

***BRICKYARD HILLS  
SUBDIVISION  
Knox County***

***TRAFFIC IMPACT STUDY***

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

***Prepared By:***



**June 2003**

# **BRICKYARD HILLS RESIDENTIAL DEVELOPMENT**

**KNOX COUNTY, TENNESSEE**

## **TRAFFIC IMPACT STUDY**

**Prepared for**

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**June 2003**

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## **INTRODUCTION**

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This traffic impact study was commissioned to address the impact of a proposed residential development in 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 Brickyard Road. The development is the continued development of property that began the development with 38 attached single-family units, adjacent to Gatehouse Avenue, and current phase being 42 detached single-family units accessing a new street, Ambergate Lane. The proposed phase would add another 60 detached single-family units. Access is from two existing streets intersecting Brickyard Road. Figure 1 is the proposed site plan.

### **Site Location**

The location of the site is west of Brickyard Road, north of West Emory Road (S.R. 131). The site is in the north area of Knox County and north 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.

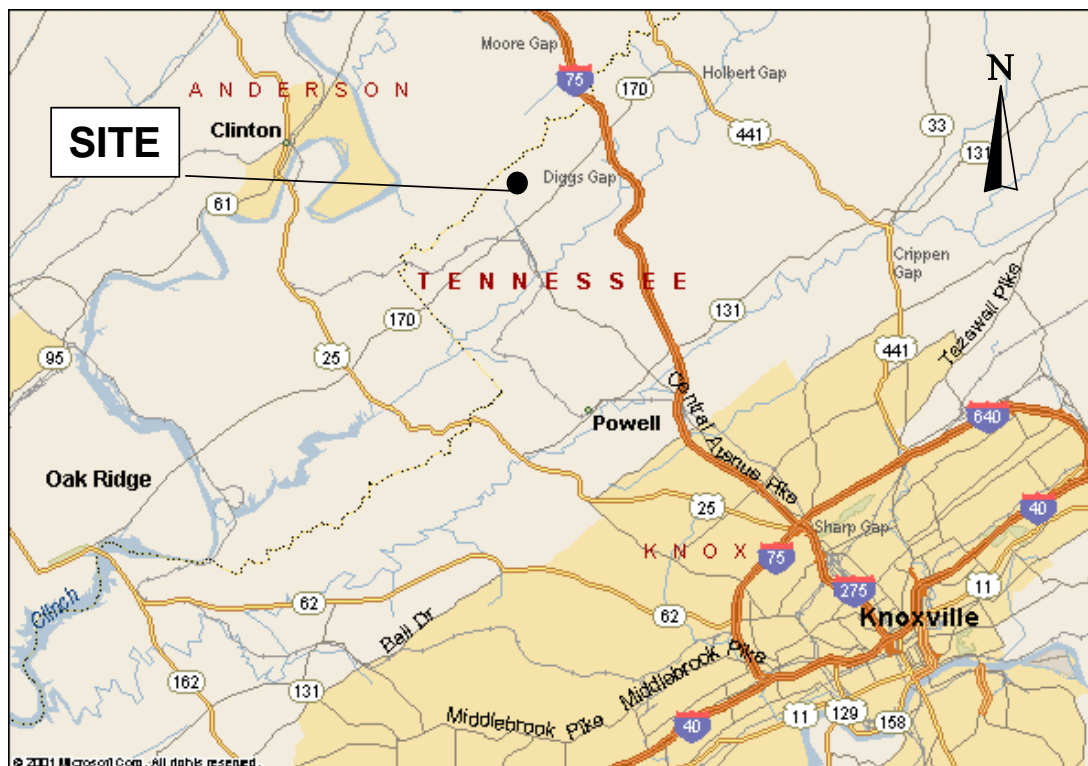
## **LOCAL AND REGIONAL ACCESS**

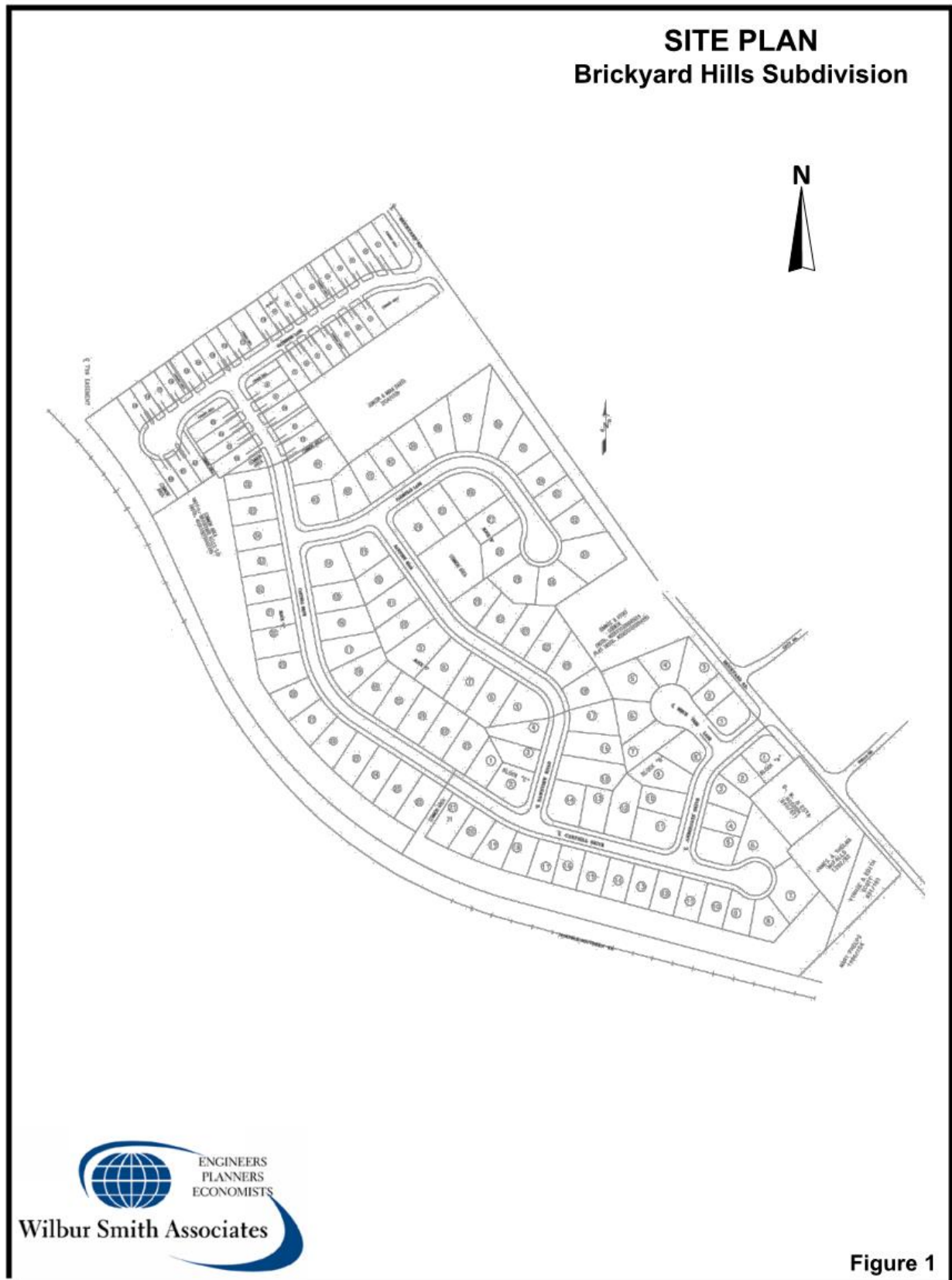
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### **Local Access**

Local access for this site is Brickyard Road. Adjacent to the proposed site, Brickyard Road is a two-lane 18-foot collector road. Site access is two residential streets intersecting Brickyard Road, Gatehouse Lane and Ambergate Lane. Brickyard Road is a north and south facility extending between West Emory (S.R. 131) to the south and Copeland Road to the north. The 2002 average weekday traffic (ADT) for Brickyard Road is approximately 1,530.

## VICINITY MAP Brickyard Hills Subdivision

**Figure 2**



**Regional Access**

To the south is West Emory Road (S.R. 131), extending east and west. To the west, S.R. 131 becomes Lovell Road,. West Emory Road has a 2002 average daily traffic (ADT) of 14,520 in the vicinity of the site. To the southwest, S.R. 131 becomes Lovell Road, which extends north and south. An ADT of 8,730 is currently using Lovell Road south and 9,640 north of Middlebrook Pike. Lovell Road intersects Interstate 40/75 to the south. To the east, West Emory Road intersects Interstate 75.

Interstate 40 is an east and west facility extending between Nashville, Tennessee and Asheville, North Carolina. The approximate 2002 ADT for I-40/75 east of Lovell Road is 97,990. To the west, I-40/75 splits with I-75 turning south to Chattanooga, Tennessee, and I-40 continuing to west to Nashville, Tennessee.

Interstate 75, east of the site, is a north and south facility intersecting I-40 to the south and continuing north to Lexington, Kentucky. The ADT of I-75, in the vicinity of the site, is approximately 41,130.

**EXISTING TRAFFIC CONDITIONS**

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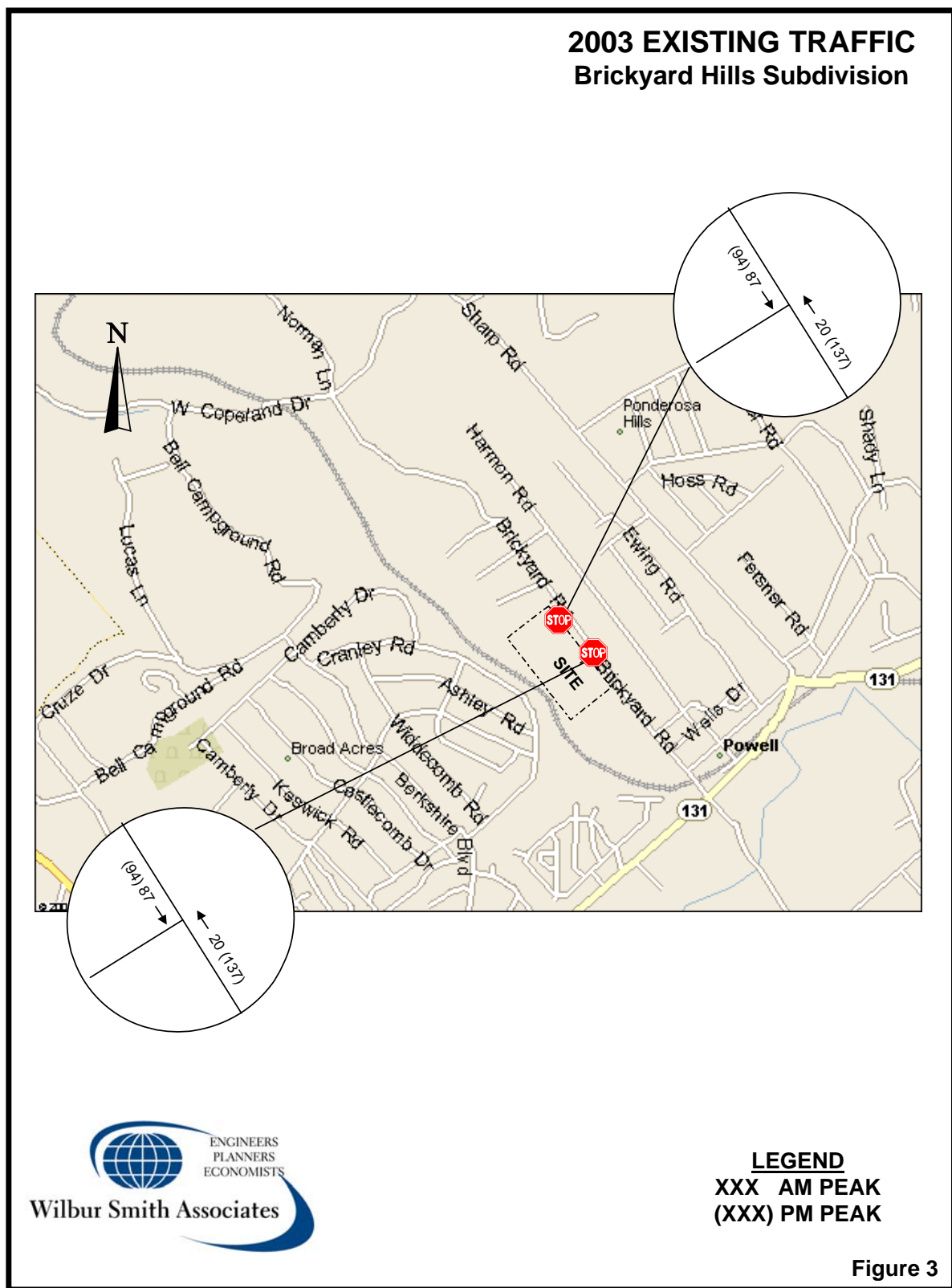
**Existing Traffic Control**

Currently traffic control within the study vicinity consists of traffic signal at the intersection of Brickyard Road at West Emory Road and a stop control at the intersections with Brickyard Road. Adjacent intersections are unsignalized at Brickyard Road. Brickyard has a posted speed limit of 30mph.

**Existing Traffic Volumes**

This traffic impact study addresses the Gatehouse Lane and Ambergate Lane intersections with Brickyard Road. A turning-movement count for Brickyard Road and Gatehouse Avenue was conducted by WSA, was used to determine the peak-hour traffic traveling adjacent to the site. Figure 3 illustrates the adjacent street traffic volumes.





## 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 developments and continued growth of Knoxville and Knox County. This traffic must be developed and analyzed for the purpose of establishing a baseline.

### **Background Traffic Volumes**

Using historical TDOT ADT count data from 1993 on Brickyard, an annual growth rate of 11.5 percent was determined. Background traffic was projected for the year 2008 using a 11.5 percent annual compounded growth rate. Completion of this development will depend largely upon market considerations; however, a five-year build-out seems reasonable. Figure 4 illustrates the resulting background traffic. This traffic is obtained growing existing traffic by a total of 72.3 percent.

## DEVELOPMENT 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 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. Rates adopted by the County were developed in conformance with the requirements of ITE. **Trip Generation** is an essential tool in calculating the traffic, which may be generated by a proposed development. From the trip generation calculations, the proposed site may generate approximately 880 daily trips. Table 1 presents the trip generation of this proposed site.

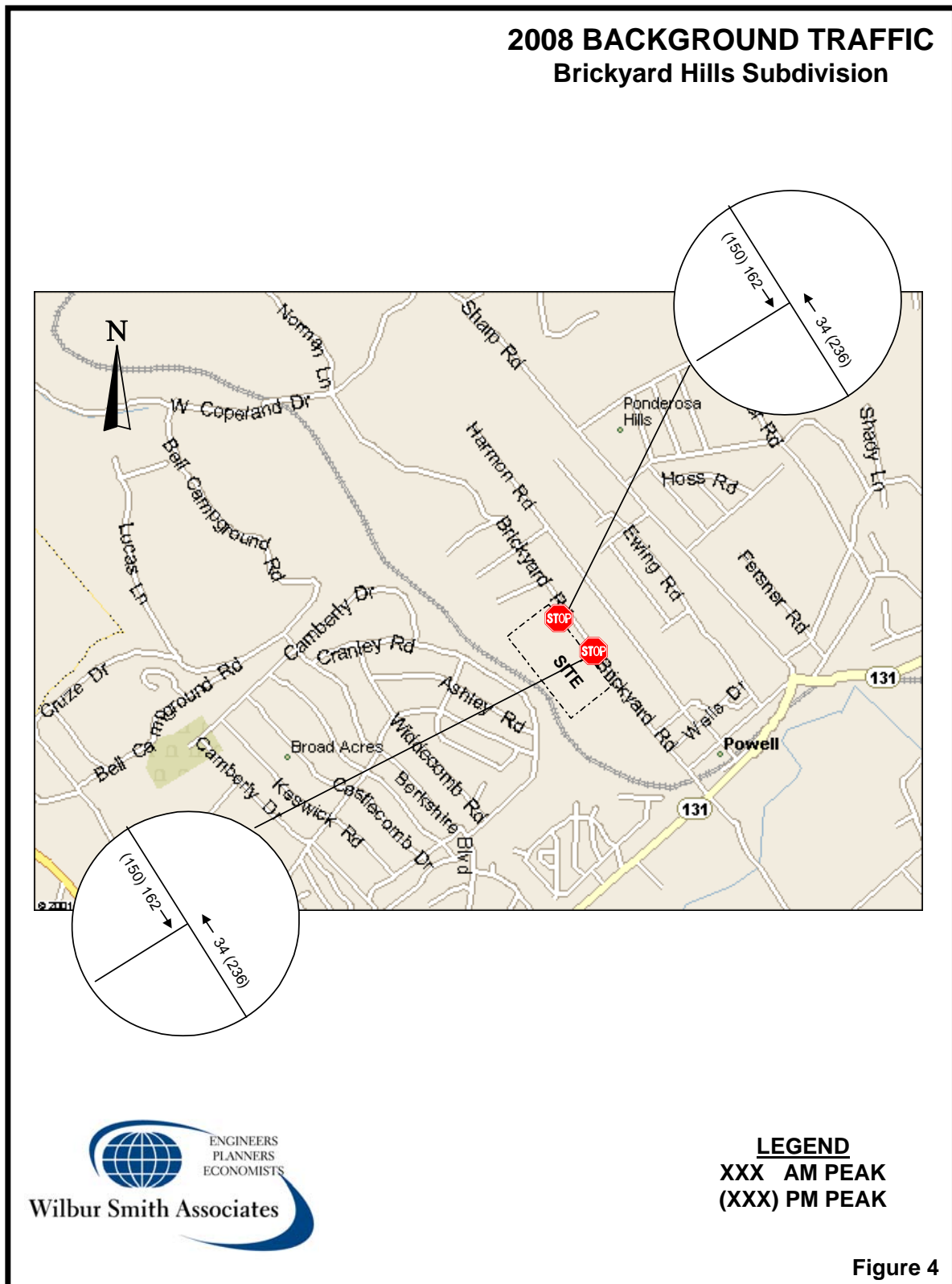


TABLE-1

## TRIP GENERATION

LAND USE	L.U.C.	Units	DAILY TRIPS	AM PEAK ENTER	AM PEAK EXIT	PM PEAK ENTER	PM PEAK EXIT
Single Family Detached	210	102	1,056	20	61	70	39
Single-Family Attached	230	82	286	4	28	18	9
<b>TOTAL</b>		<b>184</b>	<b>1,342</b>	<b>24</b>	<b>89</b>	<b>88</b>	<b>48</b>

**Trip Distribution and Assignment**

Using the turning-movement count conducted for Brickyard Road and Gatehouse Lane, the trip assignment assumes approximately 20 percent of the residential trips will turn to the north and 80 percent to the south. Figures 5 and 6 illustrate this distribution and assignment for the attached and detached residential housing, respectively.

**Project Traffic Volumes**

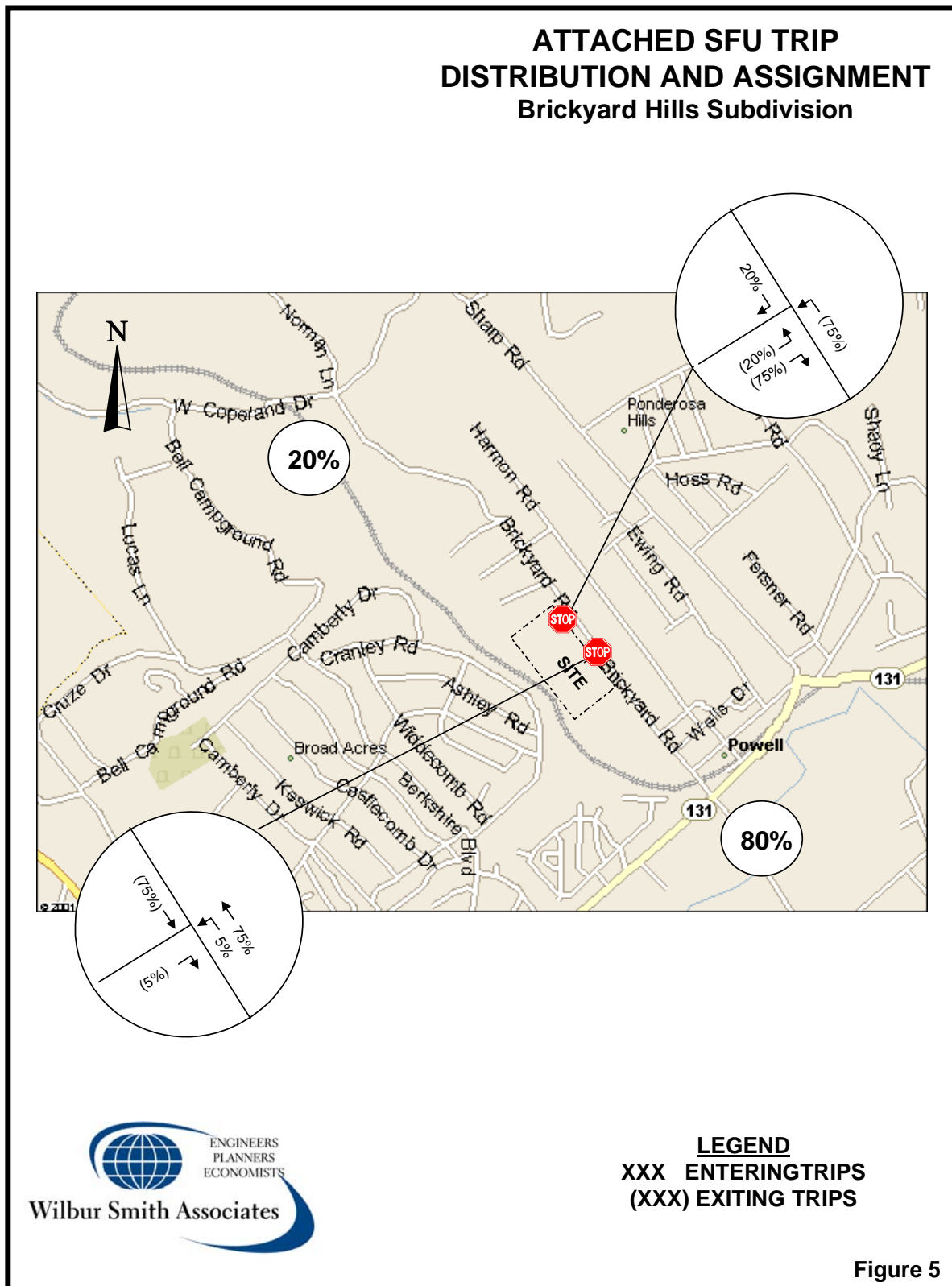
By multiplying the trips generated by the distribution percentages, the project traffic volumes were determined. Figure 7 illustrates the resulting project traffic volumes associated with the proposed project.

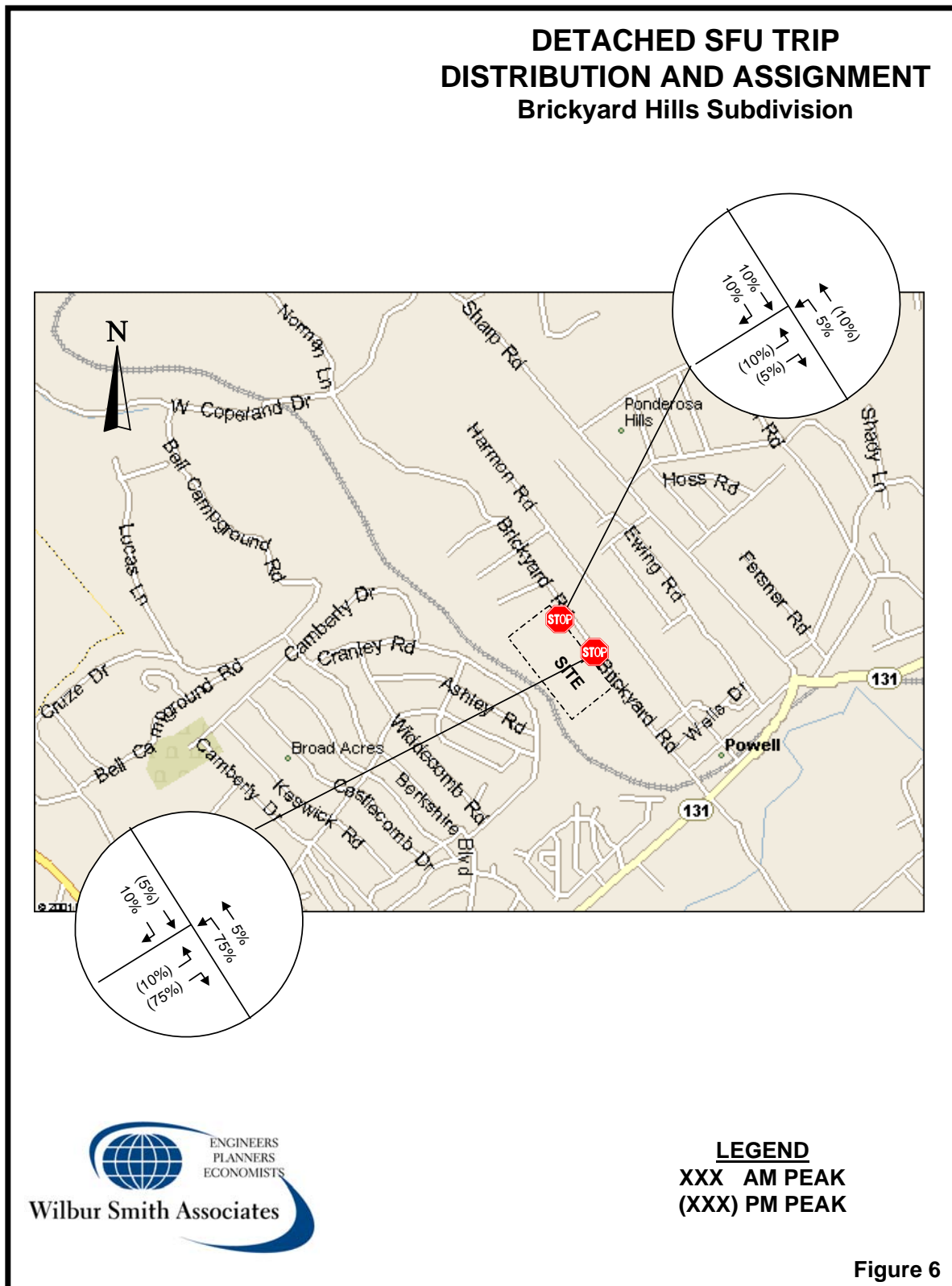
**Total Projected Traffic Volumes**

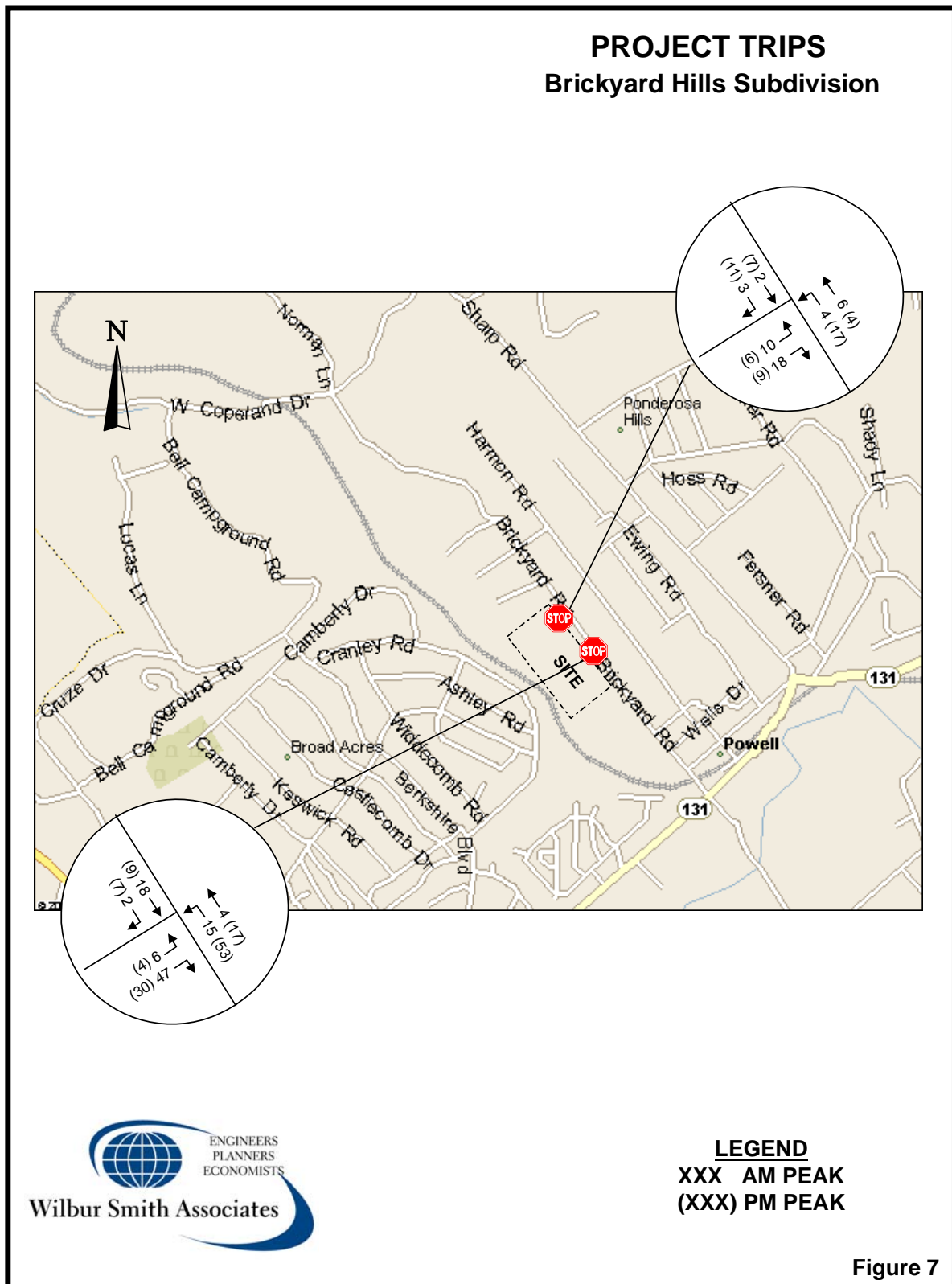
Background and project traffic volumes were added together to develop post-development traffic volumes for the year 2008. Figure 8 illustrates this 2008 projection. Using this projection, mitigation measures including traffic control devices and roadway and intersection geometry can be evaluated. The projected ADT on Brickyard Road may become approximately 1,798 to the north and 2,604 to the south of the proposed development.

**Projected Capacity and Level of Service**

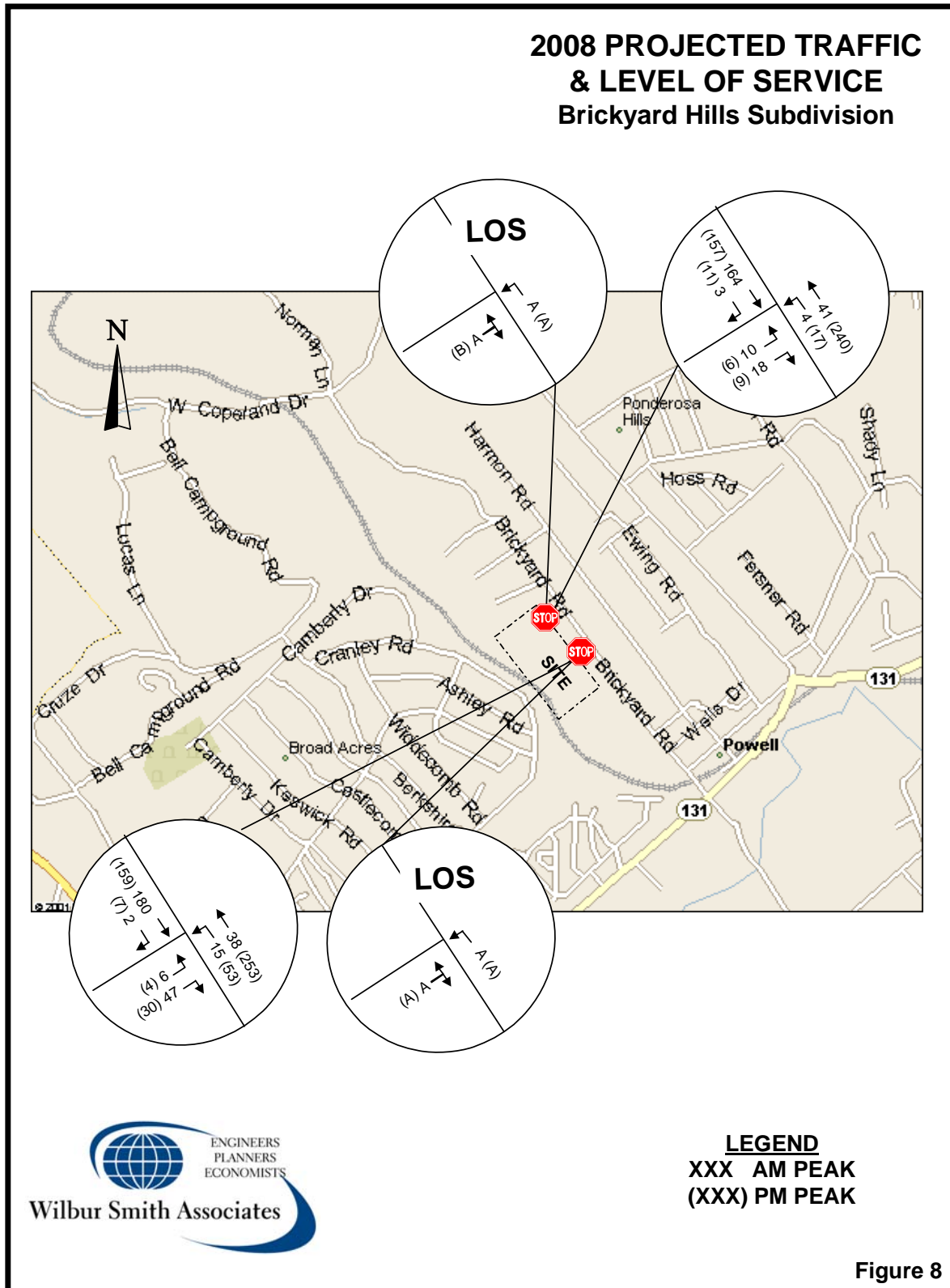
In order to evaluate the operations of the traffic control devices, capacity and level of service were calculated using the **2000 Highway Capacity Manual, Special Report 209** published by the Transportation Research Board. Signalized and unsignalized intersections are evaluated based on estimated intersection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













A is the best, and LOS F is failing.

For unsignalized intersection levels of service have lower thresholds of delays. A LOS of F exceeds estimated delays of 45 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 Tables 2.

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

LOS	AVERAGE CONTROL DELAY PER VEHICLE (seconds)
	A
	$\leq 10.0$
	B
$\leq 15.0$	$> 10.0$ and
	C
$> 15.0$ and $\leq 25.0$	
	D
$\leq 35.0$	$> 25.0$ and
	E
$> 35.0$ and $\leq 50.0$	
	F
	$> 50.0$

SOURCE: 2000 Highway Capacity Manual, TRB Special Report 209

Analyses were conducted using the Synchro Software, developed by Trafficware. Table 3 presents the unsignalized and signalized analyses of the projected traffic conditions. For unsignalized traffic control of the proposed access street, a LOS of B or better was determined for the egress and the left-turn ingress.

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

INTERSECTION	AM PEAK			PM PEAK		
	V/C	DELAY	LOS	V/C	DELAY	LOS
Brickyard Road & Ambergate Lane	0.06	9.5	A	0.04	9.6	A
Brickyard Road & Gatehouse Lane	0.03	9.4	A	0.02	10.0	B

**Note:** Unsignalized average vehicle control delay estimated in seconds for proposed street approach.

### **Sight Distance**

The project access is proposed to Brickyard, a 20-foot two-lane roadway. The road's speed limit is currently posted for 30mph. For Gatehouse Lane, measured sight distance to the north is more than 500 feet and is 300 feet to the south restricted by a vertical hill and vegetation on the adjacent property. For Ambergate, the sight-distance to the north is 380 feet and 330 feet to the south. The required distance is 250 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 both criteria and is acceptable for safe operations.

### **Turn Lane Evaluation**

Using Knox County's Access Control and Driveway Design Policy, the review and evaluation of the projected traffic volumes did not determine any requirement of left- or right-turn lanes. Projected traffic was found to be well below the traffic volume thresholds.

## **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 with a STOP sign (R1-1) at Brickyard 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 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 11.5 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 and level of service analyses were conducted using the **2000 Highway Capacity Manual**. Unsignalized levels of service were found to be acceptable. A minimum LOS B was identified for the left-turn ingress and the site egress during the peak hours.

The proposed development was identified has having a minimal 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**

