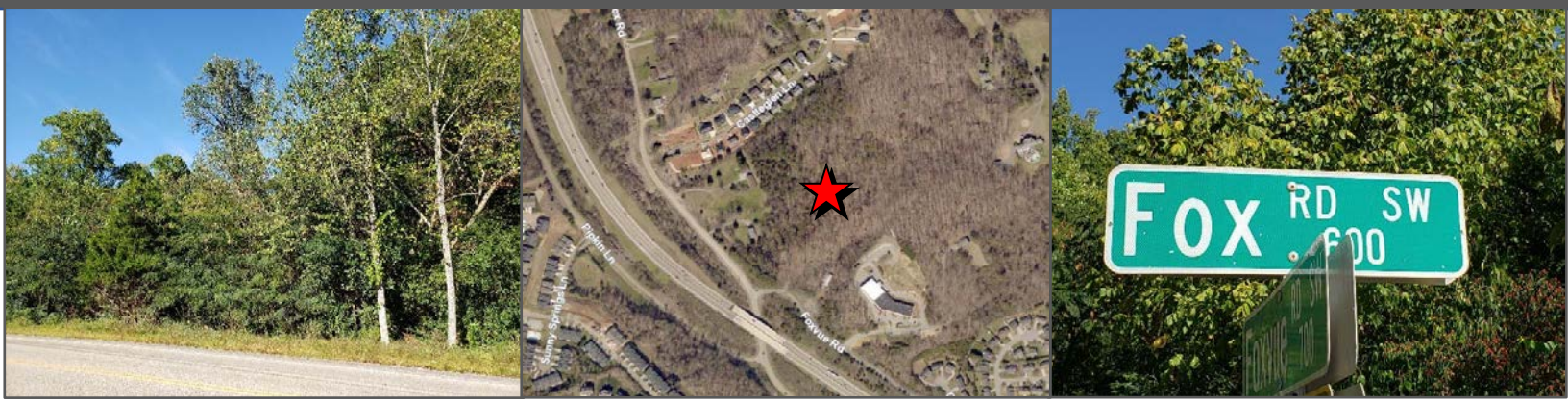
AJAX ENGINEERING

CIVIL ENGINEERING / TRAFFIC ENGINEERING

Transportation Impact Study

Fox Road Subdivision

Knox County, Tennessee



Revised November 2022

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EXECUTIVE SUMMARY

Preface:

Eagle Bend Development is proposing a residential development off Fox Road in West Knox County, TN. The proposed development will include 94 single-family detached houses on 23.59 +/- acres and is referenced in this study as the "Fox Road Subdivision" since an official name has not been decided. The development will be built in a single phase and is anticipated to be fully built and occupied by 2026. The development proposes one entrance on Fox Road, between Castleglen Lane and Foxvue Road.

This study's primary purpose is to determine and evaluate the potential impacts of the development on the adjacent transportation system. The study includes a review of the primary access road and intersection and is a Level 1 study established by Knoxville/Knox County Planning. Recommendations and mitigation measures are offered if transportation operations are projected to be below recognized engineering standards.

Study Results:

The significant findings of this study include the following:

- The Fox Road Subdivision development, with a total of 94 single-family detached houses, is estimated to generate 954 trips at full build-out and occupancy on an average weekday. Of these daily trips, 70 are estimated to occur during the AM peak hour and 94 in the PM peak hour in 2026.
- The Proposed Entrance at Fox Road is expected to operate with very reasonable vehicle delays in the projected AM and PM peak hours. The addition of the Proposed Entrance approach on Fox Road will operate acceptably in 2026 with respect to vehicle capacity.
- The projected 2026 traffic volumes do not warrant the construction of separate entering left and right-turn lanes on Fox Road at the Proposed Entrance. A single exiting lane for the development entrance at Fox Road will be sufficient.

Recommendations:

The following recommendations are offered based on the study analyses to minimize the impacts of the proposed development on the adjacent transportation system while attempting to achieve an acceptable traffic flow and improved safety. More details regarding the recommendations are discussed at the end of the report.

- It is recommended that a Stop Sign (R1-1) be installed, and a 24" white stop bar be applied to the Proposed Entrance approach at Fox Road. The stop bar should be applied a minimum of 4 feet away from the edge of Fox Road and placed at the desired stopping point that maximizes the sight distance.
- Sight distances at the Proposed Entrance approach at Fox Road must not be impacted by future landscaping, signage, or existing vegetation. Based on a posted speed limit of 30-mph on Fox Road, the required intersection sight distance is 335 feet looking in each direction at the entrance. The stopping sight distance is 205 feet looking to the north and 185 feet to the south at the Proposed Entrance on Fox Road. A visual inspection determined that the intersection and stopping sight distances are available. The site designer must ensure that these sight distances are accounted for and provided in the design plans.
- The Proposed Entrance on Fox Road will be 250 feet northwest of the existing intersection of Fox Road at Foxvue Road. The developer should request a variance to allow an intersection spacing of less than 300 feet on Fox Road. Detrimental traffic operations between the two intersections are not expected if this variance is approved.
- A 25-mph Speed Limit Sign (R2-1) is recommended to be posted near the beginning of the development entrance off Fox Road. It is recommended that a "No Outlet" Sign (W14-2a) be installed at the front of the subdivision at Fox Road. This sign can be installed above or below the street name sign.
- As shown in the report, Stop Signs (R1-1) and 24" white stop bars are recommended on the new internal roadways.
- Sight distance at the new internal road intersections must not be impacted by new signage, parked cars, or future landscaping. With a proposed speed limit of 25-mph in the development, the internal intersection sight distance is 250 feet. The required stopping sight distance is 155 feet for a level road grade. The site designer should ensure that these internal sight distance lengths are met.
- The internal roadways have long, straight road segments and are likely to have steep road grades. Straight road segments with steeper grades encourage higher

vehicle speeds. It is recommended that the site designer consider traffic calming measures on these internal roads. If implemented, speed humps or chokers are recommended for traffic calming in this development, depending on the internal road grades.

- All drainage grates and covers for the residential development must be pedestrian and bicycle safe.
- If directed by the local post office, the site designer should include a parking area within the development for a centralized mail delivery center.
- All road grade and intersection elements should be designed to AASHTO, TDOT, the City of Knoxville, and Knox County specifications and guidelines to ensure proper operation.

DESCRIPTION OF EXISTING CONDITIONS

- **STUDY AREA:**

The proposed location of this new residential development is shown on a map in Figure 1. This proposed development will be located off Fox Road, between Castleglen Lane and Foxvue Road in West Knox County, TN. The development site is just under a mile southeast of Kingston Pike and just north of the Fox Road underpass at Pellissippi Parkway (I-140). Fox Road does not have direct access to the Parkway/Interstate. The development will have a single entrance on Fox Road. The development property is in Knox County; however, Fox Road and the adjoining right-of-way are in the City of Knoxville.

As Knoxville/Knox County Planning requested, transportation impacts associated with the proposed development were analyzed at the future intersection of Fox Road at the Proposed Entrance, where the proposed development will have road access to and from outside destinations.

View of Development Site at Proposed Entrance Location
(Looking East from Fox Road)

The proposed development property is in a suburbanized area with a moderately high concentration of residential properties south of commercialized developments along Kingston Pike. In the immediate vicinity, large amounts of property are forested and are occupied by several single-family houses on larger estates. Adjacent to the development site, the last three houses in the 35-lot New Castle Subdivision along Castleglen Lane are currently under construction. Adjacent property to the south was developed for a private school off Foxvue Road.

Besides an existing single-family house and yard near Fox Road, the proposed development site is currently undeveloped and forested. This home at 504 Fox Road will be removed for the proposed subdivision development. The development property has 400 feet of road frontage across two existing parcels along the northeast side of Fox Road and north of Foxvue Road.

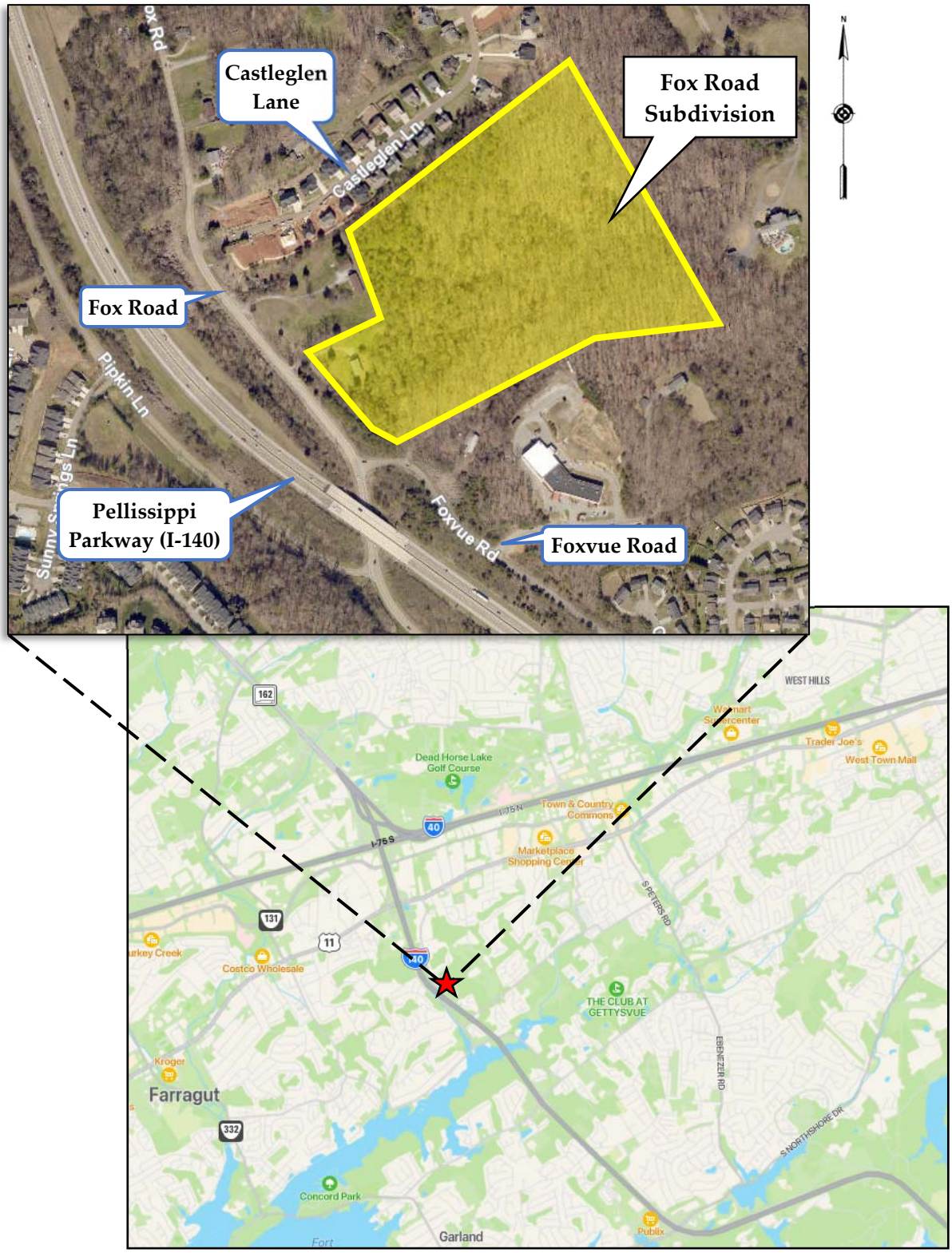


Figure 1
Location Map

- **EXISTING ROADWAYS:**

Table 1 lists the characteristics of the existing primary access roadway adjacent to the development property and included in the study:

TABLE 1
STUDY CORRIDOR CHARACTERISTICS

NAME	CLASSIFICATION [1]	SPEED LIMIT	LANES	ROAD WIDTH [2]	TRANSIT [3]	PEDESTRIAN FACILITIES	BICYCLE FACILITIES
Fox Road	Minor Collector / Major Collector	30 mph	2 undivided	32 feet	None	None	No bike lanes

[1] 2018 Major Road Plan by Knoxville/Knox County Planning
[2] From edges of pavement or face of curbs
[3] According to Knoxville Area Transit (KAT) System Map

Fox Road is classified as a Minor Collector adjacent to the development site and traverses in a generally northwest-southeast direction near the development property. On its north end, Fox Road begins at Kingston Pike (US 11/US 70/SR 1) at an unsignalized t-intersection. Fox Road continues to the south for 1.6 miles, where it makes a sharp bend to the west at the t-intersection with Emory Church Road. At Emory Church Road, Fox Road traverses a railroad crossing just north of the intersection and then follows the edge of Fort Loudoun Lake southwest for one mile. The roadway then makes a sharp bend to the north, crosses the railroad track again, and continues as Canton Hollow Road. Fox Road has a total length of 2.6 miles and is classified as a Minor Collector between Kington Pike and George Williams Road and as a Major Collector from George Williams Road to Canton Hollow Road. George Williams Road is approximately 0.4 miles south of the Fox Road Subdivision Proposed Entrance.

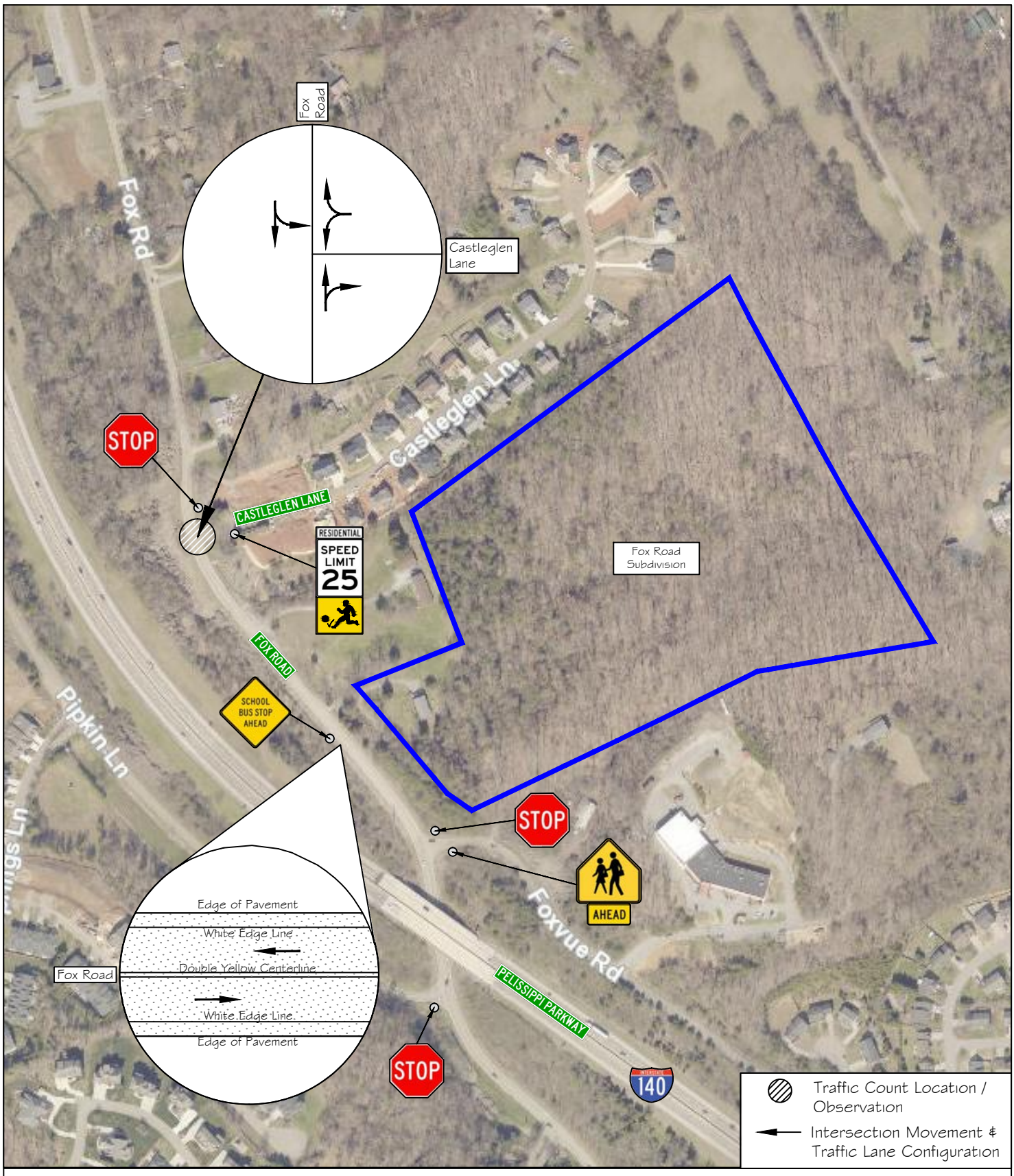
Fox Road, near the development site, currently consists of a 2-lane pavement section with 12-foot lanes and a total width of 32 feet. The roadway is striped with white edge lines and a double yellow center line. Outside the white edge lines, the pavement edge extends an additional four feet on each side. On the western side of Fox Road, a guardrail has been installed for approximately 1,000 feet between Castleglen Lane and Foxvue Road. This guardrail provides a barrier from a drainage ravine between Fox Road and Pellissippi Parkway (I-140), and the ravine has nearly been taken over

West side of Fox Road near Development Site (Looking Southeast)

by kudzu. The guardrail is located 7.5 feet outside the edge of the pavement.

The posted speed limit on Fox Road is 30-mph, and sidewalks are not provided along the roadway near the development site. A lone utility streetlight is provided on Fox Road at the intersection with Castleglen Lane on the west side in the vicinity of the development site.

Figure 2 shows the existing lane configurations of the intersection where traffic counts were conducted for the study and the current traffic road signage in the study area. The road signage shown in Figure 2 only includes warning and regulatory signage near the development site. The pages following Figure 2 give a further overview of the site study area with photographs.



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NOT TO SCALE

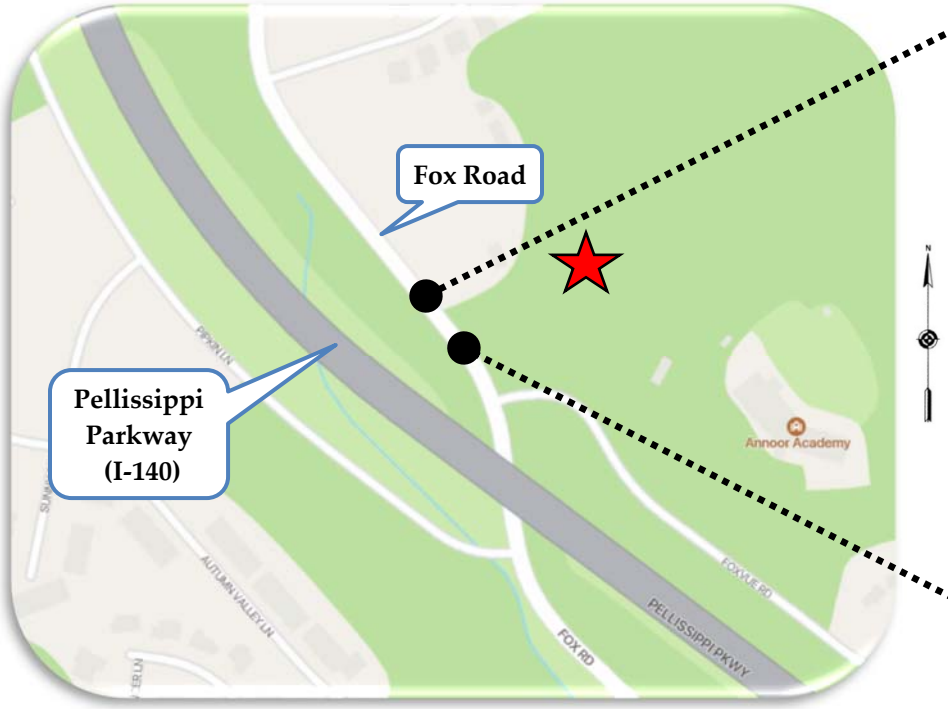
NORTH

FIGURE 2

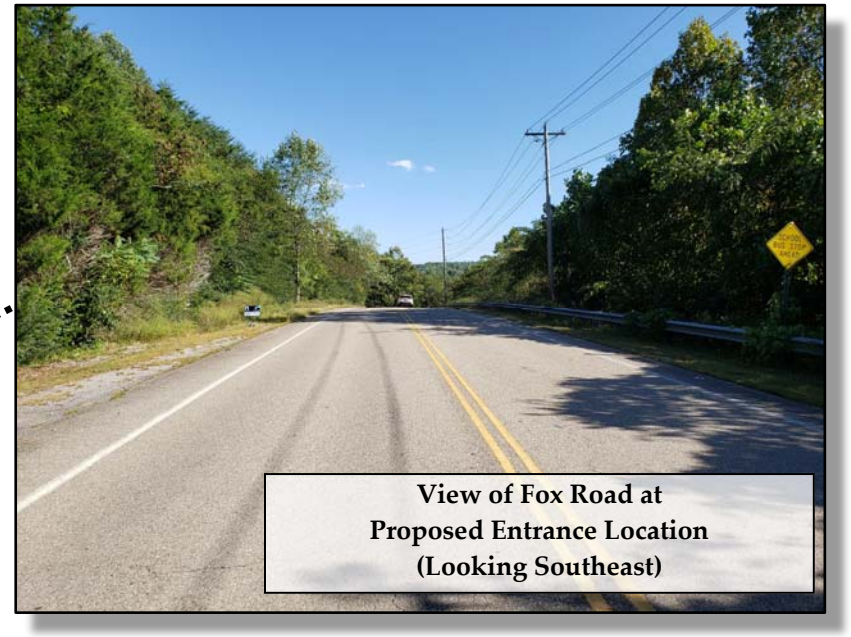
Fox Road Subdivision

Traffic Count Location, Traffic Signage & Existing Lane Configurations

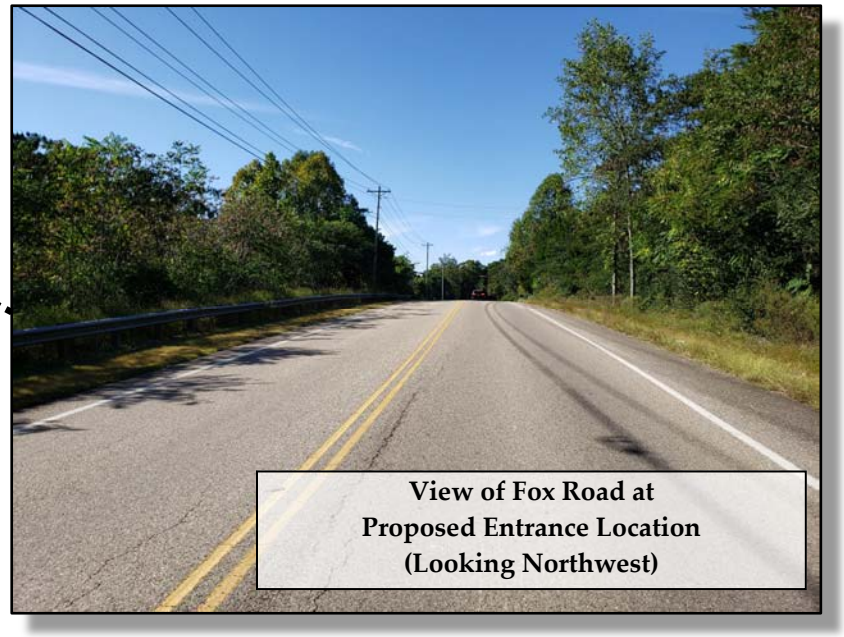
PHOTO EXHIBITS



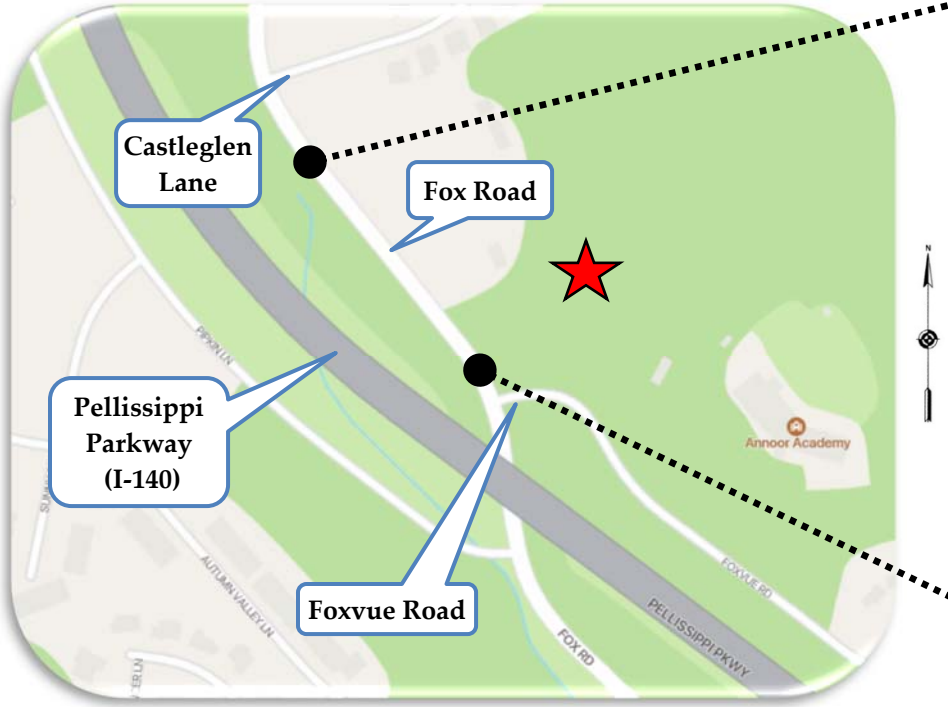
Fox Road



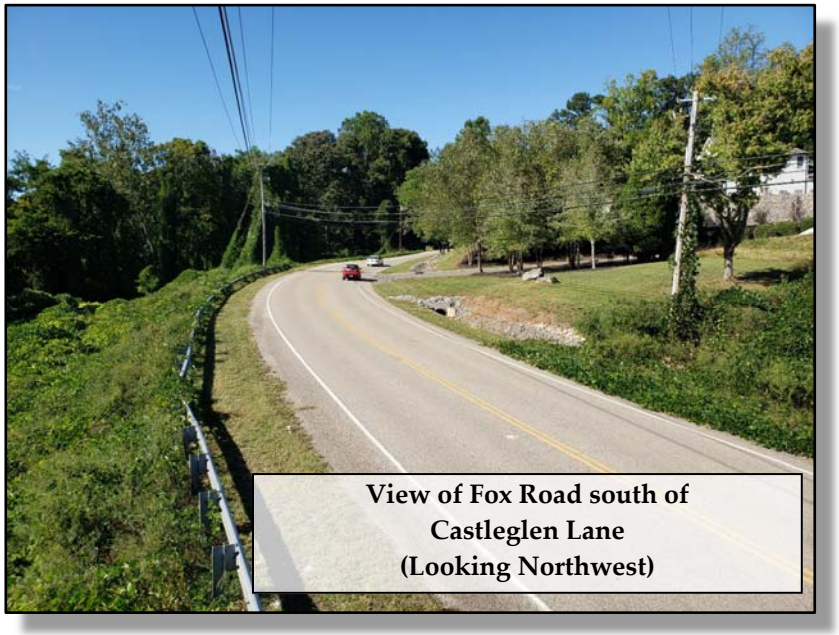
View of Fox Road at Proposed Entrance Location (Looking Southeast)



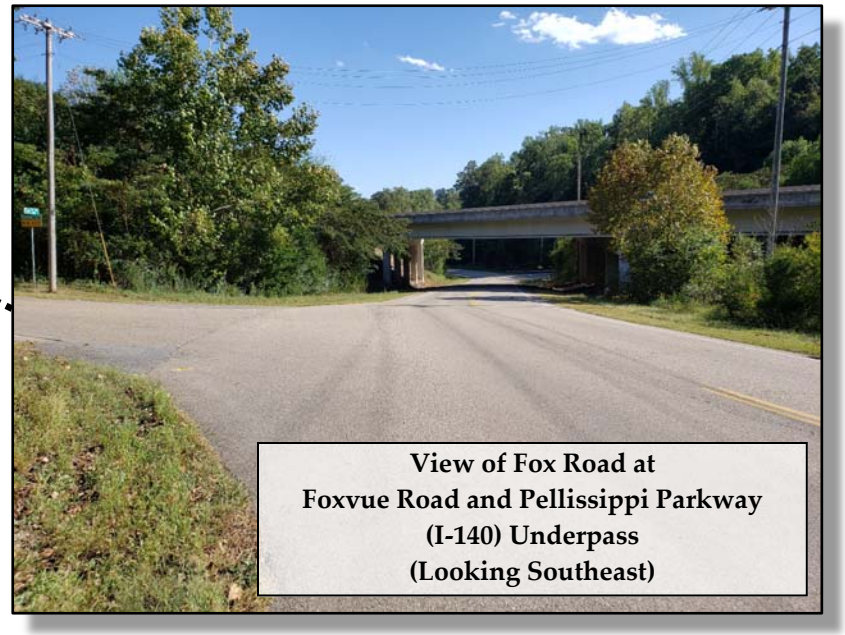
View of Fox Road at Proposed Entrance Location (Looking Northwest)



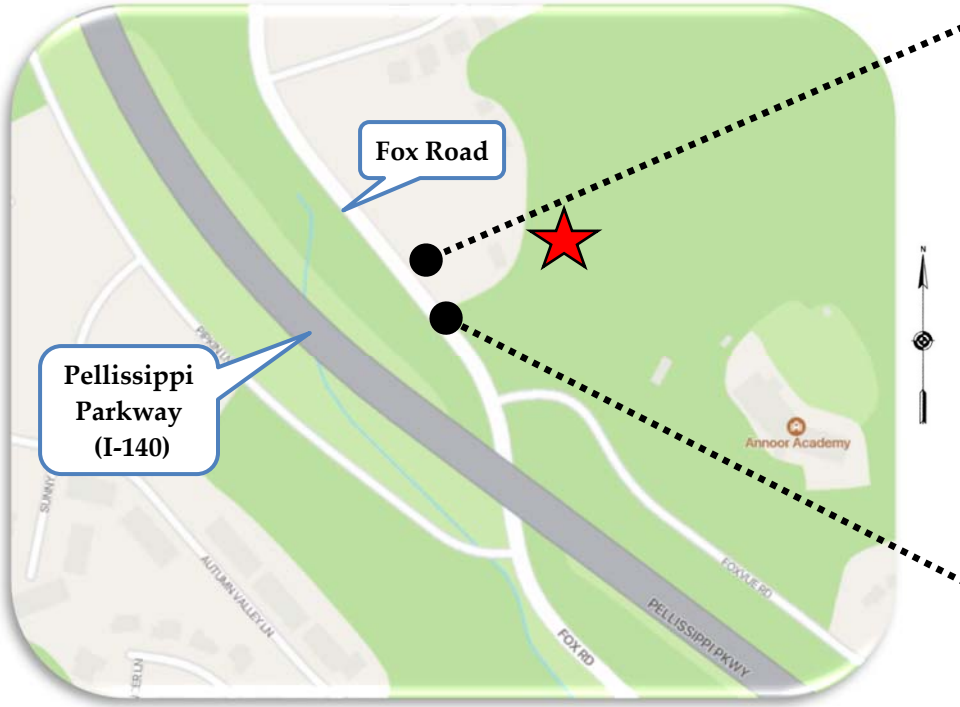
Fox Road



View of Fox Road south of Castleglen Lane (Looking Northwest)

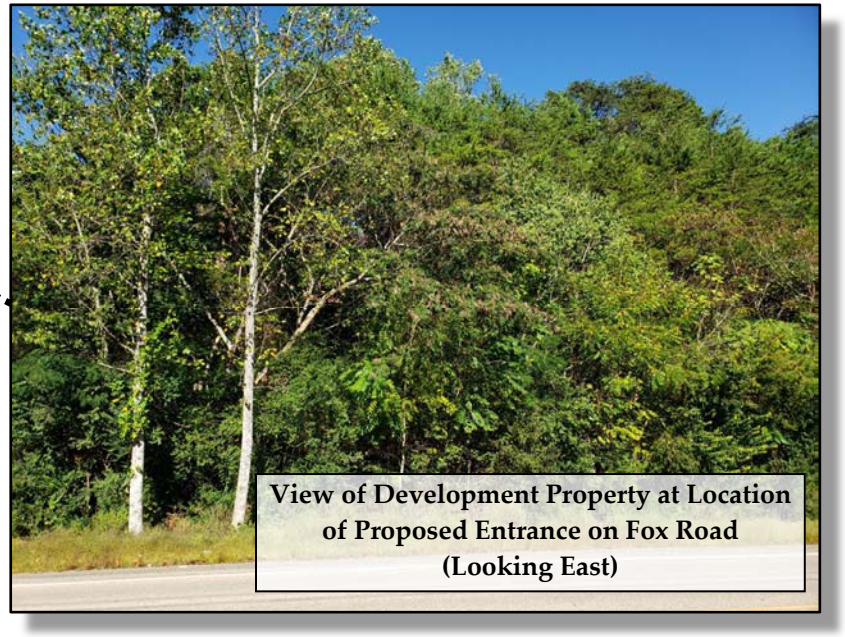


View of Fox Road at Foxvue Road and Pellissippi Parkway (I-140) Underpass (Looking Southeast)



Fox Road

View of Existing Home on Fox Road at Future Subdivision Property (Looking Northeast)



View of Development Property at Location of Proposed Entrance on Fox Road (Looking East)

- **EXISTING TRANSPORTATION VOLUMES PER MODE**:

One annual vehicular traffic count location exists nearby the study area, and the Tennessee Department of Transportation (TDOT) conducts this count. The count location data is the following and can be viewed with further details in Appendix A:

- Existing vehicular roadway traffic:
  TDOT reported an Average Daily Traffic (ADT) on Fox Road, south of Kingston Pike and north of the development site, at 5,869 vehicles per day in 2021. From 2011 to 2021, this count station has indicated a +3% average annual traffic growth rate.

- Existing bicycle and pedestrian volumes:
  The average daily pedestrian and bicycle traffic is unknown along Fox Road. Due to the lack of facilities and nearby amenities, there is assumed to be minimal pedestrian and bicyclist activity on this road in the study area. During the traffic counts for this project at Fox Road and Castleglen Lane, other than school-age children entering and exiting school buses, no bicyclists or pedestrians were observed over 6 hours.

Strava Heat Map for Bicyclists

  An online website, strava.com, provides "heat" maps detailing exercise routes taken by pedestrians, joggers, and bicyclists. The provided heat maps show the last two years of data, are updated monthly, and are gathered from individuals allowing their smart devices to track and compile their routes (millions of users). The activities in the maps are shown on the roads with color intensities with lighter colors signifying higher activity. The Strava heat maps

Strava Heat Map for Pedestrian and Joggers

show some bicycle and pedestrian activity along Fox Road. Higher pedestrian activity is shown in the existing adjacent residential subdivisions and at the private school to the southeast.

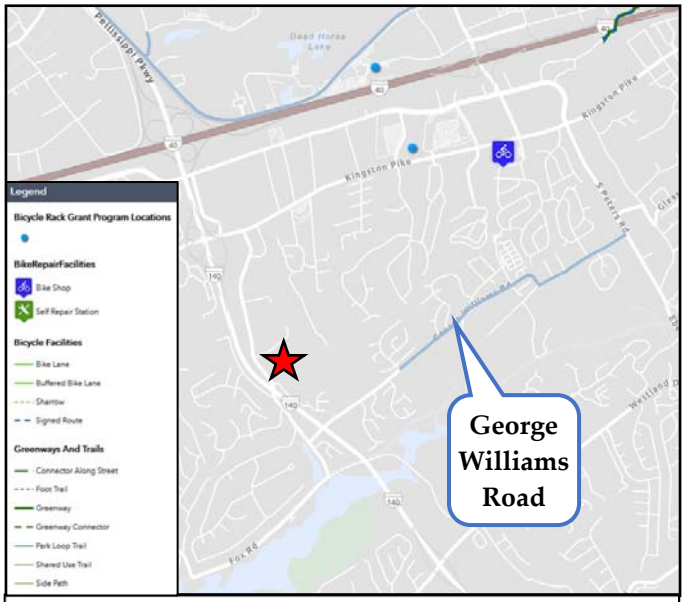
- **ON-STREET PARKING:**

On-street parking was not observed during the site review and is not allowed on Fox Road adjacent to the project site. On-street parking was observed on Castleglen Lane, and these vehicles were associated with the construction of the remaining houses in the adjacent New Castle Subdivision.

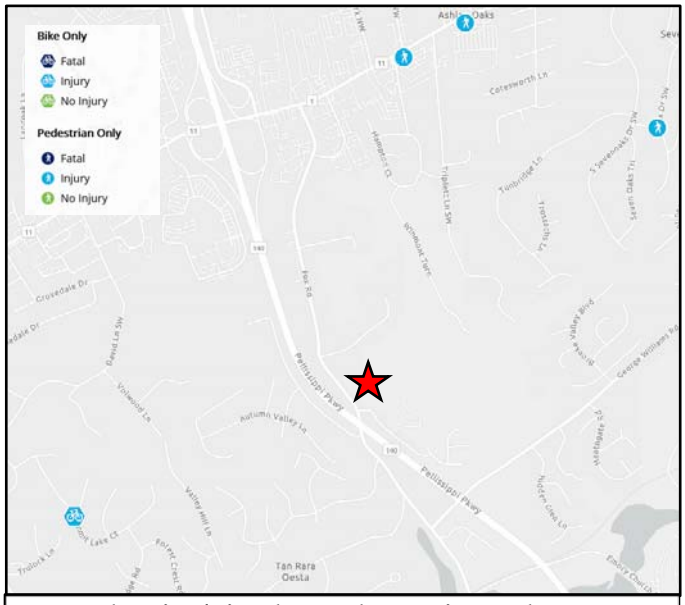
- **PEDESTRIAN AND BICYCLE FACILITIES:**

Sidewalks are not provided on Fox Road, Castleglen Lane, or Foxvue Road near the proposed development site.

Bicycle lanes and designated routes are not provided on Fox Road or other roadways adjacent to the development site. However, George Williams Road, east of the development site, is identified on KGIS mapping as a designated bicycle route. This route on George Williams Road is designated as a "Comfortable Route". A "Comfortable Route" is defined as a route "based on low to medium traffic speeds and volumes along with other criteria." This Comfortable Route on George Williams Road is 1.6 miles in length and exists between Brooke Valley Boulevard on the west end to South Peters Road on the east.

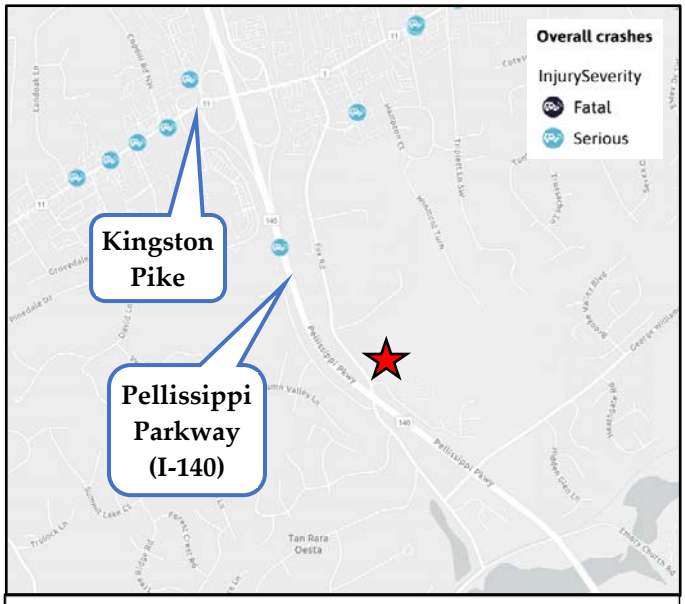


Designated Bicycle Routes in Study Area



Pedestrian/Bicycle Crash Data in Study Area

The Knoxville Transportation Planning Organization (TPO) provided a 2020 update to bicycle and pedestrian crash data for Knox County and other surrounding counties. According to the data, none of these incidents occurred near the development site in the past couple of years.

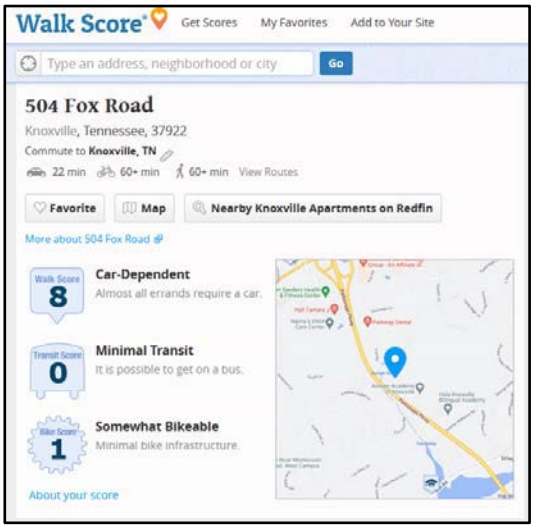


Vehicular Crash Data in Study Area

The Knoxville TPO also provides data related to "Life-Altering Traffic Crashes". This data lists "the location of 2,326 traffic crashes in the Knoxville region that resulted in a fatality or serious injury between January 2016 and June 2019." According to the data, none of these incidents occurred near the development site in the past couple of years. The closest incidents occurred on Kingston Pike and Pellissippi Parkway (I-140) to the north.

- **WALK SCORE**:

A private company offers an online website at walkscore.com that grades and gives scores to locations within the United States based on "walkability", "bikeability", and transit availability based on a patented system. According to the website, the numerical values assigned for the Walk Score and the Bike Score are based on the distance to the closest amenity in various relevant categories (businesses, schools, parks, etc.) and are graded from 0 to 100.



Appendix B shows maps and other information for the Walk Score, Bike Score, and Transit Score at the development property at 504 Fox Road (approximate development site address). The project site location is graded with a Walk Score of 8. This Walk Score indicates that almost all errands currently require a vehicle for travel at the development property. The site is graded with a Bike Score of 1, which means there is minimal bike infrastructure. The site is given a Transit Score of 0 since no public transportation locations are near the development site.

- **TRANSIT SERVICES**:

The City of Knoxville has a network of public transit opportunities offered by Knoxville Area Transit (KAT). Bus service is not available in the study area. The overall KAT bus system map is provided in Appendix C. The closest public transit bus stop to the development site is 1.9 miles away to the northwest by roadway. This bus stop is located on North Seven Oaks Drive in Windsor Square near Kingston Pike on Route 16, "Cedar Bluff Connector". It operates on weekdays and weekends; this route map is included in Appendix C. Recently, KAT had to reduce its service schedule due to workforce shortages. These changes took place on August 29th, 2022, and the reduced schedule for Route 16 is also included in Appendix C. Other transit services in the area include the East Tennessee Human Resource Agency (ETHRA) and the Community Action Committee (CAC), which provides transportation services when requested.

KAT Route 16

PROJECT DESCRIPTION

- **LOCATION AND SITE PLAN:**

The proposed plan layout with 94 single-family detached houses on 23.59 +/- acres is designed by Southland Engineering Consultants, LLC, and is shown in Figure 3. The design shows three new streets for the residential development. All the internal roads will end at cul-de-sacs, and Road "A" is the street that will intersect Fox Road at the Proposed Entrance and provide access for future residents to and from outside destinations.

The 23.59-acre residential development will include two common areas incorporating the stormwater controls with a combined size of 1.25 acres. The minimum area of the single-family detached house lots will be around 6,300 square feet (0.14 acre), with a few lots to the rear of the development property over a half-acre in size. Each house will have a garage and driveway. Internal sidewalks are not proposed for this development.

As shown in Figure 3, the house lots on the north side of the subdivision will be adjacent and back up to the New Castle Subdivision lots on Castleglen Lane. One existing single-family residential house and lot at 442 Fox Road between the subdivisions is shown as remaining. The existing house and residential lot at 504 Fox Road will be removed, and its property will be incorporated into the Fox Road Subdivision development property.

The schedule for the completion of this new residential development is dependent on economic factors and construction timelines. This project is also contingent on permitting, design, and other regulatory approvals. Currently, the real estate market in the area is experiencing large amounts of activity and growth. This study assumed that the total construction build-out of the development and full occupancy would occur within the next four years (2026).

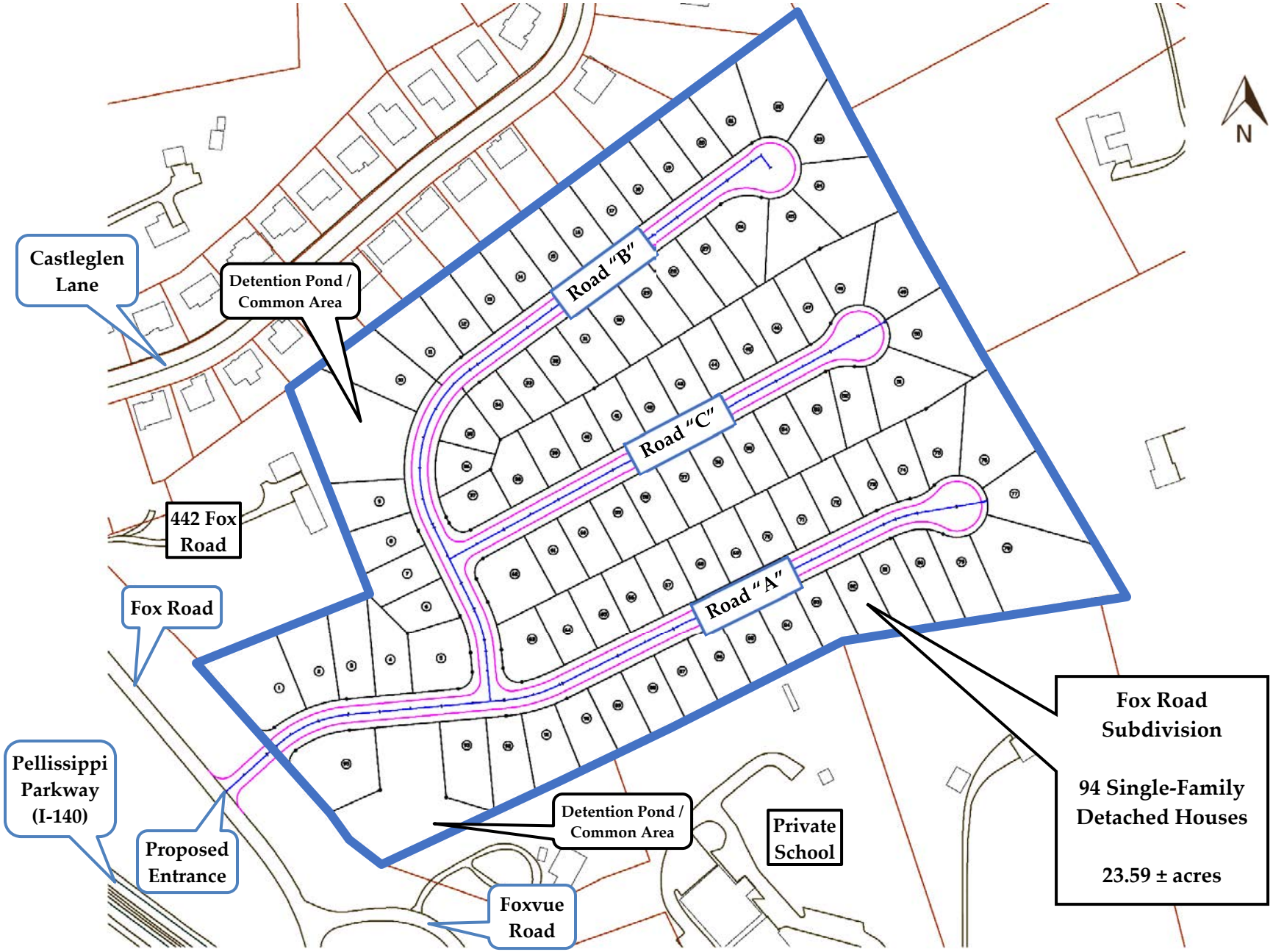


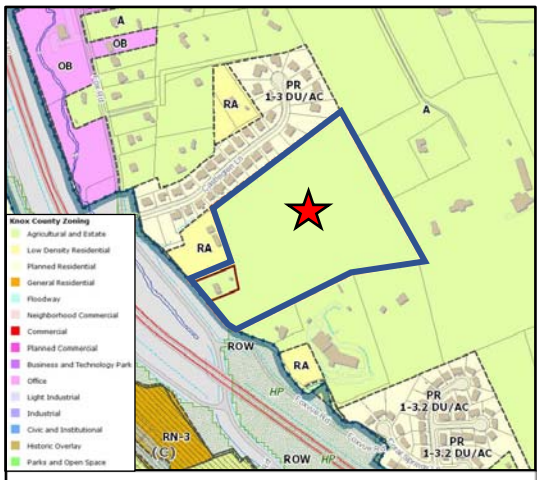
Figure 3
Proposed Plan Layout
Fox Road Subdivision

Not to Scale

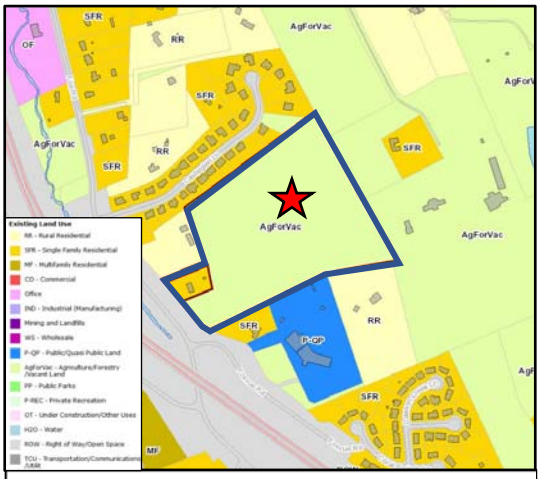
- **PROPOSED USES AND ZONING REQUIREMENTS:**

The two existing parcels comprising the Fox Road Subdivision development property are zoned as Agricultural (A) within Knox County, TN. The development property was recently requested to be rezoned to the Planned Residential (PR) zone with up to 4 units per acre. This rezoning was approved by the Knoxville/Knox County Planning Commission and is now pending Knox County Commission approval. Uses permitted in the Planned Residential (PR) zone include single-family dwellings, duplexes, and multi-dwelling structures and developments. The most recent published online KGIS zoning map is provided in Appendix D. While the development property is within Knox County - Fox Road, the area around Pellissippi Parkway (I-140) and the residential subdivisions on the other side of the Parkway/Interstate are within the City of Knoxville. The existing adjacent surrounding zoning and land uses are the following:

- Eleven parcels north and northwest of the development site are zoned as Planned Residential (PR) with a density of up to 3 units per acre. These parcels contain single-family detached houses in the New Castle Subdivision. All these abutting parcels are occupied except for one currently under construction. These properties have access to Fox Road via Castleglen Lane.
- Three large parcels to the northeast and east are zoned as Agricultural (A) and are occupied by large single-property estates. These properties are heavily forested, with other areas maintained with lawns. These parcels have road access via a shared driveway to Triplett Lane to the north with access to Kingston Pike. The largest parcel to the east also has road access to George Williams Road to the south.
- Three properties to the southeast and south are zoned as Agricultural (A). Two parcels contain single-family detached residences, and the other contains a private school, Annoor Academy of Knoxville. All these properties have road access to Foxvue Road.
- One property east of the development is zoned as Low Density Residential (RA) and contains a single-family detached house at 442 Fox Road. This house is shown as remaining and will exist between the New Castle Subdivision and the proposed Fox Road Subdivision.
- The property across Fox Road to the southwest and west is shown as Right-of-Way (ROW) and includes the area of Pellissippi Parkway (I-140). The property immediately across Fox Road from the development property is a drainage ravine that is forested and covered in kudzu.



KGIS Existing Zoning Map



KGIS Existing Land Use Map

- **DEVELOPMENT DENSITY:**

The Fox Road Subdivision development's proposed density is based on a maximum of 94 single-family detached houses on 23.59 acres. Ninety-four detached houses on 23.59 acres compute to 3.98 dwelling units per acre, just slightly less than the requested property rezoning to Planned Residential (PR) with four units per acre.

- **ON-SITE CIRCULATION:**

The total length of the three new streets within the development will be 3,222 feet (0.61 miles), designed and constructed to the Knox County, TN specifications. The development will have asphalt-paved internal roadways and 8" extruded concrete curbs. The lane widths internally will be 13 feet each for a total 26-foot pavement width. The public right-of-way within the development will be 50 feet. Sidewalks are not proposed along the internal roads. Knox County will maintain the streets in the development after construction, and these will be dedicated public roads.

- **SERVICE AND DELIVERY VEHICLE ACCESS AND CIRCULATION:**

Besides residential passenger vehicles, the internal roadways will provide access to service, delivery, maintenance, and fire protection/rescue vehicles. None of these vehicle types will impact roadway operations other than when they occasionally enter and exit the development. It is expected that curbside private garbage collection services will be available for this residential subdivision. As currently occurring for the residents in the adjacent New Castle Subdivision,

public school buses for the future school-age children in the Fox Road Subdivision will likely be served by a bus stop on Fox Road at the Proposed Entrance.

The new public streets will be designed and constructed to Knox County specifications and are expected to be adequate for fire protection and rescue vehicles, trash collection trucks, and single-unit delivery trucks. The development's internal drives will accommodate the larger vehicle types and residents' standard passenger vehicles.

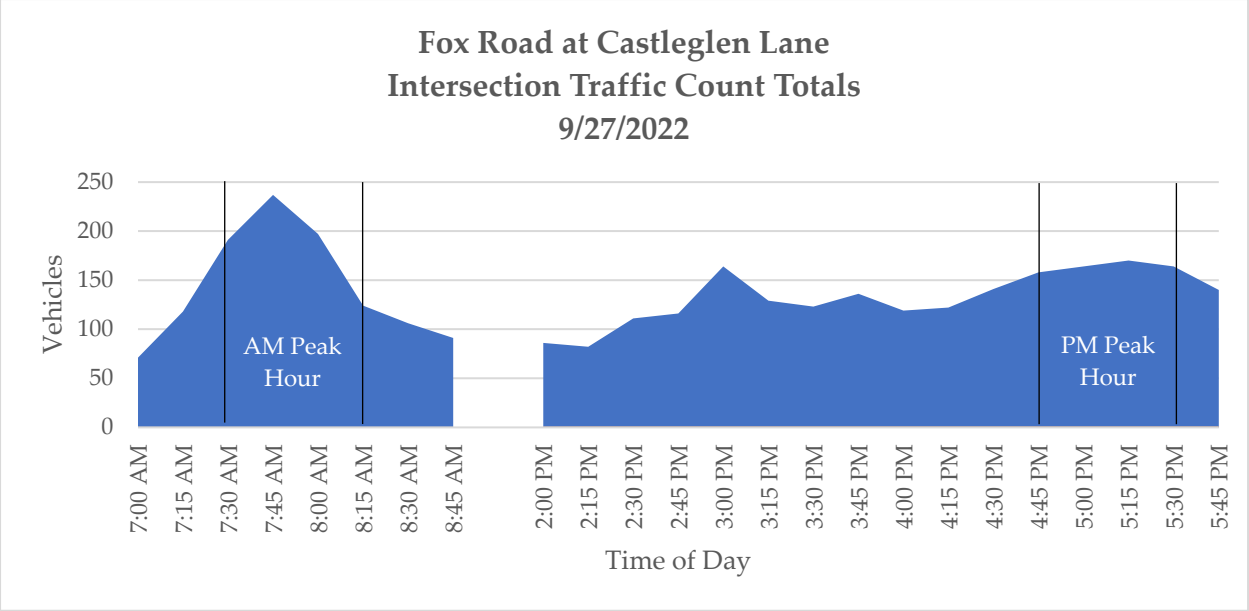
ANALYSIS OF EXISTING AND PROJECTED CONDITIONS

- **EXISTING TRAFFIC CONDITIONS:**

This study conducted a 6-hour traffic count at the unsignalized t-intersection of Fox Road at Castleglen Lane on Tuesday, September 27th, 2022. The intersection of Fox Road at Castleglen Lane is 700 feet northwest of the Proposed Entrance location for the Fox Road Subdivision, and this is the single road access point for New Castle Subdivision. The manual traffic counts were conducted to tabulate the morning and afternoon peak period volumes and travel directions near the proposed development site. Based on the traffic volumes collected, the AM and PM peak hours were observed at 7:30 – 8:30 am and 4:45 – 5:45 pm at the intersection.

The manual tabulated traffic counts of the intersection of Fox Road at Castleglen Lane can be reviewed in Figure 4 and Appendix E, and some observations from the count are listed below.

- No bicyclists or pedestrians were observed at the intersection except for children entering and exiting school buses. During the 6-hour count, one public school bus stopped at the intersection in the morning, and five stops were observed in the afternoon. All these bus stops occurred on Fox Road at Castleglen Lane and were for the school-age children in the New Castle Subdivision.
- Most of the observed traffic was passenger vehicles, but the traffic stream on Fox Road also included public school buses, dump trucks, concrete mixer trucks, and a trash collection truck. No semi-tractor trailers were observed during the traffic count.



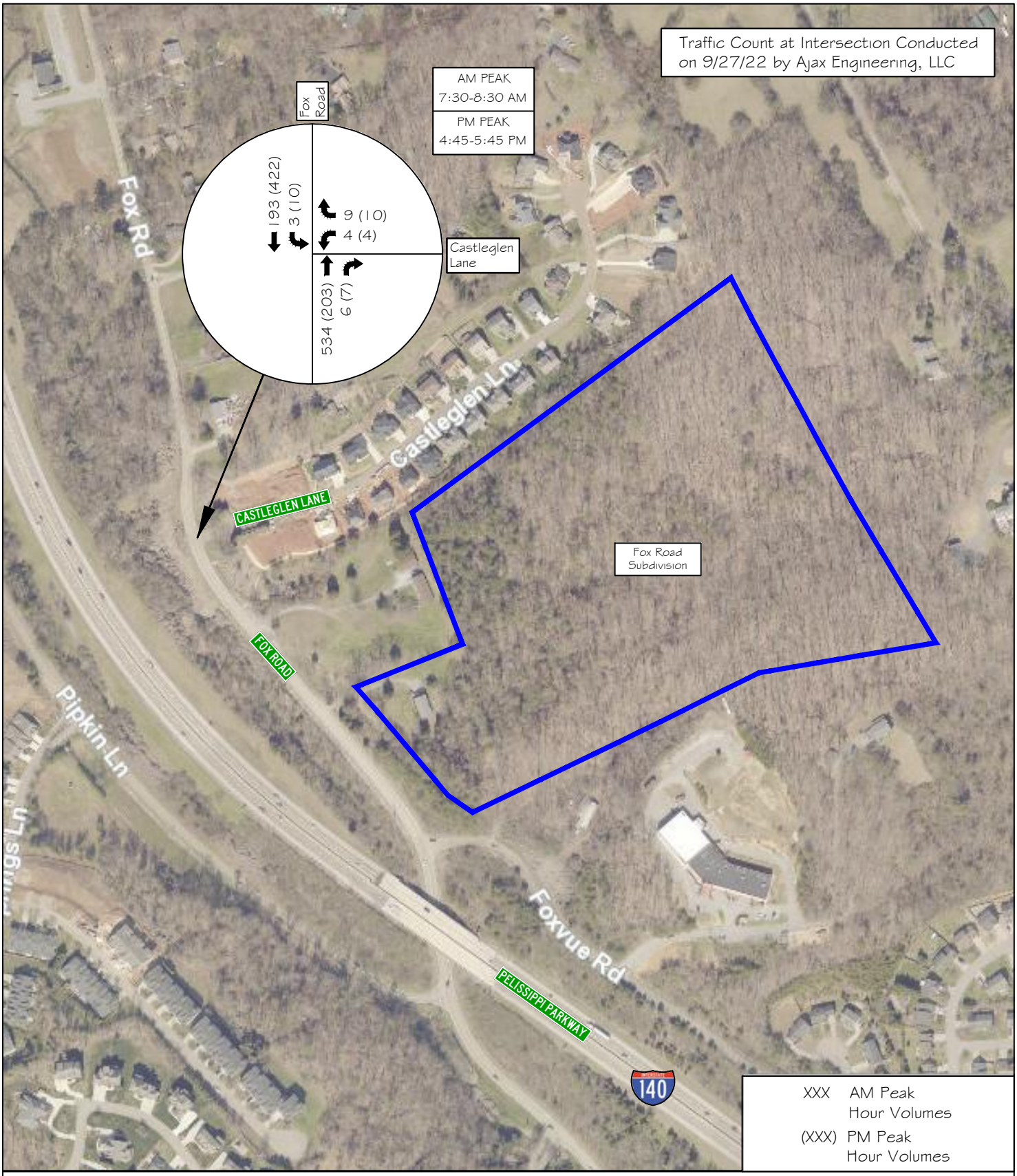


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FIGURE 4

Fox Road Subdivision

2022 Peak Hour Traffic Volumes - EXISTING TRAFFIC CONDITIONS

Capacity analyses were undertaken to determine the Level of Service (LOS) for the existing 2022 traffic volumes shown in Figure 4 at the intersection of Fox Road at Castleglen Lane. The capacity analyses were calculated following the Highway Capacity Manual (HCM) methods and Synchro Traffic Software (Version 11).

Methodology:

LOS is a qualitative measurement developed by the transportation profession to express how well an intersection or roadway performs based on a driver's perception. LOS designations include LOS A through LOS F. The designation of LOS A signifies a roadway or intersection operating at best, while LOS F signifies road operations at worst. This grading system provides a reliable, straightforward means to communicate road operations to the public. The HCM lists level of service criteria for unsignalized intersections and signalized intersections.

LOS is defined by delay per vehicle (seconds), and roadway facilities are also characterized by the volume-to-capacity ratio (v/c). LOS designations, which are based on delay, are reported differently for unsignalized and signalized intersections. For example, a delay of 20 seconds at an unsignalized intersection would indicate LOS C, and this delay would represent the additional delay a motorist would experience traveling through the intersection. Also, for example, a v/c ratio of 0.75 for an approach at an unsignalized intersection would indicate that it is operating at 75% of its available capacity. This difference is primarily due to motorists' different expectations between the two road facilities. Generally, for most instances, the LOS D / LOS E boundary is considered the upper limit of acceptable delay during peak periods in urban and suburban areas.

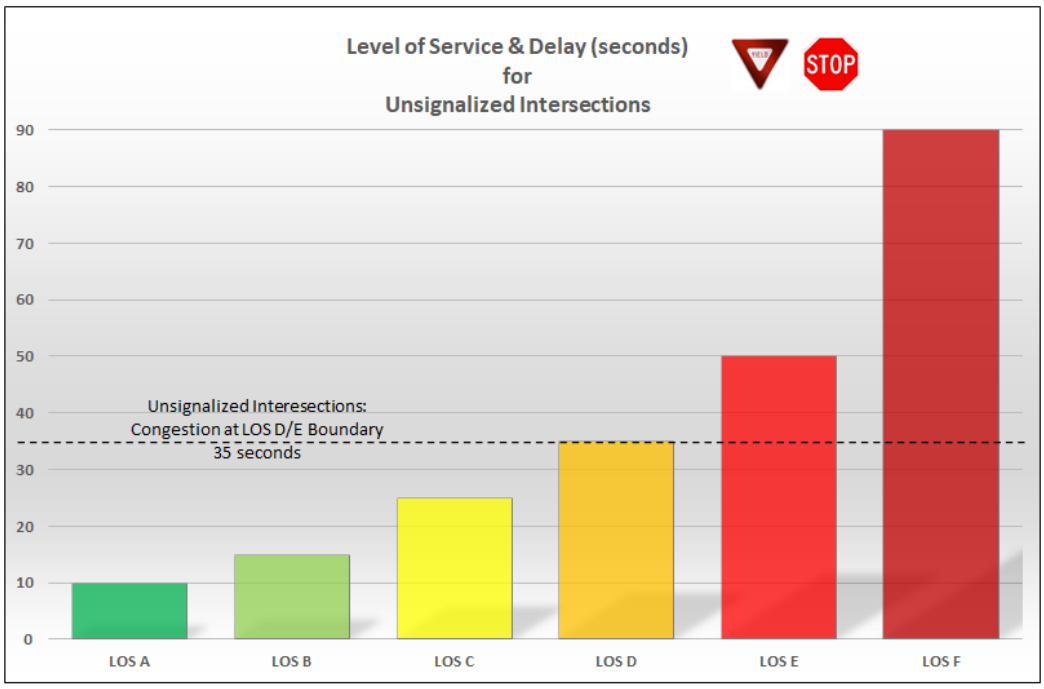
For unsignalized intersections, LOS is measured in terms of delay (in seconds). This measure is an attempt to quantify delay that includes travel time, driver discomfort, and fuel consumption. For unsignalized intersections, the analysis assumes that the mainline thru and right-turn traffic does not stop and is not affected by the traffic on the minor side streets. Thus, the LOS for a two-way stop (or yield) controlled intersection is defined by

the delay for each minor approach and major street left-turn movements. Table 2 lists the level of service criteria for unsignalized intersections. The analysis results of unsignalized intersections using the HCM methodologies are conservative due to the more significant vehicle gap parameters used in the method. More often, in normal road conditions, drivers are more willing to accept smaller gaps in traffic than what is modeled using the HCM methodology. The unsignalized intersection methodology also does not account for more significant gaps sometimes produced by nearby upstream and downstream signalized intersections. For unsignalized intersections, in most instances, the upper limit of acceptable delay during peak hours is the LOS D/E boundary at 35 seconds.

TABLE 2
LEVEL OF SERVICE AND DELAY FOR UNSIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	DESCRIPTION	CONTROL DELAY (seconds/vehicle)
A	Little or no delay	0 - 10
B	Short Traffic Delays	>10 -15
C	Average Traffic Delays	>15 - 25
D	Long Traffic Delays	>25 - 35
E	Very Long Traffic Delays	>35 - 50
F	Extreme Traffic Delays	>50

Source: Highway Capacity Manual, 6th Edition



Intersection capacity results from the existing 2022 peak hour traffic are shown in Table 3. The intersection in the table is shown with a LOS designation, delay (in seconds), and v/c ratio (volume/capacity) for the AM and PM peak hours. Appendix F includes the worksheets for the existing 2022 peak hour capacity analyses.

As shown in Table 3, the intersection is calculated to operate with good LOS and low vehicle delays in the existing 2022 conditions. These calculations and results for this intersection are presented in this report as a courtesy and point of reference. This existing intersection was not included in the Knoxville/Knox County Planning requested scope of work and is not included in the projected conditions reporting.

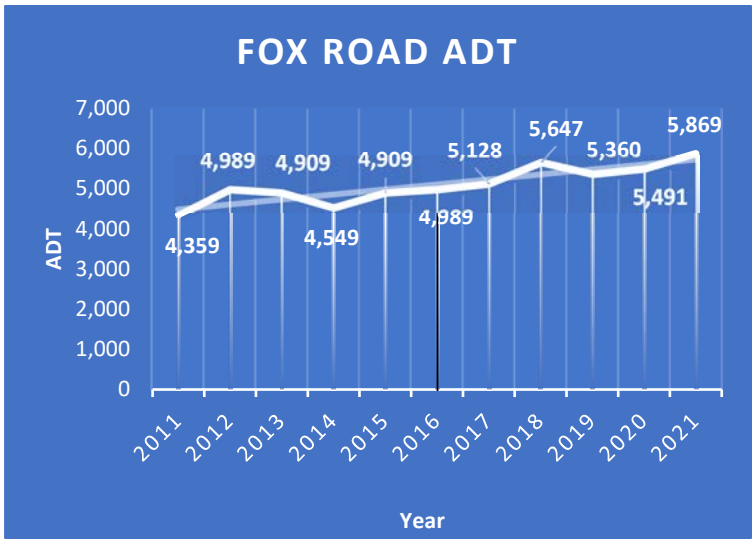
TABLE 3
2022 INTERSECTION CAPACITY ANALYSIS RESULTS -
EXISTING TRAFFIC CONDITIONS

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS [a]	DELAY [b] (seconds)	v/c [c]	LOS [a]	DELAY [b] (seconds)	v/c [c]
Fox Road (SB & NB) at Castleglen Lane (WB)	 Unsignalized	Westbound Left/Right	B	14.9	0.052	B	11.1	0.039
		Southbound Left/Thru	A	8.8	0.008	A	7.7	0.009

Note: All analyses were calculated in Synchro 11 software and reported using HCM 2010 intersection methodology
[a] Level of Service , [b] Average Delay (sec/vehicle) , [c] Volume-to-Capacity Ratio

- **PROJECTED TRAFFIC CONDITIONS (WITHOUT THE PROJECT):**

Horizon year traffic conditions represent the projected traffic volumes in the study area without the proposed project being developed (no-build option). The build-out and full occupancy for this proposed development is assumed to occur by 2026.



Vehicular traffic on Fox Road in the study area has shown moderate annual growth over the past ten years (+3%), according to the TDOT traffic count station and as shown in Appendix A. For this study, an annual growth rate of +3% was used to calculate future growth on Fox Road up to 2026 to account for potential traffic growth in the study area. Higher growth than 3% in the future is not expected since there are few remaining large properties on Fox Road or on surrounding roads that would portend to higher growth rates. It is surmised that a decent amount of recent traffic growth generated on Fox Road is due to the new apartment complex on Emory Church Road, The Village at Westland Cove. A small subdivision is currently under construction at the intersection of Fox Road at George Williams Road but will only have 12 single-family detached houses and is expected to generate only a dozen or so trips during peak hours.

The growth rate of 3% was applied to the Fox Road volumes tabulated from the traffic count at the intersection with Castleglen Lane. This growth application results in the projected volumes on Fox Road in 2026 without the potential development traffic.

Capacity analyses were not undertaken to determine the projected LOS in 2026 without the project. These analyses were not conducted since the intersection of Fox Road at the Proposed Entrance only exists in the projected conditions with the project. Figure 5 shows the projected 2026 horizon year traffic volumes on Fox Road without the project during the AM and PM peak hours at the Proposed Entrance location. The volumes shown in Figure 5 include the vehicles tabulated in the traffic count entering and exiting the New Castle Subdivision at Castleglen Lane and traveling through the Proposed Entrance location on Fox Road.

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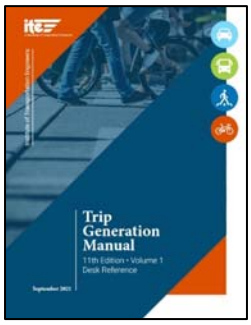
FIGURE 5

Fox Road Subdivision

2026 Peak Hour Traffic Volumes - PROJECTED TRAFFIC CONDITIONS (WITHOUT THE PROJECT)

- **TRIP GENERATION:**



A generated trip is a single or one-direction vehicle movement entering or exiting the study site. The estimated amount of traffic that the 94 single-family detached houses will generate was calculated based on rates and equations provided by the Trip Generation Manual, 11th Edition, a publication of the Institute of Transportation Engineers (ITE). The Trip Generation Manual is the traditional and most popular resource for determining trip generation rates when transportation impact studies are produced. The data and calculations from ITE for the proposed land use are shown in Appendix G. A summary of this information is presented in the following table:

TABLE 4
TRIP GENERATION FOR FOX ROAD SUBDIVISION
94 Single-Family Detached Houses

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
#210	Single-Family Detached Housing	94 Houses	954	26%	74%		63%	37%	
				18	52	70	59	35	94
Total New Volume Site Trips			**954**	**18**	**52**	**70**	**59**	**35**	**94**

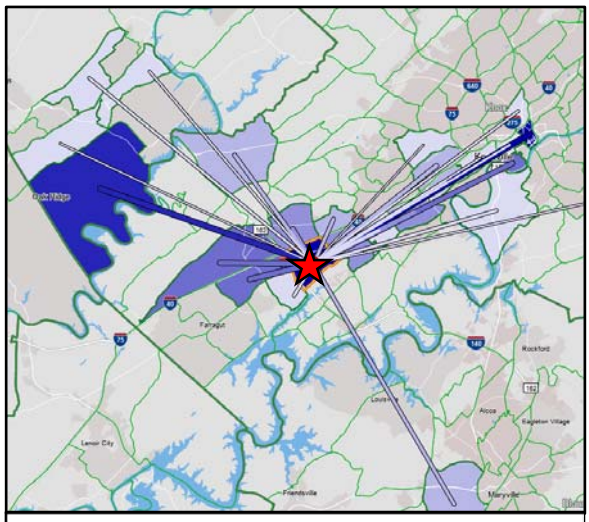
ITE Trip Generation Manual, 11th Edition
Trips calculated by using Fitted Curve Equation

For the proposed residential development, with 94 single-family detached houses, it is estimated that 18 vehicles will enter and 52 will exit, for a total of 70 generated trips during the AM peak hour in the year 2026. Similarly, it is estimated that 59 vehicles will enter and 35 will exit, for a total of 94 generated trips during the PM peak hour in the year 2026. The calculated trips generated for an average weekday are estimated to be 954 vehicles for the proposed development. No vehicle trip reductions were included in the calculations or analysis.

- **TRIP DISTRIBUTION AND ASSIGNMENT:**

The projected trip distribution and assignment for the Fox Road Subdivision development are based on several sources and engineering judgments. The first source is based on the existing traffic count volumes and the observed travel directions collected at the intersection of Fox Road at Castleglen Lane adjacent to the proposed development site.

During the traffic count, significant splits were observed during the morning and afternoon peak hours. In the AM peak hour, nearly 75% of thru traffic on Fox Road was observed traveling north towards Kingston Pike and 25% south. In the PM peak hour, nearly the opposite occurred, with a split on Fox Road of nearly 70% heading south and 30% north. The trips entering and exiting the New Castle Subdivision roughly followed the observed northbound/southbound splits on Fox Road during peak hours. However, in the AM peak hour, most entering trips were from the south (northbound right-turns). It is suspected that the higher percentage of entering trips from the south were from parents returning home after taking their children to the public schools to the south and east.

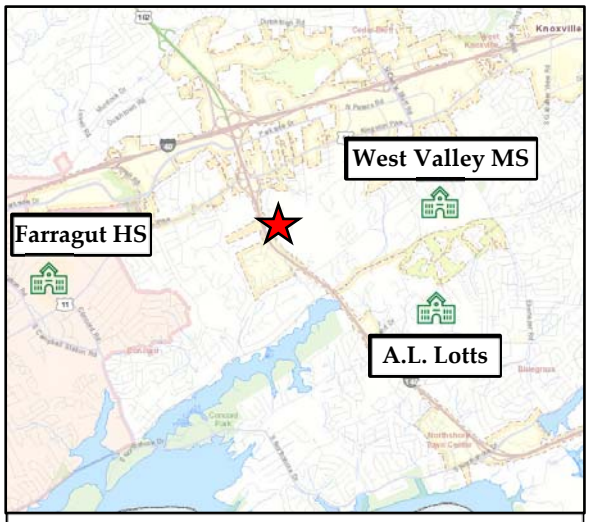


2019 Census Bureau Work-Based Trips to & from Census Tract 57.06

The second source for determining the projected trip distribution is based on work-related trips in the local area. Work-based trips will be a significant impetus for generated trips by the development, and these trips are more likely to travel to and from the west, northwest, east, and northeast. This assertion is based on data from the United States Bureau website for Census Tract 57.06, where the development property is located. Based on 2019 (latest available) census data and as shown in Appendix H, most work-based trips in the surrounding area correspond to Oak Ridge, downtown Knoxville, the University of Tennessee area, and other areas of West Knoxville.

In addition to employment centers, some generated traffic will travel to and from public and private schools. Schools will be another impetus for external trip-making. The development property is currently zoned for A.L. Lotts Elementary, West Valley Middle, and Farragut High

School. The property is just inside the Farragut High School zone, with the Bearden High School zone just to the east and along the back property line.



Zoned Public School Locations

A.L. Lotts Elementary and West Valley Middle are both 2.4 miles away by roadway south and east of the development site. The most direct route to A.L. Lotts Elementary will be south on Fox Road, south on Emory Church Road, and then east on Westland Drive. The route to West Valley Middle School will be south on Fox Road and east to the other end of George Williams Road. The most direct route to Farragut High School is north on Fox Road and west on Kingston Pike. Fox Road is notoriously difficult to turn left at Kingston Pike towards the west due to the regular backups at the exit/entrance ramps of Pellissippi Parkway (I-140) on Kingston Pike. Thus, some residents may travel south on Fox Road to Canton Hollow Road, Woody Road, Loop Road, and then Concord Road to Farragut High School.

The Knox County Schools Transportation Department has developed Parental Responsibility Zones (PRZ) to determine whether students are offered transportation services to and from school. The PRZ is defined as being 1.5 miles for grades 6 – 12 and 1.0 miles for grades K – 5 from where the students' parcel is accessed to the point where the buses unload at the school. This development will be outside the PRZ for all the zoned schools, and all school-age children attending public schools in the development will be able to utilize this service if desired.

Figure 6 shows the projected distribution of traffic entering and exiting the development at the Proposed Entrance on Fox Road. The percentages shown in the figure only pertain to the trips generated by the proposed dwellings in the development calculated from the ITE trip rates. Ultimately, the projected trip distribution was heavily based on the observed traffic at the intersection of Fox Road at Castleglen Lane. This assumed distribution retained the observed heavy northbound and southbound splits but also kept the observed higher entering percentages in the AM peak hour from the south.

Figure 7 shows the traffic assignment of the computed trips generated by the development and is based on the assumed distribution of trips shown in Figure 6.

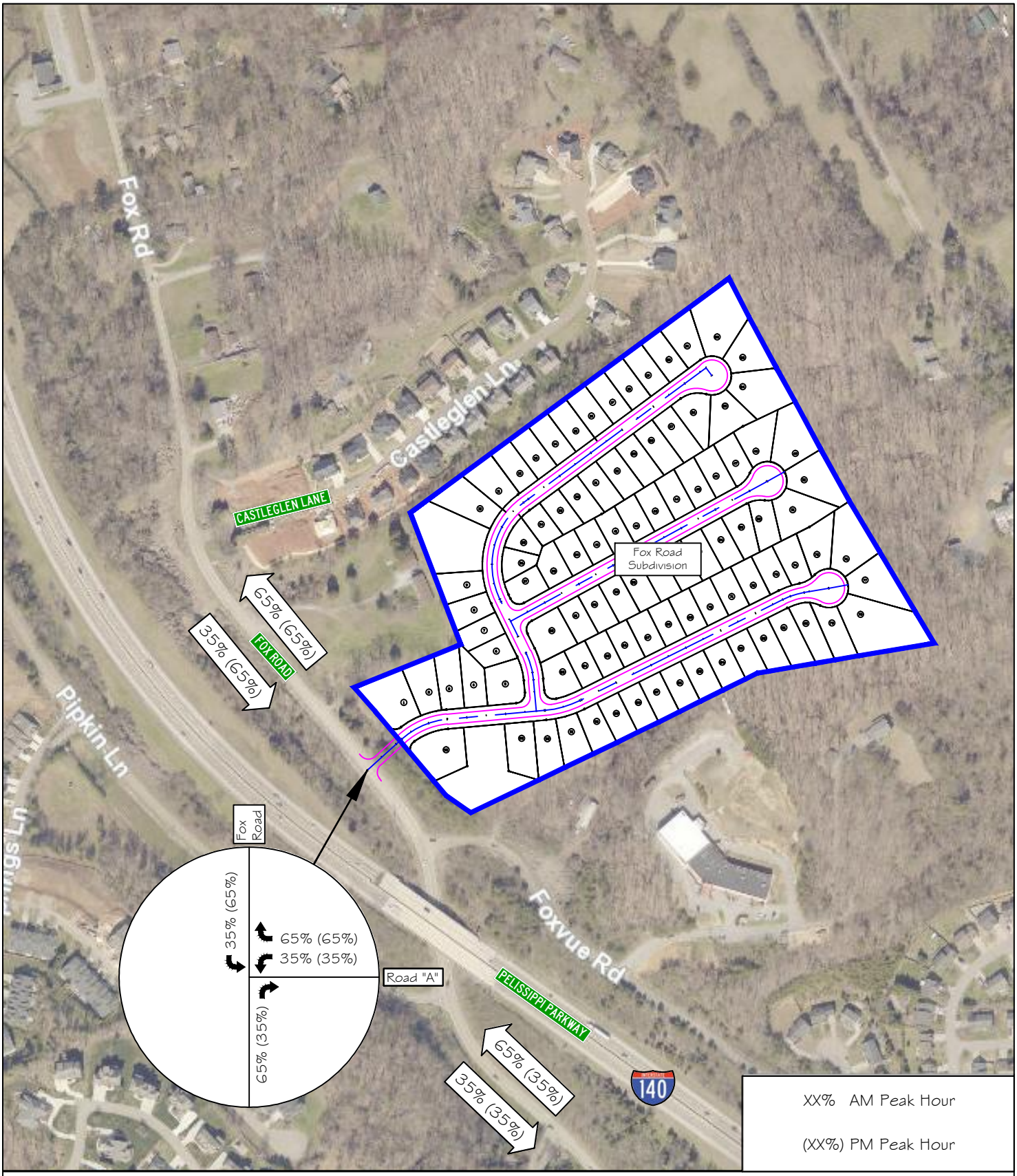


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FIGURE 6

Fox Road Subdivision

Directional Distribution of Generated Traffic during AM and PM Peak Hour

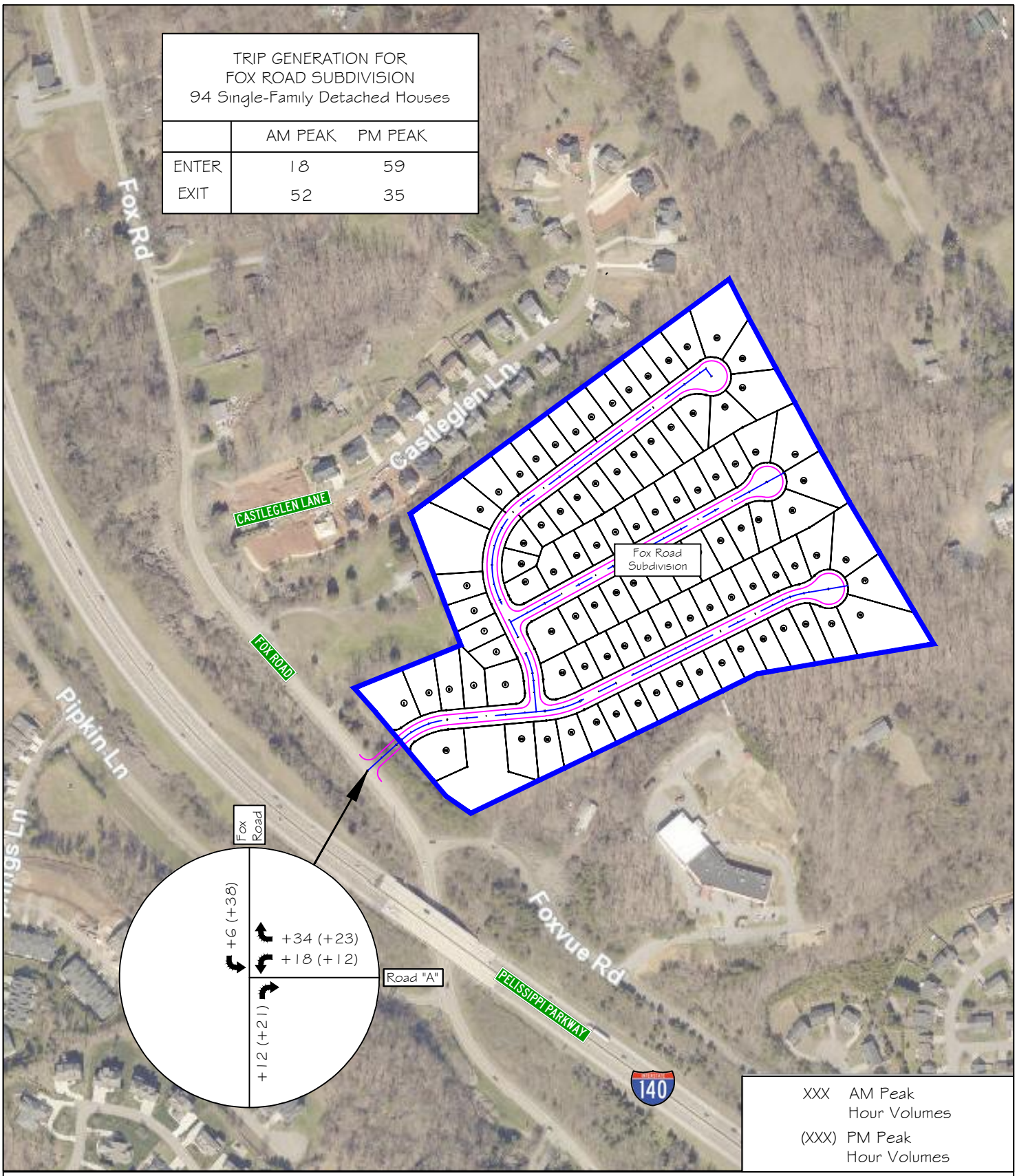

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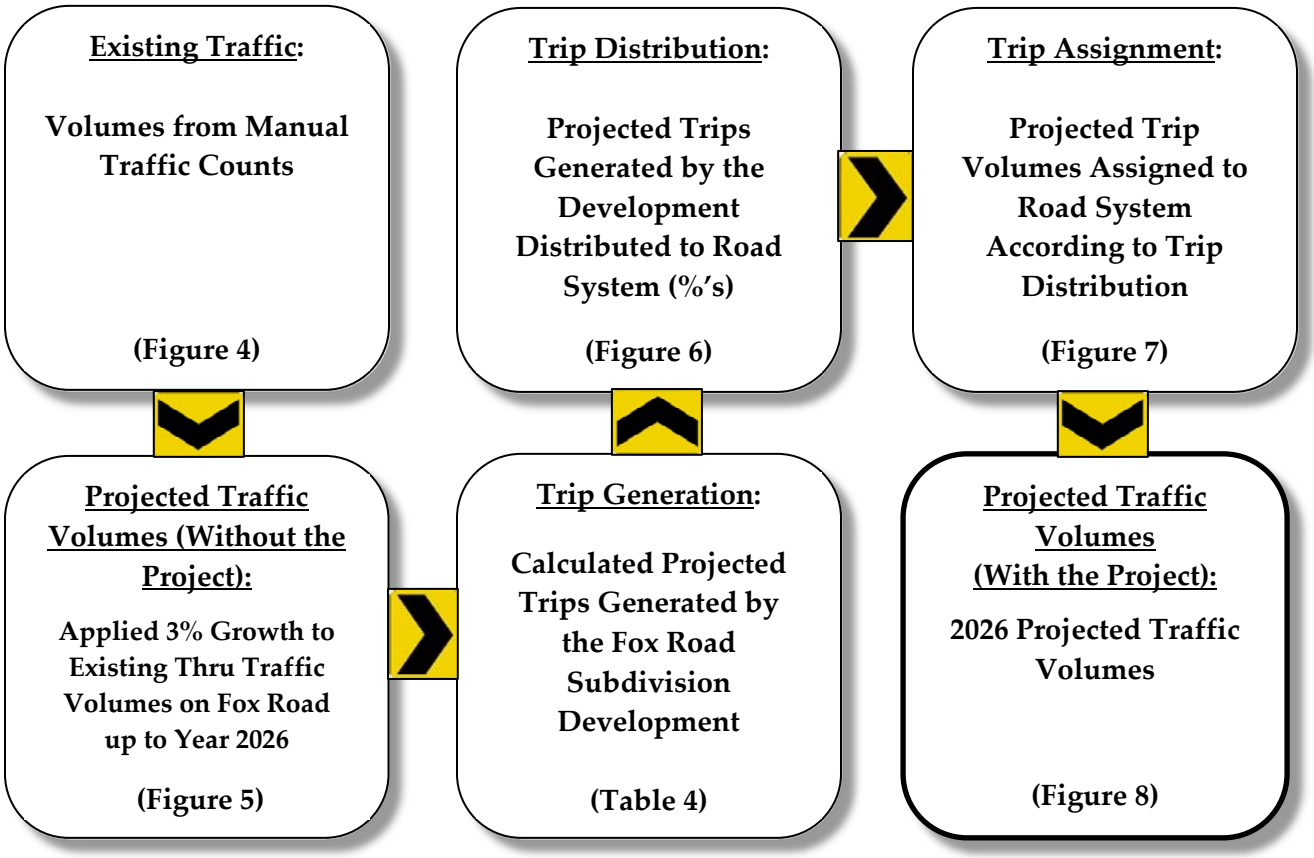
FIGURE 7

Fox Road Subdivision

Traffic Assignment of Generated Traffic during AM and PM Peak Hour

- **PROJECTED TRAFFIC CONDITIONS (WITH THE PROJECT):**

Overall, several additive steps were taken to estimate the total projected traffic volumes at the future intersection when the Fox Road Subdivision development is constructed and occupied in 2026. The steps are illustrated below for clarity and review:



The calculated peak hour traffic (Table 4) generated by the Fox Road Subdivision development was added to the 2026 horizon year traffic (Figure 5) by following the predicted trip distributions and assignments (Figures 6 and 7). This procedure was completed to obtain the total projected traffic volumes when the proposed development is fully built out and occupied in 2026. Figure 8 shows the projected 2026 AM and PM peak hours with the generated development traffic at the Proposed Entrance on Fox Road.

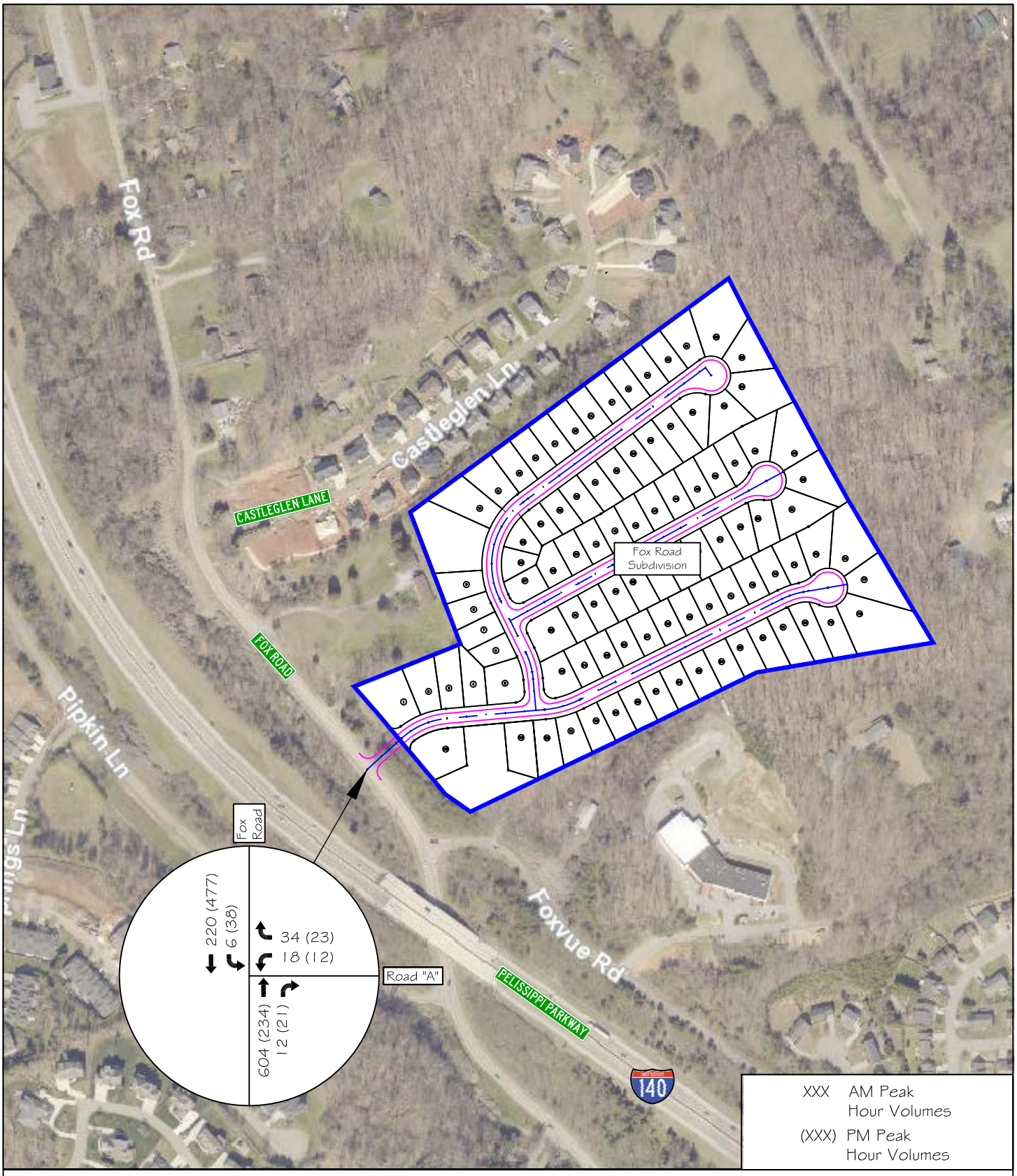


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FIGURE 8

Fox Road Subdivision

2026 Peak Hour Traffic Volumes - PROJECTED TRAFFIC CONDITIONS (WITH THE PROJECT)

Capacity analyses were conducted to determine the projected LOS at the intersection of Fox Road at the Proposed Entrance with the development traffic in 2026. The projected 2026 peak hour capacity results for the intersection with the project resulted in good LOS with low vehicle delays, as shown in Table 5. Appendix F includes the worksheets for these capacity analyses.

TABLE 5
2026 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS (WITH THE PROJECT)

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS [a]	DELAY [b] (seconds)	v/c [c]	LOS [a]	DELAY [b] (seconds)	v/c [c]
Fox Road (SB & NB) at Road "A" (WB)	Unsignalized	Westbound Left/Right	C	15.0	0.139	B	11.4	0.065
		Southbound Left/Thru	A	9.1	0.007	A	7.9	0.033

Note: All analyses were calculated in Synchro 11 software and reported using HCM 2010 intersection methodology
[a] Level of Service , [b] Average Delay (sec/vehicle) , [c] Volume-to-Capacity Ratio

- **POTENTIAL TRANSPORTATION SAFETY ISSUES:**

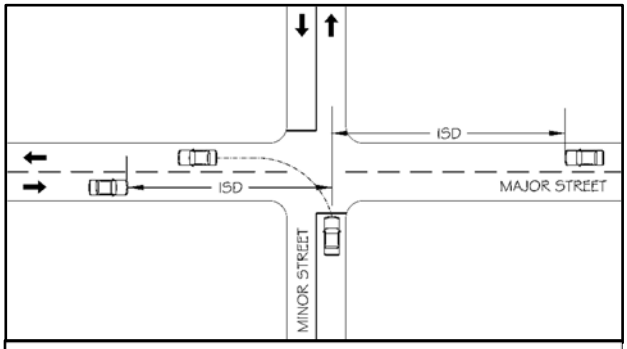
The study area was investigated for potential existing and future safety issues when the development is constructed. These adjacent transportation system features are discussed in the following pages.

EVALUATION OF SIGHT DISTANCE

For intersections, sight distance evaluations have two categories: Stopping Sight Distance (SSD) and Intersection Sight Distance (ISD).

Methodology:
SSD is the distance required for a motorist on a major street to perceive, react, and the vehicle to come to a complete stop before colliding with an object on the road. For evaluating intersections, this object would be another vehicle entering the intersection from a minor street. SSD can be considered the minimum visibility distance standard for evaluating the safety of an intersection.

ISD is the required visibility distance standard for evaluating the safety of an intersection per section 3.04.J.5 in the Knoxville-Knox County Subdivision Regulations. ISD is based on the time required to perceive, react, and complete the desired traffic maneuver once a motorist on a minor street decides to perform a traffic maneuver.



Intersection Sight Distance Diagram

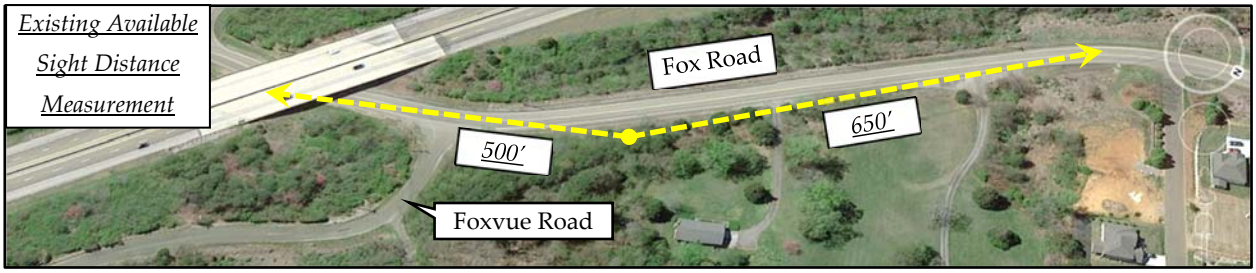
Three traffic maneuvers are available for vehicles stopped on a minor street at a 4-way intersection: (1) left-turn, (2) right-turn, (3) or a crossing maneuver across the major street. For turns from the minor street, ISD is needed to allow a stopped motorist to turn onto a major street without being overtaken by an approaching vehicle. The most critical ISD is for left turns from the minor street. The ISD for this maneuver includes the time to turn left and clear half of the intersection without conflicting with the oncoming traffic from the left and accelerating to the road's operating speed without causing the approaching vehicles from the right to reduce their speed substantially.

With a posted speed limit of 30-mph on Fox Road at the Proposed Entrance, the ISD is 335 feet calculated based on AASHTO's (American Association of State Highway Transportation Officials) guidance.

Fox Road has a 1.9% road grade downhill to the south at the Proposed Entrance location on the northern side and 5.5% on the southern side (the difference is due to the entrance's location on a vertical curve). Based on the posted speed limit of 30-mph on Fox Road and the existing road grades, the SSD is calculated to be 205 feet looking to the north and 185 feet to the south.

Visual observations of the sight distances at the Proposed Entrance location on Fox Road were undertaken. Using a Nikon Laser Rangefinder at the Proposed Entrance location, the available sight distance was visually estimated to be 650' feet to the north (towards Kingston Pike) and 500' feet to the south. Based on visual observation, the available sight distances from the Proposed Entrance on Fox Road will be adequate.

Images of the existing sight distances at the Proposed Entrance location are labeled below with the ISD, SSD, and rangefinder-measured sight distances.



View of Sight Distance on Fox Road at the Proposed Entrance (Looking South)

View of Sight Distance on Fox Road at the Proposed Entrance (Looking North)

EVALUATION OF TURN LANE THRESHOLDS

An evaluation of the need for separate entering turn lanes into the development in the projected 2026 conditions was conducted for the Proposed Entrance at Fox Road.

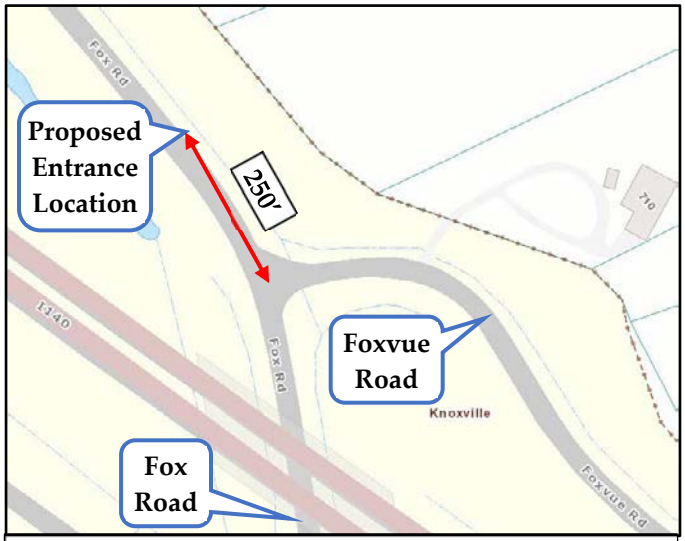
The criteria used for this turn lane evaluation were based on Knox County's "Access Control and Driveway Design Policy". This design policy relates vehicle volume thresholds based on prevailing speeds for two-lane and four-lane roadways. This Knox County policy follows TDOT and nationally accepted guidelines for unsignalized intersections. The City of Knoxville also accepts Knox County turn lane warrant analysis procedures and is appropriate to use even though Fox Road is located within the city limits.

With a posted speed limit of 30-mph on Fox Road, separate left and right-turn entering lanes are not warranted at the Proposed Entrance based on the projected 2026 AM and PM peak hour traffic volumes. The worksheets for these evaluations are provided in Appendix I.

EVALUATION OF INTERSECTION SPACING

The City of Knoxville requires specific minimum spacing between intersecting streets. The intersection of Fox Road at the Proposed Entrance will be within the City's boundary. Since Fox Road is designated as a Minor Collector at the Proposed Entrance location, the minimum intersection spacing is 300 feet.

The proposed spacing between Foxvue Road and the Proposed Entrance for the Fox Road Subdivision is approximately 250 feet from centerline to centerline, less than the City of Knoxville minimum.



Fox Road Intersection Spacing

CONCLUSIONS & RECOMMENDATIONS

The following is an overview of recommendations to minimize the transportation impacts of the proposed Fox Road Subdivision on the adjacent transportation system while attempting to achieve an acceptable traffic flow and safety level.

Fox Road at Proposed Entrance: The projected 2026 level of service calculations for the Proposed Entrance intersection at Fox Road resulted in low vehicle delays. The construction of left and right-turn lanes on Fox Road for entering traffic is not warranted at the Proposed Entrance. A single exiting lane for the development entrance will be sufficient.

1a) It is recommended that a Stop Sign (R1-1) be installed, and a 24" white stop bar be applied to the Proposed Entrance approach at Fox Road. The stop bar should be applied a minimum of 4 feet away from the edge of Fox Road and placed at the desired stopping point that maximizes the sight distance.

1b) Sight distances at the Proposed Entrance approach at Fox Road must not be impacted by future landscaping, signage, or existing vegetation. Based on a posted speed limit of 30-mph on Fox Road, the required intersection sight distance is 335 feet looking in each direction at the entrance. The stopping sight distance is 205 feet looking to the north and 185 feet to the south at the Proposed Entrance on Fox Road. A visual inspection determined that the intersection and stopping sight distances are available. The site designer must ensure that these sight distances are accounted for and provided in the design plans.

1c) The City of Knoxville requires a 300-foot minimum intersection spacing distance for Minor Collector roads. The intersection of Fox Road at the Proposed Entrance will be approximately 250 feet away to the northwest from Foxvue Road.

The developer should request a variance to allow the proposed intersection spacing to be less than the minimum. This variance should be requested since the development property has limited potential to provide an entrance on Fox Road further away.

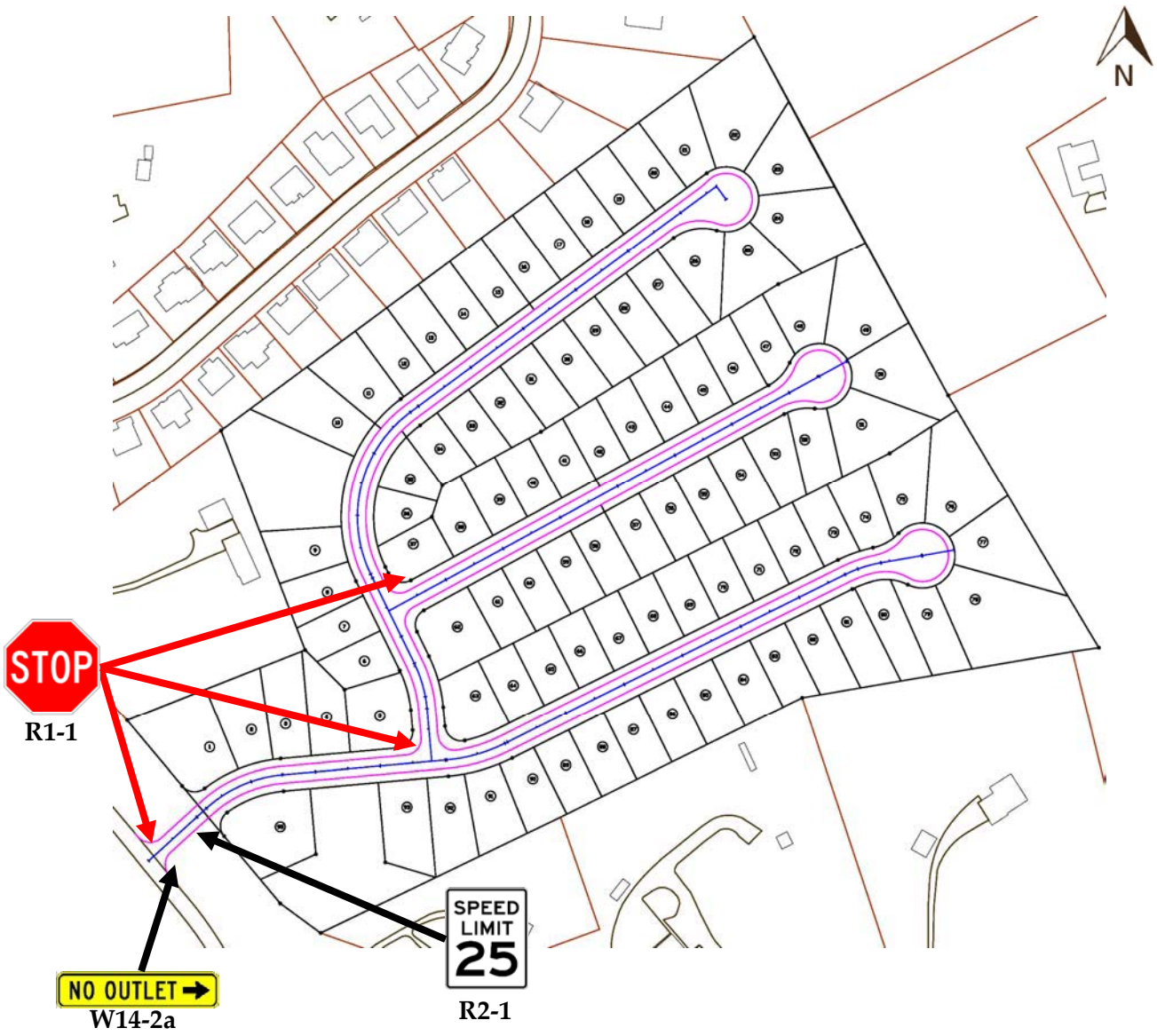
Northbound right-turn movements from Fox Road into the proposed subdivision will not create vehicle queues on Fox Road since it is a free-flow movement. Thus, these

movements will not interfere with turning movements on Fox Road at Foxvue Road. Also, since Foxvue Road and the Proposed Entrance, Road "A", will be on the same side of Fox Road, the potential for left-turn vehicle queues at each intersection on Fox Road blocking each other will not occur. Furthermore, it is not expected that southbound left turns on Fox Road at Foxvue Road would be substantial enough to cause a vehicle queue to extend back to the Proposed Entrance and block exiting traffic to turn south onto Fox Road.

Fox Road Subdivision Internal Roads: The layout plan shows one entrance on Fox Road constructed for the development, as shown in Figure 3.

2a) A 25-mph Speed Limit Sign (R2-1) is recommended to be posted near the beginning of the development entrance off Fox Road. It is recommended that a "No Outlet" Sign (W14-2a) be installed at the front of the subdivision at Fox Road. This sign can be installed above or below the street name sign.

2b) Stop Signs (R1-1) with 24" white stop bars and other traffic signage are recommended to be installed at the internal locations, as shown below:



Internal Traffic Sign Locations

2c) Sight distance at the new internal road intersections must not be impacted by signage, parked cars, or future landscaping. The development property is located within Knox County, requiring an ISD of 1 foot of sight distance per 1 mph of vehicle speed. Thus, with a proposed speed limit of 25-mph in the development, the internal intersection sight distance is 250 feet. The required stopping sight distance is 155 feet for a level road grade. The site designer should ensure that these internal sight distance lengths are met.

2d) The internal roads have long, straight road segments with the potential to have steep road grades. Straight road segments with steeper grades encourage higher vehicle speeds. It is recommended that the site designer consider traffic calming measures on these internal roads.

Speed humps are a prevalent traffic calming measure to install in residential areas to reduce vehicle speeds due to their low cost. However, speed humps are not recommended on roads with grades greater than 8%. Due to the existing topography, it is expected that the road profiles in the Fox Road Subdivision may have steep grades, possibly greater than 8%. Thus, speed humps would be inappropriate for large sections of these internal roads.

If implemented, it is recommended that the site designer consider speed humps on internal roads with grades less than 8% and chokers with grades greater than 8%. A choker is used to discourage motorists from speeding and is appropriate in residential settings. A choker is created by narrowing the road using curb extensions. A choker can also be created by installing a planting strip on an island at the road edge. Any road design with chokers must consider driveway placement, stormwater, and sight distance.

2e) All drainage grates and covers for the residential development must be pedestrian and bicycle safe.

2f) If directed by the local post office, the site designer should include a parking area within the development for a centralized mail delivery center. The site plan does not show a general location in the development, but a specific plan with a parking area should be designed and provided if required.

2g) All road grade and intersection elements should be designed to AASHTO, TDOT, the

City of Knoxville, and Knox County specifications and guidelines to ensure proper operation.

APPENDIX A

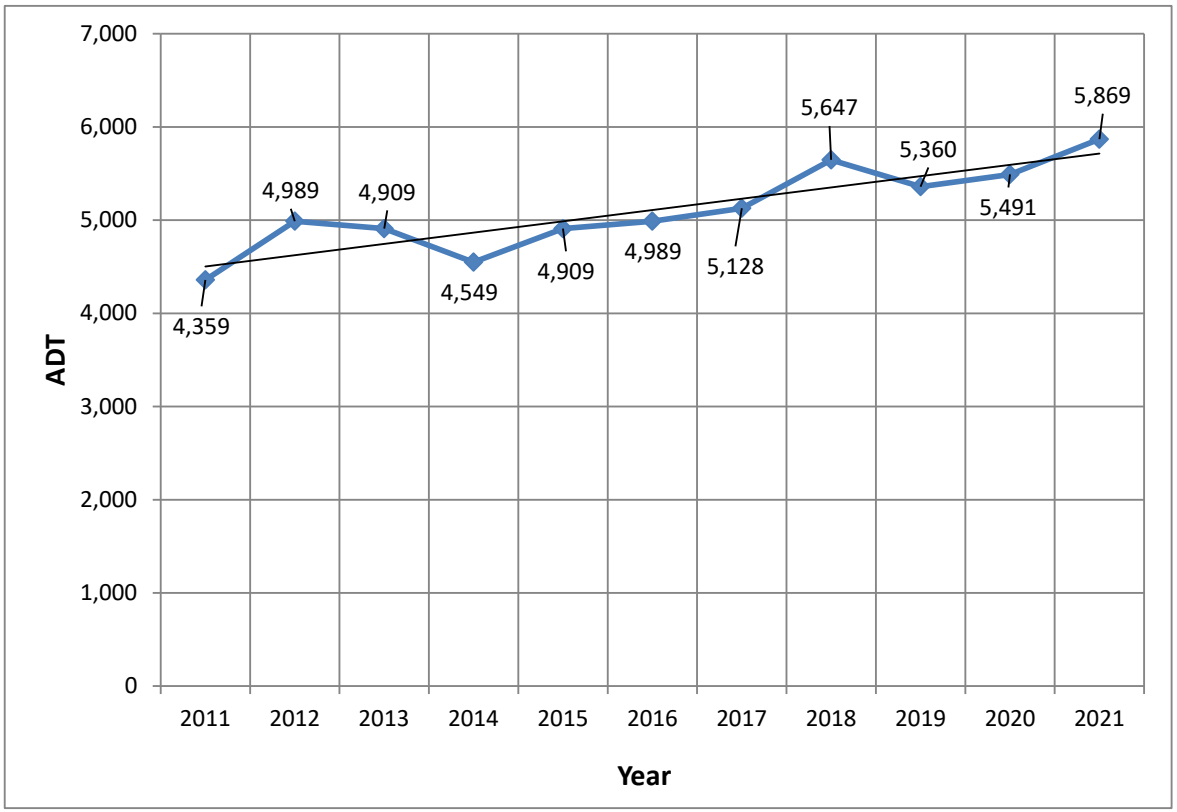
HISTORICAL TRAFFIC COUNT DATA

Historical Traffic Counts

Organization: TDOT
Station ID #: 47000499
Location: Fox Road, south of Kingston Pike

YEAR	ADT
2011	4,359
2012	4,989
2013	4,909
2014	4,549
2015	4,909
2016	4,989
2017	5,128
2018	5,647
2019	5,360
2020	5,491
2021	5,869

Trendline



2011 - 2021 Growth Rate = 34.6%
Average Annual Growth Rate = 3.0%

TN TDOT Department of Transportation

MS2 Transportation Data Management System

TCDS Help

Home | TMC | TCLS | RSMS | NMDS | WQTS | TFMS

Login | Locate | Locate All | Email This

Auto-Locate OFF

List View | All DIRs

Record 1 of 1 Goto Record go

Location ID	47000499	MPO ID	
Type	SPOT	IIPMS ID	
On NHS		On HPMS	
LRS ID	4705632001	LRS Loc Pt.	3.033
SF Group	Urban	Route Type	
AF Group	18	Route	
GF Group	Knox	Active	Yes
Class Dist Grp	18	Category	CC
Seas Clss Grp			
WIM Group			
QC Group	Default		
Fnct'l Class	Minor Collector	Milepost	
Located On	FOX RD.		
Loc On Alias			
	FARRAGUT		
More Detail			

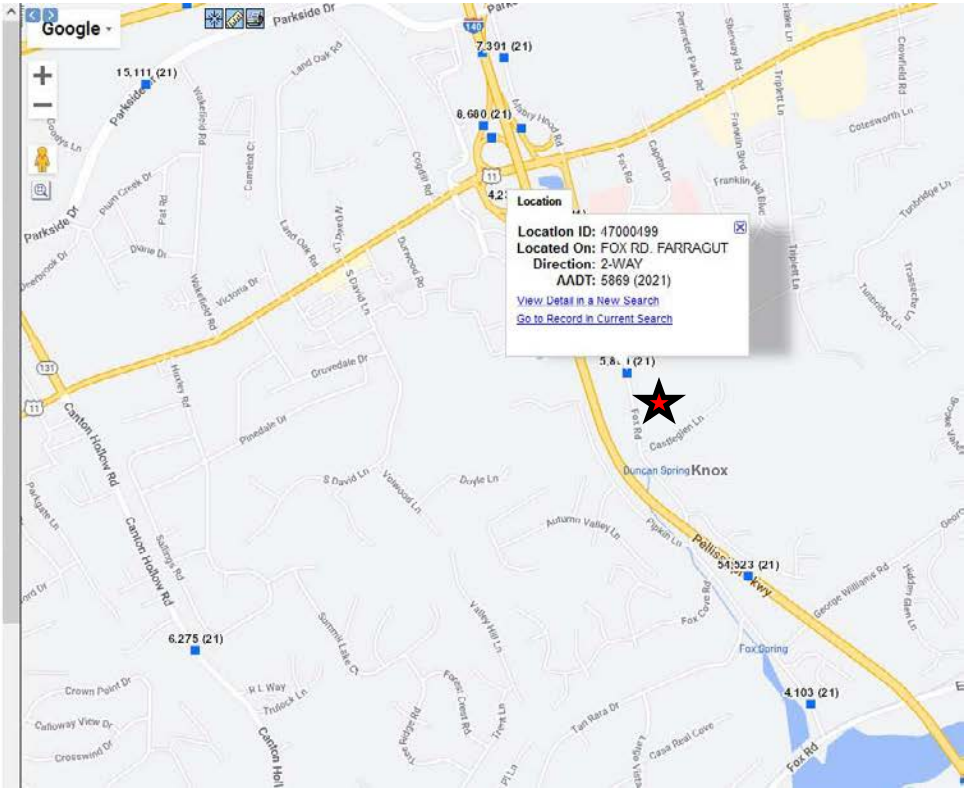
STATION DATA

Directions: 2-WAY

AADT

	Year	AADT	DHV-30	K %	D %	PA	BC	Src
	2021	5,869	495	8	65	5,786 (99%)	83 (1%)	
	2020	5,491	644	12	65	5,307 (97%)	184 (3%)	
	2019	5,360		13	65			
	2018	5,647		13	65			
	2017	5,128[2]						

|<< < > >>| 1-5 of 12

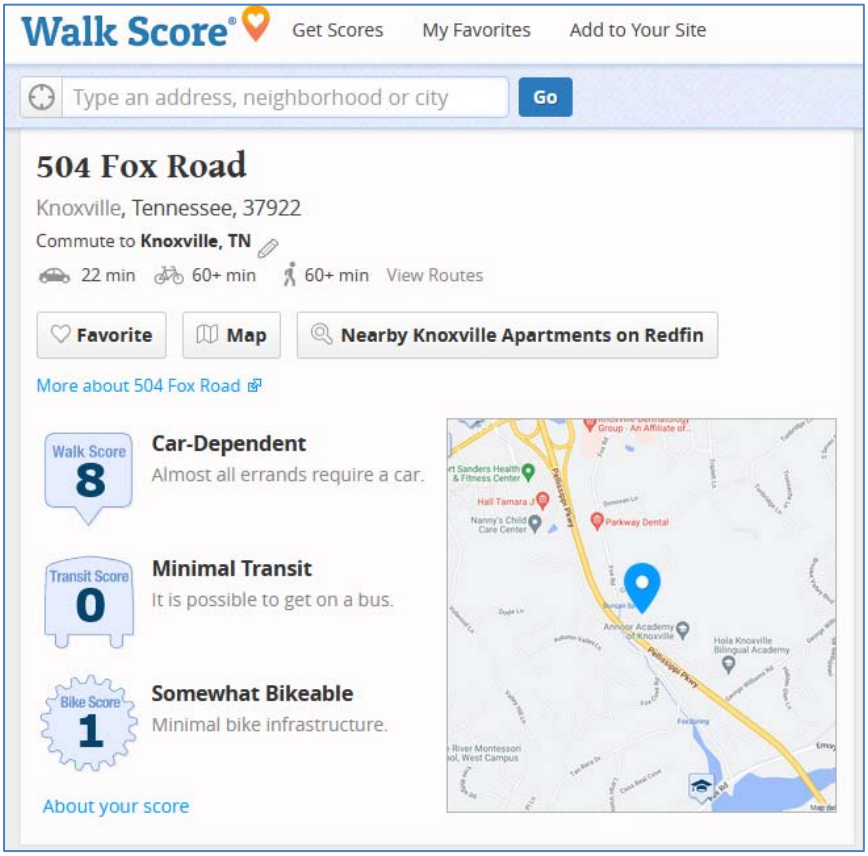


APPENDIX B

WALK SCORE

WALKSCORE

(from walkscore.com)



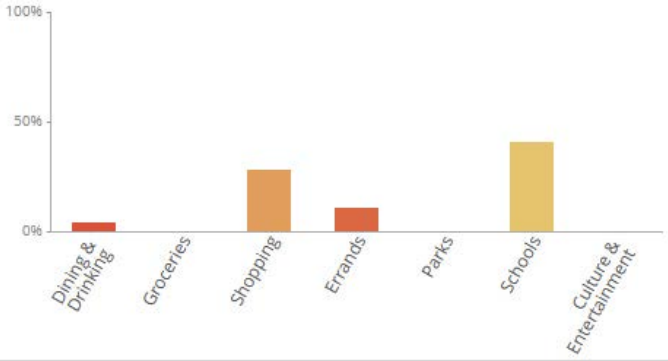
Scores for 504 Fox Road

Walk Score 8 | Bike Score 1

Walk Score | **Transit Score** | **Bike Score**

Score Details | **What is Walk Score**

The Walk Score for 504 Fox Road is based on the following categories.



Scores for 504 Fox Road

Walk Score 8 | Bike Score 1

Walk Score | **Transit Score** | **Bike Score**

Transit Score measures how well a location is served by public transit based on the distance and type of nearby transit lines.

90–100	**Rider's Paradise** World-class public transportation
70–89	**Excellent Transit** Transit is convenient for most trips
50–69	**Good Transit** Many nearby public transportation options
25–49	**Some Transit** A few nearby public transportation options
0–24	**Minimal Transit** It is possible to get on a bus

Scores for 504 Fox Road

Walk Score 8

Bike Score 1

Walk Score	Transit Score	Bike Score

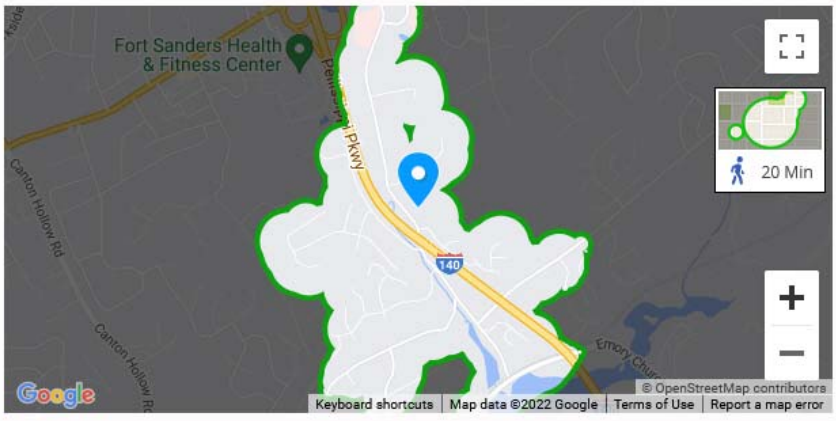
Bike Score measures whether an area is good for biking based on bike lanes and trails, hills, road connectivity, and destinations.

90–100	**Biker's Paradise** Daily errands can be accomplished on a bike
70–89	**Very Bikeable** Biking is convenient for most trips
50–69	**Bikeable** Some bike infrastructure
0–49	**Somewhat Bikeable** Minimal bike infrastructure

Travel Time Map

Add to your site

Explore how far you can travel by car, bus, bike and foot from 504 Fox Road.



What's Nearby

Restaurants:
Back Yard Burgers .8mi

Coffee:
Sami's Cafe .1mi

Bars:

Groceries:
Benefit Your Life 1.1mi

Parks:
Concord Park 2.3mi

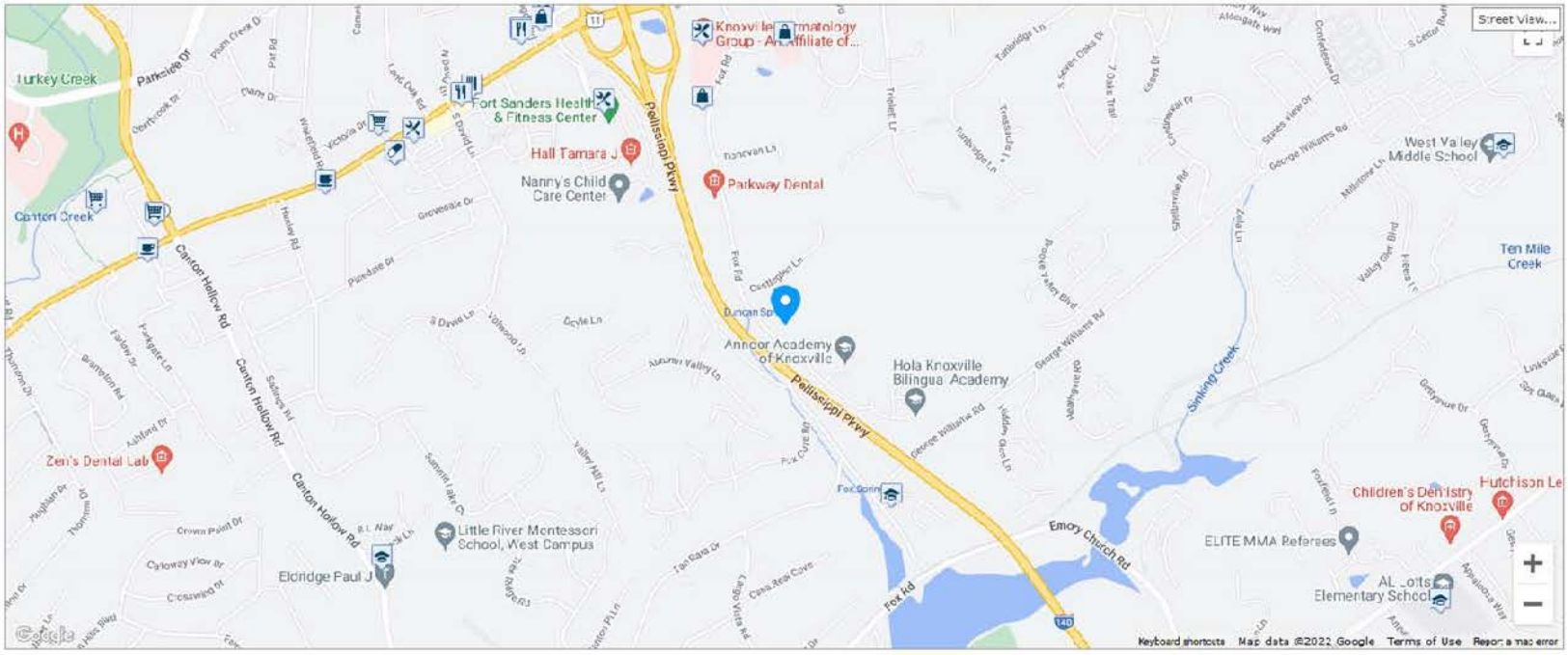
Schools:
Amoor Academy .5mi

Shopping:
Widwood Land Design .6mi

Entertainment:
Strike and Spare Family Bowl 1.4mi

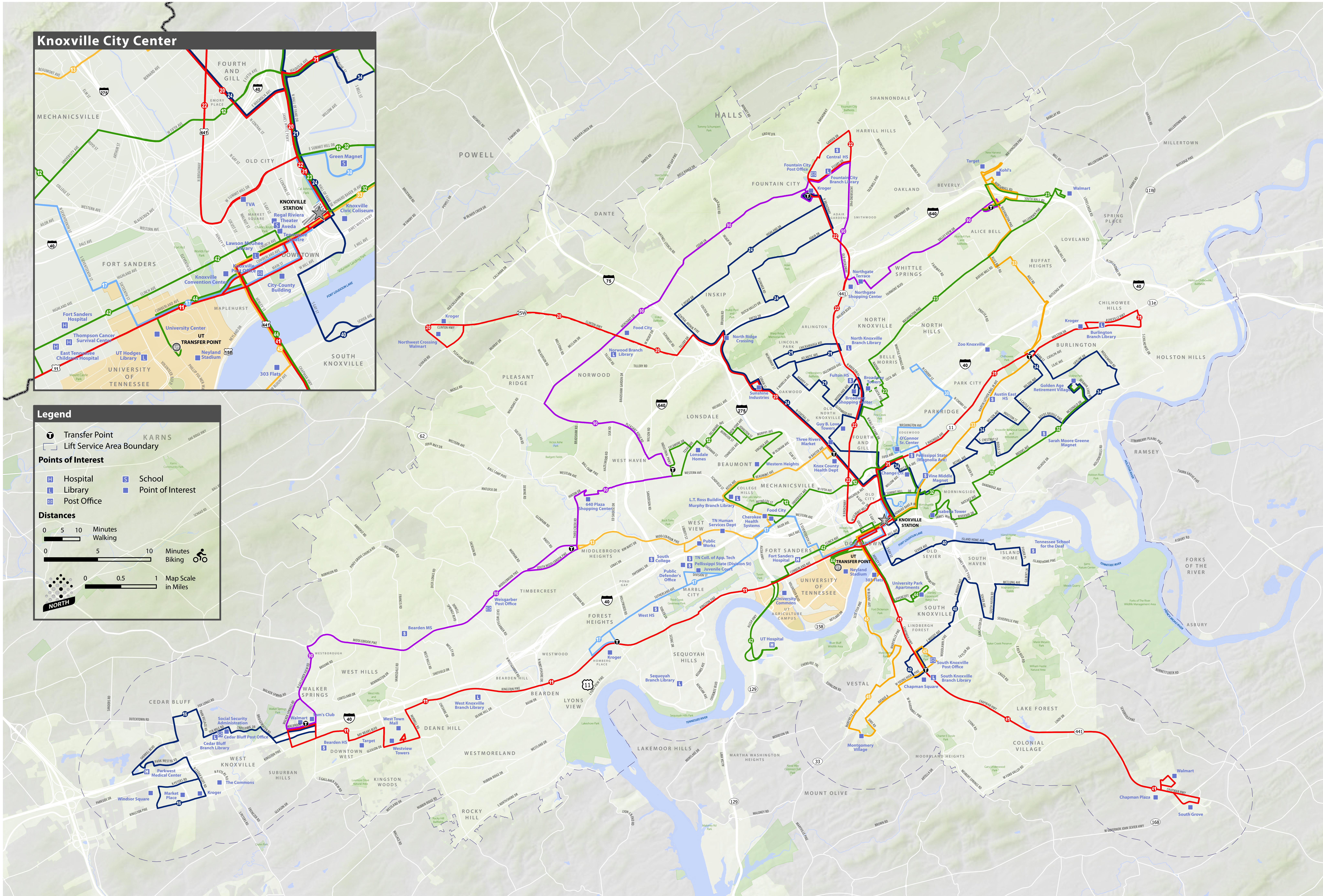
Errands:
Mops Hair Designers .7mi

Search Nearby:



APPENDIX C

KNOXVILLE AREA TRANSIT MAP AND INFORMATION



Knoxville City Center
FOURTH AND GILL
MECHANICSVILLE
OLD CITY
KNOXVILLE STATION
Green Magnet
TVA
MARKET SQUARE
Regal Riviera Theater
Aveda
Tennessee Theatre
Knoxville Civic Coliseum
Lawson McGhee Library
DOWNTOWN
Knoxville Post Office
Knoxville Convention Center
City-County Building
FORT SANDERS
Fort Sanders Hospital
Thompson Cancer Survival Center
East Tennessee Children's Hospital
UT Hodges Library
University Center
UT TRANSFER POINT
Neyland Stadium
303 Flats
MAPLEHURST
SOUTH KNOXVILLE
UNIVERSITY OF TENNESSEE
Legend
Transfer Point
Lift Service Area Boundary
Points of Interest
Hospital
School
Library
Point of Interest
Post Office
Distances
0 5 10 Minutes Walking
0 5 10 Minutes Biking
0 0.5 1 Map Scale in Miles
NORTH
KARNS
POWELL
HALLS
FOUNTAIN CITY
SHANNONDALE
HARRILL HILLS
OAKLAND
BEVERLY
MILLERTOWN
SPRING PLACE
ALICE BELL
LOVELAND
WHITTLE SPRINGS
BUFFAT HEIGHTS
DANTE
INSKIP
ARLINGTON
NORTH KNOXVILLE
NORTH HILLS
CHILHOWEE HILLS
BURLINGTON
HOLSTON HILLS
PARK CITY
PARKRIDGE
RAMSEY
NORWOOD
PLEASANT RIDGE
LONSDALE
WEST HAVEN
BEAUMONT
MECHANICSVILLE
KNOXVILLE STATION
MORNINGSIDE
MIDDLEBROOK HEIGHTS
WEST VIEW
FORT SANDERS
OLD SEVIER
SOUTH HAVEN
ISLAND HOME
FORKS OF THE RIVER
TIMBERCREST
FOREST HEIGHTS
MARBLE CITY
UNIVERSITY OF TENNESSEE
SOUTH KNOXVILLE
ASBURY
SEQUOYAH HILLS
WEST HILLS
WALKER SPRINGS
CEDAR BLUFF
BEARDEN
LYONS VIEW
VESTAL
LAKE FOREST
DEANE HILL
WEST KNOXVILLE
DOWNTOWN WEST
WESTMORELAND
LAKEMOOR HILLS
COLONIAL VILLAGE
SUBURBAN HILLS
KINGSTON WOODS
ROCKY HILL
MOUNT OLIVE

16 CEDAR BLUFF CONNECTOR

(Weekdays and Saturdays)

Legend

- Route Timepoint
- Transfer Point
- Bus Stop

Points of Interest

- Hospital
- Library
- Point of Interest
- Post Office
- School
- Park & Ride

N W E S

0 0.25 0.5 Miles

Map revised: 02.21

Route 16 - Cedar Bluff: Weekdays

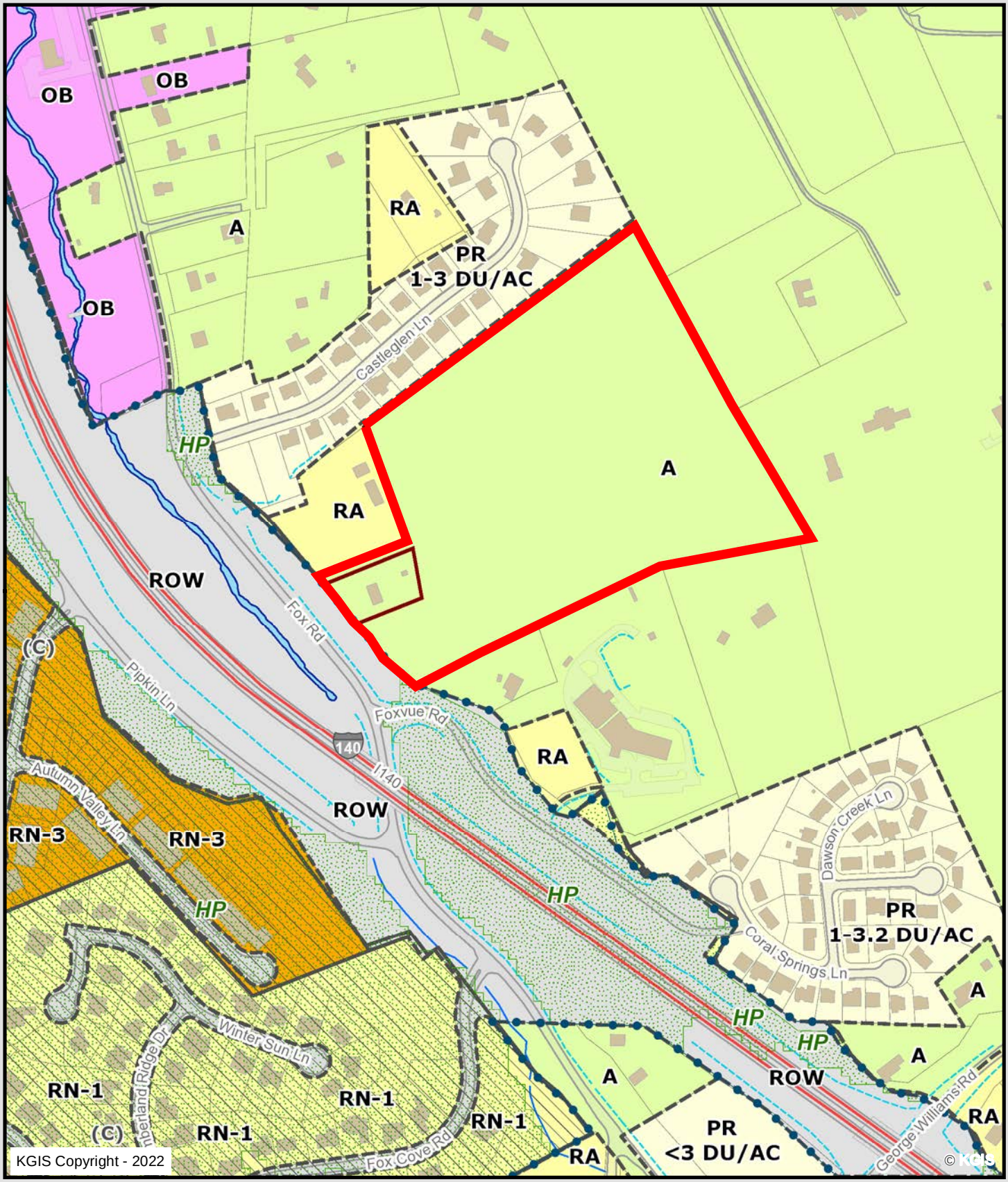
Going away from Walmart				*Going to Walmart*		
Walmart	**Park Village @ Woodpark**	**Parkwest Hospital**	**Windsor Square**	**Parkwest Hospital**	**Cedar Bluff @ Fox Lonas**	**Walmart**
1	**2**	**3**	**4**	**5**	**6**	**7**
6:15 AM	6:27 AM	6:32 AM	6:42 AM	6:50 AM	6:54 AM	7:10 AM
7:15 AM	7:27 AM	7:32 AM	7:42 AM	7:50 AM	7:54 AM	8:10 AM
8:15 AM	8:27 AM	8:32 AM	8:42 AM	8:50 AM	8:54 AM	9:10 AM
9:15 AM	9:27 AM	9:32 AM	9:42 AM	9:50 AM	9:54 AM	10:10 AM
10:15 AM	10:27 AM	10:32 AM	10:42 AM	10:50 AM	10:54 AM	11:10 AM
11:15 AM	11:27 AM	11:32 AM	11:42 AM	11:50 AM	11:54 AM	12:10 PM
12:15 PM	12:27 PM	12:32 PM	12:42 PM	12:50 PM	12:54 PM	1:10 PM
1:15 PM	1:27 PM	1:32 PM	1:42 PM	1:50 PM	1:54 PM	2:10 PM
2:15 PM	2:27 PM	2:32 PM	2:42 PM	2:50 PM	2:54 PM	3:10 PM
3:15 PM	3:27 PM	3:32 PM	3:42 PM	3:50 PM	3:54 PM	4:10 PM
4:15 PM	4:27 PM	4:32 PM	4:42 PM	4:50 PM	4:54 PM	5:10 PM
5:15 PM	5:27 PM	5:32 PM	5:42 PM	5:50 PM	5:54 PM	6:10 PM
6:15 PM	6:27 PM	6:32 PM	6:42 PM	6:50 PM	6:54 PM	7:10 PM
7:15 PM	7:27 PM	7:32 PM	7:42 PM	7:50 PM	7:54 PM	8:10 PM
8:15 PM	8:27 PM	8:32 PM	8:42 PM	8:50 PM	8:54 PM	9:10 PM
9:15 PM	9:27 PM	9:32 PM	9:42 PM	9:50 PM	9:54 PM	10:10 PM

Route 16 - Cedar Bluff: SATURDAYS

Going away from Walmart				*Going to Walmart*		
Walmart	**Park Village @ Woodpark**	**Parkwest Hospital**	**Windsor Square**	**Parkwest Hospital**	**Cedar Bluff @ Fox Lonas**	**Walmart**
1	**2**	**3**	**4**	**5**	**6**	**7**
7:15 AM	7:27 AM	7:32 AM	7:42 AM	7:50 AM	7:54 AM	8:10 AM
8:15 AM	8:27 AM	8:32 AM	8:42 AM	8:50 AM	8:54 AM	9:10 AM
9:15 AM	9:27 AM	9:32 AM	9:42 AM	9:50 AM	9:54 AM	10:10 AM
10:15 AM	10:27 AM	10:32 AM	10:42 AM	10:50 AM	10:54 AM	11:10 AM
11:15 AM	11:27 AM	11:32 AM	11:42 AM	11:50 AM	11:54 AM	12:10 PM
12:15 PM	12:27 PM	12:32 PM	12:42 PM	12:50 PM	12:54 PM	1:10 PM
1:15 PM	1:27 PM	1:32 PM	1:42 PM	1:50 PM	1:54 PM	2:10 PM
2:15 PM	2:27 PM	2:32 PM	2:42 PM	2:50 PM	2:54 PM	3:10 PM
3:15 PM	3:27 PM	3:32 PM	3:42 PM	3:50 PM	3:54 PM	4:10 PM
4:15 PM	4:27 PM	4:32 PM	4:42 PM	4:50 PM	4:54 PM	5:10 PM
5:15 PM	5:27 PM	5:32 PM	5:42 PM	5:50 PM	5:54 PM	6:10 PM
6:15 PM	6:27 PM	6:32 PM	6:42 PM	6:50 PM	6:54 PM	7:10 PM
7:15 PM	7:27 PM	7:32 PM	7:42 PM	7:50 PM	7:54 PM	8:10 PM
8:15 PM	8:27 PM	8:32 PM	8:42 PM	8:50 PM	8:54 PM	9:10 PM
9:15 PM	9:27 PM	9:32 PM	9:42 PM	9:50 PM	9:54 PM	10:10 PM

APPENDIX D

ZONING MAP



Existing Zoning - 9.25.22

Fox Road Subdivision

Knoxville - Knox County - KUB Geographic Information System

Printed: 9/25/2022 at 12:42:11 PM

0 200 400 800

ft

APPENDIX E

MANUAL TRAFFIC COUNT DATA

TRAFFIC COUNT DATA

Major Street: Fox Road (SB and NB) 9/27/2022 (Tuesday)
Minor Street: Castleglen Lane (WB) Sunny, Mild
Traffic Control: Stop Sign on Castleglen Lane Conducted by: Ajax Engineering

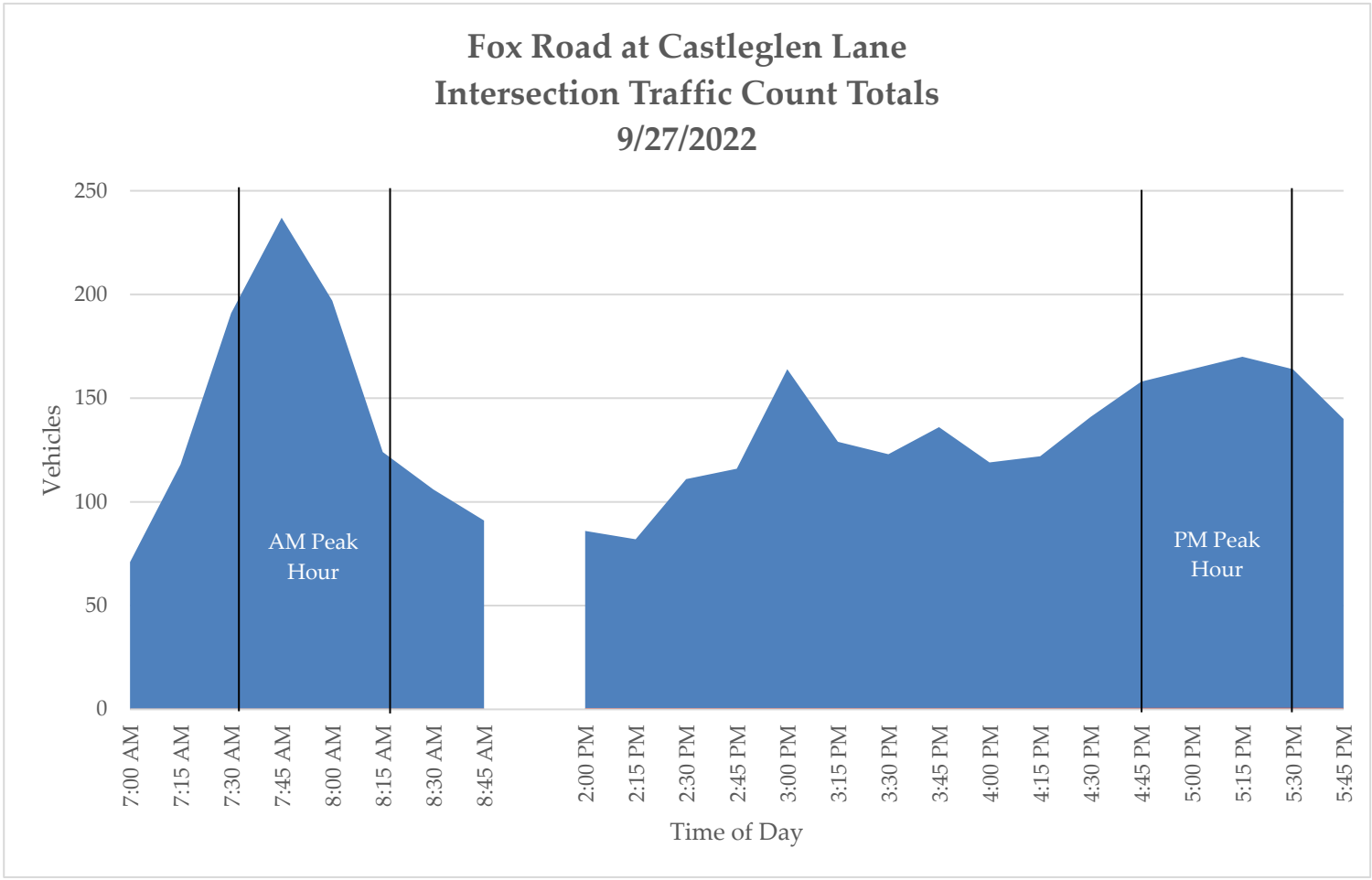
	Fox Road		Castleglen Lane		Fox Road			
TIME	SOUTHBOUND		WESTBOUND		NORTHBOUND		VEHICLE	PEAK
BEGIN	LT	THRU	LT	RT	THRU	RT	TOTAL	HOUR
7:00 AM	0	15	1	2	53	0	71	
7:15 AM	1	23	3	4	86	1	118	
7:30 AM	1	41	0	3	145	1	191	**7:30 AM - 8:30 AM**
7:45 AM	0	76	2	2	155	2	237	
8:00 AM	2	47	1	3	143	1	197	
8:15 AM	0	29	1	1	91	2	124	
8:30 AM	1	33	1	1	69	1	106	
8:45 AM	2	25	0	2	60	2	91	
TOTAL	7	289	9	18	802	10	1135	
2:00 PM	2	42	0	3	39	0	86	
2:15 PM	3	47	0	3	28	1	82	
2:30 PM	2	66	1	2	39	1	111	
2:45 PM	3	67	3	1	40	2	116	
3:00 PM	1	78	0	1	84	0	164	
3:15 PM	3	59	1	2	62	2	129	
3:30 PM	1	54	1	0	65	2	123	
3:45 PM	2	74	0	3	54	3	136	
4:00 PM	3	78	0	2	35	1	119	
4:15 PM	0	69	1	2	50	0	122	
4:30 PM	2	86	2	2	49	0	141	
4:45 PM	3	97	0	1	55	2	158	**4:45 PM - 5:45 PM**
5:00 PM	2	104	1	3	53	1	164	
5:15 PM	3	111	2	2	51	1	170	
5:30 PM	2	110	1	4	44	3	164	
5:45 PM	3	83	1	6	47	0	140	
TOTAL	35	1225	14	37	795	19	2125	

2022 AM Peak Hour **7:30 AM - 8:30 AM**

	Fox Road		Castleglen Lane		Fox Road	
TIME	SOUTHBOUND		WESTBOUND		NORTHBOUND	
BEGIN	LT	THRU	LT	RT	THRU	RT
7:30 AM	1	41	0	3	145	1
7:45 AM	0	76	2	2	155	2
8:00 AM	2	47	1	3	143	1
8:15 AM	0	29	1	1	91	2
TOTAL	**3**	**193**	**4**	**9**	**534**	**6**
PHF	**0.38**	**0.63**	**0.50**	**0.75**	**0.86**	**0.75**
Truck %	**0.0%**	**1.6%**	**0.0%**	**0.0%**	**1.3%**	**0.0%**

2022 PM Peak Hour **4:45 PM - 5:45 PM**

	Fox Road		Castleglen Lane		Fox Road	
TIME	SOUTHBOUND		WESTBOUND		NORTHBOUND	
BEGIN	LT	THRU	LT	RT	THRU	RT
4:45 PM	3	97	0	1	55	2
5:00 PM	2	104	1	3	53	1
5:15 PM	3	111	2	2	51	1
5:30 PM	2	110	1	4	44	3
TOTAL	**10**	**422**	**4**	**10**	**203**	**7**
PHF	**0.83**	**0.95**	**0.50**	**0.63**	**0.92**	**0.58**
Truck %	**0.0%**	**0.5%**	**0.0%**	**0.0%**	**0.5%**	**0.0%**


Fox Road at Castleglen Lane
Intersection Traffic Count Totals
9/27/2022
Vehicles
250
200
150
100
50
0
AM Peak Hour
PM Peak Hour
7:00 AM
7:15 AM
7:30 AM
7:45 AM
8:00 AM
8:15 AM
8:30 AM
8:45 AM
2:00 PM
2:15 PM
2:30 PM
2:45 PM
3:00 PM
3:15 PM
3:30 PM
3:45 PM
4:00 PM
4:15 PM
4:30 PM
4:45 PM
5:00 PM
5:15 PM
5:30 PM
5:45 PM
Time of Day

APPENDIX F

CAPACITY ANALYSES – HCM WORKSHEETS (SYNCHRO 11)

EXISTING CONDITIONS

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	9	534	6	3	193
Future Vol, veh/h	4	9	534	6	3	193
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	50	75	86	75	38	63
Heavy Vehicles, %	0	0	1	0	0	2
Mvmt Flow	8	12	621	8	8	306

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	947	625	0	0	629	0
Stage 1	625	-	-	-	-	-
Stage 2	322	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	292	488	-	-	963	-
Stage 1	537	-	-	-	-	-
Stage 2	739	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	289	488	-	-	963	-
Mov Cap-2 Maneuver	289	-	-	-	-	-
Stage 1	537	-	-	-	-	-
Stage 2	732	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.9	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	383	963	-
HCM Lane V/C Ratio	-	-	0.052	0.008	-
HCM Control Delay (s)	-	-	14.9	8.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	0.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	10	203	7	10	422
Future Vol, veh/h	4	10	203	7	10	422
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	50	63	92	58	83	95
Heavy Vehicles, %	0	0	1	0	0	1
Mvmt Flow	8	16	221	12	12	444

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	695	227	0	0	233	0
Stage 1	227	-	-	-	-	-
Stage 2	468	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	411	817	-	-	1346	-
Stage 1	815	-	-	-	-	-
Stage 2	634	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	406	817	-	-	1346	-
Mov Cap-2 Maneuver	406	-	-	-	-	-
Stage 1	815	-	-	-	-	-
Stage 2	626	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.1	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	610	1346	-
HCM Lane V/C Ratio	-	-	0.039	0.009	-
HCM Control Delay (s)	-	-	11.1	7.7	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

PROJECTED CONDITIONS (WITH THE PROJECT)

Intersection	
Int Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	18	34	604	12	6	220
Future Vol, veh/h	18	34	604	12	6	220
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-5	-	6	-	-	-2
Peak Hour Factor	90	90	86	90	90	63
Heavy Vehicles, %	0	0	1	0	0	2
Mvmt Flow	20	38	702	13	7	349

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1072	709	0	0	715	0
Stage 1	709	-	-	-	-	-
Stage 2	363	-	-	-	-	-
Critical Hdwy	5.4	5.7	-	-	4.1	-
Critical Hdwy Stg 1	4.4	-	-	-	-	-
Critical Hdwy Stg 2	4.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	332	483	-	-	895	-
Stage 1	598	-	-	-	-	-
Stage 2	783	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	329	483	-	-	895	-
Mov Cap-2 Maneuver	329	-	-	-	-	-
Stage 1	598	-	-	-	-	-
Stage 2	775	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15	0	0.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	416	895	-
HCM Lane V/C Ratio	-	-	0.139	0.007	-
HCM Control Delay (s)	-	-	15	9.1	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0	-

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	12	23	234	21	38	477
Future Vol, veh/h	12	23	234	21	38	477
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-5	-	6	-	-	-2
Peak Hour Factor	90	90	92	90	90	95
Heavy Vehicles, %	0	0	1	0	0	1
Mvmt Flow	13	26	254	23	42	502

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	852	266	0	0	277	0
Stage 1	266	-	-	-	-	-
Stage 2	586	-	-	-	-	-
Critical Hdwy	5.4	5.7	-	-	4.1	-
Critical Hdwy Stg 1	4.4	-	-	-	-	-
Critical Hdwy Stg 2	4.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	421	807	-	-	1298	-
Stage 1	843	-	-	-	-	-
Stage 2	659	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	402	807	-	-	1298	-
Mov Cap-2 Maneuver	402	-	-	-	-	-
Stage 1	843	-	-	-	-	-
Stage 2	629	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.4	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	600	1298	-
HCM Lane V/C Ratio	-	-	0.065	0.033	-
HCM Control Delay (s)	-	-	11.4	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

APPENDIX G

ITE TRIP GENERATION RATES

Land Use: 210
Single-Family Detached Housing

Description

A single-family detached housing site includes any single-family detached home on an individual lot. A typical site surveyed is a suburban subdivision.

Specialized Land Use

Data have been submitted for several single-family detached housing developments with homes that are commonly referred to as patio homes. A patio home is a detached housing unit that is located on a small lot with little (or no) front or back yard. In some subdivisions, communal maintenance of outside grounds is provided for the patio homes. The three patio home sites total 299 dwelling units with overall weighted average trip generation rates of 5.35 vehicle trips per dwelling unit for weekday, 0.26 for the AM adjacent street peak hour, and 0.47 for the PM adjacent street peak hour. These patio home rates based on a small sample of sites are lower than those for single-family detached housing (Land Use 210), lower than those for single-family attached housing (Land Use 251), and higher than those for senior adult housing -- single-family (Land Use 251). Further analysis of this housing type will be conducted in a future edition of *Trip Generation Manual*.

Additional Data

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITETripGen web app or the trip generation resource page on the ITE website (https://www.ite.org/technical-resources/topics/trip-and-parking-generation/).

For 30 of the study sites, data on the number of residents and number of household vehicles are available. The overall averages for the 30 sites are 3.6 residents per dwelling unit and 1.5 vehicles per dwelling unit.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Arizona, California, Connecticut, Delaware, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Minnesota, Montana, New Jersey, North Carolina, Ohio, Ontario (CAN), Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Vermont, Virginia, and West Virginia.

Source Numbers

100, 105, 114, 126, 157, 167, 177, 197, 207, 211, 217, 267, 275, 293, 300, 319, 320, 356, 357, 367, 384, 387, 407, 435, 522, 550, 552, 579, 598, 601, 603, 614, 637, 711, 716, 720, 728, 735, 868, 869, 903, 925, 936, 1005, 1007, 1008, 1010, 1033, 1066, 1077,1078, 1079

Single-Family Detached Housing
(210)

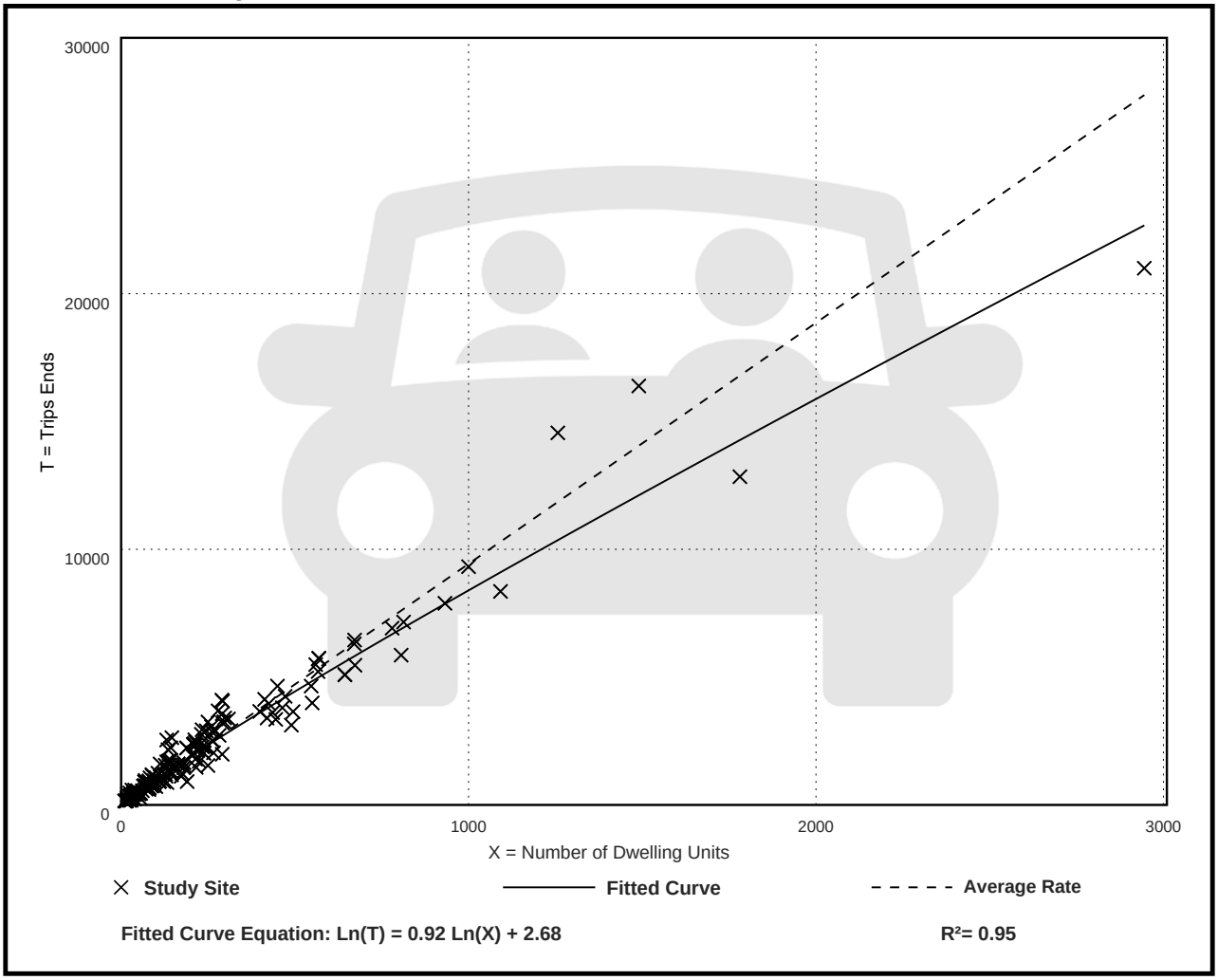
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 174
Avg. Num. of Dwelling Units: 246
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.43	4.45 - 22.61	2.13

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.92 Ln(X) + 2.68

R^2= 0.95

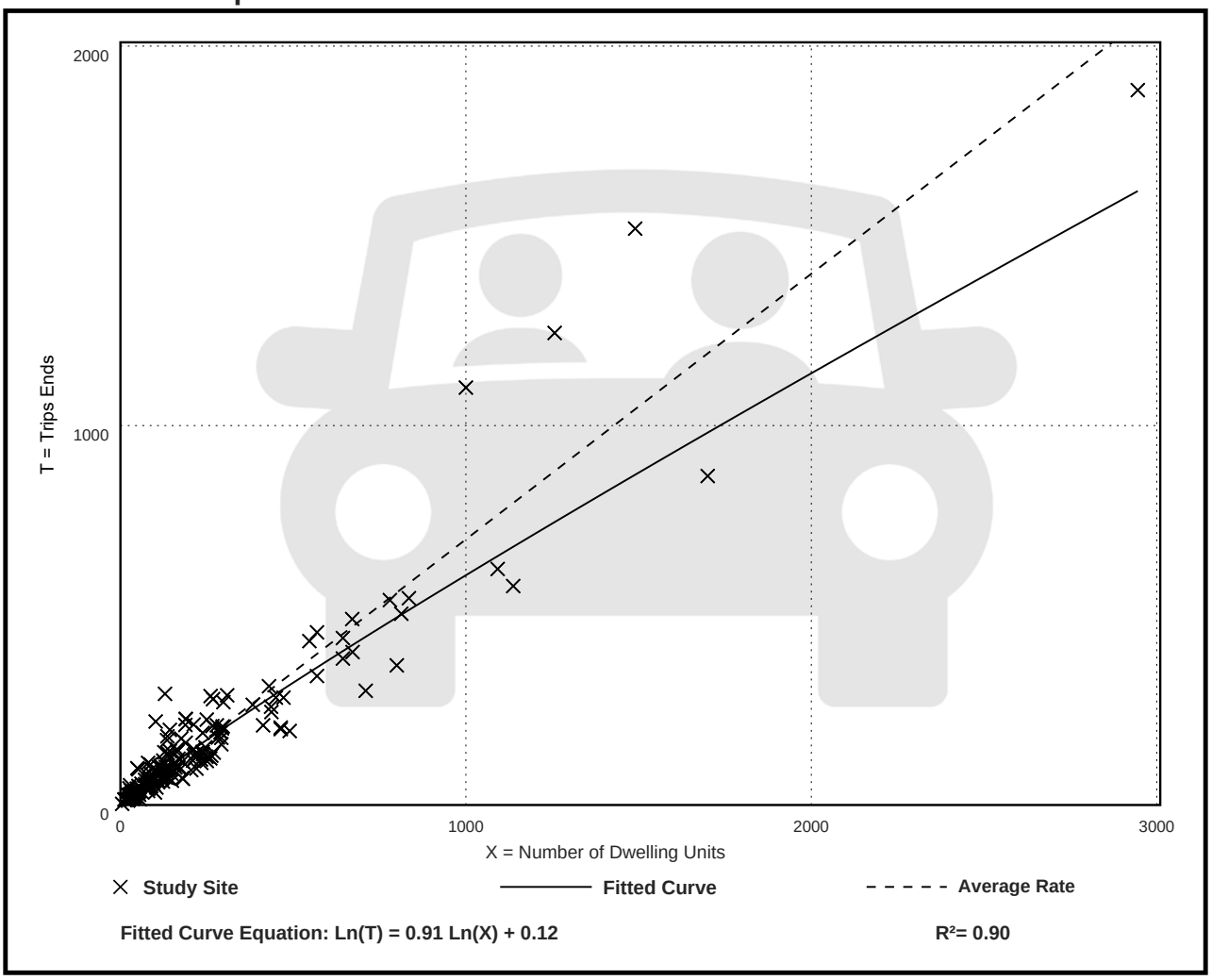
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
Number of Studies: 192
Avg. Num. of Dwelling Units: 226
Directional Distribution: 26% entering, 74% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.70	0.27 - 2.27	0.24

Data Plot and Equation



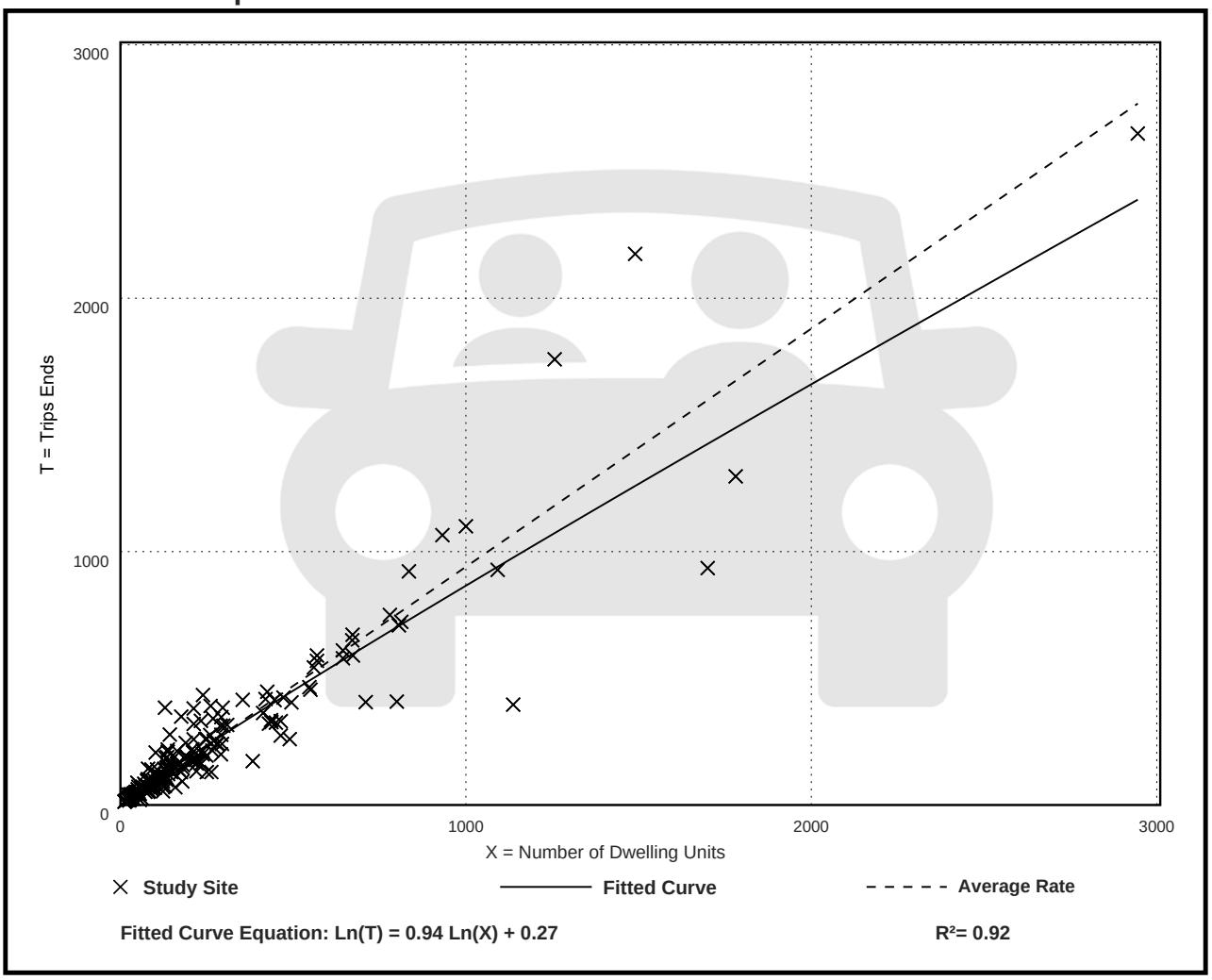
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: General Urban/Suburban
Number of Studies: 208
Avg. Num. of Dwelling Units: 248
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.94	0.35 - 2.98	0.31

Data Plot and Equation



TRIP GENERATION FOR FOX ROAD SUBDIVISION

94 Single-Family Detached Houses

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
#210	Single-Family Detached Housing	94 Houses	954	26%	74%		63%	37%	
				18	52	70	59	35	94
Total New Volume Site Trips			**954**	**18**	**52**	**70**	**59**	**35**	**94**

ITE Trip Generation Manual, 11th Edition

Trips calculated by using Fitted Curve Equation

TRIP GENERATION FOR FOX ROAD SUBDIVISION

94 Single-Family Detached Houses

94 Residential Houses = X

Weekday:

Fitted Curve Equation: Ln(T) = 0.92 Ln(X) + 2.68

Ln(T) =	0.92	*	4.54	+	2.68
Ln(T) =	6.86				
T =	**954 trips**				

Peak Hour of Adjacent Traffic between 7 and 9 am:

Fitted Curve Equation: Ln(T) = 0.91 Ln(X) + 0.12

T =	0.91	*	5	+	0.12
Ln(T) =	4.25				
T =	**70 trips**				

Peak Hour of Adjacent Traffic between 4 and 6 pm:

Fitted Curve Equation: Ln(T) = 0.94 Ln(X) + 0.27

Ln(T) =	0.94	*	4.54	+	0.27
Ln(T) =	4.54				
T =	**94 trips**				

APPENDIX H

2019 CENSUS BUREAU DATA

United States Census Bureau OnTheMap

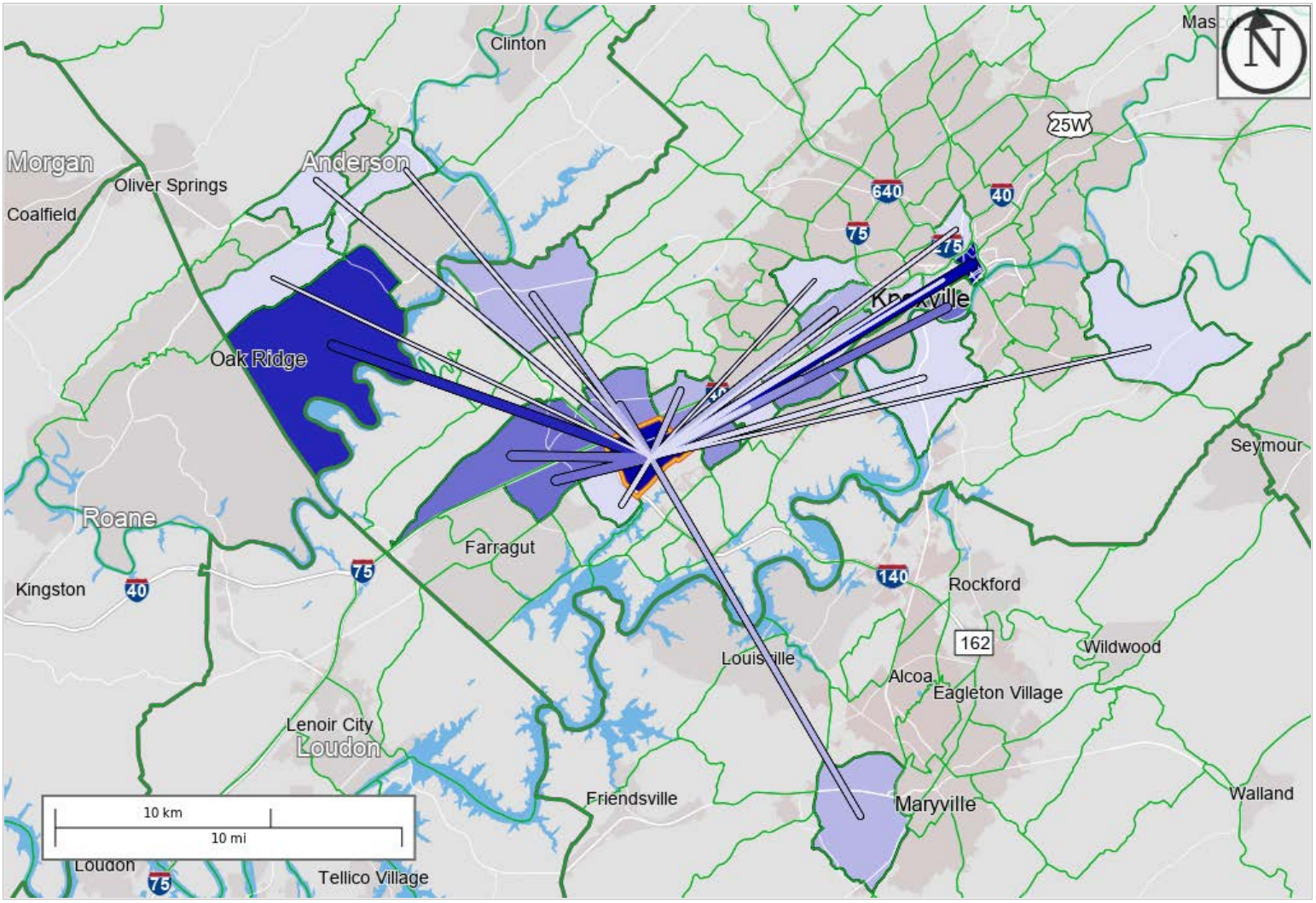
Work Destination Report - Home Selection Area to Work Census Tracts

All Jobs for All Workers in 2019

Created by the U.S. Census Bureau's OnTheMap https://onthemap.ces.census.gov on 09/25/2022

Counts of All Jobs from Home Selection Area to Work Census Tracts in 2019

All Workers



Map Legend

Job Count
- 120 - 136
- 103 - 119
- 86 - 102
- 69 - 85
- 52 - 68
- 35 - 51
- 18 - 34

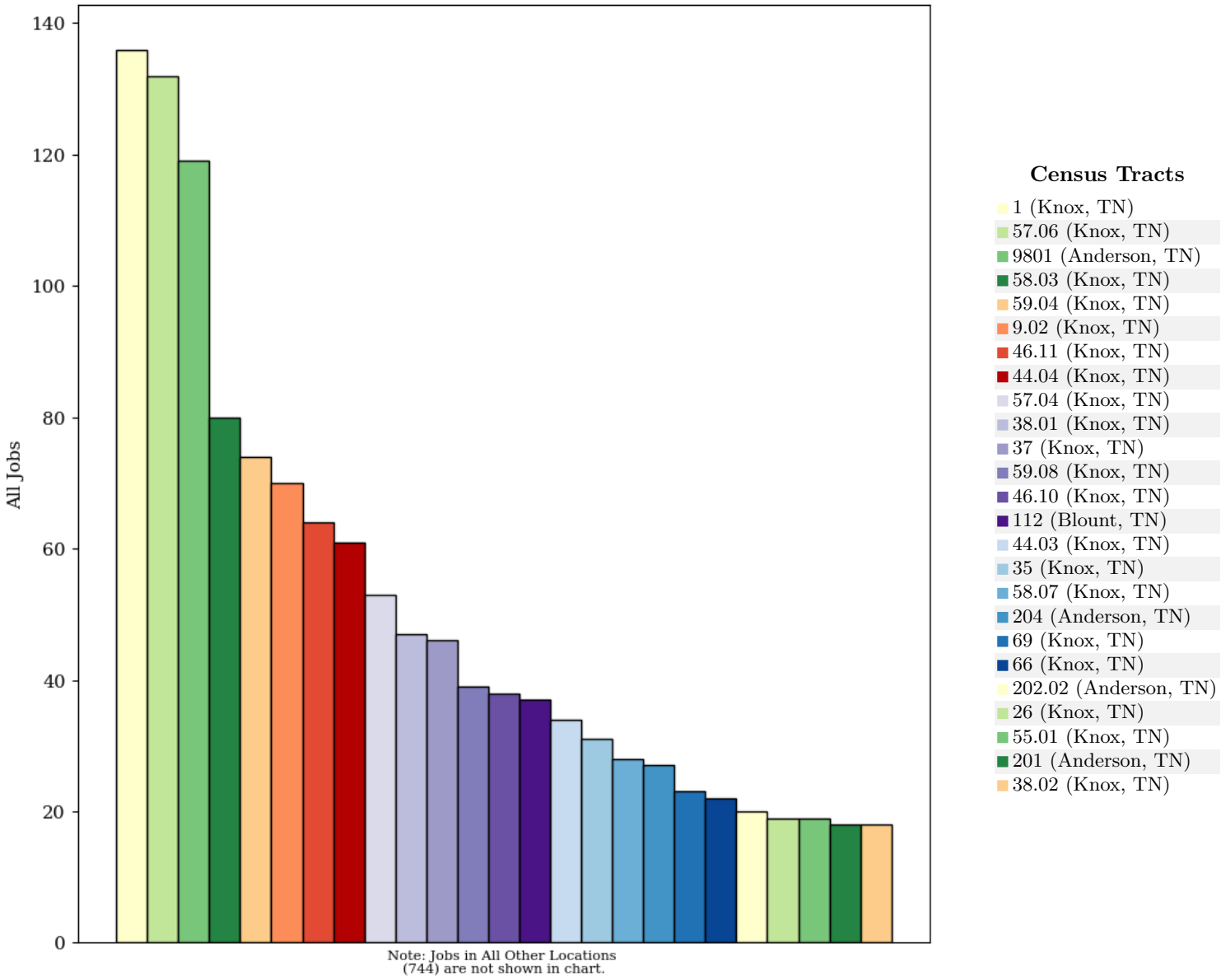
Selection Areas
- Analysis Selection

Job Count
- 120 - 136
- 103 - 119
- 86 - 102
- 69 - 85
- 52 - 68
- 35 - 51
- 18 - 34

United States Census Bureau

All Jobs from Home Selection Area to Work Census Tracts in 2019

All Workers



All Jobs from Home Selection Area to Work Census Tracts in 2019

All Workers

Census Tracts as Work Destination Area	2019 Count	Share
All Census Tracts	1,999	100.0
1 (Knox, TN)	136	6.8
57.06 (Knox, TN)	132	6.6
9801 (Anderson, TN)	119	6.0
58.03 (Knox, TN)	80	4.0
59.04 (Knox, TN)	74	3.7
9.02 (Knox, TN)	70	3.5
46.11 (Knox, TN)	64	3.2
44.04 (Knox, TN)	61	3.1
57.04 (Knox, TN)	53	2.7
38.01 (Knox, TN)	47	2.4

Census Tracts as Work Destination Area	2019 Count	Share
37 (Knox, TN)	46	2.3
59.08 (Knox, TN)	39	2.0
46.10 (Knox, TN)	38	1.9
112 (Blount, TN)	37	1.9
44.03 (Knox, TN)	34	1.7
35 (Knox, TN)	31	1.6
58.07 (Knox, TN)	28	1.4
204 (Anderson, TN)	27	1.4
69 (Knox, TN)	23	1.2
66 (Knox, TN)	22	1.1
202.02 (Anderson, TN)	20	1.0
26 (Knox, TN)	19	1.0
55.01 (Knox, TN)	19	1.0
201 (Anderson, TN)	18	0.9
38.02 (Knox, TN)	18	0.9
All Other Locations	744	37.2

Additional Information

Analysis Settings

Analysis Type	Destination
Destination Type	Census Tracts
Selection area as	Home
Year(s)	2019
Job Type	All Jobs
Selection Area	57.06 (Knox, TN) from Census Tracts
Selected Census Blocks	85
Analysis Generation Date	09/25/2022 12:59 - OnTheMap 6.8.1
Code Revision	f9358819d46a60bb89052036516a1c8fe8bbbeac
LODES Data Version	20211018_1647

Data Sources

Source: U.S. Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics (Beginning of Quarter Employment, 2nd Quarter of 2002-2019).

Notes

1. Race, Ethnicity, Educational Attainment, and Sex statistics are beta release results and are not available before 2009.
2. Educational Attainment is only produced for workers aged 30 and over.
3. Firm Age and Firm Size statistics are beta release results for All Private jobs and are not available before 2011.

APPENDIX I

KNOX COUNTY TURN LANE VOLUME THRESHOLD WORKSHEETS

TABLE 4A

LEFT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 35 MPH OR LESS

(If the left-turn volume exceeds the table value a left -turn lane is needed)

220

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149 150 - 199	300 245	235 200	185 160	145 130	120 110	100 90
200 - 249 250 - 299	205 175	170 150	140 125	115 105	100 90	80 70
300 - 349 350 - 399	155 135	135 120	110 100	95	80	65
400 - 449 450 - 499	120 105	105 90	90 80			
500 - 549 550 - 599	95 85	80 70	70			
600 - 649 650 - 699	75 70	65 60	60 55			
700 - 749 750 or More	65 60	55 50	50 45	45 40	35 35	30 30

604 + 12 = 616

Fox Road at Proposed Entrance

2026 Projected AM SB Left Turns = 6

SB Left-Turn Lane NOT Warranted

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	= / > 600
100 - 149 150 - 199	100 90	80 75	70 65	60 55	55 50	50 45
200 - 249 250 - 299	80 70	72 65	460 55	55 50	50 45	45 40
300 - 349 350 - 399	65 60	60 55	50 50	50 45	45 40	40 40
400 - 449 450 - 499	55 50	50 45	45 45	45 40	40 35	35 35
500 - 549 550 - 599	50 45	45 40	40 40	40 35	35 35	35 35
600 - 649 650 - 699	40 35	35 35	35 35	35 30	35 30	30 30
700 - 749 750 or More	30 30	30 30	30 30	30 30	30 30	30 30

* Or through volume only if a right-turn lane exists.

TABLE 4B
RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 35 MPH OR LESS

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25 25 - 49 50 - 99						
100 - 149 150 - 199						
200 - 249 250 - 299						Yes
300 - 349 350 - 399				Yes	Yes Yes	Yes Yes
400 - 449 450 - 499			Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599		Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

604

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
12 Fewer Than 25 25 - 49 50 - 99					Yes	Yes Yes
100 - 149 150 - 199				Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes			Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes			Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes			Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

Fox Road at
Proposed Entrance

2026 Projected AM
NB Right Turns = 12

NB Right-Turn Lane NOT
Warranted

* Or through volume only if a left-turn lane exists.

TABLE 4A

LEFT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 35 MPH OR LESS

(If the left-turn volume exceeds the table value a left -turn lane is needed)

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149 150 - 199	300 245	235 200	185 160	145 130	120 110	100 90
200 - 249 250 - 299	205 175	170 150	140 125	115 105	100 90	80 70
300 - 349 350 - 399	155 135	135 120	110 100	95 85	80 70	65 60
400 - 449 450 - 499	120 105	105 90	90 80	75 70	65 60	55 50
500 - 549 550 - 599	95 85	80 70	70 65	65 60	55 50	50 45
600 - 649 650 - 699	75 70	65 60	60 55	55 50	45 40	40 35
700 - 749 750 or More	65 60	55 50	50 45	45 40	35 35	30 30

477

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	= / > 600
100 - 149 150 - 199	100 90	80 75	70 65	60 55	55 50	50 45
200 - 249 250 - 299	80 70	72 65	60 55	55 50	50 45	45 40
300 - 349 350 - 399	65 60	60 55	50 50	50 45	45 40	40 40
400 - 449 450 - 499	55 50	50 45	45 45			35 35
500 - 549 550 - 599	50 45	45 40	40 40			35 35
600 - 649 650 - 699	40 35	35 35	35 35			30 30
700 - 749 750 or More	30 30	30 30	30 30	30	30	30 30

234 + 21 = 255

Fox Road at Proposed Entrance

2026 Projected PM SB Left Turns = 38

SB Left-Turn Lane NOT Warranted

* Or through volume only if a right-turn lane exists.

TABLE 4B
RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 35 MPH OR LESS

234

21

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25 25 - 49 50 - 99						
100 - 149 150 - 199						
200 - 249 250 - 299						Yes
300 - 349 350 - 399				Yes	Yes Yes	Yes Yes
400 - 449 450 - 499			Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599		Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

Fox Road at Proposed Entrance

2026 Projected PM NB Right Turns = 21

NB Right-Turn Lane NOT Warranted

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25 25 - 49 50 - 99					Yes	Yes Yes
100 - 149 150 - 199			Yes	Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

* Or through volume only if a left-turn lane exists.

APPENDIX J

RESPONSE LETTER TO ADDRESS REVIEW COMMENTS

AJAX ENGINEERING
CIVIL ENGINEERING / TRAFFIC ENGINEERING

11812 Black Road
Knoxville, Tennessee 37932
Phone (865) 556-0042
ajaxengineering@gmail.com

November 11, 2022

PROJECT NAME: Fox Road Subdivision

TO: Knoxville-Knox County Planning

SUBJECT: Response Document for Fox Road Subdivision TIS Review Comments (12-SB-22-C/12-B-22-DP)

Knoxville-Knox County Planning, Knox County Engineering, & City of Knoxville Staff:

The following response document addresses comments in a letter from Mike Conger, PE, dated November 10, 2022. This letter is added to the end of the revised report in Appendix J.

1. **The TIS needs to acknowledge the multi-jurisdictional aspect of this development where the majority of the parcel lies in the County but the proposed access and adjoining roadway right-of-way is within the city limits of Knoxville. Some key points where this should be noted:**
   - **Page 3 under the bullet of maintaining agencies that this development is subject to design specifications for**
   - **Page 4 under discussion of the study area**
   - **Page 38 under discussions of turn lane requirements and sight distance where City standards should be evaluated (note, the City has stated they accept Knox County turn lane warrant analysis procedures)**

   Response: The jurisdiction of the City of Knoxville discussion has been addressed in various locations in the following:
   - Added to the last bullet on Page 3 and Page 42 in 2g
   - Added sentence on Page 4, 1st paragraph
   - Added to Page 38, 2nd paragraph

   In addition, the jurisdiction of the City of Knoxville was also updated regarding intersection spacing at the end of Page 38 and on Page 39 in 1c.

2. **Specific to the sight distance evaluation requirements and as noted on page 2 and 37 – the required intersection sight distance (ISD) standard used in the City of Knoxville is to follow the AASHTO "Green Book" requirements. The TIS also needs to revise the reference to ISD as being "desirable" (page 36) and instead denote that it is in fact required as per section 3.04.J.5 in the Knoxville-Knox County Subdivision Regulations. Please specify all assumptions and coordinate with the site civil design engineer to include a plan and profile showing sight lines that demonstrate required sight distance is available.**

   Response: The intersection sight distance discussion has been addressed in various locations in the following:
   - Updated on Pages 2, 37, and 39 in 1b
   - Page 36 has been updated to state that meeting ISD is required

   In addition, the site designer, Wanis Rghebi, is aware of this comment and will address it in the civil site plans.

3. **On page 27 and page 34 the northbound through traffic volumes are incorrect. The cited growth rate has not been applied, and the northbound right-turn volumes at Castleglen Lane have not been added. The northbound AM and PM through volumes should be 604 and 234, respectively. Please revise all evaluations where the incorrect values were used.**

   Response: The northbound thru traffic volumes shown on Pages 27 and 34 have been corrected. As a result, Appendix I has been updated (turn lane worksheets), Appendix F has been updated (capacity analysis worksheets), and Table 5 on Page 35 has been updated.

4. **Please coordinate with the site civil engineer regarding the profile, vertical curve design and intersection grade of the proposed access road at Fox Road. The Knox County standard is for a K-value of 25 and intersection grade to not exceed 3%, but Knox County has stated that they would defer to the City of Knoxville standards for this part of the roadway which is mainly in City right-of-way. The City of Knoxville has stated that this sag vertical curve must have a minimum K-value as required by AASHTO for the desired design speed and request that the Road "A" design speed be specified that is achievable with the current design for their review and acceptance.**

   Response: The site designer, Wanis Rghebi, is aware of this comment and will address it in the civil site plans.

In addition to the revisions listed above, other changes in the report include the following:

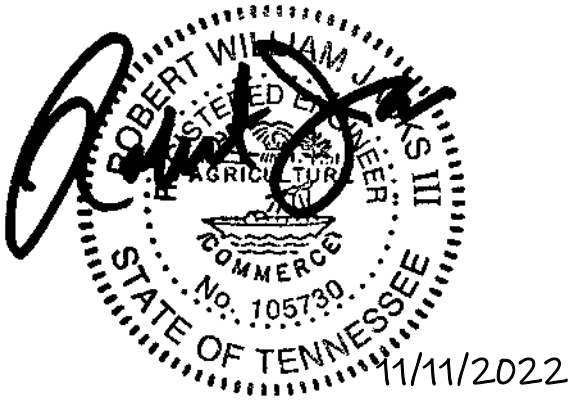
- Updated Title Page
- Updated Table of Contents
- Updated Page Footers
- A few minor grammatical corrections

- Updated 2c on Page 42 reflecting that the ISD in Knox County for the new interior roads is ten times the posted speed limit
- Added Appendix J to include this response letter

If you have any questions or further comments, please feel free to contact me. I look forward to your review and approval.

Sincerely,

Ajax Engineering, LLC
Robert W. Jacks, P.E.



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