



Tusculum Community Mobility Plan

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EXECUTIVE SUMMARY

The City of Tusculum, in coordination with Tusculum University, received a Community Transportation Planning Grant in 2020 from the Tennessee Department of Transportation (TDOT) to develop a community mobility plan that identifies and prioritizes needed transportation improvements within the study area. To support this effort, the project team identified a stakeholder group to better understand the issues facing the community and develop a proposed list of projects to address transportation needs.

Beginning in March of 2021, the project team met with stakeholders to initiate the plan and develop a preliminary set of transportation issues to evaluate and propose recommendations. Among the set of issues identified, stakeholders highlighted a lack of pedestrian facilities connecting to and within the University campus. Stakeholders also highlighted concerns with the capacity of Tusculum's roadways, wanting to better understand what options are available to accommodate increasing vehicle volumes with minimizing impacts to streets like Shiloh Road which runs through campus.

Public survey collected in May and June highlighted many of the same issues identified by stakeholders, with public feedback emphasizing safety improvements as a primary goal for the community mobility plan. Following public engagement held in-person in June, the project team refined a set of transportation issues that was presented to project stakeholders. Stakeholder feedback along with evaluation of potential right-of-way (ROW) impacts and proposed project costs were used to develop a recommended set of transportation improvements that addresses Tusculum's most important transportation needs. Recommended projects include the following:

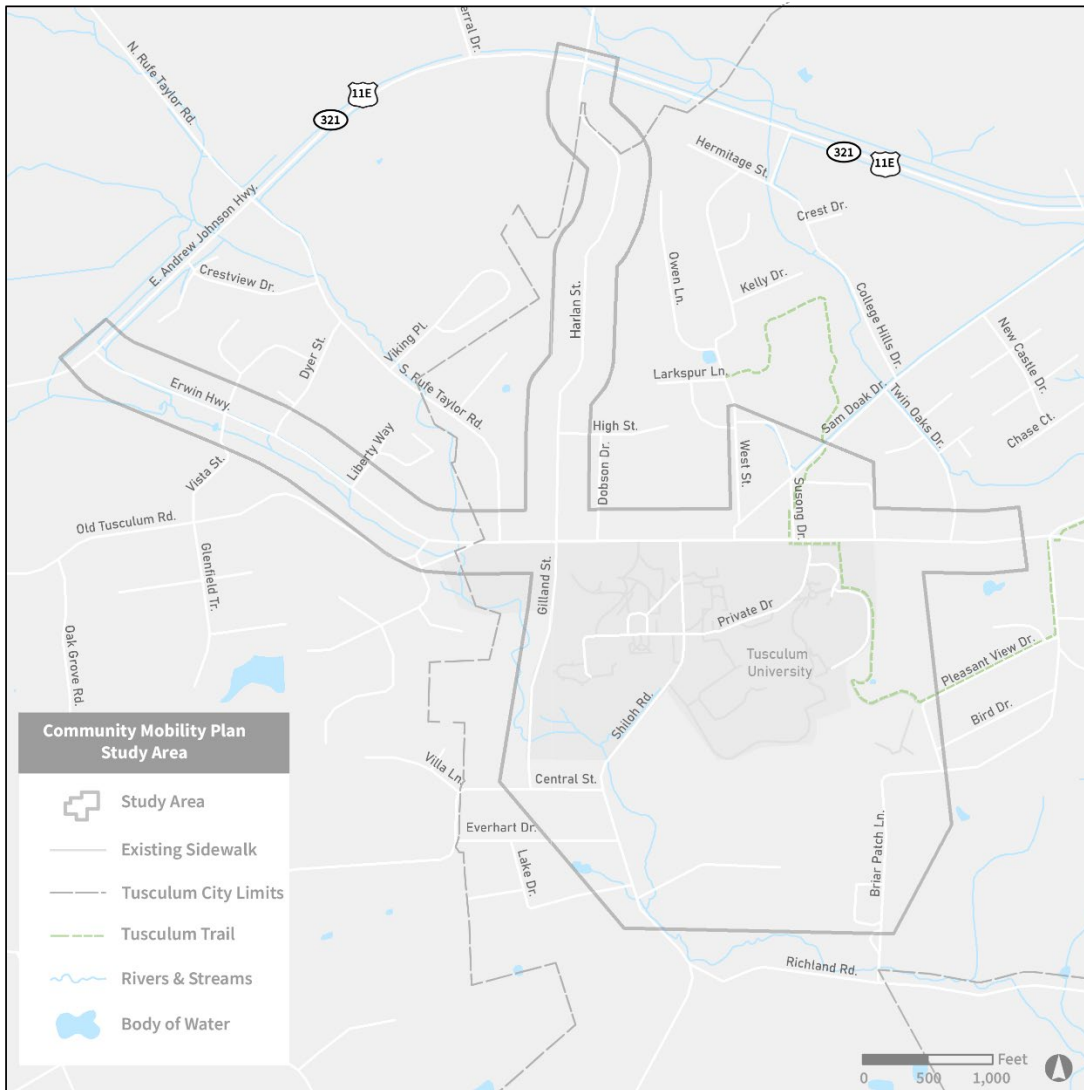
- Expansion of the existing Tusculum Trail
- Proposed re-routing of Shiloh Road
- Implementation of a consistent crosswalk treatment throughout the study area
- Roadway and intersection improvements within the study area
- Expansion of pedestrian facilities on campus

1. BACKGROUND

1.1 STUDY AREA

TDOT awarded the City of Tusculum a Community Transportation Planning Grant to develop a city-wide community mobility plan that identifies and prioritizes needed transportation improvements. As shown in Figure 1, the community mobility plan focuses on the main corridors within Tusculum – Erwin Highway, Harlan Street, Gilland Street, and Shiloh Road, with US-11E/US-321 acting as a boundary to the north and west. Tusculum University is a central point of the community mobility plan, with many of the identified issues near campus. Figure 1 also shows that portions of the study area extend outside of the Tusculum city limits. Sections of Harlan Street and Erwin Highway fall within the Town of Greeneville, including intersections with US-11E/US-321.

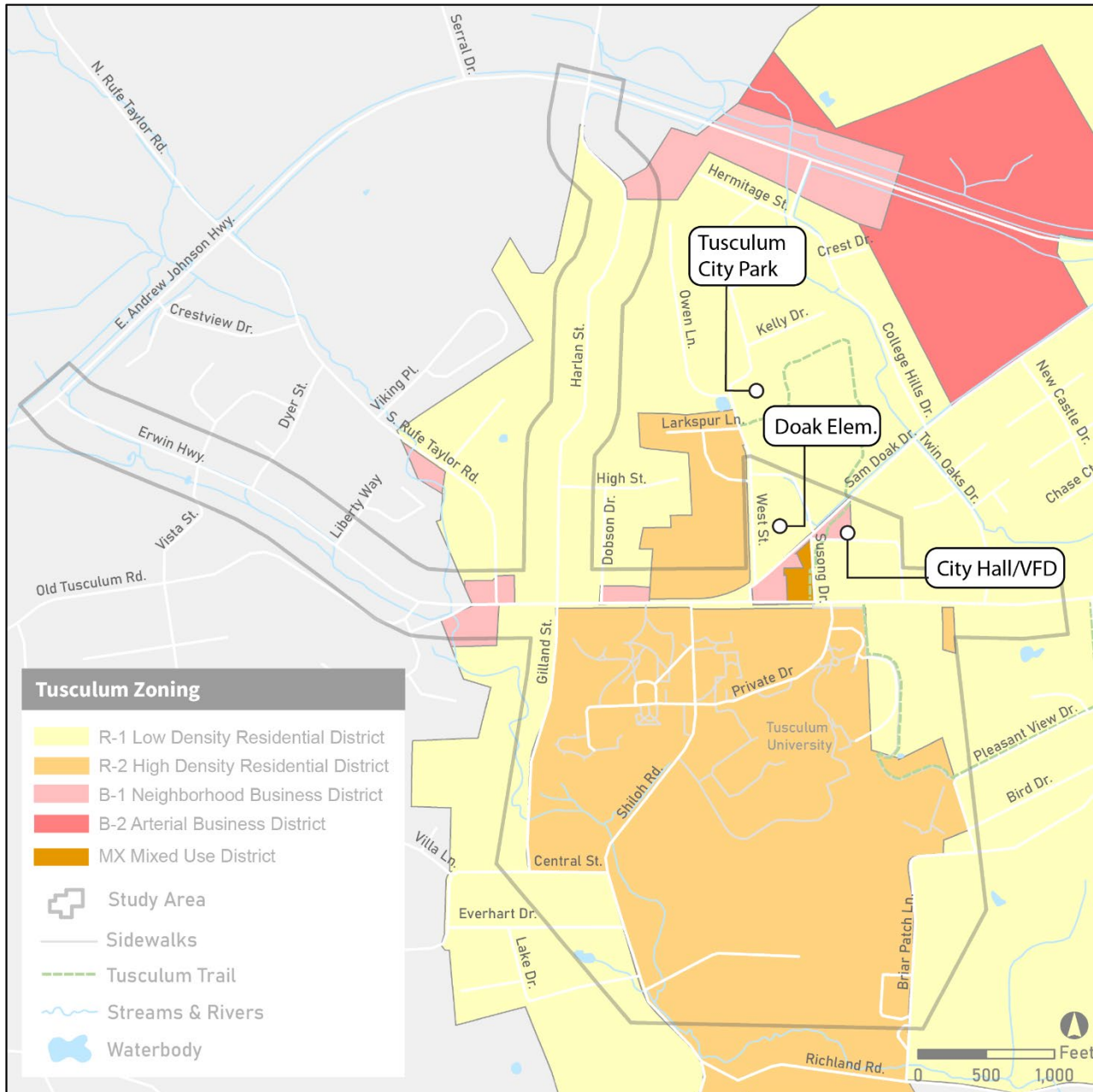
Figure 1: Tusculum Community Mobility Plan Study Area



1.2 ZONING

Much of the zoning within the study area is made up of low-density residential development. Tusculum University is a central point of the community, with approximately 1,300 students¹. There are a handful of businesses located in town, such as the Creamy Cup, as well as several businesses along US-11E/US-321, including an Aldi grocery store, Walmart, and several fast-food restaurants. Finally, there are civic spaces around town, including Tusculum City Park, Doak Elementary School, and the volunteer fire department.

Figure 2: Zoning Map



1.3 POPULATION AND DEMOGRAPHICS

Located in Greene County, Tusculum, Tennessee is located on a 4.86 square mile piece of land. It has a population of 3,298 and is currently growing at a rate of about 2.4% annually. Between the 2010 and 2020 censuses, Tusculum's population increased by more than 600 residents, nearly a 25% increase.

Tusculum has a unique demographic condition, as a large part of its population is over 65 years old, while it also contains a university, which means that a significant number of residents are under the age of 22. The median age of town residents is 41. Projections show that between 2021-2041, the population 85 and older will increase by 89%, which will present unique challenges regarding mobility and poverty, particularly as the rate of poverty among older populations is significantly higher than other age demographics. Additionally, Tusculum University anticipates an increase in student population, which may require additional residential facilities.

The City has 620 housing units. The median property value in Tusculum was \$205,400 in 2018, which is roughly on par with the national average. The median property value has increased about 1% since 2017. About 83% of Tusculum residents own their own home, which is significantly higher than the national average.

There are roughly 1,000 employees living in Tusculum. The most common employment sectors are retail, with 174 employees, educational services, with 164 employees, and manufacturing, with 148 employees². In Greene County, where Tusculum is located, there are 1,154 employers.

1.4 RELEVANT LOCAL, REGIONAL, AND STATE PLANS

Within the last decade, the City of Tusculum, as well as surrounding cities and the state of Tennessee have made investments in planning. In 1990, the City of Tusculum prepared and published its first Land Use Plan, which established a range of broad planning goals and opportunities. It projected population growth through 2010, established a series of land use principles and goals, and established a future land use plan to be implemented by 2010³. Pedestrian safety was also addressed through a 2015 TDOT-sponsored "Pedestrian Crossing Study" for the City of Tusculum and Tusculum University. Through the study, TDOT reviewed the crosswalks in place throughout the city and evaluated how improvements could be made. It made recommendations for signage and striping improvements that would draw more attention to the crossings for drivers to slow down and stop for pedestrians⁴.

In 2002, Tusculum University (then College) created a Campus Master Plan, which was tied to the Strategic Plan and would set a long-term plan for the future of the built environment on campus. While the plan does not explicitly address building sidewalks along major roads or expanding a bike network, it does set up a vision for the university that includes more connectivity, increased commercial spaces, and increased green space. It also expanded pedestrian access by removing Shiloh Road and rerouting traffic to Private Drive in favor of more pedestrian-friendly space in the center of campus.

¹ <https://home.tusculum.edu/apply/quick-facts/>

² <https://datausa.io/profile/geo/tusculum-tn/#economy>

³ City of Tusculum Land Use Plan

⁴ TDOT - City of Tusculum Pedestrian Crossing Study

Figure 3: Tusculum University Master Plan



Neighboring Greenville, Tennessee adopted the “Greenville Forward: Comprehensive Plan 2017-2037.” The plan extensively discusses the city’s goals and actions for the short and long term, which includes establishment of greenways and bicycle/pedestrian pathways. Although Tusculum is not part of Greenville, the plan references Tusculum many times, as the two municipalities share some utility services, schools, roadways, and more, and any mobility planning would impact the city as well.

Starting in 1994, the Tennessee state legislature requested that TDOT evaluate opportunities to build a four-lane highway which would connect the cities of Pigeon Forge, Sevierville, Newport, and Greenville, and the Tri-Cities Airport. In 2002, TDOT and cities in Greene County requested that a “Northern Loop Connector” be built that would improve traffic conditions on the route and in surrounding cities. This would eventually become the Greenville Bypass, which was not implemented.

Starting in 2000, the City of Tusculum began building the Tusculum Linear Park Trail, which is an 8-foot-wide trail that stretches across the Tusculum Bypass between Tusculum City Park and the Greene Valley Development Center. By 2006, it stretched four miles through the City and is a significant asset to cyclists and pedestrians in Tusculum and was funded through a TDOT grant.

1.5 PROGRAMMED TRANSPORTATION PROJECTS

To address safety and traffic concerns along Erwin Highway, TDOT recently funded an improvement to the signal at the intersection between the Tusculum Bypass and US-11E. This included turn lane improvements, timing improvements, and the loop detection system was switched to camera detection. Additionally, two TDOT resurfacing projects are planned for Greeneville within and adjacent to the study area:

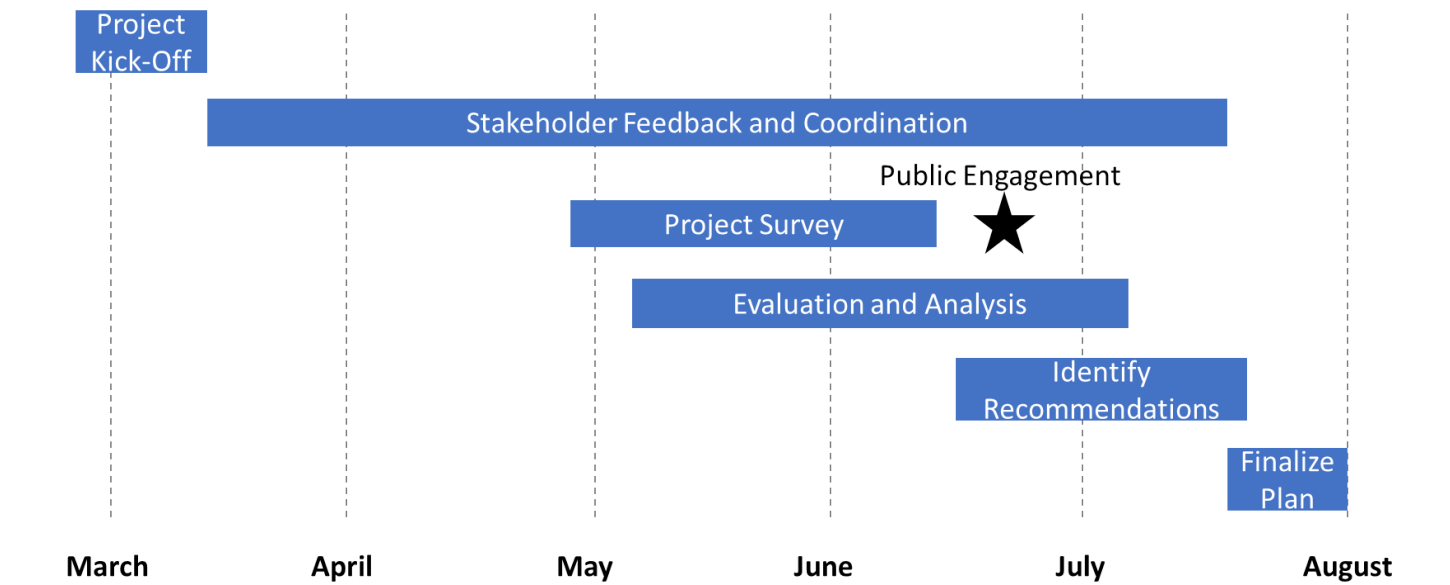
- Resurfacing of US-11E between SR-70 and Erwin Highway (Project Pin: 130390.00)
- Resurfacing of Erwin Highway between US-11E and Tusculum city limits (Project Pin: 131140.00)

2. SUMMARY OF OUTREACH ACTIVITIES

2.1 STAKEHOLDER ENGAGEMENT

The project team kicked-off engagement of stakeholders on March 24th, 2021 to review the scope and schedule of the project and identify next steps for planning activities and public engagement. As shown in the figure below, stakeholder feedback and coordination continued through July along with public survey and engagement, technical evaluation and analysis, and identification of recommendations.

Figure 4: Planning Process



Key stakeholders in the project included:

- Mayor Alan Corley
- Vice Mayor Barbara Britton
- Warren Cutshall, City of Tusculum
- Chief Danny Greene, City of Tusculum
- President Scott Hummel and Chad Grindstaff, Tusculum University

- Michelle Christian, TDOT

In addition to the project stakeholders identified above, the project team conducted the following outreach during the evaluation and analysis phase of the project:

- May 4th, First Tennessee Development District: Chase Milner and Erica Malpass
- May 18th, NET Trans, Candace Long
- June 8th, Greene County Schools, David McClain
- June 15th, TDOT Region 1 Traffic Office, Andrew Padgett, Jonathan West
- June 17th, Doak Elementary, Principal Sunshine Broyles
- June 22nd, TDOT STID, Shaun Armstrong
- July 1st, Town of Greeneville, Randy Davenport
- August 3rd, Tusculum University, Dr. Scott Hummel

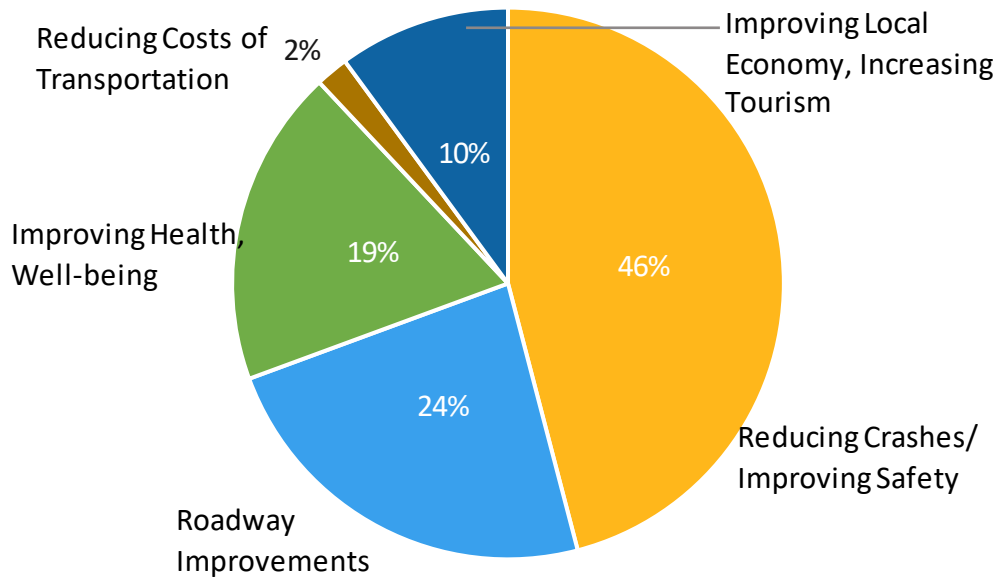
2.2 SURVEY RESULTS

As part of the public engagement effort, a survey was made available to stakeholders and the public between May 20th and June 27th. Of the 171 eventual survey responses, all but one respondent owned a car. An overwhelming number of respondents owned two or more vehicles, which shows the importance of driving among the community. Sixty-three percent of those surveyed said that they, or someone in their household, owns a bicycle. In the past 12 months, 53 percent of those surveyed had not ridden a bicycle in Tusculum. When asked if they felt safe riding a bike in Tusculum, the answers were nearly evenly split. ‘Yes’ responses received 36.4 percent while 34.4 percent answered ‘No’. The remaining 29.1 percent stated that they did not ride a bicycle.

Despite residents’ primary use of cars, there is still potential for more walking and biking interest. For those that do walk in Tusculum, 42.2 percent said that their walking has increased since March 2020, while 47 percent had not seen a change. Over half of the respondents engage in 30 minutes or more of moderate activity more than 3 times per week (69.9 percent). Additionally, almost half of survey participants said that they were “interested but concerned” in bike riding. They would be willing to bicycle if high-quality infrastructure was in place. Another 27.6 percent were “enthused and confident” in bicycle riding with the same high-quality bike infrastructure. Only 20 percent said they had no interest in bicycling at all.

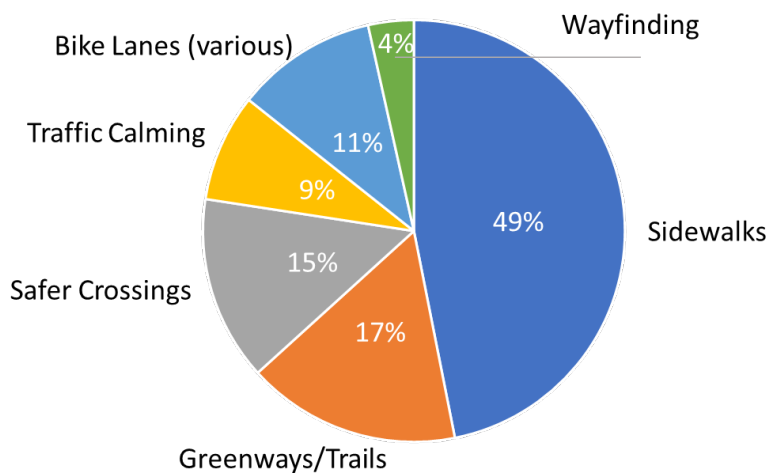
When asked what goals the community mobility plan should focus on, the community felt that reducing crashes and improving safety should be first priority. Next, they felt that using roadway improvements to make driving faster and more efficient, which is closely tied to safety. Improving health, wellbeing and quality of life came next, with improving the local economy next.

Figure 5: Mobility Plan Goals



Many of these goals could be met with improved bicycle and pedestrian facilities, which the survey asked about. Sidewalks were the most popular improvement that the community wants with almost half of respondents ranking it as their highest priority. Most of the sidewalk infrastructure is just focused on the Tusculum University campus, so residents would like to see this expanded to the town. Greenways and trails (like the existing Tusculum Trail) were identified as a top priority for 17 percent of respondents. Bike lanes were a middling option, which included buffered and separated bike lanes. Traffic calming and wayfinding came in last place, as it is likely that traffic is not necessarily a problem in a small town like Tusculum.

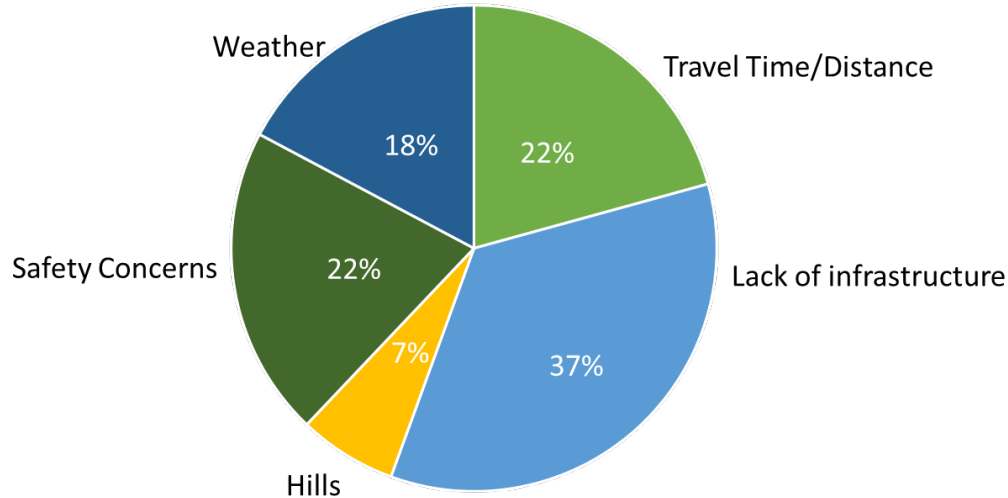
Figure 6: Types of Bicycle Pedestrian Facilities Preferred in Tusculum



In addressing walking and biking needs, the respondents continued to focus on safety issues, as they cited lack of infrastructure (such as sidewalks or paths) and safety concerns as their top two obstacles to walking or

biking more. They did not seem to be concerned with natural issues, such as weather or hills, which both came in last place as issues for biking or walking.

Figure 7: Obstacles to Walking/Biking More



2.3 PUBLIC ENGAGEMENT FEEDBACK

On June 26, 2021, the project team held public engagement events at the Tusculum Volunteer Fire Department barbecue fundraiser and at the Greeneville Flyboys game at Pioneer Park at Tusculum University. The project team provided information to the public and collected feedback in-person and via the project survey. In-person comments were generally aligned with feedback reflected in the project survey, and included recommendations for pedestrian facilities along Erwin Highway, concerns regarding intersections at Erwin Highway and Shiloh Road and at Erwin Highway and Sam Doak Street. Members of the public also expressed concerns regarding Tusculum Trail crossings and the crossing at the Tusculum Arch. Additional comments from the public raised concerns about existing lane widths of Gilland Street and Harlan Street.

Figure 8: Public Engagement Activities



3. CONDITION ASSESSMENT

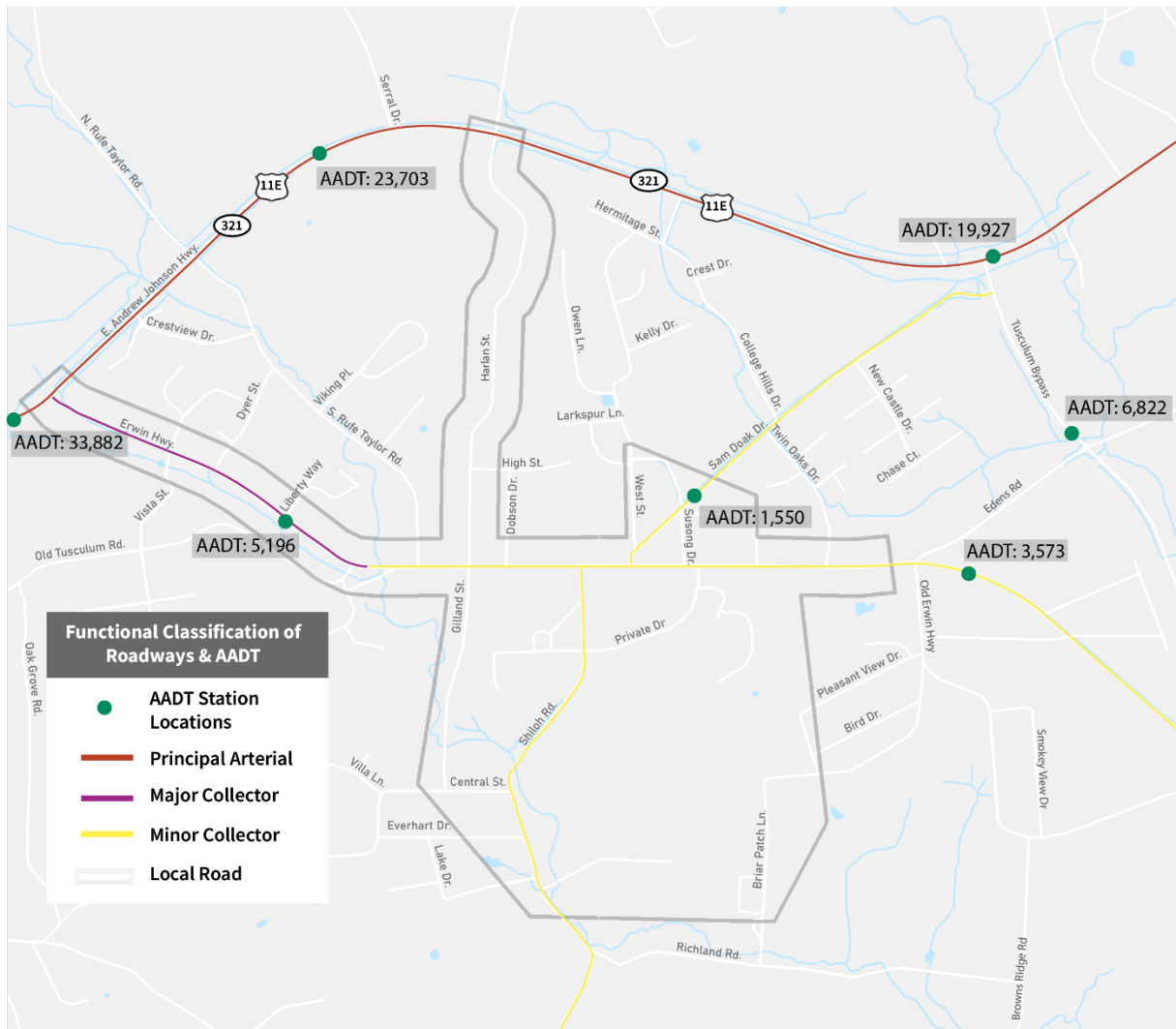
3.1 ROADWAY

This section reviews the condition of the roadway network, starting with the functional classification of and number of lanes on each roadway. Traffic counts were reviewed, future growth rates were selected, future forecasts were developed, and roadway level of service was analyzed to identify any congestion issues.

3.1 FUNCTIONAL CLASSIFICATION AND NUMBER OF LANES

Erwin Highway is a two-lane collector that runs east-west between US-11E/US-321 and SR-107/Tusculum Bypass. Within the City of Tusculum, Erwin Highway is a minor collector, and within the Town of Greeneville, Erwin Highway is a major collector. US-11E/US-321 is a principal arterial and state route. Other classified two-lane minor collectors in the study area include Shiloh Road and Sam Doak Drive. Local two-lane roads in the study area include Harland Street and Gilland Street. See Figure 11 for the functional classification map.

Figure 9: Functional Classification



3.2 TRAFFIC COUNTS AND FORECASTS

Traffic forecasting and Level of Service (LOS) analysis was performed for the corridor segments within the study area. Traffic counts were collected from TDOT count stations for various locations on those segments from 2010 to 2020. 2019 was selected as the existing condition. Growth rates from several sources were summarized in the sections below. Based on these sources a recommended project growth rate was selected.

The following datasets were considered in selecting growth rates for developing future year traffic forecasts:

- Historical Annual Average Daily Traffic (AADT - 2010 to 2019)
- Population Growth projections from 2018 to 2070 from First Tennessee Development District
- Traffic forecast for US-11E @ Tusculum Bypass intersection by TDOT
- Historical population growth from US census bureau

Historical traffic data (2010-2019) was collected from TN-TIMES (Tennessee Traffic Information Management and Evaluation System) which is an analytical and data processing tool used by TDOT to maintain, analyze, and report traffic data. Data from seven station locations were collected and analyzed which are presented in Table 1 and Figures 12 and 13 below.

Table 1: Traffic Count Locations

Roadway	Erwin Hwy	Erwin Hwy	Sam Doak St	Tusculum Bypass	US-11E	US-11E	US-11E
Location	East of US-11E	West of Tusculum Bypass	North of Erwin Hwy	South of US-11E	West of Erwin Hwy	East of Erwin Hwy	East of Tusculum Bypass
Station Number	000131	000211	000128	000210	000046	000127	000045

Figure 10: Traffic Count Locations

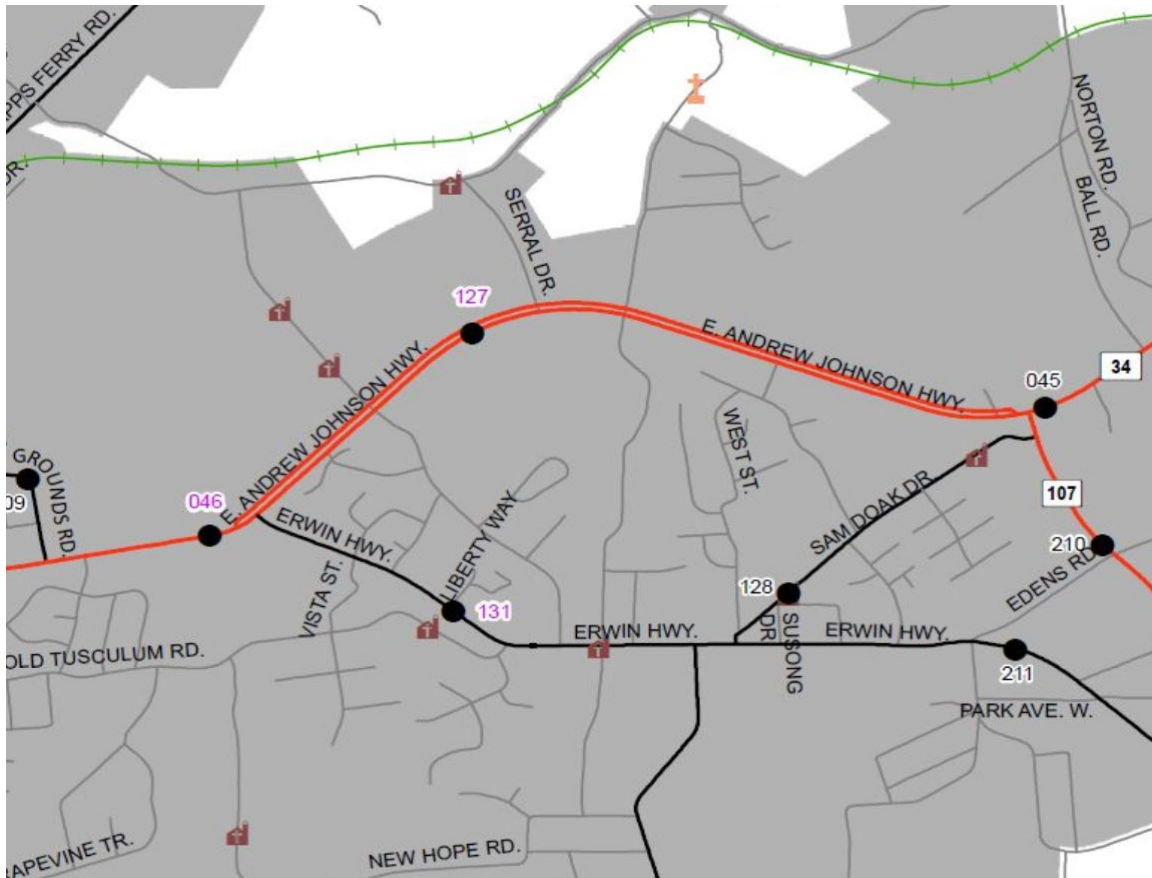


Figure 11: Traffic History

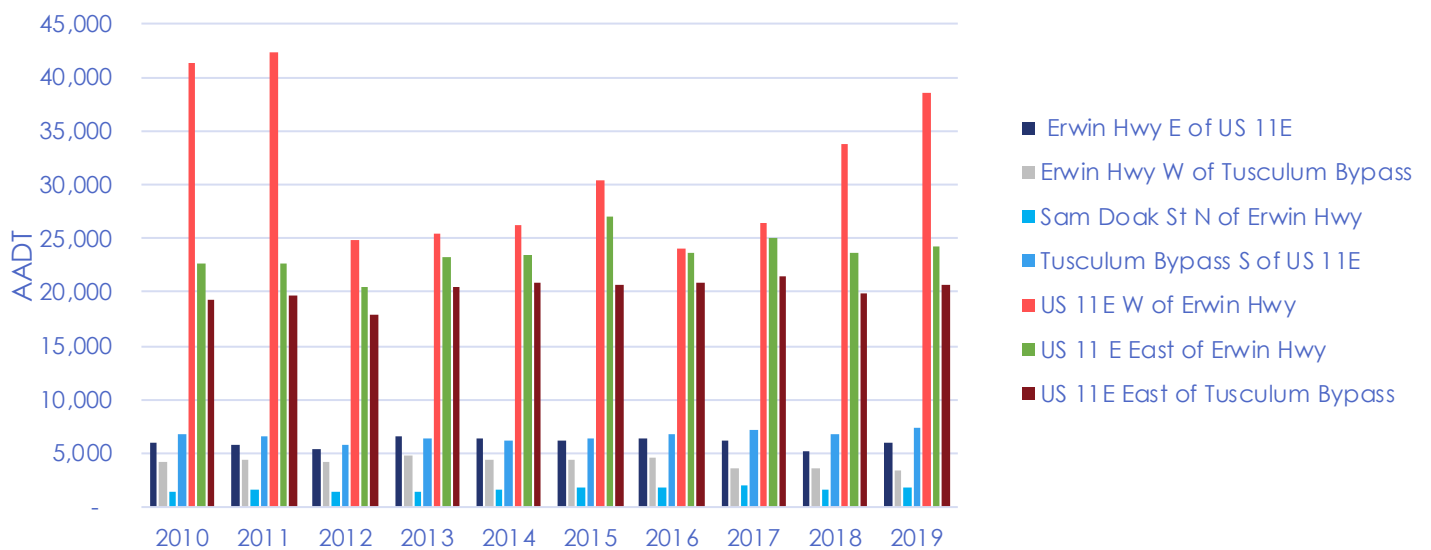


Table 2 below shows the summary of the TDOT historical data around the project area.

Table 2: Historic Traffic Growth Rates

Roadway	Stations	10 yr	5 yr	9 yr
US-11E	3	-0.39%	-0.33%	-0.25%
Erwin Hwy	2	-1.70%	0.65%	-1.20%
Sam Doak St	1	-0.48%	3.75%	3.08%
Tusculum Bypass	1	0.25%	-0.91%	1.08%

Data from US Census Bureau was reviewed for Greene County. Population growth in Greene County has slowed over the past decade. The data indicates that the population growth rate between 2000 and 2010 is 9.41 percent and 0.04 percent between 2010 and 2019. The First Tennessee Development District estimates that the population growth rate between 2018 and 2070 would be 0.04 percent.

TDOT performed a traffic forecast analysis for US-11E at the Tusculum Bypass intersection. A 1.4 percent growth rate was applied for the intersection between 2019 and 2024.

Based on the review of TDOT historic data, US-11E at the Tusculum Bypass intersection analysis, and the region population forecasts, the recommended growth rate for the corridors are shown in Table 3 below. Although historic growth rates vary by location, including some negative growth, the selected growth rates provide a conservative assessment of potential future demand.

Table 3: Proposed Traffic Growth Rates

Roadway	Selected Growth Rate
US-11E	1.0%
Erwin Hwy	1.0%
Sam Doak St	2.0%
Tusculum Bypass	1.0%

3.2 ROADWAY LEVEL OF SERVICE ANALYSIS

LOS is a qualitative measure of traffic flow describing operating conditions. Six levels of service are defined by the FHWA in the Highway Capacity Manual for use in evaluating roadway operating conditions. They are given letter designations from A to F, with LOS A representing the best operating conditions and F the worst. A facility may operate at a range of levels of service depending upon time of day, day of week or period of the year.

LOS was analyzed for the corridor segments around the count stations for which the data was collected. For each count location AADT was collected from year 2010 to 2020. Counts were lower for some stations in 2020 than the 2019 likely due to the COVID-19 pandemic and associated increase in working from home, hence 2019 was selected as the year of analysis. From 2019's AADT and K factor, the design hourly volume (DHV) was calculated. The roadway capacities for corridor segments were calculated according to the "Simplified Highway Capacity Calculation Method for the Highway Performance Monitoring System", October 2017. LOS was assigned based on the volume-to-capacity (v/c) ratios derived from DHV and capacity of each corridor segment.

Traffic projections for future years 2024 and 2044 were obtained with the recommended growth rates and base year 2019. LOS for most of the local road segments remains at base year levels in 2024 except the segment of Erwin Highway (East of US-11E) which will operate at LOS E in 2024. All segments of US-11E are projected to operate at LOS E in 2024. However, traffic conditions worsen on most of the corridor segments in 2044 except the Tusculum Bypass. Erwin Highway (west of the Tusculum Bypass) and Sam Doak Street will operate at LOS D and US-11E will have a worse traffic condition with LOS E and F. Despite the LOS E on the western portion of Erwin Highway forecast for 2044, the volume-to-capacity ratio is still projected to be below 0.7. Therefore, no roadway capacity improvements were identified.

Level of service for base and future years are presented in Table 4 and Figure 2.

Table 4: V/C & LOS for Roadway Segments

Roadway		Erwin Hwy	Erwin Hwy	Sam Doak St	Tusculum Bypass	US-11E	US-11E	US-11E
Location		East of US-11E	West of Tusculum Bypass	North of Erwin Hwy	South of US-11E	West of Erwin Hwy	East of Erwin Hwy	East of Tusculum Bypass
2019	V/C	0.54	0.32	0.25	0.25	0.88	0.64	0.55
	LOS	D	C	C	C	E	E	D
2024	V/C	0.57	0.33	0.28	0.26	0.93	0.67	0.57
	LOS	E	C	C	C	E	E	E
2044	V/C	0.69	0.41	0.41	0.32	1.13	0.82	0.70
	LOS	E	D	D	C	F	E	E

Figure 12: LOS for Year 2019

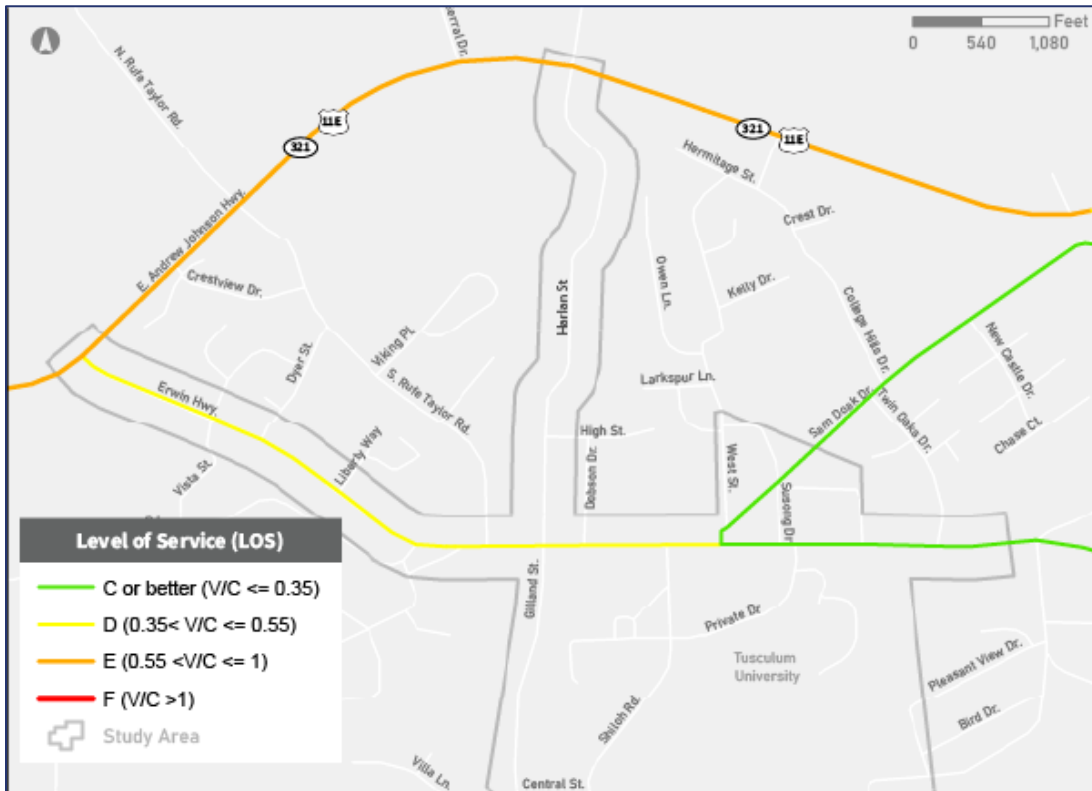


Figure 13: Level of Service (LOS) for Year 2024

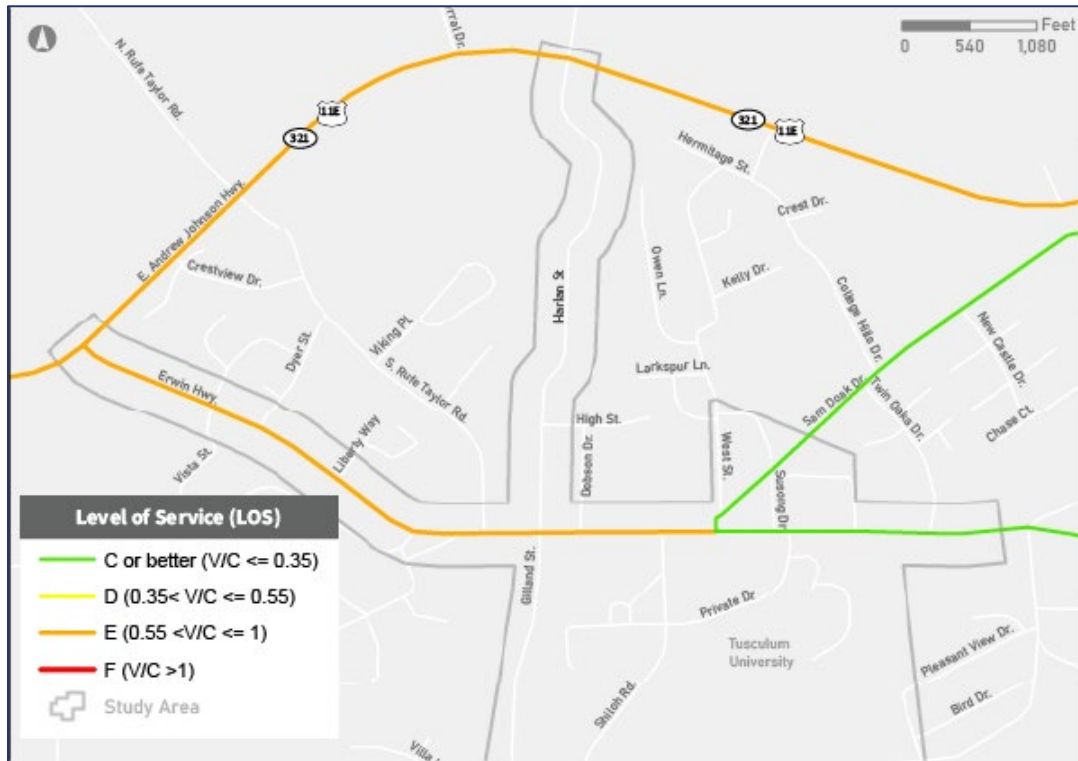
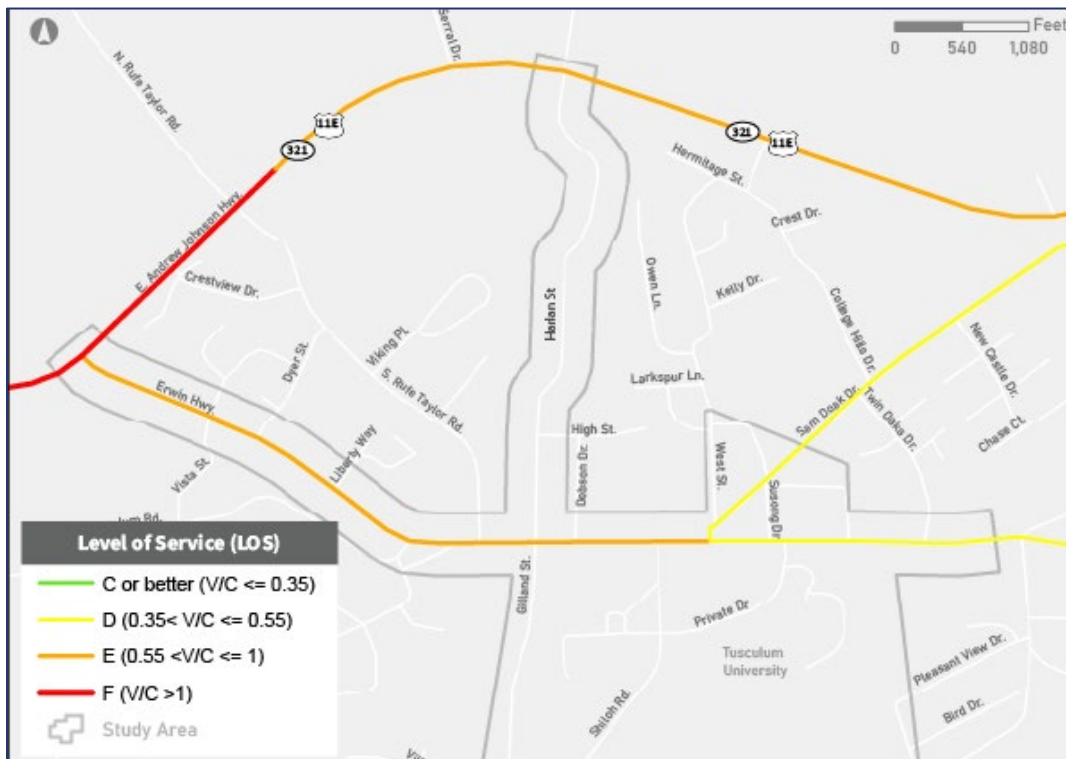


Figure 14: Level of Service (LOS) for Year 2044



3.3 SAFETY

Many of the concerns regarding traffic safety have to do with crashes along major thoroughfares in and around Tusculum. As shown in the figure below, most of the safety issues are concentrated along the intersections of US-11E/US-321 and Harlan Street, as well as US-11E/US-321 and Erwin Highway, where traffic volumes are highest. As US-11E is a four-lane highway with higher posted speeds and no pedestrian or bicycle facilities, these intersections present challenging conditions for all roadway users. Although the majority of the vehicular crashes involved only property damage, there was also a fatal crash, as well as several injury crashes shown in Figure 15. There are also significant numbers of vehicular crashes on the roads surrounding Tusculum University, along Erwin Highway and Shiloh Road.

Table 5 includes a crash analysis of intersections and roadway segments in the study area for the last three years (1/1/18-12/31-20). There was a fatal crash and multiple injury crashes at US-11E/US-321/SR-34 at Harlan Street and Morgan Road. There were no pedestrian related crashes in the study area. As the A/S Ratio compares the crash rate (A) to the statewide average rate (S), A/S Ratios greater than one indicate locations where crash rates are higher than the statewide average. The A/C Ratio relates the crash rate to the critical rate (C), which controls for randomness. A/C Ratios greater than one indicate the elevated crash rates might be due to intersection or roadway characteristics.⁵ Although most locations in Table 5 have crash rates higher than the statewide average, Erwin Highway at Harlan Street and Gilland Street is most in need of improvement according to the A/C Ratio metric.

Table 5: Crash Analysis

Intersection	Log Mile	Total Crashes	Fatal Crashes	Incap. Injury Crashes	Minor Injury Crashes	A/S Ratio	A/C Ratio
SR-34 at Erwin Hwy and Crockett Crossing	18.95	38	0	0	5	1.60	1.07
SR-34 at Harlan St and Morgan Rd	19.852	22	1	2	4	1.05	0.69
Erwin Hwy at Harlan St and Gilland St	0.777	5	0	0	2	5.10	1.32
Erwin Hwy at Sam Doak Rd	1.050	2	0	0	0	2.38	0.58
Segment	Log Mile	Total Crashes	Fatal Crashes	Incap. Injury Crashes	Minor Injury Crashes	A/S Ratio	A/C Ratio
Erwin Hwy --- From SR-34 to near Old Erwin Hwy	0.000-1.445	19	0	0	4	0.80	0.53
Harlan St --- From Erwin Hwy to SR-34	0.378-1.150	7	0	1	0	1.60	0.72
Shiloh Rd --- From Erwin Hwy to near Richland Rd	0.000-0.630	7	0	0	1	2.57	0.99

Source: TDOT Region 1 Traffic Office

⁵ Tennessee Department of Transportation Highway System Access Manual (HSAM)

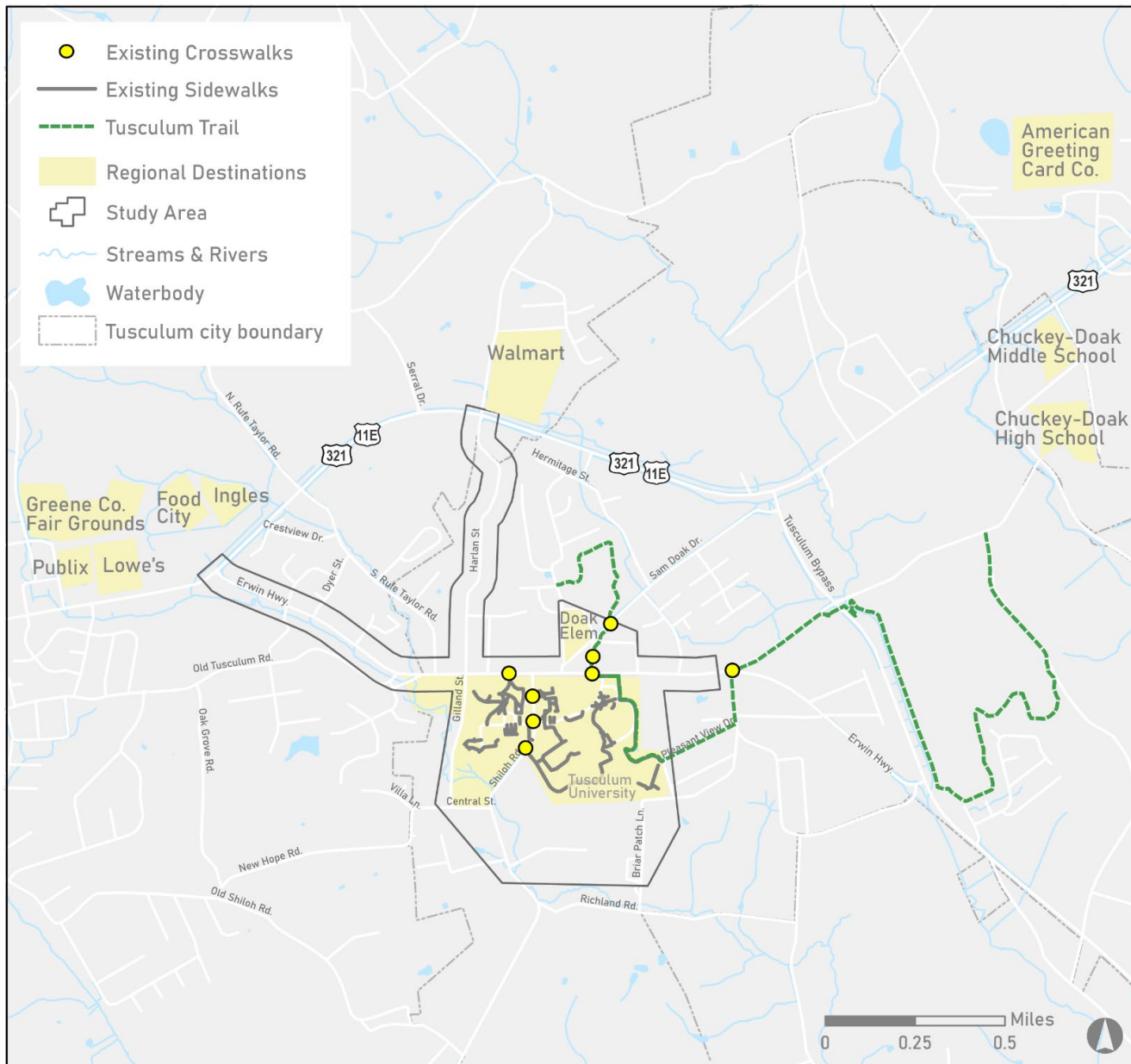
Figure 15: Crash Heat Map (ETRIMS crash data 2002-2021)



3.4 ACTIVE TRANSPORTATION

Existing bicycle and pedestrian infrastructure within the study area consists of on-campus sidewalks and the Tusculum Trail. The trail extends roughly four miles from the Tusculum City Park, north of the Doak Elementary School to the Green Valley site east of the Tusculum Bypass/SR-107. The trail provides an 8-foot multi-use path and includes marked crossings on Sam Doak Street, a mid-block crossing on Susong Lane, Erwin Highway at Susong Lane, and across Erwin Highway at Edens Road. See Figure 18 below for an inventory of existing active transportation assets.

Figure 16: Existing Active Transportation Assets



3.5 PUBLIC TRANSPORTATION

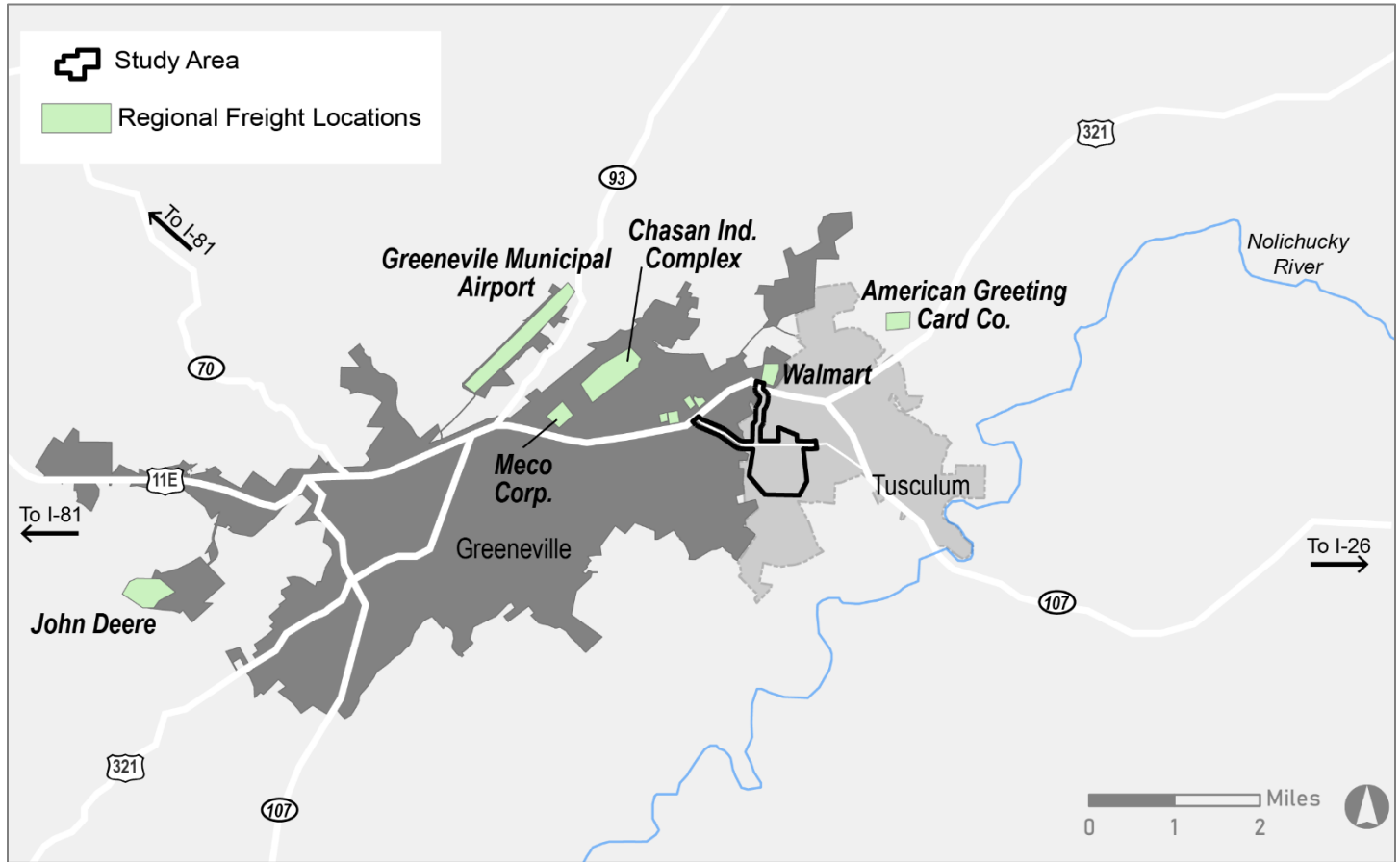
Within the study area, public transportation is provided by the Northeast Tennessee regional public transit system (NET Trans) which is part of the First Tennessee Human Resource Agency. NET Trans provides door-to-door, demand-response transportation for customers to schedule rides as needed.

The project team met with NET Trans staff to discuss the study and potential considerations for public transportation. Ridership data provided by NET Trans for 2019 showed limited usage within the study area during that period, with a total of three trips generated by a single user.

3.6 FREIGHT

Limited freight generators are present within the study area, though nearby industrial locations and manufacturing facilities like the Chasan Industrial Complex and Meco Corporation are located off of Snapps Ferry Road in Greeneville, just southeast of the municipal airport (See figure below). Commercial retailers like Walmart, Publix, Ingles, Lowe’s, and Food City are served by US-11E/US-321. Project stakeholders indicated that rock trucks serving a quarry across the river have ceased being an issue cutting through on Erwin Highway since the opening of the Tusculum Bypass/SR-107.

Figure 17: Regional Freight Locations of Interest



3.7 CAMPUS DEVELOPMENT

The University master plan (see Figure 3) identifies a number of proposed new buildings along with a closure of Shiloh Road north of the existing Niswonger Commons and alignment with the existing Private Drive just north of the athletic complex where it connects to Erwin Highway. In addition to the new Pioneer Park which opened in 2003, the master plan identifies a new student residence hall off of Gilland Street, new buildings in the center of campus, small commercial buildings at the northeast corner of Harlan Street and Erwin Highways, and a surface parking lot where the new Meen Center building is located along Erwin Highway. Figure 18 shows the existing campus facilities.

Figure 18: Tusculum University Campus Map, 2021



4. NEEDS ASSESSMENT

4.1 UNIVERSE OF IMPROVEMENTS

Public and stakeholder feedback along with evaluation conducted by the project team highlighted the issues identified in the figure below which include consideration of pedestrian crossing and intersection improvements along with roadway and trail/sidewalk improvements. A majority of issues were identified for the central study area, along Erwin Highway and Tusculum University frontage. Two intersections and the approaching roadway were identified for evaluation outside the City of Tusculum on US-11E/US-321, along Erwin Highway and Harlan Street, respectively which are located in the Town of Greeneville.

Figure 19: Study Area Issues and Opportunities



4.2 SHILOH ROAD ALTERNATIVES

Project stakeholders highlighted concerns about the high volume of pedestrian crossings along Shiloh Road and potential conflicts with vehicular traffic using the street as it cuts through campus. Currently three marked crossings along with signage are present at the existing Shiloh Road crossings. Stakeholders highlighted concerns about the need for improvements to support safe pedestrian crossings and vehicle compliance. The Tusculum University Campus Master Plan identified the opportunity to close or repurpose portions of Shiloh Road to better accommodate student crossings in the area and to create a more pedestrian-friendly experience on campus.

The University Master Plan (Figure 3) shows removal of Shiloh Road with a conversion to a cul-de-sac entrance from Erwin Highway along with construction of new campus buildings within the existing right-of-way. An alternative to the removal of Shiloh Road would be converting the existing roadway into a pedestrian plaza, using various treatments to limit vehicular access and designate the roadway to prioritize pedestrians. Fixed or retractable bollards on Shiloh Road at Erwin Highway and the Indoor Practice Facility driveway could restrict vehicular access to Shiloh Road as needed. Further improvements to the roadway using brick or stone pavers, or alternatively painted or stamped designs on the existing asphalt, could create a welcoming pedestrian environment that could also accommodate vehicles.

A precedent for the retractable bollard and paver treatment is shown in the figure below, taken from the Georgia Institute of Technology campus, where Atlantic Drive was converted from a vehicular-oriented roadway to a pedestrian-oriented walkway that accommodates vehicles, as needed.

Figure 20: Shiloh Road Pedestrian Plaza Concept – Georgia Tech, Atlantic Drive



Conversion of Shiloh Road into a pedestrian-oriented plaza would be supported by the diversion of existing traffic from Shiloh Road to alternate routes. Three alternatives were identified for re-routing traffic from Shiloh Road:

1. Private Drive, east of Shiloh Road
2. Pleasant View Drive, east of Shiloh Road
3. Central Street and Gilland Street, west of Shiloh Road

Private Drive currently provides access to Katherine Hall, the Meen Center, and Pioneer Park. Owned by the University, Private Drive is signed at 15 miles per hour and includes speed bumps in front of the athletic facilities. This alternative would route traffic east of Shiloh Road via Private Drive to Erwin Highway and include the following modifications:

- Demolition of existing speed bumps
- Signage (No Thru Traffic)
- Pavement markings
- Flashing pedestrian beacon
- Painted crosswalk

Pleasant View Drive, a former privately owned aircraft landing strip is located just east of the Tusculum Athletic Fields and connects to Erwin Highway via Old Erwin Highway. This alternative would involve routing traffic east of Shiloh Road via the driveway accessing the athletic facilities and involve construction of a new roadway connecting the driveway with Pleasant View Drive. Potential disadvantages of this alternative would be the impact to campus athletic practice fields and routing through traffic onto a residential street that does not currently experience through traffic.

A third alternative involves routing traffic west of Shiloh Road onto Central Street and Gilland Street. This alternative would likely require widening both streets to bring them up to TDOT standards of 10 feet, though additional widening to accommodate 12-foot lanes and/or additional two-foot shoulder could be included. This alternative would also require substantial intersection modification to align Shiloh Road to Gilland Street as the primary through-movement.

Some public feedback provided support for routing traffic away from the Shiloh Road, though no specifics were given for preferred re-routing. Additional survey comments, as well as comments received during the public engagement indicated support for widening of Central Street and Gilland Street, independent of Shiloh Road re-routing. Project stakeholders, including public officials and University representatives, expressed strong support for re-routing via Central Street and Gilland Street to avoid pedestrian conflicts through campus to the extent possible.

Of the three re-routing alternatives identified here, Private Drive would feature the lowest ROW impact and the lowest cost due to a shorter extent and more limited improvements needed. Both the widening of Central Street/Gilland Street and the new roadway connecting to Pleasant View Drive would entail substantially higher costs, than the Private Drive improvements. These alternatives would also involve higher ROW impacts to adjacent parcels and residents may object to increased traffic that would be expected.

Costs associated with implementation of the pedestrian plaza could vary widely, depending on the type of treatment desired, from \$100,000 to more than \$1 million.

4.3 HARLAN STREET ALTERNATIVES

Harlan Street currently features a single eight-foot lane in each direction connecting between Erwin Highway and US-11E/US-321 with adjacent single-family residential uses for the majority of its three-quarter-mile extent. Stakeholder and public feedback identified concerns that Harlan Street currently experiences more traffic than

it can safely support. Though Harlan Street does not currently include any sidewalks, stakeholders noted that often students use the street as the most direct pedestrian route to Aldi, Walmart, and other commercial destinations on US-11E/US-321.

In order to address these concerns, the project team identified road widening and implementation of sidewalk as potential solutions to address traffic concerns and pedestrian accommodations. A number of challenges would need to be addressed in order to implement the proposed improvements, however. Road widening and sidewalk installation would result in private property impacts along the street and likely involve relocation of utility poles in some sections of Harlan Street. In addition, improvements to facilitate traffic flow, such as road widening, may result in additional traffic increases in the future.

As a result, three potential improvements were identified for Harlan Street:

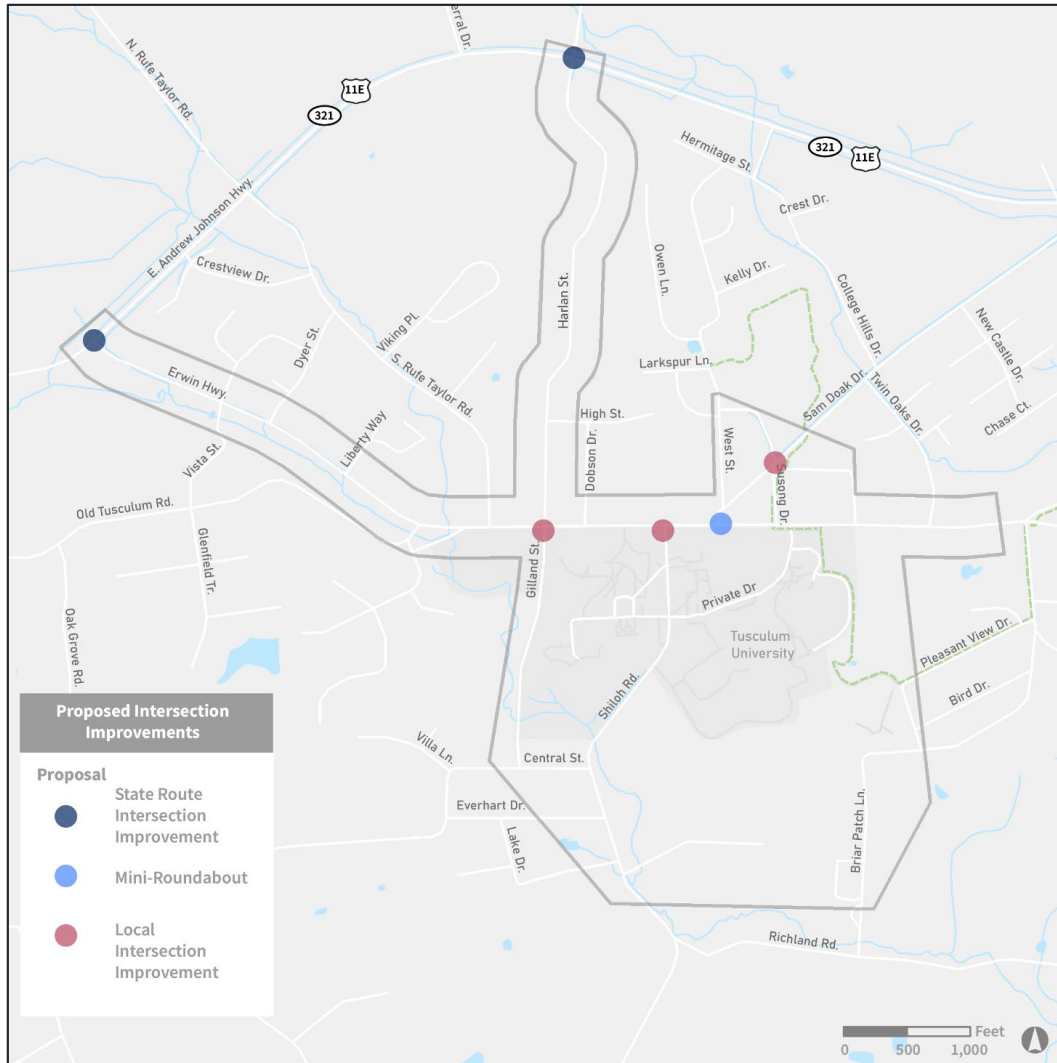
1. Widen lanes to 10'
2. Widen lanes to 12'
3. Add sidewalk on the eastern side of the street

Of the three alternatives, widening to 12-foot lanes would involve the highest cost and ROW impact, though high cost and ROW impacts would also result from widening to 10-foot lanes or installing sidewalk on the eastern side of the street.

4.4 INTERSECTION IMPROVEMENTS

Two types of intersection improvements were identified based on the existing conditions: state route intersection improvements and local intersection improvements, as described below. State route intersection improvements were identified for US-11E/US-321 at Erwin Highway and Harlan Street, respectively, which are located within the study area in the Town of Greeneville.

Figure 21: Proposed Intersection Improvements



STATE ROUTE INTERSECTION IMPROVEMENTS

In addition to roadway improvements, a number of intersections within the study area have been identified for traffic and pedestrian improvements. Two of the intersections on US-11E/US-321 fall outside the Tusculum city limits but are an important connection between the University, the City of Tusculum and the commercial destinations along US-11E/US-321. Traffic volumes between Erwin Highway at US-11E/US-321 and Harlan Street at US-11E/US-321 range between 23,000 and 33,000 vehicles per day based on 2018 TDOT AADT. These intersections also currently feature no facilities for pedestrians looking to cross the principal arterial. Project stakeholders have identified both intersections as important study area destinations for all users.

Potential improvements to both intersections include the following:

- Installation of crosswalks, ADA-compliant curb ramps, and sidewalk connections
- Installation of median refuge areas
- Incorporate pedestrian signal heads

- Shorten cycle lengths
- Reduce turning angles at channelized at Erwin Highway and US-11E/US-321

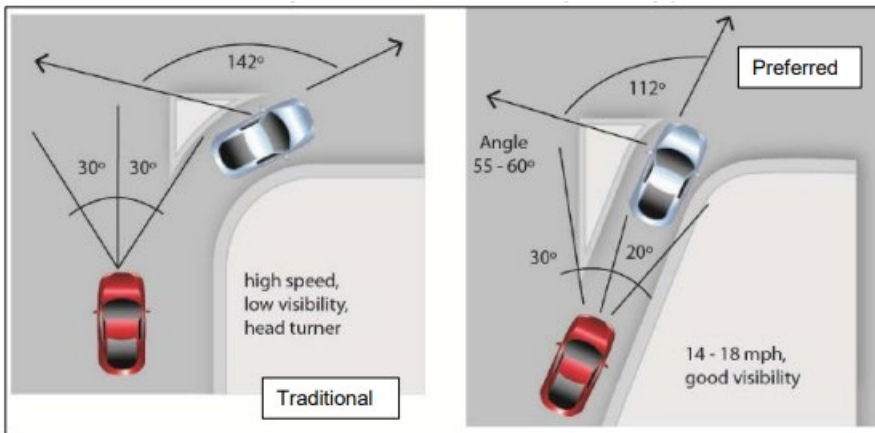
These potential improvements were selected to increase safety and visibility for pedestrians wishing to travel to popular retail and dining destinations from the university campus. Installing crosswalks and ADA-compliant curb ramps provide designated crossing locations for disabled pedestrians and signal drivers to be aware of pedestrians in the area.

Providing pedestrian refuge areas in the median at pedestrian crossings reduces the risk of pedestrian-vehicle crashes. They are encouraged on two-way streets meeting the following conditions⁶:

- Vehicle speeds greater than 35 mph
- Crossing distance greater than 44 feet
- AADT greater than 9,000 per day

Channelized right turn lanes potentially create a conflict point between vehicles and pedestrians because of the driver yield condition. The right turn lane makes the intersection wider, increasing the crossing distance for the pedestrian, and promotes higher turning vehicle speeds. Installing a concrete median to reduce the turning angles of the right turn lane not only provides a pedestrian refuge, but also promotes traffic calming and encourages vehicles to slow down as they approach the turning movement.

Figure 22: Channelized Island Design



Source: Broward County, FL Complete Streets Guidelines

Source: TDOT Multimodal Project Scoping Manual

⁶ At US-11E/US-321 intersections within the study area, posted speeds range from 45 to 50 mph; crossing distances exceed 120 feet; AADT ranges between 23,000 and 33,000.

Figure 23: State Road Intersection Improvement Concept



Proposed intersection improvements to US-11E/US-321 would result in limited ROW impacts.

LOCAL INTERSECTION IMPROVEMENTS

In addition to improvements to US-11E/US-321 intersections at Erwin Highway and Harlan Street, other local intersection improvements were identified at the following intersections:

- Erwin Highway at Sam Doak Street
- Erwin Highway at Gilland Street and Harlan Street
- Erwin Highway at Shiloh Road
- Sam Doak Street at Susong Lane/Alexander Street

The intersection at Erwin Highway, Sam Doak Street, and West Street, often referred to as “the triangle,” currently features a complex geometry and unclear right-of-way for vehicles approaching the intersection. More than any of the other intersections identified for improvements, this intersection received several comments from the public via the project survey and at the public engagement event.

A potential improvement to the intersection would involve installation of a mini roundabout, along with realignment of the approaches to the intersection. The mini roundabout features a smaller inscribed diameter, typically between 50 and 100 feet, which allows for a smaller footprint and lesser ROW impacts. Benefits of mini-roundabout installation include increased safety through reduced crashes and traffic calming, while also accommodating traffic capacity more efficiently. Converting stop-controlled intersections to a roundabout or mini roundabout has shown to have reduced severe angle crashes by up to 80 percent.

While some public feedback indicated the need to address this intersection, the proposed improvement would involve high costs and ROW impact, though ROW impact would primarily be limited to the University and the City.

Additional local intersection improvements were identified for Erwin Highway at Shiloh Road. Members of the public highlighted concerns for this intersection regarding delays resulting from left-turning vehicles on Shiloh Road. As described above, installation of a pedestrian plaza could result in the opportunity to re-direct traffic away from Shiloh Road, though a pedestrian plaza could also feature a flexible treatment that accommodates vehicular traffic as well, with the plaza serving a traffic calming function. If vehicular access were maintained, turn restrictions could be implemented to allow only right turns at this intersection. Drivers wanting to turn left could re-route via the proposed mini roundabout.

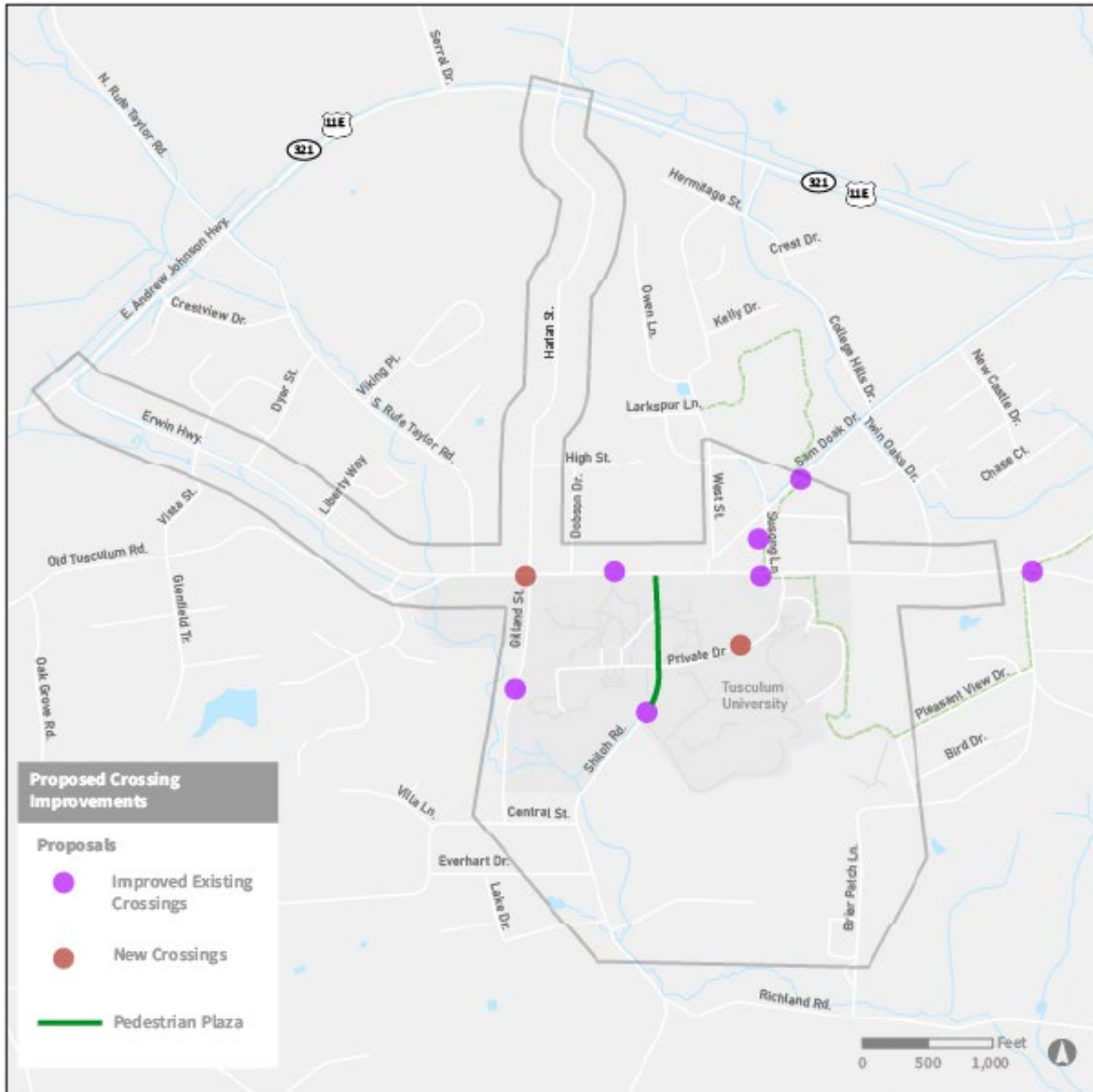
Smaller scale intersection improvements were identified for Erwin Highway at Harlan Street/Gilland Street which TDOT identified for pedestrian crosswalk improvements in 2015. The intersection of Sam Doak at Susong Lane and Alexander Street was also identified for potential improvements due to its complex geometry, multiple approaches, and unclear ROW. Access restrictions to this intersection could create a condition that would improve a location impacted by school pick-up and drop-off activity.

4.5 CROSSING IMPROVEMENTS

As noted above, TDOT conducted a pedestrian crossing study in 2015 to evaluate the conditions of existing crossings on campus and along the Tusculum Trail. The report identified potential improvements at many of the existing trail and on-campus crossings, some of which have been implemented. Project stakeholders have indicated that some improvements, such as flexible delineator posts, have previously been installed in the roadway, but due to repeated issues with maintenance, none are currently in place.

Project stakeholders and the public indicated the need for potential crossing improvements both on campus and at existing Tusculum Trail crossings. Stakeholder feedback and public comments indicated that existing pedestrian crossings may not provide adequate safety measures. Stakeholders indicated a desire to create a consistent crossing condition within the City to support safe crossings while wanting to validate the need for each of the existing crossings. Site evaluation along with the TDOT report indicated that existing crossings within the study area are warranted and that additional crossings may be necessary to support other proposed improvements. Minor modifications are proposed below for existing Tusculum Trail crossings, and proposed improvements for existing on-campus crossings would create a consistent pedestrian crossing treatment within the City.

Figure 24: Proposed Crossing Improvements



EXISTING PEDESTRIAN CROSSINGS

The TDOT pedestrian crossing report identified the need for improvements to the crossing at the Tusculum Arch on Erwin Highway. This location currently features a striped crossing along with pedestrian crossing signs, but does not include push-button activated flashing beacons like other crossings along the Tusculum Trail due to concerns about the placement of flashing beacons in proximity to the Tusculum Arch. A consistent crossing treatment could be applied to this location by shifting the crossing just west of the arch, allowing for the installation of flashing beacons and providing direct access to the Creamy Cup and Whistle Stop.

Evaluation of existing pedestrian crossings along the Tusculum Trail which currently include advanced warning signs and flashing beacons showed that crossings are largely sufficient, but that some minor modifications could support safe crossings for all users. The primary, and most costly improvement would be to install street lighting at crossing locations. Public comments indicated that visibility could be an issue at some crossings. Additional improvements to the existing trail crossings included installation of stop bar in advance of the striped crossing, along with signage “Stop Here for Pedestrians” (MUTCD R1-5b). Installation of ADA-standard detectable warnings at trail crossings would support pedestrian awareness of trail crossings while meeting ADA requirements⁷. Installation of transversable rumble strips in advance of pedestrian crossings would likely slow vehicles and alert drivers to conflict areas with pedestrians but rumble strips are typically not recommended for residential areas present within the study area.

Evaluation of existing on-campus crossings showed that a number of improvements could be made to support safe crossings. As shown in the figure above, implementation of a pedestrian plaza on Shiloh Road between the Indoor Practice Facility and Erwin Highway would create a flexible pedestrian environment that ties together both sides of the street while also providing for safe crossings at the existing crosswalks at the Indoor Practice Facility, Virginia Hall and Niswonger Commons, and at locations in between.

Potential improvements to existing and proposed on-campus crossings would improve pedestrian conditions and provide a consistent treatment at crossing locations throughout the City, elevating on-campus crossings to the same condition identified for Tusculum Trail crossings. Potential improvements to the pedestrian crossing at Gilland Street at the Doak House Trail would involve installation of flashing beacons and signage/stripping consistent with other crossings in the study area. These locations would also require ADA-compliant curb ramps and sidewalk connections as none are currently present.

NEW CROSSINGS

New crossings are proposed for Private Drive to provide a safe condition for pedestrians accessing Pioneer Park and Pioneer Field. Currently, Private Drive is signed with 15 MPH speed limits and includes speed bumps. To support safe pedestrian crossings, two locations have been identified for a similar treatment to what is proposed for other locations: installation of flashing beacons, marked crosswalks, and associated signage and marking. On Private Drive, two crossings would likely be appropriate to support safe pedestrian access between parking facilities and the stadiums, one crossing at Pioneer Field and one at Pioneer Park.

The TDOT report identified crossing improvements at Erwin Highway and Harlan Street/Gilland Street due to students using the adjacent parking at the church and crossing Erwin Highway to attend class. Project stakeholders indicated that this concern was less relevant today due to additional parking and classroom facilities available on campus. Crossing improvements at this location would be recommended should the City advance installation of sidewalks along Harlan Street/Gilland Street.

CONSIDERATIONS

The one exception for proposed improvements is to the mid-block crossing on Susong Lane, between Sam Doak Street and Erwin Highway. Currently this crossing includes a striped crosswalk with advanced warning signs, but does not include flashing beacons. This location may not warrant flashing beacons due to lower vehicle volumes than Erwin Highway or Sam Doak, but installation of additional pavement markings and ADA-standard detectable warnings could support safe crossings at this location.

⁷ Detectable warnings provide a distinctive surface pattern that alert pedestrians and people with vision impairments as they approach street crossings (<https://www.access-board.gov/prowag/other/dw-update.html>)

ROW and cost impacts resulting from proposed pedestrian crossings are limited, especially at existing crossings where many of the necessary safety improvements are currently in place.

Table 6: Description of Crossing Improvements

Crossing Location	Potential Improvement(s)
Shiloh Rd at Virginia Hall	<ol style="list-style-type: none"> 1. Implement pedestrian plaza 2. Upgrade to improved trail crossing condition (described above for existing trail crossings)
Shiloh Rd at Private Dr	<ol style="list-style-type: none"> 1. Implement pedestrian plaza 2. Upgrade to improved trail crossing condition (described above for existing trail crossings)
Erwin Hwy at Tusculum Arch	Relocate crossing just west of Tusculum Arch to avoid issue with flashers at historic archway. Install flashers, striped crosswalk, ADA-compliant curb ramp, street lighting, additional pavement markings (stop bar, “Stop Here for Pedestrians”), additional signage (“Stop Here for Pedestrians”, MUTCD R1-5b), installation of ADA-standard detectable warnings at trail crossings.
Tusculum Trail crossing – Sam Doak St	Improved trail crossing: street lighting, additional pavement markings (stop bar, “Stop Here for Pedestrians”), additional signage (“Stop Here for Pedestrians”, MUTCD R1-5b), installation of ADA-standard detectable warnings at trail crossings.
Tusculum Trail crossing – Erwin Hwy at Susong Ln	Improved trail crossing: street lighting, additional pavement markings (stop bar, “Stop Here for Pedestrians”), additional signage (“Stop Here for Pedestrians”, MUTCD R1-5b), installation of ADA-standard detectable warnings at trail crossings.
Tusculum Trail crossing – Erwin Hwy at Edens Rd	Improved trail crossing: street lighting, additional pavement markings (stop bar, “Stop Here for Pedestrians”), additional signage (“Stop Here for Pedestrians”, MUTCD R1-5b), installation of ADA-standard detectable warnings at trail crossings.
Tusculum Trail crossing – Susong Ln mid-block crossing	Install additional pavement markings (stop bar, “Stop Here for Pedestrians”), additional signage (“Stop Here for Pedestrians”, MUTCD R1-5b), installation of ADA-standard detectable warnings at trail crossings.
Erwin Hwy at Harlan St/Gilland St	Install flashers, striped crosswalk, ADA-compliant curb ramp, street lighting, additional pavement markings (stop bar, “Stop Here for Pedestrians”), additional signage (“Stop Here for Pedestrians”, MUTCD R1-5b), installation of ADA-standard detectable warnings at trail crossings.
Shiloh Rd at Indoor Practice Facility	<ol style="list-style-type: none"> 1. Implement pedestrian plaza 2. Upgrade to improved trail crossing condition (described above for existing trail crossings)
Gilland St at Doak House Trail	Install flashers, striped crosswalk, ADA-compliant curb ramp, street lighting, additional pavement markings (stop bar, “Stop Here for Pedestrians”), additional signage (“Stop Here for Pedestrians”, MUTCD R1-5b), installation of ADA-standard detectable warnings at trail crossings.
Private Dr Crossings	Install flashers, striped crosswalk, ADA-compliant curb ramp, street lighting, additional pavement markings (stop bar, “Stop Here for Pedestrians”), additional signage (“Stop Here for Pedestrians”, MUTCD R1-5b), installation of ADA-standard detectable warnings at trail crossings.

4.6 PEDESTRIAN/TRAIL IMPROVEMENTS

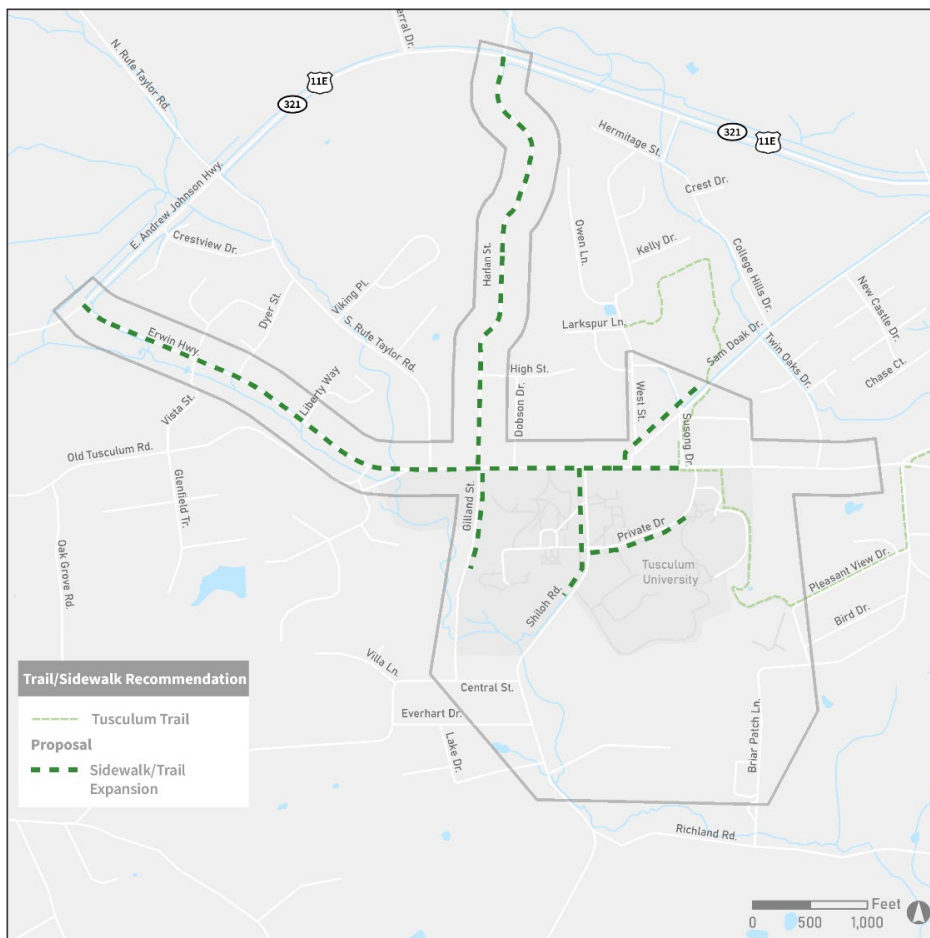
ERWIN HIGHWAY

In addition to installation of sidewalk along Harlan Street, several additional locations were identified for sidewalk and trail improvements within for the study area: Erwin Highway, Sam Doak Street, as well as on the Tusculum University campus, on Gilland Street, Shiloh Road, and Private Drive. One potential improvement for the study area received more support than any other proposed improvement for the study area: installation of pedestrian facilities along Erwin Highway. Project stakeholders and members of the public identified the need to provide pedestrian facilities along the Tusculum University frontage, as well as pedestrian connections to the Creamy Cup. Public comments identified support for expanding the Tusculum Trail in both directions, west to US-11E/US-321 which extends into the Town of Greeneville, as well as east to the middle and high schools.

To evaluate potential pedestrian improvements, three alternatives were identified for improved pedestrian conditions along Erwin Highway:

1. 5-foot sidewalk between the Tusculum Trail and US-11E/US-321 on both sides of the street
2. 8-foot multi-use path/trail between the Tusculum Trail and US-11E/US-321 on the south side of the street
3. 8-foot multi-use path/trail between the Tusculum Trail and US-11E/US-321 on the south side of the street, along with 5-foot sidewalk on the north side of Erwin Highway between the Creamy Cup and Sam Doak Street at Susong Lane

Figure 25: Proposed Trail and Sidewalk Improvements



Of the three alternatives, installation of sidewalk along both sides of Erwin Highway would involve both the highest cost and highest ROW impact, by constructing pedestrian facilities on both sides of the street. Installation of a multi-use path on the south side of the street would involve lower costs and ROW impacts while providing a condition that can accommodate both pedestrians, cyclists and other users, in the form of a wider, multi-use facility.

Providing a pedestrian facility that connects between the University, Creamy Cup, and the elementary school was also an improvement recommended by Sunshine Broyles, principal of Doak Elementary. Principal Broyles stated that classes often visit the university and the Creamy Cup on special occasions, though currently no pedestrian facilities are provided west of the Tusculum Trail at Susong Lane.

CAMPUS IMPROVEMENTS

In addition to providing a pedestrian facility along the University frontage of Erwin Highway, potential sidewalk improvements were identified on Gilland Street, Shiloh Road, and Private Drive. Currently, pedestrian facilities on campus are limited to the interior of campus, and sidewalks along Gilland Street and Shiloh Road would provide a pedestrian connection between Erwin Highway and residential building along Gilland as well as numerous campus facilities along Shiloh Road. Proposed sidewalks along Shiloh Road could vary should the City and the University advance implementation of a pedestrian plaza between the Indoor Practice Facility driveway and Erwin Highway. If not, installation of sidewalk could span from Erwin Highway to the pedestrian crossing at the Indoor Practice Facility. An additional pedestrian improvement would be to install sidewalks along Private Drive to provide a connection between campus buildings and athletic facilities and could support utilization of additional parking locations during athletic events.

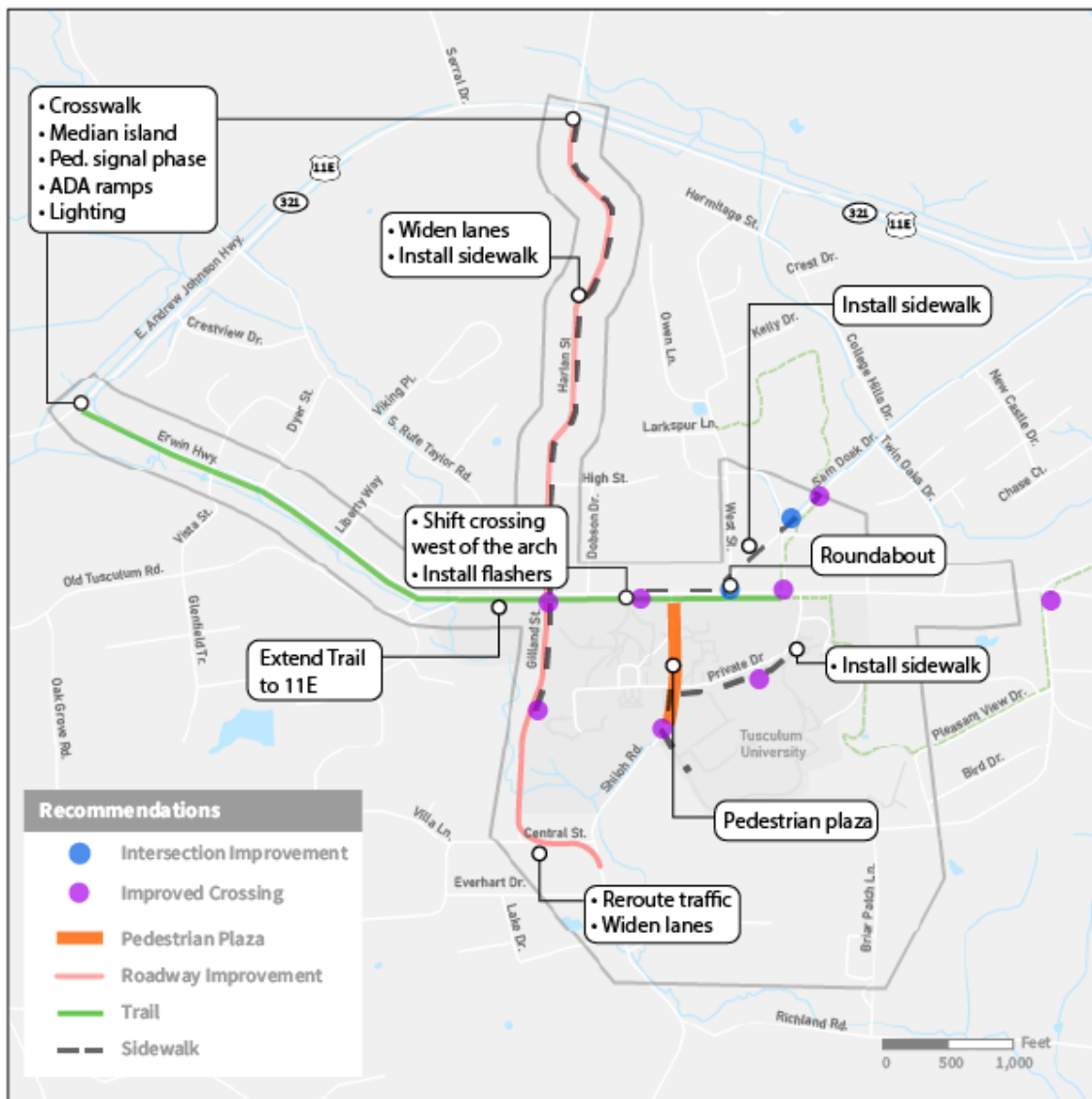
Table 7: Proposed On-Campus Sidewalk Expansion

Sidewalk Location	Extent
Gilland Street (east side)	Erwin Highway to Residential Apartment F – connection to proposed crossing improvement on Gilland Street at Doak House Trail
Shiloh Road	Erwin Highway to Indoor Practice Facility driveway, connection to existing crossing
Private Drive	Shiloh Road to Pioneer Park entrance

5. RECOMMENDATIONS

The figure below identifies recommended projects within the study area following evaluation of ROW and cost impacts and feedback from project stakeholders. Planning level cost estimates and ROW impacts were developed using TDOT's cost estimating tool elements and 2020 average bid prices, as well as costs and estimates from other peer sources including state DOTs and Federal Highway Administration (FHWA) estimates. Total cost estimates include construction cost, contingency, mobilization, other items, construction engineering and inspection, and preliminary engineering, but not right-of-way or environmental. Project prioritization is identified based on stakeholder and public feedback and implementation considerations based on other recommended projects. Based on the issues and opportunities identified by stakeholder and the public, the project team identified an assortment of potential solutions and their developed planning level cost estimates

Figure 26: Recommended Projects



Planning-level cost estimates are provided for project alternatives in the sections below in line with the following parameters:

- \$ = Cost (excl. ROW) less than \$100,000
- \$\$ = Cost (excl. ROW) between \$100,000 and \$1,000,000
- \$\$\$ = Cost (excl. ROW) greater than \$1,000,000

5.1 SHILOH ROAD

Based stakeholder and public input, the project team recommends installation of a pedestrian plaza on Shiloh Road between Erwin Highway and the Indoor Practice Facility driveway, along with re-routing of Shiloh Road traffic to Central Street/Gilland Street to Erwin Highway. Coordination between the two projects would be necessary, with improvements to Central Street and Gilland Street required to accommodate traffic re-routed from Shiloh Road prior to installation of a pedestrian plaza.

Project stakeholders indicated strong support for routing traffic via Central Street and Gilland Street. Public feedback also indicated support for improvements to Central Street and Gilland Street, with members of the public noting that narrow lanes and lack of shoulder presented uncomfortable conditions for drivers, especially when encountering oncoming traffic.

Varied and flexible treatments can be implemented on Shiloh Road to create an improved pedestrian condition. Installation of pavers and bollards would create an exclusive pedestrian plaza though decorative paint at crossing locations or along the full extent of Shiloh Road could prioritize pedestrian crossings and alert drivers to a pedestrian-oriented environment. Bollards could be implemented on a permanent or temporary basis, restricting vehicle access when student crossings are highest while allowing vehicles at other times or during special events. Installation of bollards at the following locations on Shiloh Road would allow access to campus parking facilities while enabling an east-west vehicle movement between parking facilities west of Shiloh Road to Private Drive:

- North of Indoor Practice Facility Driveway
- South of Private Drive
- North of Private Drive
- at Erwin Highway⁸

Table 8: Shiloh Road Alternatives

	Improvement	Cost	ROW	Priority	Recommended
Shiloh Rd					
	Central St to Gilland St	\$\$\$	M	H	Y
	Private Dr	\$	L		N
	Pleasant View Dr	\$\$	M		N
	Pedestrian Plaza (Erwin Hwy to Indoor Practice Facility Driveway)	\$\$\$	L	H	Y

⁸ The bollard location at Erwin Highway could be shifted slightly south on Shiloh Road to enable access from Erwin Highway to the parking locations at Virginia Hall, Katherine Hall, and Annie Hogan Byrd Auditorium.

ESTIMATED COSTS

- **Pedestrian Plaza: \$100,000 to \$1,126,000**

Cost estimates for the pedestrian plaza range between \$100,000 and \$1,126,000 depending on the level of improvement implemented. Installation of bollards at four locations on Shiloh Road are estimated to cost \$50,000, with implementation of a pedestrian plaza using pavers is estimated to cost approximately \$1.1 million. A lower cost plaza treatment would involve a painted design or mural in the existing roadway that could cost roughly \$100,000, with grant funding available through arts or philanthropic organizations.

- **Central Street/Gilland Street re-route: \$1,798,000**

This alternative is recommended as a priority improvement based on strong support from stakeholders as well as support from the public. Re-routing traffic via Central Street and Gilland Street would require roadway improvements to widen the existing 8-foot lanes to 10 feet, as well as realignments and substantial modification to Central Street intersections at Gilland Street and Shiloh Road, costing close to \$2 million.

5.2 HARLAN STREET

Of the proposed alternatives for Harlan Street, the project team recommends widening of Harlan Street to 10-foot lanes along with installing sidewalk on the east side of the street. Doing so would address project stakeholder and public concerns about vehicle volumes exceeding the existing capacity of the street as well as a lack of pedestrian facilities between Erwin Highway and commercial locations on US-11E/US-321. Widening beyond 10 feet is not recommended due to high project costs.

Table 9: Harlan Street Alternatives

	Improvement	Cost	ROW	Priority	Recommended
Harlan St					
	Widen to 10 ft lanes	\$\$\$	M	H	Y
	Widen to 12 ft lanes	\$\$\$	H		N
	Add Sidewalk (east side)	\$\$\$	M	H	Y

ESTIMATED COSTS

- **Widening from 8-foot to 10-foot lanes: \$1,074,000**

Widening of Harlan Street to 10-foot lanes is recommended due to higher costs associated with additional improvements. Widening the existing 8-foot lanes to 10 feet is estimated to cost a little more than \$1 million, while additional widening up to 12-foot lanes would cost \$1.4 million.

- **Add Sidewalk (east side): \$ 2,909,000**

Adding sidewalk along the east side of Harlan Street is recommended to provide pedestrian facilities between campus at Erwin Highway and US-11E/US-321. Coupled with intersection improvements at Harlan Street and US-11E/US-321 this project will support pedestrian access to commercial locations like Walmart and Aldi. Installation of sidewalk along the east side of Harlan Street is estimated to cost nearly \$3 million.

5.3 INTERSECTION IMPROVEMENTS

Several intersection improvements are recommended for the study area at state routes and local intersections to support pedestrian facilities recommended for Erwin Highway and Harlan Street. Limited costs were identified for the US-11E/US-321 intersections to improve pedestrian conditions with curb ramps, lighting,

signal timing improvements, pedestrian signals, and median refuge islands. Both US-11E/US-321 intersections were identified as high priority projects given stakeholder feedback supporting safer pedestrian connections between campus and commercial locations along US-11E/US-321.

Of the local intersection improvements, Erwin Highway at Sam Doak Street (“the triangle”) was identified as the highest priority improvement based on stakeholder and public support for improvements at this intersection. The recommended improvement of a mini roundabout was determined to be the highest cost intersection improvement as roundabout costs can vary depending on diameter and ROW impact, though low ROW impacts were identified for the roundabout to City or University-owned property.

Lower cost intersection improvements are also recommended for Sam Doak Street at Susong Lane and Alexander Street to close the approach on Alexander Street from Susong Lane to reduce conflict points and driver confusion at the intersection. This improvement would involve closing the approach to Alexander Street on Susong Lane.

A proposed intersection improvement at Shiloh Road and Erwin Highway is not recommended due to the recommendation of advancing of the Shiloh Road pedestrian plaza which would reduce the need for intersection improvements at this location.

Table 10: Intersection Improvements

	Improvement	Cost	ROW	Priority	Recommended
Intersections					
State Route Intersection Improvements	11 E at Erwin Hwy	\$	L	H	Y
	11 E at Harlan St	\$	L	H	Y
Local Intersection Improvements	Erwin Hwy at Sam Doak Dr	\$\$	L	H	Y
	Sam Doak Dr at Susong Ln	\$	L	L	Y
	Shiloh Rd at Erwin Hwy	\$	L		N

ESTIMATED COSTS

- **State Route Intersection Improvements: \$45,000 to \$60,000**
- **Local Intersection Improvements: \$5,000**
- **Mini roundabout: \$660,000**

Improvements to state route intersections would include installation of curb ramps, lighting, pedestrian signals, and a median pedestrian refuge island and are estimated to cost between \$45,000 and \$50,000. Local intersection improvements vary but could include access/turn restrictions and implementation of crosswalks, which would cost approximately \$5,000. Implementation of a mini roundabout at Erwin Highway and Sam Doak Street was estimated to cost \$660,000 that could fit within existing right-of-way.

5.4 CROSSING IMPROVEMENTS

The project team identified several existing and proposed crossings for potential improvements. Three of the existing crossings on Shiloh Road, are not recommended to advance in favor of implementation of the pedestrian plaza along this extent. Should the pedestrian plaza not be implemented, improvements at these crossings would be recommended to provide a consistent treatment for pedestrian crossings along Shiloh Road and at Tusculum Trail crossings. The remaining crossings identified in the table below are recommended

for implementation in line with the improvements identified in Table 6 so that all pedestrian crossings on campus and along the Tusculum Trail present users with a consistent condition.

Of these crossings, the highest priority is the existing crossing at the Tusculum Arch which currently does not include flashing beacons. The crossing at this location is recommended to shift just west of the arch to allow for installation of flashing beacons, additional pavement markings and signage, street lighting, detectable warning surfaces, curb ramps, and sidewalk connections.

Medium-priority projects identified in the figure below are those crossings that currently do not exist, or do not include flashing beacons and advance warning signage. Improvements at these locations are recommended to be prioritized to improve crossing conditions based on existing need and/or associated proposed improvements.

Table 11: Crossing Improvements

	Improvement	Cost	ROW	Priority	Recommended
Crosswalk Improvement Type					
Not recommended due to ped. plaza	Shiloh Rd at Virginia Hall	\$	L		N
Not recommended due to ped. plaza	Shiloh Rd at Private Dr	\$	L		N
Not recommended due to ped. plaza	Shiloh Rd at Indoor Practice Facility	\$	L		N
Type #1	Erwin Hwy at Tusculum Arch	\$	L	H	Y
Type #2	Tusculum Trail Crossing – Sam Doak Dr	\$	L	L	Y
Type #2	Tusculum Trail Crossing – Erwin Hwy at Susong Ln	\$	L	L	Y
Type #2	Tusculum Trail Crossing – Erwin Hwy at Edens Rd	\$	L	L	Y
Type #1	Erwin Hwy at Harlan St/Gilland St	\$	L	M	Y
Type #1	Gilland St at Apt. F - trail to Doak House Museum	\$	L	M	Y
Type #2 ⁹	Susong Ln mid-block crossing	\$	L	L	Y
Type #1	Private Dr crossing at Pioneer Park	\$	L	M	Y
Type #1	Private Dr crossing at Pioneer Field	\$	L	M	Y

ESTIMATED COSTS

Two types of pedestrian crossing improvements were identified based on the existing conditions at identified crossing locations. More robust crossing improvements (Crosswalk Improvement Type #1) would be needed at locations that currently lack flashing beacons to establish a consistent pedestrian crossing treatment at campus and Tusculum Trail crossings within the study area. Locations with existing flashing beacons and signage, like Tusculum Trail crossings at Sam Doak Street, Erwin Highway at Susong Lane, and Erwin

⁹ Due to low traffic volumes, the existing mid-block crossing at Susong Lane may not warrant flashing beacons.

Highway at Edens Road were identified for smaller scale improvements (Crosswalk Improvement Type #2) such as additional signage, pavement markings, detectable warnings at trail crossing, and lighting.

- **Type #1: \$40,000**
- **Type #2: \$18,000**

5.5 PEDESTRIAN/TRAIL IMPROVEMENTS

Of the three sidewalk/trail improvements identified for Erwin Highway, the project team recommends expansion of the Tusculum Trail along the south side of Erwin Highway from Susong Lane to US-11E/US-321 along with implementation of 5-foot sidewalk between the Creamy Cup and Doak Elementary School. This alternative provides a multi-use path facility that can accommodate both pedestrians and cyclists while implementing sidewalk where utilization would be greatest. This alternative would result in lower ROW impacts and lower costs compared to implementing sidewalk on both sides of the street.

Table 12: Pedestrian/Trail Improvements

	Improvement	Cost	ROW	Priority	Recommended
Ped/Trail (Stand Alone)					
Erwin Highway	Sidewalk (both sides) on Erwin Hwy from Susong Ln to US-11E	\$\$\$	H		N
	Trail on Erwin Hwy (south side) from Susong Ln to US-11E	\$\$\$	H		N
	Trail (south side) with limited sidewalk (north side-creamy cup to Sam Doak Dr)	\$\$\$	H	H	Y
Campus	Sidewalk on Gilland St (east side to crossing)	\$\$	L	L	Y
	Sidewalk connecting to Shiloh Rd between tennis courts and Niswonger Commons	\$	L	L	Y
	Sidewalk on Private Dr	\$	L	M	Y

In addition to pedestrian improvements along Erwin Highway, the project team recommends implementation of sidewalk on campus to provide a connection between the proposed trail expansion and existing campus crossings and destinations:

- Gilland Street (east side) between Erwin Highway and Doak House Trail crossing/Residential Apartment F
- Installation of sidewalk connecting to Shiloh Road between tennis courts and Niswonger Commons
- Private Drive (south side) from Shiloh Road to Pioneer Park entrance

ESTIMATED COSTS

- **Tusculum Trail Extension including limited sidewalk: \$4.9 million**
- **Sidewalk on Gilland Street (Erwin Highway to Doak House Trail crossing): \$497,000**
- **Sidewalk connecting to Shiloh Road (between tennis courts and Niswonger Commons): \$50,000**
- **Sidewalk on Private Drive (south side): \$45,000**

The recommended extension of the Tusculum Trail west to US-11E/US-321 along with implementation of sidewalk on the north side of Erwin Highway between Doak Elementary and the Creamy Cup is estimated to cost nearly \$5 million. Alternatives for Erwin Highway like implementation of sidewalk on both sides is estimated to cost approximately \$8.5 million, with implementation of the trail extension only, estimated to cost \$4.25 million.

On-campus sidewalk improvements range between \$45,000 and \$500,000 due to the extent of improvements needed and whether the identified segment currently includes curb and gutter. For Private Drive, which currently includes curb and gutter, installation of sidewalk is estimated to cost \$45,000 while installation of sidewalk along with curb and gutter on Gilland Street would cost \$500,000, respectively.

Table 13 summarizes the total planning level cost estimates of the various potential improvements.

Table 13: Cost Estimates and Potential ROW Requirements of Potential Improvements

Improvement	Cost	ROW	Priority	Recommended	Total Cost	ROW Acres
Shiloh Rd Reroute						
Central St to Gilland St	\$\$\$	M	H	Y	\$1,798,000	0.48
Private Dr	\$	L		N	\$31,000	-
Pleasant View Dr	\$\$	M		N	\$ 841,000	0.48
Pedestrian Plaza	\$\$	L	H	Y	\$1,126,000	-
Harlan St						
Widen to 10 ft lanes - 2' shoulder	\$\$\$	M	H	Y	\$ 1,074,000	0.78
Widen to 12 ft lanes - 2' shoulder	\$\$\$	H		N	\$ 1,433,000	1.16
Add Sidewalk (east side)	\$\$\$	M	H	Y	\$ 2,909,000	0.75
Crossings						
Shiloh at Private Dr	\$	L		N	\$ 32,000	-
Shiloh at Virginia Hall	\$	L		N	\$ 25,000	-
Erwin Hwy at Arch	\$	L	H	Y	\$ 40,000	-
Erwin Hwy at Tusculum Trail/Susong	\$	L	L	Y	\$ 18,000	-
Erwin Hwy at Tusculum Trail/Edens Rd	\$	L	L	Y	\$ 18,000	-
Tusculum Trail at Sam Doak	\$	L	M	Y	\$ 18,000	-
Erwin Hwy at Gilland St	\$	L	M	Y	\$ 40,000	-
Shiloh at Indoor Practice Facility	\$	L		N	\$ 40,000	-
Gilland at Apt. F - trail to Doak House Museum	\$	L	L	Y	\$ 40,000	-
Pedestrian/Trails						
Sidewalk on Private Dr	\$	L	M	Y	\$ 45,000	0.1
Sidewalk on Shiloh between Erwin Hwy and Private Dr	\$	L		N	\$ 497,000	0.13
Sidewalk (both sides) on Erwin Hwy from Susong Dr to 11E	\$\$\$	H		N	\$ 8,455,000	2.18
Trail on Erwin Hwy (south side) from Susong Dr to 11E	\$\$\$	H		N	\$ 4,253,000	1.50
Trail (south side) with north side limited sidewalk (Creamy Cup to Sam Doak)	\$\$\$	H	H	Y	\$ 4,948,000	1.68
Sidewalk on Shiloh between tennis courts and Private Dr	\$	L		N	\$ 294,000	0.08
Sidewalk on Gilland St (to crossing)	\$	L	L	Y	\$ 497,000	0.13
Intersections						
11 E at Erwin Hwy	\$	L	H	Y	\$ 57,000	-
11 E at Harlan St	\$	L	L	Y	\$ 47,000	-
Erwin Hwy at Sam Doak Dr	\$\$	L	H	Y	\$ 660,000	-
Sam Doak Dr at Susong Dr	\$	L	L	Y	\$ 6,000	-
Shiloh at Erwin Hwy	\$	L		N	\$ 5,000	-

APPENDIX A: SAMPLE RESOLUTION

RESOLUTION _____

A RESOLUTION TO ADOPT TUSCULUM COMMUNITY MOBILITY PLAN

August 2021

WHEREAS, City of Tusculum staff and stakeholders have met to discuss and provide input in the development of the plan/study; and

WHEREAS, the Tennessee Department of Transportation funded the plan through a Community Transportation Planning Grant; and

WHEREAS, the City of Tusculum will implement the components of the City of Tusculum Community Mobility Plan to the extent possible as resources are available;

NOW, THEREFORE, BE IT RESOLVED by the Tusculum Board of Commissioners that the Community Mobility Plan (attached) is adopted as part of the municipality's general plan.

Mayor, Tusculum Board of Commissioners

ATTEST:

Recorder