

# KENJO MARKET

## KNOXVILLE, TENNESSEE

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TRAFFIC IMPACT STUDY

RUTLEDGE PIKE  
CITY OF KNOXVILLE, TENNESSEE

CCI PROJECT NO. 00590-0012

REV 1

Case # 9-B-21-SU  
TIS Revision 1  
8/18/2021



PREPARED FOR:

MBI Companies, Inc.  
299 North Weisgarber Road  
Knoxville, TN 37919

SUBMITTED BY:

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REVISED  
AUGUST 18  
**2021**

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### REVISION I (08/18/21)

This report replaces the previous version of the traffic impact study dated 07/23/2021 prepared for this project in its entirety. The associated changes are related to comments received from the City of Knoxville and TDOT, which are located in Appendix F.

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## EXECUTIVE SUMMARY

This report provides a summary of a traffic impact study that was performed for a proposed redevelopment to the Kenjo Market on Rutledge Pike in Knoxville, Tennessee. The project site is located on the west side of Rutledge Pike just south of the I-40 / Rutledge Pike interchange. The development plan for this project proposes a new 5,000 square-foot building with a mixed-use of convenience market with gas pumps (3,100 square feet & 10 gas pumps) and a drive-through fast food restaurant (1,900 square feet). The proposed development will create a new primary full-movement access and a secondary right-in / right-out onto Rutledge Pike.

The purpose of this study was the evaluation of the traffic operational and safety impacts of the proposed development upon roadways in the vicinity of the project site. Discussion with the City of Knoxville and the Tennessee Department of Transportation staff resulted in two intersections being identified for detailed study. The studied intersections are Rutledge Pike at Primary Site Access / Existing McCalla Avenue / Proposed Rock Pointe Drive and Rutledge Pike at Secondary Site Access. Appropriate intersection evaluations such as capacity analyses, signal warrant analyses, and turn lane warrant evaluations were conducted at the study intersections for existing and future conditions, both with and without site generated traffic, in order to determine the anticipated impacts and to establish recommended measures to mitigate these impacts.

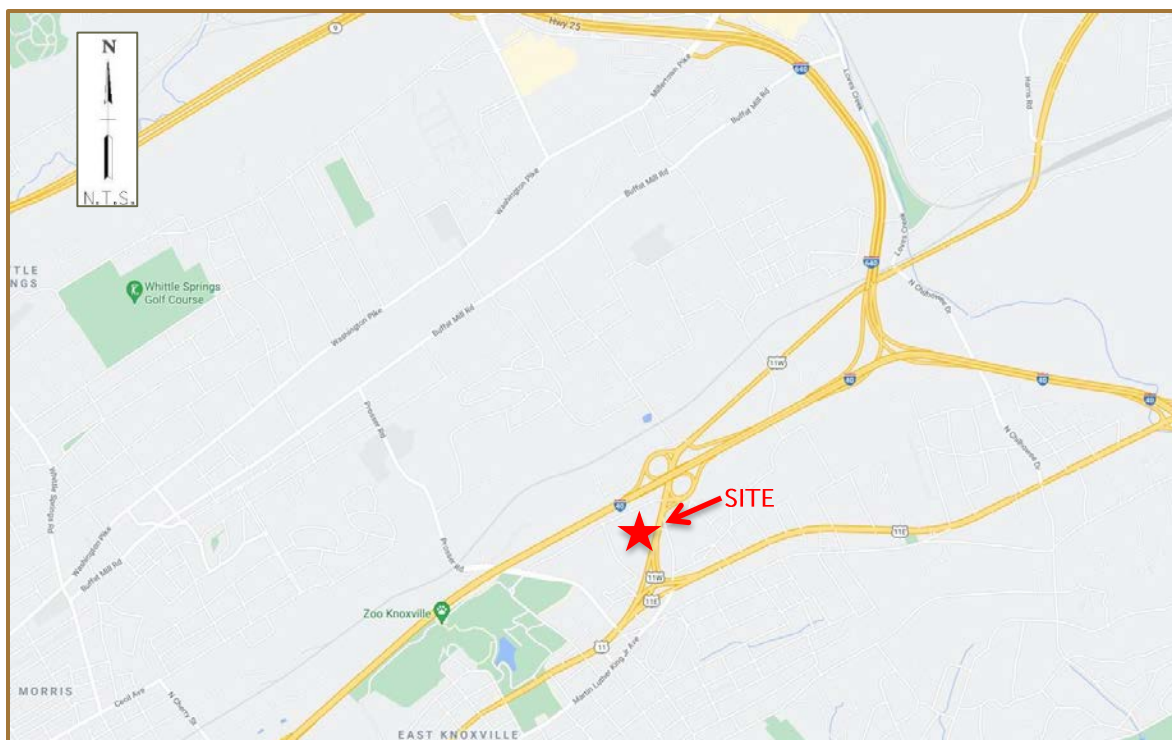
The primary conclusion of this study is that the traffic generated from the proposed development will not have a significant impact on the studied site access intersections at Rutledge Pike. Intersection levels-of-service are expected to be "C" or better exiting the site during peak traffic periods for the primary site access intersection and levels-of-service "A" exiting the site during peak traffic periods for the secondary site access intersection.

The following is a listing of recommendations that were developed to address traffic concerns in the vicinity of the project site:

1. Rutledge Pike at Primary Access / Existing McCalla Avenue / Proposed Rock Pointe Drive:
  - a. Install fourth leg (Proposed Primary Access) to the existing intersection of McCalla Avenue / Proposed Rock Pointe Drive at Rutledge Pike.
  - b. Install northbound left-turn lane with 75-foot storage lane and 180-foot taper.
  - c. Extend the existing solid white channelization line between the northbound ramps of Magnolia Avenue and Asheville Highway up to the beginning of the proposed left-turn lane to discourage drivers from making inappropriate maneuvers from the Asheville Highway Ramp to the proposed left-turn lane.
2. Rutledge Pike at Secondary Access (Right-in / Right-out):
  - a. Create new right-in / right-out intersection at Rutledge Pike.
  - b. Install a raised concrete channelization island to further enforce the right-in / right-out operation.
3. Maintain intersection corner sight distances on the site driveway by ensuring that site grading, landscaping, signage, and other site features do not restrict intersection sight distance lines of sight.

## INTRODUCTION & PURPOSE OF STUDY

This report provides a summary of a traffic impact study that was performed for a proposed redevelopment to the Kenjo Market on Rutledge Pike in Knoxville, Tennessee. The project site is located on the west side of Rutledge Pike just south of the I-40 / Rutledge Pike interchange. FIGURE 1 is a location map showing the major roadways in the project site vicinity.



**FIGURE 1  
LOCATION MAP**

The development plan for this project proposes a new 5,000 square-foot building with a mixed-use of convenience market with gas pumps (3,100 square feet & 10 gas pumps) and a drive-through fast food restaurant (1,900 square feet). The proposed development will create a new primary full-movement access and a secondary right-in / right-out onto Rutledge Pike. FIGURE 2 is a Conceptual Site Plan detailing the proposed site.

The purpose of this study was the evaluation of the traffic operational and safety impacts of the proposed development upon roadways in the vicinity of the project site. Discussion with the City of Knoxville and the Tennessee Department of Transportation staff resulted in two intersections being identified for detailed study. The studied intersections are Rutledge Pike at Primary Site Access / Existing McCalla Avenue / Proposed Rock Pointe Drive and Rutledge Pike at Secondary Site Access. Appropriate intersection evaluations such as capacity analyses, signal warrant analyses, and turn lane warrant evaluations were conducted at the study intersections for existing and future conditions, both with and without site generated traffic, in order to determine the anticipated impacts and to establish recommended measures to mitigate these impacts.



## EXISTING CONDITIONS

### EXISTING ROADWAY CONDITIONS

Roadway conditions for the study roadways are summarized as follows:

- Rutledge Pike (SR 1) is a four-lane roadway with two lanes in each direction and pocket left-turn lanes within the vicinity of the proposed site. It is classified as a major arterial per the Knoxville-Knox County Planning Major Road Plan. Lane widths are 11 feet with sidewalks, curb, and gutter on both sides of Rutledge Pike and the posted speed limit is 45 mph.
- Rock Pointe Drive (existing McCalla Avenue) is a proposed three-lane roadway with one lane in each direction and a two-way left-turn lane within the vicinity of the proposed site. There are sidewalks, curb, and gutter on both sides of proposed Rock Pointe Drive.
  - Rock Pointe Drive is a newly proposed access road for the adjacent Rock Pointe Crossing mixed-use development. According to the Transportation Impact Analysis for Rock Pointe Crossing, *“Rock Pointe Drive will begin at the existing intersection of McCalla Avenue at Rutledge Pike (SR 1).”*

Traffic control for the study intersection is as follows:

- Rutledge Pike at existing McCalla Avenue / Proposed Rock Pointe Drive is currently side-street STOP controlled.

### EXISTING SITE CONDITIONS

The proposed redevelopment is located at the existing Kenjo Market on the west side of Rutledge Pike south of the I-40 East Interchange with Rutledge Pike. The site will expand to an undeveloped wooded portion of the property to create a primary full-movement access point across from the existing McCalla Avenue / Proposed Rock Pointe Crossing. FIGURE 3 provides an aerial view of the project site and the surrounding area.

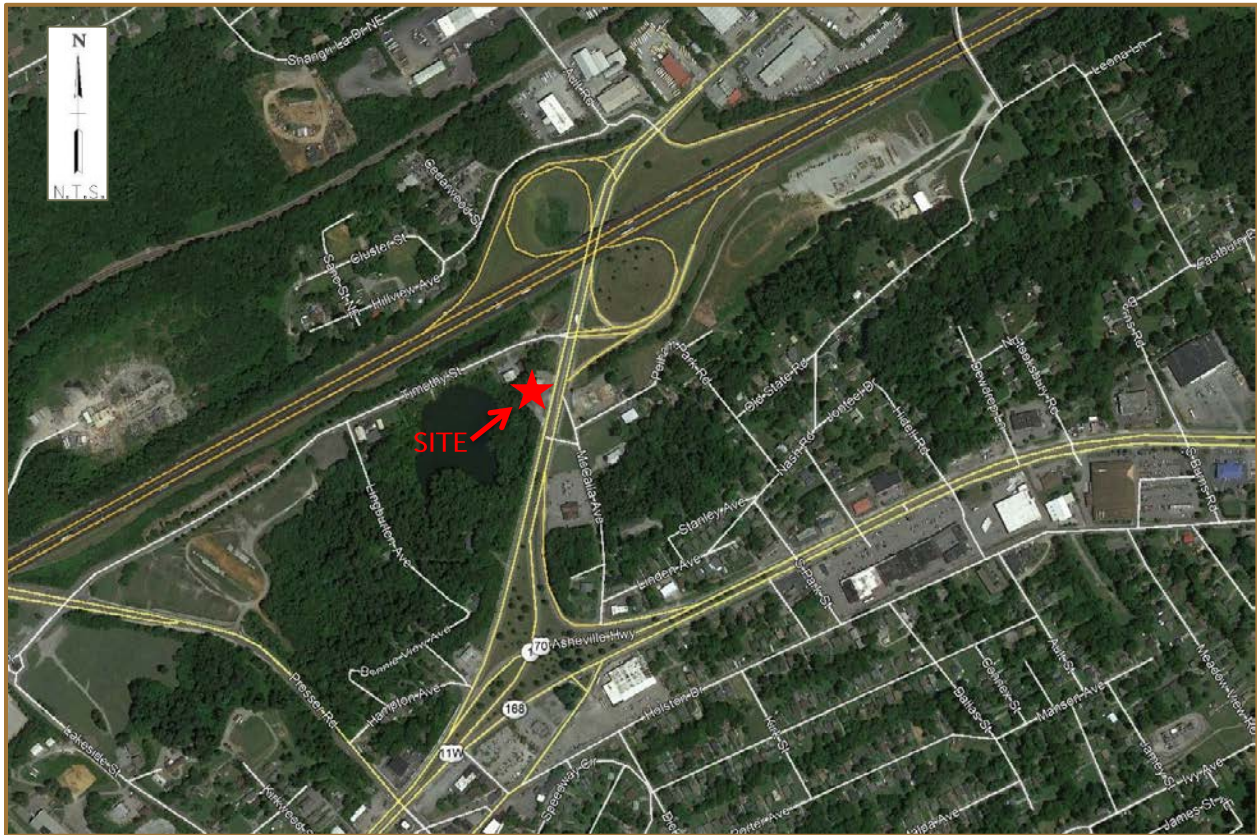


FIGURE 3  
EXISTING SITE CONDITIONS

### EXISTING TRAFFIC DATA

Two types of existing traffic data were gathered for this study. The Tennessee Department of Transportation (TDOT) collects annual average daily traffic (AADT) data on roadways in the study area. A count station was found near the project site that was felt to have particular relevance for this study. The most currently available data from this station is contained in Table 1.

TABLE 1: ANNUAL AVERAGE DAILY TRAFFIC COUNT SUMMARY

COUNT YEAR	TDOT COUNT STATION 47000358 RUTLEDGE PIKE SOUTH OF PROPOSED SITE
2016	9,978
2017	10,023
2018	10,214
2019	11,583
2020	9,122

.....

In addition to the available AADT data, intersection turning movement traffic counts were compiled at the study intersections from an adjacent proposed development, Rock Pointe Crossing, traffic impact study (TIS). The adjacent development's traffic impact study had an existing count year of 2020 so traffic volumes from that study were grown by a 1.5% growth factor to arrive at the 2021 existing traffic volumes utilized for this study.

The 2020 traffic data from the Rock Pointe Crossing TIS is summarized in FIGURE 4 and the factored 2021 existing traffic data is summarized in FIGURE 5. The Rock Pointe Crossing existing count summary sheets are contained in APPENDIX A.

### EXISTING CAPACITY ANALYSES / LEVELS-OF-SERVICE

Capacity analyses employing the methods of the *Highway Capacity Manual* were conducted for the existing conditions at the study intersections. These analyses were performed with the 2021 existing traffic volumes, shown in FIGURE 5, and existing intersection traffic control and lane configurations. The EVALUATIONS section of this report may be referenced for tabular summaries of these analyses, while more detailed summaries are presented on the computer printouts contained in APPENDIX C. Also contained in APPENDIX C is a section entitled "Capacity and Level of Service Concepts", which provides a description of the utilized procedures.

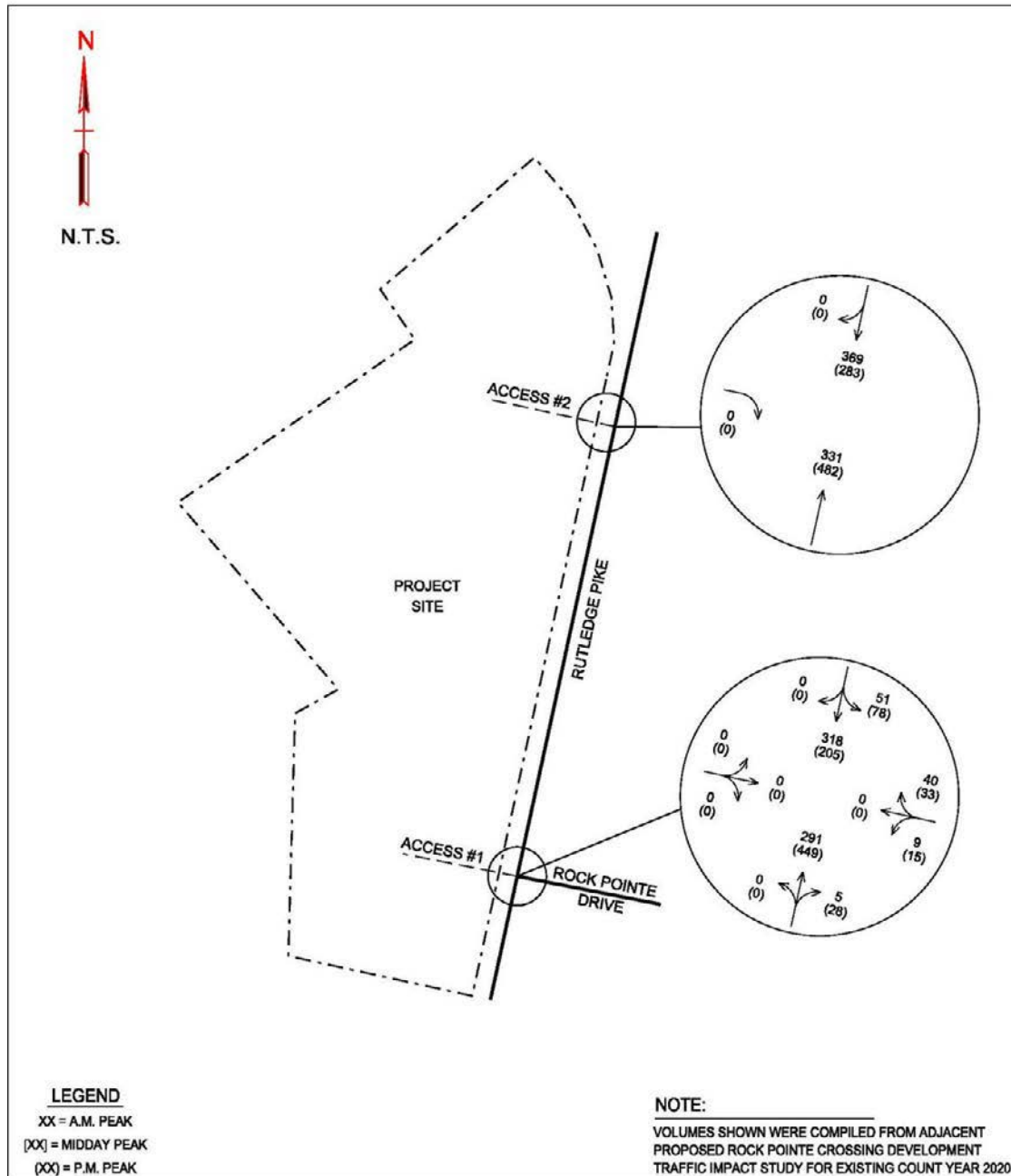


FIGURE 4  
2020 EXISTING TRAFFIC VOLUMES FROM ROCK POINTE CROSSING TIS

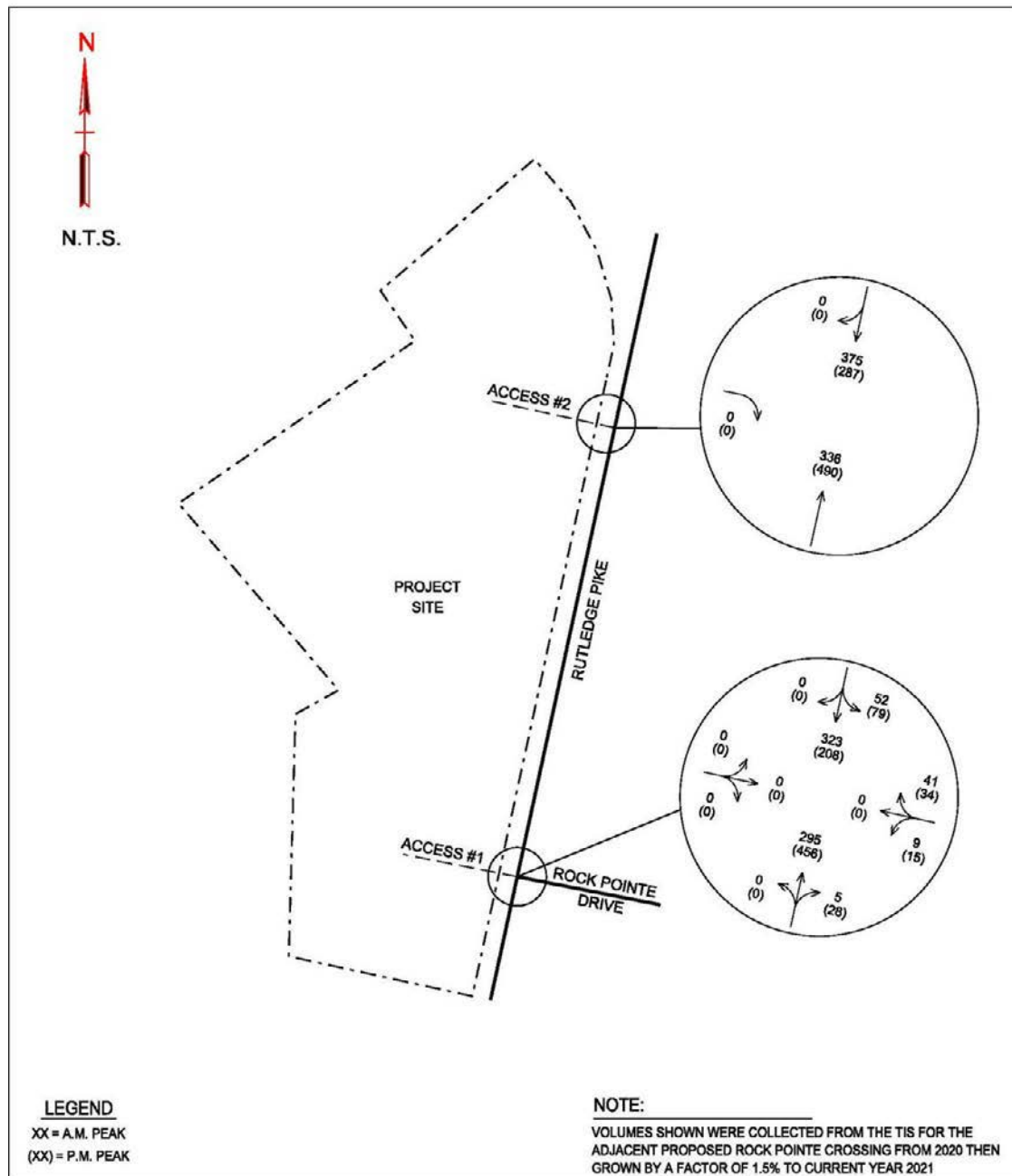


FIGURE 5  
2021 EXISTING FACTORED TRAFFIC VOLUMES

## BACKGROUND CONDITIONS

### BACKGROUND TRAFFIC GROWTH

The proposed development is anticipated to be constructed in one general phase with completion anticipated by 2022. Therefore, year 2022 was established as the appropriate design / analysis year for the study. In order to determine traffic volumes resulting solely from background traffic growth to year 2022, it was necessary to establish an annual growth rate for existing traffic. The TDOT AADT values previously discussed and a review of the recently approved TIS of the adjacent Rock Pointe Crossing mixed-use development determined an approximate annual growth rate of 1.5% to be utilized for this development. FIGURE 6 contains the background traffic volumes that would result from this annual growth rate from year 2021 to year 2022.

As previously mentioned, Rock Pointe Crossing is a mixed-use development proposed across Rutledge Pike from the primary access intersection at Rutledge Pike. The full build-out of the Rock Pointe Crossing development is anticipated to be complete by the year 2025. At the time of this study, only one of the proposed land uses is built-out and does not have direct access to Rutledge Pike through the existing McCalla Avenue / Proposed Rock Pointe Drive intersection. Since the background year for this proposed convenience market / fast-food development is anticipated to occur in 2022, prior to the full build-out of Rock Pointe Crossing in 2025, and minimal additional development has occurred to this point, no additional background traffic was accounted for from the proposed Rock Pointe Crossing development.

An additional adjacent project worth mentioning is the reconfiguration of the Rutledge Pike / Asheville Highway / Magnolia Avenue interchange directly south of the proposed development. Preliminary concept plans indicate a conversion of the interchange into a signalized intersection. This project is in the 2040 Mobility Plan but a specific construction timeline has not been established.

### BACKGROUND CAPACITY ANALYSES / LEVELS-OF-SERVICE

Capacity analyses as described in the Existing Conditions section of this report were conducted utilizing the Year 2022 background volumes shown in FIGURE 6 and existing intersection traffic control and lane configurations. The EVALUATIONS section of this report may be referenced for tabular summaries of these analyses, while more detailed summaries are presented on the computer printouts contained in APPENDIX C.

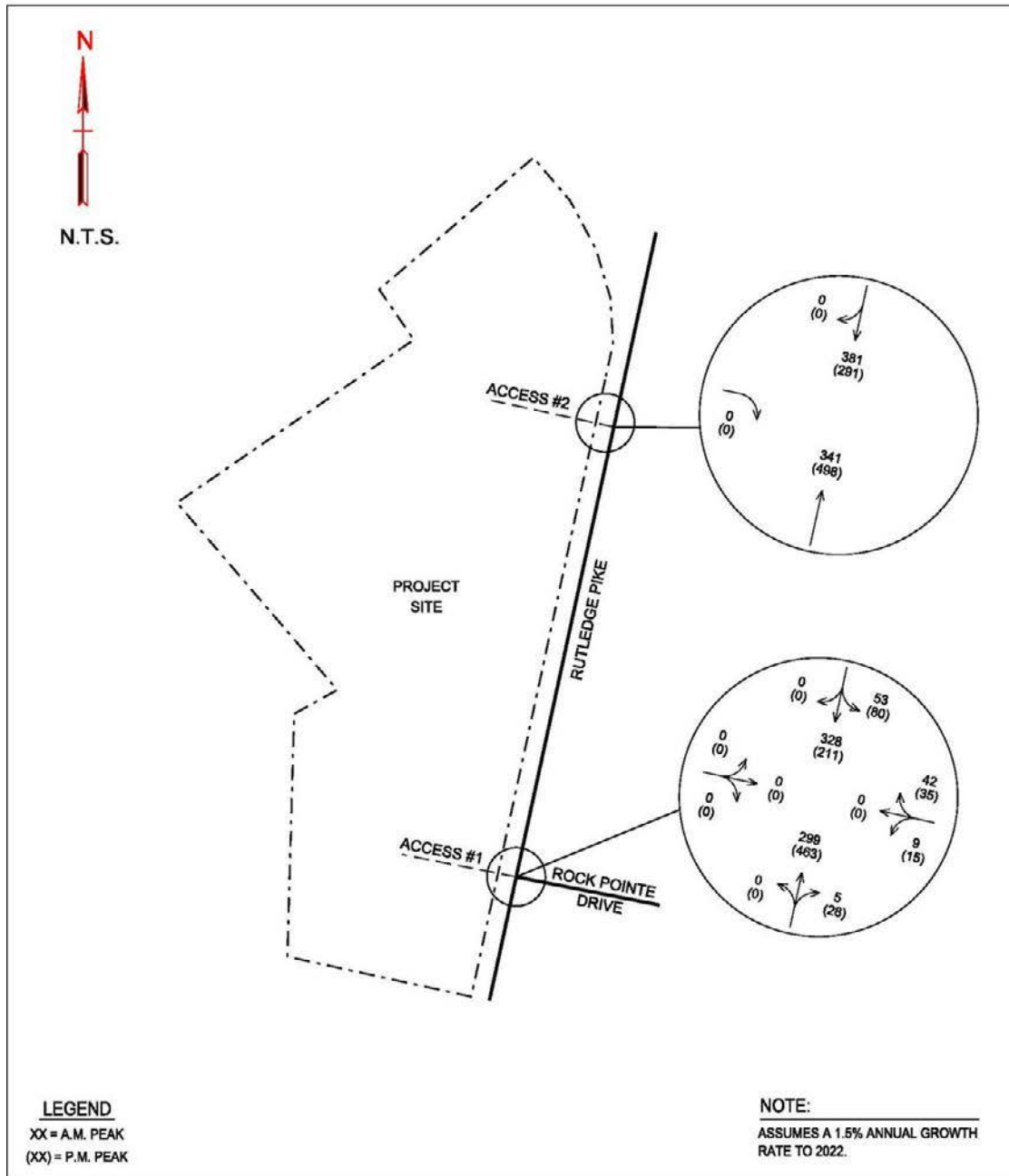


FIGURE 6  
2022 BACKGROUND TRAFFIC VOLUMES

## FUTURE CONDITIONS

### TRIP GENERATION

In order to estimate the expected traffic volumes to be generated by the proposed development, the procedures of *Trip Generation, Tenth Edition* (Institute of Transportation Engineers-ITE) were utilized. The generated trips were determined based on the weekday AM and PM peak hour of adjacent street traffic trip generation rates for Convenience Market w/ Gas Pumps (ITE Land Use Code 853) and Fast-Food w/ Drive-Thru (ITE Land Use Code 934). The generated trips for this project will consist of three specific types; internal capture trips, pass-by trips, and non-pass-by trips.

According to ITE, *"At a development site consisting of two or more land uses, there is potential for interaction among those uses (referred to as "internal capture trips"), particularly where the trip can be made by walking. As a result, the total generation of external trips (that is, those entering and exiting the overall site) may be less than the simple sum of the trips generated by each discrete land use."* ITE also states, *"An internal capture rate can be generally defined as the percentage of total person trips generated by a site that are made entirely within the site. The trip origin, destination, and travel path are all within the site."* Methodology for determining an internal capture rate followed ITE procedure and is the same methodology presented in NCHRP Report 684: *Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*. Trip reductions for internal capture are separate from pass-by trip reductions and are subtracted from initial trip generation volumes before pass-by trip reductions are applied. For this specific development, internal capture trip reductions were calculated to be 13% for the AM peak hour and 14% for the PM peak hour.

The pass-by trips are those that involve vehicles that are already going past the project site, who will now turn into the site, do business, and then exit the site continuing their primary trip in the same direction. The ITE Trip Generation Handbook, 3<sup>rd</sup> Edition, provides pass-by trip rates for the specific land uses proposed in this development. For Convenience Market w/ Gas Pumps (ITE Land Use Code 853), the pass-by trip rate is 49% for the AM peak hour and 50% for the PM peak hour. For Fast-Food w/ Drive-Thru (ITE Land Use Code 934), the pass-by trip rate is 63% for the AM peak hour and 66% for the PM peak hour. Pass-by trips are not newly generated trips but rather redistributed trips from the existing roadway network to the proposed development. The pass-by trips for this development were assumed along Rutledge Pike split between northbound and southbound directions.

The non-pass-by trips are new trips that are made for the specific purpose of doing business at the proposed development. The non-pass-by trips are represented by the remaining percentages of the pass-by trip rates presented above.

See TABLE 2 for a summary of the traffic generated for this project. The ITE trip generation worksheets and internal capture calculation spreadsheets are contained in APPENDIX B.

**TABLE 2: TRIP GENERATION SUMMARY**

LAND USE	ITE CODE	SIZE	WEEKDAY (TRIPS/DAY)	AM PEAK HOUR (TRIPS/HOUR)			PM PEAKHOUR (TRIPS/HOUR)		
				IN	OUT	TOTAL	IN	OUT	TOTAL
Convenience Market w/ Gas Pumps	853	10 Pumps	3,225	104	104	208	115	115	230
			Internal Capture Reduction*	(-14)	(-13)	(-27)	(-16)	(-16)	(-32)
			Reduced Trip Totals	90	91	181	99	99	198
			Pass-by** Non-Pass-by	(-44) 46	(-45) 46	(-89) 92	(-50) 49	(-49) 50	(-99) 99
Fast Food w/ Drive-Thru	934	1,900 SF	895	39	37	76	32	30	62
			Internal Capture Reduction*	(-5)	(-5)	(-10)	(-5)	(-4)	(-9)
			Reduced Trip Totals	34	32	66	27	26	53
			Pass-by** Non-Pass-by	(-21) 13	(-20) 12	(-41) 25	(-18) 9	(-17) 9	(-35) 18
TOTAL REDISTRIBUTED PASS-BY TRIPS				65	65	130	68	66	134
TOTAL NEW PROJECT TRIPS (NON-PASS-BY)				59	58	117	58	59	117
TOTAL PROJECT TRIPS AT SITE DRIVEWAYS				124	123	247	126	125	251

A.M. Peak Hour trip generation is based on Peak Hour of Adjacent Street Traffic, One Hour Between 7 & 9 a.m.

P.M. Peak Hour trip generation is based on Peak Hour of Adjacent Street Traffic, One Hour Between 4 & 6 p.m.

\*Internal capture trip reductions are calculated to be 13% for the AM Peak Hour and 14% for the PM Peak Hour

\*\*Pass-by trip Redistribution: (LUC 853 – AM Peak=49%, PM Peak=50%; LUC 934 – AM Peak=63%, PM Peak=66%)

## **TRIP DISTRIBUTION AND ASSIGNMENT**

The proposed trip distribution for this development was determined through a review of existing travel patterns, local knowledge of the study area, proposed site location in relation to surrounding roadway network, and engineering judgment. FIGURE 7 provides a summary of how the above site generated trips would be assigned to the study intersections. FIGURE 8 provides the proposed trip assignment volumes to the studied intersections.

## **FUTURE TRAFFIC VOLUMES**

Future projected traffic volumes for the study intersections were developed by adding the generated and assigned trips shown in FIGURE 8 to the 2022 background traffic volumes developed in the previous section and shown in FIGURE 6. These combined 2022 volumes reflect the existing traffic, the background traffic growth, and the generated traffic from the proposed development. These future volumes are shown on FIGURE 9 and are the combined volumes used in the analyses of future conditions with the proposed development.

## **FUTURE CAPACITY ANALYSES / LEVELS-OF-SERVICE**

Capacity analyses, as described in the Existing Conditions section of this report, were conducted for future conditions utilizing the traffic volumes shown in the build-out scenario. These analyses utilized existing intersection traffic control and proposed lane configurations to determine if any mitigation is required to accommodate traffic generated by the proposed site. Tabular summaries of the analysis results and associated discussion are also contained in the EVALUATIONS section. In addition, detailed computer printout summaries of the analyses are contained in APPENDIX C.

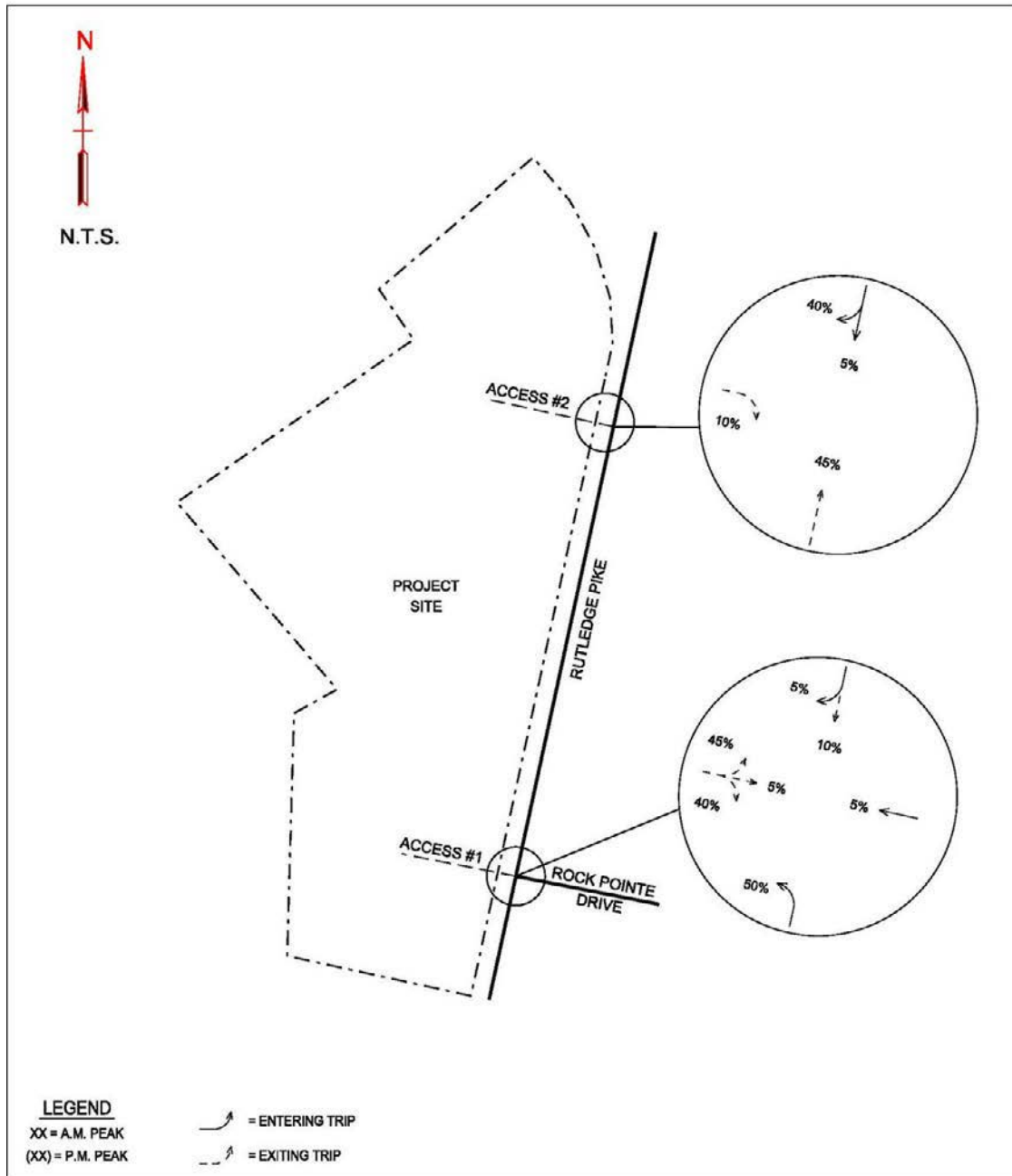


FIGURE 7  
TRIP DISTRIBUTION

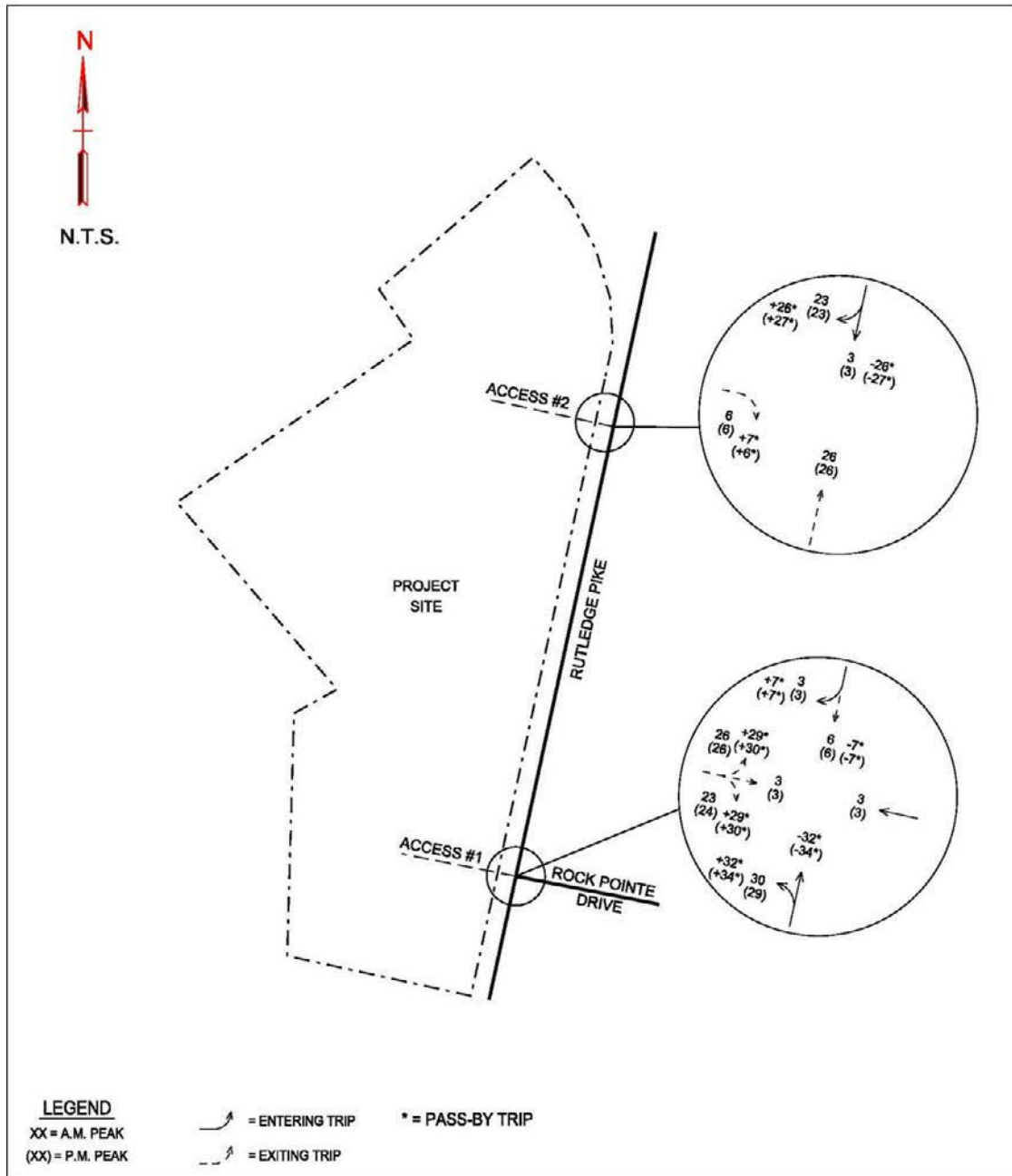


FIGURE 8  
TRIP ASSIGNMENT

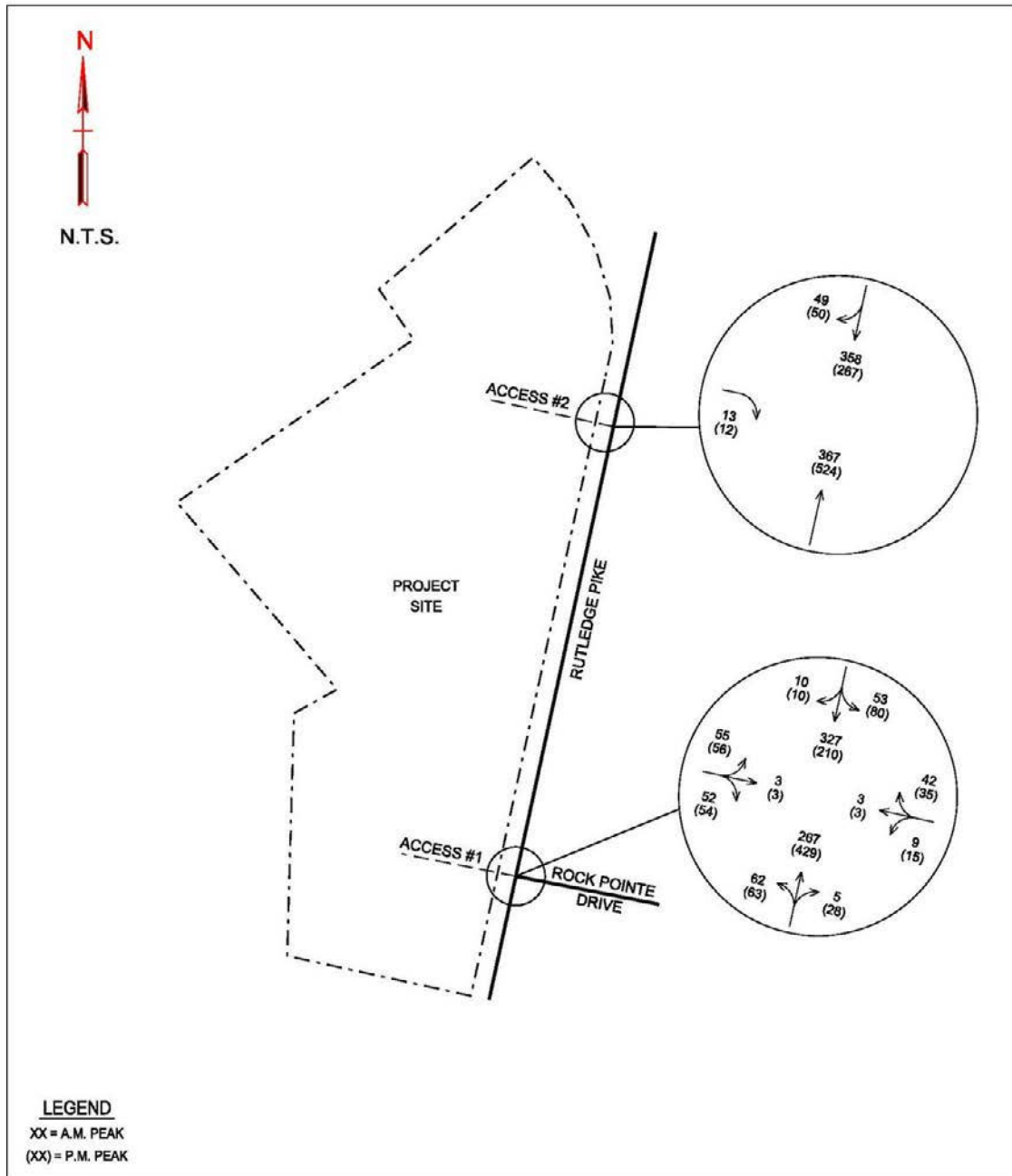


FIGURE 9  
2022 COMBINED TRAFFIC VOLUMES

## EVALUATIONS

### INTERSECTION CAPACITY ANALYSES

As discussed in the preceding sections of this report, capacity analyses employing the methods of the Highway Capacity Manual (HCM 6<sup>th</sup> Edition) were conducted for the study intersections. These analyses were performed for the previously discussed development scenario. A summary of the capacity analyses results is shown in TABLE 3, while the resulting conclusions and recommendations are covered in the CONCLUSIONS and RECOMMENDATIONS section of this report. The complete capacity analysis reports are contained in APPENDIX C.

TABLE 3: CAPACITY ANALYSES SUMMARY

INTERSECTION	TIME PERIOD	YEAR 2021 EXISTING (LOS/DELAY)	YEAR 2022 BACKGROUND (LOS/DELAY)	YEAR 2022 COMBINED (LOS/DELAY)
Rutledge Pike at Primary Access / Existing McCalla Avenue / Proposed Rock Pointe Drive <sup>1</sup> SIDE STREET STOP CONTROL	EB A.M. EB P.M.	-	-	C 18.9 C 17.8
	WB A.M. WB P.M.	B 10.5 B 13.0	B 10.5 B 13.1	B 12.0 C 15.3
Rutledge Pike at Secondary Access <sup>1</sup> SIDE STREET STOP CONTROL	EB A.M. EB P.M.	-	-	A 9.7 A 9.4

<sup>1</sup>SIDE STREET STOP CONTROL – Data shown are Level-of-Service and Average Vehicular Delay (seconds) for the critical side street approaches and major street left turn movements utilizing HCM methodology.

### TRAFFIC SIGNAL WARRANT ASSESSMENT

The traffic signal volume warrants from the Manual on Uniform Traffic Control Devices were evaluated for the study intersection of Rutledge Pike at Primary Access / McCalla Avenue / Rock Pointe Drive. Traffic signal warrant analyses were performed for the combined analysis scenario utilizing peak hour data. The results are summarized below and the spreadsheet summarizing the analysis is contained in APPENDIX D.

- Year 2022 Combined Traffic Volumes – *Peak Hour & Four-Hour signal warrants not satisfied*
  - AM Peak hour generated trips were added to volumes beginning at hours 7am & 8am
  - PM Peak hour generated trips were added to volumes beginning at hours 4pm, & 5pm

## **TURN LANE ASSESSMENTS**

A right-turn lane warrant evaluation was conducted for a potential right-turn lane on Rutledge Pike at the studied intersection of Rutledge Pike at Secondary Access (right-in / right-out). This evaluation found that a right-turn lane on Rutledge Pike is not warranted during the AM or PM peak hour.

Additionally, a left-turn lane warrant evaluation was conducted for the developer proposed northbound left-turn lane on Rutledge Pike at the studied intersection of Rutledge Pike at Primary Access. This evaluation found that a left-turn lane on Rutledge Pike is warranted for both the AM and PM peak hours. The capacity analysis and northbound left-turn vehicle queue were reviewed in order to determine the proposed northbound left-turn lane dimensions. The capacity analysis indicated typically around one vehicle would queue in the northbound left-turn lane during the AM and PM peak hours. In order to accommodate the possibility of more than one vehicle queuing in the proposed left-turn lane at a time, it is recommended to provide a 75-foot storage lane with an accommodating 180-foot taper.

Furthermore, the proposed northbound left-turn lane will be constructed within the merge area of the northbound ramp traffic from Magnolia Avenue and Asheville Highway to Rutledge Pike. In an effort to discourage inappropriate maneuvers from the Asheville Highway Ramp across the Magnolia Avenue Ramp and into the proposed left-turn lane, it is recommended to extend the existing solid white channelization line between the two ramps up to the beginning of the left turn lane storage. Flexible delineators could also be utilized to create a physical vertical barrier between the two ramps but would introduce a maintenance need if they were knocked down and needed to be replaced.

The evaluations utilized Knox County left and right-turn lane volume thresholds. The spreadsheets summarizing these evaluations are contained in APPENDIX E.

## **SIGHT DISTANCE ASSESSMENT**

Intersection sight distance was assessed looking both directions from the proposed site driveway intersections. Based on AASHTO sight distance requirements for 45 mph roadways, 500 feet of sight distance is required to make a left turn and 430 feet of sight distance is required to make a right turn from a side street stop-controlled scenario.

At the primary and secondary site access intersections, the available sight distance is well in excess of the 430 feet required to make a right turn from a side street stop-controlled scenario. The southbound approach to the proposed site driveway intersections is relatively flat, straight and without sight limiting vegetation or fixed objects.

At the primary site access intersection, the available sight distance is in excess of the 500 feet required to make a left turn from a side street stop-controlled scenario. Field measurements indicate around 550 feet of sight distance is available when looking right to make a left turn from the proposed primary site access intersection. Care should be taken during the site development process to ensure that site features such as landscaping and signage to do not restrict the existing sight distances.

## CONCLUSIONS & RECOMMENDATIONS

The primary conclusion of this study is that the traffic generated from the proposed development will not have a significant impact on the studied site access intersections at Rutledge Pike. Intersection levels-of-service are expected to be "C" or better exiting the site during peak traffic periods for the primary site access intersection and levels-of-service "A" exiting the site during peak traffic periods for the secondary site access intersection.

The following is a listing of recommendations that were developed to address traffic concerns in the vicinity of the project site:

1. Rutledge Pike at Primary Access / Existing McCalla Avenue / Proposed Rock Pointe Drive:
  - a. Install fourth leg (Proposed Primary Access) to the existing intersection of McCalla Avenue / Proposed Rock Pointe Drive at Rutledge Pike.
  - b. Install northbound left-turn lane with 75-foot storage lane and 180-foot taper
  - c. Extend the existing solid white channelization line between the northbound ramps of Magnolia Avenue and Asheville Highway up to the beginning of the proposed left-turn lane to discourage drivers from making inappropriate maneuvers from the Asheville Highway Ramp to the proposed left-turn lane.
2. Rutledge Pike at Secondary Access (Right-in / Right-out):
  - a. Create new right-in / right-out intersection at Rutledge Pike
  - b. Install a raised concrete channelization island to further enforce the right-in / right-out operation.
3. Maintain intersection corner sight distances on the site driveway by ensuring that site grading, landscaping, signage, and other site features do not restrict intersection sight distance lines of sight.

**APPENDIX**

**APPENDIX ORDER:**

**A. TRAFFIC DATA**

**B. TRIP GENERATION INFORMATION**

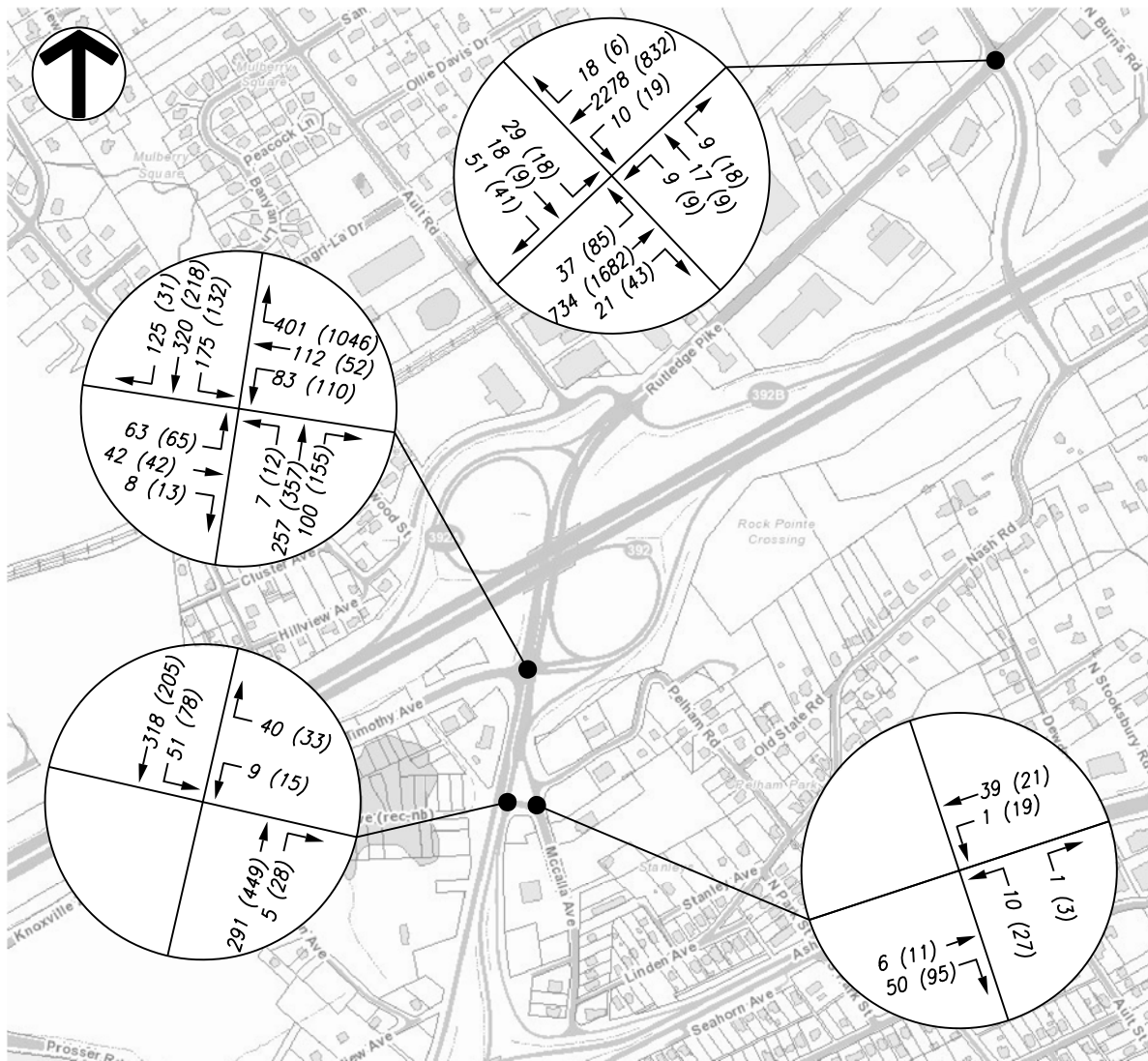
**C. CAPACITY ANALYSES**

**D. SIGNAL WARRANT SPREADSHEETS**

**E. TURN LANE WARRANT SHEETS**

**F. TIS COMMENT RESPONSE DOCUMENT**

**APPENDIX A – TRAFFIC DATA**



**LEGEND:**

← 5 (16)      TURNING MOVEMENT VOLUME AM (PM)

Figure 4: Combined 2020 Existing Peak Hour Traffic

**APPENDIX B – TRIP GENERATION INFORMATION**

## Land Use: 853

### Convenience Market with Gasoline Pumps

#### Description

This land use includes convenience markets with gasoline pumps where the primary business is the selling of convenience items, not the fueling of motor vehicles. The sites included in this land use category have the following two specific characteristics:

- The gross floor area of the convenience market is at least 2,000 gross square feet
- The number of vehicle fueling positions is less than 10

Convenience market (Land Use 851), gasoline/service station (Land Use 944), gasoline/service station with convenience market (Land Use 945), and super convenience market/gas station (Land Use 960) are related uses.

#### Additional Data

The independent variable, vehicle fueling positions, is defined as the maximum number of vehicles that can be fueled simultaneously.

Time-of-day distribution data for this land use are presented in Appendix A. For the 31 general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:30 and 8:30 a.m. and 4:45 and 5:45 p.m., respectively.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Alberta (CAN), Arkansas, Delaware, Florida, Indiana, Iowa, Kentucky, Maryland, Massachusetts, Minnesota, New Hampshire, Rhode Island, South Dakota, Texas, Vermont, and Washington.

#### Source Numbers

221, 274, 288, 300, 340, 350, 351, 352, 355, 359, 718, 810, 813, 853, 882, 883, 888, 926, 927, 936, 977

# Convenience Market with Gasoline Pumps (853)

Vehicle Trip Ends vs: Vehicle Fueling Positions  
On a: Weekday

Setting/Location: General Urban/Suburban

Number of Studies: 36

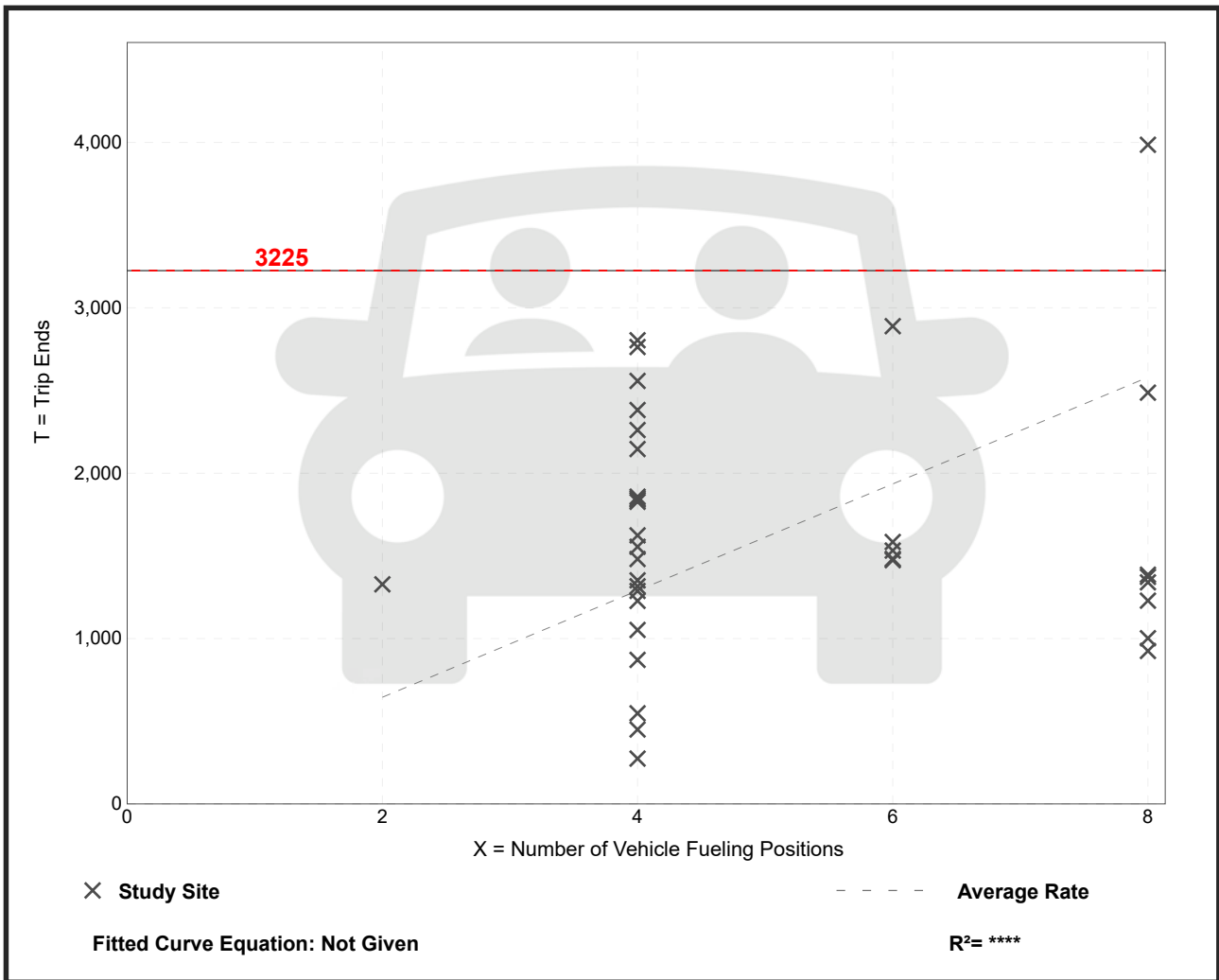
Avg. Num. of Vehicle Fueling Positions: 5

Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per Vehicle Fueling Position

Average Rate	Range of Rates	Standard Deviation
322.50	68.50 - 701.00	173.92

## Data Plot and Equation



# Convenience Market with Gasoline Pumps (853)

Vehicle Trip Ends vs: Vehicle Fueling Positions

On a: Weekday,  
Peak Hour of Adjacent Street Traffic,  
One Hour Between 7 and 9 a.m.

Setting/Location: General Urban/Suburban

Number of Studies: 59

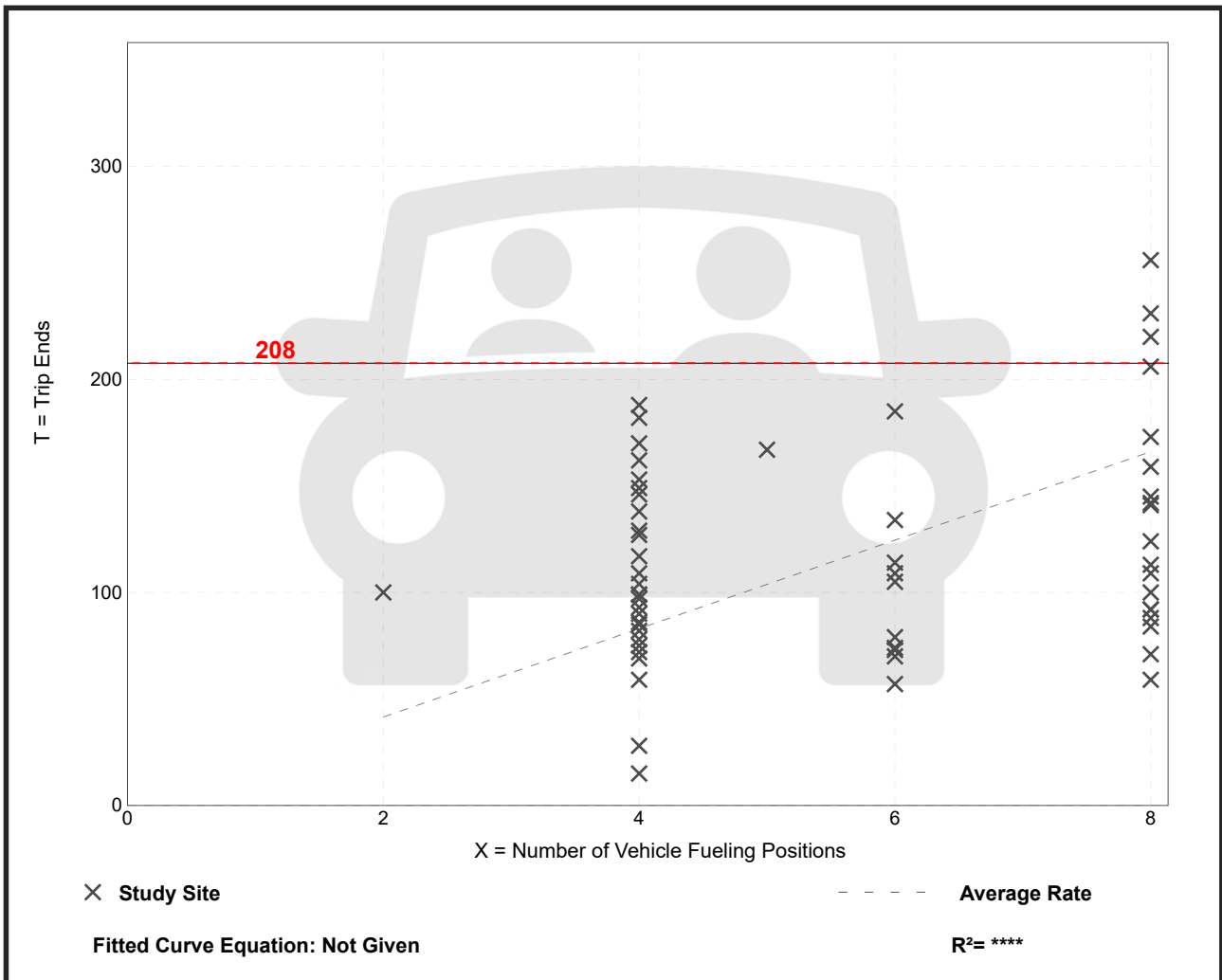
Avg. Num. of Vehicle Fueling Positions: 6

Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per Vehicle Fueling Position

Average Rate	Range of Rates	Standard Deviation
20.76	3.75 - 50.00	9.88

## Data Plot and Equation



# Convenience Market with Gasoline Pumps (853)

Vehicle Trip Ends vs: Vehicle Fueling Positions

On a: Weekday,  
Peak Hour of Adjacent Street Traffic,  
One Hour Between 4 and 6 p.m.

Setting/Location: General Urban/Suburban

Number of Studies: 69

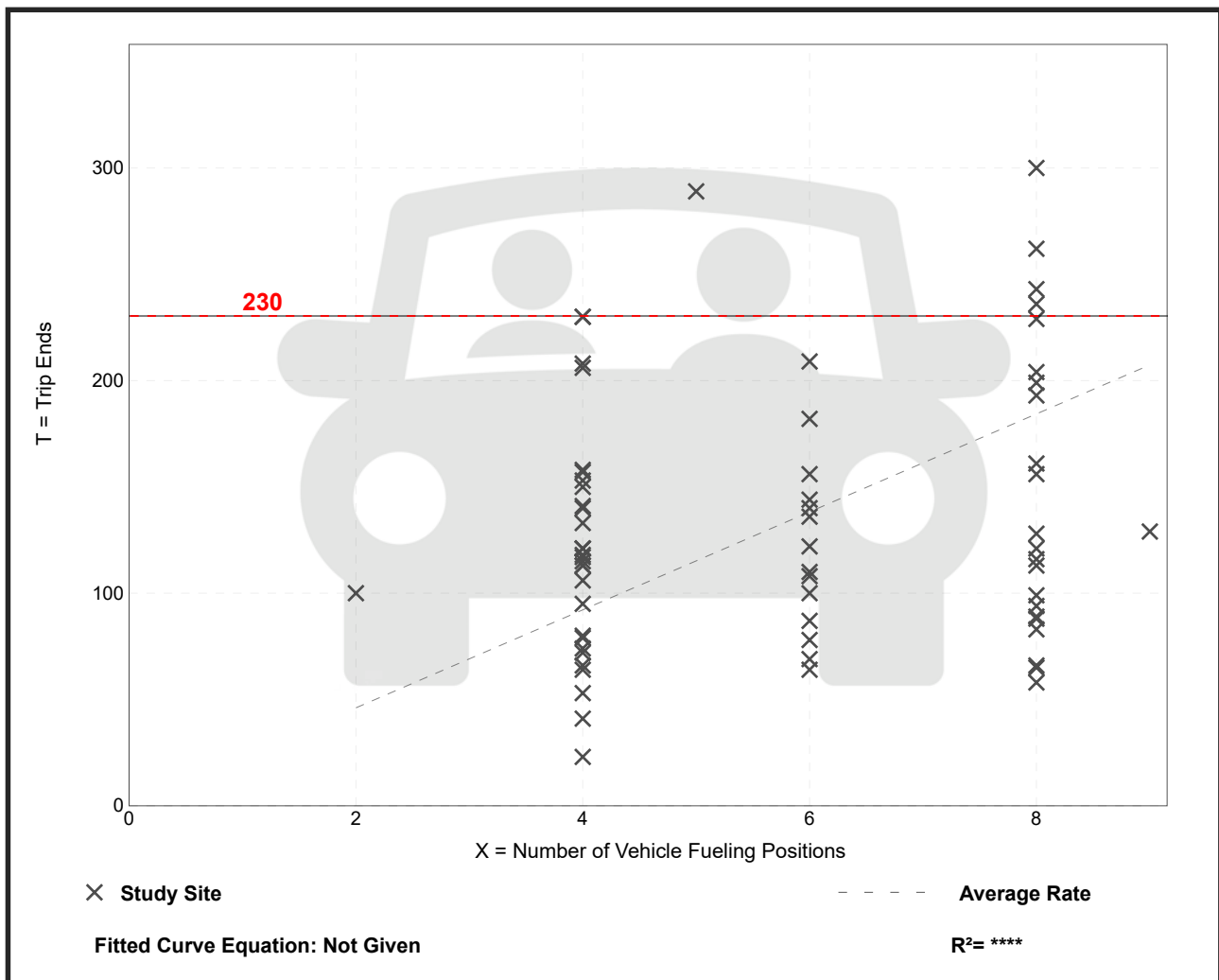
Avg. Num. of Vehicle Fueling Positions: 6

Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per Vehicle Fueling Position

Average Rate	Range of Rates	Standard Deviation
23.04	5.75 - 57.80	11.91

## Data Plot and Equation



# Land Use: 934

## Fast-Food Restaurant with Drive-Through Window

### Description

This category includes fast-food restaurants with drive-through windows. This type of restaurant is characterized by a large drive-through clientele, long hours of service (some are open for breakfast, all are open for lunch and dinner, some are open late at night or 24 hours a day) and high turnover rates for eat-in customers. These limited-service eating establishments do not provide table service. Non-drive-through patrons generally order at a cash register and pay before they eat. Fast casual restaurant (Land Use 930), high-turnover (sit-down) restaurant (Land Use 932), fast-food restaurant without drive-through window (Land Use 933), and fast-food restaurant with drive-through window and no indoor seating (Land Use 935) are related uses.

### Additional Data

***Users should exercise caution when applying statistics during the AM peak periods, as the sites contained in the database for this land use may or may not be open for breakfast. In cases where it was confirmed that the sites were not open for breakfast, data for the AM peak hour of the adjacent street traffic were removed from the database.***

The outdoor seating area is not included in the overall gross floor area. Therefore, the number of seats may be a more reliable independent variable on which to establish trip generation rates for facilities having significant outdoor seating.

Time-of-day distribution data for this land use for a weekday, Saturday, and Sunday are presented in Appendix A. For the 46 general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 11:45 a.m. and 12:45 p.m. and 12:00 and 1:00 p.m., respectively. For the one dense multi-use urban site with data, the same AM and PM peak hours were observed.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Alaska, Alberta (CAN), California, Colorado, Florida, Indiana, Kentucky, Maryland, Massachusetts, Minnesota, Montana, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Dakota, Texas, Vermont, Virginia, Washington, and Wisconsin.

### Source Numbers

163, 164, 168, 180, 181, 241, 245, 278, 294, 300, 301, 319, 338, 340, 342, 358, 389, 438, 502, 552, 577, 583, 584, 617, 640, 641, 704, 715, 728, 810, 866, 867, 869, 885, 886, 927, 935, 962, 977

# Fast-Food Restaurant with Drive-Through Window (934)

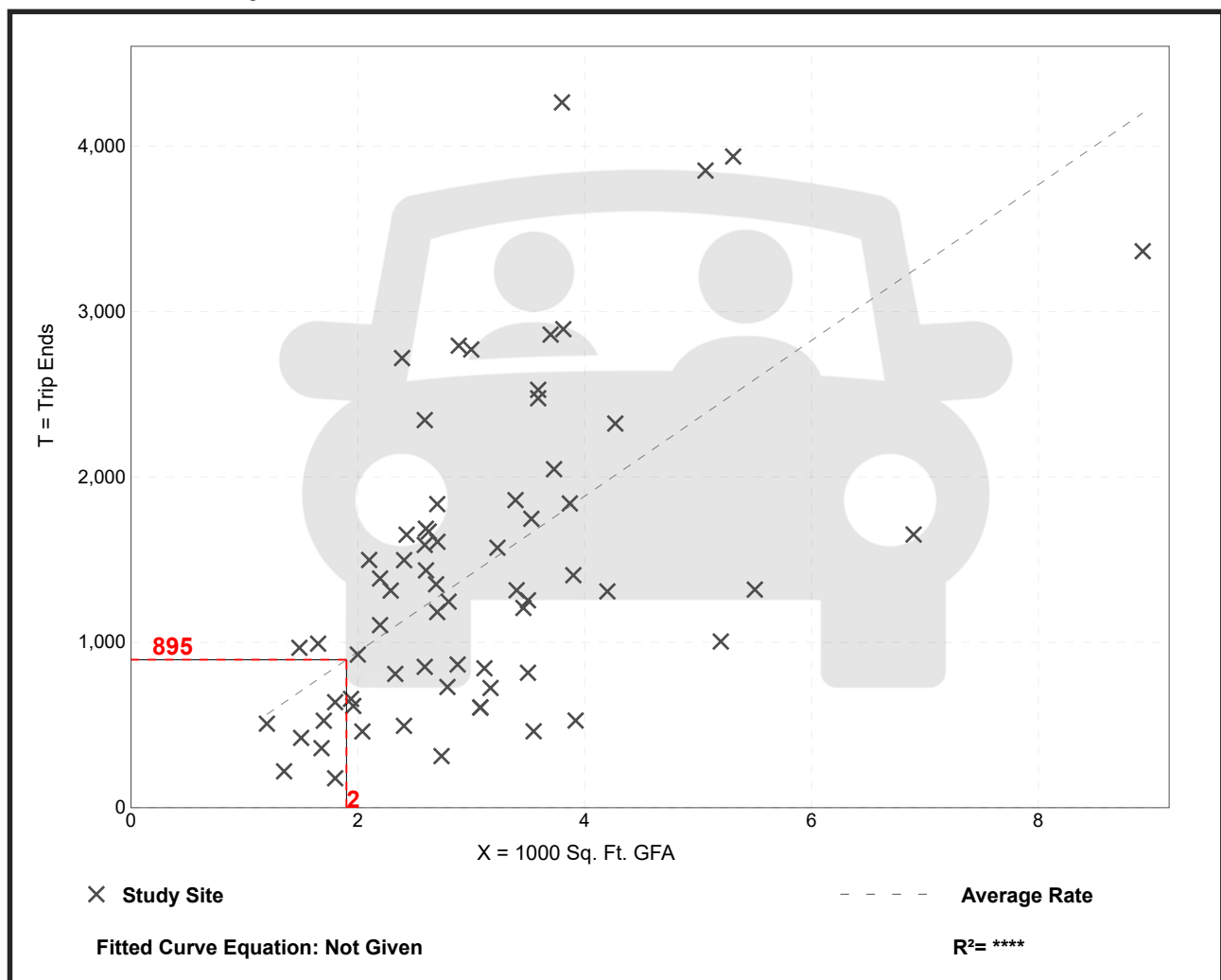
Vehicle Trip Ends vs: 1000 Sq. Ft. GFA  
On a: Weekday

Setting/Location: General Urban/Suburban  
Number of Studies: 67  
Avg. 1000 Sq. Ft. GFA: 3  
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
470.95	98.89 - 1137.66	244.44

## Data Plot and Equation



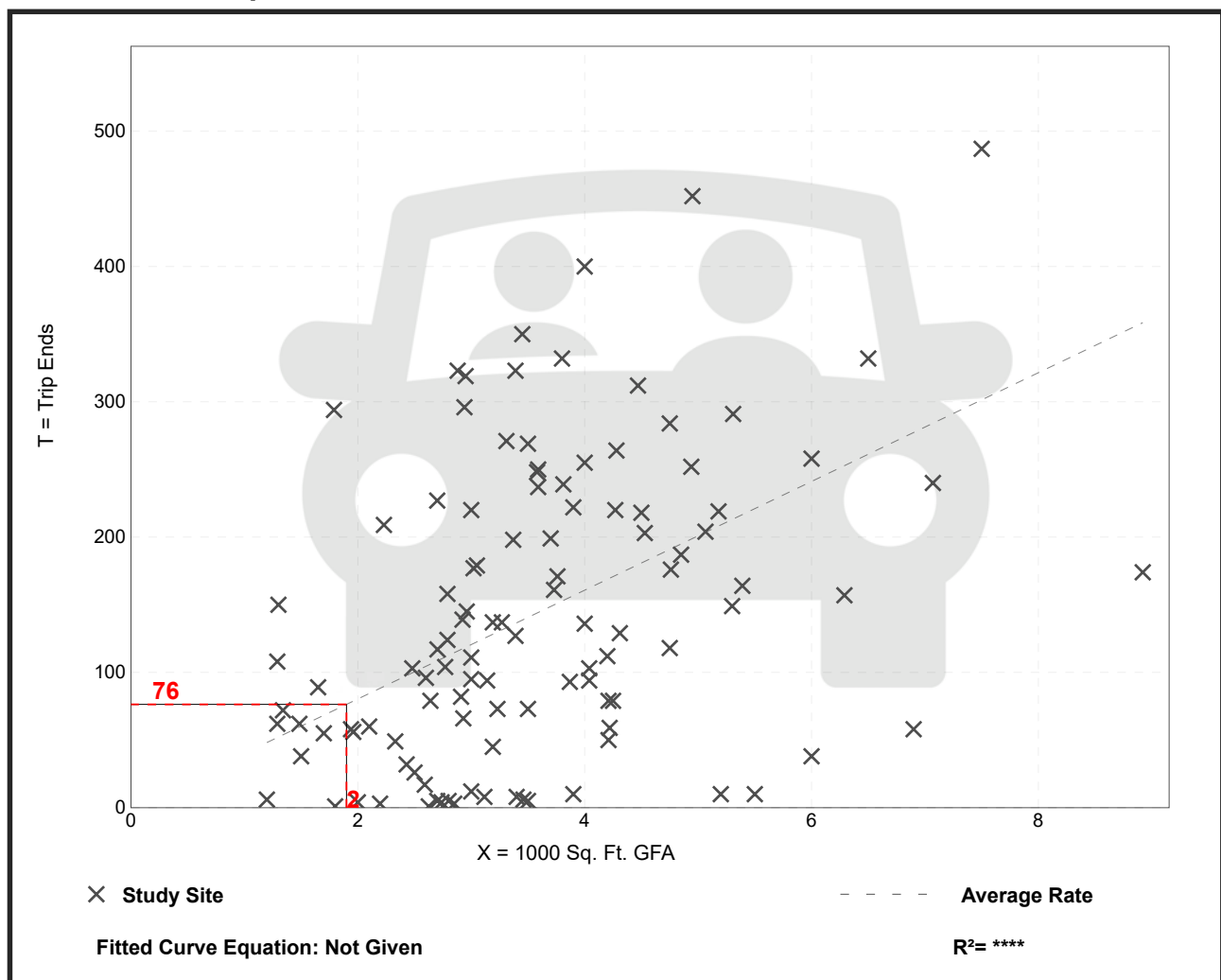
# Fast-Food Restaurant with Drive-Through Window (934)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA  
 On a: Weekday,  
 Peak Hour of Adjacent Street Traffic,  
 One Hour Between 7 and 9 a.m.  
 Setting/Location: General Urban/Suburban  
 Number of Studies: 111  
 Avg. 1000 Sq. Ft. GFA: 4  
 Directional Distribution: 51% entering, 49% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
40.19	0.38 - 164.25	28.78

## Data Plot and Equation



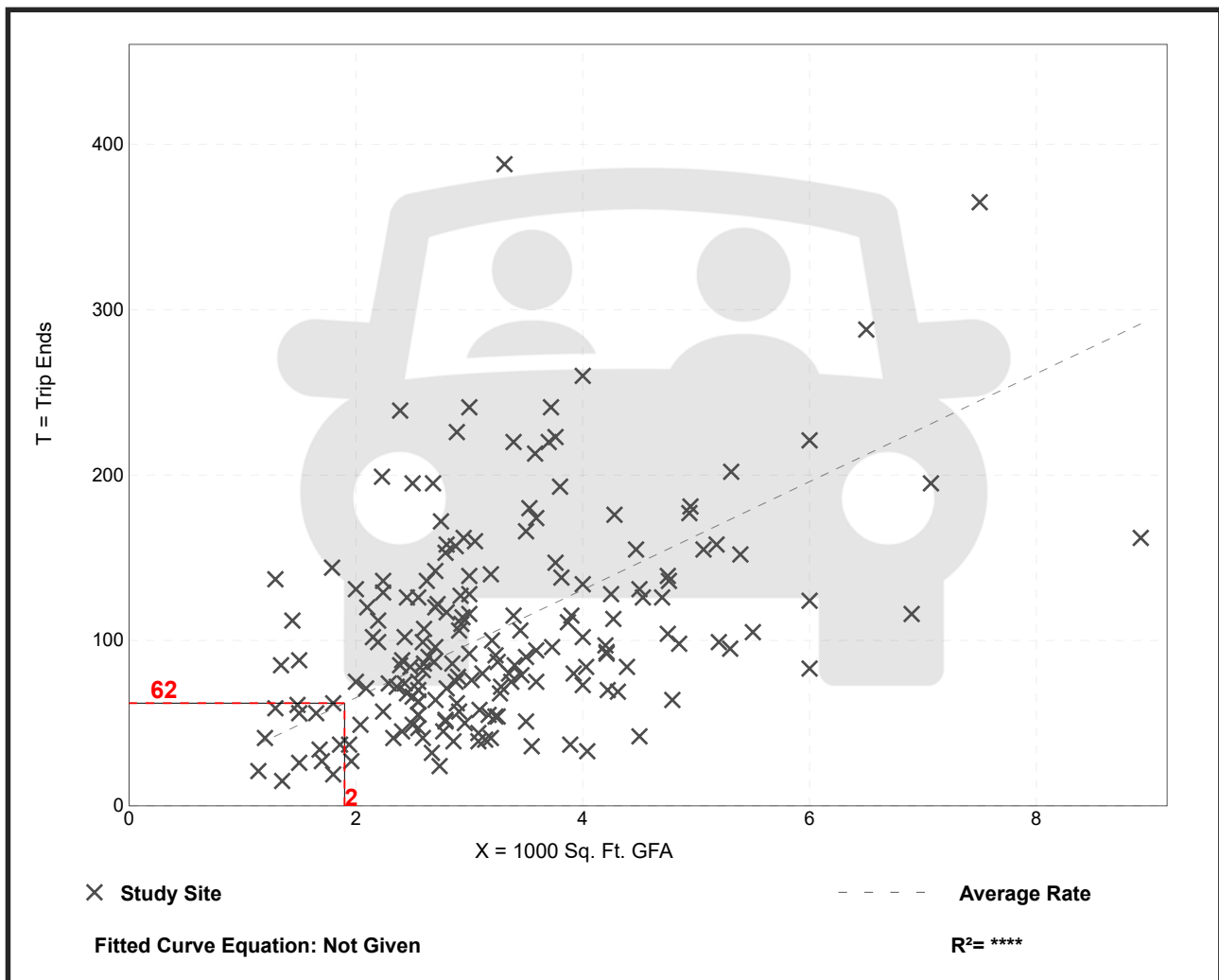
# Fast-Food Restaurant with Drive-Through Window (934)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA  
 On a: Weekday,  
 Peak Hour of Adjacent Street Traffic,  
 One Hour Between 4 and 6 p.m.  
 Setting/Location: General Urban/Suburban  
 Number of Studies: 185  
 Avg. 1000 Sq. Ft. GFA: 3  
 Directional Distribution: 52% entering, 48% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
32.67	8.17 - 117.22	17.87

## Data Plot and Equation



NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	Kenjo Market w/ Fast Food			Organization:	Cannon & Cannon, Inc.
Project Location:	Rutledge Pike			Performed By:	Wesley Stokes, PE
Scenario Description:				Date:	7/12/2021
Analysis Year:	2022			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				0		
Retail	853	10	Pumps	208	104	104
Restaurant	934	1,900	SF	76	39	37
Cinema/Entertainment				0		
Residential				0		
Hotel				0		
All Other Land Uses <sup>2</sup>				0		
				284	143	141

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						
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses <sup>2</sup>						

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		14	0	0	0
Restaurant	0	5		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	284	143	141
Internal Capture Percentage	13%	13%	13%
External Vehicle-Trips <sup>5</sup>	246	124	122
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	5%	13%
Restaurant	36%	14%
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

<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-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>	Kenjo Market w/ Fast Food
<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	104	104	1.00	104	104
Restaurant	1.00	39	39	1.00	37	37
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

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	30		14	0	15	0
Restaurant	11	5		0	1	1
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	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		33	9	0	0	0
Retail	0		20	0	0	0
Restaurant	0	8		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	18	8	0		0
Hotel	0	4	2	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	99	104	99	0	0
Restaurant	14	25	39	25	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	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	14	90	104	90	0	0
Restaurant	5	32	37	32	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	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:	Kenjo Market w/ Fast Food			Organization:	Cannon & Cannon, Inc.
Project Location:	Rutledge Pike			Performed By:	Wesley Stokes, PE
Scenario Description:				Date:	7/12/2021
Analysis Year:	2022			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				0		
Retail	853	10	Pumps	230	115	115
Restaurant	934	1,900	SF	62	32	30
Cinema/Entertainment				0		
Residential				0		
Hotel				0		
All Other Land Uses <sup>2</sup>				0		
				292	147	145

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						
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses <sup>2</sup>						

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		9	0	0	0
Restaurant	0	12		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	292	147	145
Internal Capture Percentage	14%	14%	14%
External Vehicle-Trips <sup>5</sup>	250	126	124
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	10%	8%
Restaurant	28%	40%
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

<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>	Kenjo Market w/ Fast Food
<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	115	115	1.00	115	115
Restaurant	1.00	32	32	1.00	30	30
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

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		33	5	30	6
Restaurant	1	12		2	5	2
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

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		9	1	0	0	0
Retail	0		9	0	0	0
Restaurant	0	58		0	0	0
Cinema/Entertainment	0	5	1		0	0
Residential	0	12	4	0		0
Hotel	0	2	2	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	12	103	115	103	0	0
Restaurant	9	23	32	23	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	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	9	106	115	106	0	0
Restaurant	12	18	30	18	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	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 C – CAPACITY ANALYSES**

## CAPACITY AND LEVEL-OF-SERVICE CONCEPTS

In a general sense, a roadway is similar to a pipeline or other material carrying conduit in that it has a certain capacity for the amount of material (vehicles) that it can efficiently carry. As the number of vehicles in a given time period gradually increases, the quality of traffic flow gradually decreases. On roadway sections this results in increasing turbulence in the traffic stream, and at intersections it results in increasing stops and delay. As the volumes begin to approach the capacity of the facility, these problems rapidly magnify, with resulting serious levels of congestion, stops, delay, excess fuel consumption, pollutant emissions, etc.

The Transportation Research Board has published the Year 2010 Highway Capacity Manual (HCM2010), which establishes theoretical techniques to quantify the capacity conditions on all types of roadways, intersections, ramps, pedestrian facilities, etc. A basic concept that is applicable to most of these techniques is the idea of level of service (LOS). This concept establishes a rating system that quantifies the quality of traffic flow, as perceived by motorists and/or passengers. The general system is similar to a school grade scale, and is outlined as follows:

Level of Service (LOS)	General Quality of Traffic Flow	Description of Corresponding Conditions
A	Excellent	Roadways – Free flow, high maneuverability Intersections – Very few stops, very low delay
B	Very Good	Roadways – Free flow, slightly lower maneuverability Intersections – Minor stops, low delay
C	Good	Roadways – Stable flow, restricted maneuverability Intersections – Significant stops, significant delay
D	Fair	Roadways – Marginally stable flow, congestion seriously restricts maneuverability Intersections – High stops, long but tolerable delay
E	Poor	Roadways – Unstable flow*, lower operating speeds, congestion severely restricts maneuverability Intersections – All vehicles stop, very long queues and very long intolerable delay
F	Very Poor	Roadways – Forced flow, stoppages may be lengthy, congestion severely restricts maneuverability Intersections – All vehicles stop, extensive queues and extremely long intolerable delay

\*Unstable flow is such that minor fluctuations or disruptions can result in rapid degradation to LOS F.

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**LOS CRITERIA: SIGNALIZED & UNSIGNALIZED INTERSECTIONS**

LOS	CONTROL DELAY (S/VEH)		
	SIGNALIZED	UNSIGNALIZED	ROUNDBABOUT
A	≤10	≤10	≤10
B	>10-20	>10-15	>10-15
C	>20-35	>15-25	>15-25
D	>35-55	>25-35	>25-35
E	>55-80	>35-50	>35-50
F	>80	>50	>50

Another measure of intersection capacity that is often used in the evaluation of intersection operations is the volume to capacity (V/C) ratio. This ratio is defined as “the ratio of flow rate to capacity”, and is a good measure of how much of an intersection’s available capacity has been used up by the analysis volumes. Conversely, it also provides an indication of the reserve capacity available for future growth in traffic volumes.

The Intersection Capacity Utilization (ICU) is another measure that expresses a value similar to the V/C ratio. Specifically, the ICU method “sums the amount of the time required to serve all movements at saturation for a given cycle length and divides by that reference cycle length.” The ICU is considered a more accurate measure of volume to capacity conditions for a signalized intersection, primarily because it accounts for the effects of the signal timing on intersection capacity.

# HCS7 Two-Way Stop-Control Report

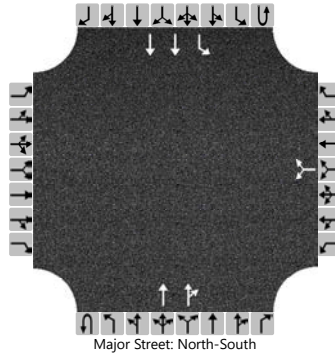
## General Information

Analyst	Wesley Stokes
Agency/Co.	Cannon & Cannon, Inc.
Date Performed	7/21/2021
Analysis Year	2021
Time Analyzed	AM Peak
Intersection Orientation	North-South
Project Description	2021 Existing

## Site Information

Intersection	Rutledge at McCalla
Jurisdiction	Knoxville
East/West Street	McCalla / Rock Pointe
North/South Street	Rutledge Pike
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	2	0	0	1	2	0
Configuration							LR				T	TR		L	T	
Volume (veh/h)						9		41			295	5	0	52	323	
Percent Heavy Vehicles (%)						3		3					3	3		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.5		6.9						4.1		
Critical Headway (sec)						6.86		6.96						4.16		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.53		3.33						2.23		

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						54								57		
Capacity, c (veh/h)						708								1223		
v/c Ratio						0.08								0.05		
95% Queue Length, Q <sub>95</sub> (veh)						0.2								0.1		
Control Delay (s/veh)						10.5								8.1		
Level of Service (LOS)						B								A		
Approach Delay (s/veh)					10.5								1.1			
Approach LOS					B											

# HCS7 Two-Way Stop-Control Report

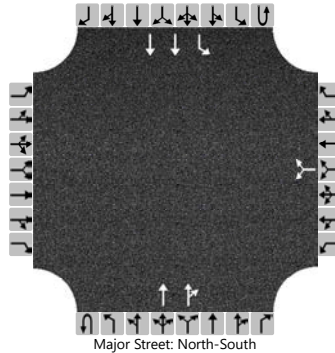
## General Information

Analyst	Wesley Stokes
Agency/Co.	Cannon & Cannon, Inc.
Date Performed	7/21/2021
Analysis Year	2021
Time Analyzed	PM Peak
Intersection Orientation	North-South
Project Description	2021 Existing

## Site Information

Intersection	Rutledge at McCalla
Jurisdiction	Knoxville
East/West Street	McCalla / Rock Pointe
North/South Street	Rutledge Pike
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	2	0	0	1	2	0
Configuration							LR				T	TR		L	T	
Volume (veh/h)						15		34			456	28	0	79	208	
Percent Heavy Vehicles (%)						3		3					3	3		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.5		6.9						4.1		
Critical Headway (sec)						6.86		6.96						4.16		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.53		3.33						2.23		

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						53								86		
Capacity, c (veh/h)						504								1030		
v/c Ratio						0.11								0.08		
95% Queue Length, Q <sub>95</sub> (veh)						0.4								0.3		
Control Delay (s/veh)						13.0								8.8		
Level of Service (LOS)						B								A		
Approach Delay (s/veh)					13.0								2.4			
Approach LOS					B											

# HCS7 Two-Way Stop-Control Report

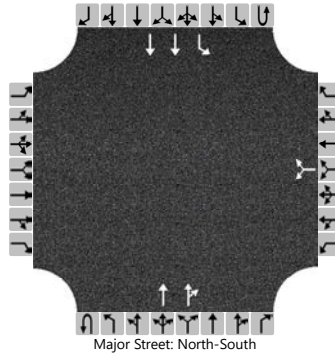
## General Information

Analyst	Wesley Stokes
Agency/Co.	Cannon & Cannon, Inc.
Date Performed	7/21/2021
Analysis Year	2022
Time Analyzed	AM Peak
Intersection Orientation	North-South
Project Description	2022 Background

## Site Information

Intersection	Rutledge at McCalla
Jurisdiction	Knoxville
East/West Street	McCalla / Rock Pointe
North/South Street	Rutledge Pike
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	2	0	0	1	2	0
Configuration							LR				T	TR		L	T	
Volume (veh/h)						9		42			299	5	0	53	328	
Percent Heavy Vehicles (%)						3		3					3	3		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.5		6.9						4.1		
Critical Headway (sec)						6.86		6.96						4.16		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.53		3.33						2.23		

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						55								58		
Capacity, c (veh/h)						706								1219		
v/c Ratio						0.08								0.05		
95% Queue Length, Q <sub>95</sub> (veh)						0.3								0.1		
Control Delay (s/veh)						10.5								8.1		
Level of Service (LOS)						B								A		
Approach Delay (s/veh)					10.5								1.1			
Approach LOS					B											

# HCS7 Two-Way Stop-Control Report

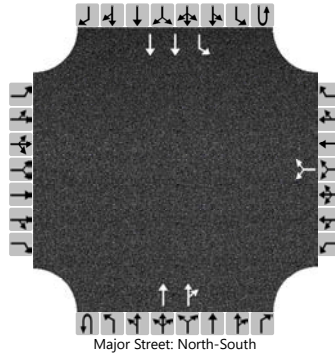
## General Information

Analyst	Wesley Stokes
Agency/Co.	Cannon & Cannon, Inc.
Date Performed	7/21/2021
Analysis Year	2022
Time Analyzed	PM Peak
Intersection Orientation	North-South
Project Description	2022 Background

## Site Information

Intersection	Rutledge at McCalla
Jurisdiction	Knoxville
East/West Street	McCalla / Rock Pointe
North/South Street	Rutledge Pike
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	2	0	0	1	2	0
Configuration							LR				T	TR		L	T	
Volume (veh/h)						15		35			463	28	0	80	211	
Percent Heavy Vehicles (%)						3		3					3	3		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.5		6.9						4.1		
Critical Headway (sec)						6.86		6.96						4.16		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.53		3.33						2.23		

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						54								87		
Capacity, c (veh/h)						501								1023		
v/c Ratio						0.11								0.08		
95% Queue Length, Q <sub>95</sub> (veh)						0.4								0.3		
Control Delay (s/veh)						13.1								8.8		
Level of Service (LOS)						B								A		
Approach Delay (s/veh)					13.1								2.4			
Approach LOS					B											

# HCS7 Two-Way Stop-Control Report

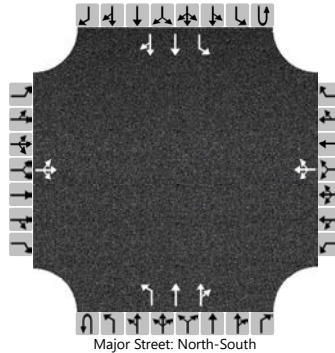
## General Information

Analyst	Wesley Stokes
Agency/Co.	Cannon & Cannon, Inc.
Date Performed	7/21/2021
Analysis Year	2022
Time Analyzed	AM Peak
Intersection Orientation	North-South
Project Description	2022 Combined

## Site Information

Intersection	Rutledge at McCalla
Jurisdiction	Knoxville
East/West Street	McCalla / Rock Pointe
North/South Street	Rutledge Pike
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	2	0	0	1	2	0
Configuration			LTR				LTR			L	T	TR		L	T	TR
Volume (veh/h)		55	3	52		9	3	42	0	62	267	5	0	53	327	10
Percent Heavy Vehicles (%)		3	3	3		3	3	3	3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			120				59			67				58		
Capacity, c (veh/h)			378				572			1182				1255		
v/c Ratio			0.32				0.10			0.06				0.05		
95% Queue Length, Q <sub>95</sub> (veh)			1.3				0.3			0.2				0.1		
Control Delay (s/veh)			18.9				12.0			8.2				8.0		
Level of Service (LOS)			C				B			A				A		
Approach Delay (s/veh)	18.9				12.0				1.5				1.1			
Approach LOS	C				B											

# HCS7 Two-Way Stop-Control Report

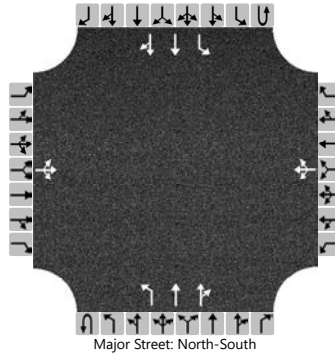
## General Information

Analyst	Wesley Stokes
Agency/Co.	Cannon & Cannon, Inc.
Date Performed	7/21/2021
Analysis Year	2022
Time Analyzed	PM Peak
Intersection Orientation	North-South
Project Description	2022 Combined

## Site Information

Intersection	Rutledge at McCalla
Jurisdiction	Knoxville
East/West Street	McCalla / Rock Pointe
North/South Street	Rutledge Pike
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	2	0	0	1	2	0
Configuration			LTR				LTR			L	T	TR		L	T	TR
Volume (veh/h)		56	3	54		15	3	35	0	63	429	28	0	53	210	10
Percent Heavy Vehicles (%)		3	3	3		3	3	3	3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			123				58			68				58		
Capacity, c (veh/h)			403				408			1318				1056		
v/c Ratio			0.30				0.14			0.05				0.05		
95% Queue Length, Q <sub>95</sub> (veh)			1.3				0.5			0.2				0.2		
Control Delay (s/veh)			17.8				15.3			7.9				8.6		
Level of Service (LOS)			C				C			A				A		
Approach Delay (s/veh)	17.8				15.3				1.0				1.7			
Approach LOS	C				C											

# HCS7 Two-Way Stop-Control Report

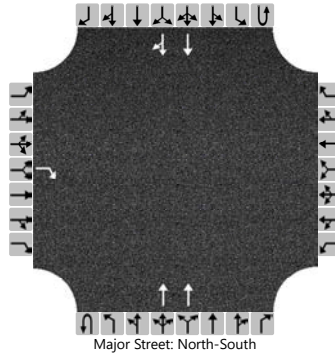
## General Information

Analyst	Wesley Stokes
Agency/Co.	Cannon & Cannon, Inc.
Date Performed	7/21/2021
Analysis Year	2022
Time Analyzed	AM Peak
Intersection Orientation	North-South
Project Description	2022 Combined

## Site Information

Intersection	Rutledge at Second Access
Jurisdiction	Knoxville
East/West Street	Secondary Access (RIRO)
North/South Street	Rutledge Pike
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	1		0	0	0	0	0	2	0	0	0	2	0
Configuration				R							T				T	TR
Volume (veh/h)				13							367				358	49
Percent Heavy Vehicles (%)				3												
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No															
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)				6.9												
Critical Headway (sec)				6.96												
Base Follow-Up Headway (sec)				3.3												
Follow-Up Headway (sec)				3.33												

## Delay, Queue Length, and Level of Service

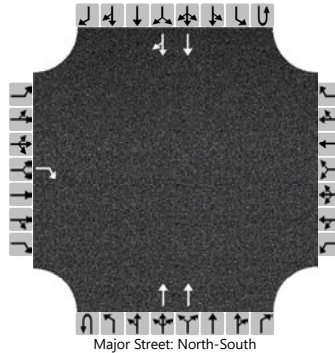
Flow Rate, v (veh/h)				14												
Capacity, c (veh/h)				779												
v/c Ratio				0.02												
95% Queue Length, Q <sub>95</sub> (veh)				0.1												
Control Delay (s/veh)				9.7												
Level of Service (LOS)				A												
Approach Delay (s/veh)	9.7															
Approach LOS	A															

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	Wesley Stokes	Intersection	Rutledge at Second Access
Agency/Co.	Cannon & Cannon, Inc.	Jurisdiction	Knoxville
Date Performed	7/21/2021	East/West Street	Secondary Access (RIRO)
Analysis Year	2022	North/South Street	Rutledge Pike
Time Analyzed	PM Peak	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	2022 Combined		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	1		0	0	0	0	0	2	0	0	0	2	0
Configuration				R							T				T	TR
Volume (veh/h)				12							524				267	50
Percent Heavy Vehicles (%)				3												
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No															
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)				6.9												
Critical Headway (sec)				6.96												
Base Follow-Up Headway (sec)				3.3												
Follow-Up Headway (sec)				3.33												

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				13												
Capacity, c (veh/h)				838												
v/c Ratio				0.02												
95% Queue Length, Q <sub>95</sub> (veh)				0.0												
Control Delay (s/veh)				9.4												
Level of Service (LOS)				A												
Approach Delay (s/veh)	9.4															
Approach LOS	A															

**APPENDIX D – SIGNAL WARRANT SPREADSHEETS**

## TRAFFIC SIGNAL WARRANT ANALYSIS - VOLUME WARRANTS

Intersection : Rutledge Pike at Primary Site Access / McCalla Ave / Rock Pointe Dr City or County : Knoxville State : Tennessee	Date of Count: Day of Week of Count:	Are warranting volumes to be adjusted for speeds or built up area? . . . . . No Adjustment factor for day of week and month of year of count . . . . . 1.00 Number of Lanes: Major Street . . 2 Minor Street . . 1
---	---	--

Time	Major Street			Minor Street		Warrant #1A (8 Hr. - Min. Vol.) Percent of Warrant	Warrant #1B (8 Hr. - Interruption) Percent of Warrant	Combination (Warrants 1A & 1B) Percent of Warrant	Warrant #2 (Four Hour Vols.)		Warrant #3 (Peak Hour Vols.)				
				Actual	Adjusted				Warrant	Percent of Warrant	Warrant	Percent of Warrant			
	App #1	App #2	Total	Volume	Total										
Beginning						Major	Minor	Major	Minor	Volume		Volume			
6:00 am	0	0	0	0	0	0	0	0	0	0	****	0	****		
7:00	390	334	724	724	110	121	73	101	92	230	48	390	28		
8:00	390	334	724	724	110	121	73	101	92	230	48	390	28		
9:00 am	0	0	0	0	0	0	0	0	0	0	****	0	****		
10:00	0	0	0	0	0	0	0	0	0	0	****	0	****		
11:00	0	0	0	0	0	0	0	0	0	0	****	0	****		
12:00 noon	0	0	0	0	0	0	0	0	0	0	****	0	****		
1:00	0	0	0	0	0	0	0	0	0	0	****	0	****		
2:00	0	0	0	0	0	0	0	0	0	0	****	0	****		
3:00 pm	0	0	0	0	0	0	0	0	0	0	****	0	****		
4:00	300	520	820	820	113	137	75	114	94	190	59	340	33		
5:00	300	520	820	820	113	137	75	114	94	190	59	340	33		
6:00 pm	0	0	0	0	0	0	0	0	0	0	****	0	****		
7:00	0	0	0	0	0	0	0	0	0	0	****	0	****		
8:00	0	0	0	0	0	0	0	0	0	0	****	0	****		
Note: , No adjustment made - Where more than one minor approach exists use the higher approach volume . Number of hours shown is the minimum meeting the MUTCD requirements. Additional hours outside of the count period may meet the MUTCD specified volume levels.						Warranting Volumes 600 150 Total Hours Meeting Warrant = 0 . Warrant Met No		Warranting Volumes 900 75 Total Hours Meeting Warrant = 0 . Warrant Met No		Warranting Volumes 720 120 Total Hours Meeting Warrant = 0 . Warrant Met No		Warranting Volumes From MUTCD Fig. 4-7 Total Hours Meeting Warrant = 0 . Warrant Met No		Warranting Volumes From MUTCD Fig. 4-5 Total Hours Meeting Warrant = 0 . Warrant Met No	

\*\*\*\*\* Major Street volume is so low that no Minor Street warrant exists

Comments: (include any information which may be useful to the reviewer  Major Street = Rutledge Pike Minor Street = Primary Site Access Point / McCalla Ave / Rock Pointe Dr All volumes included.	Major approach considered two lane Minor approach considered single lane
--	---

Analysis Prepared by: CANNON AND CANNON, INC. Wesley Stokes, P.E.	Date: 07/22/21 Time: 11:37	Developed by: T. Darcy Sullivan, P.E. Distributed by: Tennessee Transportation Assistance Program (TTAP)
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VC/R1

**APPENDIX E – TURN LANE WARRANT SHEET**

TABLE 5B  
KNOX COUNTY RIGHT-TURN LANE VOLUME THRESHOLDS  
FOR 2-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH

Project No: 00590-0012  
Project Name: Kenjo Market Redevelopment  
Notes:

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	< 100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25						
25 - 49						
50 - 99						
100 - 149						
150 - 199						
200 - 249						Yes
250 - 299					Yes	Yes
300 - 349				Yes	Yes	Yes
350 - 399			Yes	Yes	Yes	Yes
400 - 449			Yes	Yes	Yes	Yes
450 - 499		Yes	Yes	Yes	Yes	Yes
500 - 549		Yes	Yes	Yes	Yes	Yes
550 - 599	Yes	Yes	Yes	Yes	Yes	Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	= / > 600
Fewer Than 25						
25 - 49					Yes	Yes
50 - 99				Yes	Yes	Yes
100 - 149			Yes	Yes	Yes	Yes
150 - 199		Yes	Yes	Yes	Yes	Yes
200 - 249	Yes	Yes	Yes	Yes	Yes	Yes
250 - 299	Yes	Yes	Yes	Yes	Yes	Yes
300 - 349	Yes	Yes	Yes	Yes	Yes	Yes
350 - 399	Yes	Yes	Yes	Yes	Yes	Yes
400 - 449	Yes	Yes	Yes	Yes	Yes	Yes
450 - 499	Yes	Yes	Yes	Yes	Yes	Yes
500 - 549	Yes	Yes	Yes	Yes	Yes	Yes
550 - 599	Yes	Yes	Yes	Yes	Yes	Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

\* Or through volume only if a left-turn lane exists

Intersection	Time Period	Through Volume	Right-Turn Volume	Right-Turn Lane Warranted (Yes / No)
RIRO at Rutledge	AM Peak	$358 / 2 = 179$	49	No
RIRO at Rutledge	PM Peak	$267 / 2 = 134$	50	No

Note: Rutledge Pike has two lanes in southbound direction so through volumes were divided by two for warrant calculation

TABLE 5A  
KNOX COUNTY LEFT-TURN LANE VOLUME THRESHOLDS  
FOR 2-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH

Project No: 00590-0012  
Project Name: Kenjo Market Redevelopment  
Notes:

(If the left-turn volume exceeds the table value a left-turn lane is needed)

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149	250	180	140	110	80	70
150 - 199	200	140	105	90	70	60
200 - 249	160	115	85	75	65	55
250 - 299	130	100	75	65	60	50
300 - 349	110	90	70	60	55	45
350 - 399	100	80	65	55	50	40
400 - 449	90	70	60	50	45	35
450 - 499	80	65	55	45	40	30
500 - 549	70	60	45	35	35	25
550 - 599	65	55	40	35	30	25
600 - 649	60	45	35	30	25	25
650 - 699	55	35	35	30	25	20
700 - 749	50	35	30	25	20	20
750 or More	45	35	25	25	20	20

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	= / > 600
100 - 149	70	60	50	45	40	35
150 - 199	60	55	45	40	35	30
200 - 249	55	50	40	35	30	30
250 - 299	50	45	35	30	30	30
300 - 349	45	40	35	30	25	25
350 - 399	40	35	30	25	25	20
400 - 449	35	30	30	25	20	20
450 - 499	30	25	25	20	20	20
500 - 549	25	25	20	20	20	15
550 - 599	25	20	20	20	20	15
600 - 649	25	20	20	20	20	15
650 - 699	20	20	20	20	20	15
700 - 749	20	20	20	15	15	15
750 or More	20	20	20	15	15	15

\* Or through volume only if a right-turn lane exists

Intersection	Time Period	Opposing Volume	Through Volume	Left-Turn Volume	Warrant Threshold	Left-Turn Lane Warranted (Yes / No)
Rutledge at Primary	AM Peak	337	272	62	<b>60</b>	Yes
Rutledge at Primary	PM Peak	220	457	63	<b>40</b>	Yes

**APPENDIX F – TIS COMMENT RESPONSE DOCUMENT**

**Date: August 18, 2021**

**Project Name: Kenjo Market on Rutledge Pike**

**To: Tennessee Department of Transportation, City of Knoxville, and Knoxville-Knox County Planning**

**Subject: TIS Comment Response Document for Kenjo Market on Rutledge Pike**

Dear Tennessee Department of Transportation, City of Knoxville, and Knoxville-Knox County Planning Staff,

The following comment response document is submitted to address comments dated August 13, 2021:

1. **Reviewer Comment:** The TIS needs to include additional detail regarding the recommendation for the northbound left turn lane on Rutledge Pike addressing the following items:

- a. **Please document the recommended storage and taper lengths for the left-turn lane.**

Response: Comment addressed on page 18 of the Revised TIS. The recommended storage length is 75 feet and recommended taper length is 180 feet. The turn lane dimension recommendation is also included in the “Executive Summary” and “Conclusions & Recommendations” sections of the Revised TIS.

- b. **The location of the proposed left-turn lane relative to merge area of the two ramps coming together from Magnolia Avenue and Asheville Highway needs to be referenced and shown relative to the current geometry and striping of the gore area. Please provide any initial recommendations for physical barriers (flexible delineators) or other striping patterns needed to discourage inappropriate maneuvers from vehicles merging in from the Asheville Highway ramp desiring to use the new left-turn lane.**

Response: Comment addressed on page 18 of the Revised TIS. It is recommended to extend the existing solid white channelization line between the two ramps up to the beginning of the left turn lane storage to discourage inappropriate maneuvers. Additionally, the recommendation is included in the “Executive Summary” and “Conclusions & Recommendations” sections of the Revised TIS.

2. **Reviewer Comment:** Regarding the right-in/right-out driveway access – please note any recommended treatments such as painted or raised channelizing islands to emphasize this operation especially given the relatively narrow and flush median that may not be highly visible to exiting motorists.

Response: Comment addressed on page 19 in the “Conclusions and Recommendations” section of the Revised TIS. It is recommended to install a raised concrete channelization island to further enforce the right-in / right-out operation. Additionally, the recommendation is included in the “Executive Summary” section of the Revised TIS.

3. **Reviewer Comment:** The “Conclusions & Recommendations” section as well as the recommendations summary included in the Executive Summary need to specifically reference the creation of the access points and their particular operational considerations including the final outcome from responding to the first two comments above.

Response: More details provided in the “Conclusions & Recommendations” (page 19) and “Executive Summary” (page 1) sections of the Revised TIS.

Sincerely,



Wesley Stokes, P.E.