U.S. 25E Corridor Study

Morristown, Tennessee

Prepared for:

City of Morristown, Tennessee

Prepared By:

June 2002

(Revised February 2003)

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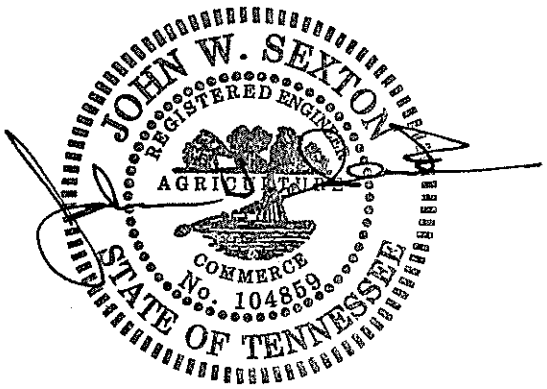

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Executive Summary

US 25E (Davy Crockett Parkway) is a four-lane median-divided highway connecting Interstate 81 to US 11W at Bean Station, continuing south to Interstate 40 and north to Interstate 75 in Kentucky. As a convenient arterial between the interstates and an alternative corridor around Knoxville, the route is expected to carry an increasing amount of through traffic in the future. It is also attractive to local development that will add to the traffic increase.

The present function of the roadway is mobility, so that through traffic may proceed largely unimpeded along the route. As commercial and industrial development increase within the corridor, there will be increasing pressure to abandon the mobility function in order to provide direct access to developed parcels. This corridor study was undertaken to evaluate the present and future needs of US 25E users and to make recommendations for the most effective type of access to the roadway.

Traffic counts and field reviews were conducted to assess current operating conditions from Cherokee Park Road to I-81. The current level of service (LOS) at intersections with public roads is D or better with one exception. (LOS is a qualitative statement of the acceptability of traffic conditions ranging from A (best) to F (worst) with D or better generally considered acceptable.) The time to travel between Cherokee Park Road and I-81 was found to be approximately eleven minutes without exceeding the posted speed limit.

Future traffic volumes were estimated based on historic traffic growth trends and projected development within the corridor. Planning horizon years of 2006 and 2026 were utilized. LOS F traffic conditions are expected for drivers at all unsignalized side streets by Year 2026. Further, the excessive delays indicated by the poor LOS likely will lead to increased safety problems. Installation of traffic signals at the intersections will improve the LOS for side-street drivers but will increase the travel time on US 25E by **20 to 50 minutes** depending on implementation of intersection capacity improvements.

Three improvement plans were evaluated to address the future traffic needs of the corridor. These are intended to be considered in an incremental process as development progresses and include:

1. Signalization of existing at-grade intersections as an interim, short-term measure. Increased signalization within the corridor is not desirable due to its impact on travel time. However, it is recognized that some additional signals may become necessary to accommodate projected traffic volumes. **These new signals are interim measures that should be replaced with more comprehensive improvements as funding allows.** Also, it will be necessary to construct additional turn lanes at most intersections to provide adequate capacity for signalized operation. Appropriate engineering studies should be conducted prior to new signal installation to address the impacts thereof.

2. Median improvements and traffic diversion to reduce the number of conflict points. The proposed design includes restriction of side-street movements to right turns only,

allowing left turns from US 25E to the side streets, and u-turn bays north and south of the intersection group to accommodate desired movements. Signalization of the US 25E left-turn movements will be required, but the signal operation will be simplified. The only movements to be controlled by the signal will be the US 25E through traffic and opposing left-turn traffic. The reduced number of signal phases will help to minimize delay to through traffic.

Several intersections or groups of intersections were identified that could be served by this design including US 25E at:

- Brights Pike, Liberty Hill Road, Jefferson Diamond Road, and Dalton Ford Road;
- Morelock Road;
- Spencer Hale Road, Vineyard Road, Cumberland Street, and Jacobs Road; and
- Old White Pine Road and Wallace Hardware Drive.

3. Construction of grade-separated crossing points and associated marginal access roadways to eliminate the need for signalization on US 25E. This alternative would restrict all at-grade crossing movements from US 25E. Proposed locations for the required bridges are near Liberty Hill Road (serving Brights Pike, Liberty Hill Road, and Jefferson Diamond Road); near Morelock Road (serving Morelock Road and Dalton Ford Road); near Cumberland Street (serving Spencer Hale Road, Vineyard Road, Cumberland Street, and Jacobs Road); and a conventional diamond interchange at Walters State Community College (serving the Mall Access Road, the WSCC Main and South entrances, and Alex Hall Lane). Right-in/right-out movements with acceleration/deceleration lanes are proposed for access to and from US 25E. The proposed marginal access/collector roads would provide access to adjacent property.

The following conclusions were arrived at:

- Traffic growth will continue given the likely trends of background traffic growth and local development.
- Development and traffic growth will demand signalization at many existing intersections. While not desirable given the impact on corridor travel time, additional signals may be the most feasible treatment as an interim measure.
- It is important to protect the mobility function of the US 25E corridor given the current function of the corridor and its relationship to other major roadways in the area.
- The alternative improvements discussed herein represent incremental measures that should be taken to address future corridor needs with the goal of protecting the long-term mobility function thereof. They are tools to apply as development trends and funding sources become evident.

The following measures are recommended:

1. The incremental improvements presented herein should be implemented as development and other traffic factors warrant. Funding should be pursued to facilitate implementation, so that the long-term interests of through traffic and development access in the US 25E corridor are served. The body of this report provides greater detail on the recommended improvements, and the following table summarizes the improvement recommendations.

Summary of Recommended Improvements and Costs

Intersections	X = Recommended Improvement: Construct median modifications with signalization. (Costs in millions)		Construct grade separation and marginal access roads. (Costs in millions)	
US 25E & Cherokee Park Rd				
Brights Pk & US 25E	X	$3.87	X	$12.18*
US 25E & Liberty Hill Rd	X		X	
US 25E & Jefferson Diamond Rd	X		X	
Dalton Ford Rd & US 25E	X		X	$16.54*
Morelock Rd & US 25E	X	$1.39	X	
Mall Access Rd & US 25E			X	$27.67*
WSCC Main Ent & US 25E			X	
WSCC South Ent & US 25E			X	
Alex Hall Ln & US 25E			X	
Wilson Hale Rd & US 25E	**			
Spencer Hale Rd & US 25E	X	$3.92	X	$21.00*
Vineyard Rd & US 25E	X		X	
US 25E & Cumberland St (SR 343)	X		X	
Jacobs Rd & US 25E	X		X	
Old White Pine Rd & US 25E	X	$1.85		
Wallace Hdwr Dr & US 25E	X			
Industrial Park & US 25E	**			
Cracker Barrel Rd & US 25E	**			
SB I-81 Ramps & US 25E	**			
NB I-81 Ramps & US 25E	**			
SR 160 & US 25E NB Ramps			X***	$1.78
SR 160 & US 25E SB Ramps			X***	
Total Cost:	$11.03 Million		$79.17 Million	
Increase in Corridor Travel Time	8 minutes		0 minutes	

* Cost includes system of marginal access roads, widening of existing roads, and crossover structure.
** No improvements recommended. See discussion in report body.
*** Add ramps on south side of SR 160 to eliminate crossing movements.

As has been noted, added signalization is not desirable and will have adverse impacts on corridor travel time. However, it is recognized that some new signals and lane additions may become necessary as interim measures. These have not been included in the above table.

As development progresses and funding becomes available, median modifications should be constructed on US 25E from Brights Pike to Morelock Road and from Spencer Hale Road to Wallace Hardware Drive. The median modifications will serve to maintain the flow of through traffic on US 25E more efficiently than the conventional intersections with interim signals because of the fewer required signal phases.

It is recommended that long-range plans be made and funding sought to construct grade separations and associated marginal access/collector roads to serve the segments of US 25E between Brights Pike and Morelock Road, between the Mall Access Road and Alex Hale Road, and between Spencer Hale Road and Jacobs Road. Also, additional ramps at the SR 160-US 25E junction should be constructed to provide a fully directional interchange between the two arterials.

2. The City should adopt an access management policy that specifies the requirements of those seeking to develop property in the US 25E corridor. This policy should include such elements as traffic impact and analysis studies, driveway requirements and design controls, procedures to insure that development site plans are compatible with the City's intended layouts of marginal access road systems and grade separations, and opportunities for dedication of right-of-way and other initiatives to facilitate private-sector construction of marginal access/collector road systems.

3. The City should identify the functional layout of grade separated structures and marginal access roadways, some of which may be constructed as a part of the site development process, minimizing public funding and providing more immediate implementation of the road systems.

4. The City should pursue right-of-way acquisition as opportunities become available.

5. The City should monitor development trends to anticipate, insofar as possible, the need for improvements so that required funding can be sought.

Introduction

The Davy Crockett Parkway, US 25E, in Hamblen County, Tennessee, is a four-lane divided highway connecting Interstate 81 (I-81) on the south to US 11W just inside Grainger County. The route continues south to Interstate 40 (I-40) and north into Kentucky where it intersects Interstate 75 (I-75). It is expected that the route will become an increasingly attractive arterial in the future with route improvements in process beyond Hamblen County. Thus, it provides a time-saving shortcut between the interstate facilities and an alternative corridor to bypass Knoxville.

In view of the mobility function of US 25E, the City of Morristown recognized the importance of protecting the nature of the roadway, particularly with regard to access and the tendency toward increased signalization with development. The US 25E corridor includes prime acreage for commercial, industrial, and residential development. Some development is already underway, including a new Wal-Mart shopping center near the Morris Boulevard interchange, new tenants in the industrial park near I-81, and smaller commercial projects near Brights Pike.

The City contracted with Wilbur Smith Associates to evaluate the present and future traffic needs of motorists on US 25E and to develop recommendations regarding the most effective access policy for the corridor. This report summarizes the methodology and findings of that study and sets forth recommendations to guide the City in developing an access policy for the corridor.

Present Traffic Conditions

In order to establish baseline information on traffic conditions in the US 25E corridor, the consultant assembled extensive data on traffic volumes, types of traffic control (stop signs versus signals) and roadway geometry. These were evaluated using nationally recognized methodologies and software. Turning movement counts were conducted at nearly every public road crossing of US 25E from I-81 to Cherokee Park Road. Additional count data from other projects were obtained as well as average daily traffic (ADT) count data collected by the Tennessee Department of Transportation (TDOT). The count data are contained in Appendix 1. A field review was conducted to document geometric conditions (number of approach lanes, channelized turn lanes, etc.) and control types for each of the study intersections.

Figure 1 presents the intersection geometrics and representative Year 2000 ADT data throughout the study area. Figures 2 and 3 present the 2001 traffic volumes and representative levels of service for the morning and evening peak hours, respectively. It should be noted that the peak hours do not necessarily coincide at all intersections. The times at which peak traffic volumes occur vary and are affected by many factors. One such factor is the type of development generating the traffic. Industrial sites with 7:00 AM and 3:00 PM shift changes contribute to peak traffic volumes around those hours. In contrast, shopping centers generally contribute to peak traffic volumes later in the morning and near 5:00 PM.

NOTE: Subsequent to the beginning of the study, the intersections of US 25E at the Mall Access Road and at College Park Drive were modified. These modifications have not been included in the discussion of existing conditions but have been accounted for in future analyses.

Traffic conditions were evaluated using the methodologies contained in the *Highway Capacity Manual* (Transportation Research Board, 2000). The manual is widely recognized as the standard practice for traffic engineering assessments and includes procedures to evaluate multi-lane highways, weaving areas, ramp junctions, and at-grade intersections (whether signalized or stop-controlled) as well as most other facility types. The *Highway Capacity Manual* procedures have been automated for microcomputer application and are contained in the *Highway Capacity Software* (McTrans Center, University of Florida, 2000). This software was used in this study for multi-lane, weave, and ramp evaluations. Additionally, the *Synchro* (Trafficware Corporation, 1993-2001) software package was used to assemble volume and geometric data and to conduct capacity analyses for at-grade intersections. *Synchro* replicates the *Highway Capacity Manual* analyses for these locations.

In order to express traffic operating conditions in a general manner, the *Highway Capacity Manual* uses the concept of level of service (LOS). This is a qualitative statement of the acceptability of traffic conditions ranging from A (best) to F (worst). For reference, LOS D or better generally is considered to be acceptable in urban areas. The criteria used to determine LOS vary depending upon the facility type or type of traffic control. For the purposes of this study, five facility or location types were evaluated. The criteria for each are presented in Table 1.

Table 1: Level of Service Criteria

Facility or Location Type:	Multi-Lane Highways	Weaving Areas	Ramp Junctions	Signalized Intersections	Stop-controlled Intersections
Parameter:	Density[1]	Density[1]	Density[1]	Delay[2]	Delay[2]
Units:	pc/mi/ln	pc/mi/ln	pc/mi/ln	sec/veh	sec/veh
Level of Service					
A	≤ 12	≤ 10	≤ 10	≤ 10	≤ 10
B	> 12 and ≤ 20	> 10 and ≤ 20	> 10 and ≤ 20	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 28	> 20 and ≤ 28	> 20 and ≤ 28	> 20 and ≤ 35	> 15 and ≤ 25
D	> 28 and ≤ 34	> 28 and ≤ 35	> 28 and ≤ 35	> 35 and ≤ 55	> 25 and ≤ 35
E	> 34 and ≤ 45	> 35 and ≤ 43	> 35	> 55 and ≤ 80	> 35 and ≤ 50
F	> 45	> 43	(See Note 3)	> 80	> 50

Notes:
1. Density of the multi-lane highway, ramp junction, or weave is measured in passenger cars per mile per lane
2. Average delay measured in seconds per vehicle
3. Demand flows exceed capacity limits

As was noted, the present LOS along US 25E are as presented in Figures 2 and 3. The capacity analysis worksheets are contained in Appendix 2. Table 2 presents summary

LOS information to facilitate comparison of subsequent analyses. It is evident in Table 2 that current traffic operations generally are very good throughout the corridor.

Travel time was measured for motorists traveling the length of the US 25E study corridor (from I-81 to Cherokee Park Road). The test driver was able to maintain the posted speed limit in the northbound and southbound test runs, and the measured travel time was approximately eleven minutes in each direction. There is presently one signalized intersection on US 25E (at Cherokee Park Road). Thus, travel in the corridor is largely unimpeded except for congestion in the vicinity of the urban area near Andrew Johnson Highway and Morris Boulevard.

Table 2: 2001 Capacity Analysis Summary

At-Grade Intersections	Type of Control	Intersection[1] or poorest side-street[2] LOS	
		AM	PM
US 25E & Cherokee Park Rd	Signal	A	A
Brights Pk & US 25E	Stop	C	D
US 25E & Liberty Hill Rd	Stop	C	C
US 25E & Jefferson Diamond Rd	Stop	B	B
Dalton Ford Rd & US 25E	Stop	C	C
Morelock Rd & US 25E	Stop	C	C
Mall Access Rd & US 25E	Stop	C	C
Walters State Community College (WSCC) Main Ent & US 25E	Stop	C	D
WSCC South Ent & US 25E	Stop	B	C
Alex Hall Ln & US 25E	Stop	C	F
Wilson Hale Rd & US 25E	Stop	B	B
Spencer Hale Rd & US 25E	Stop	B	C
Vineyard Rd & US 25E	Stop	B	B
US 25E & Cumberland St (SR 343)	Stop	B	B
Jacobs Rd & US 25E	Stop	C	D
Old White Pine Rd & US 25E	Stop	B	C
Wallace Hdwr Dr & US 25E	Stop	C	C
Cracker Barrel Rd & US 25E	Stop	C	C
SB I-81 Ramps & US 25E	Stop	C	C
NB I-81 Ramps & US 25E	Stop	B	B
SR 160 & US 25E NB Ramps[3]	Stop	B	C
SR 160 & US 25E SB Ramps[3]	Stop	C	A

Notes:
1. Intersection-wide LOS is given for signalized intersections only.
2. Poorest side-street approach LOS is given for stop-controlled intersections only.
3. While the SR 160 intersections have little impact on US 25E travel time or operating conditions, they have been included to assess needs at this connection between the two arterials.

Future Growth of Traffic

The consultant developed estimates of future traffic volumes so that traffic conditions in future years could be evaluated. For study purposes, two planning horizons were established: Year 2006 and Year 2026 (five and twenty-five years hence, respectively). In order to evaluate traffic conditions at the planning horizons, it was necessary to account for the impact of traffic growth arising from sources beyond the study area (background traffic growth) as well as local development along US 25E.

Background Traffic Growth

Traffic on US 25E may be expected to increase over time as growth occurs in population centers served by the route. These population centers include Morristown and surrounding communities where commuter traffic, shoppers, and others travel US 25E on their way to work, commercial districts, etc. Additionally, as was noted earlier in this report, US 25E connects I-40, I-75 and I-81. Increases in traffic on these facilities may be expected to lead to proportional increases in US 25E traffic. No origin-destination studies were conducted as a part of the study at hand. Instead, growth rates on area roadways were reviewed to provide a reasonable approximation of the influence of external traffic growth factors.

Historic ADT data for several locations along US 25E and for I-81 were assembled. Regression analyses were performed to determine recent growth rates. The tabulated data, regression analysis worksheets and data plots are contained in Appendix 3. Based on these data, the average rate of traffic growth on US 25E near Morristown is approximately 8% per year. This is a very aggressive rate of traffic growth and likely is not sustainable over a long period. For study purposes, separate background traffic growth rates were assumed for 2006 and 2026. In the near term (five-year horizon) it is expected that the robust growth of traffic will continue to be influenced by factors outside of the immediate US 25E study corridor. An annual background traffic growth rate of 3% per year was assumed for the 2006 horizon. As development increases along the route, it is expected that the background growth will be less influential than the immediate commercial, residential, and industrial generated traffic, so a background traffic growth rate of 1% per year was assumed for 2026. These rates were applied to the present volumes to account for the external background traffic growth.

Traffic Generated by Corridor Development

The attractiveness of US 25E to development is evidenced by the recent construction of a retail shopping center opposite Walters State Community College. It is anticipated that other development will follow throughout the study corridor. The impact of this anticipated development was addressed using local land use data and trip generation procedures.

The City of Morristown Planning Commission adopted a land use plan wherein the intended zoning for parcels is identified. This zoning will help to define the character of development within given parcels. For study purposes, it was assumed that

development along US 25E would be commercial, industrial, or residential depending upon parcel zoning. Developable parcels were identified, and the area of each was measured. Figure 4 presents the location of each site, and Table 3 presents the land use and trip generation summary for each site.

Table 3: Trip Generation Summary

Site	Land Use	Size[1] (Acres)	2006 Trip Generation[2]				2026 Trip Generation[3]			
			AM		PM		AM		PM	
			Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit
1	Industrial	900	449	92	115	408	2,244	460	575	2,039
2	Commercial	69					112	72	352	382
3	Residential	66					5	11	9	4
4	Residential	143					9	20	19	10
5	Residential	199					12	26	26	13
6	Residential	390					19	43	51	26
7	Residential	52					4	9	7	3
8	Commercial	164					188	120	623	675
9	Commercial	62	No development of these sites was assumed for Year 2006.				105	67	328	356
10	Commercial	130					164	105	535	579
11	Commercial	112					149	96	484	524
12	Commercial	20					53	34	153	165
13	Commercial	30					68	43	201	217
14	Residential	22					2	5	3	1
15	Residential	47					4	9	6	3
16	Residential	84					6	13	11	6
17	Residential	48					4	9	6	3
18	Residential	58					5	10	8	4
19	Commercial	82	337	215	1,189	1,288	384	246	1,378	1,493
20	Commercial	64	52	33	151	164	107	68	334	362
21	Commercial	3	9	6	22	24	19	12	49	53
22	Commercial	4	9	6	23	25	19	12	50	55
23	Commercial	89	63	41	187	203	130	83	415	449
24	Commercial	57	49	31	141	152	100	64	311	337
25	Residential	60	2	4	2	1	5	10	8	4
26	Commercial	22	22	14	57	62	57	36	165	179
27	Residential	44	1	3	2	1	4	8	6	3
28	Residential	38	1	3	1	1	3	7	5	3
29	Commercial	31	27	17	71	77	69	44	206	223
30	Commercial	12	15	10	39	42	40	26	112	121
31	Commercial	70	No development of these sites				113	72	354	383
32	Commercial	31	was assumed for Year 2006.				69	44	205	222
Total:			1,037	475	2,000	2,447	4,271	1,884	6,993	8,899

Notes:

1. Areas were adjusted as follows-
   20% deduction for infrastructure requirements; 50% deduction for maximum lot coverage (Industrial and Commercial only); 30% deduction for internal and pass-by trips (Commercial only); 40% deduction for rolling terrain (Residential only).
2. Anticipated percent developed at 2006-
   Sites 1, 26, 29-30 20%; Site 19 80%; Sites 20-25, 27-28 30%.
3. Applied global deduction of 85% to maintain reasonable traffic volumes (all except Sites 1 and 19).

The number of trips expected to be generated by development was estimated using the data and procedures of *Trip Generation, Sixth Edition* (Institute of Transportation Engineers, 1997). Separate estimates were made for 2006 and 2026. Typical land uses were assumed for each type of site (commercial, industrial, or residential), and the

number of generated trips was calculated. These were adjusted to reflect variations in topography, local ordinances and constraints, and other factors. A global reduction factor was applied so that the combined background and development traffic volumes were within a reasonable range.

The development traffic volumes were distributed throughout the study area roadway network in proportion to traffic volumes thereon. Separate distribution patterns were used based on development type and location. Sites 1, 2, and 8 through 13 were weighted more heavily to and from I-81 than were other commercial and industrial sites. The trip generation and trip distribution worksheets are contained in Appendix 4.

Combined Background and Development Traffic and Associated Traffic Conditions

The background traffic and development traffic were combined for each planning horizon. In order to maintain compatibility with TDOT planning methodologies, a final adjustment was made to the combined volumes. The ADT data at key locations along US 25E were projected forward to years 2006 and 2026 to set maximum values. These were converted from ADT values to design hour volumes using TDOT procedures. The projected combined traffic volumes were adjusted to match these design hour volumes and were further adjusted to balance throughout the corridor. Capacity analyses were conducted to determine the future traffic conditions assuming present lanes and types of control. Figures 5 through 8 present the analysis volumes and associated LOS. Table 4 presents a summary of the future traffic conditions.

Table 4: Future Capacity Analysis Summary with Existing Lanes and Control Type

At-Grade Intersections	Type of Control	Intersection[1] or poorest side-street[2] LOS			
		2006		2026	
		AM	PM	AM	PM
US 25E & Cherokee Park Rd	Signal	A	A	C	B
Brights Pk & US 25E	Stop	F	F	F	F
US 25E & Liberty Hill Rd	Stop	F	F	F	F
US 25E & Jefferson Diamond Rd	Stop	F	F	F	F
Dalton Ford Rd & US 25E	Stop	F	F	F	F
Morelock Rd & US 25E	Stop	F	F	F	F
Mall Access Rd & US 25E	Stop	F	F	F	F
WSCC Main Ent & US 25E	Stop	F	F	F	F
WSCC South Ent & US 25E	Stop	D	F	F	F
Alex Hall Ln & US 25E	Stop	F	F	F	F
Wilson Hale Rd & US 25E	Stop	D	E	F	F
Spencer Hale Rd & US 25E	Stop	F	F	F	F
Vineyard Rd & US 25E	Stop	C	C	F	F
US 25E & Cumberland St (SR 343)	Stop	F	F	F	F
Jacobs Rd & US 25E	Stop	F	F	F	F
Old White Pine Rd & US 25E	Stop	D	F	F	F
Wallace Hdwr Dr & US 25E	Stop	F	F	F	F
Frontage Road Connector[3]	Stop	See Note 3		C	F
Industrial Park & US 25E	Stop	F	F	F	F
Cracker Barrel Rd & US 25E	Stop	F	F	F	F
SB I-81 Ramps & US 25E	Stop	F	F	F	F
NB I-81 Ramps & US 25E	Stop	F	D	F	F
SR 160 & US 25E NB Ramps	Stop	F	F	F	F
SR 160 & US 25E SB Ramps	Stop	F	F	F	F

Notes:
1. Intersection-wide LOS is given for signalized intersections only.
2. Poorest side-street approach LOS is given for stop-controlled intersections only.
3. A frontage road has been proposed to extend along the east side of US 25E from Cracker Barrel Road to Wallace Hardware Drive with interconnection to Old White Pine Road. The proposed layout includes a new right-in/right-out connection to US 25E northbound approximately opposite the Industrial Park access. Volumes and analyses for 2026 include this proposed frontage road system.

It is evident in Table 4 that drivers on many side-street approaches to US 25E will experience unacceptable delays (LOS E or F) by 2006 with the existing stop control in place. This situation will be exacerbated by 2026 with additional traffic growth. Travel time on US 25E would continue to be approximately eleven minutes with such stop control on the side streets, although traffic congestion may be expected to reduce travel speeds and increase travel time through the corridor.

Excessive delay gives rise to two concerns. First, driver delay represents a cost to the public. Time spent waiting at a traffic control is time that could be spent more productively, either in gainful work or in leisure activities. The loss of these is an opportunity cost incurred as a result of delay. Secondly, excess delays lead to safety deficiencies. After waiting at a stop sign for what is perceived to be an excessive time period, drivers typically will become impatient and will choose to accept shorter gaps in the main street traffic stream, leading to conflicts and/or accidents. Thus, the numerous LOS E and F conditions in Table 4 are significant and will require remediation.

The typical remedy for stop-controlled intersections where side-street delay is excessive is the installation of traffic signals. Capacity analyses were conducted assuming signals at all stop-controlled intersections where side streets were projected to be at LOS E or F

at the planning horizon years. The results are summarized in Table 5. At 2006, signalization generally may be expected to provide acceptable conditions with a few exceptions. The increase in travel time on US 25E arising from signal delay is projected to be approximately seven minutes.

Table 5: Future Capacity Analysis Summary with Signalization at LOS E/F Locations

At-Grade Intersections	Type of Control	Intersection[1] or poorest side-street[2] LOS			
		2006		2026	
		AM	PM	AM	PM
US 25E & Cherokee Park Rd	Signal	A	A	B	B
Brights Pk & US 25E	Signal	A	A	F	E
US 25E & Liberty Hill Rd	Signal	B	A	D	D
US 25E & Jefferson Diamond Rd	Signal	A	A	D	D
Dalton Ford Rd & US 25E	Signal	A	A	B	B
Morelock Rd & US 25E	Signal	F	D	F	F
Mall Access Rd & US 25E	Signal	E	D	F	F
WSCC Main Ent & US 25E	Signal	F	E	F	F
WSCC South Ent & US 25E	Signal	B	B	F	F
Alex Hall Ln & US 25E	Signal	D	E	F	F
Wilson Hale Rd & US 25E	Signal	A	A	A	A
Spencer Hale Rd & US 25E	Signal	A	A	D	D
Vineyard Rd & US 25E	Stop(Signal)	C	C	(A)	(A)
US 25E & Cumberland St (SR 343)	Signal	C	D	F	F
Jacobs Rd & US 25E	Signal	A	A	F	F
Old White Pine Rd & US 25E	Signal	A	A	F	F
Wallace Hdwr Dr & US 25E	Signal	A	A	B	C
Frontage Road Connector	Signal	-	-	A	A
Industrial Park & US 25E	Signal	A	B	F	F
Cracker Barrel Rd & US 25E	Signal	B	B	F	F
SB I-81 Ramps & US 25E	Signal	C	F	F	F
NB I-81 Ramps & US 25E	Signal	F	C	F	D
SR 160 & US 25E NB Ramps	Signal	D	B	F	F
SR 160 & US 25E SB Ramps	Signal	C	D	F	F

Notes:
1. Intersection-wide LOS is given for signalized intersections only.
2. Poorest side-street approach LOS is given for stop-controlled intersections only.

By the year 2026, signalization alone will fail to provide an acceptable LOS at many of the public road intersections. Further, the increase in travel time on US 25E arising from the numerous signals is projected to be 30 to 50 minutes. Other improvements will be necessary to provide adequate capacity including dual turn lanes on many approaches. Capacity analyses were conducted for the 2026 volumes assuming signalization and selected lane additions. The capacity analysis results are summarized in Table 6, and Figure 9 presents the required lanes at each corridor intersection. The added travel time on US 25E with signalization and the laneage of Figure 9 in place is projected to be approximately 20 minutes.

Table 6: 2026 Capacity Analysis Summary with Signalization at LOS E/F Locations and Added Turn Lanes

At-Grade Intersections	Intersection LOS	
	AM	PM
US 25E & Cherokee Park Rd	B	B
Brights Pk & US 25E	F	F
US 25E & Liberty Hill Rd	B	B
US 25E & Jefferson Diamond Rd	B	A
Dalton Ford Rd & US 25E	B	B
Morelock Rd & US 25E	E	E
Mall Access Rd & US 25E	F	F
WSCC Main Ent & US 25E	F	F
WSCC South Ent & US 25E	F	F
Alex Hall Ln & US 25E	F	F
Wilson Hale Rd & US 25E	A	A
Spencer Hale Rd & US 25E	C	C
Vineyard Rd & US 25E	A	A
US 25E & Cumberland St (SR 343)	C	C
Jacobs Rd & US 25E	F	F
Old White Pine Rd & US 25E	D	E
Wallace Hdwr Dr & US 25E	B	C
Frontage Road Connector	A	A
Industrial Park & US 25E	D	C
Cracker Barrel Rd & US 25E	C	C
SB I-81 Ramps & US 25E	D	C
NB I-81 Ramps & US 25E	C	C
SR 160 & US 25E NB Ramps	C	C
SR 160 & US 25E SB Ramps	E	D

Corridor Improvement Alternatives

The previous section described the likely impact of future traffic growth in the US 25E corridor. As local development expands, and as traffic volumes increase on facilities served by the corridor, the volume of traffic on US 25E is projected to exceed 60,000 vehicles per day by the year 2026. There will be growing pressure to install more traffic signals along the corridor to meet the increasing side-street traffic volume demands and to address safety concerns arising from increased delays. With increased signalization, the character and function of US 25E will shift from its present mobility orientation. It will develop a more urbanized look and operation. Average speeds will decrease, and travel time along the corridor will increase by as much as 50 minutes. The available capacity of most existing intersections will be exceeded. Along with signalization, additional turn lanes will be required. Unacceptable operating conditions are expected to persist at intersections near the Andrew Johnson Highway and Morris Boulevard interchanges and near the intersection of Cumberland Street (SR 343) with US 25E south of Morristown. To further increase capacity, US 25E will have to be reconstructed as a six-lane facility.

Morristown city leaders have expressed a desire to protect the mobility function of US 25E while allowing development to occur within the corridor. The benefits of this posture are numerous. First, the present nature of US 25E makes it attractive to through traffic, enhancing its role in tourism. If the free-flow nature of the roadway can be preserved, it will continue to serve as a convenient avenue for visitors to reach the city from I-81 and US 11W. Secondly, maintaining the mobility function of US 25E while providing managed access at strategically located points will enhance development. Commercial users will be able to reach their destination shopping centers via well-located crossing points more easily than by trudging through a series of traffic signals. Thirdly, if the mobility function of the corridor is abandoned, there will be pressure to provide an alternative north-to-south "bypass" route. This typically is the pattern as communities absorb peripheral routes into their urban road systems and desire additional routes more distant from the developed areas.

This section will present alternative improvements that may be applied to the US 25E corridor to serve the end of protecting mobility thereon. These likely will be incremental steps that occur as development progresses and as funding becomes available for improvements. There may be cases where one or more steps will not be necessary. The three alternative improvement plans investigated are as follows:

1. Signalization of existing at-grade intersections as an interim, short-term measure;
2. Median improvements and traffic diversion to reduce the number of conflict points; and
3. Construction of grade-separated crossing points and associated marginal access roadways to eliminate the need for signalization on US 25E.

The first alternative (additional traffic signals) should not be interpreted to be a recommended improvement. It will increase travel time within the US 25E corridor, and it may tend to preempt more comprehensive improvements that would better serve the

needs of all users. However, it is recognized that some added signals may become necessary as an interim measure. The cost of such signalization and associated capacity improvements are presented for reference. The second (median improvements) and third (grade separation) alternatives are preferred in that they protect corridor travel time while facilitating access to adjacent properties along US 25E.

1. Signalization of existing at-grade intersections

The negative impact of numerous traffic signals along US 25E has been emphasized. Travel time through the corridor will increase significantly, and additional turn lanes will be necessary. However, it is expected that circumstances will arise whereby signalization is the most cost-effective and prudent remedy in the near-term for a given location. For example, major commercial developments often generate sufficient traffic volumes to warrant signalization, and funding may not be available to implement more comprehensive system improvements at the time of the development. In such cases signalization may become necessary.

It should be noted that signalization is not always available as an improvement option. Specific geometric characteristics may preclude the applicability of signalization. Such specific exceptions are beyond the scope of this report and have not been addressed herein.

For study purposes, it has been assumed that the lane improvements of Figure 9 would be implemented in addition to signalization to provide needed capacity. The LOS results would be as shown in Table 6 in the previous section of this report. Table 7 presents the estimated construction cost of the signalization and lane improvements.

Table 7: Cost to Implement Signalization with Added Turn Lanes

At-Grade Intersections	New Signal Needed?	Signal Cost (000s)[1]	# of New Auxiliary Lanes	Cost of Added Lanes (000s)[2]	Total Cost (000s)
US 25E & Cherokee Park Rd	No	0	0	0	0
Brights Pk & US 25E	Yes	60	4	240	300
US 25E & Liberty Hill Rd	Yes	60	3	180	240
US 25E & Jefferson Diamond Rd	Yes	60	5	300	360
Dalton Ford Rd & US 25E	Yes	60	0	0	60
Morelock Rd & US 25E	Yes	60	12	720	780
Mall Access Rd & US 25E	Yes	60	2	120	180
WSCC Main Ent & US 25E	No	0	4	240	240
WSCC South Ent & US 25E	Yes	60	0	0	60
Alex Hall Ln & US 25E	Yes	60	4	240	300
Wilson Hale Rd & US 25E	Yes	60	0	0	60
Spencer Hale Rd & US 25E	Yes	60	2	120	180
Vineyard Rd & US 25E	Yes	60	1	60	120
US 25E & Cumberland St (SR 343)	Yes	60	4	240	300
Jacobs Rd & US 25E	Yes	60	7	420	480
Old White Pine Rd & US 25E	Yes	60	12	720	780
Wallace Hdwr Dr & US 25E	Yes	60	0	0	60
Frontage Road Connector	Yes	60	0	0	60
Industrial Park & US 25E	Yes	60	8	480	540
Cracker Barrel Rd & US 25E	Yes	60	1	60	120
SB I-81 Ramps & US 25E	Yes	60	2	120	180
NB I-81 Ramps & US 25E	Yes	60	2	120	180
SR 160 & US 25E NB Ramps	Yes	60	1	60	120
SR 160 & US 25E SB Ramps	Yes	60	2	120	180
Total:		$1,320		$4,560	$5,880

Notes:
1. Assume $60,000 per intersection signal cost.
2. Assume 300' turn lanes/tapers, $60,000 each.

Before any new traffic signal is installed in the corridor, a traffic engineering study should be conducted. Such a study should include a review of applicable traffic signal warrants. Site-specific impacts such as proximity to interchange ramps, and safety issues such as sight distance and grades should be evaluated. Required geometric modifications should be identified, including the need for auxiliary lanes and storage lengths.

It is emphasized that installation of traffic signals on US 25E should be viewed as a short-term measure that is incompatible with the long-range goal of protecting mobility.

2. Median improvements and traffic diversion

Many communities have adopted innovative designs to address the issue of maintaining mobility while providing access. The goal of these is to offset the impact of signalization by minimizing the number of required signal phases. Most major at-grade intersections require eight signal phases (two main line left-turn phases, two main line through phases, two side-street left-turn phases, and two side-street through phases). If one or more phases can be eliminated, such as a left-turn phase, more time will be available for through-traffic movement.

Innovative designs divert traffic so that the number of conflicting movements and their associated signal phases at critical intersections are minimized. For US 25E, a modified

median design was assumed in which side-street through and left-turn movements were restricted. Side-street motorists would be allowed only to turn right and would have available median u-turn bays to complete their desired through or left-turn movement. Left turns from US 25E would be allowed. Such a design takes advantage of the available median width on US 25E and reduces the need for added right-of-way beyond the pavement edges. It would maintain desirable access opportunities while protecting the through-movement function of the roadway.

The acceptability of the design is contingent, in part, upon the degree to which intersections can be "clustered" together and conveniently served by u-turn bays on either end of the cluster. For example, the intersections of US 25E with Brights Pike, Liberty Hill Road, Jefferson Diamond Road, and Dalton Ford Road all are located within a three-quarter mile segment of US 25E. U-turn bays have been proposed approximately 1500 feet north of Brights Pike and 1500 feet south of Dalton Ford Road to provide adequate acceleration and weave lengths. A westbound driver on Dalton Ford Road wishing to go south on US 25E would be required to turn right and proceed north on US 25E approximately one mile, make a u-turn at the provided bay, then proceed south. The added travel distance is approximately two miles. This likely represents the maximum added travel distance that drivers are willing to accept and illustrates the importance of intersection proximity in applying the modified median design.

Another factor impacting the acceptability of the modified median application is the volume of through and left-turn traffic from the side-street. The modified design creates added travel distance for these movements, so it has not been applied where very large side-street through and left-turn volumes are projected. No data were available on capacity of the u-turn bays, so an objective cut-off threshold was not defined for this study. The selection of applicable intersections was done subjectively.

The following segments of US 25E were evaluated assuming the modified median in place:

A. The intersections of Brights Pike, Liberty Hill Road, Jefferson Diamond Road, and Dalton Ford Road were clustered together to be served by a pair of u-turn bays. The proposed u-turn bays would be located between Brights Pike and Cherokee Park Road (serving northbound-to-southbound u-turns) and between Morelock Road and Dalton Ford Road (serving southbound-to-northbound u-turns). Left-turn lanes were assumed to be in place on US 25E at each of the side streets. Acceleration and deceleration lanes were also assumed and were connected as auxiliary lanes where dictated by intersection spacing. As described above, side-street drivers wishing to turn left or go straight across US 25E would be required to turn right, proceed to the respective u-turn bay, and then proceed in the opposite direction on US 25E to their desired destination.

B. The intersection of US 25E with Morelock Road was evaluated with the median modification in place. A single u-turn bay was assumed to be located between Morelock Road and Dalton Ford Road adjacent to the southern-most u-turn bay identified above

and serving northbound-to-southbound u-turns. There is insufficient separation between Morelock Road and the Andrew Johnson Highway ramps to provide a second u-turn bay, so it was assumed that the Andrew Johnson Highway interchange would be used for southbound-to-northbound u-turns. Left-turn lanes, acceleration lanes, and deceleration lanes were assumed to be in place on US 25E at Morelock Road.

C. The intersections of Spencer Hale Road, Vineyard Road, Cumberland Street (SR 343), and Jacobs Road were clustered together to be served by a pair of u-turn bays. The proposed u-turn bays would be located between Wilson Hale Road and Spencer Hale Road (serving northbound-to-southbound u-turns) and between Jacobs Road and Benton Hale Road (serving southbound-to-northbound u-turns). Left-turn lanes were assumed to be in place on US 25E at each of the side streets. Acceleration and deceleration lanes were also assumed and were connected as auxiliary lanes where dictated by intersection spacing.

D. The intersections of Old White Pine Road and Wallace Hardware were clustered together to be served by a pair of u-turn bays. The proposed u-turn bays would be located between Benton Hale Road and Old White Pine Road (serving northbound-to-southbound u-turns) and immediately north of the Industrial Park driveway (serving southbound-to-northbound u-turns). Left-turn lanes were assumed to be in place on US 25E at each of the side streets. Acceleration and deceleration lanes were also assumed and were connected as auxiliary lanes where dictated by intersection spacing.

The four at-grade intersections near WSCC (US 25E at the Mall Access Road, at the two WSCC entrances, and at Alex Hall Lane) were not addressed with this median modification. Intersection spacing, the proximity of the Morris Boulevard ramps, and the large side-street left-turn volumes made the application inadvisable. Wilson Hale Road has not been addressed in this alternative treatment evaluation. The volumes of traffic to and from the roadway are minimal and may be expected to divert as needed. Also, the median modification was not applied to the Industrial Park driveway. The large volume of left-turn traffic exiting the industrial park during the evening peak hour likely would not be served effectively by such a design.

Figures 10 and 11, respectively, present the 2026 morning and evening peak hour volumes with the modified design in place. (It is not expected that the median modifications would be needed or implemented for the 2006 planning horizon.) A more detailed view of the proposed layout at each group of intersections showing the anticipated laneage is provided in the enclosed fold-out print. Table 8 presents a summary of the capacity analyses. Capacity analyses of the weave sections associated with the modified design were conducted and rendered acceptable operation with one exception. The weave movement from the westbound Old White Pine Road right turn to the north u-turn bay is projected to operate at LOS E during the evening peak hour.

It is evident that the conflicting through and left-turn volumes on US 25E are sufficient at most locations to create unacceptable delay and LOS with stop control of the US 25E left-turn traffic. Capacity analyses were conducted assuming signalization at the

modified intersections. The LOS results are included in Table 8, and the associated costs to implement this alternative with signalization are presented in Table 9.

Table 8: 2026 Capacity Analysis Summary with Median Improvements and Traffic Diversion

At-Grade Intersections	US 25E Left-turn LOS (Stop Control)				Intersection LOS (Signal Control)	
	AM		PM		AM	PM
	NB LT	SB LT	NB LT	SB LT		
Brights Pk & US 25E	F	C	F	C	D	C
US 25E & Liberty Hill Rd	F	(1)	F	D	B	B
US 25E & Jefferson Diamond Rd	E	D	D	E	B	B
Dalton Ford Rd & US 25E	(2)	D	(2)	E	A	A
Morelock Rd & US 25E	F	F	F	F	E	E
Spencer Hale Rd & US 25E	D	F	D	F	C	D
Vineyard Rd & US 25E	(2)	D	(2)	D	A	A
US 25E & Cumberland St (SR 343)	F	(2)	F	(2)	F	F
Jacobs Rd & US 25E	F	F	D	F	F	F
Old White Pine Rd & US 25E	F	F	F	F	F	F
Wallace Hdwr Dr & US 25E	F	(2)	C	(2)	C	A

Notes:
1. 0 volume, no LOS reported.
2. Movement is not provided.

Table 9: Cost to Construct Median Improvements with Signalization

At-Grade Intersections	Number of new Signals	Signal Cost (000s)[1]	Combined length of Auxiliary lanes (miles)	Cost of Added Lanes (000s)[2]	Total Cost (000s)
Brights Pk & US 25E	4	240	3.86	3,630	3,870
US 25E & Liberty Hill Rd					
US 25E & Jefferson Diamond Rd					
Dalton Ford Rd & US 25E					
Morelock Rd & US 25E	1	60	1.42	1,330	1,390
Spencer Hale Rd & US 25E	4	240	3.92	3,680	3,920
Vineyard Rd & US 25E					
US 25E & Cumberland St (SR 343)					
Jacobs Rd & US 25E					
Old White Pine Rd & US 25E	3	180	1.78	1,670	1,850
Wallace Hdwr Dr & US 25E					
Total:		$720		$10,310	$11,030

Notes:
1. Assume $60,000 per intersection signal cost.
2. Assume $0.94 million per mile for added lanes (no ROW cost).

The impact on US 25E through traffic of adding signals at the modified medians is minimal, increasing the travel time five to eight minutes. This is because only two signal phases are required (main line through and main line left-turn phases). The side-street right-turn volumes generally can be accommodated by overlapping with the main line left-turn phases.

There are deficiencies to consider in the application of the proposed median modifications. First, the alternative design has a finite capacity. At the intersections of US 25E with Morelock Road, Cumberland Street, Jacobs Road, and Old White Pine Road, the estimated 2026 volumes exceed the capacity of the modified median designs so that unacceptable delays are projected. Thus, the capacity of the modified median design will be exceeded at these locations prior to the planning horizon, and other measures will be necessary to provide acceptable operation. Secondly, they introduce some inconvenient and perhaps unexpected demands upon side-street motorists. Drivers typically do not expect to turn right in order to reach a destination to their left or straight ahead. The right-turn/u-turn combination is somewhat confusing. Thirdly, the median width on US 25E north of Jacobs Road is approximately 60 feet and may not be sufficient to allow trucks to complete the u-turn maneuver without encroaching into opposing traffic lanes. Signalization will help to minimize this deficiency by creating gaps in traffic to allow the maneuver, but other geometric improvements may be necessary.

3. Construction of grade-separated crossing points and marginal access roadways

This is the most stringent access scheme, restricting all crossing movements on US 25E. The benefit of such a design is that the mobility function of the through roadway is protected while access to and visibility of adjacent property is maintained. It is not expected that such a system of grade-separated crossing points and marginal access roads would be completed in the near term. Therefore, analysis of this access scheme was limited to the 2026 planning horizon. Figures 12 and 13 present the conceptual layout of the grade separations and associated marginal access roads along with projected 2026 morning and evening volumes, respectively. These are also illustrated as overlays on an aerial photograph in the enclosed fold-out prints.

Four major grade-separation projects were identified along with minor modification of an existing grade-separated interchange:

A. The first grade-separation would serve the segment of US 25E from Brights Pike to Jefferson Diamond Road. A crossover structure is proposed to be located between Brights Pike and Liberty Hill Road. This structure was assumed to be 60 feet wide (to accommodate five traffic lanes) and 250 feet long. The actual location of the structure and provision of sidewalks or other features will dictate the final bridge dimensions. The bridge would terminate at five-lane marginal access/collector roads on either side of US 25E, providing access to adjacent developments and connection to Brights Pike, Liberty Hill Road, and Jefferson Diamond Road. These roads should be widened to five-lane sections near the crossover area to provide added capacity. The existing intersections of these side roads with US 25E would be made right-in/right-out intersections with no left-turns onto or off of US 25E and no side-street through movements across US 25E. All crossing movements would be made via the collector roads and the crossover bridge. In order to maintain acceptable speeds on US 25E, it is recommended that the right-in/right-out intersections include acceleration and deceleration lanes to minimize impedance of US 25E traffic flow.

B. A second crossover structure is proposed to be located between Morelock Road and Dalton Ford Road. As described above, this structure was assumed to be 60 feet wide and 250 feet long and would terminate at five-lane marginal access/collector roads on either side of US 25E. The existing intersections of Morelock Road and Dalton Ford Road with US 25E would be made right-in/right-out intersections with no left-turns onto or off of US 25E and no side-street through movements across US 25E. Acceleration and deceleration lanes should be provided to minimize impedance of US 25E traffic flow. These roads should be widened to five-lane sections near the crossover area to provide added capacity.

C. In the vicinity of WSCC and College Park Drive, a conventional diamond interchange is proposed. The expanse of the WSCC campus and the limited number of intersecting side streets in this area make the interchange design more suitable than the crossovers described above. A bridge (60 feet by 250 feet assumed) would be constructed across US 25E with diamond ramps to minimize right-of-way requirements. The five-lane crossing roadway would extend east to College Park Drive, which would be widened to five lanes and extended to the north, intersecting Thompson Creek Road. Thus, additional access and frontage would be afforded near the interchange. To the west, the crossing roadway would extend to Joe Hall Road.

Associated improvements proposed to complement this project are connection of the Mall Access Road to the crossing road near the south end of WSCC. This connection was assumed to be a three-lane roadway. Also, improvement of Joe Hall Road and Fish Hatchery Road, including widening to five lanes and realignment as needed, would enhance the development potential of the interchange area. It should be noted that the south terminus of the Joe Hall Road-Fish Hatchery Road improvement has not been identified. If connected to SR 160 between the Cumberland Street and US 25E interchanges, it would necessarily be a major at-grade intersection between grade-separated interchanges, which is not desirable. (The spacing of the existing interchanges on SR 160 does not permit an additional interchange between the two.) It may be necessary to extend the proposed improved link west to Cumberland Street or east (under US 25E via the present Fish Hatchery Road alignment) to SR 160, distant from the noted interchanges.

D. Minor improvement of the existing US 25E-SR 160 interchange is proposed. The current layout incorporates a partial cloverleaf design in which the ramps terminate at SR 160 in at-grade intersections. Some concern has been expressed regarding the presence of the ramp intersections. The function of SR 160 is similar to that of US 25E, so it is desirable to maintain the freedom of traffic flow thereon. As was evident in the capacity analyses, the two ramp intersections will require signalization and geometric improvements in the future, and one of the two will continue to operate at unacceptable levels even with the signal and added turn lanes. Thus, safety and delay issues are also a concern. It is proposed that the interchange be expanded as a full cloverleaf design, with added exit and entrance ramps on the south side of SR 160. This would render a fully directional interchange with no at-grade intersections, and no new structures would

be required. Other alternatives are available but likely would require long bridge structures which may prove cost-prohibitive.

E. The final grade-separation project proposed is a crossover between Cumberland Street (SR 343) and Vineyard Road. As with the crossovers near Morelock Road and near Brights Pike, this structure was assumed to be 60 feet wide and 250 feet long, terminating at a five-lane marginal access/collector road on the east side of US 25E and at Cumberland Street on the west. The crossover would serve crossing movements at Spencer Hall Road, Vineyard Road, Cumberland Street, and Jacobs Road. Each of these would be widened to five-lane sections near the crossover for added capacity. The existing intersections of these four roadways with US 25E would be made right-in/right-out intersections with no left-turns onto or off of US 25E and no side-street through movements across US 25E. Acceleration and deceleration lanes should be provided to minimize impedance of US 25E traffic flow.

As was noted in regard to median modifications, no grade-separated improvements have been proposed for Wilson Hale Road given the minimal side-street traffic there. Also, no grade-separated improvements have been proposed for the industrial park vicinity. One factor at this location is the proximity of the I-81 ramps. The minimum desirable interchange spacing is approximately one mile, so it unadvisable to locate a new interchange on US 25E south of Old White Pine Road. Additionally, the presence of existing commercial development along the west side of US 25E in the area may make right-of-way acquisition problematic. Therefore, this access alternative was not pursued for the vicinity of the industrial park.

With the elimination of main line left turns and side-street crossing movements, US 25E would become most similar to a freeway in operational characteristics. Thus, the freeway capacity analysis methodology was applied. Table 10 presents the summary of the results. Acceptable LOS is projected with the exception of the section of the roadway near WSCC. The estimated 2026 volumes there will exceed the roadway capacity and will require three lanes per direction on US 25E for acceptable operations.

Table 10: Capacity Analysis Summary with Grade Separation and Right-in/Right-out

Link on US 25E	Freeway Analysis LOS			
	NB AM	SB AM	NB PM	SB PM
From Industrial Park interchange to SR 343	C	D	D	C
From SR 343 to SR 160	C	C	C	C
From SR 160 to WSCC	E	E	E	E
From WSCC to Morris Blvd.	E	E	E	F
From AJ Hwy. to Dalton Ford Road	D	D	D	D
From Dalton Ford Road to Brights Pike	C	C	C	C
From Brights Pike to Cherokee Park Road	B	B	B	B

Capacity analyses of the acceleration and deceleration lanes were conducted and generally rendered acceptable results. Two exceptions were noted. The first is at the Mall Access Road. The projected LOS for eastbound traffic entering US25E southbound from the Mall Access Road is projected to be LOS F during the evening peak hour. Also, the weave movements between the proposed Mall Access Road ramps and the Morris Boulevard ramps (northbound and southbound) are projected to operate at LOS

F during both peak hours. It may be advisable to route Mall Access Road traffic and Wal-Mart traffic through the proposed WSCC interchange rather than retaining the at-grade intersection and proposed auxiliary lanes.

The second ramp with an unacceptable projected LOS is the existing southbound off-ramp to SR 160, anticipated to operate at LOS E during the evening peak hour. The estimated exit traffic volume is large and may require a two-lane exit to provide adequate capacity by the 2026 planning horizon.

Table 11 presents the estimated costs for the construction of the proposed grade-separations, marginal access/collector roads, and associated improvements to existing roads. More detailed cost information is provided in Appendix 5. The required structures and assumed systems of marginal access roads are expected to be more costly than the previous alternatives, but the service life will extend up to and beyond the planning horizon (with the noted additional improvements). Also, construction of the systems of marginal access roads could begin as part of site development roadway construction.

Table 11: Cost to Construct Grade Separations and Marginal Access Roads

Locations	Cost[1] for Bridge[2]	Length(s) of New/Reconstructed Roads (miles)	ROW Cost[1] of Roads[3]	Construction Cost[1] of Roads[4]	Total Cost[1]
Jefferson Diamond Road to Brights Pike	0.98	2.1 (5-lane)	1.20	10.00	12.18
Morelock Road to Dalton Ford Road	0.98	3.0 (5-lane)	1.66	13.90	16.54
WSCC-College Park Drive-Joe Hall Road Interchange System	0.98	1.1 (Ramps), 0.6 (3-lane), 3.0 (5-lane)	4.64	22.05	27.67
SR 160 (add ramps)	0	1.0 (Ramps)	0.56[5]	1.22	1.78
Jacobs Road to Spencer Hale Road	0.98	3.8 (5-lane)	2.14	17.88	21.00
Total:	$3.92		$10.20	$65.05	$79.17

Notes:
1. All costs are in millions of dollars.
2. Assume $65 per square foot, 60' X 250'.
3. Base ROW cost is $560,000 per 2-lane roadway mile.
4. Base Construction cost is $1.7 million per 2-lane roadway mile.
5. Does not include ROW inside the proposed loop ramps.

Conclusions

1. Traffic growth will continue. It is expected that traffic volumes will continue to increase on US 25E. The route's connectivity with other major roadway facilities will ensure external traffic growth, and the attractiveness of the corridor to local development, such as the recently completed Wal-Mart shopping center, indicates a future trend that likely will include commercial, industrial, and residential ventures. Growth of traffic during the past ten years has been at a very healthy rate of 8% per year.

2. Development and traffic growth will demand signalization at many existing intersections. If at-grade intersections are retained along the corridor, many of these will require the installation of traffic signals to accommodate the increased side-street traffic volumes generated by development. Stop-control will begin to fail in its effectiveness as side-street delays increase to unacceptable levels and as safety deficiencies arise. While such signalization will benefit the minor street users, it will do so at the expense of main street traffic on US 25E, and travel time through the corridor will increase significantly.

Development generally is able to occur more quickly than major roadway improvement funding can be obtained. Thus, without adequate funding to implement more comprehensive improvements, signalization may become the most feasible mitigation in the near-term.

3. It is important to protect the mobility function of the US 25E corridor given the current function of the corridor and its relationship to other major roadways in the area. First, US 25E provides a key interconnection between major transportation facilities in the Morristown region and beyond. It is the sole arterial connecting I-81 and US 11W between Knoxville and Kingsport. It provides an arterial connection between I-40, I-75, and I-81. The implication is that the role of US 25E will continue to be that of providing mobility for traffic with origins and/or destinations beyond the immediate Morristown area. As this role is maintained, Morristown stands to gain economically by having a large volume of external traffic passing through its environs, some of which will be captured by local businesses.

US 25E is the only route that provides a crossing of the Holston River/Cherokee Lake in Hamblen County. The next nearest crossings are in Jefferson County via SR 92, immediately below Cherokee Dam, and in Hawkins County via SR 344 near Rogersville. This exclusive feature enhances the need to maintain the mobility function of the route.

The alignment of US 25E is such that it avoids the center of Morristown. Unlike US 11E, which runs through the heart of the city, US 25E is postured to provide mobility around the city-proper while accommodating connectivity to the city's existing and developing commercial centers. As development increases to the east of the corridor, it can continue to provide mobility through the area. In contrast, some cities have allowed arterial roadways to become encumbered with uncontrolled access and associated

signalization such that new bypass routes have become necessary. It would seem more desirable to protect the mobility of US 25E in close proximity to the city rather than needing to construct new bypass routes in the future.

Finally, US 25E is part of a regional arterial roadway network that includes I-81, US 11W, US 11E (Andrew Johnson Highway) west of Morristown, and SR 160. Looking at a road map, one is able to see the backbone that these routes provide with intersecting collector roads linking the arterials to local streets and roads. Protecting the mobility function of this network is critical if the area is to remain attractive to development. Drivers and industries will endure only a limited amount of inconvenience (i.e. delay) before choosing other options.

4. The alternative improvements discussed in this report represent incremental measures that should be implemented to address future corridor needs with the goal of protecting the long-term mobility function thereof. They provide something of a "tool box" to apply as development trends become more evident in specific locations. Some areas likely will require construction of grade-separated access in the near future. At other locations, signalization will provide acceptable operating conditions in the interim before development becomes more dense. Other locations will require median modifications to minimize crossing movements and make two-phase signal operation feasible. Table 12 presents a side-by-side comparison of the associated costs and impact on corridor travel time for the alternative improvements. It should be noted that the median modification and grade separation costs are for groups of intersections served by the improvements and cannot be done for the individual intersections.

Table 12: Comparison of Alternative Improvements

Intersections	Signalization with Added Turn Lanes		Median Modifications and Signalization		Grade Separation and Marginal Access Roadways[3]
	Cost in Thousands	LOS at 2026[1]	Cost in Thousands	LOS at 2026[1]	Cost in Millions
US 25E & Cherokee Park Rd	0	B			
Brights Pk & US 25E	300	F		D	
US 25E & Liberty Hill Rd	240	B		B	12.18
US 25E & Jefferson Diamond Rd	360	B	3,870	B	
Dalton Ford Rd & US 25E	60	B		A	16.54
Morelock Rd & US 25E	780	E	1,390	E	
Mall Access Rd & US 25E	180	F			
WSCC Main Ent & US 25E	240	F			27.67
WSCC South Ent & US 25E	60	F			
Alex Hall Ln & US 25E	300	F			
Wilson Hale Rd & US 25E	60	A			
Spencer Hale Rd & US 25E	180	C		D	
Vineyard Rd & US 25E	120	A		A	
US 25E & Cumberland St (SR 343)	300	C	3,920	F	21.00
Jacobs Rd & US 25E	480	F		F	
Old White Pine Rd & US 25E	780	E	1,850	F	
Wallace Hdwr Dr & US 25E	60	C		C	
Frontage Road Connector	60	A			
Industrial Park & US 25E	540	D			
Cracker Barrel Rd & US 25E	120	C			
SB I-81 Ramps & US 25E	180	D			
NB I-81 Ramps & US 25E	180	C			
SR 160 & US 25E NB Ramps	120	C			1.78
SR 160 & US 25E SB Ramps	180	E			
Total:	$5,880		$11,030		$79.17
Increase in Corridor Travel Time	20 minutes		8 minutes[2]		0 minutes[2]

Notes:
1. Poorest of AM or PM peak hour LOS at year 2026.
2. Does not include delays at intersections not included in improvement scheme.
3. With grade separations in place, the applicable LOS is for segments of US 25E. All are projected to be acceptable except between SR 160 and Morris Boulevard (LOS E)

Recommendations

1. The incremental improvements presented herein should be implemented as development and other traffic factors warrant, and funding should be pursued to facilitate implementation, so that the long-term interests of through traffic and development access in the US 25E corridor are served. Table 12 indicates that signalization and capacity improvements will provide acceptable operating conditions up to the 2026 planning horizon at the following intersections on US 25E:

- Cherokee Park Road
- Wilson Hale Road
- Industrial Park Driveway
- Cracker Barrell Lane
- I-81 ramps (NB and SB)

A traffic signal is already in place at Cherokee Park Road, and no additional improvements are indicated there. At Wilson Hale Road, signalization alone (with no additional lanes) is projected to satisfy operational needs and should be considered as traffic volumes increase, subject to community priorities and other improvements not addressed herein. In the vicinity of I-81 and the industrial park, various geometric improvements are under consideration which may preclude the need or advisability of some signalization. These locations will need to be revisited in regard to signalization as geometric modifications are finalized.

Median modifications should be implemented in the segments of US 25E from Brights Pike to Morelock Road and from Spencer Hale Road to Wallace Hardware Drive. While the projected LOS with the median modifications is only slightly better, or even poorer, compared to the conventional intersection performance with signalization and added turn lanes, the median modifications will serve to maintain the flow of through traffic on US 25E more efficiently because of simplified signal operation (fewer required signal phases).

It is recommended that long-range plans be made and funding sought to construct grade separations and associated marginal access/collector roads to serve the segments of US 25E between Brights Pike and Morelock Road, between the Mall Access Road and Alex Hale Road, and between Spencer Hale Road and Jacobs Road. Also, the proposed additional ramps at the SR 160-US 25E interchange should be included. It is expected that the proposed interchange in the vicinity of WSCC will be the first grade separation to become necessary if development projections materialize. The performance of the present at-grade signalized intersections is expected to become unacceptable in the near future, and recent commercial development in the vicinity may indicate that similar development will occur there. Thus, the need for more extensive improvements seems to be indicated.

Beyond the above general comments, this report will not attempt to recommend the time frame or geographical order in which improvements should be implemented. It is expected that such implementation will be in response to development activities and

other factors. As conditions warrant or are anticipated to warrant improvements, the appropriate actions should be taken. It is recommended that the improvements be implemented cognizant of the long-term goal of protecting mobility on US 25E. Signalization, while not desirable, should be considered only as a short-term, interim measure where feasible. Every effort should be made to minimize delay to US 25E through traffic. Where more extensive improvements, such as median u-turns, can be implemented in a timely fashion, these should be constructed as they are more compatible with the corridor function. Construction of grade separations and associated marginal access/collector roads should be pursued as the locations of anticipated development become evident. These represent the most desirable treatment to provide access while minimizing impedance of US 25E through traffic.

2. The City of Morristown should adopt an access management policy that specifies the requirements of those seeking to develop property in the US 25E corridor. This policy should include, as a minimum, the following elements:

- Requirements for traffic impact and analysis studies to assess traffic impacts of proposed developments and to identify needed improvements (traffic controls, auxiliary lane requirements, safety enhancements, etc.) arising from proposed developments;
- Driveway requirements including the allowable number of site driveways, minimum driveway spacing, and design controls;
- Procedures to insure that development site plans "dove-tail" with the City's intended layouts of marginal access road systems and grade separations (see Recommendation #3); and
- Opportunities for dedication of right-of-way and other initiatives to facilitate private-sector construction of marginal access/collector road systems.

These elements are not intended to be exhaustive, but they do outline the intent of the policy to provide a reasonable level of City control in protecting corridor mobility.

3. The City should identify the functional layout of grade separated structures and marginal access roadways. With the likely locations established, it is expected that much of the marginal access road systems can be constructed as a part of the site development process, minimizing public funding and providing more immediate implementation of the road systems. A master-plan layout with functional locations of surface street alignments and bridge structures will provide the long-term framework so that intermediate improvements and development projects may be built to conform to long-range access plans.

4. The City should pursue right-of-way acquisition as opportunities become available. The need for right-of-way will depend upon the functional layouts of Recommendation #3.

5. The City should monitor development trends to anticipate, insofar as possible, the need for improvements so that required funding can be sought. Funding for

major projects may take an extended time to obtain, but traffic growth may not be as slow in coming. City leaders and planning groups should track all available indicators to pursue funding for projects as early as practical so that improvements may be implemented before traffic conditions decline to unacceptable levels.