



March 24, 2021

Commerce Construction Co., L.P.
20100 East 32nd Parkway
Suite 150
Aurora, CO 80011

Attn: Mr. Spencer Cleveland
Project Manager

Re: Traffic Study Letter
MCC Retail Phase 1
32nd Parkway Project Access Evaluation
Aurora, CO

Dear Mr. Cleveland:

The purpose of this letter is to provide a traffic compliance trip generation comparison for the first phase of the MCC Retail project to the overall Majestic Tower Retail project previously studied. In addition, this evaluation determines if a traffic signal will be needed for the proposed access intersection along 32nd Parkway.

The Majestic Tower Retail project is proposed to be located on the southeast corner of the 32nd Parkway and Tower Road intersection in Aurora, Colorado. A vicinity map illustrating the location is attached in **Figure 1**. Specifically, MCC Phase 1 is located directly along the east side of Tower Road within the western portion of the overall development area (site map attached).

The "Majestic Tower Retail Traffic Impact Study" that included this development area was completed in July 2018 by Kimley-Horn. The trip generation of the proposed MCC Retail Phase 1 project will be compared with the trip generation from the original traffic study. The original Majestic Tower Retail traffic impact study included development of two 125-room hotels (250 rooms total), 136,000 square feet of retail space (90,000 square feet on the north side of 32nd Parkway), 23,000 square feet of restaurants (in three separate restaurants with one being an approximate 9,500 square foot Cracker Barrel), and a 12-fueling position gas station. For the purposes of this study now as MCC Retail Phase 1, it is assumed that this project will include a 10,000 square foot retail building to include 7,500 square feet of retail space (Verizon, an Insurance Office, and a Boutique) and 2,500 square feet of fast casual dining (Chipotle), a 3,000 square foot additional fast casual dining (Wahoo's Fish Tacos), a 3,100 square foot fast food restaurant with drive through (Freddy's), a 2,500 square foot high turnover sit down restaurant (IHOP), and a 110-room extended stay hotel to be developed in the first phase of the project.

This traffic compliance letter identifies the amount of traffic associated with the proposed development of MCC Retail Phase 1 and the expected trip distribution and traffic assignment along with an operational analysis for the project access intersection along 32nd Parkway. It is expected that project construction will be completed within the next couple of years; therefore, analysis was performed for the 2021 short term build out for Phase 1.

Existing Roadway Network and Traffic Counts

Regional access to the MCC Retail Phase 1 project will be provided by Interstate 70 (I-70) and Tower Road while direct access will be provided by one full movement access along the south side of 32nd Parkway. The project access along 32nd Parkway is proposed to be located approximately 500 feet east of Tower Road at the existing median opening.

32nd Parkway primarily extends east-west with two through lane in each direction with a raised median and a posted speed limit of 40 miles per hour. The access along the south side of 32nd Parkway is not currently constructed.

Peak hour counts were performed to the west of the proposed project access at the intersection of 32nd Parkway and Tower Road on Thursday, April 5, 2018. The weekday counts were conducted in 15-minute intervals during the morning and afternoon peak hours of adjacent street traffic from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM. These counts were used to calculate the eastbound and westbound through movements along 32nd Parkway at the proposed project access. The traffic volume along 32nd Parkway was found to be 416 vehicles per hour (vph) eastbound and 280 vph westbound during the morning peak hour. During the afternoon peak hour, the traffic volume along 32nd Parkway was observed to be 250 vph eastbound and 420 vph westbound. Count sheets are attached.

Unspecified Development Traffic Growth

The 2020 background traffic volumes from the original Majestic Tower Retail project traffic study were used as a basis for this study. As presented in the original traffic study, project traffic volumes from Majestic Commercenter Phase 9, Majestic Commercenter Phase 10, Gateway Buildings 22/23, Salida Flex, and Gateway V were all included in background traffic volumes. Based on the standard growth rate used by the City of Aurora, an annual growth rate of two (2) percent per year was used to calculate 2021 background traffic volumes from the previously identified 2020 background traffic volumes for the eastbound and westbound through movements along 32nd Parkway at the project access.

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 Report¹ published by the Institute of Transportation Engineers (ITE). ITE has established trip rates in nationwide studies of similar land uses.

The original traffic impact study included two 125-room hotels (250 rooms total), 136,000 square feet of retail space (90,000 square feet on the north side of 32nd Parkway), 23,000 square feet of restaurants (in three separate restaurants with one being an approximate 9,500 square foot Cracker Barrel), and a 12-fueling position gas station. For the original traffic study, trip generation average rates were based on the ITE Trip Generation, 10th Edition, for Hotel (ITE Code 310), Shopping Center (ITE Code 820), High Turnover Sit-Down Restaurant (ITE Code 932), and Gasoline Station with Convenience Market (ITE Code 945).

For this proposed project, Kimley-Horn used the average rate equations of the ITE Trip Generation, 10th Edition (most current edition), for Hotel (ITE Code 310), Shopping Center (ITE Code 820), Fast Casual Restaurant (ITE Code 930), High Turnover Sit-Down Restaurant (ITE Code 932), and Fast-Food Restaurant with Drive Through (ITE Code 934). The following **Table 1** summarizes the estimated trip generation for the project. Applicable trip generation calculations and report documentation from the original study are attached.

¹ Institute of Transportation Engineers, *Trip Generation: An Information Report*, Tenth Edition, Washington DC, 2017.

**Table 1 - Trip Generation Comparison
Majestic Tower Retail vs. MCC Phase 1 Retail**

Land Use and Size	Daily Vehicle Trips	Weekday Vehicle Trips					
		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Previous Study							
Total External Trips After Internal Capture	10,226	311	232	543	443	400	843
Current Proposal							
Hotel (ITE Code 310) – 110 Rooms	804	30	19	49	27	26	53
Shopping Center (ITE Code 820) – 7,500 SF	226	4	3	7	7	10	17
Fast Casual Restaurant (ITE Code 930) – 5,500 SF	1,620	7	4	11	39	30	69
High Turnover Sit-Down Restaurant (ITE Code 932) – 2,500 SF	264	14	11	25	14	8	21
Fast-Food Restaurant w/ D.T (ITE Code 934) – 3,100 SF	1,364	62	60	123	48	41	90
Total External Trips After Internal Capture	4,278	117	97	215	135	115	250
Net Difference in Trips	-5,948	-194	-135	-328	-308	-285	-593

As summarized in the table, the currently proposed MCC Retail Phase 1 project is anticipated to generate 4,278 daily weekday external trips after internal capture. Of these, 215 trips are expected to occur during the weekday morning peak hour while 250 trips are expected to occur during the weekday afternoon peak hour. Based on a comparison to the traffic generated from the original traffic study, MCC Retail Phase 1 is anticipated to generate traffic within the volume limits previously studied, with 5,948 less daily trips, 328 less morning peak hour trips, and 593 less afternoon peak hour trips. Phase 1 is anticipated to generate approximately 42 percent of the overall Majestic Tower Retail project trips generated.

Distribution, Assignment, and Total Traffic

Distribution of site traffic was based on the original traffic study which considered the area street system characteristics, existing traffic patterns and volumes, and the proposed access system for the project. The 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. Project traffic originating from either direction can access the site. **Figure 2** illustrates the expected trip distribution for the proposed residential project.

Traffic assignment was obtained by applying the project trip distribution to the estimated project traffic generation of the MCC Retail Phase 1 development shown in the trip generation table. The traffic assignment is shown in **Figure 3**. Site traffic volumes were added to the 2021 background volumes to represent estimated buildout year conditions. The total traffic volumes for 2021 is illustrated in **Figure 4**, along with the volumes from 2021 the 2040 total buildout volumes are included for reference in **Figure 5**.

Traffic Operations Analysis

Kimley-Horn's analysis of traffic operations in the site vicinity was conducted to determine potential capacity deficiencies at the project access intersection for the 2021 buildout. The acknowledged

source for determining overall capacity is the *Highway Capacity Manual*². 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, typical traffic study practice identifies LOS D as the minimum threshold for acceptable operations. The following **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.

32nd Parkway Access Intersection

With completion of the MCC Retail Phase 1 project, the site proposes one full movement access along the south side of 32nd Parkway. The access along 32nd Parkway is proposed to be located approximately 500 feet east of Tower Road at the existing median opening. This new access should operate with stop control along the northbound exiting approach with installation of a R1-1 “STOP” sign along this approach. Two exiting lanes, one left turn lane and one right turn lane along with a westbound left turn lane and an eastbound right turn lane entering the project driveway will allow for acceptable operations. With these lane configurations and control, the capacity analysis indicates that acceptable delay and LOS D or better is forecasted for all movements during the morning and afternoon peak hours for the 2021 buildout with Phase 1 of the project as an unsignalized intersection. **Table 3** provides the results of the level of service analysis for this intersection with LOS worksheets attached.

Table 3 – 32nd Parkway Access Intersection LOS Results

Scenario	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
2021 Background Plus Project				
Westbound Left	10.8	B	8.7	A
Northbound Approach	26.3	D	18.0	C
Northbound Left	27.9	D	18.9	C
Northbound Right	12.0	B	9.7	A
2040 Background Plus Project *	10.9	B	12.4	B

* Results from overall Majestic Tower Retail master study, a signal is expected to be needed by 2040 as full development occurs

² Transportation Research Board, *Highway Capacity Manual*, Sixth Edition, Washington DC, 2016.

To further identify if signalization of the access intersection is needed for Phase 1 of this development, four-hour and peak hour vehicle volume signal warrant analysis was performed for the intersection of 32nd Parkway Project Access in 2021. Plotting the morning and afternoon peak hour points and the overall peak hour on the graphs illustrate that this intersection is not anticipated to meet the four-hour vehicular volume warrant or the peak hour vehicular volume warrant with two lane roadway approaches while considering only half of the right turn movements along the minor approach. It is important to note that this intersection is very close to warranting signalization with Phase 1 and the currently planned development of the projects within Majestic Commercenter to the east. Therefore, signalization will likely be needed based on development of the next project beyond Phase 1. The signal warrant analyses figures for this intersection is attached as **Figures 6 and 7**.

Right Turn Lane Requirement Analysis

The City of Aurora has directed Kimley-Horn to use the Colorado Department of Transportation (CDOT) State Highway Access Code (SHAC) guidelines to determine if turn lanes are warranted for access into the project access. CDOT classifies their state highways based on roadway types. The Non-Rural Arterial Category NR-B (moderate travel speeds and moderate to high volumes) was assigned to 32nd Parkway based on matching the characteristics of the CDOT roadways.

According to the State Highway Access Code for category NR-B roadways, 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 vehicles per hour (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 vehicles per hour.

32nd Parkway currently has a posted speed limit of 40 miles per hour within the project limits. Based on the current speed limits and 2021 traffic volume projections, an eastbound right turn lane is warranted at the 32nd Parkway Access intersection based on projected background plus project traffic volumes being 104 eastbound right turns during the peak hour and the threshold being 50 vph. Since the approach of this access does not stop; the minimum storage length of 100 feet should be provided at this location. As such, it is recommended that this right turn lane provide a length of 100 feet with a 75-foot taper to match other turn lanes constructed along 32nd Parkway and to minimize the disruption of the landscaping tract located along the south side of 32nd Parkway.

Bicycle, Pedestrian, Transit, Traffic Calming Evaluation

Bicycle and pedestrian access evaluations were conducted for the MCC Retail Phase 1 development project. This focused on the areas of 32nd Parkway and Tower Road adjacent to the site, along with future internal pedestrian connectivity. The following provides a description of the assessment.

Adjacent to the site, 32nd Parkway provides sidewalks along both sides of the street. All along 32nd Parkway, pedestrian access is acceptable with wide separated sidewalks and signalized pedestrian crossings with crosswalks at the signalized intersection of Tower Road. Along Tower Road, sidewalks exist along both sides of the street. All intersections along Tower Road within a quarter mile of the 32nd Parkway intersection provide signalized pedestrian crossings as well. Currently there are no bicycle lanes along 32nd Parkway or Tower Road adjacent to the project. With construction of the project, sidewalk connections are planned between all of the proposed uses internal to the site. Pedestrian crosswalks should also be designated at the internal intersections with preferred crossing locations adjacent to stop-controlled approaches. A conceptual internal circulation plan is included in the attached site plan with proposed stop-controlled locations. W11-2 Pedestrian Warning signs with W16-9P "AHEAD" plaques could be considered 100 feet prior to the crosswalks while W11-2 Pedestrian Warning signs with W16-7P Downward Diagonal Arrow plaques could be installed at the crosswalks internal to the site; however, these warning signs are not deemed necessary internal to the site but could be pursued further by the developer if desired by the City of Aurora.

Transit within the area is provided by RTD. Route 169 along Tower Road is the nearest route to the site. This route runs daily every 60 minutes during all times, year-round. It runs north and south along Airport Boulevard between Arapahoe Road and Colfax Avenue before running north and south along Tower Road between Colfax Avenue and the Airport Boulevard Station. A bus stop exists along northbound and southbound Tower Road, just south of the intersection with 32nd Parkway. Benches exist at these bus stop locations.

Speed cushions, chicanes, and compact roundabouts internal to the site are not deemed necessary but could be pursued further by the developer if desired by the City of Aurora.

Conclusions and Recommendations

In summary, this traffic study letter provides project traffic generation estimates to identify conformance with the original traffic study. MCC Retail Phase 1 is anticipated to generate traffic volumes within the original traffic study limits. The proposed access intersection along 32nd Parkway should operate with stop control along the northbound exiting approach with installation of a R1-1 "STOP" sign. Two exiting lane should be provided at the access intersection, one left turn lane, and a right turn lane. The existing constructed westbound left turn lane should be designated. Likewise, it was found that a separate eastbound right turn lane wouldn't be needed for acceptable operations. However, it is understood that applying CDOT warrants for right turn lanes from the State Highway Access Code results in a warrant being met for an eastbound right turn lane at this intersection. As such, it is recommended that this right turn lane provide a length of 100 feet with a 75-foot taper to match other turn lanes constructed along 32nd Parkway. The recommended intersection lane configurations and control for the project buildout are illustrated in **Figure 8**.

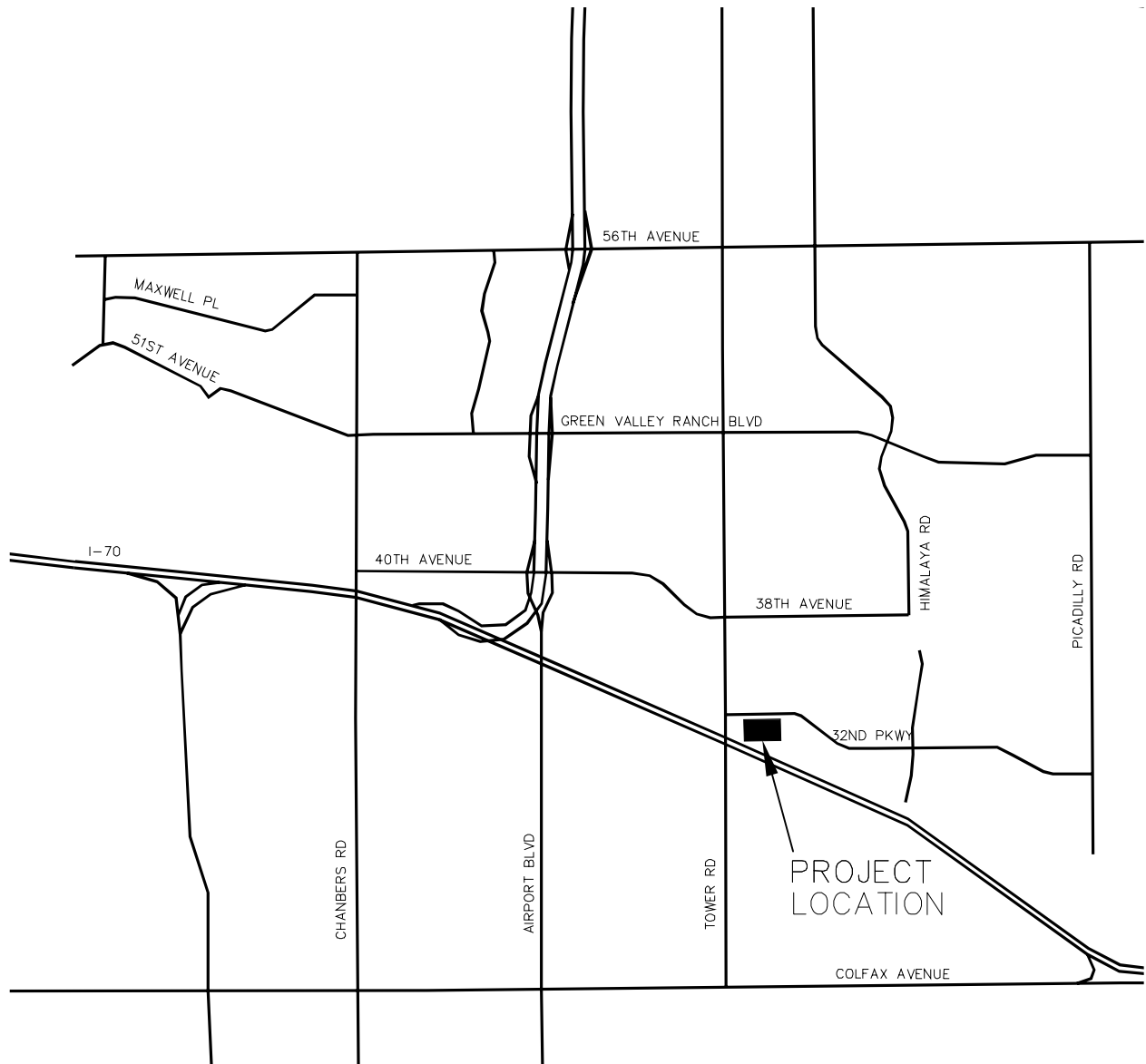
If you have any questions or require anything further, please feel free to call me at (303) 228-2304.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

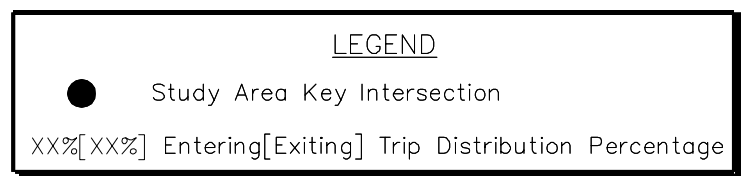
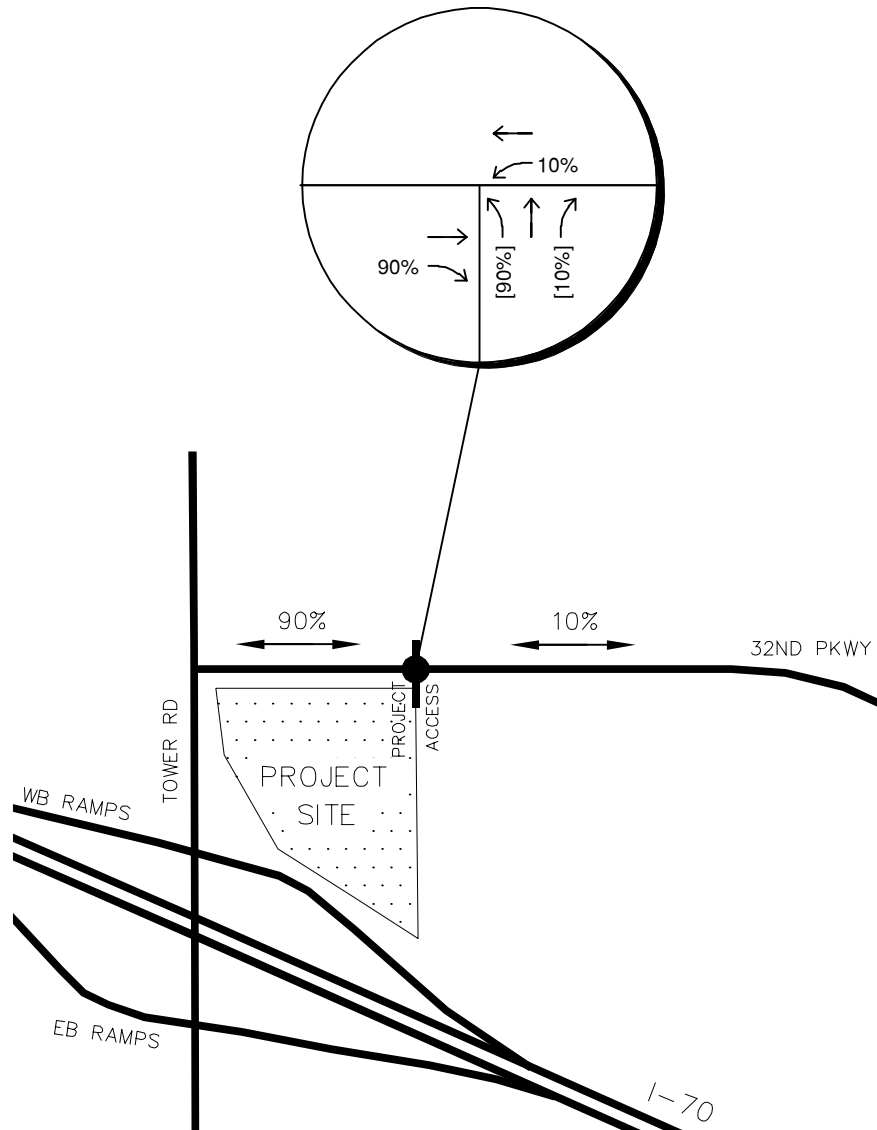
Curtis D. Rowe, P.E., PTOE
Vice President





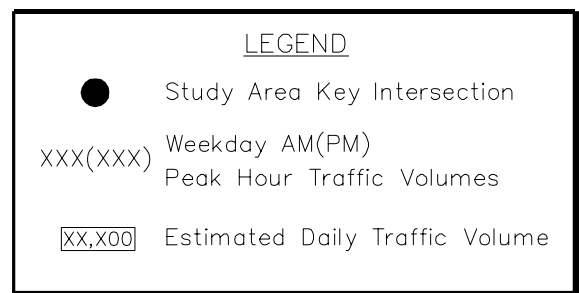
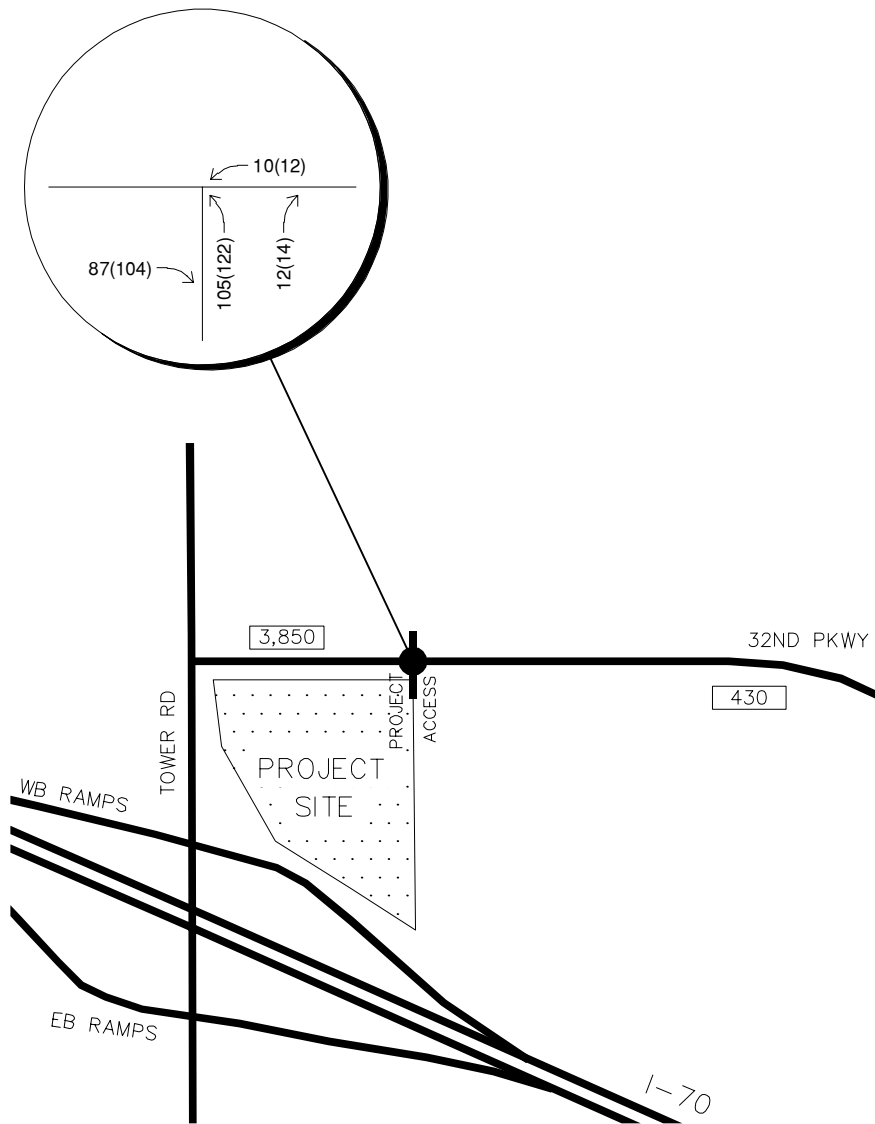
MCC RETAIL PHASE 1
 32ND PARKWAY & PROJECT ACCESS
 VICINITY MAP

FIGURE 1



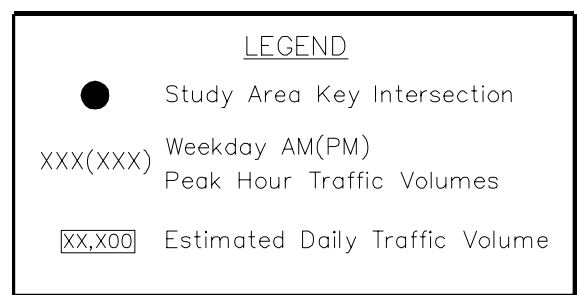
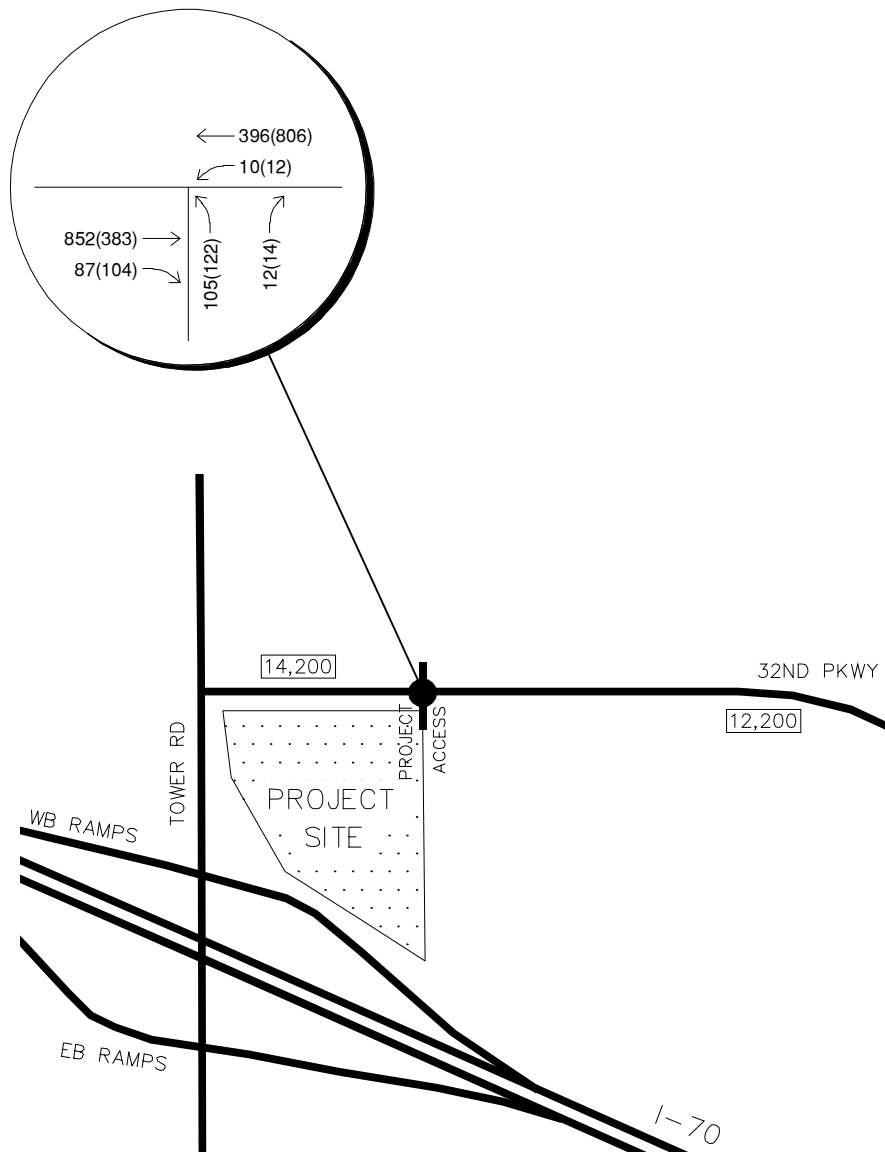
MCC RETAIL PHASE 1
32ND PARKWAY & PROJECT ACCESS
PROJECT TRIP DISTRIBUTION

FIGURE 2



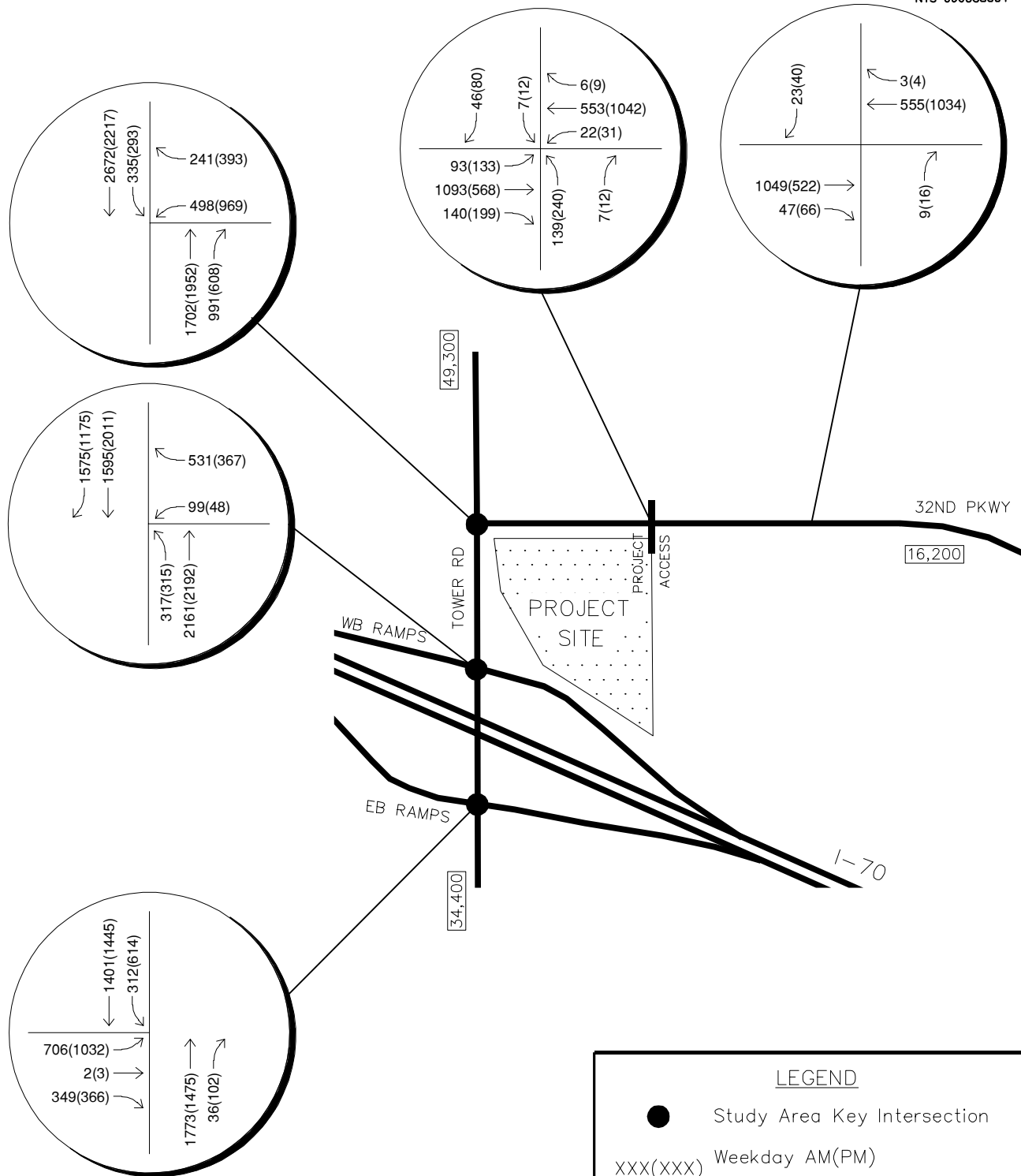
MCC RETAIL PHASE 1
32ND PARKWAY & PROJECT ACCESS
PROJECT TRAFFIC ASSIGNMENT

FIGURE 3



MCC RETAIL PHASE 1
32ND PARKWAY & PROJECT ACCESS
2021 BACKGROUND
PLUS PROJECT TRAFFIC VOLUMES

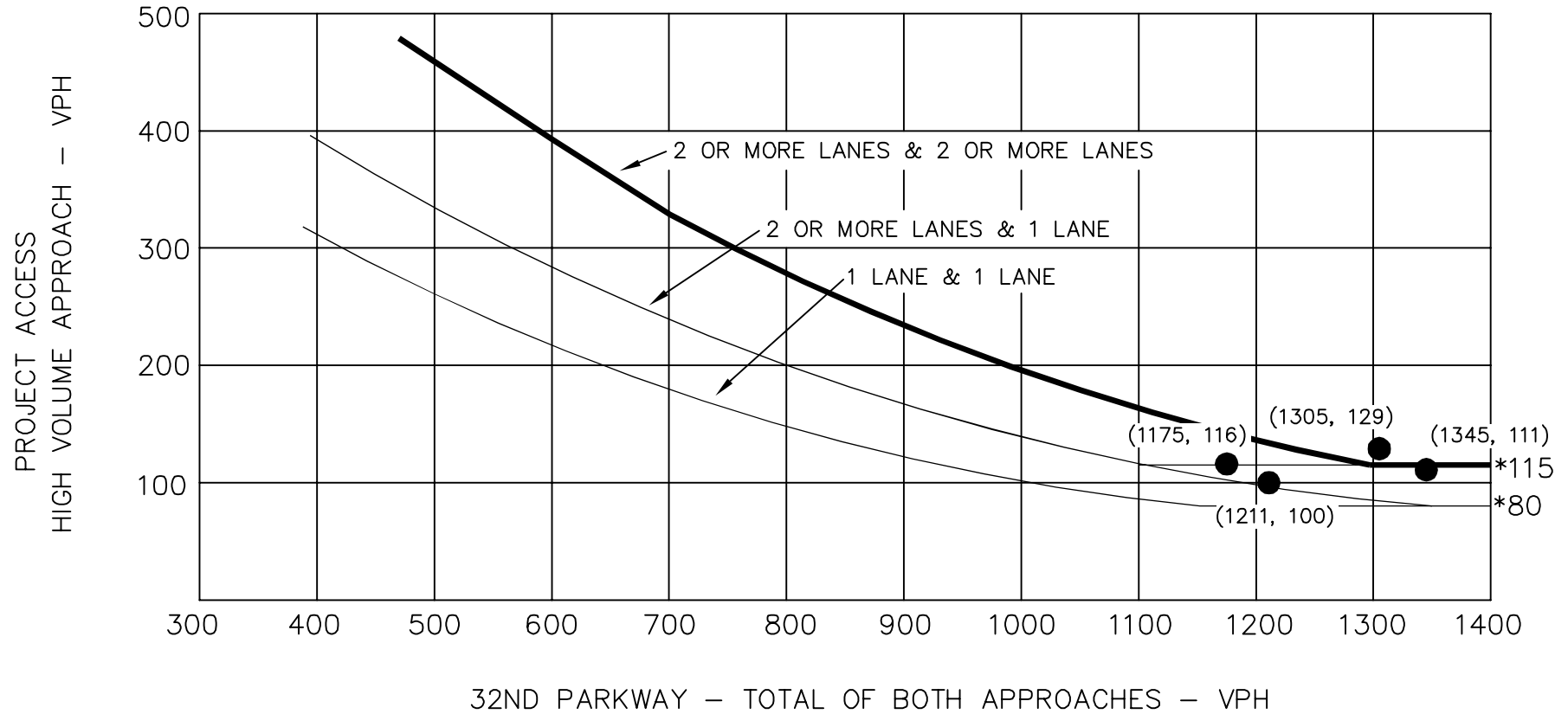
FIGURE 4



MAJESTIC TOWER RETAIL
 32ND PARKWAY & TOWER ROAD
 2040 BACKGROUND
 PLUS PROJECT TRAFFIC VOLUMES

FIGURE 5

WARRANT 2 - FOUR HOUR VEHICULAR VOLUME



MCC RETAIL PHASE 1
32ND PARKWAY ACCESS
FOUR HOUR VOLUME WARRANT

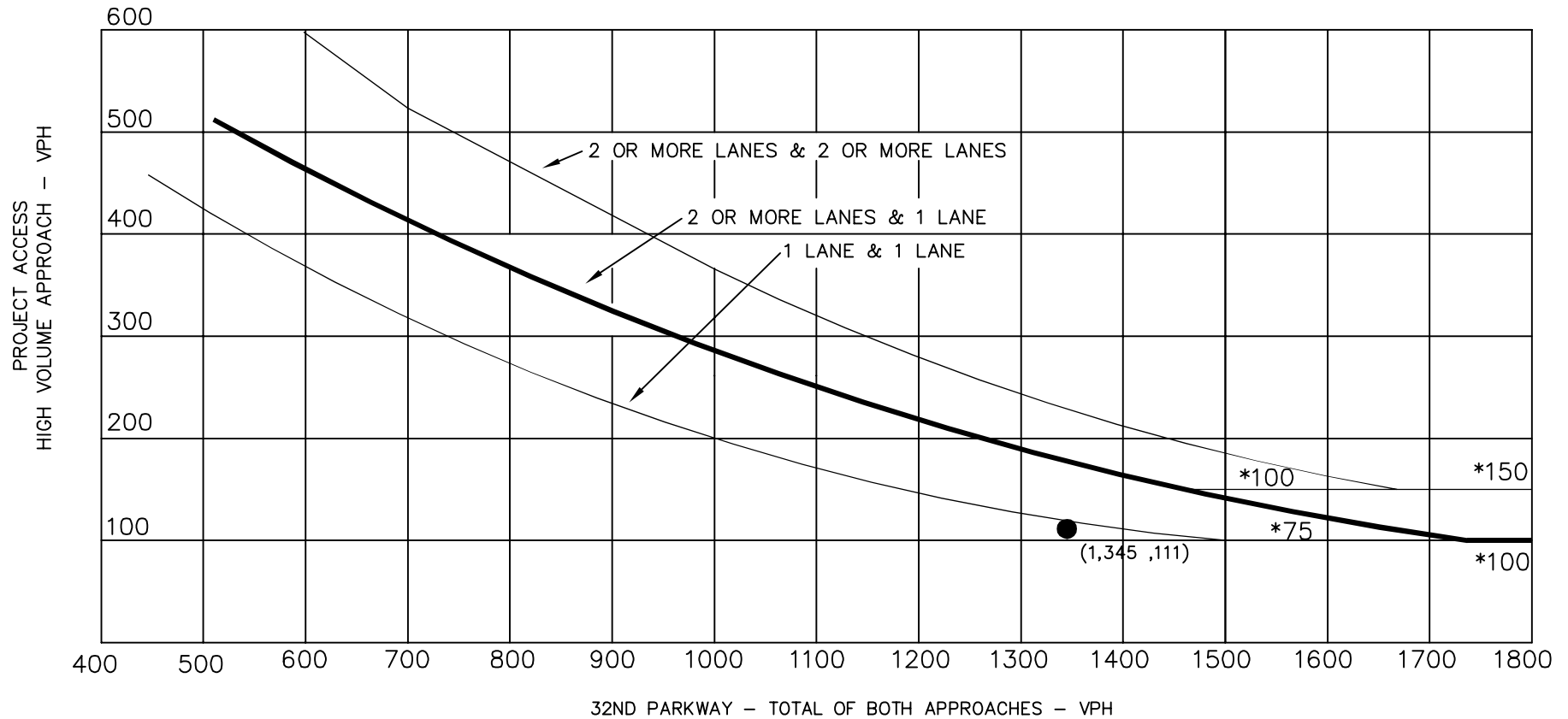
* NOTE: 115 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 80 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

● 2021 TRAFFIC DATA POINT

Source: Manual of Uniform Traffic Control Devices 2009

FIGURE 6

WARRANT 3 - PEAK HOUR



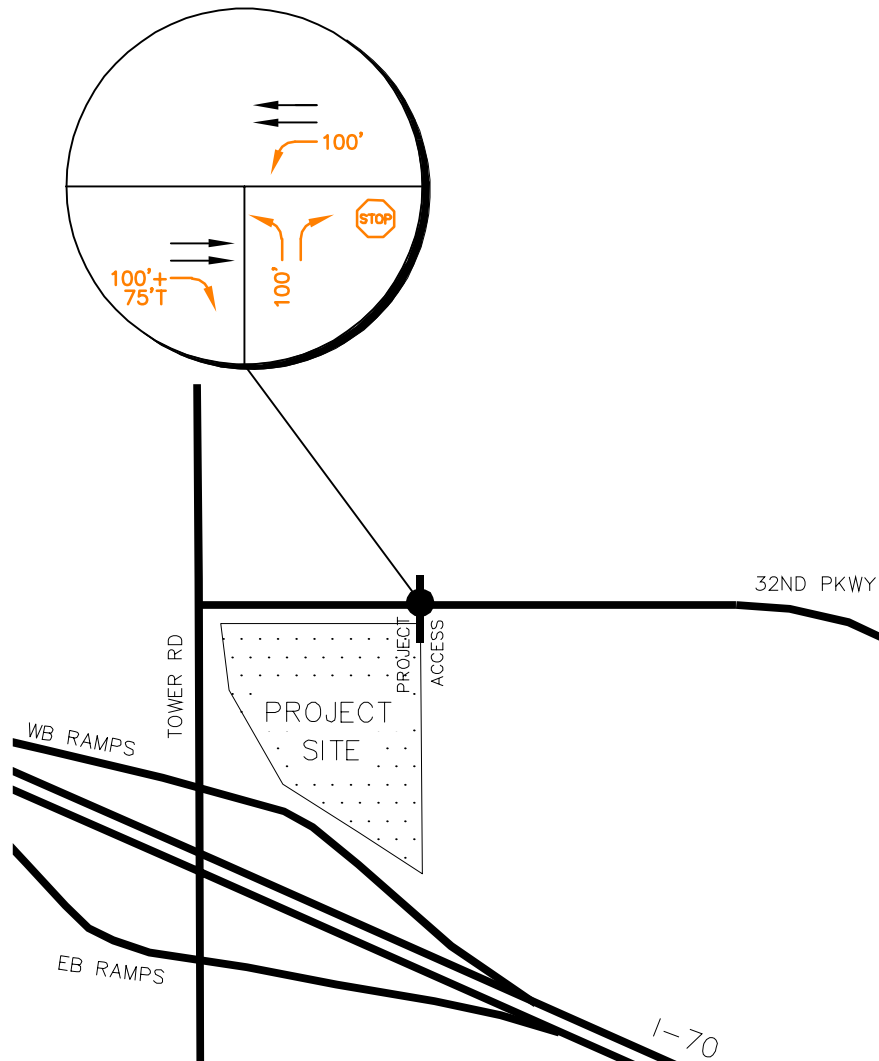
* NOTE: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

MCC RETAIL PHASE 1
32ND PARKWAY ACCESS
PEAK HOUR VOLUME TRAFFIC SIGNAL WARRANT

● 2021 TOTAL TRAFFIC DATA POINT

Source: Manual of Uniform Traffic Control Devices 2009

FIGURE 7



MCC RETAIL PHASE 1
32ND PARKWAY & PROJECT ACCESS
2021 RECOMMENDED
LANE CONFIGURATIONS AND CONTROL

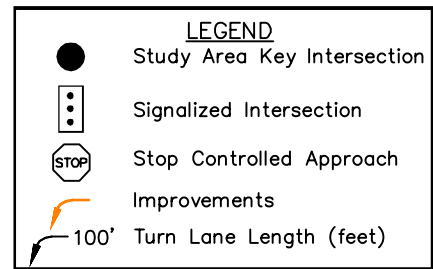


FIGURE 8



Morrison, CO 80465

Aurora, CO
Majestic Commercenter Phase 11
AM Peak
32nd Parkway and Tower Rd

File Name : 32nd Pkwy and Tower Rd AM
Site Code : IPO 329
Start Date : 4/5/2018
Page No : 1

Groups Printed- Automobiles

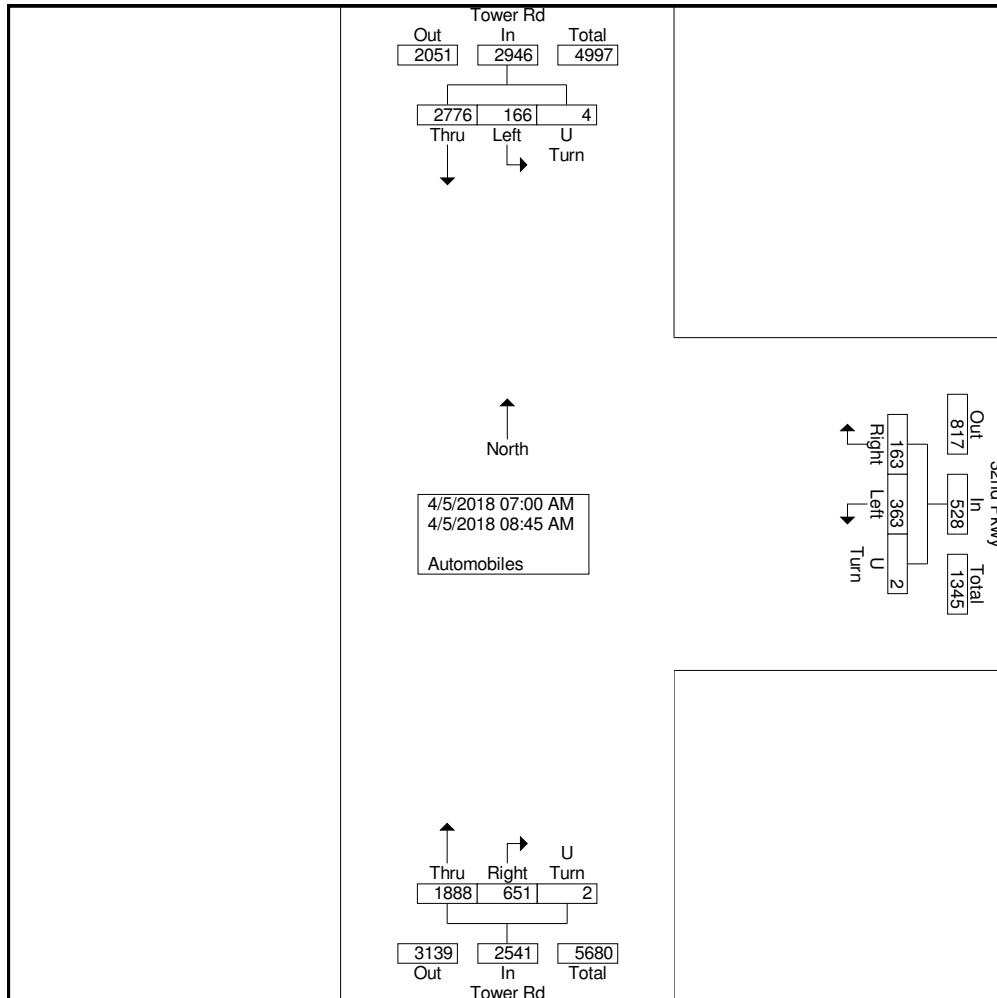
Start Time	32nd Pkwy Westbound				Tower Rd Northbound				Tower Rd Southbound				Int. Total
	Left	Right	U Turn	App. Total	Thru	Right	U Turn	App. Total	Left	Thru	U Turn	App. Total	
07:00 AM	45	20	0	65	215	77	0	292	15	378	1	394	751
07:15 AM	57	21	1	79	248	72	0	320	11	385	0	396	795
07:30 AM	58	24	0	82	304	72	1	377	24	375	0	399	858
07:45 AM	37	25	0	62	307	111	0	418	22	428	0	450	930
Total	197	90	1	288	1074	332	1	1407	72	1566	1	1639	3334
08:00 AM	45	12	0	57	236	82	0	318	22	367	1	390	765
08:15 AM	38	21	0	59	187	91	1	279	18	291	0	309	647
08:30 AM	31	28	0	59	209	75	0	284	23	287	2	312	655
08:45 AM	52	12	1	65	182	71	0	253	31	265	0	296	614
Total	166	73	1	240	814	319	1	1134	94	1210	3	1307	2681
Grand Total	363	163	2	528	1888	651	2	2541	166	2776	4	2946	6015
Apprch %	68.8	30.9	0.4		74.3	25.6	0.1		5.6	94.2	0.1		
Total %	6	2.7	0	8.8	31.4	10.8	0	42.2	2.8	46.2	0.1	49	



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Majestic Commercenter Phase 11
AM Peak
32nd Parkway and Tower Rd

File Name : 32nd Pkwy and Tower Rd AM
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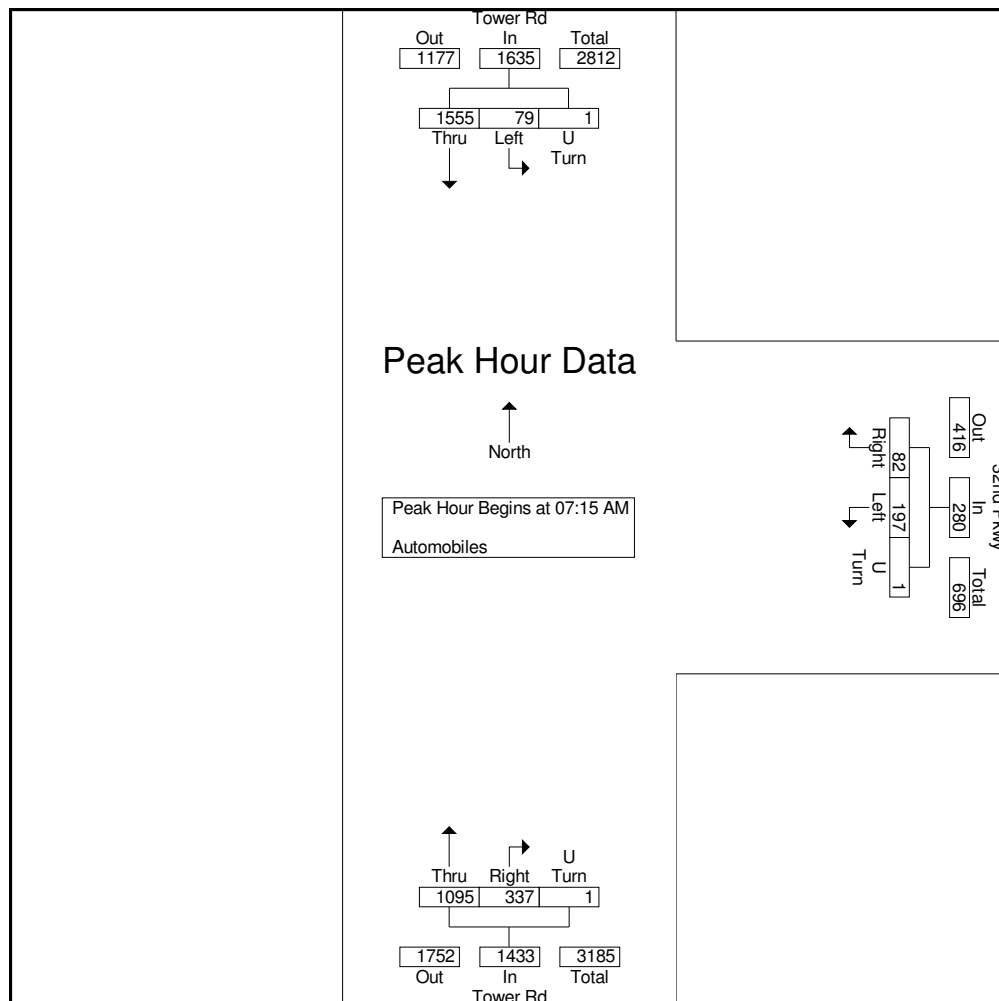


Morrison, CO 80465

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AM Peak
32nd Parkway and Tower Rd

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Page No : 3

	32nd Pkwy Westbound				Tower Rd Northbound				Tower Rd Southbound				
Start Time	Left	Right	U Turn	App. Total	Thru	Right	U Turn	App. Total	Left	Thru	U Turn	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	57	21	1	79	248	72	0	320	11	385	0	396	795
07:30 AM	58	24	0	82	304	72	1	377	24	375	0	399	858
07:45 AM	37	25	0	62	307	111	0	418	22	428	0	450	930
08:00 AM	45	12	0	57	236	82	0	318	22	367	1	390	765
Total Volume	197	82	1	280	1095	337	1	1433	79	1555	1	1635	3348
% App. Total	70.4	29.3	0.4		76.4	23.5	0.1		4.8	95.1	0.1		
PHF	.849	.820	.250	.854	.892	.759	.250	.857	.823	.908	.250	.908	.900





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Majestic Commercenter Phase 11
PM Peak
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Groups Printed- Automobiles

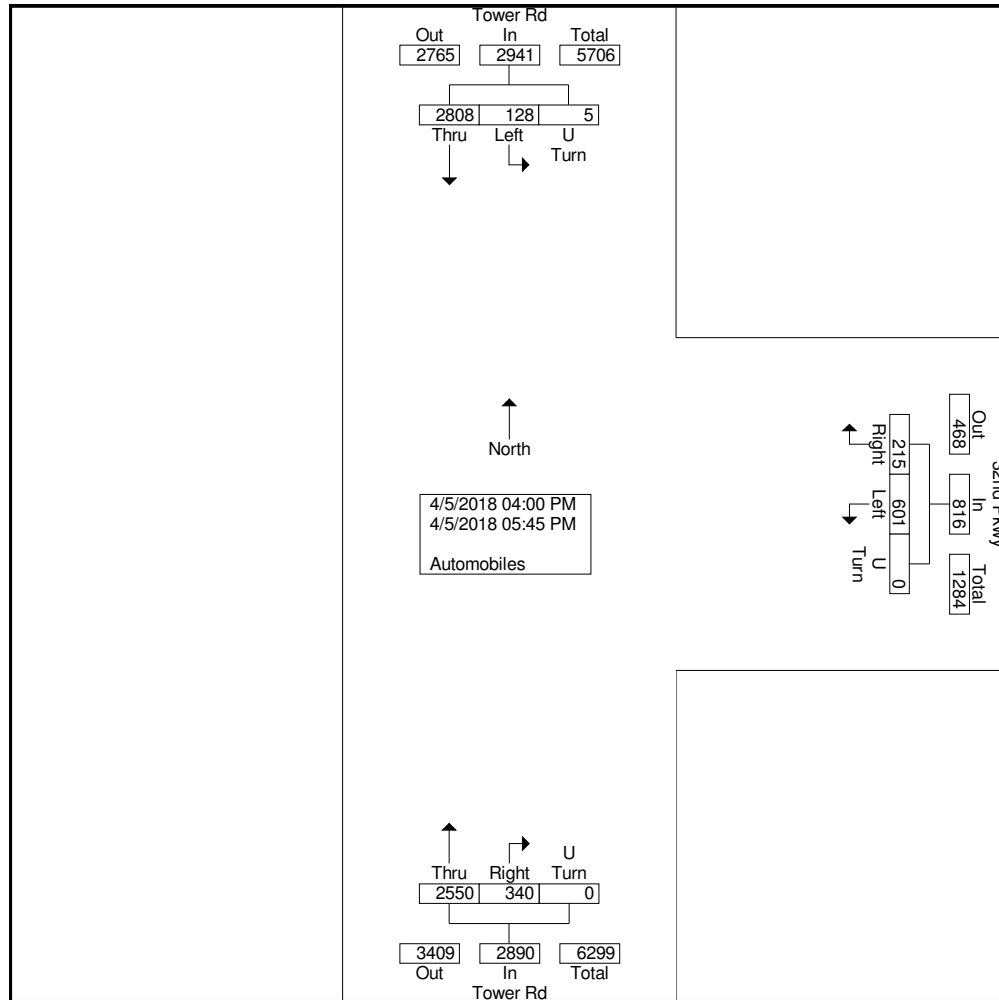
Start Time	32nd Pkwy Westbound				Tower Rd Northbound				Tower Rd Southbound				Int. Total
	Left	Right	U Turn	App. Total	Thru	Right	U Turn	App. Total	Left	Thru	U Turn	App. Total	
04:00 PM	82	26	0	108	308	58	0	366	15	345	0	360	834
04:15 PM	62	16	0	78	329	53	0	382	16	375	0	391	851
04:30 PM	102	28	0	130	294	38	0	332	15	369	0	384	846
04:45 PM	73	31	0	104	330	43	0	373	12	338	1	351	828
Total	319	101	0	420	1261	192	0	1453	58	1427	1	1486	3359
05:00 PM	96	38	0	134	301	35	0	336	18	345	0	363	833
05:15 PM	57	21	0	78	336	39	0	375	14	355	1	370	823
05:30 PM	67	34	0	101	306	47	0	353	21	333	2	356	810
05:45 PM	62	21	0	83	346	27	0	373	17	348	1	366	822
Total	282	114	0	396	1289	148	0	1437	70	1381	4	1455	3288
Grand Total	601	215	0	816	2550	340	0	2890	128	2808	5	2941	6647
Apprch %	73.7	26.3	0		88.2	11.8	0		4.4	95.5	0.2		
Total %	9	3.2	0	12.3	38.4	5.1	0	43.5	1.9	42.2	0.1	44.2	



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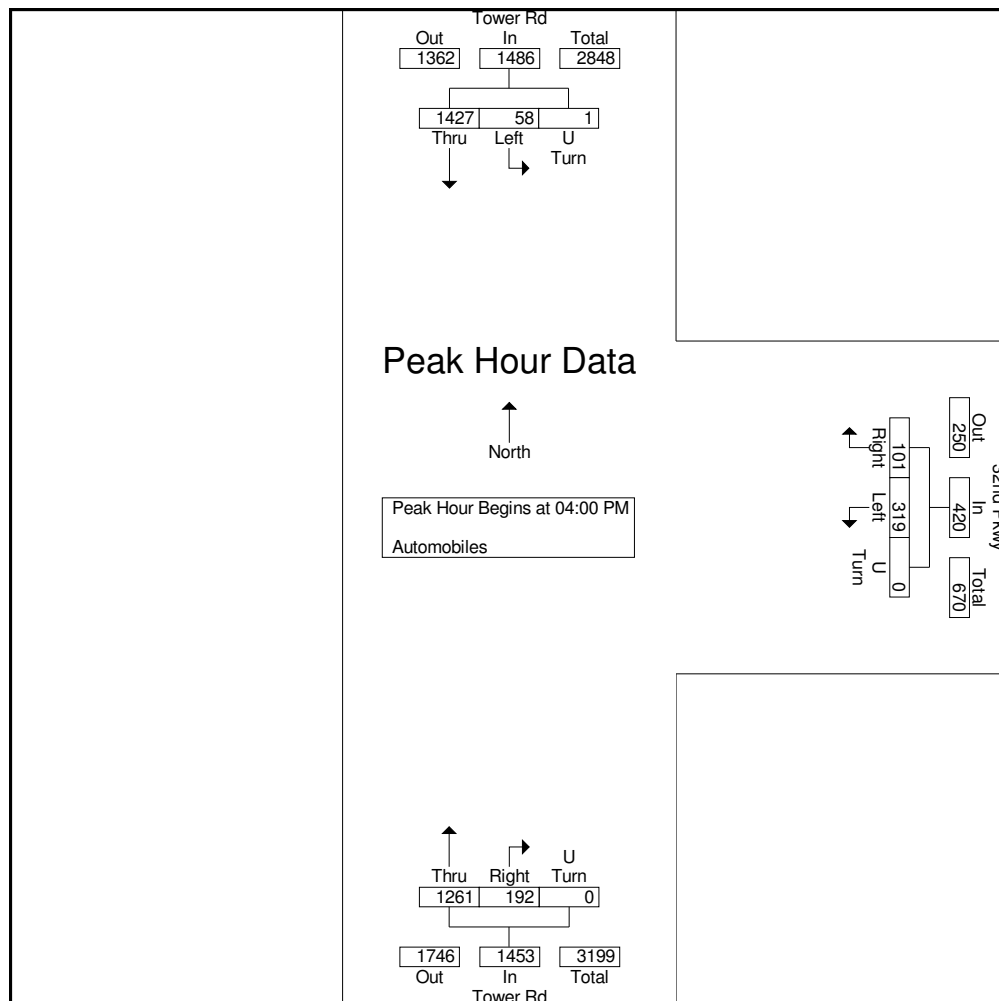


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	32nd Pkwy Westbound				Tower Rd Northbound				Tower Rd Southbound				
Start Time	Left	Right	U Turn	App. Total	Thru	Right	U Turn	App. Total	Left	Thru	U Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	82	26	0	108	308	58	0	366	15	345	0	360	834
04:15 PM	62	16	0	78	329	53	0	382	16	375	0	391	851
04:30 PM	102	28	0	130	294	38	0	332	15	369	0	384	846
04:45 PM	73	31	0	104	330	43	0	373	12	338	1	351	828
Total Volume	319	101	0	420	1261	192	0	1453	58	1427	1	1486	3359
% App. Total	76	24	0		86.8	13.2	0		3.9	96	0.1		
PHF	.782	.815	.000	.808	.955	.828	.000	.951	.906	.951	.250	.950	.987



Trip Generation Planner (ITE 10th Edition) - Summary Report



Weekday Trip Generation
Trips Based on Average Rates/Equations

Project Name
Project Number

MCC Retail Phase 1
096388006

							Rates			Total Trips								Net Trips after Internal Capture								Net Trips after Internal Capture & Pass-					
ITE Code	Internal Capture Land Use	Land Use Description	Independent Variable	Setting/Location	No. of Units	Avg Rate or Eq	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	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	110	Avg	8.36	0.47	0.60	920	52	66	31	21	34	32	804	49	53	30	19	27	26	804	49	53	30	19	27	26	
820	Retail	Shopping Center	1,000 Sq Ft GLA	General Urban/Suburban	7.5	Avg	37.75	0.94	3.81	284	7	29	4	3	14	15	226	7	17	4	3	7	10	226	7	11	4	3	5		
930	Restaurant	Fast Casual Restaurant	1,000 Sq Ft	General Urban/Suburban	5.5	Avg	315.17	2.07	14.13	1,734	11	78	7	4	43	35	1,620	11	69	7	4	39	30	1,620	11	69	7	4	39		
932	Restaurant	High-Turnover (Sit-Down) Restaurant	1,000 Sq Ft	General Urban/Suburban	2.5	Avg	112.18	9.94	9.77	282	25	24	14	11	15	9	264	25	21	14	11	14	8	264	25	12	14	11	8		
934	Restaurant	Fast-Food Restaurant w/ D.T.	1,000 Sq Ft	General Urban/Suburban	3.1	Avg	470.95	40.19	32.67	1,460	125	101	64	61	53	48	1,364	123	90	62	60	48	41	1,364	63	45	32	31	24		
Subtotal before Internal Capture			Total Office	1,000 Sq Ft																											
			Total Retail	1,000 Sq Ft	7.5					284	7	29	4	3	14	15	225	7	17	4	3	7	10								
			Total Restaurant	1,000 Sq Ft	11.1					3,476	161	203	85	76	111	92	3,247	158	180	83	75	101	79								
			Total Cinema/Entertainment	Screen(s)																											
			Total Residential	Dwelling Unit(s)																											
			Total Hotel	Room(s)	110					920	52	66	31	21	34	32	803	49	53	30	19	27	26								

NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	MCC Retail Phase 1			Organization:	Kimley-Horn and Associates, Inc.
Project Location:	Aurora, CO			Performed By:	TES
Scenario Description:				Date:	4/9/2020
Analysis Year:	2021			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 ³		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office		-	1,000 Sq Ft	0	0	0
Retail		8	1,000 Sq Ft	7	4	3
Restaurant		11	1,000 Sq Ft	161	85	76
Cinema/Entertainment		-	Screen(s)	0	0	0
Residential		-	Dwelling Unit(s)	0	0	0
Hotel		110	Room(s)	52	31	21
All Other Land Uses ²		-	0	0	0	0
				220	120	100

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% 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 ²	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	1
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	2	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	220	120	100
Internal Capture Percentage	3%	3%	3%
External Vehicle-Trips ⁵	214	117	97
External Transit-Trips ⁶	0	0	0
External Non-Motorized Trips ⁶	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	0%	0%
Restaurant	2%	1%
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	3%	10%

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

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

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

⁴Enter 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.

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

⁶Person-Trips

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

Project Name:	MCC Retail Phase 1
Analysis Period:	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	4	4	1.00	3	3
Restaurant	1.00	85	85	1.00	76	76
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	31	31	1.00	21	21

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	1		0	0	0	0
Restaurant	24	11		0	3	2
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	16	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		1	20	0	0	0
Retail	0		43	0	0	0
Restaurant	0	0		0	0	1
Cinema/Entertainment	0	0	0		0	0
Residential	0	1	17	0		0
Hotel	0	0	5	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 ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	0	4	4	4	0	0
Restaurant	2	83	85	83	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	1	30	31	30	0	0
All Other Land Uses ³	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 ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	0	3	3	3	0	0
Restaurant	1	75	76	75	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	2	19	21	19	0	0
All Other Land Uses ³	0	0	0	0	0	0

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

²Person-Trips

³Total 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:	MCC Retail Phase 1			Organization:	Kimley-Horn and Associates, Inc.
Project Location:	Aurora, CO			Performed By:	TES
Scenario Description:				Date:	4/9/2020
Analysis Year:	2021			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 ³		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office		-	1,000 Sq Ft	0	0	0
Retail		8	1,000 Sq Ft	29	14	15
Restaurant		11	1,000 Sq Ft	203	111	92
Cinema/Entertainment		-	Screen(s)	0	0	0
Residential		-	Dwelling Unit(s)	0	0	0
Hotel		110	Room(s)	66	34	32
All Other Land Uses ²		-	0	0	0	0
				298	159	139

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% 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 ²	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		4	0	0	1
Restaurant	0	7		0	0	6
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	6	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	298	159	139
Internal Capture Percentage	16%	15%	17%
External Vehicle-Trips ⁵	250	135	115
External Transit-Trips ⁶	0	0	0
External Non-Motorized Trips ⁶	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	50%	33%
Restaurant	9%	14%
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	21%	19%

¹ Land Use Codes (LUCs) from <i>Trip Generation Manual</i> , published by the Institute of Transportation Engineers.
² Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.
³ Enter trips assuming no transit or non-motorized trips (as assumed in ITE <i>Trip Generation Manual</i>).
⁴ Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made
⁵ Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.
⁶ 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

Project Name:	MCC Retail Phase 1
Analysis Period:	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	14	14	1.00	15	15
Restaurant	1.00	111	111	1.00	92	92
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	34	34	1.00	32	32

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	0		4	1	4	1
Restaurant	3	38		7	17	6
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	5	22	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		1	2	0	0	0
Retail	0		32	0	0	6
Restaurant	0	7		0	0	24
Cinema/Entertainment	0	1	3		0	0
Residential	0	1	16	0		4
Hotel	0	0	6	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 ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	7	7	14	7	0	0
Restaurant	10	101	111	101	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	7	27	34	27	0	0
All Other Land Uses ³	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 ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	5	10	15	10	0	0
Restaurant	13	79	92	79	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	6	26	32	26	0	0
All Other Land Uses ³	0	0	0	0	0	0

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

²Person-Trips

³Total 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.

Project MCC Retail Phase 1
 Subject Trip Generation for Hotel
 Designed by TES Date April 09, 2020 Job No. 096388006
 Checked by _____ Sheet No. _____ of _____

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rate Equations

Land Use Code -Hotel (310)

Independant Variable - Rooms (X)

$$X = 110$$

T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (Series 300 Page 3)

Directional Distribution: 59% ent. 41% exit.
 T = 52 Average Vehicle Trip Ends
 (T) = 0.47 (X) 31 entering 21 exiting
 (T) = 0.47 * (110.0)
 31 + 21 = 52

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (Series 300 Page 4)

Directional Distribution: 51% ent. 49% exit.
 T = 66 Average Vehicle Trip Ends
 T = 0.60 X 34 entering 32 exiting
 T = 0.60 * 110
 34 + 32 = 66

Weekday (Series 300 Page 2)

Average Weekday Directional Distribution: 50% entering, 50% exiting
 (T) = 8.36 (X) T = 920 Average Vehicle Trip Ends
 (T) = 8.36 * (110.0) 460 entering 460 exiting
 460 + 460 = 920

Saturday (300 Series Page 7)

Directional Distribution: 50% ent. 50% exit.
 T = 902 Average Vehicle Trip Ends
 T = 8.19 X 451 entering 451 exiting
 T = 8.19 * 110
 451 + 451 = 902

Saturday Peak Hour of Generator (300 Series Page 8)

Average Weekday Directional Distribution: 56% entering, 44% exiting
 (T) = 0.72 (X) T = 80 Average Vehicle Trip Ends
 (T) = 0.72 * (110.0) 45 entering 35 exiting
 45 + 35 = 80

Project MCC Retail Phase 1
 Subject Trip Generation for Shopping Center (Verizon, Insurance Office, and Boutique)
 Designed by TES Date April 09, 2020 Job No. 096388006
 Checked by _____ Date _____ Sheet No. _____ of _____

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rate Equations

Land Use Code - Shopping Center (820)

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

Gross Leasable Area = **7,500** Square Feet

X = 7.500

T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (800 Series Page 139)

Average Weekday		Directional Distribution:	62% ent.	38% exit.
T = 0.94 * (X)		T = 7	Average Vehicle Trip Ends	
T = 0.94 *	7.5	4 entering	3	exiting
		4 + 3 = 7		

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (800 Series page 140)

Average Weekday		Directional Distribution:	48% ent.	52% exit.
T = 3.81 * (X)		T = 29	Average Vehicle Trip Ends	
T = 3.81 *	7.5	14 entering	15	exiting
		14 + 15 = 29		

Weekday (800 Series page 138)

Average Weekday		Directional Distribution:	50% entering, 50% exiting
T = 37.75 * (X)		T = 284	Average Vehicle Trip Ends
T = 37.75 *	7.5	142 entering	142 exiting
		142 + 142 = 284	

Non Pass-By Trip Volumes (Per ITE Trip Generation Handbook, 3rd Edition September 2017-Page 190)

AM Peak Hour =	66%	Non-Pass By	PM Peak Hour =	66%	Non-Pass By
	IN	Out	Total		
AM Peak	3	2	5		
PM Peak	9	10	20		
Daily	94	94	188	PM Peak Hour Rate Applied to Daily	

Pass-By Trip Volumes (Per ITE Trip Generation Handbook, 3rd Edition September 2017 -Page 190)

AM Peak Hour =	34%	Pass By	PM Peak Hour =	34%	Pass By
	IN	Out	Total		
AM Peak	1	1	3		
PM Peak	5	5	10		
Daily	48	48	96	PM Peak Hour Rate Applied to Daily	

Project MCC Retail Phase 1
 Subject Trip Generation for Fast Casual Restaurant Chipotle
 Designed by TES Date April 09, 2020 Job No. 96388006
 Checked by _____ Date _____ Sheet No. _____ of _____

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rate Equations

Land Use Code - Fast Casual Restaurant (930)

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

Gross Floor Area = **2,500** Square Feet

X = 2.500

T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (900 Series Page 62)

Average Weekday		Directional Distribution:	67% ent.	33% exit.
T = 2.07 (X)		T = 5	Average Vehicle Trip Ends	
T = 2.07 *	2.500	3 entering	2 exiting	
		3 + 2 =	5	

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (900 Series Page 63)

Average Weekday		Directional Distribution:	55% ent.	45% exit.
T = 14.13(X)		T = 35	Average Vehicle Trip Ends	
T = 14.13 *	2.500	19 entering	16 exiting	
		19 + 16 =	35	

Weekday (900 Series Page 61)

Average Weekday		Directional Distribution:	50% entering, 50% exiting
T = 315.17 (X)		T = 788	Average Vehicle Trip Ends
T = 315.17 *	2.500	394 entering	394 exiting
		394 + 394 =	788

Saturday Peak Hour of Generator (900 Series Page 67)

		Directional Distribution:	55% ent.	45% exit.
T = 34.02 (X)		T = 85	Average Vehicle Trip Ends	
T = 34.02 *	2.500	47 entering	38 exiting	
		47 + 38 =	85	

Project MCC Retail Phase 1
 Subject Trip Generation for Fast Casual Restaurant Wahoo's Fish Tacos
 Designed by TES Date April 09, 2020 Job No. 96388006
 Checked by _____ Date _____ Sheet No. _____ of _____

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rate Equations

Land Use Code - Fast Casual Restaurant (930)

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

Gross Floor Area = **3,000** Square Feet

X = 3.000

T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (900 Series Page 62)

Average Weekday	Directional Distribution:	67% ent.	33% exit.
T = 2.07 (X)	T = 6	Average Vehicle Trip Ends	
T = 2.07 * 3.000	4 entering	2 exiting	
	4 + 2 = 6		

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (900 Series Page 63)

Average Weekday	Directional Distribution:	55% ent.	45% exit.
T = 14.13(X)	T = 42	Average Vehicle Trip Ends	
T = 14.13 * 3.000	23 entering	19 exiting	
	23 + 19 = 42		

Weekday (900 Series Page 61)

Average Weekday	Directional Distribution:	50% entering, 50% exiting
T = 315.17 (X)	T = 946	Average Vehicle Trip Ends
T = 315.17 * 3.000	473 entering	473 exiting
	473 + 473 = 946	

Saturday Peak Hour of Generator (900 Series Page 67)

	Directional Distribution:	55% ent.	45% exit.
T = 34.02 (X)	T = 102	Average Vehicle Trip Ends	
T = 34.02 * 3.000	56 entering	46 exiting	
	56 + 46 = 102		

Project MCC Retail Phase 1
 Subject Trip Generation for High-Turnover (Sit-Down) Restaurant IHOP

Designed by TES Date April 09, 2020 Job No. 096388006
 Checked by _____ Date _____ Sheet No. _____ of _____

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rate Equations

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

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

Gross Floor Area = 2,500 Square Feet

X = 2.500

T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (900 Series Page 97)

Average Weekday Directional Distribution: 55% ent. 45% exit.

T = 9.94 (X) T = 25 Average Vehicle Trip Ends

T = 9.94 * 2.500 14 entering 11 exiting

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (900 Series Page 98)

Average Weekday Directional Distribution: 62% ent. 38% exit.

T = 9.77 (X) T = 24 Average Vehicle Trip Ends

T = 9.77 * 2.500 15 entering 9 exiting

Weekday (900 Series Page 96)

Average Weekday Directional Distribution: 50% entering, 50% exiting

T = 112.18 (X) T = 282 Average Vehicle Trip Ends

T = 112.18 * 2.500 141 entering 141 exiting

P.M. Peak Hour of Generator (900 Series Page 100)

Average Weekday Directional Distribution: 52% ent. 48% exit.

T = 17.41 (X) T = 44 Average Vehicle Trip Ends

T = 17.41 * 2.500 23 entering 21 exiting

Saturday Peak Hour of Generator (900 Series Page 105)

Average Saturday Directional Distribution: 51% ent. 49% exit.

T = 11.19 (X) T = 28 Average Vehicle Trip Ends

T = 11.19 * 2.500 14 entering 14 exiting

Non Pass-By Trip Volumes (Per ITE Trip Generation Handbook, 3rd Edition September 2017-Page 207)

AM Peak Hour = 57% Non-Pass By PM Peak Hour = 57% Non-Pass By

IN Out Total

AM Peak 8 6 14

PM Peak 9 5 14

Daily 80 80 160 PM Peak Hour Rate Applied to Daily

Pass-By Trip Volumes (Per ITE Trip Generation Handbook, 3rd Edition September 2017 -Page 207)

AM Peak Hour = 43% Pass By PM Peak Hour = 43% Pass By

IN Out Total

AM Peak 6 5 11

PM Peak 7 4 11

Daily 61 61 122 PM Peak Hour Rate Applied to Daily

Project MCC Retail Phase 1
 Subject Trip Generation for Fast-Food Restaurant with Drive-Through Window Freddys
 Designed by TES Date April 09, 2020 Job No. 96388006
 Checked by _____ Date _____ Sheet No. _____ of _____

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rate Equations

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

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

Gross Floor Area = 3,100 Square Feet

X = 3.100

T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (900 Series page 158)

Average Weekday
 T = 40.19 (X)
 T = 40.19 * 3.100

Directional Distribution: 51% ent. 49% exit.
 T = 125 Average Vehicle Trip Ends
 64 entering 61 exiting
 64 + 61 = 125

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (900 Series page 159)

Average Weekday
 T = 32.67 (X)
 T = 32.67 * 3.100

Directional Distribution: 52% ent. 48% exit.
 T = 101 Average Vehicle Trip Ends
 53 entering 48 exiting
 53 (*)+ 48 = 101

Weekday (900 Series page 157)

Average Weekday
 T = 470.95 (X)
 T = 470.95 * 3.100

Directional Distribution: 50% entering, 50% exiting
 T = 1460 Average Vehicle Trip Ends
 730 entering 730 exiting
 730 + 730 = 1460

Saturday Peak Hour of Generator (900 Series page 163)

T = 54.86 (X)
 T = 54.86 * 3.100

Directional Distribution: 51% ent. 49% exit.
 T = 170 Average Vehicle Trip Ends
 87 entering 83 exiting
 87 + 83 = 170

Non Pass-By Trip Volumes (Per ITE Trip Generation Handbook, 3rd Edition September 2017)

AM Peak Hour =	51%	Non-Pass By	PM Peak Hour =	50%	Non-Pass By
	IN	Out			
AM Peak	33	31			
PM Peak	27	24			
Daily	365	365	730		

PM Peak Hour Rate Applied to Daily

Pass-By Trip Volumes (Per ITE Trip Generation Handbook, 3rd Edition September 2017)

AM Peak Hour =	49%	Pass By	PM Peak Hour =	50%	Pass By
	IN	Out			
AM Peak	31	30			
PM Peak	27	24			
Daily	365	365	730		

PM Peak Hour Rate Applied to Daily

Intersection						
Int Delay, s/veh	2.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑	↑↑	↑	↑
Traffic Vol, veh/h	852	87	10	396	105	12
Future Vol, veh/h	852	87	10	396	105	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	150	-	100	0
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	926	95	11	430	114	13
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1021	0	1163	463
Stage 1	-	-	-	-	926	-
Stage 2	-	-	-	-	237	-
Critical Hdwy	-	-	4.3	-	7	7.1
Critical Hdwy Stg 1	-	-	-	-	6	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	-	-	2.3	-	3.6	3.4
Pot Cap-1 Maneuver	-	-	629	-	176	525
Stage 1	-	-	-	-	328	-
Stage 2	-	-	-	-	757	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	629	-	173	525
Mov Cap-2 Maneuver	-	-	-	-	269	-
Stage 1	-	-	-	-	328	-
Stage 2	-	-	-	-	744	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.3		26.3	
HCM LOS	D					
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	269	525	-	-	629	-
HCM Lane V/C Ratio	0.424	0.025	-	-	0.017	-
HCM Control Delay (s)	27.9	12	-	-	10.8	-
HCM Lane LOS	D	B	-	-	B	-
HCM 95th %tile Q(veh)	2	0.1	-	-	0.1	-

Intersection

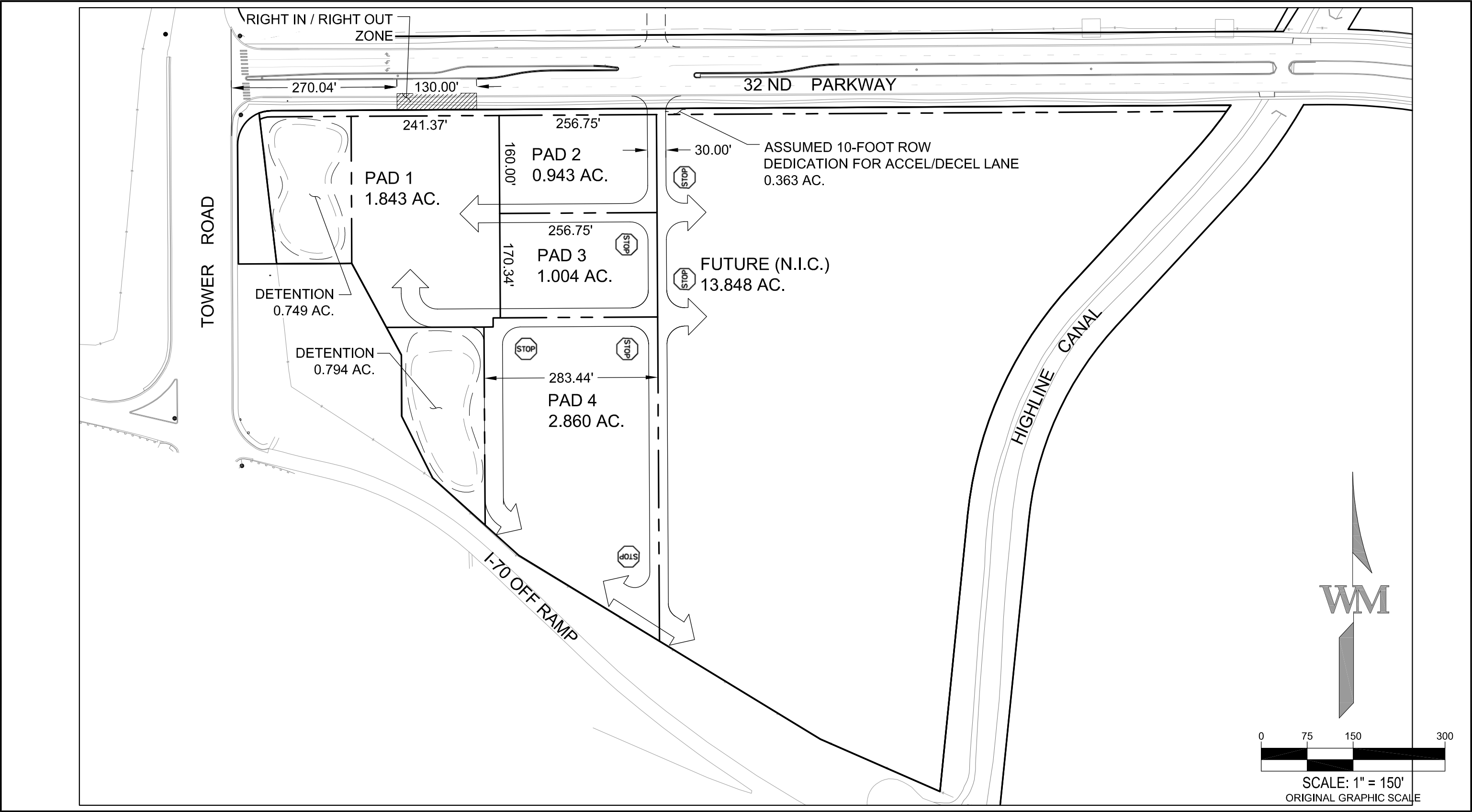
Int Delay, s/veh 1.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑	↑↑	↑	↑
Traffic Vol, veh/h	383	104	12	806	122	14
Future Vol, veh/h	383	104	12	806	122	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	150	-	100	0
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	416	113	13	876	133	15

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	529
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.3
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.3
Pot Cap-1 Maneuver	-	-	981
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	981
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	18
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	391	774	-	-	981	-
HCM Lane V/C Ratio	0.339	0.02	-	-	0.013	-
HCM Control Delay (s)	18.9	9.7	-	-	8.7	-
HCM Lane LOS	C	A	-	-	A	-
HCM 95th %tile Q(veh)	1.5	0.1	-	-	0	-



990 south broadway
suite 230
denver, co 80209
p 303.561.3333
waremalcomb.com

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CIVIL ENGINEERING

MCC RETAIL
LOTING LAYOUT

NO.	DATE	REMARKS
1	1.15.20	LOT REVS

JOB NO.:	DCS17-4046
PA / PM:	CSS
DRAWN BY:	CSS

SHEET

SP1.0

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