

RUFUS SMITH STRAWBERRY PLAINS COMMERCIAL DEVELOPMENT

TRAFFIC IMPACT STUDY

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

Prepared By:



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**RUFUS SMITH COMMERCIAL DEVELOPMENT
STRAWBERRY PLAINS PIKE
KNOX COUNTY, TENNESSEE
TRAFFIC IMPACT STUDY**

Prepared for

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June 2003

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INTRODUCTION

This study was commissioned to address the impact and access of a proposed commercial development concept located on Strawberry Plains Pike in East Knox County. The basis for this study required the collection of traffic data, generation of anticipated traffic volumes from the proposed site and development of projected traffic volumes from normal growth and from the potential site. Analysis of the resulting traffic projections was conducted to determine the capacity and levels of service for the site access. This study will develop measures necessary to mitigate traffic impacts including improved roadway geometrics and traffic control devices within the environs of the proposed commercial development.

The Knoxville-Knox County Metropolitan Planning Commission's Administrative Rules and Procedures identified this concept commercial development for a Level 2 Traffic Impact Study. WSA met with Knox County Department of Engineering and Public Works and MPC to define the study area and address specific concerns relative to the proposed commercial development. Therefore, this study will address the anticipated traffic impacts of the proposed commercial development site access on Strawberry Plains Pike as well as two adjacent intersections, Strawberry Plains Pike at Brake bill Road and Strawberry Plains Pike at Huckleberry Springs Road.

This proposed commercial development would also take into consideration the proposed Oliver Smith Commercial Development, located on the northwest side of Strawberry Plains Pike. Presently, the Oliver Smith Commercial Development is an undeveloped tract, but this study will consider the proposed Oliver Smith Commercial Development and its planned road identified as a realignment of Brakebill Road. This consideration was necessary in order to account for potential trips associated with this development and its impact at the proposed intersection to Strawberry Plains Pike.

Project Description

The proposed project is a commercial development. The proposed site is approximately 25.85 acres, consisting of ten parcels. This tract has boundaries adjacent to Strawberry Plains Pike and Huckleberry Spring Road. The proposed development will realign Huckleberry Springs Road to the reserved road right-of-way on the north side of Strawberry Plains Pike, which may serve as a realignment of Brakebill Road. The realignment of Brakebill Road and Huckleberry

Springs Road is consistent with the proposed plan identified in the Strawberry Plains Area Regional Study prepared by Allen Hoshall.

Access would be proposed on Strawberry Plains Pike and Huckleberry Springs Road. Figure 1 shows the proposed site plan. This is a concept plan; therefore, access is not specifically proposed. Specific access will be developed after specific land uses and driveway requirements determined. For the purpose of the study, it is assumed that direct access will be provided between parcel 1 and Strawberry Plains Pike and the remaining parcels would access the realigned Huckleberry Springs Road and a proposed internal street extending southwest of Huckleberry Springs Road

Site Location

The location of the proposed Rufus Smith Commercial Development is on Strawberry Plains Pike in East Knox County, Tennessee. The proposed development will be located at Strawberry Plains Pike at Huckleberry Springs Road, north of Interstate 40. The Knoxville central business district (CBD) is located to the west of the site. Figure 2 illustrates the site location relative to local and regional access.

LOCAL AND REGIONAL ACCESS

Local Access

Strawberry Plains Pike will provide local access to the proposed commercial development. Strawberry Plains Pike is classified as a minor arterial roadway. It is a northeast-southwest four-lane divided facility from Interstate 40 having two lanes in both directions that average 24' feet in width with a 36' grass median. The divided roadway tapers to a two-lane facility (2 lanes at 22') at Huckleberry Springs Road. The posted speed limit for the divided section of Strawberry Plains Pike is 45 MPH. The two-lane section of Strawberry Plains Pike has a posted speed limit of 40 MPH. The proposed commercial development site would be located adjacent to other commercial developments on Strawberry Plains Pike including several restaurants, motels, and self-service gasoline stations. Residential neighborhoods are located to the northwest of the proposed development on Brakebill Road and further north on Strawberry Plains Pike past the commercial areas, beginning at Huckleberry Springs Road. Strawberry

SITE PLAN

Rufus Smith Strawberry Plains



Figure 1

VICINITY MAP

Rufus Smith Strawberry Plains



Figure 2

Plains Pike has a 2002 average daily traffic (ADT) volume of 6,790 vehicles per day (vpd), north of Molly Bright Road and a 2002 ADT volume of approximately 9,260 vpd north of Moshina Road.

Brakebill Road is a two-lane minor collector road averaging 22' wide with no shoulders. The posted speed limit on Brakebill Road is 30 MPH. Huckleberry Springs Road is also a two-lane minor collector roadway with a width of 22 feet. The posted speed limit on Huckleberry Springs Road is 40 mph. Huckleberry Springs Road has a 2002 ADT volume of approximately 2,300 vpd south of Interstate 40.

Regional Access

Interstate 40 provides significant east and west regional access throughout Tennessee. To the east, Interstate 40 connects to Interstate 81, which extends into the Tri-Cities area into Virginia. Further to the east, I-40 extends to Asheville, North Carolina. Westbound I-40 connects to Interstate 75, providing north- and southbound connections into neighboring states such as Kentucky and Georgia, respectively. Further to the west I-40 extends through Nashville, Tennessee.

EXISTING TRAFFIC CONDITIONS

Existing Traffic Control

Both existing intersections, Strawberry Plains Pike at Brakebill and Strawberry Plains Pike at Huckleberry Springs Road, are unsignalized. The I-40 interchange, southwest of the site, is signalized. Strawberry Plains Pike has a posted speed limit of 40mph and 45mph.

Existing Traffic Control Volumes

Peak-hour turning movement counts (TMC) were conducted in April of 2003 for both existing intersections (Strawberry Plains Pike at Brakebill Road and Strawberry Plains Pike at Huckleberry Springs Road). Both intersections were counted from 7:00AM-6:00PM. Figure 3 illustrates the resulting intersection turning movements for the AM and PM peaks. The peak hours were found between 7:00 AM-8: 15 AM and 4:45- 5:45 PM.

2003 EXISTING TRAFFIC Rufus Smith Strawberry Plains

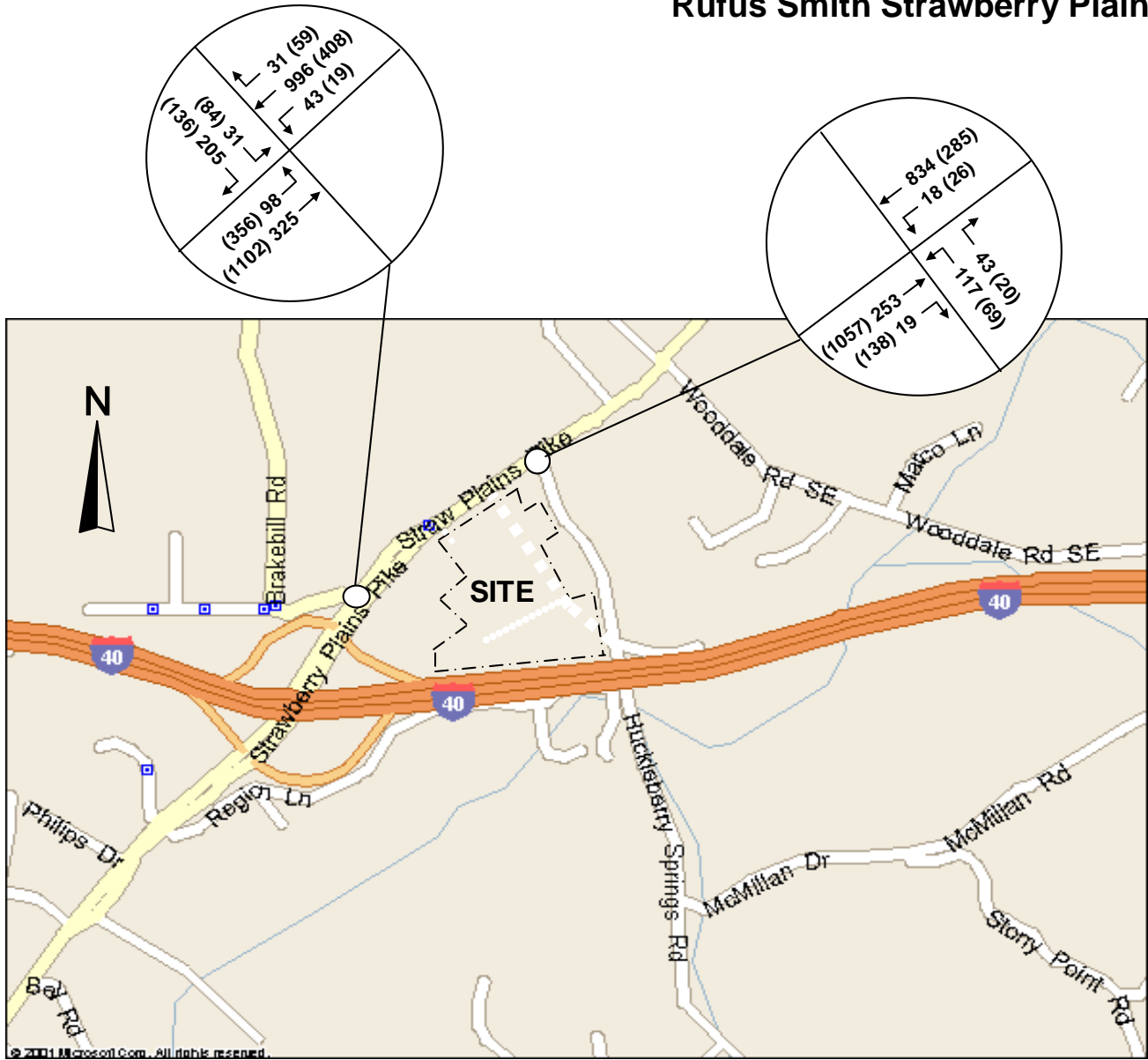


Figure 3

Signal Warrant Analyses

For the existing study intersections of Brakebill Road and Huckleberry Springs Road intersecting Strawberry Plains Pike, an evaluation for a traffic control signal was conducted. There are eight warrants published in the **Manual on Uniform Traffic Control Devices, 2000 Edition**. For prevailing speeds in excess of 40mph on Strawberry Plain Pike, signal warrant volumes for each of the warrants can be reduced. Three traffic volume warrants were examined including the Minimum Volume (Warrant 1A), Interruption to Continuous Traffic Flow (Warrant 1B), Combination (Warrant 1A & B), Four-hour (Warrant 2), and Peak-hour Volume (Warrant 3B). Any part of Warrant 1 must be met for a minimum of eight hours. Warrant 2 must be met for four hours, and one hour must be met for the Peak-Hour Warrant (Warrant 3B).

Brakebill Road was determined meeting warrants, and Huckleberry Springs Road was found to meet warrants. Brakebill Road met Warrants 1A, 1B, 1A&B, and 2 for eleven hours each warrant. Warrant 3B was met for nine hours for Brakebill Road. Signalization of Brakebill Road, however, could not be recommended for signalization because of its distance from the I-40 westbound ramps traffic signal, which is less than 300 feet. Huckleberry Springs Road met Warrant 1B for six hours of eight and Warrant 2 for the required four hours. Warrant 3B was met for two hours for Huckleberry Springs Road. From the counted traffic from Huckleberry Springs Road and an acceptable spacing from the interchange signals, signalization would be recommended.

Existing 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). 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 A is the best, and LOS F is failing.

For signalized intersections, a LOS of A has an average estimated intersection delay of less than 10 seconds, and LOS F has an estimated delay of greater than 80 seconds. A LOS of C

and D are typical design values. Within urban areas, a LOS D, delay between 35 and 55 seconds, is considered acceptable by the Institute of Transportation Engineers (ITE) for signalized intersections.

Unsignalized intersections 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 and signalized intersections is presented in Tables 1 and 2, respectively.

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

TABLE 2
LEVEL-OF-SERVICE (LOS) DESCRIPTION
FOR SIGNALIZED INTERSECTIONS

LOS	Average Control Delay per Vehicle (seconds)	Description
A	≤ 10.0	Very low delay with extremely favorable progression. Most vehicles don't stop.
B	> 10.0 and ≤ 20.0	Generally good progression. Increase number of stops from that described for LOS "A" resulting in higher delays
C	> 20.0 and ≤ 35.0	Fair progression with increased delay. Number of stopping vehicles become significant; however, many still pass through the intersection without stopping. Stable flow.
D	> 35.0 and ≤ 55.0	The influence of congestion becomes more noticeable. Longer delays resulting from unfavorable progression, longer cycles, or high V/C ratios. Approaching unstable flow.
E	> 55.0 and ≤ 80.0	Limit of acceptable delay. Long delays associated with poor progression, long cycles, or high V/C ratios.
F	> 80.0	Unacceptable operation resulting from oversaturation (flow rates exceed capacity). Poor progression, long cycles, and high V/C ratios.

SOURCE: Highway Capacity Manual, TRB Special Report 209

Analyses were conducted using the Synchro Software, developed by Trafficware. Table 3 presents the analyses of the study intersections.

TABLE-3
CAPACITY AND LEVEL OF SERVICE
2003 EXISTING TRAFFIC

INTERSECTION	TRAFFIC CONTROL	PERIOD	V/C	2003 DELAY	LOS
Strawberry Plains Pike and Brakebill Road	STOP NB-L(EB-LR)	AM	0.17 (1.02)	6.9 (104.3)	A (F)
		PM	0.37 (3.27)	7.6 (>999)	A (F)
Strawberry Plains Pike and Huckleberry Springs Road	STOP SB-L(WB-LR)	AM	0.02 (0.72)	0.40 (51.0)	A (F)
		PM	0.05 (0.77)	1.7 (93.9)	A (F)
<i>Strawberry Plains Pike and Huckleberry Springs Road</i>	<i>SIGNAL</i>	<i>AM</i>	<i>0.68</i>	<i>8.8</i>	<i>A</i>
		<i>PM</i>	<i>0.83</i>	<i>11.3</i>	<i>B</i>

NOTE: Average vehicle delay estimated in seconds

The analyses of the study intersections with Strawberry Plains Pike determined unacceptable LOS during the AM and PM peak hour periods. The traffic volumes on Strawberry Plains Pike result in some of the delays experienced on the minor street approaches at Brakebill Road and Huckleberry Springs Road. Vehicles turning from Brakebill Road or Huckleberry Springs Road onto Strawberry Plains Pike during both peak periods will experience a LOS F indicating significant delays.

With the signalization of Huckleberry Springs Road and Strawberry Plains Pike, the intersection's LOS is improved to an A and B for the AM and PM peaks, respectively.

BACKGROUND TRAFFIC CONDITIONS

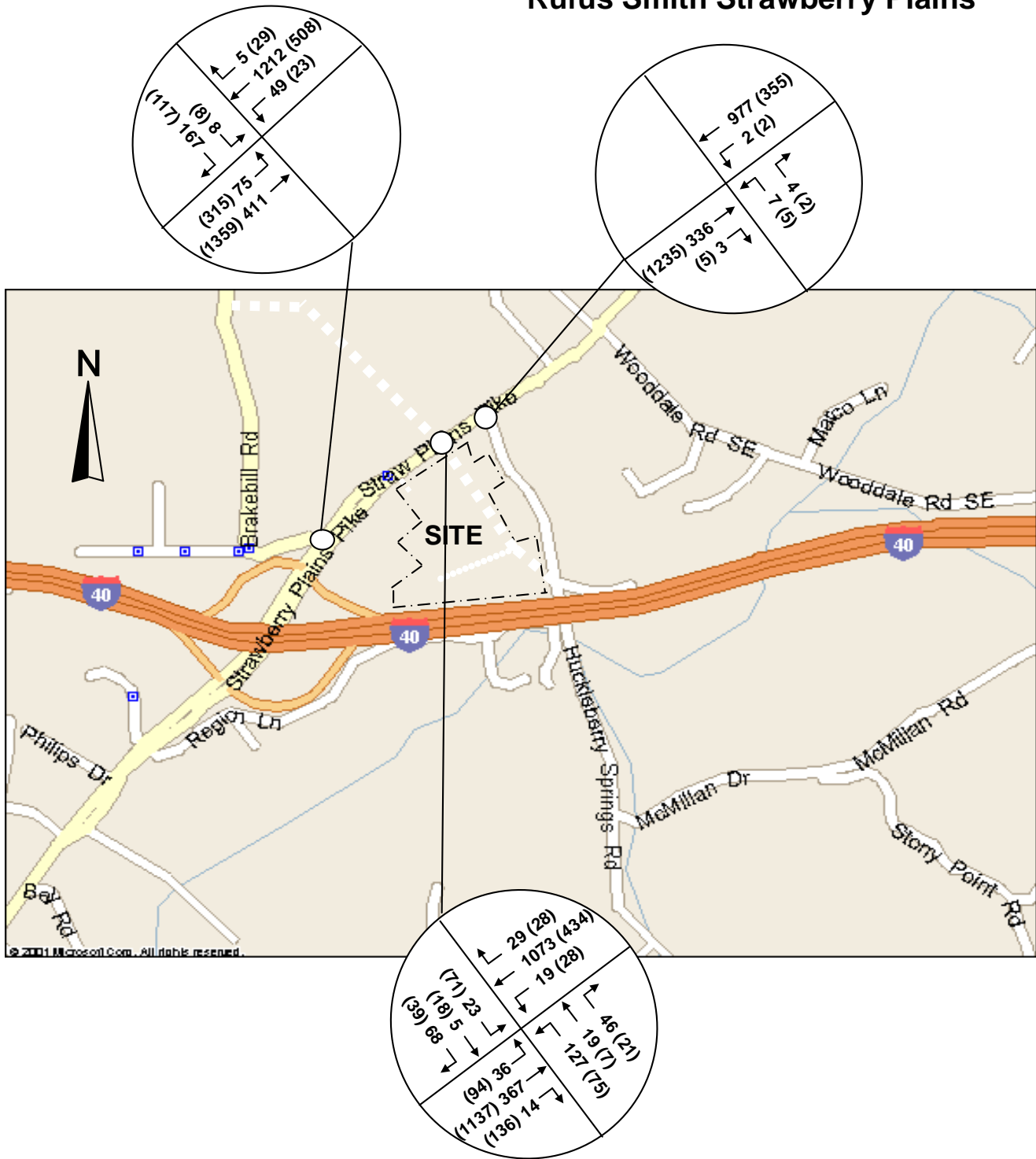
Background traffic is traffic that can be anticipated regardless of the proposed development. Traffic within the study area should continue to grow due to other developments as well as the continued growth within the surrounding area. This background traffic must be analyzed and evaluated for the purpose of establishing a baseline. In addition, the background traffic reflects the historical traffic volumes in the area of the proposed commercial development. Projected traffic from the proposed Oliver Smith Development, located to the northwest of this development, was also included in the consideration of background traffic. Because the Oliver Smith development has had no activity, background traffic was projected with and without the Oliver Smith development.

The completion of the proposed commercial development is not known, but will be assumed by the year 2010. Actual completion will depend on economic and market conditions. Using this build-out year and a growth rate for the project vicinity, background traffic may be estimated for the transportation system.

Background Transportation Network

Background traffic also had to reflect the proposed transportation system including both the realignments of Brakebill Road and Huckleberry Springs Road. The existing Huckleberry Springs Road would remain to service the adjacent residential. Traffic will divert to the new roadway alignments. Figure 4 illustrates the traffic after the diversion to the new roadway alignments.

2010 TRAFFIC REDISTRIBUTION Rufus Smith Strawberry Plains



NOTE: Brakebill Road and Huckleberry Springs Road Realignment



LEGEND
 XXX AM PEAK
 (XXX) PM PEAK

Figure 4

Background Traffic Volumes

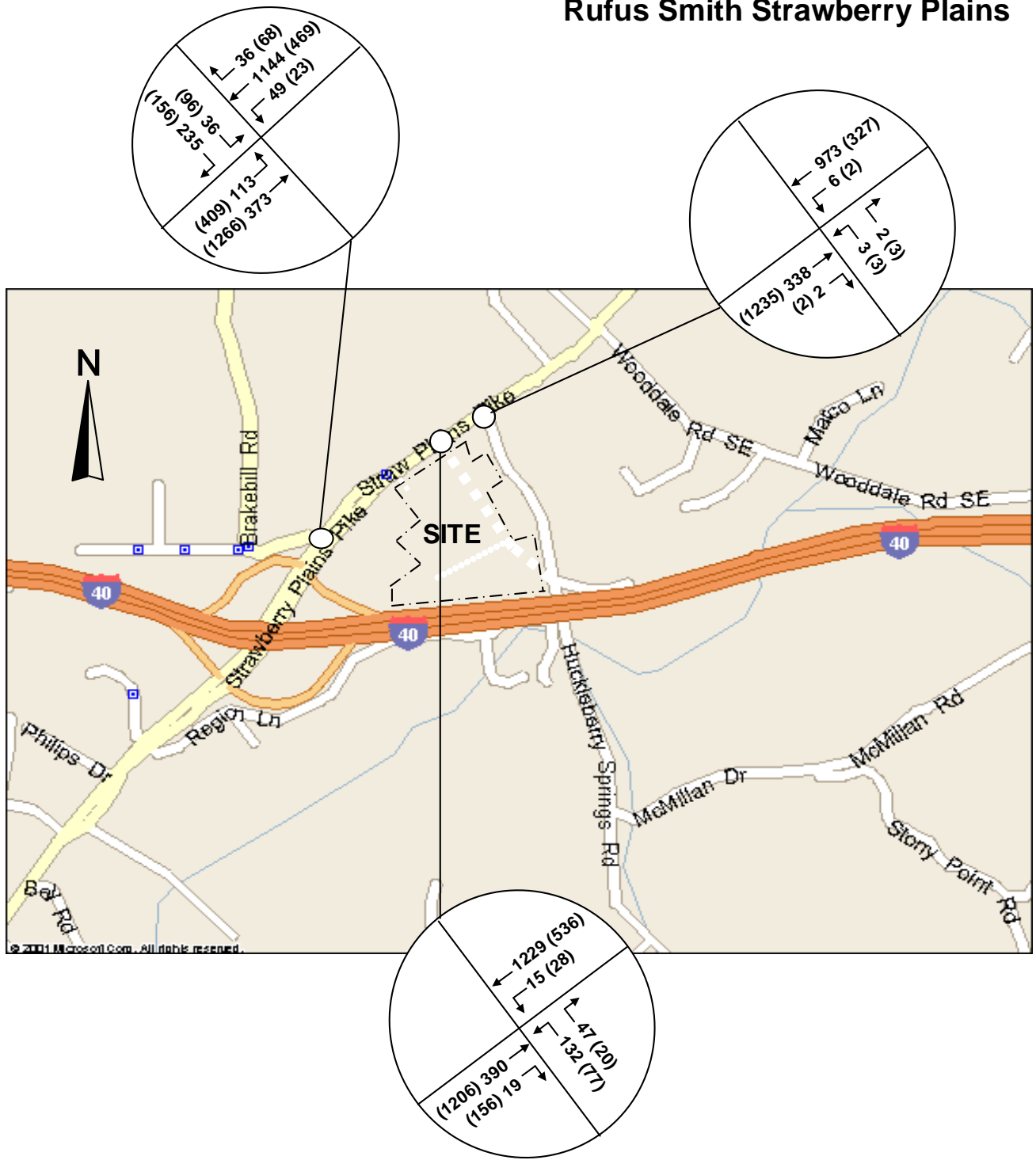
An average growth rate was determined using historical ADT traffic data from two Tennessee Department of Transportation (TDOT) count stations, T59 on Strawberry Plains Pike, north of Molly Bright Road and T67 on Strawberry Plains Pike, north of Moshina Road. Regression analysis on the historical count data for these two count stations indicated that an average of 3.15-percent could be expected for the area. However, information provided from the proposed Oliver Smith Development and interchange study by Allen and Hoshall indicated an annual growth of 2.0-percent. Therefore, this report will use an annual compounded growth rate of 2.0-percent. The next seven years period (2003 to 2010), a total traffic growth of 17-percent can be expected. The Appendix includes the historical traffic growth worksheet and regression analysis. Figures 5A and 5B illustrate the background traffic for 2010.

Background Capacity and Level of Service

Analyses of the background traffic with and without the Oliver Smith development and the Brakebill Road is presented in Table-4. The analyses of the background traffic found that without the Oliver Smith development and the realignment of Brakebill Road, the study intersection of Brakebill Road continues to fail with delays on Brakebill Road increasing. With the signalization of the realigned Huckleberry Springs Road, its LOS is an A. If Brakebill Road is developed in conjunction with the Oliver Smith property, the LOS of the realigned Brakebill Road and Huckleberry Springs Road with Strawberry Plains Pike is reduced to a D, considered acceptable for urban conditions. The reduced LOS is a result of increased traffic associated with the Oliver Smith development and the added intersection leg and signal phasing. Strawberry Plains Pike requires a 4-lane divided facility with a northbound double left-turn lane; a single southbound left-turn lane; a separate left-turn, thru, and right-turn lanes for the eastbound (Brakebill Road) approach; and a left-turn and a shared thru and right-turn lane for the westbound (Huckleberry Springs Road) approach.

With the realigned Brakebill Road, the LOS for the existing intersection may be improved to a D and E for the AM and PM peaks, respectively. The diverted traffic from the existing intersection of Brakebill Road and Strawberry Plains Pike is significant.

2010 BACKGROUND TRAFFIC Rufus Smith Strawberry Plains



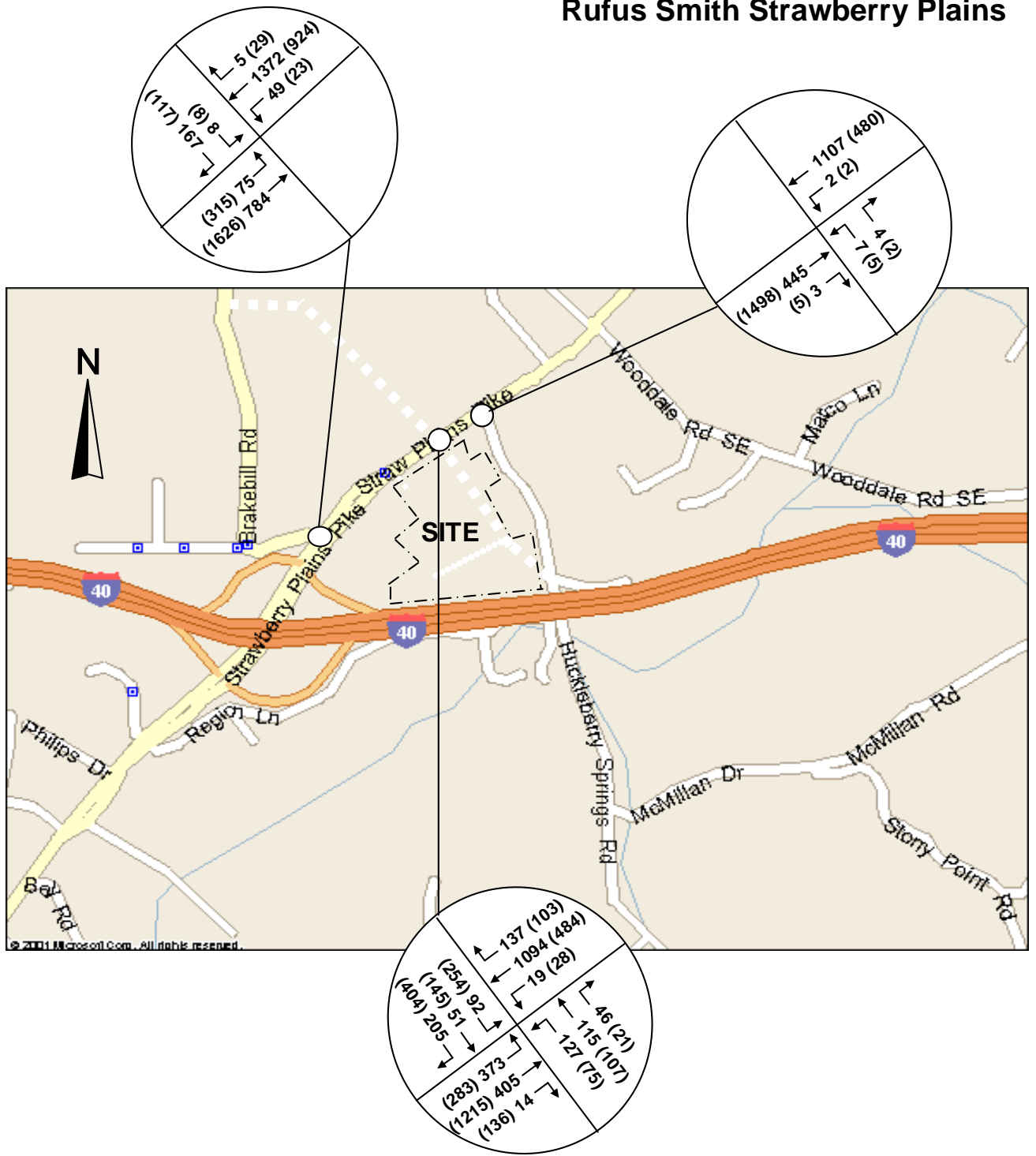
NOTE: Without Brakebill Road Realignment



LEGEND
XXX AM PEAK
(XXX) PM PEAK

Figure 5A

2010 BACKGROUND TRAFFIC Rufus Smith Strawberry Plains



NOTE: With the Brakebill Road Realignment



LEGEND
 XXX AM PEAK
 (XXX) PM PEAK

Figure 5B

**TABLE-4
CAPACITY AND LEVEL OF SERVICE
2010 BACKGROUND TRAFFIC**

INTERSECTION	TRAFFIC CONTROL	PERIOD	WITHOUT OLIVER SMITH DEVELOPMENT			WITH OLIVER SMITH DEVELOPMENT		
			V/C	DELAY	LOS	V/C	DELAY	LOS
Strawberry Plains Pike and Brakebill Road	STOP NB-L(EB-LR)	AM	0.23 (0.97)	8.3 (81.5)	A (F)	0.18 (0.62)	5.9 (34.5)	A (D)
		PM	0.45 (3.35)	9.3 (>999)	A (F)	0.51 (0.58)	13.8 (40.3)	A (E)
Strawberry Plains Pike and Huckleberry Springs Road	STOP SB-L(WB-LR)	AM	0.01 (0.01)	8.1 (12.3)	A (B)	0.00 (0.03)	8.3 (13.5)	A (B)
		PM	0.00 (0.03)	12.5 (19.5)	B (C)	0.01 (0.06)	16.8 (33.2)	C (D)
Strawberry Plains Pike and Relocated Huckleberry Springs Rd	SIGNAL	AM	0.49	5.4	A	0.81	28.1	C
		PM	0.45	3.5	A	1.01	38.7	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 was determined using the publication, **Trip Generation, 6th 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 25.85 acres of commercial development. This development would consist of ten parcels containing several assumed commercial land uses. The land uses are categorized into three zones: Zone 1 consists of a fast-food restaurant; Zone 2 consists of convenience market with gas pumps and a service station; and Zone 3 includes 2 motels, commercial retail, high quality, high turnover and fast-food restaurants. The commercial retail assumes specialty retail use. The following Table 5 presents the assumed land uses and densities for each parcel.

**TABLE-5
ASSUMED LAND USE AND DENSITIES**

PARCEL	USE	ACREAGE	UNITS
1	Fast Food Restaurant	1.2	5,200 sqft.
2	Convenience Market	1.4	3,000 sqft.
3	Service Station	1.3	8 pumps
4	Retail	1.6	15,000 sqft.
5	Fast Food Restaurant	1.0	3,000 sqft.
6	Sit-Down Restaurant	1.6	10,500 sqft.
7	Motel	1.9	100 rooms
8	Motel	1.7	90 rooms
9	Quality Restaurant	1.9	12,500 sqft.
10	Retail	8.1	75,000 sqft.

Some trip generation studies have included surveys addressing pass-by traffic and internal traffic. Studies conducted for pass-by traffic have suggested that a percentage of the traffic generated by commercial retail may originate from the existing traffic flow; therefore, the project does not necessarily introduce all new traffic to the transportation system. In addition to the pass-by traffic, the internal traffic, characteristic of mixed-use developments, accounts for the interaction between varying land uses. Internal traffic is sometimes described as multi-purpose trips.

Pass-by traffic varies relative to specific land uses and their densities. Some studies have shown varied results; however, the ITE publications, **Transportation and Land Development** by Virgil G. Stover and Frank J. Koepke and **Trip Generation**, has combined these studies to suggest uniform rates. These rates range from 14-percent for hardware stores to 60-percent for neighborhood shopping centers, gross leaseable area less than 100,000 square feet. Service stations and fast-food restaurants also exhibit high pass-by rates of 58-percent and 45-percent, respectively.

With the above in mind, this study assumes the fast-food restaurant located in Zone 1 and the convenience market and fuel services used a 45-percent pass-by rate and no internal trips, and the combined uses assumed for Zone 3 would have a 15-percent pass-by and a 5-percent internal rate. From the trip generation calculations, the proposed site may generate approximately 15,140 daily trips. After the consideration of multi-purpose and pass-by traffic, new daily trips generated could be approximately 10,510. Table 6 presents the trip generation of this proposed site.

**TABLE 6
CONCEPT SITE TRIP GENERATION**

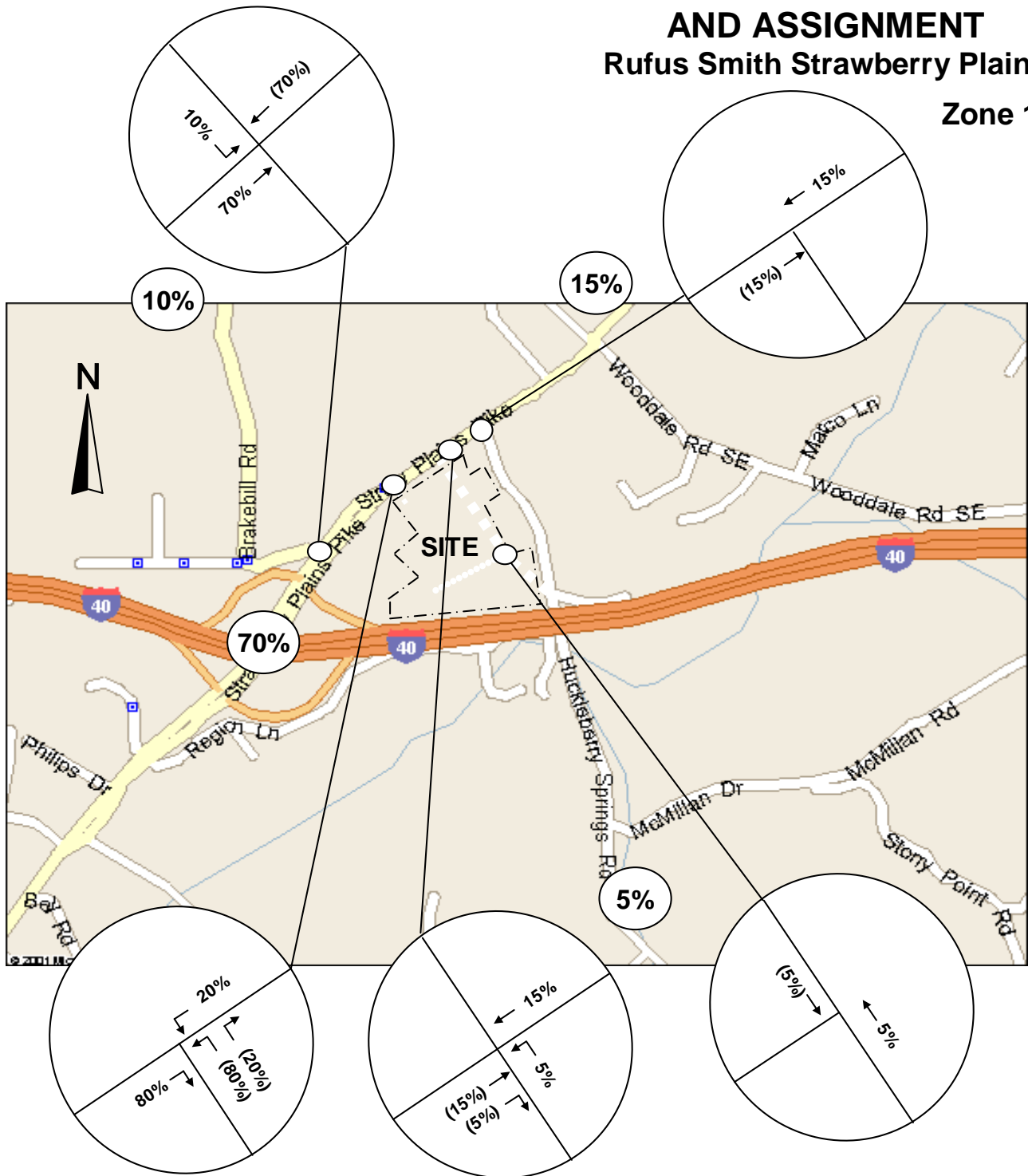
ZONE	PARCEL	CONCEPT LAND-USE	L.U.C.	DENSITY		DAILY	AM PEAK		PM PEAK	
						TRIPS	ENTER	EXIT	ENTER	EXIT
1	1	Fast Food Restaurant	834	5,200	sqft	2,580	132	127	90	83
2	2	Convenience Market with Fuel Pumps	853	3,000	sqft	2,537	68	68	91	91
2	3	Service Station with market	845	8	pumps	1,302	41	39	54	54
3	8	Motel	320	100	rooms	565	16	28	31	26
3	9	Motel	320	90	rooms	513	15	25	29	25
3	4, 10	Specialty Retail	814	90,000	sqft	3,660	54	34	100	133
3	7	Quality Restaurant	831	12,500	sqft	1,124	10	1	63	31
3	6	High-turnover Sitdown Restaurant	832	10,500	sqft	1,369	51	47	68	46
3	5	Fast-food Restaurant	834	3,000	sqft	1,488	76	73	52	48
TOTAL						15,138	463	442	578	537
TRIP GENERATION TOTALS										
ZONE										
1						2,580	132	127	90	83
2						3,839	109	107	145	145
3						8,719	222	208	343	309
TOTAL						15,138	463	442	578	537
PASS-BY TRIPS										
ZONE										
1						1,161	59	57	41	37
2						1,728	49	48	65	65
3						1,308	33	31	51	46
TOTAL						4,196	142	137	157	149
INTERNAL TRIPS										
						436	11	10	17	15
TOTAL NEW TRIPS GENERATED						10,506	310	295	404	373

Trip Distribution and Assignment

Trips generated by the concept development was distributed adjacent street and intersections based on the existing traffic, land uses within the project vicinity, and the existing transportation system. The distribution of the proposed site trips were 70-percent to the I-40 interchange where trips may turn east- or westbound using the interstate or continue to the southwest on Strawberry Plains Pike, 15-percent on Strawberry Plains Pike to the northeast, 10-percent was to and from Brakebill Road, and 5-percent to and from Huckleberry Springs Road. Figures 6-8 illustrate the trip assignment for the adjacent intersections with and without the Brakebill Road realignment.

PRIMARY DISTRIBUTION AND ASSIGNMENT Rufus Smith Strawberry Plains

Zone 1



NOTE: Without Brakebill Road Realignment



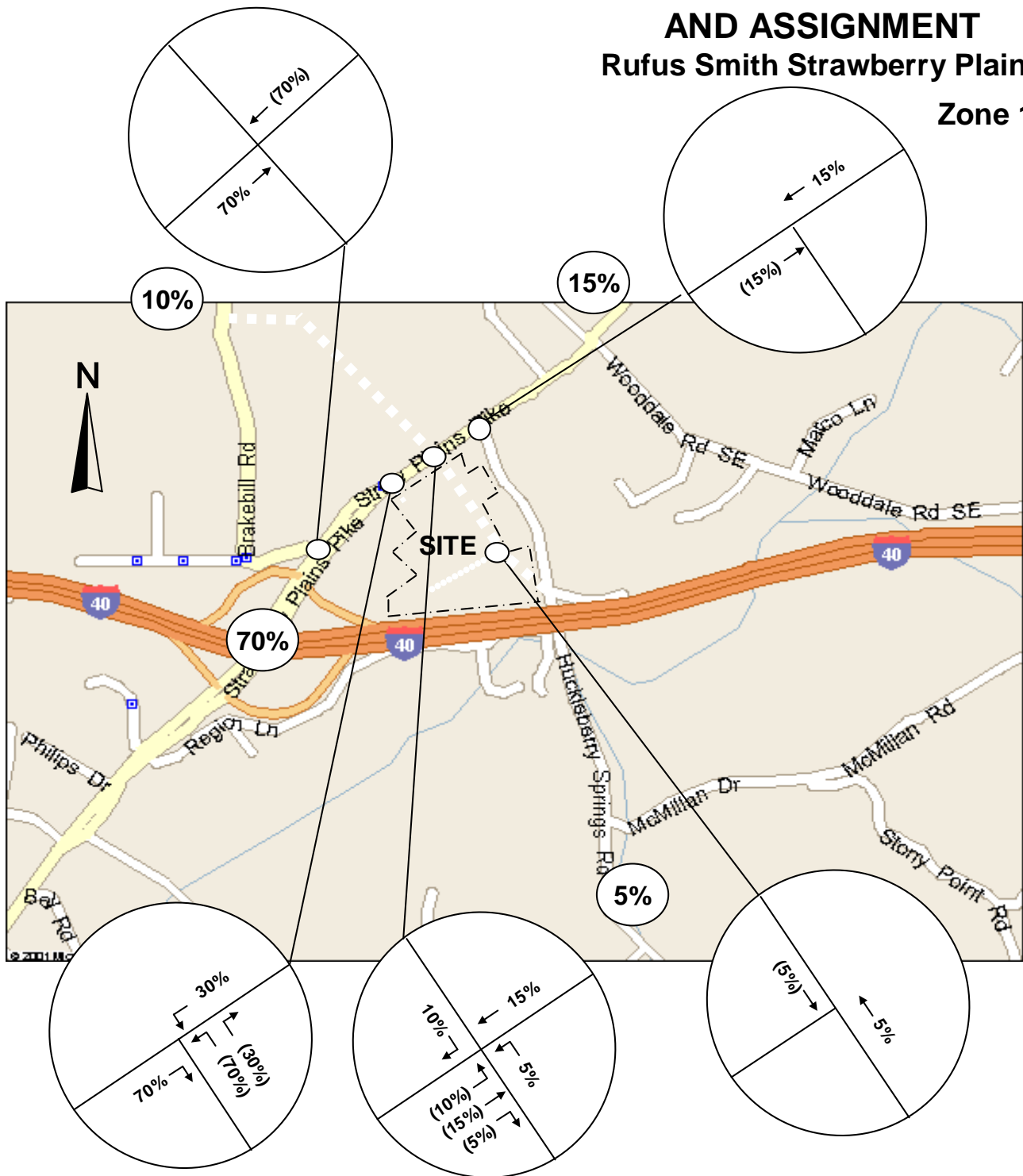
Wilbur Smith Associates

LEGEND
XX% ENTERING
(XX%) EXITING

Figure 6A

PRIMARY DISTRIBUTION AND ASSIGNMENT

Rufus Smith Strawberry Plains Zone 1



NOTE: With the Brakebill Road Realignment



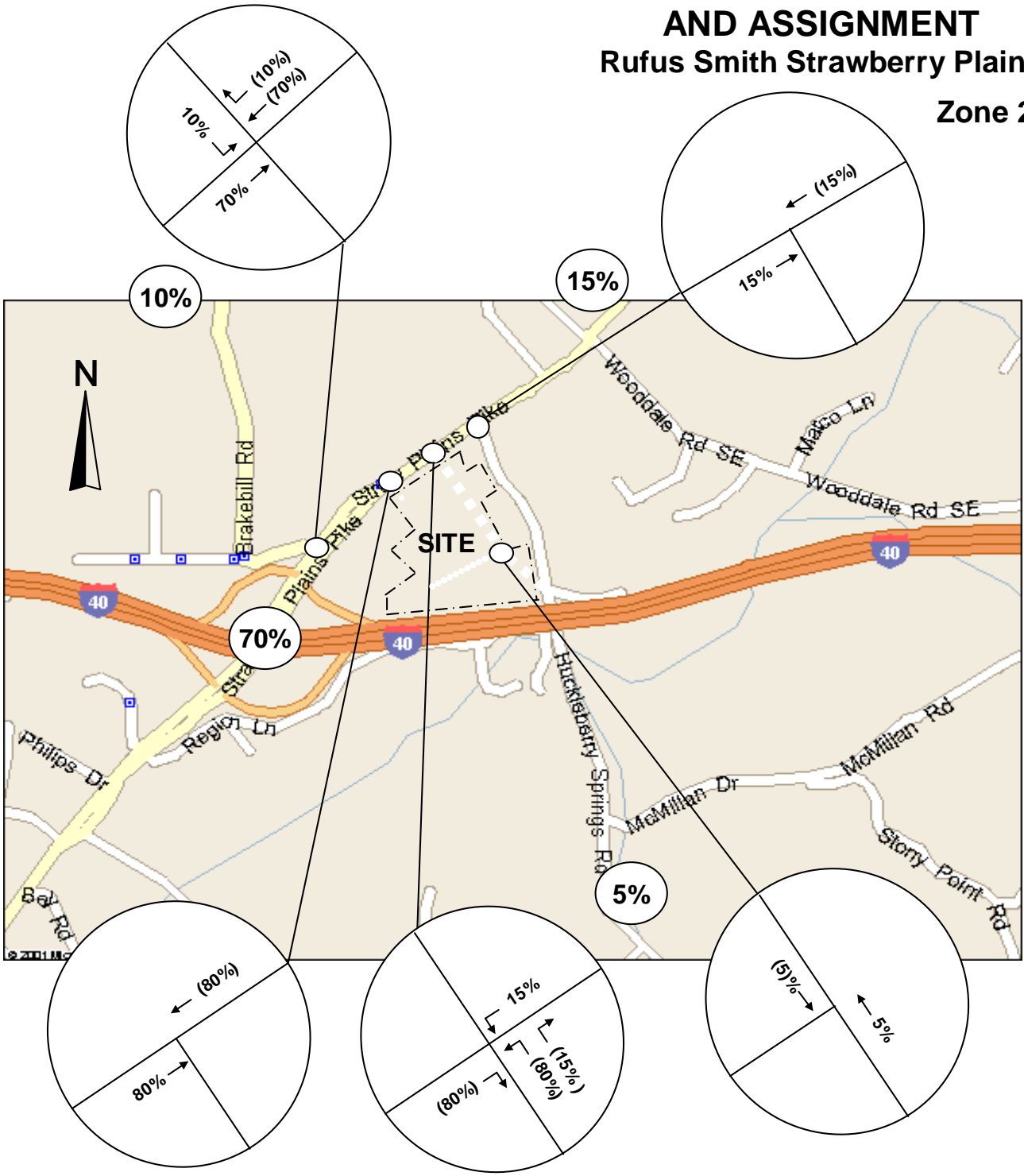
Wilbur Smith Associates

LEGEND
XX% ENTERING
(XX%) EXITING

Figure 6B

PRIMARY DISTRIBUTION AND ASSIGNMENT Rufus Smith Strawberry Plains

Zone 2



NOTE: Without Brakebill Road Realignment



Wilbur Smith Associates

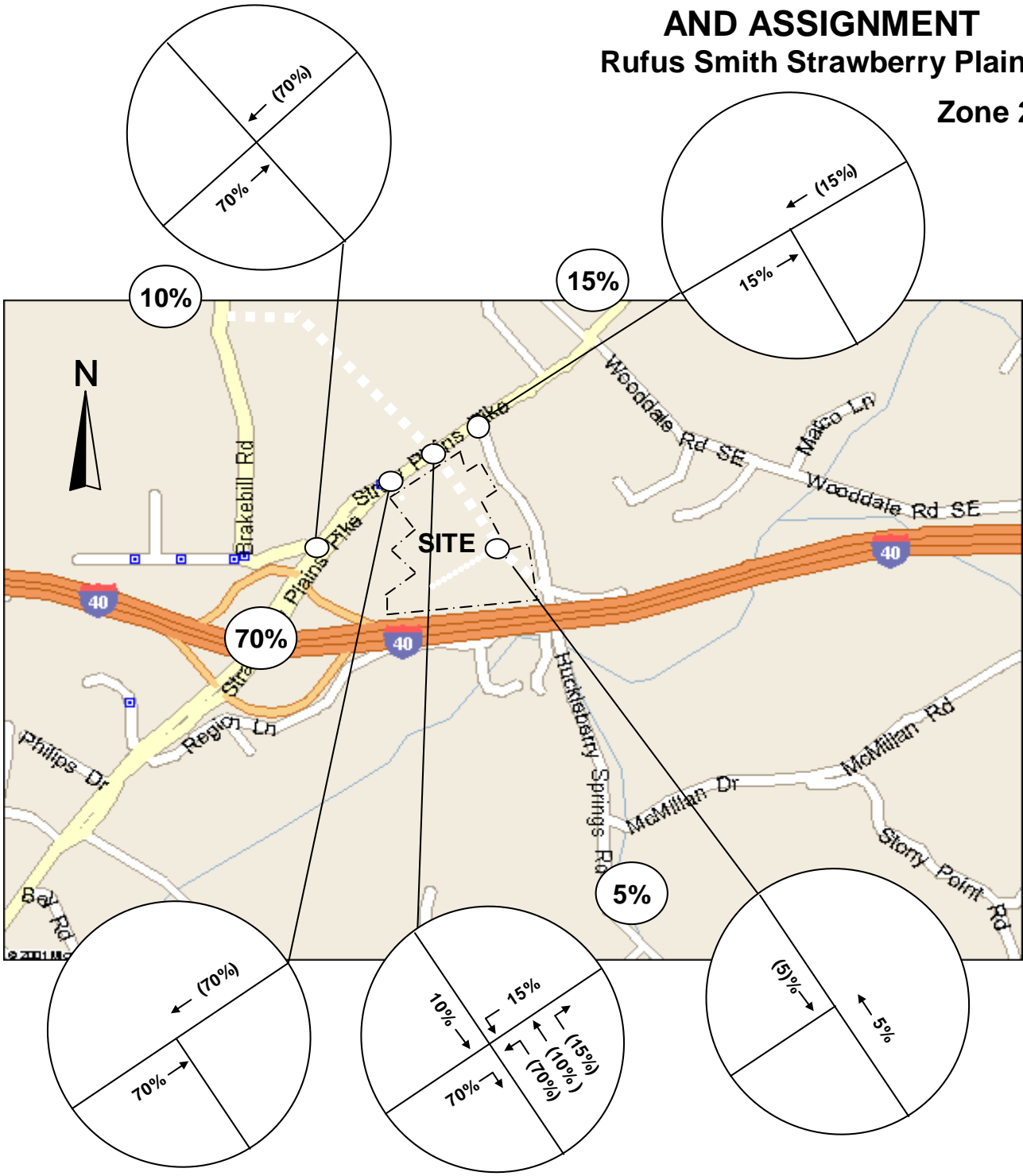
LEGEND
XX% ENTERING
(XX%) EXITING

Figure 7A

PRIMARY DISTRIBUTION AND ASSIGNMENT

Rufus Smith Strawberry Plains

Zone 2



NOTE: With the Brakebill Road Realignment



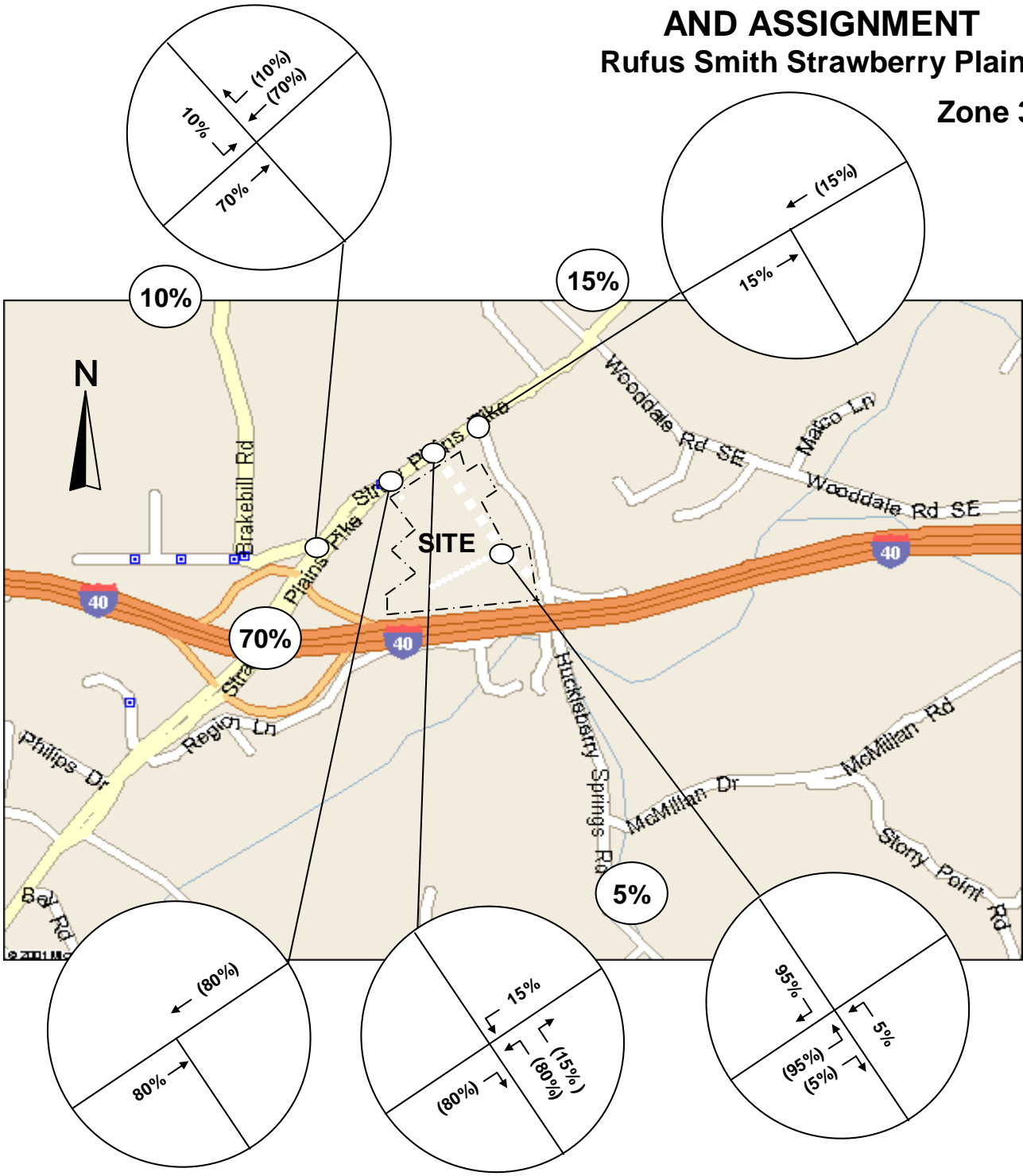
Wilbur Smith Associates

LEGEND
XX% ENTERING
(XX%) EXITING

Figure 7B

PRIMARY DISTRIBUTION AND ASSIGNMENT Rufus Smith Strawberry Plains

Zone 3



NOTE: Without Brakebill Road Realignment



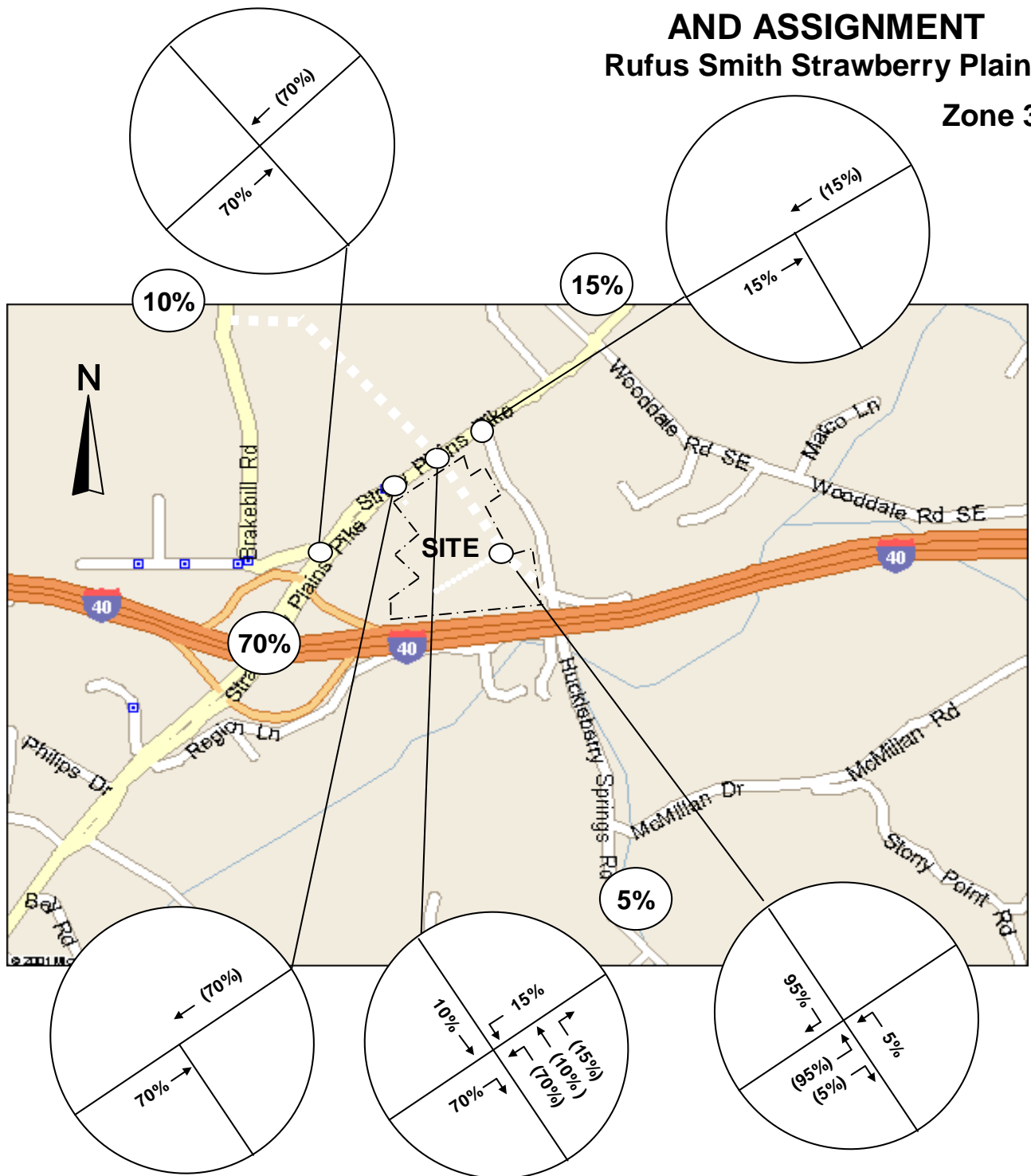
Wilbur Smith Associates

LEGEND
XX% ENTERING
(XX%) EXITING

Figure 8A

PRIMARY DISTRIBUTION AND ASSIGNMENT Rufus Smith Strawberry Plains

Zone 3



NOTE: With the Brakebill Road Realignment



LEGEND
XX% ENTERING
(XX%) EXITING

Figure 8B

Pass-by trips were distributed to the transportation network with 50-percent traveling adjacent to the site to and from the northeast and southwest on Strawberry Plains Pike. This distribution is illustrated in Figure 9.

Trip Volumes

Using the trip distribution and the trip generation for the site, project trips were assigned to the transportation system. Figures 10A and 10B illustrate the proposed site trips.

Projected Traffic Volumes

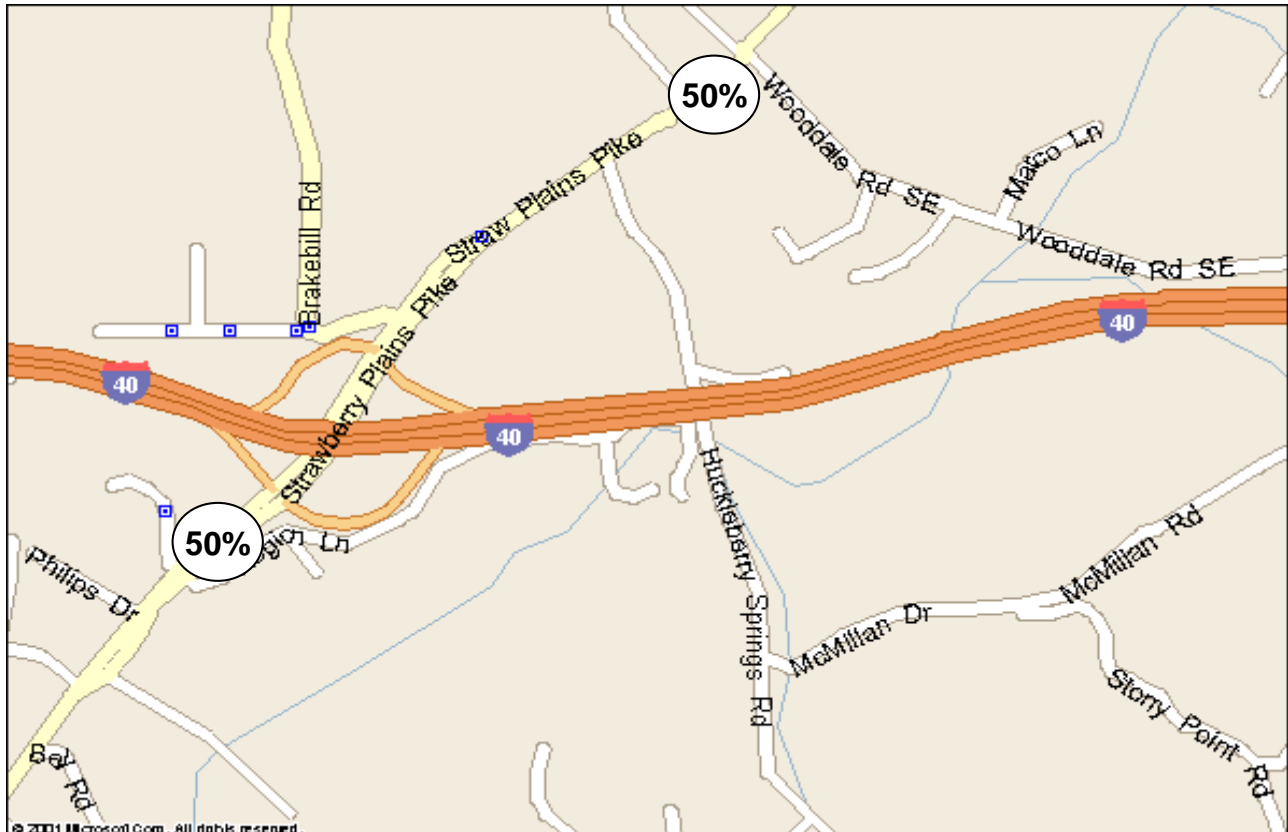
The addition of project trips to background traffic, with and without the Brakebill Road realignment, results in the projected traffic conditions with the development. Figures 11A and 11B illustrate the projected traffic for 2010 with the development built-out.

Projected Capacity and LOS

Traffic was again analyzed to determine the resulting capacity and LOS for the study intersections and the site access. Table 7 presents the results of these analyses, and Table 8 presents the summary of all the capacity and LOS analyses. With the proposed development concept, the level of service is maintained acceptable with or without the Oliver Smith development and the realignment of Brakebill Road. The development of the concept plan would require the realigned Huckleberry Springs Road approach to Strawberry Plains Pike to be provided a double left-turn, a thru, and a right-turn lane. The northbound approach of Strawberry Plains Pike at the new realigned intersection for Huckleberry Springs Road and Brakebill Road would also require a separate right-turn lane.

The LOS for the Huckleberry Springs Road access street reflects a provision of a multi-way STOP control with the Oliver Smith development. This control would be warranted due to the increased Huckleberry Springs Road traffic volumes associated with the Oliver Smith development.

PASS-BY DISTRIBUTION AND ASSIGNMENT Rufus Smith Strawberry Plains



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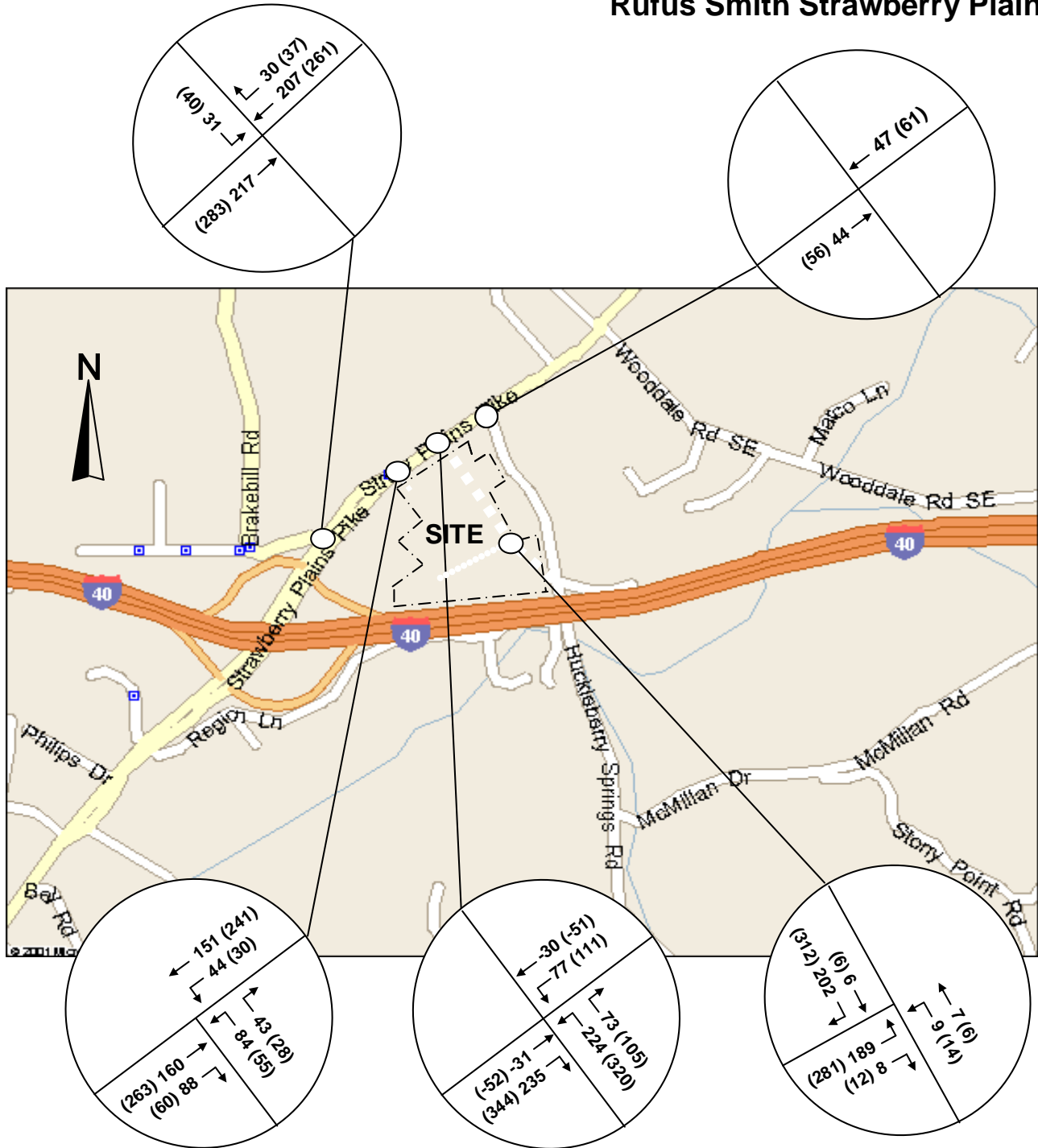
Wilbur Smith Associates

LEGEND
XX% ENTERING
(XX%) EXITING

Figure 9

PROJECT TRIPS

Rufus Smith Strawberry Plains



NOTE: Without Brakebill Road Realignment

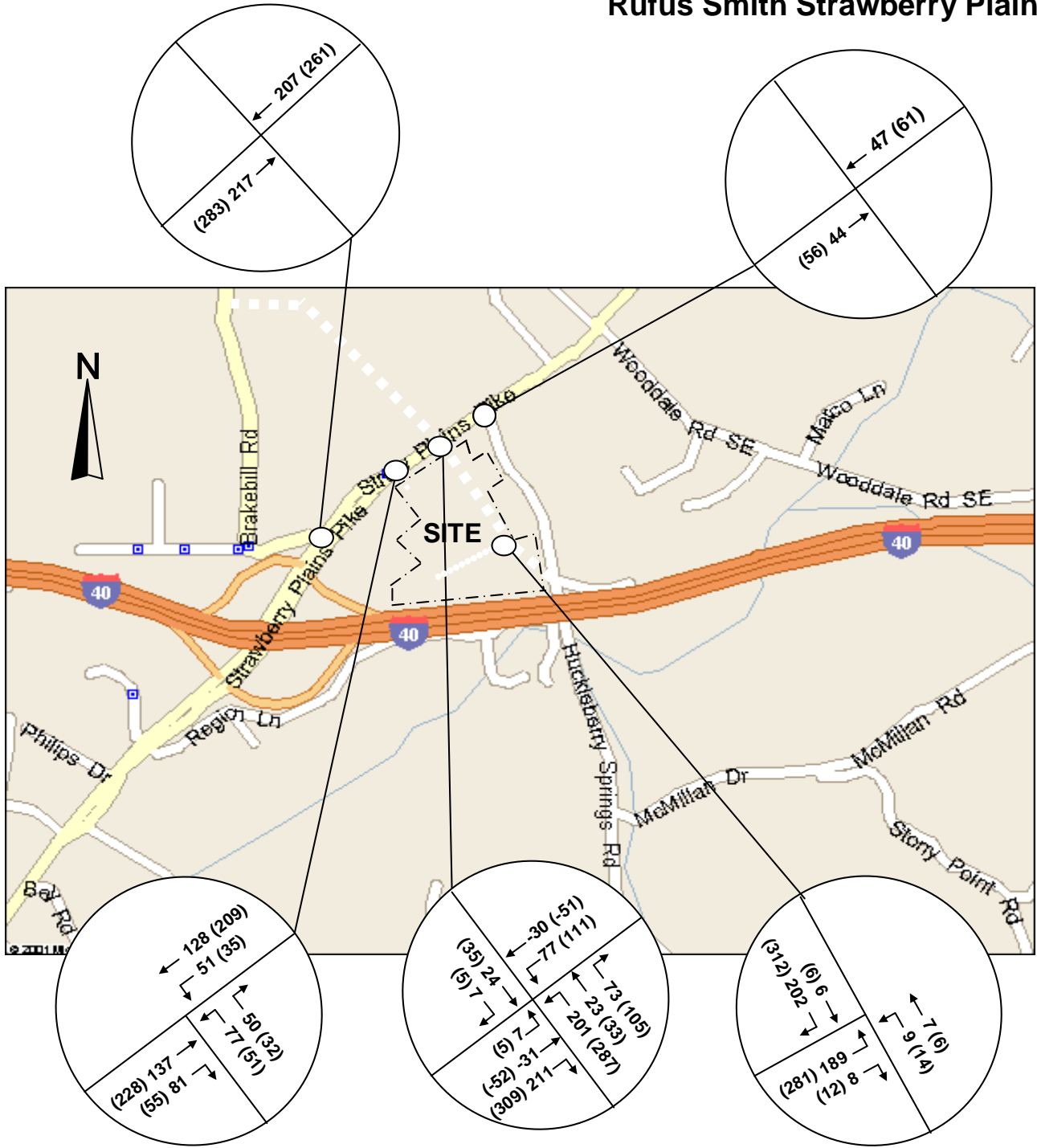
LEGEND
 XXX AM PEAK
 (XXX) PM PEAK



Figure 10A

PROJECT TRIPS

Rufus Smith Strawberry Plains



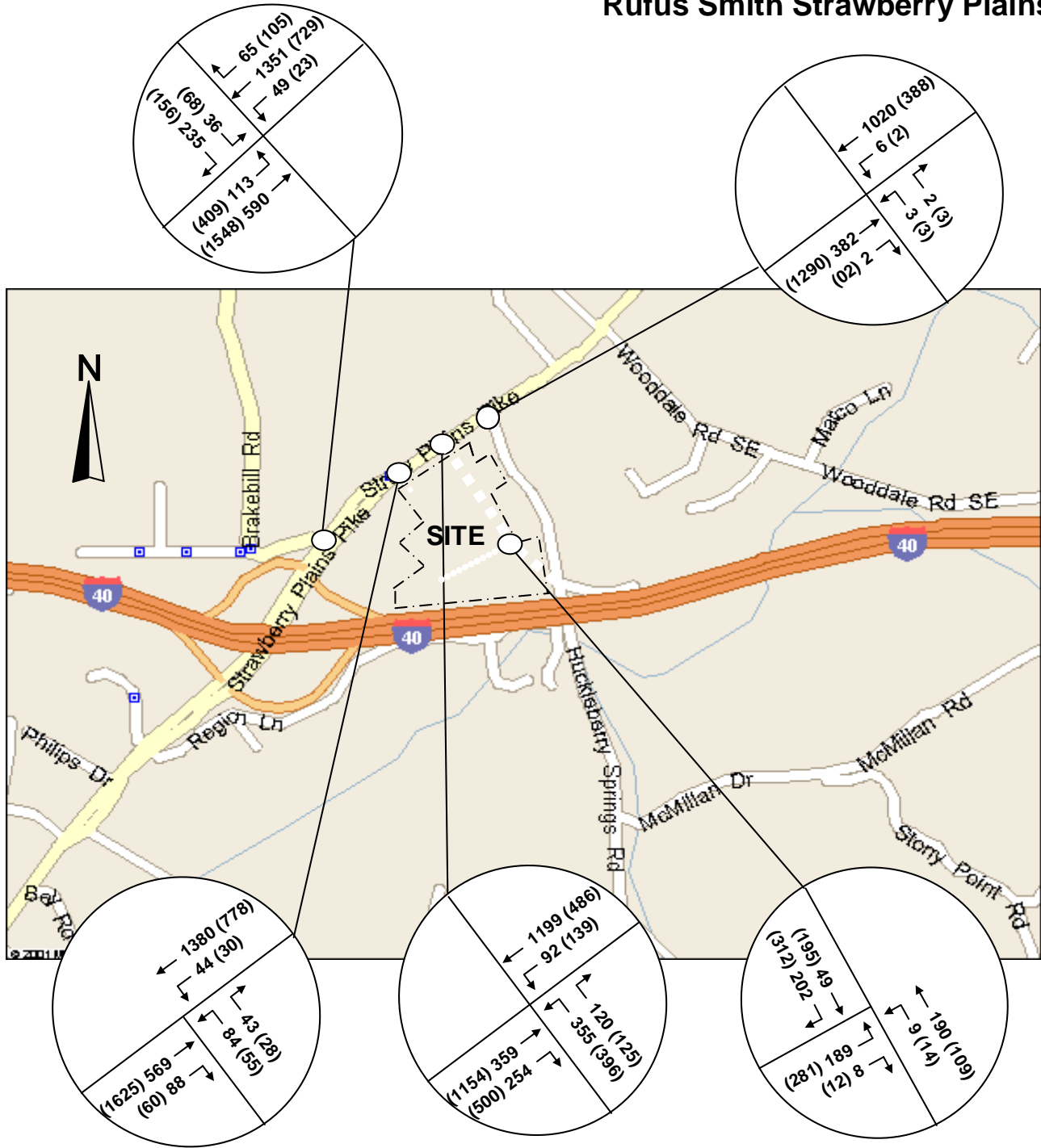
NOTE: With the Brakebill Road Realignment



LEGEND
 XXX AM PEAK
 (XXX) PM PEAK

Figure 10B

2010 PROJECTED TRAFFIC Rufus Smith Strawberry Plains



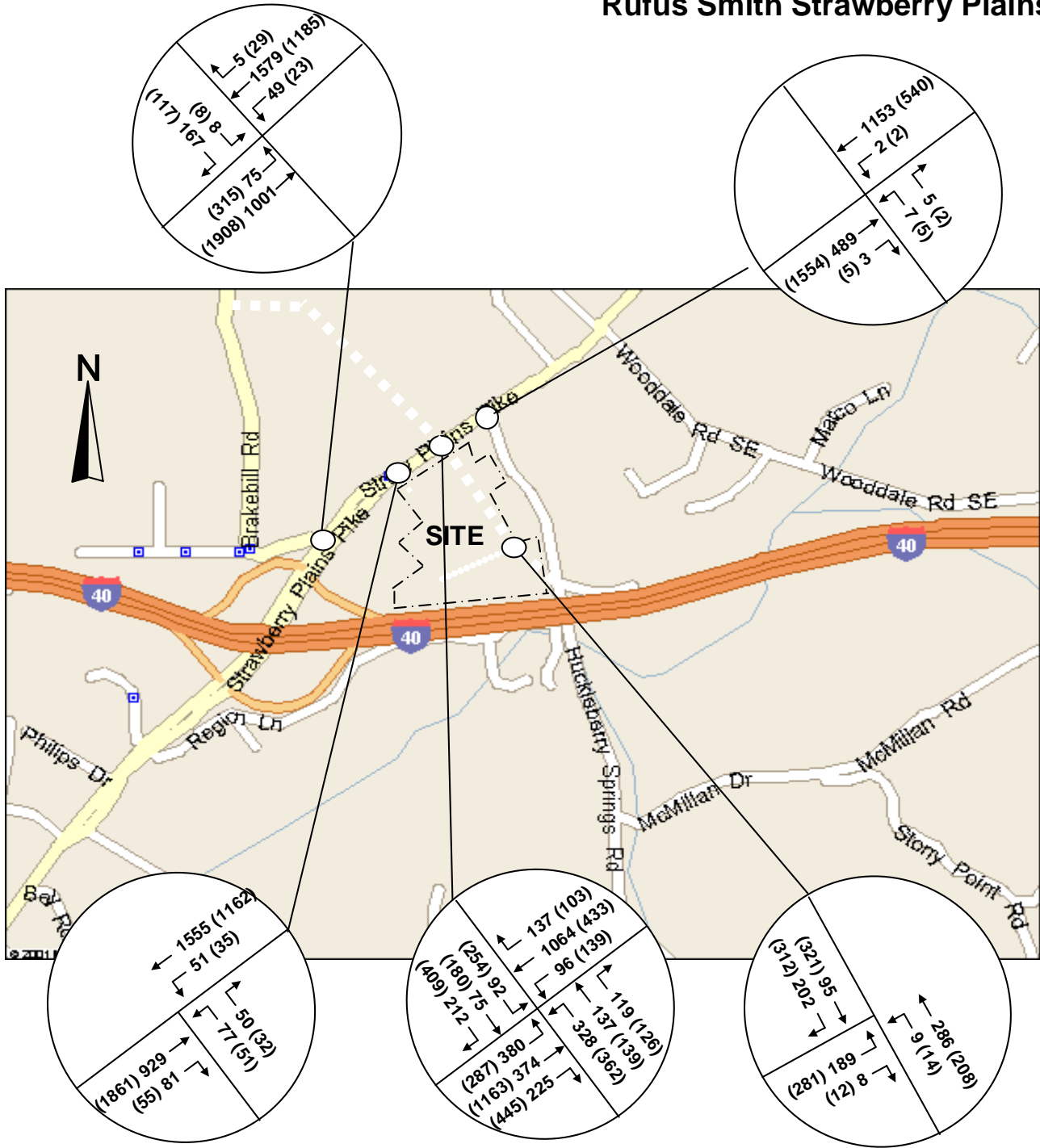
NOTE: Without Brakebill Road Realignment



LEGEND
XXX AM PEAK
(XXX) PM PEAK

Figure 11A

2010 PROJECTED TRAFFIC Rufus Smith Strawberry Plains



NOTE: With the Brakebill Road Realignment



LEGEND
XXX AM PEAK
(XXX) PM PEAK

Figure 11B

**TABLE-7
CAPACITY AND LEVEL OF SERVICE
2010 PROJECTED TRAFFIC**

INTERSECTION	TRAFFIC CONTROL	PERIOD	WITHOUT OLIVER SMITH DEVELOPMENT			WITH OLIVER SMITH DEVELOPMENT		
			V/C	DELAY	LOS	V/C	DELAY	LOS
Strawberry Plains Pike and Brakebill Road	STOP	AM	0.29 (1.71)	9.6 (381.7)	A (F)	.22 (0.77)	7.4 (55.0)	A (F)
	NB-L(EB-LR)	PM	.60 (14.07)	15.6 (>999)	C (F)	0.66 (1.79)	26.1 (492.5)	D (F)
Strawberry Plains Pike and Huckleberry Springs Road	STOP	AM	0.01 (0.01)	8.2 (12.6)	A (B)	0.00 (0.03)	8.5 (13.9)	A (B)
	SB-L(WB-LR)	PM	0.01 (0.03)	13.5 (19.9)	B (C)	0.01 (0.06)	17.8 (36.9)	C (E)
Strawberry Plains Pike and Relocated Huckleberry Springs Rd	SIGNAL	AM	0.59	8.4	A	0.76	20.00	B
		PM	0.67	12.0	B	0.87	25.80	C
Strawberry Plains Pike and South Access Parcel 1	STOP	AM	0.05 (0.37,0.07)	9.3 (27.6,11.1)	A (D,B)	0.09 (0.50,0.11)	11.2 (46.7,13.5)	B (E,B)
	SB-L(WB-L,R)	PM	0.10 (0.63,0.11)	17.1 (92.2,19.7)	C (F,C)	0.14 (0.83,0.15)	21.0 (167.1,23.7)	C (F,C)
Huckleberry Springs Road and Site Access	MULTI-WAY STOP	AM	0.30	12.2	B	---	10.50	B
	WB-LTR(NB-L,R)	PM	0.50	16.2	C	---	13.80	B

NOTE: Average vehicle delay estimated in seconds

**TABLE-8
CAPACITY AND LEVEL OF SERVICE
SUMMARY**

WITHOUT OLIVER SMITH DEVELOPMENT INTERSECTION	TRAFFIC CONTROL	PERIOD	2003			2010 BACKGROUND			2010 PROJECTED			
			V/C	DELAY	LOS	V/C	DELAY	LOS	V/C	V/C	DELAY	LOS
Strawberry Plains Pike and Brakebill Road	STOP NB-L(EB-LR)	AM	0.17 (1.02)	6.9 (104.3)	A (F)	0.23 (0.97)	8.3 (81.5)	A (F)	0.29 (1.71)	0.29 (1.71)	9.6 (381.7)	A (F)
		PM	0.37 (3.27)	7.6 (>999)	A (F)	0.45 (3.35)	9.3 (>999)	A (F)	.60 (14.07)	.60 (14.07)	15.6 (>999)	C (F)
Strawberry Plains Pike and Huckleberry Springs Road	STOP SB-L(WB-LR)	AM	0.02 (0.72)	0.40 (51.0)	A (F)	0.01 (0.01)	8.1 (12.3)	A (B)	0.01 (0.01)	0.01 (0.01)	8.2 (12.6)	A (B)
		PM	0.05 (0.77)	1.7 (93.9)	A (F)	0.00 (0.03)	12.5 (19.5)	B (C)	0.01 (0.03)	0.01 (0.03)	13.5 (19.9)	B (C)
<i>Strawberry Plains Pike and Huckleberry Springs Road</i>	SIGNAL	AM	0.68	8.8	A	---	---	---	---	---	---	---
		PM	0.83	11.3	B	---	---	---	---	---	---	---
Strawberry Plains Pike and Relocated Huckleberry Springs Rd	SIGNAL	AM	---	---	---	0.49	5.4	A	0.59	0.59	8.4	A
		PM	---	---	---	0.45	3.5	A	0.67	0.67	12.0	B
Strawberry Plains Pike and South Access Parcel 1	STOP SB-L(WB-L,R)	AM	---	---	---	---	---	---	0.05 (0.37,0.07)	0.05 (0.37,0.07)	9.3 (27.6,11.1)	A (D,B)
		PM	---	---	---	---	---	---	0.10 (0.63,0.11)	0.10 (0.63,0.11)	17.1 (92.2,19.7)	C (F,C)
Huckleberry Springs Road and Site Access	TWO-WAY STOP WB-LTR(NB-L,R)	AM	---	---	---	---	---	---	0.30	0.30	12.2	B
		PM	---	---	---	---	---	---	0.50	0.50	16.2	C

NOTE: Average vehicle delay estimated in seconds

WITH OLIVER SMITH DEVELOPMENT INTERSECTION	TRAFFIC CONTROL	PERIOD	2003			2010 BACKGROUND			2010 PROJECTED			
			V/C	DELAY	LOS	V/C	DELAY	LOS	V/C	V/C	DELAY	LOS
Strawberry Plains Pike and Brakebill Road	STOP NB-L(EB-LR)	AM	0.17 (1.02)	6.9 (104.3)	A (F)	0.18 (0.62)	5.9 (34.5)	A (D)	.22 (0.77)	.22 (0.77)	7.4 (55.0)	A (F)
		PM	0.37 (3.27)	7.6 (>999)	A (F)	0.51 (0.58)	13.8 (40.3)	A (E)	0.66 (1.79)	0.66 (1.79)	26.1 (492.5)	D (F)
Strawberry Plains Pike and Huckleberry Springs Road	STOP SB-L(WB-LR)	AM	0.02 (0.72)	0.40 (51.0)	A (F)	0.00 (0.03)	8.3 (13.5)	A (B)	0.00 (0.03)	0.00 (0.03)	8.5 (13.9)	A (B)
		PM	0.05 (0.77)	1.7 (93.9)	A (F)	0.01 (0.06)	16.8 (33.2)	C (D)	0.01 (0.06)	0.01 (0.06)	17.8 (36.9)	C (E)
<i>Strawberry Plains Pike and Huckleberry Springs Road</i>	SIGNAL	AM	0.68	8.8	A	---	---	---	---	---	---	---
		PM	0.83	11.3	B	---	---	---	---	---	---	---
Strawberry Plains Pike and Relocated Huckleberry Springs Rd	SIGNAL	AM	---	---	---	0.81	28.1	C	0.76	0.79	28.3	C
		PM	---	---	---	1.01	38.7	D	0.09	0.83	25.6	C
Strawberry Plains Pike and South Access Parcel 1	STOP SB-L(WB-L,R)	AM	---	---	---	---	---	---	0.09 (0.50,0.11)	0.09 (0.50,0.11)	11.2 (46.7,13.5)	B (E,B)
		PM	---	---	---	---	---	---	0.14 (0.83,0.15)	0.14 (0.83,0.15)	21.0 (167.1,23.7)	C (F,C)
Huckleberry Springs Road and Site Access	MULTI-WAY STOP WB-LTR(NB-L,R)	AM	---	---	---	---	---	---	---	---	10.50	B
		PM	---	---	---	---	---	---	---	---	13.80	B

NOTE: Average vehicle delay estimated in seconds

RECOMMENDATIONS

The projected traffic volumes and the analyses conducted with and without the Oliver Smith development and the realignment of Brakebill Road identified the following recommendations:

Without Realignment of Brakebill Road

- Signalize the intersection of Strawberry Plains Pike and the proposed realigned Huckleberry Springs Road. Interconnect recommended traffic signal with the I-40 interchange signals.
- Improve Strawberry Plains Pike to a 4-lane divided highway adjacent to the site.
- Provide a 275-foot minimum double left-turn lane and a minimum 275-foot right-turn lanes for the Huckleberry Springs Road approach.
- Provide a minimum 200-foot left-turn lane on Strawberry Plains Pike for the southbound approach.
- Provide a minimum 250-foot northbound right-turn lane on Strawberry Plains Pike at the proposed realignment of Huckleberry Springs Road. This turn lane may be a continuous right-turn lane adjacent to the site providing right-turn deceleration for any direct site access from Strawberry Plains Pike.
- Provide a minimum 50-foot southbound left-turn lane to Parcel 1.
- Provide a minimum 200-foot right-turn lane for the Relocated Huckleberry Springs Road and Site Access intersection.

With the Realignment of Brakebill Road

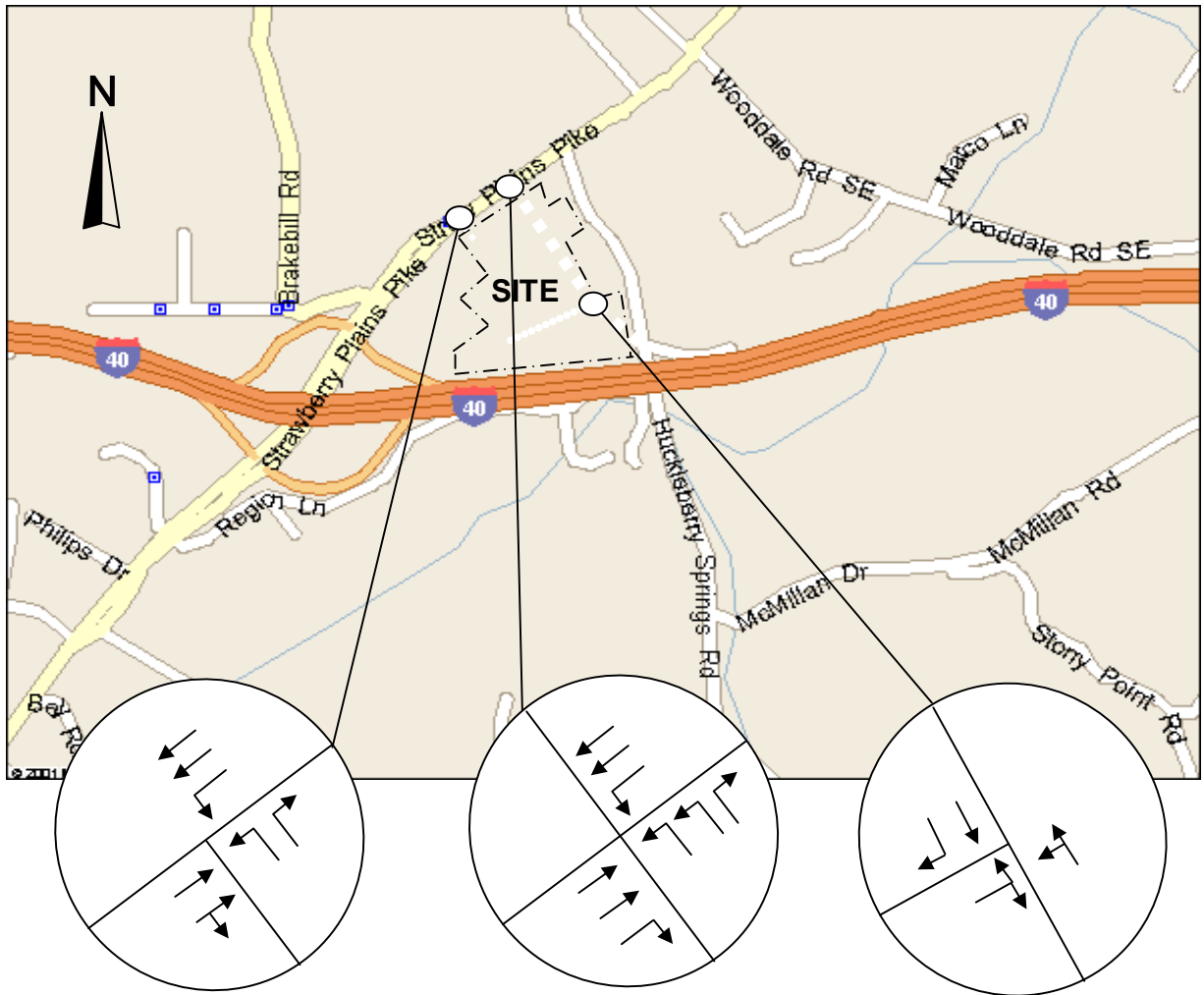
In addition to the improvements identified above, the following improvements should also be considered with the development of the Oliver Smith's development and the Brakebill Road realignment.

- Provide for a 300-foot minimum double left-turn lane on Strawberry Plains Pike for the northbound approach to the proposed realignment of Brakebill Road and Huckleberry Springs Road.
- Provide for a minimum 150-foot southbound right-turn lane on Strawberry Plains Pike at the realigned Brakebill Road and Huckleberry Springs Road.
- Provide for a 350-foot left-turn lane and a minimum 375-foot right-turn lane on the realigned Brakebill Road approach to Strawberry Plains Pike. A right-turn overlap should be included in the phasing of the signal for this approach.
- Monitor and consider the installation of a multi-way STOP for Huckleberry Springs Road and the proposed site access street.

The recommended geometry is illustrated in Figure 12A without the realignment of Brakebill Road and in Figure 12B with the Brakebill Road realignment.

2010 GEOMETRY

Rufus Smith Strawberry Plains

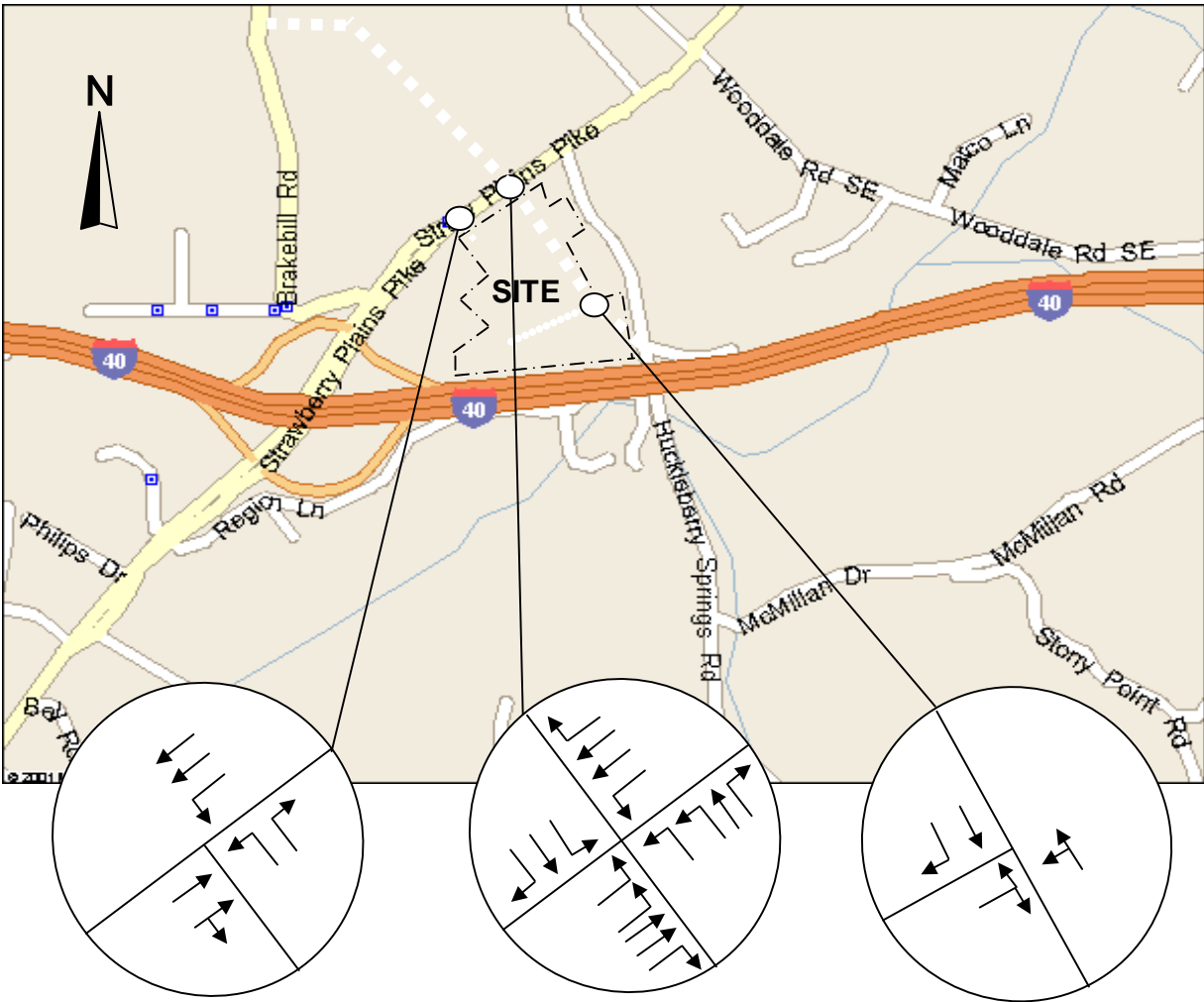


NOTE: Without the Brakebill Road Realignment



Figure 12A

2010 GEOMETRY Rufus Smith Strawberry Plains



NOTE: With the Brakebill Road Realignment



Figure 12B

Other Recommendations

- Minimize landscaping, using low growing vegetation, and signing at the driveways to insure that safe sight distance is maintained.
- Use a minimum of 25-foot driveway radius for the efficient and safe ingress and egress of the site.
- Driveway design should conform to the recommended standards and practices of the American Association of State Highway and Transportation Officials, the Institute of Transportation Engineers, the Knox County, and the Tennessee Department of Transportation.

Phased Recommendations

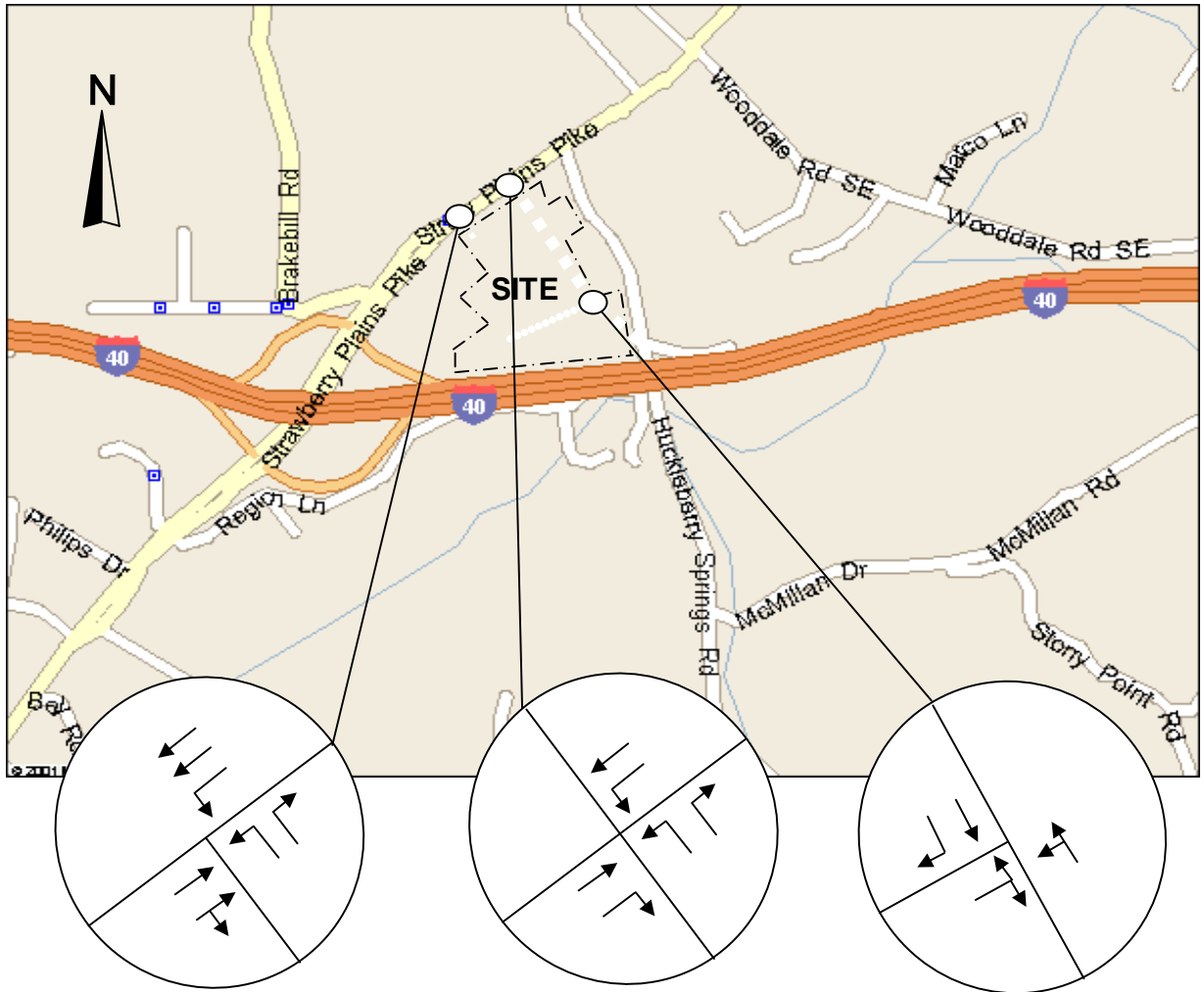
The development of this site is assumed to develop over the next eight years. It may be necessary to phase the necessary improvements. For the purpose of phasing improvements, it was assumed that Zone 3 uses would develop first including motels and quality, high-turnover, and fast-food restaurants. The commercial retail was not included in the assumed initial phase. The following recommendations resulted in a LOS B during the PM peak hour for Strawberry Plains Pike and the proposed realignment of Huckleberry Springs Road.

- Signalize the realignment of Huckleberry Springs Road at Strawberry Plains Pike.
- Provide two northbound lanes on Strawberry Plains Pike adjacent to the site and dropping a lane as a right-turn lane to realigned Huckleberry Springs Road.
- Provide a minimum 100-foot southbound left-turn lane on Strawberry Plains Pike at realigned Huckleberry Springs Road.
- Provide separate left- and right-turn lanes with a minimum 275-foot length for the realigned Huckleberry Springs Road approach to Strawberry Plains Pike.
- Install a STOP (R1-1) sign for the proposed site access street at Huckleberry Springs Road

The geometric recommendations for Phase 1 without the Brakebill Road realignment are illustrated in Figure 12C.

Phase 1 GEOMETRY

Rufus Smith Strawberry Plains



NOTE: Without the Brakebill Road Realignment



Figure 12C

CONCLUSION

The study of the proposed concept plan, located in the northeast quadrant of the I-40 and Strawberry Plains Pike interchange, examined the development of mixed commercial development including motels; convenient and fuel services; and quality, high-turnover, and fast-food restaurants. The proposed concept would realign Huckleberry Springs Road through the development. Study intersections included intersections of Strawberry Plains Pike with Brakebill Road and Huckleberry Springs Road. The study developed and evaluated existing, background, and project traffic conditions. Background traffic was determined using a 2.0-percent annual compounded growth rate until the year 2010 with and without the adjacent Oliver Smith development, which included the realignment of Brakebill Road. Traffic associated with the proposed project was then generated and distributed to the existing transportation system. Using the identified turning movements for the existing and projected traffic conditions, capacity and level of service analyses were conducted using the **2000 Highway Capacity Manual**. The unsignalized intersections of Brakebill Road and Huckleberry Springs Road are currently operating at an unacceptable LOS but could be improved with signalization and the proposed realignment of Brakebill Road and Huckleberry Springs Road.

With the recommendations of this report, traffic should flow both efficiently and safely. Signalization of the realigned Huckleberry Springs Road and Strawberry Plains Pike and its coordination with the I-40 signals should assist the maintenance of traffic platoons, thereby increase efficiency of the arterial flow of traffic. The impact of this project was determined to be manageable with acceptable levels of service.

APPENDIX

