

Traffic Impact Study

# Majestic Tower Crossings Retail

Aurora, Colorado

Prepared for:

**Commerce Construction Co., L.P.**

**Kimley»Horn**

# T R A F F I C   I M P A C T   S T U D Y

## **Majestic Tower Crossings Retail**

Aurora, Colorado

**Prepared for**  
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## 1.0 EXECUTIVE SUMMARY

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This report has been prepared to document the results of a Traffic Impact Study for Majestic Tower Crossings Retail proposed to be located on the northeast and southeast corners of the 32<sup>nd</sup> Parkway and Tower Road intersection in Aurora, Colorado. For purposes of this study, Majestic Tower Crossings Retail is proposed to include a 30,000 square foot storage facility, two hotels with 240 total rooms, a 5,000 square foot drive-in bank, and a 16-fueling position gas station with convenience market on the north side of 32<sup>nd</sup> Parkway. The development area along the south side of 32<sup>nd</sup> Parkway was studied to include a 124-room hotel, a 40,000 square foot fitness club, 27,000 square feet of retail uses, 16,000 square feet of sit-down restaurants, 10,000 square feet of fast-food restaurants, and a 2,500 square foot coffee shop. It is expected that Majestic Tower Crossings Retail will be completed in the next few years; therefore, analysis was conducted for the 2025 short-term buildout horizon as well as the 2040 long-term twenty-year planning horizon.

The purpose of this traffic study is to provide an update to the Majestic Tower Retail Traffic Impact Study prepared by Kimley-Horn in July 2018 for two full movement access intersections to be located along 32<sup>nd</sup> Parkway. In addition, right-in/right-out accesses are proposed along 32<sup>nd</sup> Parkway between Tower Road and the West Full Access for both the north and south development areas of Majestic Tower Crossings Retail. This traffic study identifies updated project traffic generation to determine potential project traffic related impacts on the local street system and to develop the necessary mitigation measures required for the identified traffic impacts with the new accesses proposed along 32<sup>nd</sup> Parkway. Therefore, the intersection of 32<sup>nd</sup> Parkway and Tower Road (#1) was incorporated into this traffic study with new counts to provide the updated traffic access evaluation. In addition, the proposed 32<sup>nd</sup> Parkway West Right-In/Right-Out access (#2) (for the northern development area), the 32<sup>nd</sup> Parkway East Right-In/Right-Out access (#3) (for the southern development area), the 32<sup>nd</sup> Parkway West Full Movement Access (#4), and the 32<sup>nd</sup> Parkway East Full Movement Access (#5) were evaluated.

Regional access to Majestic Tower Crossing Retail will be provided by I-70 and E-470. Primary access is to be provided by 32<sup>nd</sup> Parkway and Tower Road. Direct access will be provided by two full movement and two right-in/right-out accesses along 32<sup>nd</sup> Parkway and an existing right-in/right-out access along Tower Road.

Majestic Tower Crossings Retail is expected to generate approximately 16,142 weekday daily trips, with 1,548 of these trips occurring during the morning peak hour and 1,247 of these trips occurring during the afternoon peak hour.

Based on the analysis presented in this report, Kimley-Horn believes Majestic Tower Crossings Retail will be successfully incorporated into the existing and future roadway network. The eastern full movement access is anticipated to operate acceptably. Analysis of the existing street network, the proposed project development, and expected traffic volumes resulted in the following recommendations:

### **2025 Recommendations**

- With completion of the Majestic Tower Crossings Retail project, four accesses are proposed along 32<sup>nd</sup> Parkway. One right-in/right-out access is proposed on the north side of 32<sup>nd</sup> Parkway, one right-in/right-out access is proposed along the south side of 32<sup>nd</sup> Parkway, and two full movement accesses are proposed to provide access to both the northern and southern development areas. The right-in/right-out accesses are proposed to exist along 32<sup>nd</sup> Parkway between Tower Road and the western full movement access intersection.
- It is recommended that the southbound left turn lane at the intersection of 32<sup>nd</sup> Parkway and Tower Road (#1) be extended from 150 feet to 550 feet by 2025.
- It is recommended that R1-1 “STOP” signs be installed on the approaches exiting the development at both 32<sup>nd</sup> Parkway Right-In/Right-Out Accesses (#2 & #3). Since the northbound and southbound approaches at these two accesses will be restricted to right turn movements only, R3-2 No Left Turn signs should be installed under the proposed “STOP” signs. To meet City of Aurora standards it is recommended that a 150 foot with 145-foot taper eastbound right turn lane be designated at the 32<sup>nd</sup> Parkway East Right-In/Right-Out Access (#2) for the southern development area.
- With project construction the 32<sup>nd</sup> Parkway West Full Access (#4) is anticipated to warrant a traffic signal. Therefore, it is recommended that this intersection be signalized with project construction. The northbound approach should be constructed with 150-foot dual left turn

lanes and a shared through/right turn lane. Additionally, it is recommended that the southbound approach consist of a 50-foot left turn lane and a shared through/right turn lane. To meet City of Aurora standards, it is recommended that a 150-foot with 145-foot taper eastbound right turn lane be constructed.

- With project construction, the 32<sup>nd</sup> Parkway East Full Access (#5) is recommended to be stop controlled with a R1-1 “STOP” sign installed on the northbound and southbound approaches. Additionally, it is recommended that the northbound and southbound approaches consist of a 25-foot left turn lane and a shared through/right turn lane. To meet City of Aurora standards it is recommended that a 100 foot with 145-foot taper eastbound left turn lane, a 150-foot with 145-foot taper eastbound right turn lane, and a 100-foot with 145 foot taper westbound left turn lane be constructed and designated.

#### **2040 Recommendations**

- By 2040, a third northbound through lane may be needed at the intersection of 32nd Parkway and Tower Road (#1). If a third northbound through lane is constructed along Tower Road by 2040, it is recommended that the northbound right turn lane at the Tower Road Right-In/Right-Out Access (#6) be striped as a continuous shared through/right turn lane.

#### **General Recommendations**

- Any onsite or offsite improvements should be incorporated into the Civil Drawings and conform to standards of the City of Aurora and the Manual on Uniform Traffic Control Devices (MUTCD) – 2009 Edition.

## 2.0 INTRODUCTION

---

Kimley-Horn and Associates, Inc. has prepared this report to document the results of a Traffic Impact Study for Majestic Tower Crossings Retail proposed to be located on the northeast and southeast corners of the 32<sup>nd</sup> Parkway and Tower Road intersection in Aurora, Colorado. A vicinity map illustrating the Majestic Tower Crossings Retail development location is shown in **Figure 1**. Majestic Tower Crossings Retail is proposed to include a 30,000 square foot storage facility, two hotels with 240 total rooms, a 5,000 square foot drive-in bank, and a 16-fueling position gas station with convenience market on the north side of 32<sup>nd</sup> Parkway. The development area along the south side of 32<sup>nd</sup> Parkway was studied to include a 124-room hotel, a 40,000 square foot fitness club, 27,000 square feet of retail uses, 16,000 square feet of sit-down restaurants, 10,000 square feet of fast-food restaurants, and a 2,500 square foot coffee shop. A conceptual site plan is attached in **Appendix G**. It is expected that Majestic Tower Crossings Retail will be completed in the next few years; therefore, analysis was conducted for the 2025 short-term buildout horizon as well as the 2040 long-term twenty-year planning horizon.

The purpose of this traffic study is to provide an update to the Majestic Tower Retail Traffic Impact Study prepared by Kimley-Horn in July 2018 for two full movement access intersections to be located along 32<sup>nd</sup> Parkway. In addition, right-in/right-out accesses are proposed along 32<sup>nd</sup> Parkway between Tower Road and the West Full Access for both the north and south development areas of Majestic Tower Crossings Retail. This traffic study identifies updated project traffic generation to determine potential project traffic related impacts on the local street system and to develop the necessary mitigation measures required for the identified traffic impacts with the new accesses proposed along 32<sup>nd</sup> Parkway. Therefore, the intersection of 32<sup>nd</sup> Parkway and Tower Road (#1) was incorporated into this traffic study with new counts to provide the updated traffic access evaluation. In addition, the proposed 32<sup>nd</sup> Parkway West Right-In/Right-Out access (#2) (for the northern development area), the 32<sup>nd</sup> Parkway East Right-In/Right-Out access (#3) (for the southern development area), the 32<sup>nd</sup> Parkway West Full Movement Access (#4), the 32<sup>nd</sup> Parkway East Full Movement Access (#5) were evaluated. Further, the existing right-in/right-out access (#6) along Tower Road was also evaluated.



FIGURE 1  
MAJESTIC TOWER CROSSINGS RETAIL  
AURORA, COLORADO  
VICINITY MAP

## **3.0 EXISTING AND FUTURE CONDITIONS**

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### **3.1 Project Access and Existing Study Area**

Regional access to Majestic Tower Crossing Retail will be provided by I-70 and E-470. Primary access is to be provided by 32<sup>nd</sup> Parkway and Tower Road. Direct access will be provided by two full movement and two right-in/right-out accesses along 32<sup>nd</sup> Parkway and an existing right-in/right-out access along Tower Road.

The existing site is comprised of vacant land. Directly across Tower Road from the site to the west is a Walmart Supercenter retail center. Other commercial uses exist to the north of the site, along the east side of Tower Road, which includes a Les Schwab Tire Center, a multi-tenant retail building and Murphy Express gas station. Directly adjacent to the site to the east is vacant land being developed as part of Majestic Commercenter. Bordering the site to the south is Interstate 70 and the Tower Road westbound off-ramp. Outside of this immediate area, commercial uses exist to the west while residential neighborhoods are in the extended area to the north. Industrial uses are located in all directions surrounding the site.

### **3.2 Existing Roadway Network**

Through the study area, 32<sup>nd</sup> Parkway is a raised median divided roadway providing two through lanes of travel each direction, eastbound and westbound, east of Tower Road. 32<sup>nd</sup> Parkway has a posted speed limit of 40 miles per hour. Tower Road provides two through lanes of travel northbound and three through lanes of travel southbound adjacent to the site and has a posted speed limit of 40 miles per hour.

The existing intersection of 32<sup>nd</sup> Parkway and Tower Road (#1) is signalized and operates with protected/permitted left turn phasing for the southbound left turn movement. The westbound approach consists of dual left turn lanes and a right turn lane. The northbound approach consists of two through lanes and a right turn lane. The southbound approach consists of a left turn lane and three through lanes. An aerial photo of the existing intersection configuration is below (north is up).



*32<sup>nd</sup> Parkway & Tower Road (#1)*

The intersection lane configuration and control for the study area intersections are shown in **Figure 2**.

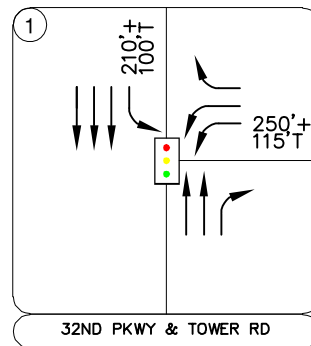
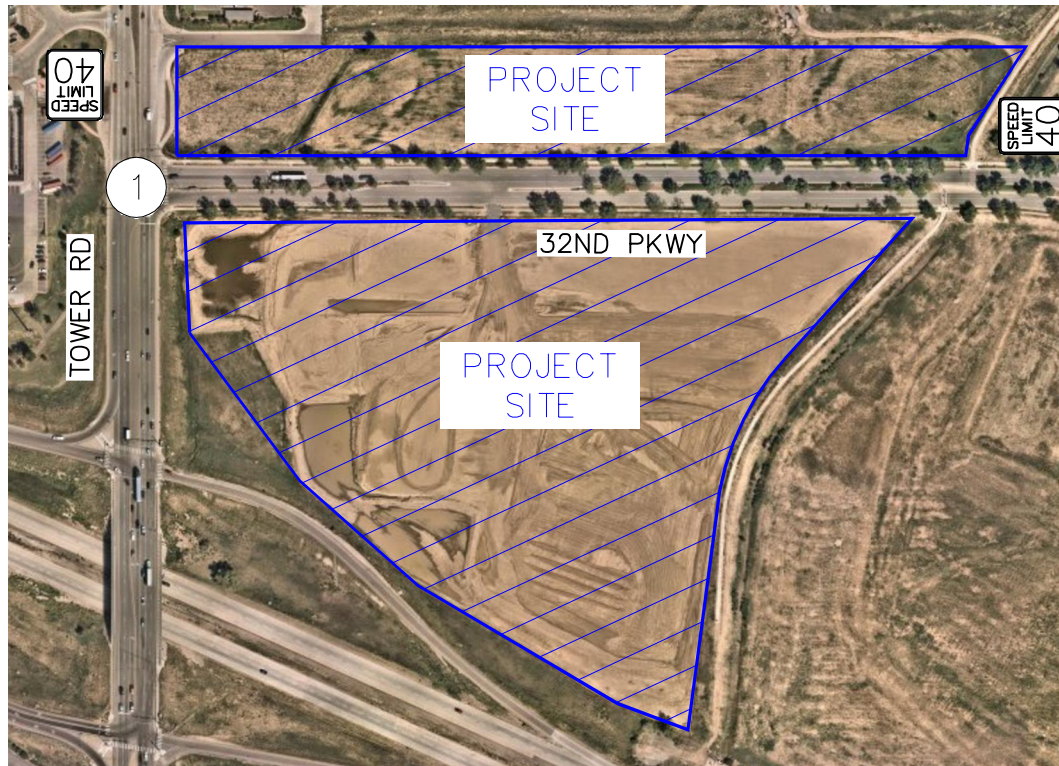
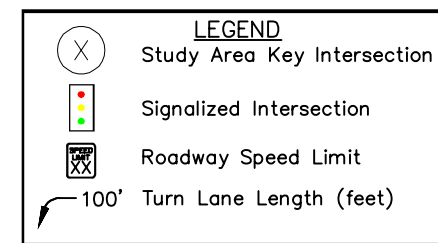


FIGURE 2  
MAJESTIC TOWER CROSSINGS RETAIL  
AURORA, COLORADO  
EXISTING GEOMETRY AND CONTROL

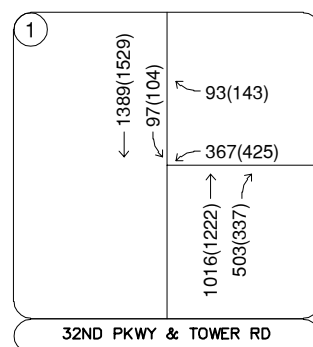
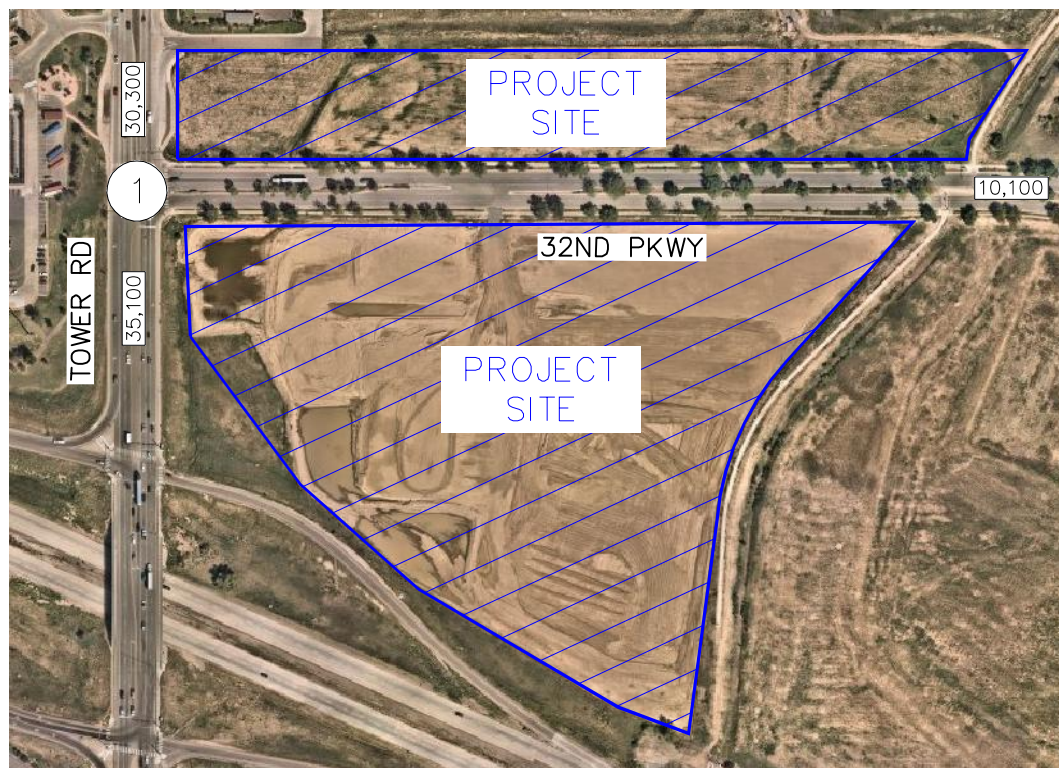


### 3.3 Existing Traffic Volumes

Existing turning movement counts were conducted at the study intersection on Tuesday, October 11, 2022, during the weekday morning and afternoon peak hours. The counts were conducted during the morning and afternoon peak hours of adjacent street traffic in 15-minute intervals from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM on this count date. The existing intersection traffic volumes are shown in **Figure 3** with count sheets provided in **Appendix A**.

### 3.4 Unspecified Development Traffic Growth

To be consistent with the City of Aurora Traffic Impact Study Guidelines, a two percent annual growth rate was used to estimate future traffic volume conditions. In addition, project traffic volumes estimated from Majestic Commercenter Phase 11 and Majestic Commercenter Building G, H, and J were included within the background traffic volumes. Traffic volumes from background studies are included in **Appendix B**. Background traffic volumes for 2025 and 2040 are shown in **Figures 4** and **5**, respectively.



Tuesday, October 11, 2022

7:15 to 8:15AM (4:00 to 5:00PM)

**FIGURE 3**  
**MAJESTIC TOWER CROSSINGS RETAIL**  
**AURORA, COLORADO**  
**2022 EXISTING TRAFFIC VOLUMES**

**LEGEND**



Study Area Key Intersection

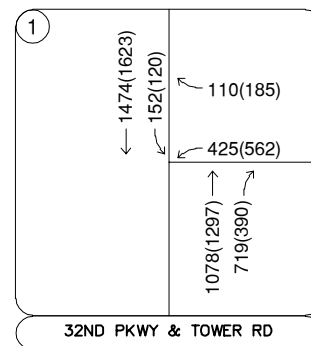
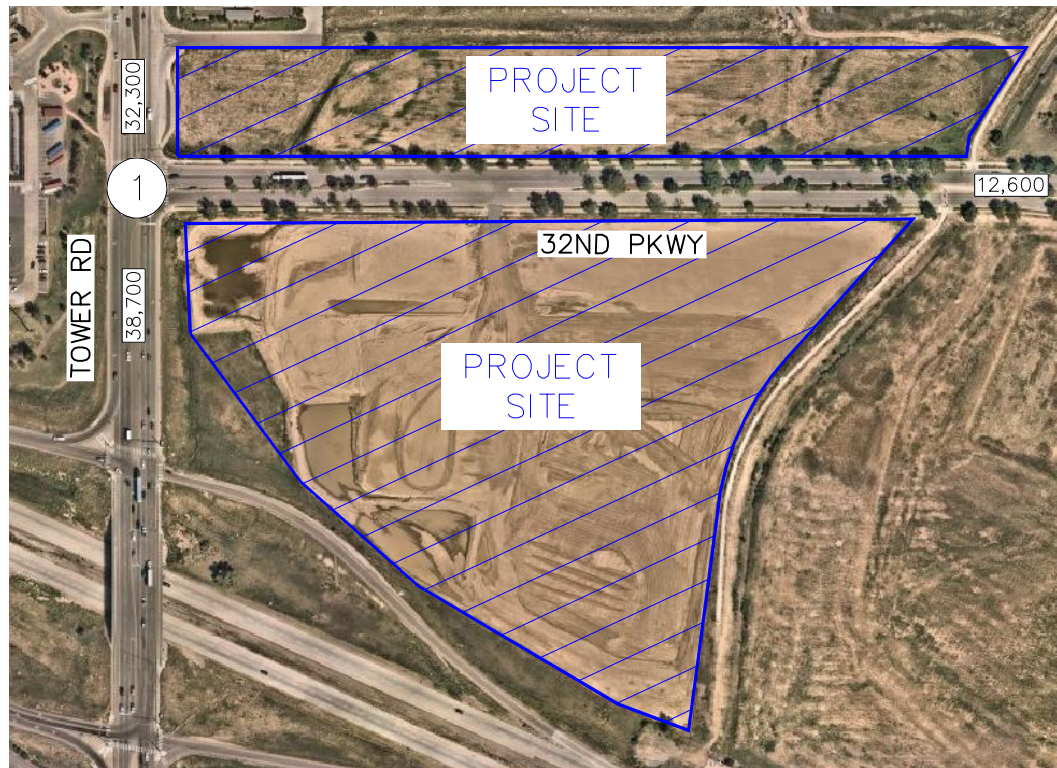
XXX(XXX)

Weekday AM(PM)

Peak Hour Traffic Volumes

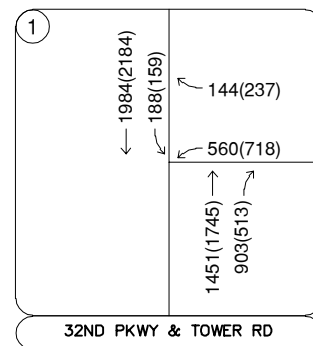
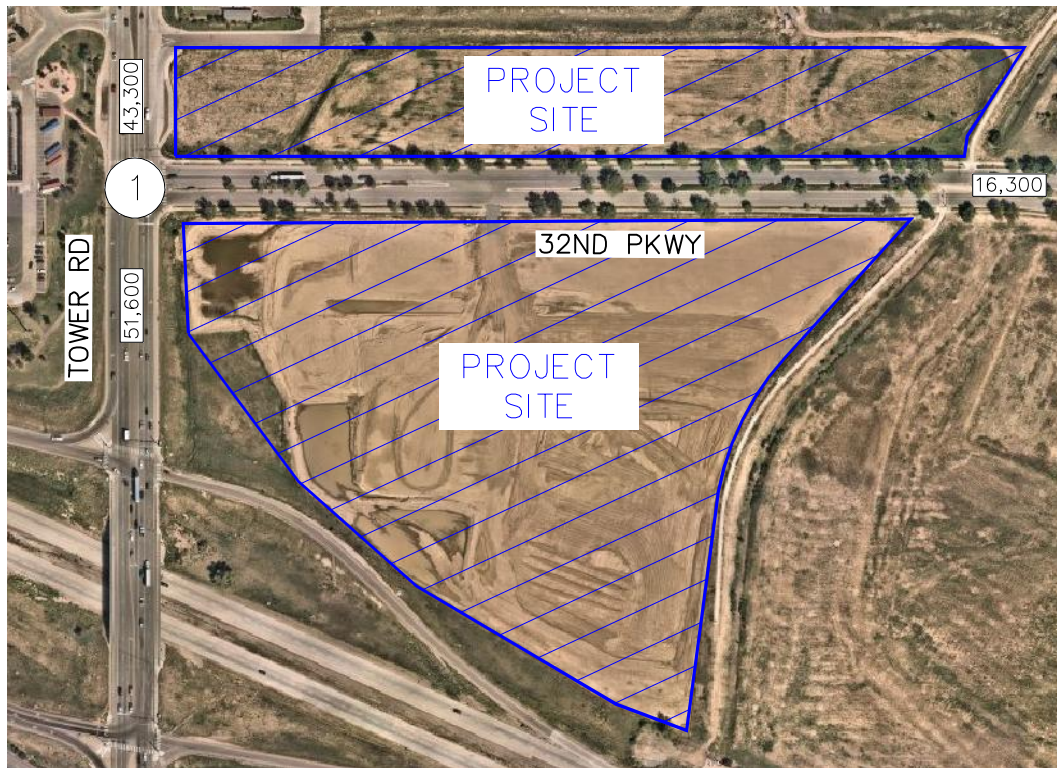
XX,X00

Estimated Daily Traffic Volume



**FIGURE 4**  
 MAJESTIC TOWER CROSSINGS RETAIL  
 AURORA, COLORADO  
 2025 BACKGROUND TRAFFIC VOLUMES

LEGEND	
(X)	Study Area Key Intersection
xxx(xxx)	Weekday AM(PM) Peak Hour Traffic Volumes
xx,x00	Estimated Daily Traffic Volume



**FIGURE 5**  
 MAJESTIC TOWER CROSSINGS RETAIL  
 AURORA, COLORADO  
 2040 BACKGROUND TRAFFIC VOLUMES

LEGEND	
(X)	Study Area Key Intersection
xxx(xxx)	Weekday AM(PM) Peak Hour Traffic Volumes
xx,x00	Estimated Daily Traffic Volume

## 4.0 PROJECT TRAFFIC CHARACTERISTICS

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### 4.1 Trip Generation

Site-generated traffic estimates are determined through a process known as trip generation. Rates and equations are applied to the proposed land use to estimate traffic generated by the development during a specific time interval. The acknowledged source for trip generation rates is the *Trip Generation Manual*<sup>1</sup> published by the Institute of Transportation Engineers (ITE). ITE has established trip rates in nationwide studies of similar land uses. For this study, Kimley-Horn used the ITE Trip Generation Report average rates/fitted curve equations that apply to Mini-Warehouse (ITE Land Use Code 151), Hotel (ITE Land Use Code 310), Drive-In Bank (ITE Land Use Code 912), and Convenience Store/Gas Station (ITE Land Use Code 945) for development on the north side of 32<sup>nd</sup> Parkway and Hotel (ITE Land Use Code 310), Health/Fitness Club (ITE Land Use Code 492), Strip Retail Plaza (ITE Land Use Code 822), High-Turnover Sit-Down Restaurant (ITE Land Use Code 932), Fast-Food Restaurant with Drive Through (ITE Land Use Code 934), and Coffee/Donut Shop with Drive Through (ITE Land Use Code 937) for development on the south side of 32<sup>nd</sup> Parkway.

Since full buildout of the Majestic Tower Crossings Retail is proposed to contain a mix of uses, internal capture trips are expected to occur on site as well. These internal capture trips are shared trips from vehicles already within the internal street network. These shared trips reduce the number of total external trips and were calculated directly per the ITE procedure.

Majestic Tower Crossings Retail is expected to generate approximately 16,142 weekday external daily trips, with 1,548 of these trips occurring during the morning peak hour and 1,247 of these trips occurring during the afternoon peak hour. Calculations were based on the procedure and information provided in the ITE *Trip Generation Manual, 11<sup>th</sup> Edition – Volume 1: User's Guide and Handbook*, 2021. **Table 1** summarizes the estimated trip generation for the Majestic Tower Crossings Retail. The trip generation worksheets are included in **Appendix C**.

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<sup>1</sup> Institute of Transportation Engineers, *Trip Generation Manual*, Eleventh Edition, Washington DC, 2021.

**Table 1 – Majestic Tower Crossings Retail Traffic Generation**

Land Use and Size	Weekday Vehicle Trips						
	Daily	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
North Side of 32 <sup>nd</sup> Parkway							
Mini-Warehouse (ITE 151) – 30,000 Square Feet	44	2	1	3	2	3	5
Hotel (ITE 310) – 240 Rooms	2,178	63	50	113	76	74	150
Drive-In Bank (ITE 912) – 5,000 Square Feet	502	29	21	50	52	53	105
Convenience Store/Gas Station (ITE 945) – 16 Fueling Positions	4,114	216	217	433	182	182	364
Total North Trips	6,838	310	289	599	312	312	624
North Trips after Internal Capture	6,540	303	282	585	295	295	590
South Side of 32 <sup>nd</sup> Parkway							
Hotel (ITE 310) – 124 Rooms	920	31	24	55	33	31	64
Health/Fitness Club (ITE 492) – 40,000 Square Feet	1,380	27	25	52	79	59	138
Strip Retail Plaza (ITE 822) – 27,000 Square Feet	1,470	38	26	64	89	89	178
Sit-Down Restaurant (ITE 932) – 16,000 Square Feet	1,716	84	69	153	88	57	145
Fast Food Restaurant w/ DT (ITE 934) – 10,000 Square Feet	4,676	227	219	446	172	158	330
Coffee/Donut Shop w/ DT (ITE 937) – 2,500 Square Feet	1,334	110	105	215	49	49	98
Total South Trips	11,496	517	468	985	510	443	953
South Trips after Internal Capture	9,602	506	457	963	362	295	657
Total Trips	18,334	827	757	1,584	822	755	1,577
Total Trips after Internal Capture	16,142	809	739	1,548	657	590	1,247

## 4.2 Trip Distribution

Distribution of site traffic on the street system was based on the area street system characteristics, existing traffic patterns, existing and anticipated surrounding demographic information, and the proposed access system for the project. The directional distribution of traffic is a means to quantify the percentage of site-generated traffic that approaches the site from a given direction and departs the site back to the original source. The project trip distribution for the proposed development is illustrated in **Figure 6** for the north portion of the development and **Figure 7** for the southern portion of the development area.

## 4.3 Traffic Assignment

Majestic Tower Crossings Retail traffic assignment was obtained by applying the project trip distribution to the estimated traffic generation of the development shown in **Table 1**. Traffic assignment is shown in **Figure 8**.

## 4.4 Total (Background Plus Project) Traffic

Site traffic volumes were added to the background volumes to represent estimated traffic conditions for the short-term 2025 buildout horizon and long-term 2040 twenty-year planning horizon. These total traffic volumes for the study area are illustrated for the 2025 and 2040 horizon years in **Figures 9** and **10**, respectively.

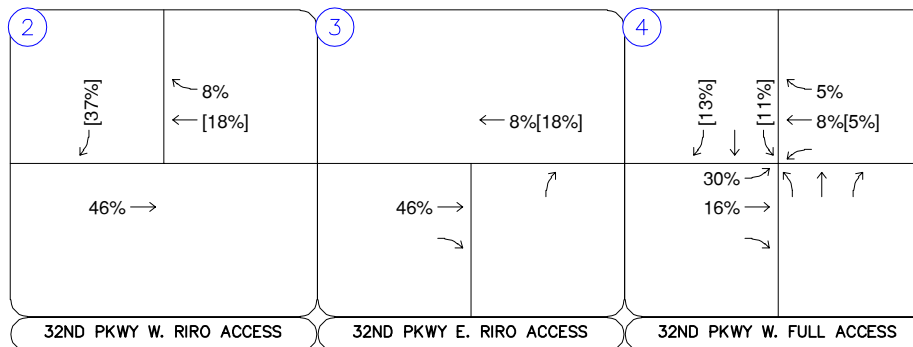
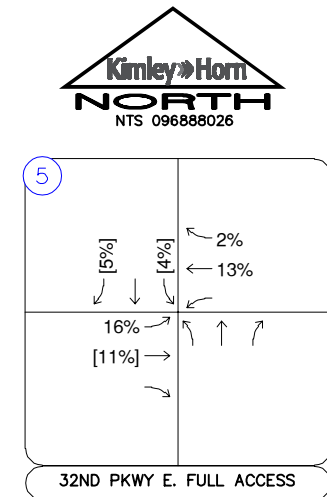
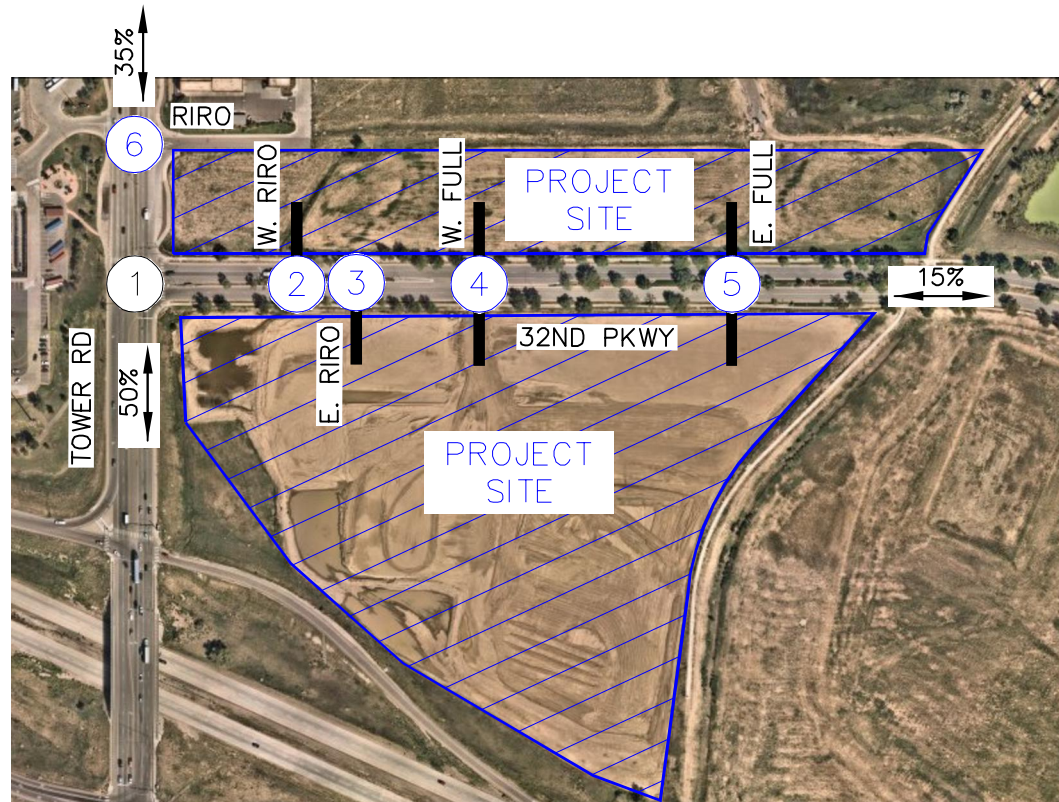
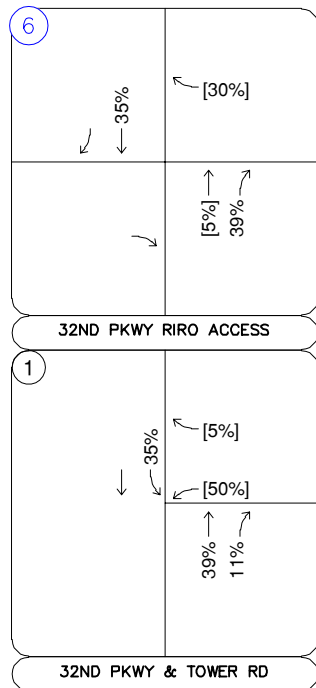
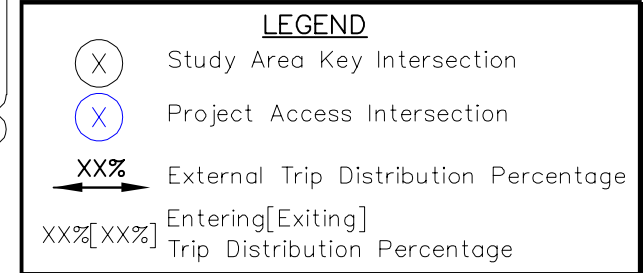


FIGURE 6  
MAJESTIC TOWER CROSSINGS RETAIL  
AURORA, COLORADO  
PROJECT TRIP DISTRIBUTION – NORTH SITE



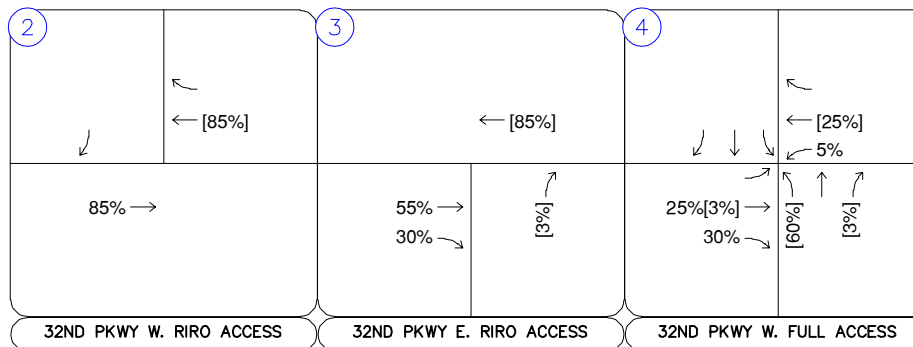
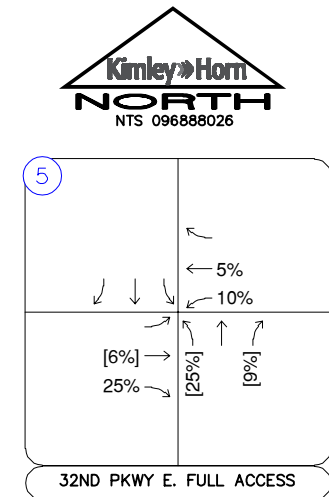
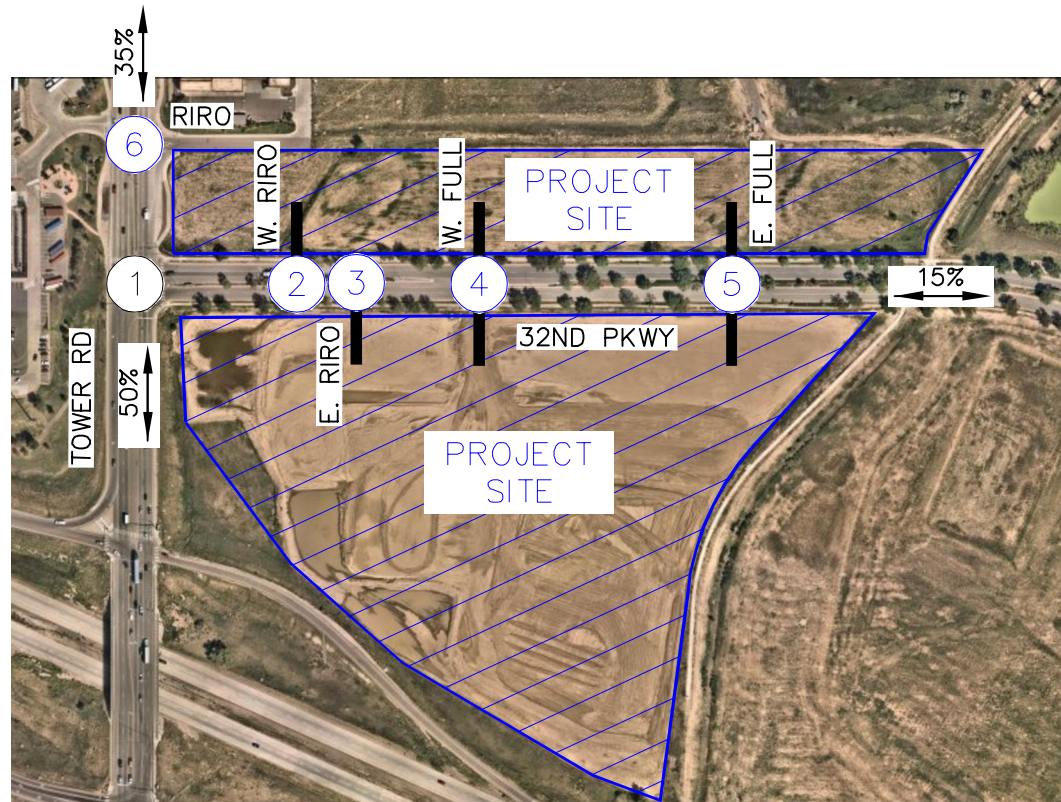
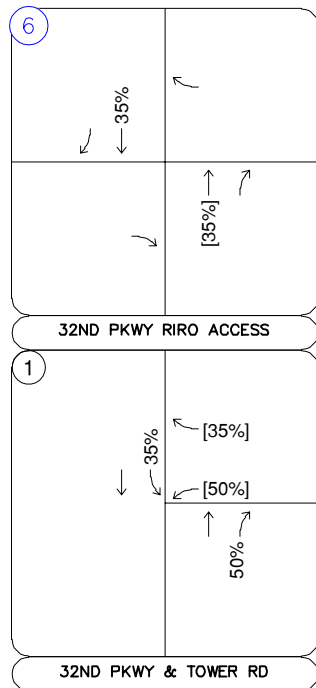
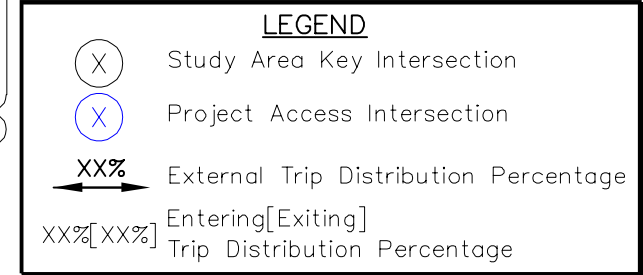


FIGURE 7  
MAJESTIC TOWER CROSSINGS RETAIL  
AURORA, COLORADO  
PROJECT TRIP DISTRIBUTION – SOUTH SITE



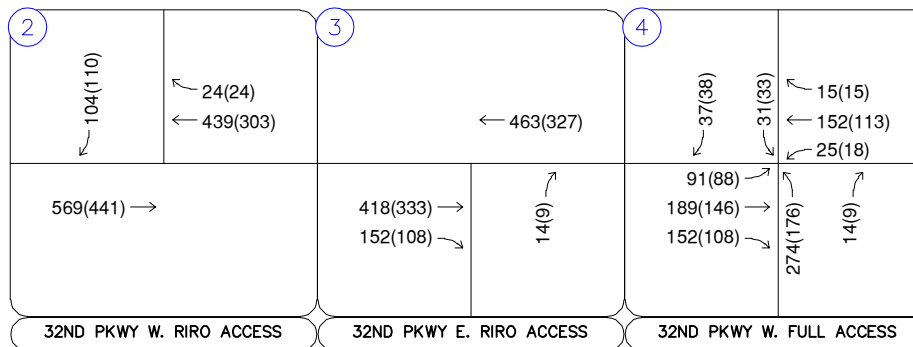
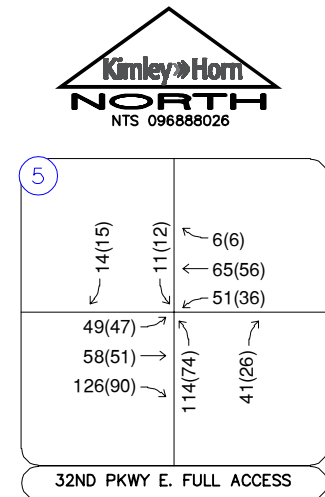
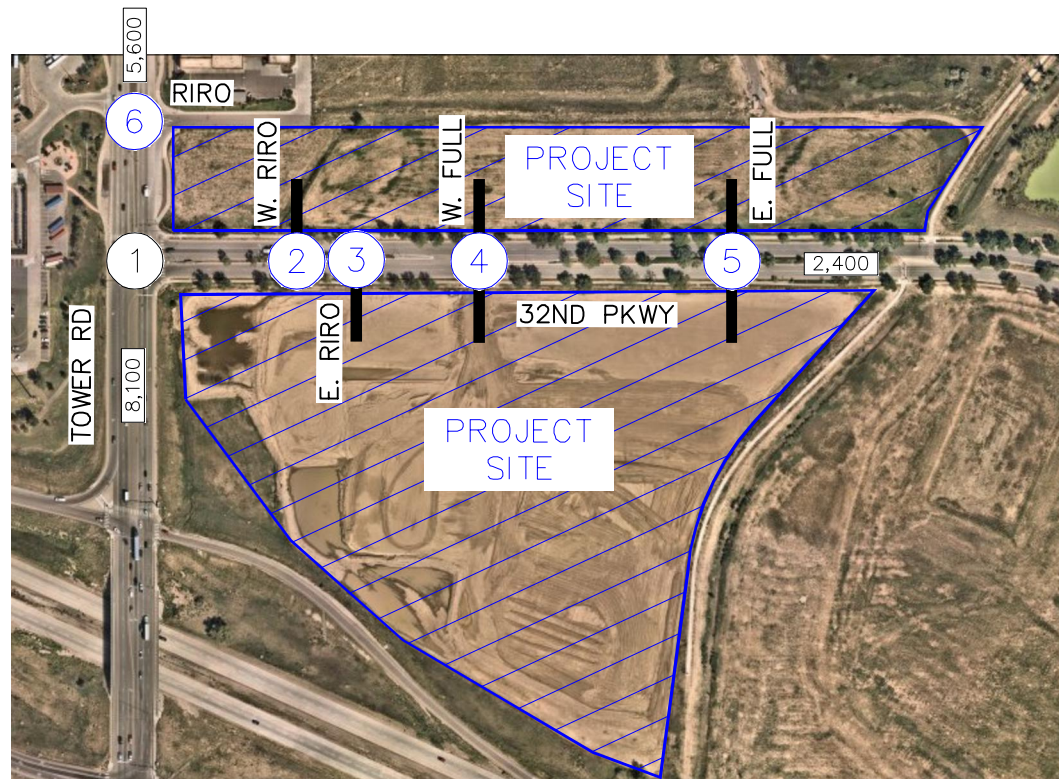
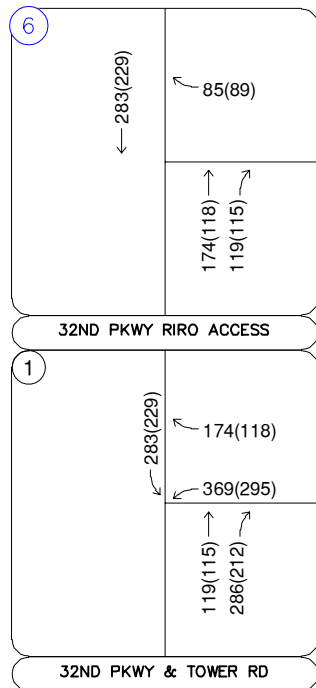
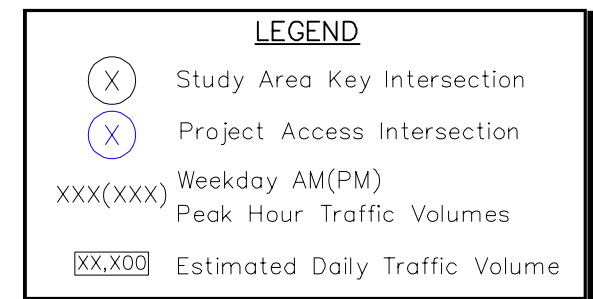
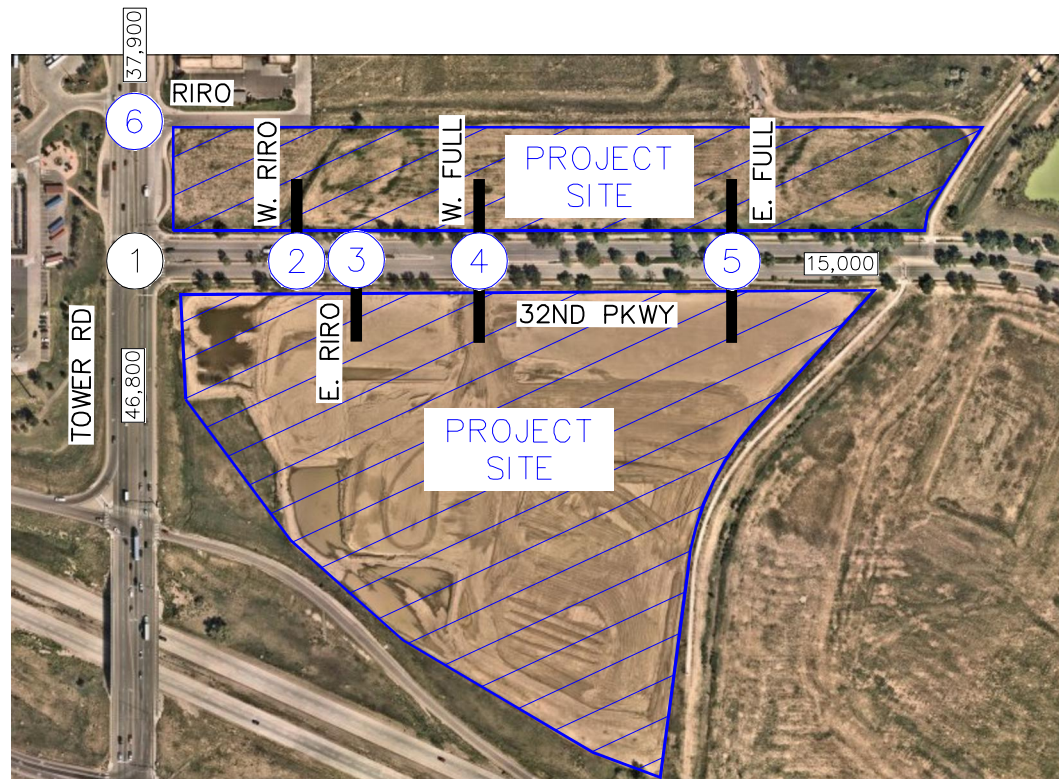


FIGURE 8  
MAJESTIC TOWER CROSSINGS RETAIL  
AURORA, COLORADO  
PROJECT TRAFFIC ASSIGNMENT



6	<div> <div>49(101)</div> <div>1863(1839)</div> </div> <div>87(93)</div>
	<div>46(133)</div> <div>1344(1556)</div> <div>137(159)</div>
32ND PKWY RIRO ACCESS	
1	<div>1474(1623)</div> <div>435(349)</div> <div>284(303)</div> <div>794(857)</div> <div>1197(1412)</div> <div>1005(602)</div>
32ND PKWY & TOWER RD	



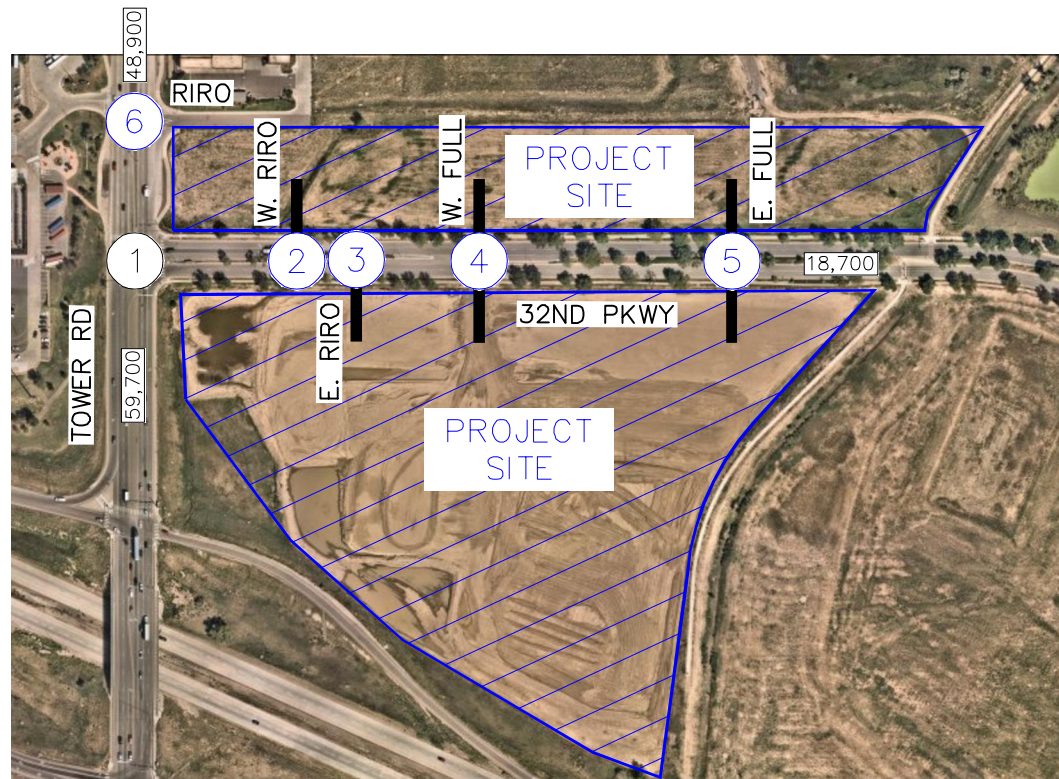
5	<div>14(15)</div> <div>11(12)</div> <div>6(6)</div> <div>600(803)</div> <div>51(36)</div>
	<div>49(47)</div> <div>929(561)</div> <div>126(90)</div> <div>114(74)</div> <div>41(26)</div>
32ND PKWY E. FULL ACCESS	

2	<div>104(110)</div> <div>24(24)</div> <div>974(1050)</div>	3	<div>998(1074)</div>	4	<div>37(38)</div> <div>31(33)</div> <div>15(15)</div> <div>687(860)</div> <div>25(18)</div>
	<div>1440(951)</div>		<div>1289(843)</div> <div>152(108)</div> <div>14(9)</div>		<div>91(88)</div> <div>1060(656)</div> <div>152(108)</div> <div>274(176)</div> <div>14(9)</div>
32ND PKWY W. RIRO ACCESS		32ND PKWY E. RIRO ACCESS		32ND PKWY W. FULL ACCESS	

FIGURE 9  
MAJESTIC TOWER CROSSINGS RETAIL  
AURORA, COLORADO  
2025 TOTAL TRAFFIC VOLUMES

LEGEND	
(X)	Study Area Key Intersection
(X)	Project Access Intersection
xxx(XXX)	Weekday AM(PM) Peak Hour Traffic Volumes
XX,X00	Estimated Daily Traffic Volume

6	<div> <div>66(136)</div> <div>← 2394(2393)</div> </div> <div> <div>88(95)</div> </div>
	<div> <div>61(179)</div> </div> <div> <div>1745(2041)</div> <div>143(174)</div> </div>
32ND PKWY RIRO ACCESS	
1	<div> <div>1984(2184)</div> <div>← 471(388)</div> </div> <div> <div>318(355)</div> </div>
	<div> <div>929(1013)</div> </div> <div> <div>1570(1860)</div> <div>1189(725)</div> </div>
32ND PKWY & TOWER RD	



5	<div> <div>14(15)</div> <div>← 769(1011)</div> </div> <div> <div>6(6)</div> </div>
	<div> <div>49(47)</div> <div>1149(723)</div> <div>126(90)</div> </div> <div> <div>11(12)</div> <div>51(36)</div> <div>41(26)</div> </div>
32ND PKWY E. FULL ACCESS	

2	<div> <div>104(110)</div> </div> <div> <div>24(24)</div> <div>← 1143(1258)</div> </div>	3	<div> <div>← 1167(1282)</div> </div>	4	<div> <div>37(38)</div> <div>← 31(33)</div> </div> <div> <div>15(15)</div> <div>← 856(1068)</div> <div>25(18)</div> </div>
	<div> <div>1660(1113)</div> </div>		<div> <div>1509(1005)</div> <div>152(108)</div> </div> <div> <div>14(9)</div> </div>		<div> <div>91(88)</div> <div>1280(818)</div> <div>152(108)</div> </div> <div> <div>274(176)</div> <div>14(9)</div> </div>
32ND PKWY W. RIRO ACCESS		32ND PKWY E. RIRO ACCESS		32ND PKWY W. FULL ACCESS	

FIGURE 10  
MAJESTIC TOWER CROSSINGS RETAIL  
AURORA, COLORADO  
2040 TOTAL TRAFFIC VOLUMES

LEGEND	
(X)	Study Area Key Intersection
(X)	Project Access Intersection
xxx(xxx)	Weekday AM(PM) Peak Hour Traffic Volumes
xx,x00	Estimated Daily Traffic Volume

## 5.0 TRAFFIC OPERATIONS ANALYSIS

Kimley-Horn's analysis of traffic operations in the site vicinity was conducted to determine potential capacity deficiencies in the 2025 and 2040 development horizons at the identified key intersections. The acknowledged source for determining overall capacity is the *Highway Capacity Manual (HCM)*<sup>2</sup>.

### 5.1 Analysis Methodology

Capacity analysis results are listed in terms of Level of Service (LOS). LOS is a qualitative term describing operating conditions a driver will experience while traveling on a particular street or highway during a specific time interval. It ranges from A (very little delay) to F (long delays and congestion). For intersections and roadways in this study area, standard traffic engineering practice recommends overall intersection LOS D and movement/approach LOS E as the minimum desirable thresholds for acceptable operations. **Table 2** shows the definition of level of service for signalized and unsignalized intersections.

**Table 2 – Level of Service Definitions**

Level of Service	Signalized Intersection Average Total Delay (sec/veh)	Unsignalized Intersection Average Total Delay (sec/veh)
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

Definitions provided from the Highway Capacity Manual, Sixth Edition, Transportation Research Board, 2016.

Study area intersections were analyzed based on average total delay analysis for signalized and unsignalized intersections. Under the unsignalized analysis, the LOS for a two-way stop-controlled intersection is determined by the computed or measured control delay and is defined for each minor movement. LOS for a two-way stop-controlled intersection is not defined for the intersection as a whole. LOS for signalized, roundabout, and all-way stop controlled intersections are defined for each approach and for the overall intersection.

<sup>2</sup> Transportation Research Board, *Highway Capacity Manual*, Sixth Edition, Washington DC, 2016.

## 5.2 Key Intersection Operational Analysis

Calculations for the operational level of service at the key intersections for the study area are provided in **Appendix D**. The existing year analysis is based on the lane geometry and intersection control shown in **Figure 2**. Existing peak hour factors were utilized in the existing, 2025 horizon analysis, and the long-term 2040 horizon analysis years. Based on increased national attention given to establishing appropriate yellow and all-red clearance intervals to improve intersection safety, these have been calculated and are applied for approaches at the signalized intersections. The increase in yellow and all red time sacrifices intersection capacity for improved safety. Synchro traffic analysis software was used to analyze the signalized, and unsignalized key intersections for HCM level of service.

### 32<sup>nd</sup> Parkway & Tower Road (#1)

The existing intersection of 32<sup>nd</sup> Parkway and Tower Road (#1) is signalized and operates with protected/permitted left turn phasing for the southbound left turn movement. The intersection operates acceptably at LOS B during both peak hours under existing conditions. With project traffic, this intersection is anticipated to continue operating at an acceptable level of service D in the 2025 horizon.

By 2040, a third northbound through lane along Tower Road may need to be constructed at this intersection. When this occurs, a separate northbound right turn lane will still be needed. With this improvement, this intersection is anticipated to operate acceptably with LOS D during both peak hours in 2040 with project traffic. Per the City of Aurora's inquiry with increases in certain movement delays, signal timings were explored in more detail and have been optimized. Improving certain movements with additional green time creates other movements to operate with LOS E or LOS F. **Table 3** provides the results of the LOS analysis conducted at this intersection.

**Table 3 – 32<sup>nd</sup> Parkway & Tower Road (#1) LOS Results**

Scenario	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
<b>2022 Existing</b>	<b>12.9</b>	<b>B</b>	<b>14.9</b>	<b>B</b>
Westbound Left	54.4	D	54.7	D
Westbound Right	47.0	D	45.9	D
Northbound Through	9.4	A	12.0	B
Northbound Right	8.0	A	8.5	A
Southbound Left	6.6	A	9.7	A
Southbound Through	4.7	A	5.9	A
<b>2025 Background</b>	<b>14.5</b>	<b>B</b>	<b>18.9</b>	<b>B</b>
Westbound Left	54.7	D	57.2	E
Westbound Right	45.6	D	42.9	D
Northbound Through	11.1	B	15.6	B
Northbound Right	11.7	B	11.2	B
Southbound Left	10.0	B	14.6	B
Southbound Through	5.6	A	8.1	A
<b>2025 Background Plus Project</b>	<b>39.9</b>	<b>D</b>	<b>43.8</b>	<b>D</b>
Westbound Left	69.0	E	74.7	E
Westbound Right	36.8	D	37.3	D
Northbound Through	39.9	D	56.7	E
Northbound Right	51.2	D	27.9	C
Southbound Left	72.7	E	79.7	E
Southbound Through	10.4	B	12.1	B
<b>2040 Background</b>	<b>20.0</b>	<b>B</b>	<b>28.8</b>	<b>C</b>
Westbound Left	57.0	E	69.3	E
Westbound Right	42.7	D	40.3	D
Northbound Through	18.0	B	31.7	C
Northbound Right	17.3	B	15.8	B
Southbound Left	38.0	D	53.7	D
Southbound Through	8.9	A	12.4	B
<b>2040 Background Plus Project #</b>	<b>44.1</b>	<b>D</b>	<b>48.6</b>	<b>D</b>
Westbound Left	72.0	E	59.4	E
Westbound Right	34.5	C	31.1	C
Northbound Through	50.6	D	54.9	D
Northbound Right	66.5	E	32.6	C
Southbound Left	69.0	E	167.0	F
Southbound Through	15.0	B	20.7	C

# = Three Northbound Through Lanes

## Project Accesses

With completion of the Majestic Tower Crossings Retail project, four accesses are proposed along 32<sup>nd</sup> Parkway and one existing right-in/right-out access will remain along Tower Road. One right-in/right-out access is proposed on the north side of 32<sup>nd</sup> Parkway, one right-in/right-out access is proposed along the south side of 32<sup>nd</sup> Parkway, and two full movement accesses are proposed to provide access to both the northern and southern development areas. The right-in/right-out accesses are proposed to exist along 32<sup>nd</sup> Parkway between Tower Road and the western full movement access intersection. The existing access along Tower Road will remain with right-in/right-out movements for access to the north side of the project site.

It is recommended that R1-1 “STOP” signs be installed on the approaches exiting the development at both 32<sup>nd</sup> Parkway Right-In/Right-Out Accesses (#2 & #3). Since the northbound and southbound approaches at these two accesses will be restricted to right turn movements only, R3-2 No Left Turn signs should be installed under the proposed “STOP” signs.

With project construction the 32<sup>nd</sup> Parkway West Full Access (#4) is anticipated to warrant a traffic signal. Therefore, it is recommended that this intersection be signalized with project construction. Signal warrant analysis is provided in **Appendix E**. For purposes of the signal warrant analysis, vehicle time-of-day data from the ITE *Trip Generation Manual*, 11<sup>th</sup> Edition has also been provided in **Appendix E** for the proposed land uses. The northbound approach should be constructed with dual left turn lanes and a shared through/right turn lane. Additionally, it is recommended that the southbound approach consist of a left turn lane and a shared through/right turn lane.

With project construction, the 32<sup>nd</sup> Parkway East Full Access (#5) is recommended to be stop controlled with a R1-1 “STOP” sign installed on the northbound and southbound approaches. Additionally, it is recommended that the northbound and southbound approaches consist of a left turn lane and a shared through/right turn lane. It is recommended that an eastbound left turn lane, an eastbound right turn lane, and a westbound left turn lane all be constructed and designated.

**Table 4** provides the results of the level of service for project accesses. As shown in the table, the unsignalized project street access intersections along 32<sup>nd</sup> Parkway are anticipated to have all movements operating with acceptable LOS D or better during the peak hours in both the

buildout year 2025 and the 2040 long term horizons with the recommended lane configurations. The signalized 32<sup>nd</sup> Parkway West Access (#4) is anticipated to operate acceptably at LOS C and B during the morning and afternoon peak hours throughout 2040 with the recommendations. By 2026, the eastbound right turn movement at the Tower Road Right-In/Right-Out Access (#6) is anticipated to operate with long vehicle delays. Of note, project traffic does not contribute to this movement; therefore, the City of Aurora may implement alternative improvements in the future if traffic volumes warrant, such as a southbound acceleration lane from the eastbound right turn movement. By 2045, a third northbound through lane is recommended along Tower Road. Therefore, it is recommended that the northbound approach at the Tower Road Right-In/Right-Out Access (#6) consist of three through lanes with the outside lane being a shared through/right turn lane.

**Table 4 – Project Access Level of Service Results**

Intersection	2025 Total				2040 Total			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
<b>32<sup>nd</sup> Pkwy &amp; W. RIRO Access (#2)</b> Southbound Approach	14.7	B	15.7	C	12.3	B	13.3	B
<b>32<sup>nd</sup> Pkwy &amp; E. RIRO Access (#3)</b> Northbound Approach	14.8	B	11.7	B	16.9	C	12.6	B
<b>32<sup>nd</sup> Pkwy &amp; W. Full Access (#4)</b> Northbound Left	>300	F	84.8	F	-	-	-	-
Northbound Through/Right	13.1	B	10.7	B	-	-	-	-
Eastbound Left	9.8	A	10.8	B	-	-	-	-
Westbound Left	12.3	B	9.6	A	-	-	-	-
Southbound Left	26.4	D	27.2	D	-	-	-	-
Southbound Through/Right	11.3	B	12.3	B	-	-	-	-
<b>32<sup>nd</sup> Pkwy &amp; W. Full Access (#4) #</b>	20.6	C	15.7	B	21.0	C	16.3	B
<b>32<sup>nd</sup> Pkwy &amp; E. Full Access (#5)</b> Northbound Left	18.7	C	17.2	C	24.2	C	20.6	C
Northbound Through/Right	10.6	B	9.3	A	11.4	B	9.7	A
Eastbound Left	9.1	A	10.0	B	9.9	A	11.2	B
Westbound Left	8.9	A	8.2	A	9.7	A	8.4	A
Southbound Left	16.7	C	20.7	C	20.8	C	27.4	D
Southbound Through/Right	10.5	B	11.6	B	11.4	B	12.8	B
<b>Tower Rd &amp; RIRO Access (#6)</b> Eastbound Right	29.7	D	66.2	F	##	##	##	##
Westbound Right	13.3	B	16.1	C	64.2	F	>300	F

# Signalized with dual northbound left turn lanes

## Three northbound through lanes

### 5.3 Turn Bay Length Analysis

The City of Aurora defaults to the Colorado Department of Transportation (CDOT) State Highway Access Code (SHAC) guidelines to determine if turn lanes are warranted at studied intersections. CDOT classifies their state highways based on roadway types. The following classifications were given to the roadway applicable with this turn lane requirement analysis based on. It is believed that 32<sup>nd</sup> Parkway matches the characteristics of a CDOT NR-C roadway. According to the State Highway Access Code for category NR-C roadways, the following threshold applies for determining the need for a turn lane:

- A left turn lane with storage length plus taper length is required for any access with a projected peak hour left ingress turning volume greater than 25 vehicles per hour (vph). If the posted speed is greater than 40 mph, a deceleration lane and taper is required for any access with a projected peak hour left ingress turning volume greater than 10 vph.
- A right turn lane with storage length plus taper is required for any access with a projected peak hour right ingress turning volume greater than 50 vph. If the posted speed limit is greater than 40 miles per hour, a right turn lane deceleration lane and taper is required for any access with a project peak hour right ingress turning volume greater than 25 vph.

32<sup>nd</sup> Parkway currently has a posted speed limit of 40 miles per hour. Based on the speed limit and traffic volume projections, turn lane requirements at all of the project accesses are as follows:

#### **32<sup>nd</sup> Parkway West Right-In/Right-Out Access (#2)**

- A westbound right turn lane is not warranted based on projected 2040 background plus project traffic volumes being 24 westbound right turns during the peak hour and the threshold being 50 vehicles per hour.

#### **32<sup>nd</sup> Parkway East Right-In/Right-Out Access (#3)**

- An eastbound right turn lane is warranted based on projected 2025 background plus project traffic volumes being 152 eastbound right turns during the peak hour and the threshold being 50 vehicles per hour. The left turn lane should be constructed with a storage requirement of 150 feet plus a 145-foot taper.

#### **32<sup>nd</sup> Parkway West Full Access (#4)**

- An eastbound right turn lane is warranted based on projected 2025 background plus project traffic volumes being 152 eastbound right turns during the peak hour and the

threshold being 50 vehicles per hour. The left turn lane should be constructed with a storage requirement of 150 feet plus a 145-foot taper.

- An eastbound left turn lane exists and **is** warranted based on projected 2025 background plus project traffic volumes being 91 eastbound left turns during the peak hour and the threshold being 25 vehicles per hour. Of note, an eastbound left turn lane currently exists and provides a length of 100 feet.
- A westbound right turn lane **is not** warranted based on projected 2040 background plus project traffic volumes being 15 westbound right turns during the peak hour and the threshold being 50 vehicles per hour.
- A westbound left turn lane exists and **is** warranted based on projected 2025 background plus project traffic volumes being 25 westbound left turns during the peak hour and the threshold being 25 vehicles per hour. Of note, a westbound left turn lane currently exists and provides a length of 100 feet.

### **32<sup>nd</sup> Parkway East Full Access (#5)**

- An eastbound right turn lane **is** warranted based on projected 2025 background plus project traffic volumes being 126 eastbound right turns during the peak hour and the threshold being 50 vehicles per hour. The right turn lane should be constructed with a storage requirement of 150 feet plus a 145-foot taper.
- An eastbound left turn lane **is** warranted based on projected 2025 background plus project traffic volumes being 49 eastbound left turns during the peak hour and the threshold being 25 vehicles per hour. The storage requirement is 50 feet with a 145-foot taper. However, it is recommended that the eastbound left turn lane be designated to a length of 100 feet with a 145-foot taper.
- A westbound right turn lane **is not** warranted based on projected 2040 background plus project traffic volumes being six (6) westbound right turns during the peak hour and the threshold being 50 vehicles per hour.
- A westbound left turn lane **is** warranted based on projected 2025 background plus project traffic volumes being 51 westbound left turns during the peak hour and the threshold being 25 vehicles per hour. The storage requirement is 50 feet with a 145-foot taper. However, it is recommended that the westbound left turn lane be designated to a length of 100 feet with a 145-foot taper.

## 5.4 Vehicle Queuing Analysis

A vehicle queuing analysis was conducted for the study area intersections. The queuing analysis was performed using Synchro presenting the results of the 95<sup>th</sup> percentile queue lengths. Results are shown in the following **Table 5** with calculations provided within the level of service operational sheets of **Appendix D** for unsignalized intersections and **Appendix F** for signalized intersections.

**Table 5 – Turn Lane Queuing Analysis Results**

Intersection Turn Lane	Existing Turn Lane Length (feet)	2025 Calculated Queue (feet)	2025 Recommended Length (feet)	2040 Calculated Queue (feet)	2040 Recommended Length (feet)
<b>32<sup>nd</sup> Pkwy &amp; Tower Rd (#1)</b>					
Westbound Left	250'/C DL	500'	250'/C DL	541'	250'/C DL
Southbound Left	210'	525'	550'	542'	550'
<b>32<sup>nd</sup> Pkwy E. RIRO Access (#3)</b>					
Eastbound Right	DNE	25'	150'+145'T	25'	150'+145'T
<b>32<sup>nd</sup> Pkwy W. Full Access (#4)</b>					
Eastbound Left	100'	40'	100'	34'	100'
Eastbound Right	DNE	25'	150'+145'T	25'	150'+145'T
Westbound Left	100'	25'	100'	25'	100'
Northbound Left	DNE	130' DL	150' DL	133' DL	150' DL
Southbound Left	DNE	50'	50'	50'	50'
<b>32<sup>nd</sup> Pkwy E. Full Access (#5)</b>					
Eastbound Left	DNE	25'	100'+145'T	25'	100'+145'T
Eastbound Right	DNE	25'	150'+145'T	25'	150'+145'T
Westbound Left	DNE	25'	100'+145'T	25'	100'+145'T
Northbound Left	DNE	50'	50'	50'	50'
Southbound Left	DNE	25'	25'	25'	25'
<b>Tower Rd RIRO Access (#6)</b>					
Northbound Right	225'	25'	225'	25'	C

DNE = Does Not Exist; C = Continuous Lane; T = Taper; **Red** Text = Storage Deficiency; **Blue** Text = Recommendation; DL = Dual Left Turn Lanes

As shown in the table above, the southbound left turn queue at the 32<sup>nd</sup> Parkway and Tower Road (#1) intersection is anticipated to extend beyond the available storage by 2025. Although this southbound left turn lane only needs 525 feet of storage by 2025, it is recommended that this lane be extended to the 550 feet to accommodate demands for the 2040 horizon.

By 2025, it is recommended that dual northbound left turn lanes be designated at the 32<sup>nd</sup> Parkway West Full Access (#4) to a length of 150 feet and the southbound left turn lane be designated to a length of 50 feet.

At the 32<sup>nd</sup> Parkway East Access (#5), it is recommended that the northbound left turn lane be designated to a length of 50 feet while the southbound left turn be designated to a length of 25 feet.

If a third northbound through lane is constructed along Tower Road by 2040, it is recommended that the northbound right turn lane at the Tower Road Right-In/Right-Out Access (#6) be striped as a continuous shared through/right turn lane.

### 5.5 Improvement Summary

Based on the results of the intersection operational and vehicle queuing analysis, the key intersection recommended improvements and control are shown in **Figure 10** for the 2025 horizon and **Figure 11** for the 2040 horizon.

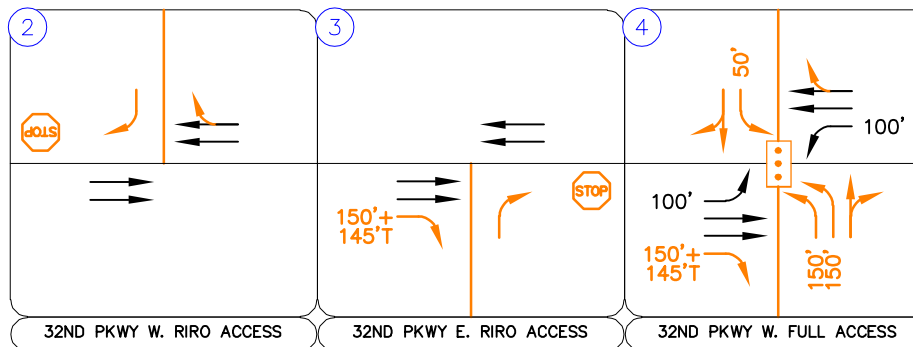
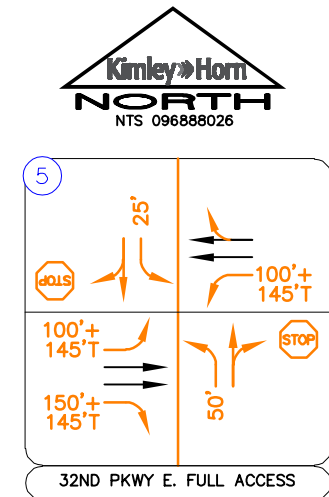
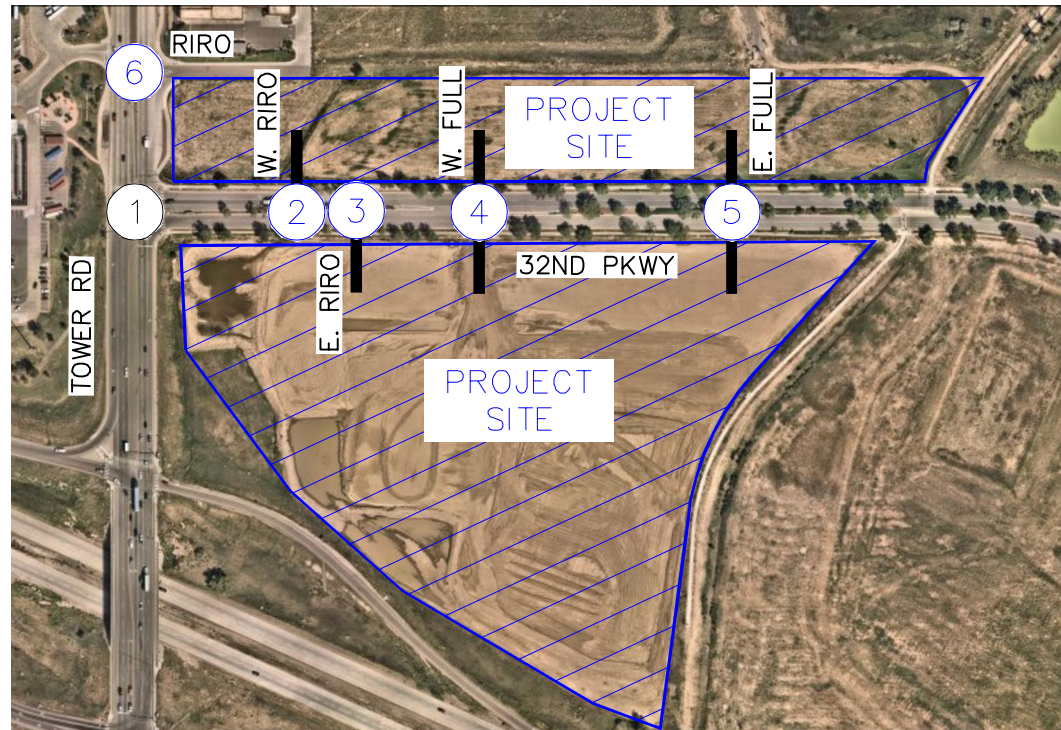
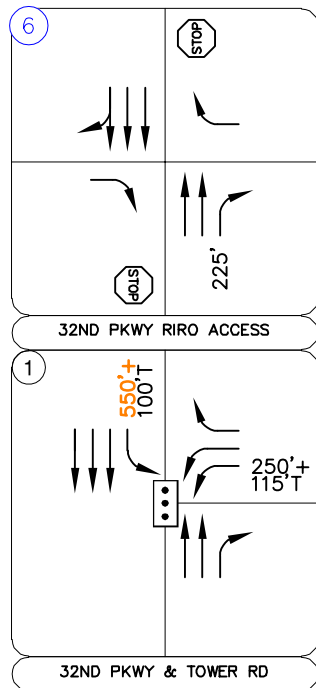
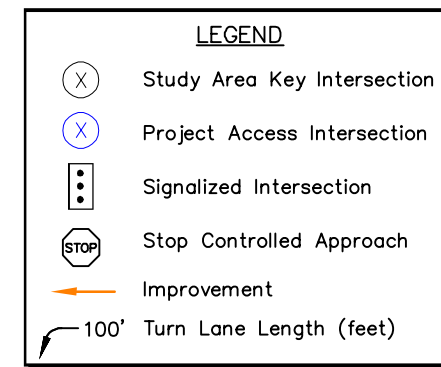


FIGURE 11  
MAJESTIC TOWER CROSSINGS RETAIL  
AURORA, COLORADO  
2025 RECOMMENDED GEOMETRY AND CONTROL



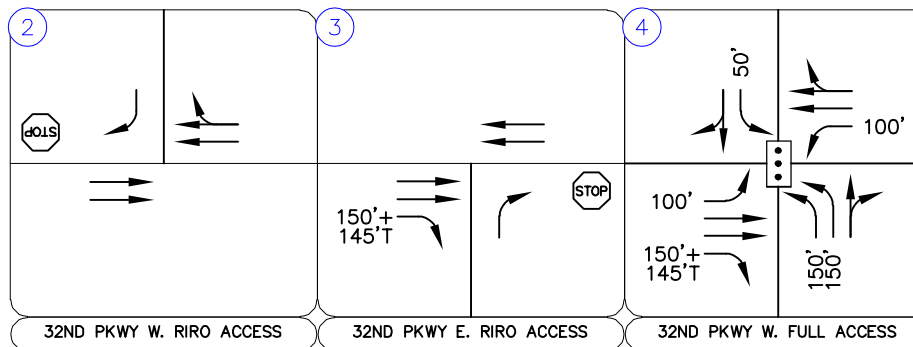
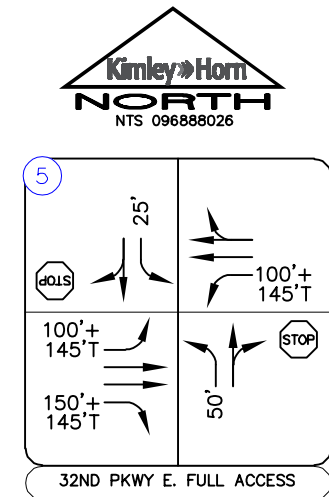
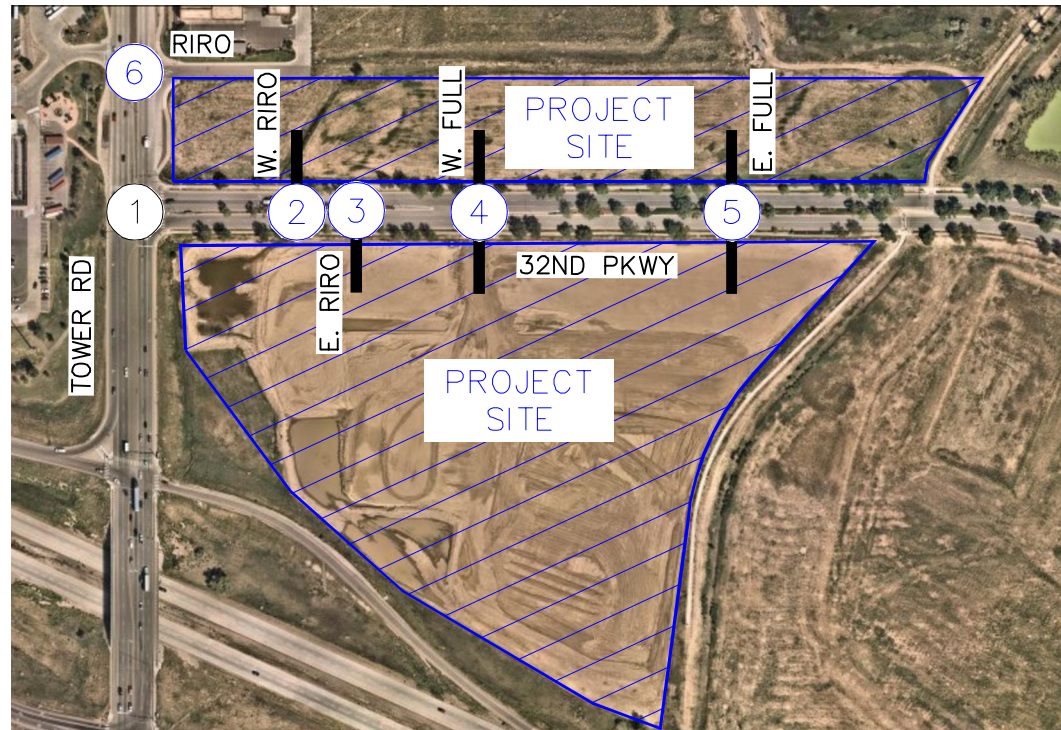
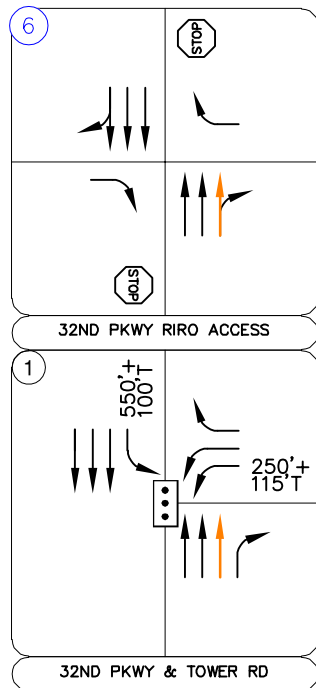
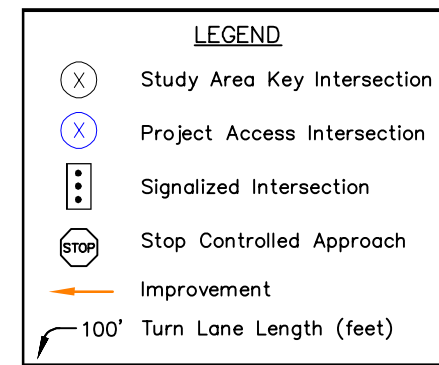


FIGURE 12  
MAJESTIC TOWER CROSSINGS RETAIL  
AURORA, COLORADO  
2040 RECOMMENDED GEOMETRY AND CONTROL



## 6.0 CONCLUSIONS AND RECOMMENDATIONS

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Based on the analysis presented in this report, Kimley-Horn believes Majestic Tower Crossings Retail will be successfully incorporated into the existing and future roadway network. The eastern full movement access is anticipated to operate acceptably. Analysis of the existing street network, the proposed project development, and expected traffic volumes resulted in the following recommendations:

### 2025 Recommendations

- With completion of the Majestic Tower Crossings Retail project, four accesses are proposed along 32<sup>nd</sup> Parkway. One right-in/right-out access is proposed on the north side of 32<sup>nd</sup> Parkway, one right-in/right-out access is proposed along the south side of 32<sup>nd</sup> Parkway, and two full movement accesses are proposed to provide access to both the northern and southern development areas. The right-in/right-out accesses are proposed to exist along 32<sup>nd</sup> Parkway between Tower Road and the western full movement access intersection.
- It is recommended that the southbound left turn lane at the intersection of 32<sup>nd</sup> Parkway and Tower Road (#1) be extended from 150 feet to 550 feet by 2025.
- It is recommended that R1-1 “STOP” signs be installed on the approaches exiting the development at both 32<sup>nd</sup> Parkway Right-In/Right-Out Accesses (#2 & #3). Since the northbound and southbound approaches at these two accesses will be restricted to right turn movements only, R3-2 No Left Turn signs should be installed under the proposed “STOP” signs. To meet City of Aurora standards it is recommended that a 150 foot with 145-foot taper eastbound right turn lane be designated at the 32<sup>nd</sup> Parkway East Right-In/Right-Out Access (#2) for the southern development area.
- With project construction the 32<sup>nd</sup> Parkway West Full Access (#4) is anticipated to warrant a traffic signal. Therefore, it is recommended that this intersection be signalized with project construction. The northbound approach should be constructed with 150-foot dual left turn lanes and a shared through/right turn lane. Additionally, it is recommended that the southbound approach consist of a 50-foot left turn lane and a shared through/right turn lane.

To meet City of Aurora standards, it is recommended that a 150-foot with 145-foot taper eastbound right turn lane be constructed.

- With project construction, the 32<sup>nd</sup> Parkway East Full Access (#5) is recommended to be stop controlled with a R1-1 “STOP” sign installed on the northbound and southbound approaches. Additionally, it is recommended that the northbound and southbound approaches consist of a 25-foot left turn lane and a shared through/right turn lane. To meet City of Aurora standards it is recommended that a 100-foot with 145-foot taper eastbound left turn lane, a 150-foot with 145-foot taper eastbound right turn lane, and a 100-foot with 145-foot taper westbound left turn lane be constructed and designated.

#### **2040 Recommendations**

- By 2040, a third northbound through lane may be needed at the intersection of 32nd Parkway and Tower Road (#1). If a third northbound through lane is constructed along Tower Road by 2040, it is recommended that the northbound right turn lane at the Tower Road Right-In/Right-Out Access (#6) be striped as a continuous shared through/right turn lane.

#### **General Recommendations**

- Any onsite or offsite improvements should be incorporated into the Civil Drawings and conform to standards of the City of Aurora and the Manual on Uniform Traffic Control Devices (MUTCD) – 2009 Edition.

# APPENDICES

# APPENDIX A

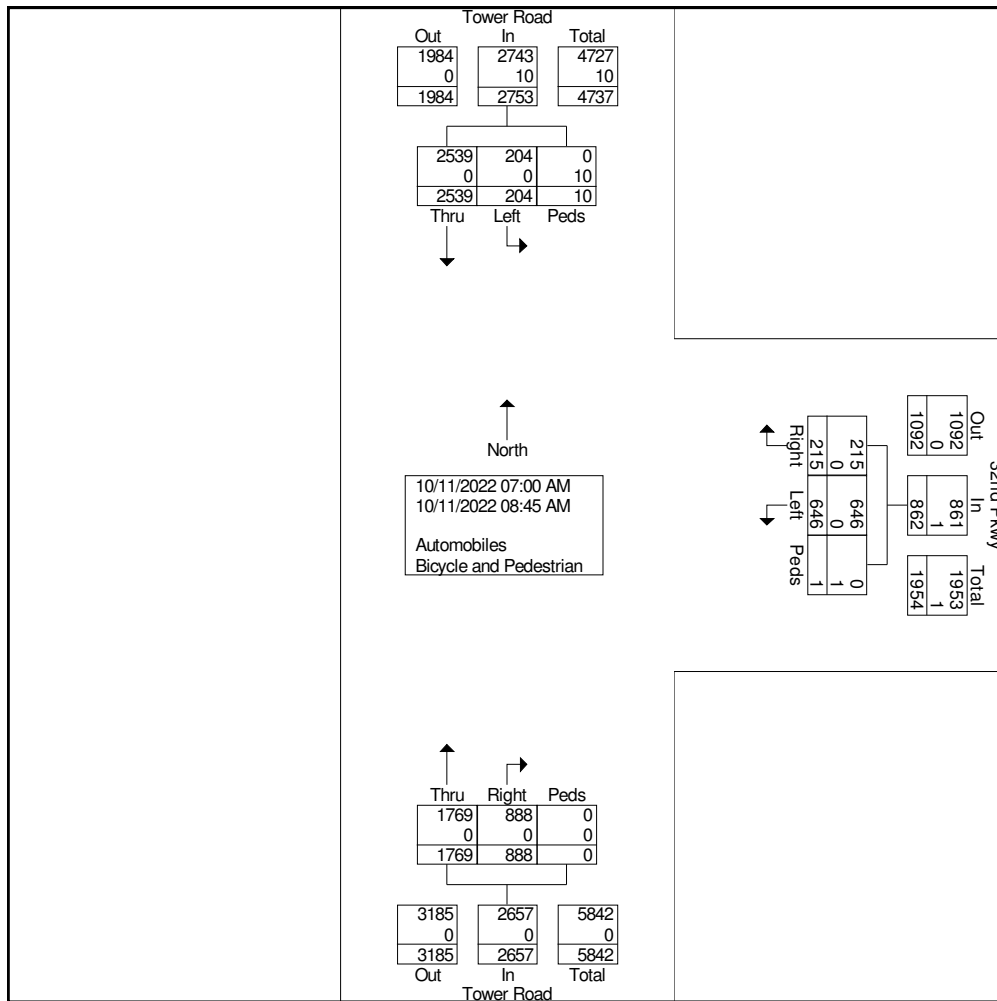
## Intersection Count Sheets



Ridgeview Data  
Collection

Aurora, CO  
Majestic Tower Crossings Retail  
AM Peak  
32nd Pkwy and Tower Road

File Name : 32nd and Tower AM  
Site Code : KHA 627  
Start Date : 10/11/2022  
Page No : 2



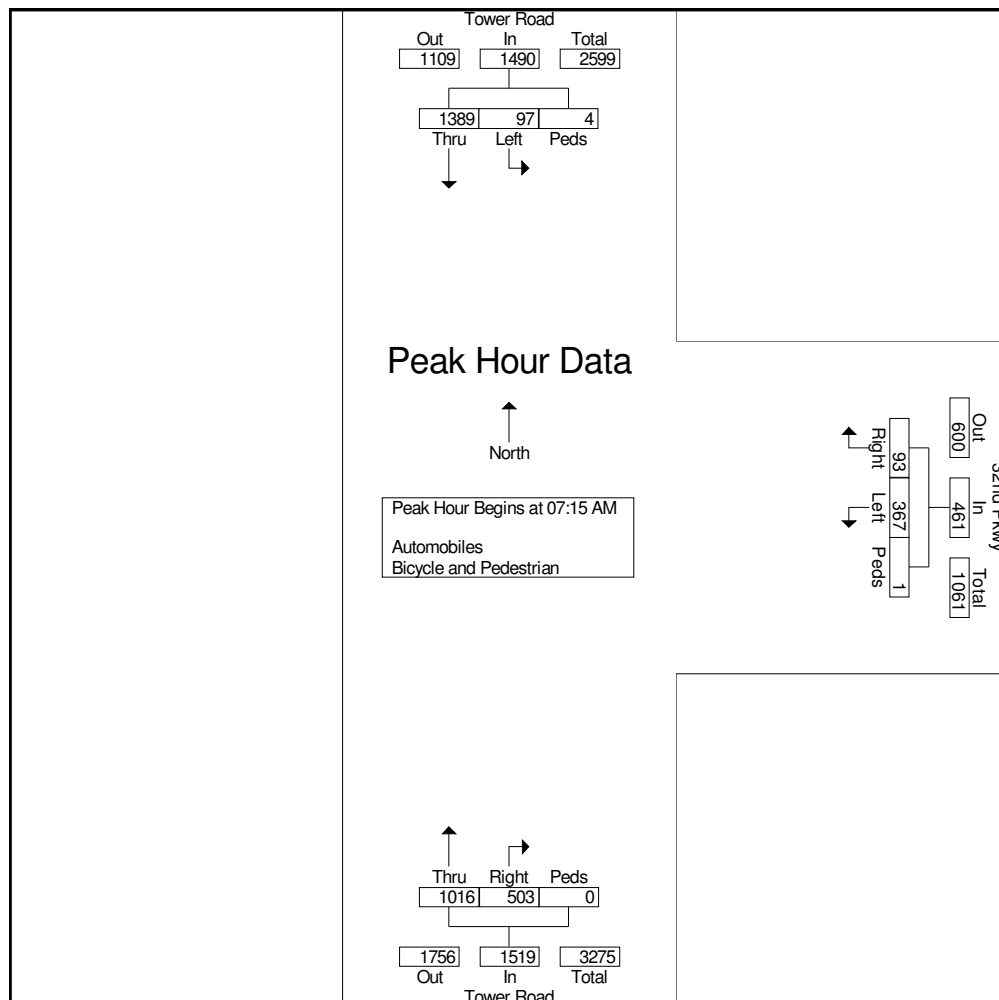


Ridgeview Data  
Collection

Aurora, CO  
Majestic Tower Crossings Retail  
AM Peak  
32nd Pkwy and Tower Road

File Name : 32nd and Tower AM  
Site Code : KHA 627  
Start Date : 10/11/2022  
Page No : 3

	32nd Pkwy Westbound				Tower Road Northbound				Tower Road Southbound				
Start Time	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	127	20	0	147	249	102	0	351	24	366	1	391	889
07:30 AM	81	23	0	104	262	97	0	359	22	352	0	374	837
07:45 AM	63	20	0	83	272	157	0	429	28	339	1	368	880
08:00 AM	96	30	1	127	233	147	0	380	23	332	2	357	864
Total Volume	367	93	1	461	1016	503	0	1519	97	1389	4	1490	3470
% App. Total	79.6	20.2	0.2		66.9	33.1	0		6.5	93.2	0.3		
PHF	.722	.775	.250	.784	.934	.801	.000	.885	.866	.949	.500	.953	.976



Aurora, CO  
Majestic Tower Crossings Retail  
PM Peak  
32nd Pkwy and Tower Road

File Name : 32nd and Tower PM  
Site Code : KHA 627  
Start Date : 10/11/2022  
Page No : 1

Groups Printed- Automobiles - Bicycle and Pedestrian

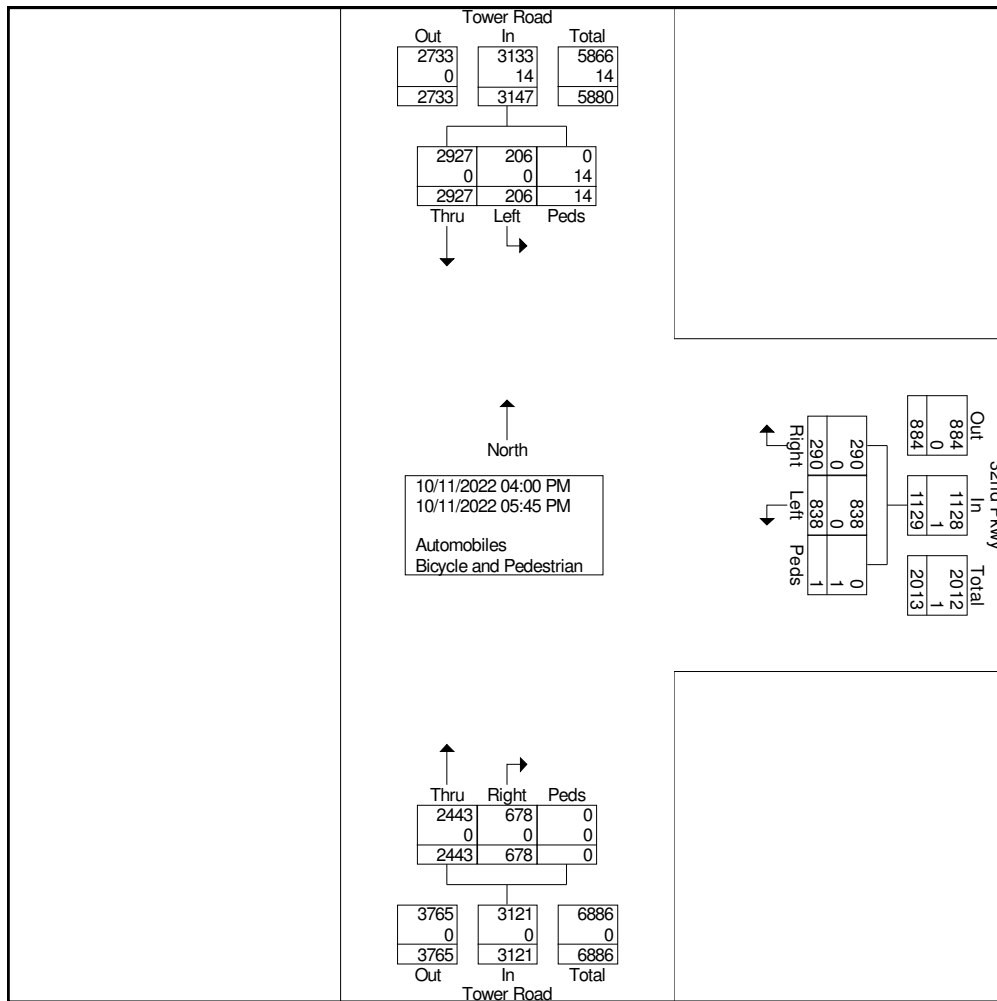
Start Time	32nd Pkwy Westbound				Tower Road Northbound				Tower Road Southbound				Int. Total
	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	
04:00 PM	115	32	0	147	314	81	0	395	22	356	1	379	921
04:15 PM	87	27	0	114	290	74	0	364	25	438	0	463	941
04:30 PM	138	48	0	186	299	79	0	378	31	382	1	414	978
04:45 PM	85	36	0	121	319	103	0	422	26	353	5	384	927
Total	425	143	0	568	1222	337	0	1559	104	1529	7	1640	3767
05:00 PM	135	34	0	169	243	90	0	333	21	347	4	372	874
05:15 PM	90	35	0	125	356	79	0	435	19	333	0	352	912
05:30 PM	115	39	1	155	312	83	0	395	29	339	0	368	918
05:45 PM	73	39	0	112	310	89	0	399	33	379	3	415	926
Total	413	147	1	561	1221	341	0	1562	102	1398	7	1507	3630
Grand Total	838	290	1	1129	2443	678	0	3121	206	2927	14	3147	7397
Apprch %	74.2	25.7	0.1		78.3	21.7	0		6.5	93	0.4		
Total %	11.3	3.9	0	15.3	33	9.2	0	42.2	2.8	39.6	0.2	42.5	
Automobiles	838	290	0	1128	2443	678	0	3121	206	2927	0	3133	7382
% Automobiles	100	100	0	99.9	100	100	0	100	100	100	0	99.6	99.8
Bicycle and Pedestrian	0	0	1	1	0	0	0	0	0	0	14	14	15
% Bicycle and Pedestrian	0	0	100	0.1	0	0	0	0	0	0	100	0.4	0.2



Ridgeview Data  
Collection

Aurora, CO  
Majestic Tower Crossings Retail  
PM Peak  
32nd Pkwy and Tower Road

File Name : 32nd and Tower PM  
Site Code : KHA 627  
Start Date : 10/11/2022  
Page No : 2



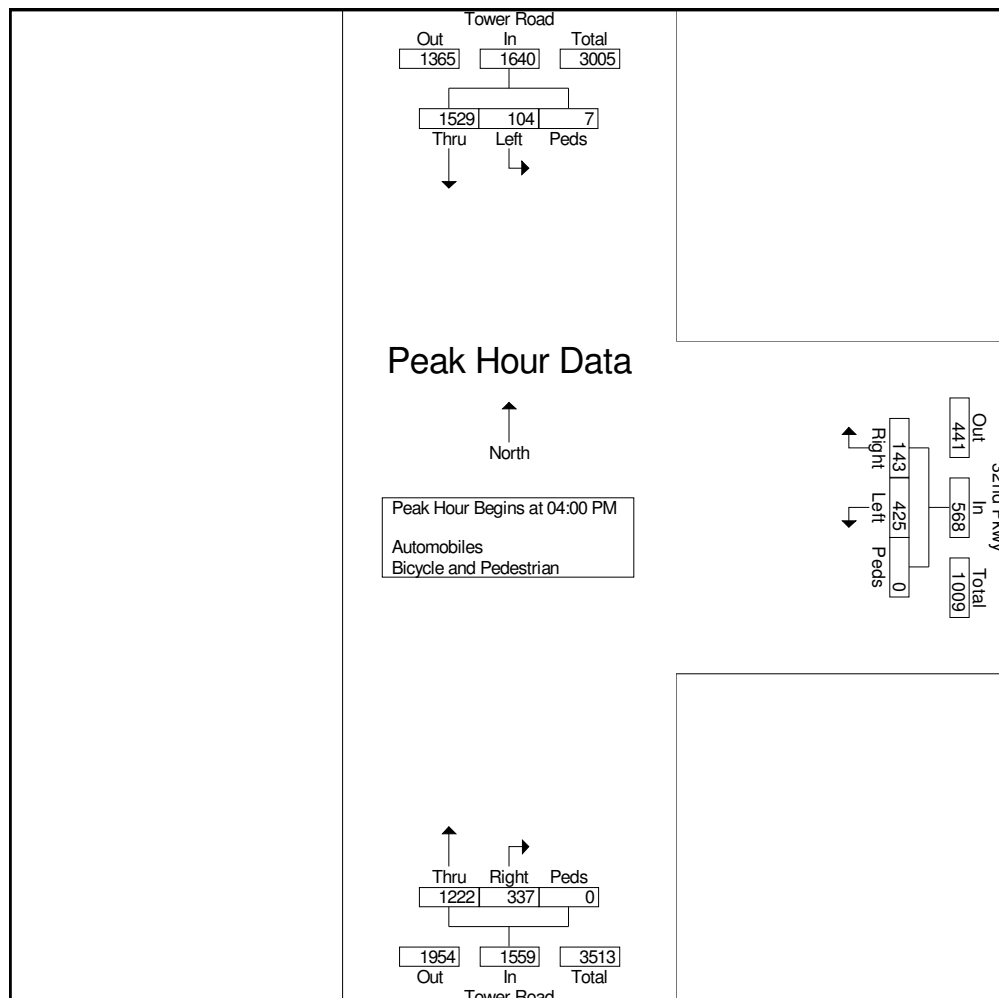


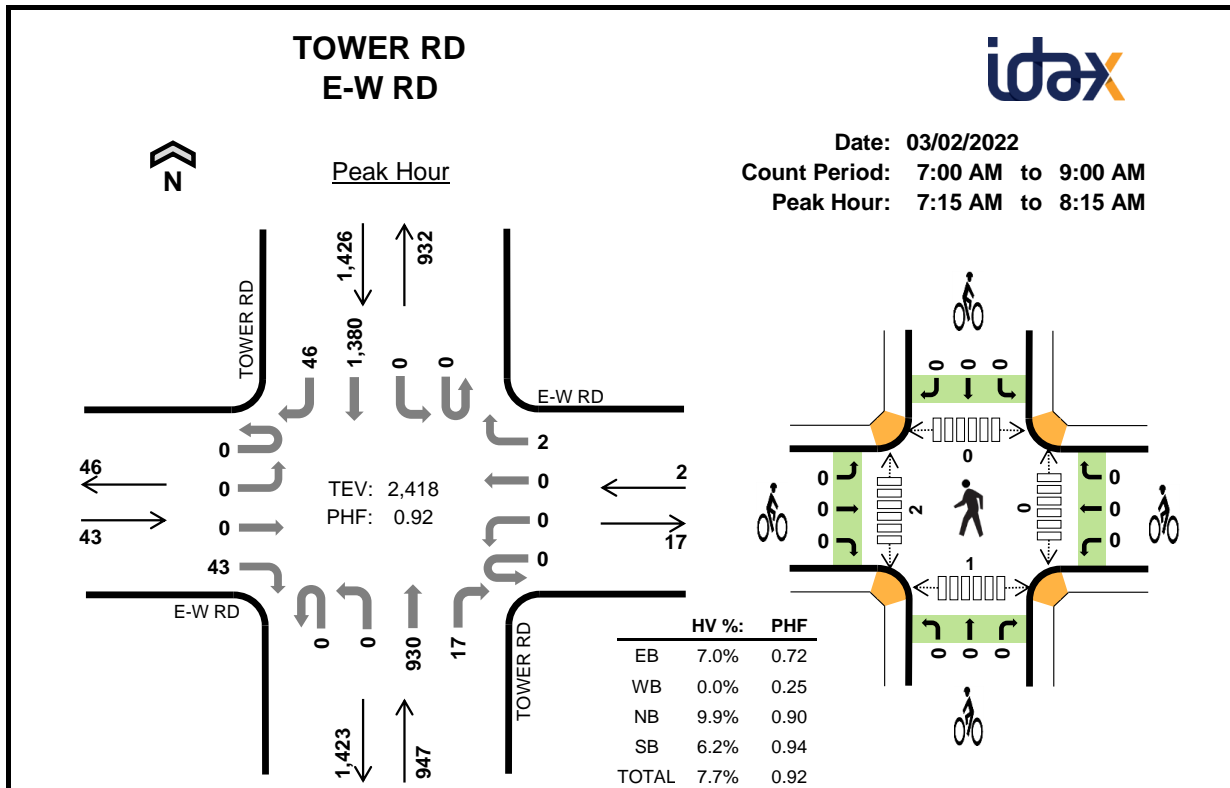
Ridgeview Data  
Collection

Aurora, CO  
Majestic Tower Crossings Retail  
PM Peak  
32nd Pkwy and Tower Road

File Name : 32nd and Tower PM  
Site Code : KHA 627  
Start Date : 10/11/2022  
Page No : 3

	32nd Pkwy Westbound				Tower Road Northbound				Tower Road Southbound				
Start Time	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	115	32	0	147	314	81	0	395	22	356	1	379	921
04:15 PM	87	27	0	114	290	74	0	364	25	<b>438</b>	0	<b>463</b>	941
04:30 PM	<b>138</b>	<b>48</b>	0	<b>186</b>	299	79	0	378	<b>31</b>	382	1	414	<b>978</b>
04:45 PM	85	36	0	121	<b>319</b>	<b>103</b>	0	<b>422</b>	26	353	<b>5</b>	384	927
Total Volume	425	143	0	568	1222	337	0	1559	104	1529	7	1640	3767
% App. Total	74.8	25.2	0		78.4	21.6	0		6.3	93.2	0.4		
PHF	.770	.745	.000	.763	.958	.818	.000	.924	.839	.873	.350	.886	.963



**Two-Hour Count Summaries**

Interval Start		E-W RD				E-W RD				TOWER RD				TOWER RD				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
	7:00 AM	0	0	0	10	0	0	0	0	0	0	193	6	0	0	329	6	544	0
	7:15 AM	0	0	0	10	0	0	0	0	0	0	263	1	0	0	373	7	654	0
	7:30 AM	0	0	0	15	0	0	0	0	0	0	215	4	0	0	335	9	578	0
	7:45 AM	0	0	0	9	0	0	0	0	0	0	248	6	0	0	342	17	622	2,398
	8:00 AM	0	0	0	9	0	0	0	2	0	0	204	6	0	0	330	13	564	2,418
	8:15 AM	0	0	0	18	0	0	0	0	0	0	196	9	0	0	322	18	563	2,327
	8:30 AM	0	0	0	17	0	0	0	0	0	0	183	6	0	0	296	21	523	2,272
	8:45 AM	0	0	0	22	0	0	0	0	0	0	205	7	0	0	271	10	515	2,165
Count Total		0	0	0	110	0	0	0	2	0	0	1,707	45	0	0	2,598	101	4,563	0
Peak Hour	All	0	0	0	43	0	0	0	2	0	0	930	17	0	0	1,380	46	2,418	0
	HV	0	0	0	3	0	0	0	0	0	0	92	2	0	0	89	0	186	0
	HV%	-	-	-	7%	-	-	-	0%	-	-	10%	12%	-	-	6%	0%	8%	0

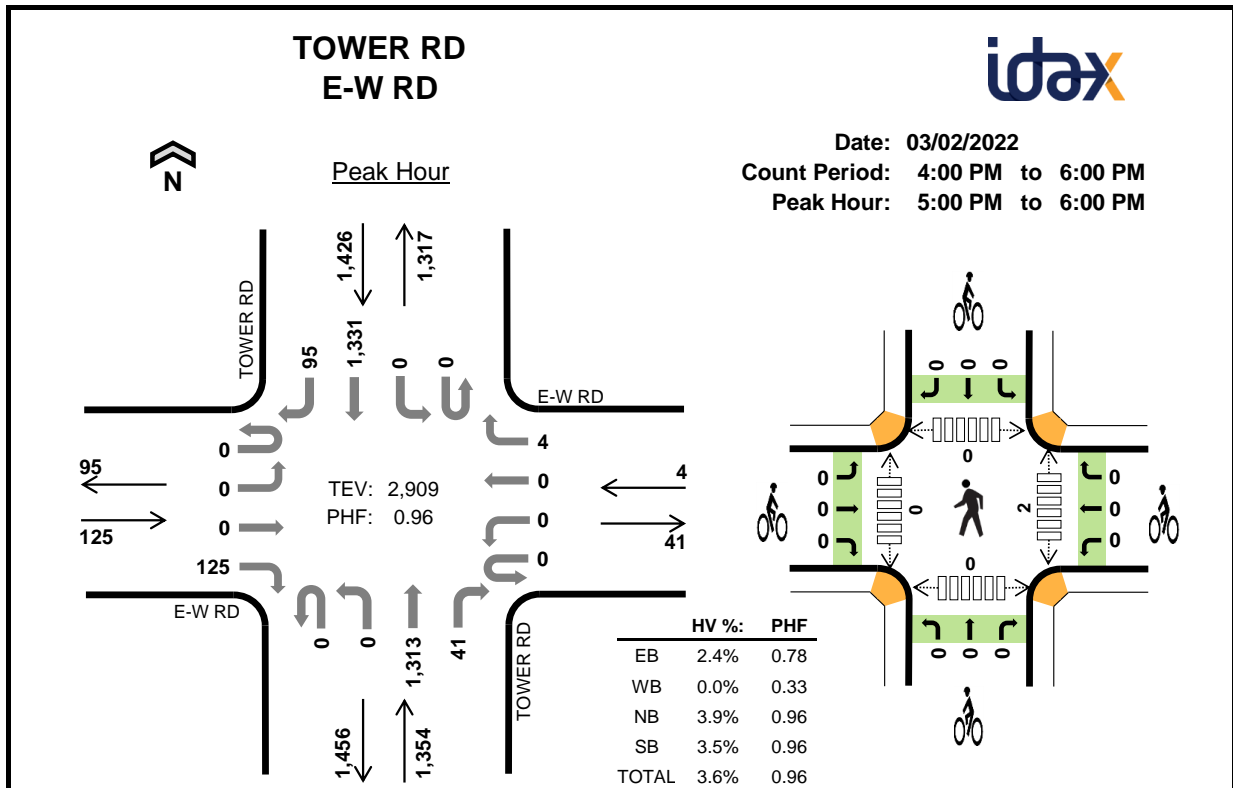
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	0	22	25	47	0	0	0	0	0	0	0	0	0	0
7:15 AM	2	0	29	21	52	0	0	0	0	0	0	1	0	1	2
7:30 AM	1	0	15	15	31	0	0	0	0	0	0	1	0	0	1
7:45 AM	0	0	28	26	54	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	22	27	49	0	0	0	0	0	0	0	0	0	0
8:15 AM	1	0	16	26	43	0	0	0	0	0	0	0	0	0	0
8:30 AM	2	0	20	33	55	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	25	25	50	0	0	0	0	0	0	0	0	0	0
Count Total	6	0	177	198	381	0	0	0	0	0	0	2	0	1	3
Peak Hour	3	0	94	89	186	0	0	0	0	0	0	2	0	1	3

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	E-W RD				E-W RD				TOWER RD				TOWER RD				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	0	0	0	19	3	0	0	25	0	47	0
7:15 AM	0	0	0	2	0	0	0	0	0	0	29	0	0	0	21	0	52	0
7:30 AM	0	0	0	1	0	0	0	0	0	0	14	1	0	0	15	0	31	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	27	1	0	0	26	0	54	184
8:00 AM	0	0	0	0	0	0	0	0	0	0	22	0	0	0	27	0	49	186
8:15 AM	0	0	0	1	0	0	0	0	0	0	16	0	0	0	26	0	43	177
8:30 AM	0	0	0	2	0	0	0	0	0	0	18	2	0	0	33	0	55	201
8:45 AM	0	0	0	0	0	0	0	0	0	0	24	1	0	0	25	0	50	197
Count Total	0	0	0	6	0	0	0	0	0	0	169	8	0	0	198	0	381	0
Peak Hour	0	0	0	3	0	0	0	0	0	0	92	2	0	0	89	0	186	0

Two-Hour Count Summaries - Bikes																		
Interval Start	E-W RD			E-W RD			TOWER RD			TOWER RD			15-min Total	Rolling One Hour				
	Eastbound			Westbound			Northbound			Southbound								
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT						
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0				

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

**Two-Hour Count Summaries**

Interval Start		E-W RD				E-W RD				TOWER RD				TOWER RD				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	0	0	38	0	0	0	0	0	0	373	4	0	0	336	26	777	0
4:15 PM		0	0	0	35	0	0	0	1	0	0	294	4	0	0	359	20	713	0
4:30 PM		0	0	0	35	0	0	0	0	0	0	327	8	0	0	345	20	735	0
4:45 PM		0	0	0	34	0	0	0	0	0	0	310	8	0	0	301	28	681	2,906
5:00 PM		0	0	0	28	0	0	0	1	0	0	338	16	0	0	342	29	754	2,883
5:15 PM		0	0	0	40	0	0	0	3	0	0	308	10	0	0	324	22	707	2,877
5:30 PM		0	0	0	27	0	0	0	0	0	0	341	4	0	0	337	21	730	2,872
5:45 PM		0	0	0	30	0	0	0	0	0	0	326	11	0	0	328	23	718	2,909
Count Total		0	0	0	267	0	0	0	5	0	0	2,617	65	0	0	2,672	189	5,815	0
Peak Hour	All	0	0	0	125	0	0	0	4	0	0	1,313	41	0	0	1,331	95	2,909	0
	HV	0	0	0	3	0	0	0	0	0	0	51	2	0	0	48	2	106	0
	HV%	-	-	-	2%	-	-	-	0%	-	-	4%	5%	-	-	4%	2%	4%	0

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	1	0	17	23	41	0	0	0	0	0	0	1	0	0	1
4:15 PM	0	0	11	12	23	0	0	0	0	0	0	0	0	0	0
4:30 PM	1	0	13	14	28	0	0	0	0	0	0	1	0	0	1
4:45 PM	2	0	9	20	31	0	0	0	0	0	0	1	0	1	2
5:00 PM	0	0	15	19	34	0	0	0	0	0	0	0	0	0	0
5:15 PM	1	0	10	8	19	0	0	0	0	0	2	0	0	0	2
5:30 PM	1	0	16	15	32	0	0	0	0	0	0	0	0	0	0
5:45 PM	1	0	12	8	21	0	0	0	0	0	0	0	0	0	0
Count Total	7	0	103	119	229	0	0	0	0	0	2	3	0	1	6
Peak Hour	3	0	53	50	106	0	0	0	0	0	2	0	0	0	2

Two-Hour Count Summaries - Heavy Vehicles																		
Interval Start	E-W RD				E-W RD				TOWER RD				TOWER RD				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	0	1	0	0	0	0	0	0	16	1	0	0	23	0	41	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	11	0	0	0	12	0	23	0
4:30 PM	0	0	0	1	0	0	0	0	0	0	13	0	0	0	14	0	28	0
4:45 PM	0	0	0	2	0	0	0	0	0	0	8	1	0	0	19	1	31	123
5:00 PM	0	0	0	0	0	0	0	0	0	0	14	1	0	0	18	1	34	116
5:15 PM	0	0	0	1	0	0	0	0	0	0	10	0	0	0	8	0	19	112
5:30 PM	0	0	0	1	0	0	0	0	0	0	16	0	0	0	14	1	32	116
5:45 PM	0	0	0	1	0	0	0	0	0	0	11	1	0	0	8	0	21	106
Count Total	0	0	0	7	0	0	0	0	0	0	99	4	0	0	116	3	229	0
Peak Hour	0	0	0	3	0	0	0	0	0	0	51	2	0	0	48	2	106	0

Two-Hour Count Summaries - Bikes																		
Interval Start	E-W RD			E-W RD			TOWER RD			TOWER RD			15-min Total	Rolling One Hour				
	Eastbound			Westbound			Northbound			Southbound								
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT						
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0				

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Aurora, CO  
Majestic Tower Crossings Retail  
AM Peak  
32nd Pkwy and Tower Road

File Name : 32nd and Tower AM  
Site Code : KHA 627  
Start Date : 10/11/2022  
Page No : 1

Groups Printed- Automobiles - Bicycle and Pedestrian

Start Time	32nd Pkwy Westbound				Tower Road Northbound				Tower Road Southbound				Int. Total
	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	
07:00 AM	82	25	0	107	174	105	0	279	34	326	2	362	748
07:15 AM	127	20	0	147	249	102	0	351	24	366	1	391	889
07:30 AM	81	23	0	104	262	97	0	359	22	352	0	374	837
07:45 AM	63	20	0	83	272	157	0	429	28	339	1	368	880
Total	353	88	0	441	957	461	0	1418	108	1383	4	1495	3354
08:00 AM	96	30	1	127	233	147	0	380	23	332	2	357	864
08:15 AM	76	23	0	99	214	116	0	330	30	301	1	332	761
08:30 AM	52	30	0	82	189	83	0	272	25	281	2	308	662
08:45 AM	69	44	0	113	176	81	0	257	18	242	1	261	631
Total	293	127	1	421	812	427	0	1239	96	1156	6	1258	2918
Grand Total	646	215	1	862	1769	888	0	2657	204	2539	10	2753	6272
Apprch %	74.9	24.9	0.1		66.6	33.4	0		7.4	92.2	0.4		
Total %	10.3	3.4	0	13.7	28.2	14.2	0	42.4	3.3	40.5	0.2	43.9	
Automobiles	646	215	0	861	1769	888	0	2657	204	2539	0	2743	6261
% Automobiles	100	100	0	99.9	100	100	0	100	100	100	0	99.6	99.8
Bicycle and Pedestrian	0	0	1	1	0	0	0	0	0	0	10	10	11
% Bicycle and Pedestrian	0	0	100	0.1	0	0	0	0	0	0	100	0.4	0.2

# APPENDIX B

## Background Traffic Studies

Traffic Impact Study

# Majestic Commercenter Buildings G, H, and J

Aurora, Colorado

Prepared for:

**Commerce Construction CO., L.P.**

**Kimley»Horn**

Project MCC Building G, H, & J  
 Subject Trip Generation for General Light Industrial  
 Designed by TES Date May 11, 2022 Job No. 096388011  
 Checked by \_\_\_\_\_ Date \_\_\_\_\_ Sheet No. 1 of 1

## **TRIP GENERATION MANUAL TECHNIQUES**

ITE Trip Generation Manual 11th Edition, Fitted Curve Equations

Land Use Code - General Light Industrial (110)

Independent Variable - 1000 Square Feet Gross Floor Feet (X)

Gross Floor Area = 342,000

X = 342.0

T = Average Vehicle Trip Ends

### **Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (100 Series Page 32)**

Average Weekday	Directional Distribution:	88% ent.	12% exit.
$T = 0.68(X) + 3.81$	T = 236	Average Vehicle Trip Ends	
$T = 0.68 * 342 + 3.81$	208 entering	28	exiting
	208 + 28 = 236		

### **Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (100 Series Page 33)**

Average Weekday	Directional Distribution:	13% ent.	87% exit.
$\ln(T) = 0.72 \ln(X) + 0.38$	T = 98	Average Vehicle Trip Ends	
$\ln(T) = 0.72 * \ln(342) + 0.38$	13 entering	85	exiting
	13 + 85 = 98		

(\*) TRIP END WAS CHANGED BY 1 TO SATISFY THE TOTAL

### **Weekday (100 Series Page 31)**

Daily Weekday	Directional Distribution:	50% entering, 50% exiting
$T = 3.76(X) + 50.47$	T = 1336	Average Vehicle Trip Ends
$(T) = 3.76 * 342 + 50.47$	668 entering	668 exiting
	668 + 668 = 1336	

MAJESTIC COMMERCENTER PHASE 11  
AURORA, COLORADO  
PROJECT TRAFFIC ASSIGNMENT

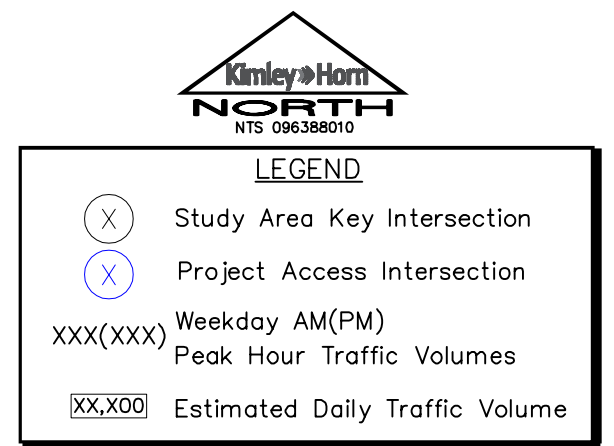
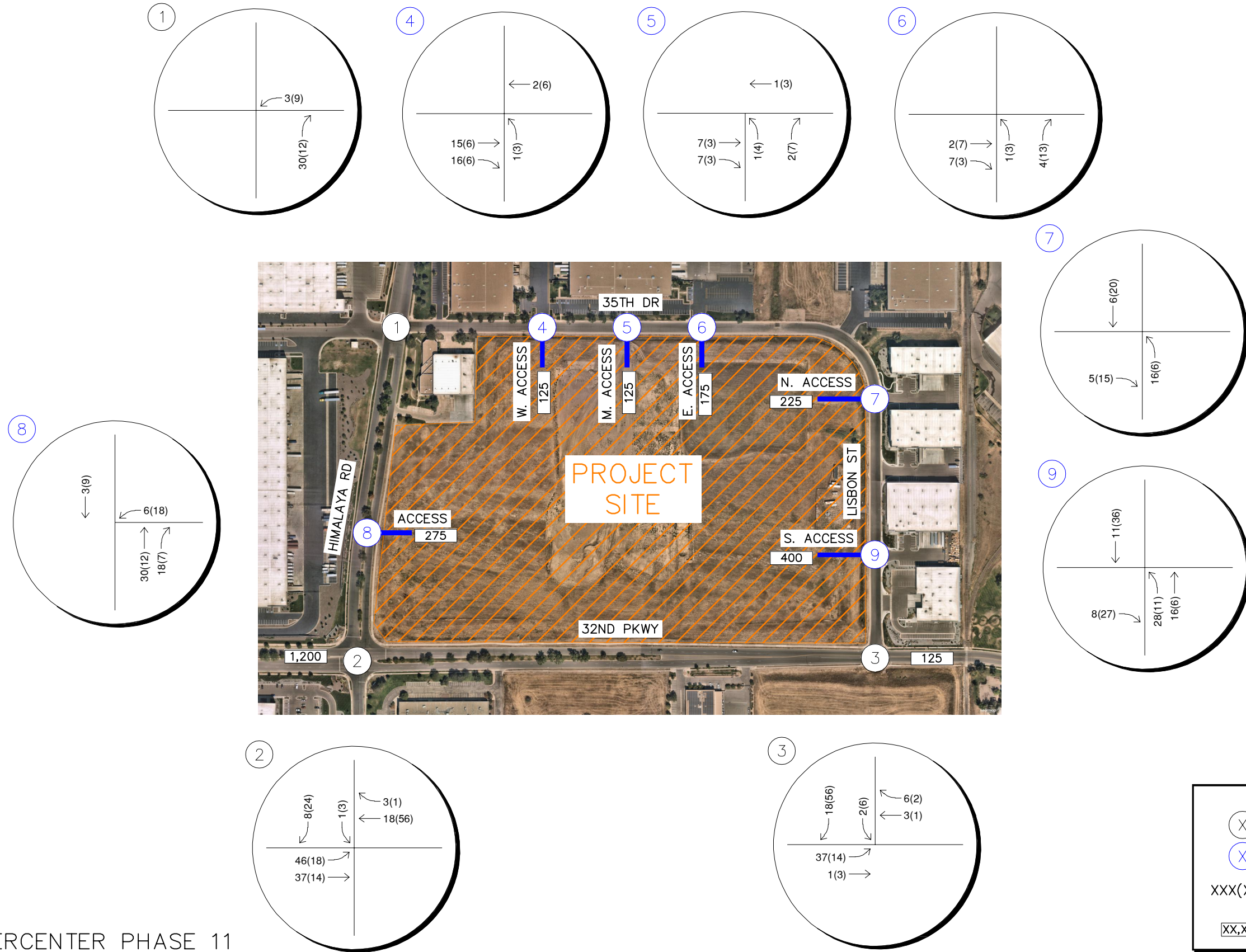


FIGURE 2

# APPENDIX C

## Trip Generation Worksheets

Trip Generation Planner (ITE 11th Edition) - Summary Report



Weekday Trip Generation  
Trips Based on Average Rates/Equations

Project Name Majestic Tower Crossing Retail (N(North)  
Project Number 0963888012

ITE Code	Internal Capture Use	Land Use Description	Independent Variable	Setting/Location	No. of Units	Avg Rate or Eq	Rates			Total Trips							Net Trips after Internal Capture						
							Daily Rate	AM Rate	PM Rate	Daily Trips	AM Trips	PM Trips	AM Trips In	AM Trips Out	PM Trips In	PM Trips Out	Daily Trips	AM Trips	PM Trips	AM Trips In	AM Trips Out	PM Trips In	PM Trips Out
151	Retail	Mini-Warehouse	1,000 Sq Ft	General Urban/Suburban	30	Avg	1.45	0.09	0.15	44	3	5	2	1	2	3	44	3	5	2	1	2	3
310	Hotel	Hotel	Room(s)	General Urban/Suburban	240	Eq	N/A	N/A	N/A	2,178	113	150	63	50	76	74	1,994	106	133	63	43	64	69
912	Retail	Drive-In Bank	1,000 Sq Ft	General Urban/Suburban	5	Avg	100.35	9.95	21.01	502	50	105	29	21	52	53	490	49	101	28	21	51	50
945	Retail	Convenience Store/Gas Station	Employee(s)	General Urban/Suburban	16	Avg	257.13	27.04	22.76	4,114	433	364	216	217	182	182	4,012	427	351	210	217	178	173
Grand Total										6,838	599	624	310	289	312	312	6,540	585	590	303	282	295	295

Project Majestic Tower Crossing Retail  
Subject Trip Generation for Mini Warehouse  
Designed by TES Date October 27, 2022 Job No. 096388012  
Checked by \_\_\_\_\_ Date \_\_\_\_\_ Sheet No. \_\_\_\_\_ of \_\_\_\_\_

## **TRIP GENERATION MANUAL TECHNIQUES**

ITE Trip Generation Manual 11th Edition, Average Rate Equations

Land Use Code - Mini-Warehouse (151)

Independant Variable - 1000 Square Feet Gross Floor Feet (X)

Gross Floor Area = 30,000

X = 30.0

T = Average Vehicle Trip Ends

### **Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (Page 111)**

Weekday Average Directional Distribution: 59% ent. 41% exit.  
T = 0.09 (X) T = 3 Average Vehicle Trip Ends  
T = 0.09 \* 30 2 entering 1 exiting  
2 + 1 = 3

### **Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (Page 112)**

Weekday Average Directional Distribution: 47% ent. 53% exit.  
T = 0.15 (X) T = 5 Average Vehicle Trip Ends  
T = 0.15 \* 30 2 entering 3 exiting  
2 + 3 = 5

### **Weekday Daily (Page 110)**

Weekday Average Directional Distribution: 50% entering, 50% exiting  
T = 1.45 (X) T = 44 Average Vehicle Trip Ends  
T = 1.45 \* 30 22 entering 22 exiting  
22 + 22 = 44

Project Majestic Tower Crossing Retail  
 Subject Trip Generation for Hotel  
 Designed by TES Date October 27, 2022 Job No. 096388012  
 Checked by \_\_\_\_\_ Sheet No. \_\_\_\_\_ of \_\_\_\_\_

## **TRIP GENERATION MANUAL TECHNIQUES**

ITE Trip Generation Manual 11th Edition, Fitted Curve

Land Use Code -Hotel (310)

Independent Variable - Rooms (X)

$$X = 240$$

T = Average Vehicle Trip Ends

### **Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (Page 501)**

(T) = 0.50 (X) - 7.45	Directional Distribution: 56% ent. 44% exit.
(T) = 0.50 * (240.0) - 7.45	T = 113 Average Vehicle Trip Ends
	63 entering 50 exiting
	63 + 50 = 113

### **Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (Page 502)**

T = 0.74 (X) - 27.89	Directional Distribution: 51% ent. 49% exit.
T = 0.74 * 240 - 27.89	T = 150 Average Vehicle Trip Ends
	76 entering 74 exiting
	76 + 74 = 150

### **Weekday (Page 500)**

Average Weekday	Directional Distribution: 50% entering, 50% exiting
(T) = 10.84 (X) - 423.51	T = 2178 Average Vehicle Trip Ends
(T) = 10.84 * (240.0) - 423.51	1089 entering 1089 exiting
	1089 + 1089 = 2178

Project Majestic Tower Crossing Retail  
 Subject Trip Generation for Drive-In Bank  
 Designed by TES Date October 27, 2022 Job No. 096388012  
 Checked by \_\_\_\_\_ Date \_\_\_\_\_ Sheet No. 1 of 1

## **TRIP GENERATION MANUAL TECHNIQUES**

ITE Trip Generation Manual 11th Edition, Average Rate Equations

Land Use Code - Drive-In Bank (912)

Independent Variable - 1000 Square Feet Gross Floor Area (X)

SF = 5,000  
 X = 5.000  
 T = Average Vehicle Trip Ends

### **Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (Page 599)**

Average Weekday	Directional Distribution:	58% ent.	42% exit.
T = 9.95 (X)	T = 50	Average Vehicle Trip Ends	
T = 9.95 * 5.000	29 entering	21 exiting	
	29 + 21 = 50		

### **Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (Page 600)**

Average Weekday	Directional Distribution:	50% ent.	50% exit.
T = 21.01 (X)	T = 105	Average Vehicle Trip Ends	
T = 21.01 * 5.000	52 entering	53 exiting	
	52 + 53 = 105		

### **Weekday (Page 598)**

Average Weekday	Directional Distribution:	50% entering, 50% exiting
T = 100.35 (X)	T = 502	Average Vehicle Trip Ends
T = 100.35 * 5.000	251 entering	251 exiting
	251 + 251 = 502	

### **Non Pass-By Trip Volumes (Per ITE Trip Generation Manual, 11th Edition)**

PM Peak Hour = 65% Non-Pass By	AM Peak Hour = 71% Non-Pass By
IN Out Total	
AM Peak 21 15 36	
PM Peak 34 34 68	
Daily 163 163 326	PM Peak Hour Rate Applied to Daily

### **Pass-By Trip Volumes (Per ITE Trip Generation Manual, 11th Edition)**

PM Peak Hour = 35% Pass By	AM Peak Hour = 29% Pass By
IN Out Total	
AM Peak 8 6 15	
PM Peak 18 19 37	
Daily 88 88 176	PM Peak Hour Rate Applied to Daily

Project QuikTrip 4235  
 Subject Trip Generation for Gasoline/Service Station with Convenience Market  
 Designed by TES Date March 17, 2022 Job No. 096888026  
 Checked by \_\_\_\_\_ Date \_\_\_\_\_ Sheet No. \_\_\_\_\_ of \_\_\_\_\_

## **TRIP GENERATION MANUAL TECHNIQUES**

ITE Trip Generation Manual 11th Edition, Average Rate Equations

Land Use Code - Convenience Store/Gas Station - GFA (4-5.5K) (945)

Independant Variable - Vehicle Fueling Positions (X)

Vehicle Fueling Positions= 16 Positions

X = 16

T = Average Vehicle Trip Ends

### **Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (Page 873)**

Average Weekday	Directional Distribution:	50% ent.	50% exit.
T = 27.04 (X)	T = 433	Average Vehicle Trip Ends	
T = 27.04 * 16	216 entering	217 exiting	
	216 + 217 = 433		

### **Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (Page 874)**

Average Weekday	Directional Distribution:	50% ent.	50% exit.
T = 22.76 (X)	T = 364	Average Vehicle Trip Ends	
T = 22.76 * 16.000	182 entering	182 exiting	
	182 + 182 = 364		

### **Weekday (Page 872)**

Average Weekday	Directional Distribution:	50% entering,	50% exiting
T = 257.13 (X)	T = 4114	Average Vehicle Trip Ends	
T = 257.13 * 16.000	2057 entering	2057 exiting	
	2057 + 2057 = 4114		

### **Non Pass-By Trip Volumes (Per ITE Trip Generation Manual, 11th Edition)**

PM Peak Hour = 25% Non-Pass By	AM Peak Hour = 24% Non-Pass By
IN Out Total	
AM Peak 52 52 104	
PM Peak 46 46 91	
Daily 514 514 1028	PM Peak Hour Rate Applied to Daily

### **Pass-By Trip Volumes (Per ITE Trip Generation Manual, 11th Edition)**

PM Peak Hour = 75% Pass By	AM Peak Hour = 76% Pass By
IN Out Total	
AM Peak 164 165 329	
PM Peak 137 137 273	
Daily 1543 1543 3086	PM Peak Hour Rate Applied to Daily

NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	Majestic Tower Crossings Retail (North)			Organization:	Kimley-Horn and Associates, Inc.
Project Location:				Performed By:	
Scenario Description:				Date:	
Analysis Year:				Checked By:	
Analysis Period:	AM Street Peak Hour			Date:	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips <sup>3</sup>		
	ITE LUCs <sup>1</sup>	Quantity	Units	Total	Entering	Exiting
Office		-	1,000 Sq Ft	0	0	0
Retail		51	1,000 Sq Ft	486	247	239
Restaurant		-	1,000 Sq Ft	0	0	0
Cinema/Entertainment		-	Screen(s)	0	0	0
Residential		-	Dwelling Unit(s)	0	0	0
Hotel		240	Room(s)	113	63	50
All Other Land Uses <sup>2</sup>		-	0	0	0	0
				599	310	289

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. <sup>4</sup>	% Transit	% Non-Motorized	Veh. Occ. <sup>4</sup>	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses <sup>2</sup>	1.00	0%	0%	1.00	0%	0%

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	7	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	599	310	289
Internal Capture Percentage	2%	2%	2%
External Vehicle-Trips <sup>5</sup>	585	303	282
External Transit-Trips <sup>6</sup>	0	0	0
External Non-Motorized Trips <sup>6</sup>	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	3%	0%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	0%	14%

<sup>1</sup>Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

<sup>2</sup>Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

<sup>3</sup>Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

<sup>4</sup>Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

<sup>5</sup>Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

<sup>6</sup>Person-Trips

\*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

<b>Project Name:</b>	Majestic Tower Crossings Retail (North)
<b>Analysis Period:</b>	AM Street Peak Hour

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	247	247	1.00	239	239
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	63	63	1.00	49.55	50

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	69		31	0	33	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	38	7	5	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		79	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	20		0	0	3
Cinema/Entertainment	0	0	0		0	0
Residential	0	42	0	0		0
Hotel	0	10	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles <sup>1</sup>	Transit <sup>2</sup>	Non-Motorized <sup>2</sup>
Office	0	0	0	0	0	0
Retail	7	240	247	240	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	63	63	63	0	0
All Other Land Uses <sup>3</sup>	0	0	0	0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles <sup>1</sup>	Transit <sup>2</sup>	Non-Motorized <sup>2</sup>
Office	0	0	0	0	0	0
Retail	0	239	239	239	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	7	43	50	43	0	0
All Other Land Uses <sup>3</sup>	0	0	0	0	0	0

<sup>1</sup>Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

<sup>2</sup>Person-Trips

<sup>3</sup>Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

\*Indicates computation that has been rounded to the nearest whole number.

NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	Majestic Tower Crossings Retail (North)			Organization:	Kimley-Horn and Associates, Inc.
Project Location:				Performed By:	
Scenario Description:				Date:	
Analysis Year:				Checked By:	
Analysis Period:	PM Street Peak Hour			Date:	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips <sup>3</sup>		
	ITE LUCs <sup>1</sup>	Quantity	Units	Total	Entering	Exiting
Office		-	1,000 Sq Ft	0	0	0
Retail		51	1,000 Sq Ft	474	236	238
Restaurant		-	1,000 Sq Ft	0	0	0
Cinema/Entertainment		-	Screen(s)	0	0	0
Residential		-	Dwelling Unit(s)	0	0	0
Hotel		240	Room(s)	150	76	74
All Other Land Uses <sup>2</sup>		-	0	0	0	0
				624	312	312

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. <sup>4</sup>	% Transit	% Non-Motorized	Veh. Occ. <sup>4</sup>	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses <sup>2</sup>	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	12
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	5	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	624	312	312
Internal Capture Percentage	5%	5%	5%
External Vehicle-Trips <sup>5</sup>	590	295	295
External Transit-Trips <sup>6</sup>	0	0	0
External Non-Motorized Trips <sup>6</sup>	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	2%	5%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	16%	7%

<sup>1</sup> Land Use Codes (LUCs) from <i>Trip Generation Manual</i> , published by the Institute of Transportation Engineers.
<sup>2</sup> Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.
<sup>3</sup> Enter trips assuming no transit or non-motorized trips (as assumed in ITE <i>Trip Generation Manual</i> ).
<sup>4</sup> Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be
<sup>5</sup> Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.
<sup>6</sup> Person-Trips
*Indicates computation that has been rounded to the nearest whole number.
Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

<b>Project Name:</b>	Majestic Tower Crossings Retail (North)
<b>Analysis Period:</b>	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	236	236	1.00	238	238
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	76	76	1.00	73.71	74

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	5		69	10	62	12
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	12	50	0	1	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		19	0	0	0	0
Retail	0		0	0	0	13
Restaurant	0	118		0	0	54
Cinema/Entertainment	0	9	0		0	1
Residential	0	24	0	0		9
Hotel	0	5	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles <sup>1</sup>	Transit <sup>2</sup>	Non-Motorized <sup>2</sup>
Office	0	0	0	0	0	0
Retail	5	231	236	231	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	12	64	76	64	0	0
All Other Land Uses <sup>3</sup>	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles <sup>1</sup>	Transit <sup>2</sup>	Non-Motorized <sup>2</sup>
Office	0	0	0	0	0	0
Retail	12	226	238	226	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	5	69	74	69	0	0
All Other Land Uses <sup>3</sup>	0	0	0	0	0	0

<sup>1</sup>Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

<sup>2</sup>Person-Trips

<sup>3</sup>Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

\*Indicates computation that has been rounded to the nearest whole number.

Trip Generation Planner (ITE 11th Edition) - Summary Report



Weekday Trip Generation  
Trips Based on Average Rates/Equations

Project Name Majestic Tower Crossing Retail  
Project Number 096388012

ITE Code	Internal Capture Use	Land Use Description	Independent Variable	Setting/Location	No. of Units	Avg Rate or Eq	Rates			Total Trips							Net Trips after Internal Capture						
							Daily Rate	AM Rate	PM Rate	Daily Trips	AM Trips	PM Trips	AM Trips In	AM Trips Out	PM Trips In	PM Trips Out	Daily Trips	AM Trips	PM Trips	AM Trips In	AM Trips Out	PM Trips In	PM Trips Out
310	Hotel	Hotel	Room(s)	General Urban/Suburban	124	Eq	N/A	N/A	N/A	920	55	64	31	24	33	31	602	50	25	30	20	11	14
492	Cinema/Entertainment	Health/Fitness Club	1,000 Sq Ft	General Urban/Suburban	40	Avg	*	1.31	3.45	1,380	52	138	27	25	79	59	1,190	52	100	27	25	54	46
822	Retail	Strip Retail Plaza (<40k)	1,000 Sq Ft GLA	General Urban/Suburban	27	Avg	54.45	2.36	6.59	1,470	64	178	38	26	89	89	1,028	56	93	33	23	38	55
932	Restaurant	High-Turnover (Sit-Down) Restaurant	1,000 Sq Ft	General Urban/Suburban	16	Avg	107.20	9.57	9.05	1,716	153	145	84	69	88	57	1,506	151	111	83	68	74	39
934	Restaurant	Fast-Food Restaurant w/ D.T.	1,000 Sq Ft	General Urban/Suburban	10	Avg	467.48	44.61	33.03	4,676	446	330	227	219	172	158	4,104	441	253	224	217	144	108
937	Restaurant	Coffee/Donut Shop w/ D.T.	1,000 Sq Ft	General Urban/Suburban	2.5	Avg	533.57	85.88	38.99	1,334	215	98	110	105	49	49	1,172	213	75	109	104	41	33
Grand Total										11,496	985	953	517	468	510	443	9,602	963	657	506	457	362	295

Project Majestic Tower Crossing Retail  
 Subject Trip Generation for Hotel  
 Designed by TES Date October 27, 2022 Job No. 096388012  
 Checked by \_\_\_\_\_ Sheet No. \_\_\_\_\_ of \_\_\_\_\_

## **TRIP GENERATION MANUAL TECHNIQUES**

ITE Trip Generation Manual 11th Edition, Fitted Curve

Land Use Code -Hotel (310)

Independent Variable - Rooms (X)

$$X = 124$$

T = Average Vehicle Trip Ends

### **Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (Page 501)**

(T) = 0.50 (X) - 7.45	Directional Distribution: 56% ent. 44% exit.
(T) = 0.50 * (124.0) - 7.45	T = 55 Average Vehicle Trip Ends
	31 entering 24 exiting
	31 + 24 = 55

### **Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (Page 502)**

T = 0.74 (X) - 27.89	Directional Distribution: 51% ent. 49% exit.
T = 0.74 * 124 - 27.89	T = 64 Average Vehicle Trip Ends
	33 entering 31 exiting
	33 + 31 = 64

### **Weekday (Page 500)**

Average Weekday	Directional Distribution: 50% entering, 50% exiting
(T) = 10.84 (X) - 423.51	T = 920 Average Vehicle Trip Ends
(T) = 10.84 * (124.0) - 423.51	460 entering 460 exiting
	460 + 460 = 920

Project Majestic Tower Crossing Retail  
 Subject Trip Generation for General Health/Fitness Club  
 Designed by TES Date October 27, 2022 Job No. 096388012  
 Checked by \_\_\_\_\_ Date \_\_\_\_\_ Sheet No. \_\_\_\_\_ of \_\_\_\_\_

## **TRIP GENERATION MANUAL TECHNIQUES**

ITE Trip Generation Manual 11th Edition, Average Rates

Land Use Code - Health/Fitness Club (492)

Independant Variable - 1000 Square Feet (X)

SF = 40,000

X = 40.000

T = Average Vehicle Trip Ends

### **Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (400 Series Page 268)**

(T) = 1.31 (X)	Directional Distribution:	51% ent.	49% exit.
(T) = 1.31 * (40.0)	T = 52	Average Vehicle Trip Ends	
	27 entering	25	exiting
	27 + 25 = 52		

### **Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (400 Series Page 269)**

(T) = 3.45 (X)	Directional Distribution:	57% ent.	43% exit.
(T) = 3.45 * (40.0)	T = 138	Average Vehicle Trip Ends	
	79 entering	59	exiting
	79 + 59 = 138		

### **Weekday (10% K-Factor of PM Trips)**

(T) = 10 (PM trips)	Directional Distribution:	50% ent.	50% exit.
(T) = 10 * (138.0)	T = 1380	Average Vehicle Trip Ends	
	690 entering	690	exiting
	690 + 690 = 1380		

Project Majestic Tower Crossing Retail  
 Subject Trip Generation for Strip Retail Plaza (<40k)  
 Designed by TES Date October 27, 2022 Job No. 096388012  
 Checked by \_\_\_\_\_ Date \_\_\_\_\_ Sheet No. \_\_\_\_\_ of \_\_\_\_\_

## **TRIP GENERATION MANUAL TECHNIQUES**

ITE Trip Generation Manual 11th Edition, Average Rate Equations

Land Use Code - Strip Retail Plaza (<40k) (822)

Independent Variable - 1000 Square Feet Gross Leasable Area (X)

Gross Leasable Area = 27,000 Square Feet

X = 27.000

T = Average Vehicle Trip Ends

### **Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (800 Series Page 230)**

Average Weekday	Directional Distribution:	60% ent.	40% exit.
T = 2.36 * (X)	T = 64	Average Vehicle Trip Ends	
T = 2.36 * 27	38 entering	26	exiting
	38 + 26 = 64		

### **Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (800 Series page 231)**

Average Weekday	Directional Distribution:	50% ent.	50% exit.
T = 6.59 * (X)	T = 178	Average Vehicle Trip Ends	
T = 6.59 * 27	89 entering	89	exiting
	89 + 89 = 178		

### **Weekday (800 Series page 229)**

Average Weekday	Directional Distribution: 50% entering, 50% exiting
T = 54.45 * (X)	T = 1470 Average Vehicle Trip Ends
T = 54.45 * 27	735 entering 735 exiting
	735 + 735 = 1470

### **Non Pass-By Trip Volumes (Per ITE Trip Generation Manual, 11th Edition)**

AM Peak Hour = 60% Non-Pass By	PM Peak Hour = 60% Non-Pass By
IN Out Total	Pass-By Rates from ITE 821
AM Peak 23 16 38	PM Peak Hour Rate Applied to AM Peak Hour
PM Peak 53 53 107	
Daily 441 441 882	PM Peak Hour Rate Applied to Daily

### **Pass-By Trip Volumes (Per ITE Trip Generation Manual, 11th Edition)**

AM Peak Hour = 40% Pass By	PM Peak Hour = 40% Pass By
IN Out Total	
AM Peak 15 10 26	PM Peak Hour Rate Applied to AM Peak Hour
PM Peak 36 36 71	
Daily 294 294 588	PM Peak Hour Rate Applied to Daily

Project Majestic Tower Crossing Retail  
 Subject Trip Generation for High Turnover Sit-Down Restaurant  
 Designed by TES Date October 27, 2022 Job No. 96388012  
 Checked by \_\_\_\_\_ Date \_\_\_\_\_ Sheet No. \_\_\_\_\_ of \_\_\_\_\_

## TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 11th Edition, Average Rates

Land Use Code - High Turnover Sit-Down Restaurant (932)

Independent Variable - 1000 Square Feet (X)

SF = 16,000

X = 16.000

T = Average Vehicle Trip Ends

### Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (900 Series Page 674)

Directional Distribution: 55% ent. 45% exit.  
 (T) = 9.57 (X) T = 153 Average Vehicle Trip Ends  
 (T) = 9.57 \* (16.0) 84 entering 69 exiting  
 84 + 69 = 153

### Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (900 Series Page 674)

Directional Distribution: 61% ent. 39% exit.  
 (T) = 9.05 (X) T = 145 Average Vehicle Trip Ends  
 (T) = 9.05 \* (16.0) 88 entering 57 exiting  
 88 + 57 = 145

### Weekday (900 Series Page 673)

Directional Distribution: 50% ent. 50% exit.  
 (T) = 107.20 (X) T = 1716 Average Vehicle Trip Ends  
 (T) = 107.20 \* (16.0) 858 entering 858 exiting  
 858 + 858 = 1716

### Non Pass-By Trip Volumes (Per ITE Trip Generation Manual, 11th Edition)

AM Peak Hour =	57%	Non-Pass By	PM Peak Hour =	57%	Non-Pass By
	IN	Out	Total		
AM Peak	48	39	87	PM Peak Hour Rate Applied to AM Peak Hour	
PM Peak	50	32	82		
Daily	489	489	978	PM Peak Hour Rate Applied to Daily	

### Pass-By Trip Volumes (Per ITE Trip Generation Manual, 11th Edition)

AM Peak Hour =	43%	Pass By	PM Peak Hour =	43%	Pass By
	IN	Out	Total		
AM Peak	36	30	67	PM Peak Hour Rate Applied to AM Peak Hour	
PM Peak	38	25	63		
Daily	369	369	738	PM Peak Hour Rate Applied to Daily	

Project Majestic Tower Crossing Retail  
 Subject Trip Generation for Fast-Food Restaurant with Drive-Through Window  
 Designed by TES Date October 27, 2022 Job No. 096388012  
 Checked by \_\_\_\_\_ Date \_\_\_\_\_ Sheet No. \_\_\_\_\_ of \_\_\_\_\_

## **TRIP GENERATION MANUAL TECHNIQUES**

ITE Trip Generation Manual 11th Edition, Average Rates

Land Use Code - Fast-Food Restaurant with Drive-Through Window (934)

Independant Variable - 1000 Square Feet (X)

SF = 10,000

X = 10.000

T = Average Vehicle Trip Ends

### **Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (900 Series Page 726)**

Directional Distribution: 51% ent. 49% exit.  
 (T) = 44.61 (X) T = 446 Average Vehicle Trip Ends  
 (T) = 44.61 \* (10.0) 227 entering 219 exiting  
 227 + 219 = 446

### **Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (900 Series Page 727)**

Directional Distribution: 52% ent. 48% exit.  
 (T) = 33.03 (X) T = 330 Average Vehicle Trip Ends  
 (T) = 33.03 \* (10.0) 172 entering 158 exiting  
 172 + 158 = 330

### **Weekday (900 Series Page 725)**

Directional Distribution: 50% ent. 50% exit.  
 (T) = 467.48 (X) T = 4676 Average Vehicle Trip Ends  
 (T) = 467.48 \* (10.0) 2338 entering 2338 exiting  
 2338 + 2338 = 4676

### **Non Pass-By Trip Volumes (Per ITE Trip Generation Manual, 11th Edition)**

AM Peak Hour =	50%	Non-Pass By	PM Peak Hour =	45%	Non-Pass By
	IN	Out	Total		
AM Peak	113	110	223		
PM Peak	77	71	149		
Daily	1052	1052	2104	PM Peak Hour Rate Applied to Daily	

### **Pass-By Trip Volumes (Per Trip Generation Manual, 11th Edition)**

AM Peak Hour =	50%	Pass By	PM Peak Hour =	55%	Pass By
	IN	Out	Total		
AM Peak	113	110	223		
PM Peak	95	87	182		
Daily	1286	1286	2572	PM Peak Hour Rate Applied to Daily	

Project Majestic Tower Crossing Retail  
 Subject Trip Generation for Coffee/Donut Shop with Drive Through  
 Designed by TES Date October 27, 2022 Job No. 096388012  
 Checked by \_\_\_\_\_ Date \_\_\_\_\_ Sheet No. \_\_\_\_\_ of \_\_\_\_\_

## **TRIP GENERATION MANUAL TECHNIQUES**

ITE Trip Generation Manual 11th Edition, Average Rate Equations

Land Use Code - Coffee/Donut Shop with Drive-Through Window (937)

Independent Variable - 1000 Square Feet Gross Floor Feet (X)

Gross Floor Area = 2,500

X = 2.5

T = Average Vehicle Trip Ends

### **Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (Series 900 Page 777)**

Directional Distribution: 51% ent. 49% exit.  
 T = 85.88 (X) T = 215 Average Vehicle Trip Ends  
 T = 85.88 \* 2.5 110 entering 105 exiting

### **Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (Series 900 Page 778)**

Directional Distribution: 50% ent. 50% exit.  
 T = 38.99 (X) T = 98 Average Vehicle Trip Ends  
 T = 38.99 \* 2.5 49 entering 49 exiting

### **Weekday (Series 900 Page 776)**

Average Weekday Directional Distribution: 50% entering, 50% exiting  
 (T) = 533.57 (X) T = 1334 Average Vehicle Trip Ends  
 (T) = 533.57 \* (2.5) 667 entering 667 exiting  
 667 + 667 = 1334

**check with PM on pass-by**

Applying ITE LU 934 Fast Food with Drive-Through Pass-by Rates

### **Non Pass-By Trip Volumes (Per ITE Trip Generation Manual, 11th Edition)**

AM Peak Hour =	50%	Non-Pass By	PM Peak Hour =	45%	Non-Pass By
	IN	Out	Total	Pass-By Rates from ITE 938	
AM Peak	55	53	108		
PM Peak	22	22	44		
Daily	300	300	600	PM Peak Hour Rate Applied to Daily	

### **Pass-By Trip Volumes (Per Trip Generation Manual, 11th Edition)**

AM Peak Hour =	50%	Pass By	PM Peak Hour =	55%	Pass By
	IN	Out	Total		
AM Peak	55	53	108		
PM Peak	27	27	54		
Daily	367	367	734	PM Peak Hour Rate Applied to Daily	

NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	Majestic Tower Crossings Retail (South)			Organization:	Kimley-Horn and Associates, Inc.
Project Location:				Performed By:	
Scenario Description:				Date:	
Analysis Year:				Checked By:	
Analysis Period:	AM Street Peak Hour			Date:	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips <sup>3</sup>		
	ITE LUCs <sup>1</sup>	Quantity	Units	Total	Entering	Exiting
Office		-	1,000 Sq Ft	0	0	0
Retail		27	1,000 Sq Ft	64	38	26
Restaurant		29	1,000 Sq Ft	814	421	393
Cinema/Entertainment		40	Screen(s)	52	27	25
Residential		-	Dwelling Unit(s)	0	0	0
Hotel		124	Room(s)	55	31	24
All Other Land Uses <sup>2</sup>		-	0	0	0	0
				985	517	468

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. <sup>4</sup>	% Transit	% Non-Motorized	Veh. Occ. <sup>4</sup>	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses <sup>2</sup>	1.00	0%	0%	1.00	0%	0%

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		3	0	0	0
Restaurant	0	3		0	0	1
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	2	2	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	985	517	468
Internal Capture Percentage	2%	2%	2%
External Vehicle-Trips <sup>5</sup>	963	506	457
External Transit-Trips <sup>6</sup>	0	0	0
External Non-Motorized Trips <sup>6</sup>	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	13%	12%
Restaurant	1%	1%
Cinema/Entertainment	0%	0%
Residential	N/A	N/A
Hotel	3%	17%

<sup>1</sup>Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

<sup>2</sup>Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

<sup>3</sup>Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

<sup>4</sup>Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

<sup>5</sup>Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

<sup>6</sup>Person-Trips

\*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

<b>Project Name:</b>	Majestic Tower Crossings Retail (South)
<b>Analysis Period:</b>	AM Street Peak Hour

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	38	38	1.00	26	26
Restaurant	1.00	421	421	1.00	393	393
Cinema/Entertainment	1.00	27	27	1.00	25	25
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	31	31	1.00	24	24

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	8		3	0	4	0
Restaurant	122	55		0	16	12
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	18	3	2	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		12	97	0	0	0
Retail	0		211	0	0	0
Restaurant	0	3		0	0	1
Cinema/Entertainment	0	0	0		0	0
Residential	0	6	84	0		0
Hotel	0	2	25	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles <sup>1</sup>	Transit <sup>2</sup>	Non-Motorized <sup>2</sup>
Office	0	0	0	0	0	0
Retail	5	33	38	33	0	0
Restaurant	5	416	421	416	0	0
Cinema/Entertainment	0	27	27	27	0	0
Residential	0	0	0	0	0	0
Hotel	1	30	31	30	0	0
All Other Land Uses <sup>3</sup>	0	0	0	0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles <sup>1</sup>	Transit <sup>2</sup>	Non-Motorized <sup>2</sup>
Office	0	0	0	0	0	0
Retail	3	23	26	23	0	0
Restaurant	4	389	393	389	0	0
Cinema/Entertainment	0	25	25	25	0	0
Residential	0	0	0	0	0	0
Hotel	4	20	24	20	0	0
All Other Land Uses <sup>3</sup>	0	0	0	0	0	0

<sup>1</sup>Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

<sup>2</sup>Person-Trips

<sup>3</sup>Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

\*Indicates computation that has been rounded to the nearest whole number.

NCHRP 684 Internal Trip Capture Estimation Tool			
<b>Project Name:</b>	Majestic Tower Crossings Retail (South)	<b>Organization:</b>	Kimley-Horn and Associates, Inc.
<b>Project Location:</b>		<b>Performed By:</b>	
<b>Scenario Description:</b>		<b>Date:</b>	
<b>Analysis Year:</b>		<b>Checked By:</b>	
<b>Analysis Period:</b>	PM Street Peak Hour	<b>Date:</b>	

Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips <sup>3</sup>		
	ITE LUCs <sup>1</sup>	Quantity	Units	Total	Entering	Exiting
Office		-	1,000 Sq Ft	0	0	0
Retail		27	1,000 Sq Ft	178	89	89
Restaurant		29	1,000 Sq Ft	573	309	264
Cinema/Entertainment		40	Screen(s)	138	79	59
Residential		-	Dwelling Unit(s)	0	0	0
Hotel		124	Room(s)	64	33	31
All Other Land Uses <sup>2</sup>		-	0	0	0	0
				953	510	443

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. <sup>4</sup>	% Transit	% Non-Motorized	Veh. Occ. <sup>4</sup>	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses <sup>2</sup>	1.00	0%	0%	1.00	0%	0%

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		26	4	0	4
Restaurant	0	45		21	0	18
Cinema/Entertainment	0	4	9		0	0
Residential	0	0	0	0		0
Hotel	0	2	15	0	0	

	Total	Entering	Exiting
All Person-Trips	953	510	443
Internal Capture Percentage	31%	29%	33%
External Vehicle-Trips <sup>5</sup>	657	362	295
External Transit-Trips <sup>6</sup>	0	0	0
External Non-Motorized Trips <sup>6</sup>	0	0	0

Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	57%	38%
Restaurant	16%	32%
Cinema/Entertainment	32%	22%
Residential	N/A	N/A
Hotel	67%	55%

<sup>1</sup>Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

<sup>2</sup>Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

<sup>3</sup>Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

<sup>4</sup>Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made.

<sup>5</sup>Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.

<sup>6</sup>Person-Trips

\*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

<b>Project Name:</b>	Majestic Tower Crossings Retail (South)
<b>Analysis Period:</b>	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	89	89	1.00	89	89
Restaurant	1.00	309	309	1.00	264	264
Cinema/Entertainment	1.00	79	79	1.00	59	59
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	33	33	1.00	30.87	31

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	2		26	4	23	4
Restaurant	8	108		21	48	18
Cinema/Entertainment	1	12	18		5	1
Residential	0	0	0	0		0
Hotel	0	5	21	0	1	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		7	6	1	0	0
Retail	0		90	21	0	6
Restaurant	0	45		25	0	23
Cinema/Entertainment	0	4	9		0	0
Residential	0	9	43	0		4
Hotel	0	2	15	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles <sup>1</sup>	Transit <sup>2</sup>	Non-Motorized <sup>2</sup>
Office	0	0	0	0	0	0
Retail	51	38	89	38	0	0
Restaurant	50	259	309	259	0	0
Cinema/Entertainment	25	54	79	54	0	0
Residential	0	0	0	0	0	0
Hotel	22	11	33	11	0	0
All Other Land Uses <sup>3</sup>	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles <sup>1</sup>	Transit <sup>2</sup>	Non-Motorized <sup>2</sup>
Office	0	0	0	0	0	0
Retail	34	55	89	55	0	0
Restaurant	84	180	264	180	0	0
Cinema/Entertainment	13	46	59	46	0	0
Residential	0	0	0	0	0	0
Hotel	17	14	31	14	0	0
All Other Land Uses <sup>3</sup>	0	0	0	0	0	0

<sup>1</sup>Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

<sup>2</sup>Person-Trips

<sup>3</sup>Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

\*Indicates computation that has been rounded to the nearest whole number.

# APPENDIX D













## Intersection Analysis Worksheets

# Timings

## 1: Tower Rd & 32nd Pkwy

2022 Existing AM

10/28/2022

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	367	93	1016	503	97	1389
Future Volume (vph)	367	93	1016	503	97	1389
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	11.0	24.0
Total Split (s)	33.0	33.0	69.0	69.0	18.0	87.0
Total Split (%)	27.5%	27.5%	57.5%	57.5%	15.0%	72.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	C-Max	C-Max	None	C-Max
Act Effect Green (s)	18.3	18.3	76.3	76.3	89.7	89.7
Actuated g/C Ratio	0.15	0.15	0.64	0.64	0.75	0.75
v/c Ratio	0.71	0.30	0.46	0.43	0.26	0.37
Control Delay	56.0	10.7	12.7	2.1	6.3	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.0	10.7	12.7	2.1	6.3	5.9
LOS	E	B	B	A	A	A
Approach Delay	46.8		9.2			5.9
Approach LOS	D		A			A

### Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 38 (32%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 12.8

Intersection LOS: B

Intersection Capacity Utilization 58.9%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 1: Tower Rd & 32nd Pkwy















# HCM 6th Signalized Intersection Summary

## 1: Tower Rd & 32nd Pkwy

2022 Existing AM

10/28/2022













						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	367	93	1016	503	97	1389
Future Volume (veh/h)	367	93	1016	503	97	1389
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	374	44	1037	258	99	1417
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	457	209	2408	1074	364	3921
Arrive On Green	0.13	0.13	0.68	0.68	0.04	0.77
Sat Flow, veh/h	3456	1585	3647	1585	1781	5274
Grp Volume(v), veh/h	374	44	1037	258	99	1417
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	1781	1702
Q Serve(g_s), s	12.6	3.0	15.9	7.5	1.9	10.7
Cycle Q Clear(g_c), s	12.6	3.0	15.9	7.5	1.9	10.7
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	457	209	2408	1074	364	3921
V/C Ratio(X)	0.82	0.21	0.43	0.24	0.27	0.36
Avail Cap(c_a), veh/h	778	357	2408	1074	470	3921
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	50.7	46.5	8.8	7.4	6.2	4.5
Incr Delay (d2), s/veh	3.7	0.5	0.6	0.5	0.4	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.7	1.2	5.9	2.6	0.7	3.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	54.4	47.0	9.4	8.0	6.6	4.7
LnGrp LOS	D	D	A	A	A	A
Approach Vol, veh/h	418		1295			1516
Approach Delay, s/veh	53.6		9.1			4.9
Approach LOS	D		A			A
Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	10.8	87.3			98.1	21.9
Change Period (Y+Rc), s	6.0	6.0			6.0	6.0
Max Green Setting (Gmax), s	12.0	63.0			81.0	27.0
Max Q Clear Time (g_c+I1), s	3.9	17.9			12.7	14.6
Green Ext Time (p_c), s	0.1	11.3			16.3	1.2
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			12.9			
HCM 6th LOS			B			

# Timings

## 1: Tower Rd & 32nd Pkwy

2022 Existing PM

10/28/2022

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	425	143	1222	337	104	1529
Future Volume (vph)	425	143	1222	337	104	1529
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	11.0	24.0
Total Split (s)	33.0	33.0	70.0	70.0	17.0	87.0
Total Split (%)	27.5%	27.5%	58.3%	58.3%	14.2%	72.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	C-Max	C-Max	None	C-Max
Act Effect Green (s)	20.8	20.8	73.4	73.4	87.2	87.2
Actuated g/C Ratio	0.17	0.17	0.61	0.61	0.73	0.73
v/c Ratio	0.74	0.37	0.59	0.32	0.37	0.43
Control Delay	54.8	9.1	16.3	2.1	9.1	7.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	54.8	9.1	16.3	2.1	9.1	7.3
LOS	D	A	B	A	A	A
Approach Delay	43.3		13.3			7.4
Approach LOS	D		B			A

### Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 38 (32%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 15.3

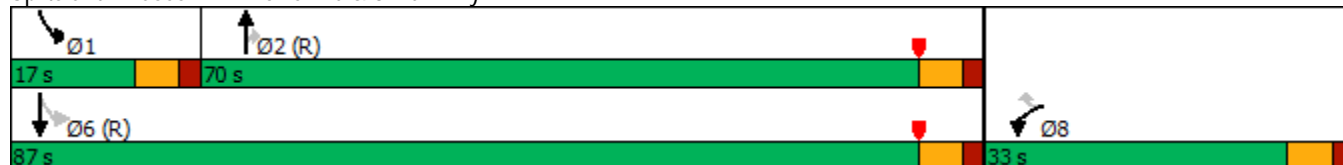
Intersection LOS: B

Intersection Capacity Utilization 66.7%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: Tower Rd & 32nd Pkwy















# HCM 6th Signalized Intersection Summary

## 1: Tower Rd & 32nd Pkwy

2022 Existing PM

10/28/2022













						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	425	143	1222	337	104	1529
Future Volume (veh/h)	425	143	1222	337	104	1529
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	443	76	1273	195	108	1593
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	529	243	2333	1040	300	3814
Arrive On Green	0.15	0.15	0.66	0.66	0.04	0.75
Sat Flow, veh/h	3456	1585	3647	1585	1781	5274
Grp Volume(v), veh/h	443	76	1273	195	108	1593
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	1781	1702
Q Serve(g_s), s	14.9	5.1	23.0	5.8	2.2	13.8
Cycle Q Clear(g_c), s	14.9	5.1	23.0	5.8	2.2	13.8
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	529	243	2333	1040	300	3814
V/C Ratio(X)	0.84	0.31	0.55	0.19	0.36	0.42
Avail Cap(c_a), veh/h	778	357	2333	1040	391	3814
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.4	45.2	11.0	8.1	9.0	5.6
Incr Delay (d2), s/veh	5.3	0.7	0.9	0.4	0.7	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.8	2.1	8.8	2.0	0.8	4.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	54.7	45.9	12.0	8.5	9.7	5.9
LnGrp LOS	D	D	B	A	A	A
Approach Vol, veh/h	519		1468			1701
Approach Delay, s/veh	53.4		11.5			6.2
Approach LOS	D		B			A
Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	10.9	84.8			95.6	24.4
Change Period (Y+Rc), s	6.0	6.0			6.0	6.0
Max Green Setting (Gmax), s	11.0	64.0			81.0	27.0
Max Q Clear Time (g_c+l1), s	4.2	25.0			15.8	16.9
Green Ext Time (p_c), s	0.1	14.1			19.9	1.4
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			14.9			
HCM 6th LOS			B			

# Timings

## 1: Tower Rd & 32nd Pkwy

2025 Background AM

10/31/2022

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	425	110	1078	719	152	1474
Future Volume (vph)	425	110	1078	719	152	1474
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	11.0	24.0
Total Split (s)	33.0	33.0	69.0	69.0	18.0	87.0
Total Split (%)	27.5%	27.5%	57.5%	57.5%	15.0%	72.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	C-Max	C-Max	None	C-Max
Act Effect Green (s)	20.5	20.5	72.7	72.7	87.5	87.5
Actuated g/C Ratio	0.17	0.17	0.61	0.61	0.73	0.73
v/c Ratio	0.74	0.31	0.51	0.59	0.44	0.41
Control Delay	54.9	9.5	15.4	3.1	9.3	7.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	54.9	9.5	15.4	3.1	9.3	7.0
LOS	D	A	B	A	A	A
Approach Delay	45.6		10.5			7.2
Approach LOS	D		B			A

### Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 38 (32%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 13.9

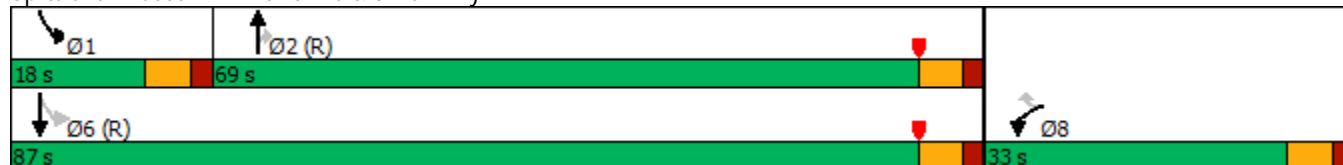
Intersection LOS: B

Intersection Capacity Utilization 65.3%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: Tower Rd & 32nd Pkwy















# HCM 6th Signalized Intersection Summary

2025 Background AM

10/31/2022

## 1: Tower Rd & 32nd Pkwy













						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	425	110	1078	719	152	1474
Future Volume (veh/h)	425	110	1078	719	152	1474
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	434	61	1100	479	155	1504
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	519	238	2327	1038	303	3829
Arrive On Green	0.15	0.15	0.65	0.65	0.05	0.75
Sat Flow, veh/h	3456	1585	3647	1585	1781	5274
Grp Volume(v), veh/h	434	61	1100	479	155	1504
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	1781	1702
Q Serve(g_s), s	14.6	4.1	18.6	17.9	3.2	12.5
Cycle Q Clear(g_c), s	14.6	4.1	18.6	17.9	3.2	12.5
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	519	238	2327	1038	303	3829
V/C Ratio(X)	0.84	0.26	0.47	0.46	0.51	0.39
Avail Cap(c_a), veh/h	778	357	2327	1038	400	3829
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.6	45.1	10.4	10.3	8.7	5.3
Incr Delay (d2), s/veh	5.1	0.6	0.7	1.5	1.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.7	1.6	7.1	6.3	1.2	4.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	54.7	45.6	11.1	11.7	10.0	5.6
LnGrp LOS	D	D	B	B	B	A
Approach Vol, veh/h	495		1579			1659
Approach Delay, s/veh	53.5		11.3			6.0
Approach LOS	D		B			A
Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	11.4	84.6			96.0	24.0
Change Period (Y+Rc), s	6.0	6.0			6.0	6.0
Max Green Setting (Gmax), s	12.0	63.0			81.0	27.0
Max Q Clear Time (g_c+I1), s	5.2	20.6			14.5	16.6
Green Ext Time (p_c), s	0.2	13.8			18.0	1.4
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			14.5			
HCM 6th LOS			B			

# Timings

2025 Background PM

10/31/2022

## 1: Tower Rd & 32nd Pkwy

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	562	185	1297	390	120	1623
Future Volume (vph)	562	185	1297	390	120	1623
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	11.0	24.0
Total Split (s)	33.0	33.0	70.0	70.0	17.0	87.0
Total Split (%)	27.5%	27.5%	58.3%	58.3%	14.2%	72.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	C-Max	C-Max	None	C-Max
Act Effect Green (s)	24.6	24.6	68.9	68.9	83.4	83.4
Actuated g/C Ratio	0.20	0.20	0.57	0.57	0.70	0.70
v/c Ratio	0.83	0.41	0.66	0.38	0.49	0.48
Control Delay	56.6	8.3	20.3	2.4	13.1	9.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.6	8.3	20.3	2.4	13.1	9.2
LOS	E	A	C	A	B	A
Approach Delay	44.6		16.2			9.4
Approach LOS	D		B			A

### Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 38 (32%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 18.5

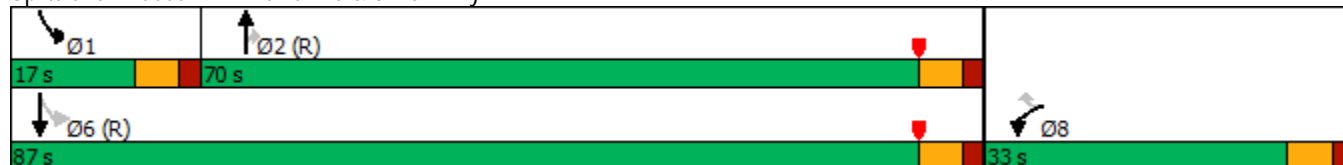
Intersection LOS: B

Intersection Capacity Utilization 73.5%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: Tower Rd & 32nd Pkwy















# HCM 6th Signalized Intersection Summary

2025 Background PM

10/31/2022

## 1: Tower Rd & 32nd Pkwy













						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	562	185	1297	390	120	1623
Future Volume (veh/h)	562	185	1297	390	120	1623
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	585	115	1351	250	125	1691
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	665	305	2188	976	255	3612
Arrive On Green	0.19	0.19	0.62	0.62	0.04	0.71
Sat Flow, veh/h	3456	1585	3647	1585	1781	5274
Grp Volume(v), veh/h	585	115	1351	250	125	1691
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	1781	1702
Q Serve(g_s), s	19.7	7.6	28.3	8.6	3.0	17.4
Cycle Q Clear(g_c), s	19.7	7.6	28.3	8.6	3.0	17.4
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	665	305	2188	976	255	3612
V/C Ratio(X)	0.88	0.38	0.62	0.26	0.49	0.47
Avail Cap(c_a), veh/h	778	357	2188	976	344	3612
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	47.1	42.2	14.3	10.5	13.2	7.7
Incr Delay (d2), s/veh	10.1	0.8	1.3	0.6	1.5	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.4	3.0	11.2	3.1	1.2	5.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	57.2	42.9	15.6	11.2	14.6	8.1
LnGrp LOS	E	D	B	B	B	A
Approach Vol, veh/h	700		1601			1816
Approach Delay, s/veh	54.9		14.9			8.6
Approach LOS	D		B			A
Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	11.0	79.9			90.9	29.1
Change Period (Y+Rc), s	6.0	6.0			6.0	6.0
Max Green Setting (Gmax), s	11.0	64.0			81.0	27.0
Max Q Clear Time (g_c+l1), s	5.0	30.3			19.4	21.7
Green Ext Time (p_c), s	0.1	14.8			21.9	1.4
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			18.9			
HCM 6th LOS			B			

# Timings

## 1: Tower Rd & 32nd Pkwy

2025 Total AM

02/27/2024

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	794	284	1197	1005	435	1474
Future Volume (vph)	794	284	1197	1005	435	1474
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	11.0	24.0
Total Split (s)	35.0	35.0	54.0	54.0	31.0	85.0
Total Split (%)	29.2%	29.2%	45.0%	45.0%	25.8%	70.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	C-Max	C-Max	None	C-Max

### Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 38 (32%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Natural Cycle: 90

Control Type: Actuated-Coordinated

Splits and Phases: 1: Tower Rd & 32nd Pkwy















# HCM 6th Signalized Intersection Summary

2025 Total AM

02/27/2024

## 1: Tower Rd & 32nd Pkwy













						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	794	284	1197	1005	435	1474
Future Volume (veh/h)	794	284	1197	1005	435	1474
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	810	86	1221	567	444	1504
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	835	383	1421	634	454	3362
Arrive On Green	0.24	0.24	0.40	0.40	0.21	0.66
Sat Flow, veh/h	3456	1585	3647	1585	1781	5274
Grp Volume(v), veh/h	810	86	1221	567	444	1504
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	1781	1702
Q Serve(g_s), s	27.9	5.2	37.7	40.1	24.1	17.1
Cycle Q Clear(g_c), s	27.9	5.2	37.7	40.1	24.1	17.1
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	835	383	1421	634	454	3362
V/C Ratio(X)	0.97	0.22	0.86	0.89	0.98	0.45
Avail Cap(c_a), veh/h	835	383	1421	634	454	3362
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.1	36.5	32.9	33.6	36.3	9.9
Incr Delay (d2), s/veh	23.9	0.3	7.0	17.5	36.5	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	14.6	2.1	17.3	18.2	16.9	6.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	69.0	36.8	39.9	51.2	72.7	10.4
LnGrp LOS	E	D	D	D	E	B
Approach Vol, veh/h	896		1788			1948
Approach Delay, s/veh	65.9		43.4			24.6
Approach LOS	E		D			C
Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	31.0	54.0			85.0	35.0
Change Period (Y+Rc), s	6.0	6.0			6.0	6.0
Max Green Setting (Gmax), s	25.0	48.0			79.0	29.0
Max Q Clear Time (g_c+l1), s	26.1	42.1			19.1	29.9
Green Ext Time (p_c), s	0.0	4.5			17.7	0.0
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			39.9			
HCM 6th LOS			D			

# Timings

## 1: Tower Rd & 32nd Pkwy

2025 Total PM

02/27/2024

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	857	303	1412	602	349	1623
Future Volume (vph)	857	303	1412	602	349	1623
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	11.0	24.0
Total Split (s)	37.0	37.0	56.0	56.0	27.0	83.0
Total Split (%)	30.8%	30.8%	46.7%	46.7%	22.5%	69.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	C-Max	C-Max	None	C-Max

### Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 38 (32%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Natural Cycle: 110

Control Type: Actuated-Coordinated

Splits and Phases: 1: Tower Rd & 32nd Pkwy















# HCM 6th Signalized Intersection Summary

2025 Total PM

02/27/2024













## 1: Tower Rd & 32nd Pkwy

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	857	303	1412	602	349	1623
Future Volume (veh/h)	857	303	1412	602	349	1623
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	893	160	1471	315	364	1691
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	893	409	1481	660	373	3276
Arrive On Green	0.26	0.26	0.42	0.42	0.17	0.64
Sat Flow, veh/h	3456	1585	3647	1585	1781	5274
Grp Volume(v), veh/h	893	160	1471	315	364	1691
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	1781	1702
Q Serve(g_s), s	31.0	10.0	49.4	17.4	20.2	21.3
Cycle Q Clear(g_c), s	31.0	10.0	49.4	17.4	20.2	21.3
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	893	409	1481	660	373	3276
V/C Ratio(X)	1.00	0.39	0.99	0.48	0.98	0.52
Avail Cap(c_a), veh/h	893	409	1481	660	373	3276
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	44.5	36.7	34.8	25.5	39.6	11.5
Incr Delay (d2), s/veh	30.2	0.6	21.9	2.5	40.1	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	16.9	4.0	25.3	7.0	14.4	7.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	74.7	37.3	56.7	27.9	79.7	12.1
LnGrp LOS	F	D	E	C	E	B
Approach Vol, veh/h	1053		1786			2055
Approach Delay, s/veh	69.0		51.6			24.1
Approach LOS	E		D			C
Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	27.0	56.0			83.0	37.0
Change Period (Y+Rc), s	6.0	6.0			6.0	6.0
Max Green Setting (Gmax), s	21.0	50.0			77.0	31.0
Max Q Clear Time (g_c+l1), s	22.2	51.4			23.3	33.0
Green Ext Time (p_c), s	0.0	0.0			21.0	0.0
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			43.8			
HCM 6th LOS			D			

# Timings 1: Tower Rd & 32nd Pkwy

2040 Background AM

10/31/2022

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	560	144	1451	903	188	1984
Future Volume (vph)	560	144	1451	903	188	1984
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	11.0	24.0
Total Split (s)	33.0	33.0	69.0	69.0	18.0	87.0
Total Split (%)	27.5%	27.5%	57.5%	57.5%	15.0%	72.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	C-Max	C-Max	None	C-Max
Act Effect Green (s)	24.4	24.4	66.4	66.4	83.6	83.6
Actuated g/C Ratio	0.20	0.20	0.55	0.55	0.70	0.70
v/c Ratio	0.82	0.34	0.76	0.74	0.76	0.57
Control Delay	56.0	8.2	24.5	6.8	40.6	10.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.0	8.2	24.5	6.8	40.6	10.2
LOS	E	A	C	A	D	B
Approach Delay	46.2		17.8			12.9
Approach LOS	D		B			B

## Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 38 (32%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 19.5

Intersection LOS: B

Intersection Capacity Utilization 81.5%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: Tower Rd & 32nd Pkwy















# HCM 6th Signalized Intersection Summary

2040 Background AM

10/31/2022













## 1: Tower Rd & 32nd Pkwy

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	560	144	1451	903	188	1984
Future Volume (veh/h)	560	144	1451	903	188	1984
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	571	96	1481	564	192	2024
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	652	299	2146	957	228	3632
Arrive On Green	0.19	0.19	0.60	0.60	0.06	0.71
Sat Flow, veh/h	3456	1585	3647	1585	1781	5274
Grp Volume(v), veh/h	571	96	1481	564	192	2024
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	1781	1702
Q Serve(g_s), s	19.3	6.3	34.0	26.3	4.7	22.7
Cycle Q Clear(g_c), s	19.3	6.3	34.0	26.3	4.7	22.7
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	652	299	2146	957	228	3632
V/C Ratio(X)	0.88	0.32	0.69	0.59	0.84	0.56
Avail Cap(c_a), veh/h	778	357	2146	957	304	3632
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	47.3	42.0	16.1	14.6	23.5	8.3
Incr Delay (d2), s/veh	9.7	0.6	1.8	2.7	14.6	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.1	2.5	13.7	9.7	4.3	7.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	57.0	42.7	18.0	17.3	38.0	8.9
LnGrp LOS	E	D	B	B	D	A
Approach Vol, veh/h	667		2045			2216
Approach Delay, s/veh	54.9		17.8			11.4
Approach LOS	D		B			B
Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	12.9	78.5			91.4	28.6
Change Period (Y+Rc), s	6.0	6.0			6.0	6.0
Max Green Setting (Gmax), s	12.0	63.0			81.0	27.0
Max Q Clear Time (g_c+I1), s	6.7	36.0			24.7	21.3
Green Ext Time (p_c), s	0.2	16.7			29.1	1.4
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			20.0			
HCM 6th LOS			B			

# Timings 1: Tower Rd & 32nd Pkwy

2040 Background PM

10/31/2022

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	718	237	1745	513	159	2184
Future Volume (vph)	718	237	1745	513	159	2184
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	11.0	24.0
Total Split (s)	33.0	33.0	70.0	70.0	17.0	87.0
Total Split (%)	27.5%	27.5%	58.3%	58.3%	14.2%	72.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	C-Max	C-Max	None	C-Max
Act Effect Green (s)	27.0	27.0	64.8	64.8	81.0	81.0
Actuated g/C Ratio	0.22	0.22	0.54	0.54	0.68	0.68
v/c Ratio	0.97	0.51	0.95	0.52	0.79	0.66
Control Delay	72.0	17.4	38.7	6.2	51.6	12.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	72.0	17.4	38.7	6.2	51.6	12.7
LOS	E	B	D	A	D	B
Approach Delay	58.5		31.3			15.3
Approach LOS	E		C			B

## Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 38 (32%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 29.2

Intersection LOS: C

Intersection Capacity Utilization 92.5%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 1: Tower Rd & 32nd Pkwy



















# HCM 6th Signalized Intersection Summary

2040 Background PM

10/31/2022

## 1: Tower Rd & 32nd Pkwy













						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		 			  
Traffic Volume (veh/h)	718	237	1745	513	159	2184
Future Volume (veh/h)	718	237	1745	513	159	2184
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	748	143	1818	326	166	2275
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	778	357	1990	888	194	3447
Arrive On Green	0.22	0.22	0.56	0.56	0.06	0.68
Sat Flow, veh/h	3456	1585	3647	1585	1781	5274
Grp Volume(v), veh/h	748	143	1818	326	166	2275
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	1781	1702
Q Serve(g_s), s	25.7	9.2	55.3	13.7	5.7	31.3
Cycle Q Clear(g_c), s	25.7	9.2	55.3	13.7	5.7	31.3
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	778	357	1990	888	194	3447
V/C Ratio(X)	0.96	0.40	0.91	0.37	0.85	0.66
Avail Cap(c_a), veh/h	778	357	1990	888	242	3447
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.0	39.6	23.8	14.6	32.8	11.4
Incr Delay (d2), s/veh	23.3	0.7	7.9	1.2	21.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.5	3.7	24.1	5.1	6.0	11.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	69.3	40.3	31.7	15.8	53.7	12.4
LnGrp LOS	E	D	C	B	D	B
Approach Vol, veh/h	891		2144			2441
Approach Delay, s/veh	64.7		29.3			15.2
Approach LOS	E		C			B
Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	13.8	73.2			87.0	33.0
Change Period (Y+Rc), s	6.0	6.0			6.0	6.0
Max Green Setting (Gmax), s	11.0	64.0			81.0	27.0
Max Q Clear Time (g_c+l1), s	7.7	57.3			33.3	27.7
Green Ext Time (p_c), s	0.1	5.9			31.7	0.0
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			28.8			
HCM 6th LOS			C			

# Timings

## 1: Tower Rd & 32nd Pkwy

2040 Total AM

02/27/2024

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	929	318	1570	1189	471	1984
Future Volume (vph)	929	318	1570	1189	471	1984
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	11.0	24.0
Total Split (s)	39.0	39.0	46.0	46.0	35.0	81.0
Total Split (%)	32.5%	32.5%	38.3%	38.3%	29.2%	67.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	C-Max	C-Max	None	C-Max

### Intersection Summary

Cycle Length: 120

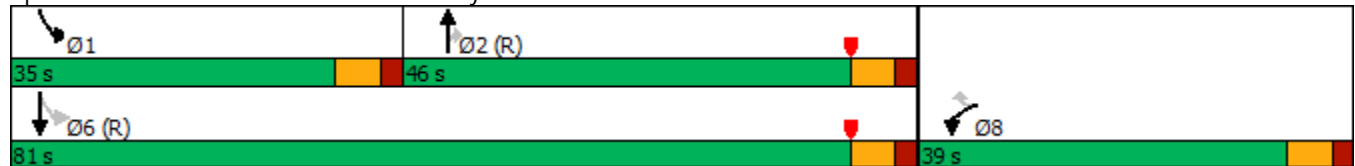
Actuated Cycle Length: 120

Offset: 38 (32%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Natural Cycle: 70

Control Type: Actuated-Coordinated

Splits and Phases: 1: Tower Rd & 32nd Pkwy















# HCM 6th Signalized Intersection Summary

2040 Total AM

02/27/2024

## 1: Tower Rd & 32nd Pkwy













						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	929	318	1570	1189	471	1984
Future Volume (veh/h)	929	318	1570	1189	471	1984
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	948	120	1602	499	481	2024
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	950	436	1702	528	496	3191
Arrive On Green	0.28	0.28	0.33	0.33	0.24	0.63
Sat Flow, veh/h	3456	1585	5274	1585	1781	5274
Grp Volume(v), veh/h	948	120	1602	499	481	2024
Grp Sat Flow(s),veh/h/ln	1728	1585	1702	1585	1781	1702
Q Serve(g_s), s	32.9	7.1	36.6	36.8	27.6	29.6
Cycle Q Clear(g_c), s	32.9	7.1	36.6	36.8	27.6	29.6
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	950	436	1702	528	496	3191
V/C Ratio(X)	1.00	0.28	0.94	0.94	0.97	0.63
Avail Cap(c_a), veh/h	950	436	1702	528	496	3191
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.5	34.1	38.9	38.9	36.4	14.0
Incr Delay (d2), s/veh	28.6	0.3	11.7	27.6	32.6	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	17.7	2.8	16.9	18.1	17.7	11.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	72.0	34.5	50.6	66.5	69.0	15.0
LnGrp LOS	E	C	D	E	E	B
Approach Vol, veh/h	1068		2101			2505
Approach Delay, s/veh	67.8		54.4			25.3
Approach LOS	E		D			C
Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	35.0	46.0			81.0	39.0
Change Period (Y+Rc), s	6.0	6.0			6.0	6.0
Max Green Setting (Gmax), s	29.0	40.0			75.0	33.0
Max Q Clear Time (g_c+l1), s	29.6	38.8			31.6	34.9
Green Ext Time (p_c), s	0.0	1.1			25.4	0.0
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			44.1			
HCM 6th LOS			D			

# Timings

2040 Total PM

## 1: Tower Rd & 32nd Pkwy

02/27/2024

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	1013	355	1860	725	388	2184
Future Volume (vph)	1013	355	1860	725	388	2184
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	11.0	24.0
Total Split (s)	44.0	44.0	52.0	52.0	24.0	76.0
Total Split (%)	36.7%	36.7%	43.3%	43.3%	20.0%	63.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	C-Max	C-Max	None	C-Max

### Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 38 (32%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Natural Cycle: 100

Control Type: Actuated-Coordinated

Splits and Phases: 1: Tower Rd & 32nd Pkwy




















# HCM 6th Signalized Intersection Summary

2040 Total PM

02/27/2024

## 1: Tower Rd & 32nd Pkwy

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		  			  
Traffic Volume (veh/h)	1013	355	1860	725	388	2184
Future Volume (veh/h)	1013	355	1860	725	388	2184
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	1055	141	1938	338	404	2275
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1094	502	1957	608	328	2979
Arrive On Green	0.32	0.32	0.38	0.38	0.15	0.58
Sat Flow, veh/h	3456	1585	5274	1585	1781	5274
Grp Volume(v), veh/h	1055	141	1938	338	404	2275
Grp Sat Flow(s),veh/h/ln	1728	1585	1702	1585	1781	1702
Q Serve(g_s), s	36.0	8.0	45.3	20.1	18.0	40.2
Cycle Q Clear(g_c), s	36.0	8.0	45.3	20.1	18.0	40.2
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	1094	502	1957	608	328	2979
V/C Ratio(X)	0.96	0.28	0.99	0.56	1.23	0.76
Avail Cap(c_a), veh/h	1094	502	1957	608	328	2979
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	40.3	30.8	36.8	29.0	39.3	18.8
Incr Delay (d2), s/veh	19.1	0.3	18.1	3.6	127.7	1.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	18.0	3.1	21.7	8.2	16.9	15.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	59.4	31.1	54.9	32.6	167.0	20.7
LnGrp LOS	E	C	D	C	F	C
Approach Vol, veh/h	1196		2276			2679
Approach Delay, s/veh	56.1		51.6			42.8
Approach LOS	E		D			D
Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	24.0	52.0			76.0	44.0
Change Period (Y+Rc), s	6.0	6.0			6.0	6.0
Max Green Setting (Gmax), s	18.0	46.0			70.0	38.0
Max Q Clear Time (g_c+l1), s	20.0	47.3			42.2	38.0
Green Ext Time (p_c), s	0.0	0.0			21.4	0.0
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			48.6			
HCM 6th LOS			D			

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Vol, veh/h	0	1440	974	24	0	104
Future Vol, veh/h	0	1440	974	24	0	104
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	0	1565	1059	26	0	113
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	-	0	-	0	-	543
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	-	0	484
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	484
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		SB		
HCM Control Delay, s	0	0		14.7		
HCM LOS	B					
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1		
Capacity (veh/h)	-	-	-	484		
HCM Lane V/C Ratio	-	-	-	0.234		
HCM Control Delay (s)	-	-	-	14.7		
HCM Lane LOS	-	-	-	B		
HCM 95th %tile Q(veh)	-	-	-	0.9		

Intersection						
Int Delay, s/veh	0.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Vol, veh/h	0	951	1050	24	0	110
Future Vol, veh/h	0	951	1050	24	0	110
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	0	1034	1141	26	0	120
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	-	0	-	0	-	584
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	-	0	455
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	455
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		SB		
HCM Control Delay, s	0	0		15.7		
HCM LOS				C		
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1		
Capacity (veh/h)	-	-	-	455		
HCM Lane V/C Ratio	-	-	-	0.263		
HCM Control Delay (s)	-	-	-	15.7		
HCM Lane LOS	-	-	-	C		
HCM 95th %tile Q(veh)	-	-	-	1		

Intersection

Int Delay, s/veh 0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Vol, veh/h	0	1660	1143	24	0	104
Future Vol, veh/h	0	1660	1143	24	0	104
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	0	1804	1242	26	0	113

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

Approach	EB	WB	SB
HCM Control Delay, s	0	0	12.3
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	607
HCM Lane V/C Ratio	-	-	-	0.186
HCM Control Delay (s)	-	-	-	12.3
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0.7

Notes

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

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↗
Traffic Vol, veh/h	0	1113	1258	24	0	110
Future Vol, veh/h	0	1113	1258	24	0	110
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	0	1210	1367	26	0	120
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	-	0	-	0	-	697
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	-	0	*554
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		1
Mov Cap-1 Maneuver	-	-	-	-	-	*554
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		SB		
HCM Control Delay, s	0	0		13.3		
HCM LOS				B		
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1		
Capacity (veh/h)	-	-	-	554		
HCM Lane V/C Ratio	-	-	-	0.216		
HCM Control Delay (s)	-	-	-	13.3		
HCM Lane LOS	-	-	-	B		
HCM 95th %tile Q(veh)	-	-	-	0.8		
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

HCM 6th TWSC  
3: E. RIRO Access & 32nd Pkwy

2025 Total AM  
01/12/2024

Intersection

Int Delay, s/veh 0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑		↑↑		↑
Traffic Vol, veh/h	1289	152	0	998	0	14
Future Vol, veh/h	1289	152	0	998	0	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	-	-	-	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	1401	165	0	1085	0	15

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	- - - 701
Stage 1	-	-	- - -
Stage 2	-	-	- - -
Critical Hdwy	-	-	- - - 6.94
Critical Hdwy Stg 1	-	-	- - -
Critical Hdwy Stg 2	-	-	- - -
Follow-up Hdwy	-	-	- - - 3.32
Pot Cap-1 Maneuver	-	-	0 - 0 381
Stage 1	-	-	0 - 0 -
Stage 2	-	-	0 - 0 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	- - - 381
Mov Cap-2 Maneuver	-	-	- - -
Stage 1	-	-	- - -
Stage 2	-	-	- - -

Approach	EB	WB	NB
HCM Control Delay, s	0	0	14.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	381	-	-	-
HCM Lane V/C Ratio	0.04	-	-	-
HCM Control Delay (s)	14.8	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.1	-	-	-

Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↗		↑↑		↗
Traffic Vol, veh/h	843	108	0	1074	0	9
Future Vol, veh/h	843	108	0	1074	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	-	-	-	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	916	117	0	1167	0	10
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	458
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	550
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	550
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		11.7	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	550	-	-	-		
HCM Lane V/C Ratio	0.018	-	-	-		
HCM Control Delay (s)	11.7	-	-	-		
HCM Lane LOS	B	-	-	-		
HCM 95th %tile Q(veh)	0.1	-	-	-		

HCM 6th TWSC  
3: E. RIRO Access & 32nd Pkwy

2040 Total AM  
01/12/2024

Intersection

Int Delay, s/veh 0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑		↑↑		↑
Traffic Vol, veh/h	1509	152	0	1167	0	14
Future Vol, veh/h	1509	152	0	1167	0	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	-	-	-	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	1640	165	0	1268	0	15

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	- - - 820
Stage 1	-	-	- - -
Stage 2	-	-	- - -
Critical Hdwy	-	-	- - - 6.94
Critical Hdwy Stg 1	-	-	- - -
Critical Hdwy Stg 2	-	-	- - -
Follow-up Hdwy	-	-	- - - 3.32
Pot Cap-1 Maneuver	-	-	0 - 0 318
Stage 1	-	-	0 - 0 -
Stage 2	-	-	0 - 0 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	- - - 318
Mov Cap-2 Maneuver	-	-	- - -
Stage 1	-	-	- - -
Stage 2	-	-	- - -










Approach	EB	WB	NB
HCM Control Delay, s	0	0	16.9
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	318	-	-	-
HCM Lane V/C Ratio	0.048	-	-	-
HCM Control Delay (s)	16.9	-	-	-
HCM Lane LOS	C	-	-	-
HCM 95th %tile Q(veh)	0.1	-	-	-

Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↗		↑↑		↗
Traffic Vol, veh/h	1005	108	0	1282	0	9
Future Vol, veh/h	1005	108	0	1282	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	-	-	-	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	1092	117	0	1393	0	10
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	546
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	482
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	482
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		12.6	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1		EBT	EBR	WBT	
Capacity (veh/h)	482		-	-	-	
HCM Lane V/C Ratio	0.02		-	-	-	
HCM Control Delay (s)	12.6		-	-	-	
HCM Lane LOS	B		-	-	-	
HCM 95th %tile Q(veh)	0.1		-	-	-	










HCM 6th TWSC  
4: W. Full Access & 32nd Pkwy

2025 Total AM  
01/12/2024

Intersection												
Int Delay, s/veh	78.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	91	1060	152	25	687	15	274	0	14	31	0	37
Future Vol, veh/h	91	1060	152	25	687	15	274	0	14	31	0	37
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	150	-	150	150	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	99	1152	165	27	747	16	298	0	15	34	0	40
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	763	0	0	1317	0	0	1778	2167	576	1583	2324	382
Stage 1	-	-	-	-	-	-	1350	1350	-	809	809	-
Stage 2	-	-	-	-	-	-	428	817	-	774	1515	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	845	-	-	521	-	-	~ 52	46	460	73	37	616
Stage 1	-	-	-	-	-	-	~ 159	217	-	340	392	-
Stage 2	-	-	-	-	-	-	575	388	-	357	180	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	845	-	-	521	-	-	~ 43	39	460	62	31	616
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 128	152	-	202	119	-
Stage 1	-	-	-	-	-	-	~ 140	192	-	300	372	-
Stage 2	-	-	-	-	-	-	510	368	-	305	159	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.7			0.4			\$ 643.8			18.2		
HCM LOS							F			C		
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2		
Capacity (veh/h)	128	460	845	-	-	521	-	-	202	616		
HCM Lane V/C Ratio	2.327	0.033	0.117	-	-	0.052	-	-	0.167	0.065		
HCM Control Delay (s)	\$ 676	13.1	9.8	-	-	12.3	-	-	26.4	11.3		
HCM Lane LOS	F	B	A	-	-	B	-	-	D	B		
HCM 95th %tile Q(veh)	25.6	0.1	0.4	-	-	0.2	-	-	0.6	0.2		
Notes												
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined					*: All major volume in platoon			

HCM 6th TWSC  
4: W. Full Access & 32nd Pkwy

2025 Total PM  
01/12/2024

Intersection												
Int Delay, s/veh	8.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	88	656	108	18	860	15	176	0	9	33	0	38
Future Vol, veh/h	88	656	108	18	860	15	176	0	9	33	0	38
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	150	-	150	150	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	96	713	117	20	935	16	191	0	10	36	0	41

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	951	0	0	830	0	0	1413	1896	357	1532	2005	476
Stage 1	-	-	-	-	-	-	905	905	-	983	983	-
Stage 2	-	-	-	-	-	-	508	991	-	549	1022	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	718	-	-	798	-	-	~ 98	69	639	80	59	535
Stage 1	-	-	-	-	-	-	298	353	-	267	325	-
Stage 2	-	-	-	-	-	-	516	322	-	488	312	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	718	-	-	798	-	-	~ 80	58	639	69	50	535
Mov Cap-2 Maneuver	-	-	-	-	-	-	213	176	-	198	191	-
Stage 1	-	-	-	-	-	-	258	306	-	231	317	-
Stage 2	-	-	-	-	-	-	464	314	-	416	270	-



















Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.1			0.2			81.2			19.2		
HCM LOS							F			C		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	213	639	718	-	-	798	-	-	198	535
HCM Lane V/C Ratio	0.898	0.015	0.133	-	-	0.025	-	-	0.181	0.077
HCM Control Delay (s)	84.8	10.7	10.8	-	-	9.6	-	-	27.2	12.3
HCM Lane LOS	F	B	B	-	-	A	-	-	D	B
HCM 95th %tile Q(veh)	7.2	0	0.5	-	-	0.1	-	-	0.6	0.2

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

Timings  
4: W. Full Access & 32nd Pkwy

2025 Total AM - Improved  
01/12/2024

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	91	1060	152	25	687	274	0	31	0
Future Volume (vph)	91	1060	152	25	687	274	0	31	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4		3	8	5	2	1	6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	4	3	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	24.0	24.0	9.5	24.0	9.5	24.0	9.5	24.0
Total Split (s)	26.0	70.0	70.0	10.0	54.0	15.0	30.0	10.0	25.0
Total Split (%)	21.7%	58.3%	58.3%	8.3%	45.0%	12.5%	25.0%	8.3%	20.8%
Yellow Time (s)	3.5	4.0	4.0	3.5	4.0	3.5	4.0	3.5	4.0
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	6.0	6.0	4.5	6.0	4.5	6.0	4.5	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	None	Max	None	Max
Act Effect Green (s)	74.9	68.0	68.0	68.4	61.4	35.5	28.0	26.1	19.1
Actuated g/C Ratio	0.62	0.57	0.57	0.57	0.51	0.30	0.23	0.22	0.16
v/c Ratio	0.25	0.57	0.17	0.11	0.42	0.40	0.03	0.11	0.07
Control Delay	10.2	19.3	4.2	9.6	19.3	34.4	0.1	31.7	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.2	19.3	4.2	9.6	19.3	34.4	0.1	31.7	0.3
LOS	B	B	A	A	B	C	A	C	A
Approach Delay		16.9			19.0		32.8		14.7
Approach LOS		B			B		C		B

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 19.4

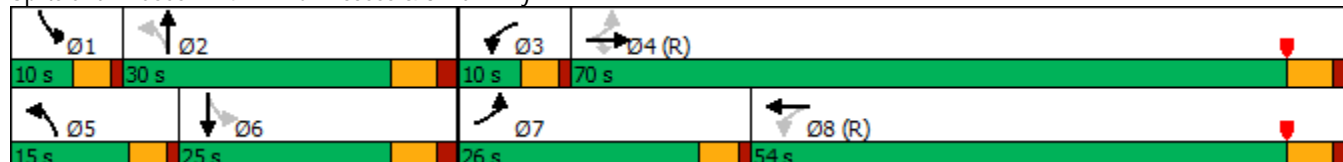
Intersection LOS: B

Intersection Capacity Utilization 61.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 4: W. Full Access & 32nd Pkwy
























# HCM 6th Signalized Intersection Summary

## 4: W. Full Access & 32nd Pkwy

2025 Total AM - Improved

01/12/2024



















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	91	1060	152	25	687	15	274	0	14	31	0	37
Future Volume (veh/h)	91	1060	152	25	687	15	274	0	14	31	0	37
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	99	1152	165	27	747	16	298	0	15	34	0	40
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	427	1974	880	247	1917	41	781	0	343	332	0	251
Arrive On Green	0.04	0.56	0.56	0.02	0.54	0.54	0.09	0.00	0.22	0.03	0.00	0.16
Sat Flow, veh/h	1781	3554	1585	1781	3557	76	3456	0	1585	1781	0	1585
Grp Volume(v), veh/h	99	1152	165	27	373	390	298	0	15	34	0	40
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1857	1728	0	1585	1781	0	1585
Q Serve(g_s), s	3.0	25.6	6.2	0.8	14.7	14.7	8.4	0.0	0.9	1.9	0.0	2.6
Cycle Q Clear(g_c), s	3.0	25.6	6.2	0.8	14.7	14.7	8.4	0.0	0.9	1.9	0.0	2.6
Prop In Lane	1.00		1.00	1.00		0.04	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	427	1974	880	247	957	1000	781	0	343	332	0	251
V/C Ratio(X)	0.23	0.58	0.19	0.11	0.39	0.39	0.38	0.00	0.04	0.10	0.00	0.16
Avail Cap(c_a), veh/h	672	1974	880	284	957	1000	785	0	343	363	0	251
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.2	17.5	13.2	14.1	16.2	16.2	35.9	0.0	37.2	40.5	0.0	43.6
Incr Delay (d2), s/veh	0.3	1.3	0.5	0.2	1.2	1.1	0.3	0.0	0.2	0.1	0.0	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	10.5	2.3	0.3	6.2	6.5	3.6	0.0	0.4	0.9	0.0	1.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.5	18.8	13.7	14.3	17.4	17.3	36.2	0.0	37.4	40.6	0.0	45.0
LnGrp LOS	B	B	B	B	B	B	D	A	D	D	A	D
Approach Vol, veh/h		1416			790			313			74	
Approach Delay, s/veh		17.8			17.2			36.3			43.0	
Approach LOS		B			B			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.9	32.0	7.5	72.7	14.9	25.0	9.5	70.7				
Change Period (Y+Rc), s	4.5	6.0	4.5	6.0	4.5	6.0	4.5	6.0				
Max Green Setting (Gmax), s	5.5	24.0	5.5	64.0	10.5	19.0	21.5	48.0				
Max Q Clear Time (g_c+I1), s	3.9	2.9	2.8	27.6	10.4	4.6	5.0	16.7				
Green Ext Time (p_c), s	0.0	0.0	0.0	11.8	0.0	0.1	0.2	5.4				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay			20.6									
HCM 6th LOS			C									

# Timings

2025 Total PM - Improved

## 4: W. Full Access & 32nd Pkwy

01/12/2024

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	88	656	108	18	860	176	0	33	0
Future Volume (vph)	88	656	108	18	860	176	0	33	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4		3	8	5	2	1	6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	4	3	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	9.5	22.5	9.5	22.5
Total Split (s)	10.0	70.0	70.0	17.0	77.0	10.0	23.0	10.0	23.0
Total Split (%)	8.3%	58.3%	58.3%	14.2%	64.2%	8.3%	19.2%	8.3%	19.2%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	None	Max	None	Max
Act Effect Green (s)	80.3	78.1	78.1	78.5	72.5	25.8	22.5	24.0	18.5
Actuated g/C Ratio	0.67	0.65	0.65	0.65	0.60	0.22	0.19	0.20	0.15
v/c Ratio	0.28	0.31	0.11	0.04	0.45	0.34	0.02	0.12	0.10
Control Delay	8.6	10.9	2.6	6.2	13.6	39.6	0.1	37.0	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.6	10.9	2.6	6.2	13.6	39.6	0.1	37.0	0.4
LOS	A	B	A	A	B	D	A	D	A
Approach Delay		9.6			13.5		37.6		17.5
Approach LOS		A			B		D		B

### Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.45

Intersection Signal Delay: 14.2



















Intersection LOS: B

Intersection Capacity Utilization 52.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: W. Full Access & 32nd Pkwy






















								
Ø1	Ø2	Ø3	Ø4 (R)					
10 s	23 s	17 s	70 s					
								
Ø5	Ø6	Ø7	Ø8 (R)					
10 s	23 s	10 s	77 s					

# HCM 6th Signalized Intersection Summary

## 4: W. Full Access & 32nd Pkwy



















2025 Total PM - Improved

01/12/2024

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	88	656	108	18	860	15	176	0	9	33	0	38
Future Volume (veh/h)	88	656	108	18	860	15	176	0	9	33	0	38
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	96	713	117	20	935	16	191	0	10	36	0	41
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	410	2238	998	451	2181	37	627	0	271	328	0	244
Arrive On Green	0.04	0.63	0.63	0.02	0.61	0.61	0.05	0.00	0.17	0.03	0.00	0.15
Sat Flow, veh/h	1781	3554	1585	1781	3575	61	3456	0	1585	1781	0	1585
Grp Volume(v), veh/h	96	713	117	20	465	486	191	0	10	36	0	41
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1859	1728	0	1585	1781	0	1585
Q Serve(g_s), s	2.4	11.2	3.5	0.5	16.6	16.6	5.5	0.0	0.6	2.0	0.0	2.7
Cycle Q Clear(g_c), s	2.4	11.2	3.5	0.5	16.6	16.6	5.5	0.0	0.6	2.0	0.0	2.7
Prop In Lane	1.00		1.00	1.00		0.03	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	410	2238	998	451	1084	1134	627	0	271	328	0	244
V/C Ratio(X)	0.23	0.32	0.12	0.04	0.43	0.43	0.30	0.00	0.04	0.11	0.00	0.17
Avail Cap(c_a), veh/h	420	2238	998	600	1084	1134	627	0	271	358	0	244
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.1	10.3	8.9	8.6	12.4	12.4	40.7	0.0	41.5	40.8	0.0	44.1
Incr Delay (d2), s/veh	0.3	0.4	0.2	0.0	1.2	1.2	0.3	0.0	0.3	0.1	0.0	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	4.3	1.3	0.2	6.7	7.0	2.4	0.0	0.3	0.9	0.0	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.4	10.7	9.1	8.7	13.6	13.5	41.0	0.0	41.8	41.0	0.0	45.5
LnGrp LOS	A	B	A	A	B	B	D	A	D	D	A	D
Approach Vol, veh/h		926			971			201			77	
Approach Delay, s/veh		10.3			13.5			41.0			43.4	
Approach LOS		B			B			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.0	25.0	6.9	80.1	10.0	23.0	9.3	77.7				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	5.5	18.5	12.5	65.5	5.5	18.5	5.5	72.5				
Max Q Clear Time (g_c+I1), s	4.0	2.6	2.5	13.2	7.5	4.7	4.4	18.6				
Green Ext Time (p_c), s	0.0	0.0	0.0	6.4	0.0	0.1	0.0	7.7				
Intersection Summary												
HCM 6th Ctrl Delay			15.7									
HCM 6th LOS			B									

Timings  
4: W. Full Access & 32nd Pkwy

2040 Total AM  
01/12/2024

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	91	1280	152	25	856	274	0	31	0
Future Volume (vph)	91	1280	152	25	856	274	0	31	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4		3	8	5	2	1	6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	4	3	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	24.0	24.0	9.5	24.0	9.5	24.0	9.5	24.0
Total Split (s)	24.0	72.5	72.5	9.5	58.0	14.0	28.5	9.5	24.0
Total Split (%)	20.0%	60.4%	60.4%	7.9%	48.3%	11.7%	23.8%	7.9%	20.0%
Yellow Time (s)	3.5	4.0	4.0	3.5	4.0	3.5	4.0	3.5	4.0
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	6.0	6.0	4.5	6.0	4.5	6.0	4.5	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	None	Max	None	Max
Act Effect Green (s)	77.1	70.3	70.3	70.0	63.5	33.5	26.3	24.5	18.0
Actuated g/C Ratio	0.64	0.59	0.59	0.58	0.53	0.28	0.22	0.20	0.15
v/c Ratio	0.29	0.67	0.17	0.14	0.51	0.42	0.03	0.11	0.08
Control Delay	9.3	20.4	6.8	9.7	19.5	36.3	0.1	33.3	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.3	20.4	6.8	9.7	19.5	36.3	0.1	33.3	0.4
LOS	A	C	A	A	B	D	A	C	A
Approach Delay		18.4			19.3		34.6		15.5
Approach LOS		B			B		C		B

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 20.3

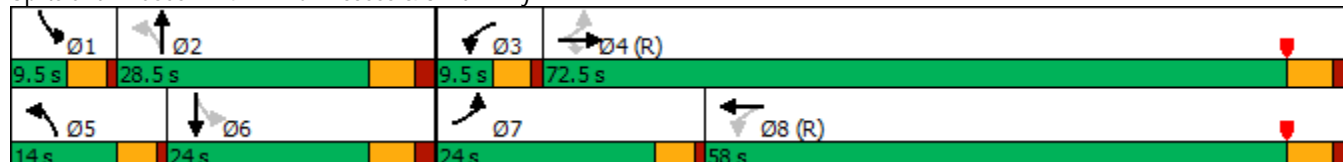
Intersection LOS: C

Intersection Capacity Utilization 67.8%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 4: W. Full Access & 32nd Pkwy

























# HCM 6th Signalized Intersection Summary

## 4: W. Full Access & 32nd Pkwy

2040 Total AM

01/12/2024



















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	91	1280	152	25	856	15	274	0	14	31	0	37
Future Volume (veh/h)	91	1280	152	25	856	15	274	0	14	31	0	37
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	99	1391	165	27	930	16	298	0	15	34	0	40
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	369	2030	905	202	1985	34	733	0	318	320	0	238
Arrive On Green	0.04	0.57	0.57	0.02	0.56	0.56	0.08	0.00	0.20	0.03	0.00	0.15
Sat Flow, veh/h	1781	3554	1585	1781	3575	61	3456	0	1585	1781	0	1585
Grp Volume(v), veh/h	99	1391	165	27	462	484	298	0	15	34	0	40
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1859	1728	0	1585	1781	0	1585
Q Serve(g_s), s	2.9	33.1	6.0	0.8	18.8	18.8	8.5	0.0	0.9	1.9	0.0	2.6
Cycle Q Clear(g_c), s	2.9	33.1	6.0	0.8	18.8	18.8	8.5	0.0	0.9	1.9	0.0	2.6
Prop In Lane	1.00		1.00	1.00		0.03	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	369	2030	905	202	987	1033	733	0	318	320	0	238
V/C Ratio(X)	0.27	0.69	0.18	0.13	0.47	0.47	0.41	0.00	0.05	0.11	0.00	0.17
Avail Cap(c_a), veh/h	586	2030	905	232	987	1033	733	0	318	344	0	238
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.1	18.1	12.3	15.2	16.0	16.0	37.4	0.0	38.7	41.3	0.0	44.5
Incr Delay (d2), s/veh	0.4	1.9	0.4	0.3	1.6	1.5	0.4	0.0	0.3	0.1	0.0	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	13.6	2.2	0.3	7.9	8.2	3.7	0.0	0.4	0.9	0.0	1.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.5	20.0	12.8	15.5	17.6	17.6	37.8	0.0	39.0	41.4	0.0	46.0
LnGrp LOS	B	C	B	B	B	B	D	A	D	D	A	D
Approach Vol, veh/h	1655			973			313			74		
Approach Delay, s/veh	18.9			17.5			37.9			43.9		
Approach LOS	B			B			D			D		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.9	30.1	7.5	74.5	14.0	24.0	9.4	72.6				
Change Period (Y+Rc), s	4.5	6.0	4.5	6.0	4.5	6.0	4.5	6.0				
Max Green Setting (Gmax), s	5.0	22.5	5.0	66.5	9.5	18.0	19.5	52.0				
Max Q Clear Time (g_c+I1), s	3.9	2.9	2.8	35.1	10.5	4.6	4.9	20.8				
Green Ext Time (p_c), s	0.0	0.0	0.0	14.4	0.0	0.1	0.2	7.1				
Intersection Summary												
HCM 6th Ctrl Delay	21.0											
HCM 6th LOS	C											

# Timings

## 4: W. Full Access & 32nd Pkwy

2040 Total PM

01/12/2024

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	88	818	108	18	1068	176	0	33	0
Future Volume (vph)	88	818	108	18	1068	176	0	33	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4		3	8	5	2	1	6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	4	3	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	9.5	22.5	9.5	22.5
Total Split (s)	12.0	75.0	75.0	12.0	75.0	10.0	23.0	10.0	23.0
Total Split (%)	10.0%	62.5%	62.5%	10.0%	62.5%	8.3%	19.2%	8.3%	19.2%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	None	Max	None	Max
Act Effect Green (s)	81.1	78.1	78.1	76.9	70.9	25.8	22.5	24.0	18.5
Actuated g/C Ratio	0.68	0.65	0.65	0.64	0.59	0.22	0.19	0.20	0.15
v/c Ratio	0.34	0.39	0.11	0.05	0.56	0.34	0.02	0.12	0.10
Control Delay	10.6	13.6	4.4	6.3	16.4	39.6	0.1	37.0	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.6	13.6	4.4	6.3	16.4	39.6	0.1	37.0	0.5
LOS	B	B	A	A	B	D	A	D	A
Approach Delay		12.4			16.2		37.6		17.6
Approach LOS		B			B		D		B

### Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Yellow

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 16.3









Intersection LOS: B

Intersection Capacity Utilization 57.8%

ICU Level of Service B

Analysis Period (min) 15

### Splits and Phases: 4: W. Full Access & 32nd Pkwy






















			
Ø1	Ø2	Ø3	Ø4 (R)
10 s	23 s	12 s	75 s
			
Ø5	Ø6	Ø7	Ø8 (R)
10 s	23 s	12 s	75 s

# HCM 6th Signalized Intersection Summary

2040 Total PM

## 4: W. Full Access & 32nd Pkwy

01/12/2024

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	88	818	108	18	1068	15	176	0	9	33	0	38
Future Volume (veh/h)	88	818	108	18	1068	15	176	0	9	33	0	38
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	96	889	117	20	1161	16	191	0	10	36	0	41
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	333	2238	998	380	2189	30	627	0	271	328	0	244
Arrive On Green	0.04	0.63	0.63	0.02	0.61	0.61	0.05	0.00	0.17	0.03	0.00	0.15
Sat Flow, veh/h	1781	3554	1585	1781	3589	49	3456	0	1585	1781	0	1585
Grp Volume(v), veh/h	96	889	117	20	575	602	191	0	10	36	0	41
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1861	1728	0	1585	1781	0	1585
Q Serve(g_s), s	2.4	14.8	3.5	0.5	22.4	22.4	5.5	0.0	0.6	2.0	0.0	2.7
Cycle Q Clear(g_c), s	2.4	14.8	3.5	0.5	22.4	22.4	5.5	0.0	0.6	2.0	0.0	2.7
Prop In Lane	1.00		1.00	1.00		0.03	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	333	2238	998	380	1084	1136	627	0	271	328	0	244
V/C Ratio(X)	0.29	0.40	0.12	0.05	0.53	0.53	0.30	0.00	0.04	0.11	0.00	0.17
Avail Cap(c_a), veh/h	373	2238	998	455	1084	1136	627	0	271	358	0	244
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.4	11.0	8.9	9.0	13.5	13.5	40.7	0.0	41.5	40.8	0.0	44.1
Incr Delay (d2), s/veh	0.5	0.5	0.2	0.1	1.9	1.8	0.3	0.0	0.3	0.1	0.0	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	5.8	1.3	0.2	9.1	9.6	2.4	0.0	0.3	0.9	0.0	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.9	11.5	9.1	9.0	15.3	15.3	41.0	0.0	41.8	41.0	0.0	45.5
LnGrp LOS	B	B	A	A	B	B	D	A	D	D	A	D
Approach Vol, veh/h	1102		1197				201		77			
Approach Delay, s/veh	11.2		15.2				41.0		43.4			
Approach LOS	B		B				D		D			
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.0	25.0	6.9	80.1	10.0	23.0	9.3	77.7				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	5.5	18.5	7.5	70.5	5.5	18.5	7.5	70.5				
Max Q Clear Time (g_c+I1), s	4.0	2.6	2.5	16.8	7.5	4.7	4.4	24.4				
Green Ext Time (p_c), s	0.0	0.0	0.0	8.5	0.0	0.1	0.1	10.6				
Intersection Summary												
HCM 6th Ctrl Delay	16.3											
HCM 6th LOS	B											










Intersection												
Int Delay, s/veh	2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑		↰	↱		↰	↱	
Traffic Vol, veh/h	49	929	126	51	600	6	114	0	41	11	0	14
Future Vol, veh/h	49	929	126	51	600	6	114	0	41	11	0	14
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	150	-	150	150	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	53	1010	137	55	652	7	124	0	45	12	0	15










Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	659	0	0	1147	0	0	1552	1885	505	1377	2019	330
Stage 1	-	-	-	-	-	-	1116	1116	-	766	766	-
Stage 2	-	-	-	-	-	-	436	769	-	611	1253	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	925	-	-	967	-	-	203	111	*685	*321	82	666
Stage 1	-	-	-	-	-	-	630	555	-	*361	410	-
Stage 2	-	-	-	-	-	-	569	409	-	*645	448	-
Platoon blocked, %		-	-	1	-	-	1	1	1	1	1	
Mov Cap-1 Maneuver	925	-	-	967	-	-	181	98	*685	*274	73	666
Mov Cap-2 Maneuver	-	-	-	-	-	-	385	279	-	*319	261	-
Stage 1	-	-	-	-	-	-	594	523	-	*340	387	-
Stage 2	-	-	-	-	-	-	524	386	-	*569	422	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0.7	16.6	13.2
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	385	685	925	-	-	967	-	-	319	666
HCM Lane V/C Ratio	0.322	0.065	0.058	-	-	0.057	-	-	0.037	0.023
HCM Control Delay (s)	18.7	10.6	9.1	-	-	8.9	-	-	16.7	10.5
HCM Lane LOS	C	B	A	-	-	A	-	-	C	B
HCM 95th %tile Q(veh)	1.4	0.2	0.2	-	-	0.2	-	-	0.1	0.1

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

Intersection												
Int Delay, s/veh	1.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	47	561	90	36	803	6	74	0	26	12	0	15
Future Vol, veh/h	47	561	90	36	803	6	74	0	26	12	0	15
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	150	-	150	150	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	51	610	98	39	873	7	80	0	28	13	0	16
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	880	0	0	708	0	0	1227	1670	305	1362	1765	440
Stage 1	-	-	-	-	-	-	712	712	-	955	955	-
Stage 2	-	-	-	-	-	-	515	958	-	407	810	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	764	-	-	1156	-	-	227	122	*867	*171	102	565
Stage 1	-	-	-	-	-	-	677	623	-	*278	335	-
Stage 2	-	-	-	-	-	-	511	334	-	*817	551	-
Platoon blocked, %		-	-	1	-	-	1	1	1	1	1	
Mov Cap-1 Maneuver	764	-	-	1156	-	-	203	110	*867	*153	92	565
Mov Cap-2 Maneuver	-	-	-	-	-	-	374	246	-	*243	267	-
Stage 1	-	-	-	-	-	-	632	581	-	*259	324	-
Stage 2	-	-	-	-	-	-	480	323	-	*738	514	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.7			0.4			15.1			15.6		
HCM LOS							C			C		
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2		
Capacity (veh/h)	374	867	764	-	-	1156	-	-	243	565		
HCM Lane V/C Ratio	0.215	0.033	0.067	-	-	0.034	-	-	0.054	0.029		
HCM Control Delay (s)	17.2	9.3	10	-	-	8.2	-	-	20.7	11.6		
HCM Lane LOS	C	A	B	-	-	A	-	-	C	B		
HCM 95th %tile Q(veh)	0.8	0.1	0.2	-	-	0.1	-	-	0.2	0.1		
Notes												
~: Volume exceeds capacity		\$: Delay exceeds 300s			+: Computation Not Defined					*: All major volume in platoon		

Intersection												
Int Delay, s/veh	2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	49	1149	126	51	769	6	114	0	41	11	0	14
Future Vol, veh/h	49	1149	126	51	769	6	114	0	41	11	0	14
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	150	-	150	150	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	53	1249	137	55	836	7	124	0	45	12	0	15

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	843	0	0	1386	0	0	1883	2308	625	1681	2442	422
Stage 1	-	-	-	-	-	-	1355	1355	-	950	950	-
Stage 2	-	-	-	-	-	-	528	953	-	731	1492	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	789	-	-	822	-	-	~ 110	46	*607	*200	33	580
Stage 1	-	-	-	-	-	-	527	472	-	*280	337	-
Stage 2	-	-	-	-	-	-	502	336	-	*572	369	-
Platoon blocked, %		-	-	1	-	-	1	1	1	1	1	
Mov Cap-1 Maneuver	789	-	-	822	-	-	~ 96	40	*607	*167	29	580
Mov Cap-2 Maneuver	-	-	-	-	-	-	309	213	-	*240	199	-
Stage 1	-	-	-	-	-	-	492	440	-	*261	314	-
Stage 2	-	-	-	-	-	-	456	313	-	*494	344	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0.6	20.8	15.5
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	309	607	789	-	-	822	-	-	240	580
HCM Lane V/C Ratio	0.401	0.073	0.068	-	-	0.067	-	-	0.05	0.026
HCM Control Delay (s)	24.2	11.4	9.9	-	-	9.7	-	-	20.8	11.4
HCM Lane LOS	C	B	A	-	-	A	-	-	C	B
HCM 95th %tile Q(veh)	1.9	0.2	0.2	-	-	0.2	-	-	0.2	0.1

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

Intersection												
Int Delay, s/veh	1.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑		↰	↱		↰	↱	
Traffic Vol, veh/h	47	723	90	36	1011	6	74	0	26	12	0	15
Future Vol, veh/h	47	723	90	36	1011	6	74	0	26	12	0	15
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	150	-	150	150	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	51	786	98	39	1099	7	80	0	28	13	0	16

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1106	0	0	884	0	0	1516	2072	393	1676	2167	553
Stage 1	-	-	-	-	-	-	888	888	-	1181	1181	-
Stage 2	-	-	-	-	-	-	628	1184	-	495	986	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	627	-	-	1090	-	-	153	64	*789	*106	53	477
Stage 1	-	-	-	-	-	-	651	591	-	*202	262	-
Stage 2	-	-	-	-	-	-	437	261	-	*744	516	-
Platoon blocked, %	-	-	-	1	-	-	1	1	1	1	1	-
Mov Cap-1 Maneuver	627	-	-	1090	-	-	135	57	*789	*93	47	477
Mov Cap-2 Maneuver	-	-	-	-	-	-	310	182	-	*174	210	-
Stage 1	-	-	-	-	-	-	598	543	-	*186	253	-
Stage 2	-	-	-	-	-	-	407	252	-	*659	475	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.6	0.3	17.8	19.3
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	310	789	627	-	-	1090	-	-	174	477
HCM Lane V/C Ratio	0.259	0.036	0.081	-	-	0.036	-	-	0.075	0.034
HCM Control Delay (s)	20.6	9.7	11.2	-	-	8.4	-	-	27.4	12.8
HCM Lane LOS	C	A	B	-	-	A	-	-	D	B
HCM 95th %tile Q(veh)	1	0.1	0.3	-	-	0.1	-	-	0.2	0.1

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

Intersection												
Int Delay, s/veh	0.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗			↗		↗↗	↗		↗↗↗	
Traffic Vol, veh/h	0	0	46	0	0	87	0	1344	137	0	1863	49
Future Vol, veh/h	0	0	46	0	0	87	0	1344	137	0	1863	49
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	-	-	225	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	50	0	0	95	0	1461	149	0	2025	53

Major/Minor	Minor2		Minor1		Major1		Major2	
Conflicting Flow All	-	-	1039	-	-	731	-	0
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	7.14	-	-	6.94	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.92	-	-	3.32	-	-
Pot Cap-1 Maneuver	0	0	195	0	0	*528	0	-
Stage 1	0	0	-	0	0	-	0	-
Stage 2	0	0	-	0	0	-	0	-
Platoon blocked, %					1		-	-
Mov Cap-1 Maneuver	-	-	195	-	-	*528	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	29.7	13.3	0	0
HCM LOS	D	B		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1WBLn1	SBT	SBR
Capacity (veh/h)	-	-	195	528	-
HCM Lane V/C Ratio	-	-	0.256	0.179	-
HCM Control Delay (s)	-	-	29.7	13.3	-
HCM Lane LOS	-	-	D	B	-
HCM 95th %tile Q(veh)	-	-	1	0.6	-

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

Intersection												
Int Delay, s/veh	2.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗			↗		↕↕	↗		↕↕↕	
Traffic Vol, veh/h	0	0	133	0	0	93	0	1556	159	0	1839	101
Future Vol, veh/h	0	0	133	0	0	93	0	1556	159	0	1839	101
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	-	-	225	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	145	0	0	101	0	1691	173	0	1999	110
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	-	1055	-	-	846	-	0	0	-	-	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	7.14	-	-	6.94	-	-	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.92	-	-	3.32	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	0	191	0	0	*424	0	-	-	0	-	-
Stage 1	0	0	-	0	0	-	0	-	-	0	-	-
Stage 2	0	0	-	0	0	-	0	-	-	0	-	-
Platoon blocked, %						1		-	-		-	-
Mov Cap-1 Maneuver	-	-	191	-	-	*424	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	66.2		16.1		0		0					
HCM LOS	F		C									
Minor Lane/Major Mvmt	NBT		NBR		EBLn1WBLn1		SBT		SBR			
Capacity (veh/h)	-		-		191 424		-		-			
HCM Lane V/C Ratio	-		-		0.757 0.238		-		-			
HCM Control Delay (s)	-		-		66.2 16.1		-		-			
HCM Lane LOS	-		-		F C		-		-			
HCM 95th %tile Q(veh)	-		-		5 0.9		-		-			
Notes												
~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    *: All major volume in platoon												

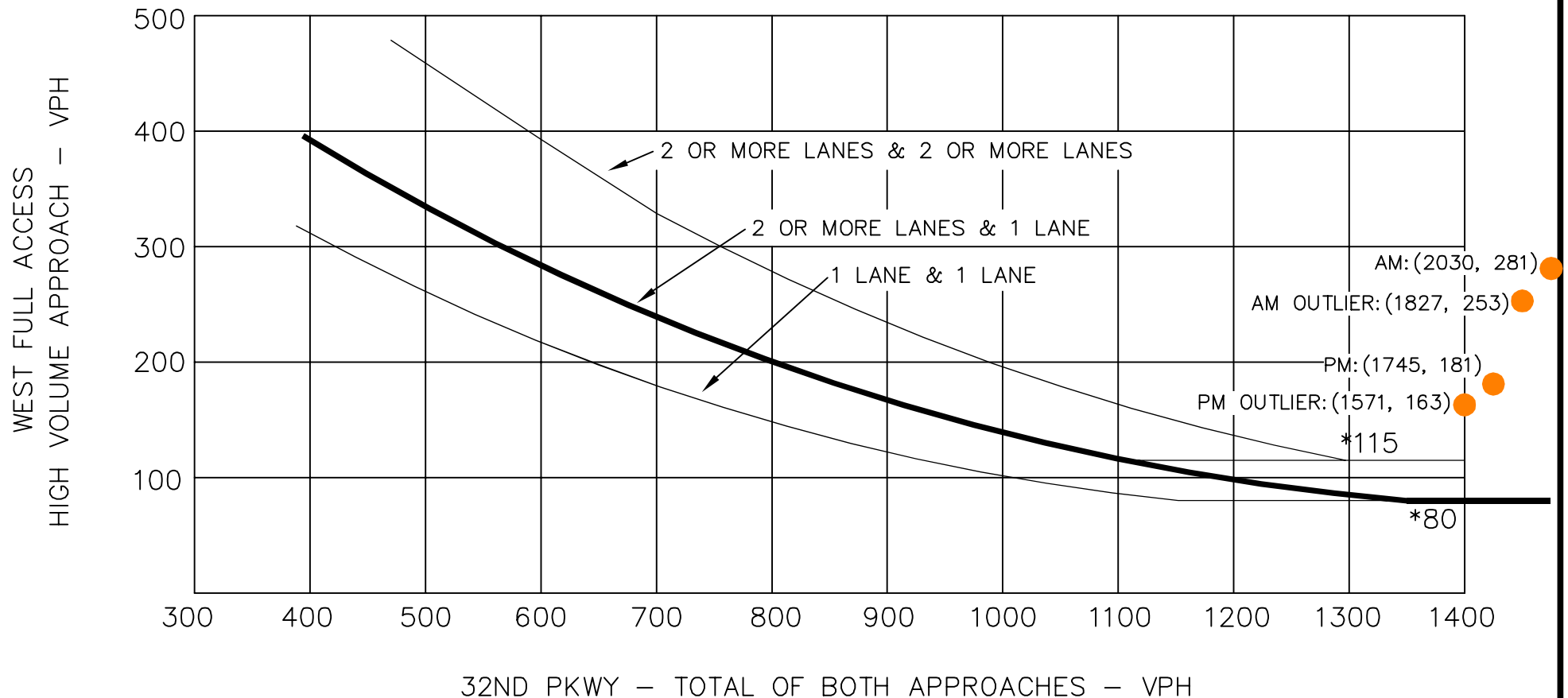
Intersection												
Int Delay, s/veh	1.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗			↗	↑↑↑	↑↑↑			↑↑↑	
Traffic Vol, veh/h	0	0	61	0	0	88	0	1745	143	0	2394	66
Future Vol, veh/h	0	0	61	0	0	88	0	1745	143	0	2394	66
Conflicting Peds, #/hr	0	0	0	0	0	0	0	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	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	66	0	0	96	0	1897	155	0	2602	72
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	-	1337	-	-	1026	-	0	0	-	-	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	7.14	-	-	7.14	-	-	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.92	-	-	3.92	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	0	123	0	0	*514	0	-	-	0	-	-
Stage 1	0	0	-	0	0	-	0	-	-	0	-	-
Stage 2	0	0	-	0	0	-	0	-	-	0	-	-
Platoon blocked, %						1		-	-		-	-
Mov Cap-1 Maneuver	-	-	123	-	-	*514	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	64.2		13.6		0		0					
HCM LOS	F		B									
Minor Lane/Major Mvmt	NBT		NBR		EBLn1WBLn1		SBT		SBR			
Capacity (veh/h)	-		-		123 514		-		-			
HCM Lane V/C Ratio	-		-		0.539 0.186		-		-			
HCM Control Delay (s)	-		-		64.2 13.6		-		-			
HCM Lane LOS	-		-		F B		-		-			
HCM 95th %tile Q(veh)	-		-		2.6 0.7		-		-			
Notes												
~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    *: All major volume in platoon												

Intersection												
Int Delay, s/veh	14.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗			↗		↑↑↑			↑↑↑	
Traffic Vol, veh/h	0	0	179	0	0	95	0	2041	174	0	2393	136
Future Vol, veh/h	0	0	179	0	0	95	0	2041	174	0	2393	136
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	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	195	0	0	103	0	2218	189	0	2601	148
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	-	1375	-	-	1204	-	0	0	-	-	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	7.14	-	-	7.14	-	-	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.92	-	-	3.92	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	0	~ 116	0	0	*425	0	-	-	0	-	-
Stage 1	0	0	-	0	0	-	0	-	-	0	-	-
Stage 2	0	0	-	0	0	-	0	-	-	0	-	-
Platoon blocked, %						1		-	-		-	-
Mov Cap-1 Maneuver	-	-	~ 116	-	-	*425	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, \$	404.4		16.2		0		0					
HCM LOS	F		C									
Minor Lane/Major Mvmt	NBT		NBR		EBLn1WBLn1		SBT		SBR			
Capacity (veh/h)	-		-		116 425		-		-			
HCM Lane V/C Ratio	-		-		1.677 0.243		-		-			
HCM Control Delay (s)	-		-		\$ 404.4 16.2		-		-			
HCM Lane LOS	-		-		F C		-		-			
HCM 95th %tile Q(veh)	-		-		14.8 0.9		-		-			
Notes												
~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    *: All major volume in platoon												

# APPENDIX E

## Signal Warrant Analysis Worksheets

## WARRANT 2 - FOUR HOUR VEHICULAR VOLUME



\* NOTE: 115 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 80 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

32ND PKWY W. FULL ACCESS  
SIGNAL WARRANT ANALYSIS  
FOUR HOUR VOLUME WARRANT

● 2025 TOTAL TRAFFIC DATA POINT

Source: Manual of Uniform Traffic Control Devices 2009

# APPENDIX F

## Queue Analysis Worksheets

## Queues

2025 Total AM

## 1: Tower Rd &amp; 32nd Pkwy

02/27/2024



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	810	290	1221	1026	444	1504
v/c Ratio	0.98	0.48	0.86	1.01	1.03	0.45
Control Delay	71.6	7.1	40.6	46.8	87.8	10.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	71.6	7.1	40.6	46.8	87.8	10.5
Queue Length 50th (ft)	322	0	450	~475	~317	190
Queue Length 95th (ft)	#452	70	547	#782	#525	221
Internal Link Dist (ft)	230		418			240
Turn Bay Length (ft)	250				150	
Base Capacity (vph)	829	602	1415	1011	430	3347
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.48	0.86	1.01	1.03	0.45

## Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

## Queues

2025 Total PM

## 1: Tower Rd &amp; 32nd Pkwy

02/27/2024



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	893	316	1471	627	364	1691
v/c Ratio	1.01	0.50	1.00	0.68	0.98	0.52
Control Delay	76.7	7.5	58.2	11.2	78.2	12.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	76.7	7.5	58.2	11.2	78.2	12.2
Queue Length 50th (ft)	~362	6	588	93	231	238
Queue Length 95th (ft)	#500	79	#761	231	#429	275
Internal Link Dist (ft)	230		418			240
Turn Bay Length (ft)	250				150	
Base Capacity (vph)	886	635	1474	926	371	3262
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.01	0.50	1.00	0.68	0.98	0.52

## Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

## Queues

2040 Total AM

02/27/2024

## 1: Tower Rd &amp; 32nd Pkwy



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	948	324	1602	1213	481	2024
v/c Ratio	1.00	0.50	0.95	1.28	0.98	0.64
Control Delay	91.2	24.2	51.4	151.8	72.0	15.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	91.2	24.2	51.4	151.8	72.0	15.2
Queue Length 50th (ft)	~400	82	440	~846	319	334
Queue Length 95th (ft)	#541	178	#542	#1110	#542	380
Internal Link Dist (ft)	230		418			240
Turn Bay Length (ft)	250				150	
Base Capacity (vph)	944	654	1695	949	489	3178
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.00	0.50	0.95	1.28	0.98	0.64

## Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

## Queues

2040 Total PM

## 1: Tower Rd &amp; 32nd Pkwy

02/27/2024



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	1055	370	1938	755	404	2275
v/c Ratio	0.97	0.52	0.99	0.79	1.24	0.77
Control Delay	65.0	16.7	56.2	14.5	161.7	21.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	65.0	16.7	56.2	14.5	161.7	21.1
Queue Length 50th (ft)	335	67	541	123	~338	460
Queue Length 95th (ft)	#540	144	#665	312	#539	523
Internal Link Dist (ft)	230		418			240
Turn Bay Length (ft)	250				150	
Base Capacity (vph)	1087	711	1949	957	327	2966
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.97	0.52	0.99	0.79	1.24	0.77

## Intersection Summary

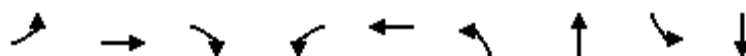
- ~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

## Queues

2025 Total AM - Improved

## 4: W. Full Access &amp; 32nd Pkwy

01/12/2024



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	99	1152	165	27	763	298	15	34	40
v/c Ratio	0.25	0.57	0.17	0.11	0.42	0.40	0.03	0.11	0.07
Control Delay	10.2	19.3	4.2	9.6	19.3	34.4	0.1	31.7	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.2	19.3	4.2	9.6	19.3	34.4	0.1	31.7	0.3
Queue Length 50th (ft)	32	303	14	7	186	91	0	19	0
Queue Length 95th (ft)	m33	m306	m16	19	244	130	0	44	0
Internal Link Dist (ft)		358			479		182		118
Turn Bay Length (ft)	150		150	150		150		150	
Base Capacity (vph)	546	2005	962	250	1806	752	525	320	536
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.57	0.17	0.11	0.42	0.40	0.03	0.11	0.07

## Intersection Summary

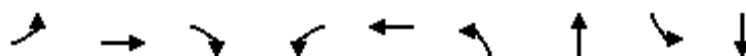
m Volume for 95th percentile queue is metered by upstream signal.

## Queues

2025 Total PM - Improved

## 4: W. Full Access &amp; 32nd Pkwy

01/12/2024



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	96	713	117	20	951	191	10	36	41
v/c Ratio	0.28	0.31	0.11	0.04	0.45	0.34	0.02	0.12	0.10
Control Delay	8.6	10.9	2.6	6.2	13.6	39.6	0.1	37.0	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.6	10.9	2.6	6.2	13.6	39.6	0.1	37.0	0.4
Queue Length 50th (ft)	23	101	2	4	196	61	0	22	0
Queue Length 95th (ft)	m40	m186	m13	12	243	94	0	50	0
Internal Link Dist (ft)		358			479		182		118
Turn Bay Length (ft)	150		150	150		150		150	
Base Capacity (vph)	347	2304	1077	569	2133	560	566	296	424
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.28	0.31	0.11	0.04	0.45	0.34	0.02	0.12	0.10

## Intersection Summary

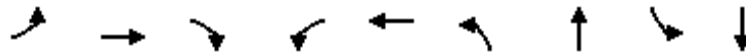
m Volume for 95th percentile queue is metered by upstream signal.

## Queues

2040 Total AM

## 4: W. Full Access &amp; 32nd Pkwy

01/12/2024



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	99	1391	165	27	946	298	15	34	40
v/c Ratio	0.29	0.67	0.17	0.14	0.51	0.42	0.03	0.11	0.08
Control Delay	9.3	20.4	6.8	9.7	19.5	36.3	0.1	33.3	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.3	20.4	6.8	9.7	19.5	36.3	0.1	33.3	0.4
Queue Length 50th (ft)	30	393	29	7	237	93	0	19	0
Queue Length 95th (ft)	m27	m323	m20	18	305	133	0	46	0
Internal Link Dist (ft)		358			479		182		118
Turn Bay Length (ft)	150		150	150		150		150	
Base Capacity (vph)	474	2073	972	187	1867	702	476	300	478
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.67	0.17	0.14	0.51	0.42	0.03	0.11	0.08

## Intersection Summary

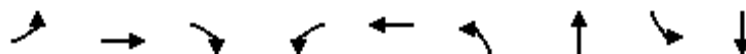
m Volume for 95th percentile queue is metered by upstream signal.

## Queues

2040 Total PM

## 4: W. Full Access &amp; 32nd Pkwy

01/12/2024



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	96	889	117	20	1177	191	10	36	41
v/c Ratio	0.34	0.39	0.11	0.05	0.56	0.34	0.02	0.12	0.10
Control Delay	10.6	13.6	4.4	6.3	16.4	39.6	0.1	37.0	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.6	13.6	4.4	6.3	16.4	39.6	0.1	37.0	0.5
Queue Length 50th (ft)	30	174	6	4	280	61	0	22	0
Queue Length 95th (ft)	m34	m260	m16	12	342	94	0	50	0
Internal Link Dist (ft)		358			479		182		118
Turn Bay Length (ft)	150		150	150		150		150	
Base Capacity (vph)	285	2304	1071	425	2088	560	522	296	394
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.39	0.11	0.05	0.56	0.34	0.02	0.12	0.10

## Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

# APPENDIX G

## Conceptual Site Plan

