

**SHANNON VALLEY FARM
CONDOMINIUMS
KNOX COUNTY, TENNESSEE**

TRAFFIC IMPACT STUDY

Prepared For:
**SOUTHLAND ENGINEERING
CONSULTANTS, INC**

Prepared By:



ENGINEERS
PLANNERS
ECONOMISTS

Wilbur Smith Associates

June 2006

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Prepared for

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June 2006

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Project No. 100434

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INTRODUCTION

This traffic impact study was commissioned to address the impact of a proposed residential development within Knox County. The study of this development required the collection of traffic data, generation of anticipated traffic volumes from the proposed site, development of future traffic volumes from both normal growth and the site, analysis of the resulting traffic conditions, and the development of measures necessary to mitigate traffic impacts of normal traffic growth and the proposed development. Methods and procedures utilized in the study are those required for a Level 1 traffic impact study as adopted by the Knoxville/Knox County Metropolitan Planning Commission.

Project Description

The proposed project is a residential development adjacent to Murphy Road and Luttrell Road. The site is approximately 29 acres with a PR and RB zoning. The proposed development will subdivide the property for 143 multi-family or “attached single-family” units. Murphy Road will provide access for the condominium site with a proposed street intersecting Murphy Road at the vacated Shannon Valley Drive intersection. Figure 1 is the proposed site plan.

Site Location

The location of the site is west of Murphy Road between Washington Pike to the south and Tazwell Pike (S.R. 139) to the north. The site is in Knox County, northeast of the Knoxville central business district (CBD). The adjacent land use is residential in character. Figure 2 illustrates this location relative to local and regional access.

LOCAL AND REGIONAL ACCESS

Local Access

Site access is a proposed street to Murphy Road. Murphy Road is a north and south facility extending between Tazwell Pike (S.R. 139) and Washington Pike. The 2005 average weekday traffic (AWT) for Murphy Road is approximately 7,810.

SITE PLAN

Shannon Valley Farms Condominiums

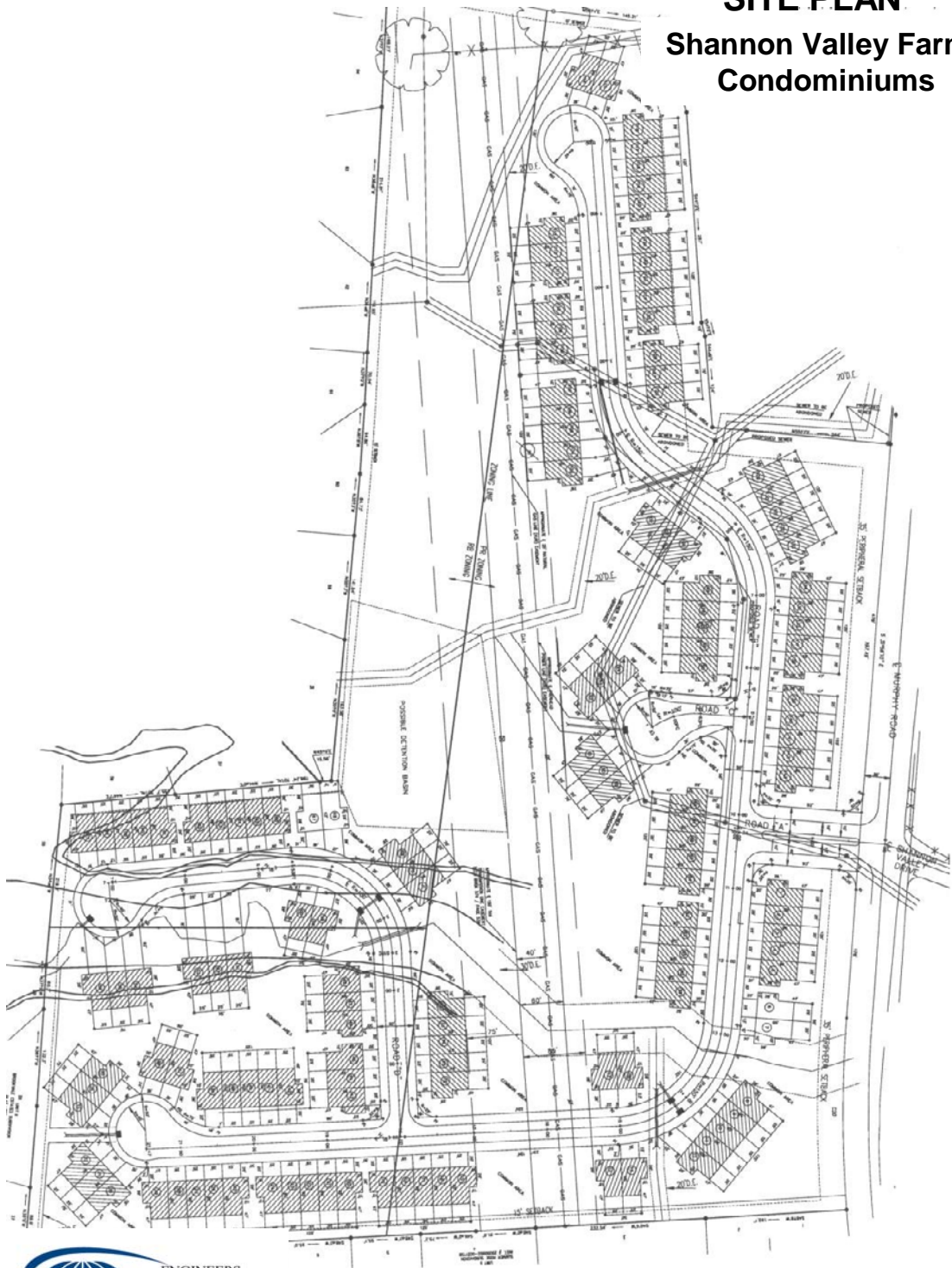


Figure 1

VICINITY MAP Shannon Valley Farms Condominiums

SITE

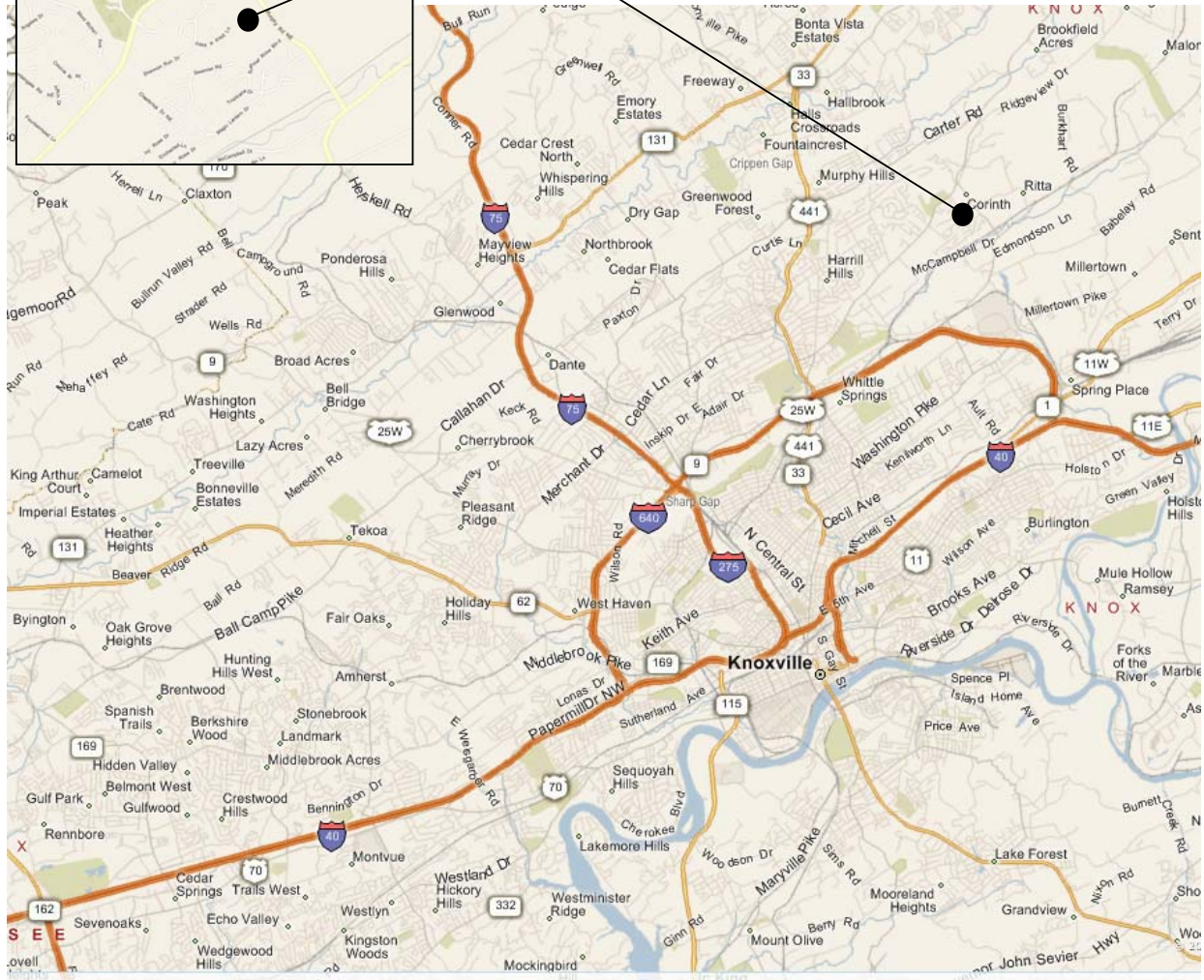


Figure 2

Regional Access

To the south Washington Pike provides regional access to Interstate 640. This Interstate access is from Washington Pike to the west and Millertown Pike to the south. Washington Pike has a 2005 average daily traffic (ADT) of approximately 9,380. Tazwell Pike (S.R. 331) is a northeast and southwest secondary state route with an ADT of 15,050. To the southwest, Tazwell Pike intersects Broadway (U.S. 441) and I-640.

Interstate 640/75 connects to I-40 east and west of the Knoxville CBD and becomes I-75 to the west. Interstate 40 is an east and west facility extending between Nashville, Tennessee and Asheville, North Carolina. The approximate 2005 ADT for I-40/75 west of I-640/75 is 154,660. To the east of I-640, I-40 has an ADT of 102,310. Interstate 75 with extends north to Lexington, Kentucky, and to the west, I-75 turns south to Chattanooga, Tennessee.

EXISTING TRAFFIC CONDITIONS

Existing Traffic Control

Currently traffic control within the study vicinity consists of traffic signals at the intersections of Murphy Road at Washington Pike and at Tazwell Pike. Adjacent intersections to Murphy Road are unsignalized. Murphy Road has a posted speed limit of 40mph.

Existing Traffic Volumes

This traffic impact study addresses the intersection of Murphy Road at the proposed access street for the site. A peak hour turning movement count was conducted for the intersection of Murphy Road and Shannon Valley Boulevard, located north of the proposed site access. Peak-hour counts were conducted for 7:00-9:00AM and 3:00-6:00PM. A 2005 AWT was found to be approximately 7,810. Figure 3 illustrates the adjacent street traffic volumes.

2006 EXISTING TRAFFIC
Shannon Valley Farm
Condominiums



LEGEND
XXX AM PEAK
(XXX) PM PEAK



Figure 3

BACKGROUND TRAFFIC CONDITIONS

Background traffic is traffic that can be anticipated regardless of the proposed development. Traffic within the study area should continue to grow due to other development as well as the continued growth through the study area. This background traffic is projected for the purpose of establishing a baseline.

Background Traffic Volumes

Previous studies conducted by WSA in the vicinity of this site determined an approximate 4.5-percent growth rate. Therefore, for the purpose of this study, background traffic was projected for the year 2010 using a 4.5-percent annual compounded growth rate. Completion of this development will depend largely upon market considerations; however, a four-year build-out seems reasonable.

In addition to a background growth rate, the Shannon Valley Farm subdivision, located east of Murphy Road and currently under construction was considered. It was estimated that 20-percent of the subdivision is occupied; therefore, 80-percent of the planned subdivision trips from a previous study was redistributed to Murphy Road. Its planned southern access street should be opposite the proposed access for the condominiums.

Background traffic was, therefore, obtained by growing existing traffic by a total of 19.3 percent and adding the redistribution of 80-percent of the Shannon Valley Farm subdivision projected trip generation. Figure 4 illustrates the resulting 2010 background traffic.

Background Capacity and Level of Service

In order to evaluate the current operations of the traffic control devices, capacity and level of service were calculated using the **2000 Highway Capacity Manual, Special Report 209** published by the Transportation Research Board (TRB). Unsignalized intersections are evaluated based on estimated intersection delays, which may be related to levels of service (LOS). Level of service and capacity are the measurements of an intersection's ability to accommodate traffic volumes. Levels of service for intersections range from A to F. A LOS A is the best, and LOS F is failing.

2010 BACKGROUND TRAFFIC

Shannon Valley Farm Condominiums



LEGEND
XXX AM PEAK
(XXX) PM PEAK



Figure 4

Unsignalized intersections levels of service have lower thresholds of delays than traffic signals. An unsignalized LOS of F exceeds an estimated delay of 50 seconds. For urban arterials, minor approaches may frequently experience levels of service E. A full level of service description for unsignalized intersections is presented in Table 1.

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

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

SOURCE: Highway Capacity Manual, TRB Special Report 209

The planned southern access for the Shannon Valley Farm subdivision which should align with the proposed condominium site access was found to operate at an acceptable LOS. The westbound subdivision approach was determined to have a LOS D for the background year of 2010. Table 2 presents the capacity and LOS findings.

TABLE 2. 2010 BACKGROUND TRAFFIC CAPACITY AND LEVEL OF SERVICE

INTERSECTION	TRAFFIC CONTROL	PEAK PERIOD	V/C	DELAY	LOS
Murphy Road & Shannon Valley Drive	STOP	AM	0.38	31.8	D
	WB	PM	0.20	27.6	D

Note: Average vehicle delay estimated in seconds.

PROJECT IMPACTS

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

Trip Generation

Project traffic for the condominium development was determined using local trip generation rates adopted by the Knoxville-Knox County Metropolitan Planning Commission in July of 2000 for multi-family developments. Local trip rates were studied in accordance with the publication, **Trip Generation, 6th Edition**. The **Trip Generation** reference is published by the Institute of Transportation Engineers (ITE) and represents national data collected for many different land uses including industrial, residential, and commercial uses. Table 3 presents the trip generation of this proposed site.

TABLE 3. TRIP GENERATION

LAND USE	L.U.C.	Units	DAILY TRIPS	AM PEAK		PM PEAK	
				ENTER	EXIT	ENTER	EXIT
Condominiums	230	143	1,316	16	58	58	48

Knoxville/Knox Co. MPC trip rates adopted in July of 2000

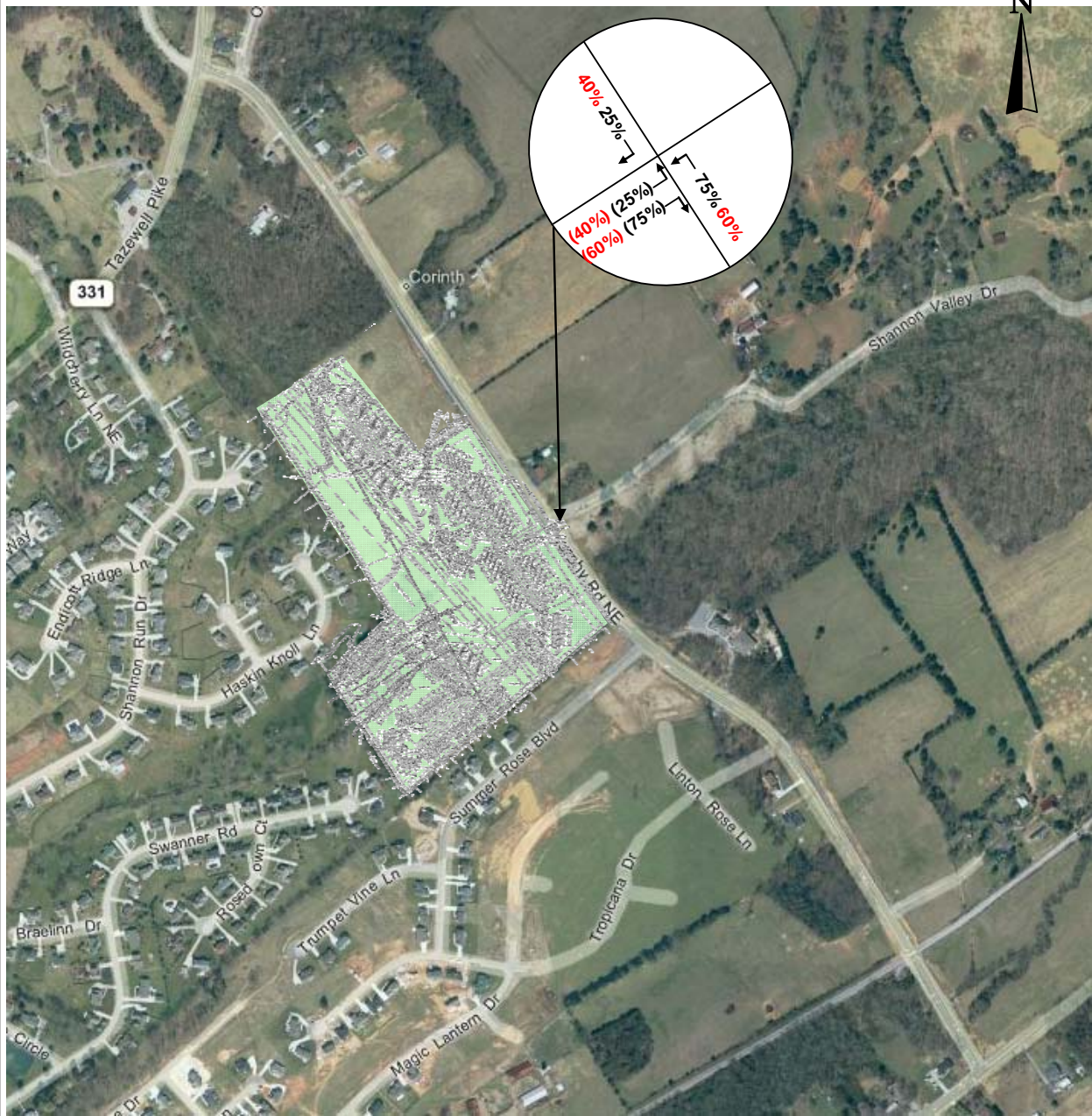
Trip Distribution and Assignment

Using the TMC count conducted for Murphy Road and Shannon Valley Boulevard, residential development characteristics, and the local and regional roadway network, generated trips are distributed to the adjacent street during the AM peak hour with 75-percent distributed to the south and 25-percent to the north. For the PM peak hour 60-percent is distributed south and 40-percent north. Figure 5 illustrates this distribution and assignment.

Project Traffic Volumes

By multiplying the trips generated by the distribution percentages, the project traffic volumes are determined. Figure 6 illustrates the resulting project traffic volumes associated with the proposed project.

TRIP DISTRIBUTION AND ASSIGNMENT Shannon Valley Farm Condominiums



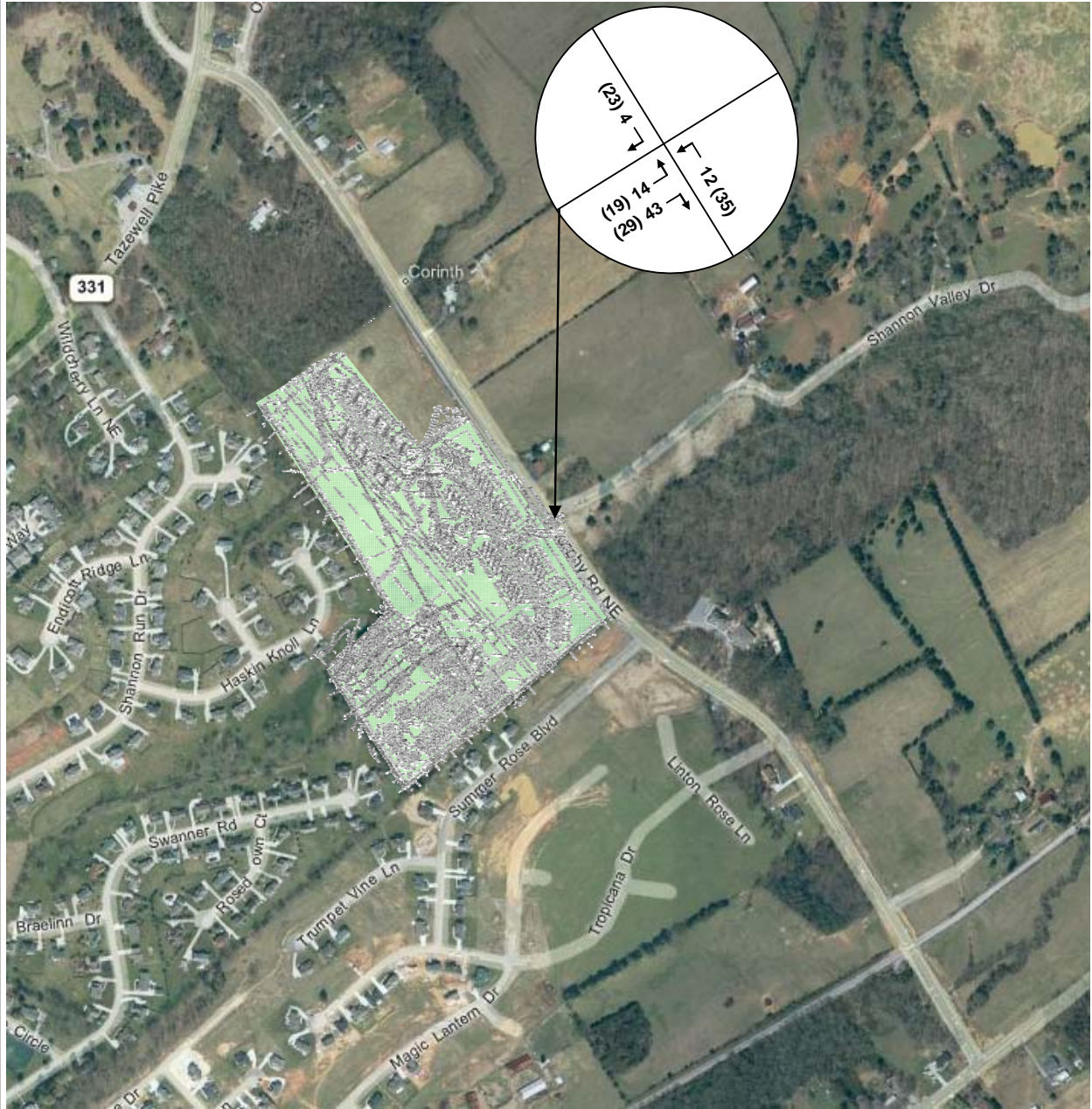
LEGEND
 XXX AM ENTERING TRIPS
 (XXX) AM EXITING TRIPS
 XXX PM ENTERING TRIPS
 (XXX) PM EXITING TRIPS



Figure 5

PROJECT TRIPS

Shannon Valley Farm Condominiums



LEGEND
XXX AM PEAK
(XXX) PM PEAK



Figure 6

Total Projected Traffic Volumes

Background and project traffic volumes were added together to develop post-development traffic volumes for the year 2010. Figure 7 illustrates this 2010 projection. Using these projections, mitigation measures including traffic control devices and roadway and intersection geometry can be evaluated. The requirements of left- and right-turn lanes were evaluated using the criteria adopted by the MPC.

Auxiliary Lane Evaluation

Using the Knox County policy for turn lane requirements, found in the Knox County's **Access Control and Driveway Design Policy**, projected traffic volumes for the proposed street were evaluated for the need to provide auxiliary lanes. The Knox County policy for left-turn lanes is based on the **Highway Research Record** report titled, *Volume Warrants for Left-turn Storage Lanes at Unsignalized Grade Intersections*, by M.D. Harmelink, and an extrapolation of that report by Knox County. The evaluation indicates that right- turn lanes are not necessary but would warrant left-turn lanes for the proposed intersection with Murphy Road. The left-turn volumes of 35 and 25; advancing minimum volumes of 500 and 392; and an opposing traffic volume of 392 and 535 would justify left-turn lanes for the northbound and southbound approaches of Murphy Road, respectively.

Projected Capacity and Level of Service

The development of the site has a manageable impact on the proposed intersection with Murphy Road. The projected capacity and LOS for the proposed residential street intersection with Murphy Road and development of 143 multi-family units is presented in Table 4. Results conclude that the study intersection would operate at an acceptable level of service for projected traffic volumes. With the proposed condominium development, the westbound approach LOS may be reduced to an E. Table 5 summarizes the analyses for background and projected traffic conditions.

TABLE 4. 2010 PROJECTED TRAFFIC CAPACITY AND LEVEL OF SERVICE

INTERSECTION	TRAFFIC CONTROL	PEAK PERIOD	V/C	DELAY	LOS
Murphy Road & Shannon Valley Drive	STOP	AM	0.10 / 0.48	16.6 / 39.2	C / E
	EB/WB	PM	0.11 / 0.23	16.9 / 25.6	C / D

Note: Average vehicle delay estimated in seconds.

2010 PROJECTED TRAFFIC Shannon Valley Farm Condominiums



LEGEND
XXX AM PEAK
(XXX) PM PEAK



Figure 7

**TABLE 5
CAPACITY AND LEVEL OF SERVICE
SUMMARY**

INTERSECTION	TRAFFIC CONTROL	PEAK PERIOD	2010 BACKGROUND TRAFFIC			2010 PROJECTED TRAFFIC		
			V/C	DELAY	LOS	V/C	DELAY	LOS
Murphy Road & Shannon Valley Drive	STOP	AM	0.38	31.8	D	0.10 / 0.48	16.6 / 39.2	C / E
	EB/WB	PM	0.20	27.6	D	0.11 / 0.23	16.9 / 25.6	C / D

Note: Average vehicle delay estimated in seconds.

Sight Distance

The project is proposed to access Murphy Road, which has a posted limit of 40mph. Sight distance was measured using the criteria published by the American Association of State Highway and Transportation Officials (AASHTO). Measured sight-distance for the proposed residential street at Murphy Road exceeds 600 feet to the south and is approximately 410 feet to the north. The speed limit of 40mph requires a minimum sight-distance of 305 feet to meet the minimum stopping sight-distance for AASHTO and 400 feet to meet the adopted Knox County minimum corner sight-distance standard. Therefore, the measured sight-distance is more than adequate for safe egress from the proposed development.

RECOMMENDATIONS

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

- Minimize landscaping, using low growing vegetation, and signing at the proposed street access to insure that safe sight distance is maintained.
- Use a minimum intersection radius of 35-foot for the efficient and safe ingress and egress of the site.
- Post STOP signs (R1-1) at the proposed residential streets at Murphy Road.
- Intersection design should conform to the recommended standards and practices of the American Association of State Highway and Transportation Officials, the Institute of Transportation Engineers, and the Knox County Engineering and Public Works Department.
- Provide 75-foot northbound and southbound left-turn lanes for Murphy Road to the proposed site access and the proposed Shannon Valley Drive.

CONCLUSION

The study of this proposed residential development evaluated the projected traffic conditions with and without the proposed condominium site. Background traffic was determined using a 4.5-percent annual compounded growth rate until the horizon year 2010 and included the trip redistribution of 80-percent of the Shannon Valley Farm subdivision currently under construction. Traffic associated with the proposed project was then generated and distributed to the proposed site access. Using the identified turning movements for the projected traffic conditions, unsignalized capacity and level of service analyses were conducted using the **2000 Highway Capacity Manual**. Unsignalized levels of service are found to be acceptable for the projected traffic conditions. The evaluation of the sight-distance for the proposed intersection was found to exceed that required for a 40mph. An evaluation for the requirement of left- and right-turn lanes using the Knox County policy determined that auxiliary right-turn lanes would not be necessary for the projected traffic volume, but left-turn lanes would be required. Therefore, with the recommendations of this report, the efficient and safe flow of traffic should be maintained with the development of the proposed condominiums.

APPENDIX

Trip Generation

Shannon Valley Farm Subdivision Trips

HCS Unsignalized Analyses

Knox County Turn Lane Volume Thresholds

Traffic Count Data

