35			0.35	
Clearance Time (s)	4.5		4.5		4.5			4.5			4.5	
Lane Grp Cap (vph)	99		128		1175			737			664	
v/s Ratio Prot											c0.21	
v/s Ratio Perm	0.00		0.01		0.07			0.14				
v/c Ratio	0.04		0.08		0.13			0.40			0.60	
Uniform Delay, d1	37.9		38.1		9.8			22.1			24.0	
Progression Factor	1.00		1.00		1.05			0.11			1.00	
Incremental Delay, d2	0.8		1.2		0.2			1.4			3.9	
Delay (s)	38.7		39.3		10.6			3.7			27.9	
Level of Service	D		D		B			A			C	
Approach Delay (s)		39.3			10.6			3.7			27.9	
Approach LOS		D			B			A			C	
Intersection Summary												
HCM 2000 Control Delay			19.4									
HCM 2000 Volume to Capacity ratio			0.33									
Actuated Cycle Length (s)			90.0									
Intersection Capacity Utilization			45.1%									
Analysis Period (min)			15									
c Critical Lane Group												