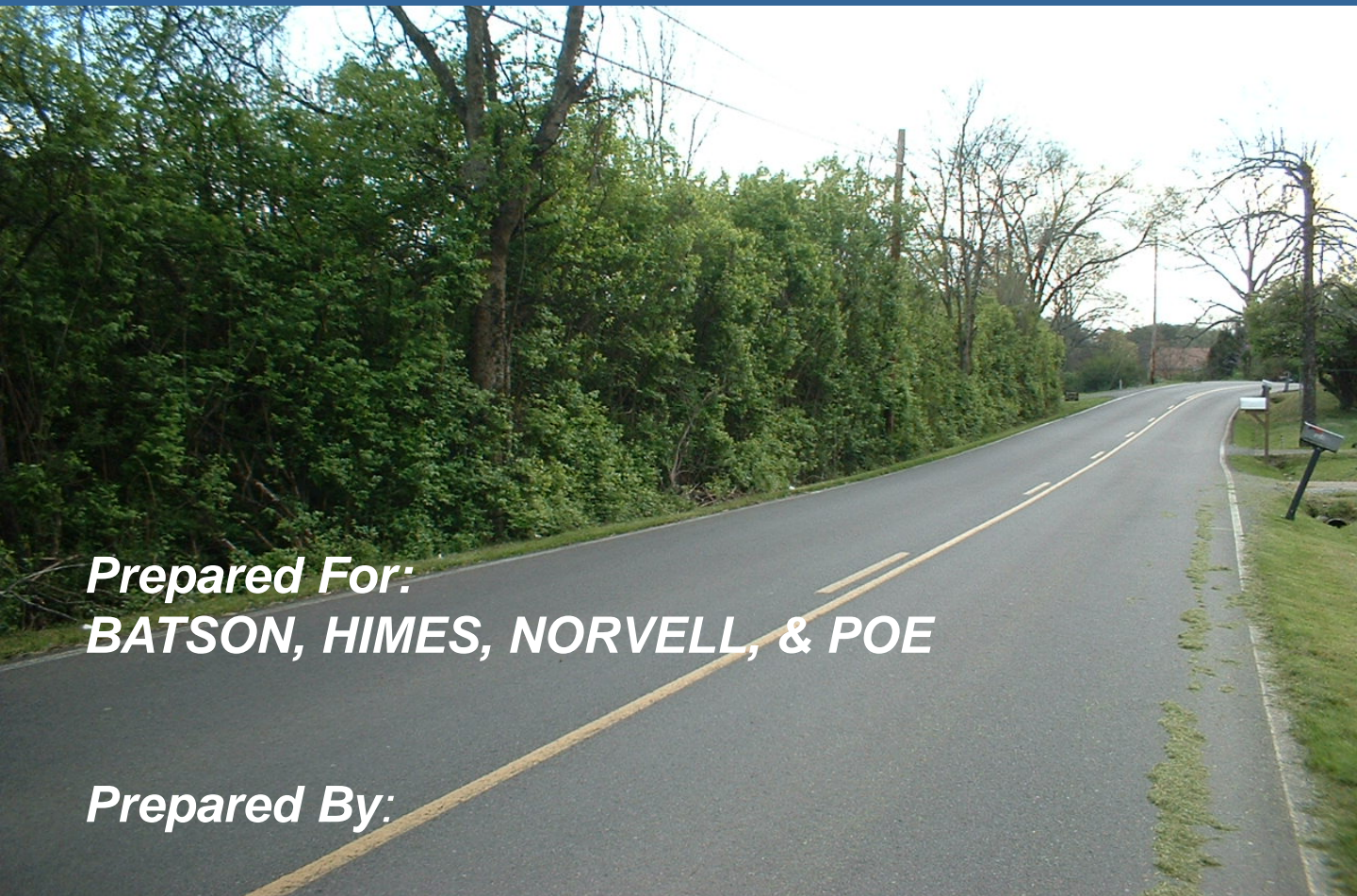


# ***WHELAHAN FARM Knox County, Tennessee***

## **Traffic Impact Study**



***Prepared For:  
BATSON, HIMES, NORVELL, & POE***

***Prepared By:***



**Wilbur Smith Associates**

**April 2005**

**WHELAHAN FARM**  
KNOX COUNTY, TENNESSEE

**TRAFFIC IMPACT STUDY**

Prepared for

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April 2005

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## **INTRODUCTION**

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Wilbur Smith Associates (WSA) is pleased to submit this report to address any traffic impact and access of a residential development located on Babelay Road in northeast Knox County. The basis for this study required the collection of traffic data, generation of anticipated traffic volumes for the proposed site and development of projected traffic volumes for normal growth and from the potential site. Analyses of the resulting traffic projections were conducted to determine the capacity and levels of service for the site access to Babelay. This study will evaluate the development's impact and determine if any mitigation measures are necessary to minimize the traffic impact including improved roadway geometrics and traffic control devices.

### **Project Description**

The proposed project is a residential development. The development is approximately 155 single-family units on approximately 58.11 acres. The site access is to Babelay from a proposed residential street. Figure 1 shows the proposed site plan.

### **Site Location**

The location of the proposed residential development is south of Babelay Road in northeast Knox County, Tennessee. Figure 2 illustrates the site location relative to local and regional access.

# SITE PLAN

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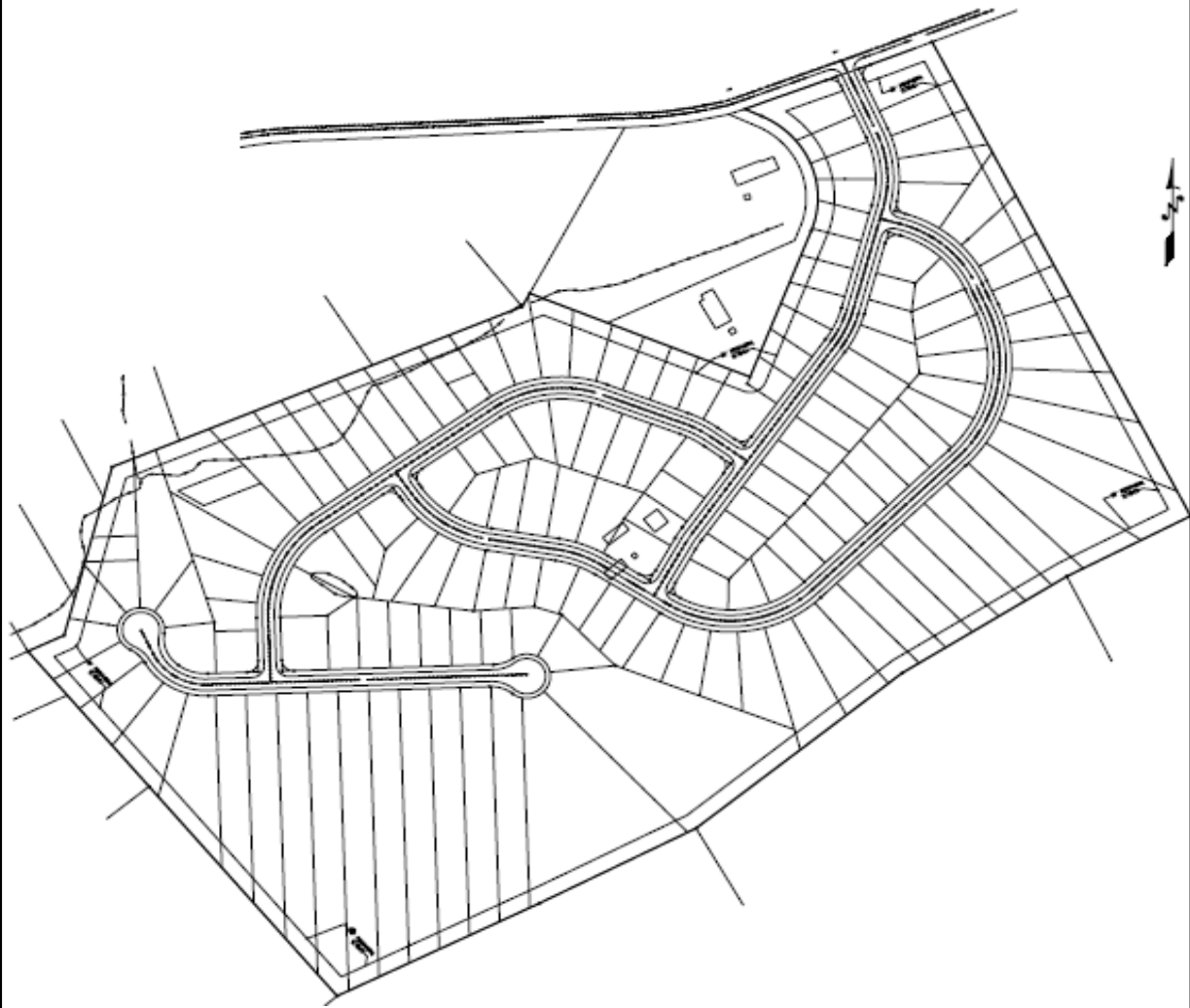


Figure 1

# PROJECT VICINITY

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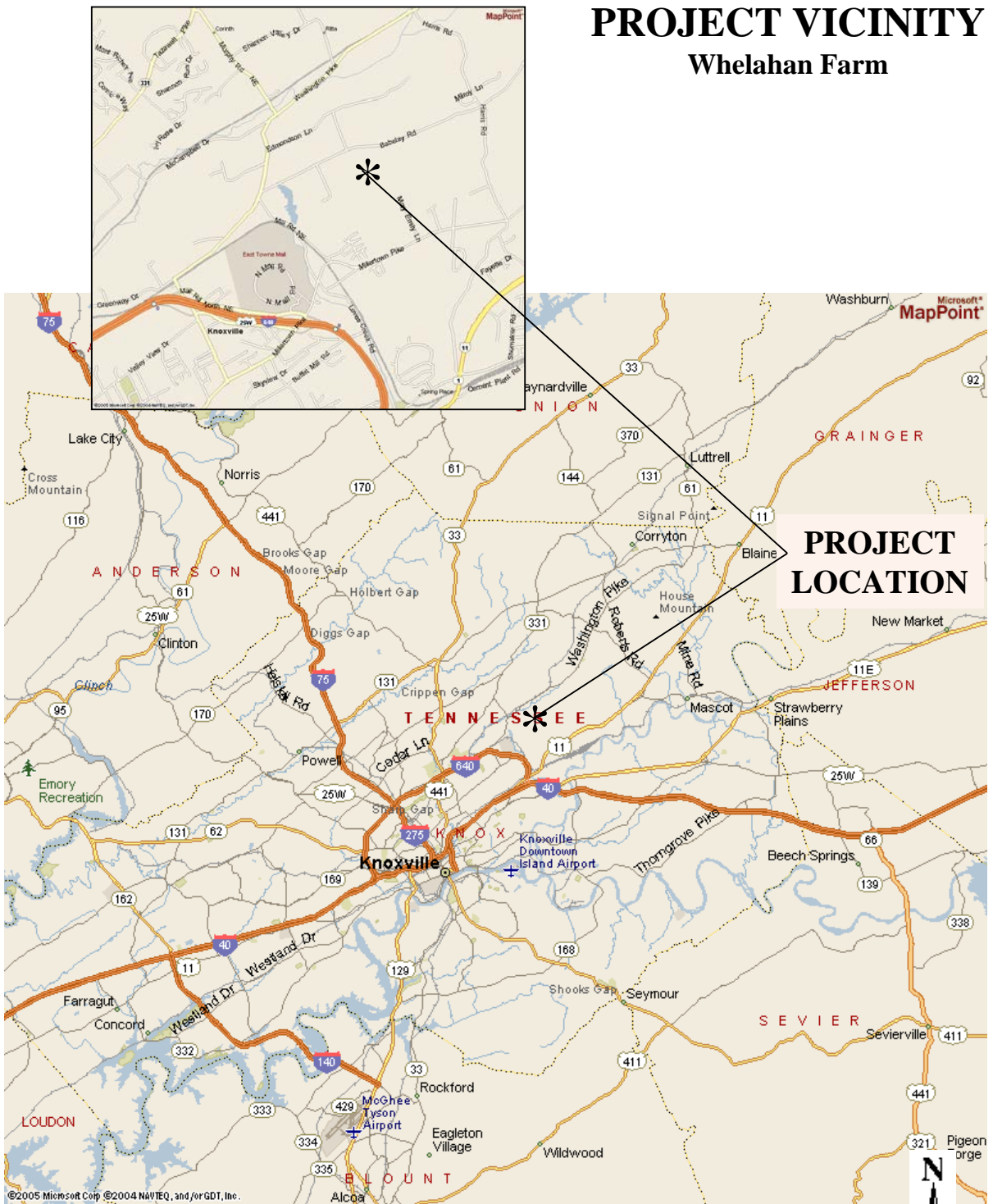


Figure 2

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## LOCAL AND REGIONAL ACCESS

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### Local Access

The proposed development will access Babelay Road, a 2-lane approximate 20-foot classified Knox county minor collector. Adjacent to the site, the 2005 average daily traffic (ADT) is approximately 920. Babelay Road extends east and west adjacent to the site. To the west, Babelay Road intersects Washington Pike where the intersection and the adjacent intersection of Mill Road are currently being improved by the County. Babelay Road intersects Bud McMillan Road to the east.

### Regional Access

To the southwest, Washington Pike provides regional access to Interstate 640. Washington Pike has a 2003 average daily traffic (ADT) of approximately 14,050. Interstate 640 may also be access to the south using Mill Road to Millertown Pike. North of Washington Pike, Tazewell Pike (S.R. 331) is a northeast and southwest, 2-lane, secondary state route with an ADT of 11,280. To the southwest, Tazewell Pike intersects Broadway (U.S. 441) and I-640. Tazewell Pike may be accessed using Murphy Road northeast of the site or Greenway Drive southwest of the site.

Interstate 640 connects to I-40 east and west of the Knoxville CBD and becomes I-75 to the west. Interstate 640, east of Washington Pike, has a 2003 ADT of 38,660. Interstate 40 is an east and west facility extending between Nashville, Tennessee, and Asheville, North Carolina. The approximate 2003 ADT for I-40/75 west of I-640 is 152,130. To the east of I-640, I-40 has an ADT of 101,080. Interstate 75 extends north to Lexington, Kentucky, and to the west, I-75 turns south to Chattanooga, Tennessee.



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## **EXISTING TRAFFIC CONDITIONS**

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### **Existing Traffic Control and Speed**

Street approaches to Babelay Road in the project vicinity are STOP controlled. The posted speed limit for Babelay Road is 30mph.

### **Existing Traffic Volumes**

WSA conducted a 24-hour mechanical count on Babelay Road at the proposed residential street intersection in early April of 2005. The AM and PM peak hours are found between 6:45a.m. to 7:45a.m. and 4:15p.m. to 5:15p.m. Figure 3 presents the AM and PM peak-hour traffic volumes at the proposed intersection location of the proposed residential street

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## **BACKGROUND TRAFFIC CONDITIONS**

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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.

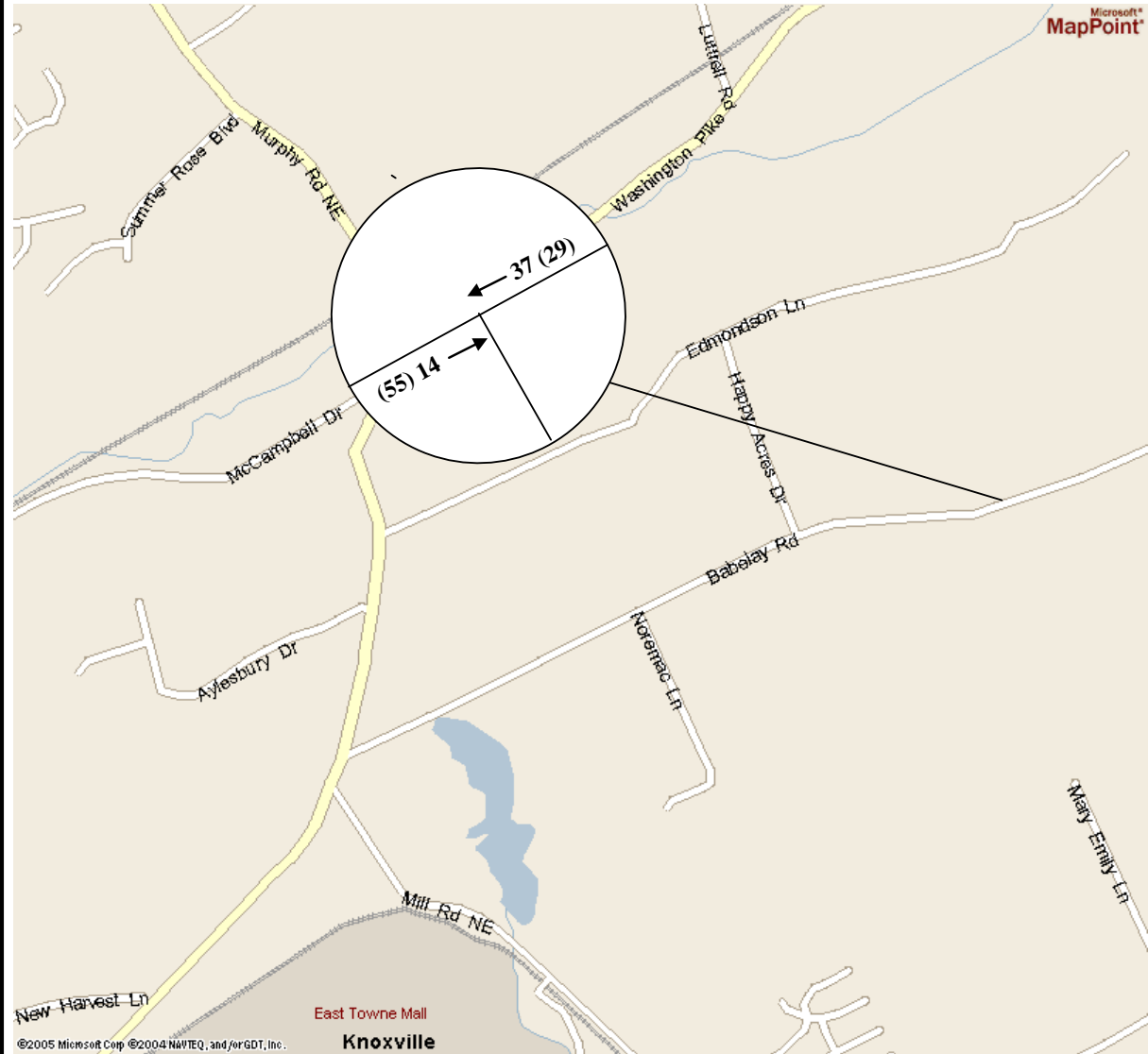
### **Background Traffic Volumes**

Historical TDOT traffic data is reviewed to determine traffic growth trends in the study area. U.S. 70 has experienced an approximate 2.3-percent growth rate over the past ten years. Peak-hour turning movement counts (TMC) conducted in 1999 for several Advance Planning Reports (APR) prepared for the City of Knoxville for the Knoxville Center area, including Millertown Pike, Washington Pike, and Tazewell Pike, were compared with the counts conducted for this impact study. The peak-hour growth is found to vary with growth rates between 5 and 15 percent. The annual rate of growth utilized in the APRs developed for Washington Pike was 7.5-percent. Background traffic volumes are, therefore, developed assuming an annual compounded growth rate of 7.5-percent. Background traffic is projected for the year 2010. Buildout of the site is planned in the next few years. Actual bailout, however, will depend largely on the housing market. Therefore the horizon year of 2010 seems reasonable.

Figure 4 presents the resulting Year 2010 AM and PM peak-hour traffic volumes without the proposed development.

# 2005 EXISTING TRAFFIC

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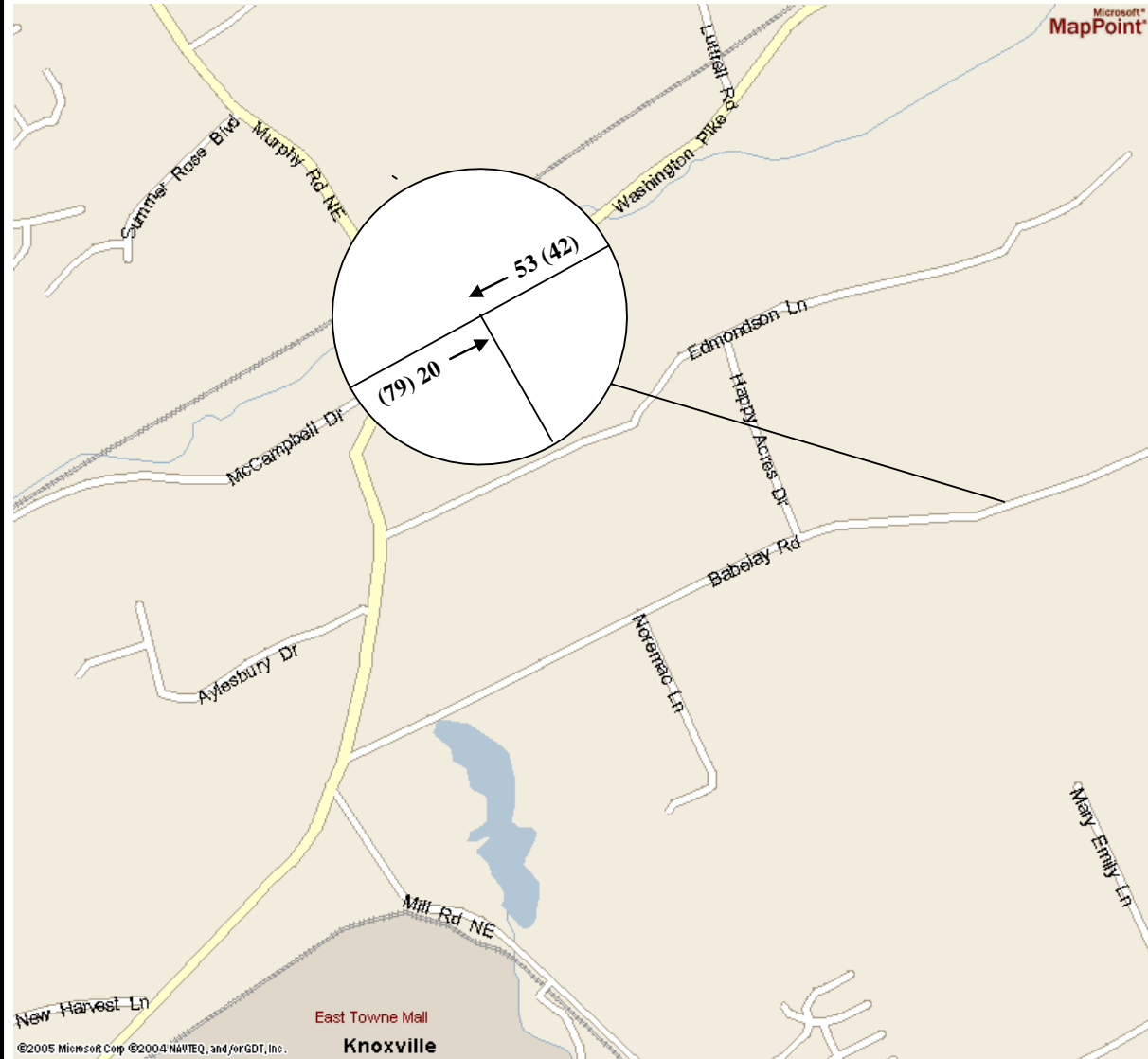
**LEGEND**  
XXX AM PEAK  
(XXX) PM PEAK



Figure 3

# 2010 BACKGROUND TRAFFIC

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**LEGEND**  
XXX AM PEAK  
(XXX) PM PEAK



Figure 4

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## PROJECT IMPACTS

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

### Trip Generation

Project traffic was determined using the publication, **Trip Generation, 7th Edition**. This reference is published by the Institute of Transportation Engineers (ITE) and represents national data collected for many different land uses including industrial, residential and commercial uses. **Trip Generation** is an essential tool in calculating the traffic, which may be generated by a proposed development. The study will generate traffic for 155 single-family units. From the trip generation calculations, the proposed site may generate approximately 1,560 daily trips. Table 1 presents the trip generation of this proposed site.

**TABLE 1. TRIP GENERATION**

LAND USE	L.U.C.	Units	DAILY TRIPS	AM PEAK ENTER	AM PEAK EXIT	PM PEAK ENTER	PM PEAK EXIT
Single Family	210	155	1,556	29	88	102	57

### Trip Distribution and Assignment

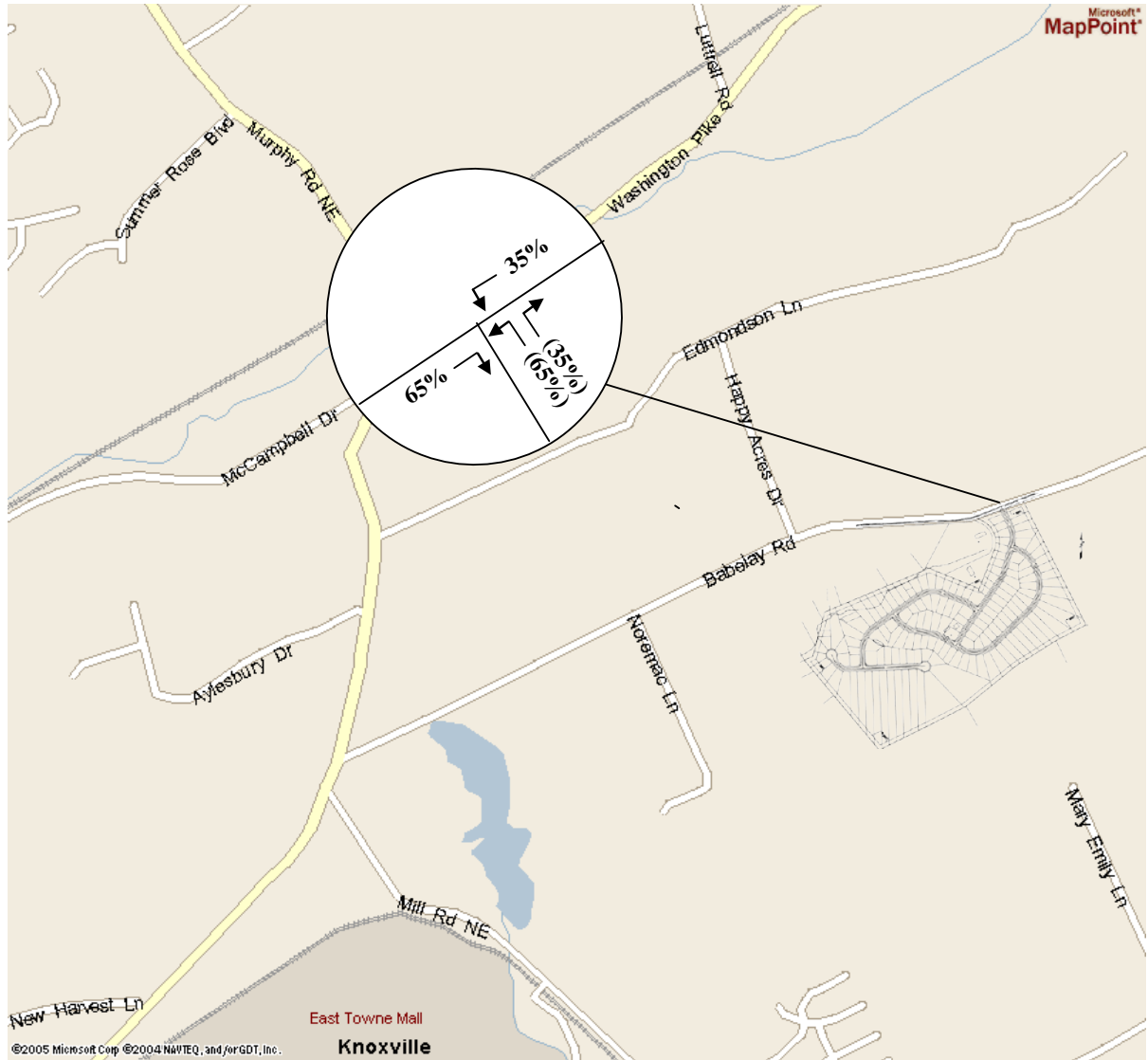
Using the mechanical count conducted for Babelay Road, residential development characteristics, and the local and regional roadway network, generated trips are distributed to the adjacent street with 65-percent distributed to the west and 35-percent to the west. Figure 5 illustrates this distribution 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

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**LEGEND**  
 XXX ENTERING  
 (XXX) EXITING



Figure 5

# PROJECT TRIPS

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**LEGEND**  
 XXX AM PEAK  
 (XXX) PM PEAK



Figure 6

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## **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 left- or right- turn lanes are not necessary. The left-turn volume of 36 is minimal with an opposing traffic volume of 145. With the opposing flow between less than 150 and an advancing flow of less than 50, a left-turn lane is not required. The right-turn volume from Babelay Road to the proposed street is 66vph and the advancing through traffic flow is less than 100vph. Therefore, a right-turn lane is not warranted using the Knox County criteria.

## **Projected Capacity and Level of Service**

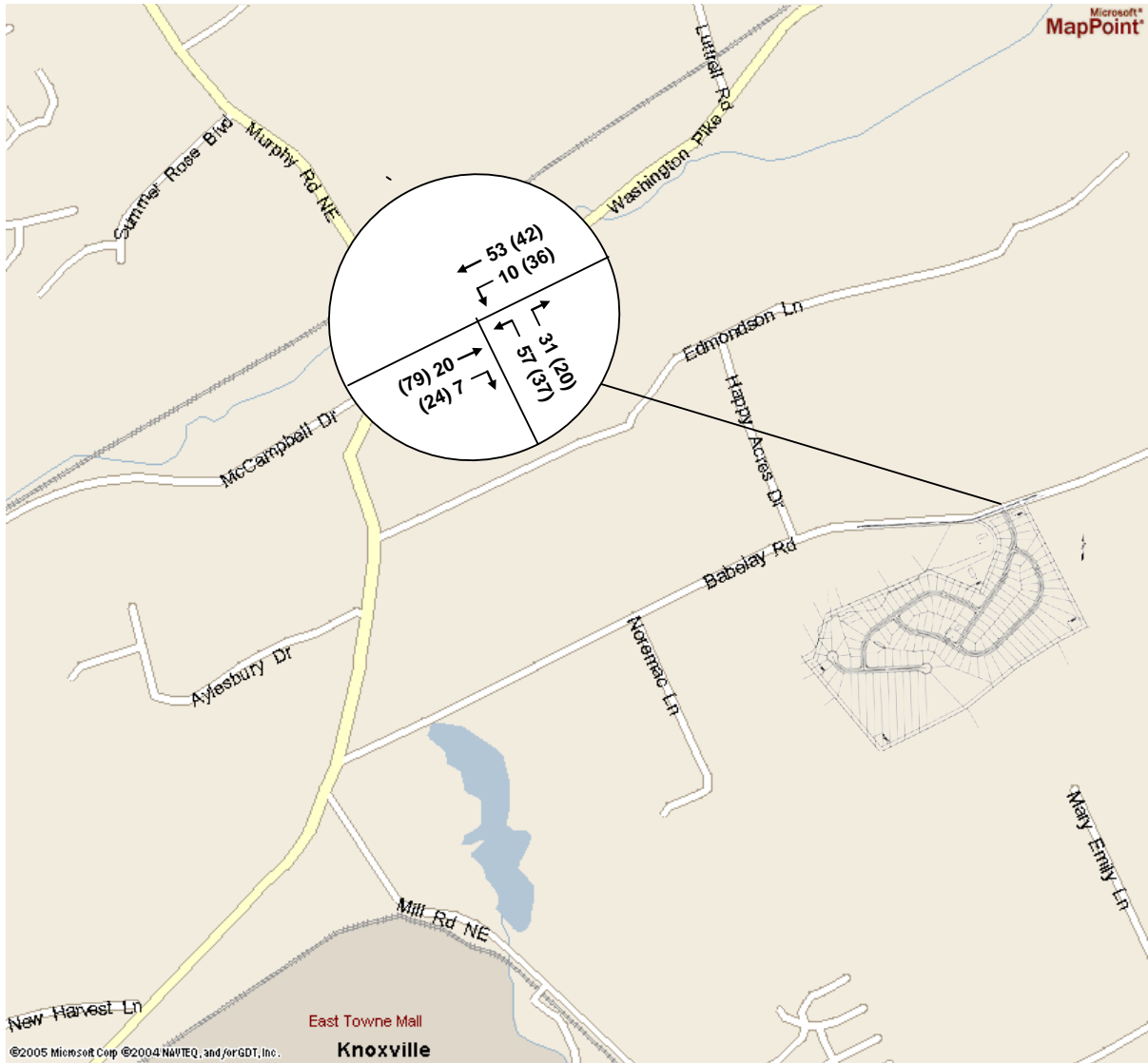
In order to evaluate the current operations of the traffic control devices, capacity and level of service were calculated using the **2000 Highway Capacity Manual, Special Report 209** published by the Transportation Research Board (TRB). Unsignalized intersections are evaluated based on estimated intersection 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.

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 2.

# 2010 PROJECTED TRAFFIC

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**LEGEND**  
 XXX AM PEAK  
 (XXX) PM PEAK



Figure 7



**TABLE 2. LEVEL OF SERVICE (LOS) DESCRIPTION  
FOR TWO-WAY STOP INTERSECTIONS**

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

**SOURCE:** Highway Capacity Manual, TRB Special Report 209

The development of the site has an insignificant impact on the proposed intersection with Babelay Road. The projected capacity and LOS for the proposed residential street intersection with Babelay Road and development of 155 single-family units is presented in Table 3. Results conclude that the study intersections would operate at a very acceptable level of service for projected traffic volumes.

**TABLE 3. 2010 PROJECTED TRAFFIC  
CAPACITY AND LEVEL OF SERVICE**

INTERSECTION	TRAFFIC CONTROL	PEAK PERIOD	V/C	DELAY	LOS
Babelay Road & Proposed Street	STOP NB/WB-L	AM PM	0.07/0.01 0.06/0.03	9.1/1.2 9.8/3.6	A/A B/A

Note: Average vehicle delay estimated in seconds. STOP control analyses presented by total minor approach and major approach left-turn.

**Sight Distance**

The project is proposed to access Babelay Road, which has a posted speed limit of 30mph. 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 Babelay Road exceeds 1,000 feet to the east and approximately 400 feet to the west.

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The speed limit of 30mph requires a minimum sight-distance of 200 feet to meet the minimum stopping sight-distance for AASHTO and 300 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

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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 30-foot for the efficient and safe ingress and egress of the site.
- Post STOP signs (R1-1) at the proposed residential street at Babelay 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.

## CONCLUSION

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The study of this proposed residential development evaluated the projected traffic conditions. Background traffic was determined using a 7.5-percent annual compounded growth rate until the horizon year 2010. 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 and signalized 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 is found to exceed that requirement for a 30mph posted speed limit. An evaluation for the requirement of left- and right-turn lanes using the Knox County policy determined that auxiliary turn lanes would not be necessary for the projected traffic volume. Therefore, with the recommendations of this report, the efficient and safe flow of traffic should be maintained with the development of the proposed subdivision.

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## APPENDIX

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Trip Generation

HCS Unsignalized Analyses

Knox County Turn Lane Volume Thresholds

Traffic Count Data

