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February 18, 2025

Mr. Tom Cave
3550 Chambers LLC
8751 E. Hampden B-6
Denver, CO 80231

Re: Ge'ez Center
Traffic Impact Analysis
Aurora, CO
LSC #230790

Dear Mr. Cave:

In response to your request, LSC Transportation Consultants, Inc. has prepared this updated traffic impact analysis for the proposed Ge'ez Center development to address City comments. As shown on Figure 1, the site is located east of Chambers Road and south of E. 35th Avenue in Aurora, Colorado.

REPORT CONTENTS

The report contains the following: the existing roadway and traffic conditions in the vicinity of the site including the lane geometries, traffic controls, posted speed limits, etc.; the existing weekday peak-hour traffic volumes; the existing daily traffic volumes in the area; the typical weekday site-generated traffic volume projections for the site; the assignment of the projected traffic volumes to the area roadways; the projected short-term and long-term background and resulting total traffic volumes on the area roadways; the site's projected traffic impacts; and any recommended roadway improvements to mitigate the site's traffic impacts or the impacts from growth in background traffic.

LAND USE AND ACCESS

The site is proposed to include 4,000 square feet of fast casual restaurant, a 2,500 square-foot fast-food restaurant with drive-through, an 81-room business hotel, and an event center. The typical event size will include 50 to 200 guests and staff with up to three days per year where the event size is expected to be 200 to 500 people. These three days will be on weekends and will be treated as special events.

Access is proposed from several locations to E. 35th Avenue and E. 33rd Place as shown in the conceptual site plan in Figure 2. Indirect access will be provided to Chambers Road via E. 33rd Place and E. 35th Avenue.

ROADWAY AND TRAFFIC CONDITIONS

Area Roadways

The major roadways in the site's vicinity are shown on Figure 1 and are described below.

- **Chambers Road** is a north-south, six-lane arterial roadway west of the site. The intersections with E. 33rd Place and E. 35th Avenue are stop-sign controlled. The posted speed limit in the vicinity of the site is 40 mph.
- **E. 35th Avenue** is an east-west, two-lane roadway north of the site. The intersections with Chambers Road and Helena Street are stop-sign controlled and the intersection with Chambers Road is limited to right-in/right-out-only.
- **Helena Street** is a north-south, two-lane local roadway east of the site. The intersections with E. 33rd Place and E. 35th Avenue are stop-sign controlled.
- **E. 33rd Place** is an east-west, two-lane roadway south of the site. The intersections with Chambers Road and Helena Street are stop-sign or yield-sign controlled and full movement.

The City has commented that the intersection of E. 33rd Place with Chambers Road (#5) should be restricted to three-quarter movement due to accident history.

Existing Traffic Conditions

Figure 3 shows the existing traffic volumes, lane geometries, and traffic controls in the site's vicinity on a typical weekday. The weekday peak-hour traffic volumes and daily traffic counts are from the attached traffic counts conducted by Counter Measures in January, 2024.

2027 and 2050 Background Traffic

Figure 4 shows the estimated 2027 background traffic and Figure 5 shows the estimated 2050 background traffic. An annual growth rate of 1.19 percent was used based on a comparison of the DRCOG 2020 (33,000 vpd) and 2050 (47,000 vpd) daily traffic volumes on Chamber Road.

Figures 4 and 5 also show the 2027 and 2050 background lane geometry and traffic control, respectively. The intersection at Chambers Road/E. 33rd Place (#5) is assumed to be restricted to three-quarter movement per the accident history and per feedback from the City of Aurora.

Existing, 2027, and 2050 Background Levels of Service

Level of service (LOS) is a quantitative measure of the level of congestion or delay at an intersection. Level of service is indicated on a scale from "A" to "F." LOS A is indicative of little congestion or delay and LOS F is indicative of a high level of congestion or delay. Attached are specific level of service definitions for unsignalized intersections. These results do not account for gaps created by the existing traffic signals along the Chambers Road corridor.

The signalized intersection of Chambers Road/E. 32nd Avenue is included in the capacity analysis model to simulate the gaps it creates at the study area site access intersection to the north. The Chambers Road/E. 32nd Avenue intersection is not analyzed for capacity analysis.

The intersections in Figures 3, 4, and 5 were analyzed as appropriate to determine the existing, 2027, and 2050 background levels of service using Synchro Version 11. Table 1 shows the level of service analysis results with all LOS "E" and "F" values highlighted. The level of service reports are attached.

1. **Chambers Road/E. 35th Avenue:** All movements at this unsignalized right-in/right-out intersection currently operate at LOS "B" or better during both morning and afternoon peak-hours and are expected to do so through 2050.
2. **E. 35th Avenue/West Site Access:** This intersection was analyzed only in the total traffic scenarios.
3. **E. 35th Avenue/East Site Access:** This intersection was analyzed only in the total traffic scenarios.
4. **Helena Street/E. 35th Avenue:** All movements at this unsignalized intersection currently operate at LOS "A" during both morning and afternoon peak-hours and are expected to do so through 2050.
5. **Chambers Road/E. 33rd Place:** All movements at this unsignalized intersection currently operate at LOS "D" or better during both morning and afternoon peak-hours with the following exception: The eastbound approach operates at LOS "E" during the afternoon peak-hour. With conversion to three-quarter movement all movements are expected to operate at LOS "D" or better through 2027. By 2050, the northbound left-turn movement is expected to operate at LOS "E" in the morning peak-hour. The capacity analysis model includes the signalized intersection at Chambers Road/E. 32nd Avenue to simulate the gaps it creates - it is included in the appendix capacity analysis reports.
6. **E. 33rd Place/West Site Access:** This intersection was analyzed only in the total traffic scenarios.
7. **E. 33rd Place/East Site Access:** This intersection was analyzed only in the total traffic scenarios.
8. **Helena Street/E. 33rd Place:** All movements at this unsignalized intersection currently operate at LOS "A" during both morning and afternoon peak-hours and are expected to do so through 2050.

TRIP GENERATION

Table 2 shows the estimated average weekday, morning peak-hour, and afternoon peak-hour trip generation for the proposed site based on the rates from Trip Generation, 11th Edition, 2021 by the Institute of Transportation Engineers (ITE) for the proposed land use.

The site is projected to generate about 2,064 vehicle-trips on the average weekday, with about half entering and half exiting the site during a 24-hour period. During the morning peak-hour, which generally occurs for one hour between 6:30 and 8:30 a.m., about 86 vehicles would enter the site and about 78 vehicles would exit the site. During the afternoon peak-hour, which generally occurs for one hour between 4:00 and 6:30 p.m., about 144 vehicles would enter and about 79 vehicles would exit the site. These estimates are expected to be reduced due to passby trips as shown in Table 2.

TRIP DISTRIBUTION

Figure 6 shows the updated estimated directional distribution of the primary site-generated traffic volumes on the area roadways based on feedback from City staff. The estimates were based on the location of the site with respect to the regional population, employment, and activity centers; and the site's proposed land use.

TRIP ASSIGNMENT

Figure 7a shows the estimated primary site-generated traffic volumes based on the directional distribution percentages (from Figure 6) and the primary trip generation estimate (from Table 2).

Figure 7b shows the estimated passby site-generated traffic volumes based on the passby trip generation estimate (from Table 2).

2027 AND 2050 TOTAL TRAFFIC

Figure 8a shows the 2027 total traffic which is the sum of the 2027 background traffic volumes (from Figure 4) and the site-generated traffic volumes (from Figures 7a and 7b). Figure 8b shows the recommended 2027 lane geometry and traffic control.

Figure 9a shows the 2050 total traffic which is the sum of the 2050 background traffic volumes (from Figure 5) and the site-generated traffic volumes (from Figures 7a and 7b). Figure 9b shows the recommended 2050 lane geometry and traffic control.

PROJECTED LEVELS OF SERVICE

The intersections in Figures 8a through 9b were analyzed to determine the 2027 and 2050 total levels of service. Table 1 shows the level of service analysis results with all LOS "E" and "F" values highlighted. The level of service reports are attached. The signalized intersection of Chambers Road with E. 32nd Avenue was added to the total traffic scenario capacity analysis to account for the gaps it creates. The various level of service reports for this intersection are included in the appendix.

- 1. Chambers Road/E. 35th Avenue:** All movements at this unsignalized intersection are expected to operate at LOS "B" or better during both morning and afternoon peak-hours through 2050.

2. **E. 35th Avenue/West Site Access:** All movements at this unsignalized intersection are expected to operate at LOS "A" during both morning and afternoon peak-hours through 2050.
3. **E. 35th Avenue/East Site Access:** All movements at this unsignalized intersection are expected to operate at LOS "A" during both morning and afternoon peak-hours through 2050.
4. **Helena Street/E. 35th Avenue:** All movements at this unsignalized intersection are expected to operate at LOS "A" during both morning and afternoon peak-hours through 2050.
5. **Chambers Road/E. 33rd Place:** All movements at this unsignalized intersection are expected to operate at LOS "D" or better through 2050 with the following exception: The north-bound left-turn movement could operate at LOS "E" by 2050. It is likely this movement would also be acceptable if the existing traffic signal to the north was included in the capacity analysis.
6. **E. 33rd Place/West Site Access:** All movements at this unsignalized intersection are expected to operate at LOS "B" or better during both morning and afternoon peak-hours through 2050.
7. **E. 33rd Place/East Site Access:** All movements at this unsignalized intersection are expected to operate at LOS "A" during both morning and afternoon peak-hours through 2050.
8. **Helena Street/E. 33rd Place:** All movements at this unsignalized intersection are expected to operate at LOS "A" during both morning and afternoon peak-hours through 2050.

RECOMMENDED IMPROVEMENTS

The recommended 2027 and 2050 improvements are shown in Figures 8b and 9b with details provided in Figure 8b. The improvements include converting the Chambers Road/E. 33rd Place intersection (#5) to three-quarter movement and lengthening the southbound left-turn lane to accommodate the additional queue length.

DRIVE-THROUGH LANE QUEUE LENGTH

The expected maximum queue length for the coffee shop is eleven vehicles per the queuing study referenced by the City and attached to this study for reference. The drive-through window was located on the south side of the building to maximize the available queue length to accommodate a minimum of eleven vehicles.

CONCLUSIONS AND RECOMMENDATIONS

Trip Generation

1. The site is projected to generated about 2,064 vehicle-trips on the average weekday, with about half entering and half exiting the site during a 24-hour period. During the morning peak-hour, about 86 vehicles would enter the site and about 78 vehicles would exit the

site. During the afternoon peak-hour, about 144 vehicles would enter and about 79 vehicles would exit the site. These estimates are expected to be reduced due to passby trips as shown in Table 2.

Projected Levels of Service

2. All movements at the unsignalized intersections are expected to operate at LOS "D" or better through 2050 with the following exception: The northbound left-turn movement at the Chambers Road/E. 33rd Place intersection (#5) is expected to operate at LOS "E" during the morning peak-hour in 2050. It is likely this movement would also be acceptable if the existing traffic signal to the north was included in the capacity analysis.

Conclusions

3. The impact of the Ge'ez Center development can be accommodated by the existing and proposed roadway network with implementation of the following recommendations.

Recommendations

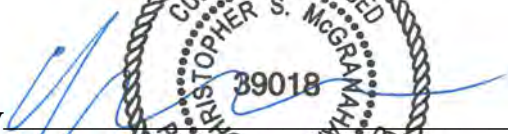
4. The recommended improvements are shown in Figures 8b and 9b with details provided in Figure 8b. The improvements include converting the Chambers Road/E. 33rd Place intersection (#5) to three-quarter movement and lengthening the southbound left-turn lane to accommodate the additional queue length.

* * * * *

We trust our findings will assist you in gaining approval of the proposed Ge'ez Center development. Please contact me if you have any questions or need further assistance.

Sincerely,

LSC TRANSPORTATION CONSULTANTS, INC.

By 

Christopher S. McGranahan, PE
Principal/President

CSM/wc

2-18-25

Enclosures: Tables 1 and 2
Figures 1 - 9b
Traffic Count Reports
Level of Service Definitions
Level of Service Reports
Drive-Through Queue Generation by CountingCars.com

Table 1
Intersection Levels of Service Analysis ⁽¹⁾
Ge'ez Center
Aurora, Colorado
LSC #230790; February, 2025

Intersection Location	Traffic Control	Existing Traffic				2027 Background Traffic				2027 Total Traffic				2050 Background Traffic				2050 Total Traffic			
		Level of Service AM	Move-ment Delay	Level of Service PM	Move-ment Delay	Level of Service AM	Move-ment Delay	Level of Service PM	Move-ment Delay	Level of Service AM	Move-ment Delay	Level of Service PM	Move-ment Delay	Level of Service AM	Move-ment Delay	Level of Service PM	Move-ment Delay	Level of Service AM	Move-ment Delay	Level of Service PM	Move-ment Delay
1) <u>Chambers Road/E. 35th Avenue</u> WB Right	TWSC	B	10.1	B	11.7	B	10.1	B	11.7	B	10.5	B	12.5	B	10.6	B	13.4	B	11.1	B	14.6
2) <u>E. 35th Avenue/West Site Access</u> NB Approach	TWSC	--	--	--	--	--	--	--	--	A	9.1	A	9.0	--	--	--	--	A	9.2	A	9.0
WB Left/Through		--	--	--	--	--	--	--	--	A	0.0	A	0.0	--	--	--	--	A	0.0	A	0.0
3) <u>E. 35th Avenue/East Site Access</u> NB Approach	TWSC	--	--	--	--	--	--	--	--	A	8.8	A	8.7	--	--	--	--	A	8.9	A	8.7
WB Left/Through		--	--	--	--	--	--	--	--	A	0.0	A	0.0	--	--	--	--	A	0.0	A	0.0
4) <u>Helena Street/E. 35th Avenue</u> NB Approach	TWSC	A	8.7	A	8.8	A	8.8	A	8.8	A	8.8	A	8.8	A	8.9	A	8.8	A	8.9	A	8.8
EB Approach		A	7.3	A	7.2	A	7.3	A	7.2	A	7.3	A	7.2	A	7.3	A	7.3	A	7.3	A	7.3
WB Approach		A	0.0	A	7.2	A	7.2	A	7.2	A	7.2	A	7.2	A	7.3	A	7.2	A	7.3	A	7.2
SB Approach		A	8.7	A	8.9	A	8.7	A	8.9	A	8.7	A	8.9	A	8.8	A	8.9	A	8.8	A	8.9
5) <u>Chambers Road/E. 33rd Place</u> NB Left	TWSC	C	18.9	C	17.2	C	20.0	C	17.9	C	20.5	C	18.0	E	38.3	D	26.2	E	39.8	D	26.7
EB Approach or Right		C	19.4	C	19.0	C	15.2	C	18.7	C	15.4	C	18.7	C	19.4	D	29.8	C	19.6	D	30.6
WB Approach		B	11.7	E	39.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
WB Right		--	--	--	--	B	10.0	B	11.7	B	10.2	B	12.2	B	10.4	B	13.5	B	10.7	B	14.2
SB Left		A	9.0	B	10.2	A	9.1	B	10.3	A	9.4	B	11.0	A	9.6	B	11.6	B	10.1	B	13.0
6) <u>E. 33rd Place/West Site Access</u> NB Approach	TWSC	--	--	--	--	--	--	--	--	B	10.4	B	11.4	--	--	--	--	B	10.5	B	11.5
EB Approach		--	--	--	--	--	--	--	--	A	7.4	A	7.4	--	--	--	--	A	7.4	A	7.4
WB Approach		--	--	--	--	--	--	--	--	A	0.0	A	0.0	--	--	--	--	A	0.0	A	0.0
SB Approach		--	--	--	--	--	--	--	--	A	8.5	A	8.5	--	--	--	--	A	8.5	A	8.6
7) <u>E. 33rd Place/East Site Access</u> EB Approach	TWSC	--	--	--	--	--	--	--	--	A	7.2	A	7.3	--	--	--	--	A	7.2	A	7.3
SB Approach		--	--	--	--	--	--	--	--	A	8.3	A	8.4	--	--	--	--	A	8.3	A	8.4
8) <u>Helena Street/E. 33rd Place</u> NB Approach	TWSC	A	8.6	A	8.8	A	8.7	A	8.8	A	8.7	A	8.8	A	8.8	A	8.9	A	8.8	A	8.9
EB Approach		A	7.2	A	7.2	A	7.2	A	7.2	A	7.2	A	7.2	A	7.2	A	7.2	A	7.2	A	7.2
WB Approach		A	0.0	A	0.0	A	7.2	A	7.3	A	7.2	A	7.3	A	7.2	A	7.3	A	7.2	A	7.3
SB Approach		A	8.9	A	8.8	A	8.8	A	8.8	A	8.8	A	8.8	A	8.9	A	8.9	A	8.9	A	8.9

Notes LOS "E" or "F"

(1) The existing and background scenarios do not include gaps created by the existing traffic signals along the Chambers Road corridor. The existing traffic signal at Chambers Road/E. 32nd Avenue was included in the modeling for the total traffic scenarios. This shows operations are expected to be acceptable when these gaps are modeled. The LOS reports for the additional intersection are included in the appendix.

Table 2
ESTIMATED TRAFFIC GENERATION
Ge'ez Center
Aurora, CO
LSC #230790; February, 2025

Trip Generating Category	Quantity	Trip Generation Rates ⁽¹⁾					Total Trips Generated				
		Average Weekday	AM Peak-Hour		PM Peak-Hour		Average Weekday	AM Peak-Hour		PM Peak-Hour	
			In	Out	In	Out		In	Out	In	Out
Currently Proposed Land Use											
Restaurant ⁽²⁾	2,500 KSF ⁽³⁾	97.14	0.715	0.715	6.903	5.648	243	2	2	17	14
Restaurant ⁽²⁾	1,500 KSF	97.14	0.715	0.715	6.903	5.648	146	1	1	10	8
Restaurant ⁽⁴⁾	2,500 KSF	467.48	22.751	21.859	17.176	15.854	1,169	57	55	43	40
Hotel ⁽⁵⁾	81 Rooms	4.02	0.140	0.220	0.171	0.139	326	11	18	14	11
Event Center ⁽⁶⁾	200 Person Capacity						180	15	2	60	6
Primary Trips =							2,064	86	78	144	79
Passby Trips ⁽⁷⁾ =							752	29	29	31	31
Net External Trips =							1,312	57	49	113	48

Notes:

- (1) Source: *Trip Generation*, Institute of Transportation Engineers, 11th Edition, 2021
- (2) ITE Land Use No. 930 - Fast Casual Restaurant
- (3) KSF = 1,000 square feet
- (4) ITE Land Use No. 934 - Fast-Food Restaurant with Drive-Through
- (5) ITE Land Use No. 312 - Business Hotel
- (6) The Event Center is expected to have about 24 weddings or similar events per year with as many as 200 attendees. Smaller events of about 50 people are expected on a near daily basis. The 200-person event is the basis for the trip generation estimate assuming 75 percent of guests arrive in the afternoon peak-hour, a vehicle occupancy of 2.5, and 10% are dropped off/picked up. The 2.5 occupants per vehicle is consistent with Federal Highway Administration's value for special events. The drop-off/pick-up percentage increases the overall trip generation so was added to maintain a conservative analysis. Assumes morning events are smaller with the big events beginning in the afternoon peak-hour. The applicant is expected to have as many as three weekend days per year where the attendance plus staff will be between 200 and 500 people - these will be treated as special events.
- (7) Passby trips are assumed to be 43% for the Fast Casual restaurant land uses and 50% for the Fast-Food Restaurant land use.

Vicinity Map

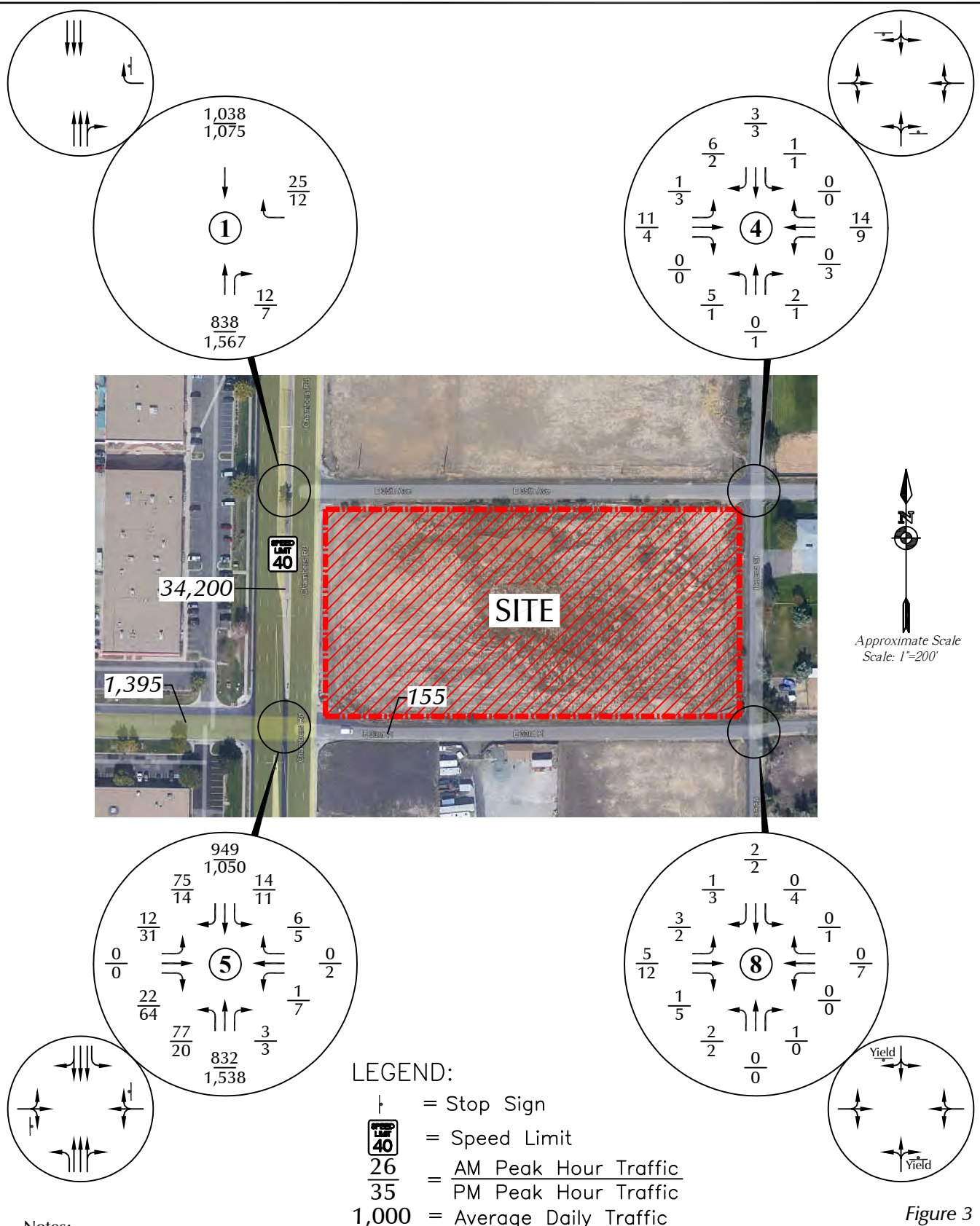


Approximate Scale
Scale: NTS

Figure 2

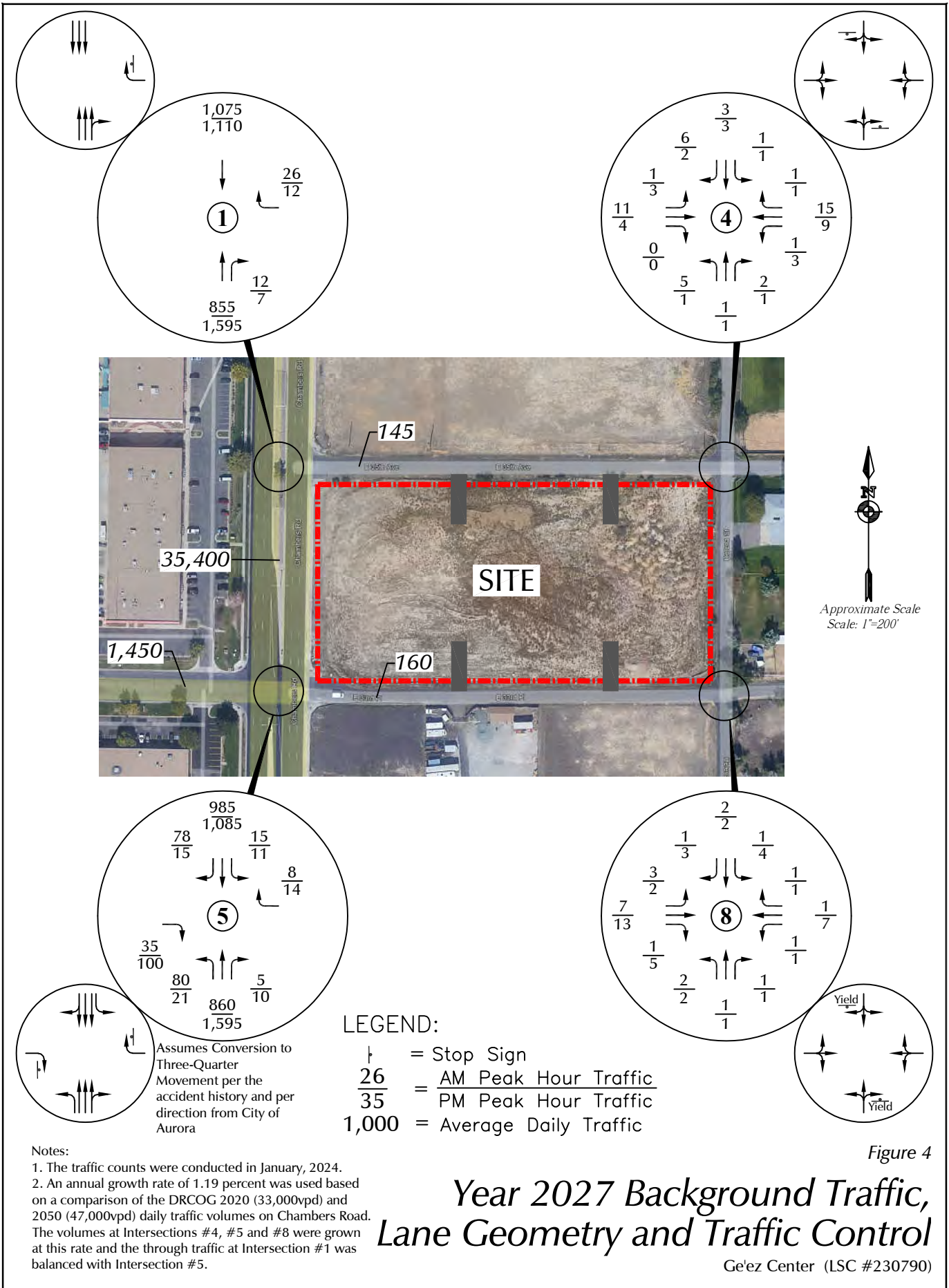
Site Plan

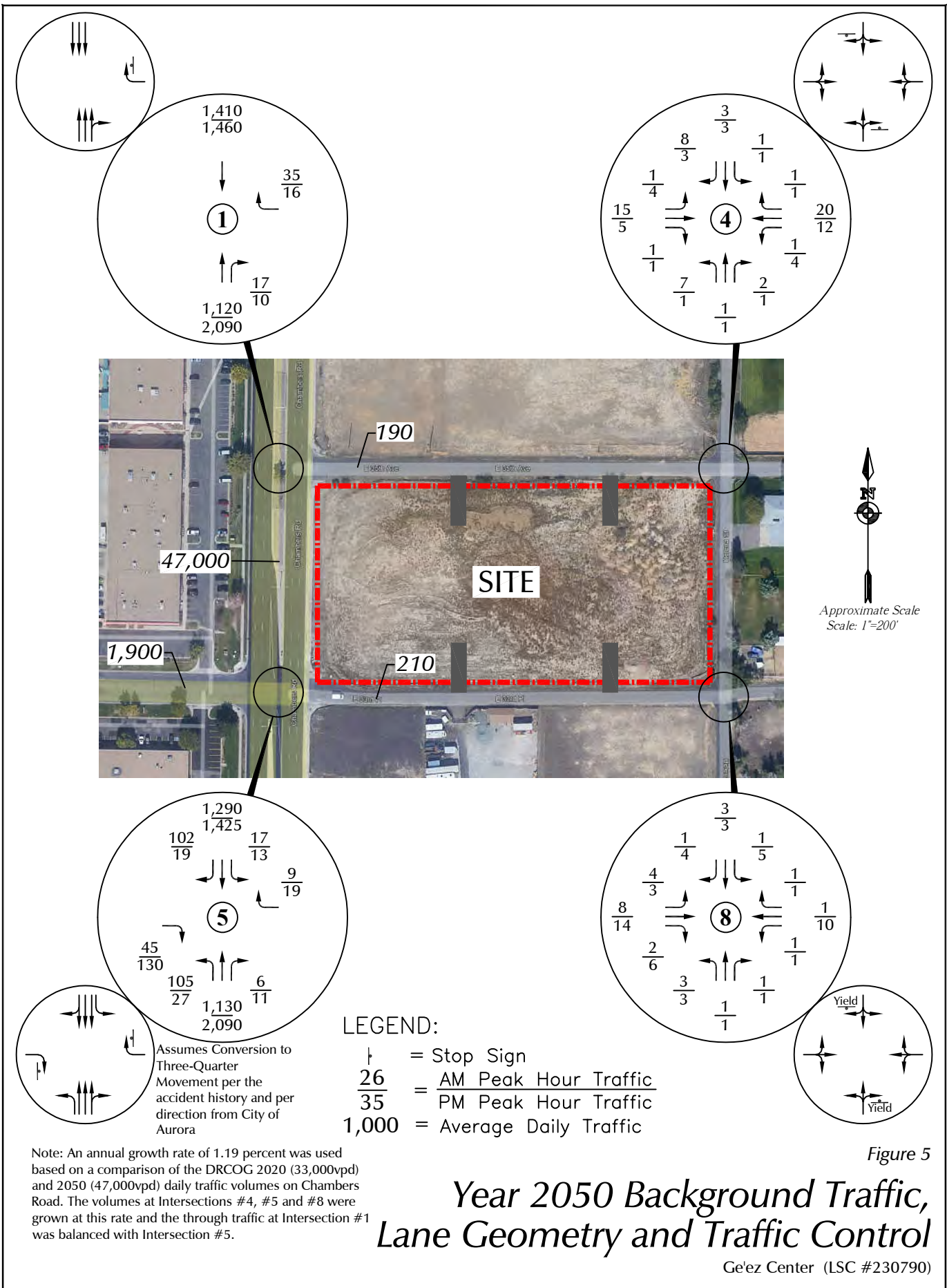
Ge'ez Center (LSC #230790)



Existing Traffic, Lane Geometry and Traffic Control

Ge'ez Center (LSC #230790)





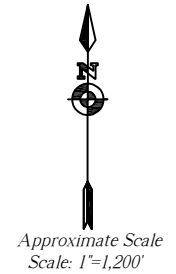


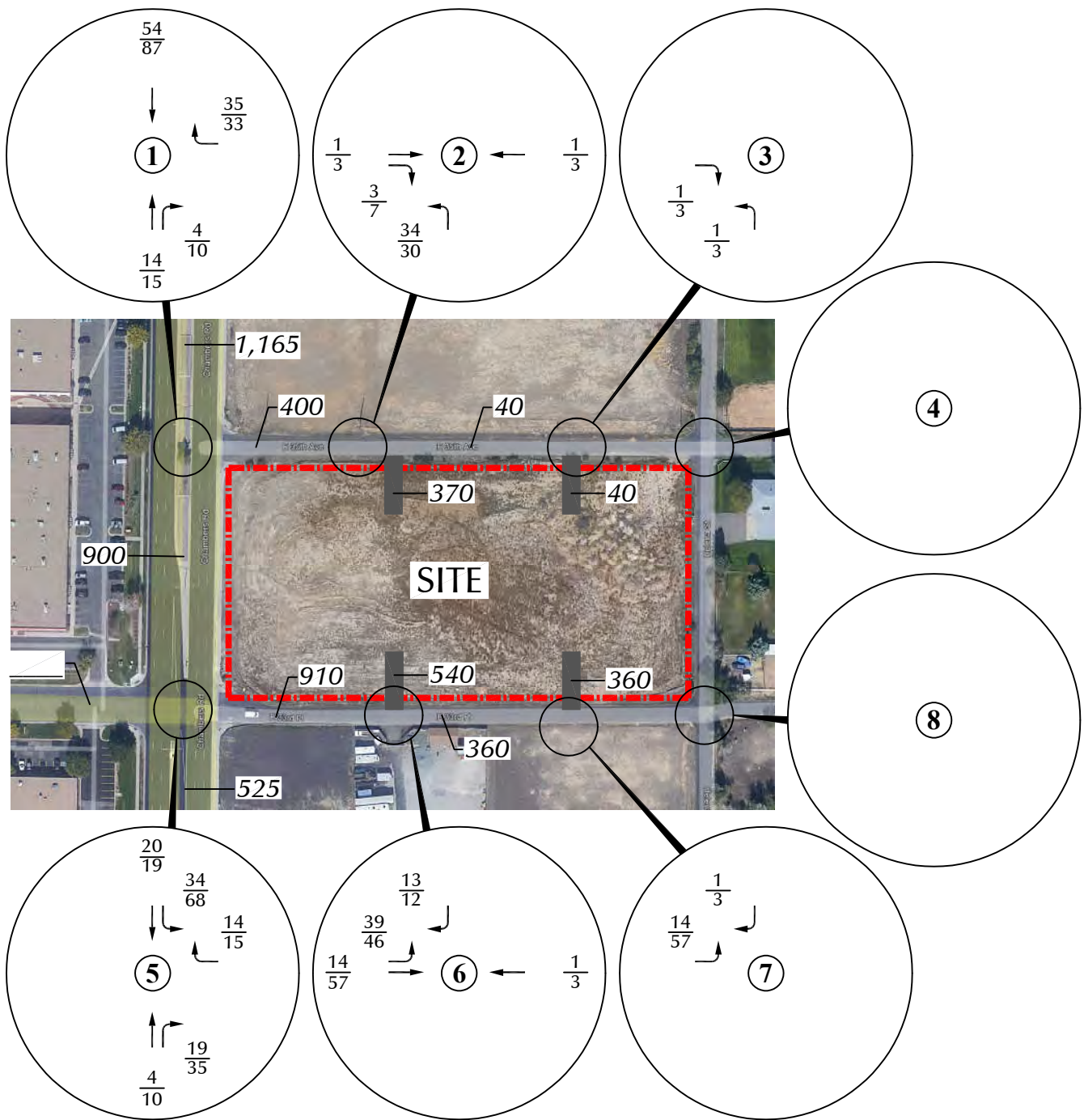
Figure 6

LEGEND:

= Percent Directional
Distribution

Directional Distribution of Primary Site-Generated Traffic

Ge'ez Center (LSC #230790)



LEGEND:

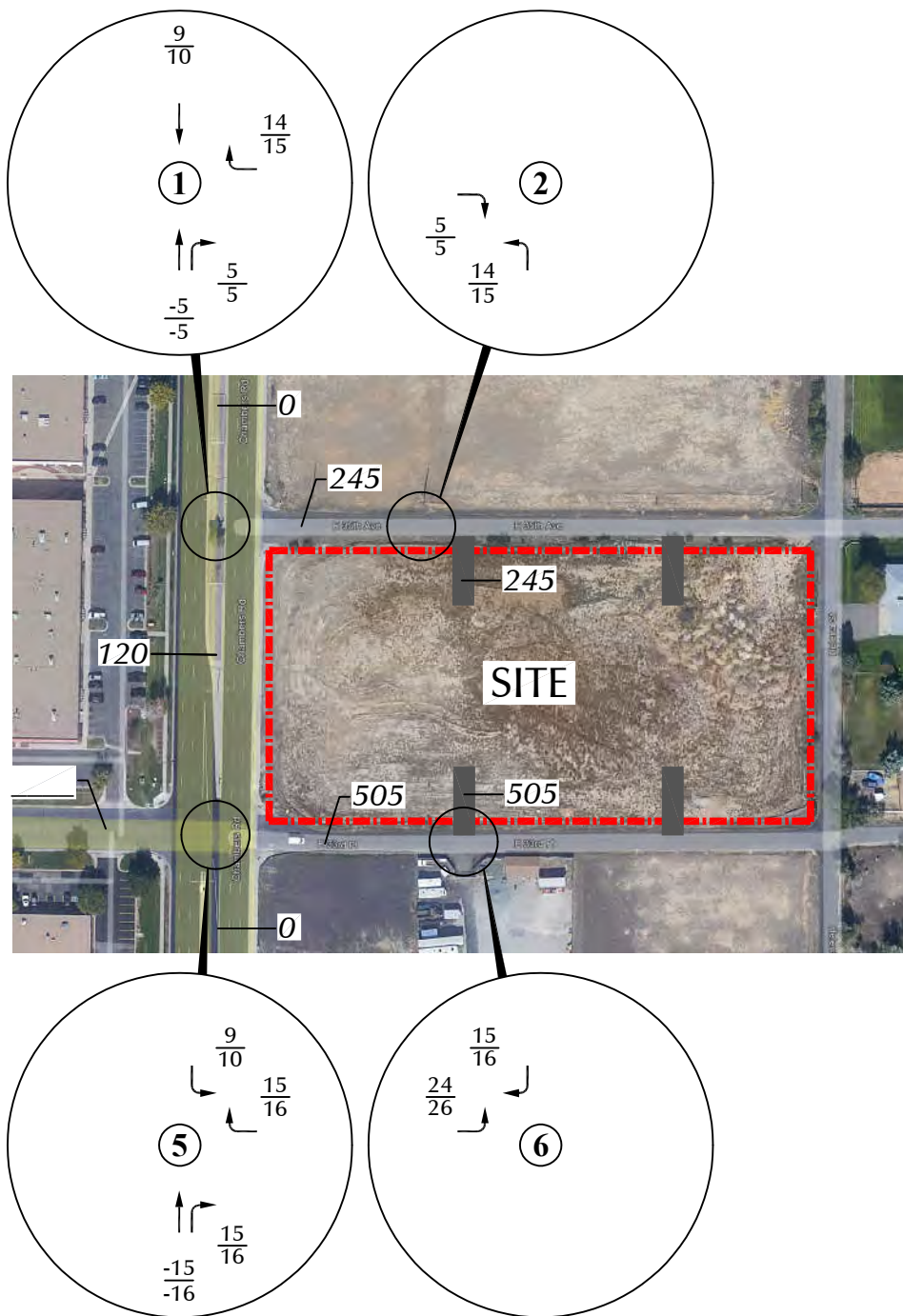
$\frac{26}{35}$ = AM Peak Hour Traffic
 $\frac{35}{35}$ = PM Peak Hour Traffic
 1,000 = Average Daily Traffic

Note: Assumes driver departing the site and wanting to travel south will turn right (north) on Chambers Road and complete a u-turn maneuver at the signalized intersection to the north.

Figure 7a

Assignment of Primary Site-Generated Traffic

Ge'ez Center (LSC #230790)



LEGEND:

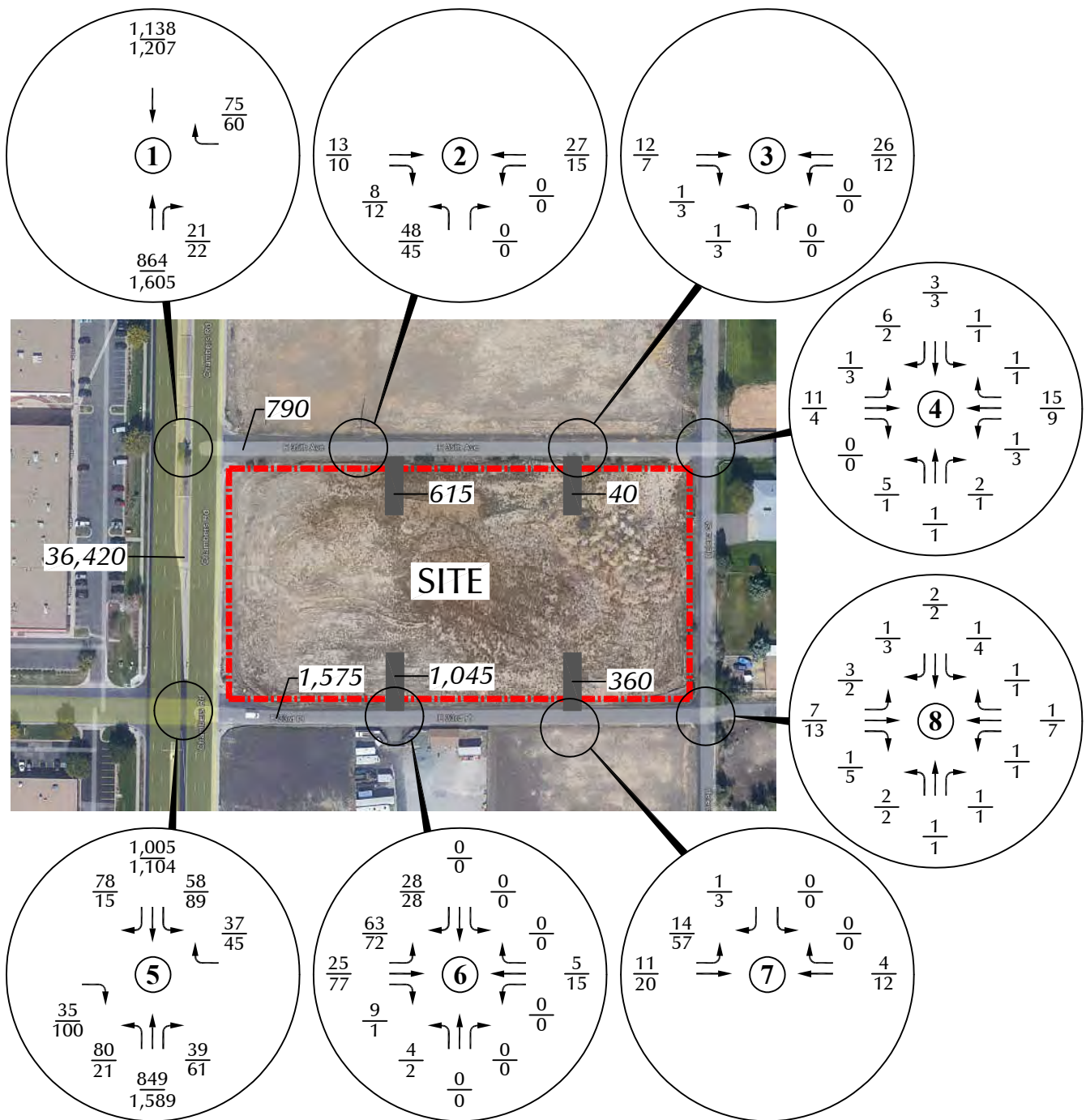
$\frac{26}{35}$ = AM Peak Hour Traffic
 $\frac{35}{26}$ = PM Peak Hour Traffic
 1,000 = Average Daily Traffic

Note: Approximately 75% of passby trips are expected to be in the northbound direction and 25% in the southbound direction.

Figure 7b

Assignment of Passby Site-Generated Traffic

Ge'ez Center (LSC #230790)



LEGEND:

$\frac{26}{35}$ = AM Peak Hour Traffic
 = PM Peak Hour Traffic
 1,000 = Average Daily Traffic

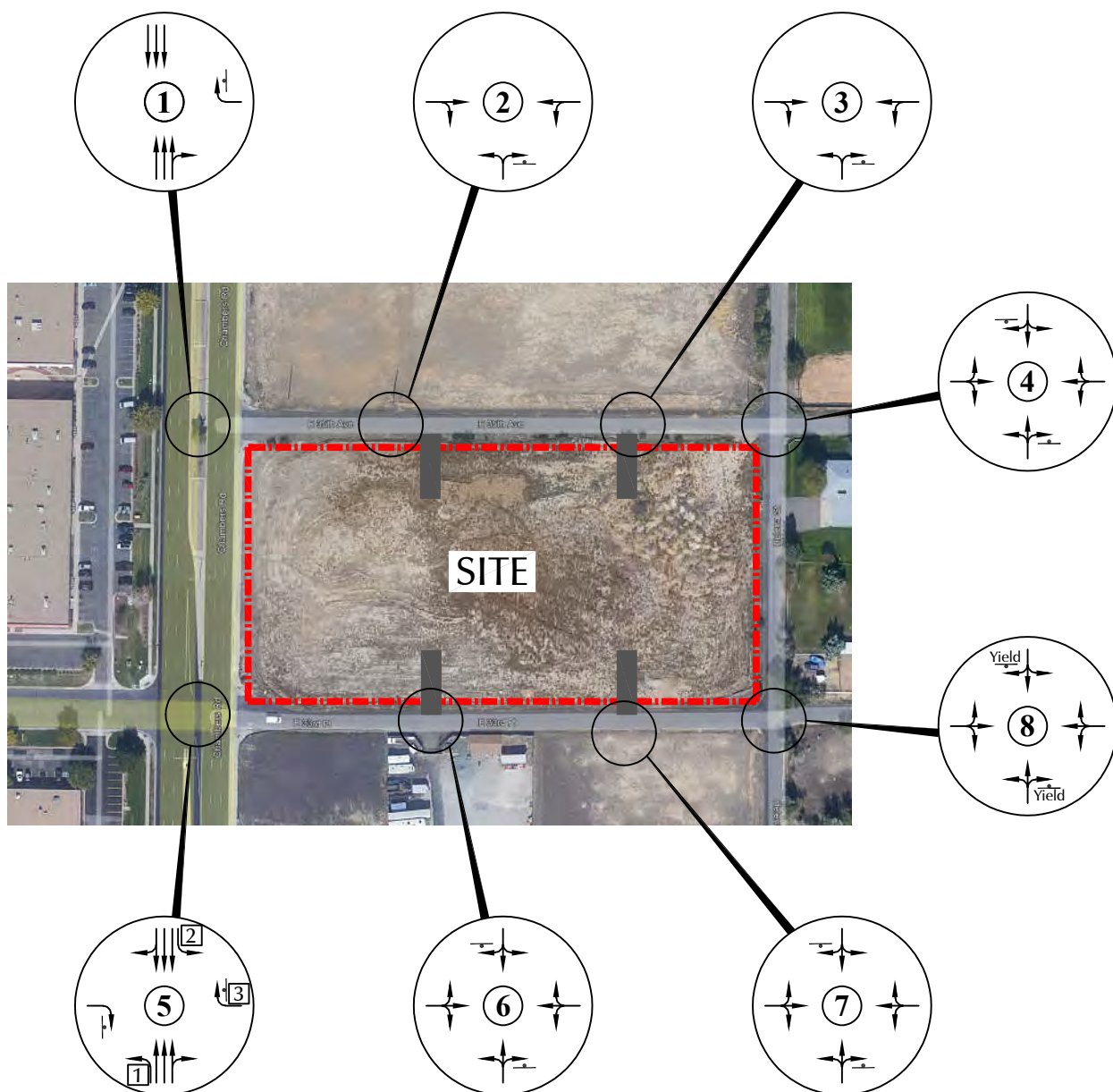
Notes:

1. These volumes are the sum of the volumes in Figures 4, 7a and 7b.
2. The capacity analysis for this scenario includes the existing traffic signal at Chambers Road/E. 32nd Avenue.

Figure 8a

**Year 2027
Total Traffic**

Ge'ez Center (LSC #230790)



Recommended Improvements:

- [1] NB LT = City requirement for 40mph is a 225-foot lane and 145-foot transition taper. This lane is not recommended to be lengthened by the applicant as the movement does not serve the project.
- [2] SB LT = Lengthen lane to 225 feet plus a 145-foot transition taper to accommodate the estimated queue length.
- [3] Convert intersection to three-quarter movement per the accident history and per direction from the City of Aurora.

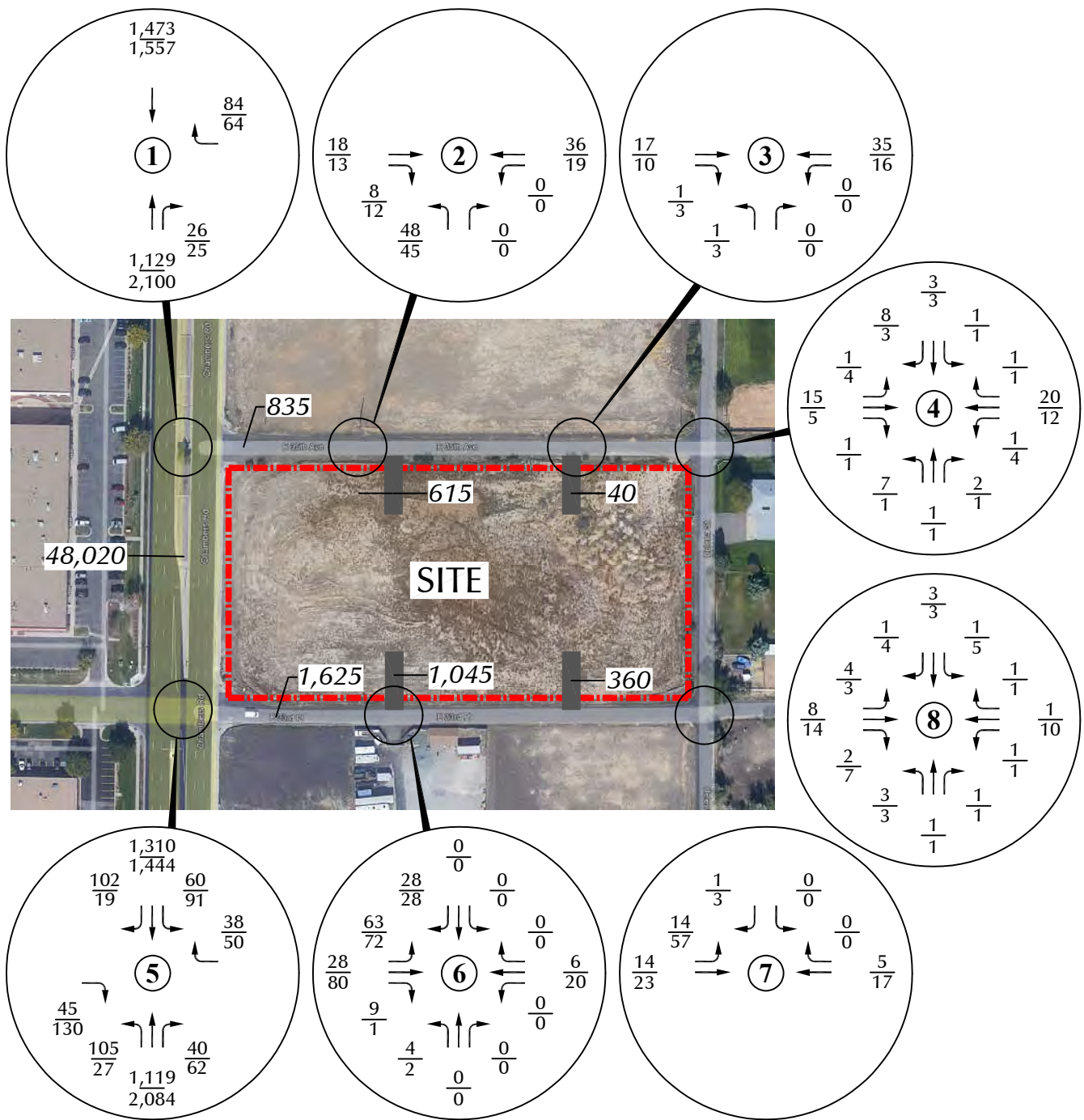
LEGEND:

⊥ = Stop Sign

Figure 8b

Year 2027 Total Lane Geometry and Traffic Control

Ge'ez Center (LSC #230790)



LEGEND:

$\frac{26}{35}$ = AM Peak Hour Traffic
 = PM Peak Hour Traffic
 1,000 = Average Daily Traffic

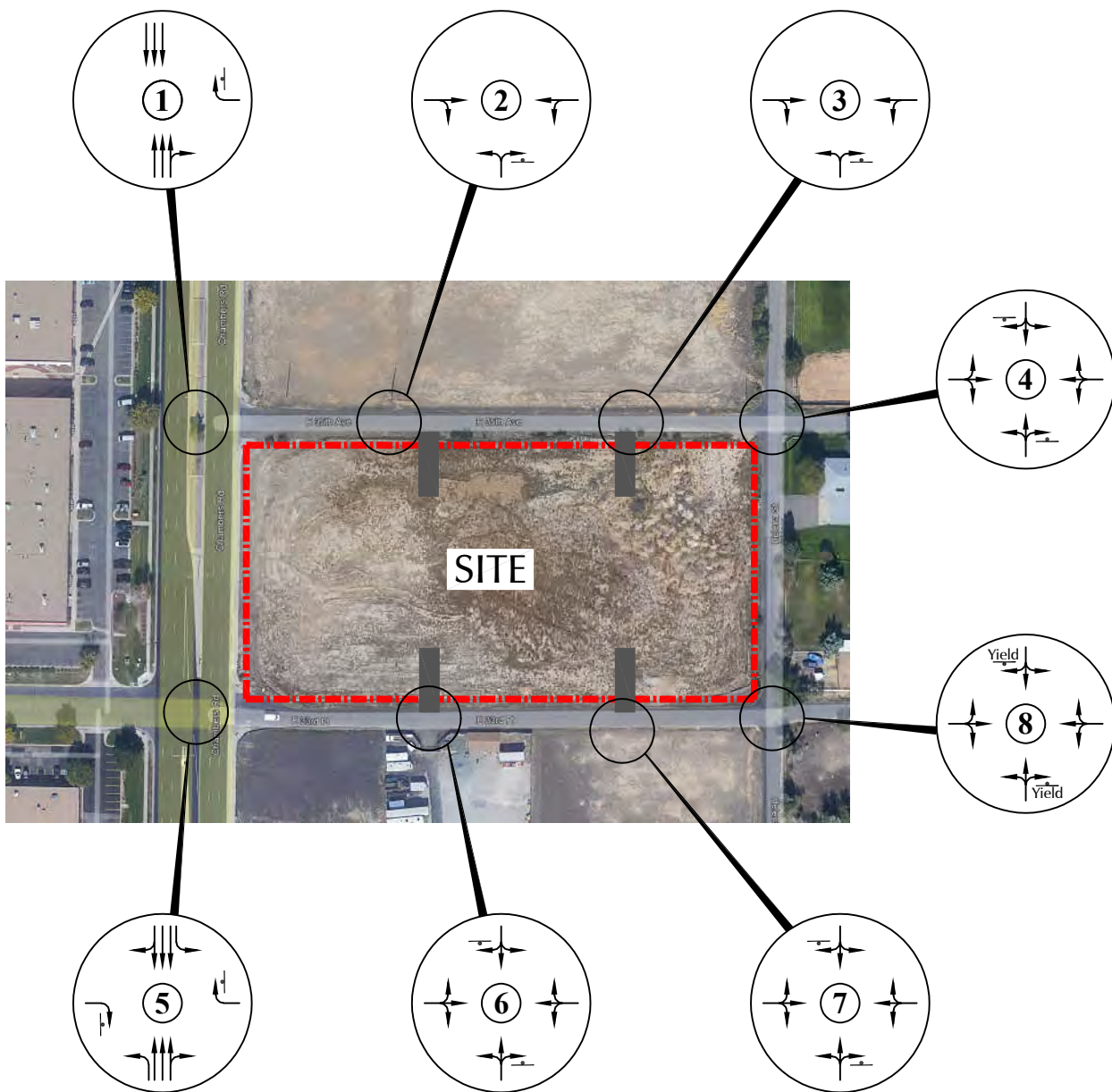
Notes:

1. These volumes are the sum of the volumes in Figures 5, 7a and 7b.
2. The capacity analysis for this scenario includes the existing traffic signal at Chambers Road/E. 32nd Avenue.

Figure 9a

**Year 2050
Total Traffic**

Ge'ez Center (LSC #230790)



LEGEND:

⊥ = Stop Sign

Figure 9b

Year 2050 Total Lane Geometry and Traffic Control

Ge'ez Center (LSC #230790)

COUNTER MEASURES INC.

1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: CHAMBERS RD
E/W STREET: 33RD PL
CITY: AURORA
COUNTY: ARAPAHOE

File Name : CHAM33PL
Site Code : 00000011
Start Date : 1/17/2024
Page No : 1

Groups Printed- VEHICLES

	CHAMBERS RD Southbound				33RD PL Westbound				CHAMBERS RD Northbound				33RD PL Eastbound				Int. Total
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:30 AM	4	158	15	0	2	0	0	0	5	132	2	0	1	0	2	0	321
06:45 AM	1	171	28	0	1	0	0	0	9	170	0	0	4	0	5	0	389
Total	5	329	43	0	3	0	0	0	14	302	2	0	5	0	7	0	710
07:00 AM	2	223	23	0	0	0	0	0	13	148	2	0	1	0	0	0	412
07:15 AM	2	204	27	0	0	0	3	0	7	193	0	1	3	0	2	0	442
07:30 AM	6	242	18	0	0	0	3	0	21	204	0	0	1	0	2	0	497
07:45 AM	5	244	16	0	0	0	2	0	27	238	1	0	1	0	2	0	536
Total	15	913	84	0	0	0	8	0	68	783	3	1	6	0	6	0	1887
08:00 AM	1	253	24	0	1	0	1	0	19	195	2	0	3	0	6	0	505
08:15 AM	2	210	17	0	0	0	0	0	10	195	0	0	7	0	12	0	453
Total	3	463	41	0	1	0	1	0	29	390	2	0	10	0	18	0	958
04:00 PM	3	288	11	0	0	0	2	0	7	345	0	0	4	0	14	0	674
04:15 PM	3	312	8	0	1	0	0	0	9	268	0	0	3	0	17	0	621
04:30 PM	4	308	6	0	2	1	2	0	9	390	0	0	12	0	19	0	753
04:45 PM	2	226	2	0	0	0	2	0	5	355	1	0	6	0	13	0	612
Total	12	1134	27	0	3	1	6	0	30	1358	1	0	25	0	63	0	2660
05:00 PM	2	233	2	0	1	1	1	0	4	408	1	2	7	0	21	0	683
05:15 PM	3	283	4	0	4	0	0	0	2	385	1	0	6	0	11	0	699
05:30 PM	0	258	2	0	0	0	0	0	7	333	0	0	2	0	10	0	612
05:45 PM	3	271	15	0	0	0	5	0	2	252	0	0	2	0	4	0	554
Total	8	1045	23	0	5	1	6	0	15	1378	2	2	17	0	46	0	2548
Grand Total	43	3884	218	0	12	2	21	0	156	4211	10	3	63	0	140	0	8763
Apprch %	1.0	93.7	5.3	0.0	34.3	5.7	60.0	0.0	3.6	96.1	0.2	0.1	31.0	0.0	69.0	0.0	
Total %	0.5	44.3	2.5	0.0	0.1	0.0	0.2	0.0	1.8	48.1	0.1	0.0	0.7	0.0	1.6	0.0	

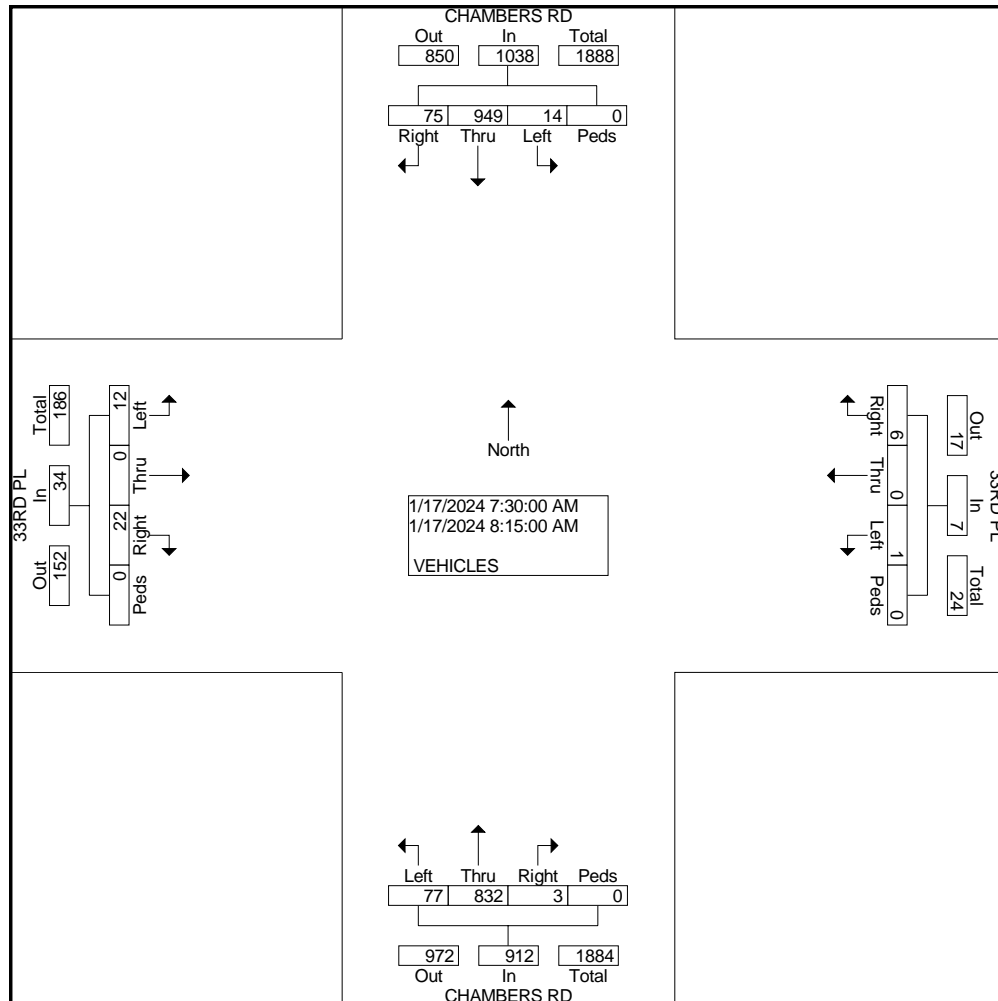
COUNTER MEASURES INC.

1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: CHAMBERS RD
E/W STREET: 33RD PL
CITY: AURORA
COUNTY: ARAPAHOE

File Name : CHAM33PL
Site Code : 00000011
Start Date : 1/17/2024
Page No : 2

	CHAMBERS RD Southbound					33RD PL Westbound					CHAMBERS RD Northbound					33RD PL Eastbound					Int.
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 06:30 AM to 08:15 AM - Peak 1 of 1																					
Intersection	07:30 AM																				
Volume	14	949	75	0	1038	1	0	6	0	7	77	832	3	0	912	12	0	22	0	34	1991
Percent	1.3	91.4	7.2	0.0		14.3	0.0	85.7	0.0		8.4	91.2	0.3	0.0		35.3	0.0	64.7	0.0		
07:45																					
Volume	5	244	16	0	265	0	0	2	0	2	27	238	1	0	266	1	0	2	0	3	536
Peak Factor																					0.929
High Int.	08:00 AM					07:30 AM					07:45 AM					08:15 AM					
Volume	1	253	24	0	278	0	0	3	0	3	27	238	1	0	266	7	0	12	0	19	
Peak Factor	0.93					0.58					0.85					0.44					
	3					3					7					7					



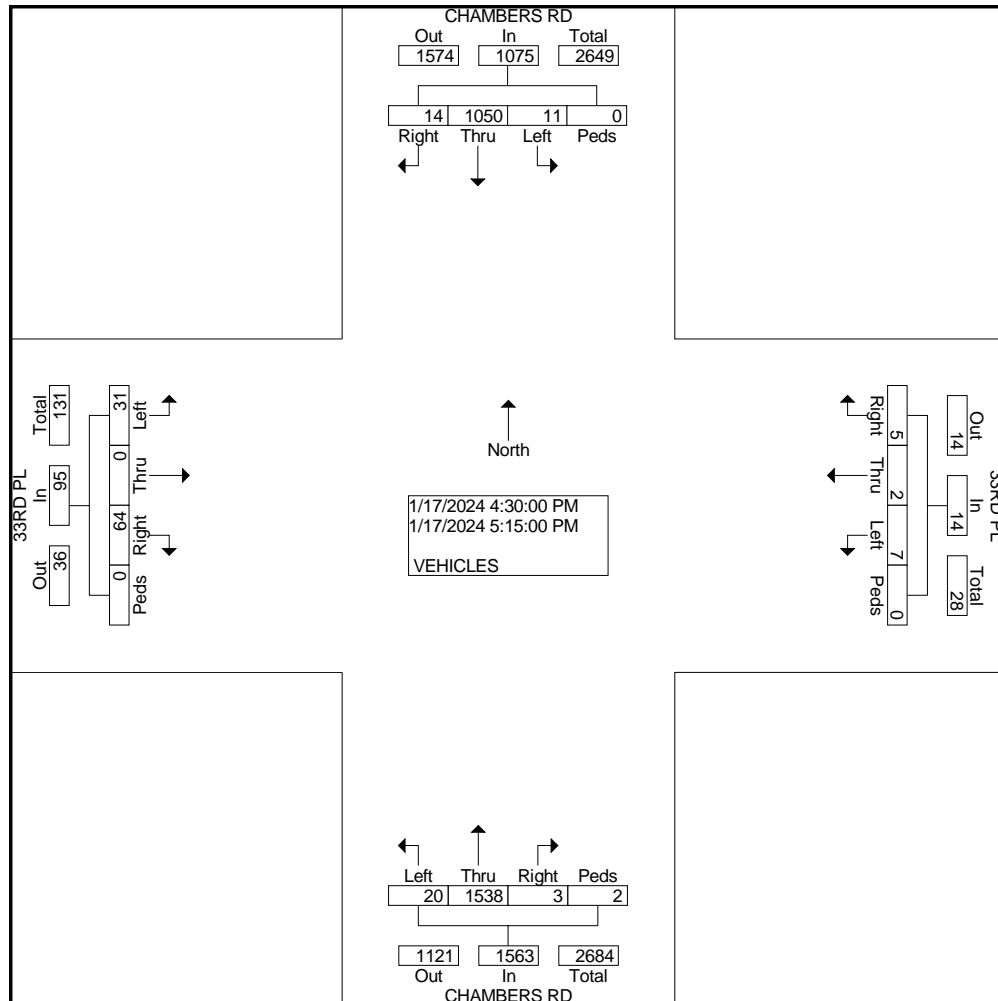
COUNTER MEASURES INC.

N/S STREET: CHAMBERS RD
E/W STREET: 33RD PL
CITY: AURORA
COUNTY: ARAPAHOE

1889 YORK STREET
DENVER.COLORADO
303-333-7409

File Name : CHAM33PL
Site Code : 00000011
Start Date : 1/17/2024
Page No : 3

	CHAMBERS RD Southbound					33RD PL Westbound					CHAMBERS RD Northbound					33RD PL Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	04:30 PM																				
Volume	11	105	14	0	1075	7	2	5	0	14	20	153	3	2	1563	31	0	64	0	95	2747
Percent	1.0	97.7	1.3	0.0		50.0	14.3	35.7	0.0		1.3	98.4	0.2	0.1		32.6	0.0	67.4	0.0		
04:30 Volume Peak Factor	4	308	6	0	318	2	1	2	0	5	9	390	0	0	399	12	0	19	0	31	753
High Int. Volume Peak Factor	04:30 PM					04:30 PM					05:00 PM					04:30 PM					0.912
	4	308	6	0	318	2	1	2	0	5	4	408	1	2	415	12	0	19	0	31	
					0.84					0.70					0.94					0.76	
					5					0					2					6	



COUNTER MEASURES INC.

1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: CHAMBERS RD
E/W STREET: 35TH AVE
CITY: AURORA
COUNTY: ARAPAHOE

File Name : CHAM35AVE
Site Code : 00000008
Start Date : 1/17/2024
Page No : 1

Groups Printed- VEHICLES

	CHAMBERS RD Southbound				35TH AVE Westbound				CHAMBERS RD Northbound				35TH AVE Eastbound				Int. Total
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:30 AM	0	163	0	0	0	0	0	0	0	127	1	0	0	0	0	0	291
06:45 AM	0	206	0	0	0	0	0	0	0	181	0	0	0	0	0	0	387
Total	0	369	0	0	0	0	0	0	0	308	1	0	0	0	0	0	678
07:00 AM	0	238	0	0	0	0	0	0	0	157	4	0	0	0	0	0	399
07:15 AM	0	227	0	0	0	0	0	0	0	181	1	1	0	0	0	0	410
07:30 AM	0	249	0	0	0	0	3	1	0	199	2	0	0	0	0	0	454
07:45 AM	0	241	0	0	0	0	7	0	0	213	1	0	0	0	0	0	462
Total	0	955	0	0	0	0	10	1	0	750	8	1	0	0	0	0	1725
08:00 AM	0	268	0	0	0	0	12	0	0	203	1	0	0	0	0	0	484
08:15 AM	0	231	0	0	0	0	3	0	16	182	0	0	0	0	0	0	432
Total	0	499	0	0	0	0	15	0	16	385	1	0	0	0	0	0	916
04:00 PM	0	290	0	0	0	0	2	0	0	335	2	1	0	0	0	0	630
04:15 PM	0	324	0	0	0	0	2	0	0	276	2	0	0	0	0	0	604
04:30 PM	0	327	0	0	0	0	0	0	0	428	0	0	0	0	0	0	755
04:45 PM	0	238	0	0	0	0	5	0	0	368	3	1	0	0	0	0	615
Total	0	1179	0	0	0	0	9	0	0	1407	7	2	0	0	0	0	2604
05:00 PM	0	244	0	0	0	0	4	0	0	425	3	1	0	0	0	0	677
05:15 PM	0	288	0	0	0	0	3	0	0	415	1	0	0	0	0	0	707
05:30 PM	0	269	0	0	0	0	1	0	0	388	1	0	0	0	0	0	659
05:45 PM	0	283	0	0	0	0	0	0	0	282	2	0	0	0	0	0	567
Total	0	1084	0	0	0	0	8	0	0	1510	7	1	0	0	0	0	2610
Grand Total	0	4086	0	0	0	0	42	1	16	4360	24	4	0	0	0	0	8533
Apprch %	0.0	100.0	0.0	0.0	0.0	0.0	97.7	2.3	0.4	99.0	0.5	0.1	0.0	0.0	0.0	0.0	
Total %	0.0	47.9	0.0	0.0	0.0	0.0	0.5	0.0	0.2	51.1	0.3	0.0	0.0	0.0	0.0	0.0	

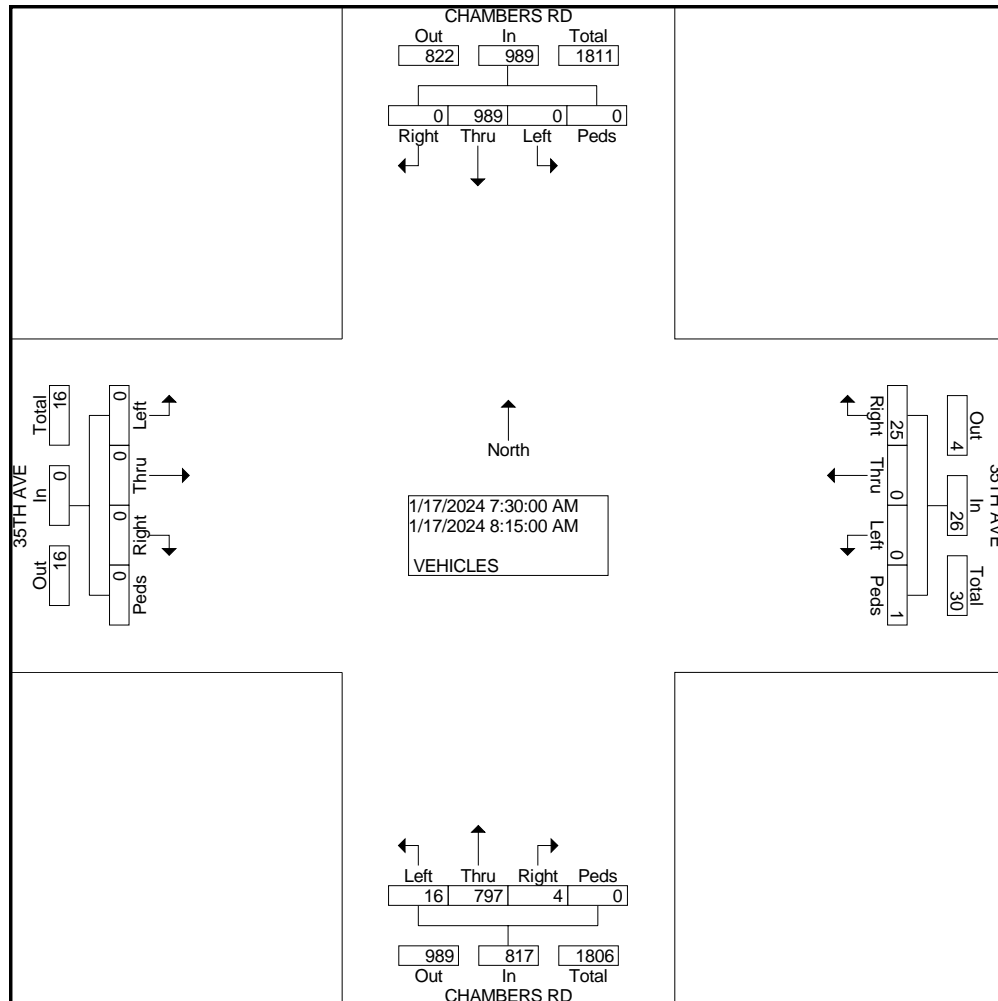
COUNTER MEASURES INC.

1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: CHAMBERS RD
E/W STREET: 35TH AVE
CITY: AURORA
COUNTY: ARAPAHOE

File Name : CHAM35AVE
Site Code : 00000008
Start Date : 1/17/2024
Page No : 2

	CHAMBERS RD Southbound					35TH AVE Westbound					CHAMBERS RD Northbound					35TH AVE Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 07:30 AM to 08:15 AM - Peak 1 of 1	07:30 AM																				
Intersection	07:30 AM																				
Volume	0	989	0	0	989	0	0	25	1	26	16	797	4	0	817	0	0	0	0	0	1832
Percent	0.0	100.0	0.0	0.0		0.0	0.0	96.2	3.8		2.0	97.6	0.5	0.0		0.0	0.0	0.0	0.0		
08:00																					
Volume	0	268	0	0	268	0	0	12	0	12	0	203	1	0	204	0	0	0	0	0	484
Peak Factor																					0.946
High Int.	08:00 AM					08:00 AM					07:45 AM										
Volume	0	268	0	0	268	0	0	12	0	12	0	213	1	0	214						
Peak Factor	0.92					0.54					0.95					4					
	3					2															



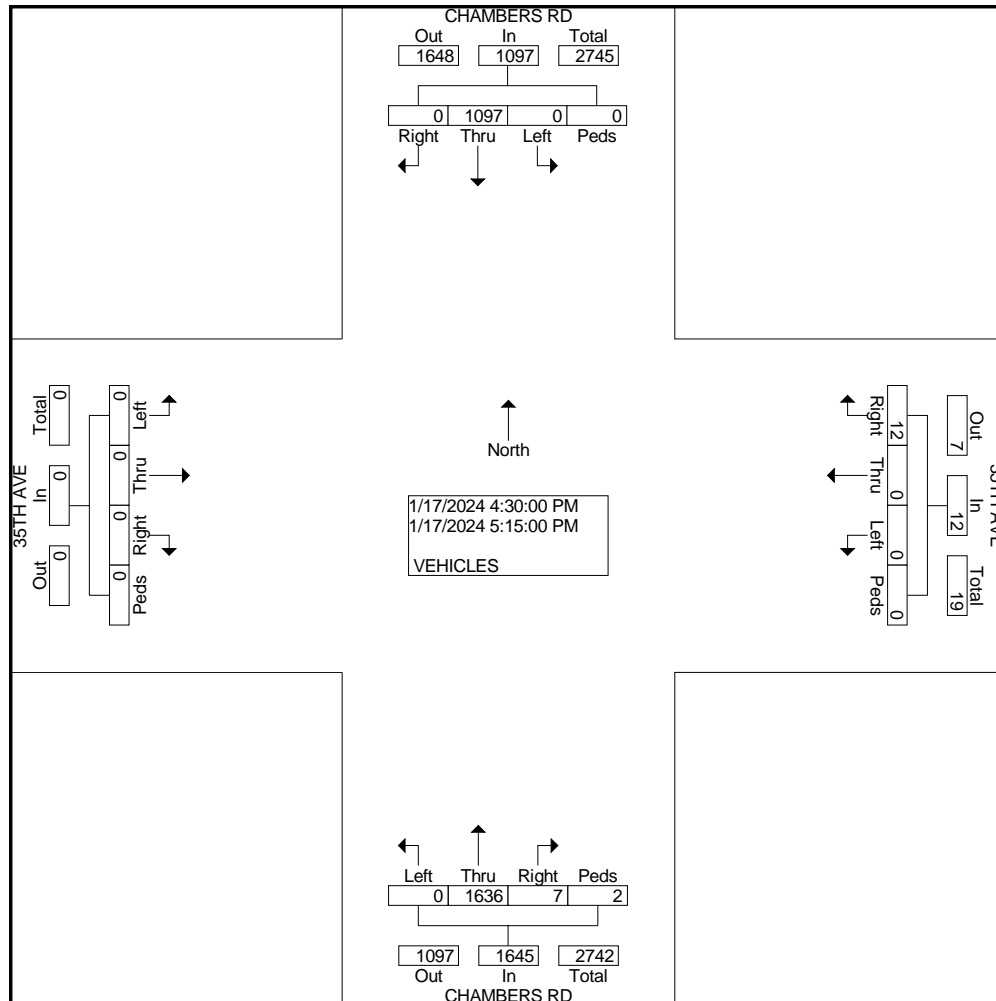
COUNTER MEASURES INC.

1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: CHAMBERS RD
E/W STREET: 35TH AVE
CITY: AURORA
COUNTY: ARAPAHOE

File Name : CHAM35AVE
Site Code : 00000008
Start Date : 1/17/2024
Page No : 3

	CHAMBERS RD Southbound					35TH AVE Westbound					CHAMBERS RD Northbound					35TH AVE Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 04:30 PM to 05:15 PM - Peak 1 of 1																					
Intersection	04:30 PM																				
Volume	0	1097	0	0	1097	0	0	12	0	12	0	1636	7	2	1645	0	0	0	0	0	2754
Percent	0.0	100.0	0.0	0.0		0.0	0.0	100.0	0.0		0.0	99.5	0.4	0.1		0.0	0.0	0.0	0.0		
04:30 Volume	0	327	0	0	327	0	0	0	0	0	0	428	0	0	428	0	0	0	0	0	755
Peak Factor																					0.912
High Int.	04:30 PM					04:45 PM					05:00 PM										
Volume	0	327	0	0	327	0	0	5	0	5	0	425	3	1	429						
Peak Factor																					
	0.839										0.600					0.959					



COUNTER MEASURES INC.

1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HELENA ST
E/W STREET: E. 33RD PL
CITY: AURORA
COUNTY: ARAPHOE

File Name : HELE33RDPL
Site Code : 00000005
Start Date : 1/18/2024
Page No : 1

Groups Printed- VEHICLES

	HELENA ST Southbound				E. 33RD PL Westbound				HELENA ST Northbound				E. 33RD PL Eastbound				Int. Total
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:30 AM	0	1	0	0	0	0	0	0	3	0	0	0	0	1	2	0	7
06:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	3
Total	0	1	0	0	0	0	0	0	3	0	0	0	0	2	4	0	10
07:00 AM	0	1	0	0	0	0	0	0	0	1	0	0	1	0	2	0	5
07:15 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	2	1	0	4
07:30 AM	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	3
07:45 AM	0	1	0	0	0	0	0	0	0	0	0	0	1	3	0	0	5
Total	0	3	0	0	0	1	0	0	0	1	0	0	3	5	4	0	17
08:00 AM	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	4
08:15 AM	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	3
Total	0	0	1	0	0	0	0	0	2	0	1	0	1	2	0	0	7
04:00 PM	0	0	0	0	0	3	0	0	0	0	0	0	0	2	0	2	7
04:15 PM	1	1	0	0	0	2	0	0	0	1	0	0	1	2	1	0	9
04:30 PM	2	1	2	0	0	2	0	0	0	0	0	0	1	2	1	0	11
04:45 PM	0	0	0	0	0	1	1	0	0	0	0	0	1	5	2	0	10
Total	3	2	2	0	0	8	1	0	0	1	0	0	3	11	4	2	37
05:00 PM	1	0	0	0	0	0	0	0	1	0	0	0	0	4	0	0	6
05:15 PM	1	1	1	0	0	4	0	0	1	0	0	0	0	1	2	0	11
05:30 PM	0	0	0	0	0	1	0	0	0	1	0	0	1	2	0	0	5
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	3
Total	2	1	1	0	0	5	0	0	2	1	0	0	1	8	4	0	25
Grand Total	5	7	4	0	0	14	1	0	7	3	1	0	8	28	16	2	96
Apprch %	31.3	43.8	25.0	0.0	0.0	93.3	6.7	0.0	63.6	27.3	9.1	0.0	14.8	51.9	29.6	3.7	
Total %	5.2	7.3	4.2	0.0	0.0	14.6	1.0	0.0	7.3	3.1	1.0	0.0	8.3	29.2	16.7	2.1	

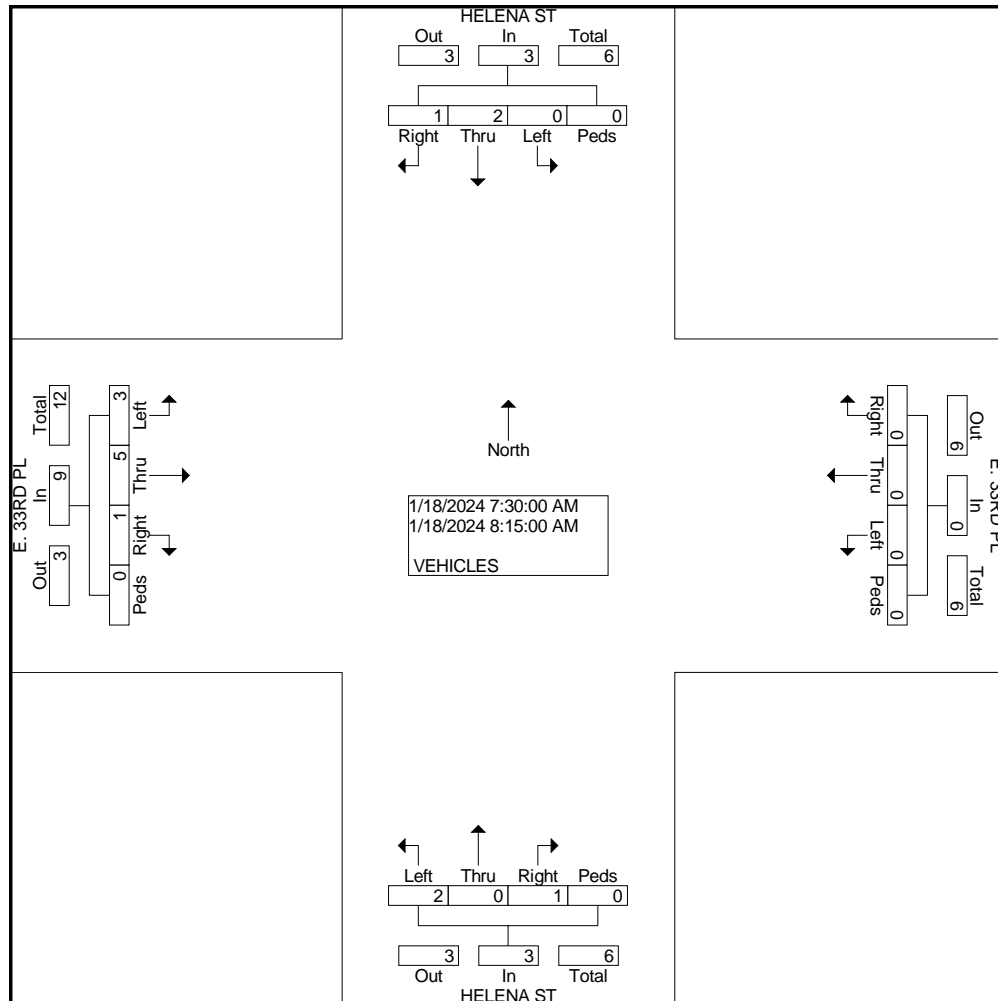
COUNTER MEASURES INC.

1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HELENA ST
E/W STREET: E. 33RD PL
CITY: AURORA
COUNTY: ARAPHOE

File Name : HELE33RDPL
Site Code : 00000005
Start Date : 1/18/2024
Page No : 2

	HELENA ST Southbound					E. 33RD PL Westbound					HELENA ST Northbound					E. 33RD PL Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 07:30 AM to 08:15 AM - Peak 1 of 1	07:30 AM																				
Intersection	07:30 AM																				
Volume	0	2	1	0	3	0	0	0	0	0	2	0	1	0	3	3	5	1	0	9	15
Percent	0.0	66.7	33.3	0.0		0.0	0.0	0.0	0.0		66.7	0.0	33.3	0.0		33.3	55.6	11.1	0.0		
07:45																					
Volume	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	3	0	0	4	5
Peak Factor																					0.750
High Int.	07:30 AM										08:00 AM					07:45 AM					
Volume	0	1	0	0	1	0	0	0	0	0	2	0	0	0	2	1	3	0	0	4	
Peak Factor	0.75										0.37					0.56					
	0										5					3					



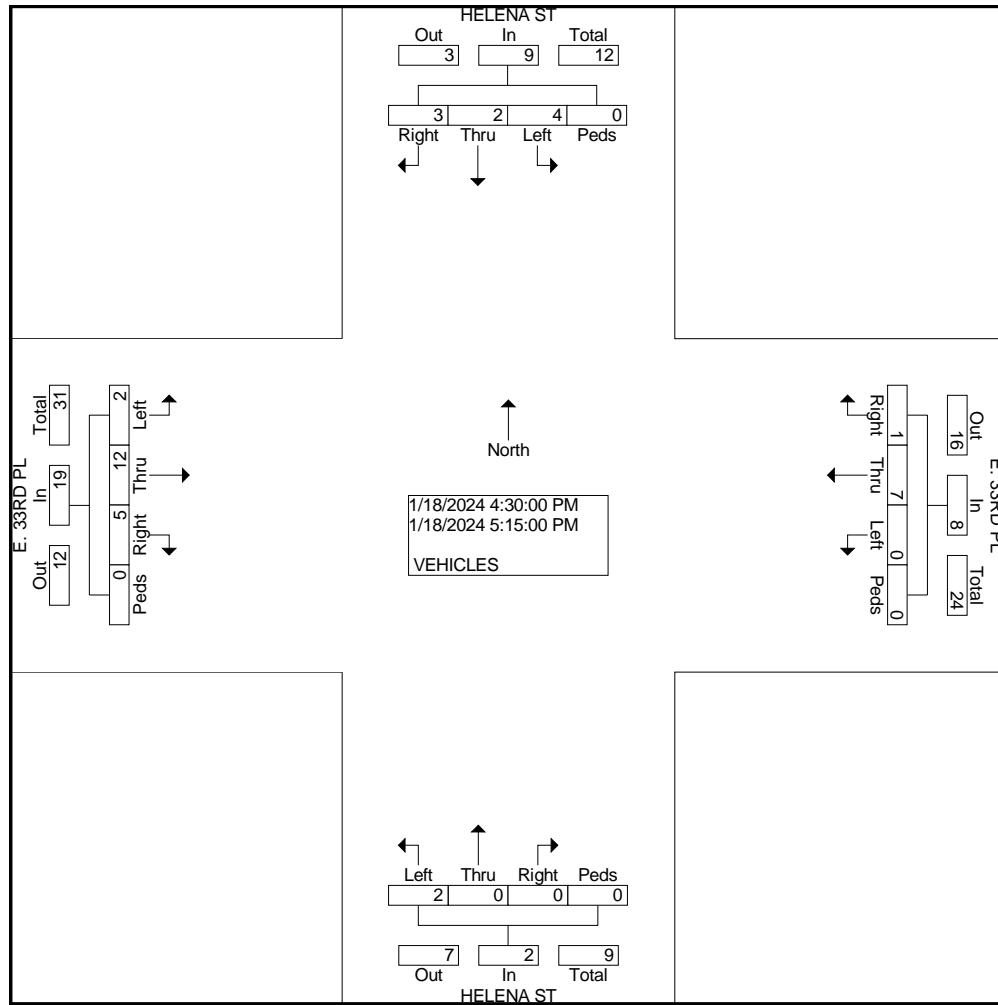
COUNTER MEASURES INC.

1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HELENA ST
E/W STREET: E. 33RD PL
CITY: AURORA
COUNTY: ARAPHOE

File Name : HELE33RDPL
Site Code : 00000005
Start Date : 1/18/2024
Page No : 3

	HELENA ST Southbound					E. 33RD PL Westbound					HELENA ST Northbound					E. 33RD PL Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 04:30 PM to 05:15 PM - Peak 1 of 1																					
Intersection	04:30 PM																				
Volume	4	2	3	0	9	0	7	1	0	8	2	0	0	0	2	2	12	5	0	19	38
Percent	44.	22.	33.	0.0		0.0	87.	12.	0.0		100.	0.0	0.0	0.0		10.	63.	26.	0.0		
	4	2	3				5	5								5	2	3			
05:15	1	1	1	0	3	0	4	0	0	4	1	0	0	0	1	0	1	2	0	3	11
Volume																					
Peak																					0.864
Factor																					
High Int.	04:30 PM					05:15 PM					05:00 PM					04:45 PM					
Volume	2	1	2	0	5	0	4	0	0	4	1	0	0	0	1	1	5	2	0	8	
Peak					0.45					0.50					0.50					0.59	
Factor					0					0					0					4	



COUNTER MEASURES INC.

1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HELENA ST
E/W STREET: E. 35TH AVE
CITY: AURORA
COUNTY: ARAPAHOE

File Name : HELE35THAVE
Site Code : 00000016
Start Date : 1/18/2024
Page No : 1

Groups Printed- VEHICLES

	HELENA ST Southbound				E. 35TH AVE Westbound				HELENA ST Northbound				E. 35TH AVE Eastbound				Int. Total
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:30 AM	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2
06:45 AM	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	3
07:00 AM	0	1	0	0	0	1	0	0	0	1	1	0	0	1	0	0	5
07:30 AM	1	1	0	0	0	1	0	0	0	0	1	0	1	5	0	0	10
07:45 AM	0	1	0	0	0	5	0	0	0	0	0	0	0	3	0	0	9
Total	1	3	0	0	0	7	0	0	0	1	2	0	1	9	0	0	24
08:00 AM	0	0	3	0	0	6	0	0	0	0	0	0	0	1	0	0	10
08:15 AM	0	1	0	0	0	2	0	0	0	0	1	0	0	2	0	0	6
Total	0	1	3	0	0	8	0	0	0	0	1	0	0	3	0	0	16
04:00 PM	0	0	0	0	1	1	0	0	0	0	0	0	0	2	0	0	4
04:15 PM	1	1	1	0	0	0	0	1	0	1	0	0	0	1	1	0	7
04:30 PM	1	2	0	0	0	4	0	0	1	0	0	0	0	1	0	0	9
04:45 PM	0	0	0	0	0	1	0	1	0	1	1	0	0	2	0	0	6
Total	2	3	1	0	1	6	0	2	1	2	1	0	0	6	1	0	26
05:00 PM	0	0	2	0	1	1	0	0	0	0	0	0	2	0	0	0	6
05:15 PM	0	1	0	0	2	3	0	0	0	0	0	0	1	1	0	0	8
05:30 PM	0	0	0	0	0	1	0	0	0	1	1	0	0	4	0	0	7
05:45 PM	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	3
Total	1	1	3	0	3	5	0	0	0	1	1	0	3	6	0	0	24
Grand Total	5	8	7	0	4	27	1	2	1	4	5	0	4	24	1	0	93
Apprch %	25.0	40.0	35.0	0.0	11.8	79.4	2.9	5.9	10.0	40.0	50.0	0.0	13.8	82.8	3.4	0.0	
Total %	5.4	8.6	7.5	0.0	4.3	29.0	1.1	2.2	1.1	4.3	5.4	0.0	4.3	25.8	1.1	0.0	

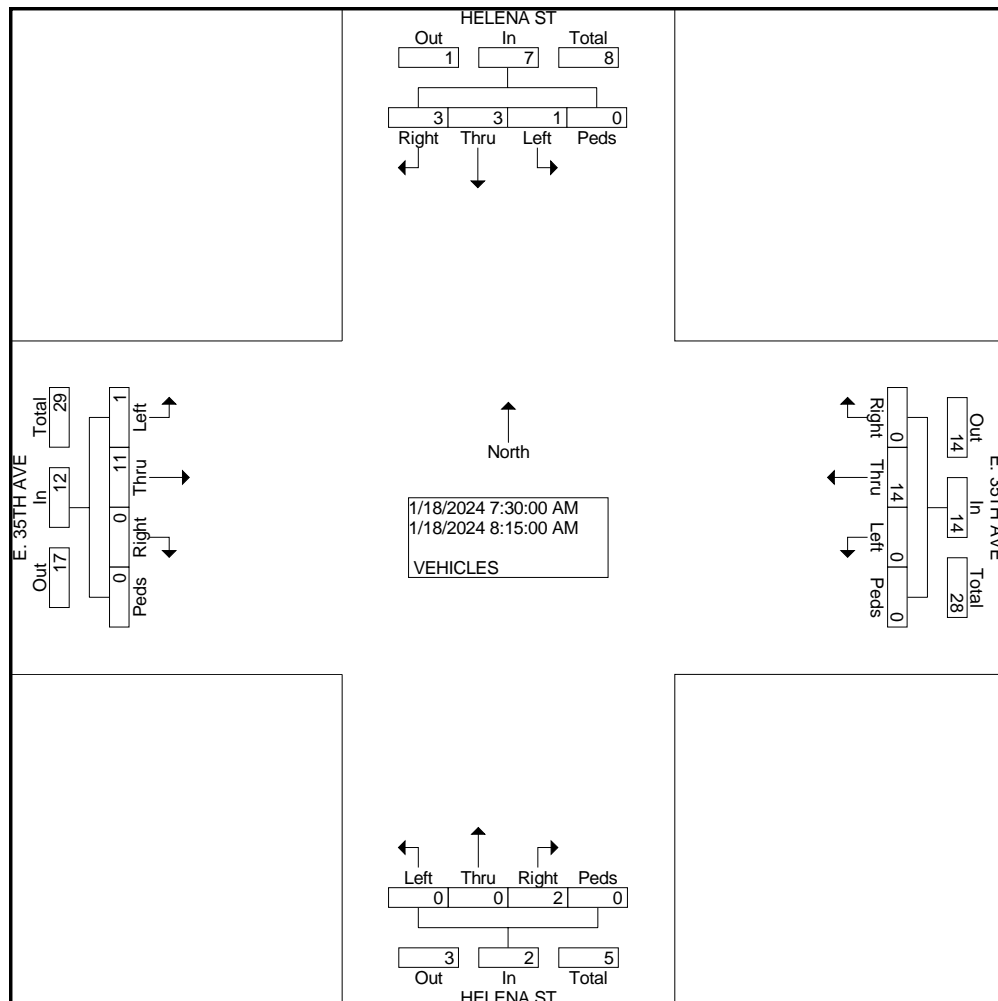
COUNTER MEASURES INC.

1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HELENA ST
E/W STREET: E. 35TH AVE
CITY: AURORA
COUNTY: ARAPAHOE

File Name : HELE35THAVE
Site Code : 00000016
Start Date : 1/18/2024
Page No : 2

	HELENA ST Southbound					E. 35TH AVE Westbound					HELENA ST Northbound					E. 35TH AVE Eastbound					Int. Total
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour From 07:30 AM to 08:15 AM - Peak 1 of 1	07:30 AM																				
Intersection	07:30 AM																				
Volume	1	3	3	0	7	0	14	0	0	14	0	0	2	0	2	1	11	0	0	12	35
Percent	14.3	42.9	42.9	0.0		0.0	100.0	0.0	0.0		0.0	0.0	100.0	0.0		8.3	91.7	0.0	0.0		
08:00																					
Volume	0	0	3	0	3	0	6	0	0	6	0	0	0	0	0	0	1	0	0	1	10
Peak Factor																					0.875
High Int.	08:00 AM					08:00 AM					07:30 AM					07:30 AM					
Volume	0	0	3	0	3	0	6	0	0	6	0	0	1	0	1	1	5	0	0	6	
Peak Factor	0.58					0.58					0.50					0.50					
	3					3					0					0					



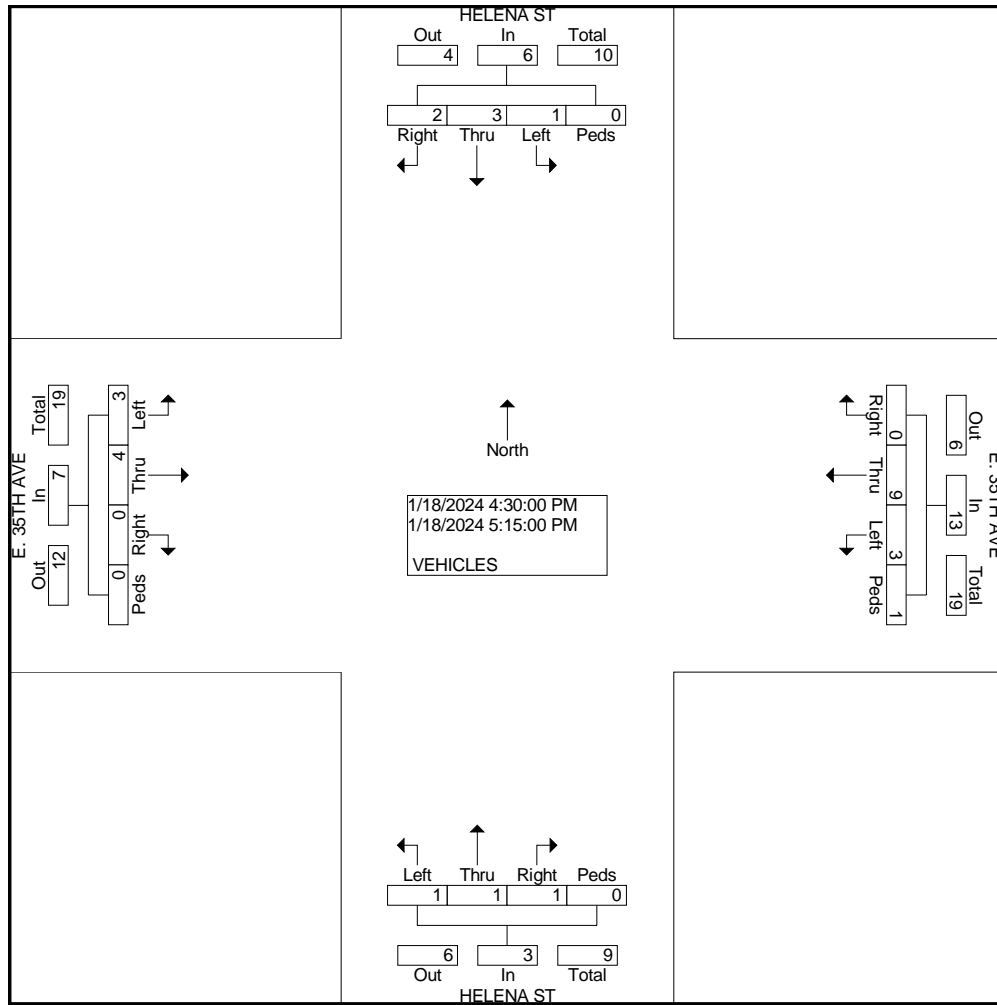
COUNTER MEASURES INC.

1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: HELENA ST
E/W STREET: E. 35TH AVE
CITY: AURORA
COUNTY: ARAPAHOE

File Name : HELE35THAVE
Site Code : 00000016
Start Date : 1/18/2024
Page No : 3

	HELENA ST Southbound					E. 35TH AVE Westbound					HELENA ST Northbound					E. 35TH AVE Eastbound					Int.
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Total
Peak Hour From 04:30 PM to 05:15 PM - Peak 1 of 1																					
Intersection	04:30 PM																				
Volume	1	3	2	0	6	3	9	0	1	13	1	1	1	0	3	3	4	0	0	7	29
Percent	16.7	50.0	33.3	0.0		23.1	69.2	0.0	7.7		33.3	33.3	33.3	0.0		42.9	57.1	0.0	0.0		
04:30 Volume	1	2	0	0	3	0	4	0	0	4	1	0	0	0	1	0	1	0	0	1	9
Peak Factor	0.806																				
High Int. Volume	04:30 PM					05:15 PM					04:45 PM					04:45 PM					
Peak Factor	1	2	0	0	3	2	3	0	0	5	0	1	1	0	2	0	2	0	0	2	
	0.50					0.65					0.37					0.87					
	0					0					5					5					



Location: CHAMBERS RD N-O 33RD PL
City: AURORA
County: ARAPAHOE
Direction: NORTH/SOUTH

COUNTER MEASURES INC.
1889 YORK STREET
DENVER, COLORADO 80206
303-333-7409

Site Code: 242216
Station ID: 242216

Start Time	22-Jan-24 Mon	NORTH	SOUTH							Total
12:00 AM		*	*							*
01:00		*	*							*
02:00		*	*							*
03:00		*	*							*
04:00		*	*							*
05:00		*	*							*
06:00		*	*							*
07:00		*	*							*
08:00		*	*							*
09:00		*	*							*
10:00		508	512							1020
11:00		611	431							1042
12:00 PM		632	447							1079
01:00		655	460							1115
02:00		741	471							1212
03:00		889	561							1450
04:00		1197	749							1946
05:00		1426	1197							2623
06:00		1532	1179							2711
07:00		859	451							1310
08:00		361	203							564
09:00		247	112							359
10:00		139	89							228
11:00		111	74							185
Total		9908	6936							16844
Percent		58.8%	41.2%							
AM Peak	-	11:00	10:00	-	-	-	-	-	-	11:00
Vol.	-	611	512	-	-	-	-	-	-	1042
PM Peak	-	18:00	17:00	-	-	-	-	-	-	18:00
Vol.	-	1532	1197	-	-	-	-	-	-	2711

Location: CHAMBERS RD N-O 33RD PL
City: AURORA
County: ARAPAHOE
Direction: NORTH/SOUTH

COUNTER MEASURES INC.
1889 YORK STREET
DENVER, COLORADO 80206
303-333-7409

Site Code: 242216
Station ID: 242216

Start Time	23-Jan-24 Tue	NORTH	SOUTH							Total
12:00 AM		94	64							158
01:00		89	59							148
02:00		69	53							122
03:00		86	79							165
04:00		131	81							212
05:00		226	131							357
06:00		309	284							593
07:00		471	430							901
08:00		764	969							1733
09:00		539	674							1213
10:00		523	532							1055
11:00		632	455							1087
12:00 PM		667	466							1133
01:00		677	452							1129
02:00		769	481							1250
03:00		923	542							1465
04:00		1243	781							2024
05:00		1434	1235							2669
06:00		1519	1208							2727
07:00		821	439							1260
08:00		329	199							528
09:00		232	119							351
10:00		126	92							218
11:00		99	78							177
Total		12772	9903							22675
Percent		56.3%	43.7%							
AM Peak	-	08:00	08:00	-	-	-	-	-	-	08:00
Vol.	-	764	969	-	-	-	-	-	-	1733
PM Peak	-	18:00	17:00	-	-	-	-	-	-	18:00
Vol.	-	1519	1235	-	-	-	-	-	-	2727

Location: CHAMBERS RD N-O 33RD PL
City: AURORA
County: ARAPAHOE
Direction: NORTH/SOUTH

COUNTER MEASURES INC.
1889 YORK STREET
DENVER, COLORADO 80206
303-333-7409

Site Code: 242216
Station ID: 242216

Start Time	24-Jan-24 Wed	NORTH	SOUTH							Total
12:00 AM		89	62							151
01:00		91	61							152
02:00		72	57							129
03:00		78	81							159
04:00		123	140							263
05:00		221	145							366
06:00		328	303							631
07:00		452	451							903
08:00		789	981							1770
09:00		558	689							1247
10:00		512	534							1046
11:00		620	459							1079
12:00 PM		645	458							1103
01:00		678	439							1117
02:00		769	489							1258
03:00		901	578							1479
04:00		1189	732							1921
05:00		1455	1179							2634
06:00		1578	1218							2796
07:00		823	429							1252
08:00		344	218							562
09:00		258	116							374
10:00		127	82							209
11:00		123	78							201
Total		12823	9979							22802
Percent		56.2%	43.8%							
AM Peak	-	08:00	08:00	-	-	-	-	-	-	08:00
Vol.	-	789	981	-	-	-	-	-	-	1770
PM Peak	-	18:00	18:00	-	-	-	-	-	-	18:00
Vol.	-	1578	1218	-	-	-	-	-	-	2796

Location: CHAMBERS RD N-O 33RD PL
City: AURORA
County: ARAPAHOE
Direction: NORTH/SOUTH

COUNTER MEASURES INC.
1889 YORK STREET
DENVER, COLORADO 80206
303-333-7409

Site Code: 242216
Station ID: 242216

Start Time	25-Jan-24 Thu	NORTH	SOUTH							Total
12:00 AM		87	65							152
01:00		87	56							143
02:00		67	51							118
03:00		90	71							161
04:00		115	96							211
05:00		234	129							363
06:00		308	281							589
07:00		459	459							918
08:00		782	943							1725
09:00		344	422							766
10:00		*	*							*
11:00		*	*							*
12:00 PM		*	*							*
01:00		*	*							*
02:00		*	*							*
03:00		*	*							*
04:00		*	*							*
05:00		*	*							*
06:00		*	*							*
07:00		*	*							*
08:00		*	*							*
09:00		*	*							*
10:00		*	*							*
11:00		*	*							*
Total		2573	2573							5146
Percent		50.0%	50.0%							
AM Peak	-	08:00	08:00	-	-	-	-	-	-	08:00
Vol.	-	782	943	-	-	-	-	-	-	1725
PM Peak	-	-	-	-	-	-	-	-	-	-
Vol.	-	-	-	-	-	-	-	-	-	-
Grand Total		38076	29391							67467
Percent		56.4%	43.6%							
ADT		ADT 22,489	AADT 22,489							

Location: CHAMBERS RD. S-O 33RD PL
City: AURORA
County: ARAPAHOE
Direction: NORTH/SOUTH

COUNTER MEASURES INC.
1889 YORK STREET
DENVER, COLORADO 80206
303-333-7409

Site Code: 242220
Station ID: 242220

Start Time	22-Jan-24 Mon	NORTH	SOUTH							Total
12:00 AM		*	*							*
01:00		*	*							*
02:00		*	*							*
03:00		*	*							*
04:00		*	*							*
05:00		*	*							*
06:00		*	*							*
07:00		*	*							*
08:00		*	*							*
09:00		344	392							736
10:00		391	720							1111
11:00		374	481							855
12:00 PM		481	436							917
01:00		476	481							957
02:00		589	491							1080
03:00		739	557							1296
04:00		984	762							1746
05:00		1394	1210							2604
06:00		1408	1109							2517
07:00		769	489							1258
08:00		340	211							551
09:00		267	139							406
10:00		201	129							330
11:00		148	104							252
Total		8905	7711							16616
Percent		53.6%	46.4%							
AM Peak	-	10:00	10:00	-	-	-	-	-	-	10:00
Vol.	-	391	720	-	-	-	-	-	-	1111
PM Peak	-	18:00	17:00	-	-	-	-	-	-	17:00
Vol.	-	1408	1210	-	-	-	-	-	-	2604

Location: CHAMBERS RD. S-O 33RD PL
City: AURORA
County: ARAPAHOE
Direction: NORTH/SOUTH

COUNTER MEASURES INC.
1889 YORK STREET
DENVER, COLORADO 80206
303-333-7409

Site Code: 242220
Station ID: 242220

Start Time	23-Jan-24 Tue	NORTH	SOUTH							Total
12:00 AM		104	89							193
01:00		81	61							142
02:00		64	50							114
03:00		79	74							153
04:00		112	89							201
05:00		211	126							337
06:00		249	279							528
07:00		391	439							830
08:00		862	921							1783
09:00		728	881							1609
10:00		412	734							1146
11:00		390	468							858
12:00 PM		489	449							938
01:00		465	490							955
02:00		609	32							641
03:00		749	0							749
04:00		976	41							1017
05:00		1412	1342							2754
06:00		1428	1129							2557
07:00		733	506							1239
08:00		327	228							555
09:00		278	156							434
10:00		211	119							330
11:00		167	116							283
Total		11527	8819							20346
Percent		56.7%	43.3%							
AM Peak	-	08:00	08:00	-	-	-	-	-	-	08:00
Vol.	-	862	921	-	-	-	-	-	-	1783
PM Peak	-	18:00	17:00	-	-	-	-	-	-	17:00
Vol.	-	1428	1342	-	-	-	-	-	-	2754

Location: CHAMBERS RD. S-O 33RD PL
City: AURORA
County: ARAPAHOE
Direction: NORTH/SOUTH

COUNTER MEASURES INC.
1889 YORK STREET
DENVER, COLORADO 80206
303-333-7409

Site Code: 242220
Station ID: 242220

Start Time	24-Jan-24 Wed	NORTH	SOUTH							Total
12:00 AM		99	109							208
01:00		89	73							162
02:00		72	46							118
03:00		89	83							172
04:00		109	93							202
05:00		228	135							363
06:00		267	265							532
07:00		378	451							829
08:00		882	945							1827
09:00		742	843							1585
10:00		408	789							1197
11:00		756	451							1207
12:00 PM		469	466							935
01:00		489	461							950
02:00		580	438							1018
03:00		722	589							1311
04:00		969	809							1778
05:00		1376	1276							2652
06:00		1419	1169							2588
07:00		790	522							1312
08:00		351	228							579
09:00		259	145							404
10:00		189	120							309
11:00		132	98							230
Total		11864	10604							22468
Percent		52.8%	47.2%							
AM Peak	-	08:00	08:00	-	-	-	-	-	-	08:00
Vol.	-	882	945	-	-	-	-	-	-	1827
PM Peak	-	18:00	17:00	-	-	-	-	-	-	17:00
Vol.	-	1419	1276	-	-	-	-	-	-	2652

Location: CHAMBERS RD. S-O 33RD PL
City: AURORA
County: ARAPAHOE
Direction: NORTH/SOUTH

COUNTER MEASURES INC.
1889 YORK STREET
DENVER, COLORADO 80206
303-333-7409

Site Code: 242220
Station ID: 242220

Start Time	25-Jan-24 Thu	NORTH	SOUTH							Total
12:00 AM		93	76							169
01:00		79	53							132
02:00		71	43							114
03:00		78	88							166
04:00		123	83							206
05:00		216	109							325
06:00		263	234							497
07:00		381	458							839
08:00		891	934							1825
09:00		*	*							*
10:00		*	*							*
11:00		*	*							*
12:00 PM		*	*							*
01:00		*	*							*
02:00		*	*							*
03:00		*	*							*
04:00		*	*							*
05:00		*	*							*
06:00		*	*							*
07:00		*	*							*
08:00		*	*							*
09:00		*	*							*
10:00		*	*							*
11:00		*	*							*
Total		2195	2078							4273
Percent		51.4%	48.6%							
AM Peak	-	08:00	08:00	-	-	-	-	-	-	08:00
Vol.	-	891	934	-	-	-	-	-	-	1825
PM Peak	-	-	-	-	-	-	-	-	-	-
Vol.	-	-	-	-	-	-	-	-	-	-
Grand Total		34491	29212							63703
Percent		54.1%	45.9%							
ADT		ADT 21,235	AADT 21,235							

3550 CHAMBERS
Location: 33RD PL E-O CHAMBERS
City: AURORA
County: ARAPAHOE
Direction: EAST/WEST



Site Code:2422303
Site Code: 2422303
Start Date: 01222024 1/22/2024
End Date: 01252024 1/25/2024
Latitude: 0.000000
Longitude: 0.000000

1/22/2024	NORTH	SOUTH	Total
Time			
12:00 AM	*	*	0
1:00	*	*	0
2:00	*	*	0
3:00	*	*	0
4:00	*	*	0
5:00	*	*	0
6:00	*	*	0
7:00	*	*	0
8:00	12	1	13
9:00	6	2	8
10:00	4	1	5
11:00	3	0	3
12:00 PM	5	1	6
1:00	4	1	5
2:00	4	2	6
3:00	11	1	12
4:00	12	0	12
5:00	18	9	27
6:00	12	7	19
7:00	6	2	8
8:00	2	0	2
9:00	1	0	1
10:00	1	0	1
11:00	0	1	1
Total	101	28	129
Percent	78.3%	21.7%	
AM Peak	8:00	9:00	8:00
Volume	12	2	13
PM Peak	5:00	5:00	5:00
Volume	18	9	27

3550 CHAMBERS
Location: 33RD PL E-O CHAMBERS
City: AURORA
County: ARAPAHOE
Direction: EAST/WEST



Site Code:2422303
Site Code: 2422303
Start Date: 01222024 1/22/2024
End Date: 01252024 1/25/2024
Latitude: 0.000000
Longitude: 0.000000

1/23/2024	NORTH	SOUTH	Total
Time			
12:00 AM	0	0	0
1:00	0	0	0
2:00	0	1	1
3:00	0	0	0
4:00	0	0	0
5:00	2	0	2
6:00	5	0	5
7:00	8	3	11
8:00	9	2	11
9:00	7	1	8
10:00	4	2	6
11:00	2	1	3
12:00 PM	6	1	7
1:00	4	2	6
2:00	5	1	6
3:00	9	2	11
4:00	14	1	15
5:00	18	6	24
6:00	11	8	19
7:00	7	3	10
8:00	1	1	2
9:00	1	0	1
10:00	1	0	1
11:00	1	0	1
Total	115	35	150
Percent	76.7%	23.3%	
AM Peak	8:00	7:00	7:00
Volume	9	3	11
PM Peak	5:00	6:00	5:00
Volume	18	8	24

3550 CHAMBERS
Location: 33RD PL E-O CHAMBERS
City: AURORA
County: ARAPAHOE
Direction: EAST/WEST



Site Code:2422303
Site Code: 2422303
Start Date: 01222024 1/22/2024
End Date: 01252024 1/25/2024
Latitude: 0.000000
Longitude: 0.000000

1/24/2024	NORTH	SOUTH	Total
Time			
12:00 AM	0	1	1
1:00	0	0	0
2:00	0	0	0
3:00	1	0	1
4:00	0	0	0
5:00	3	1	4
6:00	4	1	5
7:00	5	3	8
8:00	14	2	16
9:00	4	0	4
10:00	5	2	7
11:00	3	1	4
12:00 PM	6	2	8
1:00	5	0	5
2:00	4	2	6
3:00	13	2	15
4:00	14	2	16
5:00	20	9	29
6:00	11	5	16
7:00	7	1	8
8:00	3	1	4
9:00	1	0	1
10:00	1	1	2
11:00	1	0	1
Total	125	36	161
Percent	77.6%	22.4%	
AM Peak	8:00	7:00	8:00
Volume	14	3	16
PM Peak	5:00	5:00	5:00
Volume	20	9	29

3550 CHAMBERS
Location: 33RD PL E-O CHAMBERS
City: AURORA
County: ARAPAHOE
Direction: EAST/WEST



Site Code:2422303
Site Code: 2422303
Start Date: 01222024 1/22/2024
End Date: 01252024 1/25/2024
Latitude: 0.000000
Longitude: 0.000000

1/25/2024	NORTH	SOUTH	Total
Time			
12:00 AM	1	0	1
1:00	0	0	0
2:00	0	0	0
3:00	0	0	0
4:00	1	0	1
5:00	3	1	4
6:00	5	1	6
7:00	9	4	13
8:00	3	0	3
9:00	0	0	0
10:00	0	0	0
11:00	0	0	0
12:00 PM	0	0	0
1:00	0	0	0
2:00	0	0	0
3:00	0	0	0
4:00	0	0	0
5:00	0	0	0
6:00	0	0	0
7:00	0	0	0
8:00	0	0	0
9:00	*	*	0
10:00	*	*	0
11:00	*	*	0
Total	22	6	28
Percent	78.6%	21.4%	
AM Peak	7:00	7:00	7:00
Volume	9	4	13
PM Peak			
Volume			
Grand Total	363	105	468
Percent	77.6%	22.4%	
ADT		ADT: 156	AADT: 156

3550 CHAMBERS
Location: 33RD PL W-O CHAMBERS
City: AURORA
County: ARAPAHOE
Direction: EAST/WEST



Site Code:2422304
Site Code: 2422304
Start Date: 01222024 1/22/2024
End Date: 01252024 1/25/2024
Latitude: 0.000000
Longitude: 0.000000

1/22/2024	EAST	WEST	Total
Time			
12:00 AM	*	*	0
1:00	*	*	0
2:00	*	*	0
3:00	*	*	0
4:00	*	*	0
5:00	*	*	0
6:00	*	*	0
7:00	*	*	0
8:00	*	*	0
9:00	*	*	0
10:00	17	81	98
11:00	21	56	77
12:00 PM	26	37	63
1:00	34	21	55
2:00	25	26	51
3:00	37	31	68
4:00	54	47	101
5:00	92	62	154
6:00	64	38	102
7:00	31	26	57
8:00	11	12	23
9:00	9	7	16
10:00	8	6	14
11:00	4	4	8
Total	433	454	887
Percent	48.8%	51.2%	
AM Peak	11:00	10:00	10:00
Volume	21	81	98
PM Peak	5:00	5:00	5:00
Volume	92	62	154

3550 CHAMBERS
 Location: 33RD PL W-O CHAMBERS
 City: AURORA
 County: ARAPAHOE
 Direction: EAST/WEST



Site Code: 2422304
 Site Code: 2422304
 Start Date: 01222024 1/22/2024
 End Date: 01252024 1/25/2024
 Latitude: 0.000000
 Longitude: 0.000000

1/23/2024	EAST	WEST	Total
Time			
12:00 AM	2	1	3
1:00	0	2	2
2:00	1	3	4
3:00	0	3	3
4:00	1	9	10
5:00	2	18	20
6:00	4	31	35
7:00	12	63	75
8:00	14	158	172
9:00	32	94	126
10:00	0	75	75
11:00	21	63	84
12:00 PM	28	43	71
1:00	37	28	65
2:00	31	29	60
3:00	30	37	67
4:00	59	43	102
5:00	101	68	169
6:00	72	45	117
7:00	40	29	69
8:00	9	14	23
9:00	10	6	16
10:00	12	7	19
11:00	7	3	10
Total	525	872	1397
Percent	37.6%	62.4%	
AM Peak	9:00	8:00	8:00
Volume	32	158	172
PM Peak	5:00	5:00	5:00
Volume	101	68	169

3550 CHAMBERS
Location: 33RD PL W-O CHAMBERS
City: AURORA
County: ARAPAHOE
Direction: EAST/WEST



Site Code:2422304
Site Code: 2422304
Start Date: 01222024 1/22/2024
End Date: 01252024 1/25/2024
Latitude: 0.000000
Longitude: 0.000000

1/24/2024	EAST	WEST	Total
Time			
12:00 AM	4	2	6
1:00	1	1	2
2:00	1	2	3
3:00	1	5	6
4:00	3	11	14
5:00	3	21	24
6:00	7	35	42
7:00	18	70	88
8:00	12	147	159
9:00	39	103	142
10:00	15	76	91
11:00	23	66	89
12:00 PM	23	45	68
1:00	29	24	53
2:00	30	25	55
3:00	40	39	79
4:00	51	56	107
5:00	89	63	152
6:00	60	41	101
7:00	29	19	48
8:00	14	14	28
9:00	8	8	16
10:00	5	4	9
11:00	3	4	7
Total	508	881	1389
Percent	36.6%	63.4%	
AM Peak	9:00	8:00	8:00
Volume	39	147	159
PM Peak	5:00	5:00	5:00
Volume	89	63	152

3550 CHAMBERS
Location: 33RD PL W-O CHAMBERS
City: AURORA
County: ARAPAHOE
Direction: EAST/WEST



Site Code:2422304
Site Code: 2422304
Start Date: 01222024 1/22/2024
End Date: 01252024 1/25/2024
Latitude: 0.000000
Longitude: 0.000000

1/25/2024	EAST	WEST	Total
Time			
12:00 AM	1	2	3
1:00	0	2	2
2:00	0	4	4
3:00	1	3	4
4:00	2	8	10
5:00	2	15	17
6:00	6	35	41
7:00	11	70	81
8:00	16	152	168
9:00	23	53	76
10:00	*	*	0
11:00	*	*	0
12:00 PM	*	*	0
1:00	*	*	0
2:00	*	*	0
3:00	*	*	0
4:00	*	*	0
5:00	*	*	0
6:00	*	*	0
7:00	*	*	0
8:00	*	*	0
9:00	*	*	0
10:00	*	*	0
11:00	*	*	0
Total	62	344	406
Percent	15.3%	84.7%	
AM Peak	9:00	8:00	8:00
Volume	23	152	168
PM Peak			
Volume			
Grand Total	1528	2551	4079
Percent	37.5%	62.5%	
ADT		ADT: 1,393	AADT: 1,393

LEVEL OF SERVICE DEFINITIONS

From *Highway Capacity Manual*, Transportation Research Board







UNSIGNALIZED INTERSECTION LEVEL OF SERVICE (LOS)

Applicable to Two-Way Stop Control, All-Way Stop Control, and Roundabouts

LOS	Average Vehicle Control Delay	Operational Characteristics
A	<10 seconds	Normally, vehicles on the stop-controlled approach only have to wait up to 10 seconds before being able to clear the intersection. Left-turning vehicles on the uncontrolled street do not have to wait to make their turn.
B	10 to 15 seconds	Vehicles on the stop-controlled approach will experience delays before being able to clear the intersection. <u>The delay could be up to 15 seconds.</u> Left-turning vehicles on the uncontrolled street may have to wait to make their turn.
C	15 to 25 seconds	Vehicles on the stop-controlled approach can expect delays in the range of 15 to 25 seconds before clearing the intersection. Motorists may begin to take chances due to the long delays, thereby posing a safety risk to through traffic. <u>Left-turning vehicles on the uncontrolled street will now be required to wait to make their turn causing a queue to be created in the turn lane.</u>
D	25 to 35 seconds	<u>This is the point at which a traffic signal may be warranted for this intersection.</u> The delays for the stop-controlled intersection are not considered to be excessive. The length of the queue may begin to block other public and private access points.
E	35 to 50 seconds	The delays for all critical traffic movements are considered to be unacceptable. The length of the queues for the stop-controlled approaches as well as the left-turn movements are extremely long. <u>There is a high probability that this intersection will meet traffic signal warrants.</u> The ability to install a traffic signal is affected by the location of other existing traffic signals. Consideration may be given to restricting the accesses by eliminating the left-turn movements from and to the stop-controlled approach.
F	>50 seconds	The delay for the critical traffic movements are probably in excess of 100 seconds. The length of the queues are extremely long. Motorists are selecting alternative routes due to the long delays. <u>The only remedy for these long delays is installing a traffic signal or restricting the accesses.</u> The potential for accidents at this intersection are extremely high due to motorist taking more risky chances. If the median permits, motorists begin making two-stage left-turns.





HCM 6th TWSC
1: Chambers Road & E 35th Avenue

Existing
AM Peak

Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		 	 			 
Traffic Vol, veh/h	0	25	838	12	0	1038
Future Vol, veh/h	0	25	838	12	0	1038
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	27	901	13	0	1116
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	457	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	7.14	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.92	-	-	-	-
Pot Cap-1 Maneuver	0	*730	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		1	-	-		-
Mov Cap-1 Maneuver	-	*730	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	10.1		0		0	
HCM LOS	B					
Minor Lane/Major Mvmt	NBT		NBRWBLn1		SBT	
Capacity (veh/h)	-		- 730		-	
HCM Lane V/C Ratio	-		- 0.037		-	
HCM Control Delay (s)	-		- 10.1		-	
HCM Lane LOS	-		- B		-	
HCM 95th %tile Q(veh)	-		- 0.1		-	
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon









HCM 6th TWSC
4: Helena Street/Helena St & E 35th Avenue/E 35th Ave

Existing
AM Peak

Intersection												
Int Delay, s/veh	3.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	11	0	0	14	0	5	0	2	1	3	6
Future Vol, veh/h	1	11	0	0	14	0	5	0	2	1	3	6
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	15	0	0	19	0	7	0	3	1	4	8
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	19	0	0	15	0	0	42	36	15	38	36	19
Stage 1	-	-	-	-	-	-	17	17	-	19	19	-
Stage 2	-	-	-	-	-	-	25	19	-	19	17	-
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	1597	-	-	1603	-	-	961	856	1065	967	856	1059
Stage 1	-	-	-	-	-	-	1002	881	-	1000	880	-
Stage 2	-	-	-	-	-	-	993	880	-	1000	881	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1597	-	-	1603	-	-	949	855	1065	964	855	1059
Mov Cap-2 Maneuver	-	-	-	-	-	-	949	855	-	964	855	-
Stage 1	-	-	-	-	-	-	1001	880	-	999	880	-
Stage 2	-	-	-	-	-	-	981	880	-	996	880	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.6			0			8.7			8.7		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	979	1597	-	-	1603	-	-	979				
HCM Lane V/C Ratio	0.01	0.001	-	-	-	-	-	0.014				
HCM Control Delay (s)	8.7	7.3	0	-	0	-	-	8.7				
HCM Lane LOS	A	A	A	-	A	-	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0				

HCM 6th TWSC
5: Chambers Road & E 33rd Place/E. 33rd Place

Existing
AM Peak

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	12	0	22	1	0	6	77	832	3	14	949	75
Future Vol, veh/h	12	0	22	1	0	6	77	832	3	14	949	75
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	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	5	5	5	2	5	2	5	2	2	2	2	5
Mvmt Flow	13	0	24	1	0	6	83	895	3	15	1020	81
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1615	2155	551	1501	2194	449	1101	0	0	898	0	0
Stage 1	1091	1091	-	1063	1063	-	-	-	-	-	-	-
Stage 2	524	1064	-	438	1131	-	-	-	-	-	-	-
Critical Hdwy	6.5	6.6	7.2	6.44	6.6	7.14	5.4	-	-	5.34	-	-
Critical Hdwy Stg 1	7.4	5.6	-	7.34	5.6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.8	5.6	-	6.74	5.6	-	-	-	-	-	-	-
Follow-up Hdwy	3.85	4.05	3.95	3.82	4.05	3.92	3.15	-	-	3.12	-	-
Pot Cap-1 Maneuver	*236	87	403	291	81	*730	341	-	-	*918	-	-
Stage 1	*168	283	-	569	590	-	-	-	-	-	-	-
Stage 2	*743	589	-	519	270	-	-	-	-	-	-	-
Platoon blocked, %	1	1		1	1	1		-	-	1	-	-
Mov Cap-1 Maneuver	*188	65	403	220	60	*730	341	-	-	*918	-	-
Mov Cap-2 Maneuver	*188	65	-	220	60	-	-	-	-	-	-	-
Stage 1	*127	278	-	431	447	-	-	-	-	-	-	-
Stage 2	*558	446	-	481	266	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	19.4		11.7		1.6		0.1					
HCM LOS	C		B									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	341	-	-	287	548	*918	-	-				
HCM Lane V/C Ratio	0.243	-	-	0.127	0.014	0.016	-	-				
HCM Control Delay (s)	18.9	-	-	19.4	11.7	9	-	-				
HCM Lane LOS	C	-	-	C	B	A	-	-				
HCM 95th %tile Q(veh)	0.9	-	-	0.4	0	0.1	-	-				
Notes												
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined				*: All major volume in platoon				












HCM 6th TWSC
8: Helena Street & E. 33rd Place/E 35th Place

Existing
AM Peak

Intersection												
Int Delay, s/veh	4.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	5	1	0	0	0	2	0	1	0	2	1
Future Vol, veh/h	3	5	1	0	0	0	2	0	1	0	2	1
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	7	1	0	0	0	3	0	1	0	3	1
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	8	0	0	19	17	8	17	17	1
Stage 1	-	-	-	-	-	-	16	16	-	1	1	-
Stage 2	-	-	-	-	-	-	3	1	-	16	16	-
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	1622	-	-	1612	-	-	995	877	1074	998	877	1084
Stage 1	-	-	-	-	-	-	1004	882	-	1022	895	-
Stage 2	-	-	-	-	-	-	1020	895	-	1004	882	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1622	-	-	1612	-	-	990	875	1074	995	875	1084
Mov Cap-2 Maneuver	-	-	-	-	-	-	990	875	-	995	875	-
Stage 1	-	-	-	-	-	-	1002	880	-	1020	895	-
Stage 2	-	-	-	-	-	-	1016	895	-	1001	880	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	2.4			0			8.6			8.9		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	1017	1622	-	-	1612	-	-	935				
HCM Lane V/C Ratio	0.004	0.002	-	-	-	-	-	0.004				
HCM Control Delay (s)	8.6	7.2	0	-	0	-	-	8.9				
HCM Lane LOS	A	A	A	-	A	-	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0				

Lanes, Volumes, Timings
13: Chambers Road & E. 32nd Avenue

Existing
AM Peak

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	115	115	800	135	135	835
Future Volume (vph)	115	115	800	135	135	835
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	0.91
Frt		0.850	0.978			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	4973	0	1770	5085
Flt Permitted	0.950				0.236	
Satd. Flow (perm)	1770	1583	4973	0	440	5085
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		125	53			
Link Speed (mph)	30		40			40
Link Distance (ft)	858		696			970
Travel Time (s)	19.5		11.9			16.5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	125	125	870	147	147	908
Shared Lane Traffic (%)						
Lane Group Flow (vph)	125	125	1017	0	147	908
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60	60		60	60	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (ft)	20	20	100		20	100
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	20	6		20	6
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8			6	
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0

Lanes, Volumes, Timings
13: Chambers Road & E. 32nd Avenue

Existing
AM Peak

	↖	↗	↑	↘	↙	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Minimum Split (s)	22.5	22.5	22.5		9.5	22.5
Total Split (s)	25.0	25.0	60.0		15.0	75.0
Total Split (%)	25.0%	25.0%	60.0%		15.0%	75.0%
Maximum Green (s)	20.5	20.5	55.5		10.5	70.5
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)	7.0	7.0	7.0			7.0
Flash Dont Walk (s)	11.0	11.0	11.0			11.0
Pedestrian Calls (#/hr)	0	0	0			0
Act Effect Green (s)	12.3	12.3	66.6		78.7	78.7
Actuated g/C Ratio	0.12	0.12	0.67		0.79	0.79
v/c Ratio	0.57	0.41	0.31		0.33	0.23
Control Delay	51.1	11.2	7.4		4.9	3.2
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	51.1	11.2	7.4		4.9	3.2
LOS	D	B	A		A	A
Approach Delay	31.1		7.4			3.4
Approach LOS	C		A			A

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

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

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 8.1

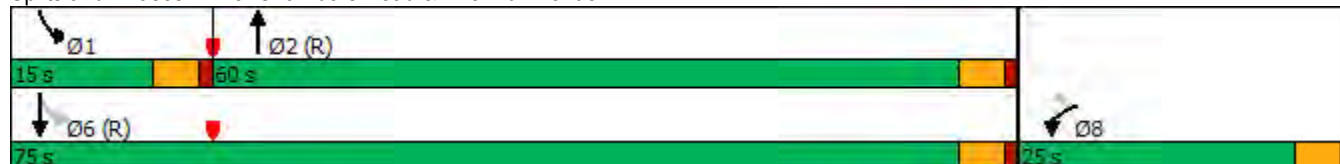
Intersection LOS: A

Intersection Capacity Utilization 43.6%

ICU Level of Service A







Analysis Period (min) 15

Splits and Phases: 13: Chambers Road & E. 32nd Avenue



HCM 6th TWSC
1: Chambers Road & E 35th Avenur

Existing
PM Peak

Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		 	 			 
Traffic Vol, veh/h	0	12	1567	7	0	1075
Future Vol, veh/h	0	12	1567	7	0	1075
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	13	1722	8	0	1181
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	-	865	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	7.14	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.92	-	-	-	-
Pot Cap-1 Maneuver	0	*549	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		1	-	-		-
Mov Cap-1 Maneuver	-	*549	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	11.7	0		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBT		
Capacity (veh/h)		-	-	549	-	
HCM Lane V/C Ratio		-	-	0.024	-	
HCM Control Delay (s)		-	-	11.7	-	
HCM Lane LOS		-	-	B	-	
HCM 95th %tile Q(veh)		-	-	0.1	-	
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon









HCM 6th TWSC
4: Helena Street/Helena St & E 35th Avenur/E 35th Ave

Existing
PM Peak

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	3	4	0	3	9	0	1	1	1	1	3	2
Future Vol, veh/h	3	4	0	3	9	0	1	1	1	1	3	2
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	5	0	4	12	0	1	1	1	1	4	3
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	12	0	0	5	0	0	37	33	5	34	33	12
Stage 1	-	-	-	-	-	-	13	13	-	20	20	-
Stage 2	-	-	-	-	-	-	24	20	-	14	13	-
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	1607	-	-	1616	-	-	968	860	1078	973	860	1069
Stage 1	-	-	-	-	-	-	1007	885	-	999	879	-
Stage 2	-	-	-	-	-	-	994	879	-	1006	885	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1607	-	-	1616	-	-	959	857	1078	968	857	1069
Mov Cap-2 Maneuver	-	-	-	-	-	-	959	857	-	968	857	-
Stage 1	-	-	-	-	-	-	1005	883	-	997	877	-
Stage 2	-	-	-	-	-	-	985	877	-	1001	883	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	3.1			1.8			8.8			8.9		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	956	1607	-	-	1616	-	-	937				
HCM Lane V/C Ratio	0.004	0.002	-	-	0.002	-	-	0.009				
HCM Control Delay (s)	8.8	7.2	0	-	7.2	0	-	8.9				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0				





HCM 6th TWSC
5: Chambers Road & E 33rd Place/E. 33rd Place

Existing
PM Peak

Intersection												
Int Delay, s/veh	1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	31	0	64	7	2	5	20	1538	3	11	1050	14
Future Vol, veh/h	31	0	64	7	2	5	20	1538	3	11	1050	14
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	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	5	5	5	2	5	2	5	2	2	2	2	5
Mvmt Flow	34	0	70	8	2	5	22	1690	3	12	1154	15
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1907	2923	585	2222	2929	847	1169	0	0	1693	0	0
Stage 1	1186	1186	-	1736	1736	-	-	-	-	-	-	-
Stage 2	721	1737	-	486	1193	-	-	-	-	-	-	-
Critical Hdwy	6.5	6.6	7.2	6.44	6.6	7.14	5.4	-	-	5.34	-	-
Critical Hdwy Stg 1	7.4	5.6	-	7.34	5.6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.8	5.6	-	6.74	5.6	-	-	-	-	-	-	-
Follow-up Hdwy	3.85	4.05	3.95	3.82	4.05	3.92	3.15	-	-	3.12	-	-
Pot Cap-1 Maneuver	*368	37	383	192	36	*575	316	-	-	708	-	-
Stage 1	*144	254	-	517	510	-	-	-	-	-	-	-
Stage 2	*585	509	-	486	252	-	-	-	-	-	-	-
Platoon blocked, %	1	1		1	1	1		-	-	1	-	-
Mov Cap-1 Maneuver	*323	34	383	147	33	*575	316	-	-	708	-	-
Mov Cap-2 Maneuver	*323	34	-	147	33	-	-	-	-	-	-	-
Stage 1	*134	250	-	481	474	-	-	-	-	-	-	-
Stage 2	*537	474	-	390	248	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	19		39.4		0.2		0.1					
HCM LOS	C		E									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	316	-	-	361	120	708	-	-				
HCM Lane V/C Ratio	0.07	-	-	0.289	0.128	0.017	-	-				
HCM Control Delay (s)	17.2	-	-	19	39.4	10.2	-	-				
HCM Lane LOS	C	-	-	C	E	B	-	-				
HCM 95th %tile Q(veh)	0.2	-	-	1.2	0.4	0.1	-	-				
Notes												
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined				*: All major volume in platoon				

HCM 6th TWSC
8: Helena Street & E. 33rd Place/E 35th Place

Existing
PM Peak

Intersection												
Int Delay, s/veh	2.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	12	5	0	7	1	2	0	0	4	2	3
Future Vol, veh/h	2	12	5	0	7	1	2	0	0	4	2	3
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	16	7	0	9	1	3	0	0	5	3	4
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	10	0	0	23	0	0	39	36	20	36	39	10
Stage 1	-	-	-	-	-	-	26	26	-	10	10	-
Stage 2	-	-	-	-	-	-	13	10	-	26	29	-
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	1610	-	-	1592	-	-	966	856	1058	970	853	1071
Stage 1	-	-	-	-	-	-	992	874	-	1011	887	-
Stage 2	-	-	-	-	-	-	1007	887	-	992	871	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1610	-	-	1592	-	-	958	854	1058	968	851	1071
Mov Cap-2 Maneuver	-	-	-	-	-	-	958	854	-	968	851	-
Stage 1	-	-	-	-	-	-	990	872	-	1009	887	-
Stage 2	-	-	-	-	-	-	1000	887	-	990	869	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.8			0			8.8			8.8		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	958	1610	-	-	1592	-	-	969				
HCM Lane V/C Ratio	0.003	0.002	-	-	-	-	-	0.012				
HCM Control Delay (s)	8.8	7.2	0	-	0	-	-	8.8				
HCM Lane LOS	A	A	A	-	A	-	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0				

Lanes, Volumes, Timings
13: Chambers Road & E. 32nd Avenue

Existing
PM Peak



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	155	155	1400	150	150	970
Future Volume (vph)	155	155	1400	150	150	970
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	0.91
Frt		0.850	0.985			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	5009	0	1770	5085
Flt Permitted	0.950				0.095	
Satd. Flow (perm)	1770	1583	5009	0	177	5085
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		168	29			
Link Speed (mph)	30		40			40
Link Distance (ft)	858		696			970
Travel Time (s)	19.5		11.9			16.5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	168	168	1522	163	163	1054
Shared Lane Traffic (%)						
Lane Group Flow (vph)	168	168	1685	0	163	1054
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (ft)	20	20	100		20	100
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	20	6		20	6
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8			6	
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0

Lanes, Volumes, Timings
13: Chambers Road & E. 32nd Avenue

Existing
PM Peak



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Minimum Split (s)	22.5	22.5	22.5		9.5	22.5
Total Split (s)	25.0	25.0	60.0		15.0	75.0
Total Split (%)	25.0%	25.0%	60.0%		15.0%	75.0%
Maximum Green (s)	20.5	20.5	55.5		10.5	70.5
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)	7.0	7.0	7.0			7.0
Flash Dont Walk (s)	11.0	11.0	11.0			11.0
Pedestrian Calls (#/hr)	0	0	0			0
Act Effect Green (s)	14.7	14.7	63.1		76.3	76.3
Actuated g/C Ratio	0.15	0.15	0.63		0.76	0.76
v/c Ratio	0.65	0.45	0.53		0.60	0.27
Control Delay	51.2	9.6	11.6		18.4	4.1
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	51.2	9.6	11.6		18.4	4.1
LOS	D	A	B		B	A
Approach Delay	30.4		11.6			6.0
Approach LOS	C		B			A

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

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

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 11.4

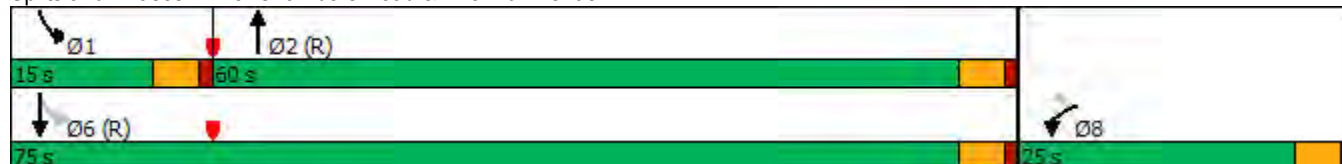
Intersection LOS: B

Intersection Capacity Utilization 58.5%

ICU Level of Service B







Analysis Period (min) 15





Splits and Phases: 13: Chambers Road & E. 32nd Avenue



HCM 6th TWSC
1: Chambers Road/Chambers Rd & E 35th Ave









2027 Background
AM Peak





Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		 	 			 
Traffic Vol, veh/h	0	26	855	12	0	1075
Future Vol, veh/h	0	26	855	12	0	1075
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	28	919	13	0	1156
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	-	466	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	7.14	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.92	-	-	-	-
Pot Cap-1 Maneuver	0	*730	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		1	-	-		-
Mov Cap-1 Maneuver	-	*730	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	10.1	0		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBT		
Capacity (veh/h)	-	-	730	-		
HCM Lane V/C Ratio	-	-	0.038	-		
HCM Control Delay (s)	-	-	10.1	-		
HCM Lane LOS	-	-	B	-		
HCM 95th %tile Q(veh)	-	-	0.1	-		
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection												
Int Delay, s/veh	3.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	11	0	1	15	1	5	1	2	1	3	6
Future Vol, veh/h	1	11	0	1	15	1	5	1	2	1	3	6
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	15	0	1	20	1	7	1	3	1	4	8
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	21	0	0	15	0	0	46	40	15	42	40	21
Stage 1	-	-	-	-	-	-	17	17	-	23	23	-
Stage 2	-	-	-	-	-	-	29	23	-	19	17	-
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	1595	-	-	1603	-	-	955	852	1065	961	852	1056
Stage 1	-	-	-	-	-	-	1002	881	-	995	876	-
Stage 2	-	-	-	-	-	-	988	876	-	1000	881	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1595	-	-	1603	-	-	943	850	1065	956	850	1056
Mov Cap-2 Maneuver	-	-	-	-	-	-	943	850	-	956	850	-
Stage 1	-	-	-	-	-	-	1001	880	-	994	875	-
Stage 2	-	-	-	-	-	-	975	875	-	995	880	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.6			0.4			8.8			8.7		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	957	1595	-	-	1603	-	-	975				
HCM Lane V/C Ratio	0.011	0.001	-	-	0.001	-	-	0.014				
HCM Control Delay (s)	8.8	7.3	0	-	7.2	0	-	8.7				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0				

HCM 6th TWSC
5: Chambers Road & E. 33rd Place












2027 Background
AM Peak

Intersection												
Int Delay, s/veh	1.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	35	0	0	8	80	860	5	15	985	78
Future Vol, veh/h	0	0	35	0	0	8	80	860	5	15	985	78
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	-	-	0	0	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	5	5	5	2	5	2	5	2	2	2	2	5
Mvmt Flow	0	0	38	0	0	9	86	925	5	16	1059	84
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	-	572	-	-	465	1143	0	0	930	0	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	7.2	-	-	7.14	5.4	-	-	5.34	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.95	-	-	3.92	3.15	-	-	3.12	-	-
Pot Cap-1 Maneuver	0	0	391	0	0	*730	326	-	-	904	-	-
Stage 1	0	0	-	0	0	-	-	-	-	-	-	-
Stage 2	0	0	-	0	0	-	-	-	-	-	-	-
Platoon blocked, %						1		-	-	1	-	-
Mov Cap-1 Maneuver	-	-	391	-	-	*730	326	-	-	904	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	15.2		10		1.7		0.1					
HCM LOS	C		B									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	326	-	-	391	730	904	-	-				
HCM Lane V/C Ratio	0.264	-	-	0.096	0.012	0.018	-	-				
HCM Control Delay (s)	20	-	-	15.2	10	9.1	-	-				
HCM Lane LOS	C	-	-	C	B	A	-	-				
HCM 95th %tile Q(veh)	1	-	-	0.3	0	0.1	-	-				
Notes												
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined				*: All major volume in platoon				

Intersection												
Int Delay, s/veh	4.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	7	1	1	1	1	2	1	1	1	2	1
Future Vol, veh/h	3	7	1	1	1	1	2	1	1	1	2	1
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	9	1	1	1	1	3	1	1	1	3	1
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2	0	0	10	0	0	24	22	10	23	22	2
Stage 1	-	-	-	-	-	-	18	18	-	4	4	-
Stage 2	-	-	-	-	-	-	6	4	-	19	18	-
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	1620	-	-	1610	-	-	987	872	1071	989	872	1082
Stage 1	-	-	-	-	-	-	1001	880	-	1018	892	-
Stage 2	-	-	-	-	-	-	1016	892	-	1000	880	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1620	-	-	1610	-	-	981	869	1071	984	869	1082
Mov Cap-2 Maneuver	-	-	-	-	-	-	981	869	-	984	869	-
Stage 1	-	-	-	-	-	-	999	878	-	1016	891	-
Stage 2	-	-	-	-	-	-	1011	891	-	995	878	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	2			2.4			8.7			8.8		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	970	1620	-	-	1610	-	-	943				
HCM Lane V/C Ratio	0.005	0.002	-	-	0.001	-	-	0.006				
HCM Control Delay (s)	8.7	7.2	0	-	7.2	0	-	8.8				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0				

Lanes, Volumes, Timings
12: Chambers Road & E. 32nd Avenue

2027 Background
AM Peak

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	120	120	825	140	140	880
Future Volume (vph)	120	120	825	140	140	880
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	0.91
Frt		0.850	0.978			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	4973	0	1770	5085
Flt Permitted	0.950				0.227	
Satd. Flow (perm)	1770	1583	4973	0	423	5085
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		130	52			
Link Speed (mph)	30		30			30
Link Distance (ft)	977		735			980
Travel Time (s)	22.2		16.7			22.3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	130	130	897	152	152	957
Shared Lane Traffic (%)						
Lane Group Flow (vph)	130	130	1049	0	152	957
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60	60		60	60	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (ft)	20	20	100		20	100
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	20	6		20	6
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8			6	
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0

Lanes, Volumes, Timings
12: Chambers Road & E. 32nd Avenue

2027 Background
AM Peak

	↖	↗	↑	↘	↙	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Minimum Split (s)	23.0	23.0	23.0		9.5	23.0
Total Split (s)	25.0	25.0	60.0		15.0	75.0
Total Split (%)	25.0%	25.0%	60.0%		15.0%	75.0%
Maximum Green (s)	20.0	20.0	55.0		10.5	70.0
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.5	1.5	1.5		1.0	1.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0		4.5	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)	7.0	7.0	7.0			7.0
Flash Dont Walk (s)	11.0	11.0	11.0			11.0
Pedestrian Calls (#/hr)	0	0	0			0
Act Effect Green (s)	12.6	12.6	65.2		77.9	77.4
Actuated g/C Ratio	0.13	0.13	0.65		0.78	0.77
v/c Ratio	0.58	0.42	0.32		0.35	0.24
Control Delay	51.1	11.0	8.1		5.4	3.6
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	51.1	11.0	8.1		5.4	3.6
LOS	D	B	A		A	A
Approach Delay	31.1		8.1			3.8
Approach LOS	C		A			A

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

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

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 8.6

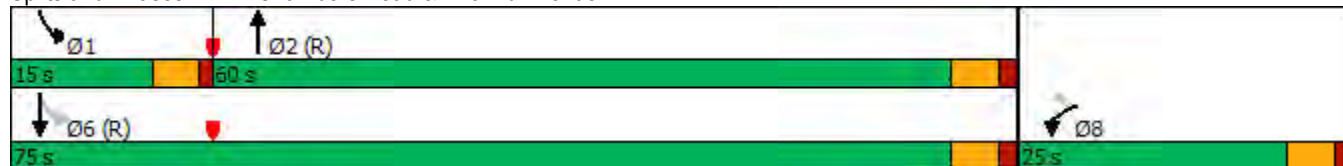
Intersection LOS: A

Intersection Capacity Utilization 45.5%

ICU Level of Service A









Analysis Period (min) 15

Splits and Phases: 12: Chambers Road & E. 32nd Avenue



HCM 6th TWSC
1: Chambers Road/Chambers Rd & E 35th Ave

2027 Background
PM Peak

Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		 	 		 	 
Traffic Vol, veh/h	0	12	1595	7	0	1110
Future Vol, veh/h	0	12	1595	7	0	1110
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	13	1753	8	0	1220
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	-	881	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	7.14	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.92	-	-	-	-
Pot Cap-1 Maneuver	0	*549	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		1	-	-		-
Mov Cap-1 Maneuver	-	*549	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	11.7	0		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBT		
Capacity (veh/h)	-	549		-		
HCM Lane V/C Ratio	-	0.024		-		
HCM Control Delay (s)	-	11.7		-		
HCM Lane LOS	-	B		-		
HCM 95th %tile Q(veh)	-	0.1		-		
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection												
Int Delay, s/veh	4.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	4	0	3	9	1	1	1	1	1	3	2
Future Vol, veh/h	3	4	0	3	9	1	1	1	1	1	3	2
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	5	0	4	12	1	1	1	1	1	4	3
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	13	0	0	5	0	0	37	34	5	35	34	13
Stage 1	-	-	-	-	-	-	13	13	-	21	21	-
Stage 2	-	-	-	-	-	-	24	21	-	14	13	-
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	1606	-	-	1616	-	-	968	859	1078	971	859	1067
Stage 1	-	-	-	-	-	-	1007	885	-	998	878	-
Stage 2	-	-	-	-	-	-	994	878	-	1006	885	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1606	-	-	1616	-	-	959	856	1078	966	856	1067
Mov Cap-2 Maneuver	-	-	-	-	-	-	959	856	-	966	856	-
Stage 1	-	-	-	-	-	-	1005	883	-	996	876	-
Stage 2	-	-	-	-	-	-	985	876	-	1001	883	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	3.1			1.7			8.8			8.9		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	956	1606	-	-	1616	-	-	935				
HCM Lane V/C Ratio	0.004	0.002	-	-	0.002	-	-	0.009				
HCM Control Delay (s)	8.8	7.2	0	-	7.2	0	-	8.9				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0				

HCM 6th TWSC
5: Chambers Road & E. 33rd Place

2027 Background
PM Peak





Intersection												
Int Delay, s/veh	0.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↰			↰	↰ ↰ ↰ ↰			↰ ↰ ↰ ↰		
Traffic Vol, veh/h	0	0	100	0	0	14	21	1595	10	11	1085	15
Future Vol, veh/h	0	0	100	0	0	14	21	1595	10	11	1085	15
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	-	-	0	0	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	5	5	5	2	5	2	5	2	2	2	2	5
Mvmt Flow	0	0	110	0	0	15	23	1753	11	12	1192	16

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	-	604	-	-	882	1208	0	0	1764	0	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	7.2	-	-	7.14	5.4	-	-	5.34	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.95	-	-	3.92	3.15	-	-	3.12	-	-
Pot Cap-1 Maneuver	0	0	372	0	0	*549	302	-	-	*690	-	-
Stage 1	0	0	-	0	0	-	-	-	-	-	-	-
Stage 2	0	0	-	0	0	-	-	-	-	-	-	-
Platoon blocked, %						1		-	-	1	-	-
Mov Cap-1 Maneuver	-	-	372	-	-	*549	302	-	-	*690	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	18.7		11.7		0.2		0.1	
HCM LOS	C		B					












Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR	
Capacity (veh/h)	302	-	-	372	549	* 690	-	-
HCM Lane V/C Ratio	0.076	-	-	0.295	0.028	0.018	-	-
HCM Control Delay (s)	17.9	-	-	18.7	11.7	10.3	-	-
HCM Lane LOS	C	-	-	C	B	B	-	-
HCM 95th %tile Q(veh)	0.2	-	-	1.2	0.1	0.1	-	-

Notes			
~: Volume exceeds capacity	\$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection												
Int Delay, s/veh	3.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	13	5	1	7	1	2	1	1	4	2	3
Future Vol, veh/h	2	13	5	1	7	1	2	1	1	4	2	3
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	17	7	1	9	1	3	1	1	5	3	4
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	10	0	0	24	0	0	42	39	21	40	42	10
Stage 1	-	-	-	-	-	-	27	27	-	12	12	-
Stage 2	-	-	-	-	-	-	15	12	-	28	30	-
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	1610	-	-	1591	-	-	961	853	1056	964	850	1071
Stage 1	-	-	-	-	-	-	990	873	-	1009	886	-
Stage 2	-	-	-	-	-	-	1005	886	-	989	870	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1610	-	-	1591	-	-	953	850	1056	959	847	1071
Mov Cap-2 Maneuver	-	-	-	-	-	-	953	850	-	959	847	-
Stage 1	-	-	-	-	-	-	988	871	-	1007	885	-
Stage 2	-	-	-	-	-	-	997	885	-	984	868	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.7			0.8			8.8			8.8		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	947	1610	-	-	1591	-	-	964				
HCM Lane V/C Ratio	0.006	0.002	-	-	0.001	-	-	0.012				
HCM Control Delay (s)	8.8	7.2	0	-	7.3	0	-	8.8				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0				

Lanes, Volumes, Timings
12: Chambers Road & E. 32nd Avenue

2027 Background
PM Peak

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	150	150	1475	155	155	955
Future Volume (vph)	150	150	1475	155	155	955
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	0.91
Fr't		0.850	0.986			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	5014	0	1770	5085
Flt Permitted	0.950				0.081	
Satd. Flow (perm)	1770	1583	5014	0	151	5085
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		163	28			
Link Speed (mph)	30		40			40
Link Distance (ft)	977		735			980
Travel Time (s)	22.2		12.5			16.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	163	163	1603	168	168	1038
Shared Lane Traffic (%)						
Lane Group Flow (vph)	163	163	1771	0	168	1038
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (ft)	20	20	100		20	100
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	20	6		20	6
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8			6	
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0

Lanes, Volumes, Timings
12: Chambers Road & E. 32nd Avenue

2027 Background
PM Peak

	↖	↗	↑	↘	↙	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Minimum Split (s)	23.0	23.0	23.0		10.0	23.0
Total Split (s)	25.0	25.0	60.0		15.0	75.0
Total Split (%)	25.0%	25.0%	60.0%		15.0%	75.0%
Maximum Green (s)	20.0	20.0	55.0		10.0	70.0
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.5	1.5	1.5		1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)	7.0	7.0	7.0			7.0
Flash Dont Walk (s)	11.0	11.0	11.0			11.0
Pedestrian Calls (#/hr)	0	0	0			0
Act Effect Green (s)	14.4	14.4	61.3		75.6	75.6
Actuated g/C Ratio	0.14	0.14	0.61		0.76	0.76
v/c Ratio	0.64	0.44	0.57		0.64	0.27
Control Delay	51.4	9.8	13.1		24.2	4.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	51.4	9.8	13.1		24.2	4.3
LOS	D	A	B		C	A
Approach Delay	30.6		13.1			7.0
Approach LOS	C		B			A

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

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

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 12.6

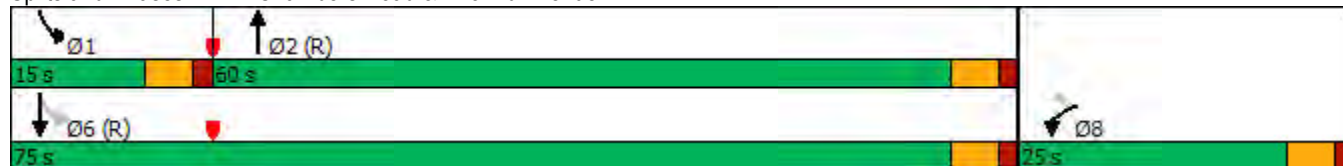
Intersection LOS: B

Intersection Capacity Utilization 61.3%

ICU Level of Service B







Analysis Period (min) 15

Splits and Phases: 12: Chambers Road & E. 32nd Avenue






HCM 6th TWSC
1: Chambers Road & E 35th Avenue

2027 Total
AM Peak

Intersection						
Int Delay, s/veh	0.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		 	 			 
Traffic Vol, veh/h	0	75	864	21	0	1138
Future Vol, veh/h	0	75	864	21	0	1138
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	81	929	23	0	1224
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	-	476	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	7.14	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.92	-	-	-	-
Pot Cap-1 Maneuver	0	*730	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		1	-	-		-
Mov Cap-1 Maneuver	-	*730	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	10.5	0		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBT		
Capacity (veh/h)	-	-	730	-		
HCM Lane V/C Ratio	-	-	0.11	-		
HCM Control Delay (s)	-	-	10.5	-		
HCM Lane LOS	-	-	B	-		
HCM 95th %tile Q(veh)	-	-	0.4	-		
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon




HCM 6th TWSC
2: West Site Access & E 35th Avenue/E 35th Ave

2027 Total
AM Peak

Intersection						
Int Delay, s/veh	4.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	13	8	0	27	48	0
Future Vol, veh/h	13	8	0	27	48	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	11	0	36	64	0
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	28	0	59	23
Stage 1	-	-	-	-	23	-
Stage 2	-	-	-	-	36	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1585	-	948	1054
Stage 1	-	-	-	-	1000	-
Stage 2	-	-	-	-	986	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1585	-	948	1054
Mov Cap-2 Maneuver	-	-	-	-	948	-
Stage 1	-	-	-	-	1000	-
Stage 2	-	-	-	-	986	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		9.1	
HCM LOS	A					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	948	-	-	1585	-	
HCM Lane V/C Ratio	0.068	-	-	-	-	
HCM Control Delay (s)	9.1	-	-	0	-	
HCM Lane LOS	A	-	-	A	-	
HCM 95th %tile Q(veh)	0.2	-	-	0	-	





HCM 6th TWSC
3: East Site Access & E 35th Ave

2027 Total
AM Peak

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	12	1	0	26	1	0
Future Vol, veh/h	12	1	0	26	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	1	0	35	1	0
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	17	0	52	17
Stage 1	-	-	-	-	17	-
Stage 2	-	-	-	-	35	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1600	-	957	1062
Stage 1	-	-	-	-	1006	-
Stage 2	-	-	-	-	987	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1600	-	957	1062
Mov Cap-2 Maneuver	-	-	-	-	957	-
Stage 1	-	-	-	-	1006	-
Stage 2	-	-	-	-	987	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		8.8	
HCM LOS					A	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	957	-	-	1600	-	
HCM Lane V/C Ratio	0.001	-	-	-	-	
HCM Control Delay (s)	8.8	-	-	0	-	
HCM Lane LOS	A	-	-	A	-	
HCM 95th %tile Q(veh)	0	-	-	0	-	

HCM 6th TWSC
4: Helena St & E 35th Ave

2027 Total
AM Peak

Intersection												
Int Delay, s/veh	3.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	11	0	1	15	1	5	1	2	1	3	6
Future Vol, veh/h	1	11	0	1	15	1	5	1	2	1	3	6
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	15	0	1	20	1	7	1	3	1	4	8
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	21	0	0	15	0	0	46	40	15	42	40	21
Stage 1	-	-	-	-	-	-	17	17	-	23	23	-
Stage 2	-	-	-	-	-	-	29	23	-	19	17	-
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	1595	-	-	1603	-	-	955	852	1065	961	852	1056
Stage 1	-	-	-	-	-	-	1002	881	-	995	876	-
Stage 2	-	-	-	-	-	-	988	876	-	1000	881	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1595	-	-	1603	-	-	943	850	1065	956	850	1056
Mov Cap-2 Maneuver	-	-	-	-	-	-	943	850	-	956	850	-
Stage 1	-	-	-	-	-	-	1001	880	-	994	875	-
Stage 2	-	-	-	-	-	-	975	875	-	995	880	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.6			0.4			8.8			8.7		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	957	1595	-	-	1603	-	-	975				
HCM Lane V/C Ratio	0.011	0.001	-	-	0.001	-	-	0.014				
HCM Control Delay (s)	8.8	7.3	0	-	7.2	0	-	8.7				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0				

HCM 6th TWSC
5: Chambers Road & E. 33rd Place

2027 Total
AM Peak

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	0	0	35	0	0	37	80	849	39	58	1005	78
Future Vol, veh/h	0	0	35	0	0	37	80	849	39	58	1005	78
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	-	-	0	200	-	-	200	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	5	5	5	2	5	2	5	2	2	2	2	5
Mvmt Flow	0	0	38	0	0	40	86	913	42	62	1081	84

Major/Minor	Minor2		Minor1		Major1		Major2	
Conflicting Flow All	-	-	583	-	-	478	1165	0
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	7.2	-	-	7.14	5.4	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.95	-	-	3.92	3.15	-
Pot Cap-1 Maneuver	0	0	384	0	0	*730	318	-
Stage 1	0	0	-	0	0	-	-	-
Stage 2	0	0	-	0	0	-	-	-
Platoon blocked, %						1	-	1
Mov Cap-1 Maneuver	-	-	384	-	-	*730	318	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.4	10.2	1.7	0.5
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	318	-	-	384	730	875	-
HCM Lane V/C Ratio	0.271	-	-	0.098	0.054	0.071	-
HCM Control Delay (s)	20.5	-	-	15.4	10.2	9.4	-
HCM Lane LOS	C	-	-	C	B	A	-
HCM 95th %tile Q(veh)	1.1	-	-	0.3	0.2	0.2	-

Notes			
~: Volume exceeds capacity	\$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

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	63	25	9	0	5	0	4	0	0	0	0	28
Future Vol, veh/h	63	25	9	0	5	0	4	0	0	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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	84	33	12	0	7	0	5	0	0	0	0	37




Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	7	0	0	45	0	0	233	214	39	214	220	7
Stage 1	-	-	-	-	-	-	207	207	-	7	7	-
Stage 2	-	-	-	-	-	-	26	7	-	207	213	-
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	1614	-	-	1563	-	-	722	684	1033	743	678	1075
Stage 1	-	-	-	-	-	-	795	731	-	1015	890	-
Stage 2	-	-	-	-	-	-	992	890	-	795	726	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1614	-	-	1563	-	-	669	648	1033	713	642	1075
Mov Cap-2 Maneuver	-	-	-	-	-	-	669	648	-	713	642	-
Stage 1	-	-	-	-	-	-	753	692	-	961	890	-
Stage 2	-	-	-	-	-	-	958	890	-	753	688	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	4.8			0			10.4			8.5		
HCM LOS							B			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	669	1614	-	-	1563	-	-	1075
HCM Lane V/C Ratio	0.008	0.052	-	-	-	-	-	0.035
HCM Control Delay (s)	10.4	7.4	0	-	0	-	-	8.5
HCM Lane LOS	B	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0.2	-	-	0	-	-	0.1





HCM 6th TWSC
7: E 35th PI & East Site Access

2027 Total
AM Peak

Intersection						
Int Delay, s/veh	3.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	14	11	4	0	0	1
Future Vol, veh/h	14	11	4	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	12	4	0	0	1
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	4	0	-	0	46	4
Stage 1	-	-	-	-	4	-
Stage 2	-	-	-	-	42	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1618	-	-	-	964	1080
Stage 1	-	-	-	-	1019	-
Stage 2	-	-	-	-	980	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1618	-	-	-	955	1080
Mov Cap-2 Maneuver	-	-	-	-	955	-
Stage 1	-	-	-	-	1010	-
Stage 2	-	-	-	-	980	-
Approach	EB	WB		SB		
HCM Control Delay, s	4.1	0		8.3		
HCM LOS				A		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1618	-	-	-	1080	
HCM Lane V/C Ratio	0.009	-	-	-	0.001	
HCM Control Delay (s)	7.2	0	-	-	8.3	
HCM Lane LOS	A	A	-	-	A	
HCM 95th %tile Q(veh)	0	-	-	-	0	












HCM 6th TWSC
8: Helena St & E 35th PI

2027 Total
AM Peak

Intersection												
Int Delay, s/veh	4.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	7	1	1	1	1	2	1	1	1	2	1
Future Vol, veh/h	3	7	1	1	1	1	2	1	1	1	2	1
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	9	1	1	1	1	3	1	1	1	3	1
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2	0	0	10	0	0	24	22	10	23	22	2
Stage 1	-	-	-	-	-	-	18	18	-	4	4	-
Stage 2	-	-	-	-	-	-	6	4	-	19	18	-
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	1620	-	-	1610	-	-	987	872	1071	989	872	1082
Stage 1	-	-	-	-	-	-	1001	880	-	1018	892	-
Stage 2	-	-	-	-	-	-	1016	892	-	1000	880	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1620	-	-	1610	-	-	981	869	1071	984	869	1082
Mov Cap-2 Maneuver	-	-	-	-	-	-	981	869	-	984	869	-
Stage 1	-	-	-	-	-	-	999	878	-	1016	891	-
Stage 2	-	-	-	-	-	-	1011	891	-	995	878	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	2			2.4			8.7			8.8		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	970	1620	-	-	1610	-	-	943				
HCM Lane V/C Ratio	0.005	0.002	-	-	0.001	-	-	0.006				
HCM Control Delay (s)	8.7	7.2	0	-	7.2	0	-	8.8				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0				

Lanes, Volumes, Timings
22: Chambers Rd/Chambers Road & E. 32nd Avenue

2027 Total
AM Peak

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	120	120	850	140	140	900
Future Volume (vph)	120	120	850	140	140	900
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	0.91
Frt		0.850	0.979			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	4979	0	1770	5085
Flt Permitted	0.950				0.220	
Satd. Flow (perm)	1770	1583	4979	0	410	5085
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		130	50			
Link Speed (mph)	30		30			30
Link Distance (ft)	940		645			928
Travel Time (s)	21.4		14.7			21.1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	130	130	924	152	152	978
Shared Lane Traffic (%)						
Lane Group Flow (vph)	130	130	1076	0	152	978
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		24			24
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60	60		60	60	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (ft)	20	20	100		20	100
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	20	6		20	6
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8			6	
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0

Lanes, Volumes, Timings
22: Chambers Rd/Chambers Road & E. 32nd Avenue

2027 Total
AM Peak

	↖	↗	↑	↘	↙	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Minimum Split (s)	23.0	23.0	23.0		9.5	23.0
Total Split (s)	25.0	25.0	60.0		15.0	75.0
Total Split (%)	25.0%	25.0%	60.0%		15.0%	75.0%
Maximum Green (s)	20.0	20.0	55.0		10.5	70.0
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.5	1.5	1.5		1.0	1.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0		4.5	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)	7.0	7.0	7.0			7.0
Flash Dont Walk (s)	11.0	11.0	11.0			11.0
Pedestrian Calls (#/hr)	0	0	0			0
Act Effect Green (s)	12.6	12.6	65.2		77.9	77.4
Actuated g/C Ratio	0.13	0.13	0.65		0.78	0.77
v/c Ratio	0.58	0.42	0.33		0.36	0.25
Control Delay	51.1	11.0	8.2		5.5	3.6
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	51.1	11.0	8.2		5.5	3.6
LOS	D	B	A		A	A
Approach Delay	31.1		8.2			3.9
Approach LOS	C		A			A

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

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

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 8.6

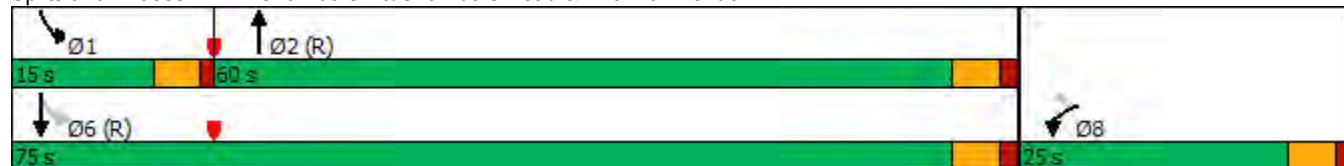
Intersection LOS: A

Intersection Capacity Utilization 46.0%

ICU Level of Service A




Analysis Period (min) 15

Splits and Phases: 22: Chambers Rd/Chambers Road & E. 32nd Avenue



HCM 6th TWSC
1: Chambers Road & E 35th Avenue

2027 Total
PM Peak

Intersection						
Int Delay, s/veh	0.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	60	1605	22	0	1207
Future Vol, veh/h	0	60	1605	22	0	1207
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	66	1764	24	0	1326

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	-	894	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	7.14	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	3.92	-
Pot Cap-1 Maneuver	0	*549	-
Stage 1	0	-	-
Stage 2	0	-	-
Platoon blocked, %	-	1	-
Mov Cap-1 Maneuver	-	*549	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-




Approach	WB	NB	SB
HCM Control Delay, s	12.5	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBT
Capacity (veh/h)	-	-	549
HCM Lane V/C Ratio	-	-	0.12
HCM Control Delay (s)	-	-	12.5
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.4

Notes			
~: Volume exceeds capacity	\$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon




HCM 6th TWSC
2: West Site Access & E 35th Avenue/E 35th Ave

2027 Total
PM Peak

Intersection						
Int Delay, s/veh	4.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	10	12	0	15	45	0
Future Vol, veh/h	10	12	0	15	45	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	16	0	20	60	0
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	29	0	41	21
Stage 1	-	-	-	-	21	-
Stage 2	-	-	-	-	20	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1584	-	970	1056
Stage 1	-	-	-	-	1002	-
Stage 2	-	-	-	-	1003	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1584	-	970	1056
Mov Cap-2 Maneuver	-	-	-	-	970	-
Stage 1	-	-	-	-	1002	-
Stage 2	-	-	-	-	1003	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		9	
HCM LOS					A	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	970	-	-	1584	-	
HCM Lane V/C Ratio	0.062	-	-	-	-	
HCM Control Delay (s)	9	-	-	0	-	
HCM Lane LOS	A	-	-	A	-	
HCM 95th %tile Q(veh)	0.2	-	-	0	-	





HCM 6th TWSC
3: East Site Access & E 35th Ave

2027 Total
PM Peak

Intersection						
Int Delay, s/veh	1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	7	3	0	12	3	0
Future Vol, veh/h	7	3	0	12	3	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	4	0	16	4	0
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	13	0	27	11
Stage 1	-	-	-	-	11	-
Stage 2	-	-	-	-	16	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1606	-	988	1070
Stage 1	-	-	-	-	1012	-
Stage 2	-	-	-	-	1007	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1606	-	988	1070
Mov Cap-2 Maneuver	-	-	-	-	988	-
Stage 1	-	-	-	-	1012	-
Stage 2	-	-	-	-	1007	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		8.7	
HCM LOS					A	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	988	-	-	1606	-	
HCM Lane V/C Ratio	0.004	-	-	-	-	
HCM Control Delay (s)	8.7	-	-	0	-	
HCM Lane LOS	A	-	-	A	-	
HCM 95th %tile Q(veh)	0	-	-	0	-	

HCM 6th TWSC
4: Helena St & E 35th Ave

2027 Total
PM Peak

Intersection												
Int Delay, s/veh	4.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	4	0	3	9	1	1	1	1	1	3	2
Future Vol, veh/h	3	4	0	3	9	1	1	1	1	1	3	2
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	5	0	4	12	1	1	1	1	1	4	3
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	13	0	0	5	0	0	37	34	5	35	34	13
Stage 1	-	-	-	-	-	-	13	13	-	21	21	-
Stage 2	-	-	-	-	-	-	24	21	-	14	13	-
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	1606	-	-	1616	-	-	968	859	1078	971	859	1067
Stage 1	-	-	-	-	-	-	1007	885	-	998	878	-
Stage 2	-	-	-	-	-	-	994	878	-	1006	885	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1606	-	-	1616	-	-	959	856	1078	966	856	1067
Mov Cap-2 Maneuver	-	-	-	-	-	-	959	856	-	966	856	-
Stage 1	-	-	-	-	-	-	1005	883	-	996	876	-
Stage 2	-	-	-	-	-	-	985	876	-	1001	883	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	3.1			1.7			8.8			8.9		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	956	1606	-	-	1616	-	-	935				
HCM Lane V/C Ratio	0.004	0.002	-	-	0.002	-	-	0.009				
HCM Control Delay (s)	8.8	7.2	0	-	7.2	0	-	8.9				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0				

HCM 6th TWSC
5: Chambers Road & E. 33rd Place

2027 Total
PM Peak

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	0	0	100	0	0	45	21	1589	61	89	1104	15
Future Vol, veh/h	0	0	100	0	0	45	21	1589	61	89	1104	15
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	-	-	0	200	-	-	200	-	-
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, %	5	5	5	2	5	2	5	2	2	1	2	5
Mvmt Flow	0	0	109	0	0	49	23	1727	66	97	1200	16

Major/Minor	Minor2		Minor1		Major1		Major2	
Conflicting Flow All	-	-	608	-	-	897	1216	0
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	7.2	-	-	7.14	5.4	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.95	-	-	3.92	3.15	-
Pot Cap-1 Maneuver	0	0	370	0	0	*549	300	-
Stage 1	0	0	-	0	0	-	-	-
Stage 2	0	0	-	0	0	-	-	-
Platoon blocked, %						1	-	1
Mov Cap-1 Maneuver	-	-	370	-	-	*549	300	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	18.7	12.2	0.2	0.8
HCM LOS	C	B		




Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	300	-	-	370	* 692	-	-
HCM Lane V/C Ratio	0.076	-	-	0.294	0.089	-	-
HCM Control Delay (s)	18	-	-	18.7	12.2	-	-
HCM Lane LOS	C	-	-	C	B	-	-
HCM 95th %tile Q(veh)	0.2	-	-	1.2	0.3	-	-

Notes			
~: Volume exceeds capacity	\$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection												
Int Delay, s/veh	4.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	72	77	1	0	15	0	2	0	0	0	0	28
Future Vol, veh/h	72	77	1	0	15	0	2	0	0	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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	96	103	1	0	20	0	3	0	0	0	0	37
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	20	0	0	104	0	0	335	316	104	316	316	20
Stage 1	-	-	-	-	-	-	296	296	-	20	20	-
Stage 2	-	-	-	-	-	-	39	20	-	296	296	-
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	1596	-	-	1488	-	-	619	600	951	637	600	1058
Stage 1	-	-	-	-	-	-	712	668	-	999	879	-
Stage 2	-	-	-	-	-	-	976	879	-	712	668	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1596	-	-	1488	-	-	568	562	951	606	562	1058
Mov Cap-2 Maneuver	-	-	-	-	-	-	568	562	-	606	562	-
Stage 1	-	-	-	-	-	-	666	625	-	935	879	-
Stage 2	-	-	-	-	-	-	942	879	-	666	625	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	3.6			0			11.4			8.5		
HCM LOS							B			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	568	1596	-	-	1488	-	-	1058				
HCM Lane V/C Ratio	0.005	0.06	-	-	-	-	-	0.035				
HCM Control Delay (s)	11.4	7.4	0	-	0	-	-	8.5				
HCM Lane LOS	B	A	A	-	A	-	-	A				
HCM 95th %tile Q(veh)	0	0.2	-	-	0	-	-	0.1				





HCM 6th TWSC
7: E 35th PI & East Site Access

2027 Total
PM Peak

Intersection						
Int Delay, s/veh	4.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	57	20	12	0	0	3
Future Vol, veh/h	57	20	12	0	0	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	62	22	13	0	0	3
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	13	0	-	0	159	13
Stage 1	-	-	-	-	13	-
Stage 2	-	-	-	-	146	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1606	-	-	-	832	1067
Stage 1	-	-	-	-	1010	-
Stage 2	-	-	-	-	881	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1606	-	-	-	800	1067
Mov Cap-2 Maneuver	-	-	-	-	800	-
Stage 1	-	-	-	-	971	-
Stage 2	-	-	-	-	881	-
Approach	EB	WB		SB		
HCM Control Delay, s	5.4	0		8.4		
HCM LOS	A					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1606	-	-	-	1067	
HCM Lane V/C Ratio	0.039	-	-	-	0.003	
HCM Control Delay (s)	7.3	0	-	-	8.4	
HCM Lane LOS	A	A	-	-	A	
HCM 95th %tile Q(veh)	0.1	-	-	-	0	












HCM 6th TWSC
8: Helena St & E 35th PI

2027 Total
PM Peak

Intersection												
Int Delay, s/veh	3.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	13	5	1	7	1	2	1	1	4	2	3
Future Vol, veh/h	2	13	5	1	7	1	2	1	1	4	2	3
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	17	7	1	9	1	3	1	1	5	3	4
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	10	0	0	24	0	0	42	39	21	40	42	10
Stage 1	-	-	-	-	-	-	27	27	-	12	12	-
Stage 2	-	-	-	-	-	-	15	12	-	28	30	-
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	1610	-	-	1591	-	-	961	853	1056	964	850	1071
Stage 1	-	-	-	-	-	-	990	873	-	1009	886	-
Stage 2	-	-	-	-	-	-	1005	886	-	989	870	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1610	-	-	1591	-	-	953	850	1056	959	847	1071
Mov Cap-2 Maneuver	-	-	-	-	-	-	953	850	-	959	847	-
Stage 1	-	-	-	-	-	-	988	871	-	1007	885	-
Stage 2	-	-	-	-	-	-	997	885	-	984	868	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.7			0.8			8.8			8.8		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	947	1610	-	-	1591	-	-	964				
HCM Lane V/C Ratio	0.006	0.002	-	-	0.001	-	-	0.012				
HCM Control Delay (s)	8.8	7.2	0	-	7.3	0	-	8.8				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0				

Lanes, Volumes, Timings
22: Chambers Rd/Chambers Road & E. 32nd Avenue

2027 Total
PM Peak

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	150	150	1520	155	155	1050
Future Volume (vph)	150	150	1520	155	155	1050
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	0.91
Fr t		0.850	0.986			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	5014	0	1770	5085
Flt Permitted	0.950				0.075	
Satd. Flow (perm)	1770	1583	5014	0	140	5085
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		163	27			
Link Speed (mph)	30		30			30
Link Distance (ft)	940		645			928
Travel Time (s)	21.4		14.7			21.1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	163	163	1652	168	168	1141
Shared Lane Traffic (%)						
Lane Group Flow (vph)	163	163	1820	0	168	1141
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		24			24
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60	60		60	60	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (ft)	20	20	100		20	100
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	20	6		20	6
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8			6	
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0

Lanes, Volumes, Timings
22: Chambers Rd/Chambers Road & E. 32nd Avenue

2027 Total
PM Peak

	↖	↗	↑	↘	↙	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Minimum Split (s)	23.0	23.0	23.0		10.0	23.0
Total Split (s)	25.0	25.0	60.0		15.0	75.0
Total Split (%)	25.0%	25.0%	60.0%		15.0%	75.0%
Maximum Green (s)	20.0	20.0	55.0		10.0	70.0
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.5	1.5	1.5		1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)	7.0	7.0	7.0			7.0
Flash Dont Walk (s)	11.0	11.0	11.0			11.0
Pedestrian Calls (#/hr)	0	0	0			0
Act Effect Green (s)	14.4	14.4	61.2		75.6	75.6
Actuated g/C Ratio	0.14	0.14	0.61		0.76	0.76
v/c Ratio	0.64	0.44	0.59		0.65	0.30
Control Delay	51.4	9.8	13.4		26.5	4.4
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	51.4	9.8	13.4		26.5	4.4
LOS	D	A	B		C	A
Approach Delay	30.6		13.4			7.2
Approach LOS	C		B			A

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

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

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 12.7

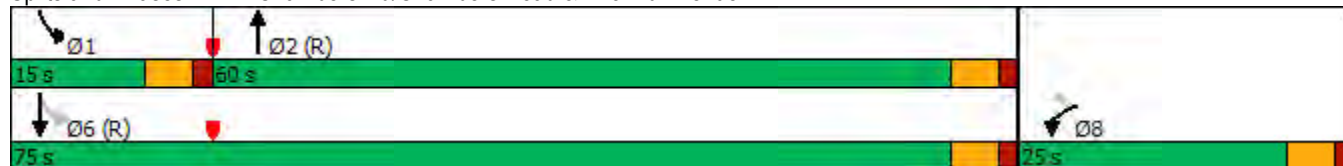
Intersection LOS: B

Intersection Capacity Utilization 62.2%

ICU Level of Service B









Analysis Period (min) 15





Splits and Phases: 22: Chambers Rd/Chambers Road & E. 32nd Avenue



HCM 6th TWSC
1: Chambers Road/Chambers Rd & E 35th Ave

2050 Background
AM Peak





Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		 	 		 	 
Traffic Vol, veh/h	0	35	1120	17	0	1410
Future Vol, veh/h	0	35	1120	17	0	1410
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	38	1204	18	0	1516
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	-	611	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	7.14	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.92	-	-	-	-
Pot Cap-1 Maneuver	0	*678	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		1	-	-		-
Mov Cap-1 Maneuver	-	*678	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	10.6	0		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBT		
Capacity (veh/h)	-	- 678		-		
HCM Lane V/C Ratio	-	- 0.056		-		
HCM Control Delay (s)	-	- 10.6		-		
HCM Lane LOS	-	- B		-		
HCM 95th %tile Q(veh)	-	- 0.2		-		
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection												
Int Delay, s/veh	3.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	15	1	1	20	1	7	1	2	1	3	8
Future Vol, veh/h	1	15	1	1	20	1	7	1	2	1	3	8
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	20	1	1	27	1	9	1	3	1	4	11
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	28	0	0	21	0	0	60	53	21	55	53	28
Stage 1	-	-	-	-	-	-	23	23	-	30	30	-
Stage 2	-	-	-	-	-	-	37	30	-	25	23	-
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	1585	-	-	1595	-	-	936	838	1056	943	838	1047
Stage 1	-	-	-	-	-	-	995	876	-	987	870	-
Stage 2	-	-	-	-	-	-	978	870	-	993	876	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1585	-	-	1595	-	-	922	836	1056	938	836	1047
Mov Cap-2 Maneuver	-	-	-	-	-	-	922	836	-	938	836	-
Stage 1	-	-	-	-	-	-	994	875	-	986	869	-
Stage 2	-	-	-	-	-	-	963	869	-	988	875	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.3			8.9			8.8		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	936	1585	-	-	1595	-	-	976				
HCM Lane V/C Ratio	0.014	0.001	-	-	0.001	-	-	0.016				
HCM Control Delay (s)	8.9	7.3	0	-	7.3	0	-	8.8				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1				

HCM 6th TWSC
5: Chambers Road & E. 33rd Place












2050 Background
AM Peak

Intersection												
Int Delay, s/veh	1.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↰			↰	↰ ↰ ↰ ↰			↰ ↰ ↰ ↰		
Traffic Vol, veh/h	0	0	45	0	0	9	105	1130	6	17	1290	102
Future Vol, veh/h	0	0	45	0	0	9	105	1130	6	17	1290	102
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	-	-	0	0	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	5	5	5	2	5	2	5	2	2	2	2	5
Mvmt Flow	0	0	48	0	0	10	113	1215	6	18	1387	110
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	-	749	-	-	611	1497	0	0	1221	0	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	7.2	-	-	7.14	5.4	-	-	5.34	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.95	-	-	3.92	3.15	-	-	3.12	-	-
Pot Cap-1 Maneuver	0	0	299	0	0	*678	217	-	-	796	-	-
Stage 1	0	0	-	0	0	-	-	-	-	-	-	-
Stage 2	0	0	-	0	0	-	-	-	-	-	-	-
Platoon blocked, %						1		-	-	1	-	-
Mov Cap-1 Maneuver	-	-	299	-	-	*678	217	-	-	796	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	19.4		10.4		3.2		0.1					
HCM LOS	C		B									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	217	-	-	299	678	796	-	-				
HCM Lane V/C Ratio	0.52	-	-	0.162	0.014	0.023	-	-				
HCM Control Delay (s)	38.3	-	-	19.4	10.4	9.6	-	-				
HCM Lane LOS	E	-	-	C	B	A	-	-				
HCM 95th %tile Q(veh)	2.7	-	-	0.6	0	0.1	-	-				
Notes												
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined				*: All major volume in platoon				

Intersection												
Int Delay, s/veh	4.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	8	2	1	1	1	3	1	1	1	3	1
Future Vol, veh/h	4	8	2	1	1	1	3	1	1	1	3	1
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	11	3	1	1	1	4	1	1	1	4	1
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2	0	0	14	0	0	29	27	13	28	28	2
Stage 1	-	-	-	-	-	-	23	23	-	4	4	-
Stage 2	-	-	-	-	-	-	6	4	-	24	24	-
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	1620	-	-	1604	-	-	980	866	1067	981	865	1082
Stage 1	-	-	-	-	-	-	995	876	-	1018	892	-
Stage 2	-	-	-	-	-	-	1016	892	-	994	875	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1620	-	-	1604	-	-	972	863	1067	976	862	1082
Mov Cap-2 Maneuver	-	-	-	-	-	-	972	863	-	976	862	-
Stage 1	-	-	-	-	-	-	992	873	-	1015	891	-
Stage 2	-	-	-	-	-	-	1009	891	-	988	872	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	2.1			2.4			8.8			8.9		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	965	1620	-	-	1604	-	-	921				
HCM Lane V/C Ratio	0.007	0.003	-	-	0.001	-	-	0.007				
HCM Control Delay (s)	8.8	7.2	0	-	7.2	0	-	8.9				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0				

Lanes, Volumes, Timings
12: Chambers Road & E. 32nd Avenue

2050 Background
AM Peak

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	175	175	1065	175	175	1160
Future Volume (vph)	175	175	1065	175	175	1160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	0.91
Frt		0.850	0.979			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	4979	0	1770	5085
Flt Permitted	0.950				0.150	
Satd. Flow (perm)	1770	1583	4979	0	279	5085
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		190	50			
Link Speed (mph)	30		30			30
Link Distance (ft)	977		735			980
Travel Time (s)	22.2		16.7			22.3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	190	190	1158	190	190	1261
Shared Lane Traffic (%)						
Lane Group Flow (vph)	190	190	1348	0	190	1261
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60	60		60	60	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (ft)	20	20	100		20	100
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	20	6		20	6
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8			6	
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0

Lanes, Volumes, Timings
12: Chambers Road & E. 32nd Avenue

2050 Background
AM Peak

	↖ ↗		↑	↘ ↙		↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Minimum Split (s)	23.0	23.0	23.0		9.5	23.0
Total Split (s)	25.0	25.0	60.0		15.0	75.0
Total Split (%)	25.0%	25.0%	60.0%		15.0%	75.0%
Maximum Green (s)	20.0	20.0	55.0		10.5	70.0
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.5	1.5	1.5		1.0	1.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0		4.5	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)	7.0	7.0	7.0			7.0
Flash Dont Walk (s)	11.0	11.0	11.0			11.0
Pedestrian Calls (#/hr)	0	0	0			0
Act Effect Green (s)	15.6	15.6	61.4		74.9	74.4
Actuated g/C Ratio	0.16	0.16	0.61		0.75	0.74
v/c Ratio	0.69	0.47	0.44		0.57	0.33
Control Delay	52.7	9.2	10.9		11.5	4.9
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	52.7	9.2	10.9		11.5	4.9
LOS	D	A	B		B	A
Approach Delay	31.0		10.9			5.8
Approach LOS	C		B			A

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

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

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 11.0

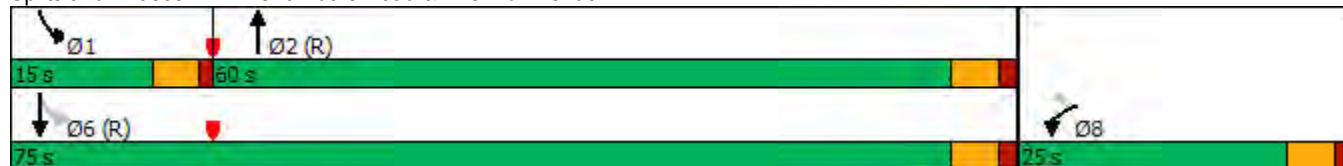
Intersection LOS: B

Intersection Capacity Utilization 56.0%

ICU Level of Service B




Analysis Period (min) 15





Splits and Phases: 12: Chambers Road & E. 32nd Avenue



HCM 6th TWSC
1: Chambers Road/Chambers Rd & E 35th Ave

2050 Background
PM Peak





Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	16	2090	10	0	1460
Future Vol, veh/h	0	16	2090	10	0	1460
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	18	2297	11	0	1604
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	1154	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	7.14	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.92	-	-	-	-
Pot Cap-1 Maneuver	0	*445	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		1	-	-		-
Mov Cap-1 Maneuver	-	*445	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	13.4		0		0	
HCM LOS	B					
Minor Lane/Major Mvmt	NBT		NBRWBLn1		SBT	
Capacity (veh/h)	-		-		445	
HCM Lane V/C Ratio	-		-		0.04	
HCM Control Delay (s)	-		-		13.4	
HCM Lane LOS	-		-		B	
HCM 95th %tile Q(veh)	-		-		0.1	
Notes						
~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon						

Intersection												
Int Delay, s/veh	4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	5	1	4	12	1	1	1	1	1	3	3
Future Vol, veh/h	4	5	1	4	12	1	1	1	1	1	3	3
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	7	1	5	16	1	1	1	1	1	4	4
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	17	0	0	8	0	0	49	45	8	46	45	17
Stage 1	-	-	-	-	-	-	18	18	-	27	27	-
Stage 2	-	-	-	-	-	-	31	27	-	19	18	-
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	1600	-	-	1612	-	-	951	847	1074	955	847	1062
Stage 1	-	-	-	-	-	-	1001	880	-	990	873	-
Stage 2	-	-	-	-	-	-	986	873	-	1000	880	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1600	-	-	1612	-	-	940	842	1074	948	842	1062
Mov Cap-2 Maneuver	-	-	-	-	-	-	940	842	-	948	842	-
Stage 1	-	-	-	-	-	-	998	877	-	987	870	-
Stage 2	-	-	-	-	-	-	975	870	-	994	877	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	2.9			1.7			8.8			8.9		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	943	1600	-	-	1612	-	-	941				
HCM Lane V/C Ratio	0.004	0.003	-	-	0.003	-	-	0.01				
HCM Control Delay (s)	8.8	7.3	0	-	7.2	0	-	8.9				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0				

HCM 6th TWSC
5: Chambers Road & E. 33rd Place












2050 Background
PM Peak

Intersection												
Int Delay, s/veh	1.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↰			↰	↰ ↰ ↰ ↰			↰ ↰ ↰ ↰		
Traffic Vol, veh/h	0	0	130	0	0	19	27	2090	11	13	1425	19
Future Vol, veh/h	0	0	130	0	0	19	27	2090	11	13	1425	19
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	-	-	0	0	-	-	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, %	5	5	5	2	5	2	5	2	2	2	2	5
Mvmt Flow	0	0	141	0	0	21	29	2272	12	14	1549	21
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	-	785	-	-	1142	1570	0	0	2284	0	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	7.2	-	-	7.14	5.4	-	-	5.34	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.95	-	-	3.92	3.15	-	-	3.12	-	-
Pot Cap-1 Maneuver	0	0	283	0	0	*445	199	-	-	*559	-	-
Stage 1	0	0	-	0	0	-	-	-	-	-	-	-
Stage 2	0	0	-	0	0	-	-	-	-	-	-	-
Platoon blocked, %						1		-	-	1	-	-
Mov Cap-1 Maneuver	-	-	283	-	-	*445	199	-	-	*559	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	29.8		13.5		0.3		0.1					
HCM LOS	D		B									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	199	-	-	283	445	* 559	-	-				
HCM Lane V/C Ratio	0.147	-	-	0.499	0.046	0.025	-	-				
HCM Control Delay (s)	26.2	-	-	29.8	13.5	11.6	-	-				
HCM Lane LOS	D	-	-	D	B	B	-	-				
HCM 95th %tile Q(veh)	0.5	-	-	2.6	0.1	0.1	-	-				
Notes												
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined				*: All major volume in platoon				

Intersection												
Int Delay, s/veh	3.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	14	6	1	10	1	3	1	1	5	3	4
Future Vol, veh/h	3	14	6	1	10	1	3	1	1	5	3	4
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	19	8	1	13	1	4	1	1	7	4	5
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	14	0	0	27	0	0	51	47	23	48	51	14
Stage 1	-	-	-	-	-	-	31	31	-	16	16	-
Stage 2	-	-	-	-	-	-	20	16	-	32	35	-
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	1604	-	-	1587	-	-	948	845	1054	953	840	1066
Stage 1	-	-	-	-	-	-	986	869	-	1004	882	-
Stage 2	-	-	-	-	-	-	999	882	-	984	866	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1604	-	-	1587	-	-	937	842	1054	947	837	1066
Mov Cap-2 Maneuver	-	-	-	-	-	-	937	842	-	947	837	-
Stage 1	-	-	-	-	-	-	983	866	-	1001	881	-
Stage 2	-	-	-	-	-	-	988	881	-	978	863	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.9			0.6			8.9			8.9		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	937	1604	-	-	1587	-	-	951				
HCM Lane V/C Ratio	0.007	0.002	-	-	0.001	-	-	0.017				
HCM Control Delay (s)	8.9	7.2	0	-	7.3	0	-	8.9				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1				

Lanes, Volumes, Timings
12: Chambers Road & E. 32nd Avenue

2050 Background
PM Peak

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	175	175	1955	175	175	1380
Future Volume (vph)	175	175	1955	175	175	1380
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	0.91
Frt		0.850	0.988			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	5024	0	1770	5085
Flt Permitted	0.950				0.062	
Satd. Flow (perm)	1770	1583	5024	0	115	5085
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		172	23			
Link Speed (mph)	30		40			40
Link Distance (ft)	977		735			980
Travel Time (s)	22.2		12.5			16.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	190	190	2125	190	190	1500
Shared Lane Traffic (%)						
Lane Group Flow (vph)	190	190	2315	0	190	1500
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (ft)	20	20	100		20	100
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	20	6		20	6
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8			6	
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0

Lanes, Volumes, Timings
12: Chambers Road & E. 32nd Avenue

2050 Background
PM Peak

	↖	↗	↑	↘	↙	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Minimum Split (s)	23.0	23.0	23.0		10.0	23.0
Total Split (s)	25.0	25.0	60.0		15.0	75.0
Total Split (%)	25.0%	25.0%	60.0%		15.0%	75.0%
Maximum Green (s)	20.0	20.0	55.0		10.0	70.0
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.5	1.5	1.5		1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)	7.0	7.0	7.0			7.0
Flash Dont Walk (s)	11.0	11.0	11.0			11.0
Pedestrian Calls (#/hr)	0	0	0			0
Act Effect Green (s)	15.6	15.6	59.4		74.4	74.4
Actuated g/C Ratio	0.16	0.16	0.59		0.74	0.74
v/c Ratio	0.69	0.49	0.77		0.76	0.40
Control Delay	52.7	11.8	18.2		41.0	5.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	52.7	11.8	18.2		41.0	5.3
LOS	D	B	B		D	A
Approach Delay	32.2		18.2			9.3
Approach LOS	C		B			A

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

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

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 16.0

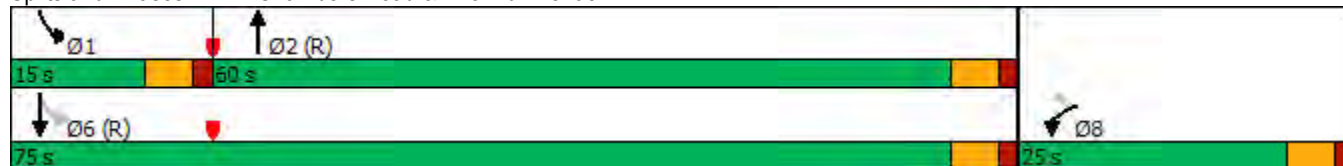
Intersection LOS: B

Intersection Capacity Utilization 73.6%

ICU Level of Service D







Analysis Period (min) 15

Splits and Phases: 12: Chambers Road & E. 32nd Avenue



HCM 6th TWSC
1: Chambers Road & E 35th Avenue

2050 Total
AM Peak

Intersection						
Int Delay, s/veh	0.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		 	 			 
Traffic Vol, veh/h	0	84	1129	26	0	1473
Future Vol, veh/h	0	84	1129	26	0	1473
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	90	1214	28	0	1584

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	-	621	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	7.14	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	3.92	-
Pot Cap-1 Maneuver	0	*678	-
Stage 1	0	-	-
Stage 2	0	-	-
Platoon blocked, %	-	1	-
Mov Cap-1 Maneuver	-	*678	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-




Approach	WB	NB	SB
HCM Control Delay, s	11.1	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBT
Capacity (veh/h)	-	-	678
HCM Lane V/C Ratio	-	-	0.133
HCM Control Delay (s)	-	-	11.1
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.5

Notes			
~: Volume exceeds capacity	\$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon




HCM 6th TWSC
2: West Site Access & E 35th Avenue/E 35th Ave

2050 Total
AM Peak

Intersection						
Int Delay, s/veh	4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	18	8	0	36	48	0
Future Vol, veh/h	18	8	0	36	48	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	24	11	0	48	64	0
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	35	0	78	30
Stage 1	-	-	-	-	30	-
Stage 2	-	-	-	-	48	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1576	-	925	1044
Stage 1	-	-	-	-	993	-
Stage 2	-	-	-	-	974	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1576	-	925	1044
Mov Cap-2 Maneuver	-	-	-	-	925	-
Stage 1	-	-	-	-	993	-
Stage 2	-	-	-	-	974	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		9.2	
HCM LOS					A	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	925	-	-	1576	-	
HCM Lane V/C Ratio	0.069	-	-	-	-	
HCM Control Delay (s)	9.2	-	-	0	-	
HCM Lane LOS	A	-	-	A	-	
HCM 95th %tile Q(veh)	0.2	-	-	0	-	

HCM 6th TWSC
3: East Site Access & E 35th Ave

2050 Total
AM Peak

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	17	1	0	35	1	0
Future Vol, veh/h	17	1	0	35	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	23	1	0	47	1	0





Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	24	0	71
Stage 1	-	-	-	-	24
Stage 2	-	-	-	-	47
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1591	-	933
Stage 1	-	-	-	-	999
Stage 2	-	-	-	-	975
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1591	-	933
Mov Cap-2 Maneuver	-	-	-	-	933
Stage 1	-	-	-	-	999
Stage 2	-	-	-	-	975

Approach	EB	WB	NB
HCM Control Delay, s	0	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	933	-	-	1591	-
HCM Lane V/C Ratio	0.001	-	-	-	-
HCM Control Delay (s)	8.9	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-











HCM 6th TWSC
4: Helena St & E 35th Ave

2050 Total
AM Peak

Intersection												
Int Delay, s/veh	3.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	15	1	1	20	1	7	1	2	1	3	8
Future Vol, veh/h	1	15	1	1	20	1	7	1	2	1	3	8
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	20	1	1	27	1	9	1	3	1	4	11
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	28	0	0	21	0	0	60	53	21	55	53	28
Stage 1	-	-	-	-	-	-	23	23	-	30	30	-
Stage 2	-	-	-	-	-	-	37	30	-	25	23	-
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	1585	-	-	1595	-	-	936	838	1056	943	838	1047
Stage 1	-	-	-	-	-	-	995	876	-	987	870	-
Stage 2	-	-	-	-	-	-	978	870	-	993	876	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1585	-	-	1595	-	-	922	836	1056	938	836	1047
Mov Cap-2 Maneuver	-	-	-	-	-	-	922	836	-	938	836	-
Stage 1	-	-	-	-	-	-	994	875	-	986	869	-
Stage 2	-	-	-	-	-	-	963	869	-	988	875	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.3			8.9			8.8		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	936	1585	-	-	1595	-	-	976				
HCM Lane V/C Ratio	0.014	0.001	-	-	0.001	-	-	0.016				
HCM Control Delay (s)	8.9	7.3	0	-	7.3	0	-	8.8				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1				

HCM 6th TWSC
5: Chambers Road & E. 33rd Place

2050 Total
AM Peak

Intersection												
Int Delay, s/veh	2.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations							 	  		  		
Traffic Vol, veh/h	0	0	45	0	0	38	105	1119	40	60	1310	102
Future Vol, veh/h	0	0	45	0	0	38	105	1119	40	60	1310	102
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	-	-	0	200	-	-	200	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	5	5	5	2	5	2	5	2	2	2	2	5
Mvmt Flow	0	0	48	0	0	41	113	1203	43	65	1409	110
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	-	760	-	-	623	1519	0	0	1246	0	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	7.2	-	-	7.14	5.4	-	-	5.34	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.95	-	-	3.92	3.15	-	-	3.12	-	-
Pot Cap-1 Maneuver	0	0	294	0	0	*678	212	-	-	768	-	-
Stage 1	0	0	-	0	0	-	-	-	-	-	-	-
Stage 2	0	0	-	0	0	-	-	-	-	-	-	-
Platoon blocked, %						1		-	-	1	-	-
Mov Cap-1 Maneuver	-	-	294	-	-	*678	212	-	-	768	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	19.6		10.7		3.3		0.4					
HCM LOS	C		B									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	212	-	-	294	678	768	-	-				
HCM Lane V/C Ratio	0.533	-	-	0.165	0.06	0.084	-	-				
HCM Control Delay (s)	39.8	-	-	19.6	10.7	10.1	-	-				
HCM Lane LOS	E	-	-	C	B	B	-	-				
HCM 95th %tile Q(veh)	2.8	-	-	0.6	0.2	0.3	-	-				
Notes												
~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon												

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	63	28	9	0	6	0	4	0	0	0	0	28
Future Vol, veh/h	63	28	9	0	6	0	4	0	0	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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	84	37	12	0	8	0	5	0	0	0	0	37




Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	8	0	0	49	0	0	238	219	43	219	225	8
Stage 1	-	-	-	-	-	-	211	211	-	8	8	-
Stage 2	-	-	-	-	-	-	27	8	-	211	217	-
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	1612	-	-	1558	-	-	716	679	1027	737	674	1074
Stage 1	-	-	-	-	-	-	791	728	-	1013	889	-
Stage 2	-	-	-	-	-	-	990	889	-	791	723	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1612	-	-	1558	-	-	662	642	1027	707	638	1074
Mov Cap-2 Maneuver	-	-	-	-	-	-	662	642	-	707	638	-
Stage 1	-	-	-	-	-	-	748	689	-	958	889	-
Stage 2	-	-	-	-	-	-	956	889	-	748	684	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	4.6			0			10.5			8.5		
HCM LOS							B			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	662	1612	-	-	1558	-	-	1074
HCM Lane V/C Ratio	0.008	0.052	-	-	-	-	-	0.035
HCM Control Delay (s)	10.5	7.4	0	-	0	-	-	8.5
HCM Lane LOS	B	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0.2	-	-	0	-	-	0.1





HCM 6th TWSC
7: E 35th PI & East Site Access

2050 Total
AM Peak

Intersection						
Int Delay, s/veh	3.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	14	14	5	0	0	1
Future Vol, veh/h	14	14	5	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	15	5	0	0	1
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	5	0	-	0	50	5
Stage 1	-	-	-	-	5	-
Stage 2	-	-	-	-	45	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1616	-	-	-	959	1078
Stage 1	-	-	-	-	1018	-
Stage 2	-	-	-	-	977	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1616	-	-	-	950	1078
Mov Cap-2 Maneuver	-	-	-	-	950	-
Stage 1	-	-	-	-	1009	-
Stage 2	-	-	-	-	977	-
Approach	EB	WB		SB		
HCM Control Delay, s	3.6	0		8.3		
HCM LOS	A					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1616	-	-	-	1078	
HCM Lane V/C Ratio	0.009	-	-	-	0.001	
HCM Control Delay (s)	7.2	0	-	-	8.3	
HCM Lane LOS	A	A	-	-	A	
HCM 95th %tile Q(veh)	0	-	-	-	0	












HCM 6th TWSC
8: Helena St & E 35th PI

2050 Total
AM Peak

Intersection												
Int Delay, s/veh	4.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	8	2	1	1	1	3	1	1	1	3	1
Future Vol, veh/h	4	8	2	1	1	1	3	1	1	1	3	1
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	11	3	1	1	1	4	1	1	1	4	1
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2	0	0	14	0	0	29	27	13	28	28	2
Stage 1	-	-	-	-	-	-	23	23	-	4	4	-
Stage 2	-	-	-	-	-	-	6	4	-	24	24	-
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	1620	-	-	1604	-	-	980	866	1067	981	865	1082
Stage 1	-	-	-	-	-	-	995	876	-	1018	892	-
Stage 2	-	-	-	-	-	-	1016	892	-	994	875	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1620	-	-	1604	-	-	972	863	1067	976	862	1082
Mov Cap-2 Maneuver	-	-	-	-	-	-	972	863	-	976	862	-
Stage 1	-	-	-	-	-	-	992	873	-	1015	891	-
Stage 2	-	-	-	-	-	-	1009	891	-	988	872	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	2.1			2.4			8.8			8.9		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	965	1620	-	-	1604	-	-	921				
HCM Lane V/C Ratio	0.007	0.003	-	-	0.001	-	-	0.007				
HCM Control Delay (s)	8.8	7.2	0	-	7.2	0	-	8.9				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0				

Lanes, Volumes, Timings
22: Chambers Rd/Chambers Road & E. 32nd Avenue

2050 Total
AM Peak

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	165	165	1100	155	155	1200
Future Volume (vph)	165	165	1100	155	155	1200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	0.91
Frt		0.850	0.982			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	4994	0	1770	5085
Flt Permitted	0.950				0.146	
Satd. Flow (perm)	1770	1583	4994	0	272	5085
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		179	40			
Link Speed (mph)	30		30			30
Link Distance (ft)	940		645			928
Travel Time (s)	21.4		14.7			21.1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	179	179	1196	168	168	1304
Shared Lane Traffic (%)						
Lane Group Flow (vph)	179	179	1364	0	168	1304
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		24			24
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60	60		60	60	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (ft)	20	20	100		20	100
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	20	6		20	6
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8			6	
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0

Lanes, Volumes, Timings
22: Chambers Rd/Chambers Road & E. 32nd Avenue

2050 Total
AM Peak

	↖	↗	↑	↘	↙	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Minimum Split (s)	23.0	23.0	23.0		10.0	23.0
Total Split (s)	25.0	25.0	60.0		15.0	75.0
Total Split (%)	25.0%	25.0%	60.0%		15.0%	75.0%
Maximum Green (s)	20.0	20.0	55.0		10.0	70.0
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.5	1.5	1.5		1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)	7.0	7.0	7.0			7.0
Flash Dont Walk (s)	11.0	11.0	11.0			11.0
Pedestrian Calls (#/hr)	0	0	0			0
Act Effect Green (s)	15.1	15.1	61.8		74.9	74.9
Actuated g/C Ratio	0.15	0.15	0.62		0.75	0.75
v/c Ratio	0.67	0.46	0.44		0.52	0.34
Control Delay	52.1	9.5	10.9		9.8	4.8
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	52.1	9.5	10.9		9.8	4.8
LOS	D	A	B		A	A
Approach Delay	30.8		10.9			5.4
Approach LOS	C		B			A

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

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

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 10.6

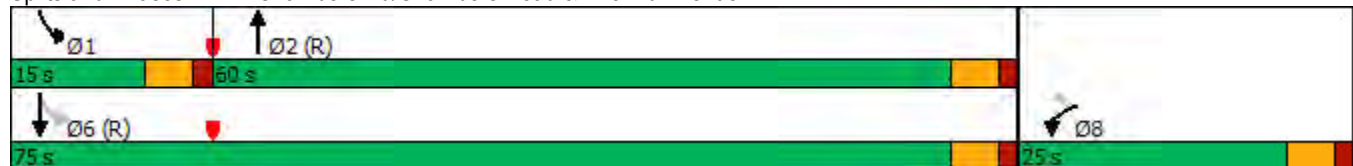
Intersection LOS: B

Intersection Capacity Utilization 54.9%

ICU Level of Service A







Analysis Period (min) 15

Splits and Phases: 22: Chambers Rd/Chambers Road & E. 32nd Avenue



HCM 6th TWSC
1: Chambers Road & E 35th Avenue

2050 Total
PM Peak

Intersection						
Int Delay, s/veh	0.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		 	 			 
Traffic Vol, veh/h	0	64	2100	25	0	1557
Future Vol, veh/h	0	64	2100	25	0	1557
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	70	2283	27	0	1692

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	-	1155	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	7.14	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	3.92	-
Pot Cap-1 Maneuver	0	*445	-
Stage 1	0	-	-
Stage 2	0	-	-
Platoon blocked, %	-	1	-
Mov Cap-1 Maneuver	-	*445	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-




Approach	WB	NB	SB
HCM Control Delay, s	14.6	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBT
Capacity (veh/h)	-	-	445
HCM Lane V/C Ratio	-	-	0.156
HCM Control Delay (s)	-	-	14.6
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.5

Notes			
~: Volume exceeds capacity	\$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon




HCM 6th TWSC
2: West Site Access & E 35th Avenue/E 35th Ave

2050 Total
PM Peak

Intersection						
Int Delay, s/veh	4.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	13	12	0	19	45	0
Future Vol, veh/h	13	12	0	19	45	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	16	0	25	60	0
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	33	0	50	25
Stage 1	-	-	-	-	25	-
Stage 2	-	-	-	-	25	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1579	-	959	1051
Stage 1	-	-	-	-	998	-
Stage 2	-	-	-	-	998	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1579	-	959	1051
Mov Cap-2 Maneuver	-	-	-	-	959	-
Stage 1	-	-	-	-	998	-
Stage 2	-	-	-	-	998	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		9	
HCM LOS					A	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	959	-	-	1579	-	
HCM Lane V/C Ratio	0.063	-	-	-	-	
HCM Control Delay (s)	9	-	-	0	-	
HCM Lane LOS	A	-	-	A	-	
HCM 95th %tile Q(veh)	0.2	-	-	0	-	





HCM 6th TWSC
3: East Site Access & E 35th Ave

2050 Total
PM Peak

Intersection						
Int Delay, s/veh	0.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	10	3	0	16	3	0
Future Vol, veh/h	10	3	0	16	3	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	4	0	21	4	0
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	17	0	36	15
Stage 1	-	-	-	-	15	-
Stage 2	-	-	-	-	21	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1600	-	977	1065
Stage 1	-	-	-	-	1008	-
Stage 2	-	-	-	-	1002	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1600	-	977	1065
Mov Cap-2 Maneuver	-	-	-	-	977	-
Stage 1	-	-	-	-	1008	-
Stage 2	-	-	-	-	1002	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		8.7	
HCM LOS					A	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	977	-	-	1600	-	
HCM Lane V/C Ratio	0.004	-	-	-	-	
HCM Control Delay (s)	8.7	-	-	0	-	
HCM Lane LOS	A	-	-	A	-	
HCM 95th %tile Q(veh)	0	-	-	0	-	








HCM 6th TWSC
4: Helena St & E 35th Ave

2050 Total
PM Peak

Intersection												
Int Delay, s/veh	4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	5	1	4	12	1	1	1	1	1	3	3
Future Vol, veh/h	4	5	1	4	12	1	1	1	1	1	3	3
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	7	1	5	16	1	1	1	1	1	4	4
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	17	0	0	8	0	0	49	45	8	46	45	17
Stage 1	-	-	-	-	-	-	18	18	-	27	27	-
Stage 2	-	-	-	-	-	-	31	27	-	19	18	-
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	1600	-	-	1612	-	-	951	847	1074	955	847	1062
Stage 1	-	-	-	-	-	-	1001	880	-	990	873	-
Stage 2	-	-	-	-	-	-	986	873	-	1000	880	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1600	-	-	1612	-	-	940	842	1074	948	842	1062
Mov Cap-2 Maneuver	-	-	-	-	-	-	940	842	-	948	842	-
Stage 1	-	-	-	-	-	-	998	877	-	987	870	-
Stage 2	-	-	-	-	-	-	975	870	-	994	877	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	2.9			1.7			8.8			8.9		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	943	1600	-	-	1612	-	-	941				
HCM Lane V/C Ratio	0.004	0.003	-	-	0.003	-	-	0.01				
HCM Control Delay (s)	8.8	7.3	0	-	7.2	0	-	8.9				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0				

HCM 6th TWSC
5: Chambers Road & E. 33rd Place

2050 Total
PM Peak

Intersection												
Int Delay, s/veh	1.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	130	0	0	50	27	2084	62	91	1444	19
Future Vol, veh/h	0	0	130	0	0	50	27	2084	62	91	1444	19
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	-	-	0	200	-	-	200	-	-
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	95	92	92
Heavy Vehicles, %	5	5	5	2	5	2	5	2	2	1	2	5
Mvmt Flow	0	0	141	0	0	54	29	2265	67	96	1570	21

Major/Minor	Minor2		Minor1		Major1		Major2	
Conflicting Flow All	-	-	796	-	-	1166	1591	0
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	7.2	-	-	7.14	5.4	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.95	-	-	3.92	3.15	-
Pot Cap-1 Maneuver	0	0	278	0	0	*445	195	-
Stage 1	0	0	-	0	0	-	-	-
Stage 2	0	0	-	0	0	-	-	-
Platoon blocked, %						1	-	1
Mov Cap-1 Maneuver	-	-	278	-	-	*445	195	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	30.6	14.2	0.3	0.7
HCM LOS	D	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	195	-	-	278	445	543	-
HCM Lane V/C Ratio	0.151	-	-	0.508	0.122	0.176	-
HCM Control Delay (s)	26.7	-	-	30.6	14.2	13	-
HCM Lane LOS	D	-	-	D	B	B	-
HCM 95th %tile Q(veh)	0.5	-	-	2.7	0.4	0.6	-

Notes			
~: Volume exceeds capacity	\$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection

Int Delay, s/veh 3.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	72	80	1	0	20	0	2	0	0	0	0	28
Future Vol, veh/h	72	80	1	0	20	0	2	0	0	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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	96	107	1	0	27	0	3	0	0	0	0	37




Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	27	0	0	108	0	0	346	327	108	327	327	27
Stage 1	-	-	-	-	-	-	300	300	-	27	27	-
Stage 2	-	-	-	-	-	-	46	27	-	300	300	-
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	1587	-	-	1483	-	-	608	591	946	626	591	1048
Stage 1	-	-	-	-	-	-	709	666	-	990	873	-
Stage 2	-	-	-	-	-	-	968	873	-	709	666	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1587	-	-	1483	-	-	558	553	946	595	553	1048
Mov Cap-2 Maneuver	-	-	-	-	-	-	558	553	-	595	553	-
Stage 1	-	-	-	-	-	-	664	623	-	927	873	-
Stage 2	-	-	-	-	-	-	934	873	-	664	623	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	3.5			0			11.5			8.6		
HCM LOS							B			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	558	1587	-	-	1483	-	-	1048
HCM Lane V/C Ratio	0.005	0.06	-	-	-	-	-	0.036
HCM Control Delay (s)	11.5	7.4	0	-	0	-	-	8.6
HCM Lane LOS	B	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0.2	-	-	0	-	-	0.1





HCM 6th TWSC
7: E 35th PI & East Site Access

2050 Total
PM Peak

Intersection						
Int Delay, s/veh	4.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	57	23	17	0	0	3
Future Vol, veh/h	57	23	17	0	0	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	62	25	18	0	0	3
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	18	0	-	0	167	18
Stage 1	-	-	-	-	18	-
Stage 2	-	-	-	-	149	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1599	-	-	-	823	1061
Stage 1	-	-	-	-	1005	-
Stage 2	-	-	-	-	879	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1599	-	-	-	791	1061
Mov Cap-2 Maneuver	-	-	-	-	791	-
Stage 1	-	-	-	-	966	-
Stage 2	-	-	-	-	879	-
Approach	EB	WB		SB		
HCM Control Delay, s	5.2	0		8.4		
HCM LOS				A		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1599	-	-	-	1061	
HCM Lane V/C Ratio	0.039	-	-	-	0.003	
HCM Control Delay (s)	7.3	0	-	-	8.4	
HCM Lane LOS	A	A	-	-	A	
HCM 95th %tile Q(veh)	0.1	-	-	-	0	












HCM 6th TWSC
8: Helena St & E 35th PI

2050 Total
PM Peak

Intersection												
Int Delay, s/veh	3.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	14	7	1	10	1	3	1	1	5	3	4
Future Vol, veh/h	3	14	7	1	10	1	3	1	1	5	3	4
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, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	19	9	1	13	1	4	1	1	7	4	5
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	14	0	0	28	0	0	52	48	24	49	52	14
Stage 1	-	-	-	-	-	-	32	32	-	16	16	-
Stage 2	-	-	-	-	-	-	20	16	-	33	36	-
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	1604	-	-	1585	-	-	947	844	1052	951	839	1066
Stage 1	-	-	-	-	-	-	984	868	-	1004	882	-
Stage 2	-	-	-	-	-	-	999	882	-	983	865	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1604	-	-	1585	-	-	936	841	1052	945	836	1066
Mov Cap-2 Maneuver	-	-	-	-	-	-	936	841	-	945	836	-
Stage 1	-	-	-	-	-	-	981	865	-	1001	881	-
Stage 2	-	-	-	-	-	-	988	881	-	977	862	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.9			0.6			8.9			8.9		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	935	1604	-	-	1585	-	-	950				
HCM Lane V/C Ratio	0.007	0.002	-	-	0.001	-	-	0.017				
HCM Control Delay (s)	8.9	7.2	0	-	7.3	0	-	8.9				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1				

Lanes, Volumes, Timings
22: Chambers Rd/Chambers Road & E. 32nd Avenue

2050 Total
PM Peak

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	175	175	2000	175	175	1400
Future Volume (vph)	175	175	2000	175	175	1400
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	0.91
Frt		0.850	0.988			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	5024	0	1770	5085
Flt Permitted	0.950				0.062	
Satd. Flow (perm)	1770	1583	5024	0	115	5085
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		123	24			
Link Speed (mph)	35		40			40
Link Distance (ft)	940		645			928
Travel Time (s)	18.3		11.0			15.8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	190	190	2174	190	190	1522
Shared Lane Traffic (%)						
Lane Group Flow (vph)	190	190	2364	0	190	1522
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		24			24
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (ft)	20	20	100		20	100
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	20	6		20	6
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8			6	
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0

Lanes, Volumes, Timings
22: Chambers Rd/Chambers Road & E. 32nd Avenue

2050 Total
PM Peak

	↖	↗	↑	↘	↙	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Minimum Split (s)	23.0	23.0	23.0		10.0	35.0
Total Split (s)	25.0	25.0	63.0		12.0	75.0
Total Split (%)	25.0%	25.0%	63.0%		12.0%	75.0%
Maximum Green (s)	20.0	20.0	58.0		7.0	70.0
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.5	1.5	1.5		1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)	7.0	7.0	7.0			7.0
Flash Dont Walk (s)	11.0	11.0	11.0			11.0
Pedestrian Calls (#/hr)	0	0	0			0
Act Effect Green (s)	15.6	15.6	59.3		74.4	74.4
Actuated g/C Ratio	0.16	0.16	0.59		0.74	0.74
v/c Ratio	0.69	0.54	0.79		0.75	0.40
Control Delay	52.7	20.3	18.2		41.6	5.4
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	52.7	20.3	18.2		41.6	5.4
LOS	D	C	B		D	A
Approach Delay	36.5		18.2			9.4
Approach LOS	D		B			A

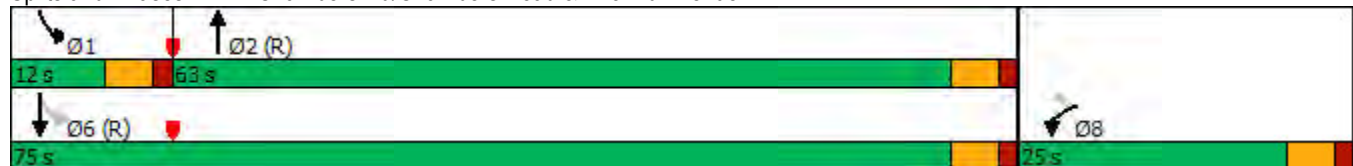
Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 16.4
Intersection Capacity Utilization 74.4%
Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service D

Splits and Phases: 22: Chambers Rd/Chambers Road & E. 32nd Avenue



Drive-Through Queue Generation

Mike Spack, PE, PTOE, Max Moreland, EIT, Lindsay de Leeuw, Nate Hood

1.0 Introduction

This report provides queuing data for businesses with drive-through services. It is intended to be an aid for site designers and reviewers, similar to the Institute of Transportation Engineers' *Trip Generation* and *Parking Generation* reports. The data presentation is modeled on the *Parking Generation* report and data is provided based on at least six sites, similar to data sets marked as statistically significant in *Trip Generation*.

Businesses with drive-through lanes are very common in the United States and having data that gives usage information for drive-through lanes will assist designers as well as cities in determining the appropriate amount of storage needed for proposed drive-through businesses. Data for drive-through queues was published by the ITE Technical Council Committee 5D-10 in 1995 based on information collected between the late 1960's and the 1990's. A paper was also published in 2009 by Mark Stuecheli, PTP giving updated information for bank and coffee shop drive-through lanes. The results from the 2009 study are incorporated into this paper (thank you Mark for your assistance).

2.0 Data Collection

Data was collected using COUNTcam video recording systems at a total of 30 drive-through locations in Minneapolis, MN and several surrounding suburbs between 2010 and 2012 (26 of the 30 videos were recorded in February of 2012, which should represent peak usage in the cold Minnesota winter). Videos of drive-through lanes were collected at banks, car washes, coffee shops, fast food restaurants and pharmacies. A total of six locations were selected for each of the five different land uses. Each location was recorded for between one and five days where the majority of locations were recorded for two consecutive days. The days of the week that each video was recorded on varies.

The 24-hour videos were watched at high speeds with the PC-TAS counting software and maximum queues throughout the day were noted. Most of the COUNTcams were set up such that the entire queue lane could be seen, but at a few locations the drive-through lanes wrapped around the building in a way that the entire queue length would not be able to be seen. For these situations, the COUNTcams were set up so that the ordering window and back of the queue could be seen and it was noted how many vehicles could fit between the ordering window and the front of the queue. For drive-through locations with multiple lanes, the number of lanes was noted but the maximum queue is defined as the sum of the queues at each lane for any given point in time, not the queue per lane. This approach provides overall demand, which may assist designers in determining how many drive through lanes are appropriate in addition to determining how long they should be.

Once the maximum queue for each day at each location was determined, the data was compiled and statistics for each land use were calculated. The average maximum queue, standard deviation, coefficient of variation, range, 85th percentile and 33rd percentile were calculated for each land use.

Data for drive-through coffee shops and banks from the Kansas City, Kansas metropolitan area was published in the 2009 paper New Drive-Through Stacking Information for Banks and Coffee Shops by Mark Stuecheli. This data is included in the analysis.

3.0 Data Analysis

Based on the peak queue lengths, it is apparent that each land use will require a different minimum drive through stacking distance. The results for each land use can be found below. The peak queue lengths for each location, broken down by land use and day of the week, can be found in the Appendix.

3.1 Banks

Data collection was done at six banks with drive-through services (including one credit union) in August 2011 and February 2012. Twelve days of data were collected. The banks were located in the cities of Minneapolis, Robbinsdale and St. Louis Park, MN.

All of the locations had a lane with a drive-through ATM and at least two other lanes. Though service times may differ for ATM lanes compared to the regular lanes, the maximum queues were counted together. This is because based upon what was observed, vehicles would occasionally switch the lane they were in. For example, a vehicle waiting in the ATM line with a queue of three vehicles may move over to a regular line with a queue of only one vehicle. Much of what can be done at the bank's drive-through lane can also be accomplished at that bank's ATM and vice versa. Vehicles being served were counted as being in the queue.

Nine days of data from the Kansas City, Kansas area is also included. This data does not factor in vehicles in ATM lanes.

Table 3.1 – Drive-Through Bank Maximum Queue Statistics

	Minnesota Data	Minnesota + Kansas Data
Number of Data Points	12	21
Average Maximum Queue (Vehicles)	5.83	5.76
Standard Deviation (Vehicles)	1.85	2.21
Coefficient of Variation	32%	38%
Range (Vehicles)	3 to 8	1 to 10
85th Percentile (Vehicles)	8.00	8.00
33rd Percentile (Vehicles)	5.00	5.00

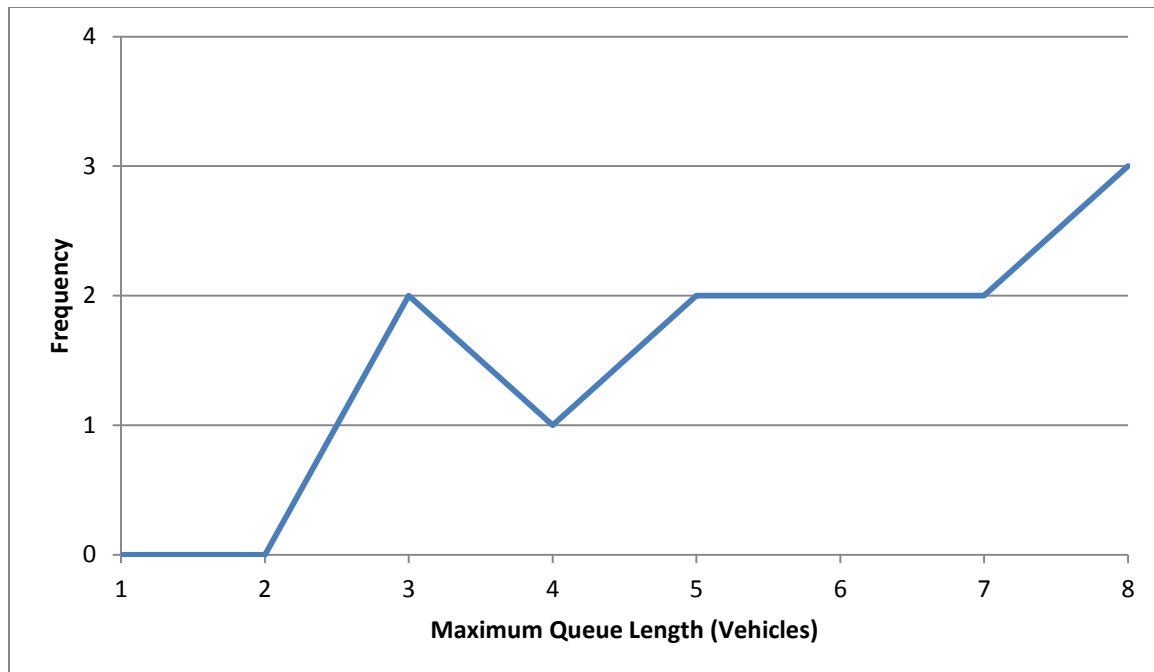


Figure 3.1.1 – Drive-Through Bank Maximum Queue Frequency – Minnesota Data



Figure 3.1.2 – Drive-Through Bank Maximum Queue Frequency – Minnesota + Kansas Data

The data for Kansas banks was collected between 4:30pm and 6:00pm. While many of the maximum queues for the data collected in Minnesota were between these times, maximum queues occurred between 8:30am and 5:30pm so it is possible that some of the Kansas data does not capture the actual maximum queues for the day.

The number of available lanes at banks, not including the ATM lane, ranged from two to seven lanes (though the most open at one time was five lanes). Even though plenty of lanes were available, cars often stacked at the lane closest to the building, thus additional lanes may not result in shorter queues. With an 85th percentile maximum queue of eight vehicles, the data suggests that banks with drive-through lanes should be able to accommodate 160 feet of vehicle stacking.

3.2 Car Washes

Data collection was done at six car washes with drive-through services (including one full-service car wash) in February 2012. Twelve days of data were collected. The car washes were located in the cities of Falcon Heights, Hopkins, Minneapolis, Roseville and St. Louis Park, MN. Five of the six car washes (excluding the full-service car wash) were located at gas stations. Only the vehicles waiting in line were counted; vehicles being washed were not added to the queue.

Table 3.2 – Drive-Through Car Wash Maximum Queue Statistics

Number of Data Points	12
Average Maximum Queue (Vehicles)	4.42
Standard Deviation (Vehicles)	2.31
Coefficient of Variation	52%
Range (Vehicles)	1 to 10
85th Percentile (Vehicles)	6.20
33rd Percentile (Vehicles)	3.00

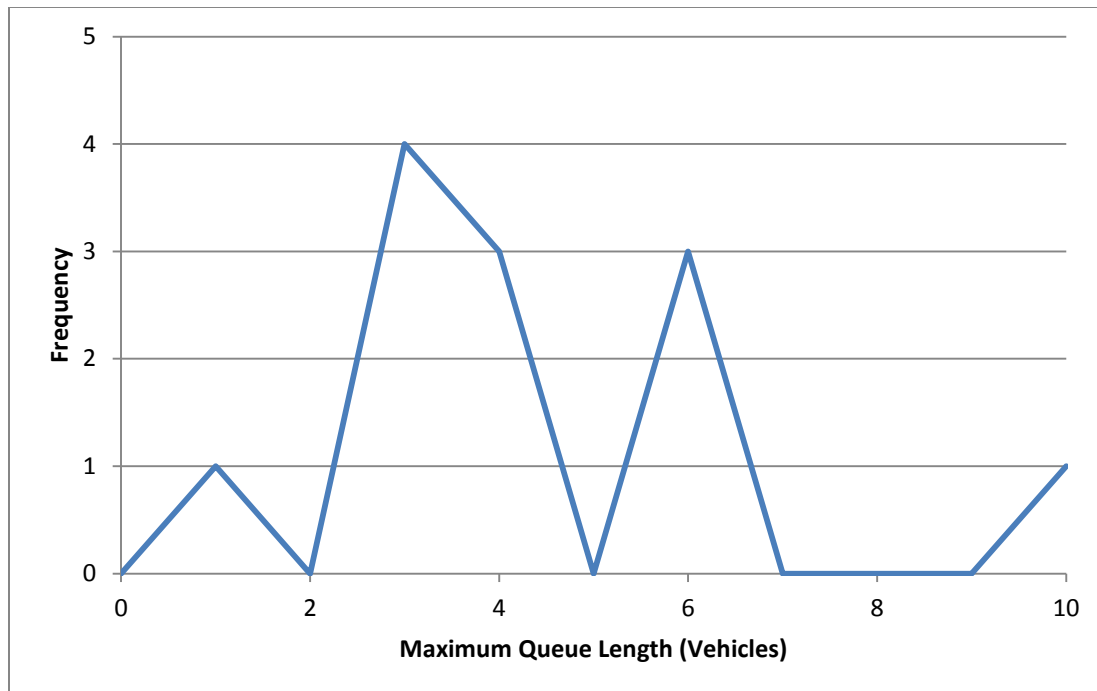


Figure 3.2 – Drive-Through Car Wash Maximum Queue Frequency

Two of the car washes had two lanes while the other four were one lane car washes. The full-service car wash had two lanes and also produced the highest maximum queue of 10 vehicles. The maximum queues for car washes were spread throughout the afternoon from 12:30pm to 8:30pm. With an 85th percentile maximum queue of more than six vehicles, the data suggests that car washes with drive-through lanes should be able to accommodate 140 feet of vehicle stacking throughout the day.

3.3 Coffee Shops

Data collection was done at six coffee shops with drive-through services in November 2010, August 2011 and February 2012. Fourteen days of data were collected. The coffee shops were located in the cities of Edina, Hopkins, Minneapolis, Roseville and St. Louis Park, MN. Vehicles being served were counted as being in the queue. Twelve days of data from the Kansas City, Kansas area is also included.

Table 3.3 – Drive-Through Coffee Shop Maximum Queue Statistics

	Minnesota Data	Minnesota + Kansas Data
Number of Data Points	14	26
Average Maximum Queue (Vehicles)	11.00	10.23
Standard Deviation (Vehicles)	2.25	2.76
Coefficient of Variation	20%	27%
Range (Vehicles)	7 to 16	3 to 16
85th Percentile (Vehicles)	13.50	13.00
33rd Percentile (Vehicles)	10.00	9.91



Figure 3.3.1 – Drive-Through Coffee Shop Maximum Queue Frequency – Minnesota Data

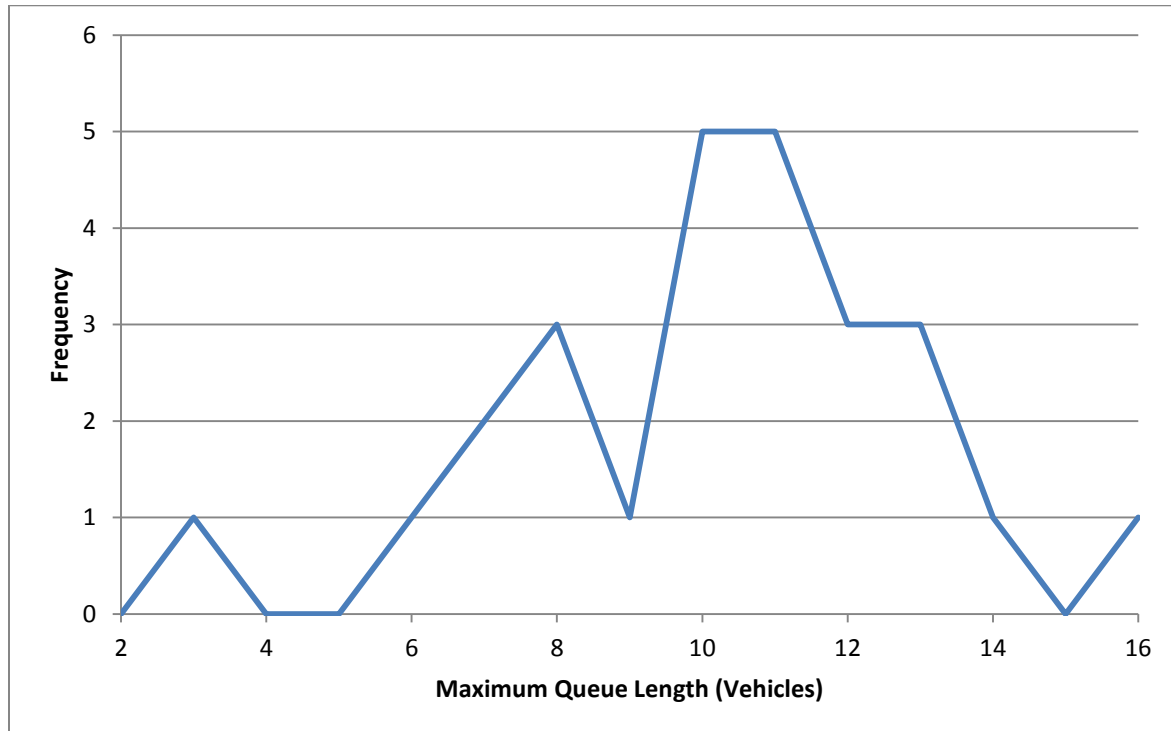


Figure 3.3.2 – Drive-Through Coffee Shop Maximum Queue Frequency – MN + KS Data

Coffee shops produced the longest maximum queues of any of the land uses in this study with all of the maximum queues occurring in the morning. In four of the six cases, the queues spilled out of the parking lot and into the street. These spillovers would typically only happen once or twice a day and last only a few minutes, however, one location had stacking into the street for about 15 minutes in addition to multiple periods of several minutes where cars would queue in the street.

With an 85th percentile maximum queue of 13 vehicles, the data suggests that coffee shops with drive-through lanes should be able to accommodate at least 260 feet of vehicle stacking during morning hours.

3.4 Fast Food Restaurants

Data collection was done at six fast food restaurants with drive-through services in August 2011 and February 2012. Fourteen days of data were collected. The restaurants were located in the cities of Golden Valley, Hopkins, Minneapolis and St. Louis Park, MN. Vehicles being served were counted as being in the queue.

Table 3.4 – Drive-Through Fast Food Restaurant Maximum Queue Statistics

Number of Data Points	14
Average Maximum Queue (Vehicles)	8.50
Standard Deviation (Vehicles)	2.68
Coefficient of Variation	32%
Range (Vehicles)	5-13
85th Percentile (Vehicles)	12.00
33rd Percentile (Vehicles)	7.90

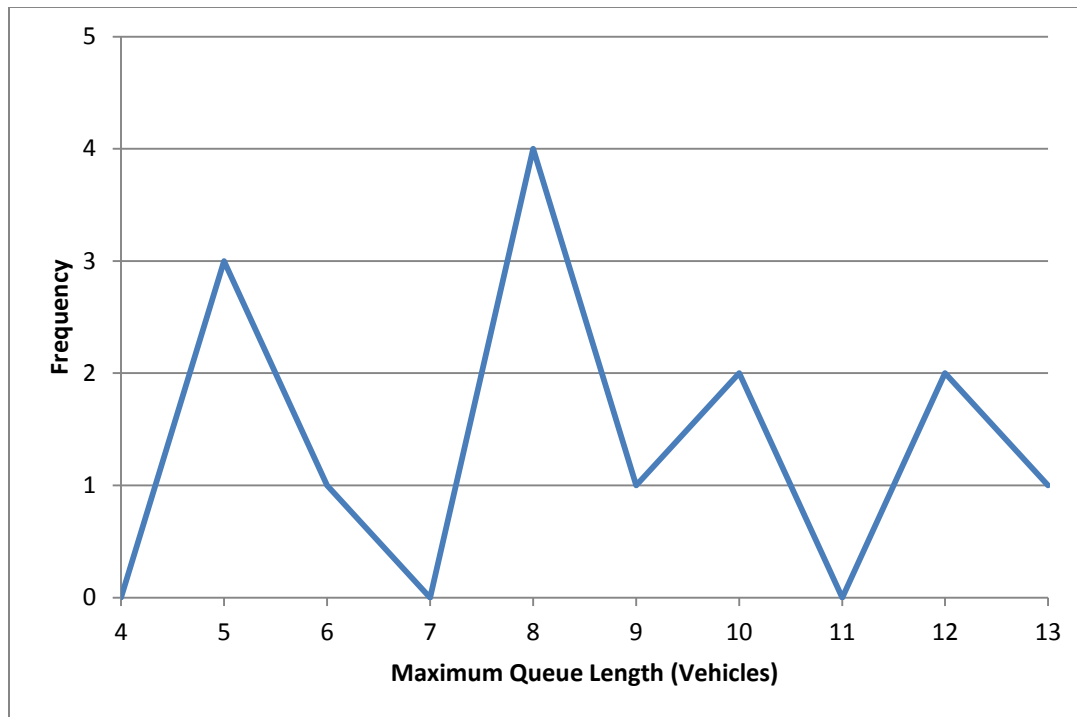


Figure 3.4 – Drive-Through Fast Food Restaurant Maximum Queue Frequency

The maximum queues for fast food restaurants were spread throughout the day from 8:00am to 10:00pm. With an 85th percentile maximum queue of 12 vehicles, the data suggests that fast food restaurants with drive-through lanes should be able to accommodate 240 feet of vehicle stacking throughout the day.

3.5 Pharmacies

Data collection was done at six pharmacies with drive-through services in February 2012. Twelve days of data were collected. The pharmacies were located in the cities of Hopkins, Minneapolis, New Hope and Robbinsdale, MN. Vehicles being served were counted as being in the queue.

Table 3.5 – Drive-Through Pharmacy Maximum Queue Statistics

Number of Data Points	12
Average Maximum Queue (Vehicles)	2.92
Standard Deviation (Vehicles)	1.16
Coefficient of Variation	40%
Range (Vehicles)	1-5
85th Percentile (Vehicles)	4.05
33rd Percentile (Vehicles)	2.00

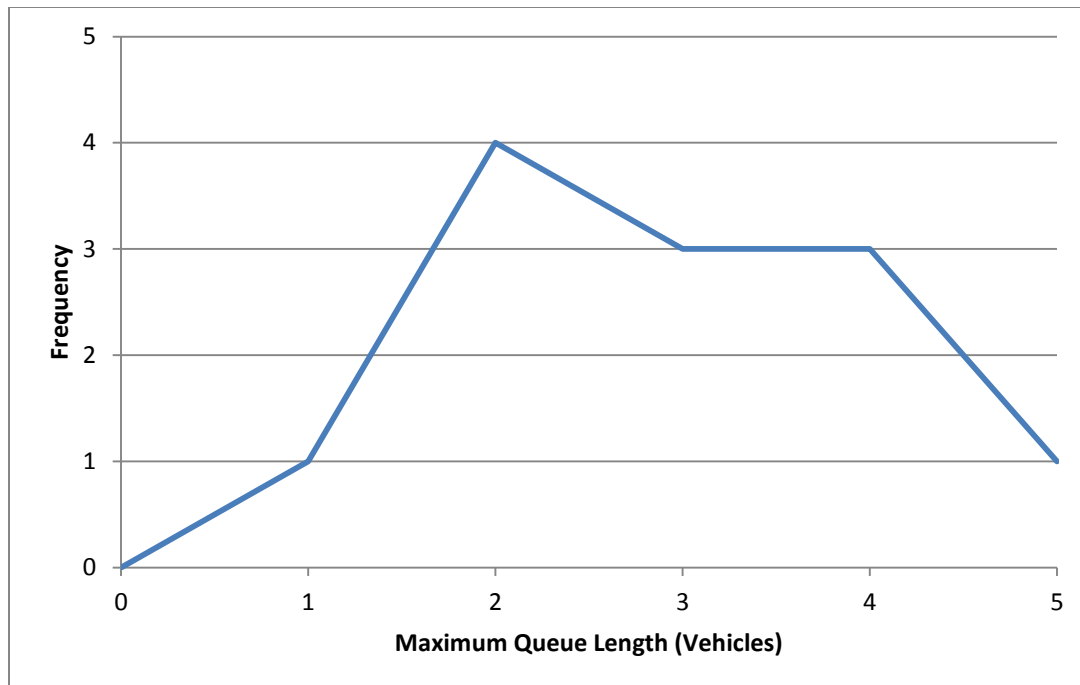


Figure 3.5 – Drive-Through Pharmacy Maximum Queue Frequency

The maximum queues for pharmacies were spread throughout the day from 8:00am to 10:00pm. With an 85th percentile maximum queue of more than 4 vehicles, the data suggests that pharmacies with drive-through lanes should be able to accommodate 100 feet of vehicle stacking throughout the day.

4.0 Conclusions

The 85th percentile maximum queue lengths for each land use are: 160 feet for banks (eight vehicles), 140 feet for car washes (seven vehicles), 260 feet for coffee shops (13 vehicles), 240 feet for fast food restaurants (12 vehicles) and 100 feet for pharmacies (five vehicles).

While some of the locations observed have an excess of space dedicated to drive-through lanes (i.e. some banks and pharmacies), others could occasionally use additional space for drive-through lanes (i.e. coffee shops in the morning).

Fast food restaurants and coffee shops have the longest maximum queues of the five land uses observed. Coffee shops have a tendency for the morning queues to build so long that they spill out onto the street, though, as is expected, their afternoon and evening queues are minimal. Fast food restaurants also have large queues, but they tended to have enough dedicated space that stacking did not go beyond the designated queuing area.

The data collected for this paper along with the data from the papers by Mark Stuecheli and the ITE Technical Committee 5D-10 (see Appendix for both of these) will hopefully provide useful data for traffic engineers and others trying to analyze drive-through queuing storage areas.

5.0 Labor Savings of the COUNTkit

Deploying people in the field to perform this data collection would not have been feasible. Using the COUNTcam video system made it possible to observe the drive through lanes 24 hours a day and the PC-TAS software made the data reduction practical. One location was recorded in November 2010 for 6 hours, three locations were recorded in August 2011 for a total of 202 hours and 26 locations were recorded in February 2012 for a total of 1012 hours. These 1220 hours of video were counted with a total of 120 hours of labor, meaning the videos were watched at approximately 10x speed. Installation of a COUNTcam takes approximately 10 minutes and retrieval takes approximately 5 minutes. This whole project was completed in approximately 3 weeks.

6.0 References

1. Stuecheli, M. (2009). New Drive-Through Stacking Information for Banks and Coffee Shops. *ITE 2009 Annual Meeting and Exhibit*. Print.
2. ITE Technical Committee 5D-10. "Queuing Areas for Drive-Thru Facilities." *ITE Journal* (May 1995): 38-42. Print.
3. Institute of Transportation Engineers. *Parking Generation*. 4th ed. Washington, DC: Institute of Transportation Engineers, 2010. Print.
4. Institute of Transportation Engineers. *Trip Generation*. 8th ed. Washington, DC: Institute of Transportation Engineers, 2008. Print.

7.0 Appendix

- A – Day of Week Maximum Queues
- B – New Drive-Through Stacking Information for Banks and Coffee Shops
- C – ITE Technical Committee 5D-10: Queuing Areas for Drive-Thru Facilities
- D – Drive-Through Data Forms

Appendix A

Day of Week Maximum Queues

		Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Fast Food	Arby's				5	5		
	Burger King	6	12				10	8
	McDonald's				12	13		
	McDonald's				9	8		
	Taco Bell				10	8		
	White Castle				8	5		
Car Wash	BP				6	6		
	BP			1	3			
	BP			4	3			
	Holiday				3	4		
	Mister Car Wash				10	6		
	Mobil				4	3		
Coffee	Caribou				11	10		
	Caribou	7	10	12			12	8
	Starbucks				14	16		
	Starbucks				10	11		
	Starbucks			10	12			
	Starbucks				11			
Bank	Citizens Independent Bank			5	5			
	SharePoint Credit Union				3	3		
	TCF	4					8	8
	US Bank				7	7		
	Wells Fargo			8	6			
	Wells Fargo			6				
Pharmacy	CVS			1	2			
	CVS			4	4			
	CVS			2	2			
	Walgreens				4	5		
	Walgreens			3	3			
	Walgreens			3	2			

Appendix B

New Drive-Through Stacking Information for Banks and Coffee Shops

Mark Stuecheli, PTP

Abstract

This paper provides updated queuing information for drive-in banks and new queuing data for coffee shops with drive-through lanes. The data is presented in a format similar to that used in the report for **ITE Technical Council Committee 5D-10**, originally published in 1995.

Significant changes have occurred in the way that bank patrons conduct business with their banks. In recognition of those changes, ITE has adjusted the trip generation information included in the Eighth Edition of **Trip Generation, an ITE Informational Report** to include only data collected since 2000, and the revised trip generation totals are significantly lower than in previous editions. Clearly, the reduced trip generation figures indicate a reduction in bank drive-through business. This report summarizes queuing information included in counts taken in the Kansas City metropolitan area.

In the last few years coffee shops with drive-through lanes have become prevalent throughout the country. Because those businesses were uncommon when the 1995 report was prepared, no data was gathered for those operations. This paper contains information on counts taken at those establishments, once again in the Kansas City metropolitan area.

Based on the count data, recommendations are included for the minimum amount of stacking distance to require for the two types of drive-through businesses that were studied.

Background

ITE Technical Council Committee 5D-10 was formed in 1987 to produce a database of queuing information for various types of drive-through lanes. The report of the findings of the Committee, published in the May 1995 **ITE Journal**, included information on the characteristics of drive-through lane stacking for fast-food restaurants, drive-in banks, car washes, day care centers and dry cleaners. The counts that were included in the Committee report were conducted from the late 1960s through the late 1980s in a limited number of mid-western, southern and eastern states.

As a former member of that Committee, and having submitted drive-through counts for the effort, I am in a position to make some observations about the change in drive-through usage.

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This paper analyzes two types of drive-through operations – one that is greatly modified and another that is new since the original report was published. First, significant changes have occurred in the ways that bank patrons conduct business with their financial institutions. On-line banking, direct deposit and the wide usage of ATMs have resulted in greatly reduced trip generation totals for drive-in banks. In recognition of that fact, ITE adjusted the trip generation information for drive-in banks in the Eighth Edition of **Trip Generation, an ITE Informational Report**, to include only data collected since 2000. The trip generation rates during the p.m. peak hour for the newer data are about 44% lower than rates in the Seventh Edition.

The amount of stacking provided for bank drive-through lanes often has a critical impact on the potential site design alternatives for proposed bank properties. If the information included in the 1995 Report were to be used as the basis for establishing stacking requirements, a large area would need to be allocated to the drive-through lanes. On tight sites, that limitation could preclude developing an acceptable layout.

Clearly, the major drop in trip generation rates indicates that fewer customers are using drive-through lanes. That reduction in drive-through usage has an impact on queue lengths and other operational characteristics observed at those facilities. This paper includes updated information on queuing in bank drive-through lanes based on counts taken in the City of Overland Park, Kansas, a suburban community of 171,000 residents in the Kansas City metropolitan area.

The second area of analysis in this paper pertains to observed queuing characteristics for coffee shops with drive-through lanes. In the last few years, drive-through coffee shops have become common throughout the country. Because those businesses were an insignificant factor when the report for **ITE Technical Council Committee 5D-10** was completed, no counts were conducted for that land use category. This paper contains data on queuing for coffee shops with drive-through lanes, based on counts conducted predominantly in the Kansas suburbs of the Kansas City metropolitan area.

As is the case for drive-in banks, the length of stacking required for a site has a major impact on potential site layouts. If a relatively short stacking distance is permitted, the lanes can be fit into very restricted sites or be more easily retrofitted to work with existing buildings. But if more queuing occurs than is provided for in a dedicated lane, the flow of traffic within a parking lot can be seriously restricted by that excess queue. In the worst case, if the drive-through stacking is located close to a public street and the excess queue extends into or near the street, the operation of the adjoining public street may be negatively impacted.

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Drive-In Banks

Counts were conducted at ten suburban drive-in banks located throughout Overland Park in the fall of 2008 and the spring of 2009. Both established locations and sites that were relatively new were counted, although all banks had been open for business for at least one year. All but one location had drive-through ATMs. Based on the results of counts taken at a single bank location during a mid-week lunch hour, a mid-week p.m. peak hour, a Friday lunch hour, and a Friday p.m. peak hour; the maximum queue lengths occurred during the Friday p.m. peak hour. Therefore, all counts used in the study were conducted during the Friday p.m. peak hour time period.

The counting process involved noting the maximum per lane and total queues for the drive-through lanes at each location in fifteen minute increments, along with collecting information on the stacking of any drive-through ATM. In all cases the vehicles in the service positions were included in the counts. Where possible, the volumes of vehicles entering and exiting the parking lot also were tabulated. As a way to evaluate the frequency of various maximum queue lengths, the total queue lengths were noted at five minute intervals.

The queuing data was analyzed in ways similar to the methods used in the 1995 Report. Table 1 lists the observed frequency of maximum queue lengths per lane. Figure 1 plots the per lane maximum queue lengths using both the 2009 data and the data that was presented in 1995 (please note that the 1995 data involved fifteen counts, compared to the ten counts in the 2009 data). Figure 2 plots the probability that the queue lengths per lane will not exceed a given maximum queue length, once again presenting both 2009 and 1995 data.

Table 1 – Drive-In Bank 2009 Maximum Queue Length Per Lane

Queue Length	Frequency	Cumulative Frequency	P($q \leq N$)
0	0	0	0.00
1	1	1	.10
2	4	5	.50
3	4	9	.90
4	1	10	1.00

Note: P($q \leq N$) indicates probability, based on sample, of queue length of “q” not exceeding length “N”

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Figure 1 – Drive-In Bank 1995 And 2009 Maximum Queue Length Per Lane Data Plot

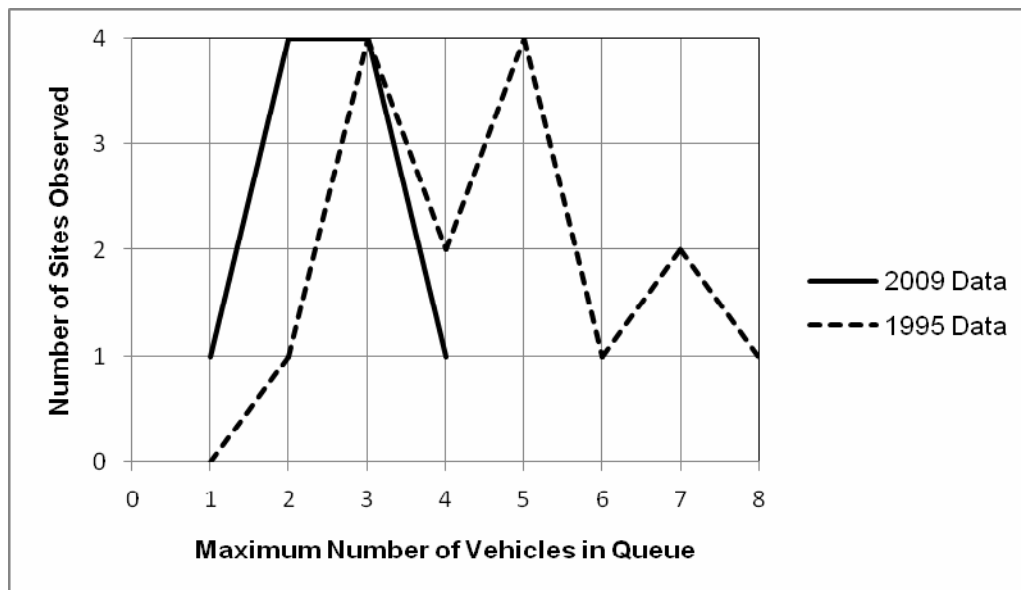
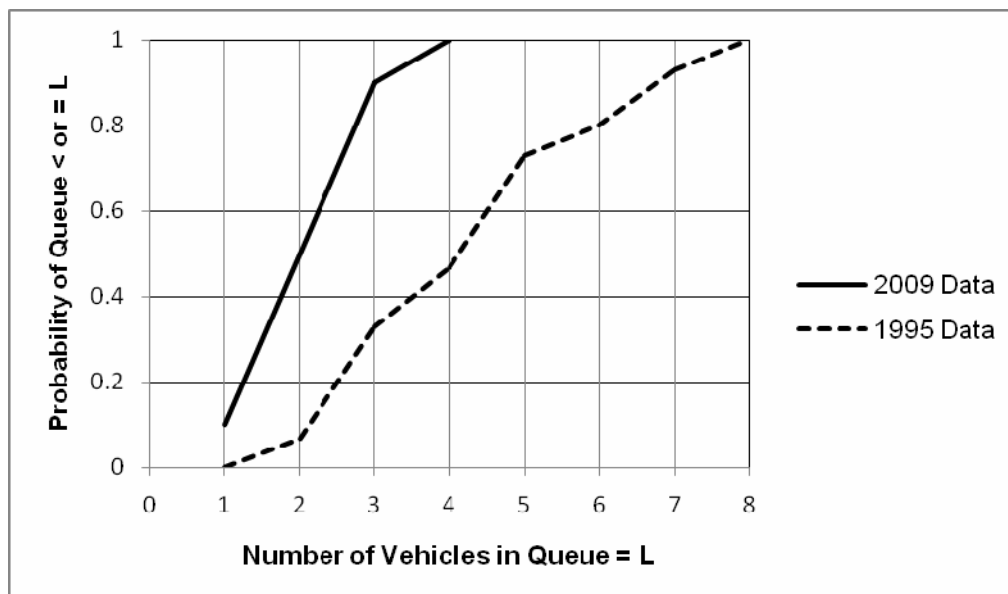


Figure 2 – Drive-In Bank 1995 And 2009 Cumulative Maximum Queue Length Per Lane Data Plot



The differences between the 1995 Report data (as noted earlier, actually based on counts conducted from the late 1960s to the late 1980s) and the 2009 counts are dramatic. The maximum per-lane queue lengths in the current counts were half what they were in the 1995 data.

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An attempt was made to determine if such factors as adjoining major street traffic volumes or the size of the building could predict the queuing results, but no correlation was found.

Observations

Some banks, especially those that have been in operation for several years, have a surplus of drive-through lanes and stacking area. That is because those sites were designed to accommodate the much higher demands that existed many years ago. Consequently, they often open only a portion of the available lanes.

In one case, for a main office bank location where it was possible to make a direct comparison between a count conducted in 1988 and a new count in 2008 (actually taken almost precisely 20 years apart), the difference was dramatic. The p.m. peak hour drive-through volumes for the 2008 count were 65% lower than the 1988 count, a much greater drop than would have been indicated by the reduced ITE trip generation figures discussed earlier. The maximum total number of vehicles queued and the maximum queue lengths per lane were correspondingly lower, dropping from 29 to 8 and 7 to 3, respectively. The demographics and development characteristics of the surrounding area have changed little since 1988 and the bank has continued as a stable operation. Considering all of those factors, it is reasonable to assume that the differences are associated with changes in customers' banking habits.

The one incidence of a four car per lane maximum stack was a single occurrence that lasted for only a few minutes. Based on that information, it is reasonable to consider the practical maximum required queue length to be three vehicles.

The maximum queue lengths for ATMS ranged from two to five vehicles. Only one location experienced the longer queue lengths and only for a short time period. All other locations had maximum queue lengths of three vehicles or less.

Coffee Shops With Drive-Through Lanes

Counts were conducted in the fall of 2008 and the spring of 2009 at twelve coffee shops located in the Kansas suburbs of Merriam, Olathe and Overland Park in the Kansas City metropolitan area and also in suburban Kansas City, Missouri. All but two of the establishments were situated in free-standing buildings, and several were located within shopping centers. Three were drive-through-only operations and the remaining nine were full-service locations that included both drive-through lanes and inside seating facilities. Because this type of use is busiest in the morning peak hour, all counts were completed during that time period.

Similar to the process used for drive-in banks, the counting process involved noting the maximum number of vehicles queued in the drive-through lane at each location for fifteen minute increments. As was done for the drive-in bank counts, the vehicle in the

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service position was included in the counts. Information on the number of vehicles entering and leaving the parking lot was collected for full-service operations (drive-through-only locations did not have any parking activity). The queuing information was tabulated for both the total length of queue and for the number of vehicles behind the menu board. The observed queue length was noted at five minute intervals as a way to evaluate the frequency of various queue lengths.

Once again, the queuing data was analyzed in ways similar to the methods used in the 1995 Report. Table 2 lists the observed frequency of maximum queue lengths. Figure 3 plots the per-lane maximum queue lengths and Figure 4 plots the probability that the queue will not exceed a given maximum queue length.

Table 2 – Coffee Shop With Drive-Through Maximum Queue Length

Queue Length	Frequency	Cumulative Frequency	$P(q \leq N)$
0	0	0	0.00
1	0	0	0.00
2	0	0	0.00
3	1	1	.08
4	0	1	.08
5	0	1	.08
6	1	2	.17
7	1	3	.25
8	2	5	.42
9	1	6	.50
10	1	7	.58
11	2	9	.75
12	0	9	.75
13	3	12	1.00

Note: $P(q \leq N)$ indicates probability, based on sample, of queue length of “q” not exceeding length “N”

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Figure 3 – Coffee Shop With Drive-Through Maximum Queue Length Data Plot

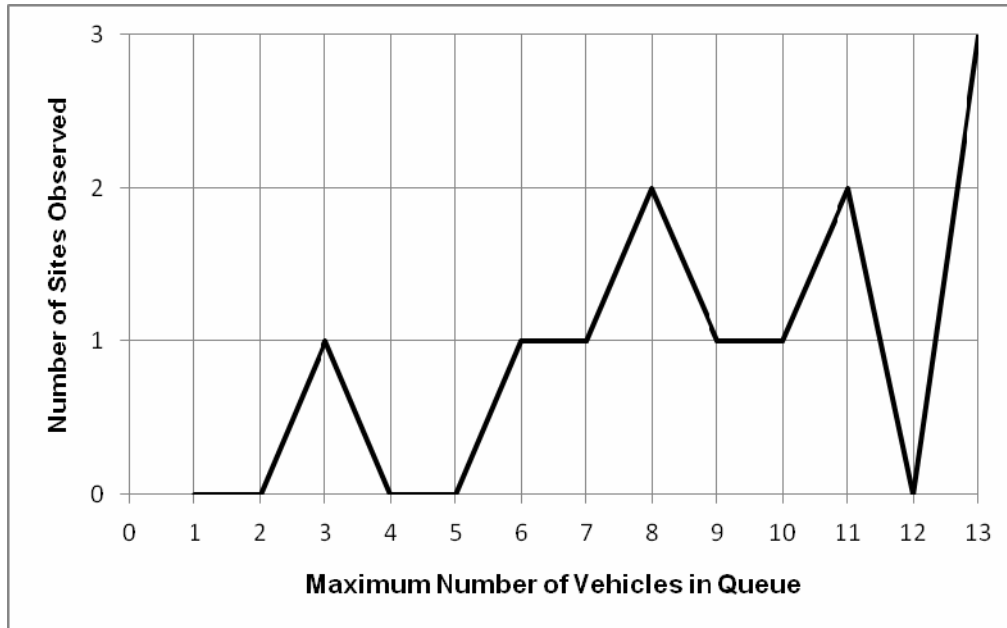
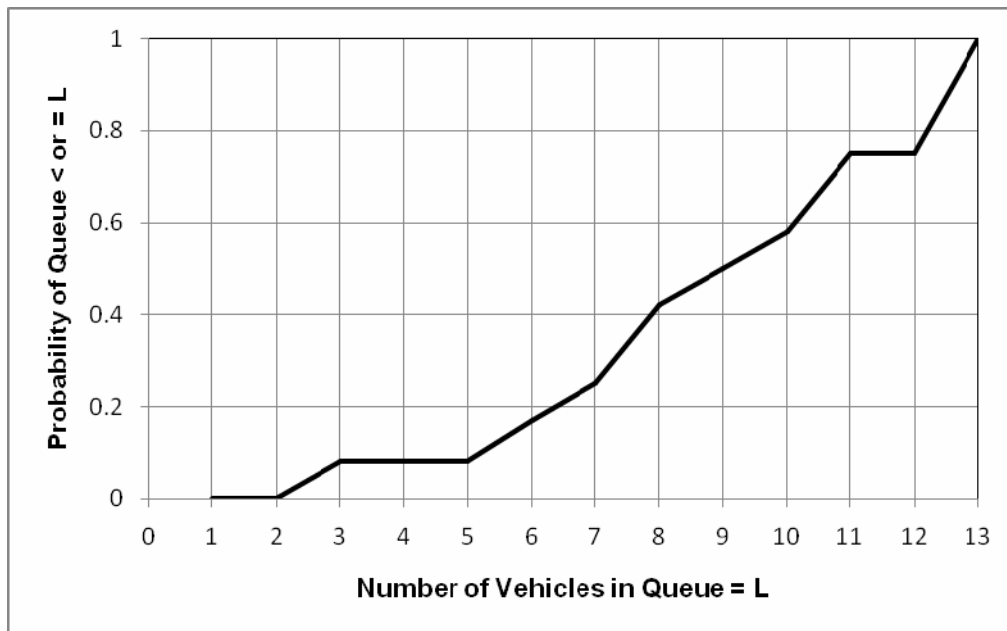


Figure 4 – Coffee Shop With Drive-Through Cumulative Maximum Queue Length Data Plot



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The total trip generation figures were compared to the a.m. peak hour ITE rates for Land Use Code 937, Coffee/Donut Shop with Drive-Through Window, and Land Use Code 938, Coffee/Donut Shop with Drive-Through Window and No Indoor Seating. The observed counts generally fell within the range of counts included in those categories, although two of the rates for the No Indoor Seating category exceeded the published range. No correlation was found between the adjoining major street traffic volumes or the size of the building and either the queuing or the trip generation results.

Observations

Several of the drive-through lanes were under-designed for the usage that was observed and queues spilled-out into parking lot circulation areas. In most cases the excess stacking did not result in disruptions of the operations of surrounding uses, since most other businesses were not open in the early morning. But for those sites where the end of the drive-through lane extended into the coffee shop parking lot, the excess queue often disrupted the movements of drivers who were trying to enter or exit parking spaces or the site itself.

One interesting facet of the data is that the three lowest observed maximum queue lengths were for the drive-through-only locations. The highest observed queue length for those operations was seven vehicles, which occurred only once at one location and only for a very short period of time. A six vehicle maximum stack was a more common occurrence.

The data shows that the volume of drive-through traffic and, therefore, the required stacking distance, is higher for full-service coffee shops than for drive-through-only operations. When total trip generation (both drive-through business and customers who park and walk in) is factored in, the full-service coffee shops did, on average, about two and one-half times the business of drive-through-only facilities. Since all of the full-service operations were Starbucks locations, it may be possible to apply the results of those counts to other proposed suburban Starbucks locations elsewhere in the country.

Total vehicular stacking available for a drive-through lane is an important consideration, but the location of the menu board relative to the pick-up window also impacts the efficiency of a drive-through lane operation. If the spacing is too short, stacking behind the pick-up window will extend into the menu board area, delaying ordering for those farther back in the line. In the counts conducted for this study, the pick-up window to menu board available stacking distances ranged from two to five vehicles.

The operation with the two car stack between the pick-up window and menu board regularly resulted in delays for drivers waiting to order at the menu board. The location with a five car stack rarely experienced delays for those ordering. Based on field observations, if an unlimited amount of stacking were available at a proposed site, the five car spacing would be ideal. Realizing that space for stacking nearly always is limited, an acceptable alternative would be the four car spacing.

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Conclusions

Drive-in bank usage has dropped dramatically, as illustrated in the data provided in this report. Consequently, a reduced amount of stacking is required. That reduced area for drive-through stacking can provide more flexibility in the design of bank sites, allowing for development on smaller sites or the provision of increased landscaped areas.

Based on the data that was gathered, the City of Overland Park has reduced its previous requirement for a minimum five car stack per lane to a three car stack (a distance of 60 feet per lane, assuming average vehicle spacing to be 20 feet). That design should be sufficient to accommodate virtually all situations. Vehicular stacking requirements for ATMs have been established, also at a minimum of three car lengths.

Coffee shop drive-through lanes are most heavily used during the morning peak period, and therefore it is important to design sites to accommodate that peak demand. The following recommended minimum stacking lengths should be appropriate in most cases. The only exceptions would be situations in which excess queuing could impact a nearby street or major drive, in which case a more conservative approach should be taken.

Based on the data that was gathered for drive-through-only operations, it appears reasonable to require that a dedicated drive-through lane be provided with a stack of 120 feet – enough to handle six vehicles. That should be sufficient to accommodate nearly all vehicles that are likely to arrive during the morning peak hour time period.

For full service establishments, a 220-foot long drive-through lane, providing eleven cars of total storage, should be adequate to handle the vast majority of the drive-through lane volumes that might be encountered. In those cases where more than eleven vehicles were counted, the duration of the extreme queue lasted for only a few minutes. For the most efficient operation, the distance between the pick-up window and menu board should be at least 80 feet to accommodate four vehicles.

References

1. Gattis, J. L., Chair of ITE Technical Council Committee 5D-10. "Queuing Areas for Drive-Thru Facilities, by ITE Technical Council Committee 5D-10." *ITE Journal* (May 1995): 38-42.

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Queuing Areas For Drive-Thru Facilities

BY ITE TECHNICAL COUNCIL COMMITTEE 5D-10

ITE Technical Council Committee 5D-10 was formed to collect and analyze basic information that may be used to estimate and evaluate lengths of automobile queues at drive-thru facilities. In addition to fulfilling this objective, this Informational Report constitutes a starting point for compiling a database for drive-thru facility queue length information.

Introduction

When faced with the need to evaluate the future impacts of a planned development, the transportation engineer often employs some form of analogy, estimating the future impacts of as-yet unbuilt development by using the attributes of existing land uses having a similar nature. For instance, the engineer may refer to published trip generation rates, derived from observations made at existing developments, to obtain a figure by which to estimate volumes that will occur at the proposed development.



J. L. Gattis, P.E., was Chair of Technical Council Committee 5D-10. He is an Assistant Professor in the Department of Civil Engineering at the University of Arkansas in Fayetteville, Ark. He is a Member of ITE.

Many types of businesses (such as fast-food restaurants, banks and cleaners) utilize drive-thru systems. A similar form of drive-thru operation can be found at sites where passenger pick-up

operations occur (such as parents picking up schoolchildren). These drive-thru systems are comprised of a server position (often at a service "window"), and vehicle queuing space in advance

QUEUING DATA SHEET							
1. Type of Service Provided	_____						
2. Day(s) of Week	Sun	Mon	Tue	Wed	Thu	Fri	Sat
3. Time(s) of Day	_____						
4. Type of Area	CBD <input type="checkbox"/>	Suburban <input type="checkbox"/>		Rural <input type="checkbox"/>			
5. Competition in Area (For Same Services)	High <input type="checkbox"/>	Medium <input type="checkbox"/>		Low <input type="checkbox"/>			
6. Service Rate Measured (Per Window or Aisle or Lane)	_____						Vehicles/Time
7. Arrival Rate Measured (Per Window or Aisle or Lane)	Avg _____		Max _____		Vehicles/Time		
8. Uniformity Rating	_____						(1 - 10)
9. Capacity of Queue Storage Area	_____						(Vehicles)
10. Measured Average Queue	_____						(Vehicles)
11. Measured Maximum Queue	_____						(Vehicles)
12. Excess Demand Volume	_____						(Vehicles)
13. Excess Demand Frequency	_____						
14. Size Sample or Length of Count Data	_____						
15. Narrative Description of Service	_____ _____ _____ _____ _____						

Figure 1. Data gathering form used in survey.

Appendix C

of the service position, for waiting in line as those ahead are served first.

When attempting to project lengths of automobile queues at proposed drive-thru facilities, the municipal or private consulting engineers may not find available data by which a projection can be made. While such data may be known by larger business chains that have drive-thru operations, the data do not seem to be generally available to the average traffic engineer trying to size or evaluate automobile queue storage area. True, some publications present results of queuing studies or equations for estimating queue lengths based on known system arrival and service rates.¹⁻³ But the proposed-site arrival and service rates may be unknown, and the proposed system may not possess attributes (such as negative exponential service time rates) needed for certain equations to properly predict queue lengths.

Drive-thru facilities are perceived as time-savers; as a convenience to the physically challenged, elderly and parents with young children; and as a way to avoid going out into inclement weather. Due to vehicle idling while in line, drive-thru facilities may also be viewed as causing unnecessary fuel consumption and air pollution. The popularity of drive-thru services creates a need to evaluate the queuing capacities of the varied drive-thru facilities. This report provides some basic drive-thru facility queue length information. It is hoped that the database will continue to grow, so that a comprehensive analytical tool may be available for the transportation professional.

Methods

The queue length data gathering form shown in Figure 1 was distributed to committee members in November 1987. The form was accompanied by specific user-instructions to ensure uniformity of procedures and compatibility of results.

Completed forms were returned to the committee chair and data were cataloged by land-use type. The maximum observed queue lengths and the maximum observed queue length frequencies were compiled. Cumulative frequencies and the probability that

Table 1. Ranges of Fast Food Queue Lengths by Food Type

Food Type	Maximum Queue Range (# in system)	Average Maximum Queue (# in system)	Studies
Donuts	4	4	2
Steak	4	4	2
Chicken	2-9	5	5
Fish	5	5	1
Sandwiches	5	5	1
Mexican	7	7	1
Roast Beef	6-8	7	2
Hamburgers	4-13	7	27

Table 2. Fast Food Queue Lengths

Maximum Queue Length (# in system)	Frequency	Cumulative Frequency	P(q≤N)
1	0	0	0.00
2	2	2	0.05
3	0	2	0.05
4	6	8	0.18
5	4	12	0.27
6	7	19	0.43
7	10	29	0.66
8	7	36	0.82
9	5	41	0.93
10	1	42	0.95
11	0	42	0.95
12	1	43	0.98
13	1	44	1.00

Note: P(q≤N) indicates probability, based on sample, of queue length "q" not exceeding length "N".

queues would not exceed an absolute maximum were calculated and shown graphically.

Findings

Within this report, data have been compiled for banks, car washes, day care facilities, dry cleaners and fast-food restaurants.

Fast Food

This category includes restaurants characterized by food being prepared in advance of, or shortly after, ordering; by high turnover for eat-in customers; and by long business hours. The ITE land-use codes (LUCs) for this use are LUC 834 (*Trip Generation*, 1991) and 836 (*Parking Generation*, 1987).

Forty-four fast-food restaurants were observed for this study. They ranged from those serving chicken to the hamburger chains. All sites were suburban locations. Queuing was observed mainly during the weekday mid-day peak from the 1970s through

the 1990s, at sites in Florida, Kansas, Illinois, Minnesota, Montana, New Jersey, Oklahoma, Pennsylvania and Texas. All fast-food facilities observed for this study had a single-window drive-thru system. The industry is changing, with double- and even triple-window systems being utilized. Further information will be needed on queuing characteristics of these facilities.

The average observed service rate was 54 vehicles per hour (vph); the maximum rate was 108 vph. The maximum observed queue lengths (number of vehicles in line, including vehicle at service position) ranged from two to 13 vehicles (see Table 1). Where there was a menu-order board followed by a service window, the combined total of vehicles in both sequential lines was reported.

The restaurants featuring hamburgers had maximum queues in the upper part of the range. Table 2 shows the frequencies of the observed maximum queue lengths, as well as a probability of a queue of less than a given number

Appendix C

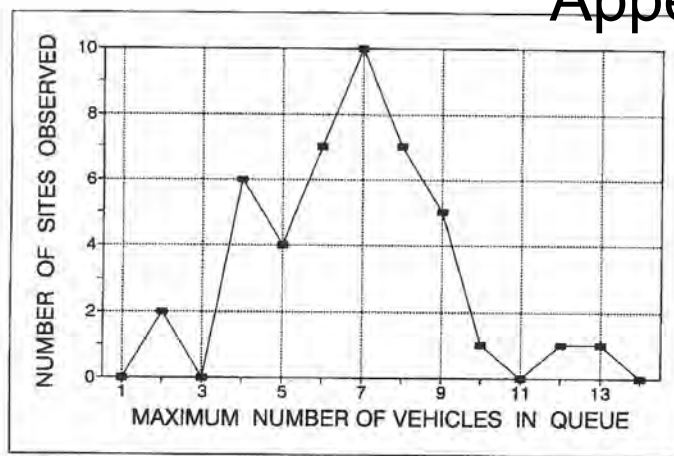


Figure 2. Maximum queue lengths at fast-food.

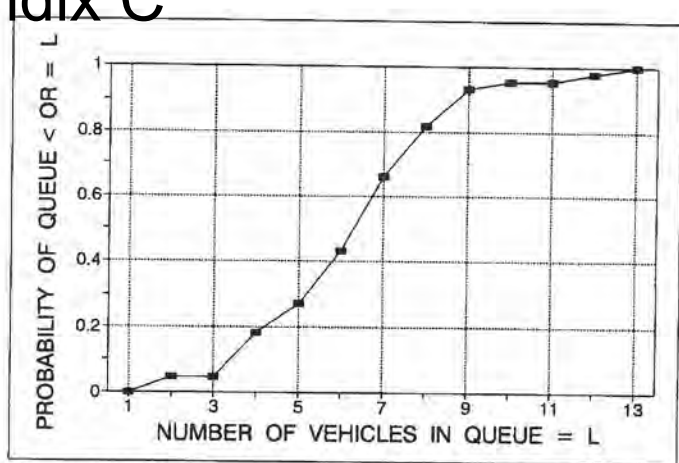


Figure 3. Maximum queue length probability at fast-food.

of vehicles. Figure 2 plots maximum queue length against the observed frequency of occurrence. Figure 3 depicts the probability that at any fast-food site, the queue will not exceed a given maximum queue length. From Table 2 or Figure 3, it can be seen that there was a 95 percent probability that the maximum queue at a site would be no more than 10 vehicles.

The maximum queues were evaluated against days of the week and were found to have no statistical relationship. Likewise, when evaluated against different levels of competition within the area and against service rates, there was no statistical relationship.

Bank

This category includes savings-and-loans with or without automatic teller machines (ATMs) and commercial banks with or without ATMs. Although there were historical differences between banks and savings-and-loans, they are now often indistinguishable to the public. The ITE land-use codes for this use are LUC 912 and 914 (*Trip Generation*, 1991) and LUC 912 (*Parking Generation*, 1987).

The studies analyzed were conducted from the late 1960s through the late 1980s; many were in Illinois, Minnesota, New Jersey and Texas. The size of the bank drive-thru facilities ranged from a minimum of one lane with one teller-window up to an institution with 10 lanes and four tellers.

Observed service rates for these institutions went up to a maximum of 35 vehicles per lane-hour. Maximum observed queues per lane ranged from two to eight vehicles. The maximum system queue lengths (all lanes com-

bined) ranged from five to 29 vehicles. At two sites, it was observed that a queue length exceeding eight vehicles per lane was not tolerated by customers. When the queue length became excessive, customers would park and use walk-in facilities rather than the drive-thru. Thus the collected data reflect a maximum queue per lane of eight vehicles.

Table 3 shows the observed frequency of occurrence of maximum queue lengths per lane. Figure 4 plots the maximum number of vehicles per lane

observed. On the basis of the studies received, there is a 100 percent probability that the queue length at a bank drive-thru facility will not exceed eight vehicles per lane, as Figure 5 shows.

Table 4 presents the maximum number of vehicles in an entire drive-thru system (all lanes combined) by ranges, along with the frequency of occurrence. This table shows that the most common maximum number-in-the-system at a bank drive-thru facility fell between six and 10 vehicles, as most observed facilities consisted of two lanes. Table 4 also

Table 3. Bank Queue Lengths

Queue Length	Maximum Queue Per Lane		$P(q \leq N)$
	Frequency	Cumulative Frequency	
0	0	0	0.00
1	0	0	0.00
2	1	1	0.07
3	4	5	0.33
4	2	7	0.47
5	4	11	0.73
6	1	12	0.80
7	2	14	0.93
8	1	15	1.00

Note: $P(q \leq N)$ indicates probability, based on sample, of queue length "q" not exceeding length "N".

Table 4. Maximum Number of Vehicles in Bank System (All Lanes)

# in system	Frequency	Cumulative Frequency	$P(q \leq N)$
0 - 5	2	2	0.13
6 - 10	6	8	0.53
11 - 15	3	11	0.73
16 - 20	2	13	0.87
21 - 25	1	14	0.93
26 - 30	1	15	1.00

Note: $P(q \leq N)$ indicates probability, based on sample, of queue length "q" not exceeding length "N".

Appendix C

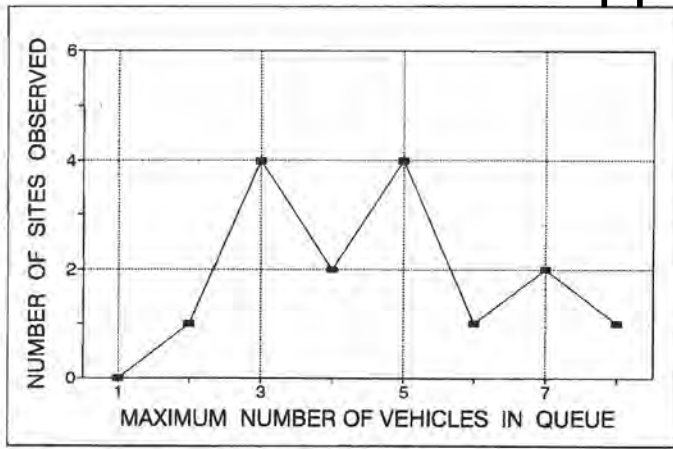


Figure 4. Maximum queue length per lane at bank.

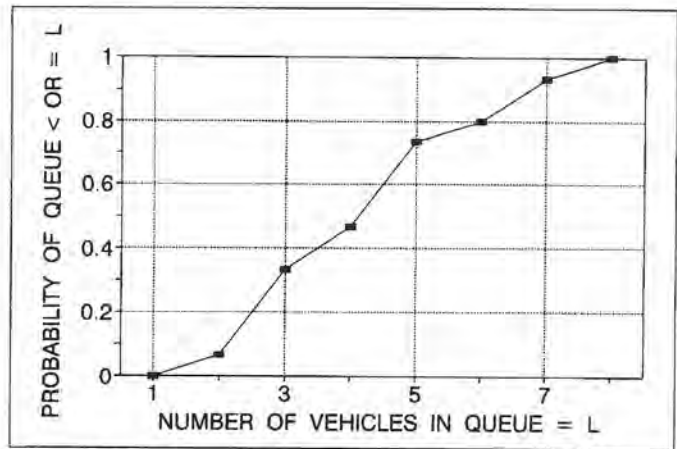


Figure 5. Maximum per lane queue length probability at bank.

gives the probability, based on the studies received, that the number of vehicles in the system will not exceed a certain range.

It should be noted that queuing lengths may be affected by time-of-day banking habits. There may be differences between the central city and a suburb. An area with a large proportion of retired persons may experience unique banking-time behaviors. In addition, the effects of banks incorporating ATMs into drive-thru aisles may also need to be investigated in future queuing studies.

Car Wash

This category includes full-service car washes (offering vacuuming and towel-drying services), exterior tunnel operation (vacuuming and towel drying not a part of the "in-line" operation, but may be offered at separate stations to the side), and self-service car washes (where customers pull into a wash bay, insert coins into a box, and proceed to wash). The ITE land-use code for these uses is LUC 847 (*Trip Generation*, 1991). This land use was not included in the 1987 *Parking Generation* report.

The studies analyzed were conducted from the late 1960s through the late 1980s in Kansas, Illinois, Montana, New Jersey and Texas. They included seven full service car washes, two exterior tunnel car washes, and nine self-service car washes. The number of self-service bays ranged from six to 14 per site. The self-service car washes typically had one or more parallel wash bays; the full-service car wash operations tended to have a single tunnel to serve customers.

Studies at the full-service car washes were made during winter or early spring months. Both full-service car washes consisted of a single tunnel. Observed service rates were 35 vph (maximum queue of nine vehicles) and 27 vph (maximum queue of 26 vehicles). At the site with a 26-vehicle queue, the queue extended off the site and onto an adjacent private street with light traffic volumes.

The self-service car wash studies were conducted on Saturday and Thursday, during late spring and/or summer months. Service rates at self-service car washes ranged from 4.1 vehicles per bay-hour to 5.4 vehicles per bay-hour. The average service rate was 4.77 vehicles per bay-hour. The maximum queue observed at two study sites was three vehicles, and at a third study site the maximum observed was one vehicle. No distinction was made as to whether these were maximum

queues per bay or total maximum queues (per entire operation).

Day Care

This category includes facilities that provide a place for children during the day, often while parents are at work. After-school care may also be provided. The ITE land-use code is LUC 565 (*Trip Generation*, 1991). This land use was not included in the 1987 *Parking Generation* report.

Data were submitted for one day-care facility in Texas, during the evening peak hour. The facility had 99 children enrolled and 94 present the day the study was conducted. The day-care facility handled children age 2 through first grade. The facility was operated in a manner that required the parents to park their cars and go inside to get their children.

The hour service rate was 46 vehicles. A maximum of eight vehicles in

This is an Informational Report of the Institute of Transportation Engineers prepared by Technical Council Committee 5D-10. The information in this report has been obtained from experiences of transportation engineering professionals and research. ITE Informational Reports are prepared for informational purposes only and do not include Institute recommendations on which is the best course of action or the preferred application of the data.

Members of Technical Council Committee 5D-10 were J. L. Gattis, P.E. (M), Chair; Grant A. Bacchus, P. Eng. (F); Benedict G. Barkan (F); Robert R. Marvin, P.E. (M); Dale B. McKinney, P.E. (F); Robert A. Nelson, P.E. (F); Seyed M. Safavian (M); James M. Schoen (A); David K. Sorenson, P.E. (A); Mark J. Stuecheli (M); and Jack Wierzenski (A).

Members of the Technical Council Department 5 Standing Committee at the time of approval of this report were Dennis O'Malley (F), Chair; Carol H. Walters, P.E. (M), Assistant Chair; Robert D. McMillen, P.E. (FL); Wamahdri W. Williams (A); and Donald J. Galloway, P.E. (F). Brian S. Bochner, P.E. (F), was the Chair of Technical Council, and John M. Mason, P.E. (F), was the Assistant Chair.

Table 5. Summary of Observed Queue Distances at Drive-Thru Facilities

	Near-maximum number of queued vehicles observed in system (does not include vehicle at service position)	Lane Length needed to store near-maximum queue (does not include vehicle at service position)
Fast-Food (Hamburger)	10 - 1 = 9	60 m (198 feet)
Bank	8 - 1 = 7	47 m (154 feet)
Car Wash (self-service)	3 - 1 = 2	13 m (44 feet)
Day Care	10 - 1 = 9	can store in parallel
Dry Cleaner	3 - 1 = 2	13 m (44 feet)

5 minutes (if sustained, equivalent to 96 vph) were observed; a 20-minute period had 28 vehicles (84 per hour). The maximum number of waiting vehicles was 10 vehicles.

VanWinkle and Kinton reported the results of 29 field studies at day-care establishments in Tennessee. Their findings are in the July 1994 *ITE Journal*.⁸

Dry Cleaners

This category includes facilities that clean clothing and other fabrics that should not be laundered. Often a walk-up window is present. No information is provided for this land use in either the ITE 1991 *Trip Generation* report or the ITE 1987 *Parking Generation* report.

One study was conducted at a dry cleaner with drive-thru facilities in Montana during a weekday p.m. peak period. An average service rate of 41 vph was measured at the single window. The observed maximum queue was three vehicles long. Forty-five percent of the customers used the drive-thru facility.

Conclusions

Table 5 summarizes the observed maximum or near-maximum observed queue lengths, and also lists the stacking distance needed to accommodate these observed queues, based on a front bumper-to-front bumper space occupied length of 22 feet (ft) per vehicle. This 22 ft may not be the exact space that vehicles occupy, but a value ranging from 20 ft to 25 ft seems appropriate for many situations. Because only one day-care facility was observed, and because parents picking up children may park in parallel or in a lot instead of in a single-file line, no stacking length was calculated for this land use.

Due to a change of committee personnel during the course of the data-gathering effort, some of the original forms submitted by committee members are not available. There are some apparent errors in the tables. For instance, the number of studies tallied in Table 1 is 41, while the number in Table 2 is 44. It is not known whether three studies were not included in Table 1, or whether there was double counting in Table 2. The unavailability of the original data forms makes it impossible to recheck the numbers.

The size of this drive-thru facility queuing characteristic database was limited. There is a need to accumulate and analyze more drive-thru queuing system data, so transportation engineers and site planners can be better informed. Additional observations of service rates are also needed in order to determine relationships between service rates and queue lengths, and to evaluate long-term trends in service rates. Finally, investigations of the amount of space occupied per vehicle within a queue are needed so that engineers will have the ability to project not only the number of vehicles that will be in the maximum queue for a given site, but also the queue storage length required for a site.

When collecting queuing data, the recorder should clearly indicate whether the number of vehicles recorded includes or excludes the vehicle(s) in the service position (that is, at the window). The data record must indicate which numbers are for a single queuing line and which totals are for the entire system of multiple queuing lines. An observer should also note instances of arriving vehicles balking or refusing to enter a queue due to excessive length, and how many vehicles were in the queue when the next arrival balked.

Other types of drive-thru operations

that could be studied include those at credit unions, funeral homes, gas stations (either gas only, full-service, self-service, or a combination with convenience stores or car washes), libraries, liquor stores, movie theater ticket booths, parking lots and garages (either pick-up ticket or pay, or key, tag, or card), post offices, pre-schools, baby-sitting or school combinations, lower grade schools, stadium ticket sales machines, truck stops and places of worship.

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9. Woods, Donald L. and Carroll J. Messer. "Design Criteria for Drive-In Banking Facilities." *Traffic Engineering* (December 1970): 30-37.

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:

Land Use/Building Type*:

Name of Business:

Address:

City:

State:

Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):

CBD	<input type="text"/>
Urban (non-CBD)	<input type="text"/>
Suburban (non-CBD)	<input checked="" type="text" value="X"/>
Suburban CBD	<input type="text"/>
Rural	<input type="text"/>
Not Given	<input type="text"/>

Competition Within Area (select one):

High	<input type="text"/>
Medium	<input checked="" type="text" value="X"/>
Low	<input type="text"/>

Drive-Through Description

4 Lanes + 1 ATM Lane

Gross Floor Area (estimated)

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday	5	3:36pm
Wednesday	5	2:37pm
Thursday		
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:

Land Use/Building Type:

Name of Business:

Address:

City:

State:

Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):

CBD	<input type="text"/>
Urban (non-CBD)	<input type="text"/>
Suburban (non-CBD)	<input checked="" type="text" value="X"/>
Suburban CBD	<input type="text"/>
Rural	<input type="text"/>
Not Given	<input type="text"/>

Competition Within Area (select one):

High	<input type="text"/>
Medium	<input checked="" type="text" value="X"/>
Low	<input type="text"/>

Drive-Through Description :

2 Lanes + 1 ATM Lane

Gross Floor Area (estimated)

7,850 sq. ft

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday		
Wednesday	3	3:28pm
Thursday	3	8:51am, 10:37am
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:

Land Use/Building Type:

Name of Business:

Address:

City:

State:

Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):

CBD	<input type="text"/>
Urban (non-CBD)	<input type="text"/>
Suburban (non-CBD)	<input checked="" type="text" value="X"/>
Suburban CBD	<input type="text"/>
Rural	<input type="text"/>
Not Given	<input type="text"/>

Competition Within Area (select one):

High	<input type="text"/>
Medium	<input checked="" type="text" value="X"/>
Low	<input type="text"/>

Drive-Through Description :

5 Lanes + 1 ATM Lane

Gross Floor Area (estimated)

6,000 sq. ft

	Maximum Queue	Time Max Queue Occurred
Sunday	4	5:18pm
Monday		
Tuesday		
Wednesday		
Thursday		
Friday	8	12:20pm, 2:20pm
Saturday	8	11:40am

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:

Land Use/Building Type:

Name of Business:

Address:

City:

State:

Zip Code:

Date(s):

Weather Conditions:

Location Within Area (select one):	CBD	<input type="text"/>	Competition Within Area (select one):	High	<input type="text"/>
	Urban (non-CBD)	<input type="text"/>		Medium	<input type="text" value="X"/>
	Suburban (non-CBD)	<input type="text" value="X"/>		Low	<input type="text"/>
	Suburban CBD	<input type="text"/>			
	Rural	<input type="text"/>			
	Not Given	<input type="text"/>			

Drive-Through Description :

3 Lanes + 1 ATM Lane

Gross Floor Area (estimated)

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday	7	4:47pm, 5:04pm
Wednesday	7	3:00pm, 5:26pm
Thursday		
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:

Land Use/Building Type:

Name of Business:

Address:

City:

State:

Zip Code:

Date(s):

Weather Conditions:

Location Within Area (select one):	CBD	<input type="text"/>	Competition Within Area (select one):	High	<input type="text"/>
	Urban (non-CBD)	<input type="text" value="X"/>		Medium	<input type="text" value="X"/>
	Suburban (non-CBD)	<input type="text"/>		Low	<input type="text"/>
	Suburban CBD	<input type="text"/>			
	Rural	<input type="text"/>			
	Not Given	<input type="text"/>			

Drive-Through Description :

4 Lanes + 1 ATM Lane

Gross Floor Area (estimated)

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday	6	1:18pm
Wednesday		
Thursday		
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:

Land Use/Building Type:

Name of Business:

Address:

City:

State:

Zip Code:

Date(s):

Weather Conditions:

Location Within Area (select one):

CBD	<input type="text"/>
Urban (non-CBD)	<input checked="" type="text" value="X"/>
Suburban (non-CBD)	<input type="text"/>
Suburban CBD	<input type="text"/>
Rural	<input type="text"/>
Not Given	<input type="text"/>

Competition Within Area (select one):

High	<input type="text"/>
Medium	<input checked="" type="text" value="X"/>
Low	<input type="text"/>

Drive-Through Description :

7 Lanes (4-5 Lanes were open at various points) + 1 ATM Lane

Gross Floor Area (estimated):

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday	8	4:41pm
Wednesday	6	11:27am, 1:48pm, 2:23pm, 4:32pm, 5:25pm
Thursday		
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:
 Land Use/Building Type:

Name of Business:
 Address:
 City:
 State:
 Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):	CBD	<input type="text"/>	Competition Within Area (select one):	High	<input type="text"/>
	Urban (non-CBD)	<input checked="" type="text" value="X"/>		Medium	<input type="text"/>
	Suburban (non-CBD)	<input type="text"/>		Low	<input checked="" type="text" value="X"/>
	Suburban CBD	<input type="text"/>			
	Rural	<input type="text"/>			
	Not Given	<input type="text"/>			

Drive-Through Description :

1 Lane. Only counted the vehicles waiting in line, not the vehicles currently being washed.

Gross Floor Area (estimated)

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday		
Wednesday	6	3:08pm
Thursday	6	3:07pm
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:
 Land Use/Building Type:

Name of Business:
 Address:
 City:
 State:
 Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):
 CBD
 Urban (non-CBD)
 Suburban (non-CBD)
 Suburban CBD
 Rural
 Not Given

Competition Within Area (select one):
 High
 Medium
 Low

Drive-Through Description :

1 Lane. Only counted the vehicles waiting in line, not the vehicles currently being washed.

Gross Floor Area (estimated)

3,150 sq. ft

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday	1	12:58pm
Wednesday	3	2:53pm
Thursday		
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:
 Land Use/Building Type:

Name of Business:
 Address:
 City:
 State:
 Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):
 CBD
 Urban (non-CBD)
 Suburban (non-CBD)
 Suburban CBD
 Rural
 Not Given

Competition Within Area (select one):
 High
 Medium
 Low

Drive-Through Description :

1 Lane. Only counted the vehicles waiting in line, not the vehicles currently being washed.

Gross Floor Area (estimated)

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday	4	1:48pm
Wednesday	3	4:29pm
Thursday		
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:
 Land Use/Building Type:

Name of Business:
 Address:
 City:
 State:
 Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):
 CBD
 Urban (non-CBD)
 Suburban (non-CBD)
 Suburban CBD
 Rural
 Not Given

Competition Within Area (select one):
 High
 Medium
 Low

Drive-Through Description :

1 Lane. Only counted the vehicles waiting in line, not the vehicles currently being washed.

Gross Floor Area (estimated)

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday		
Wednesday	3	12:37pm, 1:50pm, 3:43pm, 4:41pm, 5:10pm, 7:04pm, 7:30pm
Thursday	4	2:38pm, 4:20pm
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:
 Land Use/Building Type:

Name of Business:
 Address:
 City:
 State:
 Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):
 CBD
 Urban (non-CBD)
 Suburban (non-CBD)
 Suburban CBD
 Rural
 Not Given

Competition Within Area (select one):
 High
 Medium
 Low

Drive-Through Description :

2 Lanes, Full Service Wash, only vehicles in line were counted, not the vehicles being washed.

Gross Floor Area (estimated)

8,250 sq. ft

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday		
Wednesday	10	1:03pm
Thursday	6	4:02pm
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:
 Land Use/Building Type:

Name of Business:
 Address:
 City:
 State:
 Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):
 CBD
 Urban (non-CBD)
 Suburban (non-CBD)
 Suburban CBD
 Rural
 Not Given

Competition Within Area (select one):
 High
 Medium
 Low

Drive-Through Description :

2 lanes. Only vehicles in line were counted, not vehicles being washed.

Gross Floor Area (estimated)

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday		
Wednesday	4	6:03pm
Thursday	3	4:37pm, 6:28pm, 7:39pm, 7:51pm, 8:04pm, 8:23pm
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:
 Land Use/Building Type:

Name of Business:
 Address:
 City:
 State:
 Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):
 CBD
 Urban (non-CBD)
 Suburban (non-CBD)
 Suburban CBD
 Rural
 Not Given

Competition Within Area (select one):
 High
 Medium
 Low

Drive-Through Description :

Gross Floor Area (estimated)

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday		
Wednesday	11	8:50am
Thursday	10	7:57am
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:

Land Use/Building Type:

Name of Business:

Address:

City:

State:

Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):	CBD	<input type="text"/>	Competition Within Area (select one):	High	<input type="text"/>
	Urban (non-CBD)	<input type="text"/>		Medium	<input type="text" value="X"/>
	Suburban (non-CBD)	<input type="text" value="X"/>		Low	<input type="text"/>
	Suburban CBD	<input type="text"/>			
	Rural	<input type="text"/>			
	Not Given	<input type="text"/>			

Drive-Through Description :

1 Lane

Gross Floor Area (estimated)

	Maximum Queue	Time Max Queue Occurred
Sunday	7	9:39am, 9:41am
Monday	10	8:39am
Tuesday	12	9:26am
Wednesday		
Thursday		
Friday	12	8:12am
Saturday	8	8:52am, 10:24am

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:
 Land Use/Building Type:

Name of Business:
 Address:
 City:
 State:
 Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):
 CBD
 Urban (non-CBD)
 Suburban (non-CBD)
 Suburban CBD
 Rural
 Not Given

Competition Within Area (select one):
 High
 Medium
 Low

Drive-Through Description :

Gross Floor Area (estimated)

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday		
Wednesday	14	7:22am, 7:49am
Thursday	16	8:56am
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:
 Land Use/Building Type:

Name of Business:
 Address:
 City:
 State:
 Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):
 CBD
 Urban (non-CBD)
 Suburban (non-CBD)
 Suburban CBD
 Rural
 Not Given

Competition Within Area (select one):
 High
 Medium
 Low

Drive-Through Description :

1 Lane, Queuing Went Out Onto the Street

Gross Floor Area (estimated)

1,800 sq. ft

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday		
Wednesday	10	7:42am, 8:41am, 8:59am
Thursday	11	7:33am
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:

Land Use/Building Type:

Name of Business:

Address:

City:

State:

Zip Code:

Date(s):

Weather Conditions:

Location Within Area (select one):	CBD	<input type="text"/>	Competition Within Area (select one):	High	<input type="text"/>
	Urban (non-CBD)	<input type="text"/>		Medium	<input type="text" value="X"/>
	Suburban (non-CBD)	<input type="text" value="X"/>		Low	<input type="text"/>
	Suburban CBD	<input type="text"/>			
	Rural	<input type="text"/>			
	Not Given	<input type="text"/>			

Drive-Through Description :

1 Lane, Queue Lengths Recorded at 5 min Intervals

Gross Floor Area (estimated)

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday		
Wednesday	11	8:45am
Thursday		
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:

Land Use/Building Type:

Name of Business:

Address:

City:

State:

Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):	CBD	<input type="text"/>	Competition Within Area (select one):	High	<input type="text"/>
	Urban (non-CBD)	<input type="text"/>		Medium	<input type="text" value="X"/>
	Suburban (non-CBD)	<input type="text" value="X"/>		Low	<input type="text"/>
	Suburban CBD	<input type="text"/>			
	Rural	<input type="text"/>			
	Not Given	<input type="text"/>			

Drive-Through Description :

Gross Floor Area (estimated)

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday	10	8:09am
Wednesday	12	7:57am
Thursday		
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:
 Land Use/Building Type:

Name of Business:
 Address:
 City:
 State:
 Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):
 CBD
 Urban (non-CBD) ☒
 Suburban (non-CBD) ☐
 Suburban CBD ☐
 Rural ☐
 Not Given ☐

Competition Within Area (select one):
 High
 Medium ☒
 Low

Drive-Through Description :

Gross Floor Area (estimated)

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday		
Wednesday	5	6:04pm
Thursday	5	6:55pm
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:
 Land Use/Building Type:

Name of Business:
 Address:
 City:
 State:
 Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):
 CBD
 Urban (non-CBD)
 Suburban (non-CBD)
 Suburban CBD
 Rural
 Not Given

Competition Within Area (select one):
 High
 Medium
 Low

Drive-Through Description :

1 Lane

Gross Floor Area (estimated)

3,300 sq. ft

	Maximum Queue	Time Max Queue Occurred
Sunday	6	4:30pm
Monday	12	12:10pm
Tuesday		
Wednesday		
Thursday		
Friday	10	12:12pm
Saturday	8	9:38pm

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:

Land Use/Building Type:

Name of Business:

Address:

City:

State:

Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):	CBD	<input type="text"/>	Competition Within Area (select one):	High	<input type="text"/>
	Urban (non-CBD)	<input type="text"/>		Medium	<input type="text" value="X"/>
	Suburban (non-CBD)	<input type="text" value="X"/>		Low	<input type="text"/>
	Suburban CBD	<input type="text"/>			
	Rural	<input type="text"/>			
	Not Given	<input type="text"/>			

Drive-Through Description :

2 Order Stations

Gross Floor Area (estimated)

3,600 sq. ft

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday		
Wednesday	12	11:46am
Thursday	13	12:23pm
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:
 Land Use/Building Type:

Name of Business:
 Address:
 City:
 State:
 Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):
 CBD
 Urban (non-CBD)
 Suburban (non-CBD)
 Suburban CBD
 Rural
 Not Given

Competition Within Area (select one):
 High
 Medium
 Low

Drive-Through Description :

1 Lane

Gross Floor Area (estimated)

3,825 sq. ft.

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday		
Wednesday	9	8:48am
Thursday	8	8:54am
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:
 Land Use/Building Type:

Name of Business:
 Address:
 City:
 State:
 Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):
 CBD
 Urban (non-CBD)
 Suburban (non-CBD)
 Suburban CBD
 Rural
 Not Given

Competition Within Area (select one):
 High
 Medium
 Low

Drive-Through Description :

1 Lane

Gross Floor Area (estimated)

2,500 sq. ft

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday		
Wednesday	10	12:26pm
Thursday	8	12:17pm, 6:57pm
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:
 Land Use/Building Type:

Name of Business:
 Address:
 City:
 State:
 Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):
 CBD
 Urban (non-CBD)
 Suburban (non-CBD)
 Suburban CBD
 Rural
 Not Given

Competition Within Area (select one):
 High
 Medium
 Low

Drive-Through Description :

Gross Floor Area (estimated)

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday		
Wednesday	8	5:26pm
Thursday	5	8:13am, 12:10pm, 1:25pm, 3:22pm, 8:54pm
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:

Land Use/Building Type:

Name of Business:

Address:

City:

State:

Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):

CBD	<input type="text"/>
Urban (non-CBD)	<input type="text"/>
Suburban (non-CBD)	<input checked="" type="text" value="X"/>
Suburban CBD	<input type="text"/>
Rural	<input type="text"/>
Not Given	<input type="text"/>

Competition Within Area (select one):

High	<input checked="" type="text" value="X"/>
Medium	<input type="text"/>
Low	<input type="text"/>

Drive-Through Description :

2 Lanes

Gross Floor Area (estimated)

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday	1	13 times
Wednesday	2	5:55pm
Thursday		
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:
 Land Use/Building Type:

Name of Business:
 Address:
 City:
 State:
 Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):
 CBD
 Urban (non-CBD)
 Suburban (non-CBD)
 Suburban CBD
 Rural
 Not Given

Competition Within Area (select one):
 High
 Medium
 Low

Drive-Through Description :

2 Lanes

Gross Floor Area (estimated)

	Maximum Queue	Time(s) Max Queue Occurred
Sunday		
Monday		
Tuesday	4	5:28pm
Wednesday	4	6:38pm
Thursday		
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:
 Land Use/Building Type:

Name of Business:
 Address:
 City:
 State:
 Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):
 CBD
 Urban (non-CBD)
 Suburban (non-CBD)
 Suburban CBD
 Rural
 Not Given

Competition Within Area (select one):
 High
 Medium
 Low

Drive-Through Description :

2 Lanes

Gross Floor Area (estimated)

	Maximum Queue	Time(s) Max Queue Occurred
Sunday		
Monday		
Tuesday	2	1:57pm, 3:35pm, 5:48pm, 6:07pm, 7:10pm
Wednesday	2	3:03pm, 3:52pm, 4:07pm, 4:46pm, 5:12pm, 5:20pm, 6:43pm
Thursday		
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:

Land Use/Building Type:

Name of Business:

Address:

City:

State:

Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):	CBD	<input type="text"/>	Competition Within Area (select one):	High	<input type="text"/>
	Urban (non-CBD)	<input type="text"/>		Medium	<input type="text" value="X"/>
	Suburban (non-CBD)	<input type="text" value="X"/>		Low	<input type="text"/>
	Suburban CBD	<input type="text"/>			
	Rural	<input type="text"/>			
	Not Given	<input type="text"/>			

Drive-Through Description :

2 Lanes

Gross Floor Area (estimated)

	Maximum Queue	Time(s) Max Queue Occurred
Sunday		
Monday		
Tuesday		
Wednesday	4	2:33pm, 3:31pm, 4:46pm, 4:57pm, 5:28pm, 6:26pm, 6:38pm, 8:20pm, 9:20pm
Thursday	5	4:30pm, 4:52pm, 5:56pm, 6:00pm
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:
 Land Use/Building Type:

Name of Business:
 Address:
 City:
 State:
 Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):
 CBD
 Urban (non-CBD)
 Suburban (non-CBD)
 Suburban CBD
 Rural
 Not Given

Competition Within Area (select one):
 High
 Medium
 Low

Drive-Through Description :

2 Lanes

Gross Floor Area (estimated)

	Maximum Queue	Time(s) Max Queue Occurred
Sunday		
Monday		
Tuesday	3	4:03pm
Wednesday	3	8:34am, 4:04pm, 4:51pm
Thursday		
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:
 Land Use/Building Type:

Name of Business:
 Address:
 City:
 State:
 Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):
 CBD
 Urban (non-CBD)
 Suburban (non-CBD)
 Suburban CBD
 Rural
 Not Given

Competition Within Area (select one):
 High
 Medium
 Low

Drive-Through Description :

1 Lane

Gross Floor Area (estimated)

	Maximum Queue	Time(s) Max Queue Occurred
Sunday		
Monday		
Tuesday	3	4:49pm
Wednesday	2	12:49pm
Thursday		
Friday		
Saturday		