MILLERTOWN HARDEES
Knoxville, Tennessee

Traffic Impact Study

Prepared For:
DBS & ASSOCIATES ENGINEERING, INC

Prepared By:

CDM Smith

January 2017
Revised March 2017

MILLERTOWN PIKE HARDEES
KNOXVILLE, TENNESSEE

TRAFFIC IMPACT STUDY

Prepared for

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INTRODUCTION

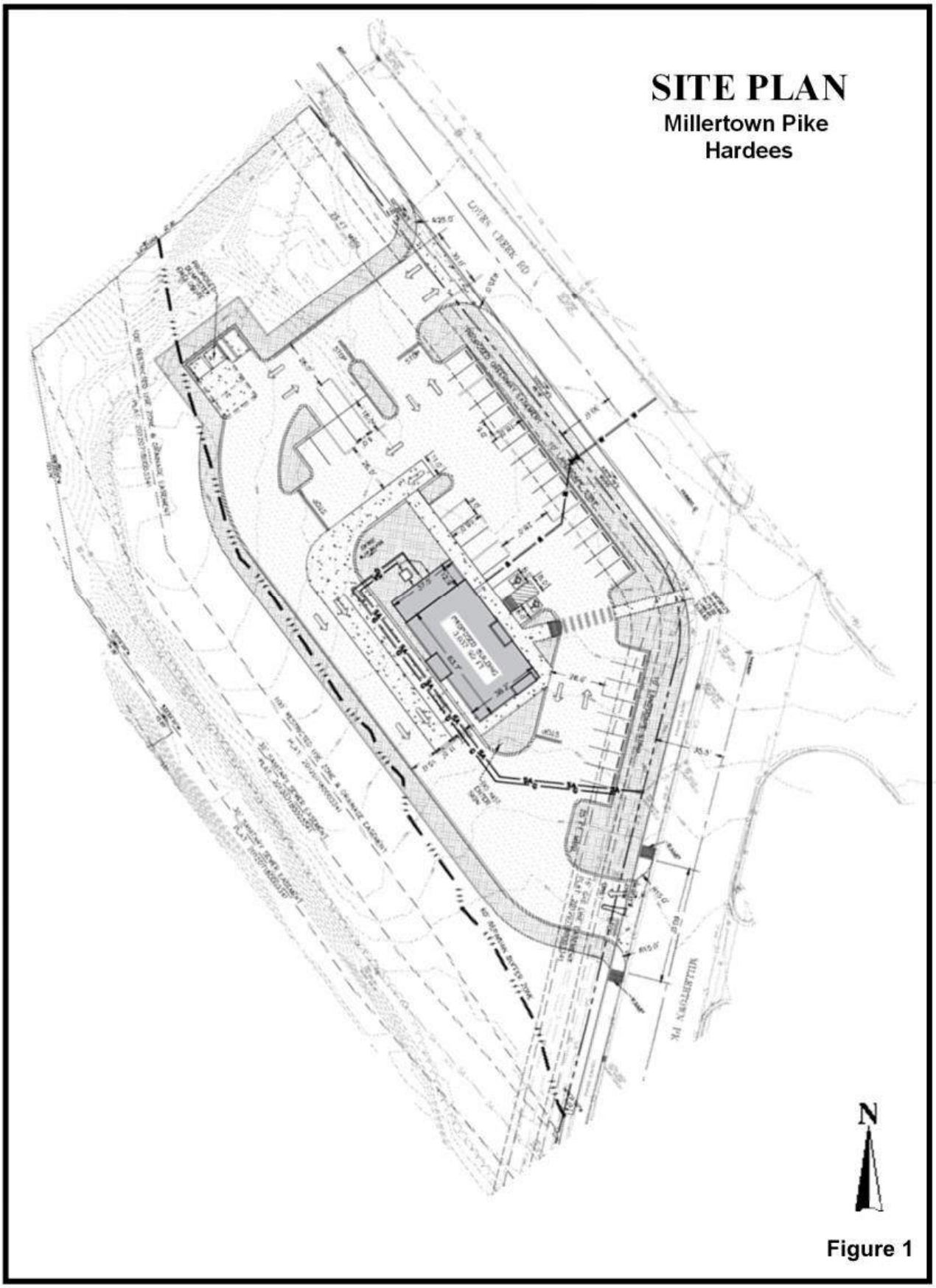
CDM Smith is pleased to submit this report to address the impact and access of a proposed fast food development in Knoxville, Tennessee. The basis for this study required the collection of traffic data, generation of anticipated traffic volumes from the proposed site, and normal (background), traffic growth, traffic that occurs regardless of the proposed development. Analysis of the resulting traffic projections was conducted to determine the capacity and levels of service for the site access and adjacent intersections with both the local and regional transportation systems. The site is located adjacent to an arterial corridor that has experienced significant traffic growth. This study will evaluate and determine the site impact on the adjacent roads with proposed site access and the adjacent intersection. The study will develop and provide recommendations of the necessary mitigation that will minimize this impact traffic on the adjacent roads.

Project Description

The proposed project is a fast food restaurant development including a 3,037 square-foot fast-food establishment. The proposed development is on an approximate 2.85 acres site, currently zoned SC-3. The site will access Millertown Pike with a driveway restricted to right-turns only and full access provided to Loves Creek Road. **Figure 1** illustrates the site plan.

Site Location

The location of the proposed commercial development is in the northeast region of Knoxville, west of Millertown Pike and south of Loves Creek Road. The site is near to the Knoxville Center Mall. **Figure 2** illustrates the site location relative to local and regional access.


SITE PLAN
Millertown Pike
Hardees
N
Figure 1

PROJECT VICINITY

Millertown Pike
Hardees

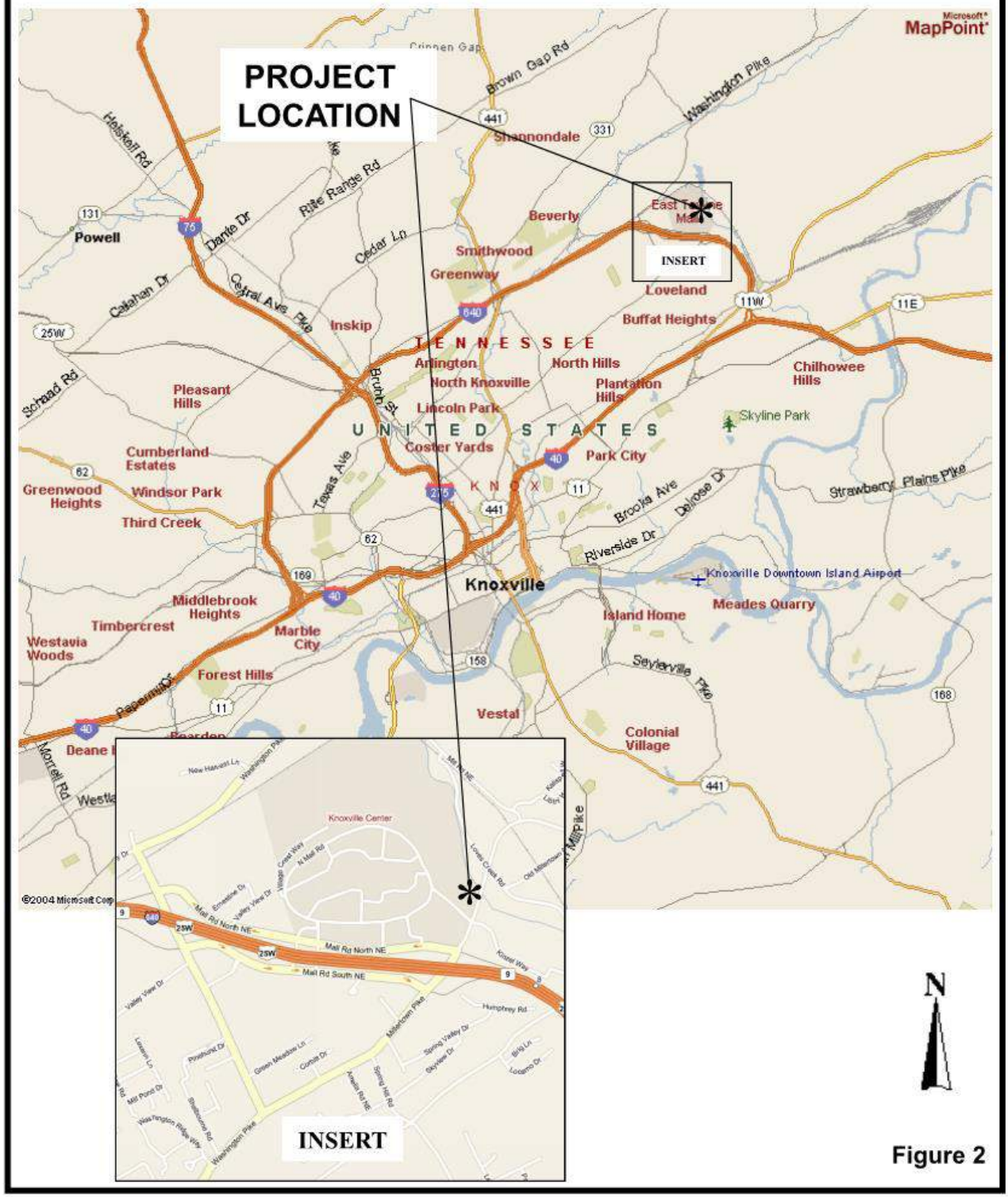


Figure 2

LOCAL AND REGIONAL ACCESS

Local Access

The proposed development will access Millertown Pike, a 2-lane classified urban minor arterial adjacent to the site with a 2015 average daily traffic (ADT) of approximately 17,200. Access to Millertown Pike will be restricted to right-turns only. A full access will be provided from Loves Creek Road, bordering the site to the north and intersecting Millertown Pike to the east. Loves Creek Road is a 2-lane collector facility extending south to Asheville Highway (U.S. 11) and has a 2015 ADT of 4,300. Millertown Pike, north of Loves Creek Road is intersected by Mill Road which extends north to Washington Pike north of the site. Millertown Pike provides for both local and regional access for the site.

Regional Access

To the southwest, Millertown Pike provides regional access to Interstate 640. This Interstate access is from Washington Pike and Millertown Pike. Millertown Pike becomes Washington Pike to the southwest intersecting Broadway. Broadway extends north and south towards the Knoxville CBD. Broadway has a 2015 ADT of 27,560 near this intersection with Washington Pike. To the northeast, Millertown intersects Rutledge Pike (U.S. 11W, S.R. 1), a 4-lane divided major arterial extending northeast towards Morristown and southwest to the Knoxville CBD. Rutledge Pike, southwest of its intersection with Millertown Pike, has a 2015 ADT of approximately 11,620.

Interstate 640 connects to I-40 east and west of the Knoxville CBD and becomes I-75 to the west. West of the Washington Pike interchange, I-640 has a 2015 ADT of 55,910. Interstate 40 is an east and west facility extending between Nashville, Tennessee and Asheville, North Carolina. The approximate 2015 ADT for I-40/75 west of I-640 is 193,910. To the east of I-640, I-40 has an ADT of 101,930. Interstate 640 intersects I-75 to the west, which extends north to Lexington, Kentucky, and to the west, I-75 turns south to Chattanooga, Tennessee.

EXISTING TRAFFIC CONDITIONS

Existing Traffic Control

The intersections of Millertown Pike at Loves Creek Road and Kinzel Way are signalized intersections. A speed limit adjacent to the site, between the interstate and Loves Creek Road, is posted 35mph. **Figure 3** illustrates the intersection geometry and traffic control.

Existing Traffic Volumes

A peak-hour turning movement count (TMC) was conducted in December of 2016 for the intersection of Millertown Pike at Loves Creek Road. The weekday AM peak-hour was found between 7:30 and 8:30AM., and the PM peak was found between 5:00 and 6:00PM. Peak-hour traffic volumes are illustrated in **Figure 4**.

Existing Capacity and Level of Service

In order to evaluate the current operations of the traffic control devices, capacity and level of service were calculated using the **2010 Highway Capacity Manual, Special Report 209** published by the Transportation Research Board (TRB). Signalized and unsignalized intersections are evaluated based on estimated intersection delays, which may be related to level of service (LOS). Level of service and capacity are the measurements of an intersection's ability to accommodate traffic volumes. Levels of service for intersections range from A to F. A LOS A is the best, and LOS F is failing.

For signalized intersections, a LOS of A has an average estimated intersection delay of less than 10 seconds, and LOS F has an estimated delay of greater than 80 seconds. A LOS of C and D are typical design values. Within urban areas, a LOS D, delay between 35 and 55 seconds, is considered acceptable by the Institute of Transportation Engineers (ITE) for signalized intersections.

Unsignalized intersections levels of service have lower thresholds of delays. A LOS of F exceeds estimated delays of 50 seconds. For urban arterials, minor approaches may frequently experience levels of service E. A full level of service description for unsignalized and signalized intersections is presented in **Table 1** and **Table 2**, respectively.

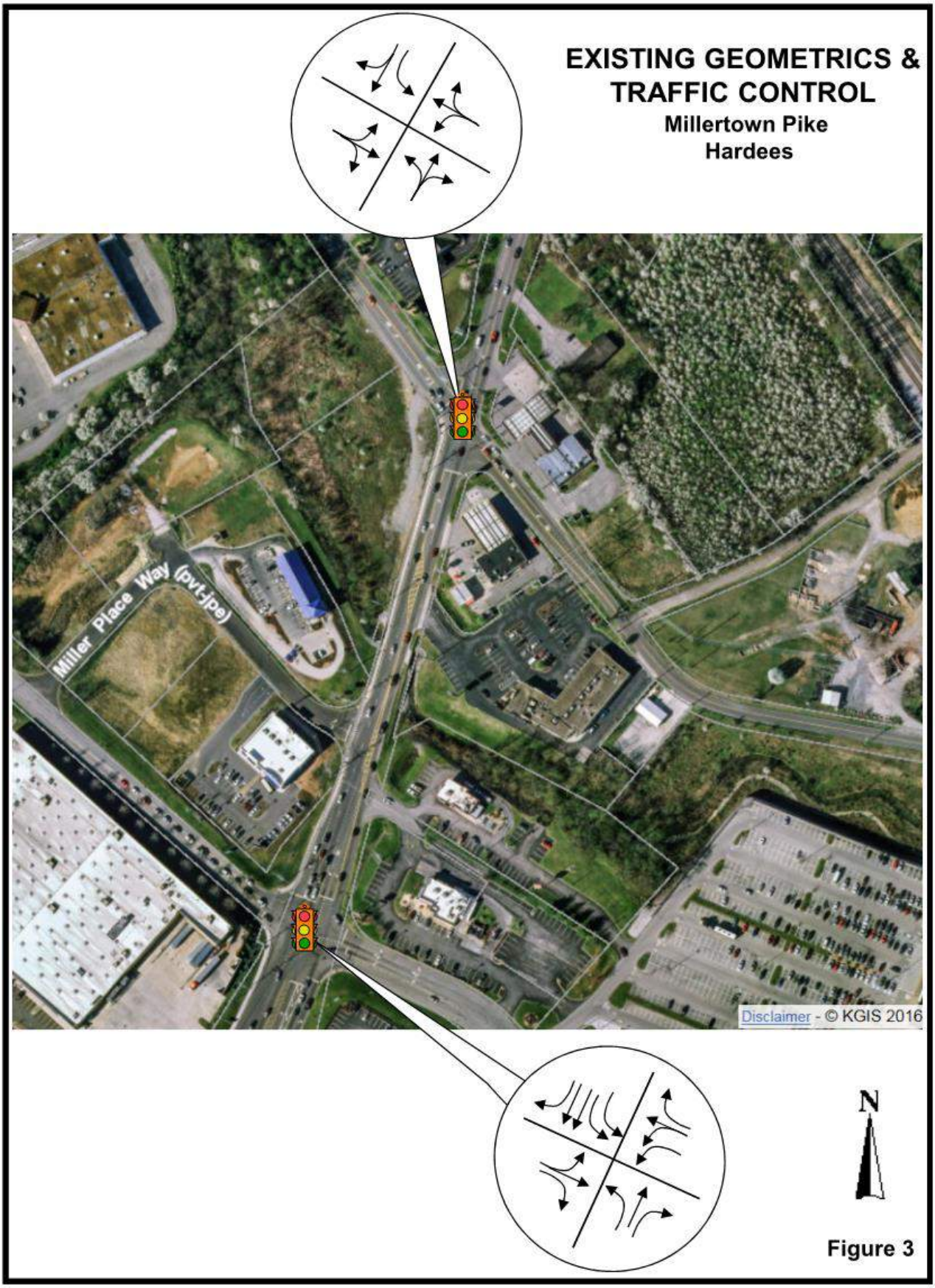

EXISTING GEOMETRICS &
TRAFFIC CONTROL
Millertown Pike
Hardees
Miller Place Way (pvt-joe)
Disclaimer - © KGIS 2016
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Figure 3


2016 EXISTING TRAFFIC
Millertown Pike
Hardees
1 (1)
1350 (912)
125 (140)
35 (227)
17 (56)
79 (151)
(102) 6
(40) 7
(51) 14
(126) 6
322 (1036)
26 (58)
Miller Place Way (pvt-jpe)
Disclaimer - © KGIS 2016
N
LEGEND
XXX AM PEAK
(XXX) PM PEAK

Figure 4

TABLE 1. LEVEL OF SERVICE (LOS) DESCRIPTION FOR TWO-WAY STOP INTERSECTIONS

Level of Service	Average Control Delay per Vehicle (seconds)
A	≤ 10.0
B	> 10.0 and ≤ 15.0
C	> 15.0 and ≤ 25.0
D	> 25.0 and ≤ 35.0
E	> 35.0 and ≤ 50.0
F	> 50.0

SOURCE: Highway Capacity Manual, TRB Special Report 209

TABLE 2. LEVEL-OF-SERVICE (LOS) DESCRIPTION FOR SIGNALIZED INTERSECTIONS

LOS	Average Control Delay per Vehicle (seconds)	Description
A	≤ 10.0	Very low delay with extremely favorable progression. Most vehicles don't stop.
B	> 10.0 and ≤ 20.0	Generally good progression. Increase number of stops from that described for LOS "A" resulting in higher delays
C	> 20.0 and ≤ 35.0	Fair progression with increased delay. Number of stopping vehicles become significant; however, many still pass through the intersection without stopping. Stable flow.
D	> 35.0 and ≤ 55.0	The influence of congestion becomes more noticeable. Longer delays resulting from unfavorable progression, longer cycles, or high V/C ratios. Approaching unstable flow.
E	> 55.0 and ≤ 80.0	Limit of acceptable delay. Long delays associated with poor progression, long cycles, or high V/C ratios.
F	> 80.0	Unacceptable operation resulting from oversaturation (flow rates exceed capacity). Poor progression, long cycles, and high V/C ratios.

SOURCE: Highway Capacity Manual, TRB Special Report 209

Analyses were conducted using the Synchro Software, developed by Trafficware. Signalized analyses found that the adjacent intersection operates at poor levels of service with optimized signal timing. **Table 3** presents the peak-hour analyses of the adjacent study intersection.

TABLE 3. 2016 TRAFFIC CAPACITY AND LEVEL OF SERVICE

INTERSECTION	TRAFFIC CONTROL	PEAK PERIOD	V/C	DELAY	LOS
Millertown Pike at Loves Creek Rd	SIGNAL	AM	1.06	91.2	F
		PM	1.11	76.2	E

Note: Average vehicle delay estimated in seconds. STOP control analyses presented by minor approach.

The study intersections were found operating over capacity for both AM and PM peak hours and failing or near failing levels of service. The high V/C ratio, exceeding 1.00, results in unstable traffic flow conditions. Increases in traffic can significantly increase the intersection delay. As the capacity ratio increase from 0.90, estimated delays will rise sharply and are less predictable. Capacity ratios in excess of 1.20 can result in invalid estimated delays.

BACKGROUND TRAFFIC CONDITIONS

Background traffic is that which can be anticipated regardless of the proposed development. The northeast area of Knoxville and Knox County has experienced much development, and additional development is planned. This development has resulted in significant traffic growth since 2000. This growth has, however, been slower over the past 5 years. This growth in traffic must be identified, analyzed, and evaluated for the purpose of establishing a baseline for the proposed development.

Background Traffic Volumes

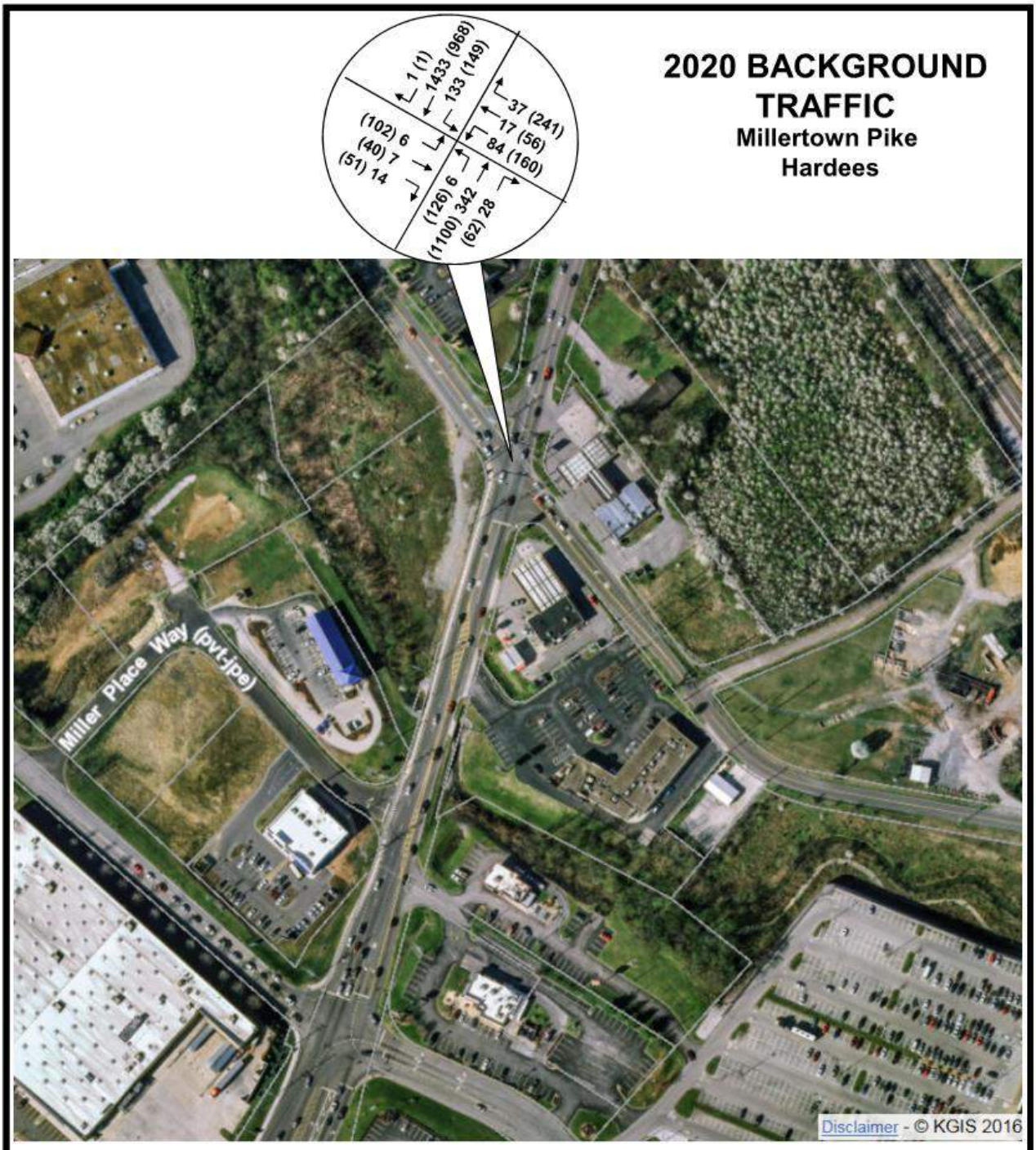
The study reviewed the historical traffic growth for Millertown Pike over the past five and ten years. This review determined that the traffic growth over the past five years has been negligible due to the slower economic conditions, but an average annual growth rate of 1.47-percent has occurred over the past 10 years. For the purpose of this study and based on growth over the past ten years, background traffic will assume a 1.5-percent annual compounded growth rate applied to the traffic passing through the study area until the assumed year 2020. Traffic to and from the Loves Creek west approach is not grown as it does not provide through movements. The west approach is a deadend street serving a few existing land uses including the Food City, thereby would not experience any growth in through traffic. Background traffic was developed and is illustrated in **Figure 5**. Use of this annual growth rate, background traffic reflects a 6.1-percent growth of the existing traffic volumes.

Background Capacity and Level of Service

Analyses were performed with the grown traffic volumes. The analyses results are presented in **Table 4**. With the traffic increasing for Millertown Pike, delays will increase for the signalized Loves Creek Road intersection and will fail for both the AM and PM peak hours. The delays are again a function of the high V/C ratios experienced at the intersection. With the intersection capacity ratios exceeding 1.00 and approaching 1.20, the estimated delays are significant. Changes in the projected traffic conditions are better judged by the changes in the V/C ratios. The capacity of Millertown Pike has been an identified condition and previously studied in a TPR (Transportation Planning Report) prepared for the City of Knoxville in 2000, which identified the need to improve this corridor for the traffic projections of the Knoxville Center area.

2020 BACKGROUND TRAFFIC

Millertown Pike
Hardees



LEGEND
XXX AM PEAK
(XXX) PM PEAK

N

Figure 5

TABLE 4. 2020 BACKGROUND TRAFFIC CAPACITY AND LEVEL OF SERVICE

INTERSECTION	TRAFFIC CONTROL	PEAK PERIOD	V/C	DELAY	LOS
Millertown Pike at Loves Creek Rd	SIGNAL	AM	1.13	114.0	F
		PM	1.19	97.2	F

Note: Average vehicle delay estimated in seconds. STOP control analyses presented by minor approach.

PROJECT IMPACTS

Project conditions are developed by generating traffic based on the proposed land uses, distributing the trips to the transportation network, and again conducting analyses for capacity and level of service.

Trip Generation

Project traffic was determined using the publication, **Trip Generation, 9th Edition**. This reference is published by the Institute of Transportation Engineers (ITE) and represents national data collected for many different land uses including industrial, residential and commercial uses. **Trip Generation** is an essential tool in calculating the traffic, which may be generated by a proposed development. The study generated traffic for the approximate 2.85 acres for a restaurant development. The development plans a 3,037 square-foot fast-food restaurant. The AM and PM peak hours of the adjacent street were evaluated for this study as these are the typical hours studied for a commercial development and because the AM peak hour is the critical peak due to the adjacent street traffic volume.

Some trip generation studies have included surveys addressing pass-by traffic. This is traffic already on the adjacent street that is attracted to the proposed development. Studies conducted for pass-by traffic have suggested that a percentage of the traffic generated by commercial retail, such as the land use at hand, may originate from the existing traffic flow; therefore, the project does not necessarily introduce all new traffic to the transportation system.

Pass-by traffic percentages differ relative to specific land uses and their densities. Some studies have shown varied results; however, the ITE publications, **Transportation and Land Development** by Virgil G. Stover and Frank J. Koepke, and **Trip Generation,** have combined these studies to suggest uniform rates for given land uses. These rates range from 14-percent for hardware stores to 60-percent for neighborhood shopping centers, gross leasable area less than 100,000 square feet. Service stations and fast-food restaurants also exhibit high pass-by rates of 58-percent and 45-percent, respectively.

With the above in mind, a 35-percent pass-by rate and no internal trips were assumed for the planned development, thereby new or primary trips is 65-percent of the trips generated. This is the assumption for this study; however, the MPC memorandum from 1996 permits as much as 40-percent. This study assumes less than that permitted in order to be conservative. From the trip generation calculations, the proposed site may generate approximately 1,510 daily weekday trips. After the consideration of pass-by traffic and internal trips, approximately 980 new daily trips may be generated for an average weekday**.** **Table 5** presents the trip generation of this proposed site.

TABLE 5. TRIP GENERATION

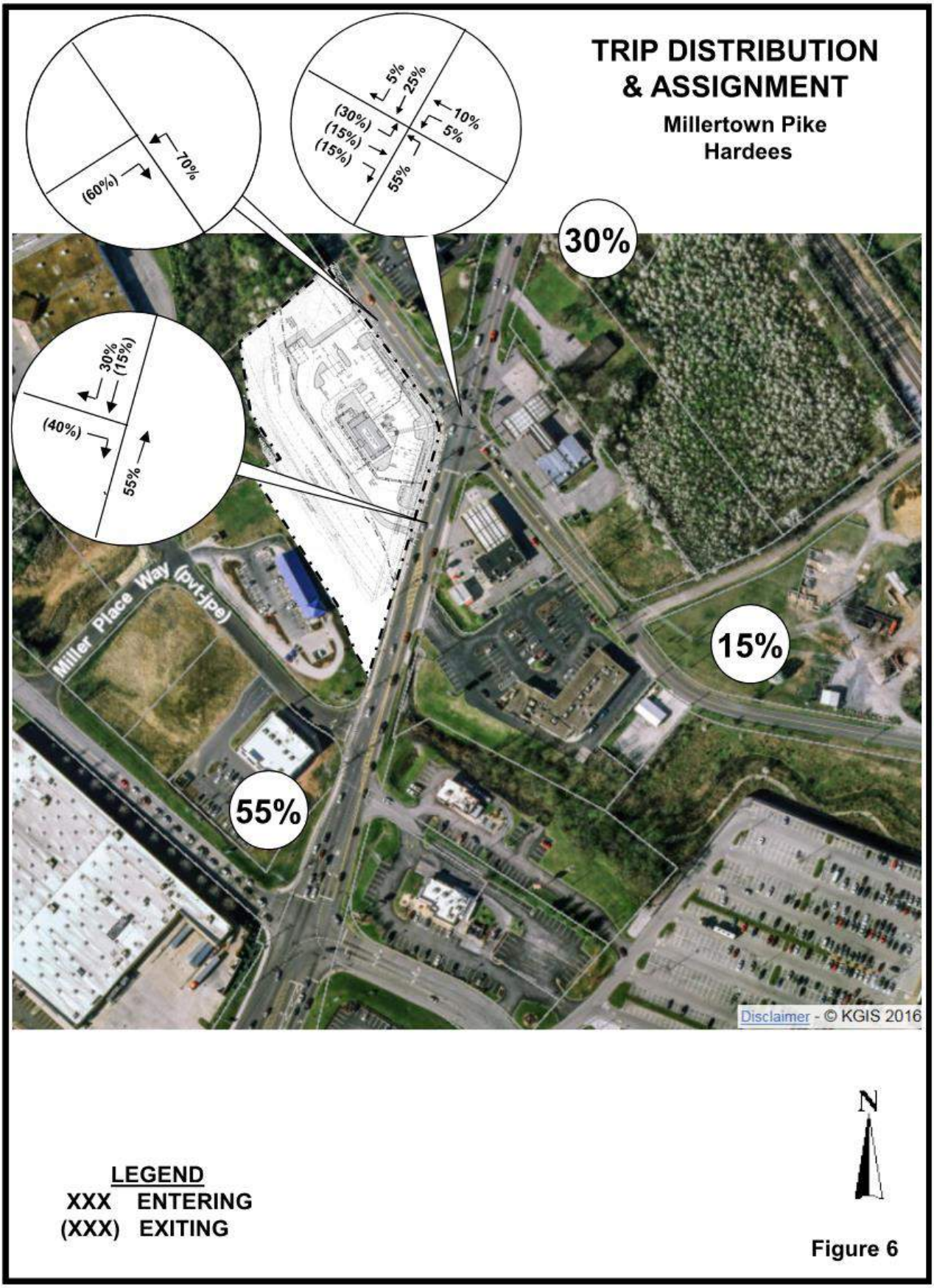
Land Use	LUC	Density (sqft)	Weekday				
			Daily	AM PEAK		PM PEAK	
				Enter	Exit	Enter	Exit
Fast Food Restaurant	934	3,037	1,507	70	68	52	48
Primary Trips	65%		980	46	44	34	31
Passby Trips	35%		527	25	24	18	17

Note: Trips generated using **Trip Generation, 9th Edition**, published by ITE.

Trip Distribution and Assignment

For the planned use, trips were distributed to Millertown Pike and Loves Creek Road. The restaurant use assumed a trip distribution with 55-percent coming from I-640 and Kinzel Way. To the north using Millertown Pike was assigned 30-percent and 15-percent was assigned to Loves Creek Road. **Figure 6** illustrates the distribution and assignment of trips to the study intersections and its site accesses for the restaurant and retail uses.

The pass-by and the diverted distributions are illustrated in **Figure 7**. Pass-by trips are assumed 40-percent to and from Millertown Pike north of the site and 50-percent south of the site. Loves Creek Road was assigned 10-percent.


TRIP DISTRIBUTION
& ASSIGNMENT
Millertown Pike
Hardees
70%
(60%)
5%
25%
10%
5%
(30%)
(15%)
(15%)
55%
30%
30%
(15%)
(40%)
55%
Miller Place Way (pvt-type)
15%
55%
Disclaimer - © KGIS 2016
N
LEGEND
XXX ENTERING
(XXX) EXITING
Figure 6

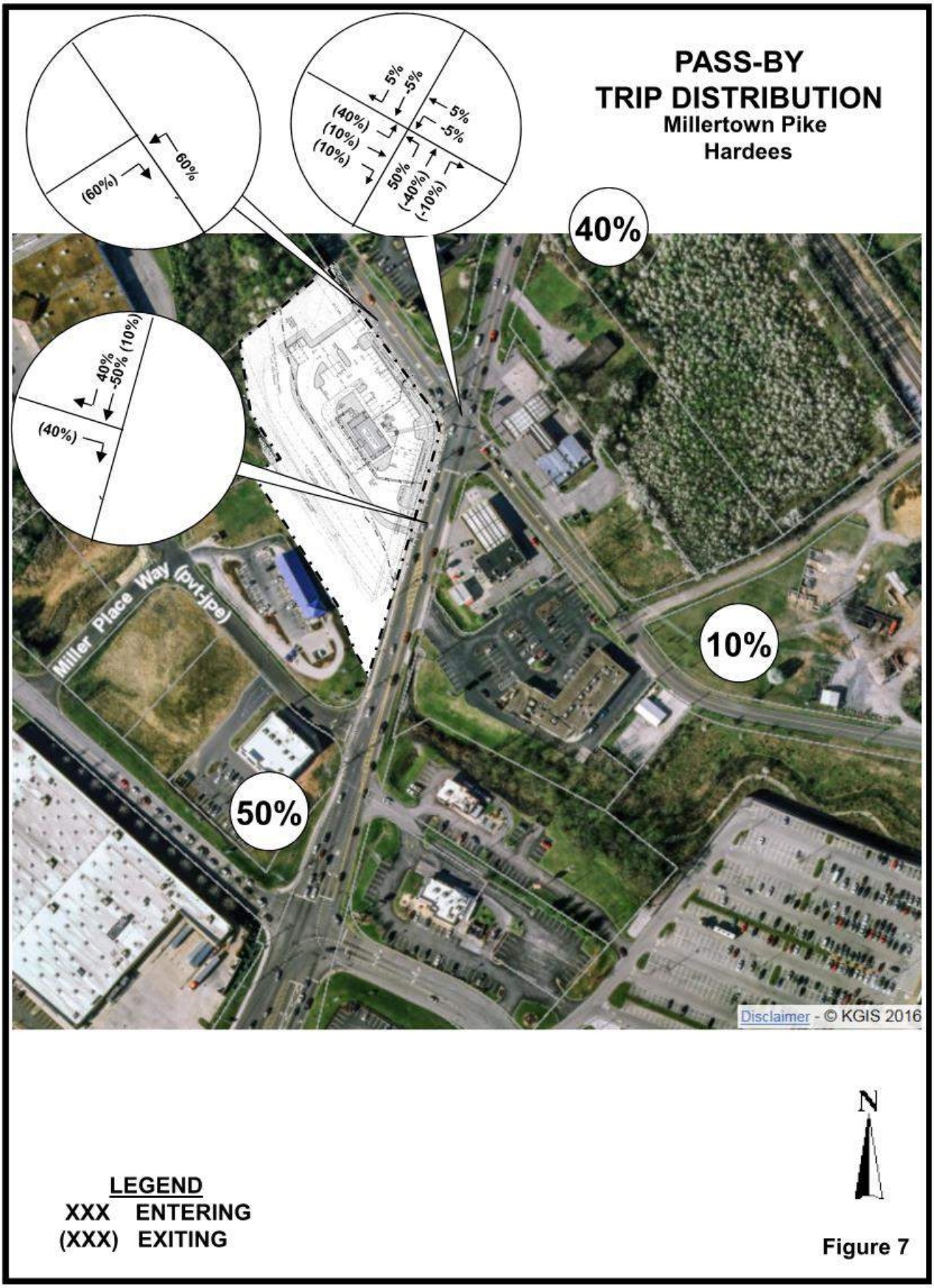

PASS-BY
TRIP DISTRIBUTION
Millertown Pike
Hardees
60%
(60%)
5%
-5%
(40%)
(10%)
(10%)
5%
-5%
50%
(-40%)
(-10%)
40%
40%
-50%
(10%)
(40%)
Miller Place Way (pvt-type)
40%
10%
50%
Disclaimer - © KGIS 2016
N
LEGEND
XXX ENTERING
(XXX) EXITING

Figure 7

Project Traffic Volumes

By multiplying the trips generated by the distribution percentages, the project traffic volumes were determined. Primary or new trips are illustrated in **Figure 8A** and pass-by trips in **Figure 8B**. **Figure 8C** illustrates the resulting total project trips associated with this development. The AM peak hour is the most significant as the southbound traffic volume on Millertown Pike exceeds 1500vph.

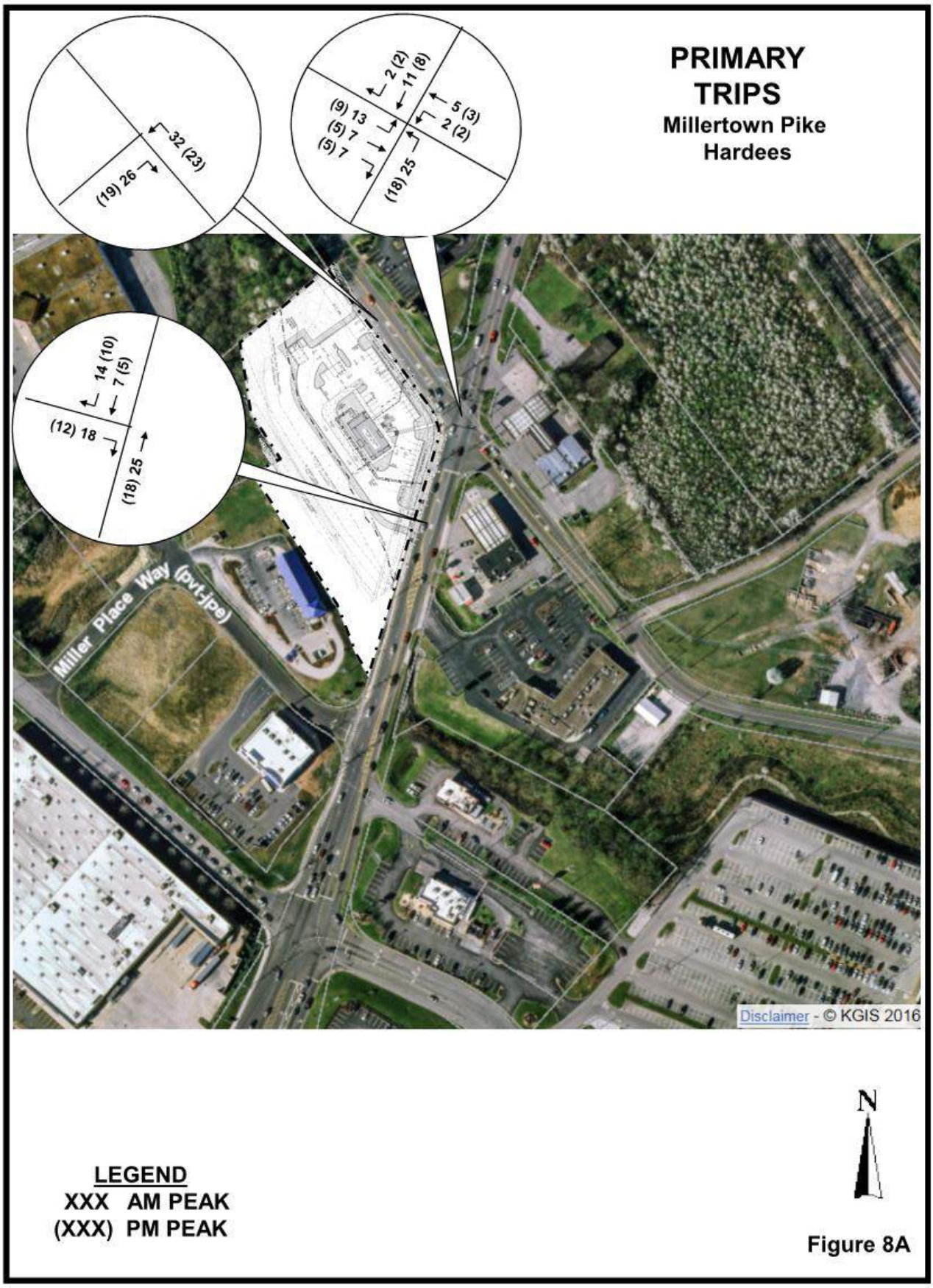
Total Projected Traffic Volumes

Background and project trips, added together, develops the post-development traffic volumes for the year 2020. The site trips were found to be less than a 5-percent increase over the 2020 projected traffic volumes. **Figure 9A** illustrates the 2020 projections. **Figure 9B** illustrates the 2020 traffic projections without the Millertown Pike right-turn ingress. The generated traffic for the proposed development has an approximate 4- and 2-percent impact on the Loves Creek intersection for the AM and PM peaks respectively. Using these projections, capacity and LOS analyses could again be conducted and mitigation measures including traffic control devices and roadway and intersection geometry could be evaluated. The entering right-turn volume from Millertown Pike to the site was determined to require a minimum of a taper based on the NCHRPR 279, and the Knox County's "Access Control & Driveway Design Policy found that this volume was on the threshold of approximately 25vph requiring a right-turn lane, therefore a minimum right-turn lane should be provided.

Projected Capacity and Level of Service

Using the identified turning movements for the projected traffic conditions, unsignalized and signalized capacity and level of service analyses were conducted. The analyses for the projected traffic conditions are shown in **Table 6**. **Table 7** summaries the volume to capacity ratio, delay, and LOS measured and projected for this development. Analyses indicate the proposed development would have a minimal impact on the Millertown Pike intersection with Loves Creek Road with insignificant increases to the V/C ratios, less than 5-percent. The Loves Creek Road intersection will continue to fail during the peak hours without improvements consisting of the multi-lanes for Millertown Pike north of Kinzel Way.

Access to Millertown Pike was restricted to right turns, and the access to Loves Creek Road is proposed with full movements. The proposed site access to Loves Creek Road was found to operate at acceptable levels of service. Because of the southbound thru traffic movement of 1,500vph on Millertown Pike, the estimated access delays are expected to exceed the limitations of the delay algorithm. The right-turn egress to Millertown will experience some delay during the AM peak hour resulting in a F LOS, but this analysis does not account for the gaps in traffic provided by the signal at the Loves Creek Road intersection. With the projected right-turn egress less than 30 vehicles during the peak hour, gaps provided by the adjacent signal should be more than adequate. A right-turn lane should be provided from


PRIMARY
TRIPS
Millertown Pike
Hardees
32 (23)
(19) 26
2 (2)
11 (8)
(9) 13
(5) 7
(5) 7
5 (3)
2 (2)
(18) 25
14 (10)
7 (5)
(12) 18
(18) 25
Miller Place Way (pvt)(pe)
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N
LEGEND
XXX AM PEAK
(XXX) PM PEAK

Figure 8A

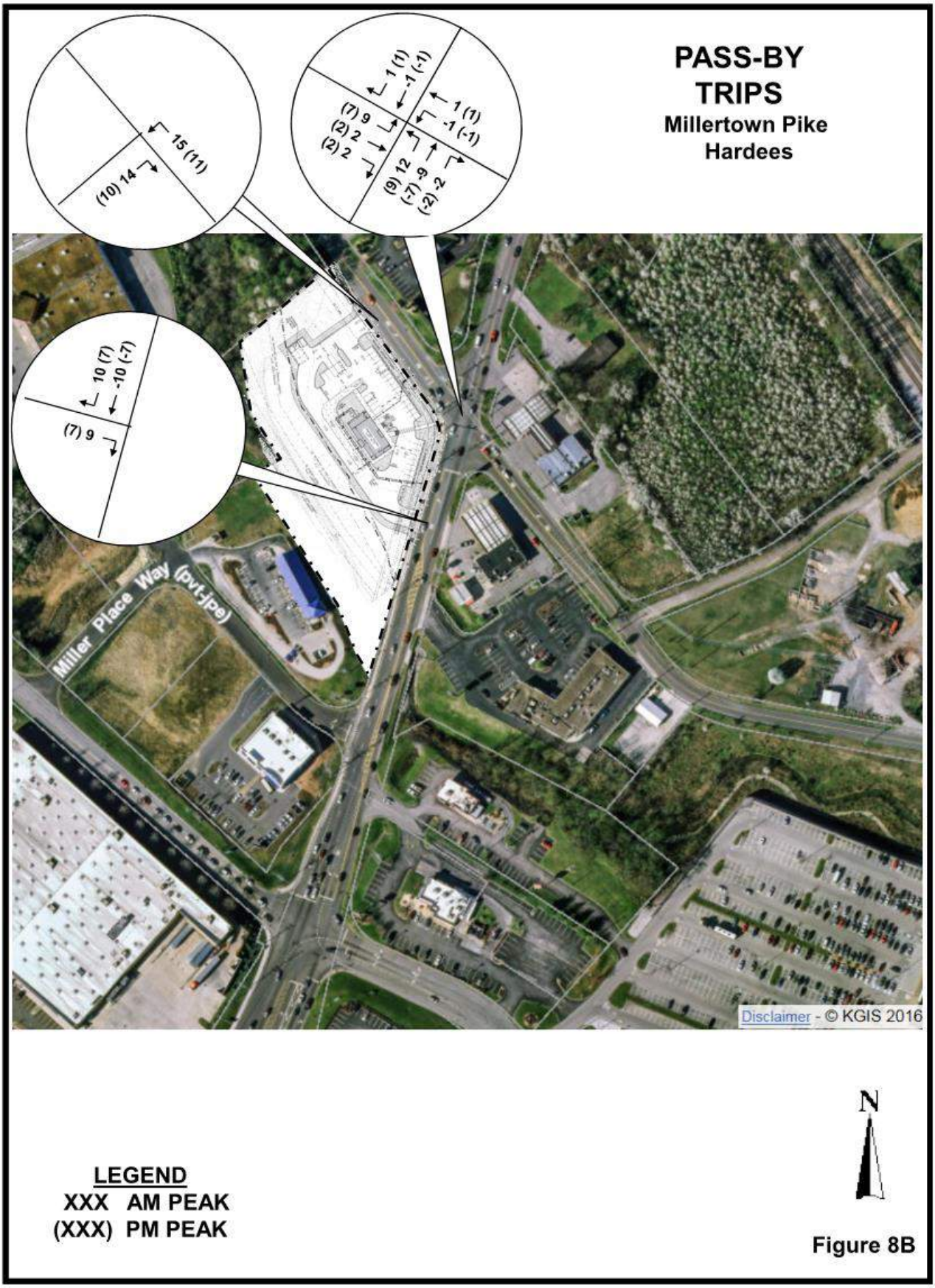

PASS-BY
TRIPS
Millertown Pike
Hardees
15 (11)
(10) 14
1 (1)
-1 (-1)
(7) 9
(2) 2
(2) 2
1 (1)
-1 (-1)
(9) 12
(-7) -9
(-2) -2
10 (7)
-10 (-7)
(7) 9
Miller Place Way (pvt/pe)
Disclaimer - © KGIS 2016
N
LEGEND
XXX AM PEAK
(XXX) PM PEAK

Figure 8B

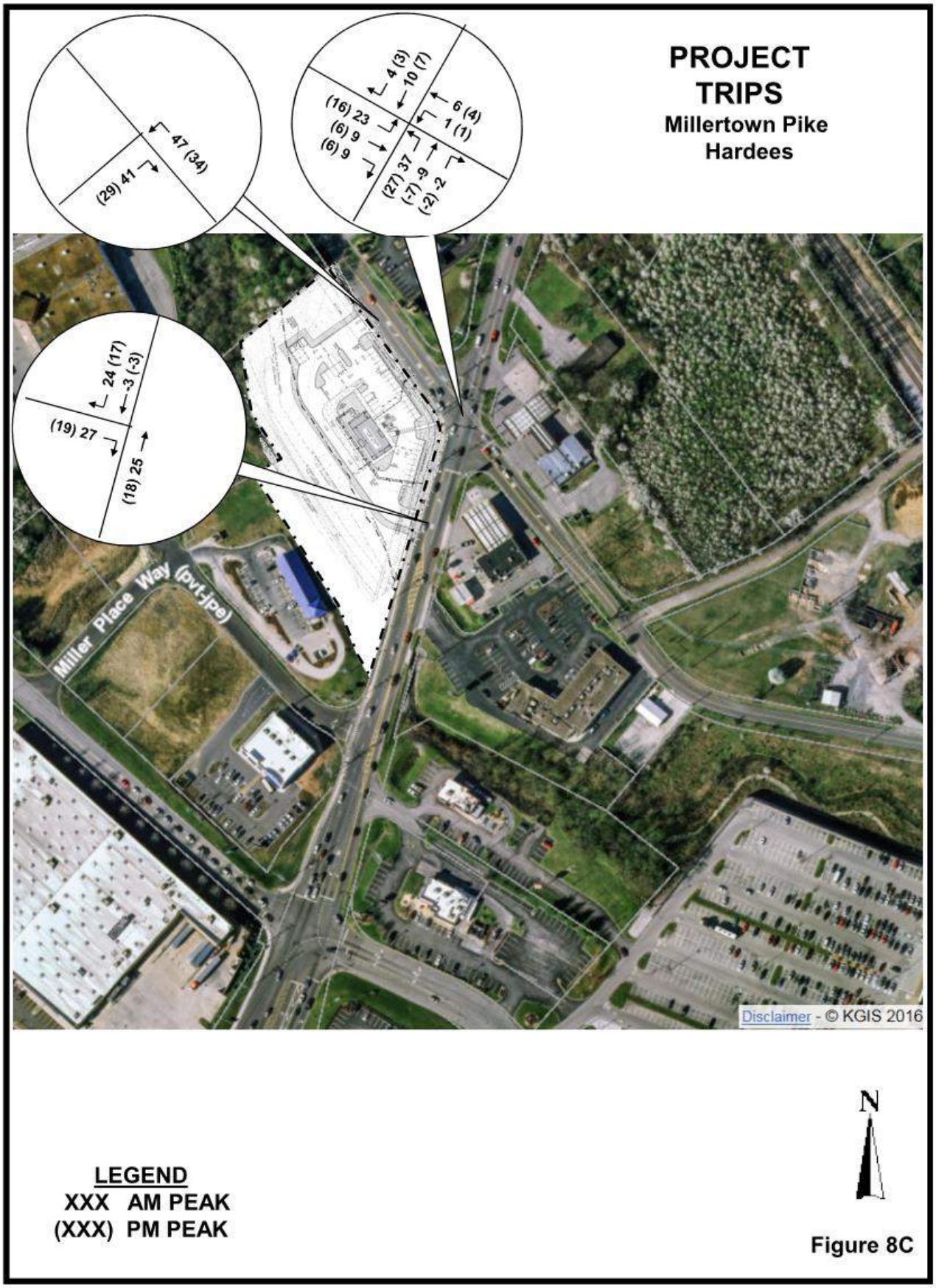

PROJECT
TRIPS
Millertown Pike
Hardees
47 (34)
(29) 41
4 (3)
10 (7)
(16) 23
(6) 9
(6) 9
6 (4)
1 (1)
(27) 37
(-7) 9
(-2) -2
24 (17)
-3 (-3)
(19) 27
(18) 25
Miller Place Way (pvt/pe)
Disclaimer - © KGIS 2016
N
LEGEND
XXX AM PEAK
(XXX) PM PEAK

Figure 8C

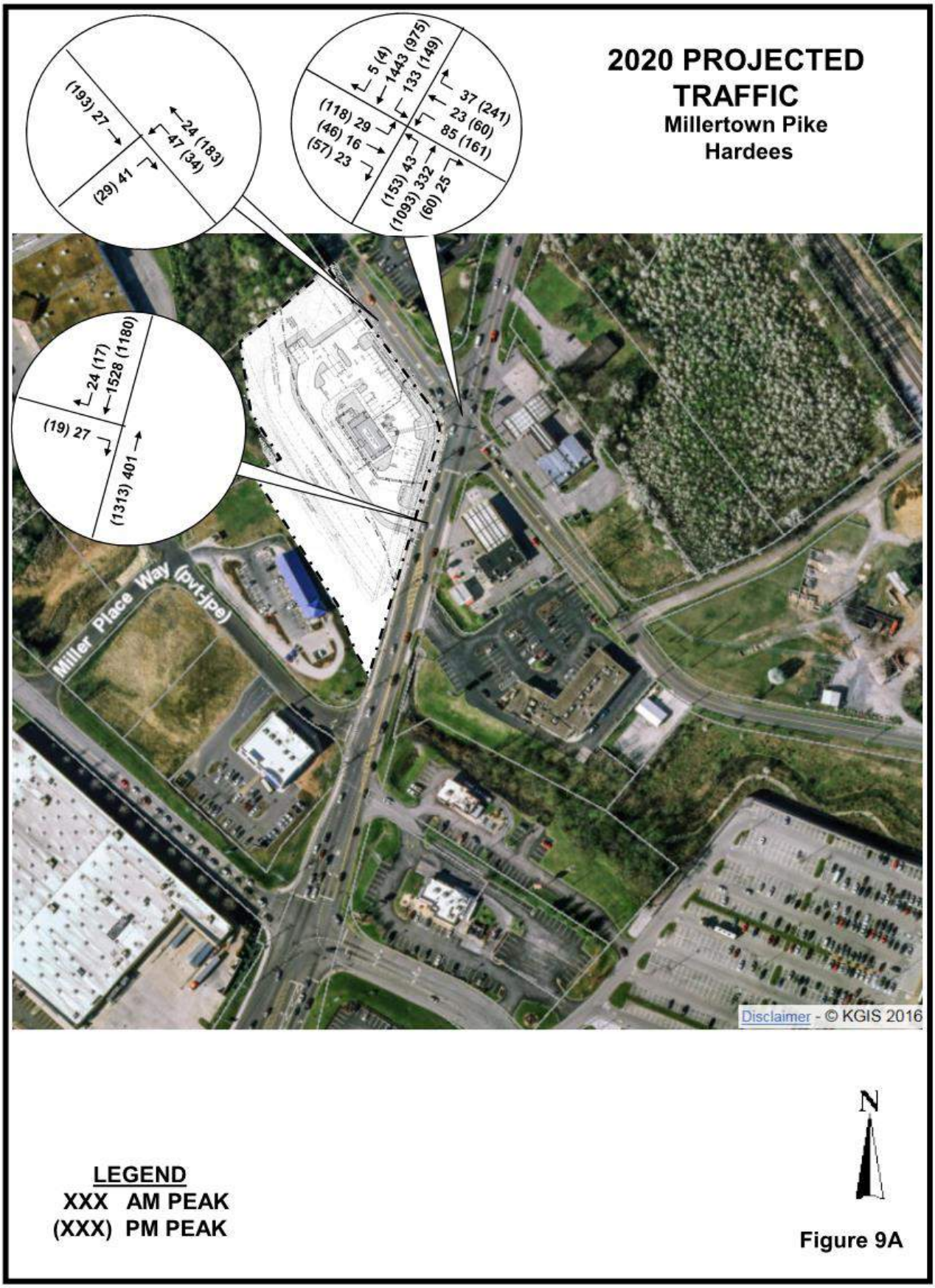
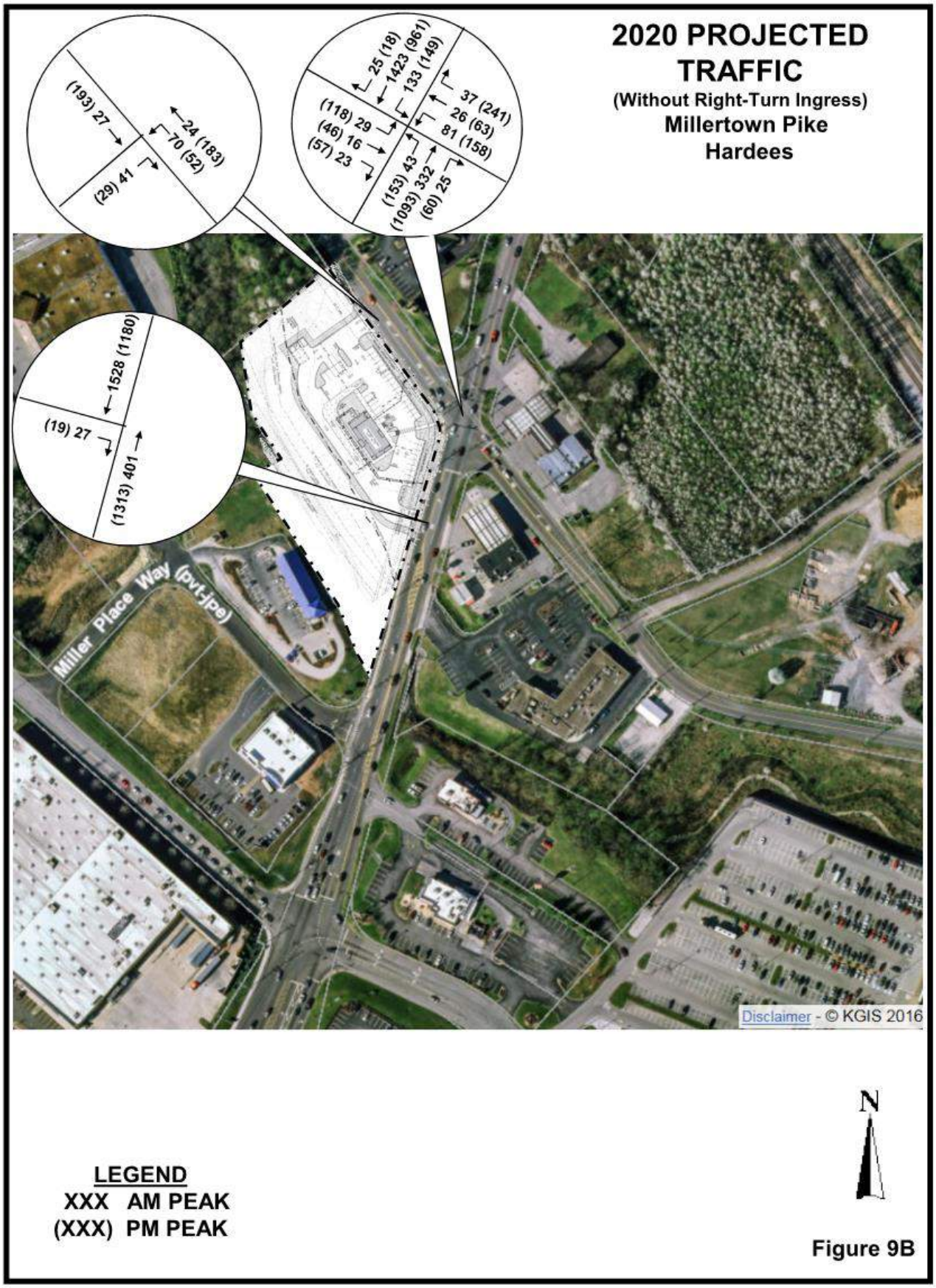

2020 PROJECTED TRAFFIC
Millertown Pike
Hardees
(193) 27
24 (183)
47 (34)
(29) 41
5 (4)
1443 (975)
133 (149)
37 (241)
23 (60)
85 (161)
(118) 29
(46) 16
(57) 23
(153) 43
(1093) 332
(60) 25
24 (17)
1528 (1180)
(19) 27
(1313) 401
Miller Place Way (pvt-type)
Disclaimer - © KGIS 2016
N
LEGEND
XXX AM PEAK
(XXX) PM PEAK

Figure 9A


2020 PROJECTED TRAFFIC
(Without Right-Turn Ingress)
Millertown Pike
Hardees
(193) 27
24 (183)
70 (52)
(29) 41
25 (18)
1423 (961)
133 (149)
37 (241)
26 (63)
81 (158)
(118) 29
(46) 16
(57) 23
(153) 43
(1093) 332
(60) 25
1528 (1180)
(19) 27
(1313) 401
Miller Place Way (pvt-type)
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N
LEGEND
XXX AM PEAK
(XXX) PM PEAK

Figure 9B

TABLE 6. 2020 PROJECTED CAPACITY AND LEVEL OF SERVICE

INTERSECTION	TRAFFIC CONTROL	PEAK PERIOD	V/C	DELAY	LOS
Millertown Pike at Loves Creek Rd	**SIGNAL**	**AM**	**1.15**	**125.2**	**F**
		PM	**1.20**	**99.0**	**F**
without Millertown Ingress	**STOP**	**AM**	**1.15**	**125.2**	**F**
		PM	**1.20**	**99.6**	**F**
Site Access at Loves Creek Rd	**STOP NB RT/WB LT**	**AM**	**0.04 / 0.03**	**8.6 / 5.0**	**A / A**
		PM	**0.04 / 0.03**	**9.5 / 1.4**	**A / A**
without Millertown Ingress	**STOP NB RT/WB LT**	**AM**	**0.04 / 0.05**	**8.6 / 5.6**	**A / A**
		PM	**0.04 / 0.04**	**9.5 / 2.0**	**A / A**
Site Access at Millertown Pike	**STOP EB**	**AM**	**2.42**	**>999.9**	**F**
		PM	**0.20**	**48.0**	**E**
without Millertown Ingress	**STOP**	**AM**	**2.42**	**>999.9**	**F**
		PM	**0.20**	**48.0**	**E**

Note: Average vehicle delay estimated in seconds. STOP control analyses presented by minor approach.

Millertown Pike to the proposed site access. With the projected entering traffic volume, approximately 25 vehicles during the peak hour, and the site circulation, the entering traffic should not be impeded thereby having little impact on the adjacent arterial. Because the adjacent thru traffic volume on Millertown Pike, a right-turn lane would minimize any conflict and friction (reduction of capacity and prevailing speeds of an arterial from driveway accesses) that the right-turning traffic may have on the Millertown Pike traffic. From the analyses, the right-turn ingress is found to have no impact on the proposed access and the Loves Creek Road intersection capacity and LOS. Without the right-turn ingress, the southbound Millertown Pike approach queue at Loves Creek Road may increase as the increased right turn movement from the approach would impede the thru traffic.

TABLE 7. SUMMARY
CAPACITY AND LEVEL OF SERVICE

INTERSECTION	TRAFFIC CONTROL	PEAK PERIOD	2016 EXISTING TRAFFIC V/C	2016 EXISTING TRAFFIC DELAY	2016 EXISTING TRAFFIC LOS	2020 BACKGROUND TRAFFIC V/C	2020 BACKGROUND TRAFFIC DELAY	2020 BACKGROUND TRAFFIC LOS	2020 PROJECTED TRAFFIC V/C	2020 PROJECTED TRAFFIC DELAY	2020 PROJECTED TRAFFIC LOS
Millertown Pike	**SIGNAL**	**AM**	**1.06**	**91.2**	**F**	**1.13**	**114.0**	**F**	**1.15**	**125.2**	**F**
at Loves Creek Rd		**PM**	**1.11**	**76.2**	**E**	**1.19**	**97.2**	**F**	**1.20**	**99.0**	**F**
without Millertown Ingress	**STOP**	**AM**							**1.15**	**125.2**	**F**
		PM							**1.20**	**99.6**	**F**
Site Access	**STOP**	**AM**							**0.04 / 0.03**	**8.6 / 5.0**	**A / A**
at Loves Creek Rd	**NB RT/WB LT**	**PM**							**0.04 / 0.03**	**9.5 / 1.4**	**A / A**
without Millertown Ingress	**STOP**	**AM**							**0.04 / 0.05**	**8.6 / 5.6**	**A / A**
	NB RT/WB LT	**PM**							**0.04 / 0.04**	**9.5 / 2.0**	**A / A**
Site Access	**STOP**	**AM**							**2.42**	**>999.9**	**F**
at Millertown Pike	**EB**	**PM**							**0.20**	**48.0**	**E**
without Millertown Ingress	**STOP**	**AM**							**2.42**	**>999.9**	**F**
		PM							**0.20**	**48.0**	**E**

Note: Average vehicle delay estimated in seconds. STOP control analyses presented by minor approach.

Drive-Thru Queuing

The proposed distance from the order window to the proposed access with Millertown Pike is approximately 175-feet or 7 vehicles. Using a simple queuing model with a single-service window, this queue capacity is sufficient to store more than half of the entering trips. Data provided for Hardees in the upper East Tennessee area found that the average breakfast window time is 60 seconds (1 minute), a service rate of 60 vehicles per hour. With 70-percent of entering trips, approximately 50 vehicles (arrival rate to service rate ratio, r, of 0.833), the queuing model below determines an average queue of 4 vehicles.

$\mathbf{L_q}$ is the average vehicle queue length:

$$E[L_q] = \frac{r^2}{1 - r}$$

Assuming the drive-thru window service of 55 patrons (vehicles) per hour, a window service rate of 65 seconds (less than the observed average), an average queue of 4 vehicles accommodates approximately 45 entering trips (r of 0.818), nearly 65-percent of the entering trips. With half of the AM peak-hour (35) entering trips choosing the drive thru (r of 0.636), the average queue is 1 vehicle. Therefore, the available storage of 7 vehicles should be sufficient to maintain the possible drive-thru queues. With the lower than average service window rate, the storage can maintain as many as 49 entering drive-thru trips per hour (r of 0.891) or 70-percent of the projected entering trips. Further analysis finds that half of the entering trips may be served with an average queue of 7 vehicles with the longest observed window service time of 90 seconds (r of 0.875).

Using the statistical model above (based on a Poisson distribution), the drive-thru queuing, assuming 70-percent of the entering trips, can be summarized below:

- Available Storage — 7 vehicles (175 feet)
- Window Service Rate/Hour — 55 vehicles (less than observed average)
- Window Arrival Rate/Hour — 49 vehicles (70% of the Entering Trips)
- Average Queue — 7 vehicles

RECOMMENDATIONS

With the proposed development, the analyses conducted and the review of the traffic volumes identified the following recommendations:

1. Restrict access to Millertown Pike to right-turns only, providing signing and channelization to prohibit movements other than right turns.

2. Provide for a southbound right-turn lane from Millertown Pike to the proposed access.

3. Minimize landscaping, using low growing vegetation and signing at the planned accesses to insure that safe sight distance is maintained.

4. Roadway and intersection design should conform to the recommended standards and practices of the American Association of State Highway and Transportation Officials, the Institute of Transportation Engineers, the Tennessee Department of Transportation, and the City of Knoxville.

CONCLUSION

The site is adjacent to an arterial corridor that has experienced significant traffic growth since 2005. The traffic impact study for the proposed site identified the existing and projected traffic conditions with and without the proposed development. The study of the proposed site was the evaluation and analysis of the traffic anticipated by the development of a fast food restaurant. Project traffic was determined using the publication **Trip Generation, 9th Edition**. The study generated traffic for a 3,037 square-foot establishment on an approximate 2.85 acre site zoned SC-3. Trips associated with the proposed development were distributed to Millertown Pike and Loves Creek Road, and background traffic estimated using an approximate 1.5-percent annual compounded growth rate. Failing levels of service were determined for existing and background conditions of the adjacent study intersection. The intersection of Millertown Pike and Loves Creek Road is currently exceeding its capacity and operating at a LOS F. A multi-lane section for Millertown Pike adjacent to the site would be the required mitigation to improve the levels of service.

Analyses indicate the proposed development would have a minimal impact on the Millertown Pike intersection with Loves Creek Road with insignificant increases to the V/C ratios, less than 5-percent. The Loves Creek Road intersection will continue to fail during the peak hours without improvements consisting of the multiple thru lanes for Millertown Pike, north of Kinzel Way through the Loves Creek intersection. Accesses to Millertown Pike would be restricted to right turns, and the accesses to Loves Creek Road are proposed for full movements. The proposed site access to Loves Creek Road will operate at an acceptable LOS. The Millertown Pike access may experience increased delays during the AM peak hour resulting in a poor LOS but will benefit from gaps provided by the signal at Loves Creek Road. This right-turn egress volume is projected with a less than 30 vehicles during the peak hour; therefore, the gaps should be more than adequate to serve this traffic volume. The right-turn ingress is found to have no impact on the proposed access and the Loves Creek Road intersection capacity and LOS. Without the right-turn ingress, the southbound Millertown Pike approach queue at Loves Creek Road may increase as the increased right-turn movement from the approach may impede the thru traffic.

The proposed distance from the order window to the proposed access with Millertown Pike is approximately 175-feet or 7 vehicles. Using a simple queuing model with a single-service window, this queue storage is sufficient to store more than half of the entering trips.

With the projected traffic entering and exiting the site, the proposed right-turn lane, and the adjacent traffic control, the site impact should be manageable and the access adequate to service the site.

APPENDIX

Trip Generation

Synchro Analyses

Right-Turn Lane Analyses

Hardees Drive-Thru Data

Traffic Counts

TRIP GENERATION

03-Jan-17

			AVERAGE						
			DAILY		AM PEAK			PM PEAK	
LAND USE	L.U.C	SIZE	TRAFFIC	ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
RESTAURANT (w. drive t	934	3,037	1,507	70	68	138	52	48	99
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0
			1,507	70	68	138	52	48	99

			REGRESSION						
			DAILY		AM PEAK			PM PEAK	
LAND USE	L.U.C	SIZE	TRAFFIC	ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
RESTAURANT (w. drive t	934	3,037	N/A	N/A	N/A	N/A	N/A	N/A	N/A
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0
			0	0	0	0	0	0	0

			SATURDAY				SUNDAY			
			DAILY		PEAK		DAILY		PEAK	
LAND USE	L.U.C	SIZE	TRAFFIC	ENTER	EXIT	TOTAL	TRAFFIC	ENTER	EXIT	TOTAL
RESTAURANT (w. drive t	934	3,037	2,193	91	88	179	1,648	106	115	221
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0
			2,193	91	88	179	1,648	106	115	221

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

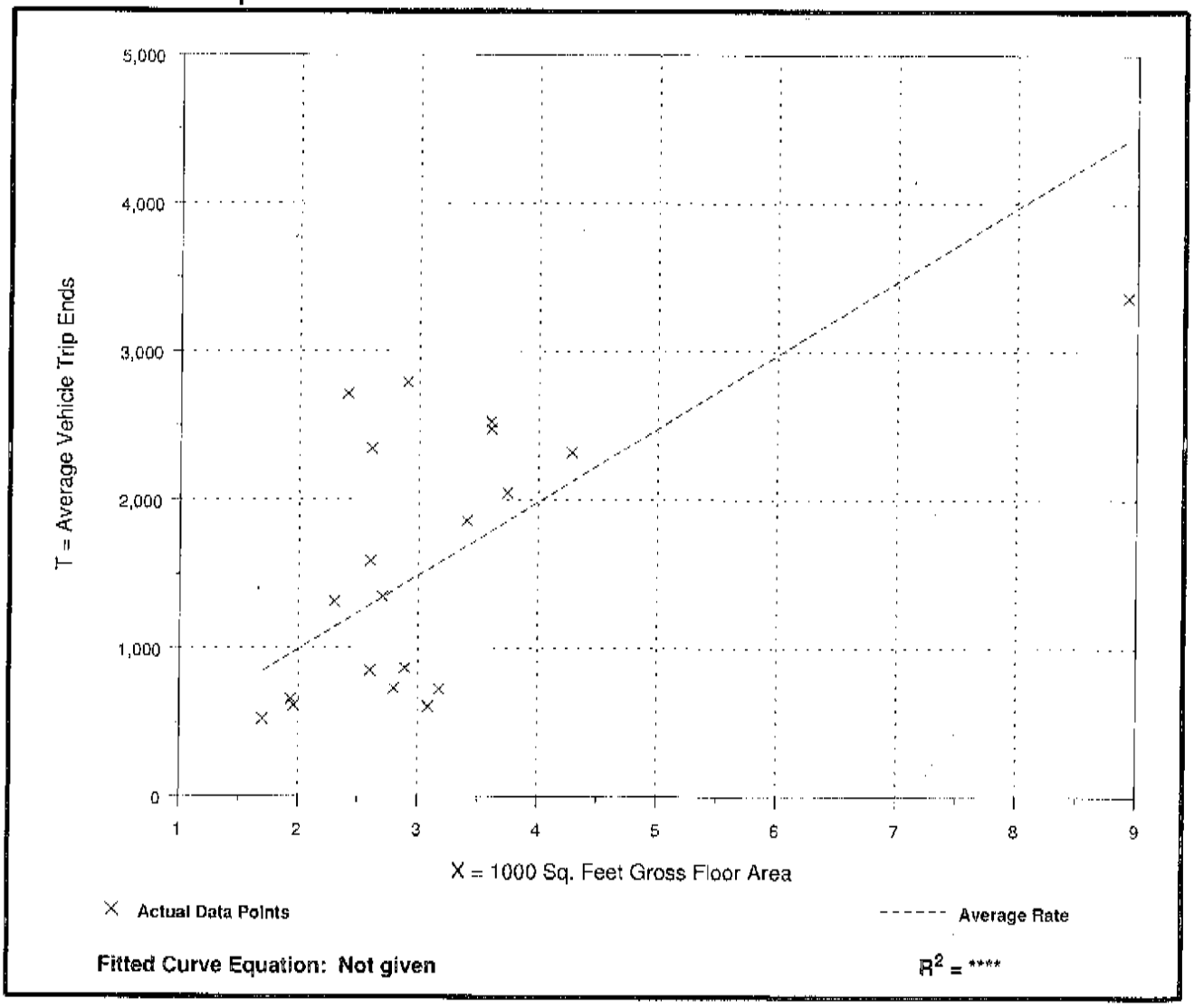
Average Vehicle Trip Ends vs: 1000 Sq. Feet Gross Floor Area
On a: Weekday

Number of Studies: 21
Average 1000 Sq. Feet GFA: 3
Directional Distribution: 50% entering, 50% exiting

Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
496.12	195.98 - 1132.92	242.52

Data Plot and Equation



Fitted Curve Equation: Not given

R^2 = ****

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

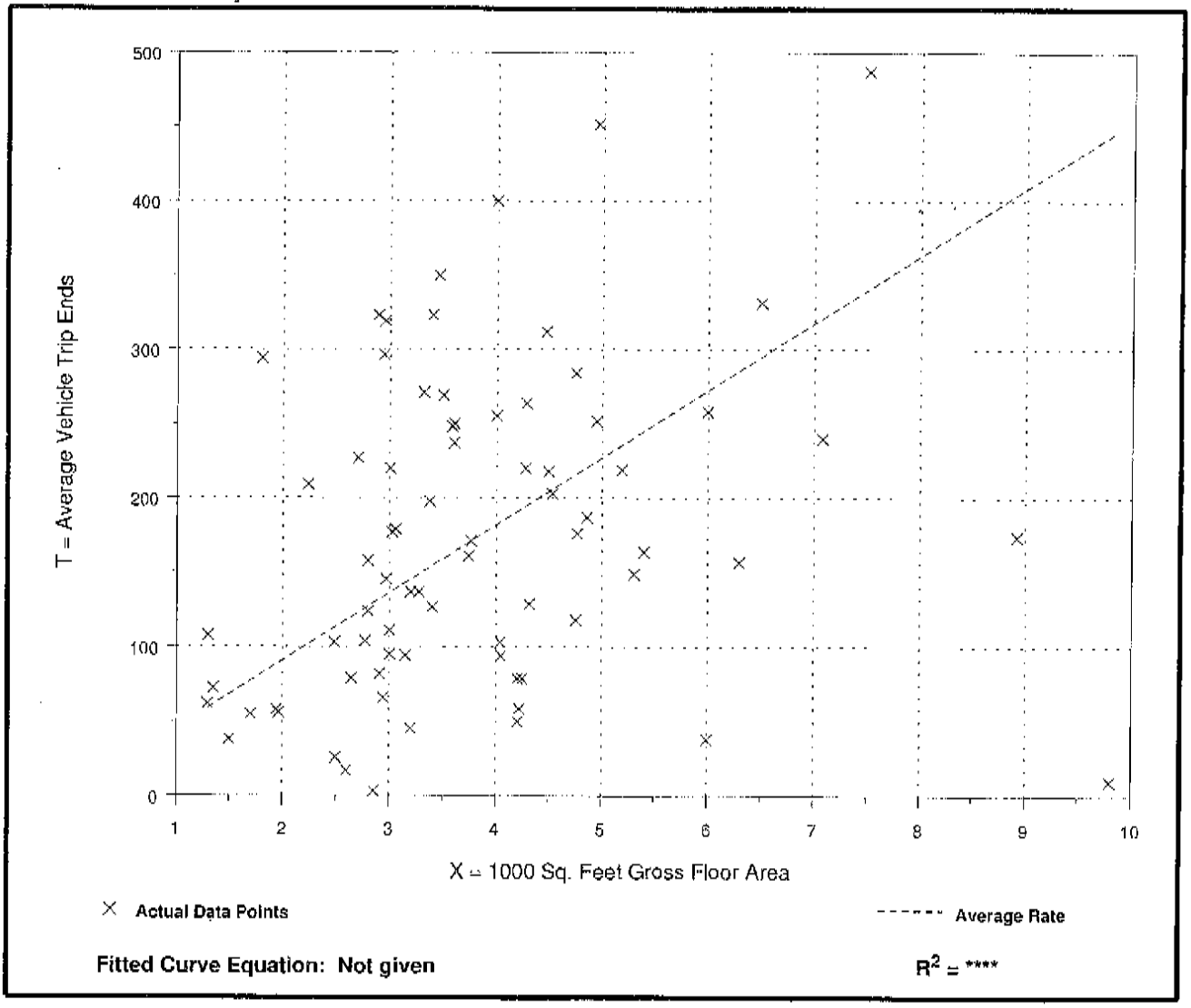
Average Vehicle Trip Ends vs: **1000 Sq. Feet Gross Floor Area**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: 75
Average 1000 Sq. Feet GFA: 4
Directional Distribution: 51% entering, 49% exiting

Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
45.42	1.02 - 163.33	28.63

Data Plot and Equation



Fitted Curve Equation: Not given

R^2 = ****

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

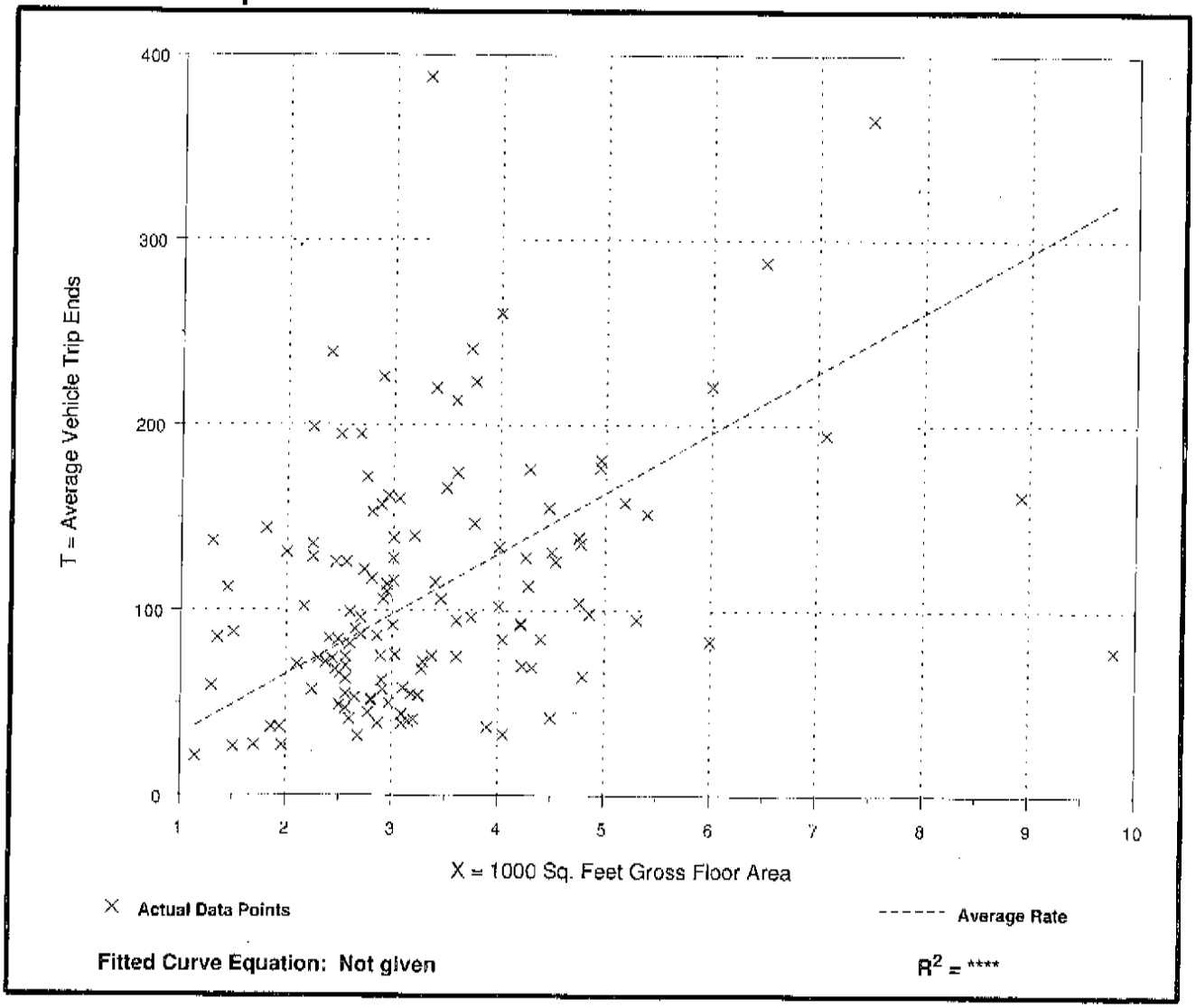
Average Vehicle Trip Ends vs: **1000 Sq. Feet Gross Floor Area**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 132
Average 1000 Sq. Feet GFA: 3
Directional Distribution: 52% entering, 48% exiting

Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
32.65	7.96 - 117.15	19.73

Data Plot and Equation



Fitted Curve Equation: Not given

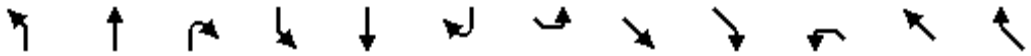
R^2 = ****

Lane Group	NBL	NBT	SBL	SBT	SEL	SET	NWL	NWT
Lane Group Flow (vph)	6	366	154	1668	11	38	99	65
v/c Ratio	0.03	0.28	0.19	1.13	0.05	0.23	0.51	0.28
Control Delay	2.8	6.1	2.9	83.9	34.3	25.4	47.2	21.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	2.8	6.1	2.9	83.9	34.3	25.4	47.2	21.4
Queue Length 50th (ft)	1	80	18	~1258	6	8	56	11
Queue Length 95th (ft)	3	121	30	#1394	13	18	90	44
Internal Link Dist (ft)		197		552		255		539
Turn Bay Length (ft)	125		50		175		175	
Base Capacity (vph)	204	1317	802	1473	209	190	195	240
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.28	0.19	1.13	0.05	0.20	0.51	0.27

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	6	322	26	125	1350	1	6	7	14	79	17	35
Future Volume (vph)	6	322	26	125	1350	1	6	7	14	79	17	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	3.0		2.0	3.0		2.0	3.0		2.0	3.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.90		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1842		1770	1863		1770	1679		1770	1674	
Flt Permitted	0.06	1.00		0.49	1.00		0.71	1.00		0.60	1.00	
Satd. Flow (perm)	109	1842		909	1863		1331	1679		1112	1674	
Peak-hour factor, PHF	0.95	0.95	0.95	0.81	0.81	0.81	0.56	0.56	0.56	0.80	0.80	0.80
Adj. Flow (vph)	6	339	27	154	1667	1	11	12	25	99	21	44
RTOR Reduction (vph)	0	3	0	0	0	0	0	23	0	0	39	0
Lane Group Flow (vph)	6	363	0	154	1668	0	11	15	0	99	26	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	67.0	66.2		75.5	70.7		7.8	6.8		13.2	9.5	
Effective Green, g (s)	71.0	68.2		77.5	72.7		11.8	8.8		16.5	11.5	
Actuated g/C Ratio	0.71	0.68		0.78	0.73		0.12	0.09		0.16	0.12	
Clearance Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	123	1256		767	1354		170	147		220	192	
v/s Ratio Prot	0.00	0.20		c0.01	c0.90		0.00	0.01		c0.03	0.02	
v/s Ratio Perm	0.03			0.14			0.01			0.05		
v/c Ratio	0.05	0.29		0.20	1.23		0.06	0.10		0.45	0.14	
Uniform Delay, d1	24.9	6.3		3.1	13.6		39.1	42.0		36.9	39.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.6		0.1	111.0		0.2	0.3		1.5	0.3	
Delay (s)	25.1	6.9		3.2	124.6		39.3	42.3		38.4	40.1	
Level of Service	C	A		A	F		D	D		D	D	
Approach Delay (s)		7.2			114.4			41.6			39.1	
Approach LOS		A			F			D			D	

Intersection Summary			
HCM 2000 Control Delay	91.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	95.5%	ICU Level of Service	F
Analysis Period (min)	15		

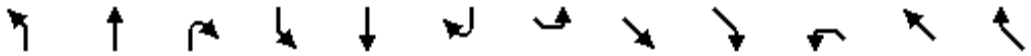
c Critical Lane Group

Lane Group	NBL	NBT	SBL	SBT	SEL	SET	NWL	NWT
Lane Group Flow (vph)	164	1420	154	1003	112	100	189	354
v/c Ratio	0.78	1.22	0.89	0.86	0.64	0.33	0.64	0.95
Control Delay	38.1	129.3	66.3	25.0	50.2	24.5	44.9	63.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.1	129.3	66.3	25.0	50.2	24.5	44.9	63.5
Queue Length 50th (ft)	30	~1182	51	498	61	29	107	156
Queue Length 95th (ft)	#84	#1115	#174	#743	#122	78	153	#260
Internal Link Dist (ft)		197		552		255		539
Turn Bay Length (ft)	125		50		175		175	
Base Capacity (vph)	209	1163	173	1171	176	303	297	374
Starvation Cap Reductn	0	5	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.78	1.23	0.89	0.86	0.64	0.33	0.64	0.95

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	126	1036	58	140	912	1	102	40	51	151	56	227
Future Volume (vph)	126	1036	58	140	912	1	102	40	51	151	56	227
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	3.0		2.0	3.0		2.0	3.0		2.0	3.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.92		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1848		1770	1862		1770	1706		1770	1639	
Flt Permitted	0.09	1.00		0.06	1.00		0.25	1.00		0.56	1.00	
Satd. Flow (perm)	169	1848		113	1862		466	1706		1044	1639	
Peak-hour factor, PHF	0.77	0.77	0.77	0.91	0.91	0.91	0.91	0.91	0.91	0.80	0.80	0.80
Adj. Flow (vph)	164	1345	75	154	1002	1	112	44	56	189	70	284
RTOR Reduction (vph)	0	2	0	0	0	0	0	43	0	0	109	0
Lane Group Flow (vph)	164	1418	0	154	1003	0	112	57	0	189	245	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	68.0	64.0		68.0	64.0		18.0	14.0		20.0	15.0	
Effective Green, g (s)	72.0	66.0		72.0	66.0		22.0	16.0		24.0	17.0	
Actuated g/C Ratio	0.69	0.63		0.69	0.63		0.21	0.15		0.23	0.16	
Clearance Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	207	1161		172	1170		172	259		287	265	
v/s Ratio Prot	0.05	c0.77		c0.05	0.54		0.04	0.03		c0.04	c0.15	
v/s Ratio Perm	0.50			0.56			0.10			0.11		
v/c Ratio	0.79	1.22		0.90	0.86		0.65	0.22		0.66	0.92	
Uniform Delay, d1	20.0	19.5		31.7	15.7		35.8	39.0		36.0	43.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	18.4	107.6		39.9	8.2		8.5	0.4		5.4	35.5	
Delay (s)	38.5	127.1		71.6	23.9		44.3	39.5		41.3	78.9	
Level of Service	D	F		E	C		D	D		D	E	
Approach Delay (s)		117.9			30.3			42.0			65.8	
Approach LOS		F			C			D			E	

Intersection Summary			
HCM 2000 Control Delay	76.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	101.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBL	NBT	SBL	SBT	SEL	SET	NWL	NWT
Lane Group Flow (vph)	6	389	164	1770	11	38	105	67
v/c Ratio	0.03	0.30	0.21	1.20	0.05	0.23	0.54	0.29
Control Delay	2.8	6.3	3.0	113.4	34.3	25.4	48.6	21.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	2.8	6.3	3.0	113.4	34.3	25.4	48.6	21.2
Queue Length 50th (ft)	1	87	19	~1394	6	8	60	12
Queue Length 95th (ft)	3	130	32	#1516	13	18	95	44
Internal Link Dist (ft)		197		552		255		539
Turn Bay Length (ft)	125		50		175		175	
Base Capacity (vph)	204	1316	781	1473	208	190	195	242
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.30	0.21	1.20	0.05	0.20	0.54	0.28

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	6	342	28	133	1433	1	6	7	14	84	17	37
Future Volume (vph)	6	342	28	133	1433	1	6	7	14	84	17	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	3.0		2.0	3.0		2.0	3.0		2.0	3.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.90		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1842		1770	1863		1770	1679		1770	1671	
Flt Permitted	0.06	1.00		0.47	1.00		0.71	1.00		0.60	1.00	
Satd. Flow (perm)	109	1842		881	1863		1329	1679		1112	1671	
Peak-hour factor, PHF	0.95	0.95	0.95	0.81	0.81	0.81	0.56	0.56	0.56	0.80	0.80	0.80
Adj. Flow (vph)	6	360	29	164	1769	1	11	12	25	105	21	46
RTOR Reduction (vph)	0	3	0	0	0	0	0	23	0	0	41	0
Lane Group Flow (vph)	6	386	0	164	1770	0	11	15	0	105	26	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	66.9	66.1		75.5	70.7		7.8	6.8		13.2	9.5	
Effective Green, g (s)	70.9	68.1		77.5	72.7		11.8	8.8		16.5	11.5	
Actuated g/C Ratio	0.71	0.68		0.78	0.73		0.12	0.09		0.16	0.12	
Clearance Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	123	1254		748	1354		170	147		220	192	
v/s Ratio Prot	0.00	0.21		c0.02	c0.95		0.00	0.01		c0.03	0.02	
v/s Ratio Perm	0.03			0.15			0.01			0.05		
v/c Ratio	0.05	0.31		0.22	1.31		0.06	0.10		0.48	0.14	
Uniform Delay, d1	24.9	6.4		3.2	13.6		39.1	42.0		37.1	39.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.6		0.1	143.7		0.2	0.3		1.6	0.3	
Delay (s)	25.0	7.1		3.3	157.3		39.3	42.3		38.7	40.1	
Level of Service	C	A		A	F		D	D		D	D	
Approach Delay (s)		7.3			144.3			41.6			39.3	
Approach LOS		A			F			D			D	

Intersection Summary			
HCM 2000 Control Delay	114.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	100.1%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBL	NBT	SBL	SBT	SEL	SET	NWL	NWT
Lane Group Flow (vph)	164	1510	164	1065	112	100	200	371
v/c Ratio	0.95	1.30	0.95	0.91	0.64	0.33	0.67	1.02
Control Delay	79.5	162.8	79.5	30.1	50.2	24.5	47.0	82.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	79.5	162.8	79.5	30.1	50.2	24.5	47.0	82.1
Queue Length 50th (ft)	58	~1311	58	571	61	29	114	~184
Queue Length 95th (ft)	#136	#1227	#189	#920	#122	78	161	#299
Internal Link Dist (ft)		197		552		255		539
Turn Bay Length (ft)	125		50		175		175	
Base Capacity (vph)	173	1163	173	1171	176	303	297	365
Starvation Cap Reductn	0	3	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.95	1.30	0.95	0.91	0.64	0.33	0.67	1.02

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	126	1100	62	149	968	1	102	40	51	160	56	241
Future Volume (vph)	126	1100	62	149	968	1	102	40	51	160	56	241
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	3.0		2.0	3.0		2.0	3.0		2.0	3.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.92		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1848		1770	1862		1770	1706		1770	1636	
Flt Permitted	0.06	1.00		0.06	1.00		0.25	1.00		0.56	1.00	
Satd. Flow (perm)	113	1848		113	1862		466	1706		1044	1636	
Peak-hour factor, PHF	0.77	0.77	0.77	0.91	0.91	0.91	0.91	0.91	0.91	0.80	0.80	0.80
Adj. Flow (vph)	164	1429	81	164	1064	1	112	44	56	200	70	301
RTOR Reduction (vph)	0	2	0	0	0	0	0	43	0	0	101	0
Lane Group Flow (vph)	164	1508	0	164	1065	0	112	57	0	200	270	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	68.0	64.0		68.0	64.0		18.0	14.0		20.0	15.0	
Effective Green, g (s)	72.0	66.0		72.0	66.0		22.0	16.0		24.0	17.0	
Actuated g/C Ratio	0.69	0.63		0.69	0.63		0.21	0.15		0.23	0.16	
Clearance Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	172	1161		172	1170		172	259		287	264	
v/s Ratio Prot	c0.05	c0.82		0.05	0.57		0.04	0.03		c0.05	c0.17	
v/s Ratio Perm	0.60			0.60			0.10			0.11		
v/c Ratio	0.95	1.30		0.95	0.91		0.65	0.22		0.70	1.02	
Uniform Delay, d1	31.1	19.5		32.9	16.9		35.8	39.0		36.4	44.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	54.7	141.0		54.7	12.0		8.5	0.4		7.2	61.8	
Delay (s)	85.7	160.5		87.6	29.0		44.3	39.5		43.6	105.8	
Level of Service	F	F		F	C		D	D		D	F	
Approach Delay (s)		153.2			36.8			42.0			84.0	
Approach LOS		F			D			D			F	

Intersection Summary			
HCM 2000 Control Delay	97.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	106.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBL	NBT	SBL	SBT	SEL	SET	NWL	NWT
Lane Group Flow (vph)	45	375	164	1787	52	77	108	75
v/c Ratio	0.23	0.29	0.22	1.31	0.23	0.39	0.55	0.41
Control Delay	5.7	6.7	3.4	161.5	36.7	25.7	47.4	27.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.7	6.7	3.4	161.5	36.7	25.7	47.4	27.7
Queue Length 50th (ft)	6	83	21	~1540	28	17	60	17
Queue Length 95th (ft)	13	125	32	#1537	37	26	97	51
Internal Link Dist (ft)		197		552		255		539
Turn Bay Length (ft)	125		50		175		175	
Base Capacity (vph)	192	1288	762	1369	229	212	197	194
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.29	0.22	1.31	0.23	0.36	0.55	0.39

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	43	332	25	133	1443	5	29	16	27	86	23	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	3.0		2.0	3.0		2.0	3.0		2.0	3.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.91		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1843		1770	1862		1770	1689		1770	1691	
Flt Permitted	0.06	1.00		0.48	1.00		0.67	1.00		0.57	1.00	
Satd. Flow (perm)	108	1843		901	1862		1242	1689		1071	1691	
Peak-hour factor, PHF	0.95	0.95	0.95	0.81	0.81	0.81	0.56	0.56	0.56	0.80	0.80	0.80
Adj. Flow (vph)	45	349	26	164	1781	6	52	29	48	108	29	46
RTOR Reduction (vph)	0	3	0	0	0	0	0	44	0	0	42	0
Lane Group Flow (vph)	45	372	0	164	1787	0	52	33	0	108	33	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	69.1	66.7		73.7	69.0		10.1	6.1		11.1	6.6	
Effective Green, g (s)	73.1	68.7		77.4	71.0		14.1	8.1		15.1	8.6	
Actuated g/C Ratio	0.73	0.69		0.77	0.71		0.14	0.08		0.15	0.09	
Clearance Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	152	1266		755	1322		206	136		207	145	
v/s Ratio Prot	c0.01	0.20		c0.01	c0.96		0.02	0.02		c0.03	0.02	
v/s Ratio Perm	0.20			0.15			0.02			0.04		
v/c Ratio	0.30	0.29		0.22	1.35		0.25	0.24		0.52	0.23	
Uniform Delay, d1	25.2	6.1		3.1	14.5		38.0	43.1		38.4	42.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	0.6		0.1	163.4		0.6	0.9		2.4	0.8	
Delay (s)	26.3	6.7		3.3	177.9		38.7	44.0		40.8	43.4	
Level of Service	C	A		A	F		D	D		D	D	
Approach Delay (s)		8.8			163.2			41.8			41.8	
Approach LOS		A			F			D			D	

Intersection Summary			
HCM 2000 Control Delay	124.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	101.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (veh/h)	0	44	27	0	50	24
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	49	30	0	56	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						335
pX, platoon unblocked						
vC, conflicting volume	168	30			30	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	168	30			30	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	95			96	
cM capacity (veh/h)	794	1044			1583	

Direction, Lane #	NB 1	SE 1	NW 1
Volume Total	49	30	82
Volume Left	0	0	56
Volume Right	49	0	0
cSH	1044	1700	1583
Volume to Capacity	0.05	0.02	0.04
Queue Length 95th (ft)	4	0	3
Control Delay (s)	8.6	0.0	5.1
Lane LOS	A		A
Approach Delay (s)	8.6	0.0	5.1
Approach LOS	A		

Intersection Summary			
Average Delay	5.2		
Intersection Capacity Utilization	20.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	27	0	401	1532	24
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	30	0	446	1702	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				638	277	
pX, platoon unblocked	0.31	0.25	0.25			
vC, conflicting volume	2148	1702	1729			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2605	2315	2422			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	0	100			
cM capacity (veh/h)	9	12	49			

Direction, Lane #	EB 1	NB 1	SB 1	SB 2
Volume Total	30	446	1702	27
Volume Left	0	0	0	0
Volume Right	30	0	0	27
cSH	12	49	1700	1700
Volume to Capacity	2.51	0.00	1.00	0.02
Queue Length 95th (ft)	117	0	0	0
Control Delay (s)	1321.5	0.0	0.0	0.0
Lane LOS	F			
Approach Delay (s)	1321.5	0.0	0.0	
Approach LOS	F			

Intersection Summary			
Average Delay	18.0		
Intersection Capacity Utilization	90.6%	ICU Level of Service	E
Analysis Period (min)	15		

Lane Group	NBL	NBT	SBL	SBT	SEL	SET	NWL	NWT
Lane Group Flow (vph)	199	1497	164	1075	130	117	201	376
v/c Ratio	1.15	1.29	0.95	0.92	0.74	0.39	0.71	1.03
Control Delay	139.1	157.9	79.5	31.4	59.3	27.2	50.1	85.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	139.1	158.0	79.5	31.4	59.3	27.2	50.1	85.8
Queue Length 50th (ft)	~105	~1292	58	583	71	39	115	~199
Queue Length 95th (ft)	#189	#1211	#189	#936	#125	93	162	#305
Internal Link Dist (ft)		197		552		224		539
Turn Bay Length (ft)	125		50		175		175	
Base Capacity (vph)	173	1163	173	1169	176	303	282	365
Starvation Cap Reductn	0	3	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.15	1.29	0.95	0.92	0.74	0.39	0.71	1.03

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	153	1093	60	149	975	4	118	46	60	161	60	241
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	3.0		2.0	3.0		2.0	3.0		2.0	3.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.92		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1848		1770	1862		1770	1705		1770	1639	
Flt Permitted	0.06	1.00		0.06	1.00		0.25	1.00		0.51	1.00	
Satd. Flow (perm)	113	1848		113	1862		466	1705		957	1639	
Peak-hour factor, PHF	0.77	0.77	0.77	0.91	0.91	0.91	0.91	0.91	0.91	0.80	0.80	0.80
Adj. Flow (vph)	199	1419	78	164	1071	4	130	51	66	201	75	301
RTOR Reduction (vph)	0	2	0	0	0	0	0	44	0	0	100	0
Lane Group Flow (vph)	199	1495	0	164	1075	0	130	73	0	201	276	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	68.0	64.0		68.0	64.0		18.0	14.0		20.0	15.0	
Effective Green, g (s)	72.0	66.0		72.0	66.0		22.0	16.0		24.0	17.0	
Actuated g/C Ratio	0.69	0.63		0.69	0.63		0.21	0.15		0.23	0.16	
Clearance Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	172	1161		172	1170		172	259		272	265	
v/s Ratio Prot	c0.07	c0.81		0.05	0.58		c0.04	0.04		c0.05	c0.17	
v/s Ratio Perm	0.73			0.60			0.12			0.12		
v/c Ratio	1.16	1.29		0.95	0.92		0.76	0.28		0.74	1.04	
Uniform Delay, d1	32.3	19.5		32.9	17.1		37.0	39.4		36.8	44.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	117.1	136.1		54.7	12.9		17.1	0.6		10.0	66.8	
Delay (s)	149.5	155.6		87.6	30.0		54.1	40.0		46.8	110.8	
Level of Service	F	F		F	C		D	D		D	F	
Approach Delay (s)		154.9			37.6			47.4			88.5	
Approach LOS		F			D			D			F	

Intersection Summary			
HCM 2000 Control Delay	99.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	107.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (veh/h)	0	31	193	0	37	183
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	34	214	0	41	203
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						304
pX, platoon unblocked	0.97					
vC, conflicting volume	500	214			214	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	468	214			214	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	96			97	
cM capacity (veh/h)	520	826			1356	

Direction, Lane #	NB 1	SE 1	NW 1
Volume Total	34	214	244
Volume Left	0	0	41
Volume Right	34	0	0
cSH	826	1700	1356
Volume to Capacity	0.04	0.13	0.03
Queue Length 95th (ft)	3	0	2
Control Delay (s)	9.6	0.0	1.5
Lane LOS	A		A
Approach Delay (s)	9.6	0.0	1.5
Approach LOS	A		

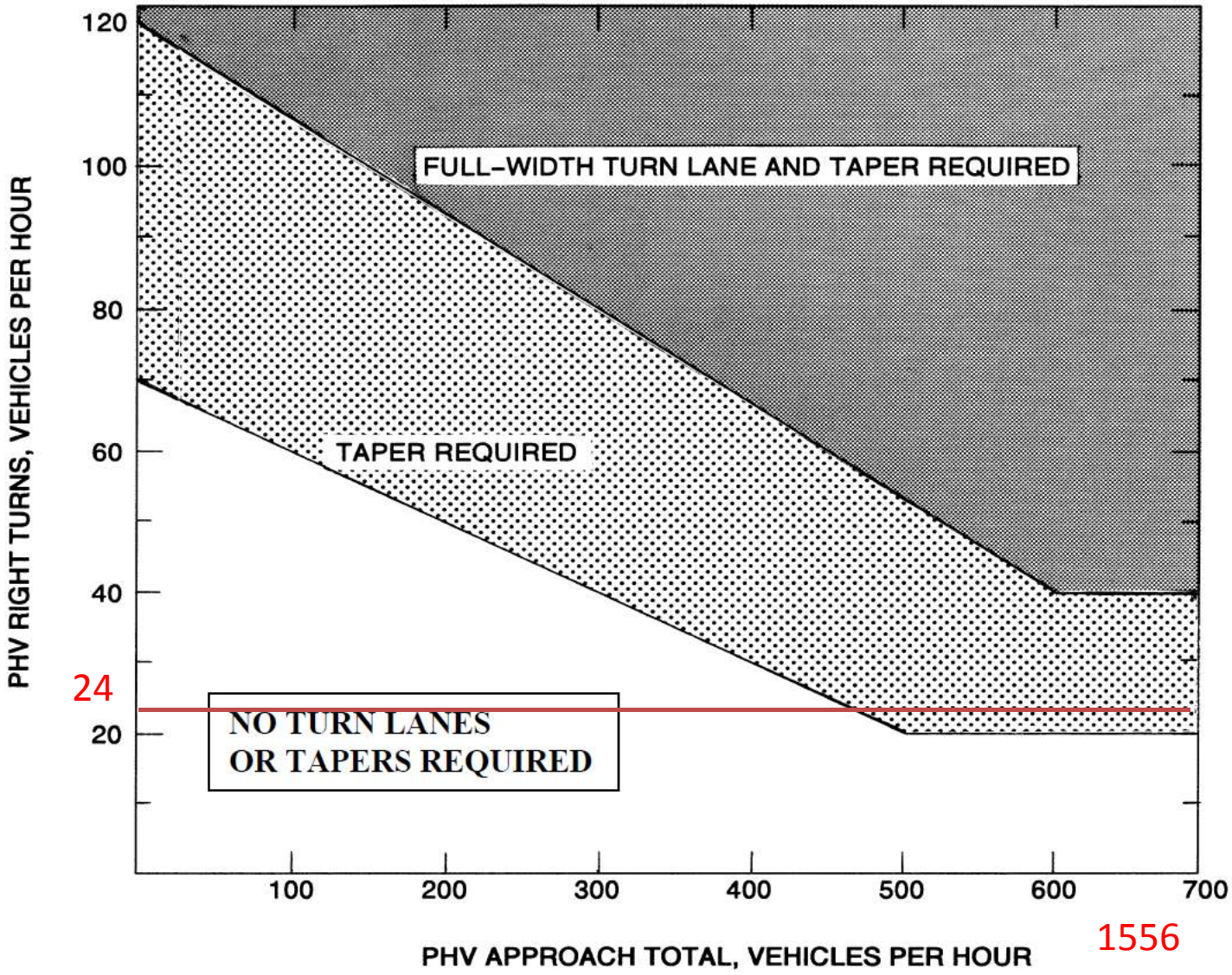
Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	35.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	19	0	1313	1182	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	21	0	1459	1313	19
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				638	277	
pX, platoon unblocked	0.35	0.28	0.28			
vC, conflicting volume	2772	1313	1332			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4322	844	911			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	80	100			
cM capacity (veh/h)	1	103	213			

Direction, Lane #	EB 1	NB 1	SB 1	SB 2
Volume Total	21	1459	1313	19
Volume Left	0	0	0	0
Volume Right	21	0	0	19
cSH	103	213	1700	1700
Volume to Capacity	0.20	0.00	0.77	0.01
Queue Length 95th (ft)	18	0	0	0
Control Delay (s)	48.6	0.0	0.0	0.0
Lane LOS	E			
Approach Delay (s)	48.6	0.0	0.0	
Approach LOS	E			

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	79.1%	ICU Level of Service	D
Analysis Period (min)	15		

MILLERTOWN PIKE RIGHT-TURN LANE ANALYSIS



Source: Virginia Department of Transportation Design Manaual

TABLE 5B

RIGHT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH

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 - 249 250 - 299					Yes	Yes Yes
300 - 349 350 - 399			Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes	Yes Yes	Yes Yes	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 - 600	+ / > 600
Fewer Than 25 25 - 49 50 - 99				Yes	Yes Yes	Yes Yes
100 - 149 150 - 199		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

24vph

Millertown Pike SB RT

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

CDM SMITH Inc.
1100 Marion Street, Suite 300
Knoxville, TN 37921
(865) 963-4300

File Name : LovesCrk_Millertown
Site Code : 00000000
Start Date : 12/15/2016
Page No : 1

Groups Printed- Unshifted

	LOVE Southbound				MILLERTOWN Westbound				LOVE Northbound				MILLERTOWN Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	0	1	1	2	21	65	0	86	3	0	0	3	2	22	5	29	120
07:15 AM	0	0	4	4	28	226	0	254	13	0	7	20	0	53	5	58	336
07:30 AM	0	1	2	3	35	422	0	457	17	1	10	28	1	63	14	78	566
07:45 AM	2	2	4	8	25	317	0	342	28	1	4	33	2	85	6	93	476
Total	2	4	11	17	109	1030	0	1139	61	2	21	84	5	223	30	258	1498
08:00 AM	3	1	0	4	33	305	0	338	17	14	10	41	0	89	2	91	474
08:15 AM	1	3	8	12	32	306	1	339	17	1	11	29	3	85	4	92	472
08:30 AM	2	3	5	10	12	168	0	180	23	0	23	46	4	52	7	63	299
08:45 AM	1	0	5	6	11	171	0	182	15	0	1	16	3	53	3	59	263
Total	7	7	18	32	88	950	1	1039	72	15	45	132	10	279	16	305	1508
*** BREAK ***																	
04:00 PM	9	10	17	36	36	199	2	237	40	5	34	79	26	176	20	222	574
04:15 PM	38	14	27	79	50	222	1	273	24	7	34	65	37	202	14	253	670
04:30 PM	14	13	15	42	28	233	1	262	38	13	45	96	21	245	15	281	681
04:45 PM	45	4	9	58	41	194	0	235	47	10	49	106	18	272	29	319	718
Total	106	41	68	215	155	848	4	1007	149	35	162	346	102	895	78	1075	2643
05:00 PM	15	9	19	43	47	241	0	288	37	19	80	136	23	247	14	284	751
05:15 PM	36	7	9	52	34	226	1	261	48	10	60	118	40	237	9	286	717
05:30 PM	23	18	12	53	29	235	0	264	28	20	55	103	40	202	12	254	674
05:45 PM	28	6	11	45	30	210	0	240	38	7	32	77	23	350	23	396	758
Total	102	40	51	193	140	912	1	1053	151	56	227	434	126	1036	58	1220	2900
Grand Total	217	92	148	457	492	3740	6	4238	433	108	455	996	243	2433	182	2858	8549
Apprch %	47.5	20.1	32.4		11.6	88.2	0.1		43.5	10.8	45.7		8.5	85.1	6.4		
Total %	2.5	1.1	1.7	5.3	5.8	43.7	0.1	49.6	5.1	1.3	5.3	11.7	2.8	28.5	2.1	33.4	

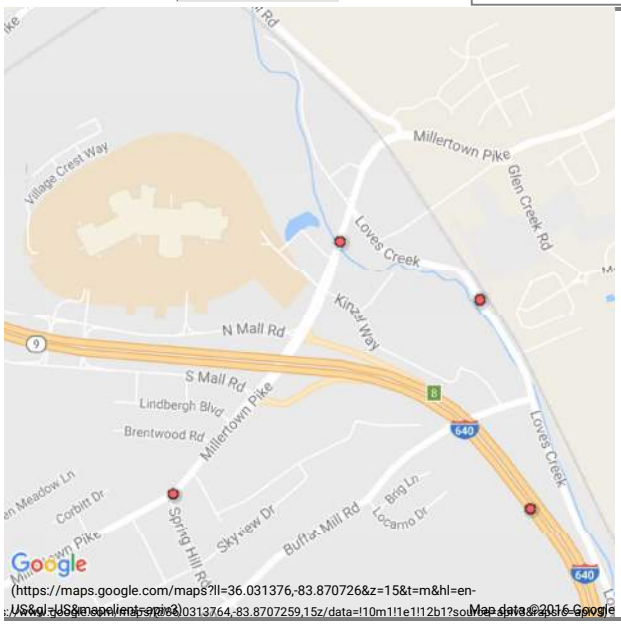
	LOVE Southbound				MILLERTOWN Westbound				LOVE Northbound				MILLERTOWN Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	0	1	2	3	**35**	**422**	0	**457**	17	1	10	28	1	63	**14**	78	**566**
07:45 AM	2	2	4	8	25	317	0	342	**28**	1	4	33	2	85	6	**93**	476
08:00 AM	**3**	1	0	4	33	305	0	338	17	**14**	10	**41**	0	**89**	2	91	474
08:15 AM	1	**3**	**8**	**12**	32	306	**1**	339	17	1	**11**	29	**3**	85	4	92	472
Total Volume	6	7	14	27	125	1350	1	1476	79	17	35	131	6	322	26	354	1988
% App. Total	22.2	25.9	51.9		8.5	91.5	0.1		60.3	13	26.7		1.7	91	7.3		
PHF	.500	.583	.438	.563	.893	.800	.250	.807	.705	.304	.795	.799	.500	.904	.464	.952	.878
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	15	9	**19**	43	**47**	**241**	0	**288**	37	19	**80**	**136**	23	247	14	284	751
05:15 PM	**36**	7	9	52	34	226	**1**	261	**48**	10	60	118	**40**	237	9	286	717
05:30 PM	23	**18**	12	**53**	29	235	0	264	28	**20**	55	103	40	202	12	254	674
05:45 PM	28	6	11	45	30	210	0	240	38	7	32	77	23	**350**	**23**	**396**	**758**
Total Volume	102	40	51	193	140	912	1	1053	151	56	227	434	126	1036	58	1220	2900
% App. Total	52.8	20.7	26.4		13.3	86.6	0.1		34.8	12.9	52.3		10.3	84.9	4.8		
PHF	.708	.556	.671	.910	.745	.946	.250	.914	.786	.700	.709	.798	.788	.740	.630	.770	.956

Traffic History

Traffic History reflects the Annual Average Daily Traffic (AADT) count along specific locations on Tennessee's road network

View stations on map: Select a county...

Non-Map Record Search: Anderson Station Number: Search



(https://maps.google.com/maps?ll=36.031376,-83.870726&z=15&t=m&hl=en-US&gl=US&mapclient=apiv3)

Station Information	
Station	000384
Route	03773
Location	NORTHEAST AN I-640
County	Knox
2015	17201
2014	19295
2013	17260
2012	17002
2011	16633
2010	17873
2009	16408
2008	16479
2007	17187
2006	16458
2005	15157
2004	15479
2003	14985
2002	13815
2001	16105
2000	15943
1999	15874
1998	15666

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Open With:	Google Earth (https://earth.google.com/)	ArcGIS Explorer (http://www.esri.com/software/arcgis/explorer/index.html)		MS Access o


CDM
Smith