

# *PIPKIN LANE SUBDIVISION*

## *Knoxville, Tennessee*

### **Traffic Impact Study**



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

*Prepared By:*



**December 2003**

**PIPKIN LANE SUBDIVISION**  
**KNOXVILLE, TENNESSEE**

**TRAFFIC IMPACT STUDY**

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## **INTRODUCTION**

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This traffic impact study was commissioned to address the impact of a proposed residential development within Knox County. The study of this development required 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 resulting traffic conditions, and 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 Pipkin Lane. The site is approximately 57 acres with a R-1 residential zoning. The proposed development will rezone the property to a RP zoning and subdivide the property for 57 single-family and 77 condominium units. Figure 1 is the proposed site plan.

### **Site Location**

The location of the site is west of Pipkin Lane intersecting Fox Road to the south. Pipkin Lane parallels Pellissippi Parkway (I-140) south of Kingston Pike (US 11/70). The site is in Knox County, west 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**

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### **Local Access**

Local access to this site is proposed street access to Pipkin Lane. Adjacent to the proposed site, Pipkin Lane is a 23-foot, 2-lane roadway with a north and south orientation which has a cul-de-sac. Pipkin Lane extends south from the site access to Fox Road, which is a classified collector street. The estimated 2003 average daily traffic (ADT) for Fox Road is approximately 3,580 vehicles per day (vpd). Fox Road extends north and south from the intersection with Pipkin Lane. To the north, Fox Road intersects Kingston Pike (US 11/70). Fox Road, to the south, turns southwest and again turns north becoming Canton Hollow Road and intersecting Kingston Pike. Extending north of the intersection from Kingston Pike, the facility becomes Lovell Road (SR 131).





**Regional Access**

Regional access is by Kingston Pike (U.S. 11/70), Pellissippi Parkway (I-140), Lovell Road (SR 131), and Interstate 40/75. Kingston Pike is a 5-lane section arterial extending east and west. To the east, Kingston Pike extends into the City of Knoxville and Farragut to the west. The 2002 ADT for Kingston Pike, east of Pellissippi Parkway is approximately 30,320 vpd.

Pellissippi Parkway extends north and south with a 2002 ADT count of approximately 44,600 vpd near the proposed project site. This facility is designated as part of the federal interstate system intersecting Interstate 40 to the north. To the south, Pellissippi Parkway intersects Alcoa Highway (S.R. 129), providing an essential link to the Knoxville Airport and the Cities of Maryville and Alcoa. Turning north on Alcoa Highway leads back to Knoxville just west of the central business district. The Kingston Pike/I-140 interchange is location west of the Kingston Pike/Fox Road intersection.

Lovell Road intersects Interstate 40/75 north of Kingston Pike. Lovell Road, which is classified as a primary state route having a 5-lane cross-section from Kingston Pike to north of I-40, continues north intersecting Pellissippi Parkway and Middlebrook Pike (SR 62). The ADT on Lovell Road, between Kingston Pike and I-40/75, is approximately 18,910 vpd serving primarily commercial development.

Interstate 40/75, north of the site is a 6-lane interstate with a 2002 TDOT ADT of 105,180 vpd between Lovell Road and Pellissippi Parkway. Interstate 40 is an east and west interstate extending to Nashville to the west and Asheville, North Carolina, to the east, through the City of Knoxville. Interstate 75 extends north to Lexington, Kentucky, and to the west, I-75 turns south to Chattanooga, Tennessee.

**EXISTING TRAFFIC CONDITIONS**

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**Existing Traffic Control**

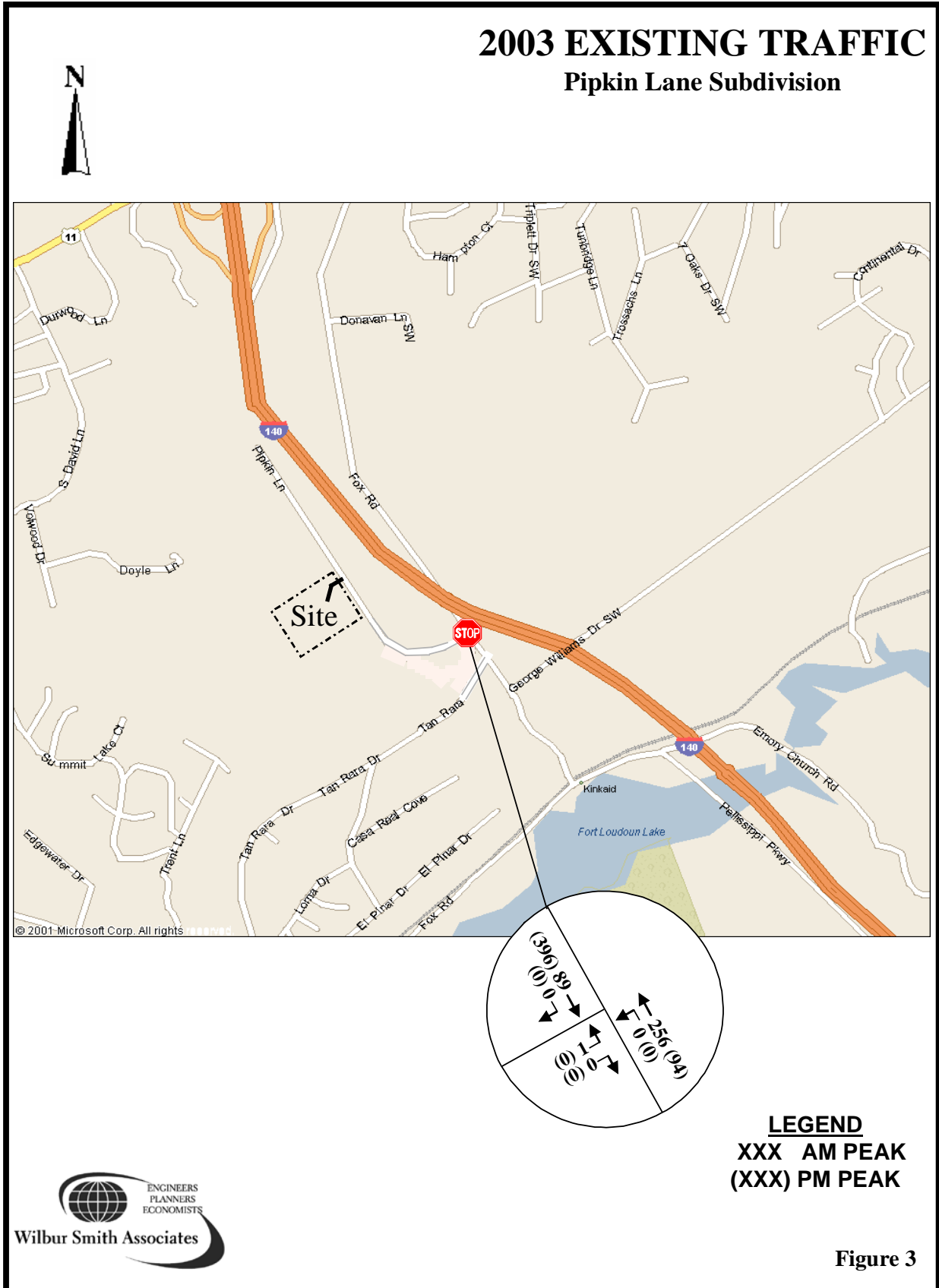
Currently traffic control within the study vicinity is stop control at the intersection of Pipkin Lane and Fox Lane. Adjacent intersections with Fox Road are stop controlled. Pipkin Lane is not posted with a speed limit and Fox Road has a posted speed limit of 30mph. Fox Lane is STOP controlled at Kingston Pike and restricted to right-turns only. Signalized access to Kingston Pike is Capitol Drive.

**Existing Traffic Volumes**

This traffic study conducted peak-hour counts between 7:00-9:00AM and 4:00-6:00PM



for the intersection of Pipkin Lane and Fox Road. Figure 3 illustrates the peak-hour traffic.



**Existing Capacity and Level of Service**

In order to evaluate the 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. Signalized and unsignalized intersections are evaluated based on estimated intersection delays, which may be related to level of service (LOS). Level of service and capacity are the measurements of an intersection's ability to accommodate traffic volumes. Levels of service for intersections range from A to F. LOS A is the best, and LOS F is failing.

Unsignalized intersection has an estimated delay less than 10 seconds for a LOS A. Delays between 15 and 25 seconds, result in a LOS C. LOS F exceeds estimated delays of 50 seconds. For urban arterials, minor approaches may frequently experience levels of service E. Levels of service and associated delays for unsignalized intersections are presented in Tables 1.

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

LOS	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: 2000 Highway Capacity Manual, TRB Special Report 209

Unsignalized levels of service for the existing traffic conditions were found to be acceptable with a LOS of C. Table-2 presents the analyses conducted.

**TABLE-2  
2003 EXISTING  
LEVELS OF SERVICE**

INTERSECTION	CONTROL	V/C	AM PEAK DELAY	LOS	V/C	PM PEAK DELAY	LOS
Pipkin Lane & Fox Road	STOP	-	11.0	B	-	0.0	A

Note: Average vehicle control delay estimated in seconds.

**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 developments and continued growth of Knoxville and Knox County. This traffic must be developed and analyzed for the purpose of establishing a baseline. For the purpose of this study, traffic was projected for the horizon year of 2008.

**Background Traffic Volumes**

In the vicinity of the proposed site, significant development is occurring. Previous studies conducted in the vicinity of this site utilized an approximate 3.5-percent annual growth rate. Existing traffic is increased by a total of 18.8-percent. In addition, an adjacent planned 150 single-family unit development is south of the proposed subdivision accessing Fox Road south of Pipkin Lane. North of Pipkin Lane is another proposed development of 60 single-family units. Using the study prepared for the 150 single family units and generating and distributing trips for the 60 single-family units, trips associated with these developments were assigned to Fox Road traveling north and south of Pipkin Lane.

The addition of the traffic increased by the annual growth rate and trips generated by developments in the project vicinity results in 2008 background traffic. Figure 4 illustrates the resulting 2008 background traffic.

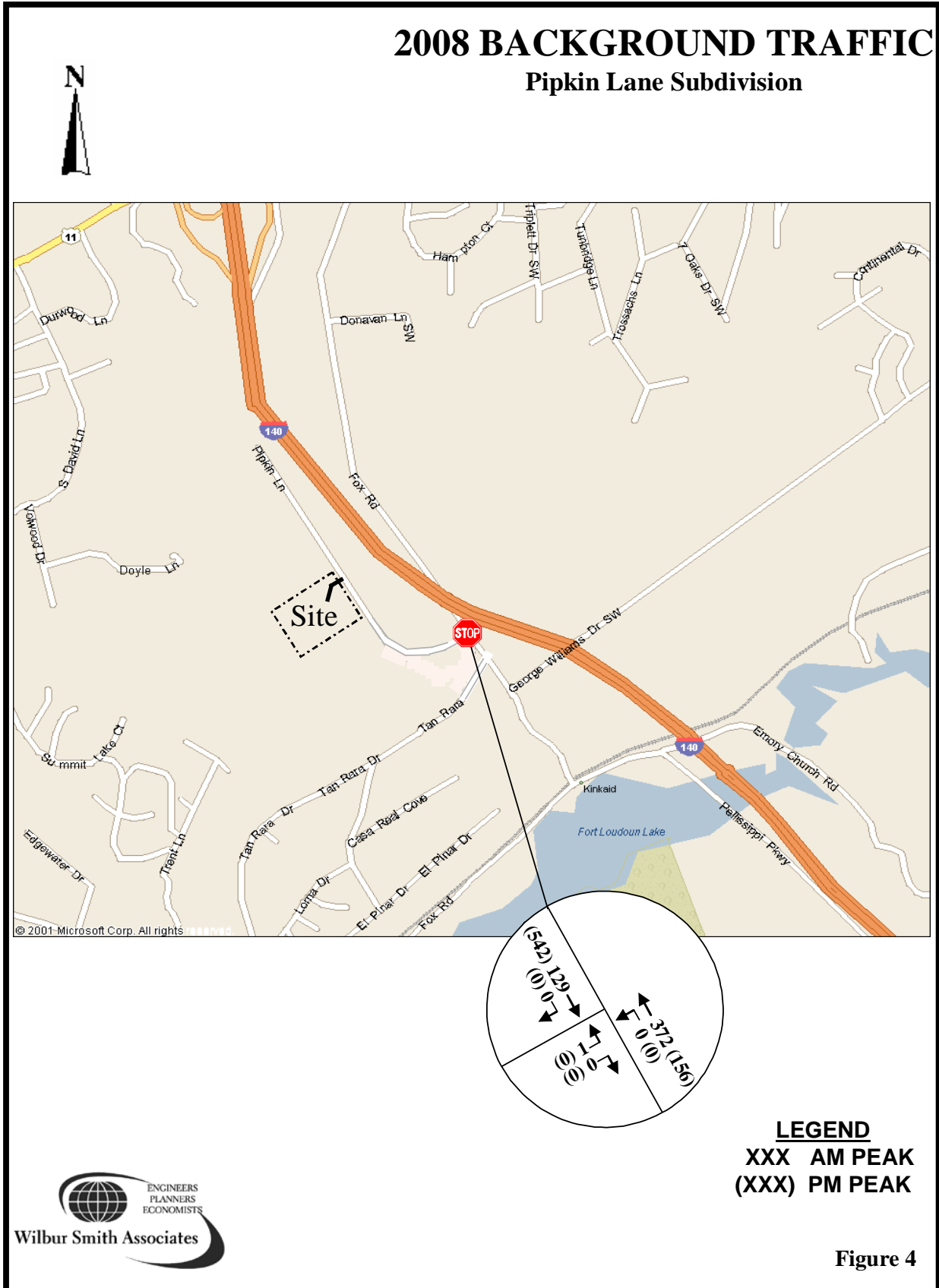
**Background Capacity and Level of Service**

The study intersection of Pipkin Lane and Fox Road was analyzed with the projected traffic. Unsignalized analyses indicate that the intersection of Pipkin Road will operate at an acceptable level of service. Table 3 presents the LOS analyses for the study intersection.

**TABLE-3  
2008 BACKGROUND  
LEVELS OF SERVICE**

<b>INTERSECTION</b>	<b>CONTROL</b>	<b>V/C</b>	<b>AM PEAK DELAY</b>	<b>LOS</b>	<b>V/C</b>	<b>PM PEAK DELAY</b>	<b>LOS</b>
Pipkin Lane & Fox Road	STOP	-	12.6	B	-	0.0	A

**Note:** Average vehicle control delay estimated in seconds.



## **DEVELOPMENT IMPACTS**

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

### **Trip Generation**

Project traffic for the single-family units was determined using 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. **Trip Generation** is an essential tool in calculating the traffic, which may be generated by a proposed development. For the condominiums, the trip generation utilized rates adopted by the MPC for multi-family dwellings and distributed in August 2000. From the trip generation calculations, the proposed site may generate approximately 1,299 daily trips. Table 4 presents the trip generation of this proposed site.

**TABLE-4**

#### **TRIP GENERATION**

<b>LAND USE</b>	<b>L.U.C.</b>	<b>Units</b>	<b>DAILY TRIPS</b>	<b>AM PEAK</b>		<b>PM PEAK</b>	
				<b>ENTER</b>	<b>EXIT</b>	<b>ENTER</b>	<b>EXIT</b>
Single Family	210	57	545	12	37	41	23
Condominiums	230	77	754	9	33	34	28
Total			1,299	21	70	75	51

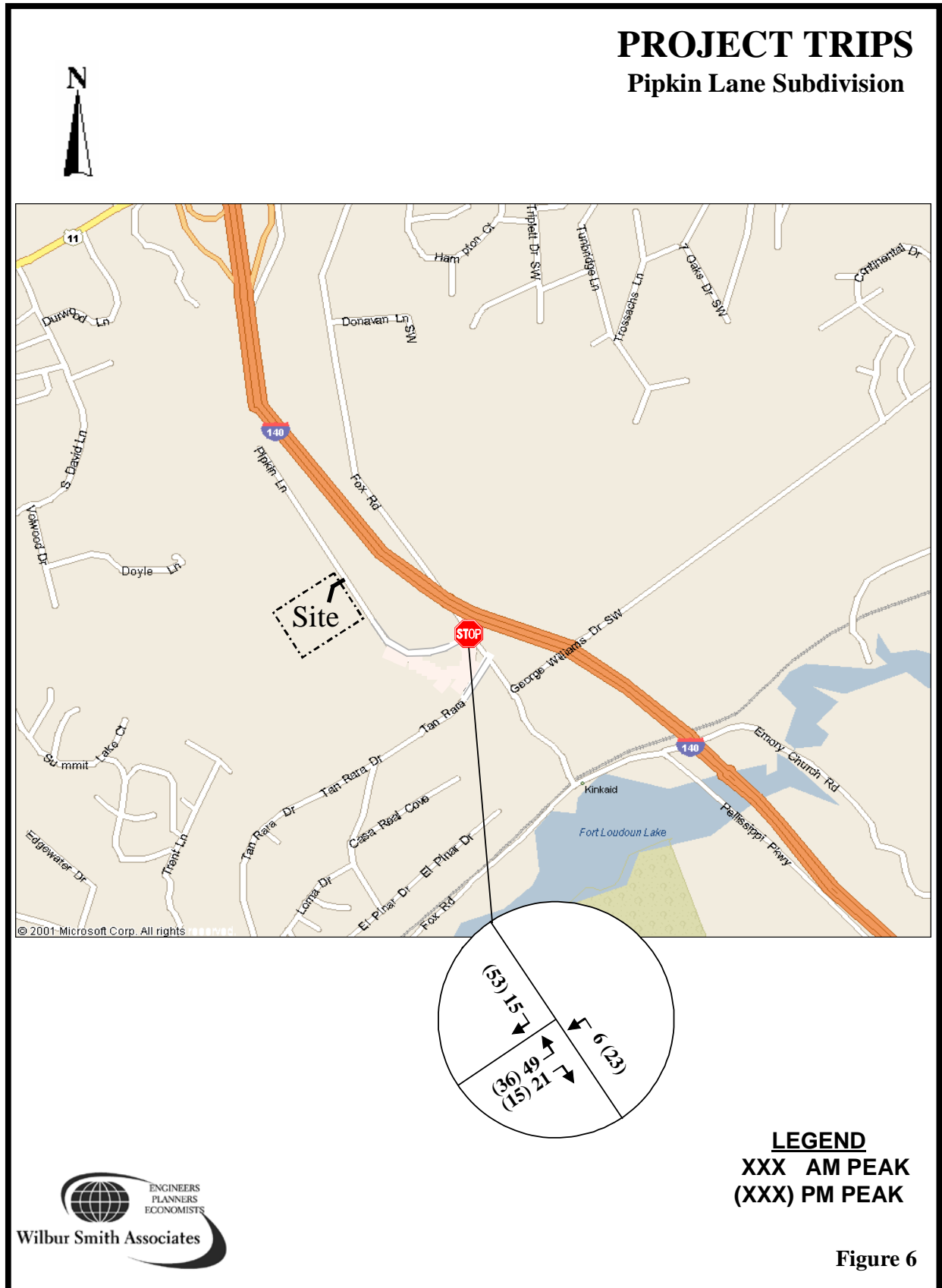
### **Trip Distribution and Assignment**

Using the traffic count conducted for Pipkin Lane and Fox Road, the trip distribution assumes approximately 70-percent of the residential trips will turn to the north towards Kingston Pike, and 30-percent to the southwest towards Canton Hollow Road and Kingston Pike or Lovell Road to the west. Figures 5 illustrate this distribution and assignment.

### **Project Traffic Volumes**

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







### Total Projected Traffic Volumes

Background and project traffic volumes were added together to develop post-development traffic volumes for the year 2008. Figure 7 illustrates this 2008 projection. Using this projection, mitigation measures including traffic control devices and geometry of the roadway and intersection can be evaluated. The projected traffic did not indicate the requirement for left- and right-turn lanes on Fox Road.

### Projected Capacity and Level of Service

The analyses conducted determined that the study intersection would operate at acceptable levels of service. The unsignalized intersection of Pipkin Lane and Fox Road would experience a LOS C. Table 5 presents the projected capacity and LOS. Unsignalized analyses suggest increases in the delay for the Pipkin Lane approach with or without the proposed development would remain within the acceptable range.

**TABLE-5**  
**2008 PROJECTED**  
**LEVELS OF SERVICE**

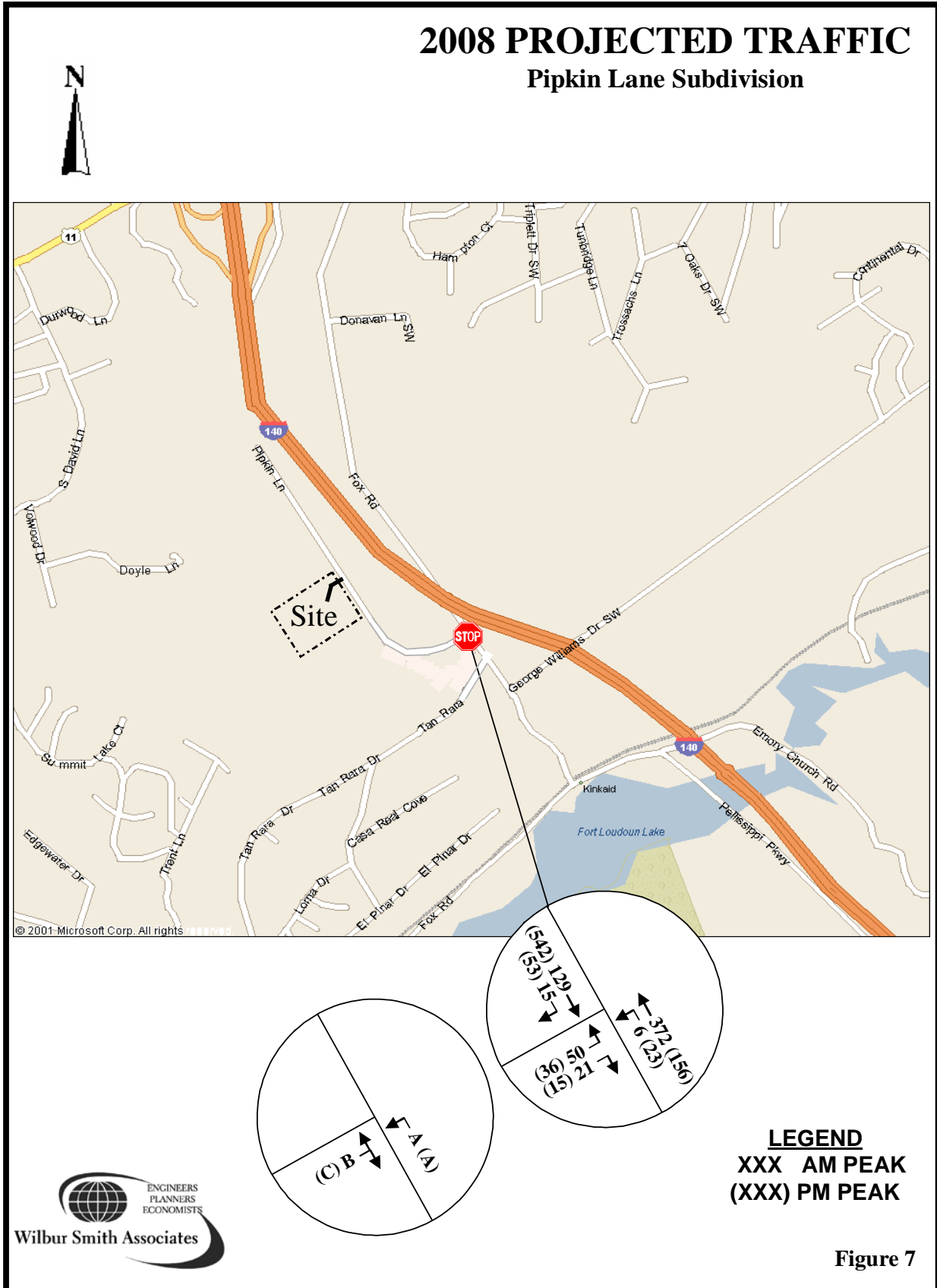
INTERSECTION	CONTROL	V/C	AM PEAK		PM PEAK		
			DELAY	LOS	DELAY	LOS	
Pipkin Lane & Fox Road	STOP	-	12.7	B	-	17.4	C

Note: Average vehicle control delay estimated in seconds.

### Sight Distance

The project access is proposed to Pipkin Lane. The road's speed limit is not currently posted. Measured sight distance for the access street is greater than 600 feet to the north and south. The required distance for a 30 MPH posted roadway is 200 feet to meet the minimum stopping sight-distance for American Association of State Highway and Transportation Officials (AASHTO) and 300 feet to meet the Knox County minimum corner sight-distance standard. The proposed site access, therefore, meets the minimum stopping sight-distance and essentially the County's corner sight-distance criteria. To the north, the sight-distance restriction is a vertical curve.

The sight distance at the intersection of Pipkin Lane and Fox Road is adequate in both directions with the posted 30 MPH speed limit.



## 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 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 the proposed street access with a STOP sign (R1-1) at Pipkin Lane.
- 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 Public Works Department.

## CONCLUSION

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The study of this proposed residential development evaluated the projected traffic conditions for the intersection of Pipkin Lane at Fox Road. Background traffic was determined using a 3.5-percent annual compounded growth rate until the year 2008. 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 were found to be acceptable for the intersection of Pipkin Lane and Fox Road for the future year studied. LOS C may be experienced for the Pipkin Lane approach to Fox Road during the peak hours for projected traffic conditions. The proposed development was found to have an insignificant impact on the unsignalized intersection of Pipkin Lane and Fox Road. Site access is found to be acceptable with adequate sight-distances.

The proposed development does not have an unacceptable impact on the adjacent street and intersections. With the recommendations of this report, the efficient and safe flow of traffic should be maintained.

## **APPENDIX**

**TRIP GENERATION  
CAPACITY AND LOS ANALYSES  
TRAFFIC COUNTS  
TURN LANE WARRANT ANALYSES**

