

# SR 249 Corridor Study

Kingston Springs, Cheatham County, TN

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For  
TDOT Long Range Planning Division  
& The Town of Kingston Springs

By  
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Gresham Smith Project No. 44606.02

July 13, 2021

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**Resolution No. 21-014**

**A RESOLUTION TO ADOPT THE SR249 CORRIDOR STUDY INITIATED THROUGH  
THE TENNESSEE DEPARTMENT OF TRANSPORTATION COMMUNITY  
TRANSPORTATION PLANNING GRANT PROGRAM**

**WHEREAS**, the Town of Kingston Springs Staff and stakeholders have met to discuss and provide input in the development of the SR249 Corridor Study; and,

**WHEREAS**, the Tennessee Department of Transportation assisted in funding the plan through a Community Transportation Planning Grant; and,

**WHEREAS**, the Town of Kingston Springs Regional Planning Commission has recommended said plan to the Kingston Springs Board of Commissioners; and,

**WHEREAS**, the Town of Kingston Springs will implement the components of the SR249 Corridor Study to the extent possible as resources are available.

**NOW, THEREFORE, BE IT RESOLVED** by the **Board of Commissioners of the Town of Kingston Springs** that the SR249 Corridor Study (attached Exhibit A) is adopted as part of the municipality's general transportation plan.

Resolved this 21<sup>st</sup> day of October in the year of 2021.

  
\_\_\_\_\_  
Mayor Francis A. Gross III

ATTEST:

  
\_\_\_\_\_  
City Recorder Jamie Dupre

## **EXECUTIVE SUMMARY**

### **PURPOSE OF THE REPORT**

The purpose of this corridor study of State Route (SR) 249 is two-fold:

- 1) Review of access to I-40 via Exit 188; and
- 2) Examine the impact of SR 249 as a connector between I-40 and US Highway 70.

SR 249 is known locally as Luyben Hills Road. The Kingston Springs Regional Planning Commission is in the initial phase of updating a long-range growth plan for Kingston Springs and the surrounding area, and a study of this busy corridor will be a key component of this plan.

The *SR 249 Corridor Study* was initiated through a Tennessee Department of Transportation (TDOT) Community Transportation Planning Grant (CTPG). TDOT established the CTBG program to assist Tennessee's small and rural communities in developing plans to address transportation, land use, and growth management issues. The program is designed to better integrate multimodal transportation systems with local land use objectives and achieve statewide transportation goals.

The grant application, dated January 21, 2020, was submitted by John Lawless, the Town of Kingston Springs City Manager. The Kingston Springs Regional Planning Commission, as well as the Kingston Springs Board of Commissioners, are in support of this grant application.

### **OVERVIEW OF ADJOINING PROJECTS**

The Town of Kingston Springs is developing a multimodal access project along SR 249 within the study area that will construct a shared-use path along the northbound lane and a sidewalk along the southbound lane. These facilities extend from the I-40 Westbound Ramps to Kingston Springs Road and are included in the Build Option. SR 249 will be overlaid with asphalt pavement and fresh pavement markings. The project will maintain the existing three-lane typical section along SR 249. The project will include curb and grass buffers/utility strips.

A preliminary design plan was submitted in 2018 to Cheatham County for a Safe Routes to School (SRTS) project. The project focuses on the Harpeth View Trail, which links to Harpeth Middle School. Although the Safe Routes to School project is not within the study area, it is located adjacent to the study area and could eventually link the trail with the study area via sidewalks. The SRTS project includes sidewalks, crosswalks, curbs, and greenery to improve the walkability of the area for students walking or biking to school.

As part of the TDOT Nashville I-40 SmartWay Intelligent Transportation System Expansion Project, TDOT will expand the SmartWay along I-40 from US 70 in Bellevue to Hogan Road in Dickson County.

### **DESCRIPTION OF EXISTING CONDITIONS**

SR 249 is located at Exit 188 of the I-40 Interchange and serves as the only access to I-40 in Cheatham County. The next exits are six (6) miles west in Williamson County or four (4) miles east in Davidson County. This section of SR 249 is a main corridor linking I-40 and US 70. Local commuter traffic mixes with commercial truck traffic along the corridor. This section of SR 249 is a primary detour location for incidents on I-40.

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Within the 0.38-mile long study area, SR 249 is functionally classified as a rural major collector with one travel lane in each direction and a two-way left-turn lane. Each lane is twelve (12) feet wide. The typical shoulder width is seven (7) feet. SR 249 is a north-south route with a posted speed limit of 30 mph. The SR 249 intersections with the I-40 Ramps are unsignalized. The SR 249 intersection with Kingston Springs Road is signalized.

### **EXISTING AND HORIZON TRAFFIC**

The Year 2026 Annual Average Daily Traffic (AADT) is projected to be 11,350. The Year 2046 AADT is projected to be 14,640.

### **RECOMMENDED IMPROVEMENTS**

The Town of Kingston Springs's multimodal access project along SR 249 within the study area will construct a shared-use path along the northbound lane and a sidewalk along the southbound lane. These facilities extend from the I-40 Westbound Ramps to Kingston Springs Road and are included in the Build Option. The traffic analysis supports maintaining the existing three-lane typical section along SR 249. This is consistent with the typical section proposed in the Town's multimodal design project. The Build Option would signalize the two-way stop intersections of SR 249 with the I-40 Ramps. The Build Option would also extend the I-40 Eastbound Exit Ramp's right-turn lane from its existing length of 50 feet to 175 feet long. Lastly, the Build Option would interconnect the two new signals at the I-40 Ramps with the existing signal at Kingston Springs Road to provide coordinated operations.

When the SR 249 Bridge over I-40 requires major rehabilitation or replacement, it is recommended to replace the existing shoulders with a sidewalk and shared-use path, consistent with the improvements in the Build Option just to the north.

The total cost of improvements within the study area for the multimodal, signalization with turn lane, and bridge replacement costs is \$11.69 million in year 2026 dollars. The bridge replacement costs are only recommended with future regular maintenance and rehabilitation of the SR 249 Bridge over I-40. The total cost of improvements within the study area, excluding the bridge replacement, is \$3.82 million in year 2026 dollars. The Town may construct the multimodal improvements prior to other improvements with town or other funds. If only signalization and turn lane improvements are constructed, the cost is \$2.74 million in year 2026 dollars.

The Build Option focuses on constructed improvements within the study area. The *SR 249 Corridor Study* included a community survey, which received 413 responses. The public noted many items that require improvements to the transportation and land use policies within and outside of the study area. These needs include improved access management regulations, non-recurring congestion mitigation, and improved maintenance of the roadside.

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## **1.0 INTRODUCTION**

### **1.1 REPORT GOALS**

The purpose of this corridor study of State Route (SR) 249 is two-fold:

- 1) Review of access to I-40 via Exit 188; and
- 2) Examine the impact of SR 249 as a connector between I-40 and US Highway 70.

SR 249 is known locally as Luyben Hills Road. The Kingston Springs Regional Planning Commission is in the initial phase of updating a long-range growth plan for Kingston Springs and the surrounding area, and a study of this busy corridor will be a key component of this plan.

SR 249 is an important corridor for the town of Kingston Springs, surrounding communities, and Cheatham County. It serves as the link between I-40 and portions of Cheatham and Dickson Counties, including the communities of Kingston Springs, Pegram, White Bluff, Charlotte, and Ashland City. This corridor is a well-used interchange for commercial semi-tractor trailer (truck) traffic. Trucks use this interchange and corridor frequently to access truck stops/travel centers on both the north and south sides of I-40 as well as an access point to southern Cheatham County and US 70.

The town has developed Construction Plans for improvements along SR 249 within the study area. The plans maintain the existing three-lane typical section along SR 249 with one lane in each direction and a center two-way left-turn lane. The project will construct a five-foot wide sidewalk along the southbound side and a ten-foot wide shared-use path along the northbound side. The primary goals of the *SR 249 Corridor Study* are:

- to determine if the three-lane typical section will meet the needs of the community through a 20-year design life,
- determine if supplementary improvements are needed to maintain safe and efficient operations for all users, and
- recommend high-level options for alternative / improved access to Kingston Springs when there is a crash or other non-recurring instance that limits access between I-40 and SR 249.

### **1.2 PROJECT INITIATION**

The *SR 249 Corridor Study* was initiated through a Tennessee Department of Transportation (TDOT) Community Transportation Planning Grant (CTPG). TDOT established the CTBG program to assist Tennessee's small and rural communities in developing plans to address transportation, land use, and growth management issues. The program is designed to better integrate multimodal transportation systems with local land use objectives and achieve statewide transportation goals.

The grant application, dated January 21, 2020, was submitted by John Lawless, the Town of Kingston Springs City Manager. The Kingston Springs Regional Planning Commission as well as the Kingston Springs Board of Commissioners are in support of this grant application. The CTPG is provided in Appendix A: *Community Transportation Planning Grant Application*. The town supported their request for the CTPG with the following items:



- A TDOT traffic study (TPR) was conducted in July of 2009 for Exit 188 off I-40. In that study the Peak Hour LOS Analysis for the corridor was rated a “C” for 2009, anticipated to be a “D” in 2014, and a “D” in 2034.
- In this 2009 TPR the Traffic and LOS Analysis for the I-40 Exit 188 Eastbound Ramp was rated as an “F/C” for 2009, anticipated to be an “F/C” in 2014, and an “F/F” in 2034.
- In this 2009 TPR the Traffic and LOS Analysis for the I-40 Exit 188 Westbound Ramp was rated as a “B/C” for 2009, anticipated to be a “B/C” in 2014, and a “D/F” in 2034.
- Recent commercial development at Exit 188 on the north side of I-40 includes the addition of a Thornton’s Travel Center catering to both car and commercial semi-tractor trailer patrons, an enlarged convenience store/gas station, additional fast food restaurant, and proposed multi-density residential development. This short corridor also includes three motels for overnight lodging.
- For eastbound commercial semi-tractor trailer traffic, Exit 188 is the last exit with a truck stop/travel center on the west side of Nashville. This generates heavy commercial traffic at the exit as drivers choose to stop prior to navigating the Nashville traffic.
- For westbound commercial semi-tractor trailer traffic, Exit 188 is the first exit with a truck stop/travel center on the west side of Nashville. This generates heavy commercial traffic at the exit as the first option for drivers to stop after navigating the Nashville traffic.
- Exit 188 is the only access to I-40 in Cheatham County. The next exits are six miles west (Exit 182 in Williamson County) or four miles east (Exit 192 in Davidson County).
- This section of SR 249 is a main corridor linking I-40 and US 70. Heavy volumes of local commuter traffic as well as commercial truck traffic use this route daily.
- This section of SR 249 is a primary detour for incidents on I-40. Cheatham County E-911 provided data indicating that from November 2018 to November 2019 the approximate seven mile stretch of I-40 in Cheatham County generated a total of 1,033 calls (including transfers, information calls, traffic hazards, etc.), with 156 of these calls involving crashes (non-injury, injury and unknown injuries). These vehicle crash calls are a 23-percent increase over the previous 2017-2018 time period total of 127. In addition, these numbers do not include calls received through Tennessee Highway Patrol or Metro Nashville. I-40 Exit 188 is the only exit available to detour interstate traffic from this area of I-40 to the east/west alternative route of US 70.
- As the only access to I-40 in Cheatham County, Exit 188 and this section of SR 249 regularly supports tourism in the area as a route to Narrows of the Harpeth State Park, Montgomery Bell State Park, the State Wildlife Management Area, Cheatham Dam, and several canoe outfitters that access the scenic Harpeth River.
- Undeveloped property adjacent to this SR 249 corridor is now being sold and developed that will introduce commercial and multi-density residential traffic.

### **1.3 STUDY AREA**

The study area is in Kingston Springs, Cheatham County, TN. The length of the study area is 0.38 mile long. Figure 1 provides an area map of the study area, Figure 2 provides a location map on aerial imagery, Figure 3 provides a vicinity map on topographic mapping, and Figure 4 provides Federal Emergency Management Agency flood mapping. The study area extends from the I-40 Eastbound Ramps (Log Mile 0.07 of Local Route A372) to Kingston Springs Road (Log Mile 0.31 of SR 249). Local Route A372 and SR 249 form a continuous route within the study area and are known locally as Luyben Hills Road. This *SR 249 Corridor Study* hereto refers to the route as SR 249 for simplicity. The following three routes intersect SR 249 within the study area:

Luyben Hills Road within the study area is a continuous route composed of SR 249 (0.31 mile) and Local Route A372 (0.07 mile). This *SR 249 Corridor Study* hereto refers to the route as SR 249 for simplicity.

1. I-40 Eastbound Ramps
2. I-40 Westbound Ramps
3. Kingston Springs Road

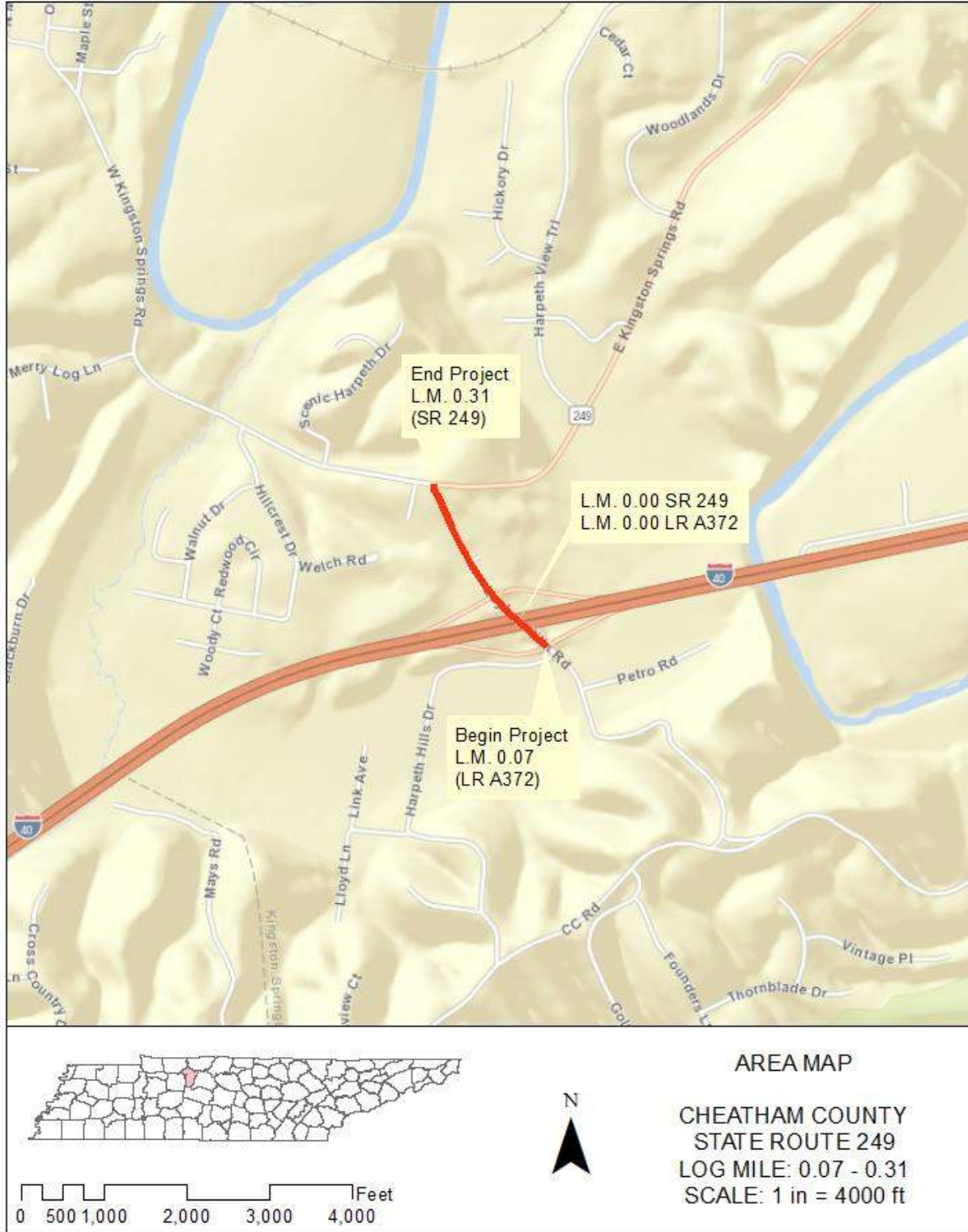


FIGURE 1: AREA MAP



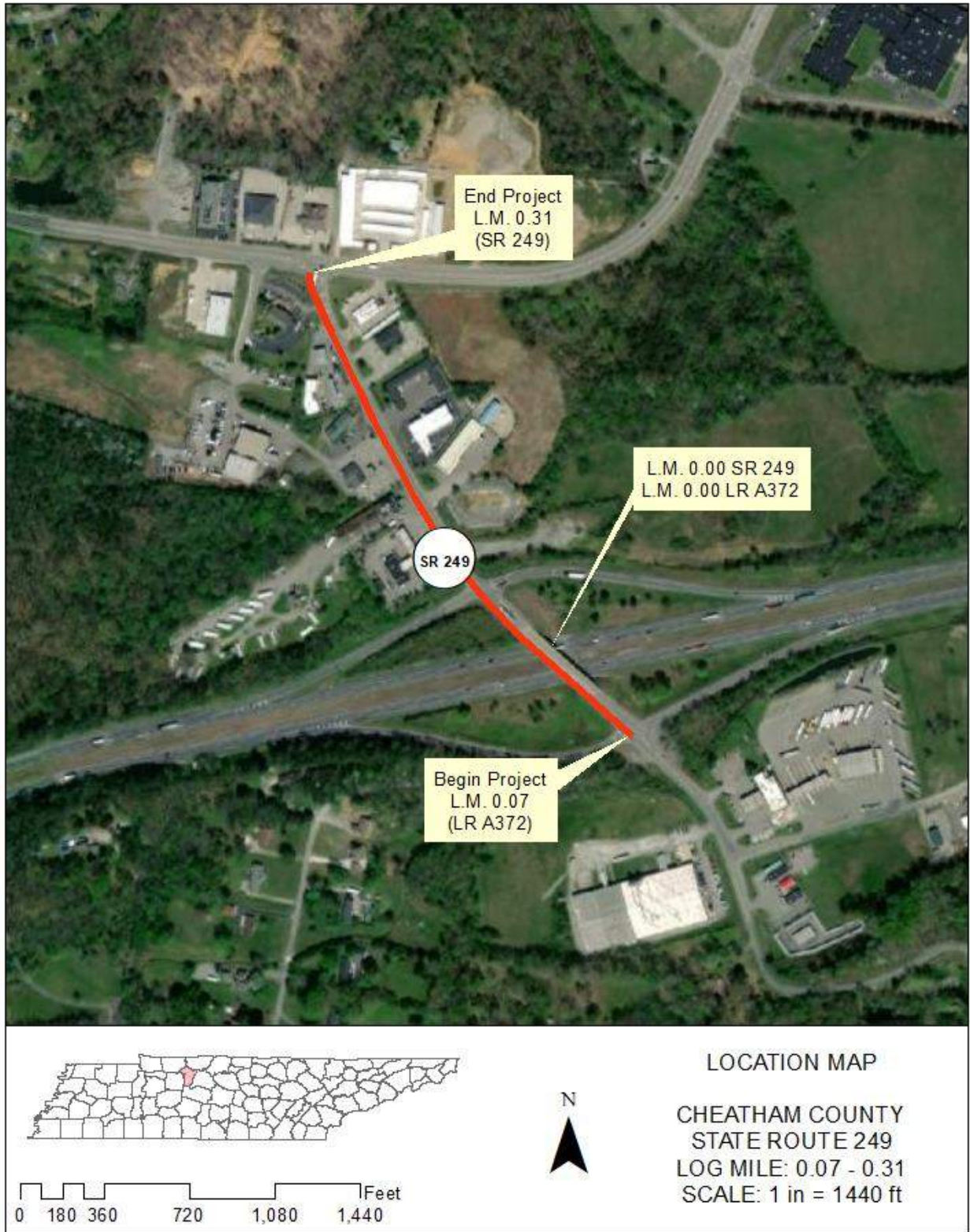
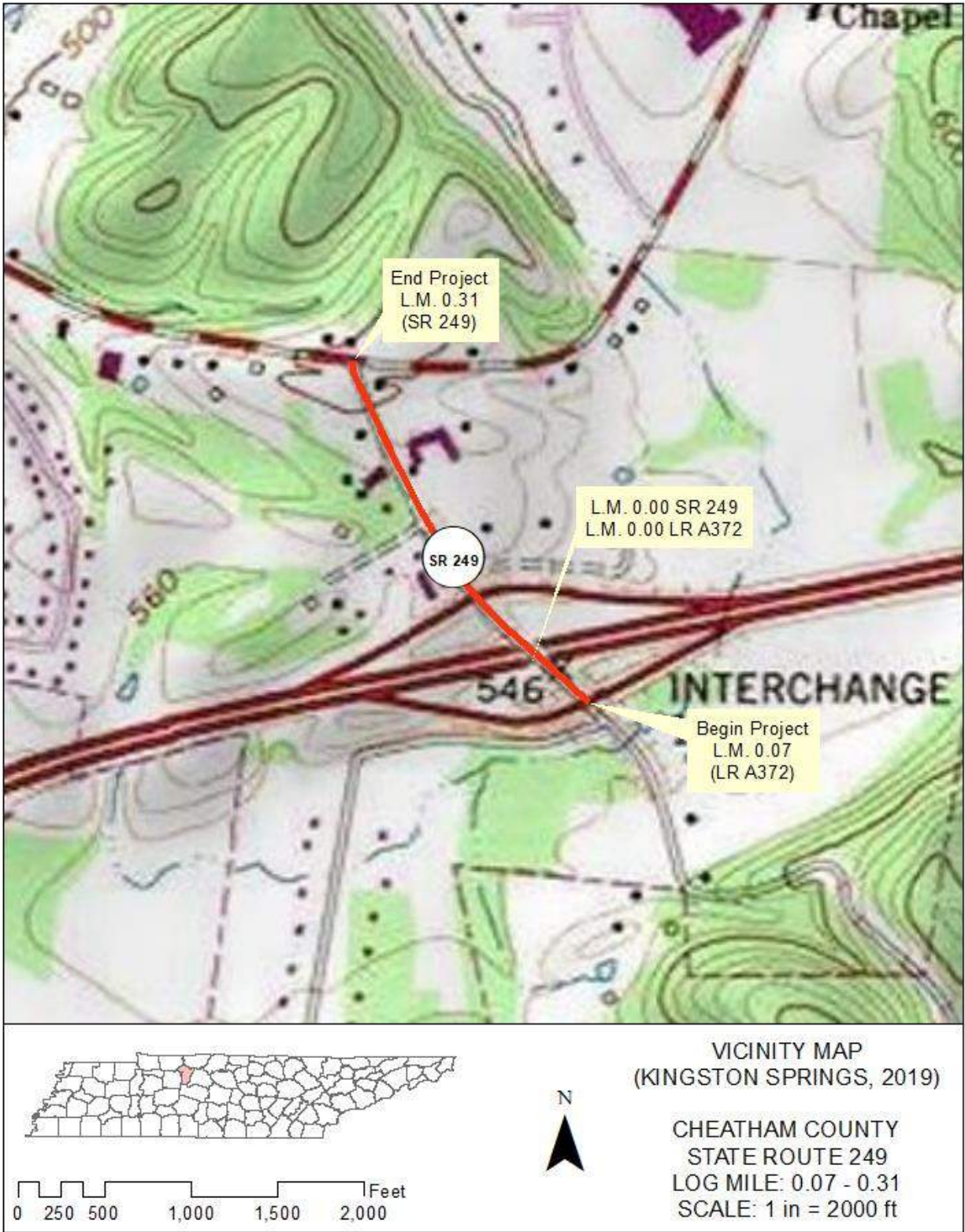
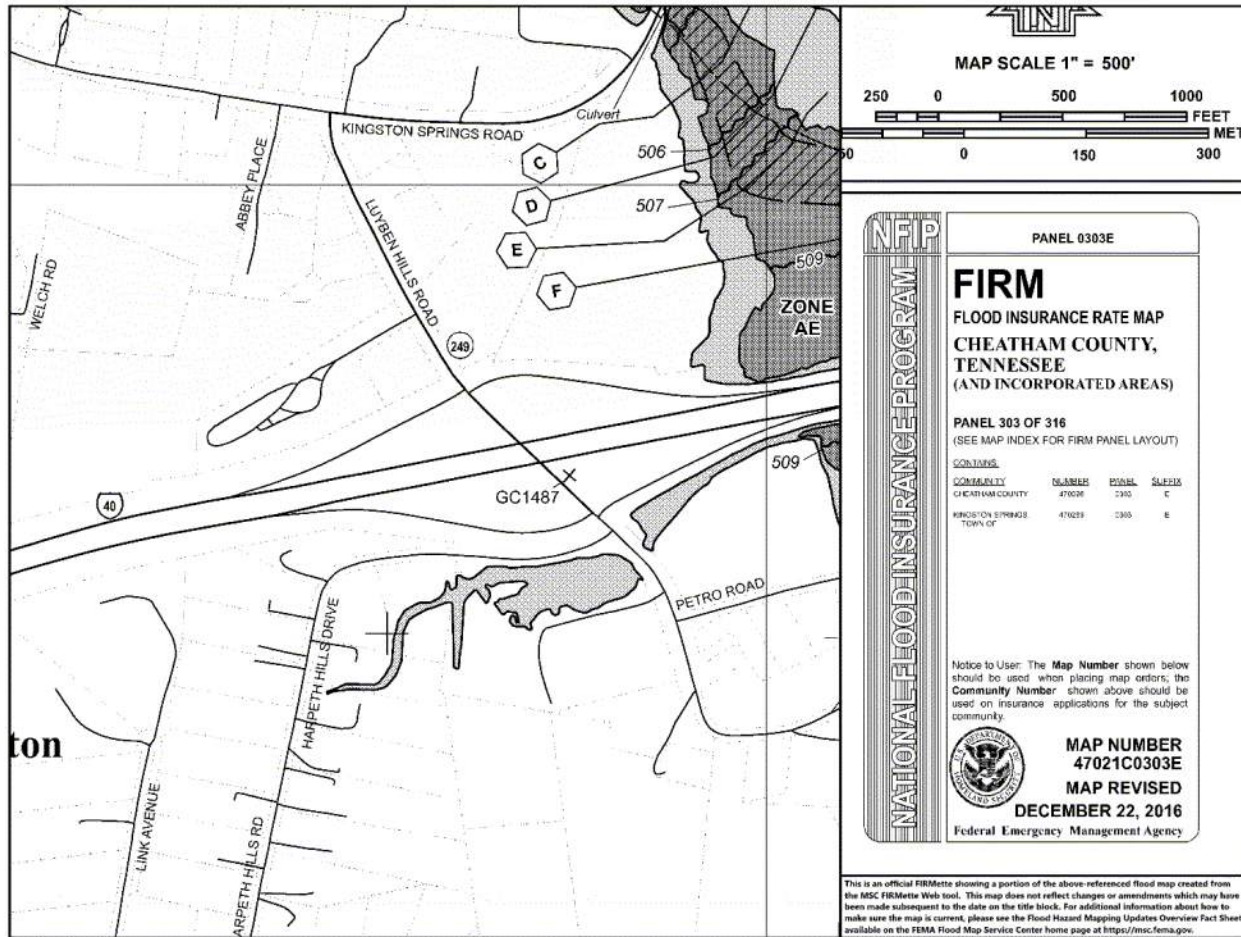


FIGURE 2: LOCATION MAP WITH AERIAL IMAGERY





**FIGURE 3: VICINITY MAP**  
Source: USGS Quad Map (Kingston Springs)



**FIGURE 4: FLOOD MAP**  
Source: FIRMETTE 4021C0303E

## 2.0 PRELIMINARY PURPOSE AND NEED

The purpose of the proposed project is to provide safe pedestrian connections that do not currently exist within Kingston Springs' commercial district, to improve traffic operations at the I-40 Interchange with SR 249, and to provide transportation network options that will prove beneficial when non-recurring congestion along I-40 occurs.

The proposed project is needed to provide multimodal options within Kingston Springs by providing a connection from schools and residential areas along Kingston Springs Road to the Kingston Springs Commercial District along SR 249. SR 249 serves as the only access to I-40 in Cheatham County.

## 3.0 EXISTING CONDITIONS

SR 249 is located at Exit 188 of the I-40 Interchange and serves as the only access to I-40 in Cheatham County. The next exits are six (6) miles west in Williamson County or four (4) miles east in Davidson County. This section of SR 249 is a main corridor linking I-40 and US 70. Local commuter traffic mixes with commercial truck traffic along the corridor. This section of SR 249 is

a primary detour location for incidents on I-40. Cheatham County E-911 indicates that from November 2018 to November 2019 that the seven-mile long stretch of I-40 in Cheatham County generated a total of 1,033 calls with 156 of these calls involving crashes.

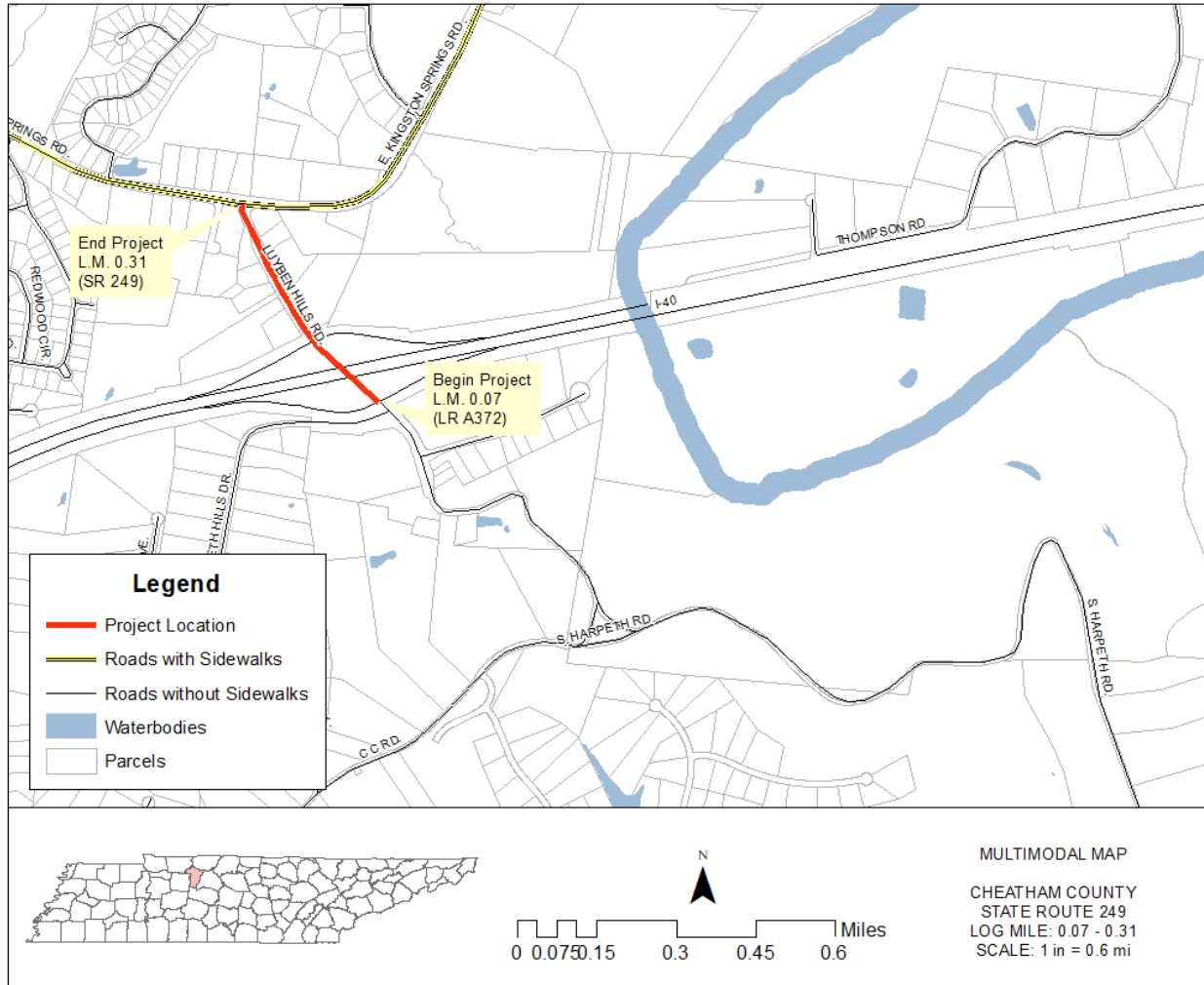
### **3.1 ROADWAY GEOMETRICS**

Within the 0.38-mile long study area, SR 249 is functionally classified as a rural major collector with one travel lane in each direction and a two-way left-turn lane. Each lane is twelve (12) feet wide. The typical shoulder width is seven (7) feet wide. SR 249 is a north-south route with a posted speed limit of 30 mph. Its northbound approach to the I-40 Eastbound Ramps consist of a shared through/right lane. It transitions to a dedicated left and through lane on the northbound approach to the I-40 Westbound Ramps. Its southbound approach to the I-40 Westbound Ramps consists of a shared through/right lane. It transitions to a dedicated left and through lane on the southbound approach to the I-40 Westbound Ramps. The SR 249 intersections with the I-40 Ramps are unsignalized. The SR 249 northbound approach to Kingston Springs Road consists of a shared through-left lane and a dedicated right lane. The SR 249 intersection with Kingston Springs Road is signalized. The terrain is rolling. The typical right-of-way width is 60 feet.

### **3.2 MULTIMODAL FACILITIES**

The study area has no bicycle facilities and few sidewalks. There are sidewalks at the intersection of SR 249 and Kingston Springs Road, which then extend east along Kingston Springs Road. There is one discontinuous strip of shared-use path fronting the newly developed Thornton's Convenience Store parcel midway along the northbound side of SR 249. This section of shared-use path was constructed with redevelopment of the parcel and will be incorporated into a future shared-use path project (see Section 6.1). Figure 5 maps the existing multimodal facilities within and adjacent to the study area.





**FIGURE 5: EXISTING MULTIMODAL FACILITIES**

### 3.3 DEMOGRAPHICS

Per the US Census Bureau's 2019 American Community Survey (ACS) 5-Year Estimates, the 2019 population of Kingston Springs was 2,741, which equates to approximately 272.7 persons per square mile (based on estimated total area of 10.05 square miles). According to the ACS 2019 estimates, the population of Kingston Springs declined at an average rate of 0.11 percent since 2010. Table 1 summarizes key demographics of Cheatham County, and provides a comparison to Tennessee and the United States.



**TABLE 1: CHEATHAM COUNTY DEMOGRAPHICS**

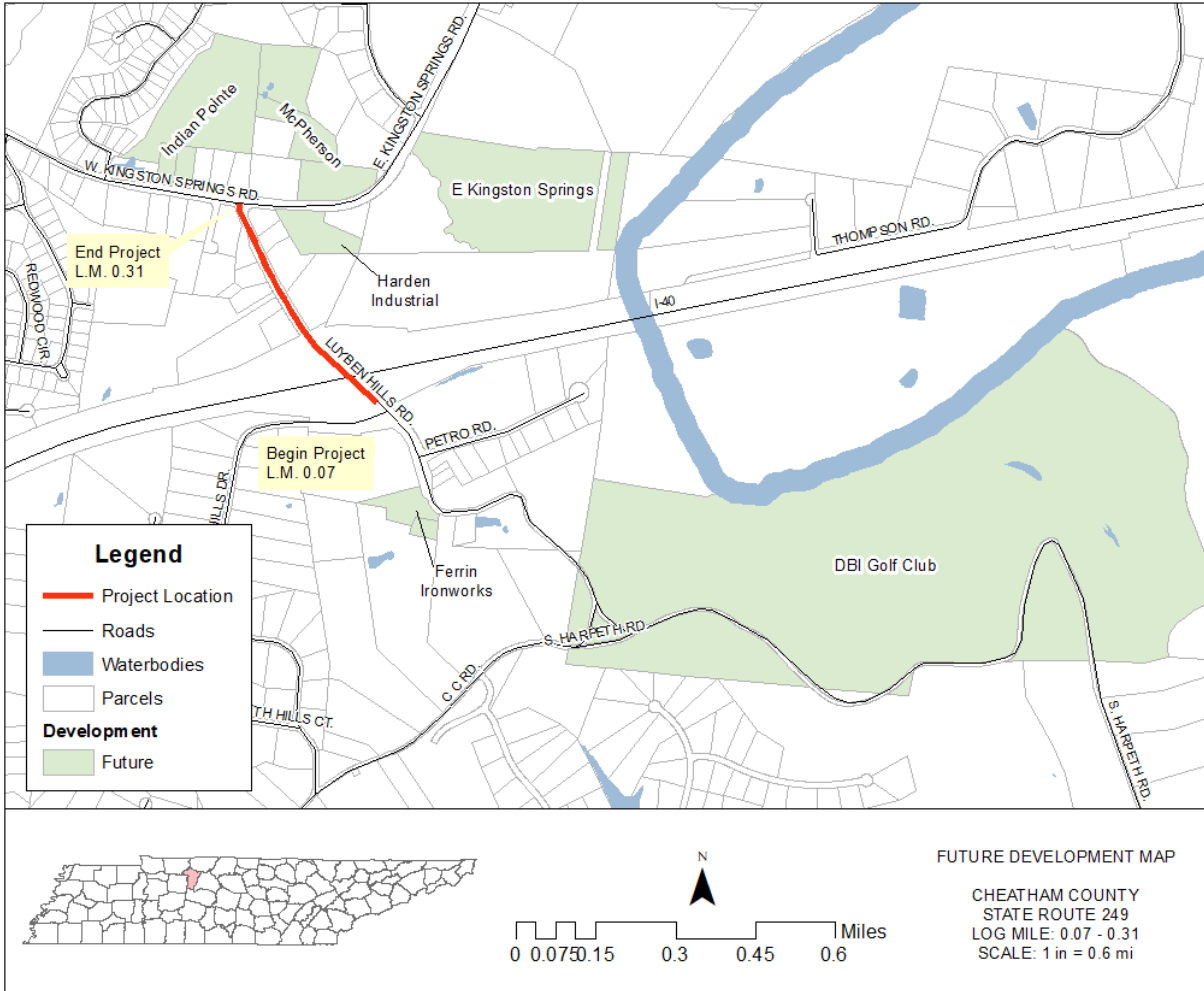
<b>Characteristics</b>	<b>Cheatham County</b>	<b>Tennessee</b>	<b>United States</b>
Growth Rate (2015 – 2019)	0.39%	0.65%	0.52%
Unemployment (2019)	4.0%	5.3%	5.3%
Minority Population (2019)	5.4%	22.8%	28.0%
Median Household Income (2019)	\$61,913	\$56,071	\$65,712
Persons Below Poverty Level (2019)	10.6%	13.9%	12.3%
Median Age (2019)	40.3	39.0	38.5

Sources: U.S. Census Bureau American Community Survey 2019 5-Year Estimates

Although Kingston Springs has not experienced past residential growth, the immediate study area is experiencing residential and commercial growth. Undeveloped property adjacent to the SR 249 corridor is being sold and developed at an increasing rate and will introduce additional commercial and multi-residential homes to the area. Currently there are seven (7) developments planned to be located along the corridor or adjacent to it. These developments include multiple residential developments, two manufacturing sites, and a golf course. Table 2 lists and Figure 6 shows the planned developments located within or adjacent to the study area.

**TABLE 2: PLANNED DEVELOPMENTS**

<b>Planned Development</b>	<b>Quantity</b>	<b>Units</b>	<b>Business Type</b>	<b>Primary Access Point</b>
McPherson Site Development	40	Homes	Residential	E. Kingston Springs Rd
Kingston Springs Homes	33	Homes	Residential	E. Kingston Springs Rd
Indian Pointe Subdivision	0	N/A	Subdivide	W. Kingston Springs Rd
Harpeth industries	15	Jobs	Manufacturing	E. Kingston Springs Rd
DBI Golf Club	18	Holes	Recreational	S. Harpeth Rd
Ferrin Iron Works	6,000	S.F.	Manufacturing	Luyben Hills Rd
Indian Pointe Condominiums	52	Homes	Residential	W. Kingston Springs Rd



**FIGURE 6: PLANNED DEVELOPMENTS**

### 3.4 EXISTING LAND USE AND ZONING

The land surrounding the study area is primarily zoned commercial, with some industrial and residentially zoned parcels. Gas stations, truck stops, and fast-food restaurants servicing travelers along I-40 compose a significant percentage of the businesses. Kingston Springs' zoning map is shown in Figure 7.



FIGURE 7: KINGSTON SPRINGS ZONING

### 3.5 PRELIMINARY ENVIRONMENTAL CONSTRAINTS

There are no known environmental constraints within the study area. The study area has a planned sidewalk and shared-use path project (see Section 6.1). This study area has undergone a Tennessee Environmental Evaluation Report (TEER) screening. TDOT determined in the TEER that “no significant environmental impacts will result from this action.” The TEER was approved in October 2017 and is provided in Appendix B: *SR 249 TEER*.

### 3.6 UTILITY INFRASTRUCTURE

Underground gas and water lines are present along SR 249, along with above-ground power lines. Many of the utility poles have overhead streetlighting attachments. The utilities are mapped in Figure 8.

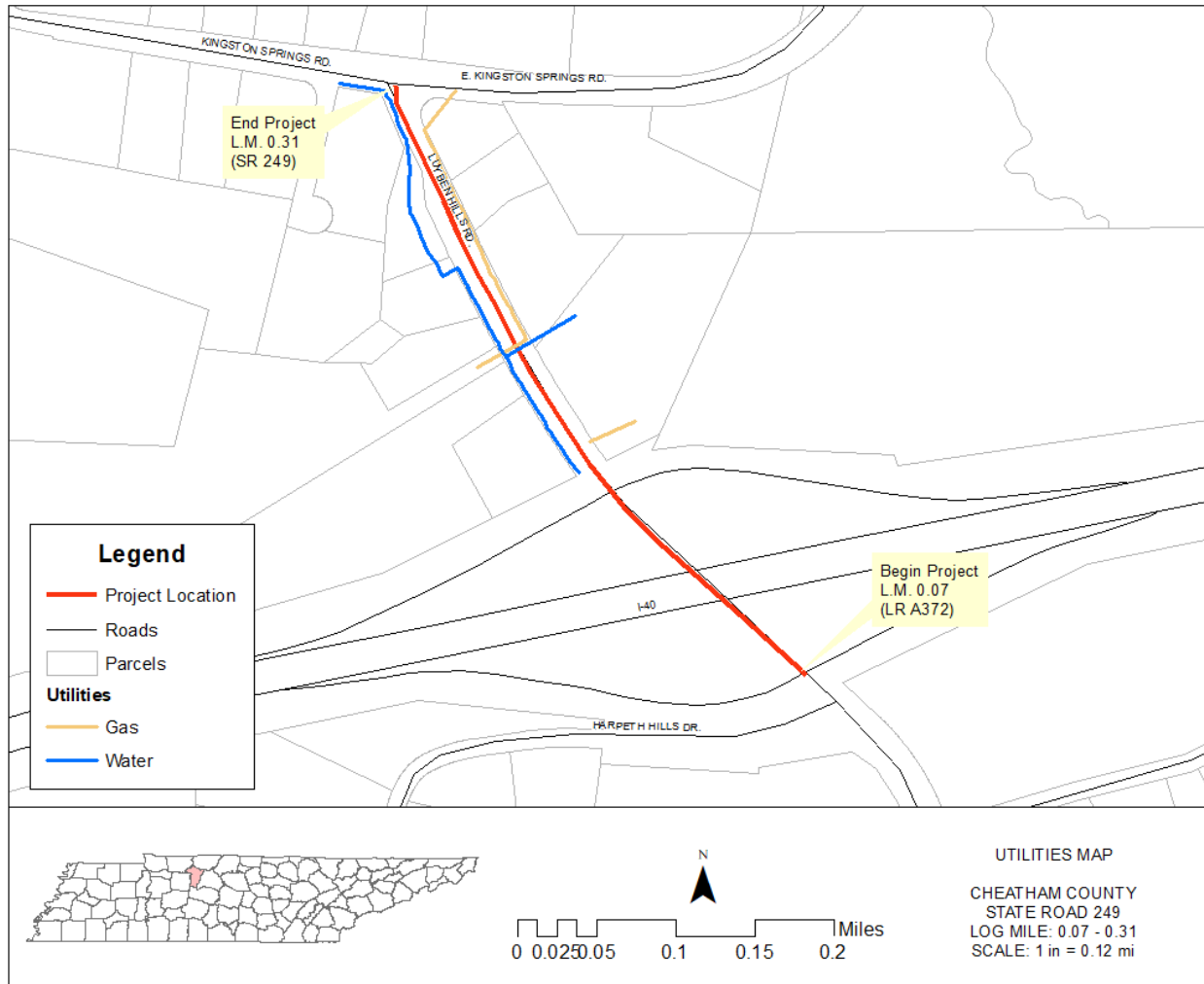


FIGURE 8: SR 249 UTILITIES

### 3.7 MAJOR STRUCTURES

The study area includes a bridge along SR 249 over I-40 (Bridge ID 11-A372-0.00). It is a three-lane bridge with twelve-foot wide lanes and eight-foot wide shoulders. The bridge is 305 feet long with a steel beams and a concrete deck. It was constructed in 1960 and underwent major widening and rehabilitation in 2007. The bridge is listed in “Fair” condition with a 92.2 sufficiency rating. The bridge inspection report is provided in Appendix C: *SR 249 Bridge Inspection Report*.

### 3.8 CRASH HISTORY

The study area includes SR 249 and Local Route 0A372 (together known locally as Luyben Hills Road) from the I-40 Eastbound Ramps to Kingston Springs Road in Cheatham County. Luyben Hills Road is designated as SR 249 north of the I-40 Overpass and LR 0A372 south of the I-40 Overpass. The crashes associated with Harpeth Hills Drive were also considered in the crash history analysis because Harpeth Hills Drive is located within the functional area of the I-40 Eastbound Ramps intersection. This extended the crash analysis 0.014 miles (74 feet) south of the I-40 Eastbound Ramps. SR 249/ LR 0A372 is a three-lane (one-lane in each direction with a two-way left turn lane) rural major collector. The speed limit is 30 miles per hour (mph).

For the three-year crash analysis study period from March 1, 2017 to March 1, 2020, for L.M. 0.00 to L.M. 0.084 (LR 0A372), the overall crash rate is 2.718 and the statewide rate is 1.596. For L.M. 0.00 to L.M. 0.031 (SR 249), the overall crash rate is 3.557 and the statewide rate is 1.888. The overall crash rates for both of the segments are above the statewide rate. There were no fatal or incapacitating injury crashes in the study segment. The crash analysis study period ending in March of 2020 was selected to avoid the effects of the COVID 19 pandemic on traffic and crash patterns.

The stop sign-controlled intersection of the westbound I-40 Ramps with Luyben Hills Road has a crash rate of 0.30 and the statewide rate is 0.099. The crash rate is above the statewide rate.

The actual crash rates were also compared to the critical crash rates. The critical crash rate is a statistical control used to be reasonably certain that an observed crash rate differs significantly from the statewide average rate. The statistical control indicates that any actual to critical ratio greater than one (1.0) is most likely not due to chance but to some unfavorable characteristic of the local conditions. TDOT utilizes a ninety-nine percent confidence level in their critical crash rate calculations. All crash rates within the study area are below the critical crash rates with actual to critical crash ratios (A/C) below 1.0.

### **Segment Overview**

- The crash analysis study area is between L.M. 0.00 (I-40 Overpass) and L.M. 0.084 (Harpeth Hills Drive just south of the I-40 Eastbound Ramps) and L.M. 0.00 (I-40 Overpass) and L.M. 0.31 (Kingston Springs Road). The total length is 0.394 miles.
- State Route 249 is classified as a rural major collector.
- The posted speed limit on Lubyen Hills Road is 30 mph.
- Within the three-year crash analysis period there have been 22 total crashes (20 property damage and 2 non-incapacitating injury).
- 73% of the crashes involved multiple vehicles.
- 82% of the crashes occurred during dry condition.
- 27% of the crashes involved a fixed object (roadway departure).
- 23% were rear end crashes and 23% were angle crashes.

The crash statistics are summarized in Table 3 to Table 5 and Figure 9 and Figure 10. Additional crash data are provided in Appendix D: *Prebrief / Crash Summary*.

**TABLE 3: CRASH STATISTICS**  
**Luyben Hills Road**  
**Harpeth Hills Dr. to Kingston Springs Rd.**  
**Crash Statistics 3/1/17 to 3/1/20**

Condition	Study Area	
	Number of Crashes	Percentage of Total
	Severity	
Fatal	0	0%
Incap. Injury	0	0%
Other Injury	2	9%
PDO	20	91%
	Manner of Collision	
Angle	5	23%
Rear-End	5	23%
Sideswipe Opp. Dir.	1	5%
Sideswipe Same Dir.	2	9%
Head-On	0	0%
Rear-to-Rear	0	0%
Unknown	9	41%
	Road Conditions	
Ice	0	0%
Snow	0	0%
Sand/Mud/Dirt	0	0%
Wet	1	5%
Dry	18	82%
	Light Condition	
Daylight	14	64%
Dusk	0	0%
Dark/Lighted	5	23%
Dark/Not Lighted	0	0%
Not Indicated	0	0%
	Crash Location	
Along Roadway	12	55%
At Intersection	10	45%
<b>Total</b>	<b>22</b>	



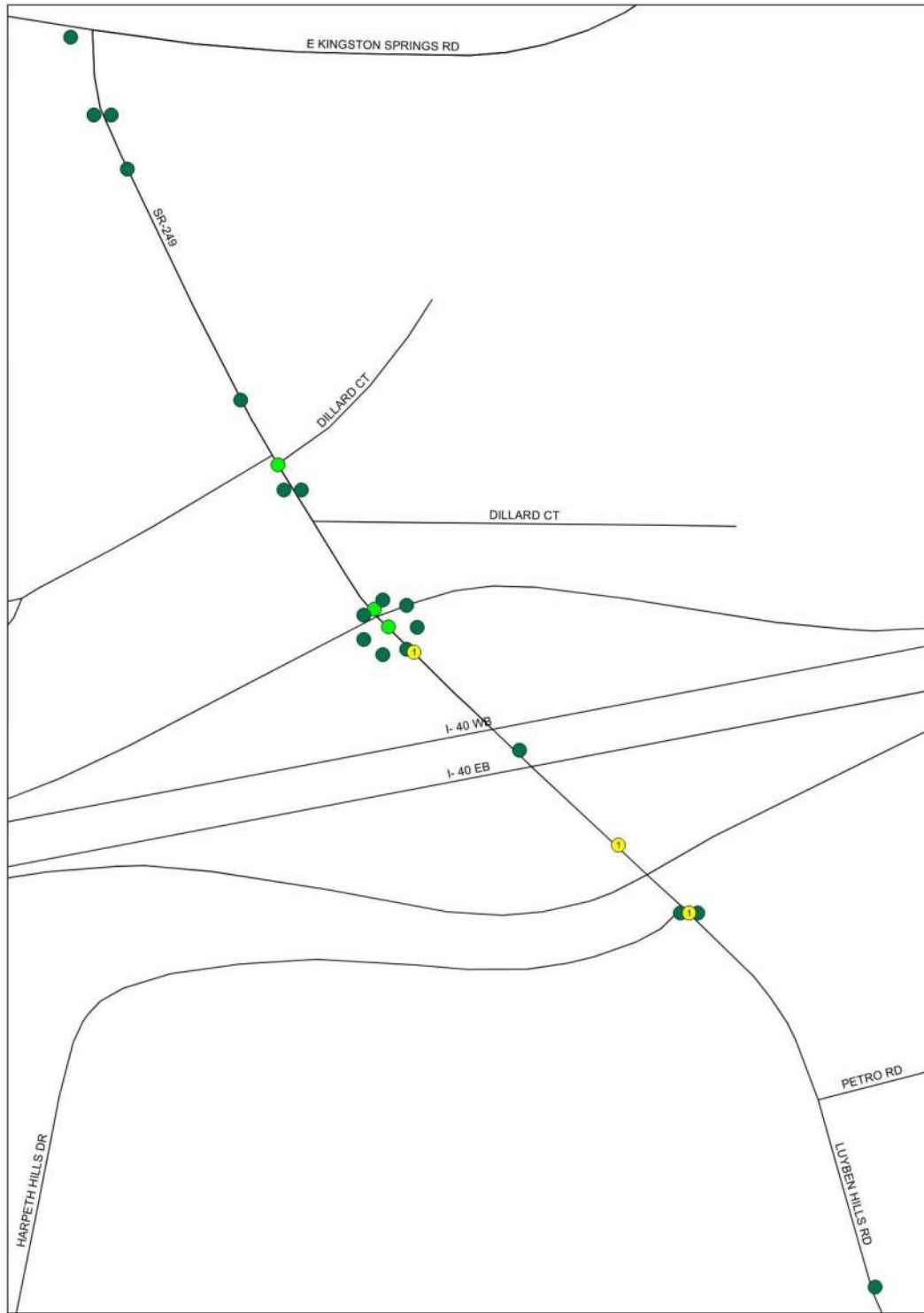
**TABLE 5: INTERSECTION CRASH RATES**

Intersection Crash Rates Luyben Hills Road (March 1, 2017 to March 1, 2020) (Intersections with 5 or More Crashes)											
LM	Route	Side Road	Entering Daily Traffic		Entering Daily Traffic		Three Year Total		Statewide Rate	Actual/Statewide	Actual/Critical
			North	South	East	West	# Crashes	Rate			
0.06	Luyben Hills Rd. (SR 249)	I-40 WB Ramps	4,555	4,555	6,101	0	5	0.30	0.099	3.03	0.97

**Notes:**

SW Rate for rural "Other Intersections" on two-lane with turn lane (2017-2019): 0.099





**SR 249 (Cheatham County) Crashes  
(March 2017 to March 2020)**

Prepared by: Gresham Smith  
Prepared for: Tennessee Department of Transportation (TDOT)  
February 2021

- Suspected Minor Injury  
(# = Number of Minor Injuries)
- Property Damage (Under)
- Property Damage (Over)



Corridor Overview



**FIGURE 9: CRASH PLOT (SIMPLE MAP)**



SR 249 (Cheatham County) Crashes  
(March 2017 to March 2020)

Prepared by: Gresham Smith  
Prepared for: Tennessee Department of Transportation (TDOT)  
February 2021

- Suspected Minor Injury  
(# = Number of Minor Injuries)
- Property Damage (Over)
- Property Damage (Under)

Corridor Overview



FIGURE 10: CRASH PLOT (AERIAL PHOTOGRAPHY)

## 4.0 COMMUNITY SURVEY RESULTS

To obtain community input, the SR 249 Corridor Study survey was introduced to the public on April 8, 2021, during Kingston Springs' Regional Planning Commission meeting. The survey was also placed on the Kingston Springs website that evening and flyers were distributed including the QR code linking to the SurveyMonkey website. There were 413 responses collected when the survey closed on April 30, 2021. Survey results are summarized below and the full survey results are provided in Appendix E: *Community Survey*.

- 93-percent of respondents were residents
- 41-percent of respondents use the corridor to commute to work
- 49-percent of respondents travel the corridor six or seven days a week
- 60-percent of respondents noted the corridor has too much freight/truck traffic
- 69-percent of respondents feel very safe or safe driving along the corridor
- No respondents walk or bike along the corridor
- 88-percent of respondents would feel very unsafe or unsafe walking along the corridor
- 94-percent of respondents would feel very unsafe or unsafe biking along the corridor
- 27-percent of respondents avoid the corridor during rush hour
- US 70 is the primary alternate route when there is a crash on I-40 or SR 249
- The primary improvement desired along the corridor is signalization of the I-40 Ramps
- The second improvement desired along the corridor is to add sidewalks
- Litter along the corridor and interstate ramps is a concern
- 56-percent of respondents expressed a need for another route to cross I-40

## 5.0 EXISTING AND FUTURE TRAFFIC PROJECTIONS

Turning movement traffic projections were developed for the *SR 249 Corridor Study*. The traffic projection calculations are provided in Appendix F: *Traffic Data and Project Summary Technical Memorandum*. The following intersections were included in the projections:

1. I-40 Eastbound Ramps
2. I-40 Westbound Ramps
3. Kingston Springs Road

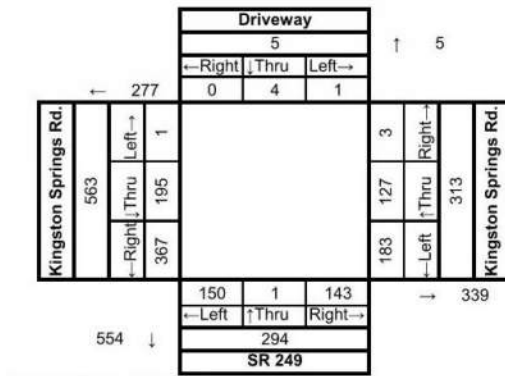
Traffic was projected to the Initial Study Year of 2026 and the Design Year of 2046. Figure 11 summarizes the Initial Study Year of 2026. Figure 12 summarizes the Design Year of 2046. Traffic data from three primary sources were utilized in the traffic projections:

- Tennessee Department of Transportation (TDOT) Annual Average Daily Traffic (AADT) Data
- Field Collected Data (collected Thursday, February 4, 2021)
- Planned developments, as provided by the City of Kingston Springs

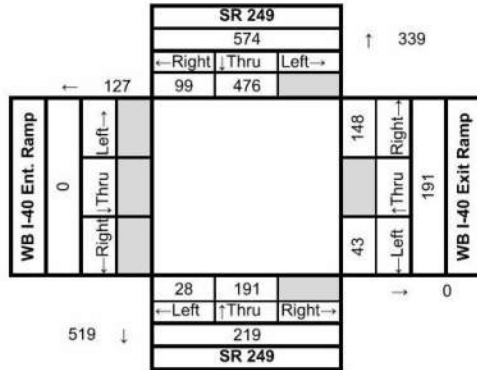
The 2026 projections account for historical/background growth of the traffic network. The 2046 projections account for the historical/background growth plus the planned future developments located within the immediate study corridor. The planned future developments are described in Section 3.3.

# SR 249 Corridor Study Cheatham County

**Location:** SR 249 (Luyben Hills Rd.) from I-40 EB to Kingston Springs Rd.  
**Condition:** AM 2026



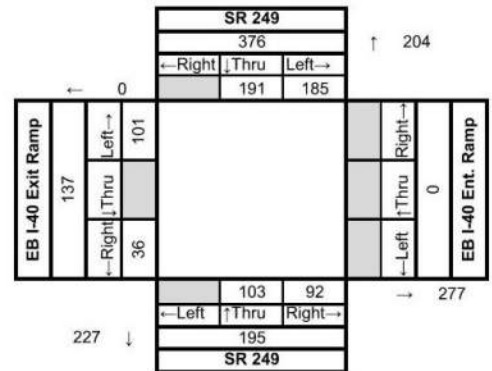
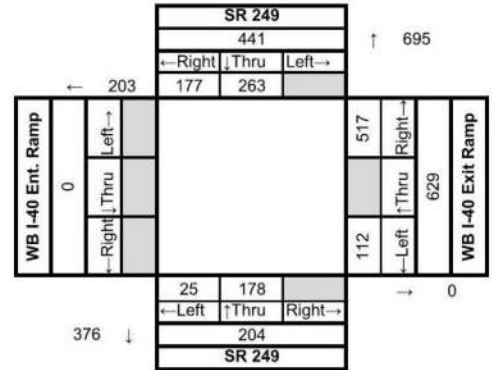
Do not balance, multiple drives



**Location:** SR 249 (Luyben Hills Rd.) from I-40 EB to Kingston Springs Rd.  
**Condition:** PM 2026

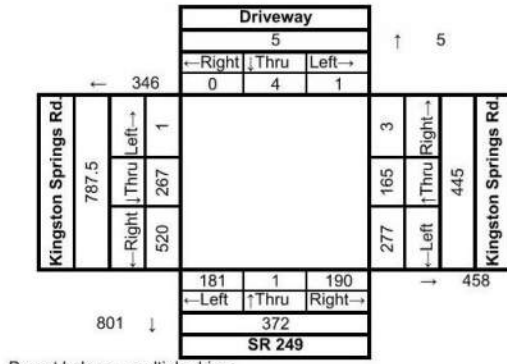


Do not balance, multiple drives



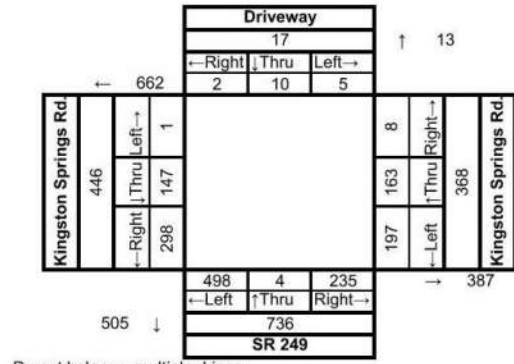
**FIGURE 11: 2026 SR 249 PROJECTED TRAFFIC**

Location: SR 249 (Luyben Hills Rd.) from I-40 EB to Kingston Springs Rd.  
Condition: AM 2046 (Background + Development)



Do not balance, multiple drives

Location: SR 249 (Luyben Hills Rd.) from I-40 EB to Kingston Springs Rd.  
Condition: PM 2046 (Background + Development)



Do not balance, multiple drives

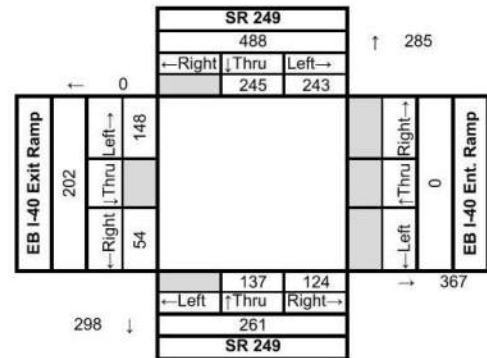
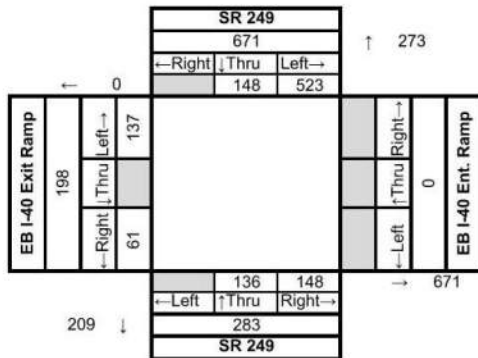
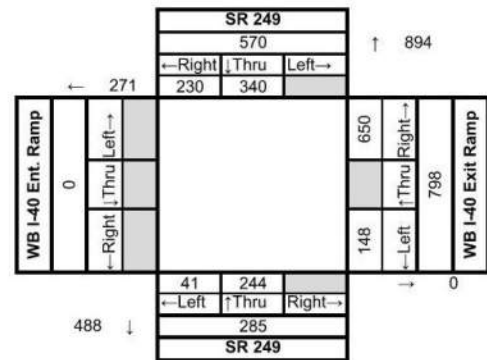
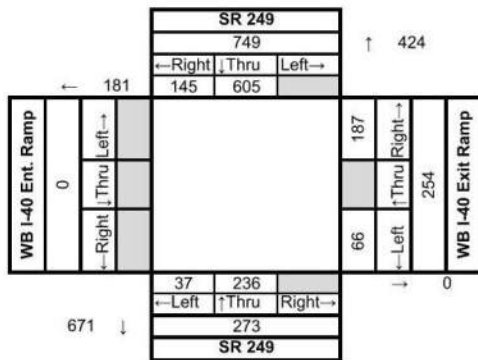


FIGURE 12: 2046 SR 249 PROJECTED TRAFFIC

## 6.0 CONCEPTUAL ALTERNATIVE

The responses to the community survey (see Section 4.0) demonstrated the community's emphasis on improving safety and traffic operations at the interstate ramps and improving safety for pedestrians within the study area. The crash analysis (see Section 3.8) and traffic analysis (see Section 7.0) supported the community's input that the intersections formed by SR 249 with the interstate ramps should be an area of emphasis. The traffic analysis supports maintaining the existing three-lane typical section along SR 249.

The proposed condition, also called the Build Option, would incorporate the Town's ongoing project to construct a sidewalk and shared-use path along SR 249. The Build Option would also signalize the two-way stop intersections of SR 249 with the I-40 Ramps. The Build Option would extend the I-40 Eastbound Exit Ramp's right-turn lane from its existing length of 50 feet to 175 feet long. Lastly, the Build Option would interconnect the two new signals at the I-40 Ramps with the existing signal at Kingston Springs Road to provide coordinated operations.

### 6.1 OVERVIEW OF ADJOINING PROJECTS

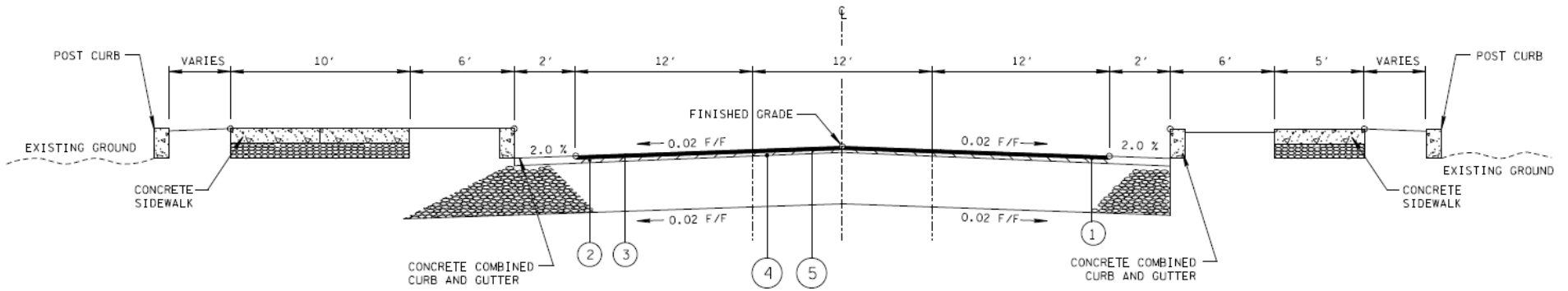
The Town of Kingston Springs is developing a multimodal access project along SR 249 within the study area that will construct a shared-use path along the northbound lane and a sidewalk along the southbound lane. These facilities extend from the I-40 Westbound Ramps to Kingston Springs Road and are included in the Build Option. SR 249 will be overlaid with asphalt pavement and fresh pavement markings. The project will maintain the existing three-lane typical section along SR 249. The project will include curb and grass buffers/utility strips. Appendix G: *SR 249 Construction Plans* includes the plans.

A preliminary design plan was submitted in 2018 to Cheatham County for a Safe Routes to School (SRTS) project. The project focuses on the Harpeth View Trail, which links to Harpeth Middle School. Although the Safe Routes to School project is not within the study area, it is located adjacent to the study area and could eventually link the trail with the study area via sidewalks. The SRTS project includes sidewalks, crosswalks, curbs, and greenery to improve the walkability of the area for students walking or biking to school. Appendix H: *Cheatham County SRTS Plans* includes the plans.

As part of the TDOT Nashville I-40 SmartWay Intelligent Transportation System Expansion Project, TDOT will expand the SmartWay along I-40 from US 70 in Bellevue to Hogan Road in Dickson County. This project is described in more detail in Section 8.2.1.

### 6.2 TYPICAL SECTION

The traffic analysis supports maintaining the existing three-lane typical section along SR 249. This is consistent with the typical section proposed in the Town's ongoing multimodal design project (Project Identification Number / PIN 123630.00). The typical section in the plans is shown in Figure 13. The full plan set is provided in Appendix G: *SR 249 Construction Plans*.



TANGENT SECTION - NEW CONSTRUCTION PLUS CURB & SIDEWALK

(BASED ON STD. DWG. RD01-TS-1)

**FIGURE 13: SR 249 PROPOSED TYPICAL SECTION**

Source: PIN 123630 Construction Plans



### **6.3 HORIZONTAL ALIGNMENT**

The Build Option's horizontal alignment will follow existing SR 249. The corridor is a tangent section.

### **6.4 MAINTENANCE OF TRAFFIC AND CONSTRUCTABILITY**

Maintenance of traffic should be relatively simple, with the existing lanes open during construction of the new sidewalk and shared-use path. Signal and turn lane construction at the I-40 Interchange Ramps should be relatively simple, also. Minimal disruption to motorists is anticipated.

### **6.5 INTERSECTION AND SIGNALIZATION IMPROVEMENTS**

The Build Option would signalize the two-way stop intersections of SR 249 with the I-40 Ramps. The Build Option would also extend the I-40 Eastbound Exit Ramp's right-turn lane from its existing length of 50 feet to 175 feet long. Lastly, the Build Option would interconnect the two new signals at the I-40 Ramps with the existing signal at Kingston Springs Road to provide coordinated operations.

### **6.6 FUTURE BRIDGE CONSIDERATION**

The SR 249 over I-40 is a three-lane bridge with twelve-foot wide lanes and eight-foot wide shoulders. It was constructed in 1960 and underwent major widening and rehabilitation in 2007. The bridge is listed in "Fair" condition and not anticipated to need replacement or major rehabilitation soon. However, when that time comes, it is recommended to replace the existing shoulders with a sidewalk and shared-use path, consistent with the improvements in the Build Option just to the north. This would extend multimodal facilities across I-40, connecting businesses and residences on both sides of the interstate.

### **6.7 DESIGN EXCEPTIONS, RETAINING WALLS, SLOPE ADJUSTMENTS**

No design exceptions, retaining walls, or notable slope adjustments are anticipated with the Build Option along SR 249.

### **6.8 COST ESTIMATE**

#### **Multimodal Improvements**

The Town of Kingston Springs's multimodal access project along SR 249 within the study area will construct a shared-use path along the northbound lane and a sidewalk along the southbound lane. These facilities extend from the I-40 Westbound Ramps to Kingston Springs Road and are included in the Build Option. SR 249 will be overlaid with asphalt pavement and fresh pavement markings. Bids for this project were opened in October 2020 with the low bid of \$843,102.00. While the town agreed to accept this bid it was higher than initially anticipated and TDOT did not concur. The town is awaiting TDOT's approval to rebid the project. The cost is not anticipated to change significantly. Design fees have already been absorbed and no right-of-way acquisition is anticipated. The estimated costs of improvements totaling \$1.08 million in year 2026 dollars are summarized in Table 6.



**TABLE 6: MULTIMODAL IMPROVEMENT COST**

COST ESTIMATE SUMMARY (2020)							
PIN	Project Type of Work	Preliminary Engineering:	Right-of-Way:	Utilities:	Construction:	Total Project Cost (2018):	
1SPR1-F7-003	Multimodal	\$ -	\$ -	\$ -	\$ 843,102	\$	843,102

INFLATED COST ESTIMATE SUMMARY							Report Type:	Technical Report
No. of Years	Year	Preliminary Engineering:	Right-of-Way:	Utilities:	Construction:	Total Inflated Project Cost		
5	2026	\$ -	\$ -	\$ -	\$ 1,080,000	\$	1,080,000	
10	2031	\$ -	\$ -	\$ -	\$ 1,370,000	\$	1,370,000	

**Signalization with Turn Lane Improvements**

The Build Option would also signalize the two-way stop intersections of SR 249 with the I-40 Ramps. The Build Option would extend the I-40 Eastbound Exit Ramp’s right-turn lane from its existing length of 50 feet to 175 feet long. Lastly, the Build Option would interconnect the two new signals at the I-40 Ramps with the existing signal at Kingston Springs Road to provide coordinated operations. The estimated costs of improvements totaling \$2.74 million in year 2026 dollars are summarized in Table 7. Appendix I: *Cost Estimates* provides the cost calculations.


**SR 249 Bridge Replacement with Sidewalk/Shared-Use Path Improvements**

When the SR 249 Bridge over I-40 requires major rehabilitation or replacement, it is recommended to replace the existing shoulders with a sidewalk and shared-use path, consistent with the improvements in the Build Option just to the north. The estimated costs of improvements totaling \$7.87 million in year 2026 dollars are summarized in Table 8. Appendix I: *Cost Estimates* provides the cost calculations.

**Cost Summary**

The total cost of improvements within the study area for the multimodal, signalization with turn lane, and bridge replacement costs is \$11.69 million in year 2026 dollars. The bridge replacement costs are only recommended with future regular maintenance and rehabilitation of the SR 249 Bridge over I-40. The total cost of improvements within the study area, excluding the bridge replacement, is \$3.82 million in year 2026 dollars. The Town may construct the multimodal improvement prior to other improvements with town or other funds. If only signalization and turn lane improvements are constructed, the cost is \$2.74 million in year 2026 dollars. The total cost of improvements is summarized in Table 9.

TABLE 7: SIGNALIZATION WITH TURN LANE IMPROVEMENT COST


Route:	SR 249	
Description:	Signalization of I-40 Ramp Intersections with Communications to Kingston Springs Road and Extend I-40 EB Exit Ramp Turn Lane to 175	
Project Type of Work:	Widen	
County:	Cheatham	
Length:	0.04 Miles	
Date:	July 6, 2021	
Estimate Type:	Concept	

DESCRIPTION	LOCAL	STATE	FEDERAL	TOTAL
	0%	0%	0%	
<b>Construction Items</b>				
Removal Items	\$0	\$0	\$0	\$0
Asphalt Paving	\$0	\$0	\$0	\$13,600
Concrete Pavement	\$0	\$0	\$0	\$105,000
Drainage	\$0	\$0	\$0	\$6,900
Appurtenances	\$0	\$0	\$0	\$0
Structures	\$0	\$0	\$0	\$0
Fencing	\$0	\$0	\$0	\$0
Signalization & Lighting	\$0	\$0	\$0	\$500,000
Railroad Crossing	\$0	\$0	\$0	\$0
Earthwork	\$0	\$0	\$0	\$128,000
Clearing and Grubbing	\$0	\$0	\$0	\$0
Seeding & Sodding	\$0	\$0	\$0	\$1,100
Rip-Rap or Slope Protection	\$0	\$0	\$0	\$0
Guardrail	\$0	\$0	\$0	\$6,100
Signing	\$0	\$0	\$0	\$800
Pavement Markings	\$0	\$0	\$0	\$16,600
Maintenance of Traffic	\$0	\$0	\$0	\$31,200
Mobilization	5%	\$0	\$0	\$40,500
Other Items	10%	\$0	\$0	\$85,000
Const. Contingency	15%	\$0	\$0	\$140,000
Const. Eng. & Inspec.	10%	\$0	\$0	\$107,000
Construction Estimate		\$0	\$0	\$1,180,000
<b>Interchanges &amp; Unique Intersections</b>				
Roundabouts	\$0	\$0	\$0	\$0
Interchanges	\$0	\$0	\$0	\$0
<b>Right-of-Way &amp; Utilities</b>				
	LOCAL	STATE	FEDERAL	TOTAL
	0%	0%	0%	
Right-of-Way	\$0	\$0	\$0	\$0
Utilities	\$0	\$0	\$0	\$855,000
<b>Preliminary &amp; Construction Engineering and Inspection</b>				
Prelim. Eng.	10%	\$0	\$0	\$118,000
<b>Total Project Cost (2020)</b>	\$ -	\$ -	\$ -	\$ 2,150,000

COST ESTIMATE SUMMARY (2020)						
PIN	Project Type of Work	Preliminary Engineering:	Right-of-Way:	Utilities:	Construction:	Total Project Cost (2018):
115PR1-F7-003	Widen	\$ 118,000	\$ -	\$ 855,000	\$ 1,180,000	\$ 2,150,000

INFLATED COST ESTIMATE SUMMARY						Report Type:	Technical Report
No. of Years	Year	Preliminary Engineering:	Right-of-Way:	Utilities:	Construction:	Total Inflated Project Cost	
5	2026	\$ 151,000	\$ -	\$ 1,090,000	\$ 1,510,000	\$ 2,740,000	
10	2031	\$ 192,000	\$ -	\$ 1,390,000	\$ 1,920,000	\$ 3,500,000	

TABLE 8: BRIDGE REPLACEMENT COST

Route:	SR 249	
Description:	Bridge over I-40 Replacement Cost	
Project Type of Work:	Widen	
County:	Cheatham	
Length:	0.00 Miles	
Date:	July 6, 2021	
Estimate Type:	Concept	

DESCRIPTION	LOCAL	STATE	FEDERAL	TOTAL
	0%	0%	0%	
<b>Construction Items</b>				
Removal Items	\$0	\$0	\$0	\$0
Asphalt Paving	\$0	\$0	\$0	\$0
Concrete Pavement	\$0	\$0	\$0	\$0
Drainage	\$0	\$0	\$0	\$0
Appurtenances	\$0	\$0	\$0	\$0
Structures	\$0	\$0	\$0	\$4,120,000
Fencing	\$0	\$0	\$0	\$0
Signalization & Lighting	\$0	\$0	\$0	\$0
Railroad Crossing	\$0	\$0	\$0	\$0
Earthwork	\$0	\$0	\$0	\$0
Clearing and Grubbing	\$0	\$0	\$0	\$0
Seeding & Sodding	\$0	\$0	\$0	\$0
Rip-Rap or Slope Protection	\$0	\$0	\$0	\$0
Guardrail	\$0	\$0	\$0	\$0
Signing	\$0	\$0	\$0	\$4,100
Pavement Markings	\$0	\$0	\$0	\$0
Maintenance of Traffic	\$0	\$0	\$0	\$92,200
Mobilization 5%	\$0	\$0	\$0	\$211,000
Other Items 10%	\$0	\$0	\$0	\$443,000
Const. Contingency 30%	\$0	\$0	\$0	\$225,000
Const. Eng. & Inspec. 10%	\$0	\$0	\$0	\$510,000
Construction Estimate	\$0	\$0	\$0	\$5,610,000
<b>Interchanges &amp; Unique Intersections</b>				
Roundabouts	\$0	\$0	\$0	\$0
Interchanges	\$0	\$0	\$0	\$0
<b>Right-of-Way &amp; Utilities</b>				
	LOCAL	STATE	FEDERAL	TOTAL
	0%	0%	0%	
Right-of-Way	\$0	\$0	\$0	\$0
Utilities	\$0	\$0	\$0	\$0
<b>Preliminary &amp; Construction Engineering and Inspection</b>				
Prelim. Eng. 10%	\$0	\$0	\$0	\$561,000
<b>Total Project Cost (2020)</b>	\$ -	\$ -	\$ -	\$ 6,170,000

COST ESTIMATE SUMMARY (2020)						
PIN	Project Type of Work	Preliminary Engineering:	Right-of-Way:	Utilities:	Construction:	Total Project Cost (2018):
1SPR-1-F7-00	Widen	\$ 561,000	\$ -	\$ -	\$ 5,610,000	\$ 6,170,000

INFLATED COST ESTIMATE SUMMARY						Report Type:	Technical Report
No. of Years	Year	Preliminary Engineering:	Right-of-Way:	Utilities:	Construction:	Total Inflated Project Cost	
5	2026	\$ 716,000	\$ -	\$ -	\$ 7,160,000	\$ 7,870,000	
10	2031	\$ 914,000	\$ -	\$ -	\$ 9,140,000	\$ 10,100,000	

**TABLE 9: TOTAL COST OF IMPROVEMENTS WITH STUDY AREA (YEAR 2026 \$)**

<b>Improvement</b>	<b>Preliminary Engineering</b>	<b>Right-of-Way</b>	<b>Utilities</b>	<b>Construction</b>	<b>Total Cost</b>
Multimodal	\$0*	\$0	\$0	\$1,080,000	\$1,080,000
Signalization with Turn Lane	\$151,000	\$0	\$1,090,000	\$1,510,000	\$2,740,000
Bridge Replacement	\$716,000	\$0	\$0	\$7,160,000	\$7,870,000
<b>Totals</b>	<b>\$867,000</b>	<b>\$0</b>	<b>\$1,090,000</b>	<b>\$9,750,000</b>	<b>\$11,690,000</b>

\*Cost already encumbered

### **6.9 CONCEPTUAL PLANS**

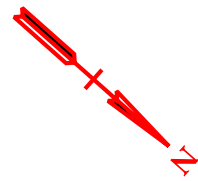
The SR 249 conceptual plans are provided on following pages. The plan sheets show both the existing condition and the Build Option.



TYPE	YEAR	COUNTY	FIGURE NO.
CORR.		CHEATHAM	1



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## CORRIDOR STUDY

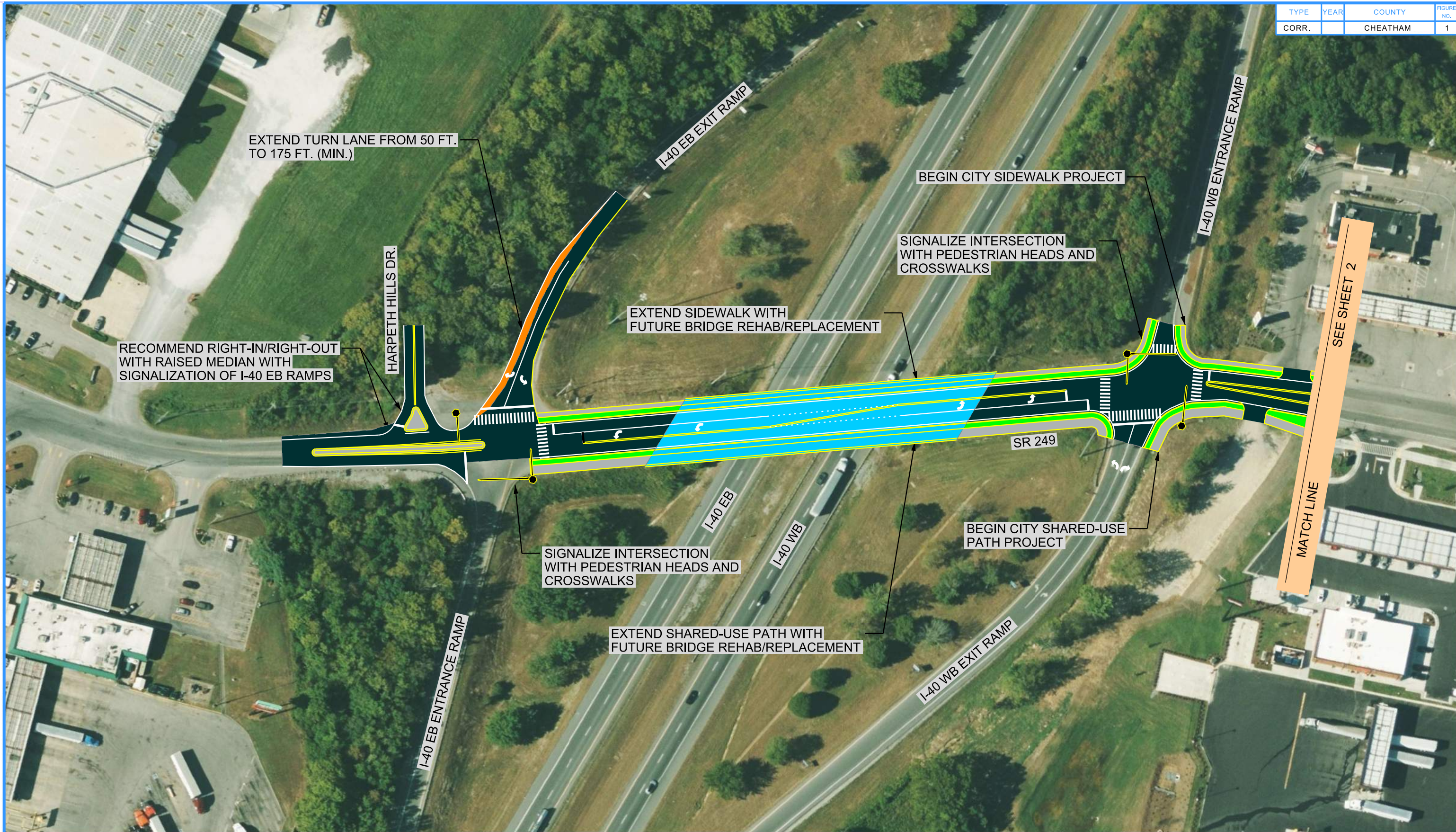
STATE ROUTE 249  
CHEATHAM COUNTY

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
S.T.I.D.

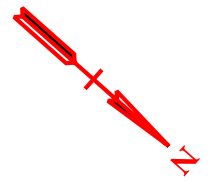
FIGURE 1  
STATE ROUTE 249



TYPE	YEAR	COUNTY	FIGURE NO.
CORR.		CHEATHAM	1



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## CORRIDOR STUDY

STATE ROUTE 249  
 CHEATHAM COUNTY

STATE OF TENNESSEE  
 DEPARTMENT OF TRANSPORTATION  
 S.T.I.D.

FIGURE 1  
 STATE ROUTE 249



TYPE	YEAR	COUNTY	FIGURE NO.
CORR.		CHEATHAM	2



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## CORRIDOR STUDY

STATE ROUTE 249  
CHEATHAM COUNTY

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
S.T.I.D.

FIGURE 2  
STATE ROUTE 249



TYPE	YEAR	COUNTY	FIGURE NO.
CORR.		CHEATHAM	2



## CORRIDOR STUDY

STATE ROUTE 249  
CHEATHAM COUNTY

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
S.T.I.D.

FIGURE 2  
STATE ROUTE 249

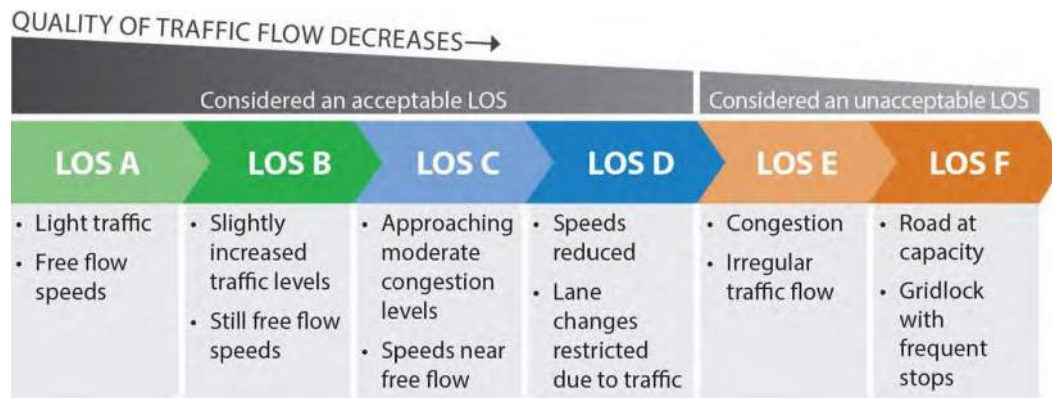


## 7.0 TRAFFIC ANALYSIS

The intersections within the study area were analyzed with the Synchro software application, Version 11. Synchro follows the methodology found in the 6th Edition of the Highway Capacity Manual (HCM). The traffic analysis output is provided in Appendix J: *Traffic Analysis Technical Memorandum*.

A “Level of Service” (LOS) index was used to gauge the operational performance at each intersection/roadway segment. The LOS is a qualitative measure that describes traffic conditions related to speed and travel time, freedom to maneuver, traffic interruptions, etc. There are six levels ranging from “A” to “F,” with “F” being the worst. Each level represents a range of operating conditions. Table 10 shows the traffic flow conditions and approximate driver comfort level at each level of service. More specifically, Table 11 defines the traffic flow conditions and approximate driver comfort at each LOS for signalized and unsignalized intersections.

**TABLE 10: LEVEL OF SERVICE DESCRIPTION**



**TABLE 11: LEVEL OF SERVICE INDEX FOR INTERSECTIONS**

LOS	TRAFFIC FLOW CONDITIONS	SIGNALIZED INTERSECTIONS DELAY (SEC/VEH)	UNSIGNALIZED INTERSECTIONS DELAY (SEC/VEH)
A	Progression is extremely favorable and most vehicles do not stop at all.	0-10	0-10
B	Good progression, some delay.	10-20	10-15
C	Fair progression, higher delay.	20-35	15-25
D	Unfavorable progression, congestion becomes apparent.	35-55	25-35
E	Poor progression, significant delay.	55-80	35-50
F	Poor progression, extreme delay.	>80	>50

### **7.1 LEVEL OF SERVICE ANALYSIS (EXISTING CONDITION)**

Table 12 summarizes the traffic analysis for the existing conditions, also called the No Build Option. The LOS are reported for the entire intersection and for each approach. The years 2026 and 2046 AM and PM Peak Hours were analyzed. For two-way stop intersections, there is no “entire intersection” LOS, just the stop-controlled approaches are assigned a LOS.

The LOS are B or higher through the 2046 Design Year for the signalized intersection of SR 249 (Luyben Hills Road) at Kingston Springs Road (also SR 249). The stop-controlled intersections of SR 249 (Luyben Hills Road) with the I-40 Ramps operate at LOS as poor as F in the Initial Study Year of 2026.

### **7.2 LEVEL OF SERVICE ANALYSIS (BUILD OPTION)**

The proposed condition, also called the Build Option, would incorporate the Town’s ongoing project to construct a sidewalk and shared-use path along SR 249. The Build Option would also signalize the two-way stop intersections of SR 249 with the I-40 Ramps. The Build Option would extend the I-40 Eastbound Exit Ramp’s right-turn lane from its existing length of 50 feet to 175 feet long. Lastly, the Build Option would interconnect the two new signals at the I-40 Ramps with the existing signal at Kingston Springs Road to provide coordinated operations.

Table 13 summarizes the traffic analysis for the Build Option. The LOS are reported for the entire intersection and for each approach. The years 2026 and 2046 AM and PM Peak Hours were analyzed. The LOS are C or higher through the 2046 Design Year for all intersections in the study area.

TABLE 12: TRAFFIC ANALYSIS – 2026 AND 2046 NO BUILD OPTION

2026		AM								PM							
		Overall Intersection			Approach LOS					Overall Intersection			Approach LOS				
ID	Intersection	Type	LOS	Delay	Max v/c	EB	WB	NB	SB	LOS	Delay	Max v/c	EB	WB	NB	SB	
1	SR 249 at I-40 EB Ramps	Stop	-	13.1	0.74	F	-	-	-	-	5.4	0.32	C	-	-	-	
2	SR 249 at I-40 WB Ramps	Stop	-	2.4	0.19	-	B	-	-	-	8.3	0.66	-	C	-	-	
3	SR 249 at Kingston Springs Road	Signal	<b>B</b>	10.2	0.50	A	B	B	C	<b>B</b>	12.7	0.47	B	B	B	C	

Note: Signal is signalized intersection; TWSC is Two-Way Stop Sign Control  
SR 249 is the Northbound / Southbound Route

2046		AM								PM							
		Overall Intersection			Approach LOS					Overall Intersection			Approach LOS				
ID	Intersection	Type	LOS	Delay	Max v/c	EB	WB	NB	SB	LOS	Delay	Max v/c	EB	WB	NB	SB	
1	SR 249 at I-40 EB Ramps	Stop	-	56.6	1.70	F	-	-	-	-	10	0.68	E	-	-	-	
2	SR 249 at I-40 WB Ramps	Stop	-	2.8	0.26	-	B	-	-	-	16.6	0.91	-	D	-	-	
3	SR 249 at Kingston Springs Road	Signal	<b>B</b>	12.9	0.61	B	B	B	D	<b>B</b>	18.2	0.61	B	C	B	D	

TABLE 13: TRAFFIC ANALYSIS – 2026 AND 2046 BUILD OPTION

2026		AM								PM							
		Overall Intersection			Approach LOS					Overall Intersection			Approach LOS				
ID	Intersection	Type	LOS	Delay	Max v/c	EB	WB	NB	SB	LOS	Delay	Max v/c	EB	WB	NB	SB	
1	SR 249 at I-40 EB Ramps	Signal	A	8.6	0.51	C	-	A	A	A	7.4	0.43	C	-	A	A	
2	SR 249 at I-40 WB Ramps	Signal	A	8.1	0.52	-	B	A	A	A	9.8	0.76	-	B	A	A	
3	SR 249 at Kingston Springs Road	Signal	B	10.2	0.50	A	B	B	C	B	12.6	0.47	B	B	B	C	

Note: Signal is signalized intersection; TWSC is Two-Way Stop Sign Control  
SR 249 is the Northbound / Southbound Route

2046		AM								PM							
		Overall Intersection			Approach LOS					Overall Intersection			Approach LOS				
ID	Intersection	Type	LOS	Delay	Max v/c	EB	WB	NB	SB	LOS	Delay	Max v/c	EB	WB	NB	SB	
1	SR 249 at I-40 EB Ramps	Signal	B	13.4	0.66	D	-	B	A	B	12.7	0.65	D	-	A	A	
2	SR 249 at I-40 WB Ramps	Signal	B	10.7	0.62	-	C	A	A	B	16.5	0.89	-	C	A	B	
3	SR 249 at Kingston Springs Road	Signal	B	14.0	0.68	B	B	B	C	C	21.4	0.65	B	C	B	D	

### **7.3 SIGNAL WARRANT ANALYSIS**

The traffic operations analysis in Section 7.1 demonstrates an existing and future need for signalizing the I-40 at SR 249 Interchange Ramps. The traffic volumes were then analyzed with the Manual on Uniform Traffic Control (MUTCD) signal warrant analysis. The MUTCD defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public travel. The MUTCD is published by the Federal Highway Administration (FHWA) under 23 Code of Federal Regulations (CFR), Part 655, Subpart F. A warrant is a condition that an intersection must meet to justify a signal installation. The MUTCD specifies three (3) volume-related warrants that typically determine whether or not an intersection is eligible for signalization. If either of the I-40 Eastbound or Westbound Ramps meet MUTCD warrants, then both ramps should be signalized due to their close proximity and for coordinated operations.

The intersection of the I-40 Eastbound Ramps with SR 249 does not meet traffic volume warrants for signalization. The intersection of the I-40 Westbound Ramps with SR 249 meets all three (3) MUTCD volume warrants for signalization if all right turn volumes are included in the analysis. The three MUTCD volume warrants are 8-hour, 4-hour, and Peak hour. However, TDOT's standard practice is to discount the right turn volumes when a dedicated right turn lane is present. When the I-40 Westbound Exit Ramp's right turn volumes are discounted, the intersection does not meet traffic volume warrants for signalization. The ramps should continue to be monitored and the MUTCD warrants evaluated as traffic increases. If delays become excessive or if queues approach the I-40 mainline, then the right turn volumes should no longer be discounted in the analysis and the ramps should be signalized. The MUTCD warrant analysis is provided in Appendix K: *Signal Warrant Analysis*.

## **8.0 ADDITIONAL RECOMMENDATIONS**

Through the community survey (see Section 4.0), the public noted many items that require improvements to the transportation system and land use policies outside of the study area. These needs include improved access management regulations, non-recurring congestion mitigation, and improved maintenance of the roadside.

### **8.1 ACCESS MANAGEMENT REGULATIONS**

Access management regulations and zoning ordinances can address many concerns expressed by survey respondents. TDOT has developed a Highway System Access Manual (HSAM) that may prove beneficial for the Town to develop stricter regulations and ordinances. The HSAM Volume 1 includes model land development regulations. The HSAM is available on TDOT's website at <https://www.tn.gov/tdot/traffic-operations-division/traffic-engineering-office/operations-and-safety/access-manual.html>.

Many survey respondents expressed concerns with trash and truck traffic associated with the large number of trucks at the interchange. Gas stations, truck stops, and fast-food restaurants servicing travelers along I-40, including many focused-on truck traffic, compose a significant percentage of the businesses along SR 249. The Town may, in the future, elect to limit such businesses through their zoning ordinances or an overlay district for the SR 249 corridor.

The commercial driveways are currently ill-defined with considerable open frontage along SR 249. The Town's multimodal access project along SR 249 within the study area will construct a shared-use path along the northbound lane and a sidewalk along the southbound lane. This project will

have a supplemental benefit of better defining commercial driveways by use of curb cuts and driveway aprons. This should improve traffic operations and safety along the corridor. The Town should also consider additional tools such as regulations to promote cross access and joint access of commercial driveways to limit the number of access points along SR 249.

Lastly, the intersection of Harpeth Hills Drive with SR 249 is located within the functional area of the intersection of the I-40 Eastbound Ramps with SR 249 (see Figure 14). The Town should not permit any land development that would increase traffic along Harpeth Hills Drive. With proposed signalization of the intersection of the I-40 Eastbound Ramps with SR 249 it may be necessary to dead-end Harpeth Hills Drive or make it right-in/right-out. Otherwise it will create safety and operational concerns with the proposed signalized intersection.



**FIGURE 14: HARPETH HILLS DRIVE INTERSECTION**

## **8.2 NON-RECURRING CONGESTION MITIGATION**

Discussions with residents and local officials indicate the most significant congestion-related concern is associated with non-recurring congestion. When there is a crash or similar incident



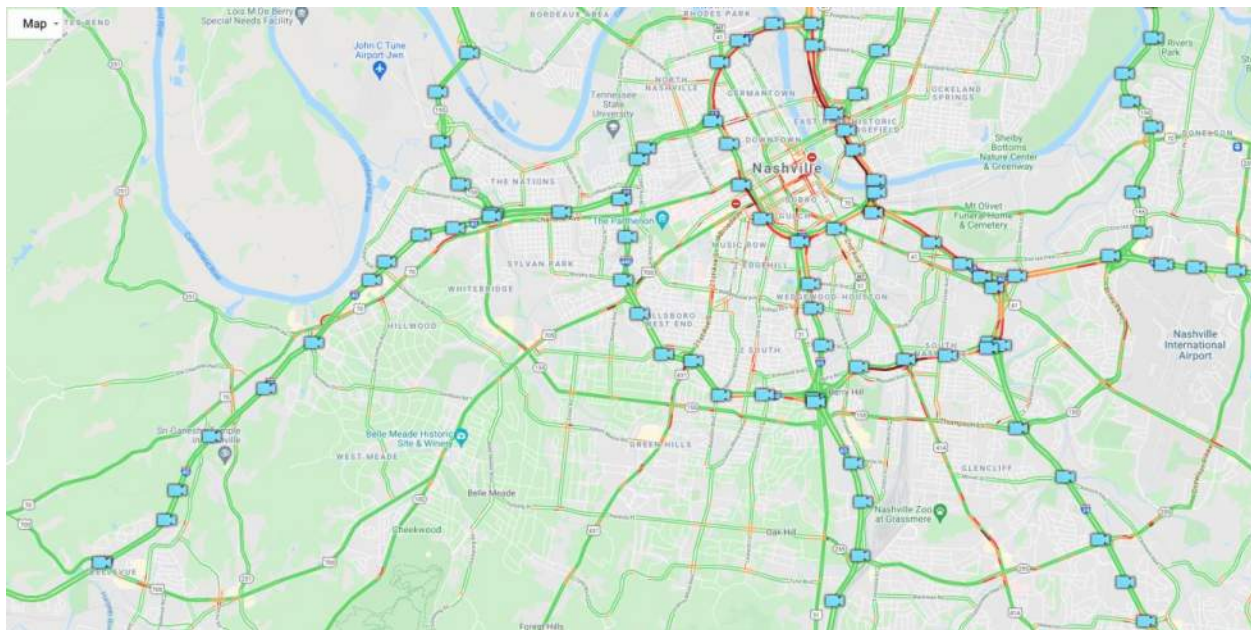
along I-40 or SR 249, it creates exceptional delays for residents accessing their homes or places of employment. Several options follow to help non-recurring congestion including Intelligent Transportation Systems improvements, improving SR 249 outside of the study area, and consideration for an additional interchange to lessen the traffic burden along SR 249.

### **8.2.1 ITS Improvements**

Intelligent Transportation Systems (ITS) improvements will help motorists avoid non-recurring congestion created by incidents such as crashes. A robust ITS System will provide information as motorists plan their trip via desktop and mobile phone applications and messages to travelling motorists via Digital Message Signs (DMS). The information will be beneficial to alter motorists' routes to avoid congestion. Fortunately, TDOT is in the process of expanding their ITS network along I-40 adjacent to the Town of Kingston Springs.

As part of the TDOT Nashville I-40 SmartWay Expansion Project (TDOT Project Number 98302-3150-44) TDOT will expand the SmartWay from US 70 in Bellevue/Davidson County to Hogan Road in Dickson County. This project includes the installation of various ITS devices that will be used to help manage traffic along I-40, including closed-circuit television (CCTV) cameras, radar detector sensors (RDS), DMS and fiber optic communications. The existing SmartWay system in the Nashville area is shown in Figure 15. In addition to helping TDOT manage incidents along I-40, the video streams from the CCTV cameras and the messages from the DMS are available to the public via the SmartWay website ([smartway.tn.gov](http://smartway.tn.gov)). Figure 16 provides examples CCTV feeds on the SmartWay website and DMS messages provided to motorists.

Specific to the Kingston Springs study area, along I-40, TDOT plans to install nine (9) CCTV cameras, ten (10) RDS, two westbound DMS and two eastbound DMS between the SR 249 Interchange and the US 70 Interchange to the east, in Bellevue. The Nashville I-40 SmartWay Expansion Project is anticipated to let in October 2021 and the construction timeframe is approximately 24 months.



**FIGURE 15: EXISTING TDOT SMARTWAY CCTV CAMERA LOCATIONS – NASHVILLE AREA**

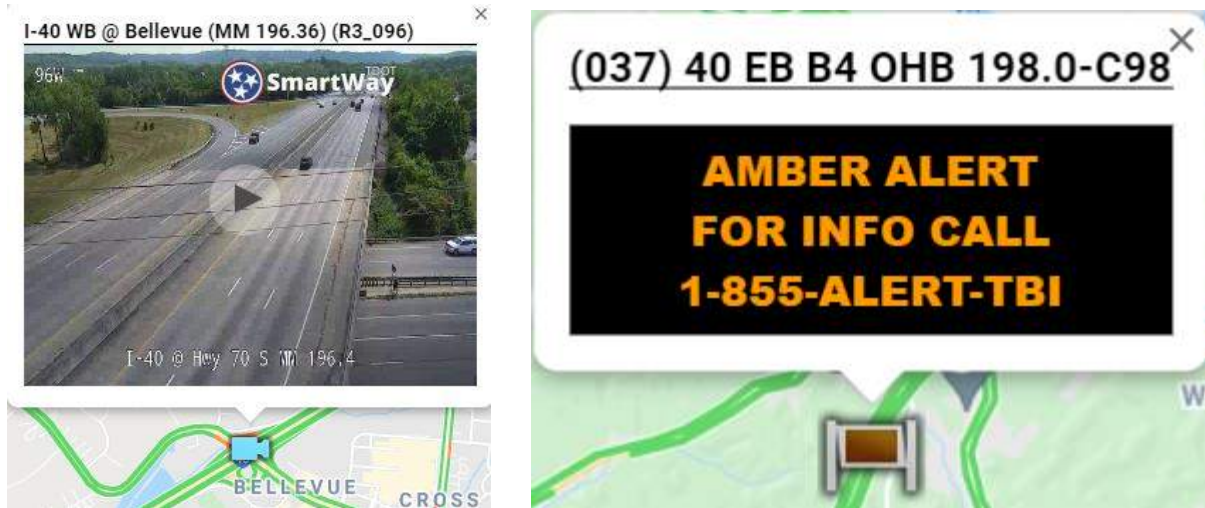


FIGURE 16: EXAMPLE CCTV FEED AND DMS MESSAGE

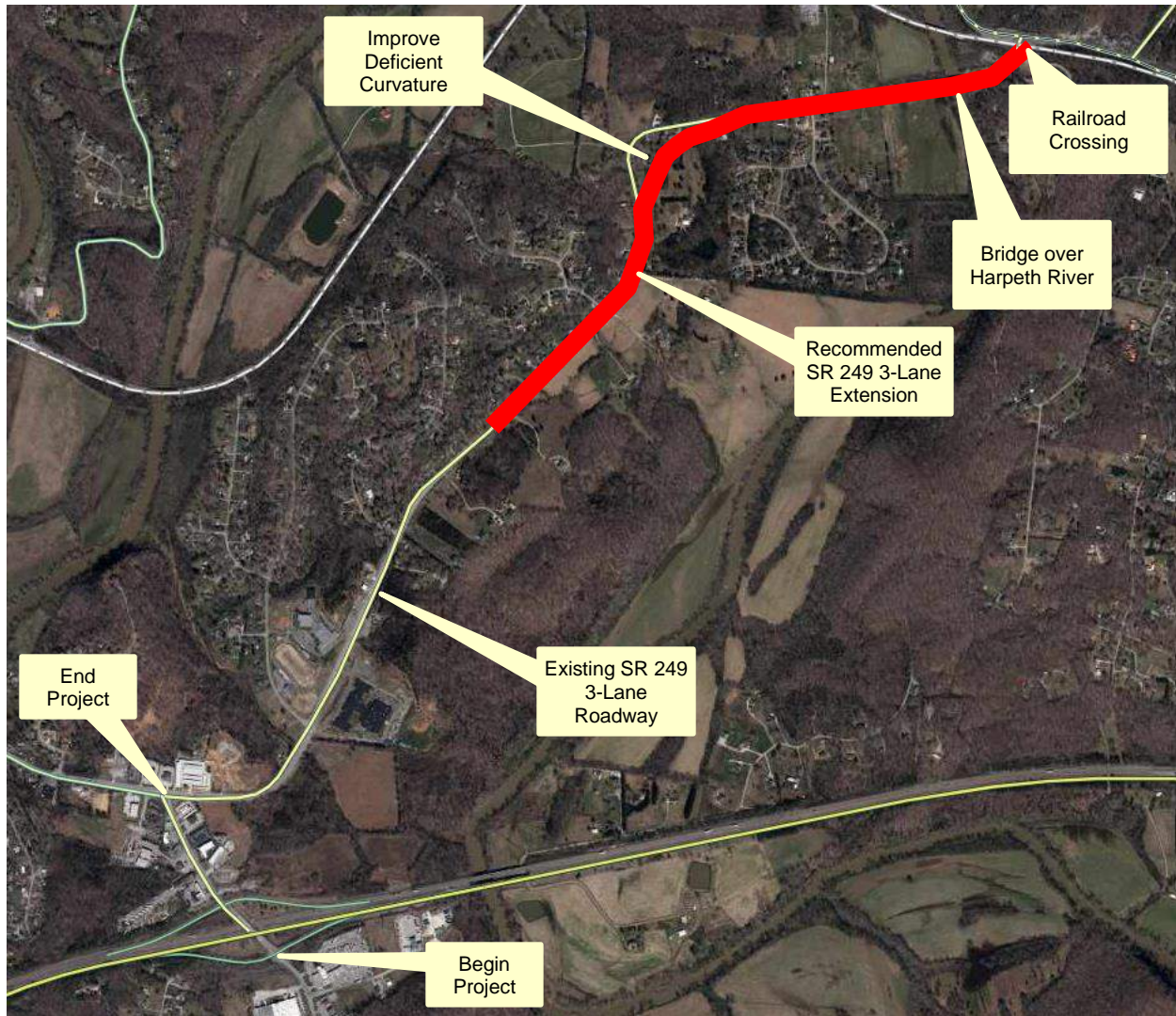
## 8.2.2 SR 249 Improvements (Outside of Study Area)

When there is a crash or other non-recurring congestion along I-40, most residents divert to US 70 and Kingston Springs Road (SR 249). The ITS improvements described in Section 8.2.1 will provide more benefit when coupled with alternate routes to direct motorists. Proposing improvements along US 70 in Davidson County is outside the scope and limits of this *SR 249 Corridor Study*. However, from US 70, most residents would access the Town of Kingston Springs via Kingston Springs Road (SR 249). Kingston Springs Road has been improved to a three-lane typical section from the northern terminus of the study area to Woodlands Drive, which is located one (1) mile to the east. The remaining 1.6 miles of Kingston Springs Road connecting to US 70 consist of a two-lane road with narrow shoulders and deficient vertical and horizontal curvature. It cannot carry the volume of traffic that a three-lane typical section can. Improving SR 249 to a three-lane typical section would remain in context of the adjacent land use and traffic volumes but allow it to more efficiently accommodate rerouted traffic when there is an incident along I-40. This section of Kingston Springs Road includes a 400-foot long bridge over the Harpeth River, one railroad crossing, and would be anticipated to require three (3) residential relocations. Kingston Springs Road is shown in Figure 17. The opinion of probable cost to improve Kingston Springs Road to a three-lane typical section is \$41.7 million in year 2026 dollars.

At the City's request, the planning team has developed an opinion of probable cost that stops the widening west of the Harpeth River, near Harpeth Meadows Drive. The widening would be 1.1 miles long. The curve along SR 249 at Garden Lane would not be realigned. Terminating at Harpeth Meadows, the bridge over the Harpeth River would not be widened and the intersection at US 70 would not be improved. Under these conditions, the estimated improvements cost is reduced to \$26 million (in 2026). It should be noted that the eastern terminus may not be considered a logical terminus, creating complications should federal or state funds be desired. However, the lack of driveways along this segment may make the City's proposed terminus acceptable. TDOT's Environmental Division should be consulted for guidance.

Appendix I: *Cost Estimates* provides the cost calculations.





**FIGURE 17: SR 249 THREE-LANE IMPROVEMENT**

### **8.2.3 Future Interchange Consideration**

Local officials and survey respondents indicate a need for an additional roadway crossing of I-40. SR 249 is the only interchange along I-40 in Cheatham County. A new crossing would provide additional options for residents to access the town and improve the benefits of the expanded ITS system described in Section 8.2.1. An additional roadway crossing would ideally be in the form of an interchange, or a roadway that could be reconfigured into an interchange. The next exits are six (6) miles west in Williamson County or four (4) miles east in Davidson County. Interchanges along the Interstate system may be spaced as close as one (1) mile in urban areas and two (2) miles in rural areas. This section of SR 249 is a main corridor linking I-40 and US 70. Local commuter traffic mixes with commercial truck traffic along the corridor. Unfortunately, there are many barriers to a new roadway crossing / interchange area between the adjacent interchanges including steep terrain, the Harpeth River, floodplains, lack of options to connect to regional routes such as US 70, and existing suburban development. These factors lead to the reason there are no interchanges already located closer. Costs could rise to high tens of millions to low hundreds

of millions of dollars. Additional study is necessary to determine the feasibility for a new crossing or interchange.

### **8.3 MAINTENANCE RECOMMENDATION**

The need for improved litter removal along the study corridor, and particularly along the I-40 Ramps, was noted by many survey respondents. The Town should consider assisting the community with developing a non-profit, non-government, organization dedicated to serving the needs of the interchange area and commercial properties along SR 249. The focus could be to develop a clean, safe, and vibrant place to work, shop, live, and do business. Additionally, the Town should coordinate with TDOT's Maintenance Division to improve litter pickups, mowing, and any other quality of life functions in the state's right-of-way.

## **9.0 SAFETY ASSESSMENT**

Improved access management associated with the proposed sidewalk and shared-use path improvements along the SR 249 study area corridor may reduce crashes by up to 50 percent according to the Transportation Research Board's (TRB) Access Management Manual 2<sup>nd</sup> Edition. Constructing a shared-use path is projected by the Crash Modification Factors Clearinghouse to reduce vehicle crashes with bicyclists by 25-percent<sup>1</sup>. Installing traffic signals at the I-40 Ramps is projected by the Cash Modification Factors Clearinghouse to reduce crashes by 44-percent<sup>2</sup>. The Build Option should improve safety along SR 249 within the study area.

## **10.0 RECOMMENDATIONS AND CONCLUSIONS**

The Town of Kingston Springs's multimodal access project along SR 249 within the study area will construct a shared-use path along the northbound lane and a sidewalk along the southbound lane. These facilities extend from the I-40 Westbound Ramps to Kingston Springs Road and are included in the Build Option. The traffic analysis supports maintaining the existing three-lane typical section along SR 249. This is consistent with the typical section proposed in the Town's multimodal design project.

The Build Option would signalize the two-way stop intersections of SR 249 with the I-40 Ramps. The Build Option would also extend the I-40 Eastbound Exit Ramp's right-turn lane from its existing length of 50 feet to 175 feet long. Lastly, the Build Option would interconnect the two new signals at the I-40 Ramps with the existing signal at Kingston Springs Road to provide coordinated operations. With the Build Option, the LOS are C or higher through the 2046 Design Year for all intersections in the study area. This is in comparison to LOS of F in the 2026 Initial Year without improvements.

When the SR 249 Bridge over I-40 requires major rehabilitation or replacement, it is recommended to replace the existing shoulders with a sidewalk and shared-use path, consistent with the improvements in the Build Option just to the north.

The total cost of improvements within the study area for the multimodal, signalization with turn lane, and bridge replacement costs is \$11.69 million in year 2026 dollars. The bridge replacement costs are only recommended with future regular maintenance and rehabilitation of the SR 249 Bridge over I-40. The total cost of improvements within the study area, excluding the bridge replacement, is \$3.82 million in year 2026 dollars. The Town may construct the multimodal

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<sup>1</sup> <http://www.cmfclearinghouse.org/detail.cfm?facid=9250>

<sup>2</sup> <http://www.cmfclearinghouse.org/detail.cfm?facid=325#commentanchor>

improvement prior to other improvements with town or other funds. If only signalization and turn lane improvements are constructed, the cost is \$2.74 million in year 2026 dollars. The Build Option should improve safety along SR 249 within the study area.

The Build Option focuses on constructed improvements within the study area. The *SR 249 Corridor Study* included a survey, which received 413 responses. The public noted many items that require improvements to the transportation and land use policies outside of the study area. These needs include improved access management regulations, non-recurring congestion mitigation, and improved maintenance of the roadside. These topics are addressed in Section 8.0 Additional Recommendations.

Due to the project limits defined in the competitive CTPG that funded this study, there are limitations concerning the development of options beyond Luyben Hills Road outside of the I-40 eastbound ramps and Kingston Springs Road. However, at the request of the Town of Kingston Springs, the planning team has considered the effects of non-recurring congestion caused by traffic incidents and their effects on access to the Town and congestion along Luyben Hills Road.

The planning team feels that a future planning study for access to Kingston Spring Road via a new road that does not connect to Luyben Hills Road may improve traffic flow and provide additional access for drivers and EMS personnel during incidents. It is likely that this additional connection would improve traffic conditions and access for residents traveling through the surrounding neighborhoods and drivers traveling through to reach Luyben Hills road and I-40. To determine the exact impacts, costs, and benefits of this local roadway, however, a traffic study would need to be performed and funded by the Town of Kingston Springs.

It should also be noted that due to the local classification-nature of such an additional roadway, construction funds for such a project could not be provided by TDOT. Since the roadway would be locally-classified (and not a state-aid roadway), the local jurisdiction entity (the Town of Kingston Springs) would be responsible for its construction and the right-of-way that would need to be acquired.

The Town may use the most recent traffic analysis performed within this study and the traffic data along Luyben Hills Road and Kingston Springs Road (SR 249) to aid in the analysis if the study is developed within three years, but the additional data and efforts to perform the analysis would be the responsibility of the Town.