SR 354

BOONES CREEK ROAD CORRIDOR STUDY

Prepared for City of Johnson City, Town of Jonesborough, and Washington County

JOHNSON CITY TENNESSEE

Historic Jonesborough Tennessee 1779 Storytelling Capital of the World

TN TDOT Department of Transportation

Prepared by:

WSP

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1. Introduction

Figure 1. View of Boones Creek Road from Elementary School

The City of Johnson City, in partnership with the Town of Jonesborough and Washington County, has identified Boones Creek Road (SR 354) for the development of a corridor study that can serve as a guide for future development. Objectives of the study include identifying land use classifications, future land use designations, and transportation enhancements (including multi-modal solutions) which align with identified future growth areas and development patterns, and support a viable and safe transportation system, including developing recommendations related active and multimodal transportation facilities along the corridor. A newly constructed diverging diamond interchange (DDI) at Boones Creek Road (SR 354) and I-26 at Exit 17 serves as a primary impetus for the plan, as developments are being pursued along the corridor.

Urban Transportation Planning Grant

To support these efforts, Johnson City has been awarded an Urban Transportation Planning Grant (UTPG) through the Tennessee Department of Transportation (TDOT). The purpose of TDOT's initiative is to provide resources to assist cities and counites located within the boundaries of Metropolitan Planning Organizations (MPOs) in developing transportation plans to address future transportation network needs, land use, and growth management. Specifically, the goals of the program are to:

- Assist urban jurisdictions with transportation-related solutions that strengthen multimodal cohesiveness of the transportation system.
- Guide communities with developing potential the strategies that will support improvements in traffic flow, safety, mobility, and overall efficiency of the transportation system.
- Provide jurisdictions with planning resources in order to achieve the community transportation and land use visions and future economic growth.

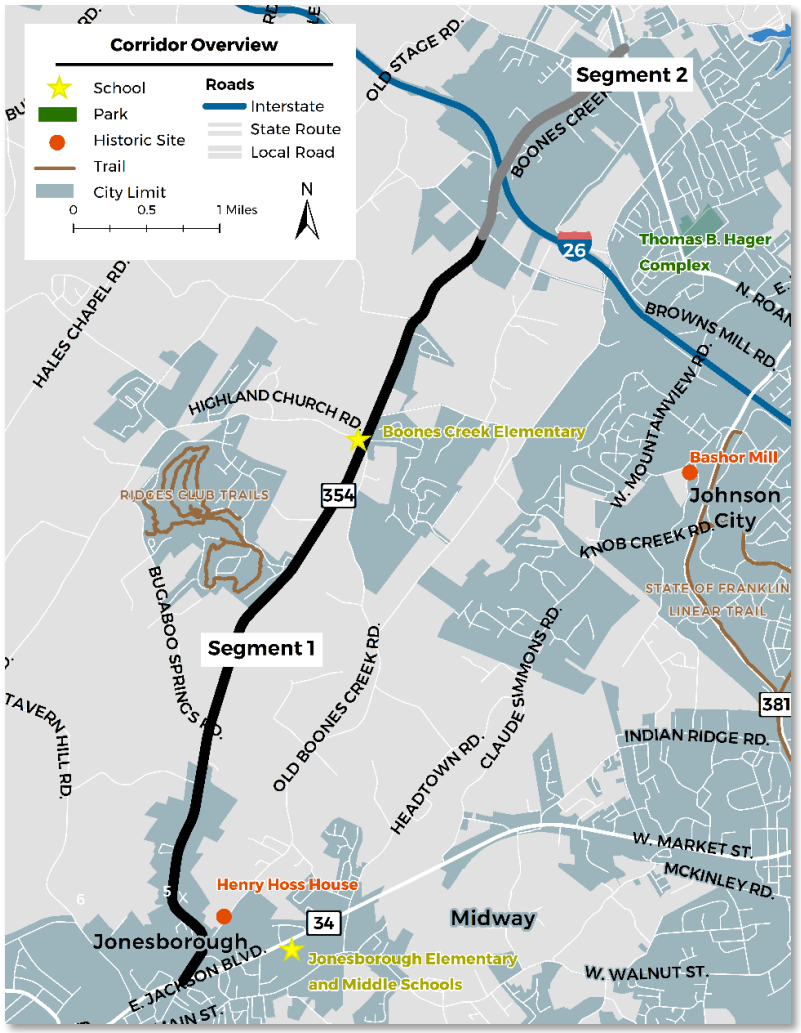
2. Corridor Overview

Study Area

The study area consists of Boones Creek Road (SR 354) beginning at the intersection of SR 34/US 11E/US 321 in Jonesborough, extending northeast towards Interstate 26 in Washington County, and ending at North Roan Street (SR 36) in Johnson City. The corridor is approximately 7.5 miles long and has been divided into two (2) segments for purposes of this corridor study, as shown in Figure 2 on:

- **Segment 1** – SR 354/Boones Creek Road from SR 34/US 11E/East Jackson Boulevard to approximately 0.20 miles west of Christian Church Road
- **Segment 2** – SR 354/Boones Creek Road from approximately 0.20 miles west of Christian Church Road to SR 36

Figure 2. Corridor Overview



Boones Creek Road (SR 354) is classified as a minor arterial, with an AADT of over 8,000 for much of the corridor. Segment 2 of the corridor has volumes around 20,000. This is largely a result of interchange access to I-26 in Segment 2. The entire corridor lies within the Johnson City Metropolitan Transportation Planning Organization (MTPO) planning area.

Presently, the majority of the corridor is undeveloped with the predominate land use being agricultural and residential. In 2019, Washington County opened a new elementary school, Boones Creek Elementary, that serves the region. The school is designed to accommodate future growth in the northern areas of the County, providing space for 1,100 students, and is located at the intersection of Boones Creek Road and Highland Church Road.

Population and Employment

The Tri-Cities region is on growth trajectory spurred by a desirable quality of life, outdoor recreation, and affordable cost of living. Current population and employment patterns in and around the Boones Creek Road (SR 354) corridor help to understand the pattern of existing development, as well as potential patterns of future development. Understanding current and future growth is imperative to identifying what types of improved transportation infrastructure will best accommodate growth. Current population and employment estimates throughout the corridor were estimated by aggregating publicly available data for Census blocks or block groups that fall partially or wholly within a half-mile of Boones Creek Road. Population data is sourced from the Census Bureau's American Community Survey 2014-2018 five-year estimates, while employment data is derived from the Census Bureau's Longitudinal Employer-Household Dynamics (LEHD).[1]

Employment and population density along the corridor are higher than that of Washington County as a whole (Table 1), but significantly lower than Johnson City and the Town of Jonesborough, consistent with the more undeveloped and bucolic character of the corridor. As shown in Figure 3, population concentrations are generally located on the east side of Segment 1 as you approach downtown Johnson City, and along Segment 2 near I-26. Households within the corridor are concentrated in residential subdivisions, including the Ridges south of Highland Church Road. Figure 3. This pattern is also reflected in the analysis of block level employment statistics for 2018, as shown in Figure 4. Employment tends to be concentrated along Segment 2 near I-26, to the east of the corridor toward the core of Johnson City, with additional concentrations of employment along SR 34/US 11E/East Jackson Boulevard in Jonesborough.

Table 1. 2018 Population and Employment

2018	Area (acres)	Total Employment	Employment Density (jobs per acre)	Total Population	Population Density (persons per acre)
Boones Creek Road Corridor	20,262	8,841	0.436	15,504	0.765
Washington County	211,072	61,300	0.291	127,055	0.602
Johnson City	27,904	47,334	1.696	66,037	2.367
Jonesborough	3,296	4,324	1.312	5,321	1.614

Sources: 2014-2018 ACS Five-Year Population Estimates, LEHD Origin-Destination Employment Statistics (LODES)

[1] Employment information is available at the block level as part of LEHD's Origin-Destination Employment Statistics (LODES) dataset. https://lehd.ces.census.gov/data/.

Figure 3. 2018 Population Density

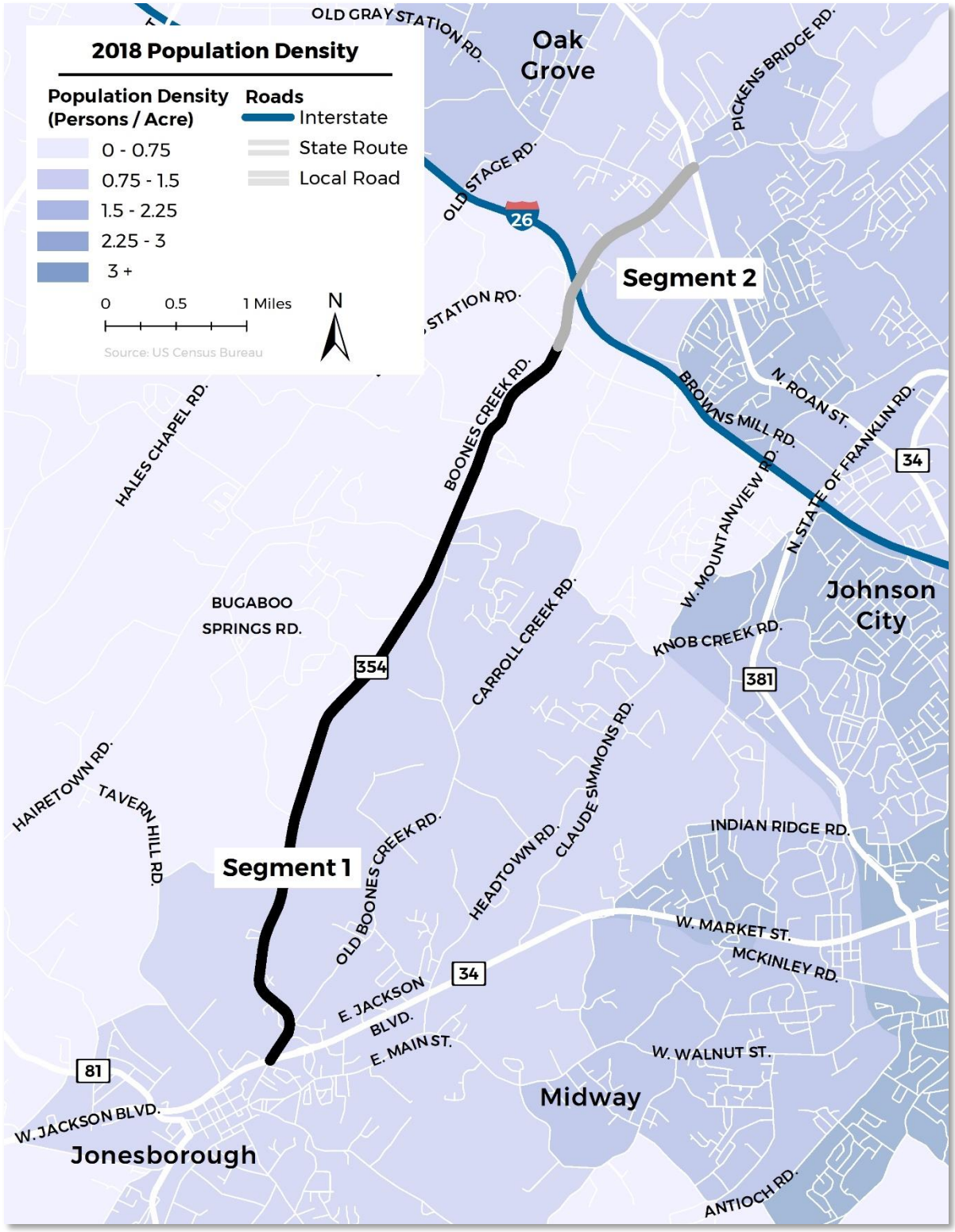
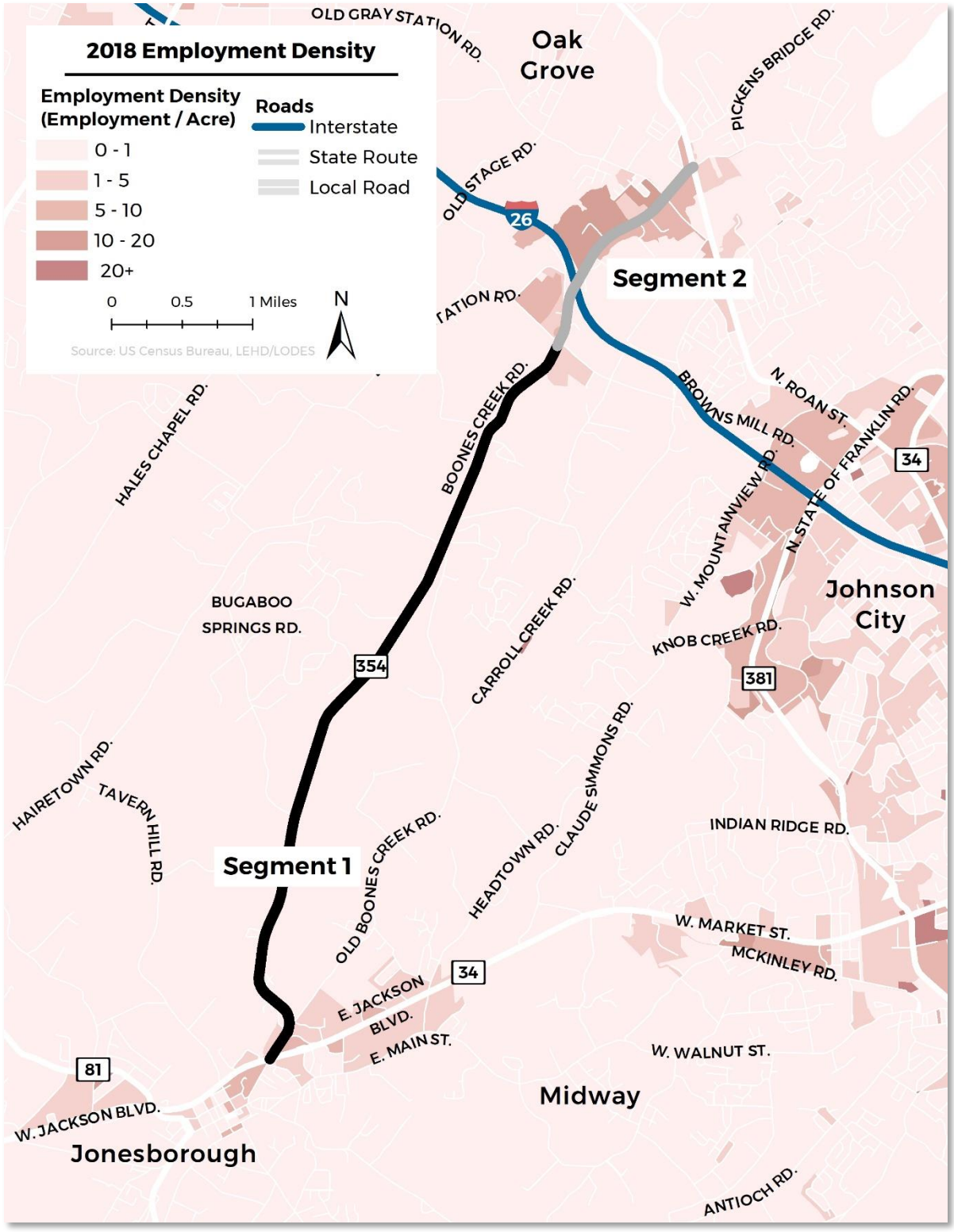


Figure 4. 2018 Employment Density



Future Population and Employment

Future employment and population projections underscore the corridor's likely development pattern going forward, highlighting areas with the greatest need for increased infrastructure capacity, including access to safe and reliable transportation opportunities. The data in the following section is sourced from the region's travel demand model (TDM), which includes forecasted population and employment to year 2045 developed as part of the MTPO's Metropolitan Transportation Plan (MTP). These projections are informed by historical trends as well as local plans, programs, and initiatives. Projections reflected in the following tables and figures represent an aggregate of all the traffic analysis zones (TAZs) that are partially or wholly inside of a half-mile buffer of Boones Creek Road.

Table 2. 2045 Population and Employment

2045	Area (Acres)	Total Employment	Employment Density (Jobs per Acre)	Total Population	Population Density (Persons Per Acre)
Boones Creek Road Corridor	11,479	12,932	1.127	11,248	0.979
Washington County	211,072	108,244	0.513	190,205	0.901
Johnson City	27,904	100,131	3.588	139,813	5.011
Jonesborough	3,296	5,846	1.774	17,091	5.185

Source: JCMTPO Travel Demand Model
Note: Calculations for Boones Creek Road Corridor differ from that provided in Table 1 due to use of TAZs compared to Census geographies.

Both population and employment density along the Boones Creek Road Corridor are expected to remain higher than Washington County and lower than that of Johnson City and Jonesborough (Table 2). Figure 5 shows that future corridor employment is expected to be concentrated at the southern terminus of Segment 1 in Historic Downtown Jonesborough and along Segment 2 to the north of I-26, in line with the proposed Regional Retail and Tourism Development District discussed later. Figure 6 shows that the highest concentration of population in 2045 is projected to be at the northern end of Segment 2. Both Figure 5 and Figure 6 demonstrate a continuation of low-density development to the west of SR 354/Boones Creek Road.

The largest projected employment growth from 2015 to 2045 exists in the northern end of Segment 1 and the southern end of Segment 2 around I-26 (see Figure 7). This area is zoned for planned arterial commercial uses, which are compatible with the projected growth in employment. The largest population growth from 2015 to 2045 is expected to occur along Segment 2 to the northwest of Interstate 26 (see Figure 8). Significant population growth is also expected on the eastern side of the corridor at the northern end of Segment 1 and the southern end of Segment 2.

Figure 5. Projected Employment Density

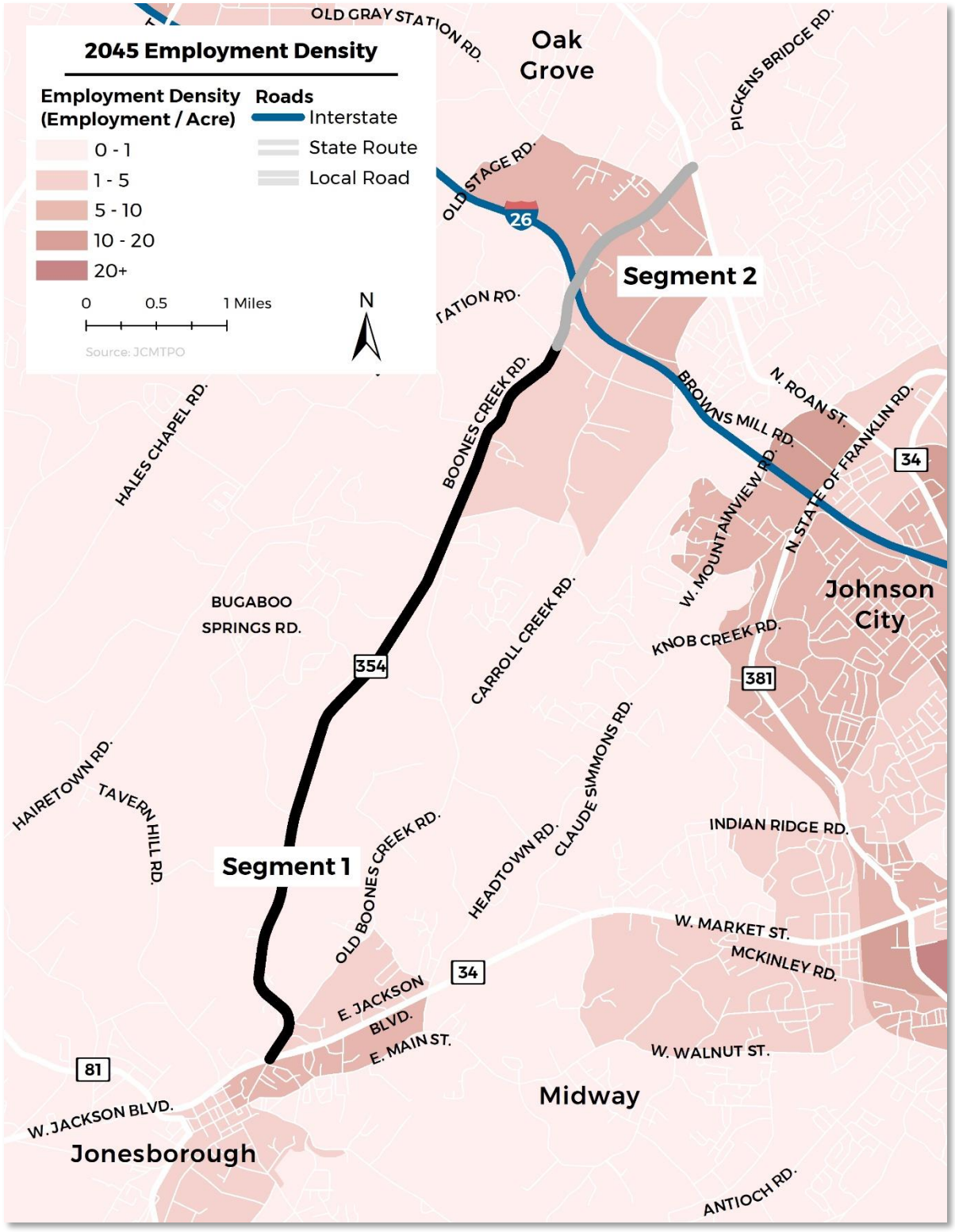


Figure 6. Projected Population Density

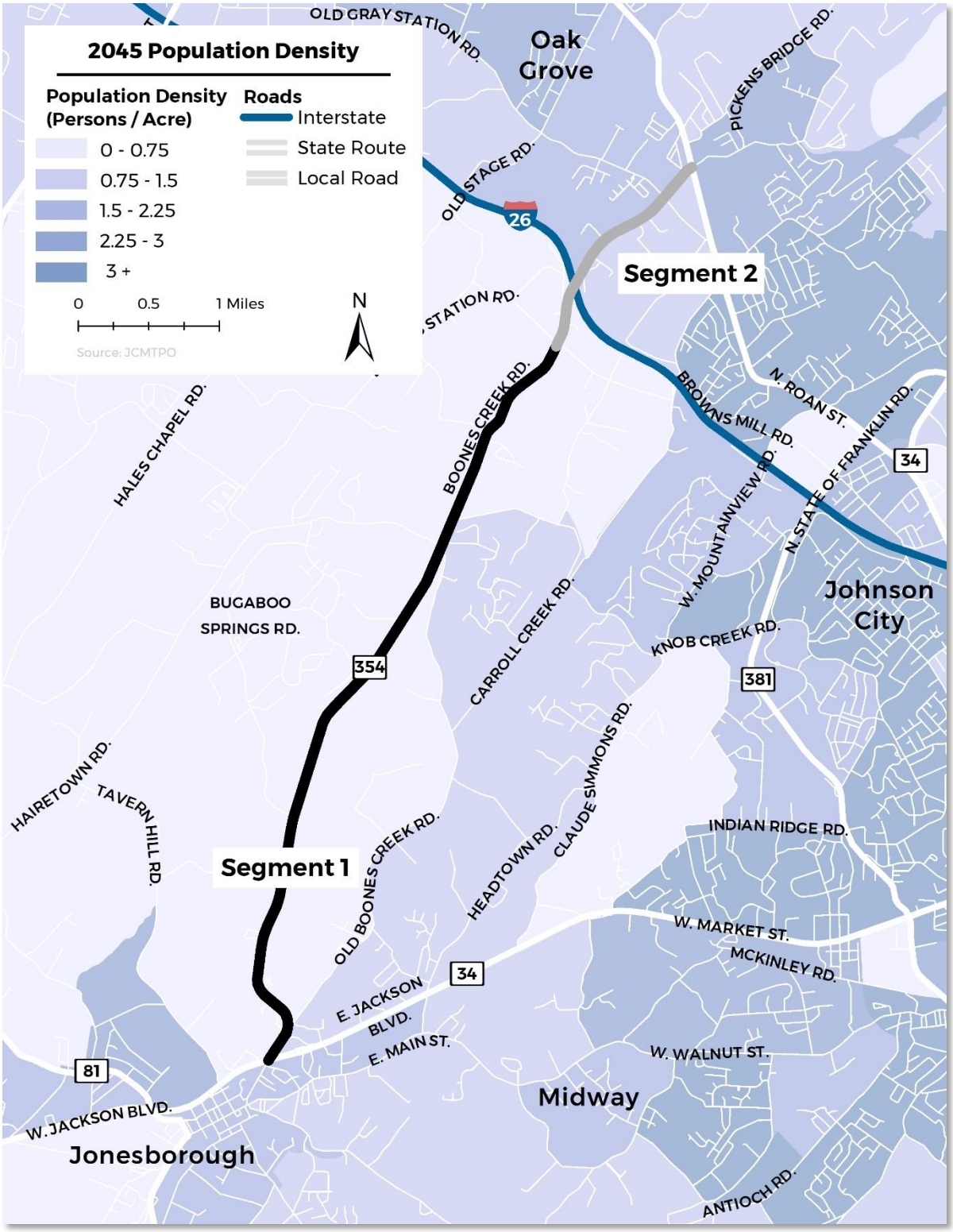


Figure 7. Employment Growth (2015-2045)

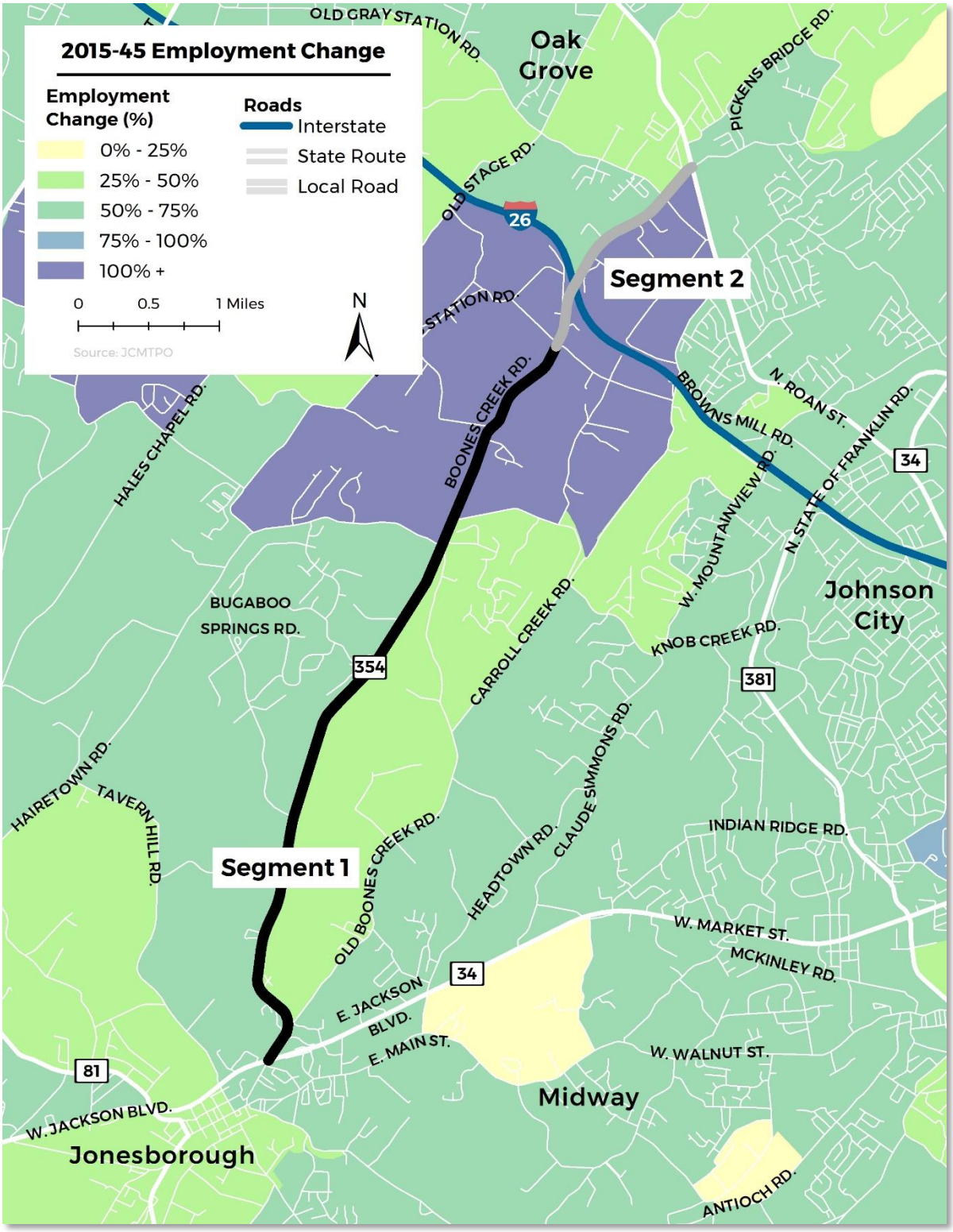
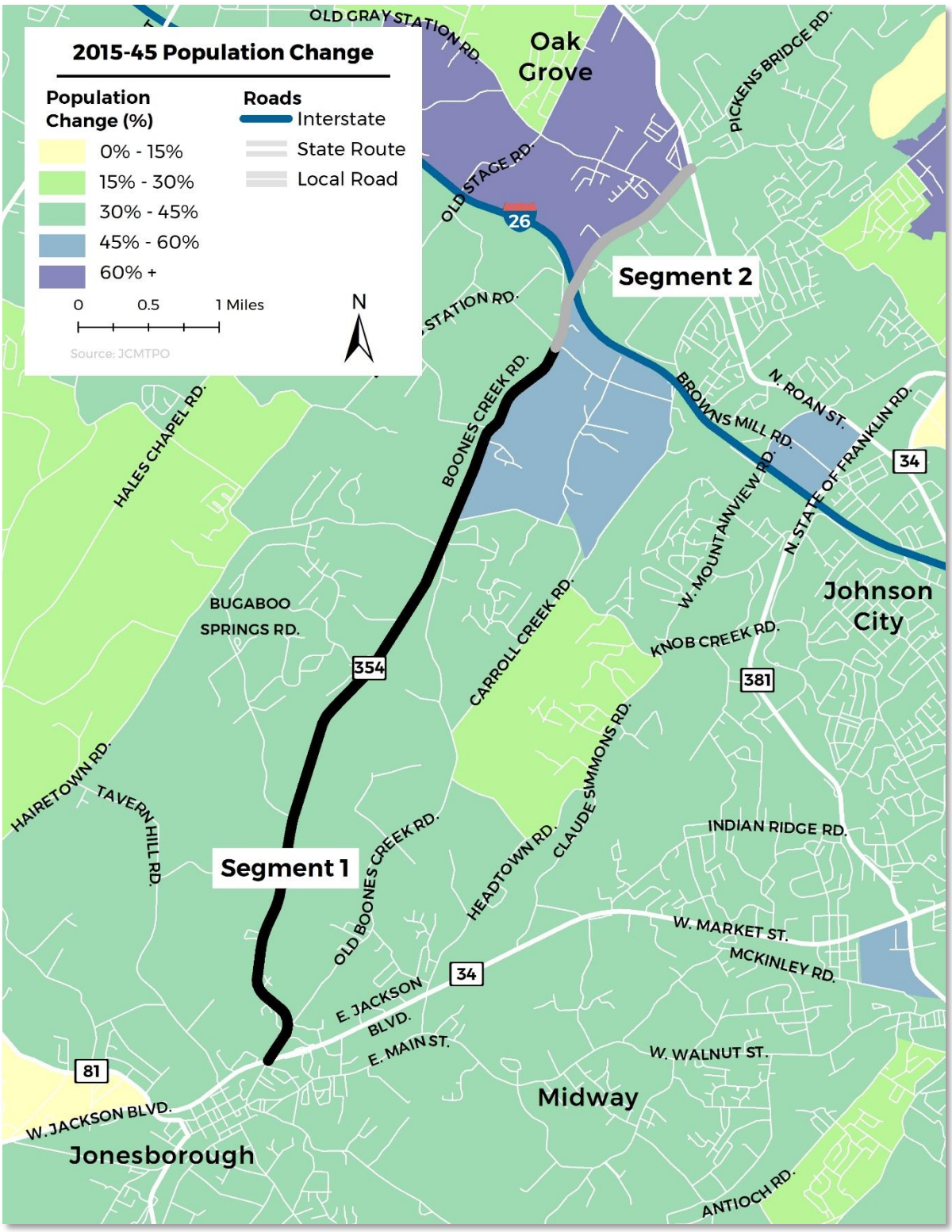


Figure 8. Population Growth (2015-2045)



Upcoming Projects and Planned Developments

Transportation Projects

Several transportation projects are planned for Boones Creek Road (SR 354) or adjacent facilities that will impact future traffic conditions. Table 3 lists the proposed projects within the study area and their funding status. Projects that are listed in the MTPO's 2020-2023 Transportation Improvement Program (TIP)[2] have funds currently programmed to them. Projects that are listed in the MTPO's 2045 Metropolitan Transportation Plan (MTP)[3] but not in the TIP are proposed but do not have programmed funding.

Table 3. Existing Projects within Study Area

Project Name	Map ID	Cost	Source	Sponsor Agency	Description
Highland Church Road Geometry Improvements	1	$3,200,000	MTP	Johnson City MTPO	Safety/geometric improvements, including paved shoulder improvements at select locations/intersections as determined through project development process. Project spans 5.3 miles from SR 75 to Boones Creek Road. *STATUS: Proposed*
Knob Creek Rd Reconstruction	2A and 2B	$41,400,000	2020-2023 TIP	TDOT	Reconstruct two-lane roadway addressing geometric issues on Knob Creek Rd. Project from SR-354 (Boones Creek Road) to Marketplace Blvd. Project occurring in two phases *STATUS: Preliminary engineering funding programmed for 2023*
Boones Creek Road Widening	3	$15,400,000	MTP	Johnson City MTPO	Widen existing two-lane roadway to four lanes. Project spans 2.2 miles from I-26 to Highland Church Rd *STATUS: Proposed*
Boones Creek Road Widening	4	$18,300.000	MTP	Johnson City MTPO	Widen existing two-lane roadway to four lanes. Project spans 2.9 miles from Highland Church Rd to Jonesborough Bypass. *STATUS: Proposed*
Boones Creek Road Widening	5	$9,400,000	MTP	Johnson City MTPO	Widen existing two-lane roadway to four lanes. Project spans 1.2 miles from Jonesborough Bypass to US 11E. *STATUS: Proposed*
Jonesborough Bypass	6	$14,600,000	MTP	Johnson City MTPO	New three-lane arterial roadway connecting Boones Creek Road and US 11E. *STATUS: Proposed*
Signal at Tiger Way	7	$415,000	2020-2023 TIP	Jonesborough	Installation of a traffic signal at the intersection of SR 34/US 11E/Jackson Blvd and Smith Lane to improve safety and congestion. *STATUS: Preliminary engineering, right-of-way, construction funding programmed for 2020*

[2] Johnson City MTPO 2020-2023 Transportation Improvement Program: https://jcmpo.org/tip.html
[3] Johnson City MTPO 2045 Metropolitan Transportation Plan: https://jcmpo.org/mtp.html

Johnson City and the Town of Jonesborough are also considering additional projects on the corridor. Johnson City is in early discussions to widen Christian Church Road north of Boones Creek Road (SR 354), though this project is in very early stages with no funding programmed. The Town of Jonesborough is working to develop concept road improvement plans to add a dual center turn lane and deceleration lanes at current and new developments for right turns between Old Boones Creek Road to the Town limits near Hales Road.

Planned and Proposed Developments

Several planned developments are anticipated to bring more residents and traffic to the corridor. Planned developments could lead to increased traffic that may require roadway improvements such as sidewalks, bike lanes, traffic signals, and road widening. There are currently several developments that have been approved or proposed within the corridor study area. See Figure 9 for the approximate location of each of these developments relative to transportation projects described in the previous section.

1. Story Town Village along Boones Creek Road (SR 354) near the southern end of the corridor in Jonesborough. This planned development will contain approximately 25 residential homes. There are additional plans for the development of townhomes north of Story Town Village.
2. Slonaker Development is planning two residential subdivisions off of Boones Creek Road (SR 354) between Hales Road and Parsons Circle.
3. A mixed-use multifamily development is proposed with a new public road that will connect to Boones Creek Road (SR 354) through a signalized intersection to the west of Parsons Circle. This will eventually also connect to a new school.
4. A large mixed-use development is planned to occur that will include restaurants, wholesale retail space, a five-story hotel, a residential complex, and other retail opportunities. This development would occur within the 950-acre retail tourism development district that is located between Boones Creek Road (SR 354) and Bart Green Drive near Exit 17 of I-26.
5. The Tennessee College of Applied Technology (TCAT) in Elizabethton is transforming the former Boones Creek Elementary School into a satellite campus. This site is located on Christian Church Road to the east of Boones Creek Road (SR 354).[4]
6. The Citi Solutions Center that is currently located in Gray, Tennessee is moving to a new facility on Lake Park Drive in the Boones Creek area by mid-2022. The site will be located on the west side of Boones Creek Road (SR 354) to the south of I-26. The relocation of this facility will bring additional traffic to the area as just under 2,000 people are employed by the company in Washington County.[5]
7. A 70-acre mixed-use development at the corner of Boones Creek Road (SR 354) and Christian Church Road, parallel to the BrightRidge power office, is planned. The preliminary site plan for the development shows a hotel, supermarket, movie theater, restaurants, and an outdoor

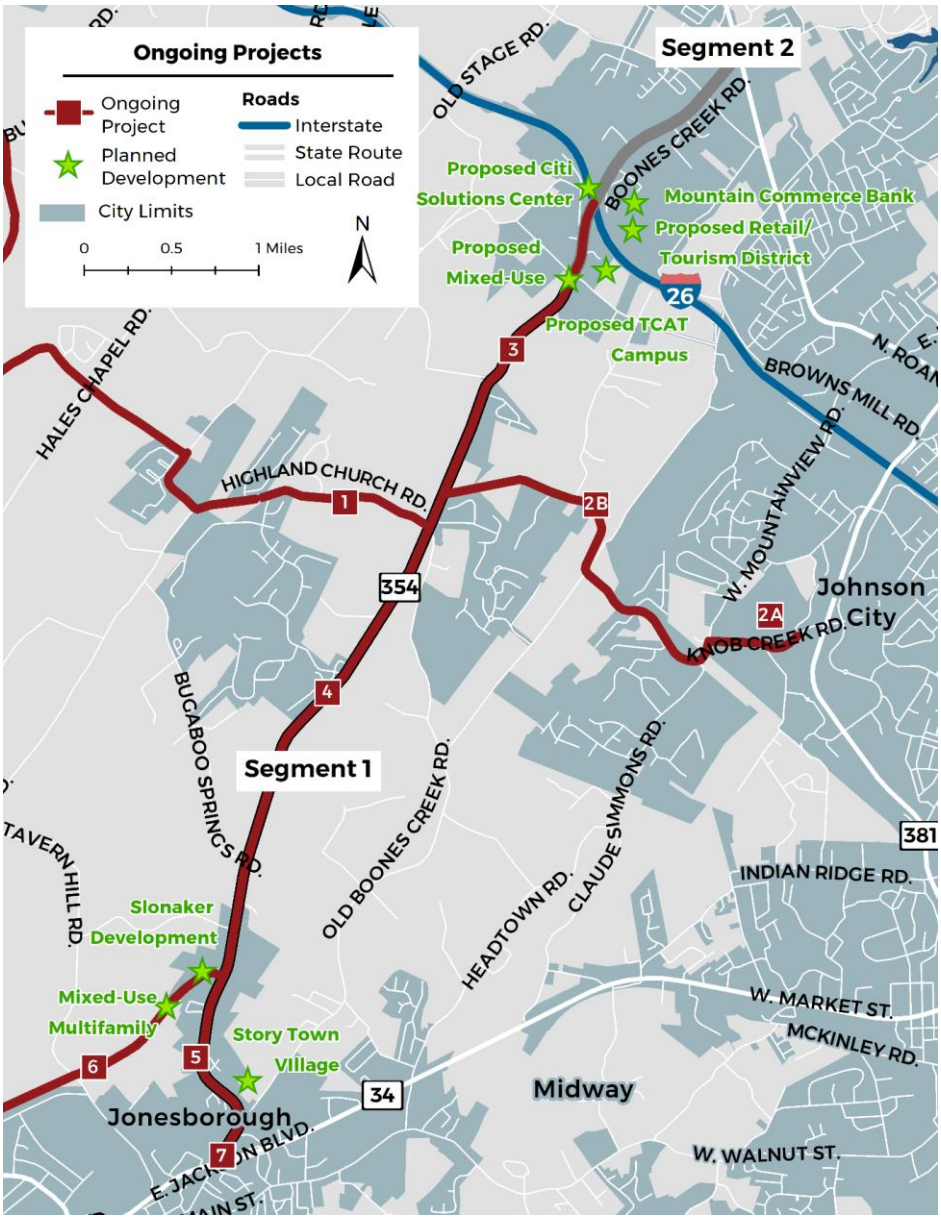
[4] School board approves TCAT plan for old Boones Creek Elementary School, Johnson City Press, July 1, 2021. https://www.johnsoncitypress.com/news/school-board-approves-tcat-plan-for-old-boones-creek-elementary-school/article_70b95bda-daaf-11eb-8148-ff17d629b169.html

[5] Citi to relocate offices from Gray to Boones Creek, News5WCYB, December 3, 2021. https://wcyb.com/news/local/citi-to-relocate-offices-from-gray-to-boones-creek

amphitheater. This development will be located on the southwest corner of the intersection of Christian Church Road and Boones Creek Road (SR 354).[6]

8. Mountain Commerce Bank is constructing a new corporate center on Memory Gardens Drive. The location will include a bank branch and is expected to break ground in summer 2022. [7]

Figure 9. Ongoing Projects



[6] A venue for people of all ages: Preliminary site concept released for Boones Creek Promenade project, WJHL News Channel 11, March 29, 2021. https://www.wjhl.com/news/local/a-venue-for-people-of-all-ages-preliminary-site-concept-released-for-boones-creek-promenade-project/

[7] Mountain Commerce Bank building new operations center in Gray. Johnson City Press, January 16, 2022. https://www.johnsoncitypress.com/news/mountain-commerce-bank-building-new-operations-center-in-gray/article_b5ba256a-73e4-11ec-ab6a-db5e2d74648f.html

3. Transportation Conditions

Roadway Conditions

Boones Creek Road (SR 354) is functionally classified as a minor arterial, within both a rural and urban setting. The corridor is characterized by rolling terrain and surrounded by a variety of land uses including commercial, residential, and rural. Data for Boones Creek Road (SR 354) was obtained from TDOT's Enhanced Tennessee Roadway Information Management System (ETRIMS). Table 4 provides a detailed description of roadway features for the corridor and an outline of varying factors such as right-of-way limits, number of lanes, and speed limit for each segment.

Figure 10. Boones Creek Road (SR 354) in Segment 1

Segment 1 – This segment of Boones Creek Road (SR 354) is 5.63 miles long and is generally characterized as a two-lane roadway with 12-foot lanes and shoulders that are approximately six feet wide on each side. The shoulders are also designated and striped as unbuffered bicycle lanes near the northern end of the segment. Near the southern end of the segment, shared lane markings are present for cyclists. At the corridor's southern terminus, there is a signalized intersection with SR 34/US 11E/East Jackson Boulevard that has a wider cross-section. The lane configuration varies between one and two lanes in each direction with an occasional two-way left-turn lane (TWLTL) and narrow shoulders. There are twenty unsignalized intersections and two signalized intersections along Segment 1. The signalized intersections are located at SR 34/US 11E/East Jackson Boulevard and at Highland Church Road. At the Highland Church Road location, Boones Creek Road has one through lane, one dedicated right-turn lane, and one left-turn lane in both directions. A TWLTL extends from east of this signalized intersection to the intersection of Knob Creek Road. The intersection at Knob Creek Road has a dedicated right-turn lane in the eastbound direction along Boones Creek Road (SR 354).

Segment 2 – The northernmost segment is 1.82 miles long. West of I-26 interchange, Boones Creek Road (SR 354) is characterized as a two-lane roadway with 12-foot lanes. There are five-foot shoulders, five-foot bicycle lanes, and a TWLTL. Sidewalks are available from Christian Church Road to Lake Park Drive. Segment 2 then transitions to a five-lane roadway with 12-foot lanes and a TWLTL. This portion of the corridor also includes five-foot shoulders, five-foot bicycle lanes, and sidewalk infrastructure along both sides of the corridor. There are five signalized and five unsignalized intersections located along Segment 2. The signalized intersections at Boones Creek Road are:

Figure 11. Boones Creek Road (SR 354) at Roan Street (SR 36)

- Christian Church Road
- I-26 on ramps
- I-26 off ramps
- Old Gray Station Road
- North Roan Street (SR 36)

Table 4. Roadway Feature by Segment

Segment Breakdown	Start Point (L.M.)	End Point (L.M.)	Approximate Right-of- Way (ft)	Number of Lanes	Speed Limit (mph)
Segment 1	0	0.25	80	3	20
	0.25	0.93	120	2	30
	0.93	1.60	120	2	45
	1.60	2.80	120	2	50
	2.80	5.63	120	2	45
Segment 2	5.63	5.70	120	3	45
	5.70	6.15	120	3	40
	6.15	6.34	300	4	40
	6.34	7.38	120	5	40
	7.38	7.45	150	5	40

Driveway Patterns

Along the corridor, there are a number of driveways that serve as access points to single unit homes, residential neighborhoods, as well as to commercial developments. High driveway density can be detrimental to the efficiency and safety of the corridor due to increased frequency of vehicles turning onto

and off of the main road. TDOT's *Highway System Access Manual (HSAM)*[8] provides guidance on the required minimum distances between driveways. For a minor arterial such as Boones Creek Road (SR 354), the minimum distance between driveways should be 880 feet for a rural environment and 660 feet for an urban environment. Several driveways located along the corridor do not adhere to this guideline.

Another key guideline to ensure safety and efficiency is a minimum distance of 40 feet between two driveways on the same parcel. This stipulation of minimum spacing typically leads to a limit of one entrance to a single parcel of land unless the parcel has a frontage that exceeds 200 feet. The driveways along the corridor were all found to be in conformance with this guidance.

Unsignalized Intersections

There are 20 unsignalized intersections in Segment 1 and five in Segment 2. All 25 intersections are three-legged intersections with stop control on the minor approach. TDOT's HSAM states that unsignalized intersections along a minor arterial should have a minimum spacing of 1,320 feet in both rural and urban areas. Several of these intersections are located closer together than the minimum spacing specified in the HSAM, including Old Towne Drive and Old Bugaboo Springs Road, and Highland Gate Drive and Knob Creek Road, Orr Court and Lake Park Drive, and Quality Circle and Kim Drive.

The corridor's use of two-way left-turn lanes (TWLTL) helps mitigate the potential issues created by closely spaced intersections. According to the HSAM, lane configurations with TWLTL's have 35 percent lower average crash rates, increased capacity, and less delay than undivided roadways. Boones Creek Road's lane configuration includes a TWLTL between SR 34/US 11E/East Jackson Boulevard and Old Boones Creek Road, between Highland Church Road and Knob Creek Road, to the west of Christian Church Road, and between the I-26 interchange and North Roan Street (SR 36).

Notable Origins and Destinations

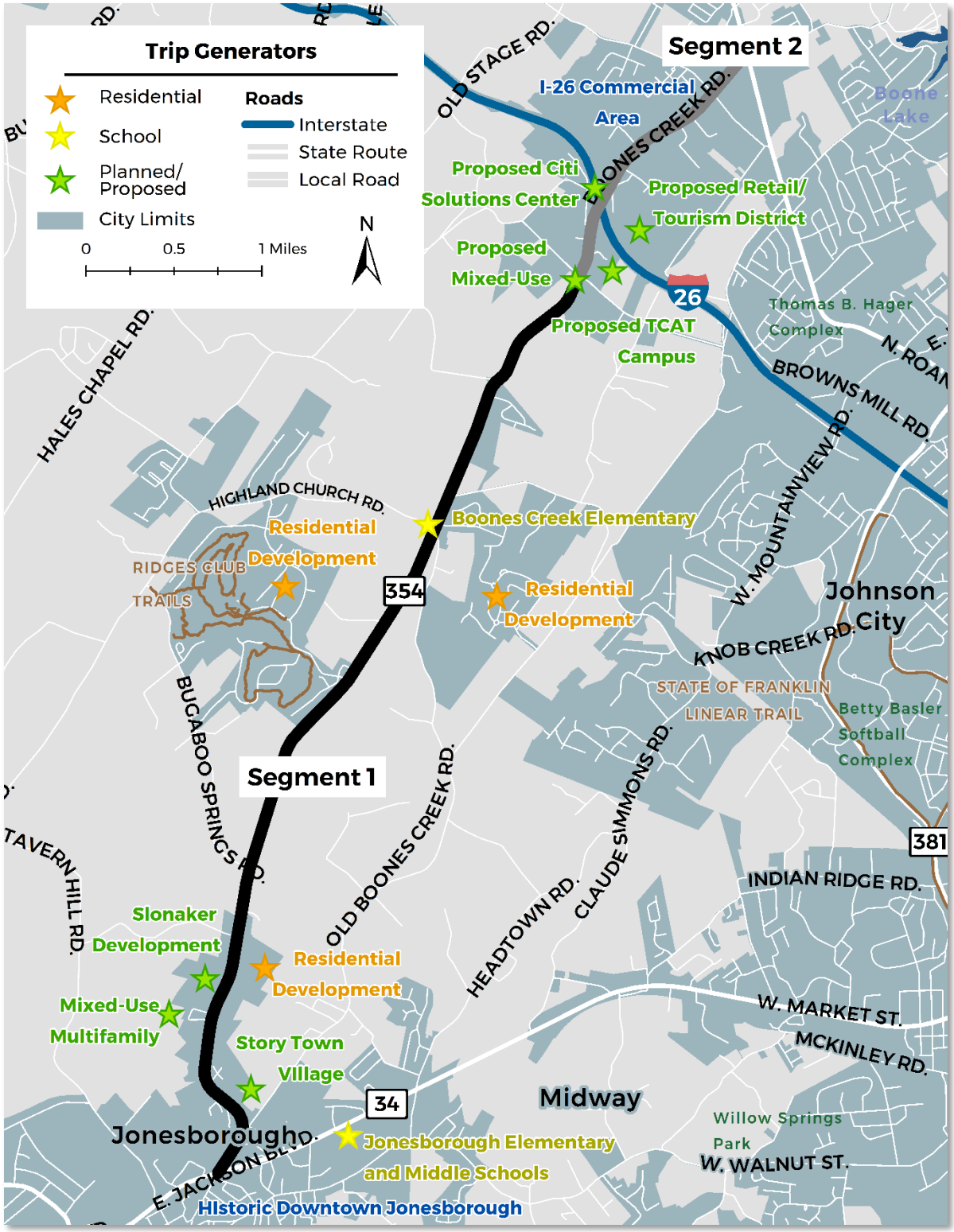
Key trip attractors along the study corridor are primarily within Segment 2 near the I-26 interchange and the southern terminus of Segment 1. Restaurants along Segment 2 include Pal's, Waffle House, Wendy's, Domino's Pizza, Bob Evans, and Cracker Barrel. Hotels along this segment include Holiday Inn Express, Quality Inn, and WoodSpring Suites.

Boones Creek Elementary School is located south of the I-26 interchange near the intersection at Highland Church Road. Providence Academy is not on the corridor, but it can be accessed by turning east onto Old Boones Creek Road at the same intersection.

The southern terminus of Segment 1 is just north of Historic Jonesborough and includes commercial and retail destinations, and health services like the Rural Health Services Medical Center of Jonesborough, the Jonesborough Community Care Center, and pharmacies. Surrounding these services are fast food restaurants McDonald's and Arby's, Dollar General, a Country Inn and Suites, and the Bank of Tennessee. Beyond these, residential neighborhoods and subdivisions in Segment 1 serve as prominent trip origin locations along this corridor. Figure 12 shows key trip existing and planned/proposed trip generators along the Boones Creek Road (SR 354) corridor.

[8] TDOTs Highway Safety Access Manual, https://www.tn.gov/tdot/traffic-operations-division/traffic-engineering-office/operations-and-safety/access-manual.html.

Figure 12. Trip Generators



Multimodal Conditions

Multimodal infrastructure along the corridor includes bicycle, pedestrian, and railroad facilities. Considerations should be made to ensure these facilities include appropriate signage for pedestrian or bicycle use, lane markings for bicycle lanes, and detectable warning surfaces that adhere to the Americans with Disabilities Act (ADA) and follow best practices recommended in the Public Right-of-Way Accessibility Guidelines (PROWAG).

Bicycle Facilities

Segment 1 – Segment 1 has bicycle facilities along most of its length. The southern end of the segment has shared lane markings, or "sharrows", for the first quarter-mile north of the intersection at SR 34/US 11E/East Jackson Boulevard. North of this section, the corridor has four to five-foot wide striped bicycle lanes in the shoulder of the road. These are un-buffered and unprotected. "BIKE LANE" signs at the edge of pavement also indicate the shoulder as a bicycle lane. Bicycle lane markings are maintained through intersections along the segment.

Segment 2 – The bicycle facilities from Segment 1 continue into Segment 2 of the corridor. Bicycle lanes in this segment decrease in width from five feet to three feet, and the bicycle lane is situated between the vehicle travel lane and the shoulder of the road. Along this segment, bicycle lane pavement markings are interrupted by frequent driveways, intersecting roads, and interstate on- and off-ramps. Segment 2 has signage indicating the presence of the bike lane. Signalized intersections in Segment 2 lack any bicycle-specific signals, signs, or markings. The bicycle lanes terminate about 500 feet south of the intersection at North Roan Street (SR 36) at the northern end of the corridor.

Pedestrian Facilities

Segment 1 – This segment does not have sidewalks or other pedestrian facilities adjacent to the roadway.

Segment 2 – This segment has paved sidewalks adjacent to the roadway along most of its length. Sidewalks appear to be in good to fair condition. At the I-26 interchange, a shared-use path accommodates pedestrian and bicycle traffic. There are crosswalks at the two signalized intersections of the interchange, and sidewalks and bike lanes resume on both sides of Boones Creek Road between Lake Park Drive and Christian Church Road. Signalized intersections in Segment 2 lack pedestrian crossing signals and detectable warning surfaces. Unsignalized intersections and driveways have ADA ramps in need of repair and detectable warning surfaces or marked crosswalks. The approximately two-mile segment has only three marked pedestrian crossings for Boones Creek Road (SR 354), all three at signalized intersections.

Railroad Infrastructure

Segment 1 - This segment passes under an elevated railroad bridge approximately 200 feet west of the intersection of Boones Creek Road (SR 354) and Keefauver Road. The separated-grade railroad is approximately 50 feet above the roadway and has support towers on either side of the roadway.

Segment 2 - This segment does not have any railroad infrastructure.

Traffic and Volumes

Existing traffic conditions along the study corridor were assessed to identify deficiencies related to capacity and operations and to establish a baseline against which the anticipated future conditions and potential impacts of future traffic growth can be evaluated. Both 2020 annual average daily traffic (AADT)

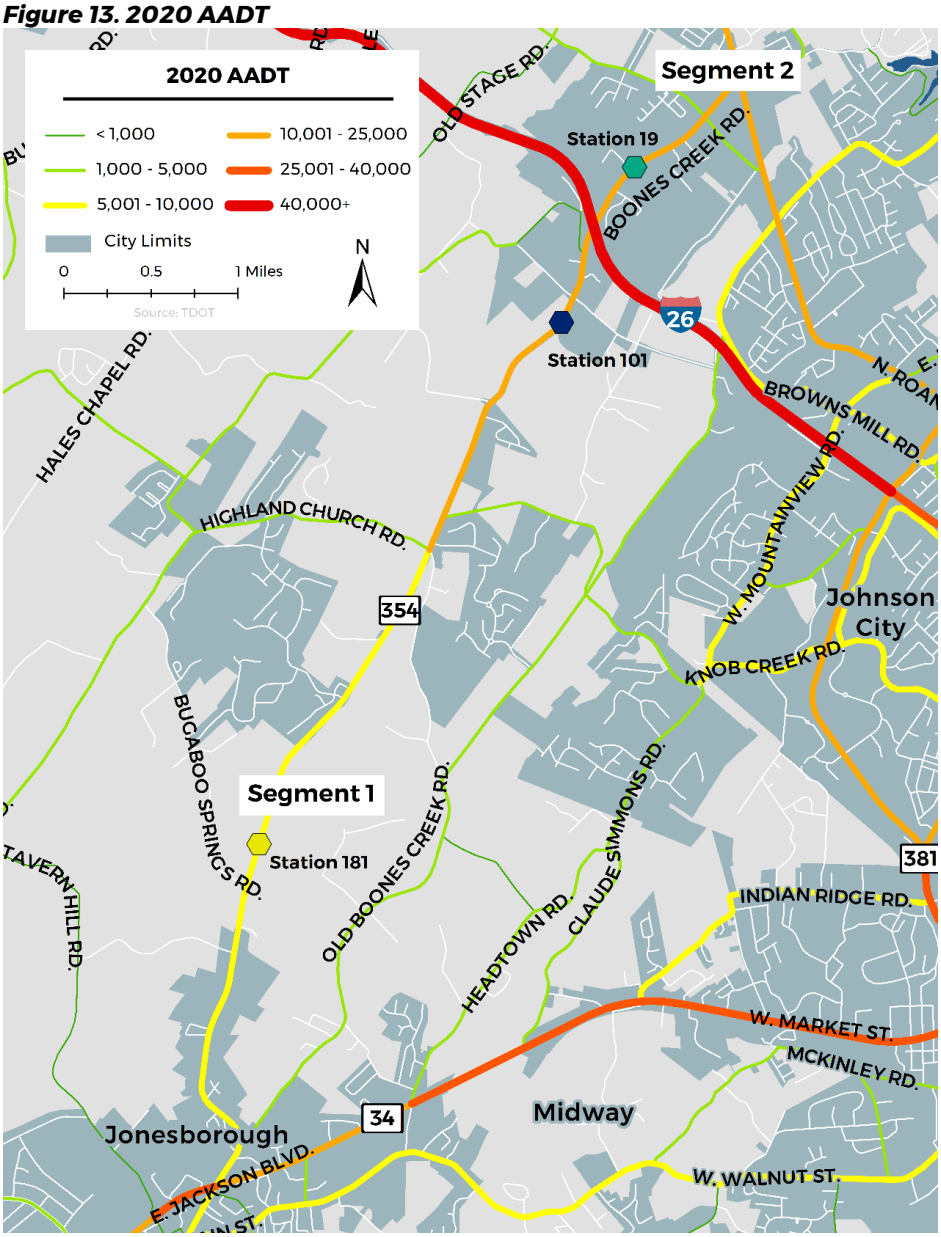
as well as historic AADT volumes from TDOT were used in the analysis. Johnson City provided a Synchro file for intersection level analysis included later.

2020 AADT

TDOT collects 24-hour bidirectional traffic volume data annually at count stations across the state. This data is adjusted using traffic variation factors (TVF) that normalize the data by accounting for weekly and monthly changes in traffic volumes. TDOT then publishes the resulting AADT for each count station, defined as the total volume of vehicles passing through the count station in a year, divided by 365 days.

Figure 13 highlights 2020 AADT along the corridor. Segment 1 has an AADT of just over 8,000 for much of its length, based on TDOT Count Station 181. Segment 2 has a significantly higher AADT, ranging from approximately 17,000 to 21,000, based on TDOT Count Stations 101 and 19. The increase in traffic volumes is likely a result of vehicles accessing I-26 at the Boones Creek Road (SR 354) interchange.

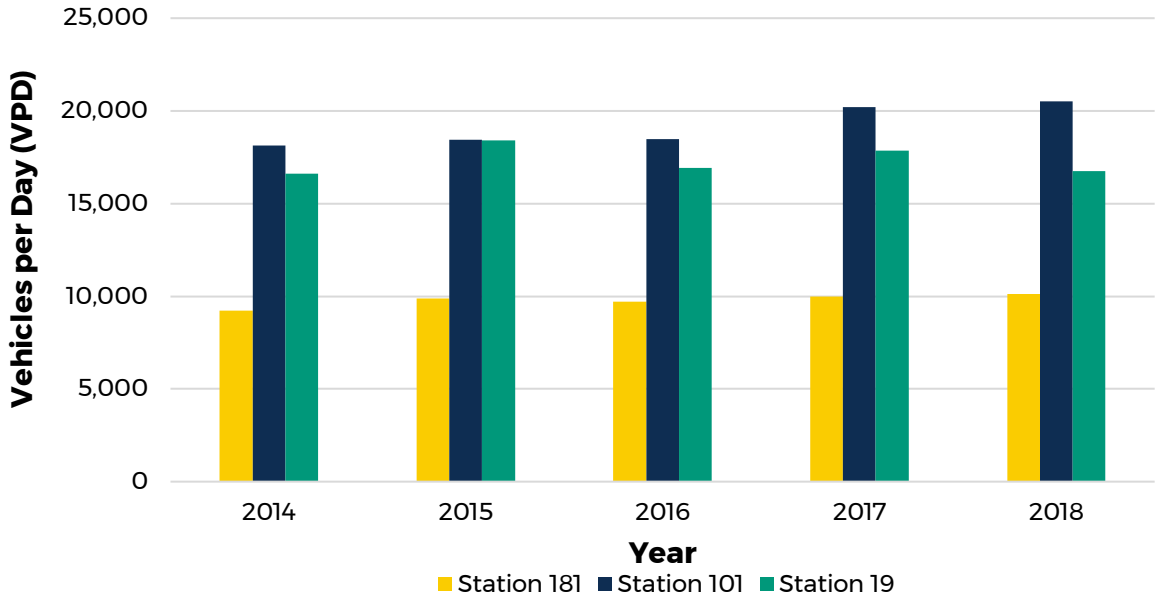
Figure 13. 2020 AADT



Historic AADT

In addition to current AADT, TDOT maintains historic AADT traffic through a publicly accessible interactive map. Figure 14 presents this five-year period of historic data at count stations 181, 101, and 19 within the study area.[9] Traffic has remained relatively consistent over the past several years, with traffic increasing more rapidly in Segment 2 south of I-26.

Figure 14. AADT (2014-2018)



Safety

Crash data used in this analysis was obtained from TDOT via ETRIMS, which contains georeferenced crash data for all roadways in the state. This analysis focused on crashes along the Boones Creek Road (SR 354) corridor and did not review crashes that occurred on intersecting side streets. Data is presented and categorized for each of the two corridor segments for the five-year period between 2016 and 2020. During this five-year period, there were a total of 322 crashes along the corridor and no fatal injury crashes.

Segment 1 - Figure 15 provides a summary of prevalent crash types for Segment 1. The most frequent crash types within Segment 1 were rear-end crashes (81, 46 percent of total crashes) and no collision crashes (47, 26 percent of total crashes). Of the rear-end crashes, 44, or 25 percent, were rear-end crashes at an intersection. A large portion of "No Collision" crashes refer to collisions with non-vehicles such as a deer, curbs, embankments, guardrails, traffic barriers, utility poles, etc. Figure 16 shows that 18 percent of crashes in this segment have been classified as injury crashes. As shown in Figure 17 there does not appear to be a consistent yearly trend in crashes along Segment 1. It should be noted that crash counts increased from 2019 to 2020 even with the COVID-19 pandemic, though crash totals were not as high as the 2018 count.

[9] TDOT Traffic History Website, https://www.tn.gov/tdot/long-range-planning-home/longrange-annual-average-daily-traffic-aadt.html.

Figure 15. Manner of Collision (Segment 1)

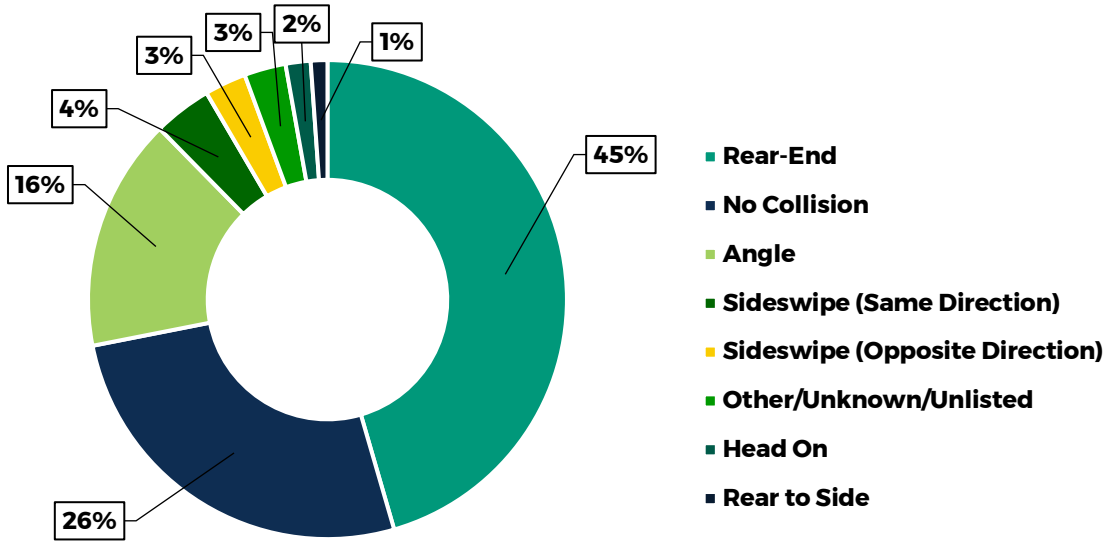
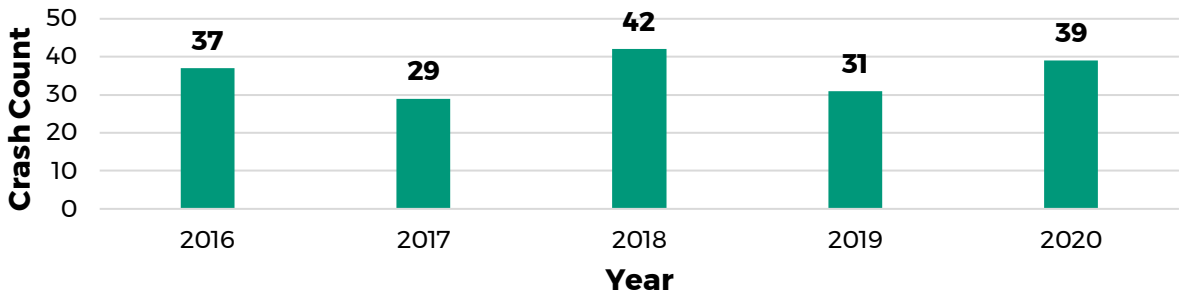


Figure 16. Crash Severity (Segment 1)

Figure 17. Crashes Per Year (Segment 1)



Segment 2 - Figure 18 provides a summary of crash types for Segment 2. The most frequent crash types within Segment 2 were rear-end crashes (82, 57 percent of total crashes) and angle crashes (40, 28 percent of total crashes). Of the rear-end crashes, 64, or 44 percent, were rear-end crashes at an intersection. Similarly, of the angle crashes, 28, or 19 percent, were angle crashes at an intersection. Notably, 102, or 71 percent of all crashes in Segment 2, occurred at an intersection. As shown in Figure 19, 14 percent of crashes in this segment have been classified as an injury crash. As shown in Figure 20, there appeared to be an increasing yearly trend in crashes between 2017 and 2019. However, there was a slight decrease in crashes in 2020, likely due to the COVID-19 pandemic.

Figure 18. Manner of Collision (Segment 2)

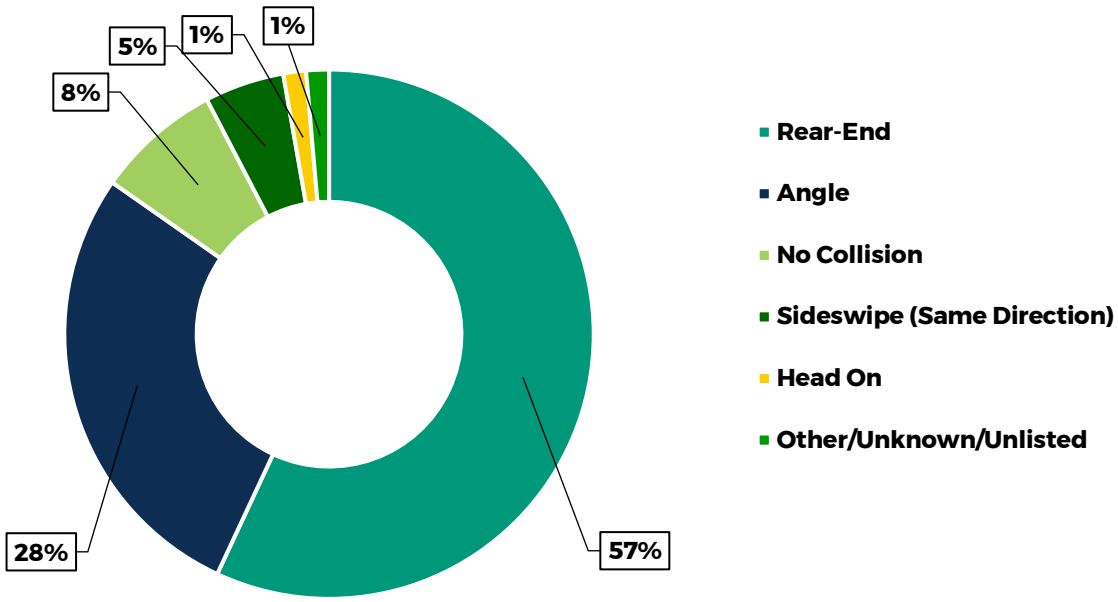


Figure 19. Crash Severity (Segment 2)

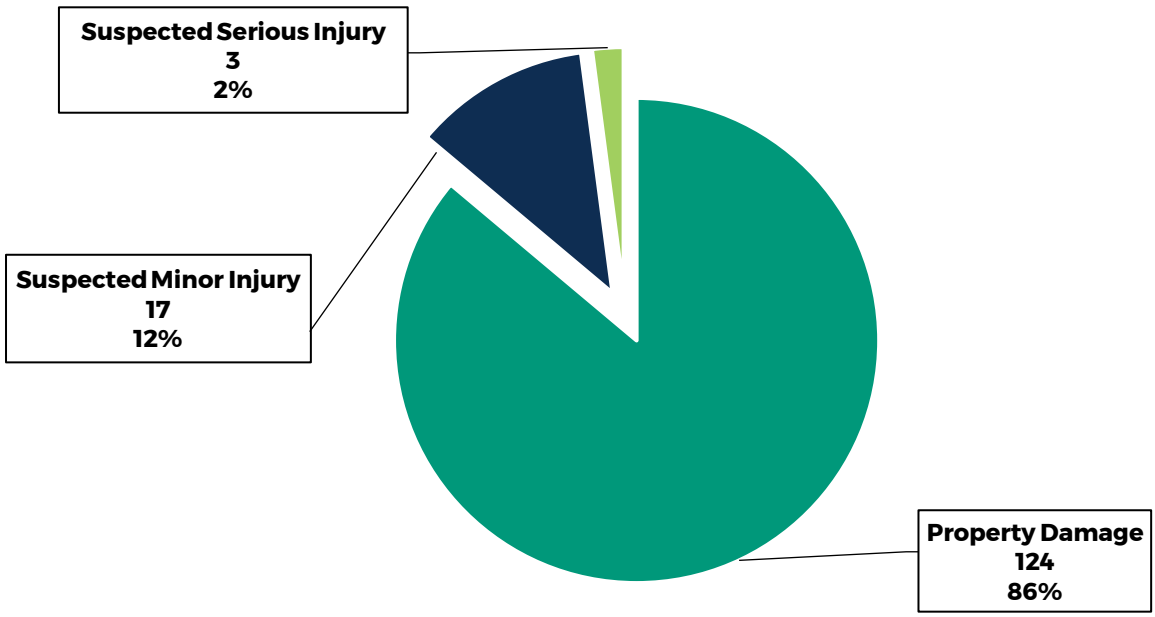
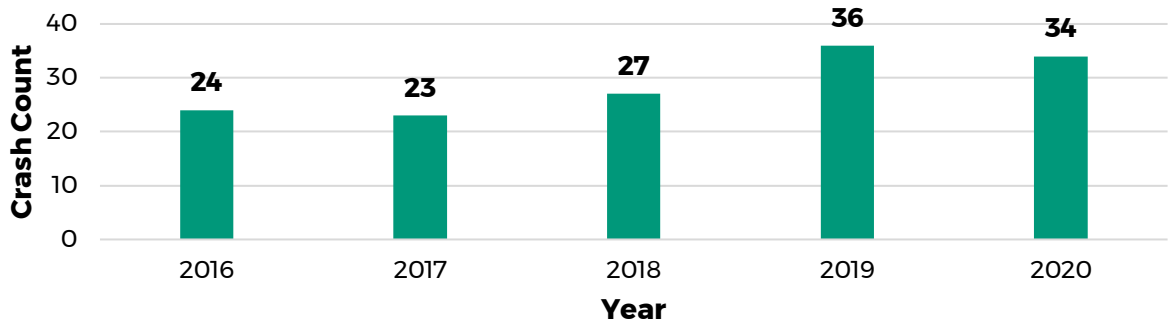


Figure 20. Crashes Per Year (Segment 2)



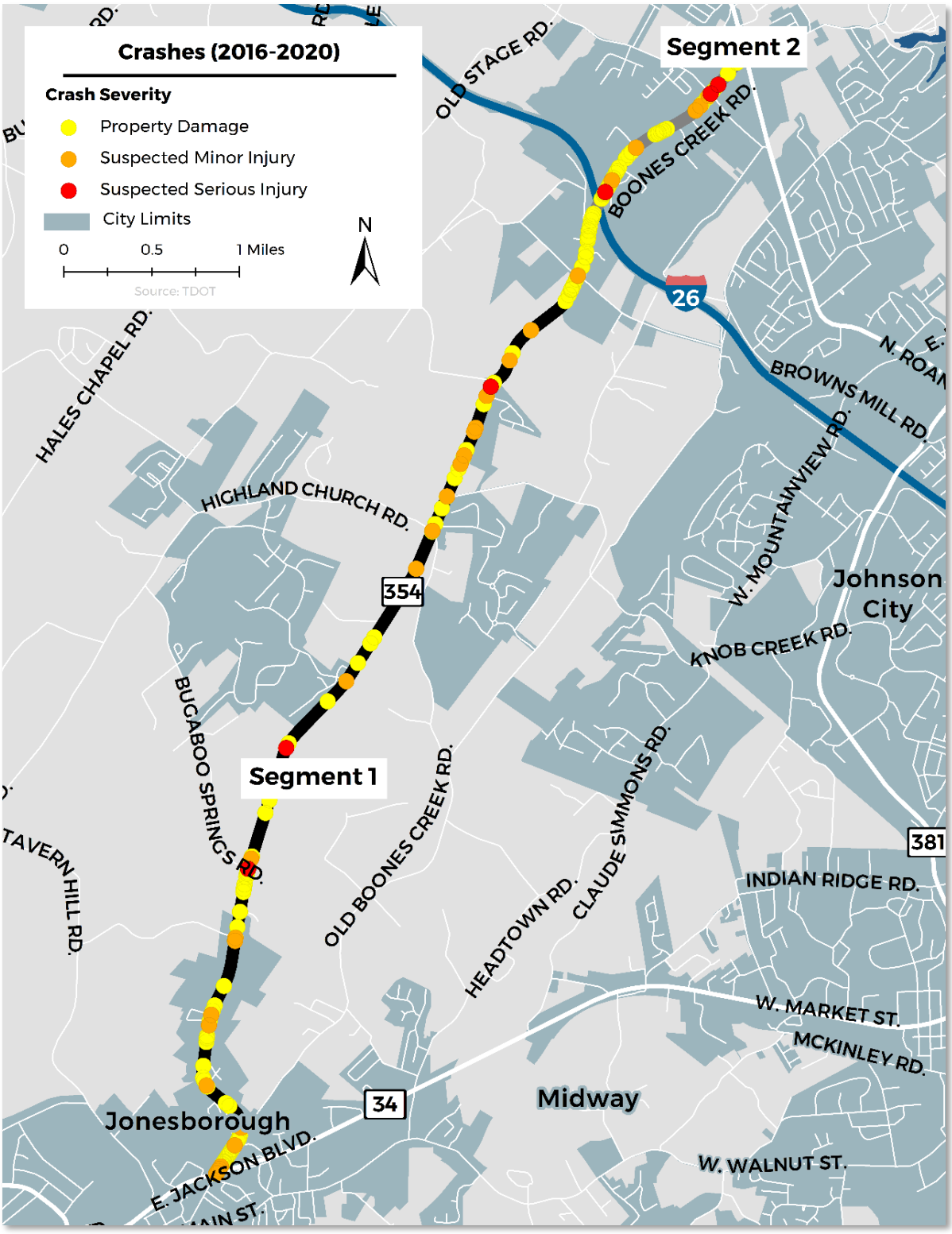
In the period between 2016 and 2020, Segment 2 had more than double the crashes per mile than Segment 1. This is likely a function of denser development patterns and higher traffic volumes along Segment 2 and surrounding I-26. Land use recommendations will take into account the higher crash rates along Segment 2 (see Table 5 and Figure 21).

Table 5. Crashes by Segment (2016-2020)

Segment Breakdown	Route	# of Crashes	Miles in Segment	Annual Average Crashes per Mile of Segment
1	SR354	178	5.63	6.4
2	SR354	144	1.82	15.8

[continued on next page]

Figure 21. Crash Severity (2016-2020)



Traffic Signal Timing

There are seven signalized intersections on Boones Creek Road within the study area:

- East Jackson Boulevard
- Christian Church Road
- Old Gray Station Road
- Highland Church Road
- I-26 on-ramp
- I-26 off-ramp
- North Roan Street (SR 36)

Out of these seven intersections, five intersections run without coordination. The two signals at I-26 are coordinated on a weekday and weekend schedule. Although five intersections lack coordination, there are detection devices for all movements at the signalized intersections. Video detection devices are located at I-26, Christian Church Road, and Highland Church Road. Loop detection is installed at North Roan Street (SR 36) and Old Gray Station Road.

Intersection Traffic Operations and Level of Service (LOS)

Synchro 10 traffic analysis software was used to analyze the intersection operations along Boones Creek Road (SR 354). Synchro is a deterministic analysis and signal optimization software that enables evaluation of intersection delay and performance based on traffic volumes, roadway and intersection characteristics, and signal phasing and timing plans.

Level of Service (LOS) is a categorization of intersection delay based upon driver tolerance for delay and signal efficiency. The LOS criteria for signalized and unsignalized (two-way stop-controlled) intersections as defined in the *Highway Capacity Manual 6 (HCM)* is summarized in Table 6.

The HCM 2000 Edition methodology was used to calculate the LOS and delay at both unsignalized and signalized intersections. The worst approach delay was used to calculate the LOS for unsignalized intersections, while the average intersection delay was used for signalized intersections. For the I-26 diverging diamond interchange (DDI), the delay was calculated based on the methodologies of DDI interchange with yield control provided in HCM 6.

Based on available data, seven different intersections in northern portions of the corridor were analyzed using Synchro 10: Lake Park Drive, Christian Church Road, I-26 DDI, Pinnacle Drive, Orr Court, Boones Ridge Road, and Young Property Entrance. Of these seven, two (Christian Church Road and I-26 interchange) were signalized intersections and the rest were unsignalized intersections with stop control on the minor approach.

There were six total scenarios for the analysis: 2018 AM/PM, 2025 AM/PM, and 2045 AM/PM. The outputs for existing conditions (2018 AM/PM) are summarized in Table 7 and Table 8.

Table 6. LOS Definition at Signalized Intersections

LOS	Description	Average Control Delay (s/veh)	
		Signalized	Unsignalized
A	Operations with very low control delay occurring with favorable progression and short cycle lengths.	d ≤ 10	d ≤ 10
B	Operations with low control delay, short queues, good signal progression and short cycle lengths.	10 < d ≤20	10 < d ≤ 15
C	Operations with average control delays resulting from fair progression and short cycle lengths.	20 < d ≤ 35	15 < d ≤ 25
D	Operations with longer control delays due to unfavorable progression, occasional cycle failures, long cycle lengths, and/or high V/C ratios.	35 < d ≤ 55	25 < d ≤ 35
E	Operations with high control delays, poor progression, long cycle lengths, frequent cycle failures and V/C >=1.0.	55 < d ≤ 80	35 < d ≤ 50
F	Operations with control delays unacceptable to most drivers occurring due to oversaturation, poor progression, and/or very long cycle lengths.	d > 80	d > 50

Source: Highway Capacity Manual Sixth Edition (HCM 6), Transportation Research Board, 2016

Table 7. 2018 AM Traffic Operations

Scenario	Intersection Name	Traffic Control	Delay (s)	LOS
2018 AM	Christian Church Rd	Signalization	17.4	B
	Pinnacle Dr	Two-Way Stop Control	129.6	F
	Orr Ct	Two-Way Stop Control	102.3	F
	Lake Park Dr	Two-Way Stop Control	-	F
	I-26 DDI	Signalization	21.7	C
	Young Property Ent	Two-Way Stop Control	226.9	F
	Boone Ridge Dr	Two-Way Stop Control	-	F

**Delays notated by a dash ("-") exceed 300 seconds; any additional delay over 300 seconds is irrelevant and indicates a need for operational changes at the intersection.*

Table 8. 2018 PM Traffic Operations

Scenario	Intersection Name	Traffic Control	Delay (s)	LOS
2018 PM	Christian Church Rd	Signalization	33.4	C
	Pinnacle Dr	Two-Way Stop Control	174.1	F
	Orr Ct	Two-Way Stop Control	161.1	F
	Lake Park Dr	Two-Way Stop Control	-	F
	I-26 DDI	Signalization	28.1	C
	Young Property Ent	Two-Way Stop Control	-	F
	Boone Ridge Dr	Two-Way Stop Control	-	F

**Delays notated by a dash ("-") exceed 300 seconds; any additional delay over 300 seconds is irrelevant and indicates a need for operational changes at the intersection.*

Based on these Synchro outputs, the two-way stop-controlled intersections have significant delay for both AM and PM with a consistent level of service "F". The unsignalized intersection at Young Property Entrance is especially problematic, with a delay far exceeding 300 seconds. Current conditions for the signalized intersections at Christian Church Road and I-26 performed better. The 2018 AM scenario returned a LOS of "B" for Christian Church Road and "C" for the I-26 interchange, and the 2018 PM scenario returned a LOS of "C" for both.

Future Conditions

Projected Traffic

Traffic volume growth rates were developed using a weighted combination of historic volume data, local population forecasts, and Johnson City MTPO's TDM. Growth rates were separated into short-term (2018-2025) and long-term (2025-2045) rates. To account for the potential skewing of the volume associated with COVID-19 pandemic, the period of short-term growth rate was projected from 2018 as opposed to the more recent 2020 counts. This potential skewing is evident in the steady increase of AADT

for five years along Segment 1 from 9,218 in 2014 to 10,111 in 2018 followed by a significant decrease to 8,118 in 2020. [10]

Historic volume data from TDOT was used to identify historical growth trends. Census data and local population projections were used to calculate estimated population growth rates. Johnson City MTPO's TDM provided modeled traffic volumes for 2015 and 2045 that were used to develop a third growth rate. These three growth rates from historical counts, population projections, and the TDM were then assigned weights based on their reliability and were combined as weighted averages for short- and long-term growth. Table 9 gives the weights of each subcategory of growth rate.

Table 9. Corridor Growth Rate Subcategories

Source	Scenario	Weight	Rate
Historical Traffic Counts (Linear Projection)	Short-term	40%	1.48%
	Long-term		1.11%
Population	Short-term	20%	0.69%
	Long-term		0.82%
TDM	Short-term	40%	1.96%
	Long-term		1.96%
Combined	Short-term	100%	1.51%
	Long-term		1.39%

2025 AADT

The calculated growth rates were applied to existing AADT data and resulted in a 2025 estimated AADT of 11,232 for Segment 1 and between approximately 19,000 and 23,000 for Segment 2. These counts are summarized in Figure 22.

2025 Level of Service (LOS)

The LOS at intersections in 2025 are expected to decline as volumes increase through the corridor. The unsignalized intersections' LOS remains at "F", with a much higher delay. For example, Boone Ridge Road in 2018 AM experienced a delay of 317.5 seconds. This delay is projected to increase to 4951.8 seconds in 2025. Signalized intersections are projected to experience LOS issues with the increase in volumes as well. LOS during the morning peak at Christian Church Road and I-26 is anticipated to be a "C", and the evening peak hour is anticipated to operate at an LOS of "D". Table 10 and Table 11 show projected intersection performance for intersections analyzed through Synchro, and Figure 23 shows segment level anticipated LOS as included in the MTPO's TDM.

[10] TDOT Count Station 181 was used to approximate volumes along Segment 1. 2019 traffic data was not available at the time analysis was conducted.

Figure 22. 2025 AADT

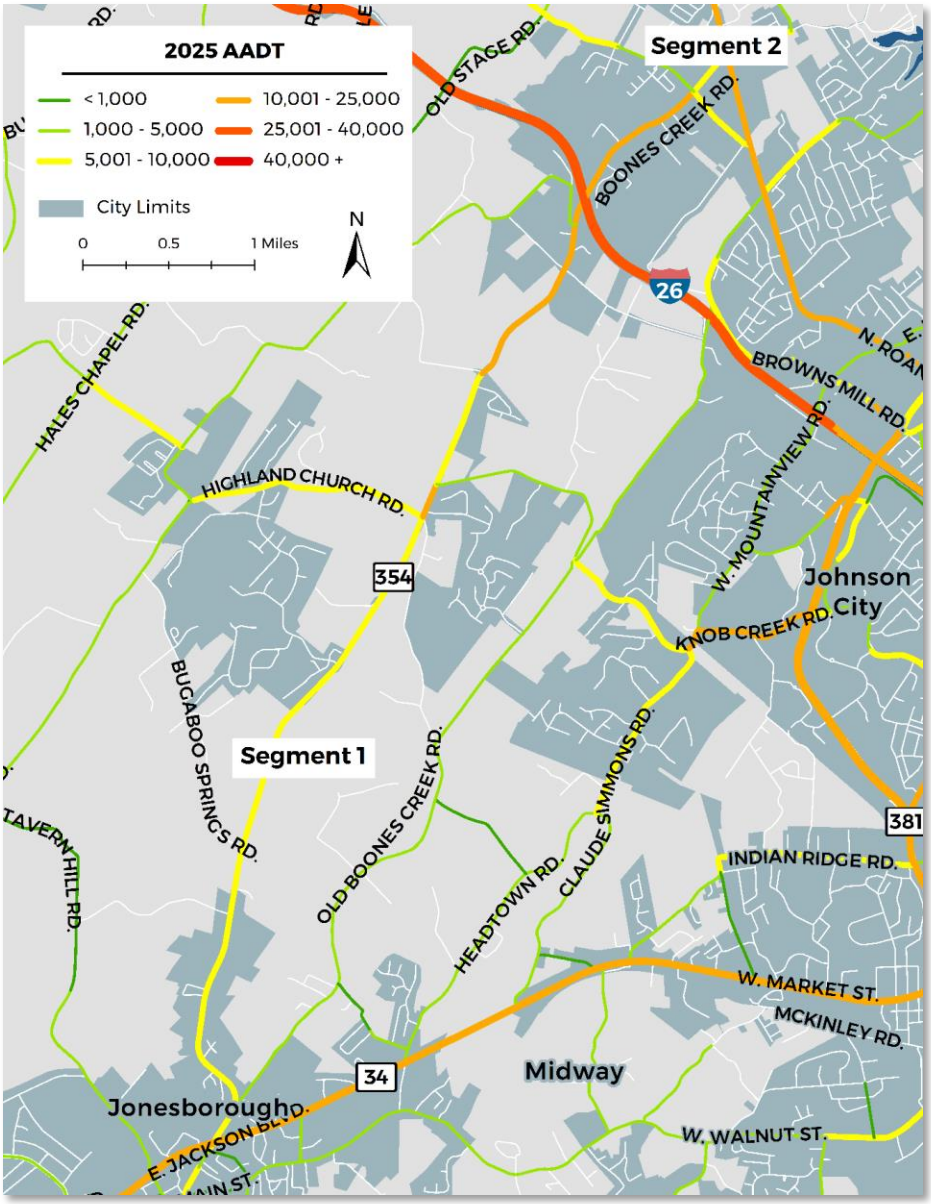


Table 10. 2025 AM LOS

Scenario	Intersection Name	Traffic Control	Delay (s)	LOS
2025 AM	Christian Church Rd	Signalization	22.3	C
	Pinnacle Dr	Two-Way Stop Control	-	F
	Orr Ct	Two-Way Stop Control	174.8	F
	Lake Park Dr	Two-Way Stop Control	-	F
	I-26 DDI	Signalization	27.8	C
	Young Property Ent	Two-Way Stop Control	-	F
	Boone Ridge Dr	Two-Way Stop Control	-	F

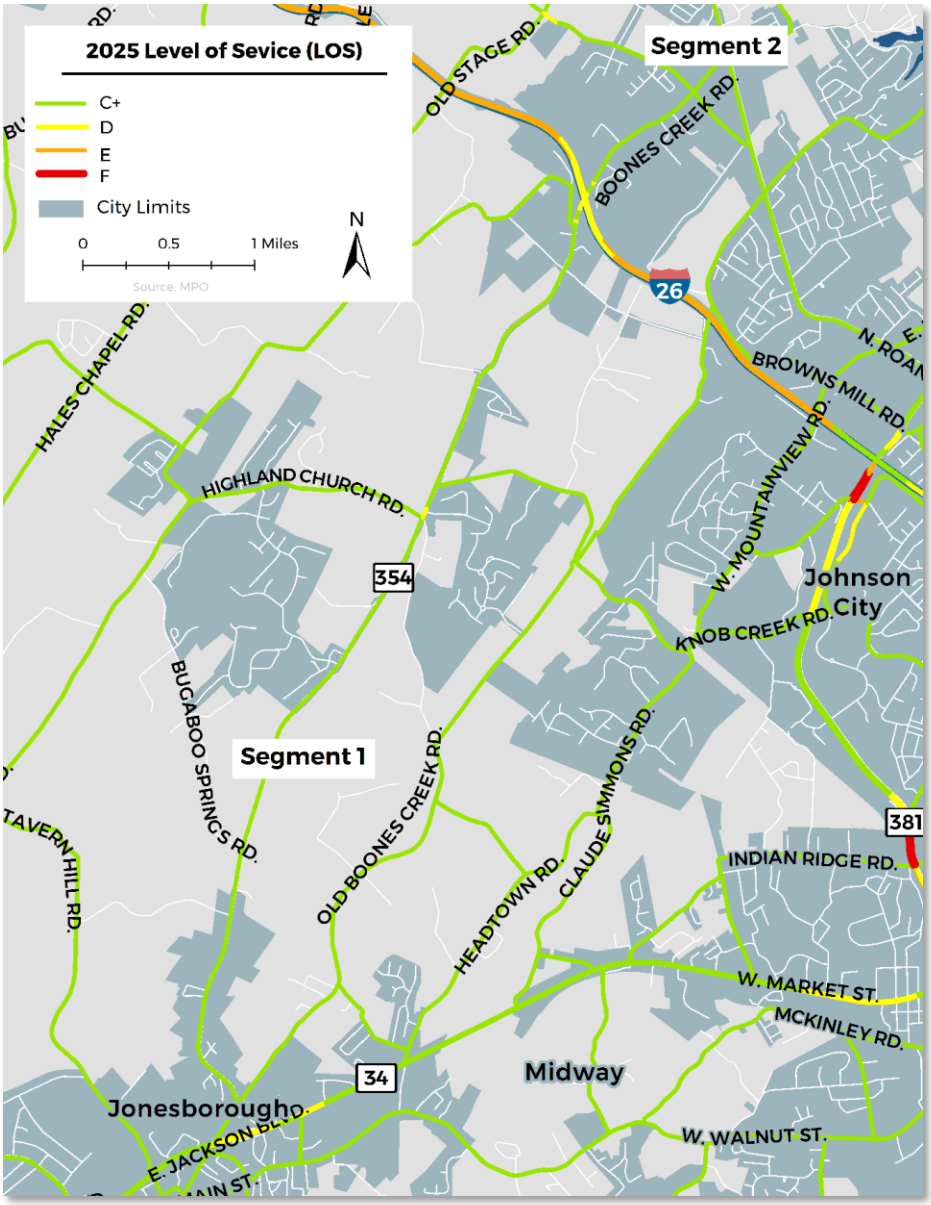
**Delays notated by a dash ("-") exceed 300 seconds; any additional delay over 300 seconds is irrelevant and indicates a need for operational changes at the intersection.*

Table 11. 2025 PM LOS

Scenario	Intersection Name	Traffic Control	Delay (s)	LOS
2025 PM	Christian Church Rd	Signalization	54.6	D
	Pinnacle Dr	Two-Way Stop Control	-	F
	Orr Ct	Two-Way Stop Control	-	F
	Lake Park Dr	Two-Way Stop Control	-	F
	I-26 DDI	Signalization	41.8	D
	Young Property Ent	Two-Way Stop Control	-	F
	Boone Ridge Dr	Two-Way Stop Control	-	F

**Delays notated by a dash ("-") exceed 300 seconds; any additional delay over 300 seconds is irrelevant and indicates a need for operational changes at the intersection.*

Figure 23: 2025 LOS



2045 AADT

The growth rates indicated in Section 2.1.1 were also applied to 2045. In 2045, Segment 1 is projected to have an AADT of 14,800. In Segment 2, the AADT is projected to exceed 30,000 to the south of interchange and nearly 25,000 to the north. See Figure 24 for anticipated AADT.

2045 Level of Service (LOS)

Without new improvements, level of service for 2045 for all analyzed intersections is anticipated to be "F", with the exception of Christian Church Road. For Christian Church Road, 2045 AM scenario returned a LOS of "E". The delays at the two-way stop-controlled intersections are extreme to a point where Synchro returned errors for most intersections. Improvements will be necessary at all seven intersections to manage the significant increase in traffic volumes by 2045. Table 12 and Table 13 show intersection performance for intersections analyzed through Synchro, while Figure 25 shows segment level anticipated LOS as included in the MTPO's TDM.

Figure 24. 2045 AADT

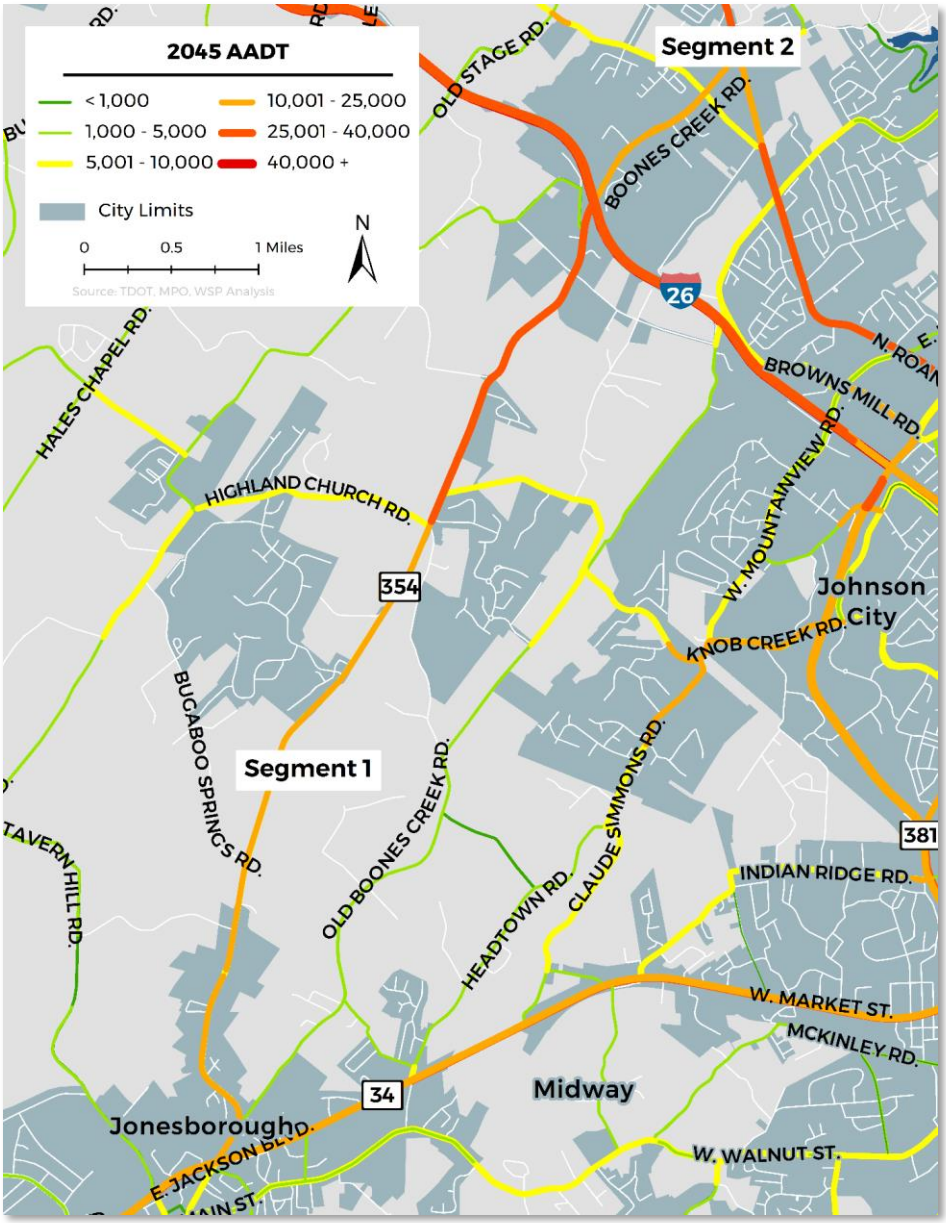


Table 12. 2045 AM LOS

Scenario	Intersection Name	Traffic Control	Delay (s)	LOS
2045 AM	Christian Church Rd	Signalization	59.3	E
	Pinnacle Dr	Two-Way Stop Control	-	F
	Orr Ct	Two-Way Stop Control	-	F
	Lake Park Dr	Two-Way Stop Control	-	F
	I-26 DDI	Signalization	97.6	F
	Young Property Ent	Two-Way Stop Control	-	F
	Boone Ridge Dr	Two-Way Stop Control	-	F

**Delays notated by a dash ("-") exceed 300 seconds; any additional delay over 300 seconds is irrelevant and indicates a need for operational changes at the intersection.*

Table 13. 2045 PM LOS

Scenario	Intersection Name	Traffic Control	Delay (s)	LOS
2045 PM	Christian Church Rd	Signalization	138.8	F
	Pinnacle Dr	Two-Way Stop Control	-	F
	Orr Ct	Two-Way Stop Control	-	F
	Lake Park Dr	Two-Way Stop Control	-	F
	I-26 DDI	Signalization	158.9	F
	Young Property Ent	Two-Way Stop Control	-	F
	Boone Ridge Dr	Two-Way Stop Control	-	F

**Delays notated by a dash ("-") exceed 300 seconds; any additional delay over 300 seconds is irrelevant and indicates a need for operational changes at the intersection.*

[continued on next page]

Figure 25: 2045 LOS

Figures 26 through 31 show the existing and anticipated future LOS for each modeled intersection's turning movement. A finer grained measure than LOS for the overall intersection, turning movement analysis shows the precise approach(es) contributing to delays and allows for more specific recommendations when seeking to remediate intersection congestion. LOS was calculated for each turning movement within the intersections in all cases except the DDI at Boones Creek and I-26. According to the Highway Capacity Manual 6th Edition (HCM 6), an LOS for each movement within a DDI does not accurately capture the vehicle movements; it is instead a more accurate depiction to report the LOS for the DDI as a whole.

Figure 26: Christian Church Road–Turning Movement Level of Service

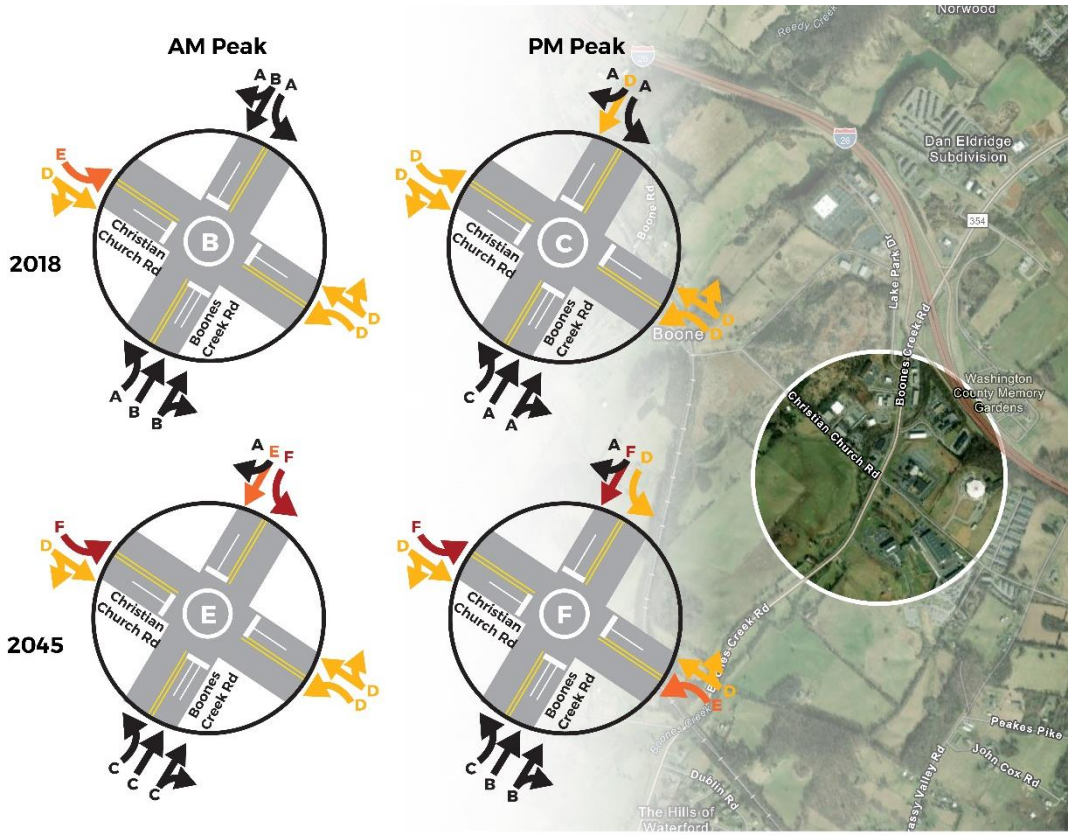


Figure 27: Pinnacle Drive–Turning Movement Level of Service

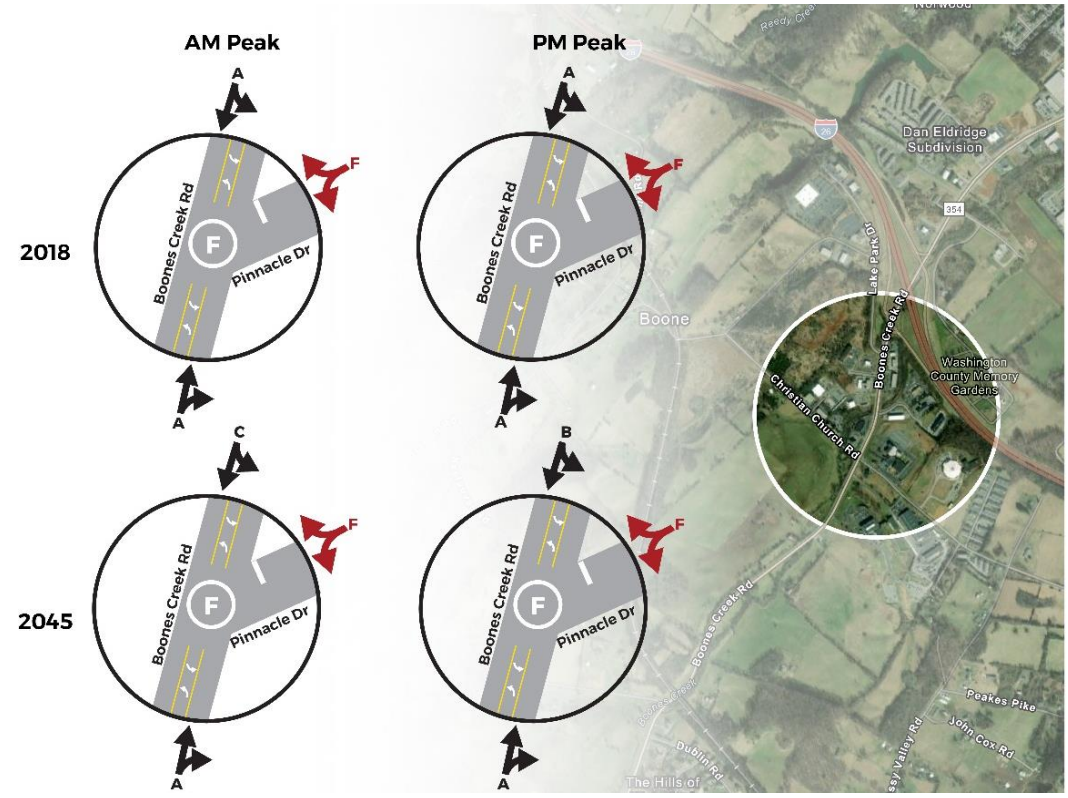


Figure 28: Orr Court–Turning Movement Level of Service

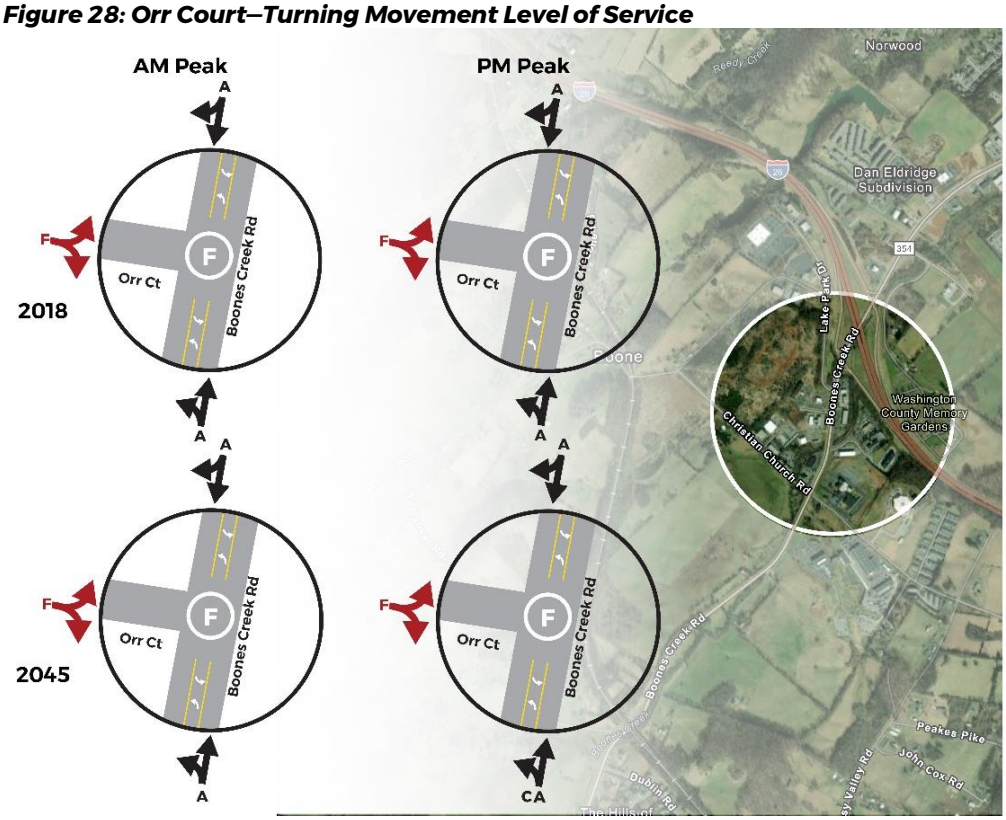


Figure 29: Lake Park Drive–Turning Movement Level of Service

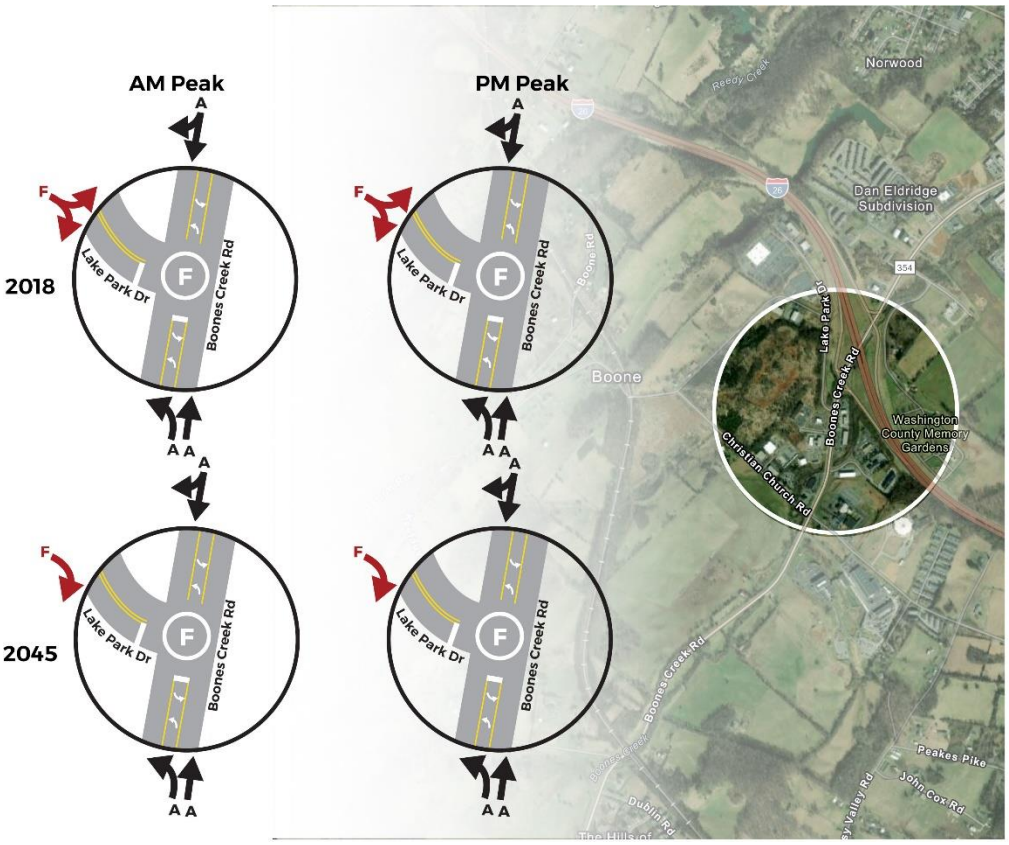


Figure 30: Young Property–Turning Movement Level of Service

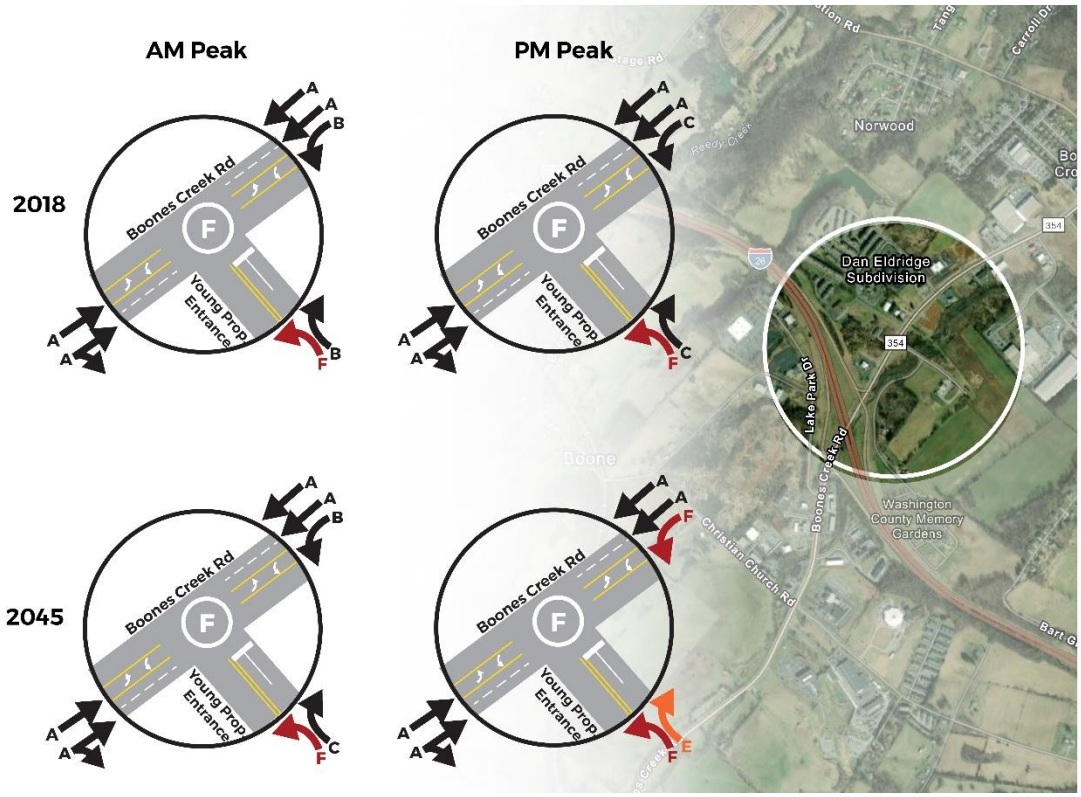
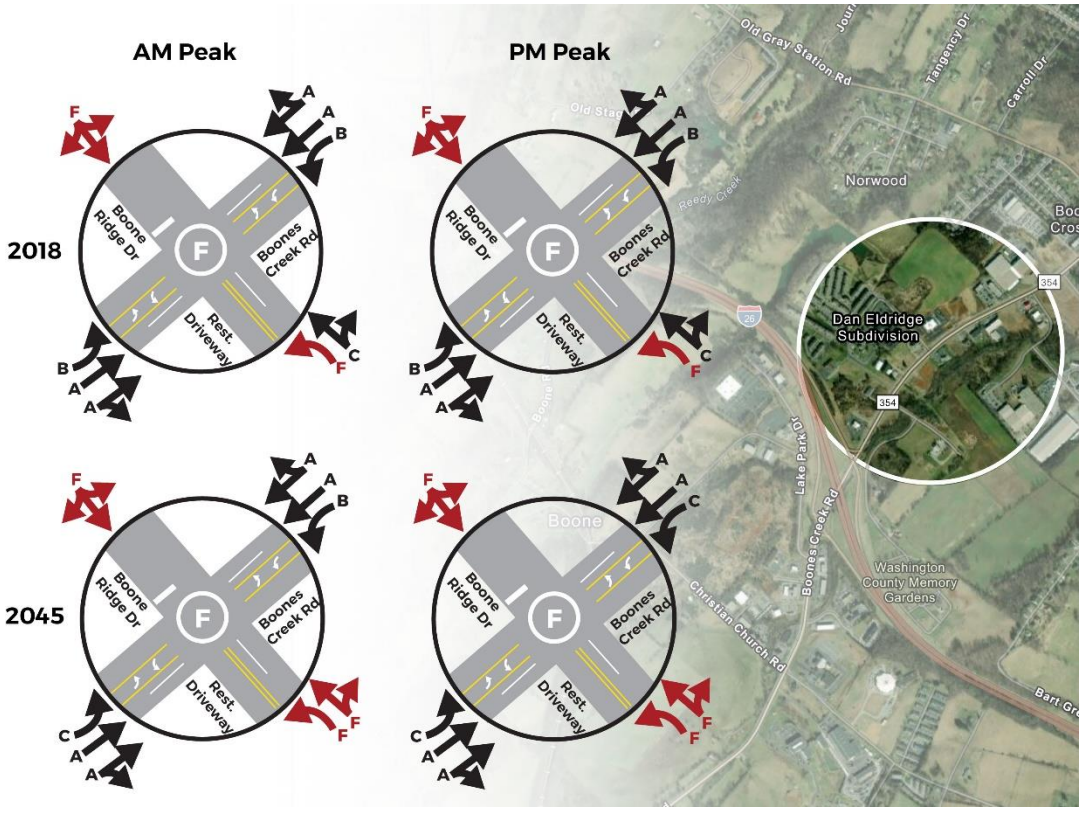


Figure 31: Boone Ridge Drive–Turning Movement Level of Service



Impact of Key Projects

Impacts from I-26 Interchange Reconstruction

Impacts from the I-26 interchange reconstruction on traffic operations along the Boones Creek Road (SR 354) corridor were measured through analyzing the MTPO's travel demand model (TDM). The 2015 TDM prior to the interchange reconstruction was modified to include the newly constructed diverging diamond interchange. These outputs were then compared to determine the impacts from the reconstruction. From this comparison, the number of trips generated along the corridor increased steadily between 2015 and 2045, but the average congestion along the corridor remained consistent. However, level of service (LOS) along Boones Creek Road (SR 354) is expected to decline to LOS F near the I-26 interchange by 2045. In the base year of 2015, Segments 1 and 2 had an LOS of C+, as shown in Figure 23. Although this LOS is projected to remain consistent through 2025, the LOS for Segment 2 is projected to decline to D and E by 2045, as shown in Figure 25. This is likely due to the increased activity and development that the newly reconstructed I-26 interchange will bring to the study corridor and the expected increase in traffic volumes by 2045.

Figure 32. Newly Constructed Diverging Diamond Interchange on I-26 at Exit 17

Impacts from Knob Creek Road Reconstruction

The Knob Creek Road reconstruction project is expected to relieve traffic congestion that is generated from the single lane tunnel by constructing a five-lane roadway and flyover bridge over the existing railroad tracks. The existing tunnel goes underneath the railroad tracks and is located along Knob Creek Road near the intersection at Claude Simmons Road, approximately 2 miles east of Boones Creek Road. This road is heavily used by commuters, and the project is expected to improve the level of service near the area. The Knob Creek Road Expansion project will reconstruct the existing two-lane road from Boones Creek Road (SR 354) to Mizpah Hills Drive. Further, this project will open up the development potential along Knob Creek Road that has been limited due to the congestion in that area.[11] This project is in the MTPO's TIP with funding for preliminary engineering programmed for 2023.

[11] "*Johnson City commissioners dampen expectations for breaking ground on Knob Creek Road project*", Johnson City Press, March 21, 2018, https://www.johnsoncitypress.com/news/johnson-city-commissioners-dampen-expectations-for-breaking-ground-on-knob-creek-road-project/article_1a6e02d2-2089-5096-8b5a-7549de00bd82.html.

Key Findings

High level findings and observations are summarized below.

SEGMENT 1
KEY OBSERVATIONS
❖ Several driveways are too close for safe and efficient traffic operations. ❖ Sidewalks are not present throughout this segment. ❖ Multimodal improvements may be considered such as pedestrian crossings, sidewalks, detectable warning surfaces, buffered bicycle lanes, and connections to greenways. ❖ Segment level of service is projected to remain at C+ through 2045. ❖ 2020 AADT is 8,118 in this segment, and is projected to increase to 14,800 by 2045.
SEGMENT 2
KEY OBSERVATIONS
❖ This segment had more than double the number of crashes per mile compared to Segment 1. ❖ Paved sidewalks run along the segment but lack detectable warning surfaces and pedestrian crossing signals at signalized intersections. ❖ Level of service at unsignalized intersections in this segment is anticipated to be "F" by 2045, with delay projected to significantly increase as well. ❖ Level of service at Christian Church Road is projected to degrade from "B" to "E". ❖ Level of service at the I-26 interchange is projected to degrade from "C" to "F". ❖ 2020 AADT ranges between 17,000 and 21,000 in this segment, and is projected to increase to 30,204 to the south of the I-26 interchange and 24,533 to the north of the interchange. ❖ A coordinated signal system may be considered between Christian Church Road, Old Gray Station Road, and North Roan Street (SR 36).

Potential Needs and Deficiencies

Based on the assessment of the existing transportation conditions along the corridor, the project team identified potential transportation needs and deficiencies within the study area.

Traffic Operations

The unsignalized intersections at Lake Park Drive, Pinnacle Drive, Orr Court, Boones Ridge Road, and Young Property Entrance all have a LOS of "F" and may require improvements. Although the signalized intersections at Christian Church Road and I-26 interchange have sufficient levels of service of "B" and "C" currently, they are unlikely to manage an increase in traffic volumes anticipated by 2045. The LOS tables for 2025 and 2045 can be seen in Table 10 through Table 13.

Access Management

A number of driveways and unsignalized intersections in the corridor are not currently in compliance with the minimum spacing guidelines in the TDOT *Highway System Access Manual (HSAM)*. Current spacing may become increasingly debilitating to traffic operations and safety as traffic volumes continue to increase. The two-way left-turn lane (TWLTL) may be extended to service more segments of the

corridor, especially between Christian Church Road and the I-26 interchange in Segment 2. A non-traversable median may also be recommended by the HSAM when traffic volumes start to exceed 17,000 vehicles per day for three-lane sections and 28,000 vehicles per day for five-lane sections, but projected traffic volumes for 2045 do not exceed these volumes.

Active Transportation Facilities

Segment 1 - Current bike lanes are unbuffered and directly adjacent to the vehicle lane with a speed limit that reaches 50 mph in some areas. This may present a dangerous speed differential between bicyclists and vehicles traveling in close proximity. The addition of a buffer zone to further separate the bicycle lane from the vehicle travel lane could reduce this proximity between mixed travel speeds and increase safety for bicyclists. Addressing the safety through reduction of conflicts between the modes could also promote greater bicycle usage in the area.

There is a potential need for increased sidewalk provision along this segment as well as other pedestrian facilities that would enhance pedestrian accessibility. Worn footpaths were observed adjacent to the pavement at various locations, indicating the potential demand for sidewalks and pedestrian facilities as development occurs along the corridor.

A potential area of improvement is developing a trail system along the corridor that connects to and provides connectivity between existing greenways. This project could take advantage of existing funding from TDOT's Multimodal Access Grant (MMAG) while increasing regional connectivity. The MMAG could also be used to improve off-road bicycle and pedestrian paths.

Segment 2 - This segment lacks adequate bicycle facilities for much of its length. Boones Creek Road (SR 354) widens from three lanes to five lanes, increasing the risk for high-speed traffic directly adjacent to bicyclists traveling along this segment. Potential countermeasures that could be implemented include widening bicycle lanes to five feet and creating a buffer zone to provide further separation between vehicular traffic and bicyclists. Bicycle lane markings could also be extended through intersections, and bicycle-vehicle conflict zones could be called out with dedicated signage and pavement markings.

Pedestrian facilities would benefit from an increase in marked crossings that meet ADA standards. These include crosswalk markings and ADA compliant ramps with detectable warning surfaces at the intersections and driveways. Pedestrian poles and crossing signals may be installed at signalized intersections to facilitate driver expectancy of a potential conflict and safer passage for pedestrians.

Similar to Segment 1, the MMAG opens up possibilities for multimodal improvements in Segment 2 as well. Developing multi-use trails may also present an efficient way to improve pedestrian and bicycle facilities.

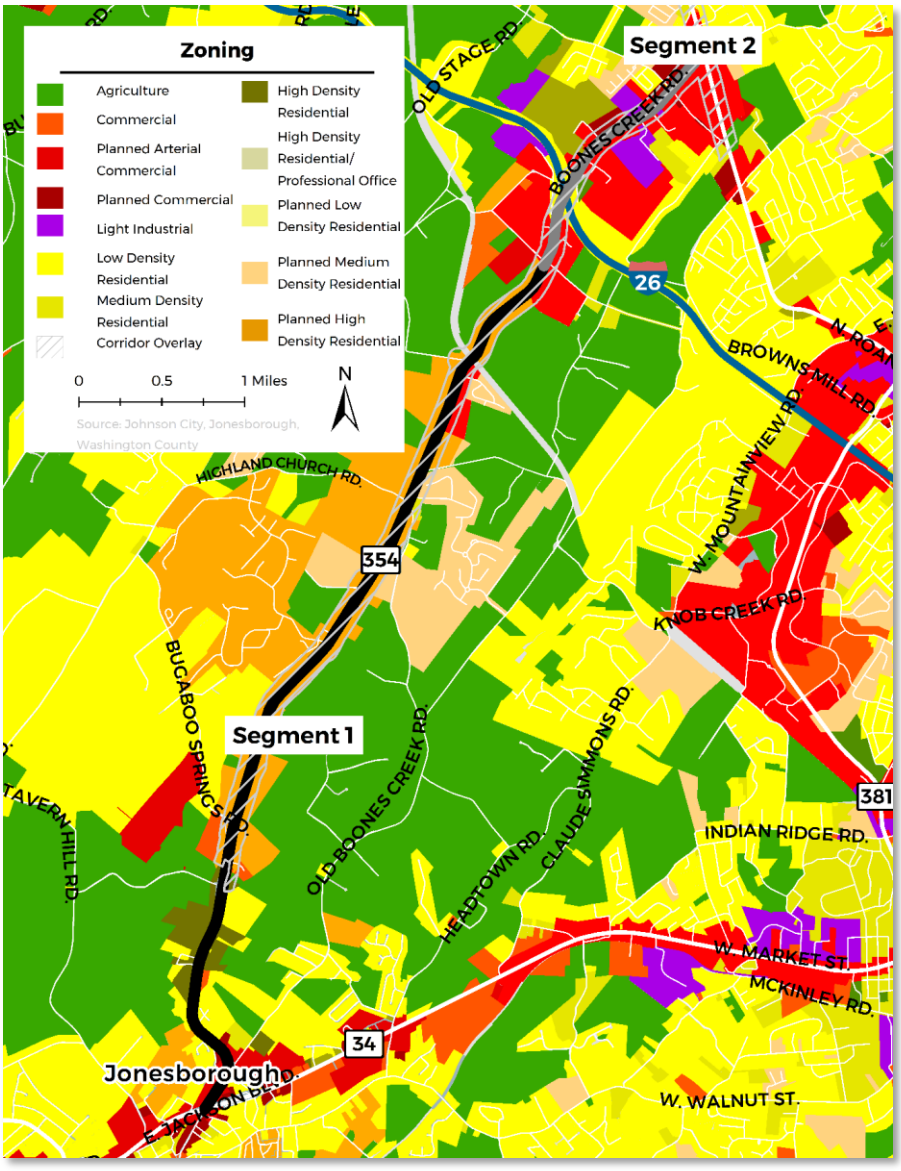
Any recommended multimodal improvements will need to comply with TDOT's *Multimodal Roadway Design Guidelines*, most recently revised in August 2021.

4. Land Use and Development Conditions

Development in the corridor is managed by three different local governments: Johnson City, Jonesborough, and Washington County. Each jurisdiction has adopted zoning to regulate land uses and building placement within its respective jurisdictional boundaries. Each jurisdiction has also adopted subdivision regulations to organize the division of land, and to govern the platting and land division process.

Although each jurisdiction maintains separate, distinct zoning ordinances and zoning maps, it is possible to generalize zoning categories across the corridor. The pattern is fairly typical in that the areas within municipal boundaries (Johnson City and Jonesborough) contain a wider mix of residential and non-residential zoning districts. Areas in unincorporated Washington County are primarily zoned for agricultural and low density residential uses.

Figure 33. Corridor Zoning



Zoning

Local municipalities and counties have a level of control over land use patterns through local zoning ordinances and resolutions, also referred to as a zoning code. A zoning code is a legal document that designates how specific geographic areas can be used; different zones permit

different types of land use and development densities. Some zones may permit only industrial uses, some may permit only residential, and other zones may allow a combination of different land uses, such as residential and commercial. A municipality can pass a local law to amend its zoning ordinance to encourage particular types of development. For example, a city seeking additional commercial development may change its zoning code to permit higher commercial densities in a particular area. Likewise, a city may determine that a zone that only permits commercial use may also permit residential uses.

The Johnson City zoning code establishes zoning districts within the limits of the City.[12] The code is meant to regulate the location, height, bulk, number of stories, and size of buildings, the percentage of lot occupancy, required open space, and residential density. This code prescribes residential, commercial, industrial, and historic and conservation land uses and includes design overlay districts that govern the design of structures regardless of use.

The Town of Jonesborough zoning code establishes zoning districts within the Town. The code is meant to guide and accomplish coordinated development. This code also has a section that governs land use in floodplains with the purpose of minimizing the effects of flooding on development.[13]

The Washington County zoning code establishes zoning districts within the unincorporated territory in all of Washington County. The purposes of this ordinance include promoting public safety, lessening congestion, preventing the overcrowding of land, and facilitating the provisions of public utilities. This code also has a flood damage prevention section to minimize danger to life and property due to flooding.[14]

Corridor Zoning

The zoning along Segment 1 includes agricultural, planned high density residential, commercial, high density residential, high density residential/professional office, low density residential, and planned low density residential (Figure 33). Planned residential districts differ from traditional residential districts in their added objective to encourage more imaginative solutions to environmental design problems and the promotion of open space and unified building and site development. The zoning along Segment 2 includes commercial, light industrial, low density residential, and high density residential.

General characteristics of the zoning districts within the study area are outlined below.

- **Low-Density Residential:** The purpose of this district is to establish low-density residential areas. Permitted uses include single-family residences, public utility stations, government buildings or land uses, cemeteries, publicly owned recreational facilities, and general farming, not including the raising of farm animals.
- **Medium-Density Residential:** The purpose of this district is to establish medium-density residential areas separate from other uses. Permitted uses include single-family, two-family, and multi-family residences, boarding or rooming houses, churches with parish houses and Sunday school buildings, childcare facilities, mortuary establishments, and emergency shelters.

[12] Zoning Code of the City of Johnson City, Tennessee, https://library.municode.com/tn/johnson_city/codes/zoning?nodeId= ZOCOJOTE.
[13] The Jonesborough Municipal Code, https://www.mtas.tennessee.edu/system/files/codes/combined/Jonesborough-code.pdf.
[14] Zoning Resolution of Washington County, Tennessee, https://www.washingtoncountytn.org/DocumentCenter/View/119/ Washington-County-Zoning-Resolution-PDF.

- **High-Density Residential:** The purpose of the district is to establish high-density residential areas along arterial or collector streets. Permitted uses include those allowed in low and medium density residential, along with schools, golf courses, and nursing homes.
- **Planned Residential:** The purpose of this district is to provide optional methods of land development which encourage more imaginative solutions to environmental design problems. Permitted uses include single, two, and multi-family residences, public uses, and recreational uses.
- **High-Density Residential/Professional Office**: The purpose of this district is to establish an area that allows residential and some types of commercial development. Permitted uses include single, two, and multi-family residences, day-care centers, churches, public utility stations, schools, libraries, clinics, banks, and office buildings.
- **Commercial:** The purpose of this district is to establish an area that promotes uses which are compatible with downtown uses, the urban core, or neighborhood business districts. Permitted uses include but are not limited to banks, hotels, government buildings, pharmacies, schools, and hospitals.
- **Planned Commercial and Arterial Commercial:** The purpose of these districts is to encourage a unified development approach along the major highway corridors that caters specifically to motor-vehicle-oriented trades and services and to provide for selected community retail sales, service, office, and public use establishments so that there is no adverse impact on the areas existing character. Permitted uses include but are not limited to amusements and recreation, bus terminals, churches, clinics, financial institutions, and government buildings.
- **Light Industrial**: The Light Industrial District is designed to accommodate wholesale, warehouse, storage, research and development, and manufacturing activities whose external effects are restricted to the site and have no detrimental effects on the surrounding area. Permitted uses include bottling works, carpenters' shops, clinics, building materials yards, equipment rental establishments, parking lots and garages, research laboratories, vehicular sales, and warehouses.
- **Agricultural:** This district is intended to provide space for agricultural and similar rural uses and activities. A second intent is to conserve the city's active farms, agricultural lands, and other rural areas until urban development occurs, and the appropriate zoning changes are made. Permitted uses include raising of crops, raising of animals, agricultural industries, churches, day care centers, fairgrounds, golf courses, public uses, and single-family residences.

Boones Creek Overlay

Several prominent corridors in Johnson City, including Bristol Highway, North Roan Street/Kingsport Highway, and Boones Creek Road are part of a Corridor Overlay District that establishes higher environmental, aesthetic, and design standards for properties visible from designated roadways, as outlined in Article 6, Section 28 of Johnson City's Zoning Code.[15] Washington County's Zoning Resolution also includes a Corridor Overlay District under Section 622 of their zoning ordinance.[16] Much of the corridor is subject to either the City or County overlay with Johnson City's overlay governing

[15] Section 28, Article VI, Zoning Code of the City of Johnson City, Tennessee, https://library.municode.com/tn/johnson_city/codes/zoning?nodeId=ZOCO_ARTVIUSREDI_6.28COCOOVDI.

[16] Section 622 CO – Corridor Overlay District, https://www.washingtoncountytn.org/DocumentCenter/View/145/Corridor-Overlay-District-PDF

portions of the corridor within City boundaries, extending south to the southern end of the Ridges residential development and south of Ridges Club Drive. Washington County's overlay district governs from here to Hales Road. Language regarding the corridor overlay is similar between the City and County, with some adjustments specific to each jurisdiction. The district extends 300 feet on both sides of Boones Creek Road (SR 354), and its requirements apply regardless of a parcel's zoning district, in addition to the standards of the underlying zoning regulations. Any developments within the geographic limits of the district are subject to development standards governing permissible uses, building facades, lighting, signage, and placement of utilities. For example, all new utility lines, including, but not limited to, electric, telephone, and TV cable, shall be placed underground (with exception for electric power lines in excess of 100 amp, three phase, 2500 KVA, which may be placed aboveground).[17]

Tourism Development District

The northern segment of the corridor, north of the CSX railroad trestle and extending north beyond I- 26, is home to a Regional Retail and Tourism Development District, permissible through the State of Tennessee's Regional Retail Tourism Development District Act.[18] The Act, written specifically for Exit 17 of I-26, allows municipalities in which the districts exist to receive the apportionment of state sales and use taxes from the incremental growth of the sales tax dollars generated by the property included in the district. A local ordinance approving the district was approved in 2020. Rebate funds may be used for infrastructure improvements in the area and as incentive funds for developments in the district.

Existing Land Use

While zoning information provides details on the permissible uses and policies governing property along the corridor, land use data provides additional details regarding the current use of property. Land use shows what the existing character of a community is and allows people to determine whether the character of their community should change to better fit their needs and goals.

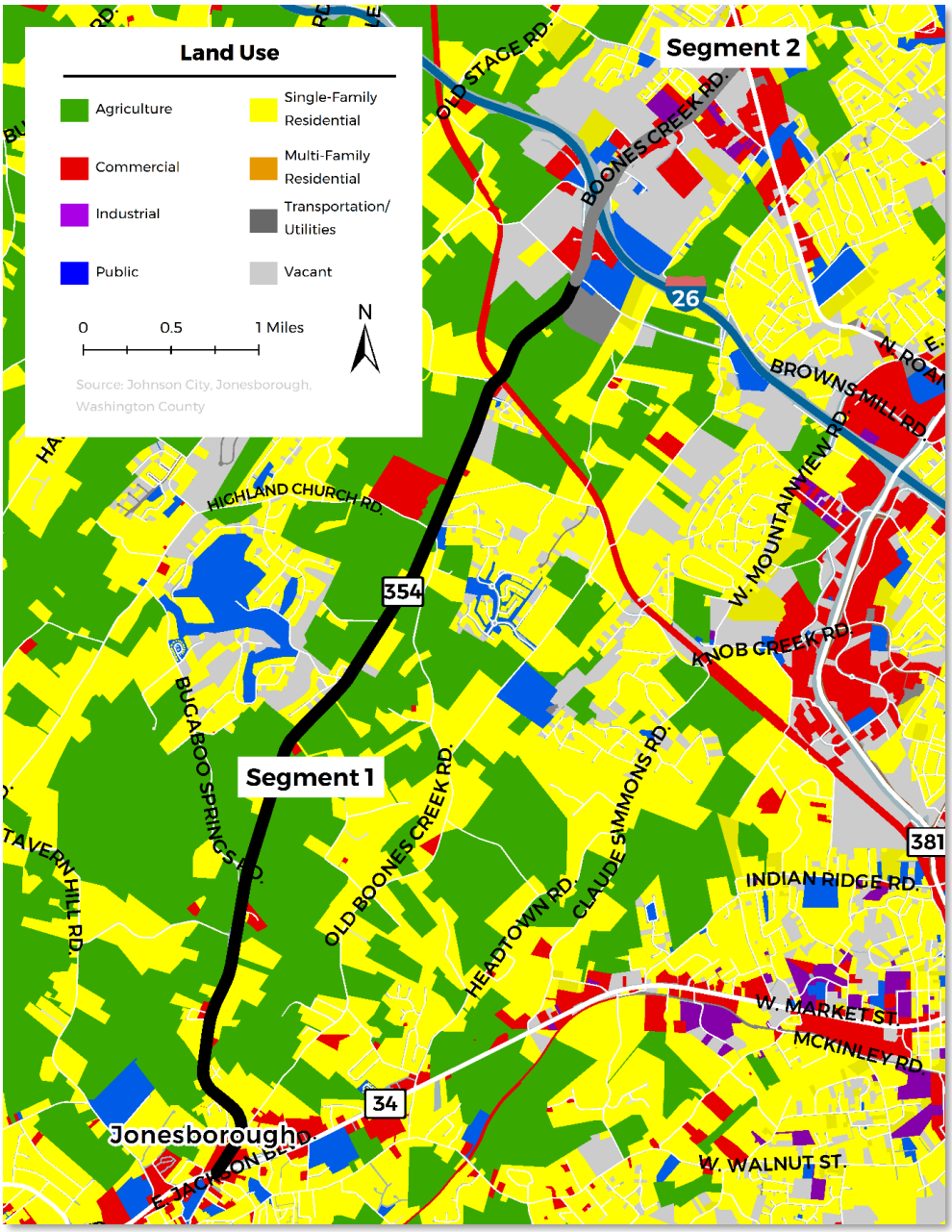
The land use along Segment 1 is characterized by commercial uses at the southern terminus, with residential and agricultural uses throughout the remainder of the segment. Residential land uses dominate the central section of Segment 1 with a few agricultural and public lands at Highland Church Road, including Boones Creek Elementary School which opened in 2019. Property near the Boones Creek Road intersection with Highland Church Road also includes planned residential communities, including the Ridges on the western side of the road. The northern end of Segment 1 consists of residential, agricultural, and utility land uses. This includes a recycling drop-off facility, BrightRidge Electric Company south of Christian Church Road, and churches, hotels, and food services north of Christian Church Road. The land adjacent to Segment 2 is predominantly public and commercial, with a significant amount of currently vacant property. Several properties located both north and south of the I-26 interchange are currently vacant, however are projected to grow by 2045, based on data provided as part of the MTPO's TDM. See Figure 34 for additional details.

Existing differences between approved zoning and existing land use create development opportunities along the corridor. These include:

[17] Present in Johnson City Zoning Code only.
[18] Tennessee Code Annotated, Title 7, Chapter 41, Tenn. Code Ann. § 7-41-101.

- Commercial and mixed-use expansion north of I-26 that is currently vacant land.
- Commercial and mixed-use expansion between I-26 and the CSX railroad trestle that is currently vacant and single-family land uses.
- High-density residential development west of Boones Creek Road (SR 354) to the north of Historic Downtown Jonesborough, that is currently a mix of single family residential and commercial.

Figure 34. Land Use



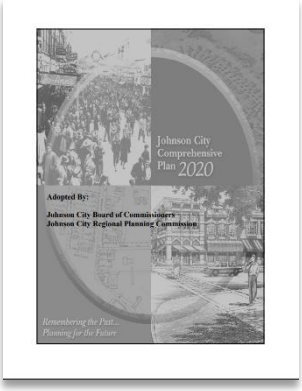
Prominent Destinations

Prominent destinations along the corridor are concentrated at the northern and southern termini and are summarized in the bullets below. See Figure 12 in Chapter 3.

- The I-26 commercial area with destinations north and south of I-26, including hotels, food services, financial institutions, churches, and public institutions.
- Historic Downtown Jonesborough at the southern end of the corridor. Destinations in Downtown Jonesborough include restaurants, financial institutions, governmental institutions, retail stores, historic sites, public parks, hotels, churches, and museums. Jonesborough is also home to several festivals and events throughout the year, including Jonesborough Days Parade and the National Storytelling Festival.
- Boones Creek Elementary School is located along the northern section of Segment 1 of the Boones Creek Road Corridor at Highland Church Road. This school includes grades K-8 and more than 800 enrolled students as of 2020.[19]

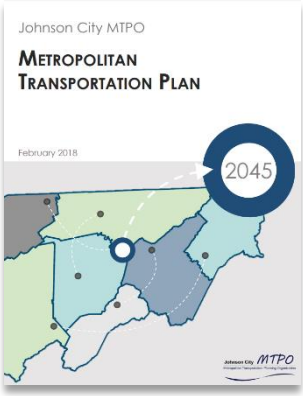
Existing Plans and Policies

Johnson City Comprehensive Plan 2020



The Johnson City Comprehensive Plan 2020 outlines a comprehensive vision for development in Johnson City through 2020. Although this plan's horizon year has passed, it is still valuable to assess if the goals of this plan were met. In 2020, Johnson City adopted a Bridge Plan that carries forward all relevant policies from the Comprehensive Plan until a time when a complete Comprehensive Plan update can take place; a full update was delayed due to the COVID-19 pandemic and delays to the 2020 Census. Some of the recommendations from the Johnson City Comprehensive Plan 2020 that are still applicable include:

- Johnson City should use annexation to "'fill in' developed and developing areas within the Urban Service Area where providing services is cost effective" in the Boones Creek Road/Old Gray Station Road area, among others.
- Create a connection between Jonesborough and Johnson City via Boones Creek Road.
- Support beautification projects that enhance gateways into Johnson City on Boones Creek Road.



Johnson City MTPO Metropolitan Transportation Plan (MTP)

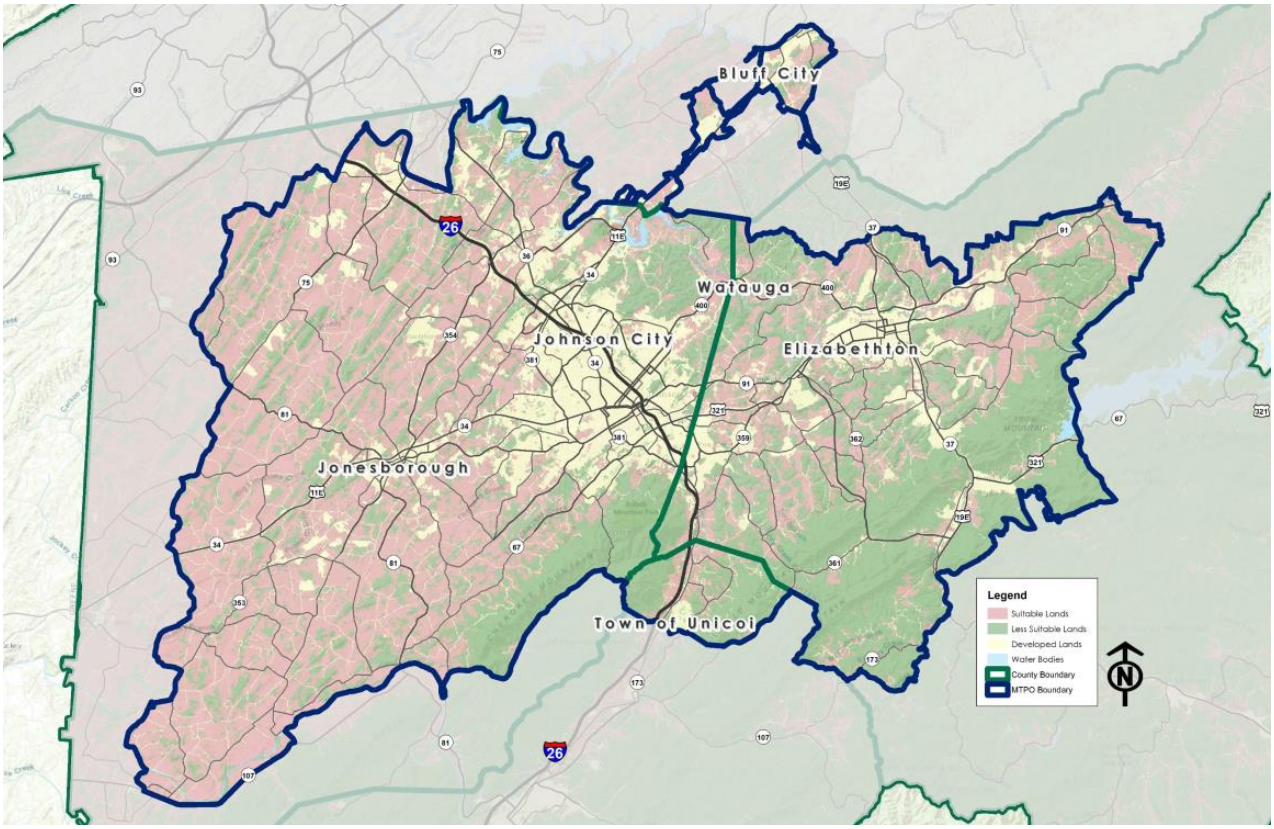
The Johnson City MTPO Metropolitan Transportation Plan (MTP) was completed in 2018 and serves as the long-range transportation plan for the federally-designated Metropolitan Planning Organization (MPO) of the Johnson City region. The MTP has a horizon year of 2045 and provides a blueprint for transportation investments that are multimodal and developed in coordination with state and local partner agencies. The plan describes

[19] National Center for Education Statistics

future employment concentrations along I-26, including at the newly constructed DDI at Boones Creek Road (SR 354). Specific investments included as part of the MTP are included in a later section and described in Chapter 2. Corridor Overview.

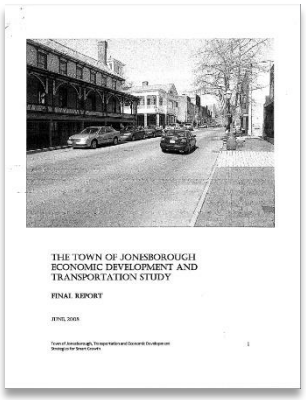
The plan also conducted a suitability analysis of the Metropolitan Planning Area (MPA). The results of this analysis are shown in Figure 35**,** and concluded that most of the land that is directly adjacent to the Boones Creek Road Corridor is suitable for development.

Figure 35. MTPO Land Suitability Analysis



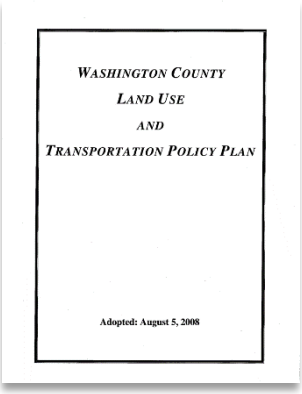
Source : Johnson City MTPO 2045 Metropolitan Transportation Plan

Jonesborough Economic Development and Transportation Study



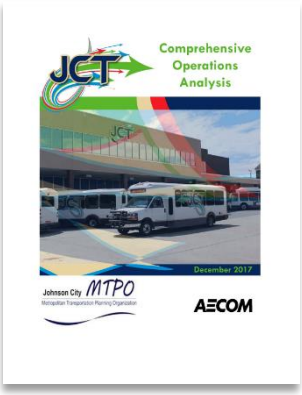
The Town of Jonesborough Economic Development and Transportation Study was completed in 2008 and provides strategies for smart growth and economic and community development. Some of the goals outlined in the plan include context sensitive solutions and design, enhanced small town character, and diversified economic development. The plan states that these goals can be met through creating gateways into the downtown area, promoting higher density residential development, implementing density bonuses, creating a vacant property inventory, developing a unifying streetscape, encouraging a mix of land uses, and providing a variety of transportation choices. Recommendations included in the study prioritize coordination with the MTPO and operational improvements at various intersections of US 11E including SR 354/Boones Creek Road.

Washington County Land Use and Transportation Plan



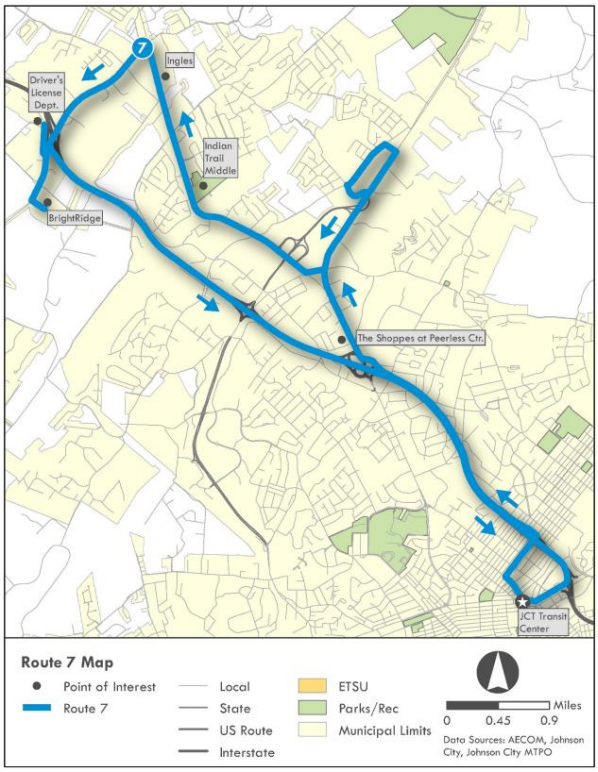
The Washington County Land Use and Transportation Plan was adopted in 2008 and serves as the county's 20-year long-range plan. Many of the goals established in this plan center on managing growth and directing development towards locations with utility availability and capacity. The plan also recommends clustering commercial developments and limiting entrance and exit points as well as locating new commercial shopping centers on frontage or access roads with controlled ingress or egress points. Managed growth has the further advantage of assuring protection and integrity of the surrounding natural environment.

Johnson City Transit Comprehensive Operations Analysis (COA)



In December of 2017, Johnson City Transit (JCT) completed a Comprehensive Operations Analysis (COA) to identify areas where existing service could be more responsive to growing transit needs, and to recommend improvements to meet those needs. One of the recommendations from the COA was to adjust Route 7 to serve Segment 2 of the Boones Creek Corridor Study Area. Figure 36 shows Route 7 that was included in the COA in the context of route efficiency recommendations. Route 7 currently provides service to Brightridge; service improvements were recommended to better serve the Boones Creek area due to the projected increases in employment and population in the area surrounding I-26.

Figure 36. Johnson City Transit Route 7



Development Constraints and Considerations

Recommendations to be included at the culmination of this corridor study must consider environmental and other constraints that may impacts the feasibility or sustainability of various development strategies. Many of these considerations can be found on Figure 37.

Flooding and Topography

Flooding is a major consideration when identifying the risks associated with development and significantly limits opportunities for future development. The Federal Emergency Management Agency (FEMA) develops maps that show areas that are at risk of flooding. There is a 100-year (1%) flood zone inside the corridor study area that encompasses Boones Creek in Segments 1 and 2 and Little Limestone Creek near the southern terminus of the corridor.

Topography is defined as the general configuration of the earth's surface, including slop and geological characteristics. While the Tri-Cities region contains some of the most varied topography in the state, the land suitability analysis conducted by the MTPO and described earlier in this memo demonstrates that much of the SR 354/Boones Creek Road corridor is suitable and may accommodate development.

Historic Sites and Districts

There are two historic sites and a historic district that fall within the Boones Creek Study Area. The Jonesborough historic district is just south of the terminus of Segment 1. The purpose of this district is to preserve historical buildings and sites, protect from uses that would lessen the significance of the surrounding uses, create an aesthetic atmosphere, and strengthen the economy. The Henry Hoss House is located within the study area near the southern terminus of Segment 1 and the Martin Kitzmiller House is located on the northern border of the study area.

Century Farms

Thirty Century Farms are currently located throughout Washington County. While the specific locations of these farms are not available in an effort to maintain the privacy of farm owners, several agricultural properties along the corridor may potentially apply to the Tennessee Century Farms Program at some point in the future. The Century Farms Program was established in 1975 and honors and recognizes dedication and contributions of families who have owned and farmed the same land for at least 100 years. The program offers no legal protection, but is considered a model for rural preservation throughout the state.

Access Management

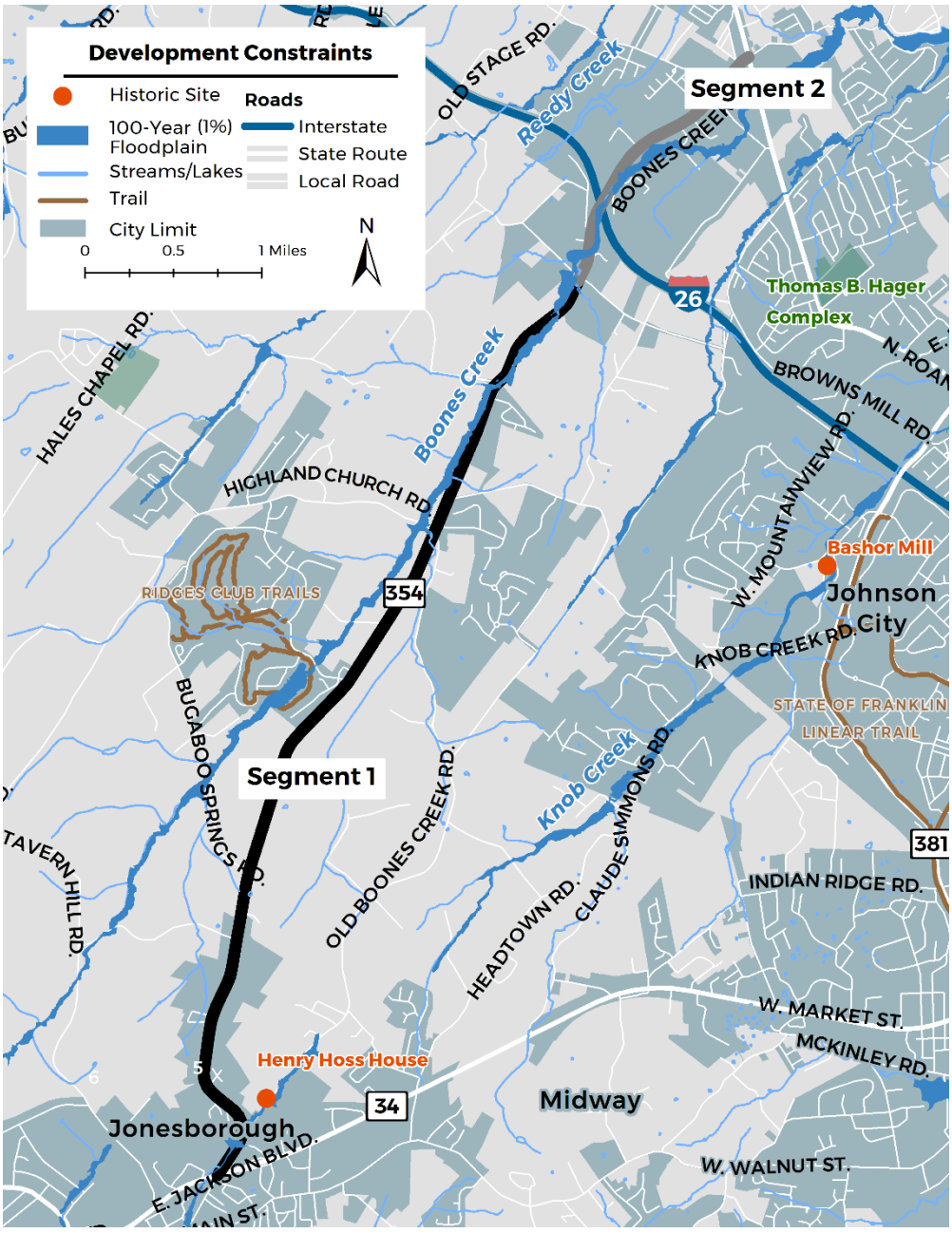
There are a number of driveways along the corridor that serve as access points to single unit homes, residential neighborhoods, and commercial developments. High driveway density can be detrimental to the efficiency and safety of the corridor due to increased frequency of vehicles turning onto and off of the main road. TDOT's Highway System Access Manual (HSAM)[20] provides guidance on the required minimum distances between driveways. Volume One of the HSAM focuses on planning and provides an

[20] TDOTs Highway Safety Access Manual, https://www.tn.gov/tdot/traffic-operations-division/traffic-engineering-office/operations-and-safety/access-manual.html.

overview of best practices for incorporating access management into land development regulations, including an introduction to various planning and regulatory tools through which local jurisdictions may promote access management, such as the establishment of a corridor management agreement. Corridor Management Agreements (CMAs) are multijurisdictional tools that help establish consensus around a unified vision and set of needs for a corridor, and help foster consensus around implementable strategies that maintain an agreed upon character, as well as mobility, safety, and reliability of the roadway.

Additional information on existing driveway spacing along SR 354/Boones Creek Road is available in the previous chapter profiling Existing Transportation Systems and Facilities.

Figure 37. Development Constraints



Key Findings

High level findings are summarized below. The next chapter includes recommendations related to the preferred character and development type along the corridor.

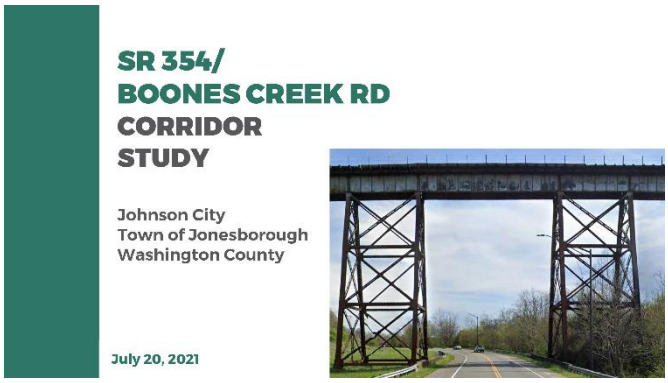
SEGMENT 1
KEY OBSERVATIONS
❖ Existing land use directly adjacent to the corridor is primarily residential and agricultural, and land uses within the broader Segment 1 area include commercial and public land concentrated at the southern terminus of the corridor. ❖ Employment is concentrated around the southern terminus in and near Historic Downtown Jonesborough and is expected to remain as the highest employment center through 2045. ❖ Population and employment density are expected to be low to the west of SR 354/Boones Creek Road. ❖ Zoning along Segment 1 includes low-density residential, agricultural, commercial, planned high-density residential, and high-density residential. ❖ Two potential growth areas have been identified in southern portions of Segment 1, with residential and agricultural uses defining the corridor north of these potential growth areas.
SEGMENT 2
KEY OBSERVATIONS
❖ Existing land use adjacent to the corridor is primarily commercial and vacant land, and land uses within the larger Segment 2 area include light industrial, residential, and public lands. ❖ Employment is concentrated to the north of Interstate 26. Employment growth is expected to be concentrated around the I-26 interchange with SR 354/Boones Creek Road. ❖ Population density is higher along Segment 2 than Segment 1 ❖ Segment 2 is expected to see high population and employment growth by 2045. ❖ Segment 2 is home to a proposed Regional Retail and Tourism Development District, with developments planned for the area. ❖ Zoning along Segment 2 is primarily commercial with some residential in the area. ❖ Much of Segment 2 has been identified as a future growth area that may accommodate a mix of uses including commercial, retail, entertainment, and residential developments.

5. Stakeholder and Public Involvement

Stakeholder Kickoff

The project team held a Stakeholder Kickoff meeting on July 20, 2021 at the Historic Jonesborough Visitors Center. There were 20 participants from stakeholder agencies including the Johnson City Planning Department, Johnson City Public Works, Johnson City Water and Sewer Services, Town of Jonesborough, Johnson City MTPO, Washington County, Regional Planning Commission, and TDOT.

Figure 38. Stakeholder Kickoff Presentation



The Stakeholder Kickoff meeting began with a presentation of the corridor's existing traffic, projections of 2045 congestion, and a review of ongoing or planned projects in the vicinity of the study area. The following discussion focused on key questions:

- What are the development goals for the Boones Creek Road corridor?
- What are the existing transportation needs?
- Where are top safety concerns?

Stakeholders expressed an interest in focusing development at the northern end of corridor near the interstate where a more intense development pattern is already set, and to a lesser extent at the southern end of the corridor within the Town of Jonesborough. The middle portion of corridor is primarily agricultural and residential and should stay this way; future development in this area will likely increase residential density but should not alter the general character. Most importantly, existing sewer and water infrastructure should limit the scope of development to the east and west of Boones Creek Road. A goal of this plan is to funnel development demands to areas of Boones Creek Road where infrastructure already exists and to have a planned approach to development in place for the area between ridgelines.

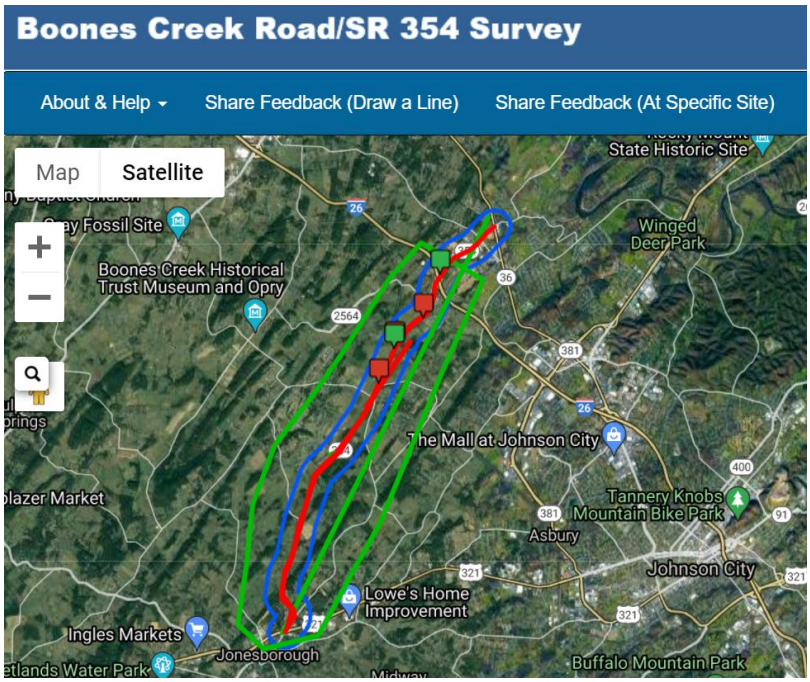
This corridor plan will provide land use recommendations for jurisdictions that they can implement as local policies. To this end, representatives from Johnson City, the Town of Jonesborough, and Washington County expressed interest in adopting a Corridor Management Agreement (CMA) to better coordinate access management along the length of the corridor. This plan will provide guidance and recommendations for effectively implementing a CMA for Boones Creek Road.

Specific transportation recommendations discussed for the corridor included a preference for interconnectivity between developments and internal connections between subdivisions. This measure can hopefully ease congestion on major roads and could be a feasible access management strategy. Stakeholders also discussed desire for multi-modal infrastructure in the form of an off-road trail. Routes separated from vehicle traffic, though requiring right-of-way acquisition, could connect Jonesborough to Johnson City and tie into the small greenway on SR-36.

WikiMap Feedback

WikiMap is an online platform where site visitors can view a project study area and leave location-specific feedback. A WikiMap for the project was live and publicly accessible throughout the duration of the project, and 74 visitors left 24 comments. Users could choose to mark a concern or issue in red and an idea or solution in green (see Figure 39). A QR code (Figure 40) was also distributed to project partners following the Visioning Session to help increase awareness and participation.

Figure 39. Sample of WikiMap Results



Comments were generally located along the northern half of the corridor and focused on the following topics:

- Speed limits fluctuate too much and should have more continuity along the route.
- There should be more stop lights at intersections with Boones Creek Road.
- There should be more left turn lanes and turning signals at intersections with Boones Creek Road.
- School traffic creates congestion.
- Bike lanes are obstructed by both debris and vehicle traffic (due to decreasing road geometries in some places).

Visioning Session

On November 12, 2021, the project team held an internal visioning session with representatives from TDOT, Johnson City, JCMPO, and Washington County. Key takeaways included the following:

- There is anticipated delay and congestion at side street intersections with corridor, safety concerns due to high speeds, high volume of truck traffic, and daring maneuvers between Highland Church Road segments.
- Access management is a priority, especially with new residential developments on the horizon. Reduce the number of driveway cuts, focus development locations around existing driveways, and align driveways for a single signal opportunity.
- DDI at I-26 may require driver education as well as spot safety improvements to correct for some of the illegal left

Figure 40. WikiMap QR Code

turns and misuse of intersection. The projected 2045 LOS F is not a concern and may reflect a need for signal timing adjustments or better coordination.

- Boones Creek and other area streams are simultaneously a barrier to future development and assets to maintain and protect.

The group discussed an overall vision for the corridor, which is largely consistent with the discussion during the July Stakeholder meeting and with the comments left on the project's WikiMap:

- The area near I-26 should be focused on economic development, job growth, and densification.
- Undeveloped land throughout the corridor should be considered in relationship to its topographic and environmental constraints and utility presence/absence.
- The corridor is a gateway into both Jonesborough and Johnson City.
- Boones Creek Road should manage access points.
- Development should retain the viewshed and integrity of the Creek itself and mitigate impacts to the environment and natural resources.
- There should not be a sidewalk along the portion of the corridor in Washington County. Instead, implement an off-road path.
- Boones Creek Road should have a unified aesthetic that includes signage standards, lighting, and speed limit coordination to the extent possible.

6. Boones Creek Corridor Vision and Goals

VISION FOR BOONES CREEK ROAD

The Boones Creek Road corridor serves an integral transportation function throughout Washington County as a rural spoke between various destinations. The corridor shall continue to balance providing safe and reliable travel, while prioritizing the preservation of historical and natural resources, and scenic beauty of the region.

This corridor vision was established by key stakeholders including representatives from Johnson City, the Johnson City MTPO, Washington County, and TDOT.

Boones Creek Road has several roles: the corridor is a major transportation artery between Johnson City and Jonesborough, a rural spoke through Washington County, and witness to the aesthetic beauty of adjacent creeks and rolling ridgelines. As more development comes to the area, both land use and transportation policies should ensure that Boones Creek Road (SR 354) can continue to fill these diverse roles.

Four goals with associated objectives and strategies have been developed for the corridor. These goals provide direction on how to achieve the corridor vision, and may be used by the City and partner agencies as they implement transportation and other investments in and along the corridor.

Objectives and strategies address specific safety issues identified through analysis of existing and projected future transportation conditions, and input provided by project partners, stakeholders, and the public.

GOAL

Create safe traveling conditions for all modes of transportation.

OBJECTIVES

- Anticipate and address the need for travelers to adapt to changes in the corridor.
- Decrease opportunities for conflicts between modes.
- Manage vehicle speeds in areas where pedestrian activity is likely to be high.

STRATEGIES

- Create standardized and predictable access standards across jurisdictions that, at a minimum, follow TDOT Highway Access Manual guidance.
- Create and implement educational programs for drivers and other users of the corridor when installing new infrastructure, such as diverging diamonds. One option is to introduce Diverging Diamond Interchange navigation in high school drivers' education classes. Another is to circulate an instruction video explaining how the new interchange will work.

- Encourage entry/exit points on roads adjacent to or connecting with Boones Creek Road, rather than on main corridor as development occurs.
- Identify areas for truck acceleration/deceleration lanes.
- Separate bicyclists and pedestrians from cars; maintain usable facilities.
- Incorporate buffers, planting strips, and other means of physical separation between modes. as part of new on-road multimodal facilities.

Implementing projects and policies that support a cohesive experience for users of Boones Creek Road aids in supporting multijurisdictional cooperation among the various local governments represented along the corridor.

GOAL

Support reliable travel and a cohesive user experience.

Objectives

- Support multijurisdictional cooperation and the adoption of mutually supported transportation, land use, and open space standards along the corridor.
- Minimize delay at key intersections.

Strategies

- Implement a Corridor Management Agreement (CMA) to ensure consistent goals and guidance across jurisdictions. A CMA could take the form of a resolution, memorandum of understanding, or intergovernmental agreement and could encompass elements such as access management, traffic management and operations, land use planning, and streetscapes. TDOT's Highway Access Manual provides additional guidance.
- Create standardized and predictable access standards that, at a minimum, follow TDOT Highway Access Manual guidance.
- Evaluate existing speed limit on corridor.
- Consider dedicated turn lanes on intersecting roadways at key intersections.

The Boones Creek area is home to natural beauty and environmental resources that are a priority to preserve. With rapid development and growth occurring, particularly at the northern portion of the corridor, prioritizing the preservation of existing environmental resources, such as streams and views of ridgelines, is important.

GOAL

Preserve environmental and aesthetic beauty while accommodating ongoing growth and development.

Objectives

- Minimize environmental impacts from development.
- Preserve aesthetic and design standards along the corridor.
- Leverage the area's natural beauty as development occurs.

Strategies

- Include landscaping and/or other context sensitive infrastructure that helps reduce flooding and runoff in the design and construction of new paved areas.
- Use new projects as opportunities to educate the public about natural resources. May incorporate educational markers in design of new facilities.
- Avoid developments in areas with sensitive resources (e.g. Boones Creek).
- Utilize signage standards in line with established zoning and overlay(s).

Focusing development where infrastructure can accommodate it, particularly at the northern and southern ends of the corridor, provides for sound and sustainable planning that is both cost effective and supports other goals (i.e., natural resource protection).

GOAL

Focus corridor development where there is existing or planned infrastructure present (e.g., water and sewer service, etc.).

Objectives

- Focus new development in denser areas of the corridor.
- Support multi-use development where drivers can access many services with one automobile trip.
- Support context sensitive development.

Strategies

- Development around I-26 may accommodate large lot and regional retail, commercial, mixed-use, and tourism. Development around Historic Downtown Jonesborough may accommodate local and neighborhood scale retail, commercial, and mixed-use.
- Concentrate new development where utility capacity exists.
- Avoid developing where significant environmental resources exist.

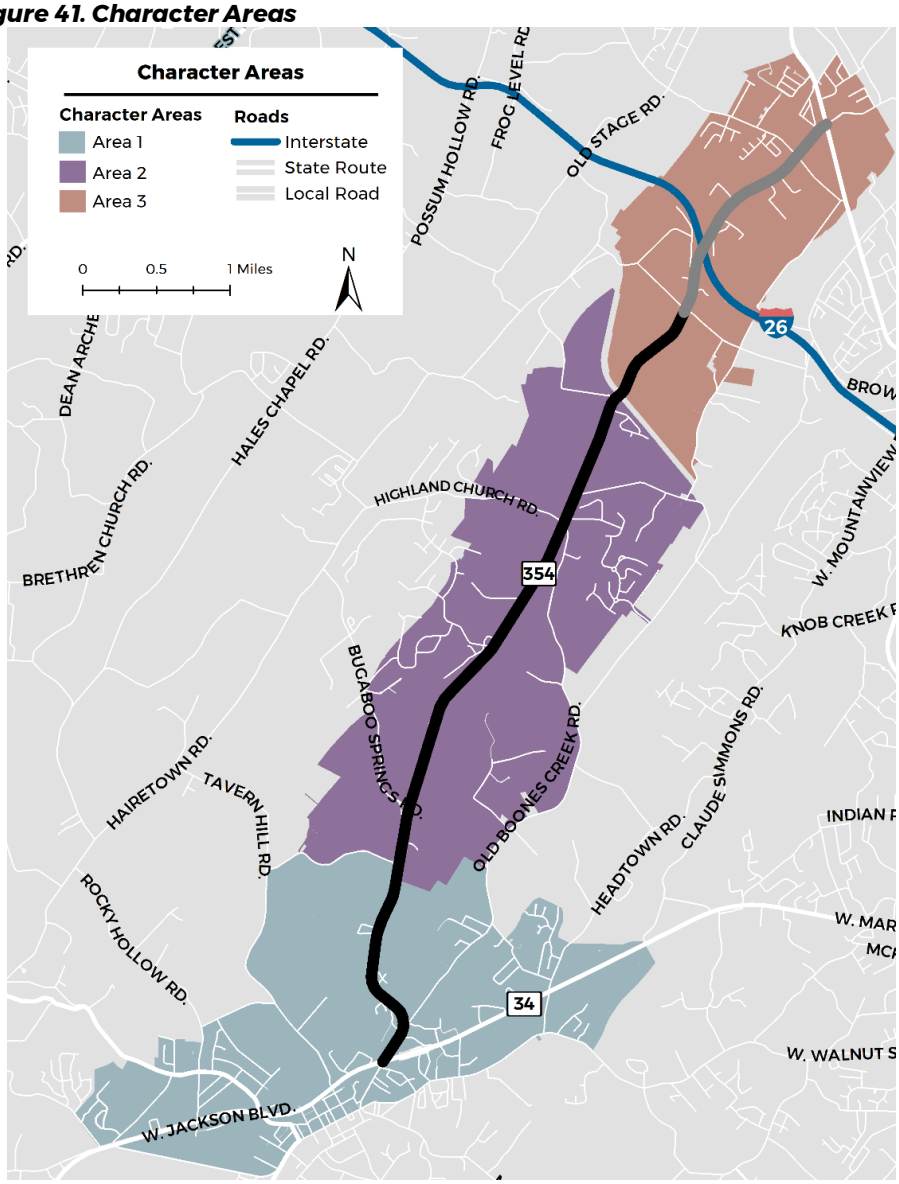
[continued on next page]

Character Areas

Character Areas focus on the way an area looks and how it functions. This allows communities to tailor strategies to specific areas, with the goal of enhancing the existing character or promoting a desired character for the future. Character Areas define sections of the community that presently have unique or special characteristics that need to be preserved, have potential to evolve into unique areas, or require special attention because of unique development issues.

Developing an agreed upon desired character for a corridor is a key factor in determining and guiding what types of development should occur in the future. Establishing a vision for the character of a community or corridor can help prevent incompatibilities among land uses that would have a negative impact on residents or workers. The three Character Areas created for the Boones Creek Road (SR 354) Corridor are described in greater detail below, and can help partner jurisdictions target corridor goals and strategies in specific areas of the corridor study area. These Character Areas are defined in Figure 41 and reflect feedback received from project partners and stakeholders.

Figure 41. Character Areas



- **Neighborhood Town Center (Character Area 1).** Located just north of Historic Downtown Jonesborough, Character Area 1 represents the southern termini of the corridor and may accommodate concentrated neighborhood scale development, including commercial, retail, residential, and mixed-use development patterns. Approximate boundaries of this character area run from the southern terminus of the corridor at SR 34/US 11E/East Jackson Boulevard to Hales Road.

- **Rural/Suburban Countryside (Character Area 2)** represents the middle portion of the corridor running from Hales Road to the railroad trestle just north of Keefauver Road. This area is recommended to continue to accommodate lower density residential, planned residential, and agricultural uses. Implementation of agreed upon access management standards will be important to ensuring safety and reliability throughout this portion of the corridor.
- **Regional Center (Character Area 3)** runs from the railroad trestle to the northern terminus of the corridor at SR 36/North Roan Street may be a target for large scale, commercial, retail, service-oriented, mixed-use, and dense residential developments. This area is located in and around the newly constructed DDI at I-26 and includes the proposed regional retail and tourism district.

7. Recommendations

The transportation and land use analysis conducted as part of this study, coupled with the visioning exercise that resulted in a set of goals, objectives and strategies aimed at retaining the desired character and identity of Boones Creek Road (SR 354), all serve to guide the development of policy- and-project level recommendations for the corridor.

Character Area Development Policies

While not regulatory, the future land use policy plan and policy areas, denoted by the different categories and colors in the plan, will help guide discussions about future development. The policy plan also includes recommended street network connections to provide options for driving, walking, and bicycling along the corridor, and a proposed greenway linking both ends of the corridor.

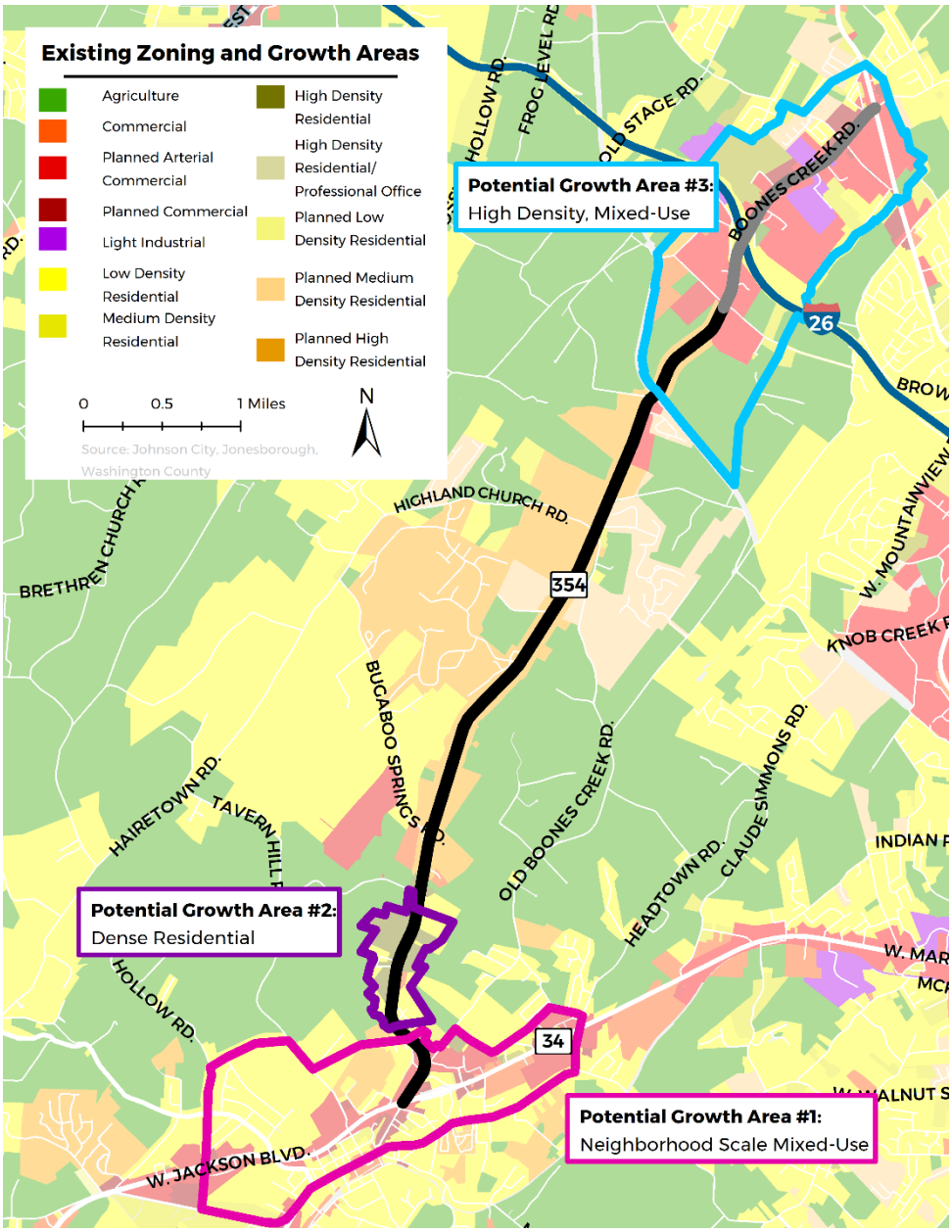
Concentrate Development in Identified Growth Areas

Future growth areas have also been identified that have a foundation in each jurisdiction's zoning code, and pivot off the character areas defined in the previous section. Three growth areas are described below and include opportunities for mixed-use and commercial development growth, while also preserving the existing residential and agricultural character in the center of the corridor. See Figure 42. By concentrating growth in these portions of the corridor, development will concentrate where utility capacity presently exists, and mitigates need for additional utility investments in portions of the corridor prioritized for preservation of rural, and low intensity development.

- **Neighborhood Scale Mixed Use in Growth Area 1.** The southern portion of the corridor is currently characterized by a mix of uses including single-family residential, commercial, agricultural, multi-family residential, and public lands. This growth area has a northern termini at Olde Town Drive, with land currently zoned as a mix of planned high-density residential, commercial, and low-density residential. This area is a good candidate for mixed-use development because of the existing diversity of uses and the downtown character. Future development should complement and not conflict with any regulations outlined in Jonesborough's zoning regulations, including existing historic district requirements and guidance.
- **Residential Development Concentration in Growth Area 2.** This area extends from Olde Town Drive to Hales Road and is currently characterized by primarily agricultural and single-family residential lands. This area is zoned for high-density residential, agricultural, and single family residential. Several existing development plans are currently planned for this growth area. Development in this area should be accompanied by pedestrian infrastructure and connections to the downtown Jonesborough area to the south.
- **High Density, Mixed- Use in Growth Area 3.** This area extends from the railroad trestle near Kefauver Road to the northern terminus of the corridor at Roan Street (SR 36) and is currently characterized primarily by vacant land, public land (currently greenspace and a fire station), commercial space, single family residences, and agricultural land. The area includes the proposed Regional Retail and Tourism Development District and is zoned as planned arterial commercial, light industrial, low-density residential, and high-density residential. The planned arterial commercial zone allows for restaurants, offices, schools, retail, and residential in upper floors of buildings. This area could become a mixed-use district that includes office space, retail/services,

and high-density residential uses. This area is a good candidate for mixed-use development due to its proximity to Interstate 26, its mix of permitted land uses, and anticipated growth in employment already observed in the MTP. It may be valuable to identify efforts to further enhance the multimodal environment and infrastructure connecting both sides of the Interstate.

Figure 42. Growth Areas



Utilize Signage Standards to Preserve Corridor Beauty

The use of policy measures to guide corridor aesthetics and utility has a long history: in 1937, the Johnson City Planning Board approved a measure that would limit roadside signage and preserve a 100- foot setback on Bristol Highway (see Figure 43). The purpose of signage standards incorporated into zoning policies is to ensure that desired character, and environmental and aesthetic beauty of the corridor reflects the community's vision for the corridor. Inconsistency in signage standards does not allow travelers to see an organized effort to maintain and preserve the beauty of the corridor, a primary objective for Boones Creek Road (SR 354). Without consistency in color, size, or font, the traveler does not receive the impression of an organized program.

Figure 43. 1937 Article from Johnson City Press

Johnson City's Planning Board Approves Move To Bar Unsightly Highway Objects

National Roadside Body Plans Vigorous Drive For Legislative Acts

How Many Roadside Signs Mar Natural Beauty

The Johnson City planning commission is in accord with a plan of the National Roadside Council, composed of 15 organizations interested in preserving and restoring natural beauty, to make a determined assault next year on roadside advertisements that mar the landscape, and is already on record as desiring to mitigate the highway sign nuisance in this section of Tennessee.

This announcement was made yesterday by the local organization's chairman, J. E. Brading. Other members are D. R. Shearer, secretary; James A. Summers, Guy L. Smith, C. L. Marshall and Jack W. Cummins. City Engineer W. O. Dyer is a member ex officio.

"Last May," Brading said, "the city planning commission adopted a resolution expressing the view that no one should be allowed to build a house or, by inference, erect a billboard within 100 feet of the Johnson City-Kingsport highway. We decided to begin our campaign against unsightly roadside structures on this highway because unusual efforts, such as erecting the Masengill monument, have been made to beautify it and the attention of the public could easily be directed toward anything that would mar the general effect. Our thought was that if we were successful there we then could carry the campaign elsewhere.

"Any action of ours must be confirmed by the city commission, however, and this has not yet been done. I have been informed by an attorney that there is some doubt concerning the legality of our resolution and that the question has not yet been definitely decided. We are willing to have it said unmistakably, however, that indiscriminate use of billboards is a nuisance to which we are opposed and that we would appreciate the the cooperation of our citizens in any efforts to make Johnson City and its environs a more attractive place in which to live."

The National Roadside Council's aim is nothing less than complete elimination of advertising from the rural countryside. It admits that no state regulations have as yet accomplished this aim, but is hopeful in view of drastic proposals scheduled to come before many state legislative sessions in 1938.

Posted on Ted's Johnson City Time Warp on 11-21-21 by Ted Bowers, Retrieved and formatted from microfilm of the Johnson City Press dated 11-21-37.

Johnson City and Washington County currently have established corridor overlay districts that govern the form and use of property within 300 feet of Boones Creek Road and include signage regulations for each jurisdiction. Signage standards as included in Section 6.28.3.5 Johnson City's Code outline that, "No freestanding or development identification sign shall exceed 30 feet in height as measured from the surface grade at the base of the sign or from the surface grade of the highway to which this overlay is applied.". Section 622.3.5 of Washington County's zoning resolution governs signage within the corridor overlay district and reads, "All signage located within this overlay shall comply with the requirements of the underlying zoning unless modified below. Monument signs shall be the only sign allowed not attached to a building. No monument sign shall exceed one-hundred (100) square feet of sign area and shall not exceed fourteen (14) feet in height above ground level including supports."

A potential corridor management agreement (CMA) may help better identify precise signage, fonts, and colors, as well as and design review policies for the corridor.

Figure 44. Signage Examples

Left: Example of a wayfinding sign from Rock Hill, SC designed for roadside installation, with large text that can be easily read from a car.

Right: Example of wayfinding sign from downtown Franklin, TN which is designed at a pedestrian scale and is appropriate to place along a sidewalk or beside a building.

Enhance Landscaping as a Means to Separate Modes

TDOT's Highway Beautification Office has developed *Landscape Design Guidelines* that may be used to preserve the beauty of the Boones Creek Road Corridor, develop an aesthetic that helps develop the corridor as a scenic byway throughout the region, and help create separation between various modes.[21]

Landscaping as a way to beautify the corridor and separate modes will differ between character areas, with the more rural low density Character Area 2 adopting a more rural and naturalistic design approach, and areas in Character Areas 1 and 3 adopting an urban or suburban aesthetic. Guidance from TDOT's Highway Beautification Office is included in Figure 45 and Figure 46, and Table 14..

Landscaping Enhancements near I-26

Walking and bicycling are a few activities that occur more frequently within the urban and suburban state route right-of-way than in rural landscapes. Curb cuts and the presence of stop lights and utility fixtures contribute to visually cluttered corridors. The proper arrangement of these factors, along with plants and maintenance can help the create a welcoming feeling and enhance the beauty and aesthetic appeal of Boones Creek Road nearest the interstate (roughly between Christian Church Road and Boone Ridge Road). For instance, repeating one or two tree species along the length of a road at regular intervals can make a visually cluttered corridor appear more orderly and create a unified appearance.

Figure 45. Landscaping in Suburban Context

Figure 46. Landscaping in Rural Context

Source: TDOT Landscape Design Guidelines

[21] TDOT Highway Beautification Office, Landscape Design Guidelines, https://www.tn.gov/tdot/environmental-home/environmental-highway-beautification-office/beautification-landscape-design.html

Table 14. Landscaping and Beautification Components by Development Pattern

	Suburban (Character Areas 1 and 3)	Rural (Character Area 2)
Approach	Ornamental or Naturalistic, Low to Moderate Maintenance	Naturalistic, Low Maintenance
Goals	• Enhance appearance of growing business district • Enhance the pedestrian and motorist experience • Increase safety for users of all modes of transportation	• Create a sense of arrival for motorists • Improve maintenance crew safety • Preserve visibility of signage
Vegetation	• Urban tolerant plant species • Small flowering and evergreen trees for year-round interest and to create a complementary scale with street trees • Evergreen and flowering shrubs, spreading evergreen and flowering ground covers, and flowering annuals and perennials for seasonal interest and to reduce mowing	• Large canopy trees • Native understory trees • Native grasses and wildflowers for seasonal interest
Components	• Well-defined crosswalks and bike lanes • Preserve viewshed • Preserve open site lines at intersections • Create focal points with flowering annuals and perennials	• Preserve scenic vista • Select species that will not obstruct views • Prairie grasses and wildflowers to improve aesthetics

Source: Adapted from TDOT Landscape Design Guidelines

Rural sections of Boones Creek Road should also consider landscaping as a way to enhance the safety of cyclists and pedestrians. Litter can become a problem on more rural routes and should be addressed through the planting of taller vegetation, such as native grasses at the edge of the roadway to create a physical barrier that contains the majority of litter close to the roadway

Corridor Management Approach

Implement Access Management Strategies along Corridor

For all new developments along Boones Creek Road, access management standards should comply with TDOT's *Highway System Access Manual (HSAM)* including spacing requirements for driveways and intersections and geometric design criteria. In addition, local jurisdictions can promote a range of access management policies and strategies through their land development regulations (LDRs). Strategic land use controls, in congress with state access management efforts, can help improve the transportation system for users of all ages and abilities. Access management standards can be advanced through comprehensive plans, zoning ordinances, and land development and subdivision regulations. Jurisdictions may also amend current overlays to include access management guidance. All LDRs should follow state-wide guidance as described in HSAM Volume 1.

Strategies for consideration may be further detailed in a CMA and include:

- Reduce density through driveway closure, consolidation, or relocation
- Manage spacing of intersection and access points
- Limit allowable movements at driveways (such as right-in/right-out only)
- Place entry/exit points on side roads instead of on Boones Creek Road (SR 354)
- Use lower speed one-way or two-way off-arterial circulation roads
- Place driveways on an intersection approach corner rather than a receiving corner, which is expected to have fewer total crashes.

Along the corridor, there are a number of driveways that serve as access points to single unit homes, residential neighborhoods, as well as to commercial developments. High driveway density can be detrimental to the efficiency and safety of the corridor due to increased frequency of vehicles turning onto and off of the main road. Volume Three of TDOT's HSAM provides guidance on the minimum distances between driveways. For a minor arterial such as SR 354/Boones Creek Road, the minimum distance between driveways should be 880 feet for a rural environment and 660 feet for an urban environment. Several driveways located along the corridor do not adhere to this guideline.

Another key guideline to ensure safety and efficiency is a minimum distance of 40 feet between two driveways on the same parcel. This stipulation of minimum spacing typically leads to a limit of one entrance to a single parcel of land unless the parcel has a frontage that exceeds 200 feet. The driveways along the corridor were all found to be in conformance with this guidance.

Preliminary analysis of the correlation between access points and crashes is included in Table 15 below.

Table 15. Access Density and Crashes by Character Area

Character Area	Length	Approximate Termini	Total Access Points	Access Points Per Mile	Crashes per Mile
1	1.5	Jackson Blvd to Hales Rd	37	24.7	11.0
2	3.6	Hales Rd to RR trestle north of Keefauver Rd	52	14.4	4.9
3	2.4	RR trestle north of Keefauver Rd to Roan St	61	25.4	12.7

Source: ETRIMS

- **Character Area 1.** This stretch of Boones Creek Road has 24.8 access points per mile and had 11 crashes per mile annually between 2016 and 2020. Reducing driveway density can reduce total crashes along urban/suburban arterials by 25-31%.[22]
- **Character Area 2.** While this portion of the corridor has been identified for continued rural/suburban character development, implementation of access management strategies for future developments may help mitigate any future safety or reliability issues. This portion of the corridor should focus on retaining the number of access points where feasible as development continues to add trip generators and traffic in the region.
- **Character Area 3.** Imminent development near I-26 will benefit from sound access management strategies for existing curb cuts as well as for future developments in an effort to reduce crashes and mitigate future safety and reliability concerns.

Implement a Corridor Management Agreement (CMA) to Ensure Consistent Goals and Guidance Across Jurisdictions

Just as Johnson City and Jonesborough have programs and policies that manage their respective downtown Main Street districts, corridor management agreements (CMAs) offer a similar mechanism for operating and maintaining highway corridors. Many highways, including Boones Creek Road, are owned

[22] Proven Safety Countermeasures, Federal Highway Administration (FHWA), https://safety.fhwa.dot.gov/provencountermeasures/corridor_access_mgmt.cfm

and operated by the state department of transportation, and because of their length, span multiple jurisdictions. Accordingly, a CMA is fundamentally an agreement among public agency stakeholders to preserve the long-term value of a transportation corridor by actively coordinating and implementing improvements. The cooperative spirit required to successfully initiate a CMA is reflected in the collaborative visioning effort that informed this study's recommendations.

For the Boones Creek Road (SR 354) corridor, a CMA is especially relevant in developing transportation improvements, policies, and standards among TDOT, Johnson City, Jonesborough, and Washington County. The agreement would facilitate consistency among standards for development, signage, design, management, and operations of the corridor long into the future. Without an agreement, for example, driveway access to the highway will continue to be granted in a largely unpredictable manner, compounding current safety and operational issues. Accordingly, CMAs require commitment from each participating jurisdiction, While a memorandum of understanding (MOU) is currently the preferred method used for CMAs throughout Tennessee, the HSAM discusses other potential vehicles, as shown in Figure 47.

There are 4 key steps in the CMA development process: (1) identification of a candidate corridor (2) definition of corridor vision and needs- often done through development of a corridor management plan (3) drafting an effective corridor management agreement (4) incentives and implementation. This Corridor Study effectively serves to satisfy the second key step of this development process and provides an actionable framework on which an agreement can be based.

Figure 47. CMA Documents as Outlined in HSAM

INSTRUMENTS OF COOPERATION FOR CORRIDOR MANAGEMENT

- **Resolution** – a formal statement of support or approval by a legislative body. This offers a means for the body to publicly take a position on an issue, as well as express intent regarding future legislation or budget decisions.

- **Memorandum of Understanding (MOU)** – a legally non-binding agreement among jurisdictions that outlines the terms and details of a mutual understanding or agreement, noting each party's roles and responsibilities – but without establishing a formal, legally-enforceable contract. This is the most common type of agreement for corridor management with respect to corridor studies and access management.

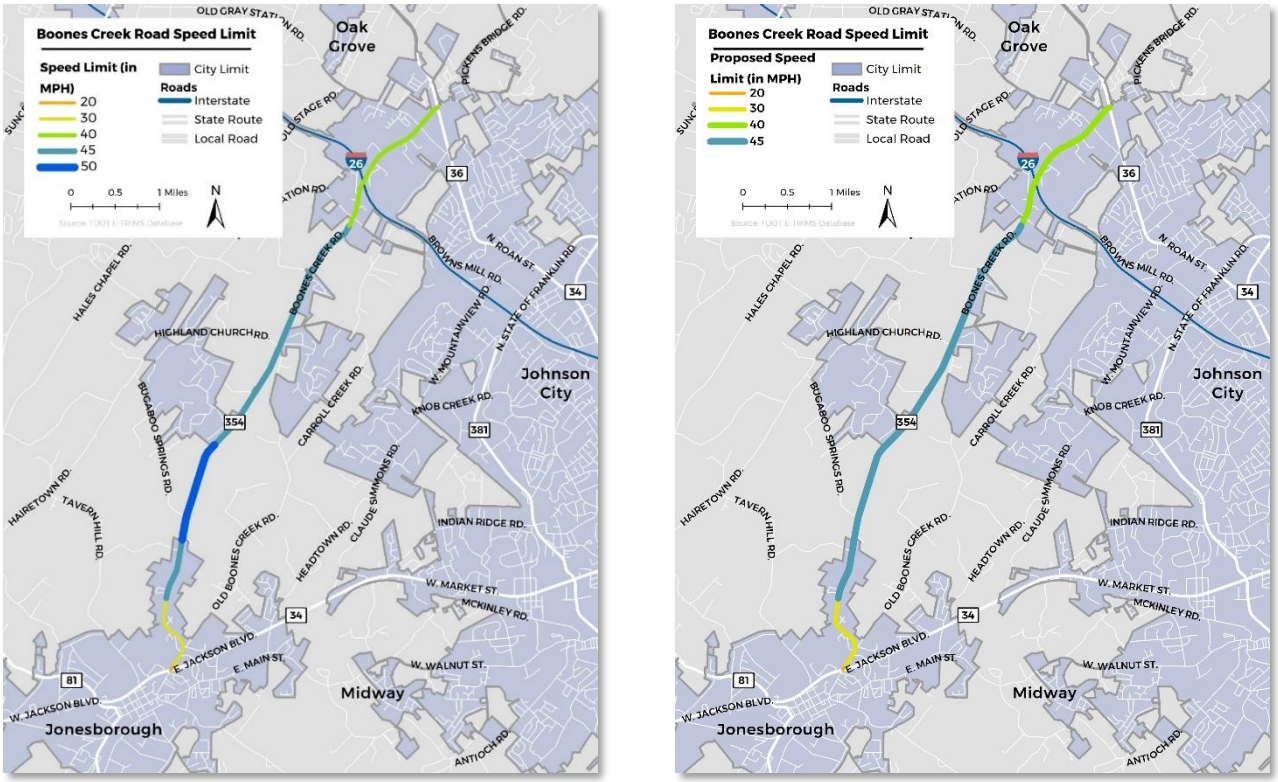
- **Intergovernmental Agreement** – an agreement that involves or is made between two or more governments in cooperation to solve problems of mutual concern. The maintenance agreement is the most common form of intergovernmental agreements deployed with respect to access management. These agreements are generally legally-binding, as they impact signatories' budgets through commitments to resource allocation.

If a CMA is the desire of Johnson City, Jonesborough, and Washington County, jurisdictional representatives should initiate discussions with the TDOT Office of Community Transportation (OCT). While a CMA requires an ongoing commitment from each of the stakeholders, if managed well, the CMA can generate long-term value for each of the participating jurisdictions.

Provide Consistent and Predictable Speed Limits

Providing predictable and consistent speed limits throughout the corridor study area will help travelers better understand roadway context and help mitigate speed differentials between passenger and freight vehicles. Stakeholder and public feedback included that speed limits fluctuate too much along the corridor and noted a desire for continuity along the route. TDOT's Traffic Operations Division developed a *Guidance on Setting Speed Limits* document.[23] The speed limit from one zone to another should not change by more than is reasonable for a driver, with a five or ten mile per hour difference recommended. This is currently exceeded at the southern end of the Boones Creek Road (SR 354) corridor. Existing and proposed speed limits are included in Figure 48. It should be noted that a formal speed limit change requires an engineering study by the Regional Traffic Engineer to determine the recommended limit and school zone speed.

Figure 48. Existing and Proposed Speed Limit



[23] *Guidance on Setting Speed Limits*, TDOT Traffic Operations Division, Traffic Engineering Office, https://www.tn.gov/content/dam/tn/tdot/traffic-engineering/TOM%201801.pdf

Transportation Projects

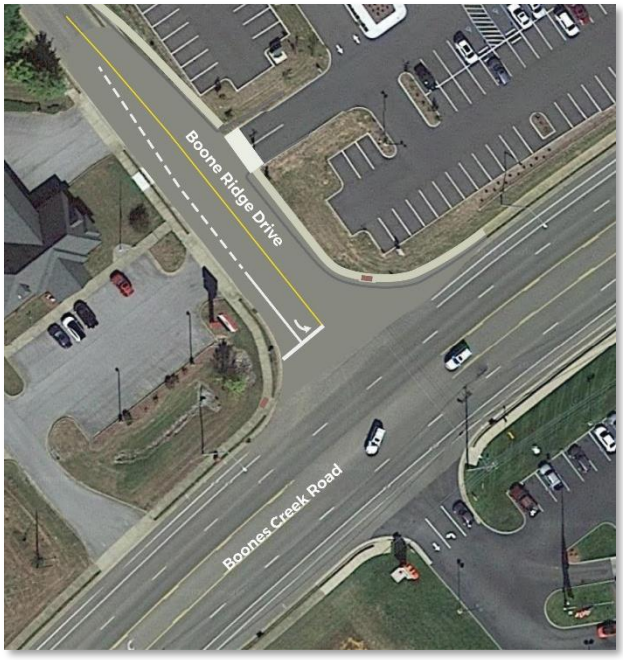
Development policies and recommendations work in lockstep with infrastructure enhancements. While the focus of this study has been on identifying growth strategies and policies to help preserve the reliability and safety of the corridor, specific transportation needs and deficiencies have been identified through the analysis conducted as part of this effort. These needs largely focus on intersection level operations, multimodal enhancements, and providing multimodal opportunities in tandem with upcoming development. The recommendations described below have been developed to align with and support preferred growth patterns.

Improve Operations at Select Intersections

Boone Ridge Drive

Figure 31 earlier in this document describes intersection level of service for Boone Ridge Drive and Boones Creek Road (SR 354). Significant delays are anticipated for drivers attempting to turn onto Boones Creek Road (SR 354) from this approach. By adding a designated left turn lane on Boone Ridge Drive for traffic turning onto Boones Creek Road northbound, delays may be minimized. The storage length should be approximately 180' according to HSAM standards and observed traffic volumes. It is anticipated that the project can be completed within the existing TDOT-owned right-of-way, but additional analysis will need to take place to confirm ownership status prior to implementation.

Figure 49. Boone Ridge Drive



Extend turn lanes at Highland Church Road

School related traffic congestion has been a primary topic of feedback received as part of this Corridor Study. Extending turn lane storage for both northbound and southbound Boones Creek Road (SR 354) at Highland Church Road can help mitigate school related congestion and improve intersection operations. Preliminary analysis suggests extending the northbound left turn lane by 250' and extending the southbound right turn lane by 100'. TDOT's geometric design guidelines, note storage lengths at signalized intersections are a function of signal timings, volumes, and saturation flow rates. Assistance in determining storage lengths can be provided by the Traffic Operations Division, Signal and Lighting Section. The Knob Creek Road widening, currently underway, will likely create more traffic along this portion of Boones Creek Road. Once Knob Creek Road is fully operational, the signal at Highland Church Road may require timing adjustments. This recommendation should be coupled with a realignment of the existing south bound bicycle lane on Boones Creek Road (SR 354), to be finalized during project design.

Signal Timing Improvements throughout Segment 2

Coordinated signal timing is a set of parameters that allow multiple traffic signals to run in sync with one another. When multiple adjacent traffic signals are running coordinated signal timing, they are said to

be running in a "coordinated system." Coordinated timing is accomplished by giving all signals in a coordinated system either the same cycle length or a multiple of the same cycle length. The value of the cycle length is the amount of time the traffic signal takes to cycle through each of its phases. Once the cycle length is determined, the cycle time is divided among each of the phases, depending on the amount of traffic demand expected for each phase. The amount of cycle time each phase receives is called a "split."

In a coordinated signal system, the amount of split time given to each phase can vary from intersection to intersection.

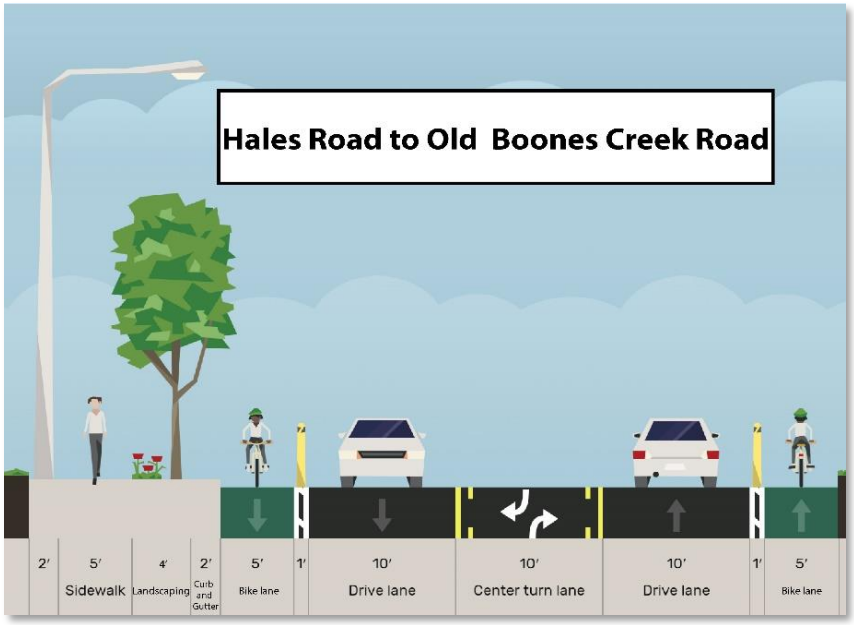
Developing a coordinated signal timing plan for Segment 2 of the corridor (approximately 0.20 miles west of Christian Church Road to Roan Street/SR 36) will help mitigate delays at signalized intersections, improve traffic flow, and help accommodate upcoming developments within existing capacity constraints. In the long term, implementing adaptive signal control technology may also optimize vehicle flow. Additional details on traffic signal design, operations, and coordination within Segment 2 should be developed in cooperation with TDOT's Traffic Operations Division.

If future development along this portion of the corridor creates higher levels of congestion than expected, an additional signal may be suitable at Boone Ridge Drive due to its spacing from existing signalized intersections. Before adding a signal, a signal warrant analysis should be conducted according to HSAM standards. Future development should implement access points off of existing side roads and driveways to limit additional curb cuts on Boones Ridge Road.

Expand and Maintain Multimodal Amenities

Multimodal infrastructure along the corridor, including a bike lane throughout and sidewalks concentrated at the northern and southern ends should be maintained, while also prioritizing an expansion of multimodal amenities in the corridor as development continues to come online.

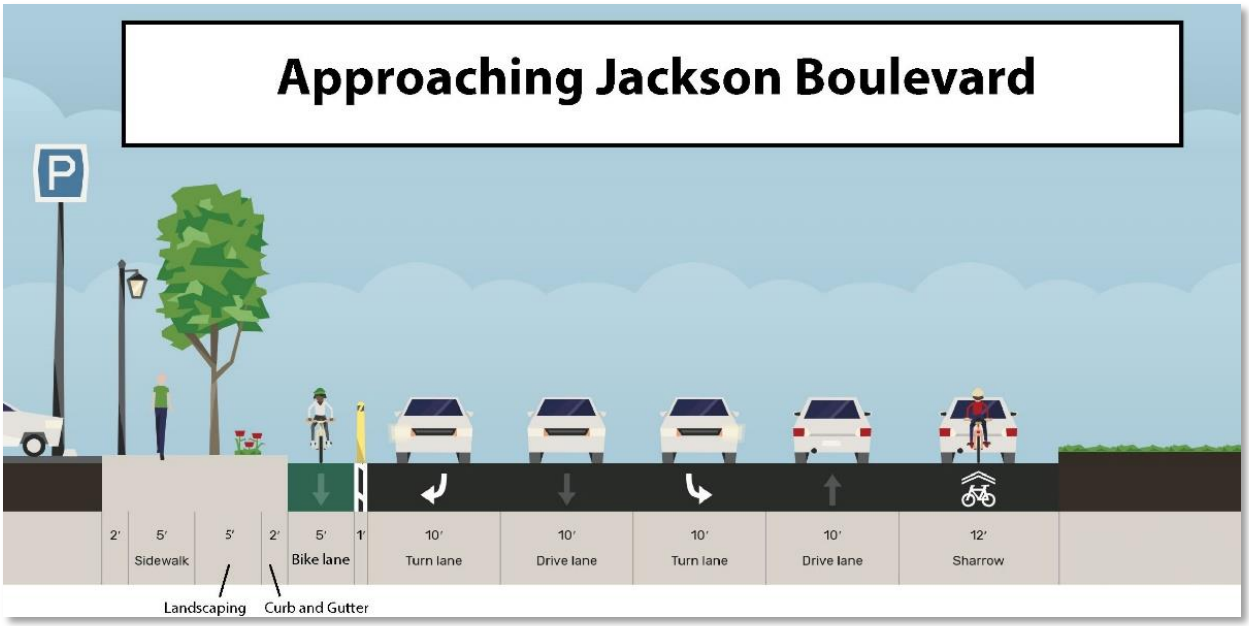
Figure 50. Potential Multimodal Improvements in Growth Area 2



Character Area 1

A sidewalk should be built from the developments that are occurring to the south of Hales Road (see page 13) to Jackson Boulevard. It is anticipated that this can be constructed within existing right-of-way, though additional engineering analysis will need to take place to confirm ownership status prior to implementation. Figures 50 and 51 and shows potential sections to enhance pedestrian and bicycle mobility and safety in this portion of the corridor.

Figure 51. Potential Multimodal Improvements near Jackson Blvd (Growth Area 1)



Add Crosswalks on Minor Streets at Unsignalized Intersections

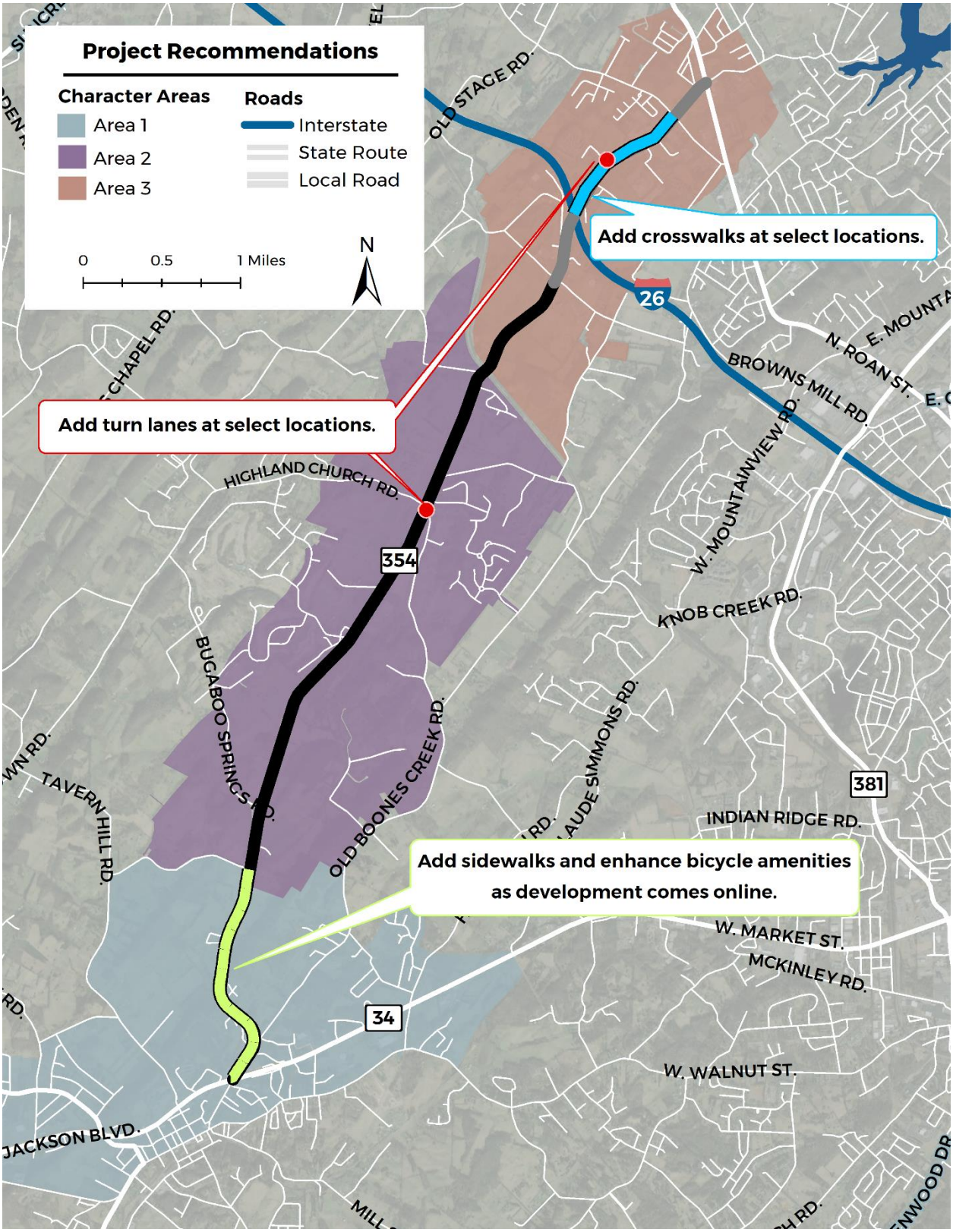
These include intersections within Growth Area 3 and I-26 – Klm Drive, Quality Circle, Boone Ridge Drive, and Browns Mill Blvd. Crosswalks should be designed to minimize the walking distance to cross the intersections, may require relocating the stopping lines on minor street approaches, and should be zebra striped to enhance visibility for motorists.

Maintain Existing Multimodal Facilities

Sweep lanes to ensure that debris is not an obstacle for cyclists. Routinely trim adjacent vegetation. Replace hazards that create uneven surfaces such as grates or utility covers. Create a request form where users can report problems.

[continued on next page]

Figure 52. Recommended Transportation Improvements



Cost Estimates

Cost estimates were developed for early action solutions including intersection operation improvements and multimodal enhancements. Estimates utilized a planning-level cost estimate tool from TDOT's Strategic Transportation Investments Division (STID). Each location is subject to unique circumstances and situations that will determine costs, such as available right-of-way, right-of-way access costs, pavement condition, and utility locations

Table 16. Cost Estimates

Project	Description	Character Area	Cost
Boones Ridge Drive	Add left turn lane.	3	$194,000
Boones Creek Elementary School Access	Extend left and right turn lanes onto Highland Church Road.	2	$480,000
Crosswalks	Includes intersections within Growth Area 3 – Klm Drive, Quality Circle, Boone Ridge Drive, and Browns Mill Blvd.	3	$2,540/crossing
Sidewalks in Character Area 1	Add sidewalks to connect upcoming developments.	1	$3,940,000

8. Implementation and Next Steps

This study provides Johnson City and project partners with a robust set of policy- and project-level recommendations that can be implemented as demand warrants, and in cooperation with TDOT. To help the region create a cohesive user experience, develop the corridor as a gateway between regional destinations, and implement the vision and goals developed for the Boones Creek Road (SR 354) corridor, the following next steps have been identified.

Step 1: Adopt Boones Creek Road Corridor Study. By adopting this study across all partner jurisdictions, project partners commit to the vision and goals established within this document.

Step 2: Identify preferred corridor management approach and guiding document. Initiate discussion with TDOT Office of Community Transportation (OCT) about a corridor management agreement, addressing important issues such as access management, signage and beautification standards, and speed limit coordination.

Step 3: Consider additional policy guidance (including modifications to existing overlays). Refining existing zoning and overlay language can help formalize guidance related to signage, landscaping, and beautification, as well as access management along the corridor.

Funding Opportunities

While the focus of this study has been on identifying growth strategies and policies to help preserve the reliability and safety of the corridor, implementing targeted transportation improve projects will allow project partners to better accommodate the growth of the corridor. Various funding opportunities exist at the state and federal level and may be pursued. Recommendations may be implemented in phases, with project development ultimately depending on funding opportunities. There are several funding opportunities available through State and Federal grant programs that can aide in financing the implementation of the study recommendations, including:

- **TDOT Multimodal Access Grant Program** - TDOT's Multimodal Access Grant (MMAG) is a state-funded program created to support the transportation needs of transit users, pedestrians and bicyclists through infrastructure projects that address existing gaps along state routes. Applicants may submit projects that deviate from state routes to connect origins or destinations within 0.25 miles of the state route.
- **TDOT Transportation Alternatives Program** – This program funds programs and projects including pedestrian and bicycle facilities, infrastructure projects for improving non-driver access to public transportation and enhanced mobility, community improvement activities, and environmental mitigation.
- **TDOT Spot Safety Improvement Program** - The Spot Safety Improvement Program provides funds for projects on state routes or intersections with state routes. Funding may be used to install a traffic signal on a state route, resolve a sight-distance problem on or near a state route, add a turning lane or lanes with or without signals on a state route, install school flashing signals on a state route, or install a flashing beacon on a state route.
- **Surface Transportation Block Program (STBG)** – A federal program that provides flexible funding that may be used for projects to preserve and improve the conditions and performance on a Federal-aid roadway.

9. Appendix

Cost Estimate Sheets

COST ESTIMATE SUMMARY

Route:	Boone Ridge Dr
Description:	Add turn lane
Project Type of Work:	Turn Lanes
County:	Washington
Length:	0.03 Miles
Date:	January 27, 2022
Estimate Type:	Concept

DESCRIPTION		LOCAL	STATE	FEDERAL	TOTAL
		0%	0%	0%	
Construction Items					
Removal Items		$0	$0	$0	$4,800
Asphalt Paving		$0	$0	$0	$24,100
Concrete Pavement		$0	$0	$0	$0
Drainage		$0	$0	$0	$24,100
Appurtenances		$0	$0	$0	$25,900
Structures		$0	$0	$0	$0
Fencing		$0	$0	$0	$0
Signalization & Lighting		$0	$0	$0	$0
Railroad Crossing		$0	$0	$0	$0
Earthwork		$0	$0	$0	$18,800
Clearing and Grubbing		$0	$0	$0	$0
Seeding & Sodding		$0	$0	$0	$300
Rip-Rap or Slope Protection		$0	$0	$0	$0
Guardrail		$0	$0	$0	$4,000
Signing		$0	$0	$0	$100
Pavement Markings		$0	$0	$0	$400
Maintenance of Traffic		$0	$0	$0	$4,400
Mobilization	5%	$0	$0	$0	$5,350
Other Items	10%	$0	$0	$0	$11,200
Const. Contingency	30%	$0	$0	$0	$37,000
Const. Eng. & Inspec.	10%	$0	$0	$0	$16,000
Construction Estimate		$0	$0	$0	$176,000
Interchanges & Unique Intersections					
Roundabouts		$0	$0	$0	$0
Interchanges		$0	$0	$0	$0
Right-of-Way & Utilties		**LOCAL**	**STATE**	**FEDERAL**	**TOTAL**
		0%	0%	0%	
Right-of-Way		$0	$0	$0	$0
Utilities		$0	$0	$0	$0
Preliminary & Construction Engineering and Inspection					
Prelim. Eng.	10%	$0	$0	$0	$17,600
Total Project Cost (2020)		$0	$0	$0	$ 194,000

COST ESTIMATE SUMMARY

Route:	Boones Creek Road/SR 354
Description:	Add turn lanes near Boones Creek Elementary School (Highland Church Road)
Project Type of Work:	Widen
County:	Washington
Length:	0.07 Miles
Date:	January 27, 2022
Estimate Type:	Concept

DESCRIPTION		LOCAL	STATE	FEDERAL	TOTAL
		0%	0%	0%	
Construction Items					
Removal Items		$0	$0	$0	$11,700
Asphalt Paving		$0	$0	$0	$64,600
Concrete Pavement		$0	$0	$0	$0
Drainage		$0	$0	$0	$10,200
Appurtenances		$0	$0	$0	$0
Structures		$0	$0	$0	$100,000
Fencing		$0	$0	$0	$0
Signalization & Lighting		$0	$0	$0	$0
Railroad Crossing		$0	$0	$0	$0
Earthwork		$0	$0	$0	$24,900
Clearing and Grubbing		$0	$0	$0	$0
Seeding & Sodding		$0	$0	$0	$1,500
Rip-Rap or Slope Protection		$0	$0	$0	$31,900
Guardrail		$0	$0	$0	$25,800
Signing		$0	$0	$0	$300
Pavement Markings		$0	$0	$0	$1,300
Maintenance of Traffic		$0	$0	$0	$11,500
Mobilization	5%	$0	$0	$0	$14,200
Other Items	10%	$0	$0	$0	$29,800
Const. Contingency	30%	$0	$0	$0	$68,300
Const. Eng. & Inspec.	10%	$0	$0	$0	$39,600
Construction Estimate		$0	$0	$0	$436,000
Interchanges & Unique Intersections					
Roundabouts		$0	$0	$0	$0
Interchanges		$0	$0	$0	$0
Right-of-Way & Utilties		**LOCAL**	**STATE**	**FEDERAL**	**TOTAL**
		0%	0%	0%	
Right-of-Way		$0	$0	$0	$0
Utilities		$0	$0	$0	$0
Preliminary & Construction Engineering and Inspection					
Prelim. Eng.	10%	$0	$0	$0	$43,600
Total Project Cost (2020)		$0	$0	$0	$ 480,000

COST ESTIMATE SUMMARY

Route:	Boones Creek Road/SR 354
Description:	Add sidewalks to Character Area 1 as development comes online.
Project Type of Work:	Sidewalk Improvements
County:	Washington
Length:	1.60 Miles
Date:	January 27, 2022
Estimate Type:	Concept

DESCRIPTION		LOCAL	STATE	FEDERAL	TOTAL
		0%	0%	0%	
Construction Items					
Removal Items		$0	$0	$0	$56,800
Asphalt Paving		$0	$0	$0	$573,000
Concrete Pavement		$0	$0	$0	$0
Drainage		$0	$0	$0	$295,000
Appurtenances		$0	$0	$0	$89,900
Structures		$0	$0	$0	$0
Fencing		$0	$0	$0	$0
Signalization & Lighting		$0	$0	$0	$0
Railroad Crossing		$0	$0	$0	$0
Earthwork		$0	$0	$0	$896,000
Clearing and Grubbing		$0	$0	$0	$0
Seeding & Sodding		$0	$0	$0	$40,600
Rip-Rap or Slope Protection		$0	$0	$0	$0
Guardrail		$0	$0	$0	$108,000
Signing		$0	$0	$0	$2,100
Pavement Markings		$0	$0	$0	$18,600
Maintenance of Traffic		$0	$0	$0	$89,000
Mobilization	5%	$0	$0	$0	$108,000
Other Items	10%	$0	$0	$0	$228,000
Const. Contingency	30%	$0	$0	$0	$752,000
Const. Eng. & Inspec.	10%	$0	$0	$0	$326,000
Construction Estimate		$0	$0	$0	$3,580,000
Interchanges & Unique Intersections					
Roundabouts		$0	$0	$0	$0
Interchanges		$0	$0	$0	$0
Right-of-Way & Utilties		**LOCAL**	**STATE**	**FEDERAL**	**TOTAL**
		0%	0%	0%	
Right-of-Way		$0	$0	$0	$0
Utilities		$0	$0	$0	$0
Preliminary & Construction Engineering and Inspection					
Prelim. Eng.	10%	$0	$0	$0	$358,000
Total Project Cost (2020)		$0	$0	$0	$ 3,940,000