DRAFT

SR 343, From SR 160 to US 25
CORRIDOR STUDY
Hamblen County

Prepared For:
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June 2008

State Route 343 Corridor Study

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EXECUTIVE SUMMARY

The Lakeway Area Metropolitan Transportation Planning Organization retained Wilbur Smith Associates to conduct a corridor study of SR 343 in Morristown, TN. The limits of the study extend from south of SR 160 to US 25E. Some of the key issues within the corridor include traffic operations at intersections, safety and effectiveness of access.

The consultant assembled various data including field reviews of roadway geometry and traffic control devices, turning movement counts and review of traffic accident histories. Capacity analyses were also conducted for the study intersections and the study corridors. Based on these analyses, the following actions are recommended:

Implement the following improvements immediately:

- Consider reduction of 50 mph speed limit to 45 mph due to geometric deficiencies and poor sight distance on this southern section of SR 343.
- Cut back any vegetation (where possible) within ROW to help improve sight distance concerns noted in Figure 10 Intersection Sight Distance.
- Consider refurbishing all warning signs for intersections ahead on SR 343 including supplemental speed plates. Consider adding supplemental warning signs for intersections ahead with speed plates on the left side of the road for extreme sight distance deficiencies at Old Witt Road (northbound SR 343) and Croxdale Road (southbound SR 343).
- Consider adding southbound Cross Road Ahead (W2-1) with supplemental speed plate (35 mph) in advance (480 feet) of Statem Gap Road/Duggan Drive intersection to mitigate poor intersection sight distance.
- Consider adding southbound Side Road Ahead (W2-2) in advance of Sequoyah Drive (480 feet) to mitigate poor intersection sight distance.
- Consider refurbishing existing striping and correcting passing sight distance concern between Croxdale Road and Statem Gap Road on SR 343 with the installation of a double solid yellow line.

Initiate and maintain an ongoing process of establishing access management policies.

Implement the following intersection improvements as near term improvements (5-years):

- Install a Southbound left-turn lane on SR 343 at Spencer Hale Road. Provide a refuge area for left turners from Spencer Hale Road onto 343 southbound to allow for a two-phase left-turn movement. This should help to mitigate poor sight distance looking right from a stopped position on Spencer Hale Road.
- Install a Northbound left-turn lane on SR 343 at Old Witt Road. Provide a refuge area for left turners from Old Witt Road onto 343 northbound to allow for a two-phase left – turn movement. This should help to mitigate poor sight distance looking right from a stopped position on Old Witt Road.
- Install a southbound left-turn lane on SR 343 at the intersection with US 25E.

Implement the following improvements as long term improvements (25-years):

- Construct interchange at the intersection of SR 343. US 25 E is to be maintained as a high speed corridor with a possible improvement of functional classification to either expressway or freeway. It is assumed, for this reason, that signalization at this intersection will not be considered a permanent alternative. However, a temporary signalization could be considered until the time that an interchange could be fully constructed.
- Construct eastbound left-turn lane on Pine Brook Road at SR 343 and southbound right-turn lane on SR 343 at Pine Brook Road.
- Closely monitor the northbound SR 343 left turning traffic onto Pine Brooke Lane for capacity and / or increase accidents and consider installation of northbound left-turn lane on SR 343 if deemed appropriate.
- Consider alignment improvements for Croxdale Road at the intersection with SR 343 to help improve sight distance and the skew of the minor side street approach.

INTRODUCTION

Wilbur Smith Associates (WSA) is pleased to submit this report to address the impact and access of the State Route 343 corridor. The Lakeway Area Metropolitan Transportation Planning Organization has undertaken this study of the State Route 343 corridor in Morristown (Hamblen County), Tennessee. The road is a key north-south link through the heart of Morristown with termini at each end on US 25E (Davy Crockett Parkway).

Site Location

The southern segment, which is the subject of this proposed study, carries 6,000 to 10,000 vehicles per day. SR 343 is a visible gateway route from the south to downtown Morristown; hence, this planning and engineering study is viewed as a critical component for regional access and mobility. Project limits for this study are from SR 160 to US 25E. Figure 1 shows the general study area. The study intersections are as follows:

- SR 343 / S. Cumberland Street at Pine Brook Road &W. Croxdale Road
- SR 343 / S. Cumberland Street at Duggan Drive & Statem Gap Road
- SR 343 / S. Cumberland Street at Southern Terrace & Roblee Road
- SR 343 at Wilson Hale Road
- SR 343 at Old Witt Road
- SR 343 at Spencer Hale Road
- SR 343 at Balch Street
- SR 343 at Sequoyah Drive
- SR 343 at Watkins Chapel Road
- SR 343 at US 25E / Davy Crockett Parkway

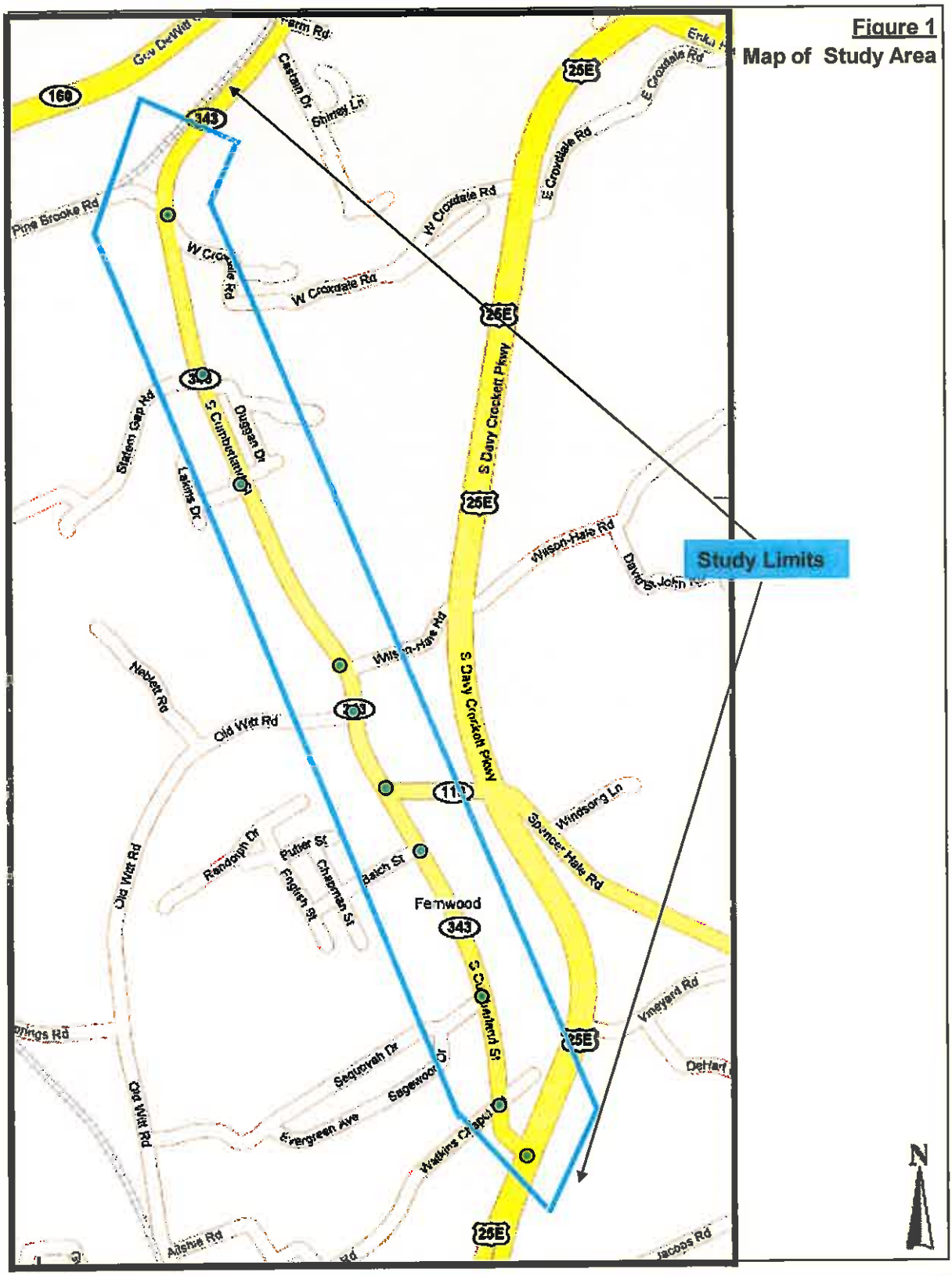
Project Description

Some of the key issues within the corridor include traffic operations at intersections, safety and effectiveness of access. It is anticipated that traffic growth will continue over time such that any existing capacity or safety deficiencies will be exacerbated, and future land use changes may be expected to introduce additional demands upon the street system. In order to anticipate and address these future impacts, LAMTPO has outlined several specific concerns to be addressed by this corridor study. These include evaluation of roadway and intersection capacity at present and at the near-term (five year) and long-term (25 year) planning horizons, development of an access management plan within the corridor, identification of environmental and aesthetic

considerations in regard to recommended improvements, and consideration of local development/redevelopment within the study environs.

Wilbur Smith Associates collected various data and analyzed traffic capacity/LOS conditions, crash trends and impacts of land use plans. Alternative recommendations were developed for the planning horizons (2013 and 2033). The following sections describe these tasks and findings in greater detail.

Figure 1: Map of Study Area



Roadway

SR 343 is a two-lane arterial roadway within the project limits without turn lanes or traffic signals. Figure 2 shows the current laneage and traffic control. The typical section includes little, if no, shoulders until south of Watkins Chapel Road. WSA identified the right-of-way insofar as possible using parcel plans from LAMTPO. The ROW width is approximately 80 feet along SR 343 until the intersection of US 25E. The posted speed limit on SR 343 is 50 MPH south of Wilson Hale Road and 45 MPH north thereof.

Land Use

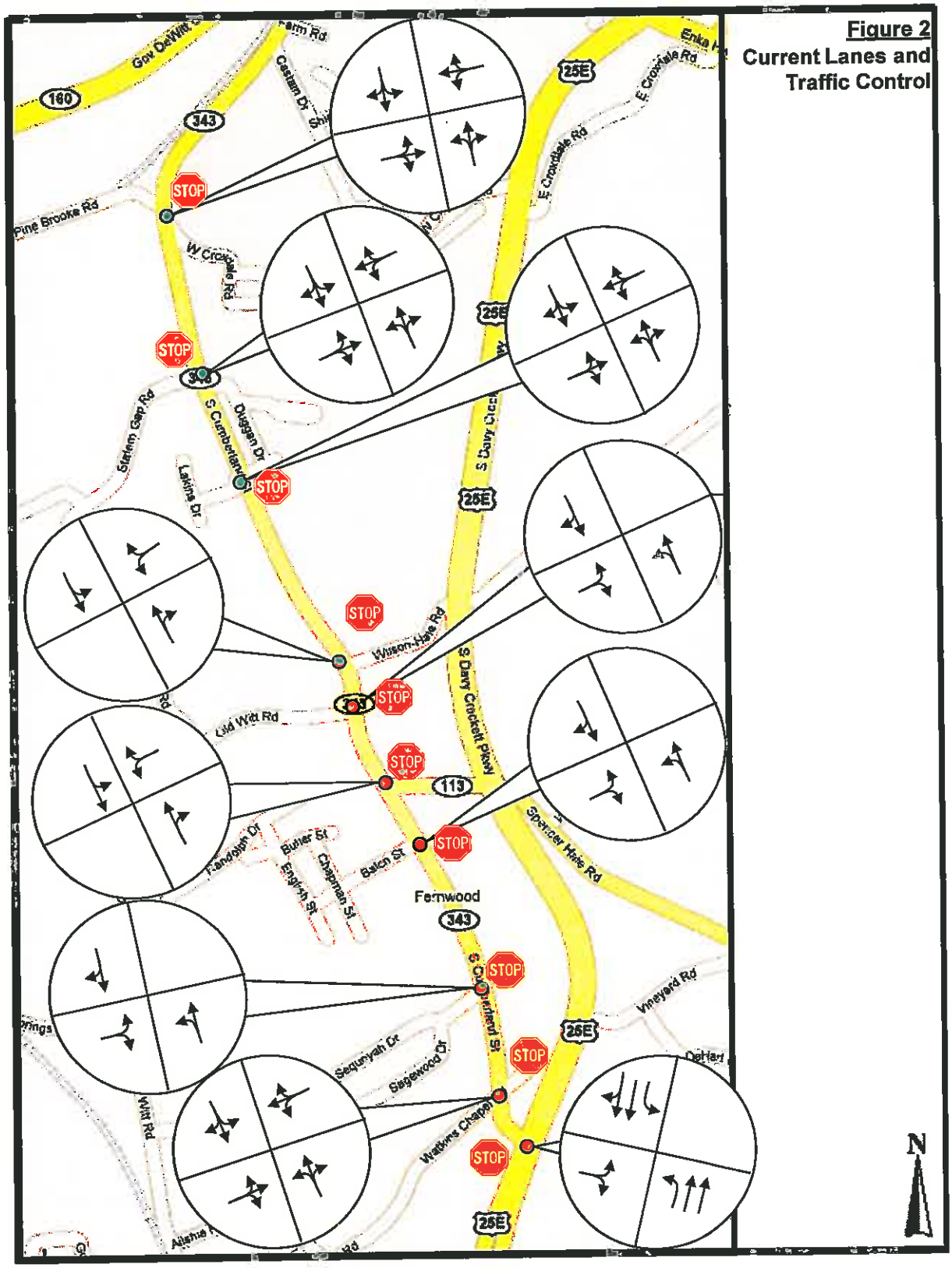
A majority of the existing adjacent property along this corridor is zoned for commercial development. Smaller sections of this corridor are currently zoned industrial and low density residential. The defining boundary between the industrial zone and the commercial zone is Pine Brook Road. Properties located to the north of Pine Brooke Road are industrial in nature. The boundary for the low density residential is located at Wilson-Hale Road. Properties located to the south and to the west of SR 343 of this intersection have the designation of low density residential. This corridor has been transitioning from industrial uses to more commercial uses in recent history.

It is anticipated that most of the industrial properties will be replaced by commercial uses by the 25 year horizon. It is also likely some additional lots that are currently zoned low density residential may convert to commercial uses. The corridor has been exhibiting new growth as new population is moving back into some areas in southern Morristown. Thus, a new commercial growth is being realized just to the north of this southernmost section of SR 343 and is likely to continue southward along the SR 343 corridor as the population grows.

Environmental

A search for previously documented archaeological resources within the South Corridor was conducted at the Division of Archaeology of the Tennessee Department of Environment and Conservation, Nashville. No archaeological sites have been documented within the South Corridor, nor have any archaeological surveys been conducted within it. One survey was conducted east of the South Corridor and documented an archaeological site, 40HB10. This site is located well outside the SR 343 South Corridor limits.

Figure 2. Current Lanes and Traffic Control



A search for previously documented historic properties within the South Corridor was conducted at the Tennessee Historical Commission of the Tennessee Department of Environment and Conservation, Nashville. No historic properties have been documented within the South Corridor. While there are several documented historic properties located outside the South Corridor limits to the east, west, and south (in particular the town of Witt), none of these properties are National Register properties.

GIS Data obtained from the National Wetlands Inventory of the United States Fish & Wildlife Service (http://www.tngis.org/wetlands_metadata.html) located no wetlands within the South Study Corridor.

WSA conducted a windshield survey of wetland areas near SR 343. While there are several stream crossings, no extensive wetlands were noted that likely would be impacted by potential widening of the roadway. According to GIS data (http://www.tngis.org/tn_huc_12_metadata.html) the South Study Corridor traverses three drainage basins: Turkey Creek, Long Creek, and Flat Creek. Approximately 2454 feet (~0.46 miles) of Turkey Creek is contained within the North Study Corridor in the Turkey Creek drainage Basin. No other streams are present within the other two drainage basins.

Existing Traffic Volumes

WSA conducted turning movement counts at the study intersections between November 29 and December 4, 2007. The count hours were from 7 to 9 AM, 11 AM to 1 PM, and 2 to 6 PM. Figure 3 shows the observed morning and evening peak hour volumes. The "worst-case" peak hour volume was chosen for each intersection. The raw turning movement count data are contained in the Appendix.

Growth Rates

The Tennessee Department of Transportation (TDOT) maintains several count stations on SR 343 in the study area at which average daily traffic volumes are reported based on annual traffic counts. ADT is the average 24-hour volume of traffic including both directions of travel at a given location along the roadway and is a good general indicator of traffic demand. Figure 4 shows the 2008 and projected 2013 and 2033 ADT values at each station.

Table 1. ADT Growth Rates

TDOT Count Station Number and Location	Annual Traffic Growth
Station #29-north of Pine Brooke Road on SR 343	2.02%
Station #100-west of SR 343 on Old Witt Road	1.55%
Station #99-south of Sequoyah Drive on SR 343	No Growth
Station #68-north of Wilson Hale Rd on US 25E	2.84%

It is evident in Table 1 that traffic growth in the northern portion of the corridor has increased just over two percent per year while traffic has increased at just over one and a half percent per year in the southern portion. For study purposes in projecting future traffic demand, it was assumed that all traffic will increase at a rate of two percent per year. The projected peak hour volumes for 2013 and 2033 (see Figures 5 and 6, respectively) were estimated based on this assumed growth rate.

Figure 3. 2008 Peak Hour Volumes AM (PM)

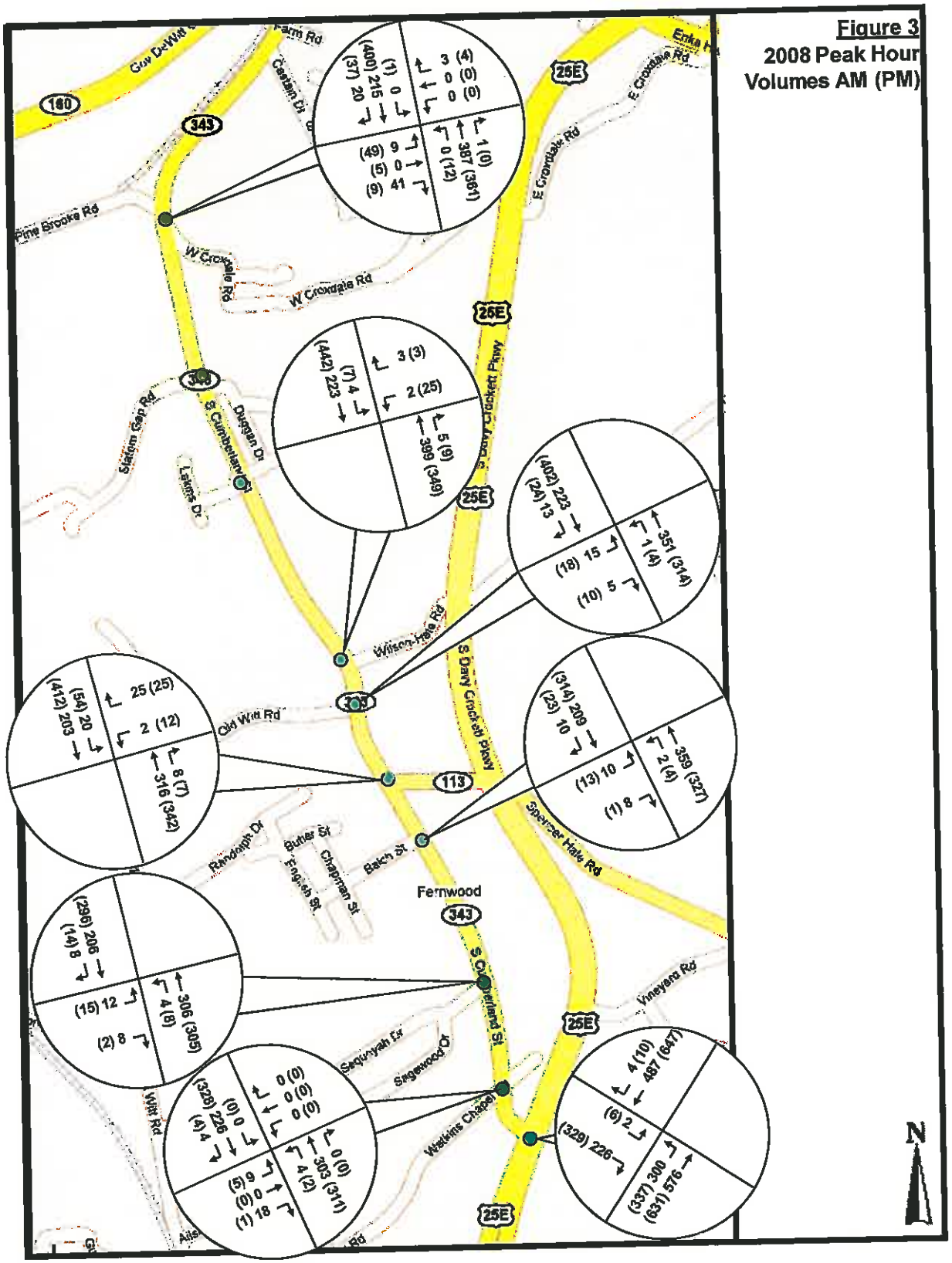


Figure 4. Future Average Daily Traffic Volumes

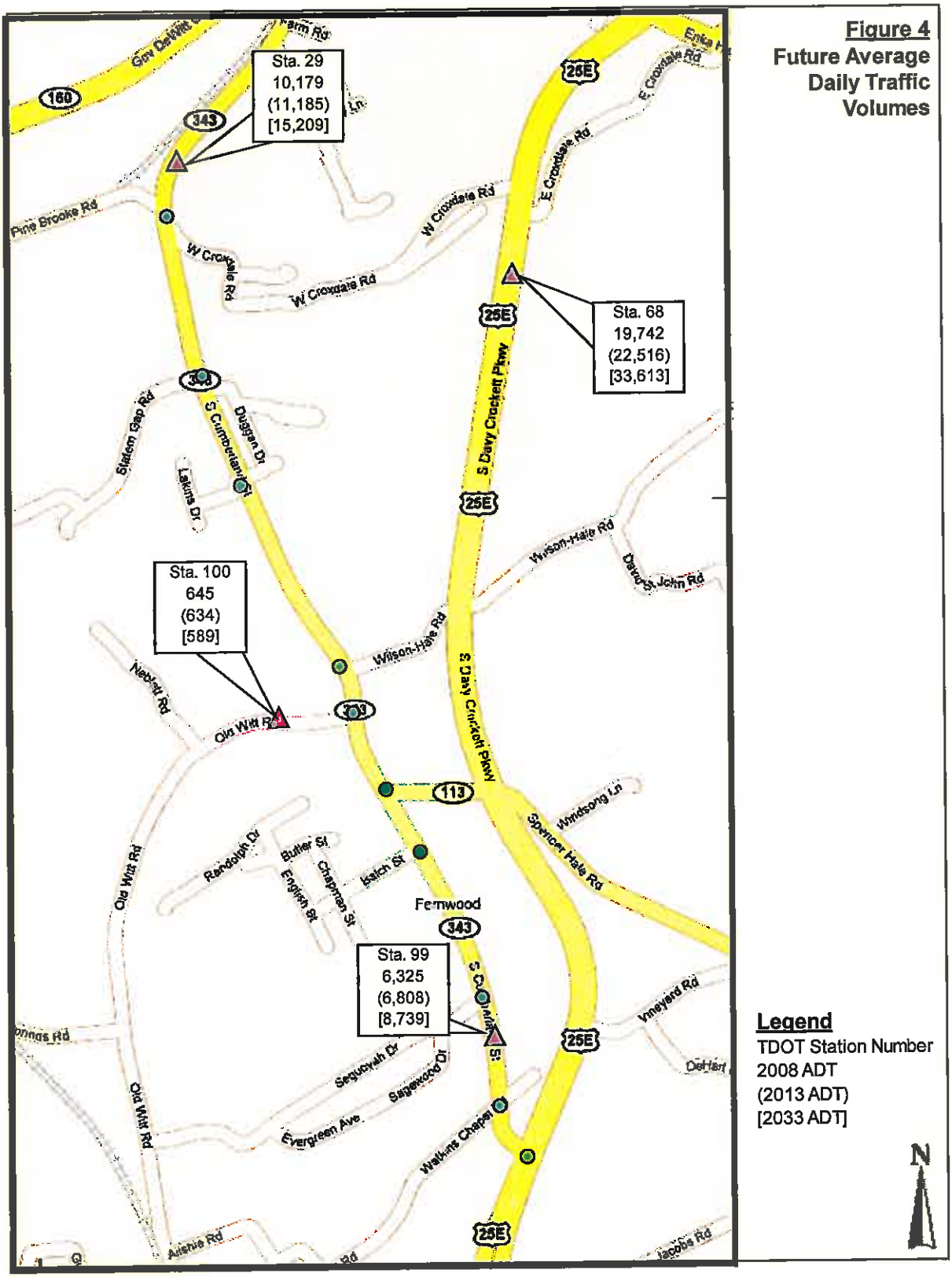


Figure 5. 2013 Peak Hour Volumes AM (PM)

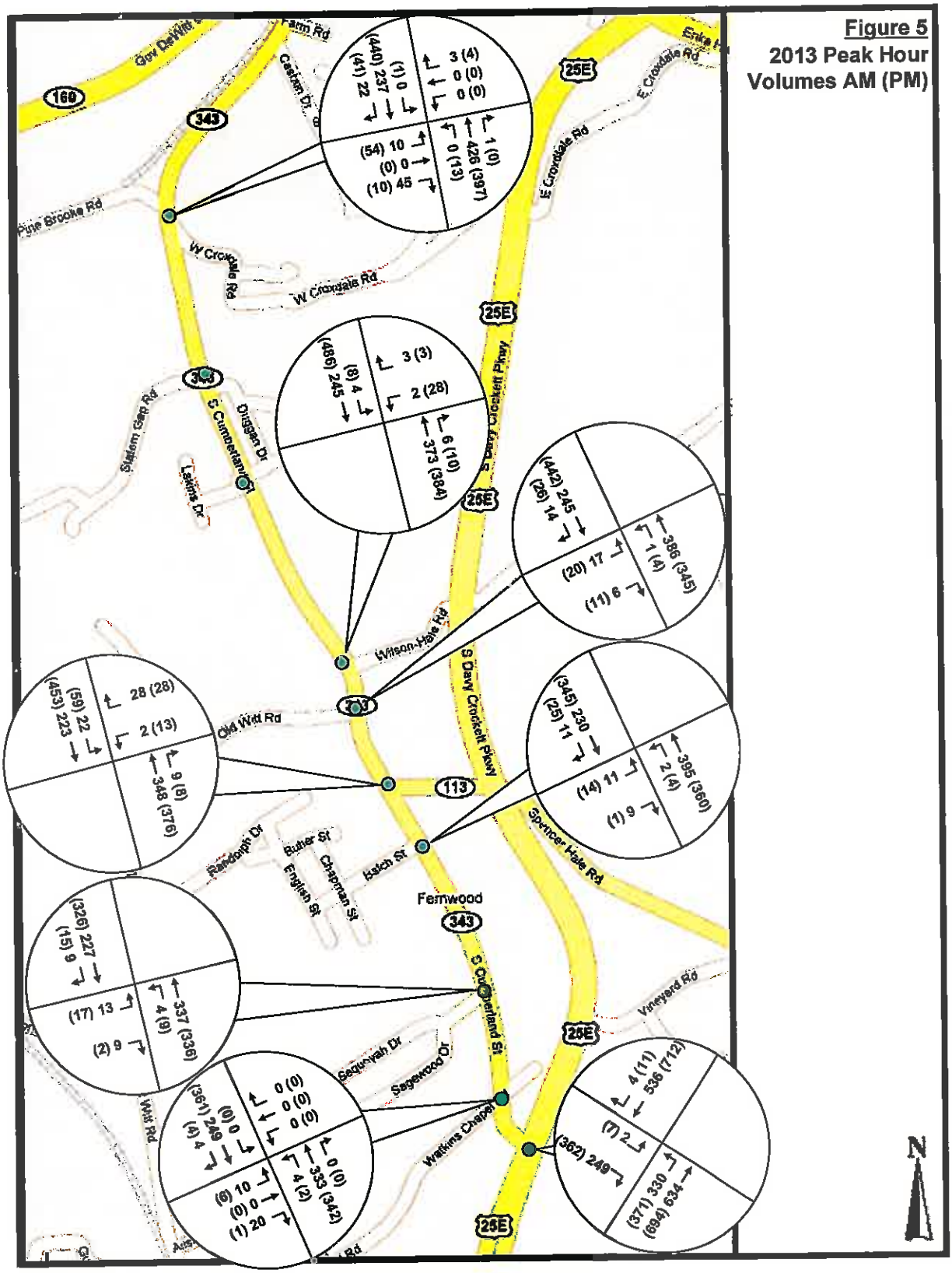
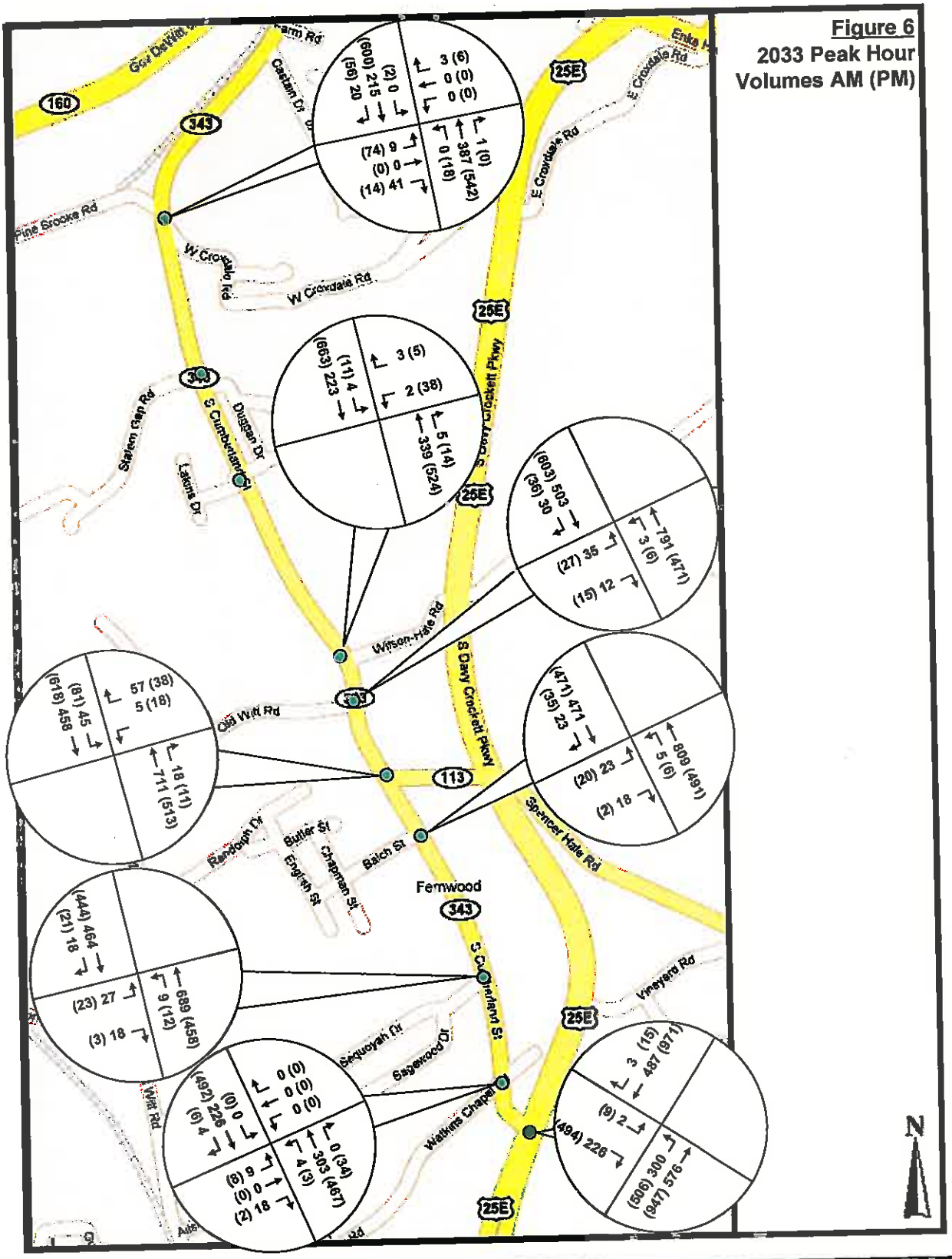


Figure 6. 2033 Peak Hour Volumes AM (PM)



Level of Service

WSA conducted intersection capacity analyses to assess current and future traffic conditions at the study intersections with the current laneage and traffic control in place. The *Synchro Software* (Trafficware Ltd., version 6) was utilized for the capacity analyses. It replicates the procedures of the *Highway Capacity Manual* (Transportation Research Board, 2000) which is the nationally-accepted standard for transportation engineering evaluations. One of the measures employed in intersection capacity analyses is "level of service" (LOS), a qualitative statement of the acceptability of traffic conditions based on delay. The LOS index ranges from LOS A, indicating excellent traffic conditions with minimal delay, to LOS F indicating very congested conditions with excessive delay. LOS D generally is considered the minimum acceptable condition. Table 2 presents the delay criteria for the various levels of service at STOP-controlled.

Table 2. 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**

Analyses were conducted using the Synchro Software, developed by Trafficware. Figures 7, 8, and 9 show the levels of service for each of the study intersections with current laneage and traffic control devices at 2008, 2013, and 2033, respectively. The analysis output reports for these and subsequent capacity analyses are contained in the Appendix.

Figure 7. 2008 Peak Hour LOS AM (PM)

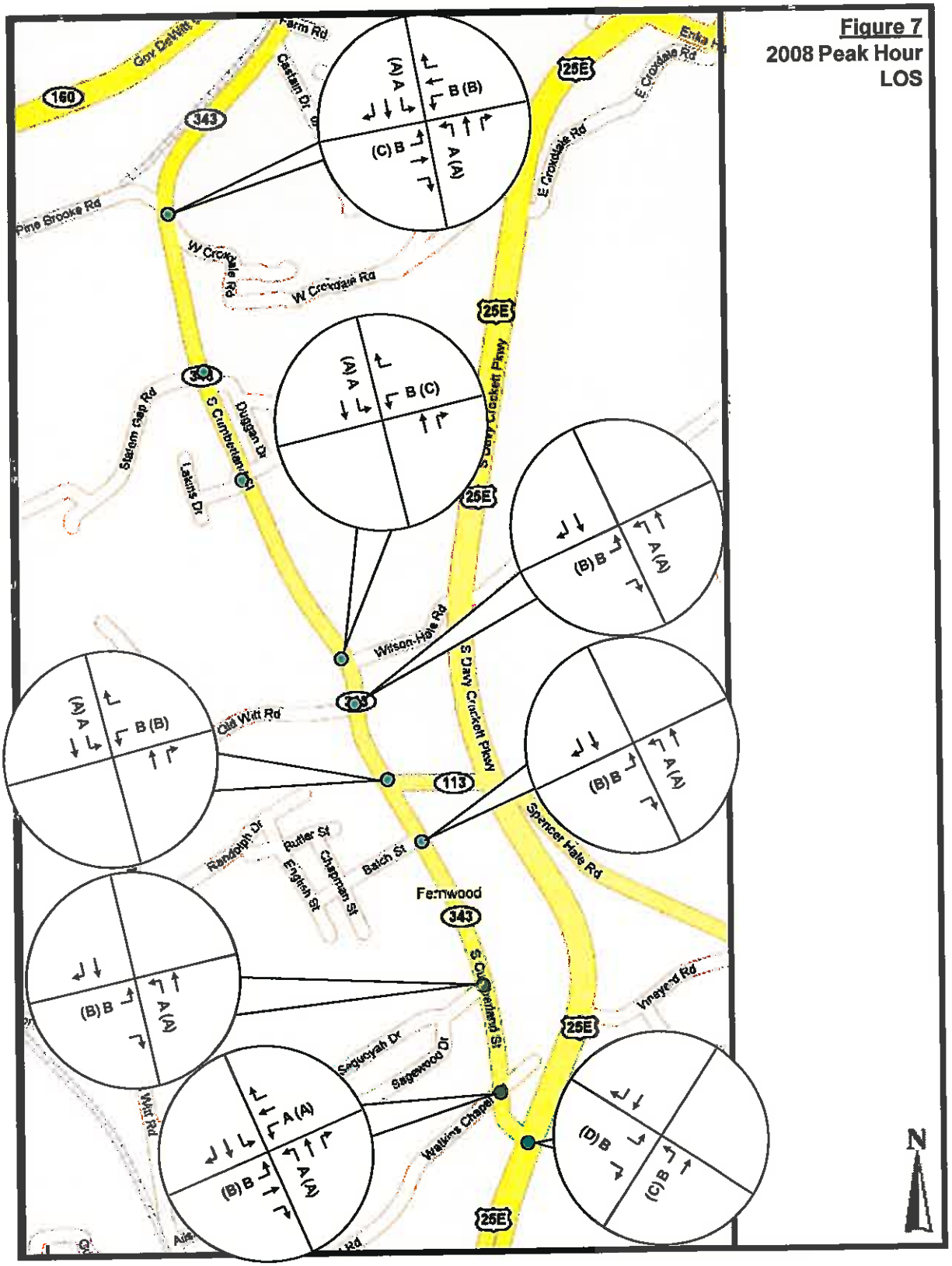


Figure 8. 2013 Peak Hour LOS AM (PM)

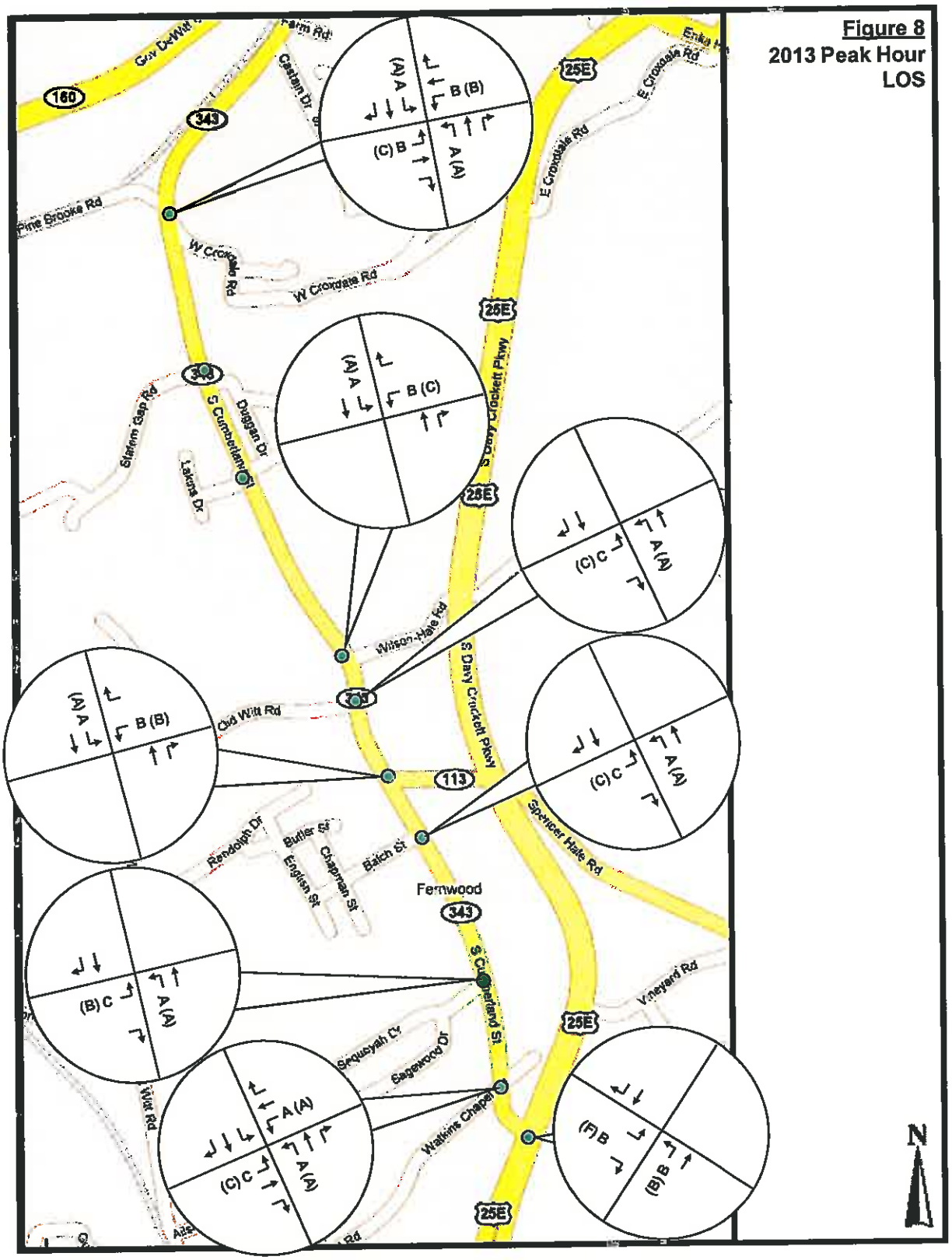
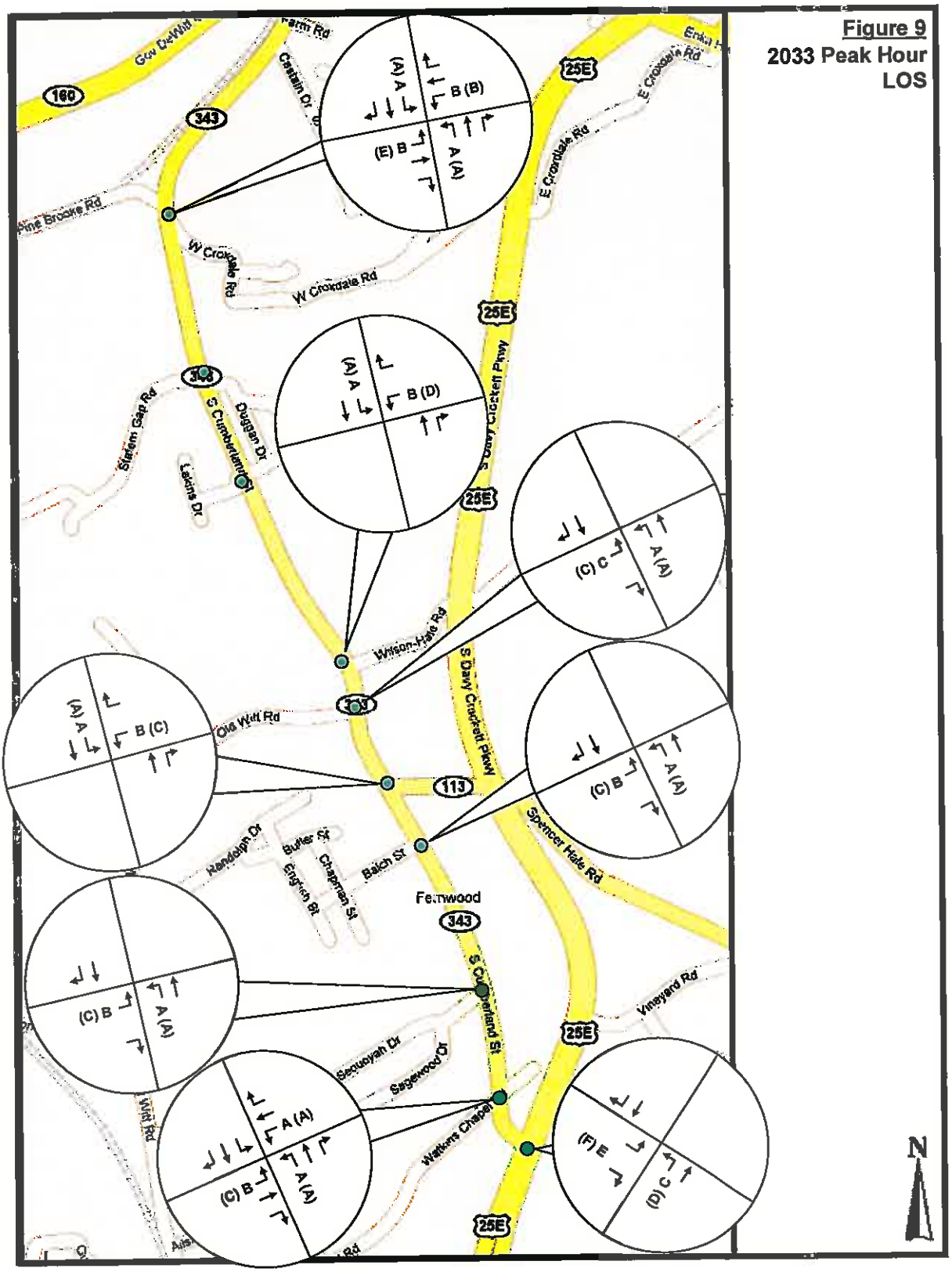


Figure 9. 2033 Peak Hour LOS AM (PM)



Several existing or projected capacity-related deficiencies are evident in Figures 7, 8, and 9. Others were identified upon detailed review of the capacity analysis output reports:

SR 343 and Pine Brooke Road

By 2033, the eastbound left turning movements on Pine Brooke Road are expected to operate at LOS E during the PM hours.

SR 343 and Wilson Hale Road

At 2033, the westbound left turning movements on Wilson Hale Road are expected to operate at LOS D during the PM hours. LOS D is generally considered the minimum acceptable condition.

SR 343 and Old Witt

At 2033, the eastbound left turning movement on Old Witt are expected to operate at LOS C during the AM & PM hours, LOS C is considered acceptable.

SR 343 and Balch Street

At 2033, the eastbound left turning movement on Balch St. are expected to operate at LOS C during the AM & PM Hour, LOS C is considered acceptable.

SR 343 and US 25E

The eastbound left and right turning movements on SR 343 currently operate at LOS D during the AM hours. LOS D is generally considered the minimum acceptable condition. By the year 2013, these movements are expected to operate at LOS F during the PM peak hour. By the year 2033, these movements are expected to operate at LOS E during the AM peak hour. At 2033, the northbound left turning movements on US 25E are expected to operate at LOS D during the PM hours. LOS D is generally considered the minimum acceptable condition.

Table 3 presents the upper ADT limits for roadway levels of service based on functional classification. This table serves as a level of service guide that reflects the criteria of the *Highway Capacity Manual*. The existing and projected ADT volumes presented in Figure 3 were evaluated using Table 3 to determine the levels of service for the study segment of SR 343. This segment of SR 343 is classified as an principal arterial and has two travel lanes.

Table 3. Upper Limits for Roadway level of Service by Functional Class

Functional Class	Lanes	Upper Service Volume Limit				
		A	B	C	D	E
Freeway	4	28,710	43,360	58,600	37,390	78,520
Expressway	4	20,580	31,080	42,000	48,300	56,280
Principal Arterial – Divided	4	16,460	24,860	33,600	38,640	45,020
Principal Arterial – Undivided	**2**	**7,150**	**10,800**	**14,600**	**16,790**	**19,560**
Principal Arterial – Undivided	5	16,460	24,860	33,600	38,640	45,020
Minor Arterial – Divided	4	12,150	18,350	24,800	28,520	33,230
Minor Arterial – Undivided	2	5,290	7,990	10,800	12,420	14,470
Minor Arterial – Undivided	5	12,150	18,350	24,800	28,520	33,230
Collector	2	4,800	7,250	9,800	11,270	13,130
Collector	4	8,400	12,700	17,200	19,800	23,000
Collector	5	9,600	14,500	19,600	22,500	26,300
These values assume a capacity range of 1,700 to 2,200 vehicles per hour per lane (depending upon facility speed) and default factors for lane width, frequency of left-turning traffic, and other adjustments.						

At TDOT Count Station 29 (near Pine Brooke Rd), SR 343 currently operates at LOS B and is expected to operate at LOS D by the year 2033. At TDOT Count Station 99 (near Sequoyah Drive), SR 343 currently operates at LOS A and is expected to operate at LOS B by the year 2033.

Signal Warrant Evaluation

In view of the projected poor or marginally acceptable levels of service under the current STOP control at US 25E and Pine Brooke Road, WSA conducted traffic signal warrant analyses for these intersections based on the criteria set forth in the *Manual on Uniform Traffic Control Devices* (FHWA, 2003, hereinafter referred to as the MUTCD). Three volume-based warrants are defined in the MUTCD as follows:

- Warrant 1: Eight-Hour Vehicular Volume.
- Warrant 2: Four-Hour Vehicular Volume.
- Warrant 3: Peak Hour.

Warrant 1 is subdivided into three conditions. Condition A (Minimum Vehicular Volume) is applicable where a large volume of intersecting traffic is the principal reason for signalization. Condition B (Interruption of Continuous Traffic) is applicable where major street traffic volumes are so heavy that minor street drivers suffer excessive delay or conflict entering or crossing the major street. The third condition provides for a combination of Conditions A and B.

Satisfaction of Warrant 1 threshold values implies that traffic volumes are sufficient for most of the day such that signalization should be considered. In contrast, Warrant 2 may be met if volumes are problematic for only four hours of the day. Warrant 3 requires that threshold traffic volumes be present for only a single hour of the day and generally is limited in application to locations with severe peaking characteristics such as near industrial sites where shift change traffic creates a brief surge in traffic volumes.

Another consideration in the application of traffic signal warrants is the treatment of right-turn volumes. Some agencies, including the regional TDOT traffic engineering office, discount some or all right-turn traffic where a separate right-turn lane is available on either the minor street or the major street. The reasoning is that motorists turning right from a side street encounter fewer conflicts than drivers turning left or crossing the main line and should not be fully considered in justification of a traffic signal. Similarly, where a right-turn lane is available on the major street, drivers approaching on the side street are able to determine that the major street right-turning traffic will not cross their travel path and may proceed even if major street right-turn vehicles are approaching.

All signal warrants were met at the intersection of SR 343 and US 25E for the present and future years. No warrants are met at other intersections along the southern study corridor.

Left-Turn Lane Warrant Evaluation

Left-turn lanes provide added safety and efficiency at unsignalized intersections. Vehicles turning left at cross streets may cause substantial delays to through traffic and may contribute to crashes. To determine the need for left-turn lanes, Harmelink's warrant thresholds by roadway speeds were used. All southbound left-turn lane warrants were met at the intersection of SR 343 and Spencer Hale Road for the present and future years. No warrants are met at the other intersections.

Sight Distance

Intersection Sight Distance

The driver of a vehicle approaching or departing from an intersection should have an unobstructed view of the intersection, including any traffic control devices, and sufficient lengths along the intersecting highway to permit the driver to anticipate and avoid potential collisions. The left-turn movement from a minor street requires first clearing the traffic on the left, then entering the traffic stream on the right. The required sight distance for this maneuver is affected by the amount of time it takes the stopped vehicle to turn left clearing traffic and reach average running speed without affecting the speed of the approaching vehicle. The right turn maneuver must have sufficient sight distance to permit entrance onto the intersecting roadway and then accelerate to the posted speed limit without being overtaken by approaching vehicles. Table 4 lists ASSHTO's minimum recommended sight distances for this maneuver based on design speeds. Table 5 lists the City of Morristown's minimum design standards for corner sight distance.

Table 4. AASHTO's Minimum Recommended Sight Distance Based on Vehicle Maneuver

Vehicle Speed (mph)	Stopping Sight Distance for Left-Turn Maneuver (feet)	Stopping Sight Distance for Crossover and Right-Turn Maneuvers (feet)
15	170	145
20	225	195
25	280	240
30	335	290
35	390	335
40	445	385
45	500	430
50	555	480
55	610	530

Note: Distances are from the 2001 AASHTO *Green Book* and are for two-lane roadways. Distances may change in future versions.

Table 5. City of Morristown Corner Sight Distance

Design Speed (mph)	Corner Intersection Sight Distance (feet)
20	250
30	300
40	400
50	500
60	600

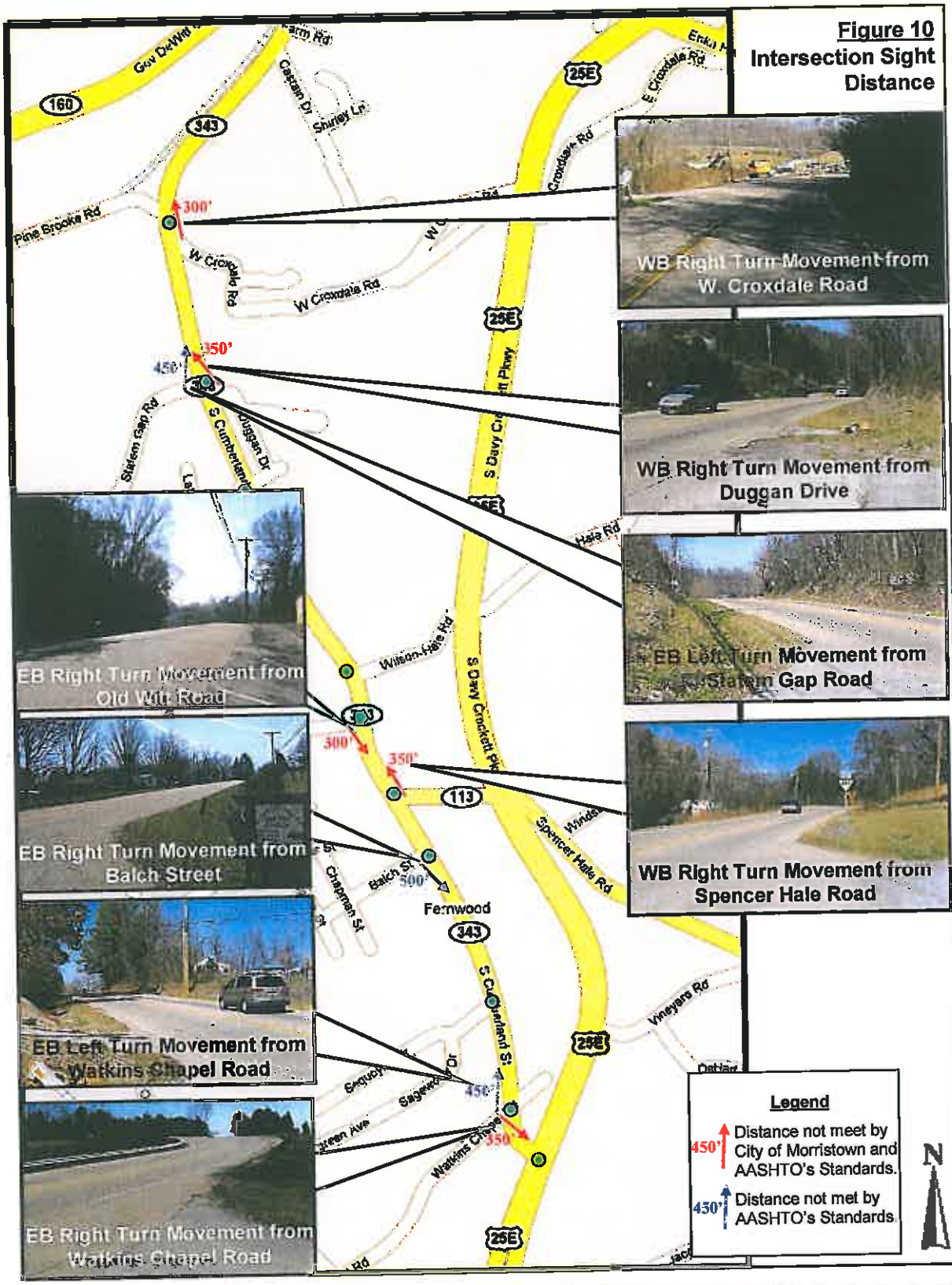
Note: Distances are from the City of Morristown Subdivision Regulations.

Figure 10 shows the sight distances that didn't meet ASSHTO and the City of Morristown's design standards.

Passing Sight Distance

Passing sight distance has is a concern for this section of SR 343. An analysis of passing sight distance was performed in this study as well as previously in a TDOT field study performed on April 9, 2008. The findings of this study are consistent with the TDOT field report. A copy of the TDOT field report is included in the appendix for reference. Likewise, several of the recommendations in the TDOT study are recommended herein. Of particular note, is a section of SR 343 between Statem Gap Road intersection and the Croxdale Road intersection which does not meet minimum standards for passing sight distance and should be striped with a double solid yellow line as a short term improvement.

Figure 10. Intersection Sight Distance



Crash Data Analysis

TDOT provided crash data for the study area covering the period from 2003 through approximately May 2006. These are summarized in Table 6, and the raw data, log mile landmarks and other crash data worksheets are contained in the Appendix. The crash data include accidents either worked by the Tennessee Highway Patrol or submitted by the Morristown Police Department for inclusion in the state database. Crash information included location by log mile (discussed below), severity, crash type (angle, sideswipe, etc.), light and weather conditions, date and time, and other details. The data did not indicate direction of travel for vehicles involved, so WSA was not able to prepare crash diagrams to present the data graphically.

Table 6. Summary of Crash Data at Intersections

Location on SR 343 (Cross Street)	Number of Crashes											Crash Rates	
		By Type							By Severity				
	Total	Angle	Rear-End	Sideswipe	Fixed Object	Pedestrian	Head-On	Other	PDO[1]	Injury	Fatality	Location[2]	Critical[3]
Pine Brooke Road	3	1			1		1		2	1		0.29	0.62
Statem Gap Road	3	1	1					1	2	1		0.29	0.62
Wilson Hale Road	3		1	1	1				3			0.15	0.75
Old Witt Road	1		1						1			0.14	0.73
Spencer Hale Road	1	1								1		0.14	0.72
Balch Street	2	1	1						2			0.28	0.74
Watkins Chapel Road	1				1					1		0.15	0.75
US 25E	17	1	12	2			2		16	1		0.79	0.46
Total	**31**	**5**	**16**	**3**	**3**	**0**	**3**	**1**	**26**	**5**	**0**		

Notes:
1. Property Damage Only
2. Crash rate for locaion in crashes per million entering vehicles.
3. Critical crash rate for location. This is a statistical control. If the location rate exceeds the critical rate, it is likely that there are causative factors at hand leading to the elevated crash rates.

TDOT utilizes a log mile system for crash locations. Distances are measured at landmarks along each route and reset to zero at each county line crossing. The southern study limit is at Hamblen County SR 343 log mile 0.000 (US 25E), and the northern study limit is log mile 2.190 (Castain Drive).

There were 56 reported crashes within the whole study corridor (44 property-damage-only, 11 with injury, and 1 fatal). The single location with the highest number of crashes is at US 25E (17

crashes). This signalized intersection carries a large traffic volume given the intersecting arterial roadways. There were 3 crashes at Pine Brooke Road, Statem Gap Road, Wilson Hale Road. The next highest location is at Balch Street with 2 reported crashes in the 3 years.

There was one fatal crash in the data set. It occurred in September 2005 approximately 425 feet north of Spencer Hale Road and involved an overturned vehicles traveling in the rain at a non-intersection location.

WSA calculated crash rates for each of the locations at which traffic counts were conducted. These are also included in Table 6. The location crash rate takes into account both the number of crashes and the volume of traffic entering the intersection. It is a uniform indicator of the level of safety at locations with varying traffic volumes. One expects a greater number of crashes at locations with greater traffic volumes because of the increased traffic exposure and interaction. The critical crash rate is a statistical measure (often used as a screening tool) that also accounts for number of crashes and traffic exposure as well as the statewide average crash rate for similar locations. It indicates whether or not the location rate is to be expected based on traffic volumes. Where the location rate significantly exceeds the critical rate, there is a likelihood that geometric or other deficiencies exist.

All location rates, except for US 25E, were below the respective critical rates. These data are consistent with the existing capacity-related deficiencies discussed in the preceding section (poor levels of service during one or more peak hours).

There are immediate improvement needs within the study area that need to be addressed within the short term and other needs that should be considered in later years. It is clear that traffic demand and the associated delay and crash experience are likely to occur with future traffic growth. Access management policies for this southern section of the SR 343 corridor have the opportunity to allow for a higher level of planned growth than other sections of the corridor as these southern section likely transitions from industrial issues to more commercial issues. As such, implementation and enforcement of traffic impact studies, subdivision regulations, and zoning regulations should allow for managed growth. It should be noted that special considerations should be given to the implementation of turn-lanes and wide turning radii for development as site distance and geometric deficiencies are of major concern for this section of the corridor. In view of the above analyses and observations, WSA makes the following recommendations. Table 7 shows a summary of the recommendations by location and opinions of probable costs for the improvements.

Implement the following improvements immediately:

- Consider reduction of 50 mph speed limit (northbound) to 45 mph due to geometric deficiencies and poor sight distance on this southern section of SR 343.
- Cut back any vegetation (where possible) within ROW to help improve sight distance concerns noted in Figure 10 Intersection Sight Distance.
- Consider refurbishing all warning signs for intersections ahead on SR 343 including supplemental speed plates. Consider adding supplemental warning signs for Side Road Ahead (W2-2) with speed plates on the left side of the road for extreme sight distance deficiencies at Old Witt Road (northbound SR 343) and Croxdale Road (southbound SR 343).
- Consider adding southbound Cross Road Ahead (W2-1) with supplemental speed plate (35 mph) in advance (480 feet) of Statem Gap Road/Duggan Drive intersection to mitigate poor intersection sight distance.
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- Consider refurbishing existing striping and correcting passing sight distance concern between Croxdale Road and Statem Gap Road on SR 343 with the installation of a double solid yellow line.

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- Install a Southbound left-turn lane on SR 343 at Spencer Hale Road. Provide a refuge area for left turners from Spencer Hale Road onto 343 southbound to allow for a two-phase left-turn movement. This should help to mitigate poor sight distance looking right from a stopped position on Spencer Hale Road.
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- Install a southbound left-turn lane on SR 343 at the intersection with US 25E.

Implement the following improvements as long term improvements (25-years):

- Construct interchange at the intersection of SR 343 with US 25 E. US 25 E is to be maintained as a high speed corridor with a possible improvement of functional classification to either expressway or freeway. It is assumed, for this reason, that signalization at this intersection will not be considered a permanent alternative. However, a temporary signalization could be considered until the time that an interchange could be fully constructed.
- Construct eastbound left-turn lane on Pine Brook Road at SR 343 and southbound right-turn lane on SR 343 at Pine Brook Road.
- Closely monitor the northbound SR 343 left turning traffic onto Pine Brooke Lane for capacity and / or increase accidents and consider installation of northbound left-turn lane on SR 343 and to the north of this intersection as a center turn lane for left turning vehicles into areas of commercial/industrial development.
- Consider alignment improvements for Croxdale Road at the intersection with SR 343 to help improve sight distance and the skew of the minor side street approach.
- Reconstruction of SR 343 and associated intersections with deficient sight distance with a wider section would be preferred. However, it is likely that a total reconstruction of the vertical and horizontal alignment of SR 343 would be not economically feasible. It is assumed that US 25 E is to remain the main gateway into Morristown proper. However, should emphasis change with regards to the status of US 25 E as the main gateway;

consideration may want to be given to the widening and correction of vertical and horizontal deficiencies on this section of SR 343. This would likely mean a significant acquisition of property and construction in difficult terrain. If major reconstruction were to be come feasible then a minimum three lane section would be recommended with curb and gutter and sidewalk. For the purposes of this study the existing two-lane typical section with turn lane improvements mentioned previously was assumed.

Table 7. Opinion of Probable Cost for the Recommended Improvements

Recommendation	Cost	Time Frame
Consider refurbishing all warning signs for intersections ahead on SR 343 including supplemental speed plates. Also, consider refurbishing striping in corridor and associated intersections (correct passing zone striping between Statem Gap Road and Croxdale Road intersections with double solid yellow lines).	$25,000	Immediate/ Short-Term
Consider adding supplemental warning signs for intersections ahead with speed plates on the left side of the road for extreme sight distance deficiencies at Old Witt Road (northbound SR 343) and Croxdale Road (southbound SR 343). Also, add appropriate signs to mitigate poor sight distance in advance of Statem Gap intersection and Sequoyah Drive intersection.	$4,000	
Install a Southbound left-turn lane on SR 343 at Spencer Hale Road and Install a Northbound left-turn lane on SR 343 at Old Witt Road with appropriate tapers and storage.	$600,000	
Install a southbound left-turn lane on SR 343 at the intersection with US 25E.	$200,000	
Develop and implement access management policies.	None	Ongoing
Construct interchange at the intersection of SR 343 with US 25 E.	$25 million	Long-Term
Construct eastbound left-turn lane on Pine Brook Road at SR 343 and southbound right-turn lane on SR 343 at Pine Brook Road.	$400,000	
Closely monitor the northbound SR 343 left turning traffic onto Pine Brooke Lane for capacity and / or increase accidents and consider installation of northbound left-turn lane on SR 343 if deemed appropriate.	$200,000	
Consider alignment improvements for Croxdale Road at the intersection with SR 343 to help improve sight distance and the skew of the minor side street approach.	$100,000	
Monitor SR 343 corridor for potential traffic growth and improve corridor if needed as major gateway into Morristown.	$14 million	

1. All costs are approximate in today's dollars and do not include ROW cost.
2. All costs do not include utility relocation cost.
3. Assume the cost of roadway construction is $300-$350/lane-foot in today's dollars. Assume cost for outside curb/gutter with sidewalk is the same as the cost for a traffic lane.
4. Assume the cost of installing new signage is $225 per sign in today's dollars.
5. Assume the cost of installing a new crosswalk (plastic pavement marking) is $33 per LF in today's dollars.
6. Assume the cost of stop line removal is $7 per LF in today's dollars.
7. Cost estimates do not include pavement overlays, which are typically required on state routes when restriping is done.