HERITAGE WOODS SUBDIVISION

Traffic Impact Study

Heritage Lake Boulevard

Knoxville, TN

A Traffic Impact Study for the Heritage Woods Subdivision

Submitted to

Knoxville – Knox County Metropolitan Planning Commission

Revised December 17, 2018
November 26, 2018
FMA Project No. 525.009

Submitted By:

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Executive Summary

Mesana Invesments, LLC is proposing a residential development (i.e., Heritage Woods Subdivision) with single family housing located in Knox County. The project is located on Heritage Lake Boulevard at the intersection with Westland Drive and west of Pellissippi Parkway (I-140). The development will consist of 133 new single family housing lots. Construction is proposed to take place this year and this study assumes full build out for the development will occur in 2021.

The proposed roadway connection for the Heritage Woods Subdivision will tie into both Heritage Lake Boulevard and to the main roadway for the Westland Oaks Subdivision, which has an approved concept plan for 74 single family housing lots. Westland Oaks Subdivision is currently under construction and has a separate roadway connection to Westland Drive. Therefore traffic from both subdivisions will be able to enter/exit from either Westland Drive at Heritage Lake Boulevard or Westland Drive at Westland Oaks Roadway.

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

Westland Drive at Heritage Lake Boulevard

The full buildout traffic conditions at the usignalized intersection of Westland Drive at Heritage Lake Boulevard were analyzed using the Highway Capacity Software (HCS7). The eastbound and westbound approaches operate at a LOS A during both the AM and PM peak hours. The northbound approach operates at a LOS C during both the AM and PM peak hours. The southbound left turn lane operates at a LOS F during both the AM and PM peak hours and the southbound thru/right lane operates at a LOS B during both the AM and PM peak hours.

After the completion of both the Westland Oaks Subdivision and the Heritage Woods Subdivision an eastbound right turn lane is not warranted at the intersection of Westland Drive at Heritage Lake Boulevard.

Westland Drive at Westland Oaks Roadway

The full buildout traffic conditions at the usignalized intersection of Westland Drive at Westland Oaks Roadway were analyzed using the Highway Capactiy Software (HCS7). The westbound approach operates at a LOS A during both the AM and PM peak hours. The northbound approach operates at a LOS C during the AM peak hour and a LOS B during the PM peak hour.

After the completion of the Westland Oaks Subdivision an eastbound right turn lane is not warranted and a westbound left turn lane is warranted during the PM peak hour due to the high volume of thru traffic on Westland Drive.

FMA does not recommend an additional westbound turn lane be built on Westland Drive. FMA assumed that approximately 50% of the westbound entering traffic from the Westland Oaks Subdivision would enter at the intersection with Heritage Lake Boulevard. The existing left turn lane on Westland Drive at the intersection with Heritage Lake Boulevard has adequate storage to handle the additional traffic from both the Westland Oaks and Heritage Woods Subdivisions. The unsignalized intersection capacity analyses for the full buildout of both subdivisions shows a 95% queue length for the westbound left turn lane of less than one car length during both the AM and PM peak hours.

Westland Drive

Knox County provided crash data from the year 2015 to 2017 on Westland Drive within the vicinity of Andover View Lane to Heritage Lake Boulevard. There were 10 crashes reported for this stretch of Westland Drive during the time frame stated. There are not any recommended improvements for Westland Drive at this time due to the relatively low number of crashes reported.

1 Introduction

1.1 Project Description

This report provides a summary of a traffic impact study that was performed for the proposed Heritage Woods Subdivision. The project is located on Heritage Lake Boulevard at the intersection with Westland Drive and west of Pellissippi Parkway (I-140). The location of the site is shown in Figure 1.

The full buildout of the development will consist of 67 single family housing lots. Construction is proposed to take place this year and this study assumes full build out for the development will occur in 2021.

The proposed roadway connection for the Heritage Woods Subdivision will tie into both Heritage Lake Boulevard and to the main roadway for the Westland Oaks Subdivision, which has an approved concept plan for 74 single family housing lots. Westland Oaks Subdivision is currently under construction and has a separate roadway connection to Westland Drive. Therefore, traffic from both subdivisions will be able to enter/exit from either Westland Drive at Heritage Lake Boulevard or Westland Drive at Westland Oaks Roadway. 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 subdivision and to review the "Heritage Lake Traffic Impact Study" prepared by Wilbur Smith Associates dated February 1999.

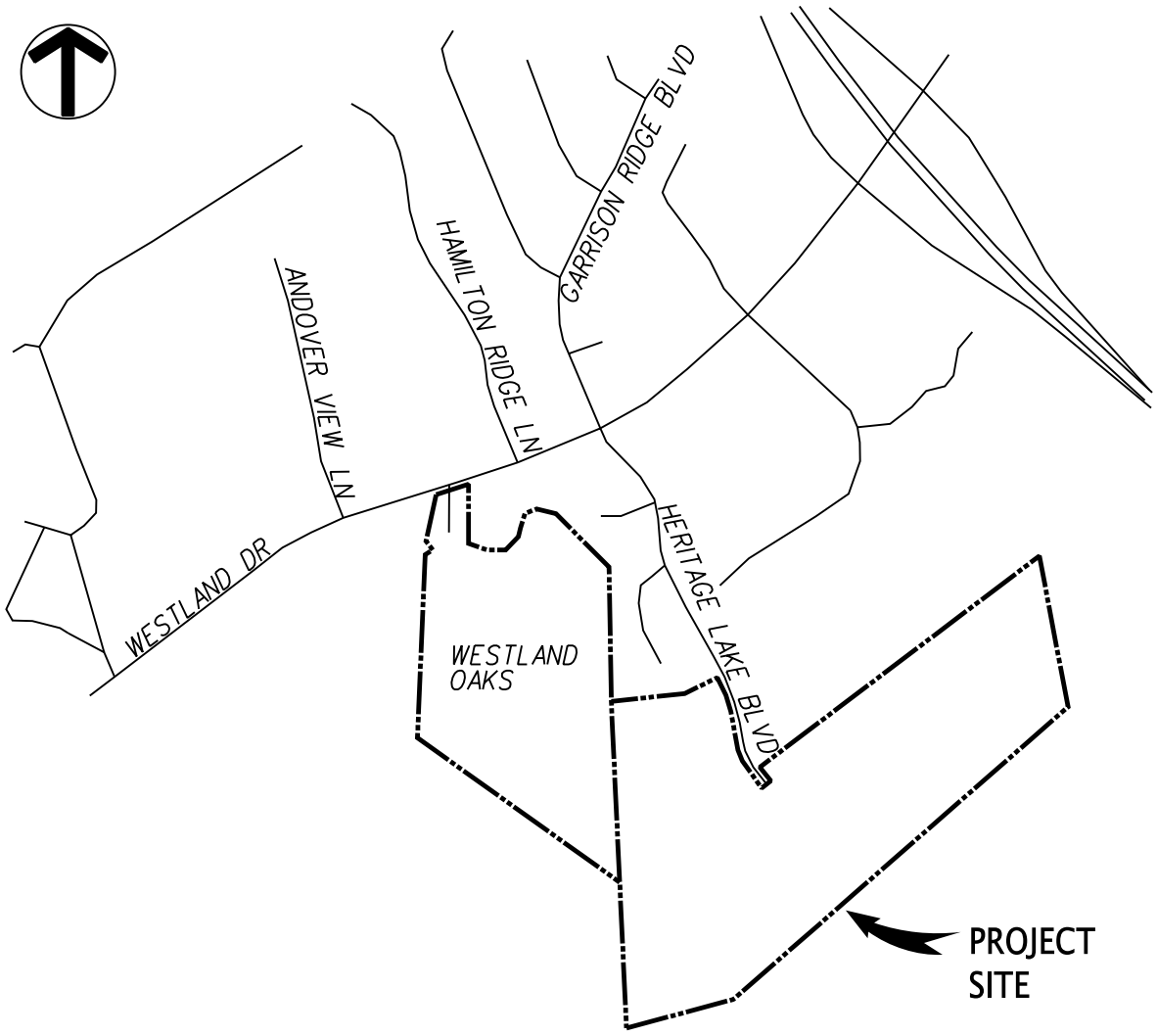


Figure 1: Location Map

Figure 2: Site Plan

1.2 Existing Site Conditions

Westland Drive at the intersection with Heritage Lake Boulevard is a two-lane road with a left turn lane of 225 feet storage length and a 135 feet taper. The Knoxville-Knox County Metropolitan Planning Commission classifies Westland Drive as a minor arterial with an 88 foot right-of-way per the Major Road Plan. The posted speed limit on Westland Drive is 40 mph.

Heritage Lake Boulevard is a two-lane road with a 10-foot wide boulevard at the intersection with Westland Drive. The Knoxville-Knox County Metropolitan Planning Commission does not classify Heritage Lake Boulevard per the Major Road Plan therefore; it is considered a local street. The posted speed limit on Heritage Lake Boulevard is 25 mph. The measured sight distance at the intersection with Westland Drive is 425 feet eastbound and greater than 500 feet westbound.

Garrison Ridge Boulevard is a two-lane road with a left turn lane with a 100-foot storage length and a 25-foot taper. Westland Drive at the intersection with Garrison Ridge Boulevard also has an existing right turn lane with an 80-foot storage length and a 65-foot taper length. The Knoxville-Knox County Metropolitan Planning Commission does not classify Garrison Ridge Boulevard per the Major Road Plan therefore; it is considered a local street. The posted speed limit on Garrison Ridge Boulevard is 25 mph.

Westland Oaks has a proposed roadway connection to Westland Drive that is currently under construction. The sight distance at this intersection was measured in April 2017 prior to the approval of the concept plan. The required sight distance on a road with a speed limit of 40 mph is 400 feet. The measured sight distance at this intersection was 450 feet westbound and greater than 450 feet eastbound.

Aerial photos of the existing intersections are included in Attachment 1.

1.3 Heritage Lake Development

A Level II traffic impact study was done for the mixed use Heritage Lake Development located on Westland Drive within Knox County. The "Heritage Lake Traffic Impact Study" was prepared by Wilbur Smith Associates dated February 1999. The scope of this traffic impact study included the intersections of Westland Drive at the I-140 northbound and southbound ramps, Westland Drive at the shared office/commercial access, Westland Drive at the shared apartment/commercial access and Westland Drive at Garrison Ridge Boulevard.

Heritage Lake is a mixed use project containing both residential and commercial development. The residential development was expected to include 77 single family units, 262 multi-family units and a 126 unit assisted living facility. The commercial development includes a 1.84 acre site with a nonspecified use at the time that the traffic impact study was conducted. The anticipated completion date was the year 2005.

As of November 2018, the following has been built within the Heritage Lake Development: 262 apartment units, 20 single family housing units, 51,000 SF Cornerstone Church and a 11,900 SF Law Office.

The parcel at the southeast corner of the intersection of Westland Drive at Heritage Lake Boulevard is the location for the 126 unit assisted living facility. As of November 2018 that parcel is still unused and there are no plans to build on that parcel at this time.

The recommendations for the 2005 project traffic conditions at the intersection of Westland Drive at Garrison Ridge Boulevard were to "provide a 50 foot westbound left-turn lane on Westland Drive".

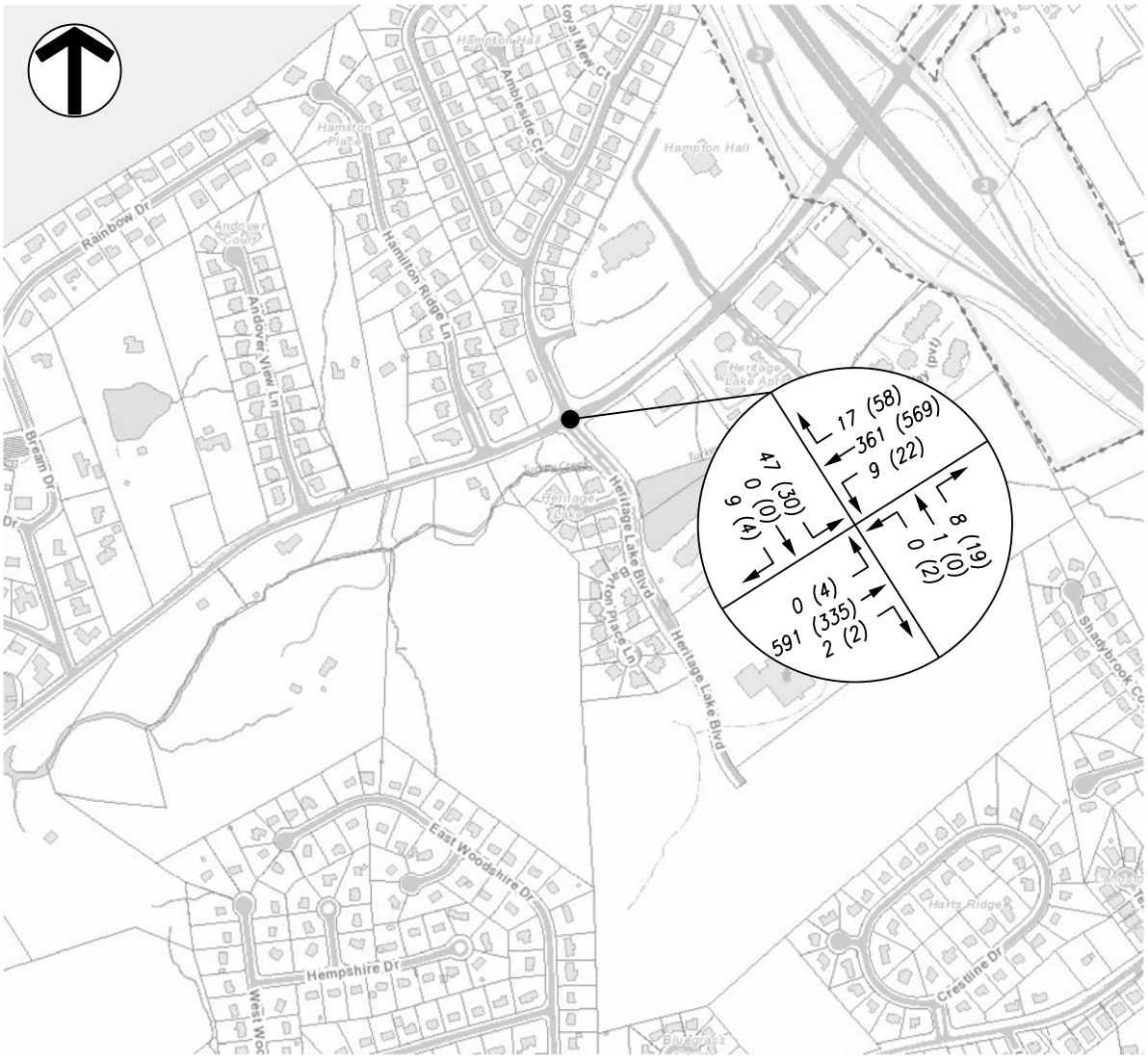
A copy of the recommendations for the Wilbur Smith Associates "Heritage Lake Traffic Impact Study" dated February 1999 is included in Attachment 2.

2 Existing Traffic Volumes

FMA conducted a turning movement count at the intersection of Westland Drive at Heritage Lake Boulevard from 7:00 a.m. to 9:00 a.m. and 11:00 a.m. to 1:00 p.m. on Wednesday November 7, 2018 and from 2:00 p.m. to 6:00 p.m. on Tuesday November 13, 2013.

The current AM peak hour and PM peak hour were determined using the turning movement count that FMA conducted. At the intersection of Westland Drive at Heritage Lake Lane the AM peak hour occurred between 8:00 a.m. and 9:00 a.m., and the PM peak hour occurred between 4:45 p.m. and 5:45 p.m.

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 3.



LEGEND:

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

Figure 3: 2018 Existing Peak Hour Traffic

3 Background Growth

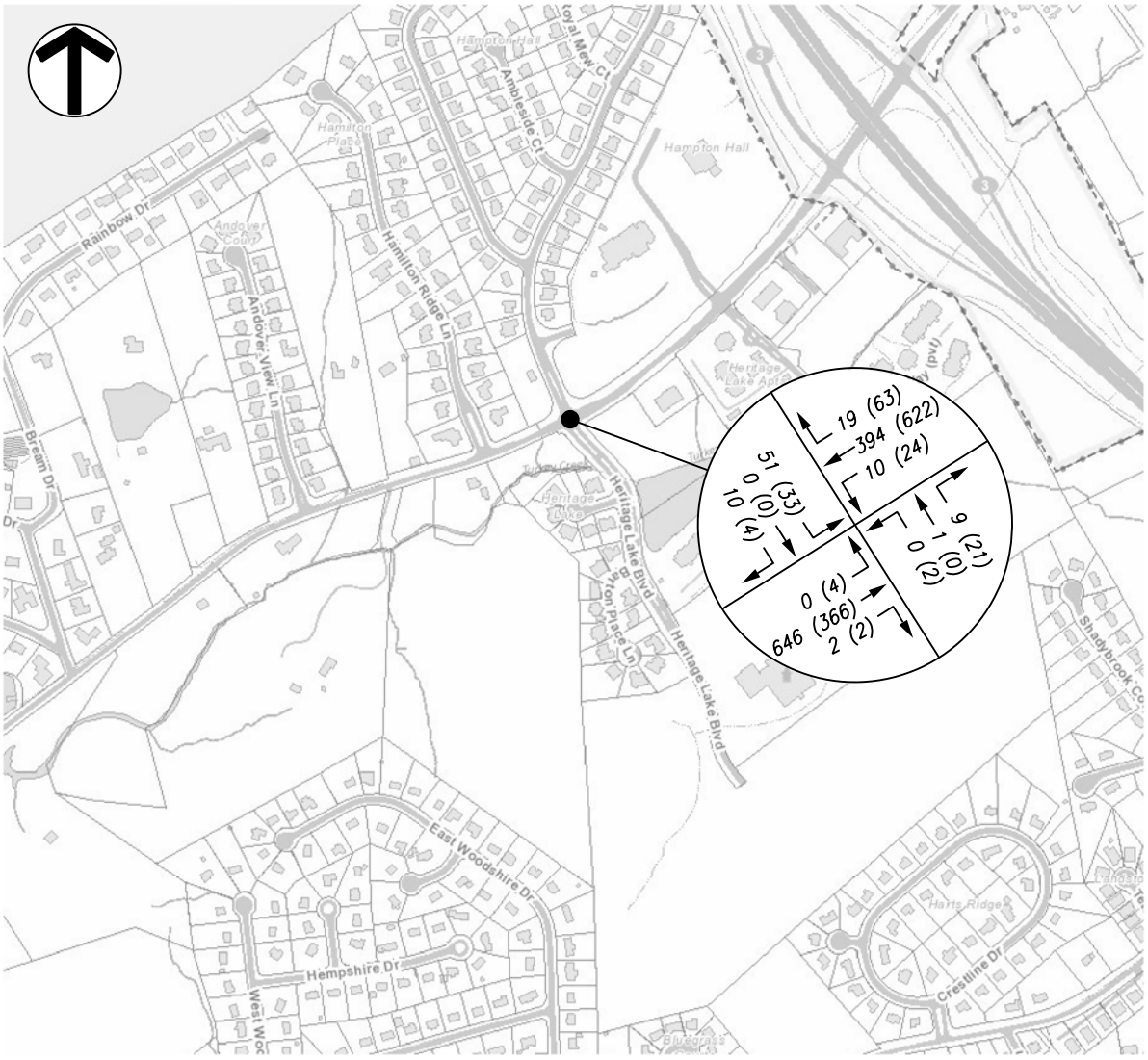
The Tennessee Department of Transportation (TDOT) and the Knoxville Regional Transportation Planning Organization (TPO) maintain count stations in the vicinity of the proposed development.

TDOT count station #000437 is located on Westland Drive west of project location and east of S Northshore Drive. The annual growth rate for this station over the last five years is approximately 2.43% and the 2017 ADT was 8,246 vehicles per day.

Knoxville TPO count station ID: 093M085 is located on Westland Drive just east of the intersection with Heritage Lake Boulevard. The annual growth rate for this station over the last five years is approximately 3.04% and the 2016 ADT was 11,520 vehicles per day.

For the purpose of this study, an annual growth rate of 3.0% was assumed for traffic at the intersection of Westland Drive at Heritage Lake Boulevard until full occupancy is reached in 2021. Attachment 4 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 intersection of Westland Drive at Heritage Lake Boulevard after applying the background growth rate to the existing conditions.



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

Figure 4: 2021 Background Peak Hour Traffic

3.1 Hamilton Place Subdivision

Hamilton Place Subdivision is an existing subdivision located west of the proposed Heritage Woods Subdivision at the intersection of Westland Drive at Hamilton Ridge Lane. Hamilton Place Subdivision has 32 existing single family lots.

Due to an equipment malfunction FMA estimated the traffic generated at the intersection of Westland Drive at Hamilton Ridge Lane instead of collecting the data using a traffic counting device. Single- Family Detached Housing or Land Use 210 was used to calculate site trips for the subdivision using the fitted curve equations from the *Trip Generation, 10th Edition,* published by the Institute of Transportation Engineers. The land use worksheets are included in Attachment 5.

Table 3.1-1
Trip Generation Summary

Hamilton Place Subdivision 32 Units - LUC 210					
	Total New Trips	% Entering	%Exiting	Number Entering	Number Exiting
Weekday	364	50	50	182	182
A.M. Peak	28	25	75	7	21
P.M. Peak	34	63	37	21	13

The directional distribution of the traffic generated by the Hamilton Place Subdivision was determined using the existing traffic volumes at the intersection with Westland Drive at Garrison Ridge Boulevard. At the existing intersection of Westland Drive at Garrison Ridge Boulevard the entering traffic was 100% westbound during the AM peak hour and 90% westbound during the PM peak hour. The exiting traffic was 85% eastbound and 15% westbound during both the AM and PM peak hours.

In order to get an estimate of the thru traffic at the intersection of Westland Drive at the Westland Oaks Roadway connection FMA took the background traffic at the intersection of Westland Drive at Heritage Lake Boulevard / Garrison Ridge Boulevard and added and/or subtracted the trip generation from the existing Hamilton Place Subdivision.

Figure 5 shows the Hamilton Ridge Lane background peak hour traffic along with the projected thru volume for the intersection of Westland Drive at Westland Oaks Roadway.

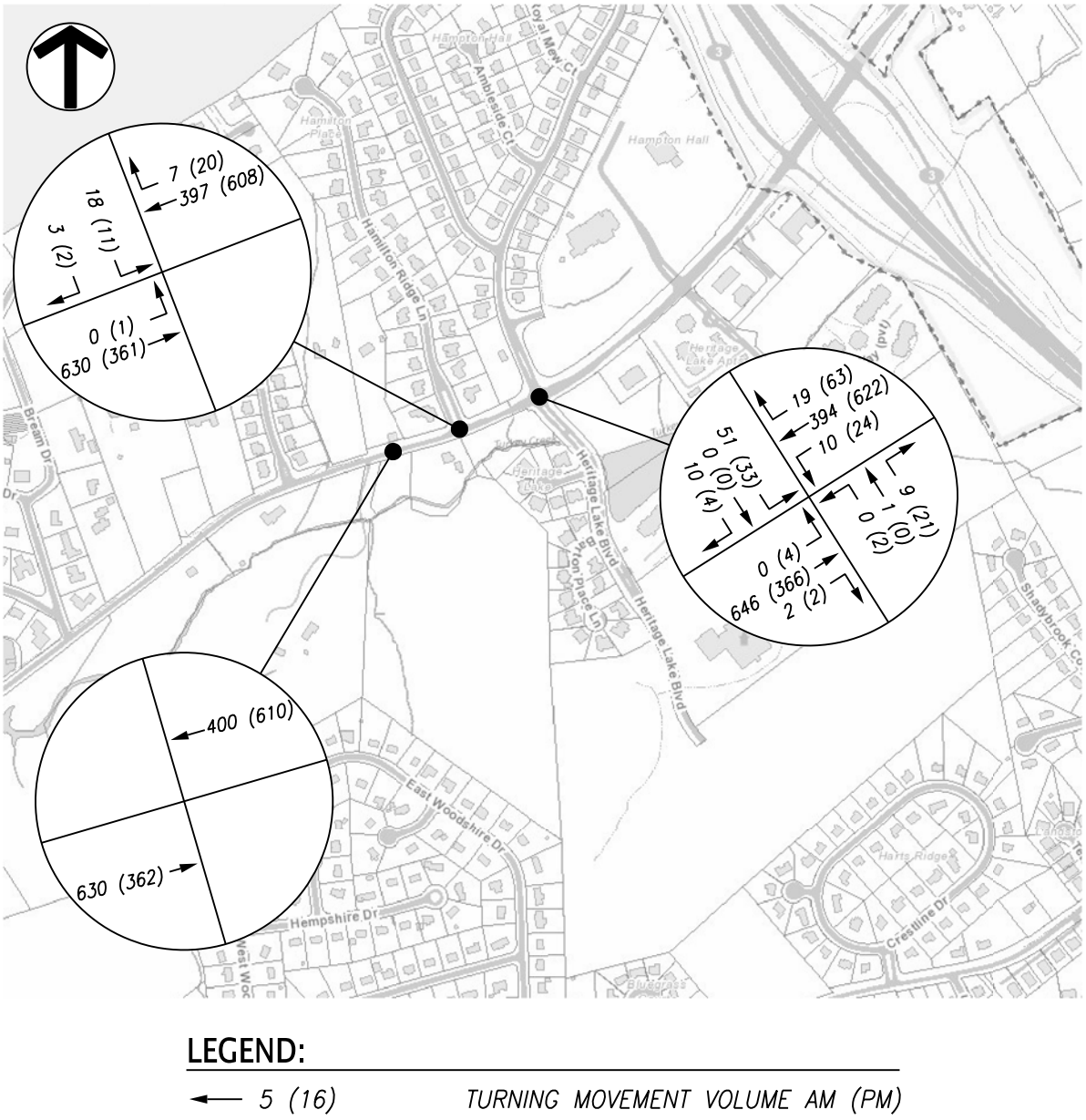


Figure 5: Hamilton Ridge Lane Background Peak Hour Traffic

4 Trip Generation and Trip Distribution

The Heritage Woods Subdivision proposes 133 single family lots. The Westland Oaks Subdivision has an approved concept plan for 74 single family lots. Single-Family Detached Housing or Land Use 210 was used to calculate site trips for the subdivision using the fitted curve equations from the *Trip Generation, 10th Edition,* published by the Institute of Transportation Engineers. The land use worksheets are included in Attachment 5.

The total trips generated by the Heritage Woods Subdivision was estimated to be 1,352 daily trips and the total trips generated by the Westland Oaks Subdivision was estimated to be 788 daily trips for a combined total of 2,140 new daily trips. A trip generation summary for both subdivisions is shown in Table 4-1.

Table 4-1
Trip Generation Summary

Heritage Woods Subdivision 133 Units - LUC 210					
	Total New Trips	% Entering	%Exiting	Number Entering	Number Exiting
Weekday	1352	50	50	676	676
A.M. Peak	99	25	75	25	74
P.M. Peak	134	63	37	84	50
Westland Oaks Subdivision 74 Units - LUC 210					
	Total New Trips	% Entering	%Exiting	Number Entering	Number Exiting
Weekday	788	50	50	394	394
A.M. Peak	57	25	75	14	43
P.M. Peak	76	63	37	48	28
Total Combined					
Weekday	2,140			1070	1070
A.M. Peak	156			39	117
P.M. Peak	210			132	78

Westland Drive at the Westland Oaks Roadway has a trip distribution of 60% eastbound and 40% westbound during the AM peak hour and 40% eastbound and 60% westbound during the PM peak hour.

The directional distribution of the traffic generated by the Heritage Woods Subdivision and the Westland Oaks Subdivision was determined using the existing traffic volumes at the intersection with Westland Drive at Heritage Lake Boulevard / Garrison Ridge Boulevard. At the existing intersection the entering traffic was 85% westbound and 15% eastbound during both the AM and PM peak hours. The exiting traffic was 85% eastbound and 15% westbound during both the AM and PM peak hours.

FMA assumed that approximately 50% of the westbound entering traffic from the Westland Oaks Subdivision would enter at the intersection with Heritage Lake Boulevard. This assumption was based on the high percentage of westbound traffic on Westland Drive coming from Pellissippi Parkway and that westbound traffic would utilize the existing westbound left turn lane.

Figures 6 and 7 show the AM and PM peak hour trip distribution for the Westland Oaks Subdivision and Figures 8 and 9 show the AM and PM peak hour trip distribution for the Heritage Woods Subdivision.

Figure 10 shows the peak hour site traffic from both subdivisions and Figure 11 shows the peak hour full buildout traffic.

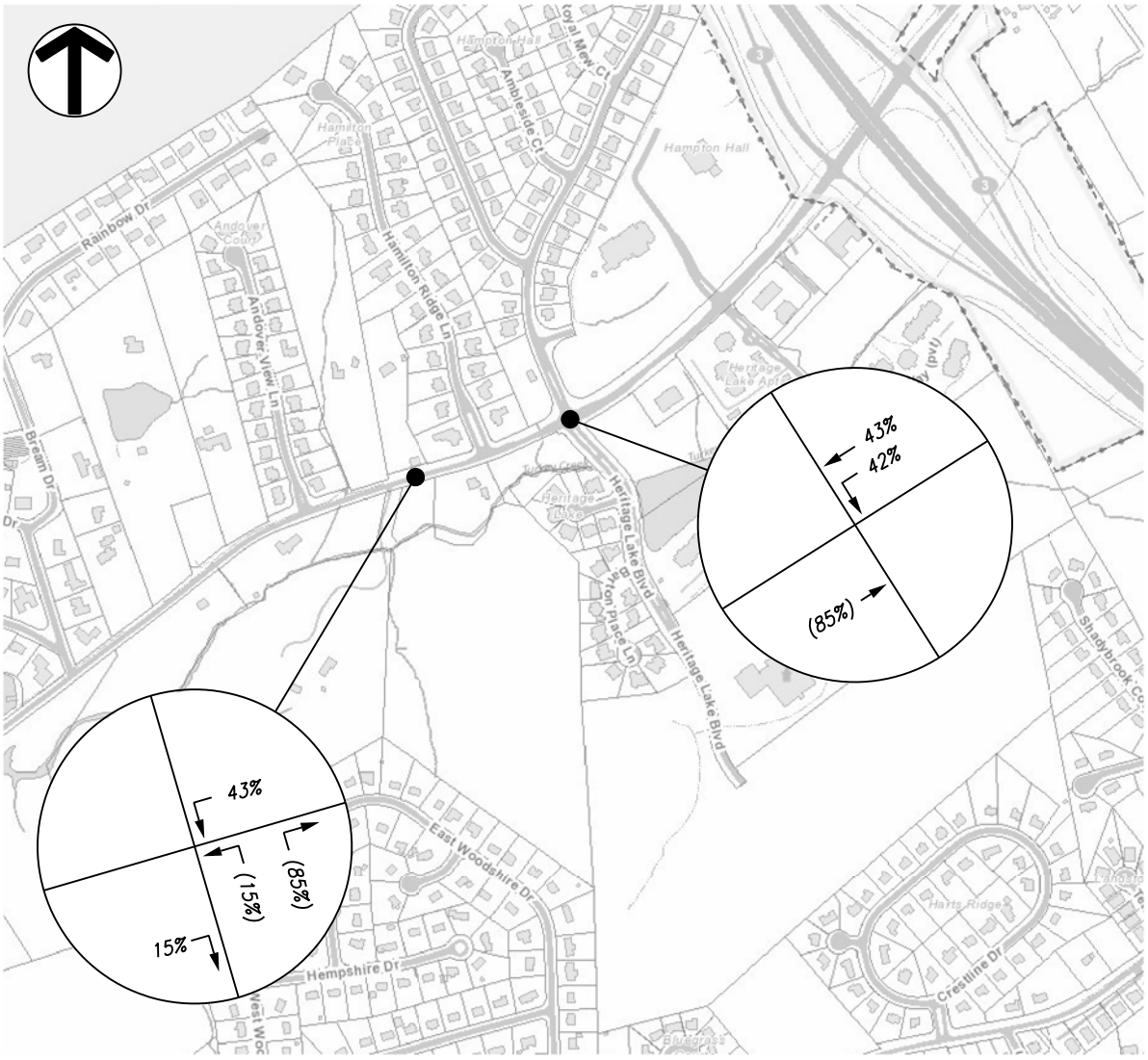


Figure 6: AM Peak Hour Trip Distribution Westland Oaks

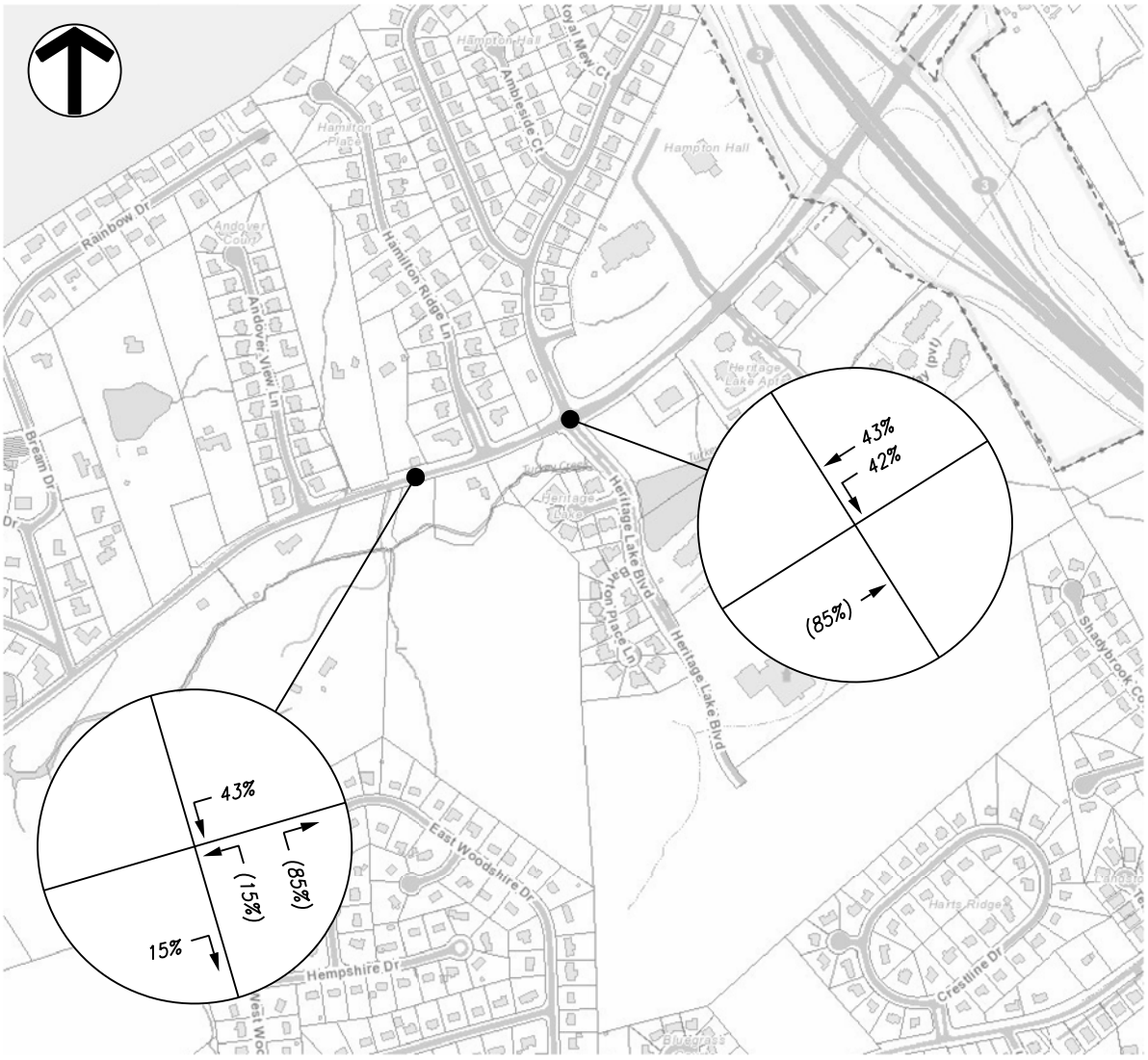


Figure 7: PM Peak Hour Trip Distribution Westland Oaks

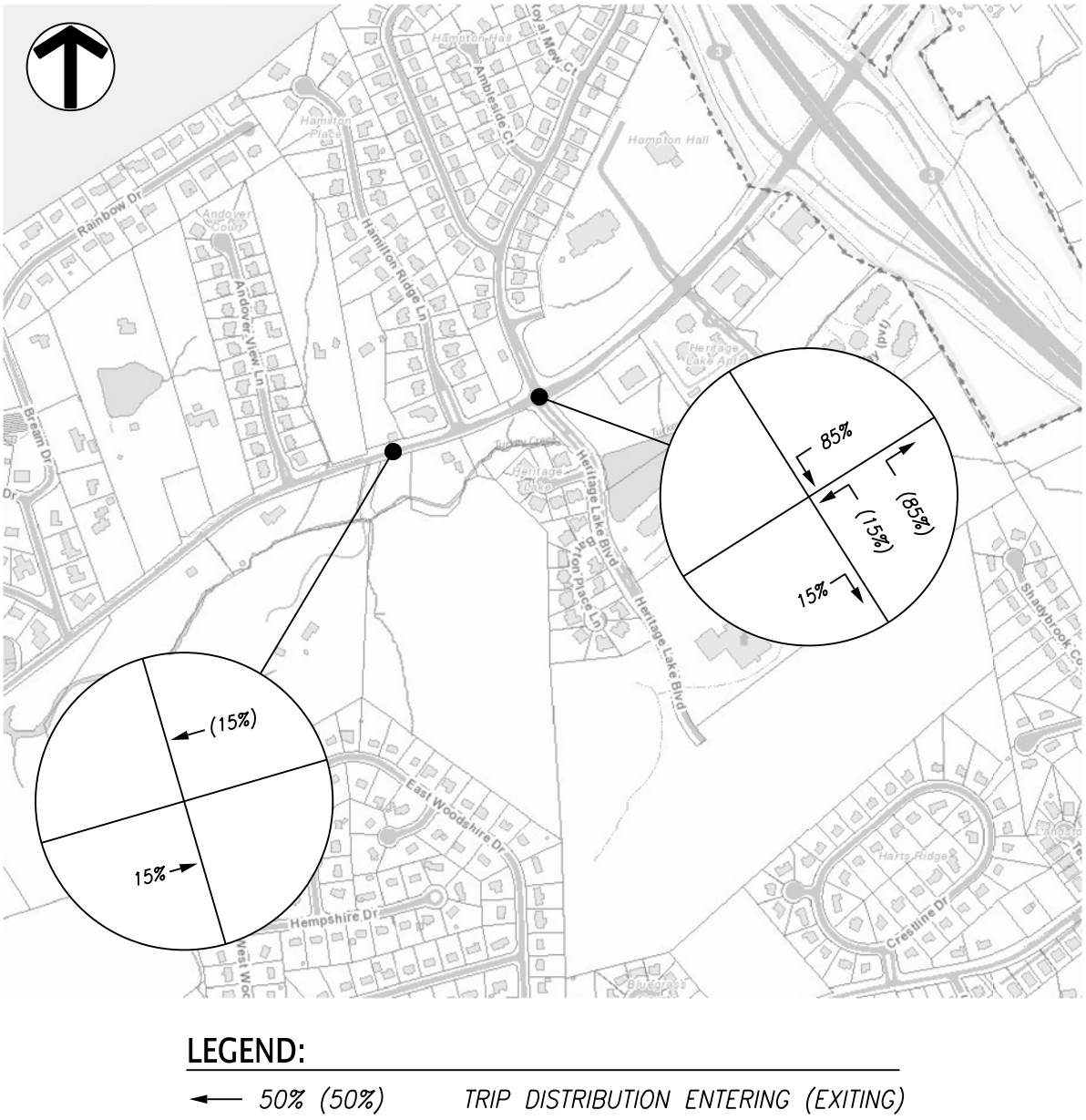


Figure 8: AM Peak Hour Trip Distribution Heritage Woods

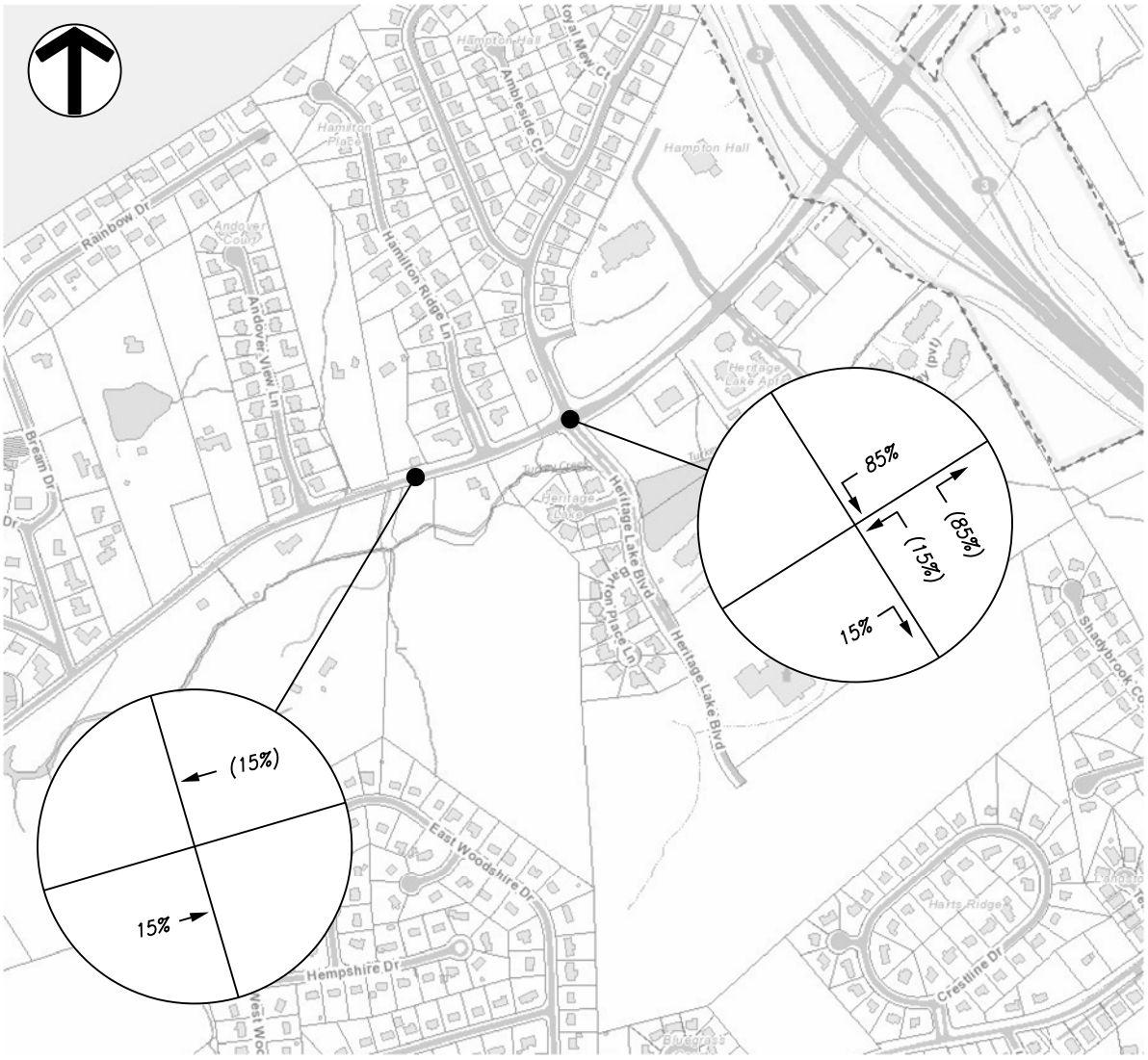


Figure 9: PM Peak Hour Trip Distribution Heritage Woods

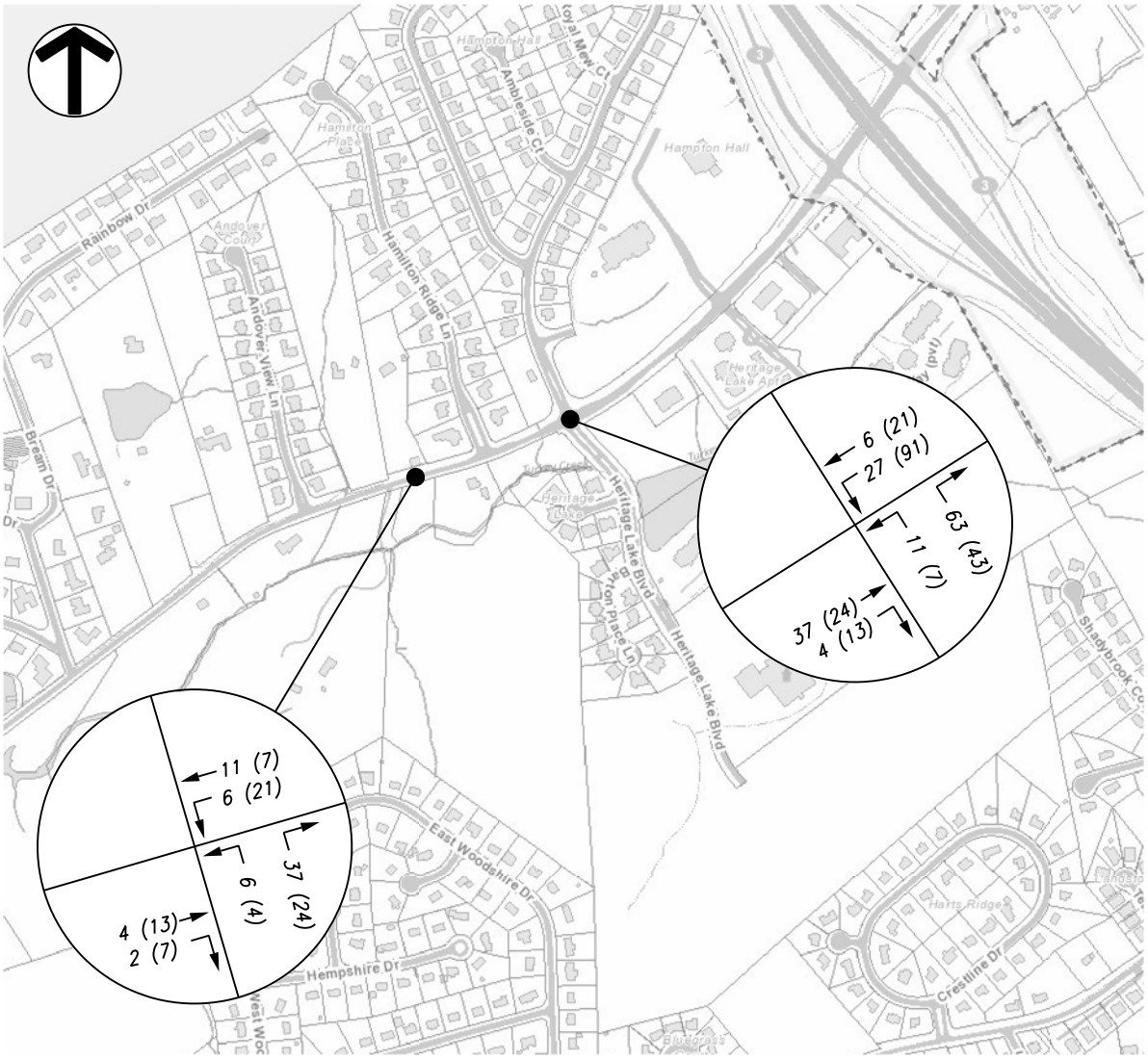
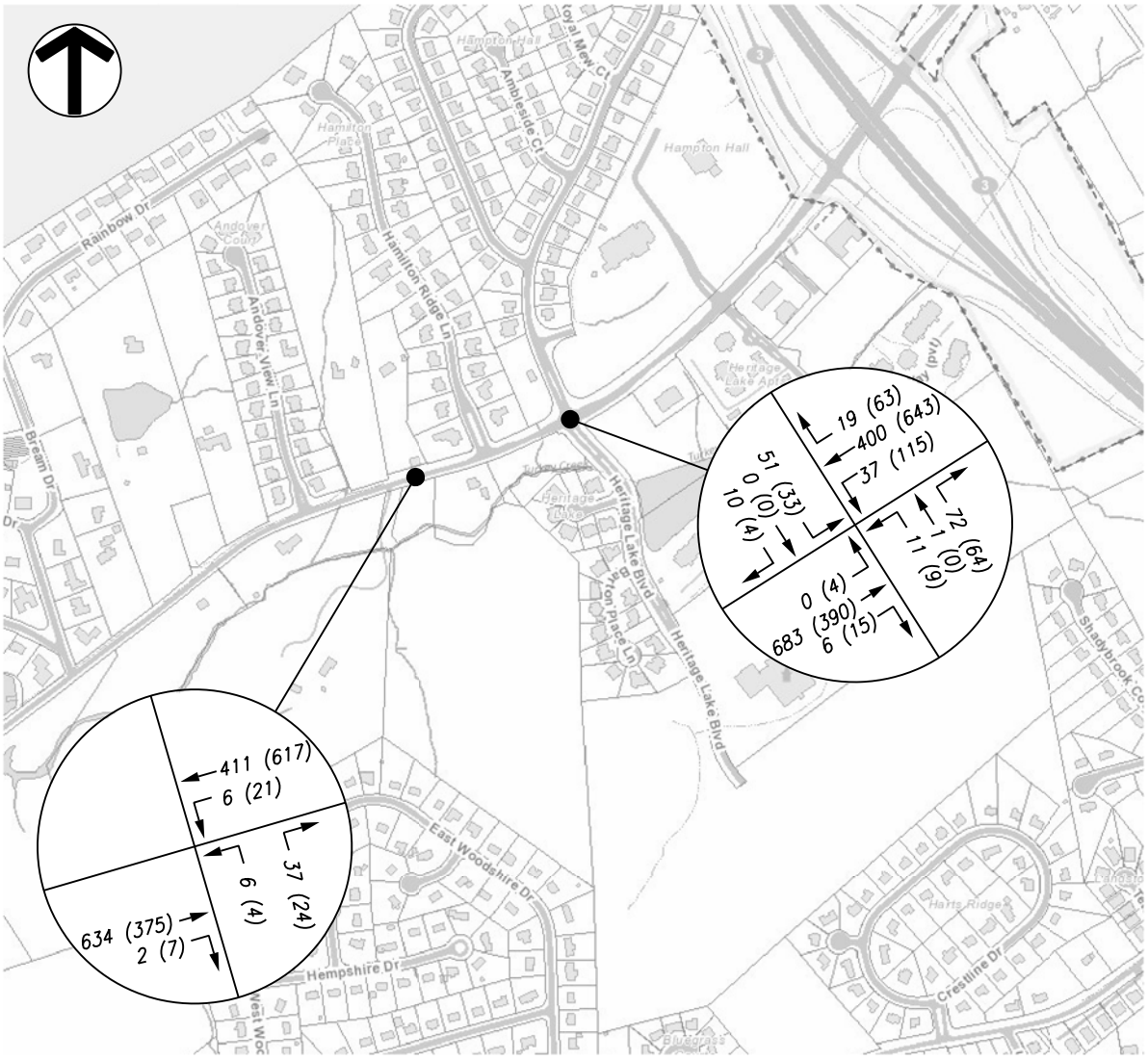


Figure 10: Peak Hour Site Traffic



LEGEND:

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

Figure 11: Peak Hour Full Buildout 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 Westland Drive at Heritage Lake Boulevard and Westland Drive at Westland Oaks Roadway.

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 6, 7 and 8.

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

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

		Delay (sec)/LOS
Westland Drive @ Heritage Lake Boulevard (Existing 2018)		
AM Peak	EB Approach	8.2 / A
	WB Approach	8.9 / A
	NB Approach	13.8 / B
	SB Approach	27.3 / D
PM Peak	EB Approach	9.0 / A
	WB Approach	8.1 / A
	NB Approach	11.9 / B
	SB Approach	26.5 / D
Westland Drive @ Heritage Lake Boulevard (Background 2021)		
AM Peak	EB Approach	8.3 / A
	WB Approach	9.1 / A
	NB Approach	14.6 / B
	SB Approach	33.7 / D
PM Peak	EB Approach	9.3 / A
	WB Approach	8.2 / A
	NB Approach	12.3 / B
	SB Approach	32.2 / D
Westland Drive @ Heritage Lake Boulevard (Full Buildout 2021)		
AM Peak	EB Approach	8.3 / A
	WB Approach	9.4 / A
	NB Approach	20.9 / C
	SB Approach	63.7 / F
PM Peak	EB Approach	9.3 / A
	WB Approach	8.7 / A
	NB Approach	17.4 / C
	SB Approach	68.6 / F
Westland Drive @ Westland Oaks Roadway (Full Buildout 2021)		
AM Peak	WB Approach	9.0 / A
	NB Approach	15.7 / C
PM Peak	WB Approach	8.2 / A
	NB Approach	12.5 / B

6 Turn Lane Warrant Analysis

The intersection of Westland Drive at Heritage Lake Boulevard was evaluated to determine if a right turn lane is warranted and the intersection of Westland Drive at the Westland Oaks Roadway was evaluated to determine if a right turn lane or a left 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.

A right turn lane is not warranted at the intersection of Westland Drive at Heritage Lake Boulevard. At the intersection of Westland Drive at the Westland Oaks Roadway a right turn lane is not warranted and a left turn lane is warranted during the PM peak hour. The turn lane warrant worksheets and analysis are included in Attachment 9.

7 Signal Warrant Analysis

The intersection of Westland Drive at Heritage Lake Boulevard was evaluated to determine if a traffic signal is warranted for the existing, background and full buildout conditions. The "Manual of Uniform Traffic Control Devices" (MUTCD) published by the Federal Highway Administration in 2009 was used to determine if the intersection met a warrant for a signal. The volume based warrants including Warrant 1, Eight-Hour Vehicular Volume, Warrant 2, Four-Hour Vehicular Volume and Warrant 3, Peak Hour were evaluated based on existing, background and full buildout conditions. The traffic signal warrant worksheet is included in Attachment 10.

The intersection of Westland Drive at Heritage Lake Boulevard does not meet any of the conditions for Warrant 1, Eight-Hour Vehicular Volume, Warrant 2, Four-Hour Vehicular Volume or Warrant 3, Peak Hour and therefore does not warrant a traffic signal for any of the existing, background or full buildout conditions.

8 Conclusions and Recommendations

8.1 Westland Drive @ Heritage Lake Boulevard

The existing traffic conditions at the usignalized intersection of Westland Drive at Heritage Lake Boulevard were analyzed using the Highway Capacity Software (HCS7). The eastbound and westbound approaches operate at a LOS A during both the AM and PM peak hours. The northbound approach operates at a LOS B during both the AM and PM peak hours. The southbound left turn lane operates at a LOS D during both the AM and PM peak hours and the southbound thru/right lane operates at a LOS B during both the AM and PM peak hours.

The background traffic conditions at the usignalized intersection of Westland Drive at Heritage Lake Boulevard were analyzed using the Highway Capacity Software (HCS7). The eastbound and westbound approaches operate at a LOS A during both the AM and PM peak hours. The northbound approach operates at a LOS B during both the AM and PM peak hours. The southbound left turn lane operates at a LOS E during the AM peak hour and LOS D during the PM peak hour and the southbound thru/right lane operates at a LOS B during both the AM and PM peak hours.

The full buildout traffic conditions at the usignalized intersection of Westland Drive at Heritage Lake Boulevard were analyzed using the Highway Capacity Software (HCS7). The eastbound and westbound approaches operate at a LOS A during both the AM and PM peak hours. The northbound approach operates at a LOS C during both the AM and PM peak hours. The southbound left turn lane operates at a LOS F during both the AM and PM peak hours and the southbound thru/right lane operates at a LOS B during both the AM and PM peak hours.

After the completion of both the Westland Oaks Subdivision and the Heritage Woods Subdivision an eastbound right turn lane is not warranted at the intersection of Westland Drive at Heritage Lake Boulevard.

The existing left turn lane on Westland Drive at the intersection with Heritage Lake Boulevard has a storage length of 225 feet and a taper length of 135 feet. The unsignalized intersection capacity analyses shows a 95% queue length at the full buildout for the westbound approach of Westland Drive of less than one car length during both the AM and PM peak hours; therefore the existing storage at the intersection is adequate and no change is necessary.

The existing left turn lane on Garrison Ridge Boulevard at the intersection with Heritage Lake Boulevard has a storage length of 100 feet and a taper length of 35 feet. The unsignalized intersection capacity analyses shows a 95% queue length at the full buildout for the southbound left turn lane of three car lengths during the AM

peak hour and two car lengths during the PM peak hour; therefore the existing storage at the intersection is adequate and no change is necessary.

The intersection of Westland Drive at Heritage Lake Boulevard was evaluated to determine if a traffic signal is warranted for the existing, background and full buildout conditions. Based on the "Manual of Uniform Traffic Control Devices" (MUTCD) published by the Federal Highway Administration in 2009 there are no signal warrants met for either the existing, background and full buildout conditions and therefore a signal is not warranted at this intersection at this time.

The intersection of Westland Drive at Heritage Lake Boulevard does not meet any of the conditions for Warrant 1, Eight-Hour Vehicular Volume, Warrant 2, Four-Hour Vehicular Volume or Warrant 3, Peak Hour and therefore does not warrant a traffic signal for any of the existing, background or full buildout conditions.

8.2 Westland Drive @ Westland Oaks Roadway

The full buildout traffic conditions at the usignalized intersection of Westland Drive at Westland Oaks Roadway were analyzed using the Highway Capactiy Software (HCS7). The westbound approach operates at a LOS A during both the AM and PM peak hours. The northbound approach operates at a LOS C during the AM peak hour and a LOS B during the PM peak hour.

After the completion of the Westland Oaks Subdivision an eastbound right turn lane is not warranted and a westbound left turn lane is warranted during the PM peak hour due to the high volume of westbound thru traffic on Westland Drive.

FMA does not recommend an additional westbound turn lane be built on Westland Drive. FMA assumed that approximately 50% of the westbound entering traffic from the Westland Oaks Subdivision would enter at the intersection with Heritage Lake Boulevard. The existing left turn lane on Westland Drive at the intersection with Heritage Lake Boulevard has adequate storage to handle the additional traffic from both the Westland Oaks and Heritage Woods Subdivisions. The unsignalized intersection capacity analyses for the full buildout of both subdivisions shows a 95% queue length for the westbound left turn lane of less than one car length during both the AM and PM peak hours.

8.3 Westland Drive

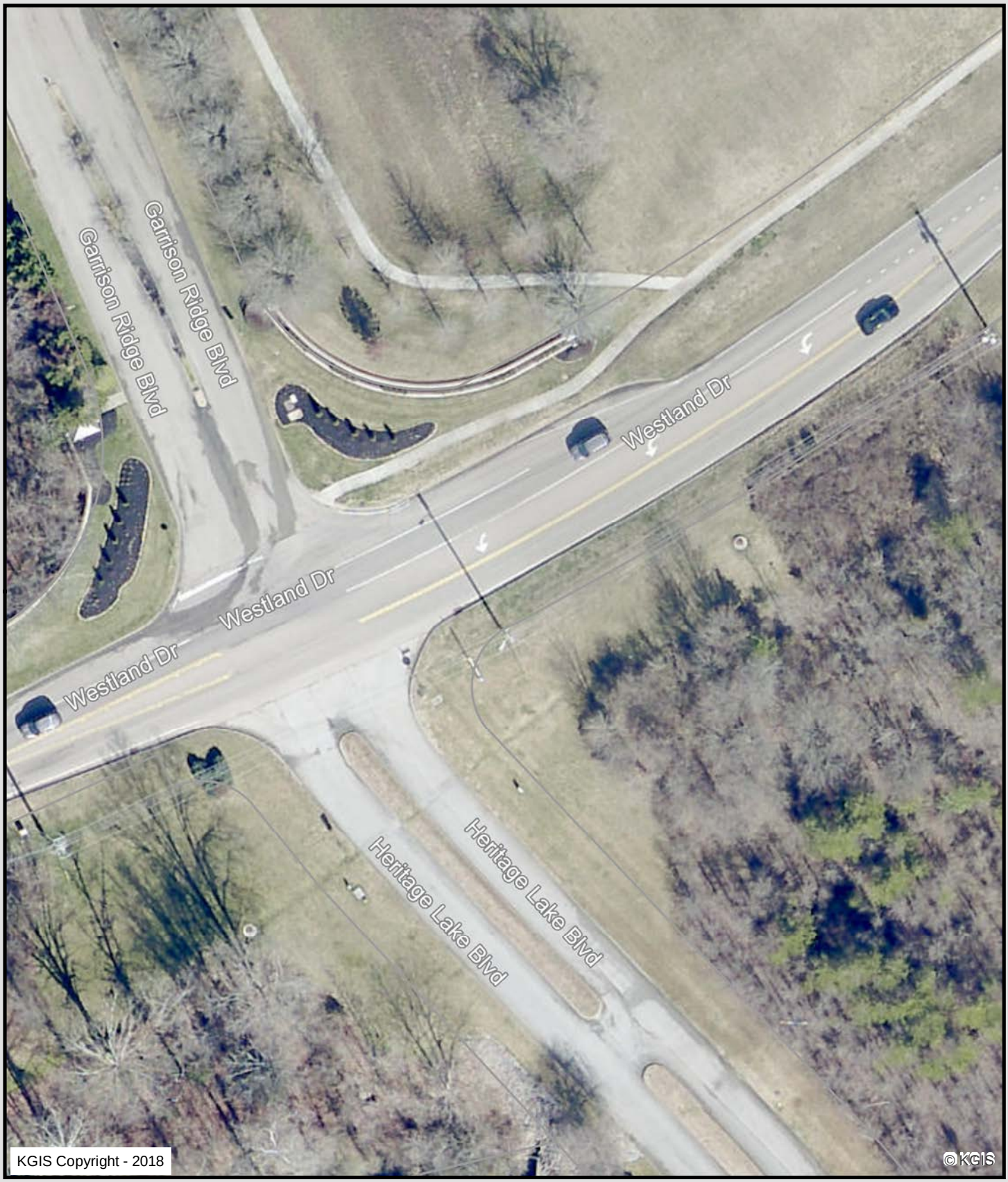
Knox County provided crash data from the year 2015 to 2017 on Westland Drive within the vicinity of Andover View Lane to Heritage Lake Boulevard. There were 10 crashes reported for this stretch of Westland Drive during the time frame stated. There are not any recommended improvements for Westland Drive at this time due to the relatively low number of crashes reported.

8.4 Heritage Woods Road "C"

The minimum required sight distance for a road with a posted speed limit of 25 mph is 250 feet in each direction in accordance with the "Subdivision Regulations" for Knoxville and Knox County. FMA measured the sight distance at the proposed intersection of Heritage Lake Boulevard at Heritage Woods Road "C". At 15 feet from the edge of pavement the sight distance at the proposed intersection is greater than 250 feet northbound and southbound; however, the northbound sight distance is partially blocked due to the existing overgrowth conditions.

FMA recommends that the sight distance be re-evaluated in the field after the completion of the proposed Heritage Woods Subdivision to ensure that the sight distance complies with the requirements for Knox County Engineering and Public Works. FMA also recommends any landscaping be installed so as to maintain the sight distance and continue to comply with Knox County Engineering and Public Works.

Attachment 1
Aerial Photo



Westland at Heritage Lake

Knoxville - Knox County - KUB Geographic Information System

Printed: 11/19/2018 at 8:09:38 AM

0 25 50 100

ft

Westland Oaks

Knoxville - Knox County - KUB Geographic Information System

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0 25 50 100

ft

Attachment 2
Heritage Lake Background Info

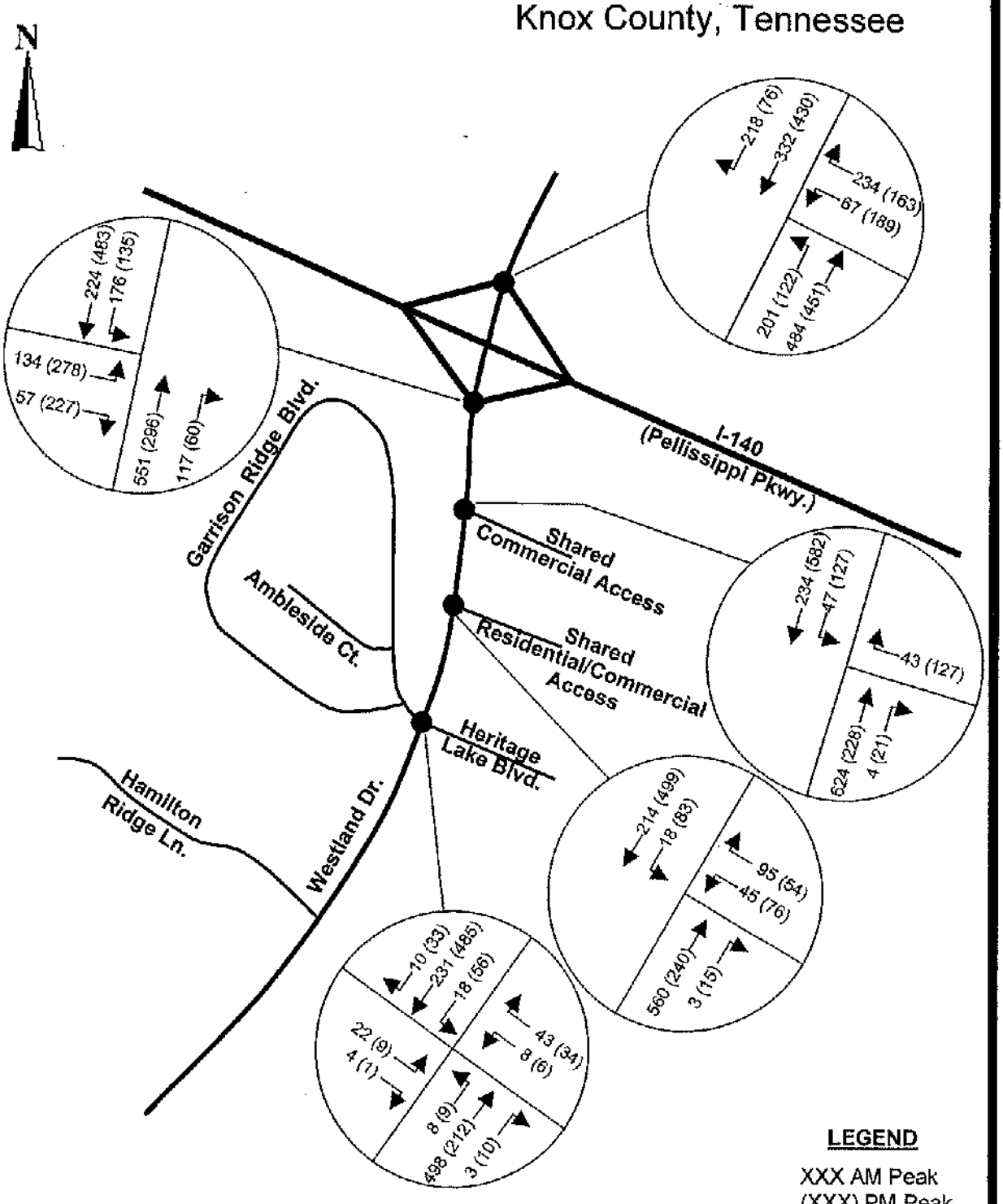
SITE PLAN
HERITAGE LAKE DEVELOPMENT
Knox County, Tennessee

N

WSA Wilbur Smith Associates

Figure 1

2005 PROJECTED TRAFFIC
HERITAGE LAKE DEVELOPMENT
Knox County, Tennessee



LEGEND

XXX AM Peak
(XXX) PM Peak

WSA **Wilbur Smith Associates**

Figure 10

was no significant changes in LOS for unsignalized and signalized intersections along Westland Drive. Tables 7 and 8 present the results of the analyses for signalized and unsignalized intersections, respectively.

TABLE 7

SIGNALIZED INTERSECTIONS
LEVEL OF SERVICE AND CAPACITY
SUMMARY

		2005 BACKGROUND			2005 PROJECT		
INTERSECTION	PERIOD	V/C	DELAY	LOS	V/C	DELAY	LOS
WESTLAND DRIVE	AM	0.580	10.5	B	0.683	13.7	B
I-140 S.B. RAMPS	PM	0.419	10.2	B	0.528	11.0	B
WESTLAND DRIVE	AM	0.661	10.6	B	0.713	11.7	B
I-140 N.B. RAMPS	PM	0.482	10.6	B	0.567	11.3	B

Average vehicle delay estimated in seconds

Sight Distance

The project access is along Westland Drive. Westland drive is a two-lane collector with fairly gentle vertical and horizontal geometry adjacent to the site. The posted speed limit is 40mph. A prevailing speed of 40mph requires a sight distance of 325 feet. A field review of the proposed site access points to Westland Drive determined sight distance is in excess of 400 feet, more than required for the posted speed of 40mph. Therefore, sight distance is more than acceptable and should be maintained with good driveway standards employed.

RECOMMENDATIONS

The analysis conducted and the review of the traffic volumes identified the following recommendations:

2005 Background Traffic Conditions:

- Signalize both the north and southbound ramps of Pellissippi Parkway and Westland Drive
- Provide a 250 foot eastbound left-turn storage on Westland Drive at the northbound Pellissippi on-ramp.
- Provide a 225 foot westbound left-turn storage on Westland Drive at the southbound Pellissippi

on-ramp.

- Provide a 375 foot minimum left-turn lane on the southbound Pellissippi off-ramp.
- Provide a 250 foot minimum left-turn lane on the northbound Pellissippi off-ramp.

Storage lengths for the left-turn lanes at signalized intersections were estimated using a nomograph developed by the Northwestern Traffic Institute, found in the ITE publication, **Transportation and Land Development**.

2005 Project Traffic Conditions:

- Provide a 50 foot westbound left-turn lane on Westland Drive at Garrison Ridge Boulevard.
- Provide a 125 foot westbound left-turn lane on Westland Drive at the proposed apartment access.
- Provide a 75 foot westbound left-turn lane on Westland Drive at the proposed shared access between the Weigels and office/commercial parcel.
- Minimize landscaping, using low growing vegetation, and signing at the driveways and public street intersections to insure that safe sight distance is maintained.
- Use a minimum of 15 foot driveway radius for the efficient and safe ingress and egress of the site.
- At public street intersections, use a minimum radius of 30 feet.
- Driveway and turn lane design should conform to the recommended standards and practices of the American Association of State Highway and Transportation Officials, the Institute of Transportation Engineers, and the Knox County Public Works Department.

The storage lengths for left-turn lanes at unsignalized intersections identified in the above recommendations were developed using Harmelink's criteria for left-turn lanes at unsignalized intersections. For the proposed intersection of Westland Drive and the access serving the multi-family units, the westbound left-turn lane was estimated assuming a traffic signal may be warranted in conjunction with commercial development proposed for the opposite side of Westland Drive.

CONCLUSION

The study of this Westland Drive project developed and evaluated existing, background, and project traffic conditions. Background traffic was determined using a 4.0 percent annual

Attachment 3
Traffic Counts

Project: Heritage Woods Subdivision
Intersection: Westland Dr at Heritage Lake Blvd / Garrison Ridge Blvd
Date Conducted: 11/7/2018 & 11/13/2018

	Westland Drive Eastbound				Westland Drive Westbound				Heritage Lake Blvd Northbound				Garrison Ridge Blvd Southbound				
Start	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Int. Total
7:00 AM	0	155	0	155	0	30	0	30	0	0	1	1	9	0	1	10	196
7:15 AM	0	195	0	195	1	50	0	51	0	0	3	3	16	0	2	18	267
7:30 AM	1	149	0	150	1	63	1	65	0	0	3	3	20	0	2	22	240
7:45 AM	0	138	0	138	0	75	8	83	0	0	1	1	16	0	1	17	239
Total	1	637	0	638	2	218	9	229	0	0	8	8	61	0	6	67	942
8:00 AM	0	151	1	152	0	77	3	80	0	0	4	4	15	0	1	16	252
8:15 AM	0	167	1	168	2	98	4	104	0	0	1	1	10	0	4	14	287
8:30 AM	0	136	0	136	4	97	7	108	0	1	2	3	10	0	1	11	258
8:45 AM	0	137	0	137	3	89	3	95	0	0	1	1	12	0	3	15	248
Total	0	591	2	593	9	361	17	387	0	1	8	9	47	0	9	56	1045
11:00 AM	1	77	0	78	5	63	0	68	0	0	2	2	3	0	0	3	151
11:15 AM	0	87	0	87	1	79	2	82	0	0	0	0	2	0	1	3	172
11:30 AM	0	81	0	81	2	96	2	100	0	0	2	2	5	0	0	5	188
11:45 AM	1	76	1	78	4	96	7	107	0	0	4	4	1	0	1	2	191
Total	2	321	1	324	12	334	11	357	0	0	8	8	11	0	2	13	702
12:00 PM	3	68	0	71	3	88	7	98	0	0	1	1	8	0	2	10	180
12:15 PM	0	80	0	80	2	90	0	92	1	0	1	2	4	0	0	4	178
12:30 PM	0	77	0	77	3	85	4	92	0	0	2	2	5	0	1	6	177
12:45 PM	2	92	0	94	1	84	4	89	0	0	6	6	5	0	1	6	195
Total	5	317	0	322	9	347	15	371	1	0	10	11	22	0	4	26	730
2:00 PM	2	78	0	80	3	71	4	78	0	0	6	6	4	0	0	4	168
2:15 PM	2	81	2	85	2	70	4	76	0	0	3	3	3	0	1	4	168
2:30 PM	0	68	0	68	4	82	7	93	0	0	3	3	3	0	2	5	169
2:45 PM	1	85	0	86	5	87	5	97	0	0	3	3	8	1	2	11	197
Total	5	312	2	319	14	310	20	344	0	0	15	15	18	1	5	24	702
3:00 PM	2	85	1	88	3	71	7	81	1	0	5	6	6	1	1	8	183
3:15 PM	1	67	0	68	3	94	4	101	2	0	10	12	5	0	0	5	186
3:30 PM	0	77	0	77	0	113	7	120	0	0	4	4	2	0	1	3	204
3:45 PM	3	78	0	81	2	142	14	158	1	0	2	3	7	0	1	8	250
Total	6	307	1	314	8	420	32	460	4	0	21	25	20	1	3	24	823
4:00 PM	0	84	0	84	4	122	9	135	0	0	2	2	14	0	1	15	236
4:15 PM	1	80	1	82	2	135	13	150	1	0	3	4	4	0	0	4	240
4:30 PM	2	83	0	85	7	119	11	137	1	0	7	8	3	0	1	4	234
4:45 PM	1	76	0	77	5	124	19	148	2	0	8	10	3	0	1	4	239
Total	4	323	1	328	18	500	52	570	4	0	20	24	24	0	3	27	949
5:00 PM	1	94	2	97	7	153	16	176	0	0	4	4	13	0	1	14	291
5:15 PM	0	86	0	86	6	142	10	158	0	0	5	5	9	0	1	10	259
5:30 PM	2	79	0	81	4	150	13	167	0	0	2	2	5	0	1	6	256
5:45 PM	1	71	2	74	6	132	12	150	1	0	4	5	8	0	1	9	238
Total	4	330	4	338	23	577	51	651	1	0	15	16	35	0	4	39	1044
Grand Total	15	2188	8	2211	60	2076	161	2297	9	1	72	82	187	1	25	213	4803
Approach %	0.7	99.0	0.4		2.6	90.4	7.0		11.0	1.2	87.8		87.8	0.5	11.7		
Total %	0.3	45.6	0.2	46.0	1.2	43.2	3.4	47.8	0.2	0.0	1.5	1.7	3.9	0.0	0.5	4.4	

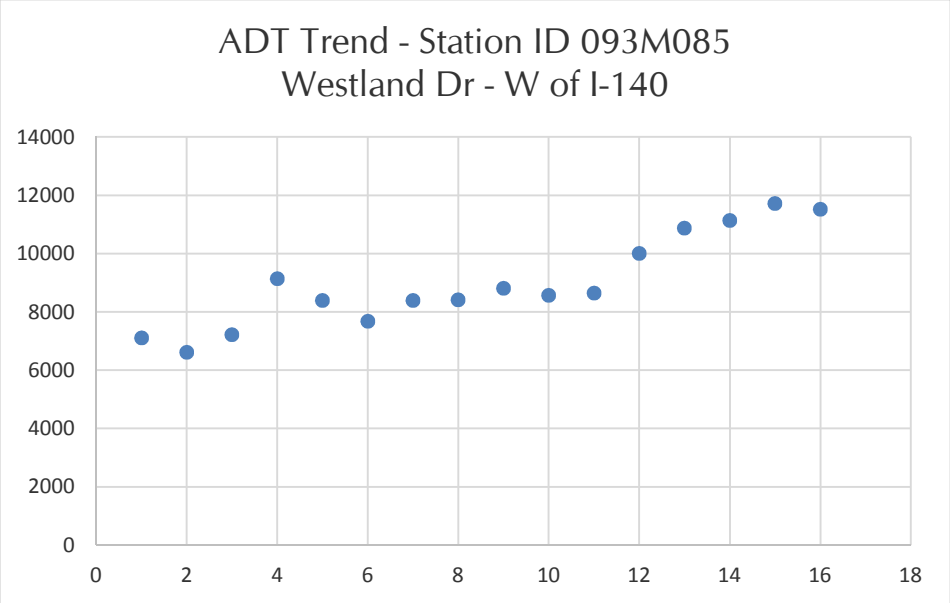
Project: Heritage Woods Subdivision
Date Conducted: 11/7/2018

AM Peak Hour	8:00 AM - 9:00 AM	1045
PM Peak Hour	4:45 PM - 5:45 PM	1045

	Westland Drive Eastbound				Westland Drive Westbound				Heritage Lake Blvd Northbound				Garrison Ridge Blvd Southbound				
Start	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Int. Total
Peak Hour Analysis from 7:00 AM to 9:00 AM																	
AM Peak Hour begins at 8:00 AM																	
8:00 AM	0	151	**1**	152	0	77	3	80	0	0	**4**	4	**15**	0	1	16	252
8:15 AM	0	**167**	1	168	2	**98**	4	104	0	0	1	1	10	0	**4**	14	**287**
8:30 AM	0	136	0	136	**4**	97	**7**	108	0	**1**	2	3	10	0	1	11	258
8:45 AM	0	137	0	137	3	89	3	95	0	0	1	1	12	0	3	15	248
Total Volume	0	591	2	593	9	361	17	387	0	1	8	9	47	0	9	56	1045
Future (3% over 3 yrs)	0	646	2		10	394	19		0	1	9		51	0	10		1142
PHF	-	0.88	0.50		0.56	0.92	0.61		-	0.25	0.50		0.78	-	0.56		0.91
Peak Hour Analysis from 3:00 PM to 6:00 PM																	
PM Peak Hour begins at 4:45 PM																	
4:45 PM	1	76	0	77	5	124	**19**	148	**2**	0	**8**	10	3	0	**1**	4	239
5:00 PM	1	**94**	**2**	97	**7**	**153**	16	176	0	0	4	4	**13**	0	1	14	**291**
5:15 PM	0	86	0	86	6	142	10	158	0	0	5	5	9	0	1	10	259
5:30 PM	**2**	79	0	81	4	150	13	167	0	0	2	2	5	0	1	6	256
Total Volume	4	335	2	341	22	569	58	649	2	0	19	21	30	0	4	34	1045
Future (3% over 3 yrs)	4	366	2		24	622	63		2	0	21		33	0	4		1142
PHF	0.50	0.89	0.25		0.79	0.93	0.76		0.25	-	0.59		0.58	-	1.00		0.90

Attachment 4
ADT Trends

Year	Adjusted Average Daily Traffic
2001	7110
2002	6610
2003	7210
2004	9140
2005	8391
2006	7680
2007	8390
2008	8410
2009	8810
2010	8570
2011	8640
2012	10000
2013	10870
2014	11130
2015	11710
2016	11520

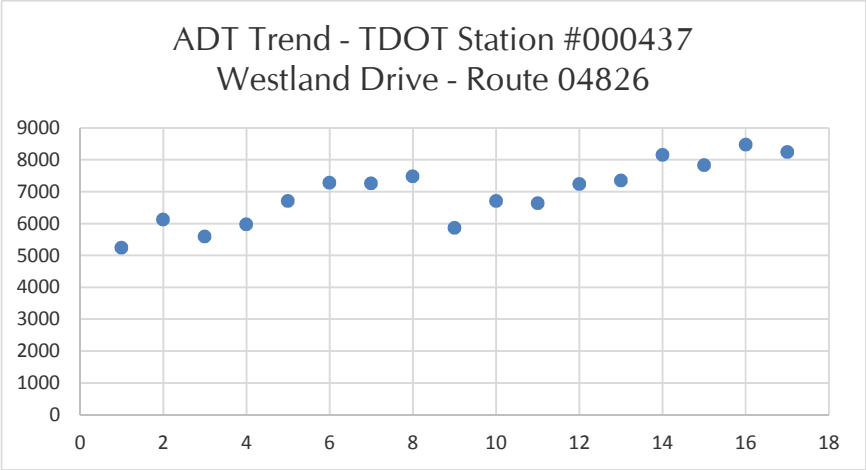


Most Recent Trend Line Growth

Year	ADT
2012	10000
2016	11520

Annual Percent Growth	**3.04%**

	Year	Adjusted Average Daily Traffic
1	2001	5238
2	2002	6119
3	2003	5589
4	2004	5969
5	2005	6706
6	2006	7278
7	2007	7257
8	2008	7475
9	2009	5865
10	2010	6706
11	2011	6634
12	2012	7243
13	2013	7353
14	2014	8156
15	2015	7834
16	2016	8475
17	2017	8246



Most Recent Trend Line Growth

Year	ADT
2013	7353
2017	8246

Annual Percent Growth	**2.43%**

Attachment 5
Trip Generation

Project: Heritage Woods
Date Conducted: 12/17/2018

Single-Family Detached Housing (LUC 210)
133 Single Family Lots

Average Daily Traffic
$Ln(T) = 0.92Ln(X) + 2.71$
$Ln(T) = 0.92Ln(133) + 2.71$
$T = 1352$

Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.
$T = 0.71(X) + 4.80$
$T = 0.71(133) + 4.80$
$T = 99$

Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.
$Ln(T) = 0.96Ln(X) + 0.20$
$Ln(T) = 0.96Ln(133) + 0.20$
$T = 134$

Time Period	Total Trips	Percent		Number	
		Enter	Exit	Enter	Exit
Weekday (24 hours)	1352	50%	50%	676	676
AM Peak Hour	99	25%	75%	25	74
PM Peak Hour	134	63%	37%	84	50

Project: Westland Oaks
Date Conducted: 11/7/2018

Single-Family Detached Housing (LUC 210)
74 Single Family Lots

Average Daily Traffic
$Ln(T) = 0.92Ln(X) + 2.71$
$Ln(T) = 0.92Ln(74) + 2.71$
$T = 788$

Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.
$T = 0.71(X) + 4.80$
$T = 0.71(74) + 4.80$
$T = 57$

Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.
$Ln(T) = 0.96Ln(X) + 0.20$
$Ln(T) = 0.96Ln(74) + 0.20$
$T = 76$

Time Period	Total Trips	Percent		Number	
		Enter	Exit	Enter	Exit
Weekday (24 hours)	788	50%	50%	394	394
AM Peak Hour	57	25%	75%	14	43
PM Peak Hour	76	63%	37%	48	28

Project: Existing Hamilton Ridge Subdivision
Date Conducted: 11/18/2018

Single-Family Detached Housing (LUC 210)
32 Single Family Lots

Average Daily Traffic

$Ln(T) = 0.92Ln(X) + 2.71$
$Ln(T) = 0.92Ln(32) + 2.71$
$T = 364$

Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.

$T = 0.71(X) + 4.80$
$T = 0.71(32) + 4.80$
$T = 28$

Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.

$Ln(T) = 0.96Ln(X) + 0.20$
$Ln(T) = 0.96Ln(32) + 0.20$
$T = 34$

Time Period	Total Trips	Percent		Number	
		Enter	Exit	Enter	Exit
Weekday (24 hours)	364	50%	50%	182	182
AM Peak Hour	28	25%	75%	7	21
PM Peak Hour	34	63%	37%	21	13

Single-Family Detached Housing
(210)

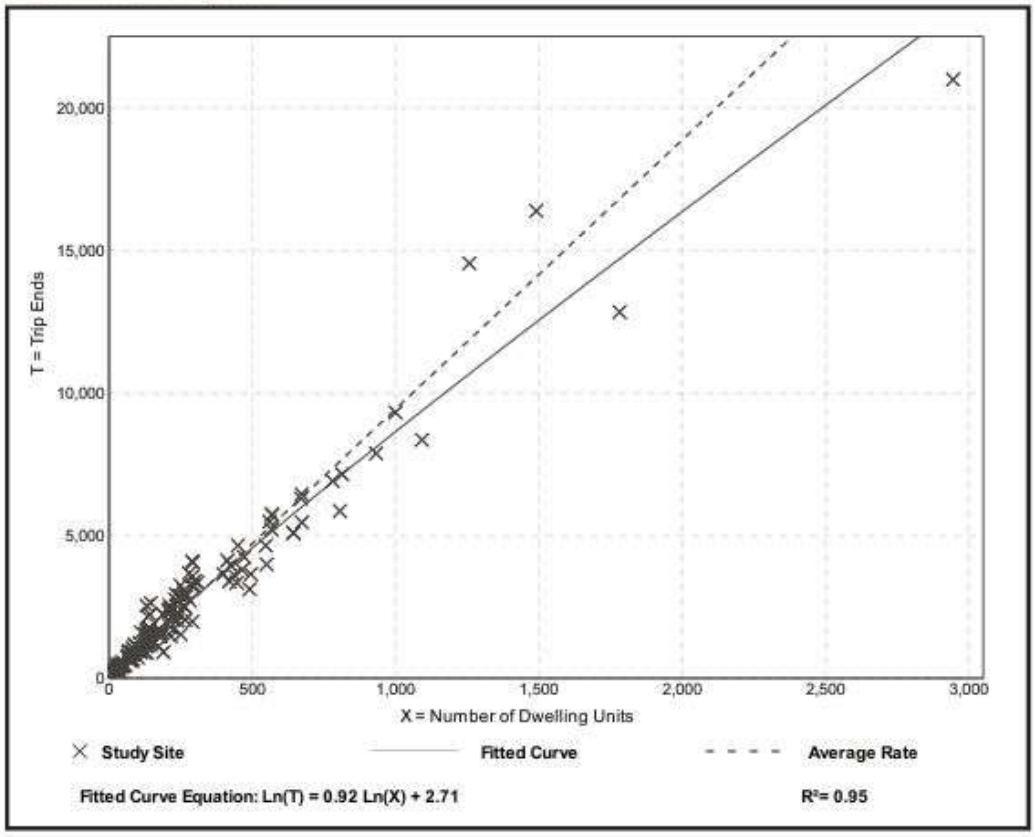
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 159
Avg. Num. of Dwelling Units: 264
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.44	4.81 - 19.39	2.10

Data Plot and Equation



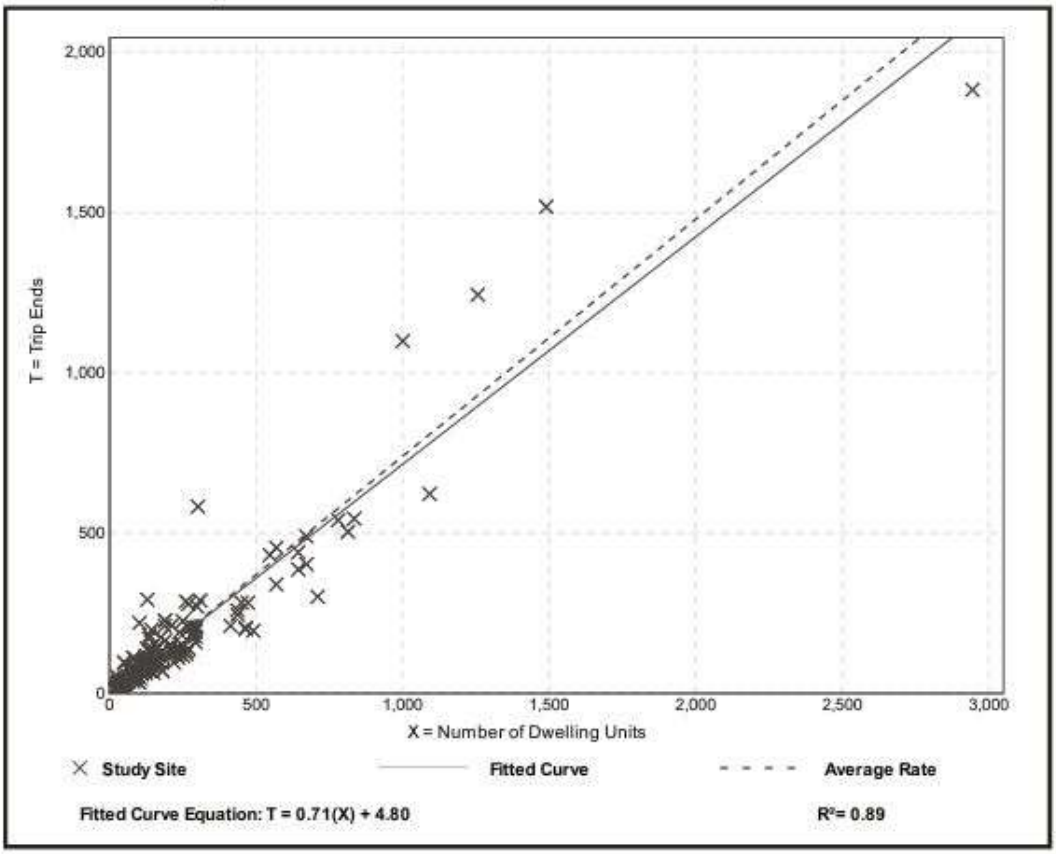
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs:	**Dwelling Units**
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:	173
Avg. Num. of Dwelling Units:	219
Directional Distribution:	25% entering, 75% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.74	0.33 - 2.27	0.27

Data Plot and Equation



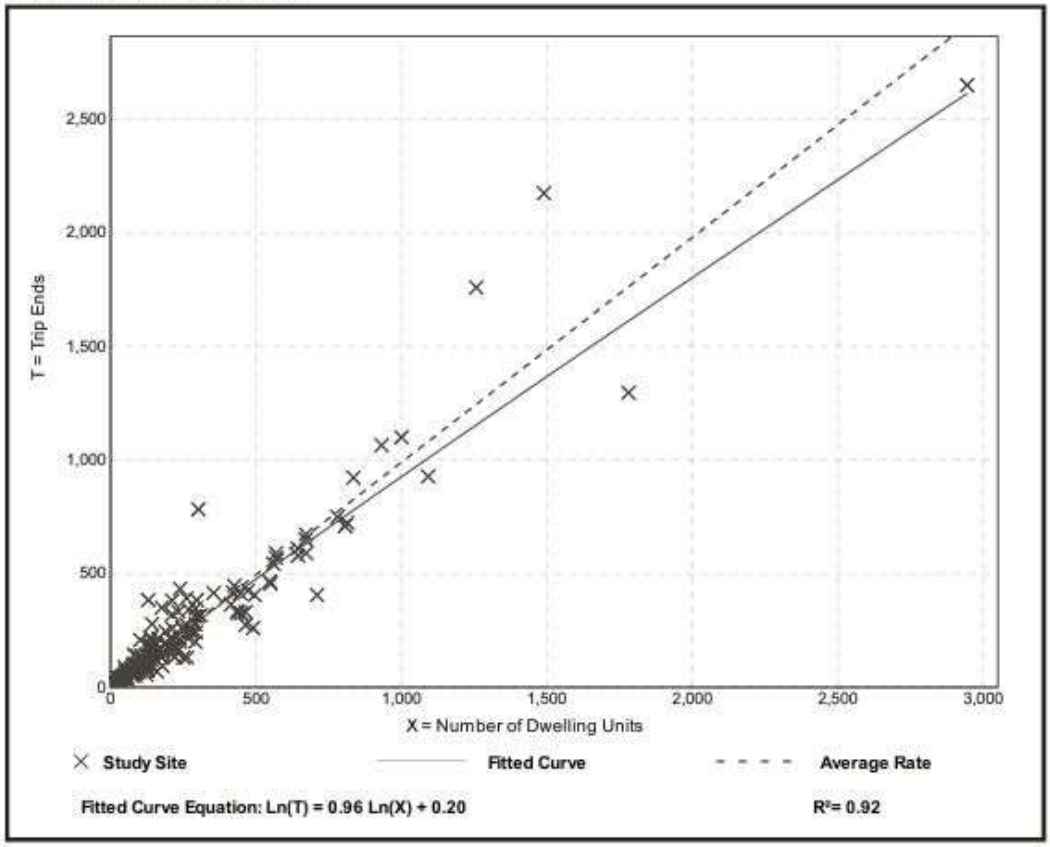
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs:	**Dwelling Units**
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:	190
Avg. Num. of Dwelling Units:	242
Directional Distribution:	63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31

Data Plot and Equation



Attachment 6
Intersection Worksheets – Existing AM/PM Peaks

HCS7 Two-Way Stop-Control Report

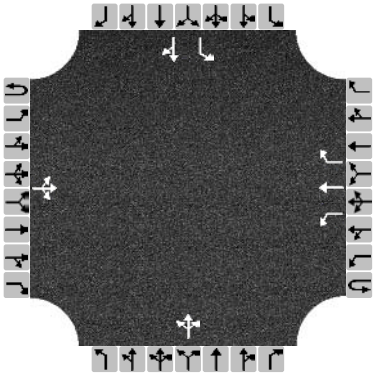
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	11/19/2018
Analysis Year	2018
Time Analyzed	Existing AM Peak
Intersection Orientation	East-West
Project Description	525.009 Heritage Woods Subdivision

Site Information

Intersection	Westland at Heritage Lake
Jurisdiction	Knox County
East/West Street	Westland Drive
North/South Street	Heritage Lake Boulevard
Peak Hour Factor	0.91
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	1	1	1		0	1	0		1	1	0
Configuration			LTR			L	T	R			LTR			L		TR
Volume, V (veh/h)		0	591	2		9	361	17		0	1	8		47	0	9
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				10					10			52		10
Capacity, c (veh/h)		1142				935					419			192		652
v/c Ratio		0.00				0.01					0.02			0.27		0.02
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.1			1.1		0.0
Control Delay (s/veh)		8.2				8.9					13.8			30.6		10.6
Level of Service, LOS		A				A					B			D		B
Approach Delay (s/veh)		0.0				0.2				13.8				27.3		
Approach LOS										B				D		

HCS7 Two-Way Stop-Control Report

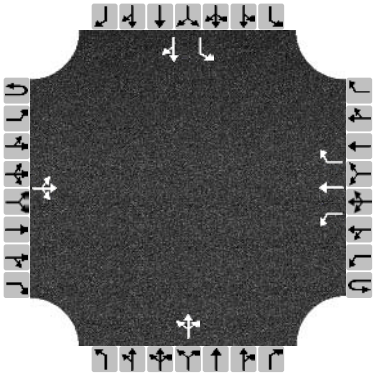
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	11/19/2018
Analysis Year	2018
Time Analyzed	Existing PM Peak
Intersection Orientation	East-West
Project Description	525.009 Heritage Woods Subdivision

Site Information

Intersection	Westland at Heritage Lake
Jurisdiction	Knox County
East/West Street	Westland Drive
North/South Street	Heritage Lake Boulevard
Peak Hour Factor	0.90
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	1	1	1		0	1	0		1	1	0
Configuration			LTR			L	T	R			LTR			L		TR
Volume, V (veh/h)		4	335	2		22	569	58		2	0	19		30	0	4
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				24					23			33		4
Capacity, c (veh/h)		899				1184					548			188		480
v/c Ratio		0.00				0.02					0.04			0.18		0.01
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.1			0.6		0.0
Control Delay (s/veh)		9.0				8.1					11.9			28.2		12.6
Level of Service, LOS		A				A					B			D		B
Approach Delay (s/veh)		0.1				0.3				11.9				26.5		
Approach LOS										B				D		

Attachment 7
Intersection Worksheets – Background AM/PM Peaks

HCS7 Two-Way Stop-Control Report

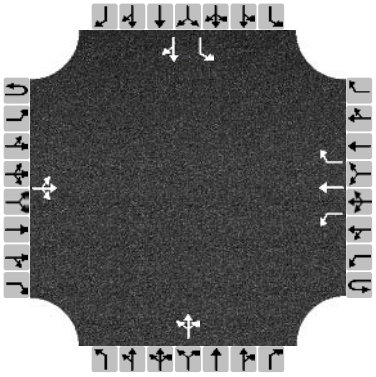
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	11/19/2018
Analysis Year	2021
Time Analyzed	Background AM Peak
Intersection Orientation	East-West
Project Description	525.009 Heritage Woods Subdivision

Site Information

Intersection	Westland at Heritage Lake
Jurisdiction	Knox County
East/West Street	Westland Drive
North/South Street	Heritage Lake Boulevard
Peak Hour Factor	0.91
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	1	1	1		0	1	0		1	1	0
Configuration			LTR			L	T	R			LTR			L		TR
Volume, V (veh/h)		0	646	2		10	394	19		0	1	9		51	0	10
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				11					11			56		11
Capacity, c (veh/h)		1106				887					386			163		623
v/c Ratio		0.00				0.01					0.03			0.34		0.02
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.1			1.4		0.1
Control Delay (s/veh)		8.3				9.1					14.6			38.2		10.9
Level of Service, LOS		A				A					B			E		B
Approach Delay (s/veh)		0.0				0.2				14.6				33.7		
Approach LOS										B				D		

HCS7 Two-Way Stop-Control Report

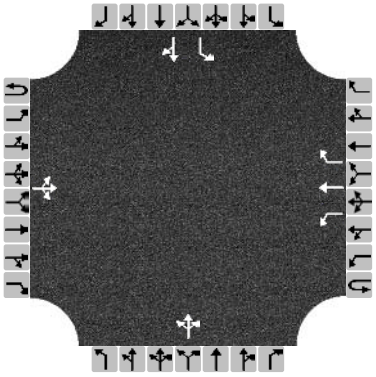
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	11/19/2018
Analysis Year	2021
Time Analyzed	Background PM Peak
Intersection Orientation	East-West
Project Description	525.009 Heritage Woods Subdivision

Site Information

Intersection	Westland at Heritage Lake
Jurisdiction	Knox County
East/West Street	Westland Drive
North/South Street	Heritage Lake Boulevard
Peak Hour Factor	0.90
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	1	1	1		0	1	0		1	1	0
Configuration			LTR			L	T	R			LTR			L		TR
Volume, V (veh/h)		4	366	2		24	622	63		2	0	21		33	0	4
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				27					25			37		4
Capacity, c (veh/h)		851				1149					516			160		444
v/c Ratio		0.00				0.02					0.05			0.23		0.01
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.2			0.9		0.0
Control Delay (s/veh)		9.3				8.2					12.3			34.3		13.2
Level of Service, LOS		A				A					B			D		B
Approach Delay (s/veh)		0.1				0.3				12.3				32.2		
Approach LOS										B				D		

Attachment 8
Intersection Worksheets – Full Buildout AM/PM Peaks

HCS7 Two-Way Stop-Control Report

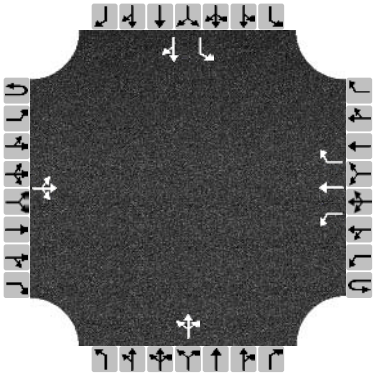
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	12/17/2018
Analysis Year	2021
Time Analyzed	Full Buildout AM Peak
Intersection Orientation	East-West
Project Description	525.009 Heritage Woods Subdivision

Site Information

Intersection	Westland at Heritage Lake
Jurisdiction	Knox County
East/West Street	Westland Drive
North/South Street	Heritage Lake Boulevard
Peak Hour Factor	0.91
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	1	1	1		0	1	0		1	1	0
Configuration			LTR			L	T	R			LTR			L		TR
Volume, V (veh/h)		0	683	6		37	400	19		11	1	72		51	0	10
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				41					92			56		11
Capacity, c (veh/h)		1099				853					317			104		617
v/c Ratio		0.00				0.05					0.29			0.54		0.02
95% Queue Length, Q_{95} (veh)		0.0				0.2					1.2			2.5		0.1
Control Delay (s/veh)		8.3				9.4					20.9			74.0		10.9
Level of Service, LOS		A				A					C			F		B
Approach Delay (s/veh)		0.0				0.8				20.9				63.7		
Approach LOS										C				F		

HCS7 Two-Way Stop-Control Report

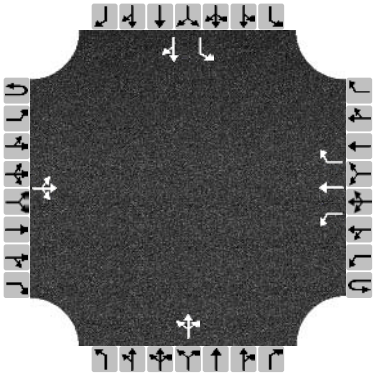
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	12/17/2018
Analysis Year	2021
Time Analyzed	Full Buildout PM Peak
Intersection Orientation	East-West
Project Description	525.009 Heritage Woods Subdivision

Site Information

Intersection	Westland at Heritage Lake
Jurisdiction	Knox County
East/West Street	Westland Drive
North/South Street	Heritage Lake Boulevard
Peak Hour Factor	0.90
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	1	1	1		0	1	0		1	1	0
Configuration			LTR			L	T	R			LTR			L		TR
Volume, V (veh/h)		4	390	15		115	643	63		9	0	64		33	0	4
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				128					81			37		4
Capacity, c (veh/h)		834				1110					370			87		431
v/c Ratio		0.00				0.12					0.22			0.43		0.01
95% Queue Length, Q_{95} (veh)		0.0				0.4					0.8			1.7		0.0
Control Delay (s/veh)		9.3				8.7					17.4			74.5		13.4
Level of Service, LOS		A				A					C			F		B
Approach Delay (s/veh)		0.1				1.2				17.4				68.6		
Approach LOS										C				F		

HCS7 Two-Way Stop-Control Report

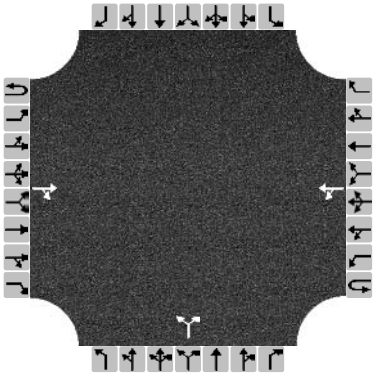
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	12/17/2018
Analysis Year	2021
Time Analyzed	Full Buildout AM Peak
Intersection Orientation	East-West
Project Description	525.009 Heritage Woods Subdivision

Site Information

Intersection	Westland at Westland Oaks
Jurisdiction	Knox County
East/West Street	Westland Drive
North/South Street	Westland Oaks Roadway
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		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			634	2		6	411			6		37				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
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)						7					47					
Capacity, c (veh/h)						903					385					
v/c Ratio						0.01					0.12					
95% Queue Length, Q_{95} (veh)						0.0					0.4					
Control Delay (s/veh)						9.0					15.7					
Level of Service, LOS						A					C					
Approach Delay (s/veh)						0.2				15.7						
Approach LOS										C						

HCS7 Two-Way Stop-Control Report

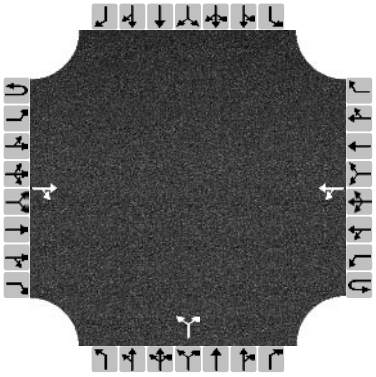
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	12/17/2018
Analysis Year	2021
Time Analyzed	Full Buildout PM Peak
Intersection Orientation	East-West
Project Description	525.009 Heritage Woods Subdivision

Site Information

Intersection	Westland at Westland Oaks
Jurisdiction	Knox County
East/West Street	Westland Drive
North/South Street	Westland Oaks Roadway
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		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			375	7		21	617			4		24				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
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)						23					30					
Capacity, c (veh/h)						1142					511					
v/c Ratio						0.02					0.06					
95% Queue Length, Q_{95} (veh)						0.1					0.2					
Control Delay (s/veh)						8.2					12.5					
Level of Service, LOS						A					B					
Approach Delay (s/veh)						0.5					12.5					
Approach LOS											B					

Attachment 9
Turn Lane Warrant Analysis

Project: Heritage Woods Subdivision

Westland Drive at Heritage Lake Boulevard

Westland Drive VOLUMES
at Heritage Lake Boulevard

RIGHT TURN	Thru	RT	RT MAX	Warrant Met
AM	683	6	25	NO
PM	394	15	199	NO

Westland Drive at Westland Oaks Driveway

Westland Drive VOLUMES
at Westland Oaks Driveway

LEFT TURN	Opposing	Thru	LT	LT MAX	Warrant Met
AM	634	411	6	20	NO
PM	375	617	21	20	YES

Westland Drive VOLUMES
at Westland Oaks Driveway

RIGHT TURN	Thru	RT	RT MAX	Warrant Met
AM	634	2	25	NO
PM	375	7	199	NO

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				15 RT PM Peak ◯		
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				6 RT AM Peak ◯ Yes	Yes Yes	Yes Yes
100 - 149 150 - 199		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

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

TABLE 5A

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

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

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

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

6 LT AM Peak

21 LT PM Peak

* Or through volume only if a right-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	7 RT PM Peak			2 RT AM Peak Yes	Yes Yes	Yes Yes
100 - 149 150 - 199		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

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

Attachment 10
Signal Warrant Analysis

Project: Heritage Woods Subdivision
Intersection: Westland Dr at Heritage Lake Blvd / Garrison Ridge Blvd
Date Conducted: 12/17/2018

	Existing Conditions		**Warrant 1**			**Warrant 2**	**Warrant 3**
	Major Street	Minor Street	Condition A	Condition B	Condition A/B		
Start	veh/hr	veh/hr					
7:00 a.m.	867	67	NO	NO	NO	NO	NO
8:00 a.m.	980	56	NO	NO	NO	NO	NO
11:00 a.m.	681	13	NO	NO	NO	NO	NO
12:00 p.m.	693	26	NO	NO	NO	NO	NO
2:00 p.m.	663	24	NO	NO	NO	NO	NO
3:00 p.m.	774	24	NO	NO	NO	NO	NO
4:00 p.m.	898	27	NO	NO	NO	NO	NO
5:00 p.m.	989	39	NO	NO	NO	NO	NO

	Background Conditions		**Warrant 1**			**Warrant 2**	**Warrant 3**
	Major Street	Minor Street	Condition A	Condition B	Condition A/B		
Start	veh/hr	veh/hr					
7:00 a.m.	947	73	NO	NO	NO	NO	NO
8:00 a.m.	1071	61	NO	NO	NO	NO	NO
11:00 a.m.	744	14	NO	NO	NO	NO	NO
12:00 p.m.	757	28	NO	NO	NO	NO	NO
2:00 p.m.	724	26	NO	NO	NO	NO	NO
3:00 p.m.	846	26	NO	NO	NO	NO	NO
4:00 p.m.	981	30	NO	NO	NO	NO	NO
5:00 p.m.	1081	43	NO	NO	NO	NO	NO

	Full Buildout		**Warrant 1**			**Warrant 2**	**Warrant 3**
	Major Street	Minor Street	Condition A	Condition B	Condition A/B		
Start	veh/hr	veh/hr					
7:00 a.m.	1021	84	NO	YES	NO	NO	NO
8:00 a.m.	1145	84	NO	YES	NO	YES	NO
11:00 a.m.	818	14	NO	NO	NO	NO	NO
12:00 p.m.	831	28	NO	NO	NO	NO	NO
2:00 p.m.	873	26	NO	NO	NO	NO	NO
3:00 p.m.	995	26	NO	NO	NO	NO	NO
4:00 p.m.	1130	73	NO	NO	NO	NO	NO
5:00 p.m.	1230	73	NO	NO	NO	NO	NO

Date: December 17, 2018

Project Name: Heritage Woods Subdivision

To: MPC and Knox County Engineering & Public Works

Subject: TIS Comment Response Document for Heritage Woods Subdivision Traffic Impact Study Review Comments Dated December 11, 2018.

Dear MPC and Knox County staff,

The following comment response document is submitted to address comments dated December 11, 2018:

1. **Reviewer Comment:** In the Executive Summary (page 3) second paragraph, the Heritage Woods Subdivision not only ties into Heritage Lake Boulevard but it will also tie into the main street serving the previously approved Westland Oaks Subdivision to the west. Please include this in the discussion.

   Response: Revised Executive Summary (page 3) second paragraph to read. "The proposed roadway connection for the Heritage Woods Subdivision will tie into both Heritage Lake Boulevard and to the main roadway for the Westland Oaks Subdivision, which has an approved concept plan for 74 single family housing lots."

a. **Reviewer Comment:** Please include the eastbound approach discussion on Level-of-Service (LOS) in the last paragraph of this page.

   Response: There is no measured delay per the HCS7 reports for the eastbound approach at the intersection of Westland Drive at Westland Oaks Roadway.

b. **Reviewer Comment:** On page 4 second paragraph, please expand upon reasoning of why FMA does not recommend an additional westbound turn lane to be built on Westland Drive. Are there trips from the rear of the Westland Oaks Subdivision that would mainly use the Heritage Lake Boulevard access to Westland Drive?

   Response: Added the following to the executive summary. "FMA does not recommend an additional westbound turn lane be built on Westland Drive. FMA assumed that approximately 50% of the westbound entering traffic from the Westland Oaks Subdivision would enter at the intersection with Heritage Lake Boulevard. The existing left turn lane on Westland Drive at the intersection with Heritage Lake Boulevard has adequate storage to handle the additional traffic from both the Westland Oaks and Heritage Woods Subdivisions. The unsignalized intersection capacity analyses for the full buildout of both subdivisions shows a 95%

queue length for the westbound left turn lane of less than one car length during both the AM and PM peak hours."

2. **Reviewer Comment:** Please update the site plan (page 7) to the current one submitted for review for the January 10, 2019 Planning Commission meeting, which shows the proposed subdivision of the entire site (to include the Westland Oaks and Heritage Lake Boulevard Subdivisions).

   Response: Update Figure 2 – Site Plan.

3. **Reviewer Comment:** On page 8, correct "with a left turn lane with a 225-foot storage length and a 135-foot taper" to "with a left-turn lane of 225 feet storage length and 135 feet taper".

   Response: Revised page 8.

a. **Reviewer Comment:** The last sentence should read "existing intersections" since this proposed development has two access points. Also, please add the aerial photo of the main street serving Westland Oaks Subdivision at Westland Drive to Attachment 1.

   Response: Added a KGIS aerial to Attachment 1 of the Westland Oaks Roadway under construction and revised the last sentence to read "existing intersections."

4. **Reviewer Comment:** Page 9 third paragraph should read "Heritage Lake Development: 262 apartment units, 20 single family…."

   Response: Revised page 9 third paragraph to read "As of November 2018, the following has been built within the Heritage Lake Development: 262 apartment units, 20 single family housing units, 51,000 SF Cornerstone Church and a 11,900 SF Law Office.

5. **Reviewer Comment:** On page 14 third paragraph, the report mentioned the use of existing traffic volumes to determine the traffic generated by the Hamilton Place Subdivision. Why was a turning movement count not used? If equipment broke or something else took place, please explain.

   Response: Added the following to the second paragraph on page 14. "Due to an equipment malfunction FMA estimated the traffic generated at the intersection of Westland Drive at Hamilton Ridge Lane instead of collecting the data using a traffic counting device."

6. **Reviewer Comment:** On page 26 Section 7, the report discusses that a signal warrant analysis was used to evaluate the intersection of Westland Drive at Heritage Lake Boulevard, but there was no discussion on if a signal was warranted or not. Please add.

Response: Added the following to Section 7 "The intersection of Westland Drive at Heritage Lake Boulevard does not meet any of the conditions for Warrant 1, Eight-Hour Vehicular Volume, Warrant 2, Four-Hour Vehicular Volume or Warrant 3, Peak Hour and therefore does not warrant a traffic signal for any of the existing, background or full buildout conditions."

7. **Reviewer Comment:** The TDOT count station #437 in the Attachments had a 2018 year in the graph, but the data only shows up to 2017. Was this added by accident? I do not believe TDOT has published their 2018 traffic count data.

   Response: I printed a revised graph for the TDOT count station #437 located in Attachment 4. There were no changes to the TDOT data or background growth.

8. **Reviewer Comment:** Please include an evaluation of the sight distance at the Westland Oaks Subdivision and Heritage Lake Subdivision entrances along Westland Drive, and include the internal streets of the new subdivision.

   Response: The sight distance for Westland Oaks was in the report stamped 11/26/18 under Existing Conditions. "Westland Oaks has a proposed roadway connection to Westland Drive that is currently under construction. The sight distance at this intersection was measured in April 2017 prior to the approval of the concept plan. The required sight distance on a road with a speed limit of 40 mph is 400 feet. The measured sight distance at this intersection was 450 feet westbound and greater than 450 feet eastbound."

   I added the sight distance for Westland Drive at Heritage Lake Boulevard to the Existing Site Conditions second paragraph "The measured sight distance at the intersection with Westland Drive is 425 feet eastbound and greater than 500 feet westbound."

   I also added an evaluation of the intersection of Heritage Lake Boulevard at Heritage Woods Road "C" to the Conclusions and Recommendations Section 8.4 Heritage Woods Road "C"

   "The minimum required sight distance for a road with a posted speed limit of 25 mph is 250 feet in each direction in accordance with the "Subdivision Regulations" for Knoxville and Knox County. FMA measured the sight distance at the proposed intersection of Heritage Lake Boulevard at Heritage Woods Road "C". At 15 feet from the edge of pavement the sight distance at the proposed intersection is greater than 250 feet northbound and southbound; however, the northbound sight distance is partially blocked due to the existing overgrowth conditions.

   FMA recommends that the sight distance be re-evaluated in the field after the completion of the proposed Heritage Woods Subdivision to ensure that the sight

distance complies with the requirements for Knox County Engineering and Public Works. FMA also recommends any landscaping be installed so as to maintain the sight distance and continue to comply with Knox County Engineering and Public Works."

Sincerely,

Addie Kirkham, P.E.