THE CRESCENT AT EBENEZER COMMERCIAL SITE

Traffic Impact Study

Ebenezer Road
Knoxville, TN

A Traffic Impact Study for The Crescent at Ebenezer Commercial Site

Submitted to

Knoxville – Knox County Planning Commission

Revised July 8, 2019
Revised June 20, 2019
May 20, 2019
FMA Project No. 223.013.1

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Executive Summary

Crescent Bend Development, LLC is proposing a commercial development with a drive-through window located in Knox County. The project is located between the intersections of Ebenezer Road at Westland Drive (north) and Ebenezer Road at Westland Drive (south). The full buildout of the development was assumed to include a 10,850 SF medical-dental building and a 2,152 SF coffee shop with a drive-through window. Construction is proposed to take place this year and this study assumes full build out for the development will occur in 2021.

The main entrance/exit for The Crescent at Ebenezer Commercial Site will connect to Crescent Lake Way, which is the proposed driveway location for the Crescent Bend Apartments located on Ebenezer Road. Also proposed is a full access entrance/exit with separate right and left turn lanes on Westland Drive and a right-in/right-out entrance/exit on Ebenezer Road.

The property at the corner of Ebenezer Road at Westland Drive (north) has a concept plan that was approved for a Weigel's convenience market with gasoline pumps by the Knoxville-Knox County Planning Commission on July 12, 2012. The Weigel's will share access with The Crescent at Ebenezer Commercial Site and therefore was included in the traffic impact study.

In order to maintain or provide an acceptable level-of-service for each of the intersections studied, some recommendations are presented.

Ebenezer Road @ Westland Drive (north)
After the completion of The Crescent at Ebenezer Commercial Site the signalized intersection of Ebenezer Road at Westland Drive (north) will continue to operate at a LOS D during the AM peak hour and a LOS C during the PM peak hour using the existing signal timing provided by Knox County.

The LOS D during the AM peak hour is caused by the westbound thru/right lane having a volume to capacity ratio greater than 1.0. This is the case for the existing traffic volumes and the increase in delay caused by The Crescent at Ebenezer Commercial Site is expected to be minimal.

Ebenezer Road @ Westland Drive (south)
After the completion of The Crescent at Ebenezer Commercial Site the signalized intersection of Ebenezer Road at Westland Drive (south) will operate at a LOS B during the AM peak hour and a LOS D during the PM peak hour using the existing signal timing provided by Knox County.

The eastbound double left turn lanes operate at a LOS C during the existing traffic conditions and a LOS F during both the background traffic conditions and after the completion of The Crescent at Ebenezer Commercial Site. The delay is caused by the turn lanes having a volume to capacity ratio greater than 1.0 and a queue storage ratio of greater than 2.0. The increase in delay caused by The Crescent at Ebenezer Commercial Site is expected to be minimal.

Ebenezer Road @ Driveway Connection
Knox County Engineering and Public Works recommended that the Ebenezer Road driveway be a right-in/right-out driveway connection.

Ebenezer Road @ Crescent Lake Way
After the completion of The Crescent at Ebenezer Commercial Site the westbound approach will operate at a LOS E during the AM peak hour and a LOS D during the PM peak hours and the southbound approach will operate at a LOS C during the AM peak hour and a LOS B during the PM peak hour.

The unsignalized intersection capacity analyses shows a 95% queue length after the completion of The Crescent at Ebenezer Commercial Site at Crescent Lake Way of approximately two car lengths during the peak hours; therefore the existing storage at the intersection is adequate and no change is necessary.

Westland Drive @ Driveway Connection
After the completion of The Crescent at Ebenezer Commercial Site the westbound approach will continue to operate at a LOS A during both the AM and PM peak hours and the northbound approach will operate at a LOS C during the AM peak hour and a LOS F during the PM peak hour.

The signalized intersection capacity analyses shows a 95% queue length at the full buildout at the intersection of Ebenezer Road at Westland Drive (north) of 1,017 feet at the westbound thru/right lane and 156 feet at the westbound left turn lanes during the AM peak hour and 226 feet at the westbound thru/right lane and 322 feet for the westbound left turn lanes during the PM peak hour. Thus the queue from the signalized intersections of Ebenezer Road at Westland Drive (north) will block the proposed driveway connection for a portion of time during both the AM and PM peak hours.

1 Introduction

1.1 Project Description

This report provides a summary of a traffic impact study that was performed for The Crescent at Ebenezer Commercial Site. The project is located between the intersections of Ebenezer Road at Westland Drive (north) and Ebenezer Road at Westland Drive (south) in Knox County. The location of the site is shown in Figure 1.

The full buildout of the development was assumed to include a 10,850 SF medical-dental building and a 2,152 SF coffee shop with a drive-through window. Construction is proposed to take place this year and this study assumes full build out for the development will occur in 2021.

The main entrance/exit for The Crescent at Ebenezer Commercial Site will connect to Crescent Lake Way, which is the proposed driveway location for the Crescent Bend Apartments located on Ebenezer Road. Also proposed is a full access entrance/exit with separate right and left turn lanes on Westland Drive and a right-in/right-out entrance/exit on Ebenezer Road. The proposed site layout is shown in Figure 2.

The purpose of this study is to evaluate the impacts to the traffic conditions caused by the proposed development.

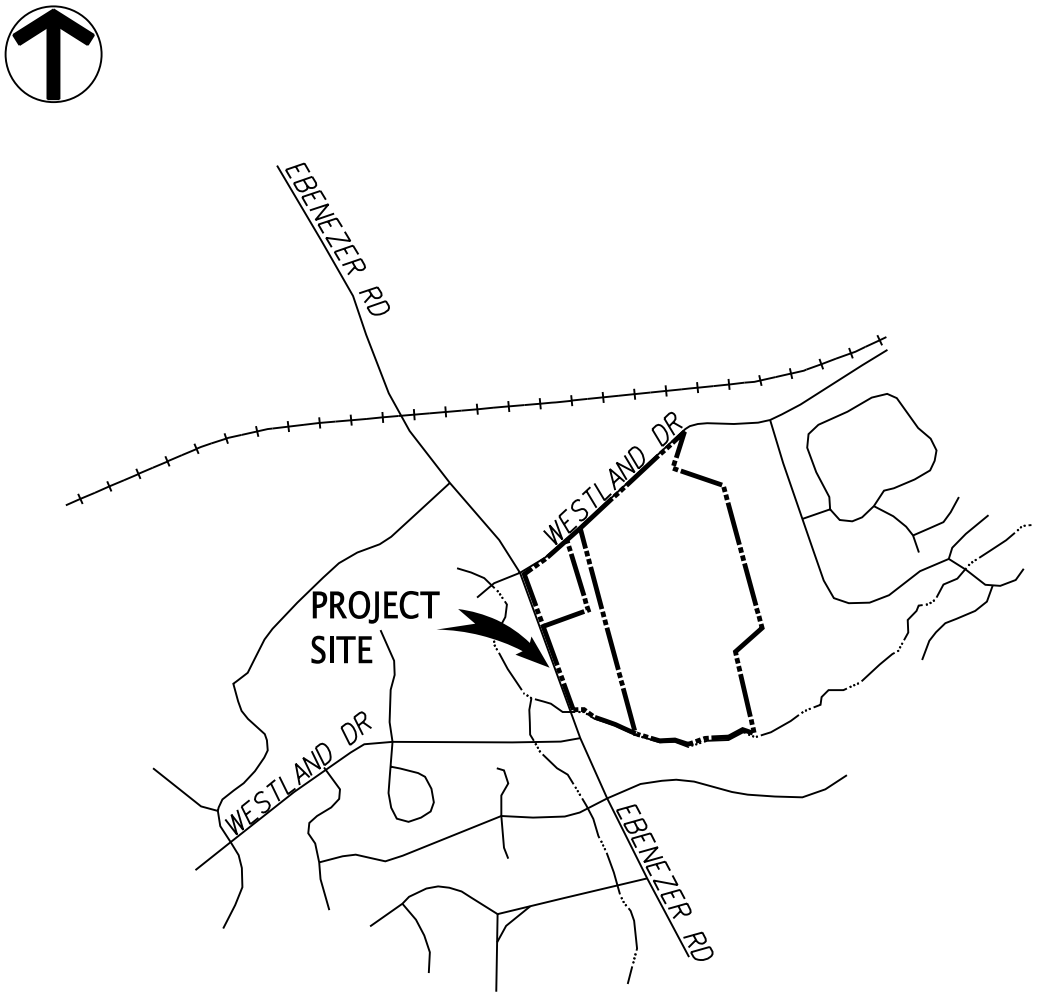


Figure 1: Location Map

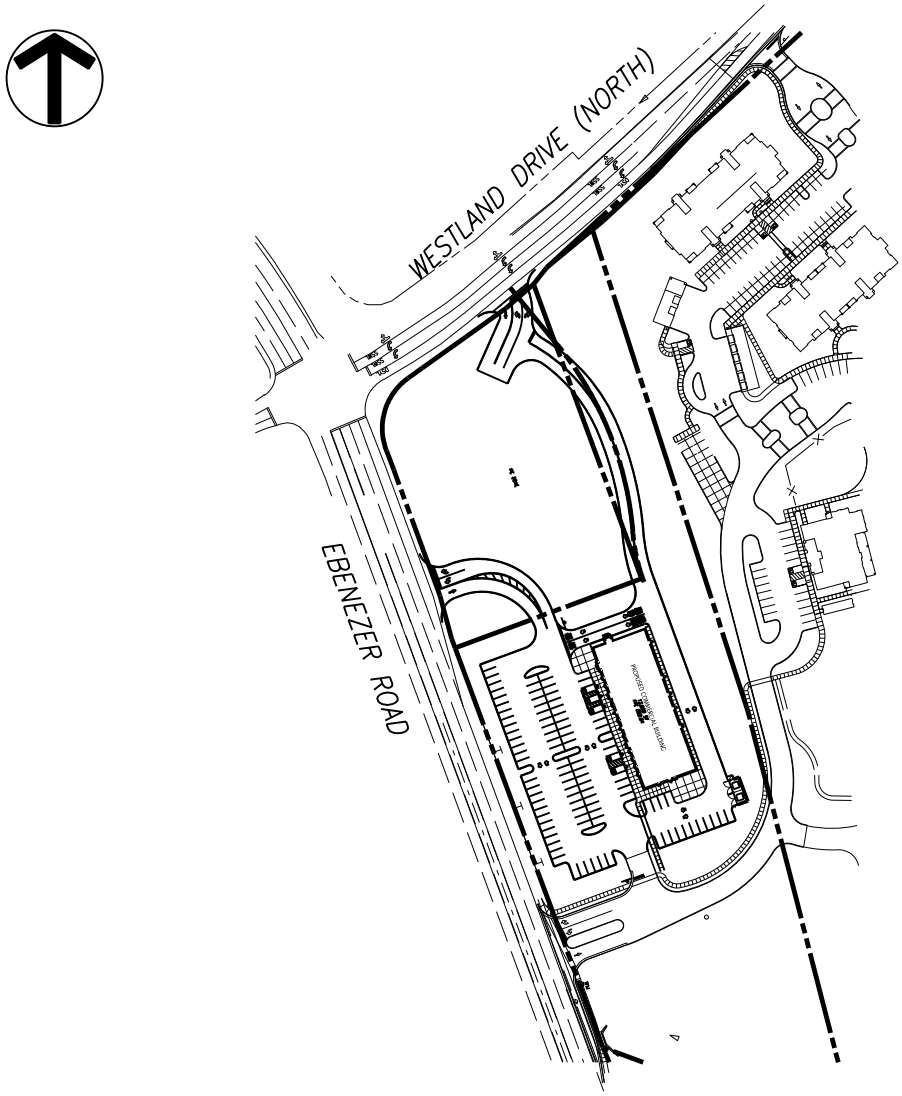


Figure 2: Site Plan

1.2 Existing Site Conditions

Crescent Lake Way is located approximately 235 feet north of the intersection of Westland Drive (south) and approximately 735 feet south of the intersection of Westland Drive (north). The roadway has a width of approximately 40 feet with separate right and left turn lanes.

The additional right-in/right-out driveway connection to Ebenezer Road is located approximately 310 feet south of the intersection of Westland Drive (north).

The proposed driveway connection to Westland Drive is located approximately 435 feet south of Serene Breeze Way (The Crescent at Ebenezer Apartments driveway connection) and approximately 250 feet north of the intersection of Ebenezer Road at Westland Drive (north). The proposed driveway has a width of 30 feet with separate right and left turn lanes.

There is also a private driveway connection at 1040 Ebenezer road located approximately 195 feet north of the intersection of Westland Drive (south). The house and driveway are expected to be removed as a part of phase 1 of The Crescent at Ebenezer apartment development.

Westland Drive east of the intersection of Ebenezer Road is a two-lane road. Westland Drive west of the intersection of Ebenezer Road is a three-lane road with a two-way left turn lane. The Knoxville-Knox County Planning Commission classifies Westland Drive as a minor arterial (with an 88 foot ROW) per the Major Road Plan. The posted speed limit on Westland Drive is 40 mph.

Ebenezer Road is a five-lane road with a two-way left turn lane at the existing driveway connection. The Knoxville-Knox County Planning Commission classifies Ebenezer Road at the location of the development between S Peters Road and S Northshore Drive as a minor arterial (with a 100 foot ROW) per the Major Road Plan. The posted speed limit on Ebenezer Road is 45 mph.

The existing sidewalk on Ebenezer Road extends northbound to the intersection of S Peters Road at Kingston Pike and southbound to the intersection with S Northshore Drive. The existing sidewalk on Westland Drive (north) extends 425 feet eastbound from the intersection with Ebenezer Road.

Aerial photos of the existing intersections are included in Attachment 9.

2 Existing Traffic Volumes

FMA conducted a turning movement count at the intersection of Ebenezer Road at Westland Drive (north) on Thursday May 10, 2018. FMA also conducted a turning movement count at the intersection of Ebenezer Road at Westland Drive (south) on Thursday May 17, 2018.

The current AM peak hour and PM peak hour were determined using the turning movement count that FMA conducted. At the intersection of Ebenezer Road at Westland Drive (north) the AM peak hour occurred between 7:15 am and 8:15 am, and the PM peak hour occurred between 5:00 pm and 6:00 pm. At the intersection of Ebenezer Road at Westland Drive (south) the AM peak hour occurred between 7:30 am and 8:30 am, and the PM peak hour occurred between 5:00 pm and 6:00 pm.

The existing volumes including the AM and PM peak hour traffic volumes at the count locations are shown in Figure 3, and the count data collected is included in Attachment 1.

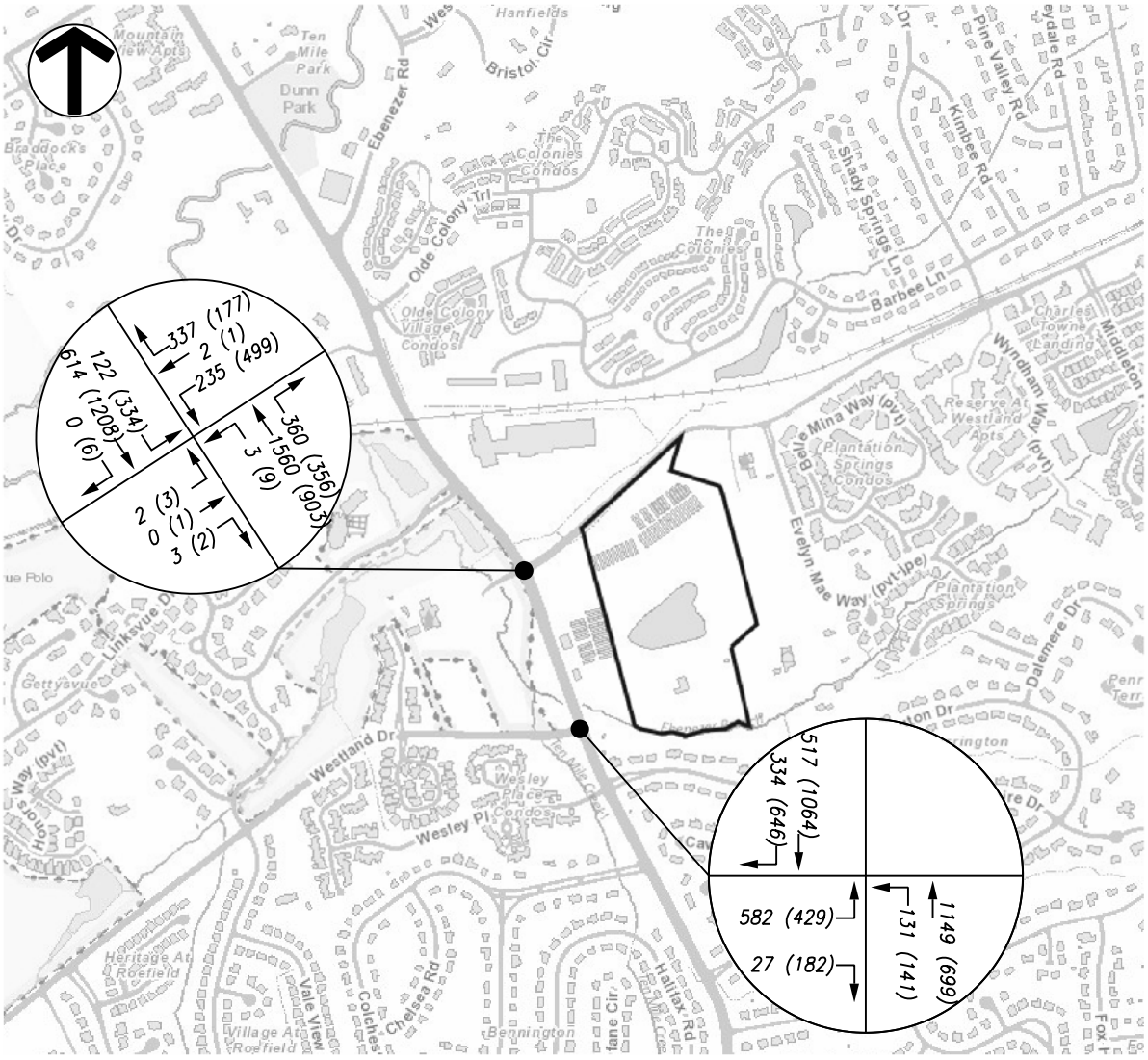


Figure 3: 2018 Existing Peak Hour Traffic

3 Background Growth

The Tennessee Department of Transportation (TDOT) and the Knoxville Regional Transportation Planning Organization (TPO) maintain count stations in the vicinity of the proposed development.

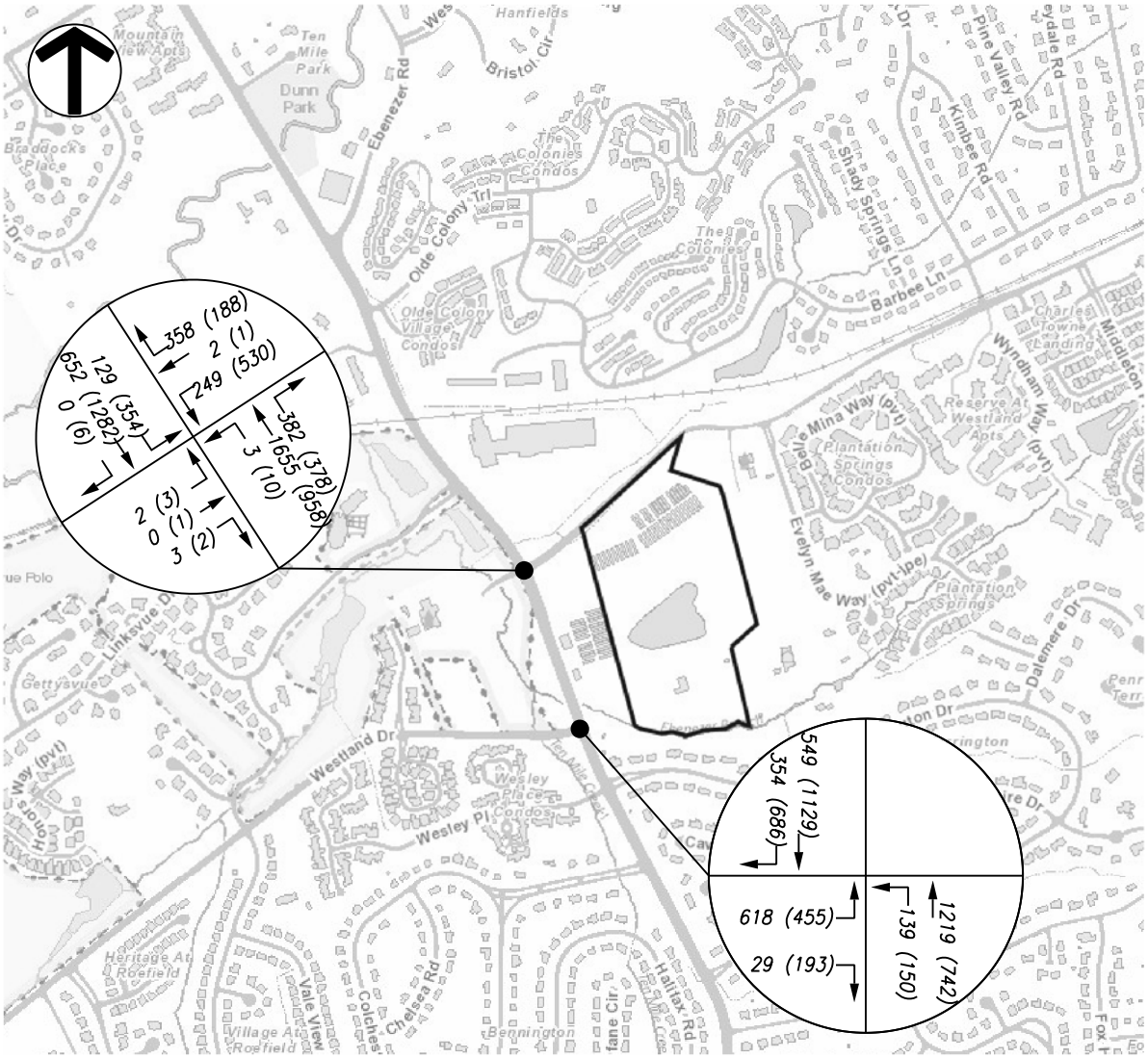
Knoxville TPO count station ID: 093M002 is located on Westland Drive 1000 feet east of Villa Crest Drive and northeast of the proposed development. The annual traffic growth rate for this station over the last five years is approximately 2.90% and the 2017 ADT was 9,870 vehicles per day.

Knoxville TPO count station ID: 093M001 is located on Westland Drive 100 feet east of Cloverhill Road and west of the proposed development. The annual growth rate for this station over the last five years is approximately 2.85% and the 2017 ADT was 12,110 vehicles per day.

TDOT count station #000286 is located on Ebenezer Road south of the intersection with Westland Drive. The annual growth rate for this station over the last ten years is approximately -1.02%. However the ADT has started to increase again and the annual growth rate for this station over the last four years is approximately 0.54%. The 2017 ADT was 14,691 vehicles per day.

For the purpose of this study, an annual growth rate of 2.0% was assumed for traffic at both intersections of Ebenezer Road at Westland Drive until full occupancy is reached in 2021. Attachment 2 shows the trend line growth charts for the Knoxville TPO and TDOT count stations.

Figure 4 demonstrates the projected background peak hour volumes at the intersections after applying the background growth rate to the existing conditions.



LEGEND:

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

Figure 4: 2021 Background Peak Hour Traffic

3.1 The Crescent at Ebenezer

A Level I traffic impact study was completed for The Crescent at Ebenezer development located between the intersections of Ebenezer Road at Westland Drive (north) and Ebenezer Road at Westland Drive (south) within Knox County. "The Crescent at Ebenezer Traffic Impact Study" was prepared by Fulghum, MacIndoe & Associates dated August 27, 2018 and Knoxville-Knox County Planning Commission approved the concept plan on September 13, 2018.

The Crescent at Ebenezer is a residential development with a combination of apartment buildings and senior adult housing units. The full buildout of the development will consist of 249 apartment units and 180 independent living units. The anticipated completion date was the year 2021.

The main entrance/exit for The Crescent at Ebenezer will connect to the existing driveway connection for the Cedar Row Nursery (Crescent Lake Way) located on Ebenezer Road. A second entrance/exit will connect to a proposed driveway location (Serene Breeze Way) on Westland Drive.

FMA recommended the installation of a northbound right turn lane at the intersection of Ebenezer Road at Crescent Lake Way to be built during the phase 1 (apartment development) construction and the installation of a westbound left turn lane at the intersection of Westland Drive at Serene Breeze Way be built during the phase 2 (independent living development) construction.

The total combined trips generated by The Crescent at Ebenezer was estimated to be 2,724 daily trips. The estimated trips are 160 trips during the AM peak hour and 222 trips during the PM peak hour. A trip generation summary is shown in Table 3.1-1.

Table 3.1-1
The Crescent at Ebenezer
Trip Generation Summary

Land Use	Density	Daily Trips	AM Peak Hour Enter	AM Peak Hour Exit	PM Peak Hour Enter	PM Peak Hour Exit
The Crescent at Ebenezer						
Apartments (Local Trip Gen Study)	249 Units	2,167	27	97	97	80
Senior Adult Housing (LUC 252)	180 Units	557	12	24	24	21
The Crescent at Ebenezer		**2,724**	**39**	**121**	**121**	**101**

Figure 5 shows the combined peak hour site traffic for The Crescent at Ebenezer apartment and senior adult housing trips.

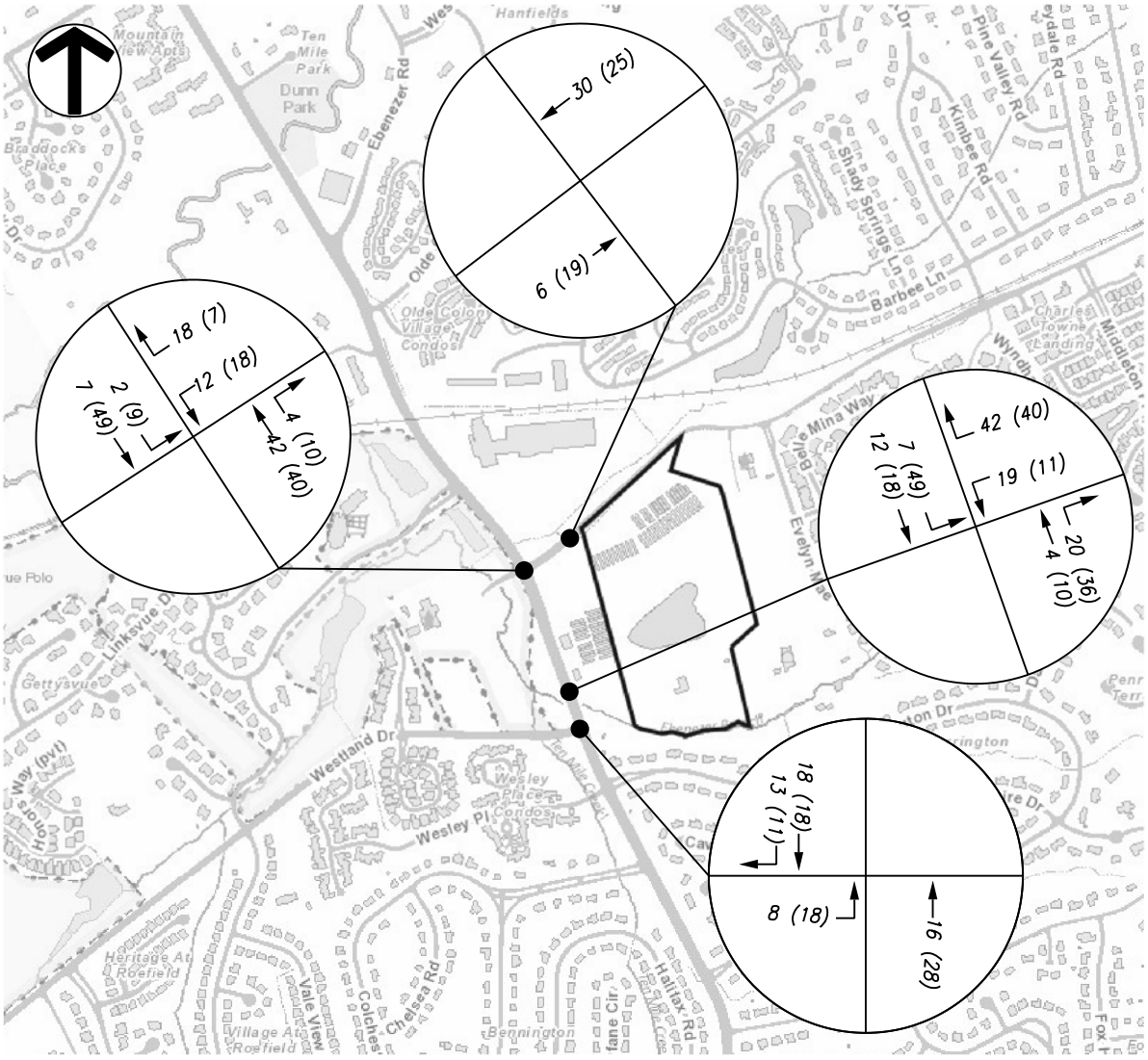


Figure 5: Apartment & Senior Adult Housing Peak Hour Site Traffic

3.2 Weigel's

A Level I traffic impact study was done for Ebenezer Road at Westland Drive Weigel's located within Knox County. The "Ebenezer Road - Westland Drive Weigel's Convenience Store Traffic Impact Study" was prepared by CDM Smith dated May 21, 2012.

The proposed project is a 3,997 SF Weigel's convenience store with 16 fueling stations. A full access driveway connection is proposed for the Weigel's site from both Ebenezer Road and Westland Drive.

CDM Smith had the following recommendations:

- Minimize landscaping, using low growing vegetation, and signing at the proposed street access to insure that safe sight distance is maintained.
- Extend the planned northbound right-turn lane on Ebenezer Road for Westland Drive approximately another 100 feet to be also used by traffic entering the Weigel's convenience store.
- Provide separate left and right turn lanes from the site access.
- Post STOP signs (R1-1) for exiting traffic from the site driveways.
- Intersection design should conform to the recommended standards and practices of the Tennessee Department of Transportation, American Association of State Highway and Transportation Officials, the Institute of Transportation Engineers and the Knox County, Department of Engineering and Public Works.

Knoxville-Knox County Planning Commission approved the concept plan on July 12, 2012. Knox County Engineering and Public Works recommended that the Westland Road driveway connection remain a full access driveway and that the Ebenezer Road driveway be revised to a right-in/right-out driveway connection.

Due to the changes in the site access FMA recalculated the trip generation and trip distribution for the Weigel's convenience market with gasoline pumps and using the equations provided in the *Trip Generation, 10th Edition,* published by the Institute of Transportation Engineers. Site trips were calculated for a convenience market with gasoline pumps (Land Use 853) for a 3,997 SF building and up to 16 fueling stations. A pass-by rate reduction of 65% was used for Land Use 853 as recommended by the Knoxville-Knox County Planning Commission.

The total combined trips generated by the Weigel's Gasoline/Service Station was estimated to be 2,495 daily trips. The estimated trips are 56 new trips during the AM peak hour and 68 new trips during the PM peak hour. A trip generation summary is shown in Table 3.2-1 and the land use worksheets are included in Attachment 3.

Table 3.2-1
Weigel's Gasoline/Service Station
Trip Generation Summary

Land Use	Density	Daily Trips	AM Peak Hour Enter	AM Peak Hour Exit	PM Peak Hour Enter	PM Peak Hour Exit
Weigel's Gasoline/Service Station						
Weigel's (LUC 853)	3,997 SF	2,495	81	81	99	99
65% Pass-By Reduction		1,622	53	53	64	64
35% New Trips		873	28	28	34	34

Figure 6 shows the Weigel's AM & PM peak hour trip distribution and Figures 7 and 8 show the Weigel's AM & PM peak hour trip distribution pass-by trips.

Figure 9 shows the Weigel's peak hour traffic and Figure 10 shows the Weigel's pass-by trips.

Figure 11 shows the background peak hour combined traffic including the 2021 background traffic, peak hour site traffic from the Crescent at Ebenezer apartment and senior adult living development and the peak hour site traffic from the Weigel's.

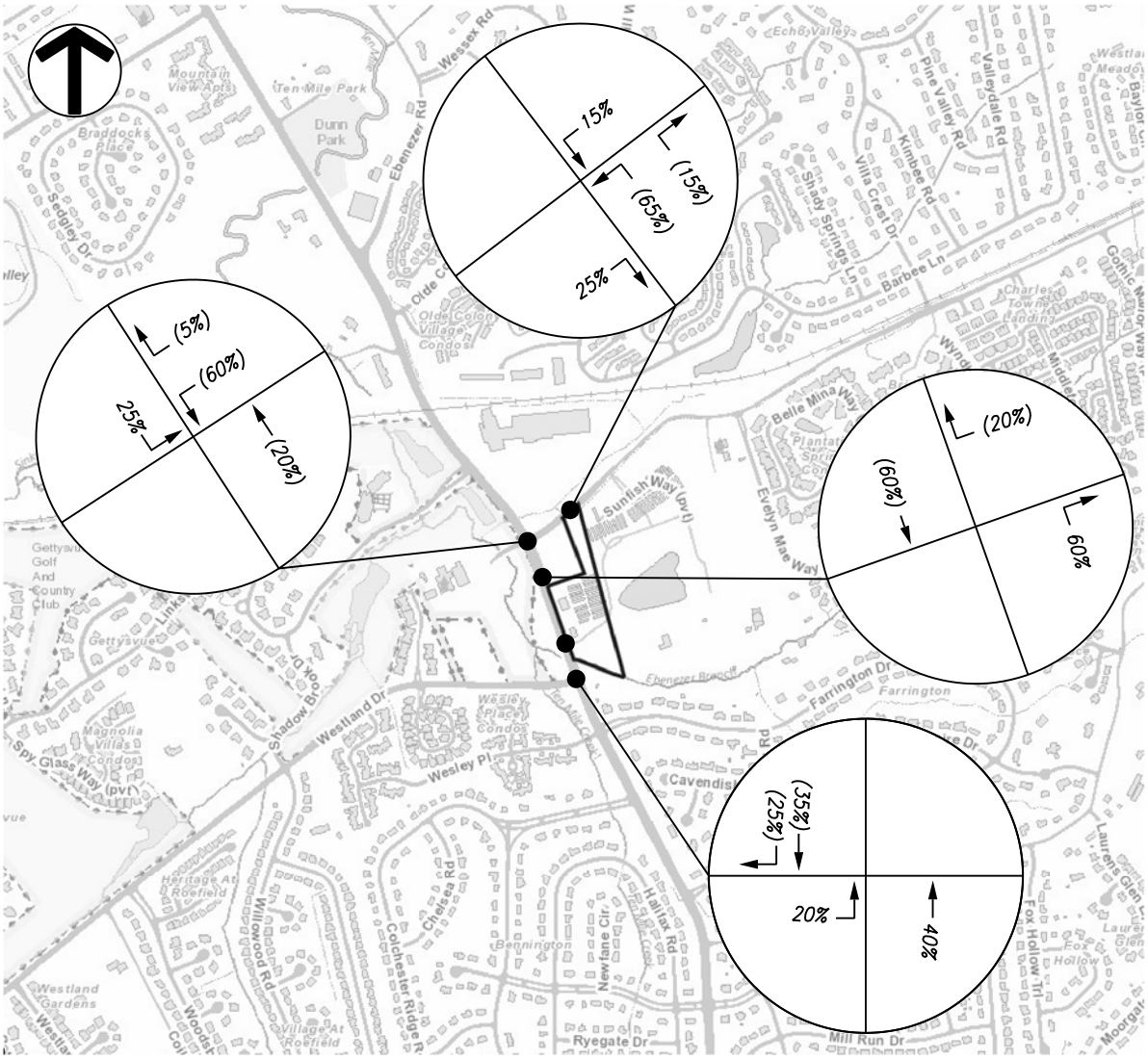


Figure 6: Weigel's AM & PM Peak Hour Trip Distribution

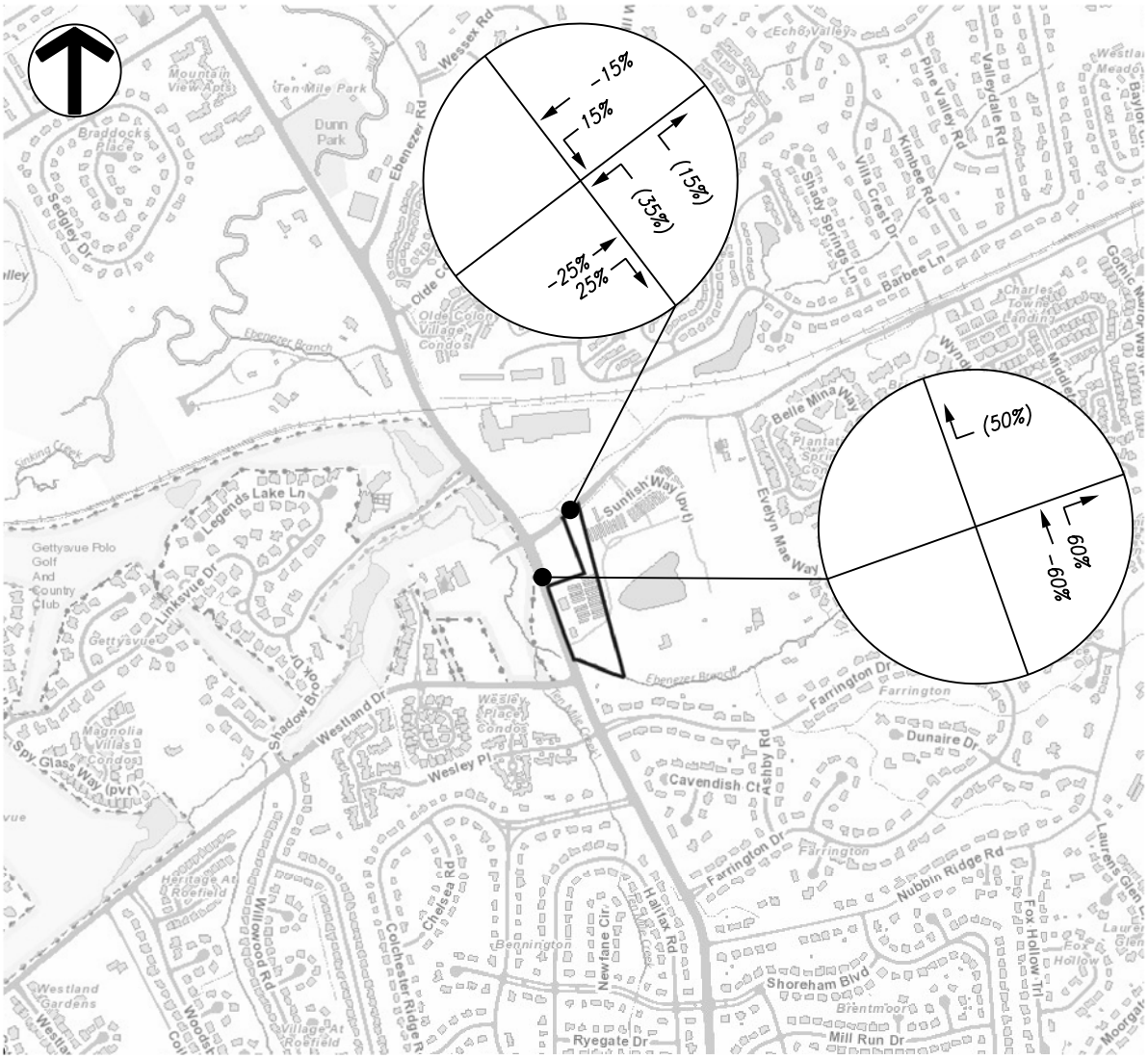


Figure 7: Weigel's AM Peak Hour Trip Distribution Pass-By Trips

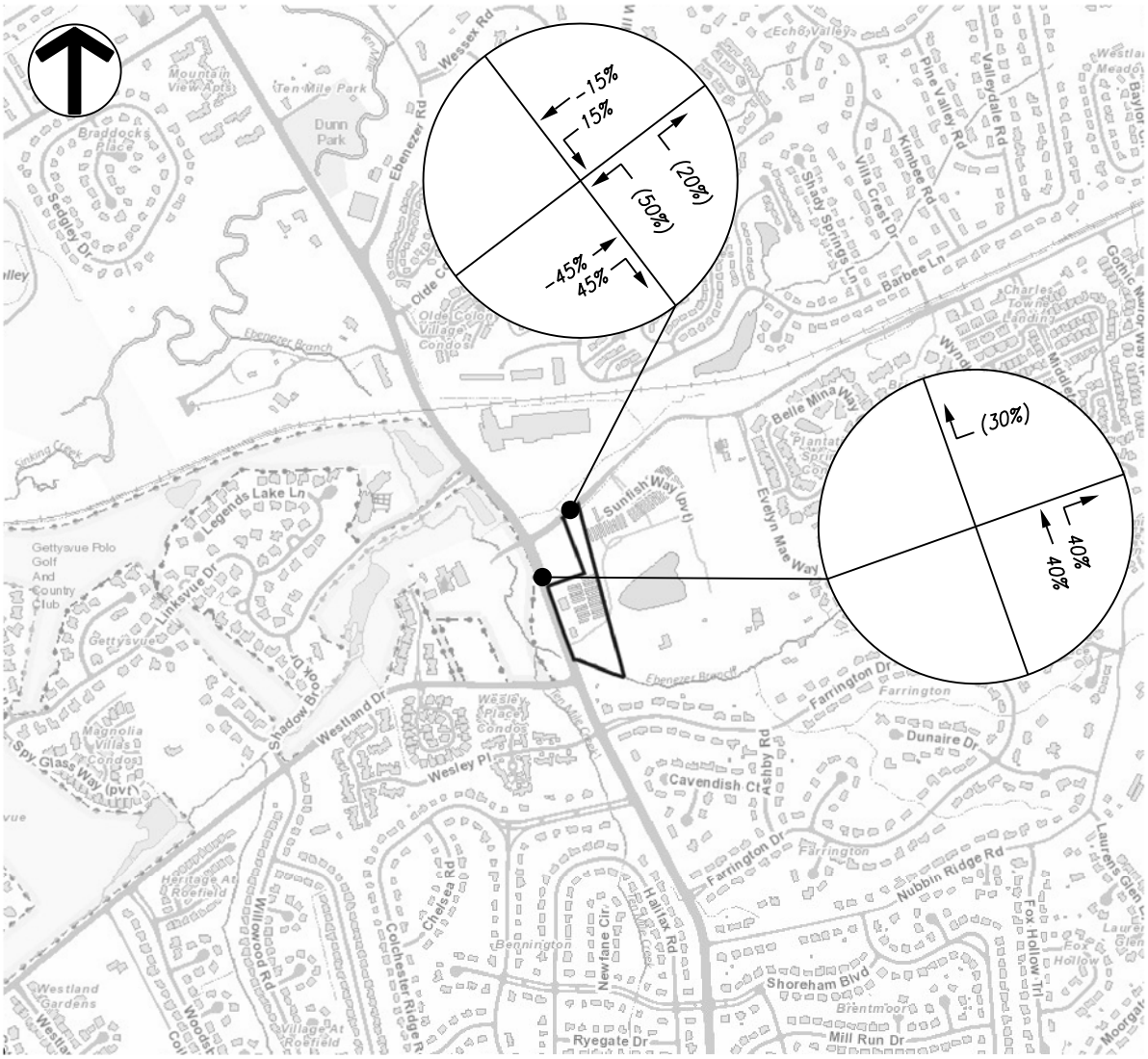
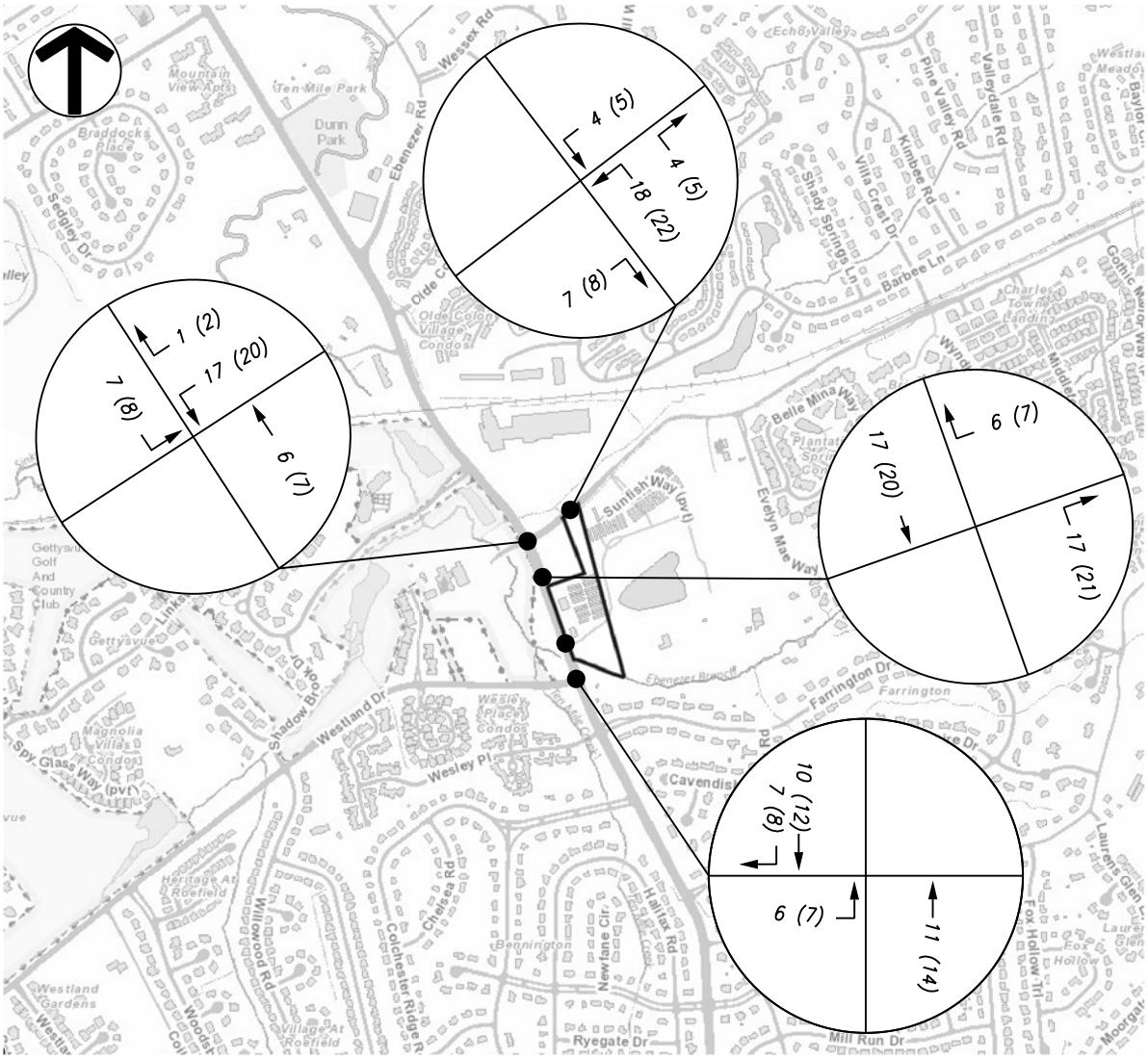


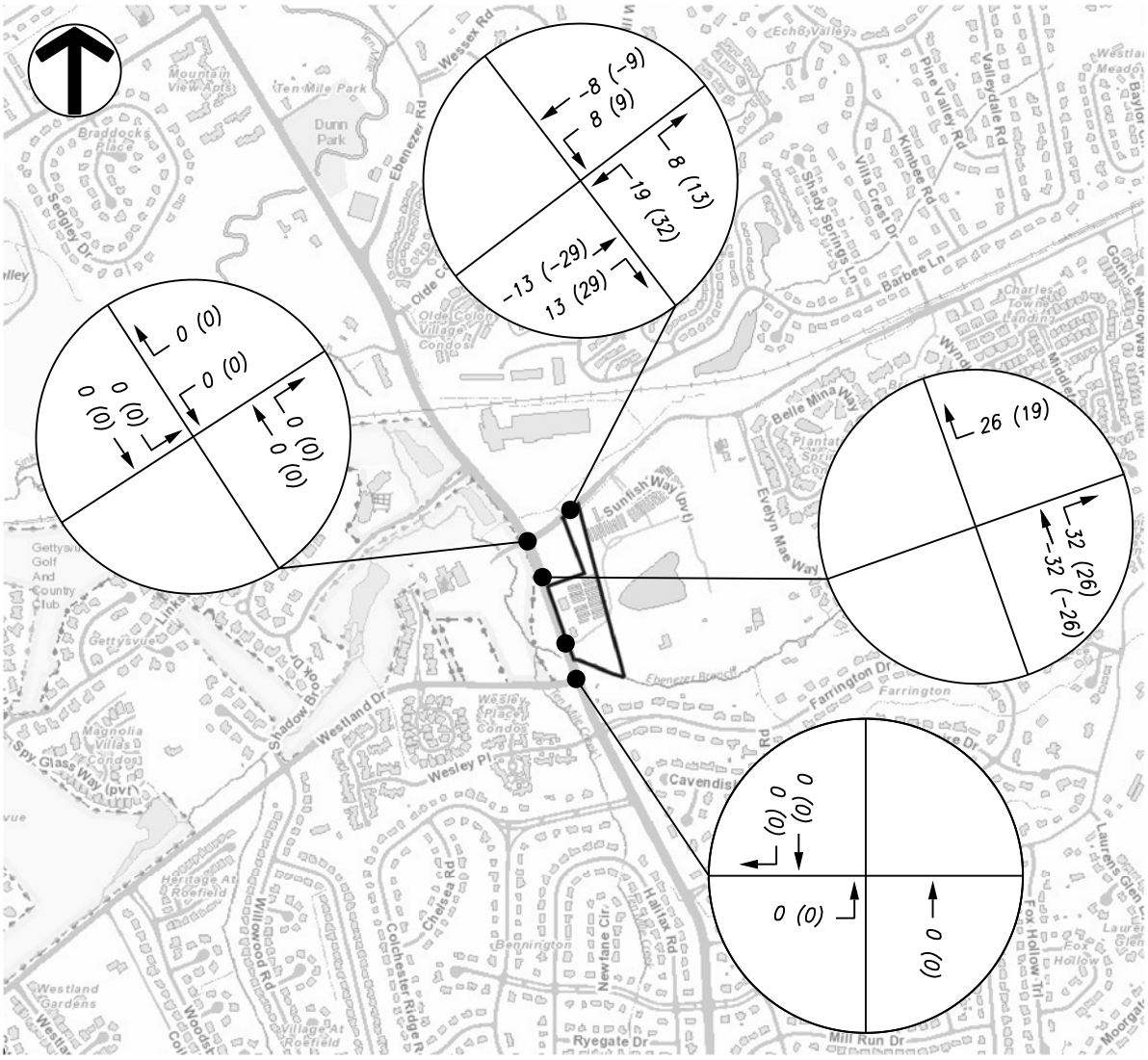
Figure 8: Weigel's PM Peak Hour Trip Distribution Pass-By Trips



LEGEND:

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

Figure 9: Weigel's Peak Hour Site Traffic



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

Figure 10: Weigel's Peak Hour Pass-By Trips

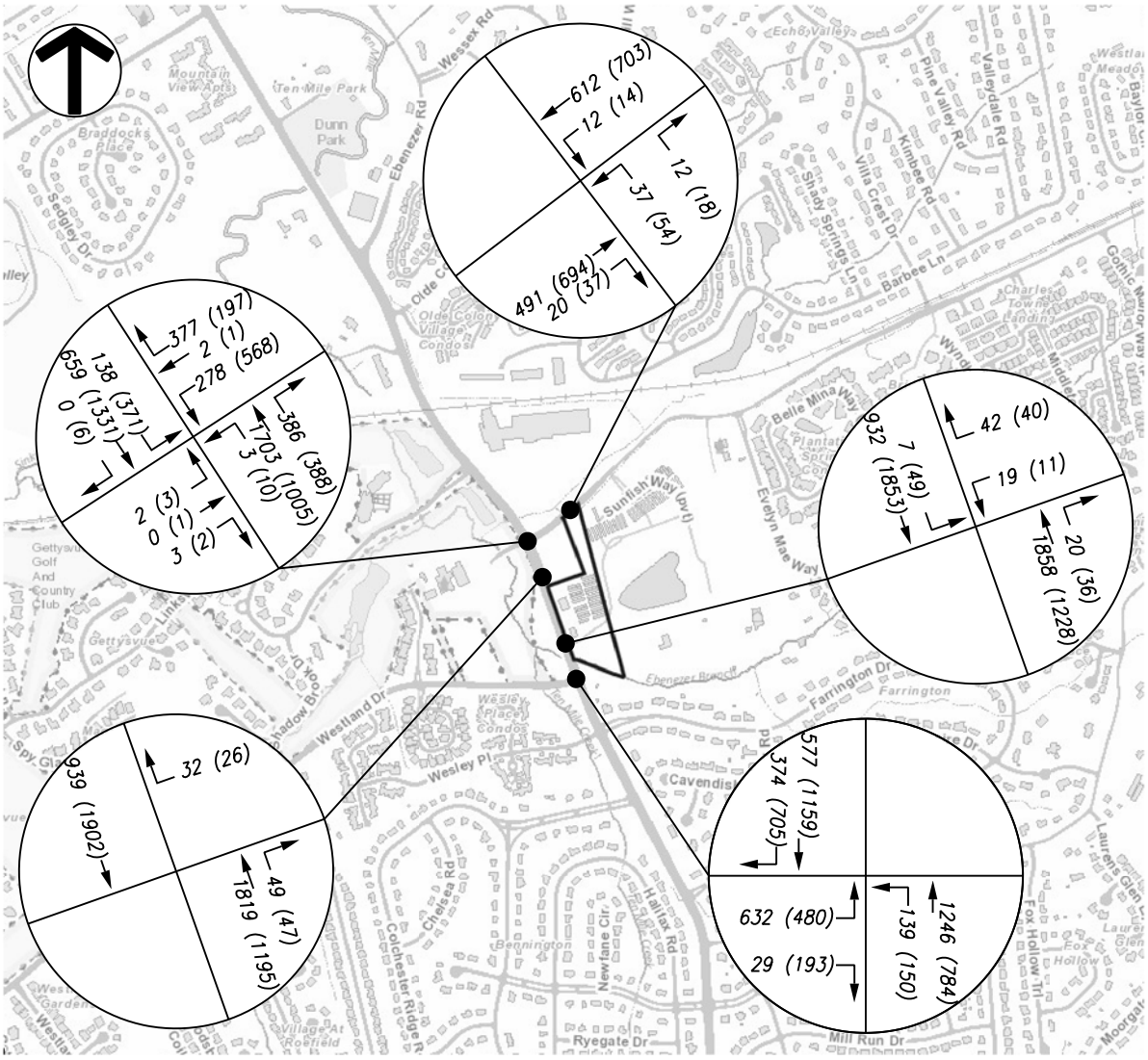


Figure 11: Background Peak Hour Combined Traffic

4 Trip Generation and Trip Distribution

For The Crescent at Ebenezer Commercial Site FMA assumed a 10,850 SF medical-dental office building and a 2,152 SF coffee/donut shop with a drive-through window. The equations provided in the *Trip Generation, 10th Edition,* published by the Institute of Transportation Engineers were used to calculate the expected site trips using both the coffee/donut shop with drive-through window (Land Use 937) and Medical-Dental Office Building (Land Use 720).

A pass-by trip occurs when a proposed development diverts traffic that is already traveling on a street adjacent to the site. A pass-by rate reduction of 40% was used for coffee/donut shop with a drive-through window or Land Use 937 as recommended by the Knoxville-Knox County Planning Commission.

The land use worksheets are included in Attachment 3.

The total combined trips generated by The Crescent at Ebenezer Commercial Site was estimated to be 1,388 daily trips. The estimated trips are 146 trips during the AM peak hour and 95 trips during the PM peak hour. A trip generation summary is shown in Table 4-1.

Table 4-1
The Crescent at Ebenezer Commercial Site
Trip Generation Summary

Land Use	Density	Daily Trips	AM Peak Hour Enter	AM Peak Hour Exit	PM Peak Hour Enter	PM Peak Hour Exit
The Crescent at Ebenezer Commercial Site						
Coffee/Donut Shop w/ Drive Through Window (LUC 937)	2,152 SF	1,765	98	94	47	47
40% Pass-By Reduction		706	39	38	19	19
60% New Trips		1059	59	56	28	28
Medical-Dental Office (LUC 720)	10,850 SF	329	24	7	11	28
Commercial New Trips		**1,388**	**83**	**63**	**39**	**56**

Ebenezer Road at the existing driveway connection has a trip distribution of 67% northbound and 33% southbound during the AM peak hour and 40% northbound and 60% southbound during the PM peak hour.

Westland Drive at the proposed driveway connection has a trip distribution of 45% eastbound and 55% westbound during the AM peak hour and 50% eastbound and 50% westbound during the PM peak hour.

The directional distribution of the traffic generated by The Crescent at Ebenezer Commercial Site was determined using the existing traffic volumes in combination with the concept plan layout. Crescent Lake Way was designed to operate as the main entrance/exit to the commercial development.

It was assumed that 20% of traffic would enter/exit using the Westland Drive driveway connection and 80% of traffic would enter/exit using Crescent Lake Way. This assumption was made after measuring the existing traffic volume which is split 60% Ebenezer Road to/from the south, 25% Ebenezer Road to/from the north and 15% Westland Drive.

Figure 12 shows the commercial site AM & PM peak hour trip distribution and Figures 13 and 14 show the commercial site AM & PM peak hour trip distribution pass-by trips.

Figure 15 shows the commercial site peak hour traffic, Figure 16 shows the commercial site pass-by trips and Figure 17 shows the full buildout peak hour combined traffic.

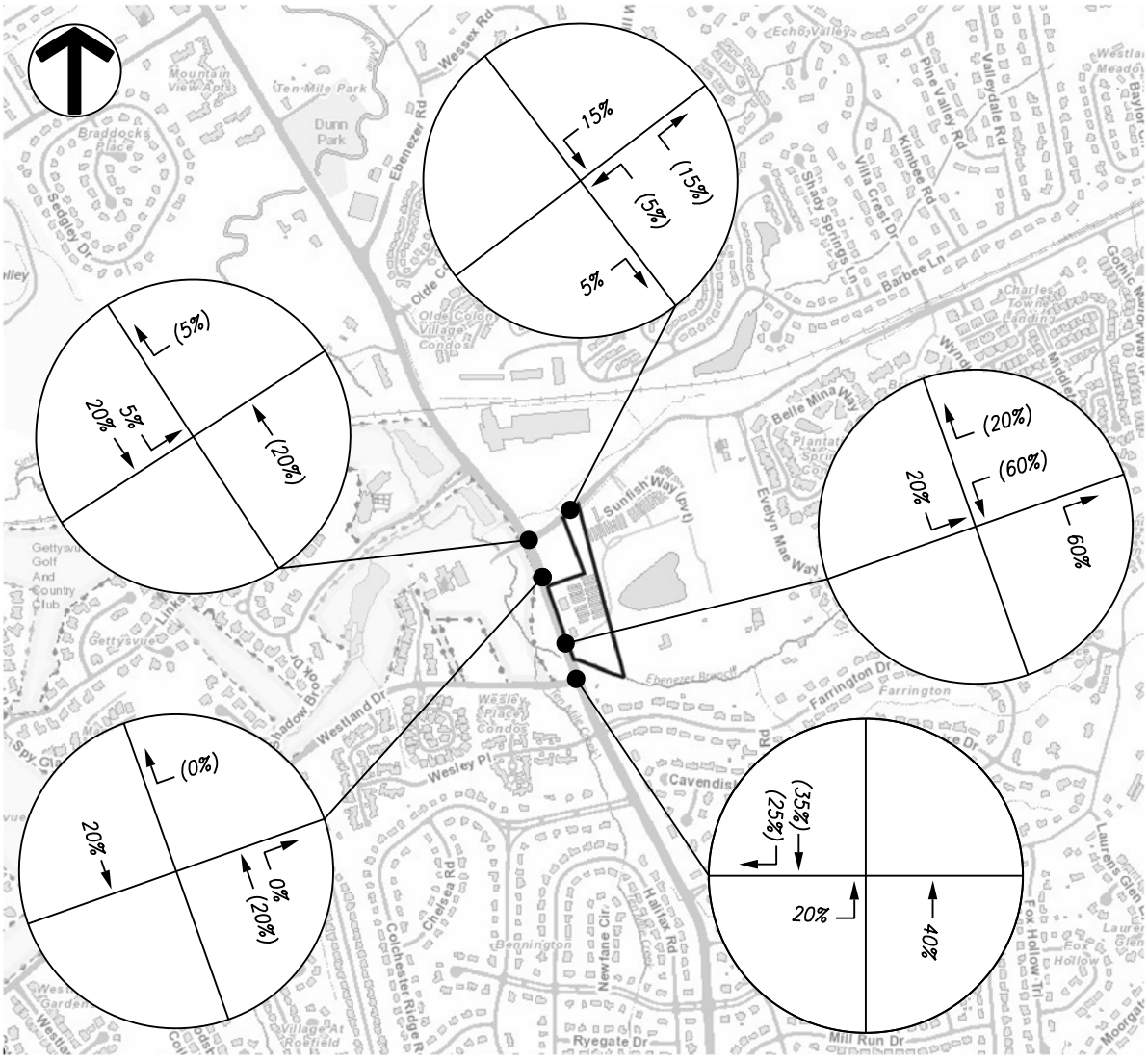


Figure 12: Commercial AM & PM Peak Hour Trip Distribution

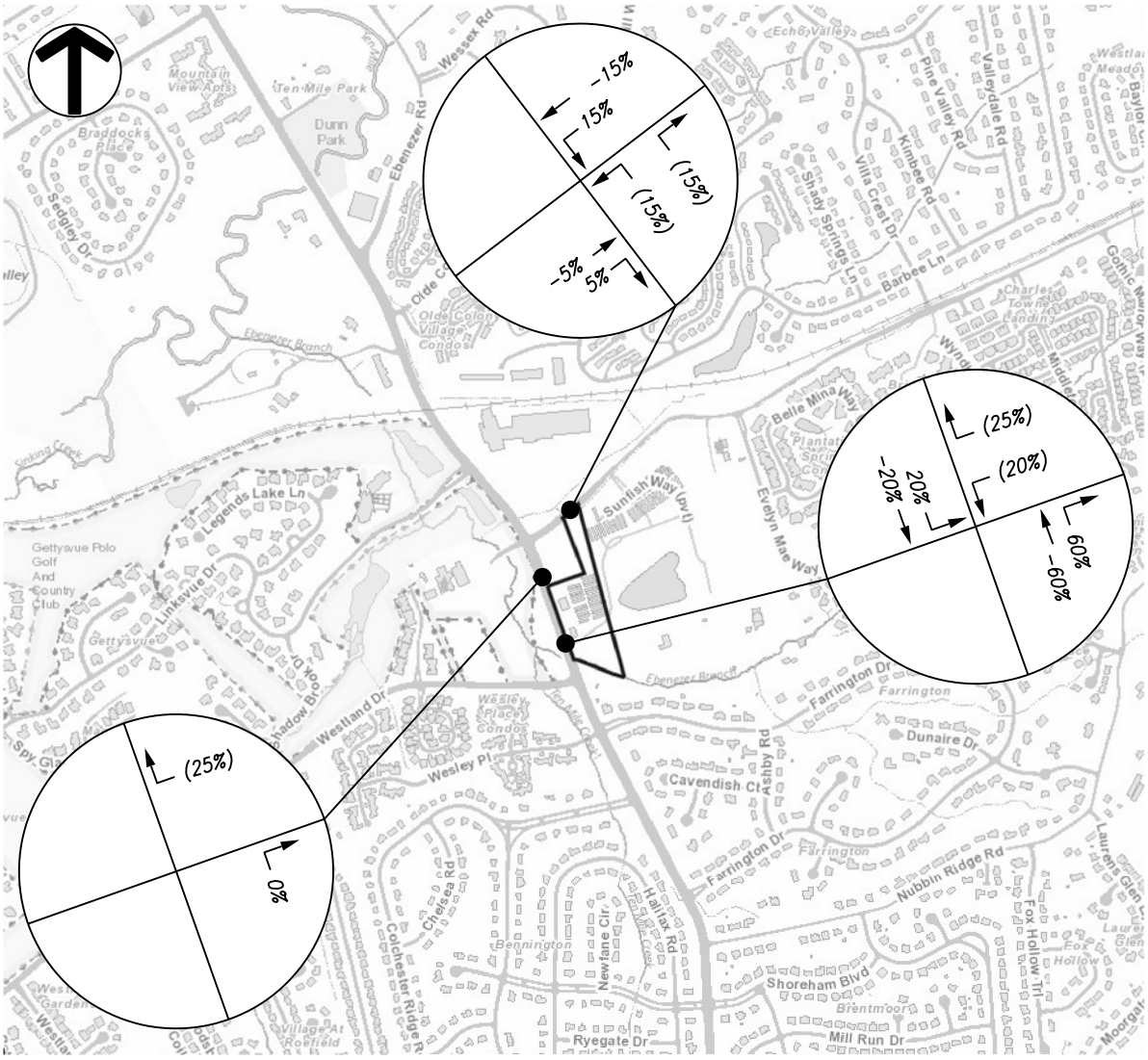


Figure 13: Commercial AM Peak Hour Trip Distribution Pass-By Trips

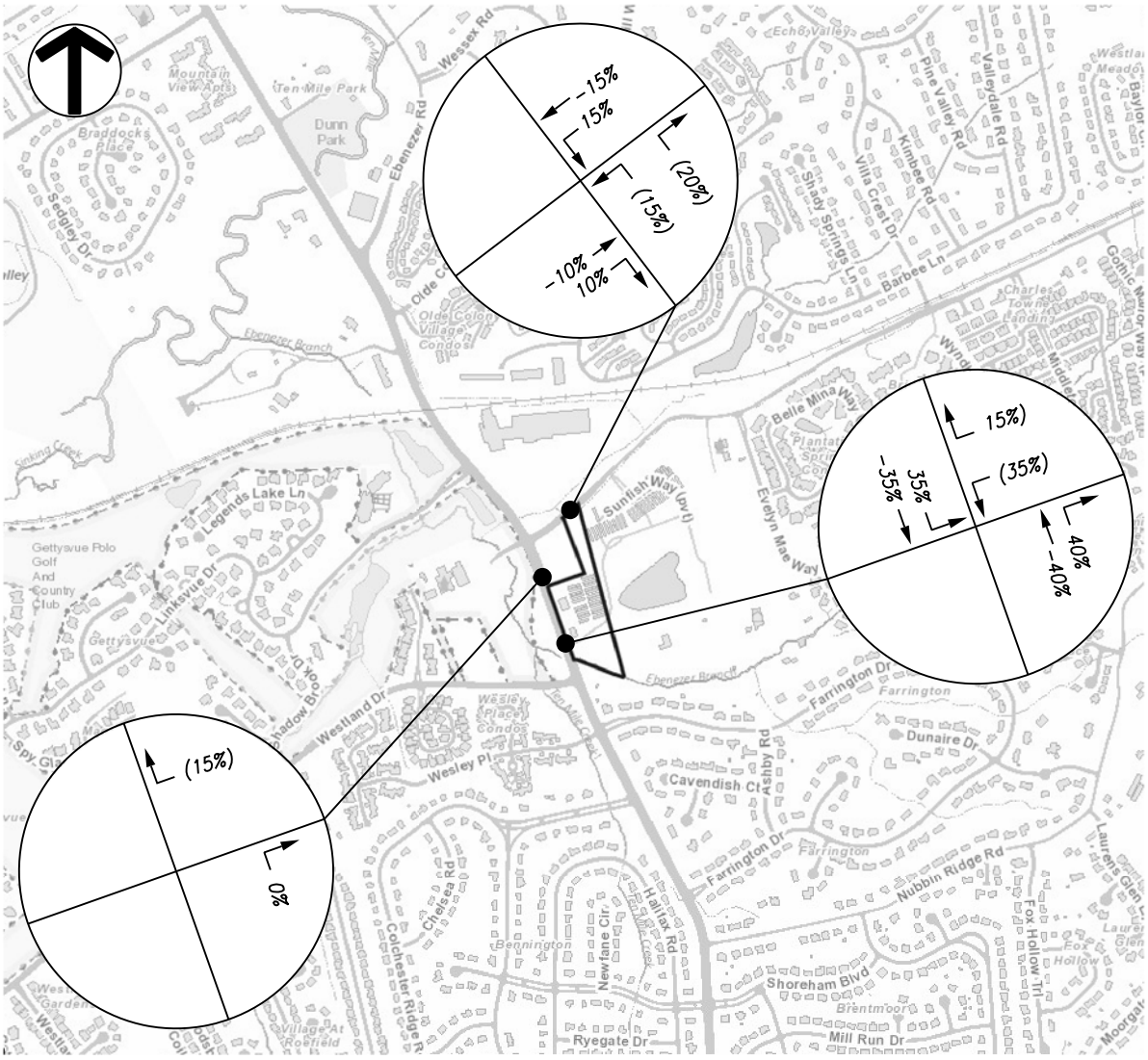


Figure 14: Commercial PM Peak Hour Trip Distribution Pass-By Trips

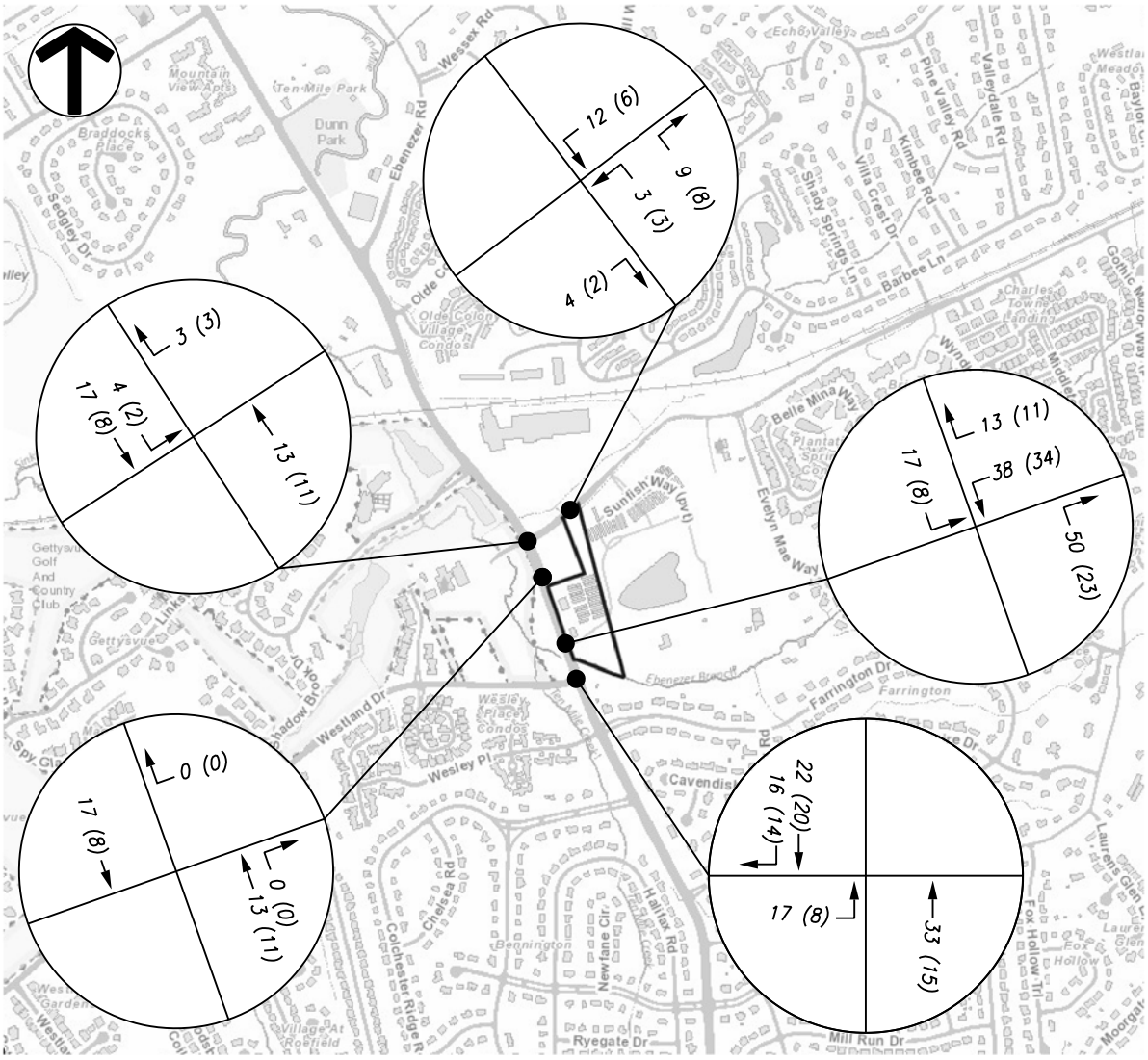


Figure 15: Commercial Peak Hour Site Traffic

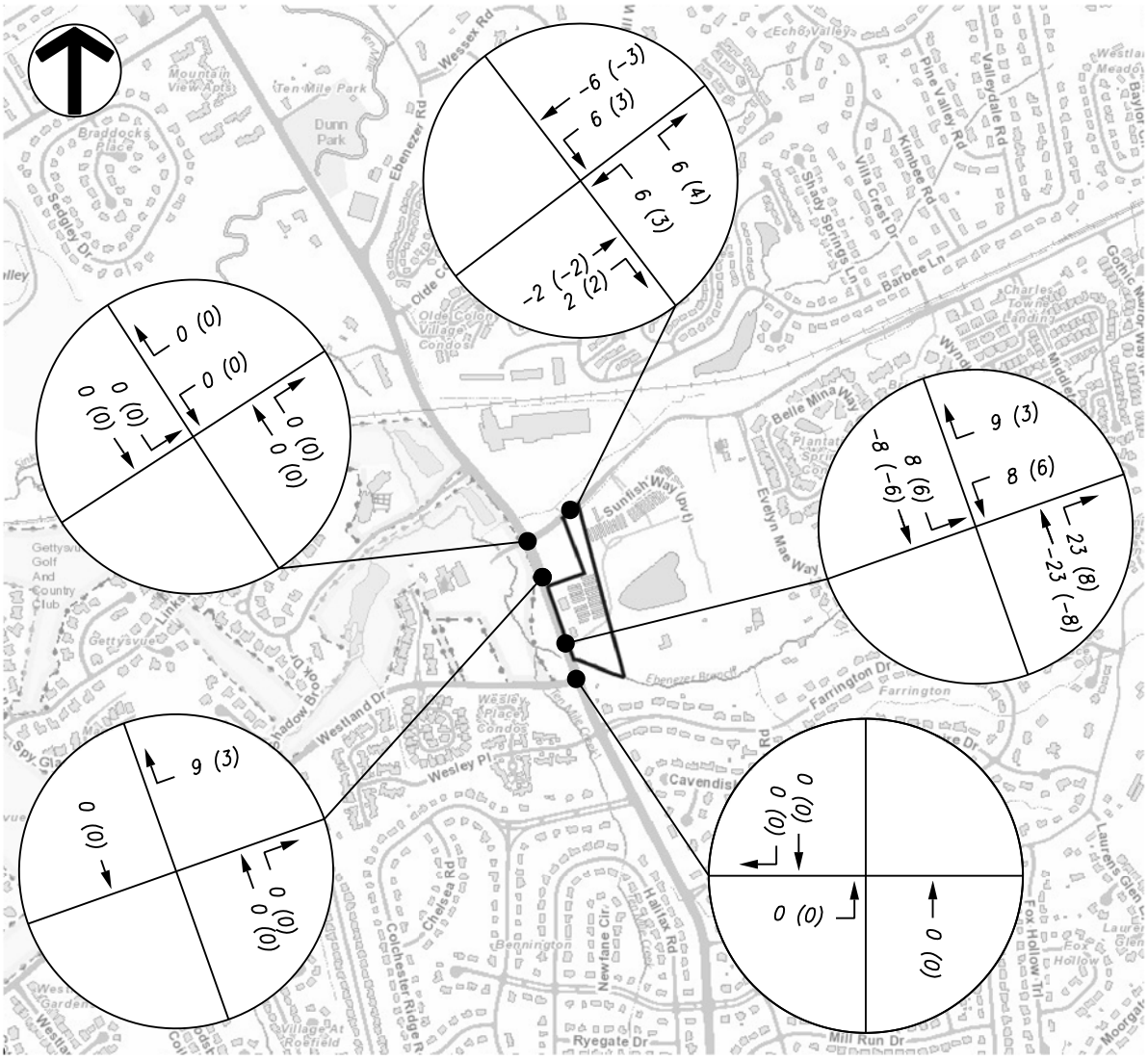


Figure 16: Commercial Peak Hour Pass-By Trips

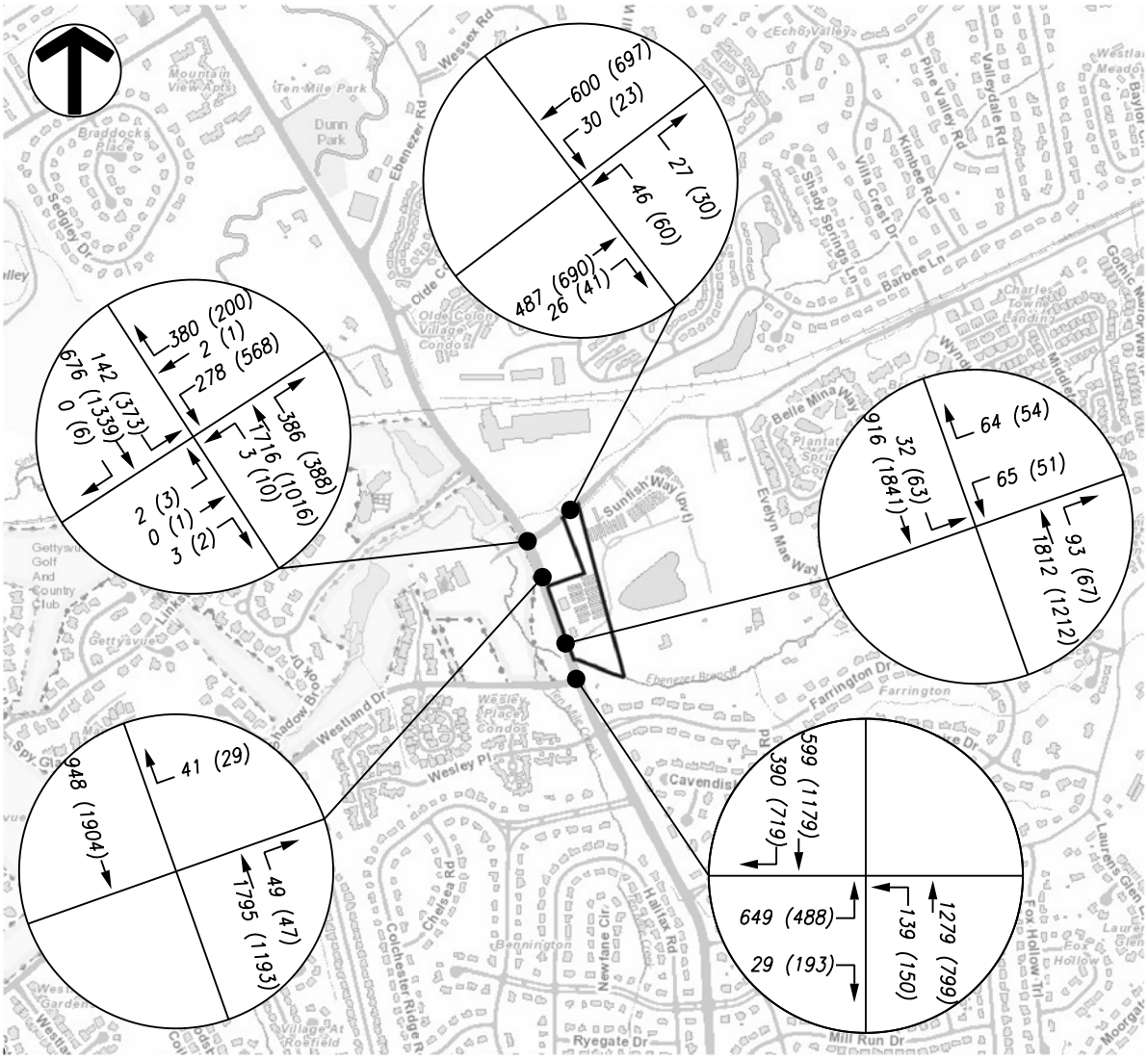


Figure 17: Full Buildout Peak Hour Combined Traffic

5 Projected Capacity and Level of Service

Unsignalized intersection capacity analyses were performed using the Highway Capacity Software (HCS7) for the AM and PM peak hours to evaluate the traffic conditions at the intersections of Ebenezer Road at the proposed driveway connection, Ebenezer Road at Crescent Lake Way and Westland Drive at the proposed driveway location.

Signalized intersection capacity analyses were performed using Highway Capacity Software (HCS7) with the existing signal timing for the AM and PM peak hours to evaluate the traffic conditions at both intersections of Ebenezer Road at Westland Drive. The existing signal timing was provided by Knox County and is included in Attachment 4.

The results from the analyses are expressed with a term "level of service" (LOS), which is based on the amount of delay experienced at the intersection. The LOS index ranges from LOS A, indicating excellent traffic conditions with minimal delay, to LOS F indicating very congested conditions with excessive delay. LOS D generally is considered the minimum acceptable condition in urban areas. The HCS7 worksheets are included in Attachments 5, 6, and 7.

Table 5-1 shows the results of the capacity analyses.

Table 5-1
Intersection Analysis
Level of Service (LOS) Summary

		Delay (sec)/LOS
Ebenezer Road @ Westland Drive (north) (Existing 2018)		
AM Peak	Intersection	36.8 / D
PM Peak	Intersection	14.4 / B
Ebenezer Road @ Westland Drive (south) (Existing 2018)		
AM Peak	Intersection	15.4 / B
PM Peak	Intersection	26.2 / C
Ebenezer Road @ Westland Drive (north) (Background 2021)		
AM Peak	Intersection	53.4 / D
PM Peak	Intersection	20.2 / C
Ebenezer Road @ Westland Drive (south) (Background 2021)		
AM Peak	Intersection	17.8 / B
PM Peak	Intersection	44.1 / D
Ebenezer Road @ Driveway Connection (Background 2021)		
AM Peak	WB Approach	12.1 / B
PM Peak	WB Approach	9.7 / A
Ebenezer Road @ Crescent Lake Way (Background 2021)		
AM Peak	WB Approach SB Approach	22.0 / C 16.6 / C
PM Peak	WB Approach SB Approach	15.5 / C 12.0 / B
Westland Drive @ Driveway Connection (Background 2021)		
AM Peak	WB Approach NB Approach	8.6 / A 24.5 / C
PM Peak	WB Approach NB Approach	9.4 / A 49.3 / E

Ebenezer Road @ Westland Drive (north) (Commercial Site 2021)		
AM Peak	Intersection	54.1 / D
PM Peak	Intersection	20.3 / C
Ebenezer Road @ Westland Drive (south) (Commercial Site 2021)		
AM Peak	Intersection	18.2 / B
PM Peak	Intersection	45.7 / D
Ebenezer Road @ Driveway Connection (Commercial Site 2021)		
AM Peak	WB Approach	12.2 / B
PM Peak	WB Approach	9.7 / A
Ebenezer Road @ Crescent Lake Way (Commercial Site 2021)		
AM Peak	WB Approach SB Approach	41.5 / E 18.4 / C
PM Peak	WB Approach SB Approach	30.6 / D 12.4 / B
Westland Drive @ Driveway Connection (Commercial Site 2021)		
AM Peak	WB Approach NB Approach	8.7 / A 24.8 / C
PM Peak	WB Approach NB Approach	9.5 / A 51.0 / F

6 Turn Lane Warrant Analysis

The intersection of Westland Drive at the driveway connection and the intersection of Ebenezer Road at the driveway connection were evaluated to determine if a right turn lane is warranted. The Knox County Department of Engineering and Public Works handbook, "Access Control and Driveway Design Policy," was used to analyze the information. After the completion of the Crescent at Ebenezer Commercial Site both a right turn lane on Westland Drive at the driveway location and on Ebenezer Road at the driveway location are warranted. The turn lane warrant worksheets and analysis are included in Attachment 8.

The intersection of Ebenezer Road at Crescent Lake Way was not evaluated to determine if a turn lane is warranted. There is an existing two-way left turn lane on Ebenezer Road and a right turn lane is being built as a part of The Crescent at Ebenezer apartment development.

7 Conclusions and Recommendations

7.1 Ebenezer Road @ Westland Drive (north)

The existing traffic conditions at the signalized intersection of Ebenezer Road at Westland Drive (north) operate at a LOS D during the AM peak hour and a LOS B during the PM peak hour using the existing signal timing provided by Knox County.

The background traffic conditions at the signalized intersection of Ebenezer Road at Westland Drive (north) operate at a LOS D during AM peak hour and a LOS C during the PM peak hour using the existing signal timing provided by Knox County.

After the completion of The Crescent at Ebenezer Commercial Site the signalized intersection of Ebenezer Road at Westland Drive (north) will continue to operate at a LOS D during the AM peak hour and a LOS C during the PM peak hour using the existing signal timing provided by Knox County.

The LOS D during the AM peak hour is caused by the westbound thru/right lane having a volume to capacity ratio greater than 1.0. This is the case for the existing traffic volumes and the increase in delay caused by The Crescent at Ebenezer Commercial Site is expected to be minimal.

7.2 Ebenezer Road @ Westland Drive (south)

The existing traffic conditions at the signalized intersection of Ebenezer Road at Westland Drive (south) operate at a LOS B during the AM peak hour and a LOS C during the PM peak hour using the existing signal timing provided by Knox County.

The background traffic conditions at the signalized intersection of Ebenezer Road at Westland Drive (south) operate at a LOS B during the AM peak hour and a LOS D during the PM peak hour using the existing signal timing provided by Knox County.

After the completion of The Crescent at Ebenezer Commercial Site the signalized intersection of Ebenezer Road at Westland Drive (south) will operate at a LOS B during the AM peak hour and a LOS D during the PM peak hour using the existing signal timing provided by Knox County.

The eastbound double left turn lanes operate at a LOS C during the existing traffic conditions and a LOS F during both the background traffic conditions and after the completion of The Crescent at Ebenezer Commercial Site. The delay is caused by the turn lanes having a volume to capacity ratio greater than 1.0 and a queue storage ratio of greater than 2.0. The increase in delay caused by The Crescent at Ebenezer Commercial Site is expected to be minimal.

7.3 Ebenezer Road @ Driveway Connection

Knox County Engineering and Public Works recommended that the Ebenezer Road driveway be a right-in/right-out driveway connection.

The background traffic conditions at the intersection of Ebenezer Road at the Driveway Connection for the westbound approach will operate at a LOS B during the AM peak hour and a LOS A during the PM peak hour.

After the completion of The Crescent at Ebenezer Commercial Site the westbound approach will continue to operate at a LOS B during the AM peak hour and a LOS A during the PM peak hour.

A northbound right turn lane is warranted at the intersection of Ebenezer Road at the driveway connection during both the AM and PM peak hours after the completion of the Weigel's convenience market with gasoline pumps. CDM Smith's recommendation was to "extend the planned northbound right-turn lane on Ebenezer Road for Westland Drive approximately another 100 feet to be also used by traffic entering the Weigel's convenience store." A sketch of the right-turn lane

layout is included in Attachment 8. The turn lane improvements are expected to be installed prior to the construction of the Weigel's.

7.4 Ebenezer Road @ Crescent Lake Way

The background traffic conditions at the intersection of Ebenezer Road at the Crescent Lake Way for the westbound approach will operate at a LOS C during both the AM and PM peak hours and the southbound approach will operate at a LOS C during the AM peak hour and a LOS B during the PM peak hour.

After the completion of The Crescent at Ebenezer Commercial Site the westbound approach will operate at a LOS E during the AM peak hour and a LOS D during the PM peak hours and the southbound approach will operate at a LOS C during the AM peak hour and a LOS B during the PM peak hour.

The unsignalized intersection capacity analyses shows a 95% queue length after the completion of The Crescent at Ebenezer Commercial Site at Crescent Lake Way of approximately two car lengths during the peak hours; therefore the existing storage at the intersection is adequate and no change is necessary.

It is estimated based on field observations that the intersection of Ebenezer Road at Crescent Lake Way is blocked by the traffic from the signalized intersection of Ebenezer Road at Westland Drive (north) and Ebenezer Road at Westland Drive (south) approximately 50% during the AM peak hour and 20% during the PM peak hour.

7.5 Westland Drive @ Driveway Connection

The background traffic conditions at the intersection of Westland Drive at the driveway connection for the westbound approach will operate at a LOS A during both the AM and PM peak hours and the northbound approach will operate at a LOS C during the AM peak hour and a LOS E during the PM peak hour.

After the completion of The Crescent at Ebenezer Commercial Site the westbound approach will continue to operate at a LOS A during both the AM and PM peak hours and the northbound approach will operate at a LOS C during the AM peak hour and a LOS F during the PM peak hour.

The unsignalized intersection capacity analyses shows a 95% queue length at the full buildout for the driveway connection of less than one car length during the AM peak hour and approximately 3 car lengths during the PM peak hour; therefore the existing storage at the intersection is adequate and no change is necessary.

The signalized intersection capacity analyses shows a 95% queue length at the full buildout at the intersection of Ebenezer Road at Westland Drive (north) of 1,017 feet at the westbound thru/right lane and 156 feet at the westbound left turn lanes during the AM peak hour and 226 feet at the westbound thru/right lane and 322 feet for the westbound left turn lanes during the PM peak hour. Thus the queue from the signalized intersections of Ebenezer Road at Westland Drive (north) will block the proposed driveway connection for a portion of time during both the AM and PM peak hours.

Westland Drive is classified as a minor arterial. The minimum intersection spacing required for an arterial is 400 feet per the "Minimum Subdivision Regulations" for Knoxville and Knox County. The nearest road intersection to the proposed driveway connection is currently 250 feet east at the intersection of Ebenezer Road. This intersection does not meet the required 400 feet spacing; however, given the constraints this location was determined to be the best fit and has been coordinated with Knox County Engineering & Public Works.

An eastbound right turn lane is warranted at the intersection of Westland Drive at the driveway connection during the PM peak hour after the completion of the Weigel's convenience market with gasoline pumps.

Attachment 1
Traffic Counts

Project: The Crescent at Ebenezer
Intersection: Ebenezer Road at Westland Drive / Ebenezer United Methodist Church
Date Conducted: 05/10/2018

	Ebenezer UMC Eastbound				Westland Drive Westbound				Ebenezer Road Northbound				Ebenezer Road Southbound				
Start	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Int. Total
7:00 AM	0	1	0	1	32	0	37	69	0	161	40	201	12	102	0	114	385
7:15 AM	0	0	0	0	68	0	68	136	0	306	61	367	15	146	0	161	664
7:30 AM	0	0	0	0	51	0	93	144	0	406	101	507	39	167	0	206	857
7:45 AM	2	0	0	2	57	2	91	150	0	449	78	527	32	138	0	170	849
Total	2	1	0	3	208	2	289	499	0	1322	280	1602	98	553	0	651	2755
8:00 AM	0	0	3	3	59	0	85	144	3	399	120	522	36	163	0	199	868
8:15 AM	0	0	0	0	50	0	47	97	0	265	73	338	32	174	1	207	642
8:30 AM	0	0	0	0	61	0	54	115	0	211	91	302	20	128	1	149	566
8:45 AM	0	0	0	0	47	0	51	98	0	192	65	257	18	112	0	130	485
Total	0	0	3	3	217	0	237	454	3	1067	349	1419	106	577	2	685	2561
11:00 AM	2	0	0	2	35	0	29	64	1	141	44	186	30	133	0	163	415
11:15 AM	1	0	0	1	35	0	29	64	0	134	60	194	29	134	1	164	423
11:30 AM	0	0	0	0	34	0	41	75	0	138	47	185	32	142	1	175	435
11:45 AM	2	2	0	4	42	0	42	84	0	183	52	235	37	129	0	166	489
Total	5	2	0	7	146	0	141	287	1	596	203	800	128	538	2	668	1762
12:00 PM	7	2	0	9	38	0	45	83	1	126	37	164	24	151	0	175	431
12:15 PM	1	0	0	1	46	0	39	85	0	148	46	194	37	164	0	201	481
12:30 PM	2	1	2	5	50	1	32	83	1	150	39	190	38	164	1	203	481
12:45 PM	0	0	0	0	52	0	47	99	0	175	50	225	30	167	0	197	521
Total	10	3	2	15	186	1	163	350	2	599	172	773	129	646	1	776	1914
2:00 PM	0	0	0	0	62	0	41	103	0	127	51	178	53	184	1	238	519
2:15 PM	0	0	0	0	70	0	32	102	0	143	40	183	41	191	1	233	518
2:30 PM	0	0	0	0	64	1	32	97	1	147	28	176	36	202	0	238	511
2:45 PM	1	0	0	1	72	0	42	114	0	185	47	232	45	176	2	223	570
Total	1	0	0	1	268	1	147	416	1	602	166	769	175	753	4	932	2118
3:00 PM	0	0	0	0	53	0	52	105	0	193	49	242	40	186	0	226	573
3:15 PM	0	0	0	0	53	0	55	108	0	208	64	272	48	184	0	232	612
3:30 PM	0	1	1	2	83	0	56	139	0	169	37	206	54	242	1	297	644
3:45 PM	0	0	2	2	97	1	48	146	0	162	64	226	76	339	0	415	789
Total	0	1	3	4	286	1	211	498	0	732	214	946	218	951	1	1170	2618
4:00 PM	0	0	2	2	99	0	34	133	1	165	61	227	62	255	0	317	679
4:15 PM	1	1	0	2	72	0	43	115	1	187	77	265	59	259	0	318	700
4:30 PM	0	0	2	2	93	1	44	138	0	162	72	234	68	245	0	313	687
4:45 PM	0	0	0	0	106	1	47	154	0	181	99	280	74	277	0	351	785
Total	1	1	4	6	370	2	168	540	2	695	309	1006	263	1036	0	1299	2851
5:00 PM	1	0	0	1	129	1	49	179	2	189	78	269	75	309	2	386	835
5:15 PM	1	0	1	2	131	0	53	184	1	213	102	316	88	316	0	404	906
5:30 PM	1	1	1	3	126	0	36	162	2	224	83	309	80	308	2	390	864
5:45 PM	0	0	0	0	113	0	39	152	4	277	93	374	91	275	2	368	894
Total	3	1	2	6	499	1	177	677	9	903	356	1268	334	1208	6	1548	3499
Grand Total	6	4	12	22	1580	6	1082	2668	14	4719	1508	6241	1019	4325	9	5353	14284
Approach %	27.3	18.2	54.5		59.2	0.2	40.6		0.2	75.6	24.2		19.0	80.8	0.2		
Total %	0.0	0.0	0.1	0.2	11.1	0.0	7.6	18.7	0.1	33.0	10.6	43.7	7.1	30.3	0.1	37.5	

Project: The Crescent at Ebenezer
Date Conducted: 5/10/2018

AM Peak Hour	7:15 AM - 8:15 AM	3238
PM Peak Hour	5:00 PM - 6:00 PM	3499

	Ebenezer UMC Eastbound				Westland Drive Westbound				Ebenezer Road Northbound				Ebenezer Road Southbound				
Start	Left	Thru	Right	App. Tota	Left	Thru	Right	App. Tota	Left	Thru	Right	App. Tota	Left	Thru	Right	App. Tota	Int. Total
Peak Hour Analysis from 7:00 AM to 9:00 AM																	
AM Peak Hour begins at 7:30 AM																	
7:15 AM	0	**0**	0	0	**68**	0	68	136	0	306	61	367	15	146	0	161	664
7:30 AM	0	0	0	0	51	0	**93**	144	0	406	101	507	**39**	**167**	0	206	857
7:45 AM	**2**	0	0	2	57	**2**	91	150	0	**449**	78	527	32	138	0	170	849
8:00 AM	0	0	**3**	3	59	0	85	144	**3**	399	**120**	522	36	163	0	199	**868**
Total Volume	2	0	3	5	235	2	337	574	3	1560	360	1923	122	614	0	736	3238
Future (2% over 3 yrs)	2	0	3		249	2	358		3	1655	382		129	652	0		3436
PHF	0.25	-	0.25		0.86	0.25	0.91		0.25	0.87	0.75		0.78	0.92	-		0.93
Peak Hour Analysis from 3:00 PM to 6:00 PM																	
PM Peak Hour begins at 5:00 PM																	
5:00 PM	**1**	0	0	1	129	**1**	49	179	2	189	78	269	75	309	**2**	386	835
5:15 PM	1	0	**1**	2	**131**	0	**53**	184	1	213	**102**	316	88	**316**	0	404	**906**
5:30 PM	1	**1**	1	3	126	0	36	162	2	224	83	309	80	308	2	390	864
5:45 PM	0	0	0	0	113	0	39	152	**4**	**277**	93	374	**91**	275	2	368	894
Total Volume	3	1	2	6	499	1	177	677	9	903	356	1268	334	1208	6	1548	3499
Future (2% over 3 yrs)	3	1	2		530	1	188		10	958	378		354	1282	6		3713
PHF	0.75	0.25	0.50		0.95	0.25	0.83		0.56	0.81	0.87		0.92	0.96	0.75		0.97

Project: The Crescent at Ebenezer
Intersection: Ebenezer Road at Westland Drive
Date Conducted: 05/17/2018

	Westland Drive Eastbound			Ebenezer Road Northbound			Ebenezer Road Southbound			
Start	Left	Right	Total	Left	Thru	Total	Thru	Right	Total	Int. Total
7:00 AM	64	7	71	37	129	166	68	79	147	384
7:15 AM	97	11	108	27	196	223	76	164	240	571
7:30 AM	149	3	152	33	378	411	111	97	208	771
7:45 AM	168	4	172	34	331	365	130	72	202	739
Total	478	25	503	131	1034	1165	385	412	797	2465
8:00 AM	153	8	161	32	241	273	142	80	222	656
8:15 AM	112	12	124	32	199	231	134	85	219	574
8:30 AM	87	10	97	42	153	195	93	71	164	456
8:45 AM	79	14	93	29	154	183	99	51	150	426
Total	431	44	475	135	747	882	468	287	755	2112
11:00 AM	62	15	77	27	99	126	109	60	169	372
11:15 AM	73	15	88	13	126	139	110	71	181	408
11:30 AM	77	19	96	23	128	151	114	54	168	415
11:45 AM	52	15	67	20	143	163	125	61	186	416
Total	264	64	328	83	496	579	458	246	704	1611
12:00 PM	58	20	78	12	127	139	147	61	208	425
12:15 PM	72	21	93	21	123	144	132	94	226	463
12:30 PM	64	9	73	12	146	158	143	70	213	444
12:45 PM	52	18	70	21	133	154	160	84	244	468
Total	246	68	314	66	529	595	582	309	891	1800
2:00 PM	66	16	82	15	123	138	137	75	212	432
2:15 PM	54	17	71	19	111	130	154	93	247	448
2:30 PM	45	21	66	19	111	130	144	110	254	450
2:45 PM	66	34	100	33	170	203	142	105	247	550
Total	231	88	319	86	515	601	577	383	960	1880
3:00 PM	79	14	93	28	130	158	131	86	217	468
3:15 PM	103	31	134	23	154	177	165	103	268	579
3:30 PM	87	27	114	23	144	167	241	92	333	614
3:45 PM	69	20	89	20	139	159	289	138	427	675
Total	338	92	430	94	567	661	826	419	1245	2336
4:00 PM	83	32	115	29	144	173	208	105	313	601
4:15 PM	90	43	133	25	164	189	211	128	339	661
4:30 PM	98	37	135	37	149	186	231	116	347	668
4:45 PM	93	40	133	29	159	188	232	126	358	679
Total	364	152	516	120	616	736	882	475	1357	2609
5:00 PM	109	45	154	38	157	195	234	158	392	741
5:15 PM	98	46	144	27	179	206	291	184	475	825
5:30 PM	124	52	176	40	175	215	307	166	473	864
5:45 PM	98	39	137	36	188	224	232	138	370	731
Total	429	182	611	141	699	840	1064	646	1710	3161
Grand Total	2781	715	3496	856	5203	6059	5242	3177	8419	17974
Approach %	79.5	20.5		14.1	85.9		62.3	37.7		
Total %	15.5	4.0	19.5	4.8	28.9	33.7	29.2	17.7	46.8	

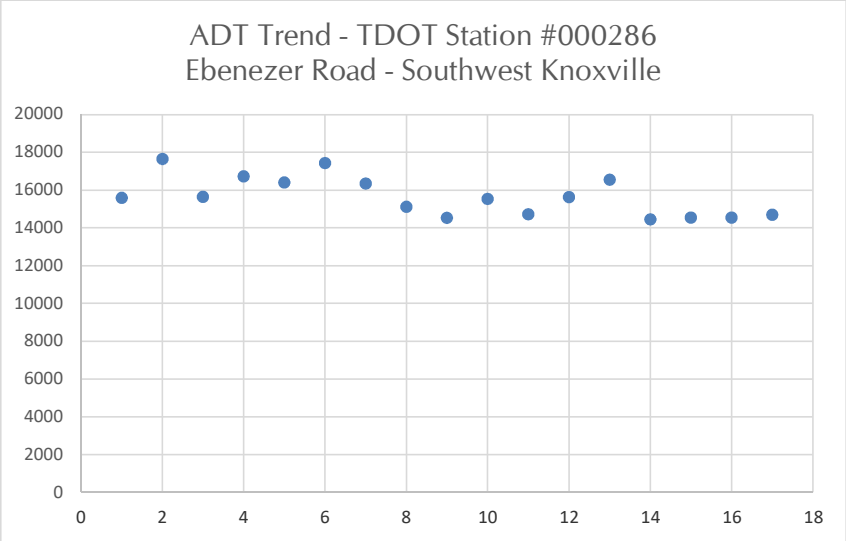
Project: The Crescent at Ebenezer
Date Conducted: 5/17/2018

AM Peak Hour	7:30 AM - 8:30 AM	2740
PM Peak Hour	5:00 PM - 6:00 PM	3161

	Westland Drive Eastbound			Ebenezer Road Northbound			Ebenezer Road Southbound			
Start	Left	Right	App. Total	Left	Thru	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis from 7:00 AM to 9:00 AM										
AM Peak Hour begins at 7:30 AM										
7:30 AM	149	3	152	33	**378**	411	111	**97**	208	**771**
7:45 AM	**168**	4	172	**34**	331	365	130	72	202	739
8:00 AM	153	8	161	32	241	273	**142**	80	222	656
8:15 AM	112	**12**	124	32	199	231	134	85	219	574
Total Volume	582	27	609	131	1149	1280	517	334	851	2740
Future (2% over 3 yrs)	618	29		139	1219		549	354		2908
PHF	0.87	0.56		0.96	0.76		0.91	0.86		0.89
Peak Hour Analysis from 3:00 PM to 6:00 PM										
PM Peak Hour begins at 5:00 PM										
5:00 PM	109	45	154	38	157	195	234	158	392	741
5:15 PM	98	46	144	27	179	206	291	**184**	475	825
5:30 PM	**124**	**52**	176	**40**	175	215	**307**	166	473	**864**
5:45 PM	98	39	137	36	**188**	224	232	138	370	731
Total Volume	429	182	611	141	699	840	1064	646	1710	3161
Future (2% over 3 yrs)	455	193		150	742		1129	686		3354
PHF	0.86	0.88		0.88	0.93		0.87	0.88		0.91

Attachment 2
ADT Trends

	Year	Adjusted Average Daily Traffic
1	2001	15586
2	2002	17645
3	2003	15651
4	2004	16730
5	2005	16397
6	2006	17434
7	2007	16355
8	2008	15111
9	2009	14530
10	2010	15533
11	2011	14717
12	2012	15634
13	2013	16555
14	2014	14456
15	2015	14550
16	2016	14546
17	2017	14691



Most Recent Trend Line Growth

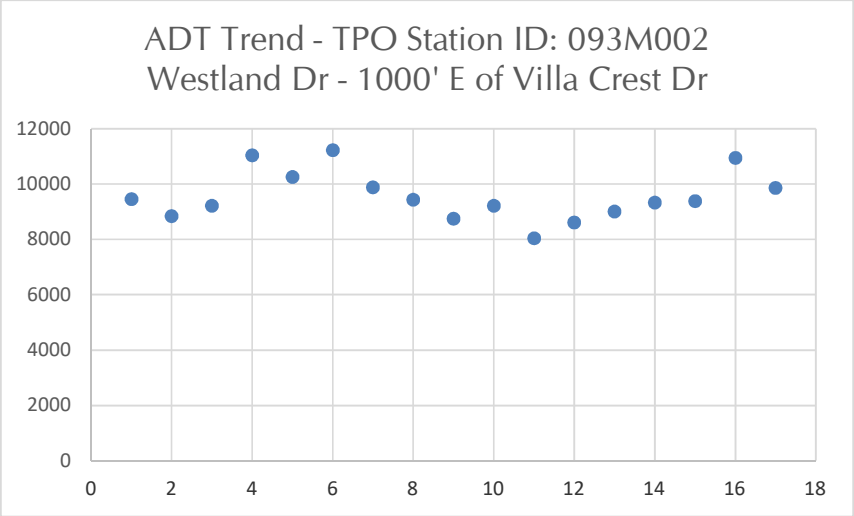
Year	ADT
2007	16355
2017	14691

Annual Percent Growth **-1.02%**

Year	ADT
2014	14456
2017	14691

Annual Percent Growth **0.54%**

	Year	Adjusted Average Daily Traffic
1	2001	9460
2	2002	8850
3	2003	9220
4	2004	11040
5	2005	10267
6	2006	11230
7	2007	9890
8	2008	9440
9	2009	8750
10	2010	9220
11	2011	8050
12	2012	8620
13	2013	9010
14	2014	9340
15	2015	9390
16	2016	10950
17	2017	9870

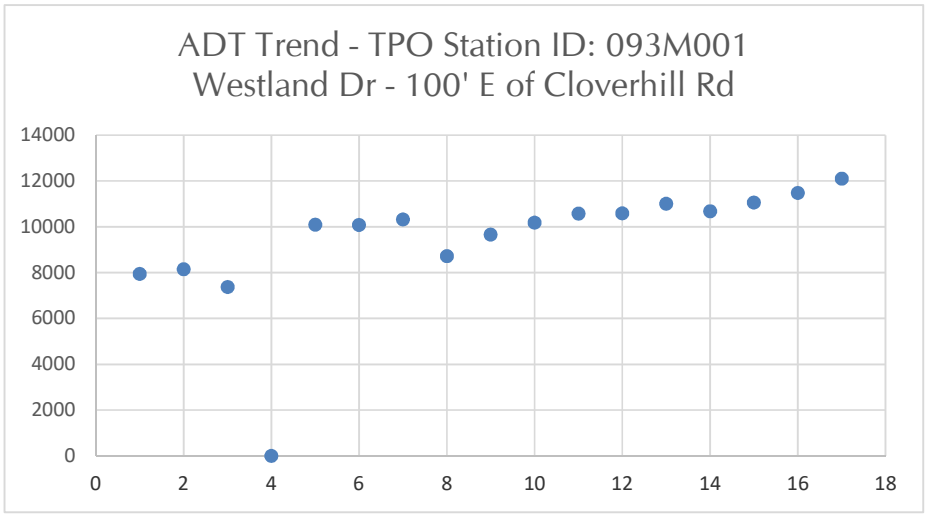


Most Recent Trend Line Growth

Year	ADT
2012	8620
2017	9870

Annual Percent Growth **2.90%**

	Year	Adjusted Average Daily Traffic
1	2001	7950
2	2002	8150
3	2003	7380
4	2004	0
5	2005	10094
6	2006	10080
7	2007	10330
8	2008	8730
9	2009	9670
10	2010	10190
11	2011	10580
12	2012	10600
13	2013	11010
14	2014	10680
15	2015	11070
16	2016	11480
17	2017	12110



Most Recent Trend Line Growth

Year	ADT
2012	10600
2017	12110

Annual Percent Growth **2.85%**

Attachment 3
Trip Generation

Project: Westland and Ebenezer Development
Date Conducted: 6/18/2019

Medical-Dental Office Building
10,850 SF

Average Daily Traffic
T = 38.42(X) - 87.62
T = 38.42(10.85) - 87.62
T = 329

Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.
Ln(T) = 0.89 Ln(X) +1.31
Ln(T) = 0.89 Ln(10.85) +1.31
T = 31

Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.
T = 3.39(X) + 2.02
T = 3.39(10.85) + 2.02
T = 39

		Percent		Number	
Time Period	Total Trips	Enter	Exit	Enter	Exit
Weekday (24 hours)	329	50%	50%	165	165
AM Peak Hour	31	78%	22%	24	7
PM Peak Hour	39	28%	72%	11	28

Project: Westland and Ebenezer Development
Date Conducted: 7/7/2019

Coffee/Donut Shop with Drive-Through Window (LUC 937)
2,152 SF

Average Daily Traffic
Average Rate = 470.95
T = 820.38 * (2.152)
T = 1765

Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.
Average Rate = 88.99
T = 88.99 (2.152)
T = 192

Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.
Average Rate = 43.38
T = 43.38 (2.152)
T = 93

		Percent		Number	
Time Period	Total Trips	Enter	Exit	Enter	Exit
Weekday (24 hours)	1765	50%	50%	883	883
AM Peak Hour	192	51%	49%	98	94
PM Peak Hour	93	50%	50%	47	47

Pass-By Trips 40%

		Percent		Number	
Time Period	Total Trips	Enter	Exit	Enter	Exit
Weekday (24 hours)	706	50%	50%	353	353
AM Peak Hour	77	51%	49%	39	38
PM Peak Hour	37	50%	50%	19	19

New Trips 60%

		Percent		Number	
Time Period	Total Trips	Enter	Exit	Enter	Exit
Weekday (24 hours)	1059	50%	50%	530	530
AM Peak Hour	115	51%	49%	59	56
PM Peak Hour	56	50%	50%	28	28

Project: Westland and Ebenezer Development
Date Conducted: 7/7/2019

Gasoline/Service Station With Convenience Market - LUC 853
3,997 SF

Average Daily Traffic
Average Rate = 624.20
T = 624.20 (3.997)
T = 2495

Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.
Average Rate = 40.59
T = 40.59 (3.997)
T = 162

Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.
Average Rate = 49.29
T = 49.29 (3.997)
T = 197

		Percent		Number	
Time Period	Total Trips	Enter	Exit	Enter	Exit
Weekday (24 hours)	2495	50%	50%	1248	1248
AM Peak Hour	162	50%	50%	81	81
PM Peak Hour	197	50%	50%	99	99

Pass-By Trips 65%

		Percent		Number	
Time Period	Total Trips	Enter	Exit	Enter	Exit
Weekday (24 hours)	1622	50%	50%	811	811
AM Peak Hour	105	50%	50%	53	53
PM Peak Hour	128	50%	50%	64	64

New Trips 35%

		Percent		Number	
Time Period	Total Trips	Enter	Exit	Enter	Exit
Weekday (24 hours)	873	50%	50%	437	437
AM Peak Hour	57	50%	50%	28	28
PM Peak Hour	69	50%	50%	34	34

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

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

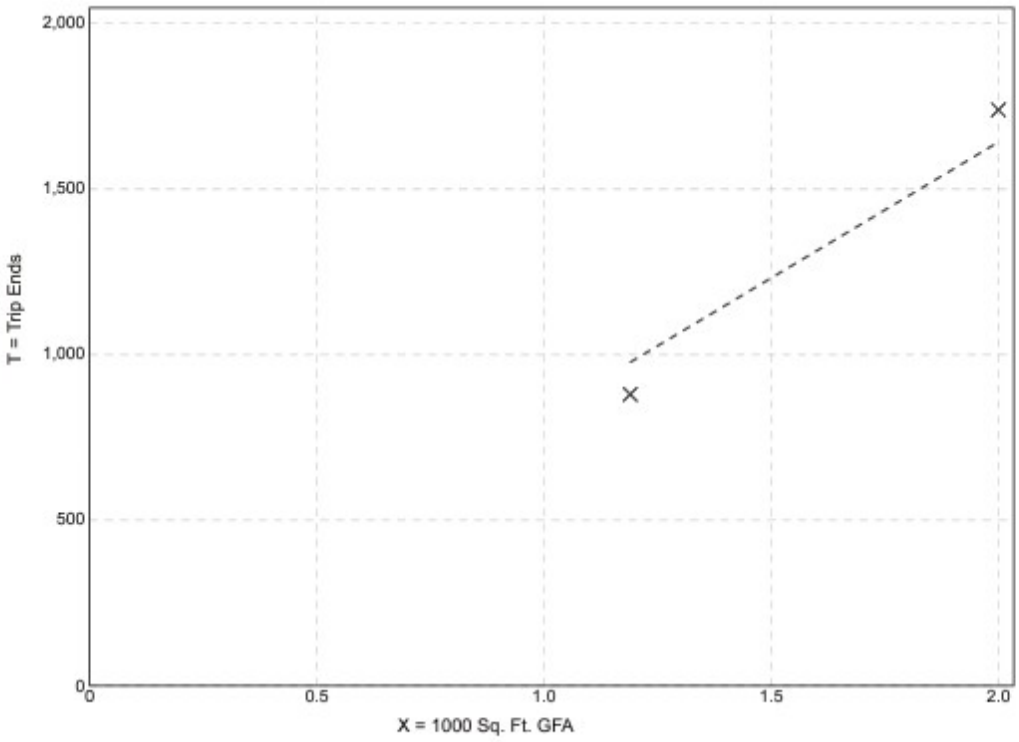
Setting/Location: **General Urban/Suburban**
Number of Studies: 2
1000 Sq. Ft. GFA: 2
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
820.38	738.66 - 869.00	*

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= ****

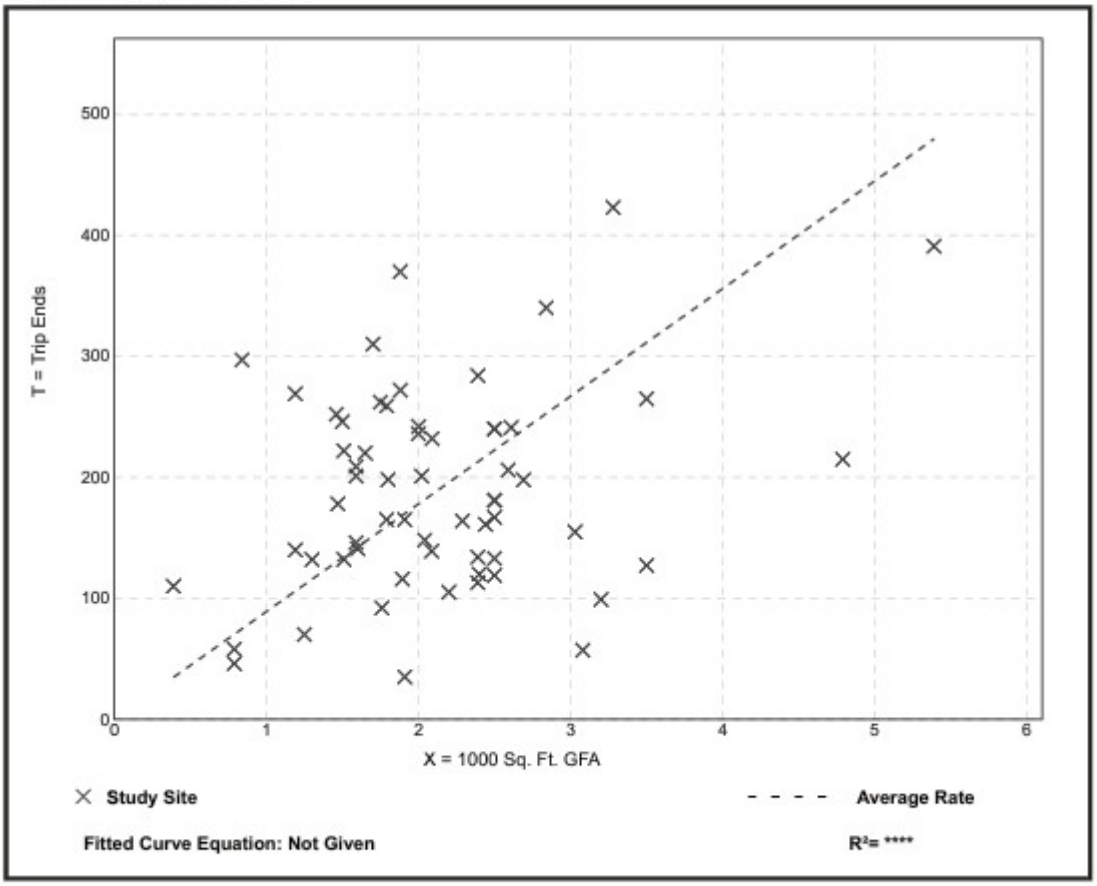
Coffee/Donut Shop with Drive-Through Window
(937)

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:	61
1000 Sq. Ft. GFA:	2
Directional Distribution:	51% entering, 49% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
88.99	18.32 - 353.57	48.19

Data Plot and Equation



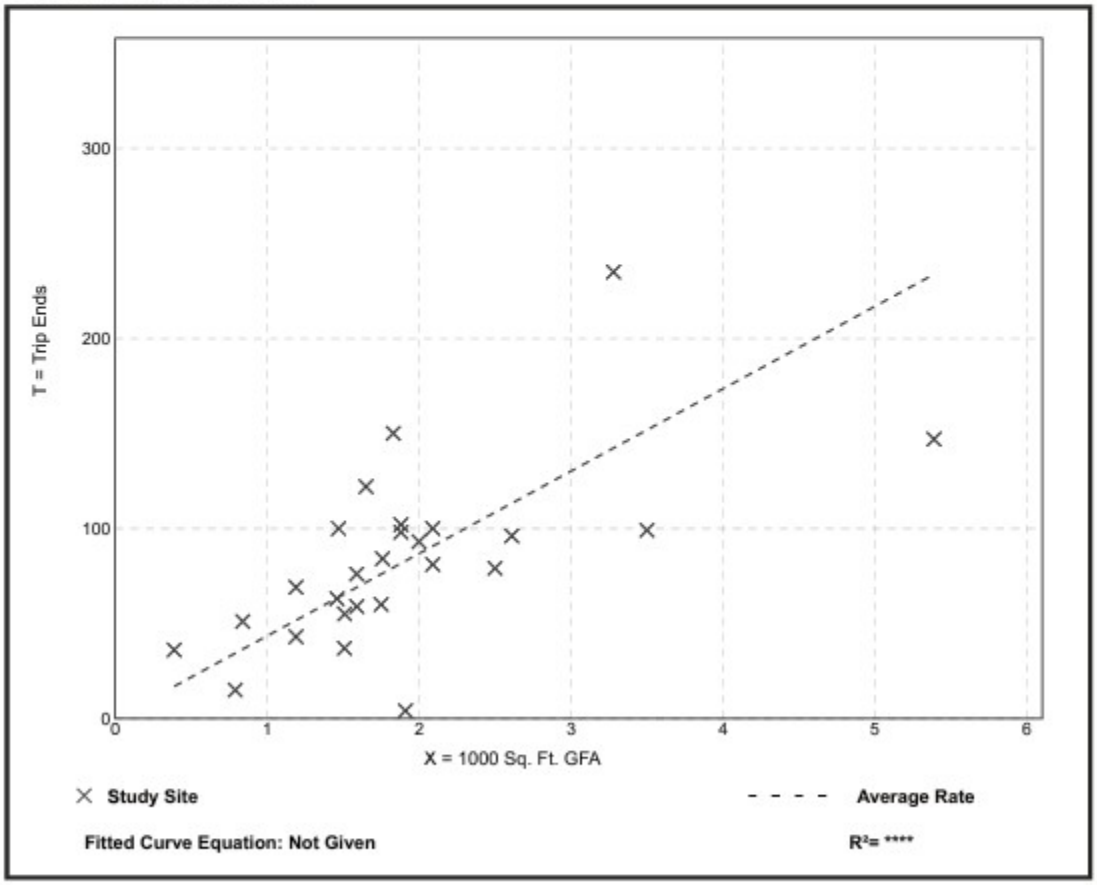
Coffee/Donut Shop with Drive-Through Window
(937)

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:	26
1000 Sq. Ft. GFA:	2
Directional Distribution:	50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
43.38	2.09 - 92.31	18.88

Data Plot and Equation



Medical-Dental Office Building
(720)

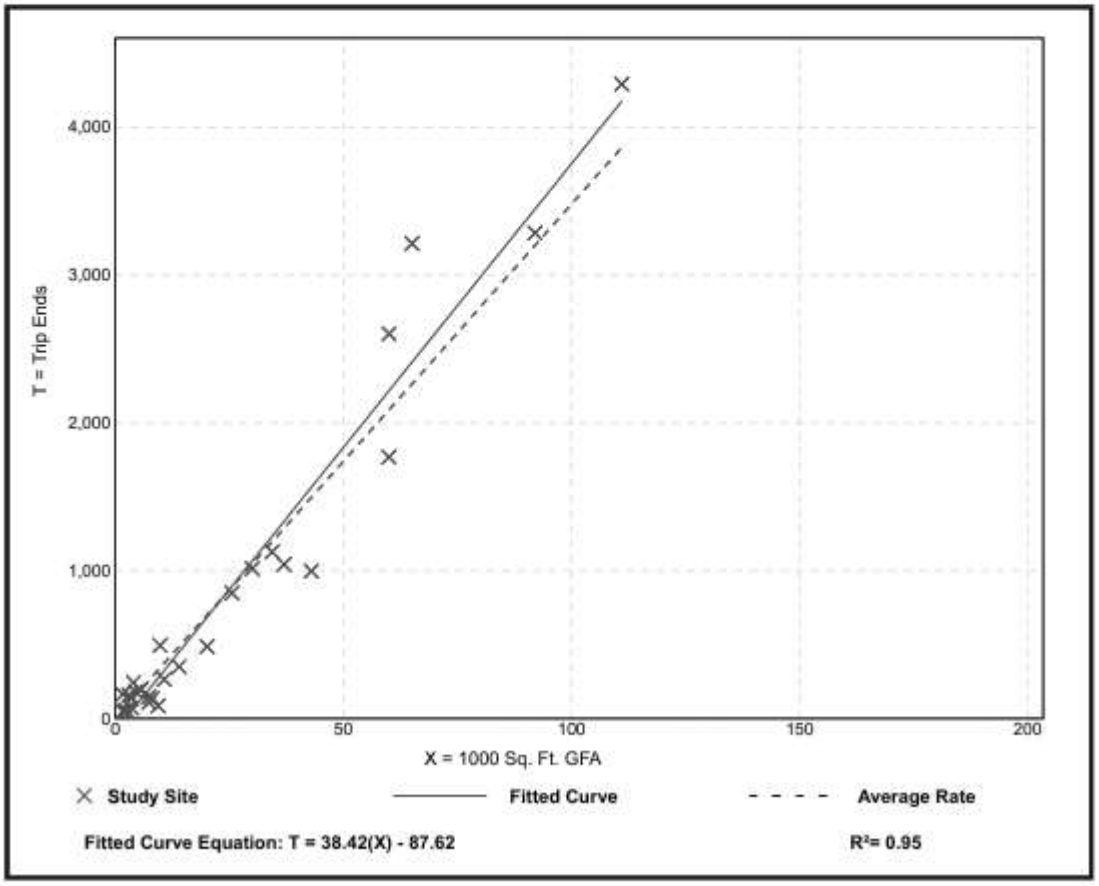
Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 28
1000 Sq. Ft. GFA: 24
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
34.80	9.14 - 100.75	9.79

Data Plot and Equation



Fitted Curve Equation: T = 38.42(X) - 87.62

R^2= 0.95

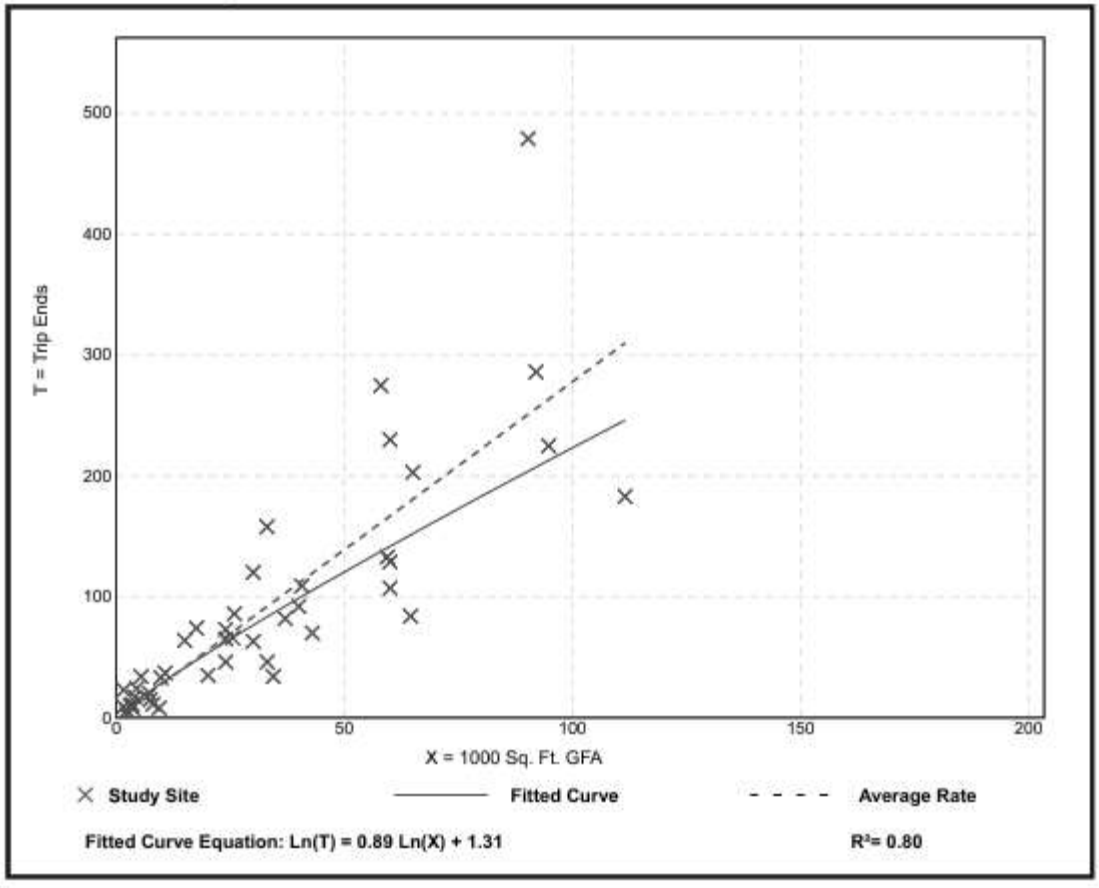
Medical-Dental Office Building
(720)

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: 44
1000 Sq. Ft. GFA: 32
Directional Distribution: 78% entering, 22% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
2.78	0.85 - 14.30	1.28

Data Plot and Equation



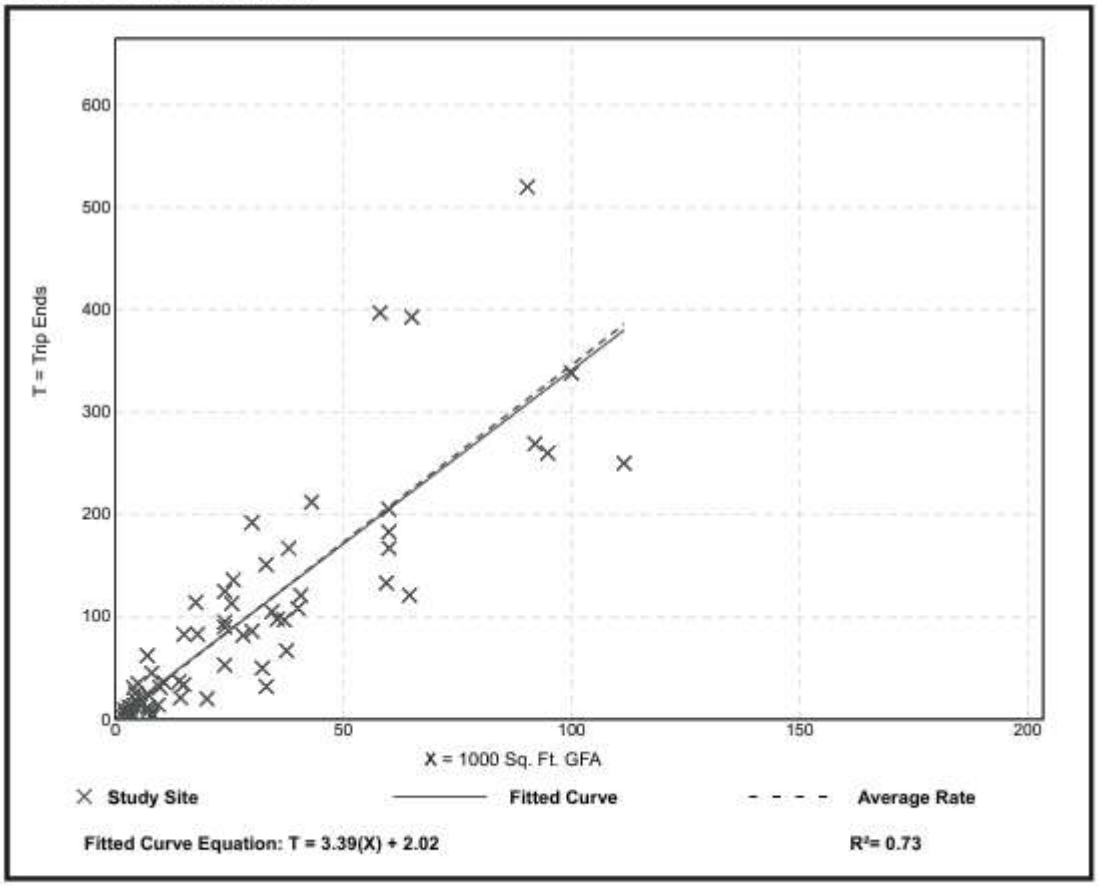
Medical-Dental Office Building
(720)

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: 65
1000 Sq. Ft. GFA: 28
Directional Distribution: 28% entering, 72% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
3.46	0.25 - 8.86	1.58

Data Plot and Equation



Convenience Market with Gasoline Pumps
(853)

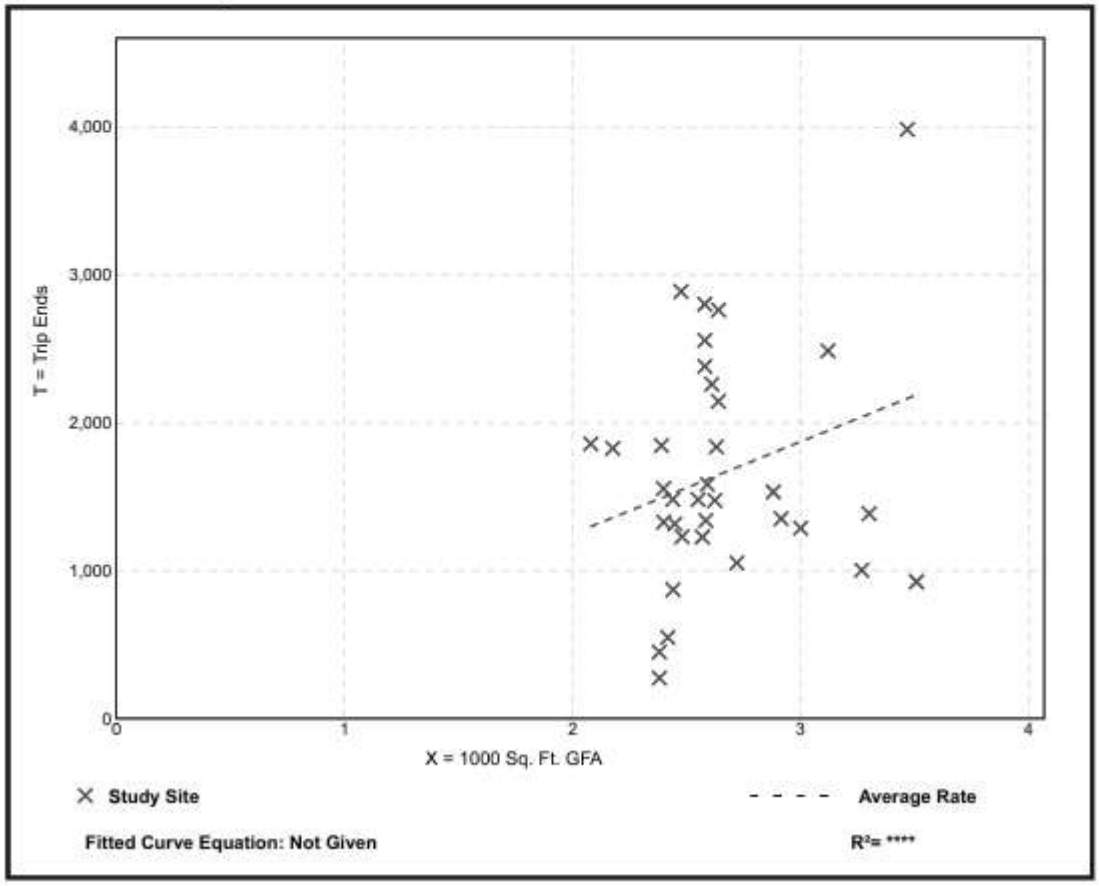
Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 34
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
624.20	115.13 - 1167.27	283.35

Data Plot and Equation



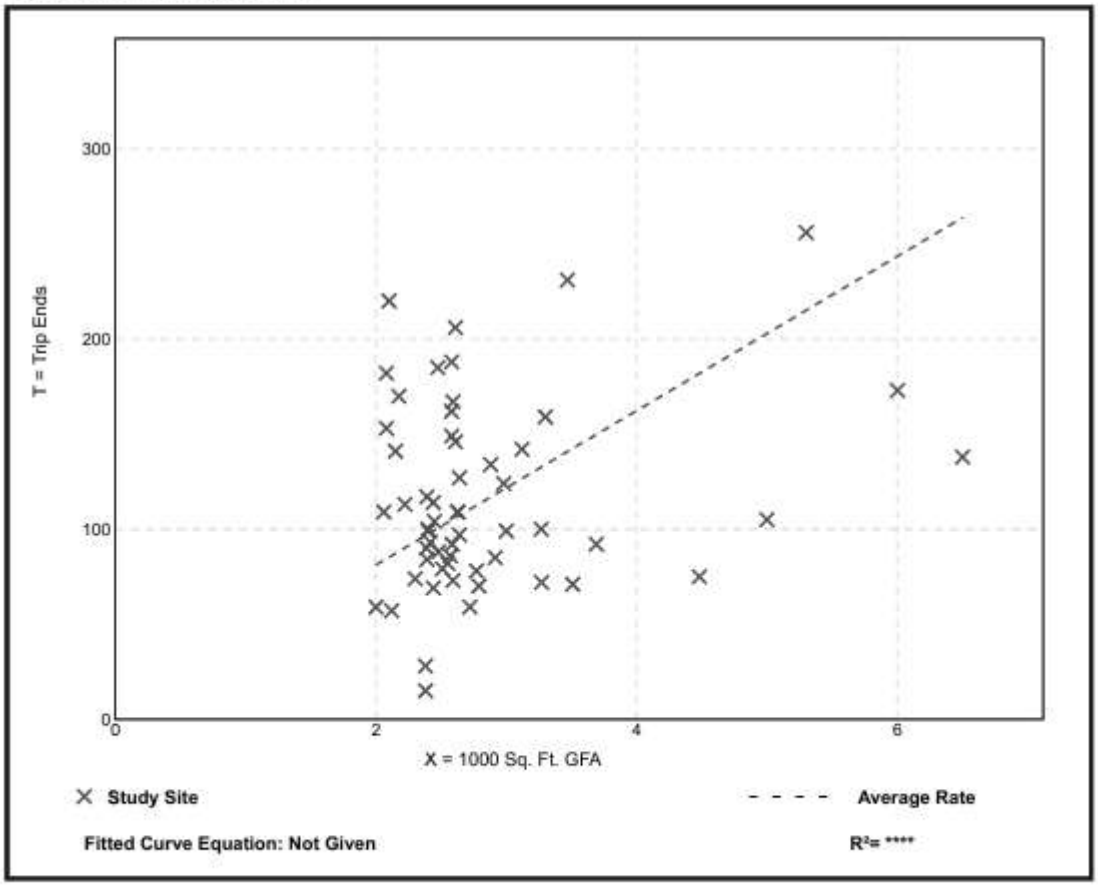
Convenience Market with Gasoline Pumps
(853)

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:	57
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
40.59	6.30 - 104.76	19.18

Data Plot and Equation



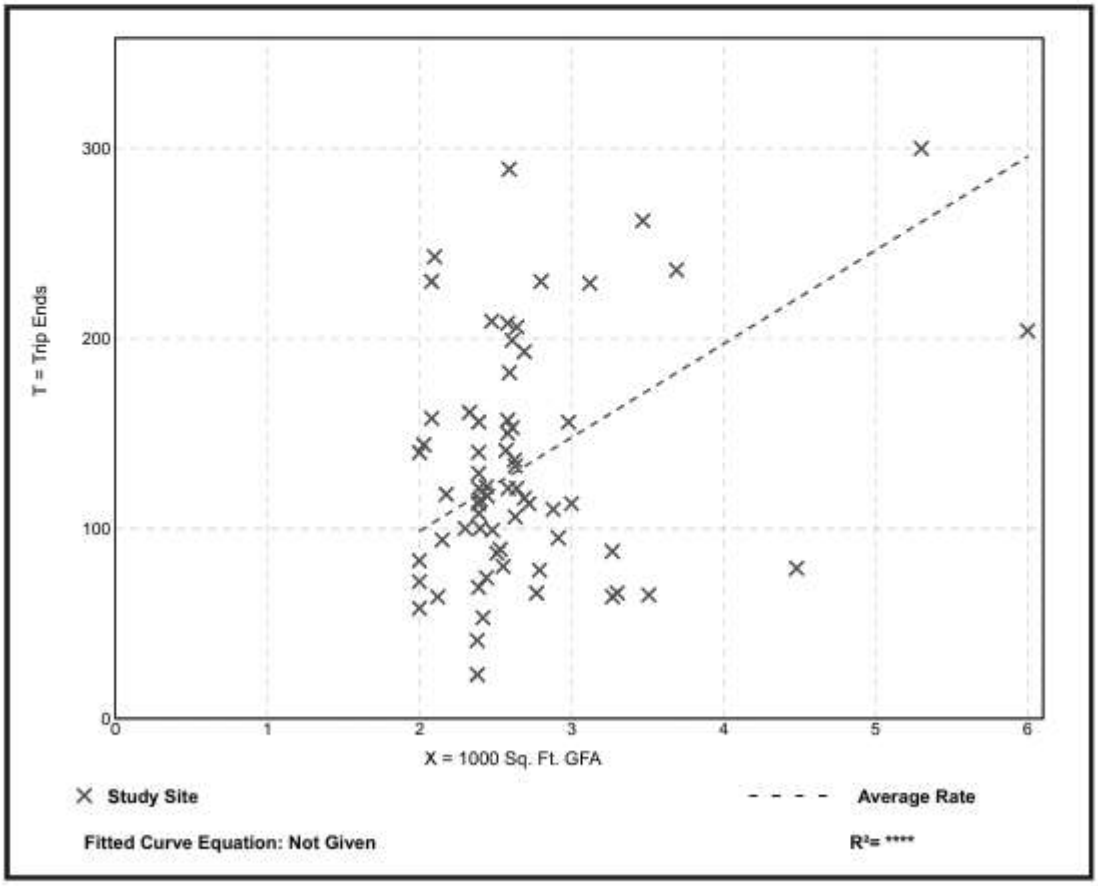
Convenience Market with Gasoline Pumps
(853)

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: 67
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
49.29	9.66 - 115.71	22.49

Data Plot and Equation



Attachment 4
Signal Timing

LOCAL CONTROLLER PROGRAMMING

INTERSECTION NUMBER: **19** ZONE: **D**

INTERSECTION: Ebenezer Road at Westland Drive (north)

INSTALLATION DATE: _____

PROGRAMMED BY: _____

NOTES: _____

PEEK TRAFFIC — A Q-Free Company

PEEK 3000 SERIES

MASTER TYPE: PEEK 3000

MASTER LOCATION: _____

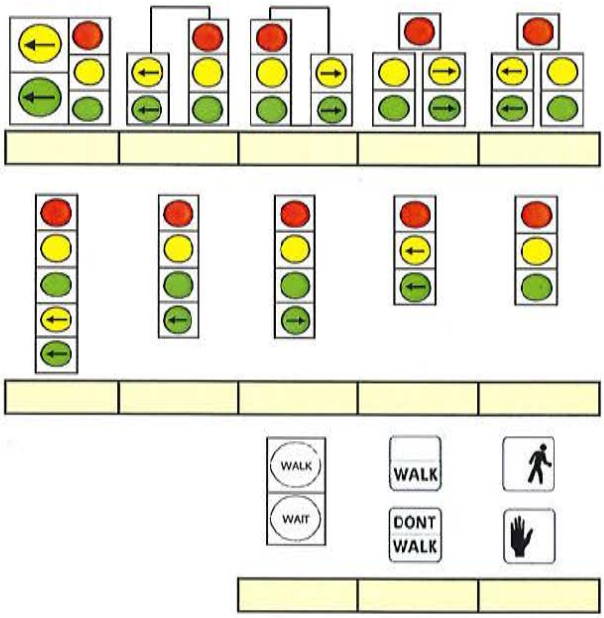
TIME BY PHASE (SEC) & FUNCTIONS

PHASE	1	2	3	4	5	6	7	8
INITIAL	6	20	6	8				
PASSAGE	3.0	3.0	3.0	3.0				
YELLOW	4.0	4.5	3.0	3.5				
RED CLEAR	2.0	1.5	2.5	2.0				
WALK		7	7	7				
PED CLEAR		18	26	25				
MAX 1								
MAX 2								
MAX 3 LIMIT								
MAX 3 ADJUST								
CNA 1								
CNA 2								
WALK REST MOD.								
FLASH WALK								
INHIBIT MAX								
PED RECYCLE								
MIN RECALL								
MAX RECALL								
PED RECALL								
SOFT RECALL								
NON-LOCK								
VEHICLE OMIT								
PED OMIT								
MAX OUTS TO ADJ MAX 3								
GAP OUTS TO ADJ MAX 3								

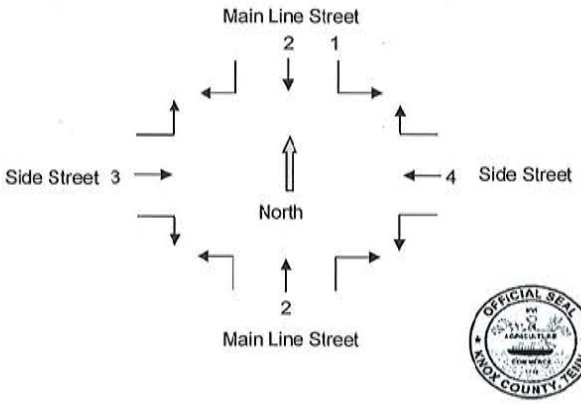
CONTROLLER OPTIONS

PHASE	1	2	3	4	5	6	7	8
START UP								
UCF LAST								
UCF EXIT								
SIM. GAP								
MIN RED REVERT		UCF OVERRIDE HOLD				PRE-EMPT OVERRIDES STOP TIME		
RED REVERT TIME		UCF TEST A OR B						
AUTO PED CLEAR		PASSAGE SEQUENTIAL						
START UP FLASH		ENABLE SIM. GAP						
START UP INTERVAL		ENHANCED PED OPERATION						
START UP ALL RED		EXT. START OVERRIDES						
FLASH								
FREE								
SPECIAL								

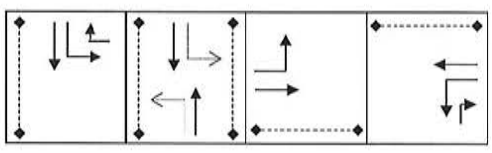
SIGNAL DISPLAYS



PHASING SCHEMATIC



PHASING SEQUENCE



KNOX COUNTY
DEPARTMENT OF ENGINEERING AND PUBLIC WORKS

INTERSECTION NUMBER: **19** ZONE: **D**

INTERSECTION: Ebenezer Road at Westland Drive (north)

INSTALLATION DATE: _____

PROGRAMMED BY: _____

NOTES: _____

DETECTOR SETTINGS

PEEK TRAFFIC
A Q-Free Company

PEEK 3000 SERIES

DETECTION DATA

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
LOOPS																
VIDEO																

DETECTOR ASSIGNMENTS

DETECTOR	1	2	3	4	5	6	7	8
DETECTOR 1	X							
DETECTOR 2		X						
DETECTOR 3			X					
DETECTOR 4				X				
DETECTOR 5					X			
DETECTOR 6						X		
DETECTOR 7							X	
DETECTOR 8								X

DETECTOR MODES & TIMING

DETECTOR	DETECTOR MODE	DELAY TIME	STRETCH/ STOP BAR
1			
2			
3			
4			
5			
6			
7			
8			

DELAY INHIBITS

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DETECTOR 1																
DETECTOR 2																
DETECTOR 3																
DETECTOR 4																
DETECTOR 5																
DETECTOR 6																
DETECTOR 7																
DETECTOR 8																

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KNOX COUNTY
DEPARTMENT OF ENGINEERING AND PUBLIC WORKS

INTERSECTION NUMBER: **19** ZONE: **D**

INTERSECTION: Ebenezer Road at Westland Drive (north)

INSTALLATION DATE: _____

PROGRAMMED BY: _____

NOTES: Offset is referenced at beginning of yellow

COORDINATION AND OPERATION

PEEK TRAFFIC A Q-Free Company

PEEK 3000 SERIES

PHASE ALLOCATIONS (SEC)

PHASE	1	2	3	4	5	6	7	8
CYCLE 1/SPLIT 1	16	66	13	15	16	66	13	15
CYCLE 1/SPLIT 2								
CYCLE 2/SPLIT 1	30	46	15	29	30	46	15	29
CYCLE 2/SPLIT 2								
CYCLE 3/SPLIT 1	16	34	20	20	16	34	20	20
CYCLE 3/SPLIT 2								
CYCLE 4/SPLIT 1								
CYCLE 4/SPLIT 2								

DYNAMIC OMITS

PHASE/OVL	1/A	2/B	3/C	4/D	5/E	6/F	7/G	8/H
OMIT PHASE								
IF PHASE OR OVL ON								
OMIT PHASE								
IF PHASE OR OVL ON								
OMIT PHASE								
IF PHASE OR OVL ON								
OMIT PHASE								
IF PHASE OR OVL ON								

OPERATING MODE

FUNCTION	
AUTO PERM	
END OF MAIN ST	
ENHANCED PERM	
FIXED FORCE OFF	
YELLOW OFFSET	
CENTRAL OVERIDE	
NO PCL OFFSET ADJ	
OFFSET ENTRY IN %	
PERM-PA ENTRY IN %	
INVERT FREE IN	
SPLIT MATRIX	
4 SPLITS / CYCLE	
NO EARLY COORD PED	
CYCLE SOURCE	
SPLIT SOURCE	
OFFSET SOURCE	
FREE SOURCE	
FLASH SOURCE	
INTER. TOD REVERT	
TYPE OF PERM	
OFFSET SEEKING	
PED PERMISSIVE	
YIELD PERCENT	

CYCLE LENGTH / DWELL / OFFSETS

CYCLE	1	2	3	4	5	6
CYCLE LENGTH	110	120	90			
MAX DWELL						
OFFSET 1	21	47	40			
OFFSET 2						
OFFSET 3						
OFFSET 4						
OFFSET 5						

PHASE REVERSAL

PATTERN	MODE	PHASES	
		LEAD	LAG

DUAL ENTRY

PHASE	1	2	3	4	5	6	7	8
PHASE 1								
PHASE 2								
PHASE 3								
PHASE 4								
PHASE 5								
PHASE 6								
PHASE 7								
PHASE 8								

COORD. PHASES

CYCLE	PHASES TO BE COORD	
1	2	6
2		
3		
4		
5		
6		

CYCLE / OFFSET / SPLIT / FREE TO TOD CIRCUITS

PLAN	C / O / S / FREE				CKT	CKT	CKT	CKT
1								
2								

KNOX COUNTY
DEPARTMENT OF ENGINEERING AND PUBLIC WORKS

INTERSECTION NUMBER: **19** ZONE: **D**

INTERSECTION: Ebenezer Road at Westland Drive (north)

INSTALLATION DATE: _____

PROGRAMMED BY: _____

NOTES: _____

TIME OF DAY PROGRAMMING

PEEK TRAFFIC
A Q-Free Company

PEEK 3000 SERIES

WEEKLY PROGRAM PLAN

PLAN	SUN 1	MON 2	TUE 3	WED 4	THU 5	FRI 6	SAT 7
1	2	1	1	1	1	1	2
2							
3							
4							
5							

DAYLIGHT SAVINGS

	MONTH	W-O-M
SPRING	3	2
FALL	11	1

CIRCUIT OVERRIDES

CKT	SYM	ON/OFF/TOD

TIME DEPENDENT SYNC REF

CYCLE	HH:MM
1	
2	
3	
4	
5	
6	
SYNC REF	

DAY PLAN EVENTS

PLAN	HH:MM	CKT PLAN	C/O/S	CKT	ON/OFF
1	00:00	FREE			
1	06:30		1/1/1		
1	09:30		3/1/1		
1	14:30		2/1/1		
1	18:00		3/1/1		
1	21:00	FREE			
2	00:00	FREE			
2	09:00		3/1/1		
2	19:00	FREE			

TOD CIRCUIT PLANS

PLAN	CKT	ON/OFF	CKT	ON/OFF	CKT	ON/OFF	CKT	ON/OFF
1								
2								
3								

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KNOX COUNTY
DEPARTMENT OF ENGINEERING AND PUBLIC WORKS

LOCAL CONTROLLER PROGRAMMING

INTERSECTION NUMBER: **20** ZONE: **D**

INTERSECTION: Ebenezer Road at Westland Drive (south)

INSTALLATION DATE: _____

PROGRAMMED BY: _____

NOTES: _____

PEEK TRAFFIC
A Q-Free Company

PEEK 3000 SERIES

MASTER TYPE: PEEK 3000

MASTER LOCATION: _____

TIME BY PHASE (SEC) & FUNCTIONS

PHASE	1	2	3	4	5	6	7	8
INITIAL	6	16		8		16		
PASSAGE	3.0	5.0		3.0		5.0		
YELLOW	4.0	4.0		4.0		4.0		
RED CLEAR	2.0	2.0		2.0		2.0		
WALK		7		7				
PED CLEAR		23		22				
MAX 1	20	40		20		40		
MAX 2	12	20		20		20		
MAX 3 LIMIT								
MAX 3 ADJUST								
CNA 1								
CNA 2								
WALK REST MOD.								
FLASH WALK								
INHIBIT MAX								
PED RECYCLE								
MIN RECALL								
MAX RECALL								
PED RECALL								
SOFT RECALL								
NON-LOCK								
VEHICLE OMIT								
PED OMIT								
MAX OUTS TO ADJ MAX 3								
GAP OUTS TO ADJ MAX 3								

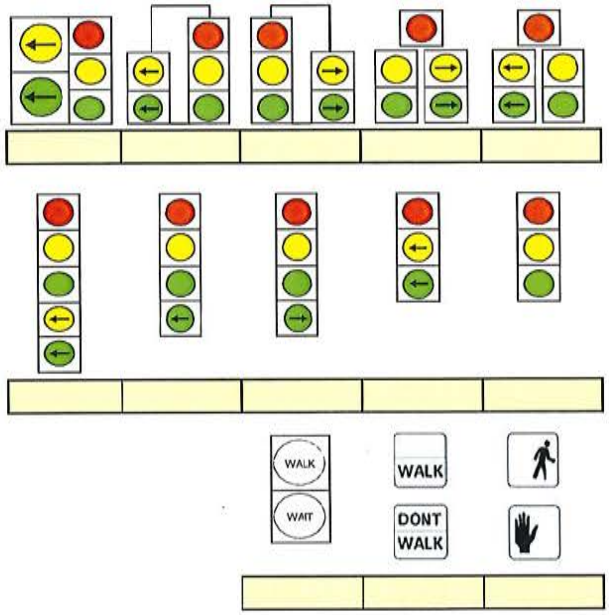
CONTROLLER OPTIONS

PHASE	1	2	3	4	5	6	7	8
START UP								
UCF LAST								
UCF EXIT								
SIM. GAP								

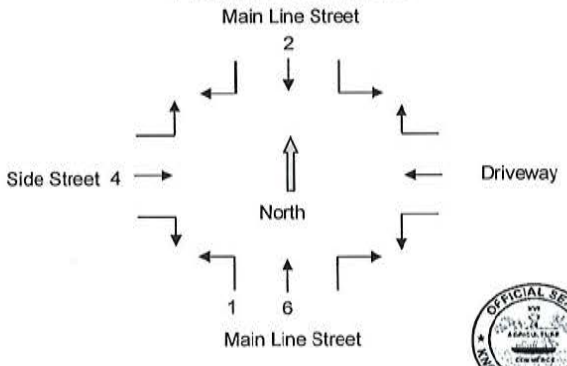
MIN RED REVERT		UCF OVERRIDE HOLD		PRE-EMPT
RED REVERT TIME		UCF TEST A OR B		OVERRIDES
AUTO PED CLEAR		PASSAGE SEQUENTIAL		STOP TIME
START UP FLASH		ENABLE SIM. GAP		
START UP INTERVAL		ENHANCED PED OPERATION		
START UP ALL RED		EXT. START OVERRIDES		

FLASH	
FREE	
SPECIAL	

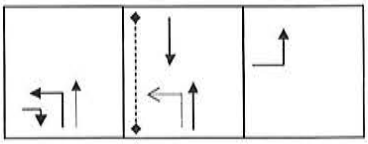
SIGNAL DISPLAYS



PHASING SCHEMATIC



PHASING SEQUENCE



KNOX COUNTY
DEPARTMENT OF ENGINEERING AND PUBLIC WORKS

INTERSECTION NUMBER: **20** ZONE: **D**

INTERSECTION: Ebenezer Road at Westland Drive (south)

INSTALLATION DATE: _____

PROGRAMMED BY: _____

NOTES: _____

DETECTOR SETTINGS

PEEK TRAFFIC
A Q-Free Company

PEEK 3000 SERIES

DETECTION DATA

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
LOOPS																
VIDEO																

DETECTOR ASSIGNMENTS

DETECTOR	1	2	3	4	5	6	7	8
DETECTOR 1	X							
DETECTOR 2		X						
DETECTOR 3			X					
DETECTOR 4				X				
DETECTOR 5					X			
DETECTOR 6						X		
DETECTOR 7							X	
DETECTOR 8								X

DETECTOR MODES & TIMING

DETECTOR	DETECTOR MODE	DELAY TIME	STRETCH/ STOP BAR
1			
2			
3			
4			
5			
6			
7			
8			

DELAY INHIBITS

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DETECTOR 1																
DETECTOR 2																
DETECTOR 3																
DETECTOR 4																
DETECTOR 5																
DETECTOR 6																
DETECTOR 7																
DETECTOR 8																

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KNOX COUNTY
DEPARTMENT OF ENGINEERING AND PUBLIC WORKS

INTERSECTION NUMBER: **20** ZONE: **D**

INTERSECTION: Ebenezer Road at Westland Drive (south)

INSTALLATION DATE: _____

PROGRAMMED BY: _____

NOTES: Offset is referenced at beginning of yellow

COORDINATION AND OPERATION

PEEK TRAFFIC
A Q-Free Company

PEEK 3000 SERIES

PHASE ALLOCATIONS (SEC)

PHASE	1	2	3	4	5	6	7	8
CYCLE 1/SPLIT 1	18	58		34		76		34
CYCLE 1/SPLIT 2								
CYCLE 2/SPLIT 1	15	85		20		100		20
CYCLE 2/SPLIT 2								
CYCLE 3/SPLIT 1	18	44		28		62		28
CYCLE 3/SPLIT 2								
CYCLE 4/SPLIT 1								
CYCLE 4/SPLIT 2								

DYNAMIC OMITS

PHASE/OVL	1/A	2/B	3/C	4/D	5/E	6/F	7/G	8/H
OMIT PHASE								
IF PHASE OR OVL ON								
OMIT PHASE								
IF PHASE OR OVL ON								
OMIT PHASE								
IF PHASE OR OVL ON								
OMIT PHASE								
IF PHASE OR OVL ON								

OPERATING MODE

FUNCTION	
AUTO PERM	
END OF MAIN ST	
ENHANCED PERM	
FIXED FORCE OFF	
YELLOW OFFSET	
CENTRAL OVERIDE	
NO PCL OFFSET ADJ	
OFFSET ENTRY IN %	
PERM-PA ENTRY IN %	
INVERT FREE IN	
SPLIT MATRIX	
4 SPLITS / CYCLE	
NO EARLY COORD PED	
CYCLE SOURCE	
SPLIT SOURCE	
OFFSET SOURCE	
FREE SOURCE	
FLASH SOURCE	
INTER. TOD REVERT	
TYPE OF PERM	
OFFSET SEEKING	
PED PERMISSIVE	
YIELD PERCENT	

CYCLE LENGTH / DWELL / OFFSETS

CYCLE	1	2	3	4	5	6
CYCLE LENGTH	110	120	90			
MAX DWELL						
OFFSET 1	31	76	44			
OFFSET 2						
OFFSET 3						
OFFSET 4						
OFFSET 5						

PHASE REVERSAL

PATTERN	MODE	PHASES	
		LEAD	LAG

DUAL ENTRY

PHASE	1	2	3	4	5	6	7	8
PHASE 1								
PHASE 2								
PHASE 3								
PHASE 4								
PHASE 5								
PHASE 6								
PHASE 7								
PHASE 8								

COORD. PHASES

CYCLE	PHASES TO BE COORD	
1	2	6
2		
3		
4		
5		
6		

CYCLE / OFFSET / SPLIT / FREE TO TOD CIRCUITS

PLAN	C / O / S / FREE				CKT	CKT	CKT	CKT
1								
2								

OFFICIAL SEAL KNOX COUNTY, TENN.

KNOX COUNTY
DEPARTMENT OF ENGINEERING AND PUBLIC WORKS

TIME OF DAY PROGRAMMING

INTERSECTION NUMBER: **20** ZONE: **D**

INTERSECTION: **Ebenezer Road at Westland Drive (south)**

INSTALLATION DATE: _____

PROGRAMMED BY: _____

NOTES: _____

PEEK TRAFFIC
A Q-Free Company

PEEK 3000 SERIES

WEEKLY PROGRAM PLAN

PLAN	SUN 1	MON 2	TUE 3	WED 4	THU 5	FRI 6	SAT 7
1	2	1	1	1	1	1	2
2							
3							
4							
5							

DAYLIGHT SAVINGS

	MONTH	W-O-M
SPRING	3	2
FALL	11	1

CIRCUIT OVERRIDES

CKT	SYM	ON/OFF/TOD

TIME DEPENDENT SYNC REF

CYCLE	HH:MM
1	
2	
3	
4	
5	
6	
SYNC REF	

DAY PLAN EVENTS

PLAN	HH:MM	CKT PLAN	C/O/S	CKT	ON/OFF
1	00:00	FREE			
1	06:30		1/1/1		
1	09:30		3/1/1		
1	14:30		2/1/1		
1	18:00		3/1/1		
1	21:00	FREE			
2	00:00	FREE			
2	09:00		3/1/1		
2	19:00	FREE			

TOD CIRCUIT PLANS

PLAN	CKT	ON/OFF	CKT	ON/OFF	CKT	ON/OFF	CKT	ON/OFF
1								
2								
3								

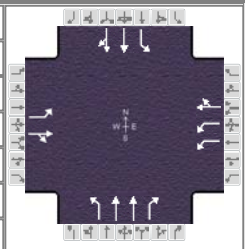
OFFICIAL SEAL KNOX COUNTY TENN.

KNOX COUNTY
DEPARTMENT OF ENGINEERING AND PUBLIC WORKS

Attachment 5
Intersection Worksheets – Existing AM/PM Peaks

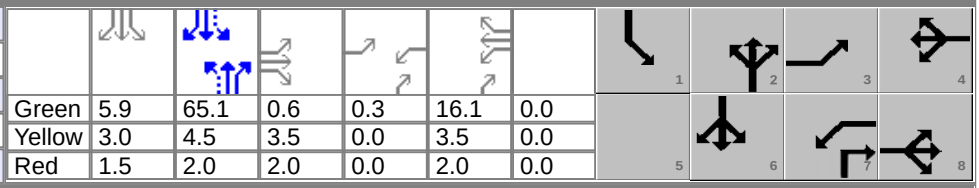
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	5/31/2018	Area Type	Other
Jurisdiction	Knox County	Time Period	Existing AM Peak	PHF	0.93
Urban Street	Ebenezer Road	Analysis Year	2018	Analysis Period	1> 7:00
Intersection	Ebenezer Road at Westl…	File Name	Existing AM Peak_Westland (north).xus		
Project Description	223.013 The Crescent at Ebenezer				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	2	0	3	235	2	337	3	1560	360	122	614	0

Signal Information			
Cycle, s	110.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	On



Green	5.9	65.1	0.6	0.3	16.1	0.0
Yellow	3.0	4.5	3.5	0.0	3.5	0.0
Red	1.5	2.0	2.0	0.0	2.0	0.0

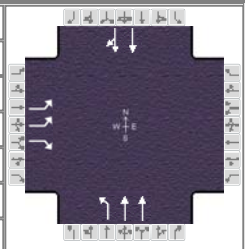
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4		2	1	6
Case Number	1.2	4.0	1.3	4.0		5.3	1.0	4.0
Phase Duration, s	6.4	6.1	21.9	21.6		71.6	10.4	82.0
Change Period, ($Y+R_c$), s	6.0	5.5	6.0	6.0		6.5	4.5	6.5
Max Allow Headway (*MAH*), s	3.9	4.4	4.3	4.3		0.0	4.1	0.0
Queue Clearance Time (g_s), s	2.1	2.2	4.6	17.6			5.0	
Green Extension Time (g_e), s	0.0	0.0	1.9	0.0		0.0	0.2	0.0
Phase Call Probability	0.06	0.09	1.00	1.00			0.98	
Max Out Probability	0.07	0.14	0.09	1.00			0.13	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	2	3		253	328		3	1677	387	131	660	0
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1585		1730	1587		774	1781	1585	1781	1870	0
Queue Service Time (g_s), s	0.1	0.2		2.6	15.6		0.1	29.4	5.4	3.0	2.2	0.0
Cycle Queue Clearance Time (g_c), s	0.1	0.2		2.6	15.6		0.1	29.4	5.4	3.0	2.2	0.0
Green Ratio (*g/C*)	0.00	0.01		0.15	0.14		0.59	0.59	0.74	0.66	0.69	
Capacity (*c*), veh/h	72	8		632	225		524	2108	1168	257	2568	
Volume-to-Capacity Ratio (*X*)	0.030	0.397		0.400	1.456		0.006	0.796	0.331	0.511	0.257	0.000
Back of Queue (*Q*), ft/ln (95 th percentile)	2.8	7		129.6	802.3		0.9	264.4	170.8	63.3	31.6	0
Back of Queue (*Q*), veh/ln (95 th percentile)	0.1	0.3		5.1	31.6		0.0	10.4	6.7	2.5	1.2	0.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.11	0.00		0.30	0.00		0.01	0.00	0.74	0.45	0.00	0.00
Uniform Delay (d_1), s/veh	54.5	54.5		38.3	44.6		4.7	7.8	12.7	14.3	1.6	
Incremental Delay (d_2), s/veh	0.2	28.5		0.4	228.3		0.0	3.2	0.8	1.6	0.2	0.0
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	54.7	82.9		38.7	272.9		4.8	11.0	13.5	15.9	1.8	
Level of Service (LOS)	D	F		D	F		A	B	B	B	A	
Approach Delay, s/veh / LOS	71.6	E		171.0	F		11.5	B		4.1	A	
Intersection Delay, s/veh / LOS	36.8						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.9	C	2.4	B	2.2	B
Bicycle LOS Score / LOS	0.5	A	1.4	A	2.2	B	1.1	A

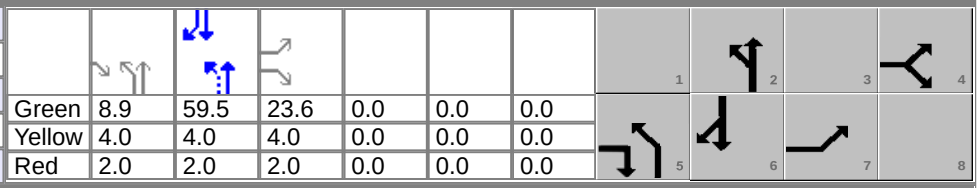
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	May 31, 2018	Area Type	Other
Jurisdiction	Knox County	Time Period	Existing AM Peak	PHF	0.89
Urban Street	Ebenezer Road	Analysis Year	2018	Analysis Period	1> 7:00
Intersection	Ebenezer Road at Westl…	File Name	Existing AM Peak_Westland (south).xus		
Project Description	223.013 The Crescent at Ebenezer				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	582		27				131	1149			517	334

Signal Information			
Cycle, s	110.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	8.9	59.5	23.6	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0

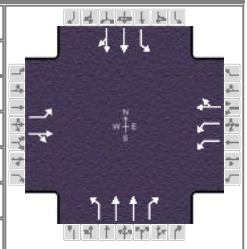
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		8.3
Phase Duration, s		29.6			14.9	80.4		65.5
Change Period, ($Y+R_c$), s		6.0			6.0	6.0		6.0
Max Allow Headway (*MAH*), s		4.1			4.1	0.0		0.0
Queue Clearance Time (g_s), s		21.9			5.6			
Green Extension Time (g_e), s		1.7			0.3	0.0		0.0
Phase Call Probability		1.00			0.99			
Max Out Probability		0.53			0.00			

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	654		30				147	1291			512	444
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1730		1585				1781	1781			1870	1624
Queue Service Time (g_s), s	19.9		1.4				3.6	7.5			20.5	13.2
Cycle Queue Clearance Time (g_c), s	19.9		1.4				3.6	7.5			20.5	13.2
Green Ratio (*g/C*)	0.21		0.30				0.64	0.68			0.54	0.54
Capacity (*c*), veh/h	741		468				418	2410			1013	879
Volume-to-Capacity Ratio (*X*)	0.883		0.065				0.352	0.536			0.506	0.506
Back of Queue (*Q*), ft/ln (95 th percentile)	343.6		24				58.4	80.7			205.1	181.5
Back of Queue (*Q*), veh/ln (95 th percentile)	13.5		0.9				2.3	3.2			8.1	7.3
Queue Storage Ratio (*RQ*) (95 th percentile)	1.25		0.00				0.61	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	38.0		25.3				10.5	2.1			8.9	8.9
Incremental Delay (d_2), s/veh	9.3		0.1				0.5	0.9			1.8	2.1
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	47.3		25.4				11.0	3.0			10.7	10.9
Level of Service (LOS)	D		C				B	A			B	B
Approach Delay, s/veh / LOS	46.3	D		0.0			3.8	A		10.8	B	
Intersection Delay, s/veh / LOS	15.4						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.7	C	0.7	A	2.4	B
Bicycle LOS Score / LOS		F			1.7	B	1.3	A

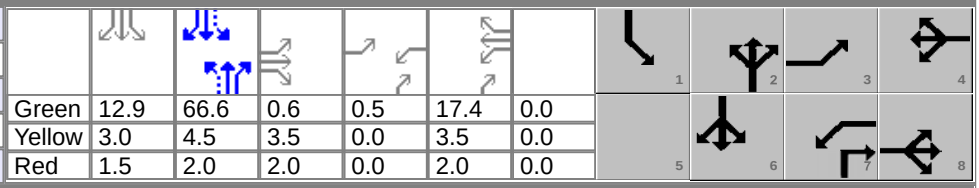
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	5/31/2018	Area Type	Other
Jurisdiction	Knox County	Time Period	Existing PM Peak	PHF	0.97
Urban Street	Ebenezer Road	Analysis Year	2018	Analysis Period	1> 7:00
Intersection	Ebenezer Road at Westl…	File Name	Existing PM Peak_Westland (north).xus		
Project Description	223.013 The Crescent at Ebenezer				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	3	1	2	499	1	177	9	903	356	334	1208	6

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	On



Green	12.9	66.6	0.6	0.5	17.4	0.0
Yellow	3.0	4.5	3.5	0.0	3.5	0.0
Red	1.5	2.0	2.0	0.0	2.0	0.0

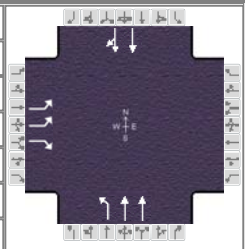
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4		2	1	6
Case Number	1.2	4.0	1.3	4.0		5.3	1.0	4.0
Phase Duration, s	6.6	6.1	23.4	22.9		73.1	17.4	90.5
Change Period, ($Y+R_c$), s	6.0	5.5	6.0	6.0		6.5	4.5	6.5
Max Allow Headway (*MAH*), s	3.9	4.3	4.2	4.2		0.0	4.1	0.0
Queue Clearance Time (g_s), s	2.2	2.2	14.8	12.3			11.6	
Green Extension Time (g_e), s	0.0	0.0	2.6	2.7		0.0	1.3	0.0
Phase Call Probability	0.10	0.10	1.00	0.99			1.00	
Max Out Probability	0.00	0.00	0.02	0.01			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	3	3		514	146		9	931	367	344	626	625
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1670		1730	1587		444	1781	1585	1781	1870	1867
Queue Service Time (g_s), s	0.2	0.2		12.8	10.3		0.7	12.5	7.0	9.6	4.8	4.8
Cycle Queue Clearance Time (g_c), s	0.2	0.2		12.8	10.3		0.7	12.5	7.0	9.6	4.8	4.8
Green Ratio (*g/C*)	0.01	0.00		0.15	0.14		0.56	0.56	0.70	0.68	0.70	0.70
Capacity (*c*), veh/h	69	8		622	224		306	1977	1110	522	1309	1307
Volume-to-Capacity Ratio (*X*)	0.045	0.377		0.827	0.655		0.030	0.471	0.331	0.659	0.478	0.478
Back of Queue (*Q*), ft/ln (95 th percentile)	4.5	7		290.8	186		3.7	182.1	67.1	148.8	68	66.9
Back of Queue (*Q*), veh/ln (95 th percentile)	0.2	0.3		11.4	7.3		0.1	7.2	2.6	5.9	2.7	2.7
Queue Storage Ratio (*RQ*) (95 th percentile)	0.18	0.00		0.68	0.00		0.04	0.00	0.29	1.06	0.00	0.00
Uniform Delay (d_1), s/veh	59.3	59.4		45.0	46.0		7.0	8.6	8.5	9.3	1.4	1.4
Incremental Delay (d_2), s/veh	0.3	26.3		2.9	3.2		0.2	0.8	0.8	1.4	1.3	1.3
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	59.6	85.7		47.9	49.3		7.2	9.4	9.3	10.7	2.6	2.6
Level of Service (LOS)	E	F		D	D		A	A	A	B	A	A
Approach Delay, s/veh / LOS	72.7	E		48.2	D		9.3	A		4.4	A	
Intersection Delay, s/veh / LOS	14.4						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.9	C	2.5	B	2.2	B
Bicycle LOS Score / LOS	0.5	A	1.6	B	1.6	B	1.8	B

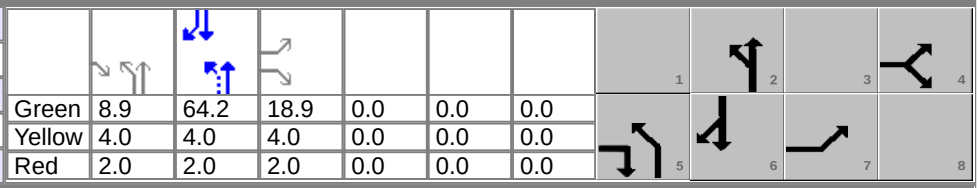
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	May 31, 2018	Area Type	Other
Jurisdiction	Knox County	Time Period	Existing PM Peak	PHF	0.89
Urban Street	Ebenezer Road	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Ebenezer Road at Westl…	File Name	Existing PM Peak_Westland (south).xus		
Project Description	223.013 The Crescent at Ebenezer				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	429		182				141	699			1064	646

Signal Information			
Cycle, s	110.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	8.9	64.2	18.9	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		8.3
Phase Duration, s		24.9			14.9	85.1		70.2
Change Period, ($Y+R_c$), s		6.0			6.0	6.0		6.0
Max Allow Headway (*MAH*), s		4.2			4.1	0.0		0.0
Queue Clearance Time (g_s), s		16.5			7.3			
Green Extension Time (g_e), s		2.4			0.4	0.0		0.0
Phase Call Probability		1.00			0.99			
Max Out Probability		0.11			0.00			

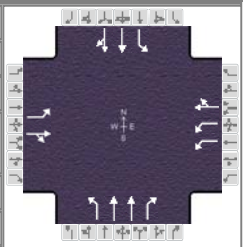
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	482		204				158	785			964	957
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1730		1585				1781	1781			1870	1646
Queue Service Time (g_s), s	14.5		11.9				5.3	1.4			64.4	63.3
Cycle Queue Clearance Time (g_c), s	14.5		11.9				5.3	1.4			64.4	63.3
Green Ratio (*g/C*)	0.17		0.25				0.68	0.72			0.58	0.58
Capacity (*c*), veh/h	594		401				210	2562			1091	960
Volume-to-Capacity Ratio (*X*)	0.812		0.510				0.754	0.307			0.883	0.997
Back of Queue (*Q*), ft/ln (95 th percentile)	256		198.2				196.5	19.8			426.2	649
Back of Queue (*Q*), veh/ln (95 th percentile)	10.1		7.8				7.7	0.8			16.8	26.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.93		0.00				2.07	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	40.7		32.7				31.9	0.7			9.5	12.1
Incremental Delay (d_2), s/veh	3.6		1.0				5.4	0.3			10.4	28.3
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	44.4		33.7				37.3	1.0			19.9	40.4
Level of Service (LOS)	D		C				D	A			B	D
Approach Delay, s/veh / LOS	41.2		D	0.0			7.1		A	30.1		C
Intersection Delay, s/veh / LOS	26.2						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.7	C	0.7	A	2.4	B
Bicycle LOS Score / LOS		F			1.3	A	2.1	B

Attachment 6
Intersection Worksheets – Background AM/PM Peaks

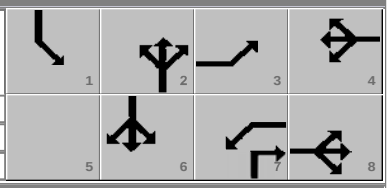
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	Jul 7, 2019	Area Type	Other
Jurisdiction	Knox County	Time Period	Background AM Peak	PHF	0.93
Urban Street	Ebenezer Road	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Westland (north)	File Name	Phase 3 AM Peak_Signalized.xus		
Project Description	223.013 The Crescent at Ebenezer				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	2	0	3	278	2	377	3	1703	386	138	659	0

Signal Information													
Cycle, s	110.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	No	Simult. Gap E/W	Off	Green	5.9	65.1	0.6	0.3	16.1	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.0	4.5	3.5	0.0	3.5	0.0			
				Red	1.5	2.0	2.0	0.0	2.0	0.0			



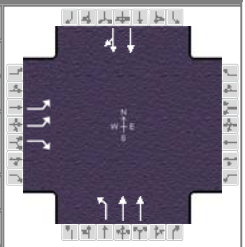
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4		2	1	6
Case Number	1.2	4.0	1.3	4.0		5.3	1.0	4.0
Phase Duration, s	6.4	6.1	21.9	21.6		71.6	10.4	82.0
Change Period, (*Y+R c*), s	6.0	5.5	6.0	6.0		6.5	4.5	6.5
Max Allow Headway (*MAH*), s	3.9	4.4	4.3	4.3		0.0	4.1	0.0
Queue Clearance Time (*g s*), s	2.1	2.2	6.0	17.6			5.4	
Green Extension Time (*g e*), s	0.0	0.0	2.1	0.0		0.0	0.2	0.0
Phase Call Probability	0.06	0.09	1.00	1.00			0.99	
Max Out Probability	0.07	0.14	0.18	1.00			0.20	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	2	3		299	369		3	1718	389	148	709	0
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1585		1730	1586		740	1781	1585	1781	1870	0
Queue Service Time (*g s*), s	0.1	0.2		4.0	15.6		0.1	43.3	8.6	3.4	2.4	0.0
Cycle Queue Clearance Time (*g c*), s	0.1	0.2		4.0	15.6		0.1	43.3	8.6	3.4	2.4	0.0
Green Ratio (*g/C*)	0.00	0.01		0.15	0.14		0.59	0.59	0.74	0.66	0.69	
Capacity (*c*), veh/h	72	8		632	225		503	2107	1167	218	2568	
Volume-to-Capacity Ratio (*X*)	0.030	0.397		0.473	1.638		0.006	0.815	0.334	0.681	0.276	0.000
Back of Queue (*Q*), ft/ln (95 th percentile)	2.8	7		155.7	1001.3		1.1	590.5	271.5	113.6	34.2	0
Back of Queue (*Q*), veh/ln (95 th percentile)	0.1	0.3		6.1	39.4		0.0	23.2	10.7	4.5	1.3	0.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.11	0.00		0.37	0.00		0.01	0.00	1.18	0.81	0.00	0.00
Uniform Delay (*d 1*), s/veh	54.5	54.5		38.7	44.6		6.8	19.9	23.9	22.6	1.6	
Incremental Delay (*d 2*), s/veh	0.2	28.5		0.6	306.3		0.0	2.4	0.5	3.7	0.3	0.0
Initial Queue Delay (*d 3*), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	54.7	82.9		39.2	350.9		6.8	22.3	24.4	26.3	1.8	
Level of Service (LOS)	D	F		D	F		A	C	C	C	A	
Approach Delay, s/veh / LOS	71.6	E		211.4	F		22.7	C		6.1	A	
Intersection Delay, s/veh / LOS	53.4						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.9	C	2.5	B	2.2	B
Bicycle LOS Score / LOS	0.5	A	1.6	B	2.3	B	1.2	A

HCS7 Signalized Intersection Results Summary

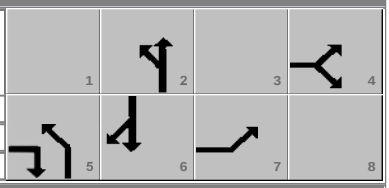
General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	Jul 7, 2019	Area Type	Other
Jurisdiction	Knox County	Time Period	Background AM Peak	PHF	0.89
Urban Street	Ebenezer Road	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Westland (south)	File Name	Phase 3 AM Peak_Signalized.xus		
Project Description	223.013 The Crescent at Ebenezer				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	632		29				139	1246			577	374

Signal Information			
Cycle, s	110.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	8.9	58.0	25.1	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		8.3
Phase Duration, s		31.1			14.9	78.9		64.0
Change Period, ($Y+R_c$), s		6.0			6.0	6.0		6.0
Max Allow Headway (*MAH*), s		4.1			4.1	0.0		0.0
Queue Clearance Time (g_s), s		23.6			6.0			
Green Extension Time (g_e), s		1.4			0.3	0.0		0.0
Phase Call Probability		1.00			0.99			
Max Out Probability		0.94			0.02			

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	710		33				156	1400			541	470
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1730		1585				1781	1781			1870	1623
Queue Service Time (g_s), s	21.6		1.4				4.0	10.6			23.9	17.2
Cycle Queue Clearance Time (g_c), s	21.6		1.4				4.0	10.6			23.9	17.2
Green Ratio (*g/C*)	0.23		0.31				0.63	0.66			0.53	0.53
Capacity (*c*), veh/h	789		490				383	2361			986	856
Volume-to-Capacity Ratio (*X*)	0.900		0.067				0.408	0.593			0.549	0.549
Back of Queue (*Q*), ft/ln (95 th percentile)	373.8		24.9				66	108.1			320.9	233
Back of Queue (*Q*), veh/ln (95 th percentile)	14.7		1.0				2.6	4.3			12.6	9.3
Queue Storage Ratio (*RQ*) (95 th percentile)	1.36		0.00				0.69	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	37.1		24.1				12.2	2.8			15.1	12.0
Incremental Delay (d_2), s/veh	11.4		0.1				0.7	1.1			2.1	2.4
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	48.5		24.2				12.9	3.9			17.2	14.4
Level of Service (LOS)	D		C				B	A			B	B
Approach Delay, s/veh / LOS	47.5	D		0.0			4.8	A		15.9	B	
Intersection Delay, s/veh / LOS	17.8						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.7	C	0.7	A	2.4	B
Bicycle LOS Score / LOS		F			1.8	B	1.4	A

HCS7 Two-Way Stop-Control Report

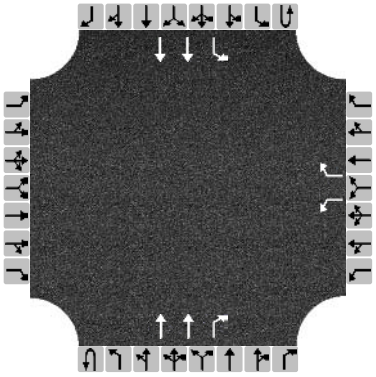
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	7/7/2019
Analysis Year	2021
Time Analyzed	Background AM Peak
Intersection Orientation	North-South
Project Description	213.013 The Crescent at Ebenezer

Site Information

Intersection	Ebenezer at Crescent Lake
Jurisdiction	Knox County
East/West Street	Crescent Lake Way
North/South Street	Ebenezer Road
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

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		1	0	1	0	0	2	1	0	1	2	0
Configuration						L		R			T	R		L	T	
Volume, V (veh/h)						19		42			1858	20		7	932	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked						0.500		0.500						0.500		
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)						7.5		6.9						4.1		
Critical Headway (sec)						6.84		6.94						4.14		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						21		46						8		
Capacity, c (veh/h)						115		542						320		
v/c Ratio						0.18		0.08						0.03		
95% Queue Length, Q_{95} (veh)						0.6		0.3						0.1		
Control Delay (s/veh)						43.4		12.3						16.6		
Level of Service, LOS						E		B						C		
Approach Delay (s/veh)						22.0								0.1		
Approach LOS						C										

HCS7 Two-Way Stop-Control Report

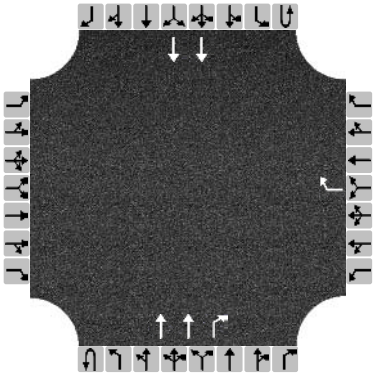
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	7/7/2019
Analysis Year	2021
Time Analyzed	Background AM Peak
Intersection Orientation	North-South
Project Description	213.013 The Crescent at Ebenezer

Site Information

Intersection	Ebenezer at Driveway
Jurisdiction	Knox County
East/West Street	Weigel's Driveway
North/South Street	Ebenezer Road
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

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	0	1	0	0	2	1	0	0	2	0
Configuration								R			T	R			T	
Volume, V (veh/h)								32			1819	49			939	
Percent Heavy Vehicles (%)								2								
Proportion Time Blocked								0.500								
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)								6.9								
Critical Headway (sec)								6.94								
Base Follow-Up Headway (sec)								3.3								
Follow-Up Headway (sec)								3.32								

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)								35								
Capacity, c (veh/h)								542								
v/c Ratio								0.06								
95% Queue Length, Q_{95} (veh)								0.2								
Control Delay (s/veh)								12.1								
Level of Service, LOS								B								
Approach Delay (s/veh)						12.1										
Approach LOS						B										

HCS7 Two-Way Stop-Control Report

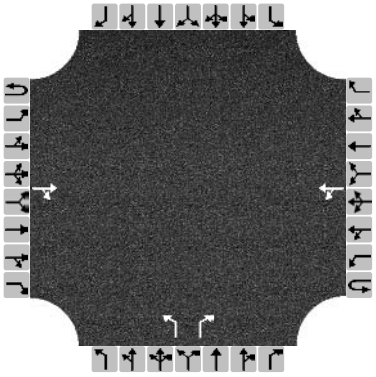
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	7/7/2019
Analysis Year	2021
Time Analyzed	Background AM Peak
Intersection Orientation	East-West
Project Description	223.013 The Crescent at Ebenezer

Site Information

Intersection	Westland at Driveway
Jurisdiction	Knox County
East/West Street	Westland Drive
North/South Street	Driveway Connection
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume, V (veh/h)			491	20		12	612			37		12				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked						0.000				0.000		0.000				
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage			Undivided													

Critical and Follow-up Headways

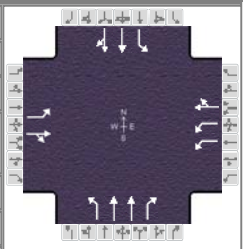
Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						13				40		13				
Capacity, c (veh/h)						1014				192		538				
v/c Ratio						0.01				0.21		0.02				
95% Queue Length, Q_{95} (veh)						0.0				0.8		0.1				
Control Delay (s/veh)						8.6				28.6		11.9				
Level of Service, LOS						A				D		B				
Approach Delay (s/veh)						0.3				24.5						
Approach LOS										C						

HCS7 Signalized Intersection Results Summary

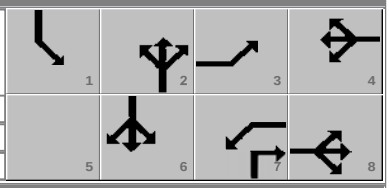
General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	Jul 7, 2019	Area Type	Other
Jurisdiction	Knox County	Time Period	Background PM Peak	PHF	0.97
Urban Street	Ebenezer Road	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Westland (north)	File Name	Phase 3 PM Peak_Signalized.xus		
Project Description	223.013 The Crescent at Ebenezer				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	3	1	2	568	1	197	10	1005	388	371	1331	6

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	On

Green	15.2	61.7	0.6	0.5	20.0	0.0
Yellow	3.0	4.5	3.5	0.0	3.5	0.0
Red	1.5	2.0	2.0	0.0	2.0	0.0



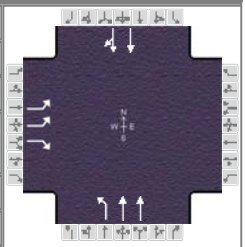
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4		2	1	6
Case Number	1.2	4.0	1.3	4.0		5.3	1.0	4.0
Phase Duration, s	6.6	6.1	26.0	25.5		68.2	19.7	87.9
Change Period, ($Y+R_c$), s	6.0	5.5	6.0	6.0		6.5	4.5	6.5
Max Allow Headway (*MAH*), s	3.9	4.3	4.2	4.2		0.0	4.1	0.0
Queue Clearance Time (g_s), s	2.2	2.2	17.0	14.9			13.8	
Green Extension Time (g_e), s	0.0	0.0	3.0	3.1		0.0	1.4	0.0
Phase Call Probability	0.10	0.10	1.00	1.00			1.00	
Max Out Probability	0.00	0.00	0.05	0.03			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	3	3		586	185		9	906	350	382	690	689
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1670		1730	1586		393	1781	1585	1781	1870	1867
Queue Service Time (g_s), s	0.2	0.2		15.0	12.9		1.1	22.5	10.7	11.8	8.3	8.3
Cycle Queue Clearance Time (g_c), s	0.2	0.2		15.0	12.9		1.1	22.5	10.7	11.8	8.3	8.3
Green Ratio (*g/C*)	0.01	0.00		0.17	0.16		0.51	0.51	0.68	0.66	0.68	0.68
Capacity (*c*), veh/h	69	8		697	258		262	1831	1080	486	1269	1267
Volume-to-Capacity Ratio (*X*)	0.045	0.377		0.840	0.715		0.034	0.495	0.324	0.787	0.544	0.544
Back of Queue (*Q*), ft/ln (95 th percentile)	4.5	7		322.2	222.5		5.1	358	248.8	190.6	107.2	105.5
Back of Queue (*Q*), veh/ln (95 th percentile)	0.2	0.3		12.7	8.8		0.2	14.1	9.8	7.5	4.2	4.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.18	0.00		0.76	0.00		0.05	0.00	1.08	1.36	0.00	0.00
Uniform Delay (d_1), s/veh	59.3	59.4		43.2	44.4		12.0	23.7	15.4	14.5	2.2	2.2
Incremental Delay (d_2), s/veh	0.3	26.3		4.0	3.7		0.2	0.6	0.5	2.9	1.7	1.7
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	59.6	85.7		47.2	48.1		12.1	24.4	15.9	17.3	3.9	3.9
Level of Service (LOS)	E	F		D	D		B	C	B	B	A	A
Approach Delay, s/veh / LOS	72.7	E		47.4	D		22.0	C		6.8	A	
Intersection Delay, s/veh / LOS	20.2						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.9	C	2.4	B	2.2	B
Bicycle LOS Score / LOS	0.5	A	1.8	B	1.7	B	1.9	B

HCS7 Signalized Intersection Results Summary

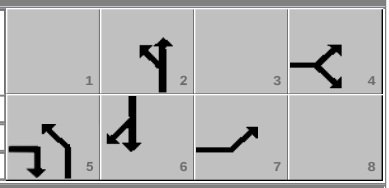
General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	Jul 7, 2019	Area Type	Other
Jurisdiction	Knox County	Time Period	Background PM Peak	PHF	0.91
Urban Street	Ebenezer Road	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Westland (south)	File Name	Phase 3 PM Peak_Signalized.xus		
Project Description	223.013 The Crescent at Ebenezer				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	480		193				150	784			1159	705

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	9.0	79.0	14.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		8.3
Phase Duration, s		20.0			15.0	100.0		85.0
Change Period, ($Y+R_c$), s		6.0			6.0	6.0		6.0
Max Allow Headway (*MAH*), s		4.2			4.1	0.0		0.0
Queue Clearance Time (g_s), s		16.0			5.6			
Green Extension Time (g_e), s		0.0			0.1	0.0		0.0
Phase Call Probability		1.00			1.00			
Max Out Probability		1.00			1.00			

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	527		212				165	862			980	980
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1730		1585				1781	1781			1870	1646
Queue Service Time (g_s), s	14.0		14.0				3.6	0.0			52.3	57.1
Cycle Queue Clearance Time (g_c), s	14.0		14.0				3.6	0.0			52.3	57.1
Green Ratio (*g/C*)	0.12		0.19				0.75	0.78			0.66	0.66
Capacity (*c*), veh/h	404		303				234	2790			1232	1084
Volume-to-Capacity Ratio (*X*)	1.307		0.699				0.704	0.309			0.795	0.904
Back of Queue (*Q*), ft/ln (95 th percentile)	580.5		259.8				169.6	5.1			551.9	635.7
Back of Queue (*Q*), veh/ln (95 th percentile)	22.9		10.2				6.7	0.2			21.7	25.4
Queue Storage Ratio (*RQ*) (95 th percentile)	2.11		0.00				1.79	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	50.7		43.3				29.4	0.0			12.5	13.6
Incremental Delay (d_2), s/veh	155.1		6.9				9.1	0.3			4.0	9.4
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	205.7		50.3				38.5	0.3			16.5	23.0
Level of Service (LOS)	F		D				D	A			B	C
Approach Delay, s/veh / LOS	161.1	F		0.0			6.4	A		19.7	B	
Intersection Delay, s/veh / LOS	44.1						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.8	C	0.6	A	2.4	B
Bicycle LOS Score / LOS		F			1.3	A	2.2	B

HCS7 Two-Way Stop-Control Report

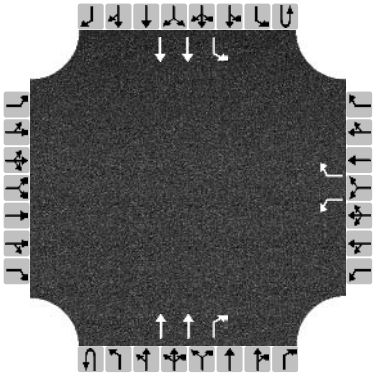
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	7/7/2019
Analysis Year	2021
Time Analyzed	Background PM Peak
Intersection Orientation	North-South
Project Description	213.013 The Crescent at Ebenezer

Site Information

Intersection	Ebenezer at Crescent Lake
Jurisdiction	Knox County
East/West Street	Crescent Lake Way
North/South Street	Ebenezer Road
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

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		1	0	1	0	0	2	1	0	1	2	0
Configuration						L		R			T	R		L	T	
Volume, V (veh/h)						11		40			1228	36		49	1853	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked						0.200		0.200						0.200		
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)						7.5		6.9						4.1		
Critical Headway (sec)						6.84		6.94						4.14		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						12		43						53		
Capacity, c (veh/h)						131		766						566		
v/c Ratio						0.09		0.06						0.09		
95% Queue Length, Q_{95} (veh)						0.3		0.2						0.3		
Control Delay (s/veh)						35.2		10.0						12.0		
Level of Service, LOS						E		A						B		
Approach Delay (s/veh)						15.5								0.3		
Approach LOS						C										

HCS7 Two-Way Stop-Control Report

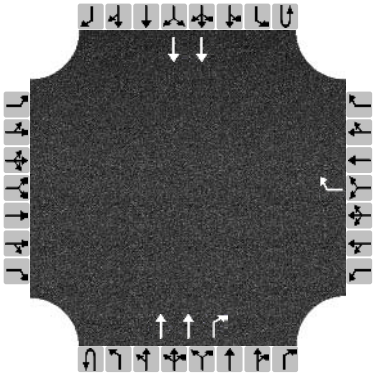
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	7/7/2019
Analysis Year	2021
Time Analyzed	Background PM Peak
Intersection Orientation	North-South
Project Description	213.013 The Crescent at Ebenezer

Site Information

Intersection	Ebenezer at Driveway
Jurisdiction	Knox County
East/West Street	Weigel's Driveway
North/South Street	Ebenezer Road
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

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	0	1	0	0	2	1	0	0	2	0
Configuration								R			T	R			T	
Volume, V (veh/h)								26			1195	47			1902	
Percent Heavy Vehicles (%)								2								
Proportion Time Blocked								0.200								
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)								6.9								
Critical Headway (sec)								6.94								
Base Follow-Up Headway (sec)								3.3								
Follow-Up Headway (sec)								3.32								

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)								28								
Capacity, c (veh/h)								792								
v/c Ratio								0.04								
95% Queue Length, Q_{95} (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

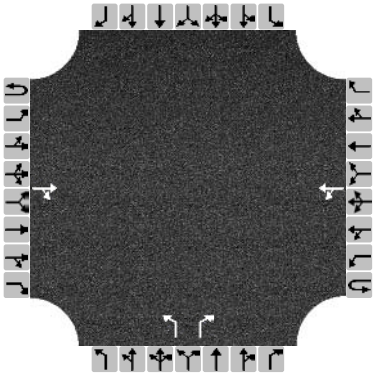
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	7/7/2019
Analysis Year	2021
Time Analyzed	Background PM Peak
Intersection Orientation	East-West
Project Description	223.013 The Crescent at Ebenezer

Site Information

Intersection	Westland at Driveway
Jurisdiction	Knox County
East/West Street	Westland Drive
North/South Street	Driveway Connection
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume, V (veh/h)			694	37		14	703			54		18				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked						0.000				0.000		0.000				
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

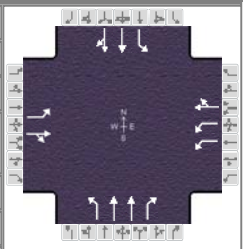
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						15				59		20				
Capacity, c (veh/h)						827				120		398				
v/c Ratio						0.02				0.49		0.05				
95% Queue Length, Q_{95} (veh)						0.1				2.2		0.2				
Control Delay (s/veh)						9.4				61.1		14.5				
Level of Service, LOS						A				F		B				
Approach Delay (s/veh)						0.5				49.3						
Approach LOS										E						

Attachment 7
Intersection Worksheets – Commercial Site AM/PM Peaks

HCS7 Signalized Intersection Results Summary

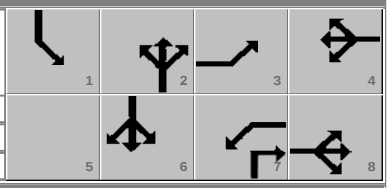
General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	Jul 7, 2019	Area Type	Other
Jurisdiction	Knox County	Time Period	Commercial AM Peak	PHF	0.93
Urban Street	Ebenezer Road	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Westland (north)	File Name	Phase 4 AM Peak_Signalized.xus		
Project Description	223.013 The Crescent at Ebenezer				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	2	0	3	278	2	380	3	1716	386	142	676	0

Signal Information			
Cycle, s	110.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.9	65.1	0.6	0.3	16.1	0.0
Yellow	3.0	4.5	3.5	0.0	3.5	0.0
Red	1.5	2.0	2.0	0.0	2.0	0.0



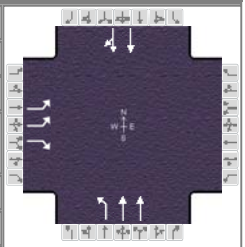
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4		2	1	6
Case Number	1.2	4.0	1.3	4.0		5.3	1.0	4.0
Phase Duration, s	6.4	6.1	21.9	21.6		71.6	10.4	82.0
Change Period, (*Y+R c*), s	6.0	5.5	6.0	6.0		6.5	4.5	6.5
Max Allow Headway (*MAH*), s	3.9	4.4	4.3	4.3		0.0	4.1	0.0
Queue Clearance Time (*g s*), s	2.1	2.2	6.0	17.6			5.5	
Green Extension Time (*g e*), s	0.0	0.0	2.2	0.0		0.0	0.2	0.0
Phase Call Probability	0.06	0.09	1.00	1.00			0.99	
Max Out Probability	0.07	0.14	0.19	1.00			0.22	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	2	3		299	372		3	1766	397	153	727	0
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1585		1730	1586		728	1781	1585	1781	1870	0
Queue Service Time (*g s*), s	0.1	0.2		4.0	15.6		0.1	45.6	8.9	3.5	2.4	0.0
Cycle Queue Clearance Time (*g c*), s	0.1	0.2		4.0	15.6		0.1	45.6	8.9	3.5	2.4	0.0
Green Ratio (*g/C*)	0.00	0.01		0.15	0.14		0.59	0.59	0.74	0.66	0.69	
Capacity (*c*), veh/h	72	8		632	225		496	2106	1167	210	2568	
Volume-to-Capacity Ratio (*X*)	0.030	0.397		0.473	1.652		0.006	0.838	0.340	0.728	0.283	0.000
Back of Queue (*Q*), ft/ln (95 th percentile)	2.8	7		155.7	1017.2		1.1	616	278.5	119.9	35.1	0
Back of Queue (*Q*), veh/ln (95 th percentile)	0.1	0.3		6.1	40.0		0.0	24.3	11.0	4.7	1.4	0.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.11	0.00		0.37	0.00		0.01	0.00	1.21	0.86	0.00	0.00
Uniform Delay (*d 1*), s/veh	54.5	54.5		38.7	44.6		6.9	20.4	24.2	23.7	1.6	
Incremental Delay (*d 2*), s/veh	0.2	28.5		0.6	312.6		0.0	2.7	0.5	5.1	0.3	0.0
Initial Queue Delay (*d 3*), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	54.7	82.9		39.2	357.2		6.9	23.1	24.7	28.7	1.8	
Level of Service (LOS)	D	F		D	F		A	C	C	C	A	
Approach Delay, s/veh / LOS	71.6	E		215.5	F		23.4	C		6.5	A	
Intersection Delay, s/veh / LOS	54.1						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.9	C	2.5	B	2.2	B
Bicycle LOS Score / LOS	0.5	A	1.6	B	2.4	B	1.2	A

HCS7 Signalized Intersection Results Summary

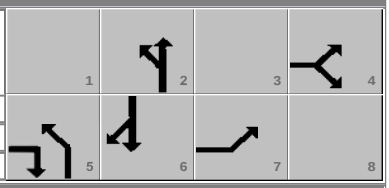
General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	Jul 7, 2019	Area Type	Other
Jurisdiction	Knox County	Time Period	Commercial AM Peak	PHF	0.89
Urban Street	Ebenezer Road	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Westland (south)	File Name	Phase 4 AM Peak_Signalized.xus		
Project Description	223.013 The Crescent at Ebenezer				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	649		29				139	1279			599	390

Signal Information			
Cycle, s	110.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	8.9	57.5	25.6	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		8.3
Phase Duration, s		31.6			14.9	78.4		63.5
Change Period, ($Y+R_c$), s		6.0			6.0	6.0		6.0
Max Allow Headway (*MAH*), s		4.1			4.1	0.0		0.0
Queue Clearance Time (g_s), s		24.3			6.0			
Green Extension Time (g_e), s		1.3			0.3	0.0		0.0
Phase Call Probability		1.00			0.99			
Max Out Probability		1.00			0.03			

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	729		33				156	1437			551	478
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1730		1585				1781	1781			1870	1622
Queue Service Time (g_s), s	22.3		1.4				4.0	11.7			25.3	17.8
Cycle Queue Clearance Time (g_c), s	22.3		1.4				4.0	11.7			25.3	17.8
Green Ratio (*g/C*)	0.23		0.31				0.62	0.66			0.52	0.52
Capacity (*c*), veh/h	804		497				370	2345			978	848
Volume-to-Capacity Ratio (*X*)	0.907		0.066				0.422	0.613			0.563	0.564
Back of Queue (*Q*), ft/ln (95 th percentile)	384.4		24.7				67.1	118.4			326.5	236.7
Back of Queue (*Q*), veh/ln (95 th percentile)	15.1		1.0				2.6	4.7			12.9	9.5
Queue Storage Ratio (*RQ*) (95 th percentile)	1.40		0.00				0.71	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	36.8		23.7				12.9	3.0			15.2	12.2
Incremental Delay (d_2), s/veh	12.3		0.1				0.8	1.2			2.2	2.6
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	49.1		23.8				13.7	4.2			17.5	14.7
Level of Service (LOS)	D		C				B	A			B	B
Approach Delay, s/veh / LOS	48.0	D		0.0			5.1	A		16.2	B	
Intersection Delay, s/veh / LOS	18.2						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.7	C	0.7	A	2.4	B
Bicycle LOS Score / LOS		F			1.8	B	1.4	A

HCS7 Two-Way Stop-Control Report

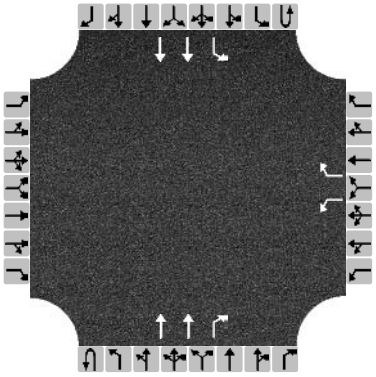
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	7/7/2019
Analysis Year	2021
Time Analyzed	Commercial AM Peak
Intersection Orientation	North-South
Project Description	213.013 The Crescent at Ebenezer

Site Information

Intersection	Ebenezer at Crescent Lake
Jurisdiction	Knox County
East/West Street	Crescent Lake Way
North/South Street	Ebenezer Road
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

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		1	0	1	0	0	2	1	0	1	2	0
Configuration						L		R			T	R		L	T	
Volume, V (veh/h)						65		64			1812	93		32	916	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked						0.500		0.500						0.500		
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)						7.5		6.9						4.1		
Critical Headway (sec)						6.84		6.94						4.14		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						71		70						35		
Capacity, c (veh/h)						121		542						304		
v/c Ratio						0.59		0.13						0.12		
95% Queue Length, Q_{95} (veh)						2.9		0.4						0.4		
Control Delay (s/veh)						70.0		12.6						18.4		
Level of Service, LOS						F		B						C		
Approach Delay (s/veh)						41.5								0.6		
Approach LOS						E										

HCS7 Two-Way Stop-Control Report

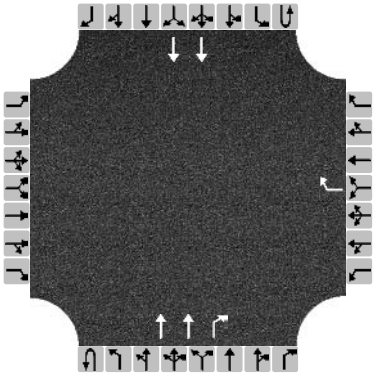
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	7/7/2019
Analysis Year	2021
Time Analyzed	Commercial AM Peak
Intersection Orientation	North-South
Project Description	213.013 The Crescent at Ebenezer

Site Information

Intersection	Ebenezer at Driveway
Jurisdiction	Knox County
East/West Street	Weigel's Driveway
North/South Street	Ebenezer Road
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

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	0	1	0	0	2	1	0	0	2	0
Configuration								R			T	R			T	
Volume, V (veh/h)								41			1795	49			948	
Percent Heavy Vehicles (%)								2								
Proportion Time Blocked								0.500								
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)								6.9								
Critical Headway (sec)								6.94								
Base Follow-Up Headway (sec)								3.3								
Follow-Up Headway (sec)								3.32								

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)								45								
Capacity, c (veh/h)								542								
v/c Ratio								0.08								
95% Queue Length, Q_{95} (veh)								0.3								
Control Delay (s/veh)								12.2								
Level of Service, LOS								B								
Approach Delay (s/veh)						12.2										
Approach LOS						B										

HCS7 Two-Way Stop-Control Report

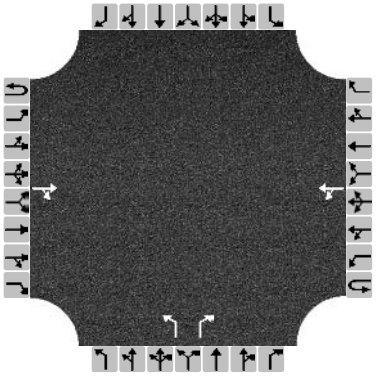
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	7/7/2019
Analysis Year	2021
Time Analyzed	Commercial AM Peak
Intersection Orientation	East-West
Project Description	223.013 The Crescent at Ebenezer

Site Information

Intersection	Westland at Driveway
Jurisdiction	Knox County
East/West Street	Westland Drive
North/South Street	Driveway Connection
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume, V (veh/h)			487	26		30	600			46		27				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked						0.000				0.000		0.000				
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage			Undivided													

Critical and Follow-up Headways

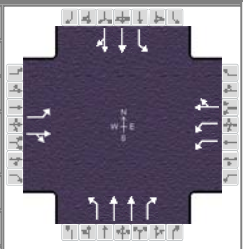
Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						33				50		29				
Capacity, c (veh/h)						1013				182		540				
v/c Ratio						0.03				0.28		0.05				
95% Queue Length, Q_{95} (veh)						0.1				1.1		0.2				
Control Delay (s/veh)						8.7				32.2		12.1				
Level of Service, LOS						A				D		B				
Approach Delay (s/veh)						0.8				24.8						
Approach LOS										C						

HCS7 Signalized Intersection Results Summary

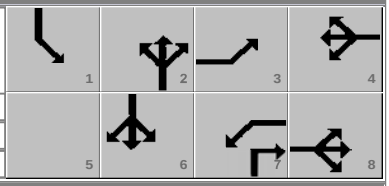
General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	Jul 7, 2019	Area Type	Other
Jurisdiction	Knox County	Time Period	Commercial PM Peak	PHF	0.97
Urban Street	Ebenezer Road	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Westland (north)	File Name	Phase 4 PM Peak_Signalized.xus		
Project Description	223.013 The Crescent at Ebenezer				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	3	1	2	568	1	200	10	1016	388	373	1339	6

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	On

Green	15.3	61.6	0.6	0.5	20.0	0.0
Yellow	3.0	4.5	3.5	0.0	3.5	0.0
Red	1.5	2.0	2.0	0.0	2.0	0.0



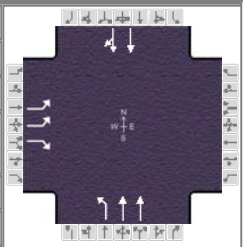
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4		2	1	6
Case Number	1.2	4.0	1.3	4.0		5.3	1.0	4.0
Phase Duration, s	6.6	6.1	26.0	25.5		68.1	19.8	87.9
Change Period, ($Y+R_c$), s	6.0	5.5	6.0	6.0		6.5	4.5	6.5
Max Allow Headway (*MAH*), s	3.9	4.3	4.2	4.2		0.0	4.1	0.0
Queue Clearance Time (g_s), s	2.2	2.2	17.0	15.2			13.9	
Green Extension Time (g_e), s	0.0	0.0	3.0	3.1		0.0	1.4	0.0
Phase Call Probability	0.10	0.10	1.00	1.00			1.00	
Max Out Probability	0.00	0.00	0.05	0.04			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	3	3		586	188		9	921	352	385	694	693
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1670		1730	1586		390	1781	1585	1781	1870	1867
Queue Service Time (g_s), s	0.2	0.2		15.0	13.2		1.1	22.9	10.7	11.9	8.4	8.4
Cycle Queue Clearance Time (g_c), s	0.2	0.2		15.0	13.2		1.2	22.9	10.7	11.9	8.4	8.4
Green Ratio (*g/C*)	0.01	0.00		0.17	0.16		0.51	0.51	0.68	0.66	0.68	0.68
Capacity (*c*), veh/h	69	8		698	258		260	1828	1078	482	1268	1266
Volume-to-Capacity Ratio (*X*)	0.045	0.377		0.839	0.727		0.035	0.504	0.326	0.797	0.547	0.547
Back of Queue (*Q*), ft/ln (95 th percentile)	4.5	7		322.1	226.1		5.1	361.3	246.6	192.8	108.4	106.6
Back of Queue (*Q*), veh/ln (95 th percentile)	0.2	0.3		12.7	8.9		0.2	14.2	9.7	7.6	4.3	4.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.18	0.00		0.76	0.00		0.05	0.00	1.07	1.38	0.00	0.00
Uniform Delay (d_1), s/veh	59.3	59.4		43.2	44.5		11.9	23.8	15.3	14.8	2.3	2.3
Incremental Delay (d_2), s/veh	0.3	26.3		4.0	3.9		0.2	0.6	0.5	3.1	1.7	1.7
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	59.6	85.7		47.2	48.4		12.1	24.4	15.8	17.9	4.0	4.0
Level of Service (LOS)	E	F		D	D		B	C	B	B	A	A
Approach Delay, s/veh / LOS	72.7	E		47.5	D		22.0	C		7.0	A	
Intersection Delay, s/veh / LOS	20.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.9	C	2.4	B	2.2	B
Bicycle LOS Score / LOS	0.5	A	1.8	B	1.7	B	1.9	B

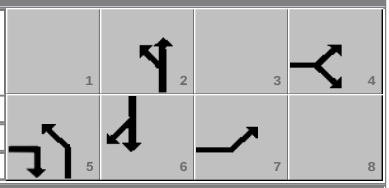
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	FMA			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	Jul 7, 2019	Area Type	Other
Jurisdiction	Knox County	Time Period	Commercial PM Peak	PHF	0.91
Urban Street	Ebenezer Road	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Westland (south)	File Name	Phase 4 PM Peak_Signalized.xus		
Project Description	223.013 The Crescent at Ebenezer				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	488		193				150	799			1179	719

Signal Information												
Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									
Green	9.0	79.0	14.0	0.0	0.0	0.0						
Yellow	4.0	4.0	4.0	0.0	0.0	0.0						
Red	2.0	2.0	2.0	0.0	0.0	0.0						



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		8.3
Phase Duration, s		20.0			15.0	100.0		85.0
Change Period, ($Y+R_c$), s		6.0			6.0	6.0		6.0
Max Allow Headway (*MAH*), s		4.2			4.1	0.0		0.0
Queue Clearance Time (g_s), s		16.0			5.8			
Green Extension Time (g_e), s		0.0			0.1	0.0		0.0
Phase Call Probability		1.00			1.00			
Max Out Probability		1.00			1.00			

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	536		212				165	878			984	984
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1730		1585				1781	1781			1870	1646
Queue Service Time (g_s), s	14.0		14.0				3.8	0.0			54.6	57.8
Cycle Queue Clearance Time (g_c), s	14.0		14.0				3.8	0.0			54.6	57.8
Green Ratio (*g/C*)	0.12		0.19				0.75	0.78			0.66	0.66
Capacity (*c*), veh/h	404		303				232	2790			1232	1084
Volume-to-Capacity Ratio (*X*)	1.329		0.699				0.709	0.315			0.799	0.908
Back of Queue (*Q*), ft/ln (95 th percentile)	601.1		259.8				170.6	5.2			556.8	644.4
Back of Queue (*Q*), veh/ln (95 th percentile)	23.7		10.2				6.7	0.2			21.9	25.8
Queue Storage Ratio (*RQ*) (95 th percentile)	2.19		0.00				1.80	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	50.7		43.3				29.9	0.0			12.5	13.7
Incremental Delay (d_2), s/veh	164.2		6.9				9.5	0.3			4.1	9.7
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	214.9		50.3				39.5	0.3			16.6	23.4
Level of Service (LOS)	F		D				D	A			B	C
Approach Delay, s/veh / LOS	168.2	F		0.0			6.5	A		20.0	B	
Intersection Delay, s/veh / LOS	45.7						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.8	C	0.6	A	2.4	B
Bicycle LOS Score / LOS		F			1.3	A	2.2	B

HCS7 Two-Way Stop-Control Report

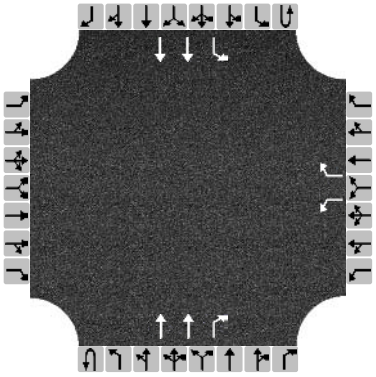
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	7/7/2019
Analysis Year	2021
Time Analyzed	Commercial PM Peak
Intersection Orientation	North-South
Project Description	213.013 The Crescent at Ebenezer

Site Information

Intersection	Ebenezer at Crescent Lake
Jurisdiction	Knox County
East/West Street	Crescent Lake Way
North/South Street	Ebenezer Road
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

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		1	0	1	0	0	2	1	0	1	2	0
Configuration						L		R			T	R		L	T	
Volume, V (veh/h)						51		54			1212	67		63	1841	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked						0.200		0.200						0.200		
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)						7.5		6.9						4.1		
Critical Headway (sec)						6.84		6.94						4.14		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						55		59						68		
Capacity, c (veh/h)						128		780						556		
v/c Ratio						0.43		0.08						0.12		
95% Queue Length, Q_{95} (veh)						1.9		0.2						0.4		
Control Delay (s/veh)						52.7		10.0						12.4		
Level of Service, LOS						F		A						B		
Approach Delay (s/veh)						30.6								0.4		
Approach LOS						D										

HCS7 Two-Way Stop-Control Report

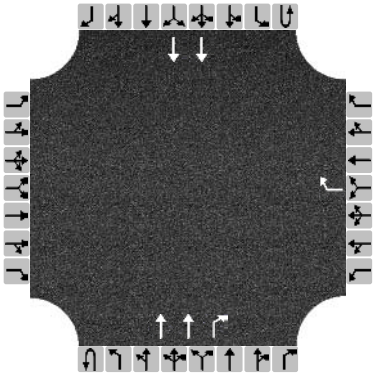
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	7/7/2019
Analysis Year	2021
Time Analyzed	Commercial PM Peak
Intersection Orientation	North-South
Project Description	213.013 The Crescent at Ebenezer

Site Information

Intersection	Ebenezer at Driveway
Jurisdiction	Knox County
East/West Street	Weigel's Driveway
North/South Street	Ebenezer Road
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

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	0	1	0	0	2	1	0	0	2	0
Configuration								R			T	R			T	
Volume, V (veh/h)								29			1193	47			1904	
Percent Heavy Vehicles (%)								2								
Proportion Time Blocked								0.200								
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)								6.9								
Critical Headway (sec)								6.94								
Base Follow-Up Headway (sec)								3.3								
Follow-Up Headway (sec)								3.32								

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)								32								
Capacity, c (veh/h)								794								
v/c Ratio								0.04								
95% Queue Length, Q_{95} (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

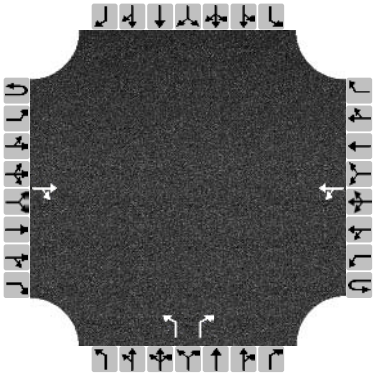
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	7/7/2019
Analysis Year	2021
Time Analyzed	Commercial PM Peak
Intersection Orientation	East-West
Project Description	223.013 The Crescent at Ebenezer

Site Information

Intersection	Westland at Driveway
Jurisdiction	Knox County
East/West Street	Westland Drive
North/South Street	Driveway Connection
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume, V (veh/h)			690	41		23	697			60		30				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked						0.000				0.000		0.000				
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						25				65		33				
Capacity, c (veh/h)						826				116		399				
v/c Ratio						0.03				0.56		0.08				
95% Queue Length, Q_{95} (veh)						0.1				2.7		0.3				
Control Delay (s/veh)						9.5				69.4		14.8				
Level of Service, LOS						A				F		B				
Approach Delay (s/veh)						0.8				51.0						
Approach LOS										F						

Attachment 8
Turn Lane Warrant Analysis

Project: The Crescent at Ebenezer Commercial Site

Background (Weigel's)

Westland Drive VOLUMES
at Proposed Driveway

RIGHT TURN	Thru	RT	RT MAX	Warrant Met
AM	491	20	99	NO
PM	694	37	25	YES

Ebenezer Road VOLUMES
at Proposed Driveway

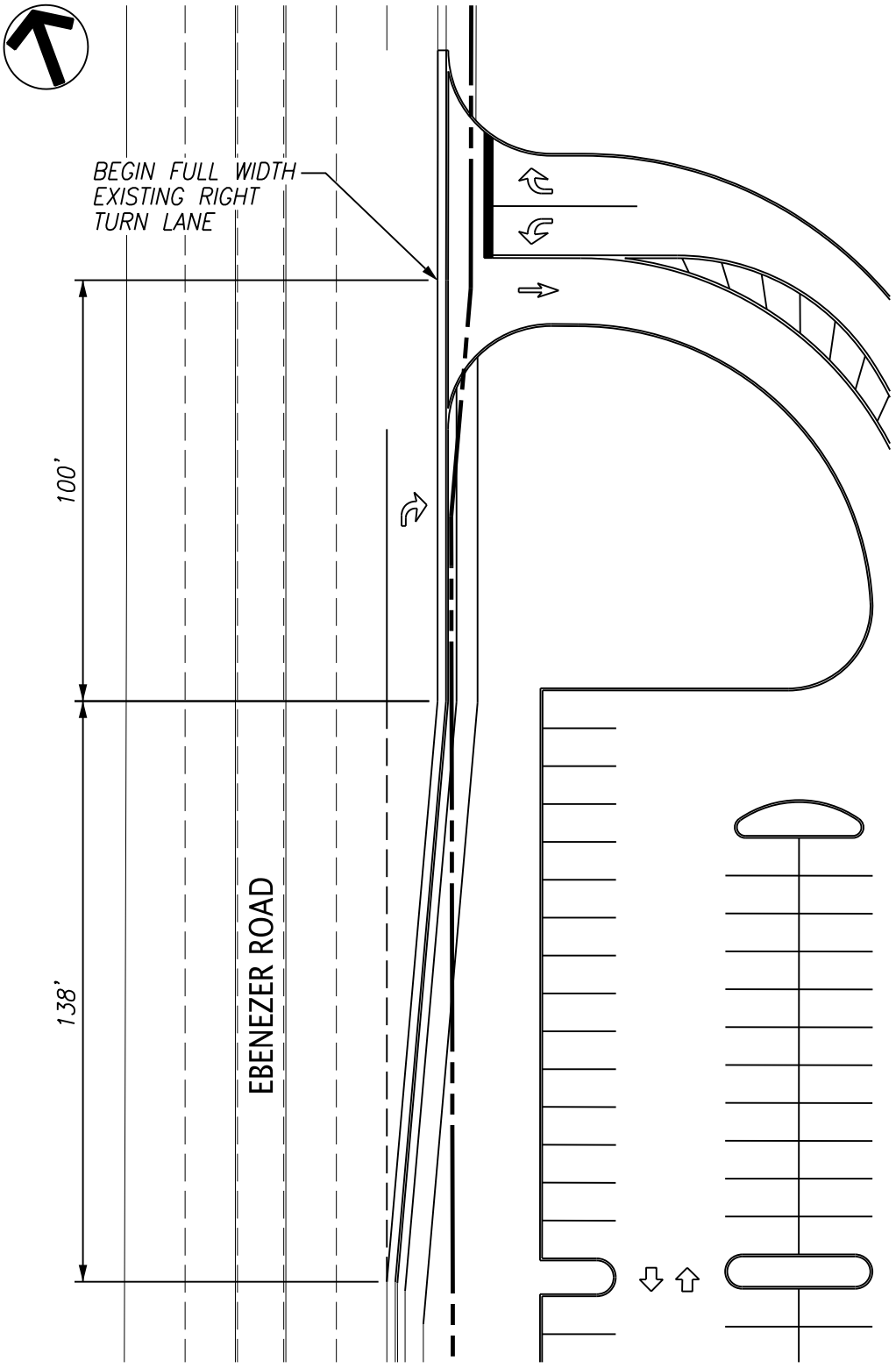
RIGHT TURN	Thru	RT	RT MAX	Warrant Met
AM	955*	49	25	YES
PM	627*	47	25	YES

Commercial Site

Westland Drive VOLUMES
at Proposed Driveway

RIGHT TURN	Thru	RT	RT MAX	Warrant Met
AM	487	26	99	NO
PM	690	41	25	YES

* The volume per lane was multiplied by 1.05 in accordance with the Knox County Department of Engineering and Public Works "Access Control and Driveway Design Policy"



Future Turn Lane
Scale: 1" = 40'

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
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

AM Peak 20 RT

PM Peak 37 RT

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

TABLE 6B

RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 46 TO 55 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						Yes
200 - 249 250 - 299				Yes	Yes Yes	Yes Yes
300 - 349 350 - 399			Yes Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499		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

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	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

PM Peak 47 RT
AM Peak 49 RT

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

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
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

AM Peak 26 RT PM Peak 41 RT

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

Attachment 9
Aerial Photos

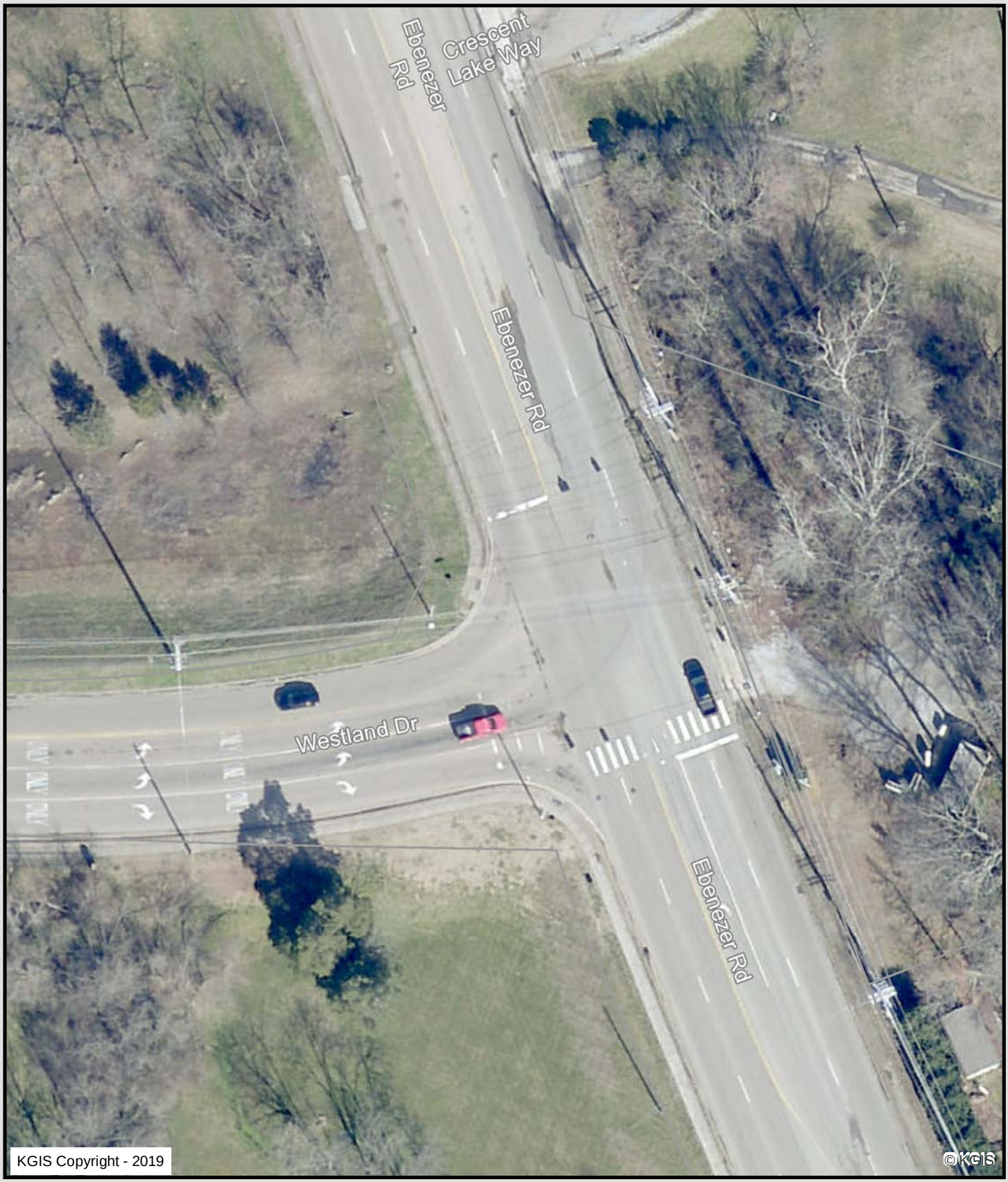
Westland (north)

Printed: 5/13/2019 at 7:19:44 PM

0 25 50 100

ft

Knoxville - Knox County - KUB Geographic Information System



Westland (south)

Printed: 5/13/2019 at 7:21:25 PM

0 25 50 100

ft

Knoxville - Knox County - KUB Geographic Information System

Date: July 8, 2019

Project Name: The Crescent at Ebenezer Commercial Site

To: Knoxville-Knox County Planning

Subject: TIS Comment Response Document for The Crescent at Ebenezer Commercial Site TIS Comments (7-E-19-UR) Dated June 6, 2019.

Dear Knoxville-Knox County Planning staff,

The following comment response document is submitted to address comments dated June 6, 2019 and the additional comments dated June 28, 2019:

1. **Reviewer Comment:** Throughout the report please identify if "The Crescent at Ebenezer" is for the commercial or the residential portion of the site. For example, on page 1 (Table of Contents) 3.1 is labeled "The Crescent at Ebenezer." We assume this title is for the residential, but there are also sections where the report could be referencing the commercial property for the whole site. It helps to provide more clarification on what is being discussed.

   Response: The Crescent at Ebenezer refers to the apartments and senior adult housing units and The Crescent at Ebenezer Commercial Site refers to the proposed commercial development.

   a. **Reviewer Comment:** On page 1, please add a description to "7.3 Ebenezer Road @ Driveway Connection" to know which driveway connection the report is talking about. This should also be replicated in the Conclusions and Recommendations section. Which driveway connection are you talking about? The main driveway for residential & proposed commercial, or the other driveway for the proposed commercial & Weigel's site? Depending upon which driveway connection this one is referring to, there should be the other driveway connection to Ebenezer Road discussed throughout the report.

      Response: The Crescent at Ebenezer apartment driveway connection on Ebenezer Road is named Crescent Lake Way and the driveway connection on Westland Drive is named Serene Breeze Way All mention of these roadways have been updated to reflect the new names.

2. **Reviewer Comment:** Throughout the report the development mentions 10,800 SF of medical-dental building, but the site plan layout submitted to Planning Staff

shows multiple tenant spaces. Please verify these tenant spaces (10,800 SF) will all be medical-office spaces.

Response: The medical-dental building was assumed for all tenants with the exception of the coffee shop with a drive-through window.

3. **Reviewer Comment:** On page 5 last paragraph, please indicate that the "westbound thru lane" is actually a "westbound thru/right lane." Also, when mentioning "westbound left turn lane," it should be "westbound left turn lanes."

   Response: Adjusted the turn lane descriptions on page 5 and page 37.

4. **Reviewer Comment:** In all Figures, please outline or provide a directional arrow to the appropriate site for the proposed commercial.

   Response: Revised the background info to show the property line for the Crescent Commercial site.

5. **Reviewer Comment:** On page 9 second to last line, please make the correction concerning the sidewalk and where it extends to the north and south. The Ebenezer Road sidewalk extends from this property northbound to S Peters Road and Kingston Pike, and southbound to S Northshore Drive.

   Response: Revised to "The existing sidewalk on Ebenezer Road extends northbound to the intersection of S Peters Road at Kingston Pike and southbound to the intersection with S Northshore Drive. The existing sidewalk on Westland Drive (north) extends 425 feet eastbound from the intersection with Ebenezer Road."

6. **Reviewer Comment:** Section 3 – Background Growth (pg 12) should include the surrounding roadway traffic between the initial traffic count year & the full buildout year, the approved apartments & senior adult housing site traffic, the approved Weigel's development site traffic, and the total background. Please add a paragraph that describes the inclusion of these into the background growth, and update all Figures to reflect this inclusion. See below for reference.

Intersections	**Existing**	**Background growth**	**Combined growth**
Ebenezer Rd @ Westland Dr (north)	✓	✓	✓
Ebenezer Rd @ Westland Dr (south)	✓	✓	✓
Ebenezer Rd @ Apt. driveway		✓	✓
Ebenezer Rd @ Proposed driveway		✓	✓
Westland Dr @		✓	✓

Proposed driveway			

Response: Revised Figures and Capacity Analysis to included Weigel's in the background section.

a. **Reviewer Comment:** Page 16 (3.2 Weigel's) should mention the change of the original access points on the Weigel's site from full access off Ebenezer Rd and Westland Dr, to full access off Westland Dr and right-in/right-out off Ebenezer Rd.

   Response: Added the following to page 16. "Knox County Engineering and Public Works made the recommendation that the Westland Road driveway connection remain a full access driveway and that the Ebenezer Road driveway be revised to a right-in/right-out driveway connection."

7. **Reviewer Comment:** The first two paragraphs in Section 4 (pg 17) should be removed and placed into the Background growth section. The fourth paragraph mentions the pass-by rate of 65% used for the convenience market (Weigel's), which should not apply in this instance since the Weigel's full buildout site traffic is being used in the background section.

   Response: Relocated the first two paragraphs to the background section and added "3.1 The Crescent at Ebenezer" and "3.2 Weigel's".

   a. **Reviewer Comment:** With the inclusion of the apartments, senior adult housing, & the Weigel's into the background, the Trip Generation discussed on page 17-19, should remove these from the discussion and Table 4-1.

      Response: Revised section "4 Trip Generation and Trip Distribution" to only include the information regarding the proposed Commercial Site.

   b. **Reviewer Comment:** In Table 4-1, please correct the Land Use description for the Coffee/Donut Shop to say "Coffee/Donut Shop w/ Drive-Through Window."

      Response: Added "w/ Drive-Through Window" to Table 4-1.

   c. **Reviewer Comment:** The Figures to have in this section should be the Primary trips, Pass-by trips, Combined Site trips, and Full Buildout (Background total + Combined) site trips.

      Response: Moved the Weigel's figures to the background section and included only the commercial site figures in section 4.

8. **Reviewer Comment:** In the Conclusions & Recommendations section (pg 35), please include a sentence or two describing the extension of the right-turn lane by 100 ft once the Weigel's comes in, per Weigel's 2012 study. What will this look like? Please provide an access diagram to include this extension since this is one of the proposed access points.

   Response: Added the following paragraph to the Conclusions & Recommendations. "A northbound right turn lane is warranted at the intersection of Ebenezer Road at the driveway connection during both the AM and PM peak hours after the completion of the Weigel's convenience market with gasoline pumps. CDM Smith's recommendation was to "extend the planned northbound right-turn lane on Ebenezer Road for Westland Drive approximately another 100 feet to be also used by traffic entering the Weigel's convenience store." A sketch of the right-turn lane layout is included in Attachment 8. The turn lane improvements are expected to be installed prior to the construction of the Weigel's."

Additional Knox County Comments dated June 28, 2019:

1. **Reviewer Comment:** Page 18 – The maximum pass-by split for a convenience market under 10,000 SF is 60%. I have attached the local values used. Please let me know if Tarren had approved a higher rate.

   Response: MPC had recommended a 65% pass-by rate due to Ebenezer Road and Westland Drive having an ADT between 10,000 – 20,000 trips per day.

2. **Reviewer Comment:** Page 25 – The entering/exiting splits do not match the Trip Generation worksheets. Please revise as needed.

   Response: Revised entering/exiting splits to match the Trip Generation 10th edition.

3. **Reviewer Comment:** Page 27 – One bubble is for Ebenezer/Westland (north) and not the site driveway.

   Response: Revised the bubble on page 27.

4. **Reviewer Comment:** Page 36 – Use the name of the apartment roadway.

   Response: Revised to Crescent Lake Way on page 36.

5. **Reviewer Comment:** Appendix pages – see comment for page 25.

   Response: Revised the trip generation worksheets in the appendix to match the Trip Generation 10th edition.

Sincerely,

Addie Kirkham, P.E.