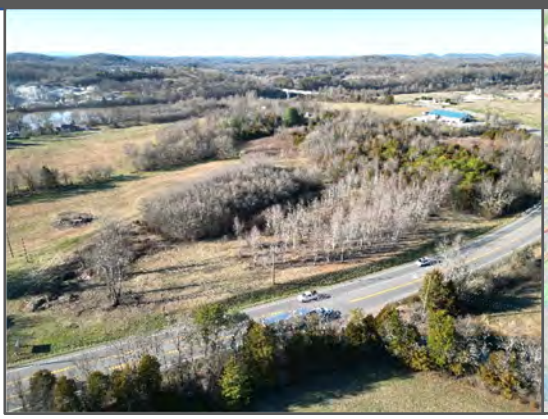
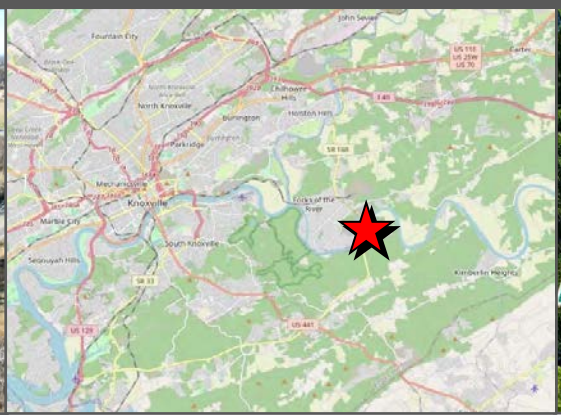
AJAX ENGINEERING

CIVIL ENGINEERING / TRAFFIC ENGINEERING

Transportation Impact Study
Heartland Development Subdivision
Knox County, Tennessee





Revised March 2024

Prepared for:
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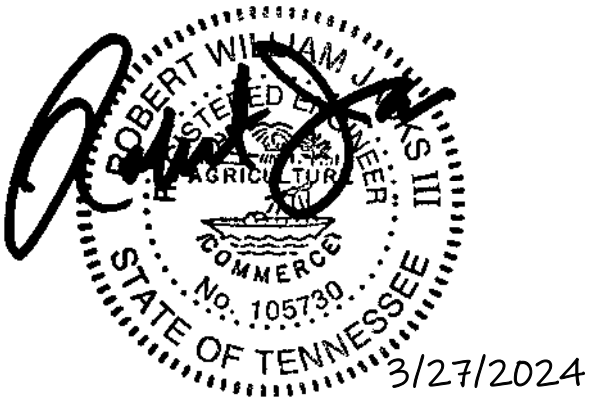

4-SE-24-C / 4-G-24-DP
TIS Version 2
3/27/2024

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EXECUTIVE SUMMARY

Preface:

Heartland Development proposes a residential development adjacent to E Governor John Sevier Highway near French Road in Southeast Knox County, TN. The proposed development will include a maximum of 151 single-family detached houses on 35.8 +/- acres and is referenced in this study as the "Heartland Development Subdivision" since an official name has not been chosen. The development will be built in a single phase and is anticipated to be fully built and occupied by 2027. The development proposes a single entrance at E Governor John Sevier Highway south of the existing unsignalized t-intersection with French Road.

The primary purpose of this study 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 roads and intersections 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 Heartland Development Subdivision, with a maximum of 151 single-family houses, is estimated to generate 1,474 trips at full build-out and occupancy on an average weekday. Of these daily trips, 108 are estimated to occur during the AM peak hour and 146 in the PM peak hour in 2027.
- The projected 2027 level of service calculations for the intersections of E Governor John Sevier Highway at French Road and at the Proposed Entrance resulted in reasonable LOS and vehicle delays for the existing and proposed approaches. The projected 2027 vehicle queue lengths are calculated not to be excessive and will be adequately contained in the provided vehicle lanes.
- Based on Tennessee Department of Transportation standards, the projected 2027 volumes at the intersection of E Governor John Sevier Highway at the Proposed Entrance will warrant an exclusive southbound right-turn lane on E Governor John Sevier Highway for motorists entering the development from the north.

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. The recommendations marked with an asterisk indicate an existing transportation need and are not associated with the proposed development's projected impacts. More details regarding all the recommendations are discussed at the end of the report.

- The separate left and right exiting lanes for the development at E Governor John Sevier Highway should be marked on the pavement with the appropriate white turn arrows, delineated with white lane lines, and include a storage length of 75 feet for the right-turn lane as shown in the design plan.
- It is recommended that the center two-way left-turn lane (TWLTL) pavement markings on E Governor John Sevier Highway be modified to reflect an exclusive northbound left-turn lane at the Proposed Entrance. The existing pavement markings in the TWLTL should be re-striped to accommodate a dedicated minimum storage length of 50 feet for northbound left turns, and a white left-turn arrow should be applied to the pavement. Additionally, within the extent of the Proposed Entrance intersection at E Governor John Sevier Highway, the existing center TWLTL markings should be removed to indicate a public road opening/intersection.
- A 12-foot southbound right-turn lane on E Governor John Sevier Highway is recommended to be constructed at the Proposed Entrance with 340 feet of lane change and deceleration distance. This distance should include a taper length of 180 feet (15:1). The right-turn lane should include the appropriate right-turn arrow pavement markings, as shown in the Tennessee Department of Transportation (TDOT) standard drawing T-M-4. The designer must coordinate with TDOT to design and construct this southbound right-turn lane.
- 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 E Governor John Sevier Highway. The stop bar should be applied a minimum of 4 feet away from the edge of E Governor John Sevier Highway and placed at the desired stopping point that maximizes the sight distance.
- Sight distances at the Proposed Entrance approach must not be impacted by future landscaping, signage, or vegetation. The site designer must ensure that the intersection sight distances are accounted for and provided in the design plans.

Based on an observed 85th percentile speed of 56 mph for southbound traffic on E Governor John Sevier Highway, the required intersection sight distance is 660 feet. A visual inspection determined that these sight distances are available to the south. The sight distance to the north appears adequate for the stopping sight distance but does not appear to meet the required intersection sight distance, with a visually estimated distance of 550 feet. It is recommended that a registered land surveyor measure the available sight distance to the north at the Proposed Entrance location on E Governor John Sevier Highway and determine what must be removed to attain the required sight distance. It is believed that the additional 110 feet of sight distance needed (660′ required – 550′ observed = 110′) could be gained by reducing the existing cut slope and vegetation on the west side of E Governor John Sevier Highway to the north of the Proposed Entrance location. The cut slope and vegetation are believed to be within the TDOT right-of-way. However, any earth grading or vegetation removal to increase the sight distance will require permitting and permission from TDOT.

- It is recommended that an advance intersection warning sign be installed on E Governor John Sevier Highway for southbound motorists. This warning signage should be an Offset Road Intersection Sign (W2-7l) with a Street Name Plaque Sign (W16-8aP) below. The Street Name Plaque Sign should denote the intersecting roads, French Road, and the chosen name for the Proposed Entrance Road. The sign should be installed on a single post for the southbound lane on E Governor John Sevier Highway, preferably 500 feet north of French Road.
- The existing advance intersection warning sign for northbound traffic on E Governor John Sevier Highway must be replaced with an Offset Road Intersection Sign (W2-7l). It should include a Street Name Plaque Sign (W16-8aP) below denoting the intersecting roads, French Road, and the chosen name for the Proposed Entrance Road. This existing sign on E Governor John Sevier Highway is approximately 850 feet south of the intersection of French Road and is currently posted with a Side Road Intersection (W2-2r) sign.
- The developer should consider installing a single overhead roadway light to delineate the Proposed Entrance at E Governor John Sevier Highway for travel at night or in low-light conditions. This lighting would be ideally placed adjacent to the Proposed Entrance driveway and off E Governor John Sevier Highway and would fully illuminate the intersection.
- The construction of the Proposed Entrance on E Governor John Sevier Highway will require a TDOT Highway Entrance Permit. The developer will need to apply

for this permit and coordinate with TDOT regarding their specific requirements for this entrance.

- Knox County requires a 400-foot minimum intersection spacing distance on Arterial roads. The intersection of E Governor John Sevier Highway at the Proposed Entrance will be 250 feet away to the southwest from French Road (centerline to centerline). The site designer must request a variance to allow the proposed intersection spacing to be less than the minimum required.
- A 25-mph Speed Limit (R2-1) sign is recommended to be posted near the beginning of the development entrance off E Governor John Sevier Highway. It is recommended that a "No Outlet" Sign (W14-2a) be posted at the front of the subdivision. This sign can be posted above or below the street name sign.
- Dual end-of-roadway object markers (OM4-1) should be installed at the end of the subdivision stub-out road if constructed as shown in the concept plan. An additional sign should be posted at the end of the stub-out road to follow Knoxville-Knox County Subdivision Regulations. This sign is for notification of a possible future street connection. It should state, "NOTICE – This road will be extended with future development – for more info. contact Knox Co. Engineering & Public Works (865) 215-5800".
- Stop Signs (R1-1) with 24" white stop bars and other traffic signage are recommended to be installed at the internal road locations, as shown in the report.
- Sight distance at the new internal intersections must not be impacted by new signage, parked cars, or future landscaping. With a 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 internal sight distance lengths are met and account for different proposed road grades.
- If directed by the local post office, the site designer should include a parking area and a centralized mail delivery center within the development for the subdivision residents.
- All drainage grates and covers for the residential development must be pedestrian and bicycle safe.
- It is recommended that the site designer consider including traffic calming measures on the internal roads, such as speed humps or tables. Specifics regarding this recommendation should be discussed in the design phase with Knox County Engineering.
- All road grade and intersection elements should be designed to AASHTO, TDOT,

and Knox County specifications and guidelines to ensure proper transportation operations.

- The northbound lane of E Governor John Sevier Highway has a Reduced Speed Limit Ahead (W3-5) sign posted to the south of French Road that indicates an upcoming reduction of the speed limit from 50-mph to 45-mph. However, a 45-mph Speed Limit (R2-1) sign is not posted to the north of this sign, designating the start of the 45-mph speed zone. Since this is located on a state route, TDOT should install a 45-mph Speed Limit (R2-1) sign where the 45-mph speed zone officially begins on the highway.
- TDOT should consider installing a Two-Way Left Turn Only (R3-9b) sign for southbound traffic on E Governor John Sevier Highway. It would be appropriate for this sign to be installed just south of the bridge crossing the French Broad River, where the center TWLTL begins.
- Knox County is recommended to install a 30-mph Speed Limit (R2-1) sign on French Road off E Governor John Sevier Highway for motorists traveling east on French Road due to the lack of a speed limit sign in this direction.
- As part of the revised study and during the site revisit for the spot speed study, it was noted that the existing 50 mph Speed Limit Sign (R2-1) on the west of E Governor John Sevier Highway adjacent to the development property for southbound highway traffic had been knocked down and the sign was missing. TDOT should replace this sign.

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 on E Governor John Sevier Highway just southwest of French Road in Southeast Knox County, TN. The development site is east and adjacent to the French Broad River and is just under three miles south of the intersection of E Governor John Sevier Highway and Strawberry Plains Pike. The development will have a single entrance tied to E Governor John Sevier Highway.

As Knoxville/Knox County Planning requested, transportation impacts associated with the proposed development were analyzed at the unsignalized intersection of E Governor John Sevier Highway at French Road, and where the Proposed Entrance will tie into E Governor John Sevier Highway.

View of Development Site along E Governor John Sevier Highway (Looking Northeast from French Road)

The proposed development property is in a quasi-rural area that is slowly being transformed into an area that is more suburbanized due to increased development. A large veterans cemetery was constructed just north of the proposed development site on E Governor John Sevier Highway and adjacent to the French Broad River. The East Tennessee State Veterans Cemetery was established in 2011 and has a capacity of 28,000 plots. Governor John Sevier Highway has become more attractive to developers and residents over the past few years due to the dwindling availability of developable and affordable property in other parts of Knox County and due to its proximity to other major roads.

The development property has 1,300 feet of road frontage on the west side of E Governor John Sevier Highway. The proposed development site is currently undeveloped, nearly split between

open areas used for farm production and areas covered with forest. A single farm storage building is located on the far northwestern part of the development property near the French Broad River. The development property will be built on two existing parcels.

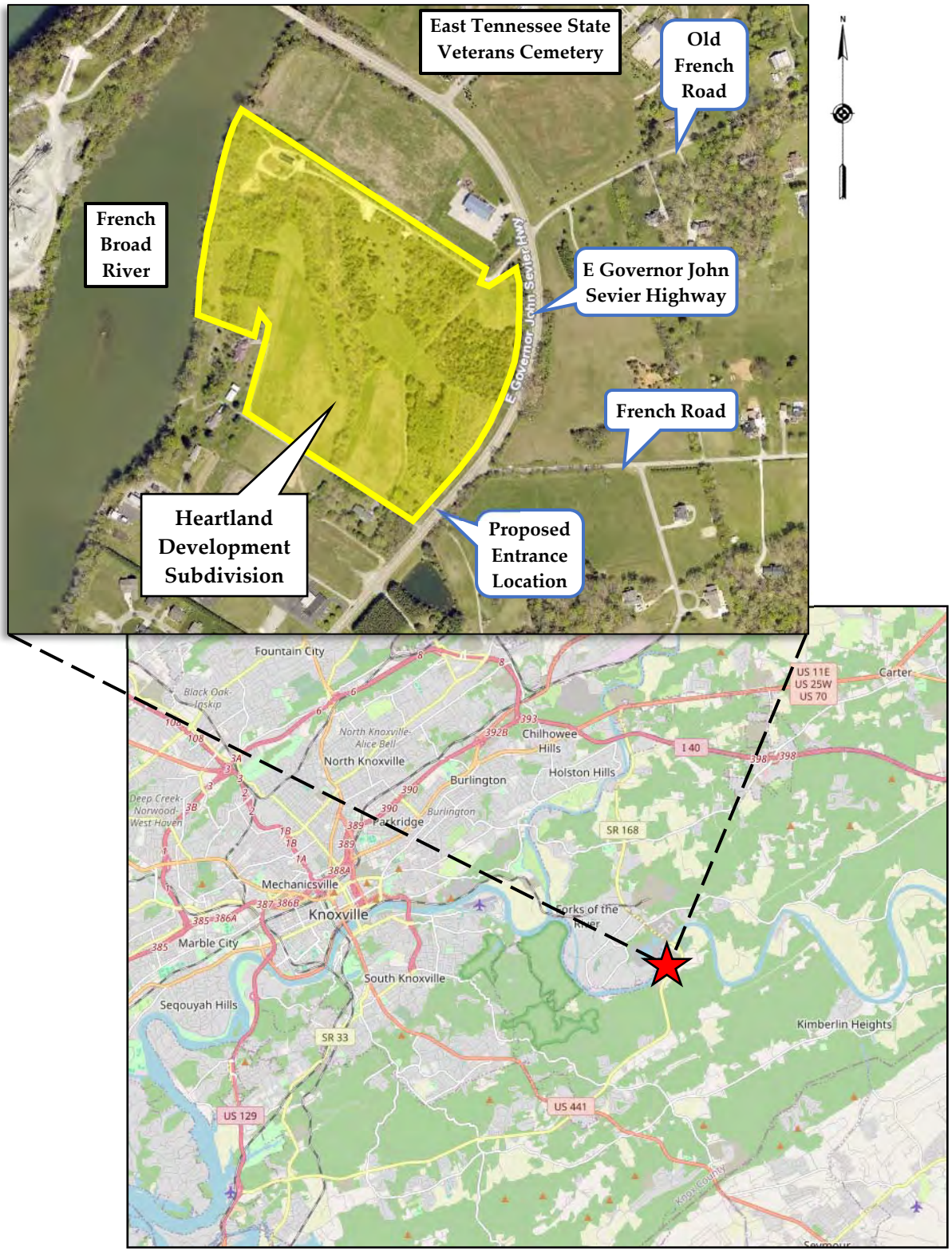


Figure 1
Location Map

- **EXISTING ROADWAYS:**

Table 1 lists the characteristics of the existing primary roadways 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
East Governor John Sevier Highway (SR 168)	Major Arterial	45 mph	3 (with TWLTL)	46 feet	None	No sidewalks along roadway	No bike lanes
French Road	Local Street	30 mph	2 undivided	17 feet	None	No sidewalks along roadway	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

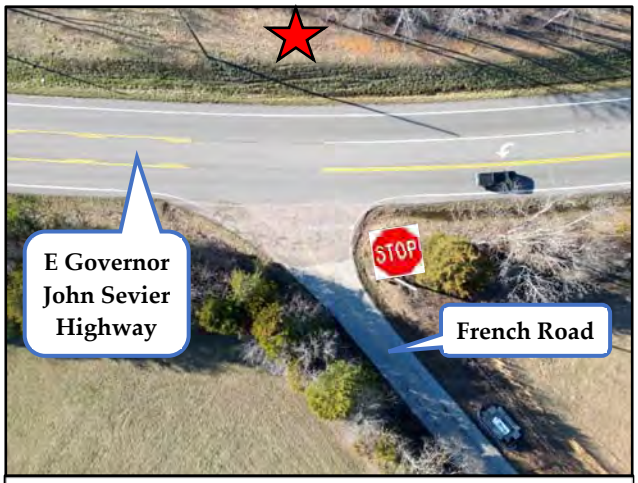
Governor John Sevier Highway (State Route 168) is classified as a Major Arterial and traverses in a general north-south direction in the study area. W Governor John Sevier Highway begins at the interchange with Alcoa Highway (US 129/SR 115) on its southwest end. On its northeast end, E Governor John Sevier Highway terminates at the intersection with Asheville Highway (US 11E/US 25/US 70/SR 9), totaling 18.1 miles. The delineation of the East/West designation of Governor John Sevier Highway occurs at the overpass intersection with Chapman Highway, 3.8 miles to the southwest of the development site.

E Governor John Sevier Highway at Development Site Property (Looking Northeast)

E Governor John Sevier Highway at the development site currently consists of a 3-lane pavement section that includes a continuous center two-way left-turn turn lane (TWLTL). The lanes are 12 feet wide with 4-foot paved shoulders outside the white edge lines. The pavement surface is approximately 46 feet in total width. Grass side slopes are located immediately outside of the paved shoulders. At the project site, utility streetlights are not provided on E Governor John Sevier Highway, and the speed limit is posted at 45-mph. The posted speed limit is increased to 50-mph near the development's southern edge at the highway. The center TWLTL for the

southbound approach of E Governor John Sevier Highway has a designated storage length of 110 feet for vehicles turning onto French Road.

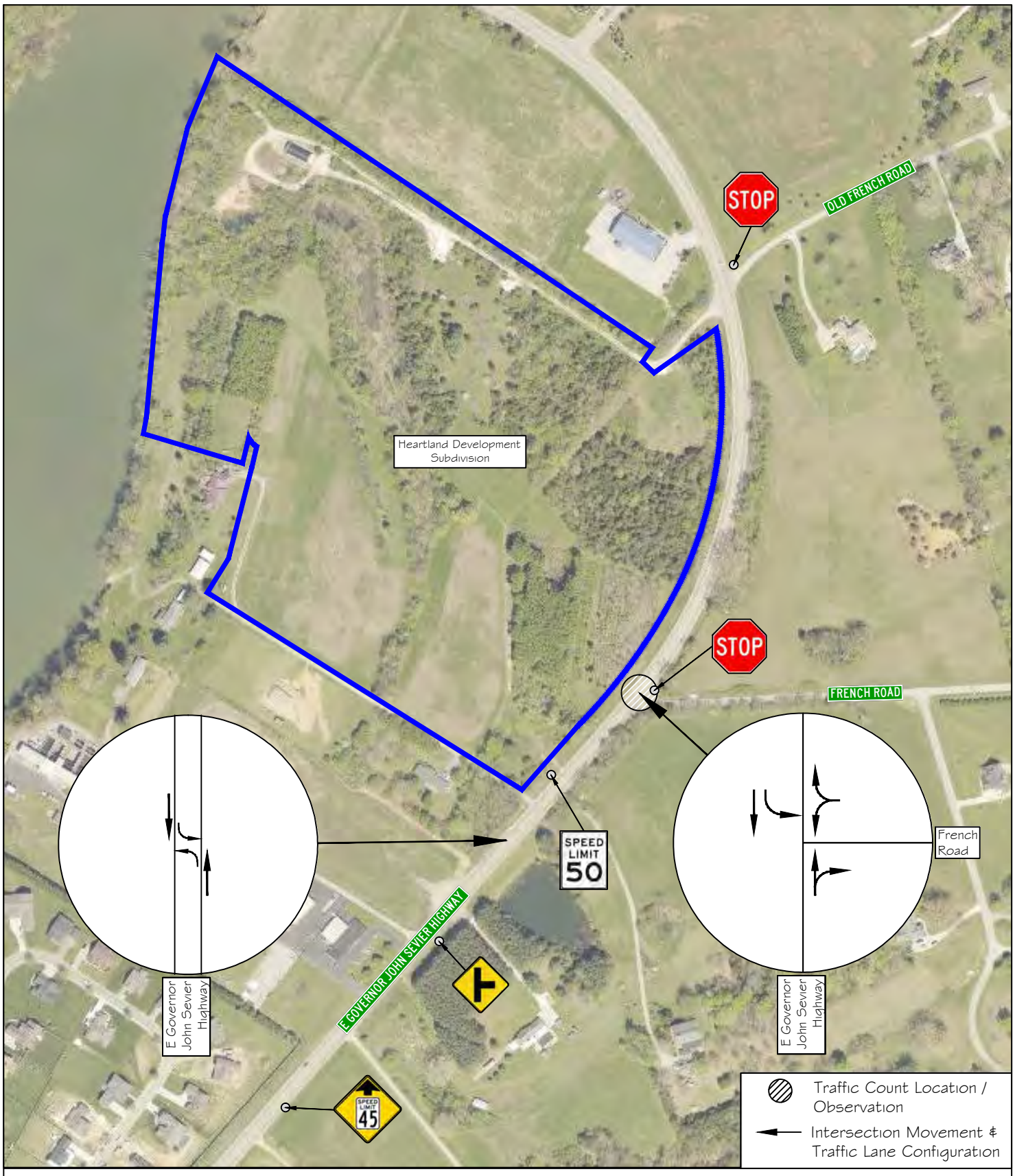
French Road is classified as a Local Street with a total length of 1.8 miles. This road traverses between E Governor John Sevier Highway on its north side and Hopewell Road on its south side. Near E Governor John Sevier Highway, French Road has a pavement width of 17 feet with a painted double yellow centerline and white edge lines with a straight alignment. Off E Governor John Sevier Highway, French Road has an east-west alignment until it intersects Old French Road. Past Old French Road, French Road has a more north-south alignment, and further to the south, the roadway becomes windier and slightly narrower and is not delineated by any painted pavement markings. The posted speed limit is 30-mph; however, it is only posted for northbound/westbound travel on French Road towards E Governor John Sevier Highway. The northbound/westbound direction of travel on French Road has two 30-mph speed limit signs posted, while southbound/eastbound travel does not have any posted speed limit signs.



Unsignalized T-Intersection of E Governor John Sevier Highway at French Road

French Road provides access to residential houses, farm properties, and undeveloped properties in a more rural part of Knox County. At the intersection of French Road at E Governor John Sevier Highway, the horizontal alignment of French Road makes a slight turn to line up perpendicularly with the highway. A Stop Sign (R1-1) at E Governor John Sevier Highway controls the French Road approach.

Figure 2 shows the existing lane configurations of the intersection examined in the study, the traffic count location 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 and adjacent to the studied intersection. The pages following Figure 2 give a further overview of the site study area with photographs.



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NOT TO SCALE

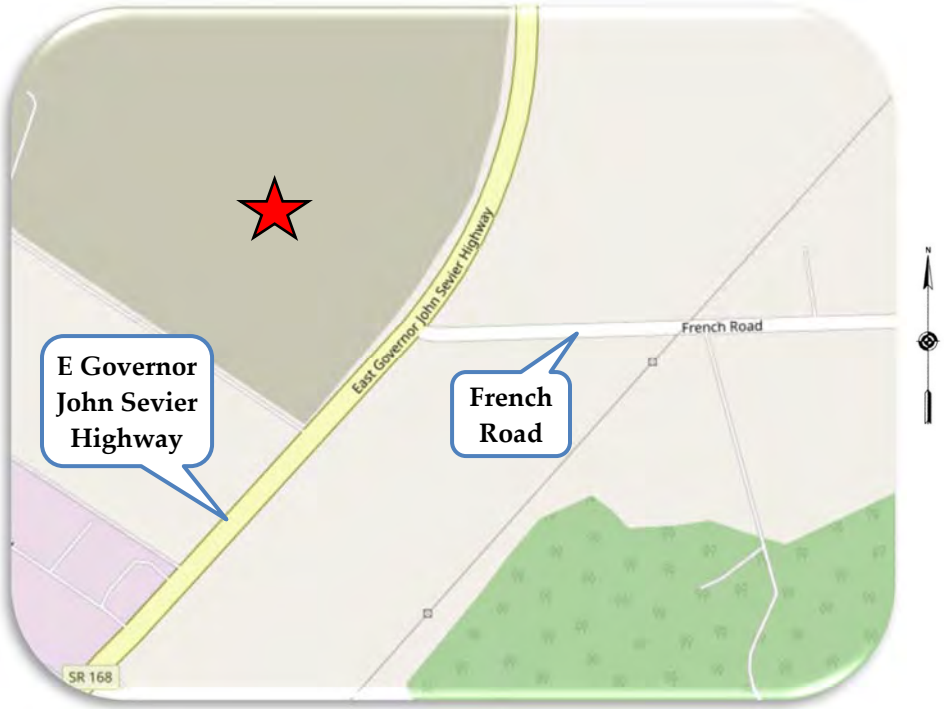
NORTH

FIGURE 2

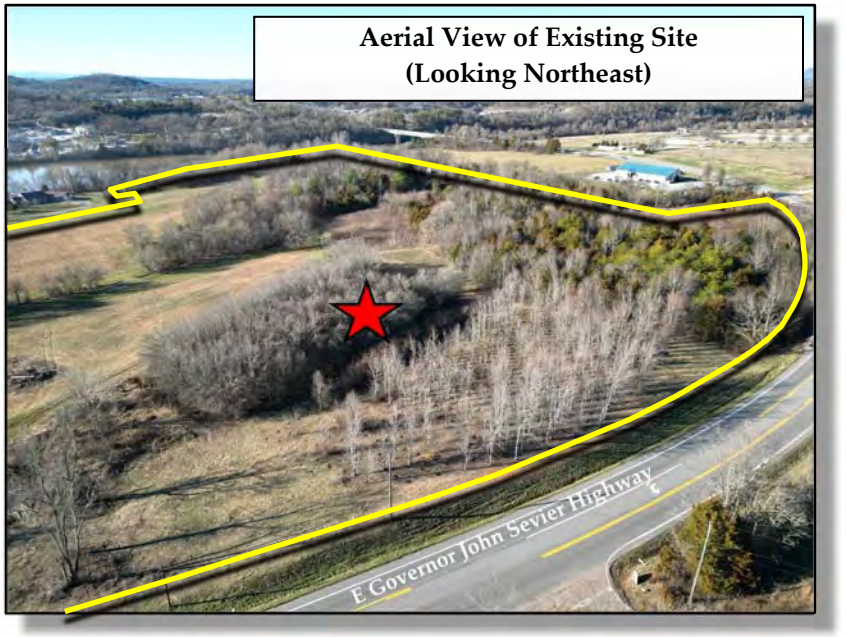
Heartland Development Subdivision

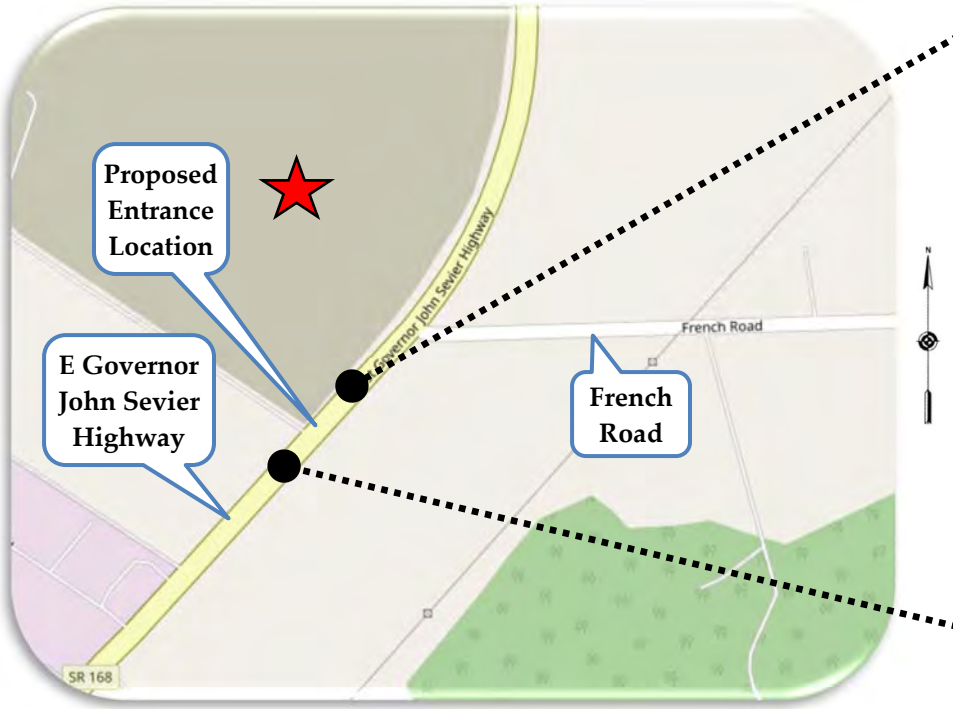
Traffic Count Location, Traffic Signage & Existing Lane Configurations

PHOTO EXHIBITS



E Governor John Sevier Highway at French Road and the Proposed Development Site

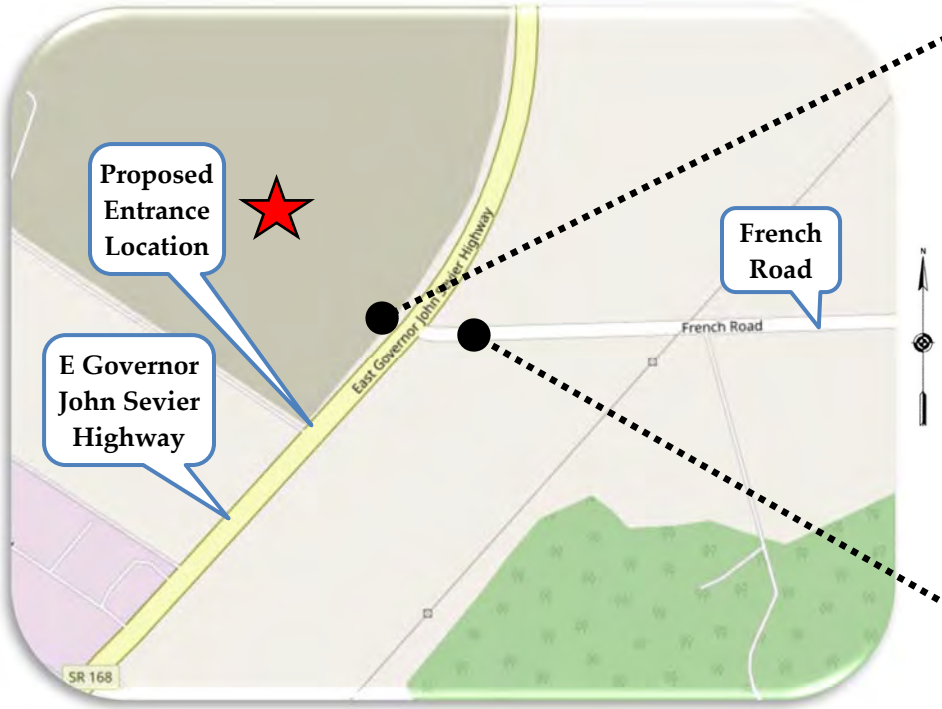




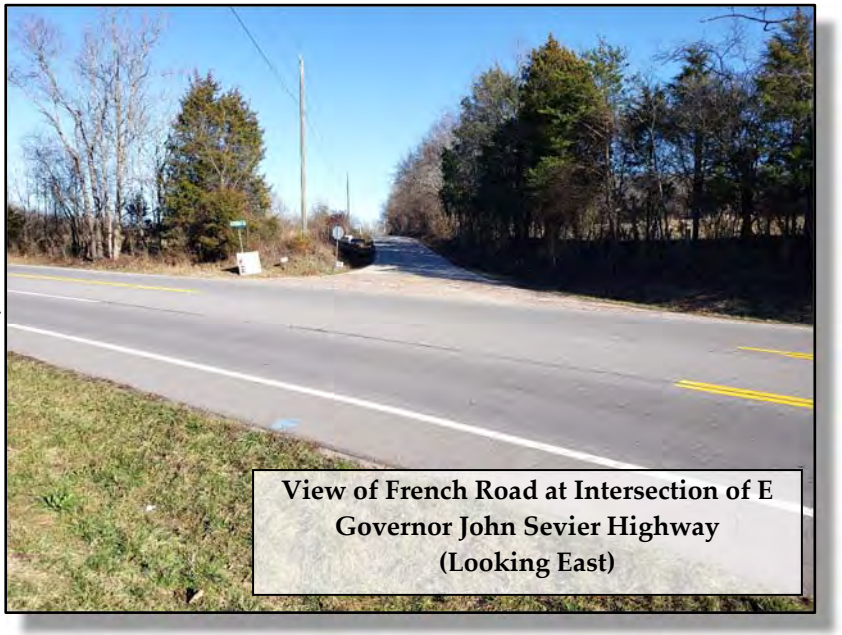
E Governor John Sevier Highway at the Proposed Development Site and Proposed Entrance Location

View of E Governor John Sevier Highway at the Proposed Entrance Location (Looking Southwest)

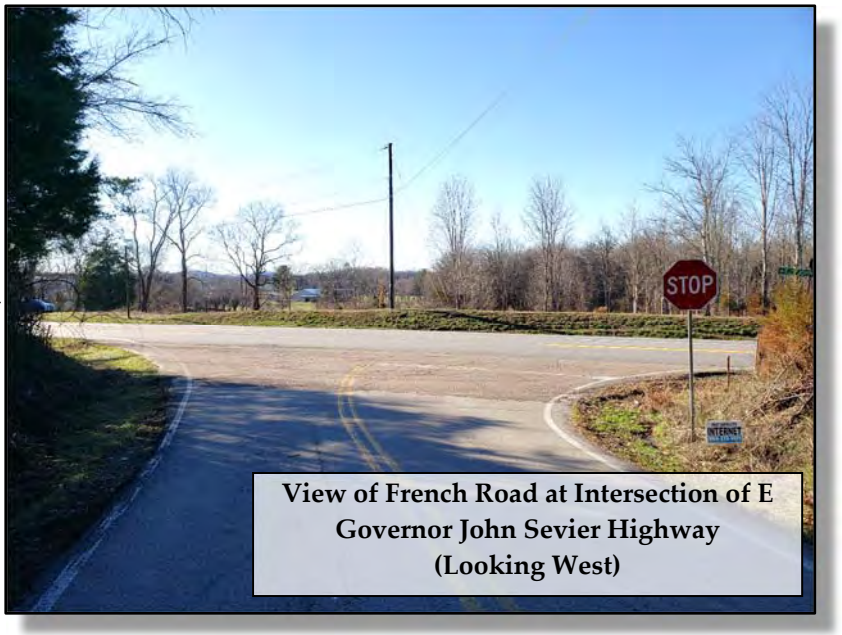
View of E Governor John Sevier Highway at the Proposed Entrance Location (Looking Northeast)



E Governor John Sevier Highway at French Road and the Proposed Development Site



View of French Road at Intersection of E Governor John Sevier Highway (Looking East)



View of French Road at Intersection of E Governor John Sevier Highway (Looking West)

- **EXISTING TRANSPORTATION VOLUMES PER MODE**:

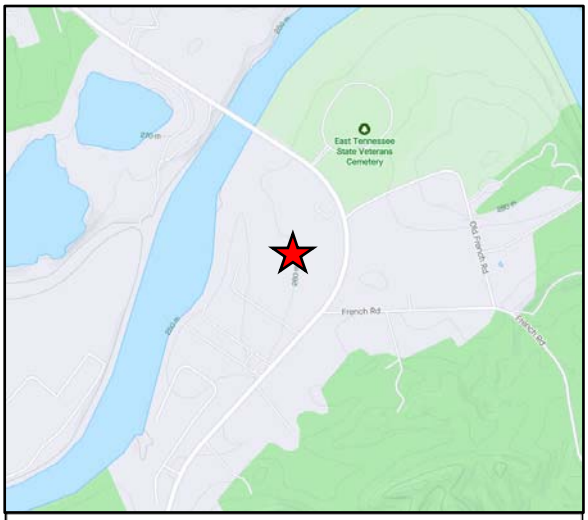
One annual vehicular traffic count location exists near the study area, and the Tennessee Department of Transportation (TDOT) conducts this count. The count location data is the following and can be viewed with further details in Appendix A:

- Existing vehicular roadway traffic:
  The TDOT reported an Average Daily Traffic (ADT) on E Governor John Sevier Highway, just north of the development site, at 12,062 vehicles per day in 2023. From 2013 to 2023, this count station has indicated a 1.9% average annual traffic growth rate.

- Existing bicycle and pedestrian volumes:
  The average daily pedestrian and bicycle traffic along the studied roadways is unknown. Due to the lack of facilities, it is assumed that few pedestrians and bicyclists use the roads in the study area. No pedestrians or bicyclists were observed during the 6-hour traffic count for this project at the intersection of E Governor John Sevier Highway at French Road.

Strava Heat Map for Bicyclists

An online website, strava.com, provides "heat" maps detailing 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. Some bicycle traffic is recorded on the E

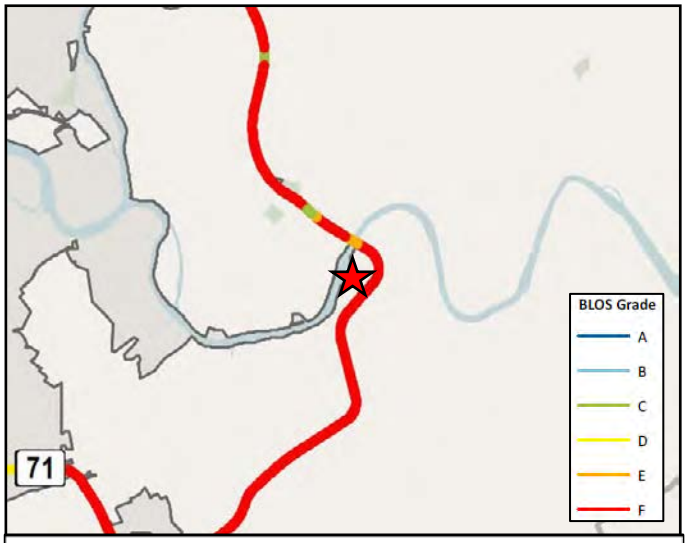


Strava Heat Map for Pedestrian and Joggers

Governor John Sevier Highway and French Road sections adjacent to the development site. The Strava heat map data shows no pedestrian traffic along E Governor John Sevier Highway or French Road.

- **PEDESTRIAN AND BICYCLE FACILITIES**:

Bicycle facilities (lanes) are not available within the project site study area. Sidewalks are not provided either. Even though bicycle facilities are not provided on E Governor John Sevier Highway, TDOT has published mapping illustrating the Bicycle Level of Service (BLOS) for state routes in Knox County. BLOS is a nationally used measure of bicyclist comfort based on a roadway's geometry and traffic conditions. BLOS A designates the route as most suitable for bicyclists and BLOS F as the least suitable. The BLOS mapping for E Governor John Sevier Highway (SR 168) in the study area at the development site shows a BLOS grade of F.



Mapping of Bicycle Level of Service (BLOS) - TDOT

- **WALK SCORE**:

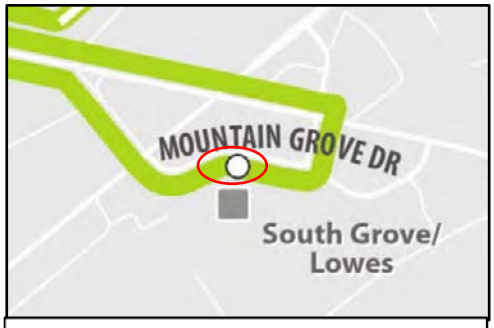
A private company offers a website at walkscore.com that grades and gives scores to locations within the United States based on "walkability", "bikeability", and transit availability based on a patented system. According to the website, the numerical values assigned for the Walk Score and the Bike Score 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, Bike, and Transit Score at the approximate development property address (2000 E Governor John Sevier Highway). The project site location is graded with a Walk Score of 0. This Walk Score indicates that almost all errands currently require a vehicle for travel at the development property. The Walk Score is graded at zero due to the lack of sidewalks and nearby amenities. The site is graded with a Bike Score of 13, which means there is minimal bike infrastructure, but it is somewhat bikeable. 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 near the development site. The overall KAT bus system map is provided in Appendix C.

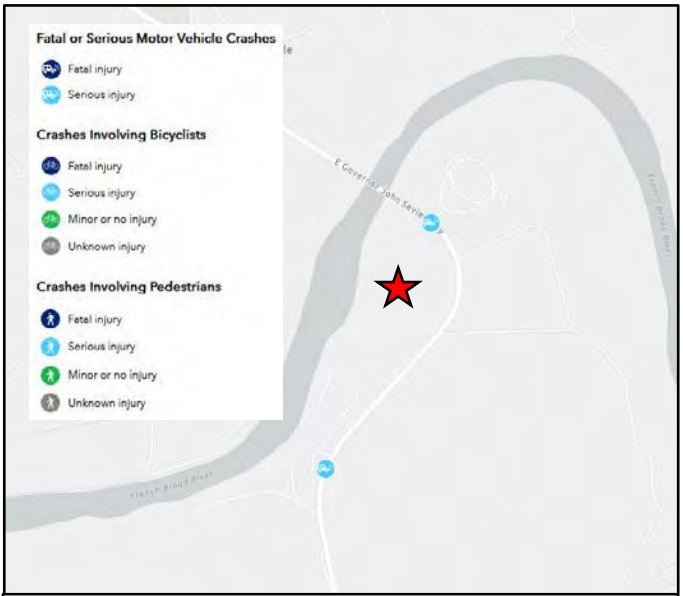
The closest public transit bus stop to the development site is 3.9 miles away to the southwest by roadway. The bus stop is on Mountain Grove Drive near Chapman Highway in front of the Lowe's Home Improvement Center and on Route 41, "Chapman Highway". It operates on weekdays and weekends; this route map is also included in Appendix C. KAT had to reduce its service schedule due to workforce shortages. These changes took place on August 29th, 2022, and the reduced schedule for this route is also included in Appendix C. However, according to news reports, KAT plans to increase services on some routes on Sundays and evenings starting April 8, 2024. 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 41

Since the distance to the nearest public bus service is several miles away, with no sidewalks or bike lanes available to access the bus stop without using a private vehicle, the proposed development is not expected to have any reduced vehicle trips due to public transit usage.

- **CRASH DATA**:



Bicycle, Pedestrian, and Vehicle Crash Data in Study Area

The Knoxville Transportation Planning Organization (TPO) provides a website that lists bicycle, pedestrian, and vehicle severe or fatal crashes from October 2016 to September 2021. According to the data, none of these incidents occurred near the development site or at the studied intersection in the past couple of years. The closest incidents occurred north and south of the proposed development site on E Governor John Sevier Highway. The two closest crashes involved suspected DUI incidents. The one to the north near the Veteran's Cemetery occurred on August 3rd, 2021, involved a single vehicle and resulted in a serious injury. The other incident occurred to the south near Stonesilo Way on August 12th, 2018. This crash also involved a single vehicle and resulted in a serious injury.

TDOT publishes and lists State crash data on its website that has involved a serious injury or a fatality over the past three calendar years. Between 2022 and 2024, the data shows no serious or fatal crashes near the proposed development site.

TDOT - Serious or Fatal Injury Traffic Crashes in Study Area (2022 – 2024)

PROJECT DESCRIPTION

- **LOCATION AND SITE PLAN:**

The proposed plan layout with a maximum of 151 single-family detached houses on 35.8 +/- acres is designed by LJA Engineering and is shown in Figure 3. The development property will be a re-subdivision of two parcels in Knox County. As shown in the figure, five new streets will be constructed for the residential development. This longest internal roadway will terminate at a stub-out at the edge of the northern boundary for potential future development; however, no specific developments are known or planned. The property to the north is owned by a church, with most of the property outside the church building and parking lot undeveloped. The end of this stub-out road will be constructed with a paved vehicle turnaround area.

The subdivision will have one entrance on E Governor John Sevier Highway approximately 250 feet southwest of the existing unsignalized t-intersection with French Road, where an existing gravel drive currently provides a field entrance to the property.

View of Front (East Side) of Development Property at Intersection of E Governor John Sevier Highway at French Road

The 35.8-acre residential development will incorporate a large common area on the east side of the development along the French Broad River. The minimum size of the single-family detached house lots will be a tenth of an acre (4,500 ft^2), with a few lots a quarter of an acre in size. Each house will have a garage and driveway. Besides a common river access point for future residents, no other subdivision amenities are being proposed. Sidewalks are not proposed for this development.

The schedule for the completion of this new residential development depends on economic factors and construction timelines. This project is also contingent on permitting, design, and other regulatory approvals. The area's real estate market is still experiencing large amounts of activity

and growth due to population growth and other factors. This study assumed that the total construction build-out of the development and full occupancy would occur within the next three years (2027).

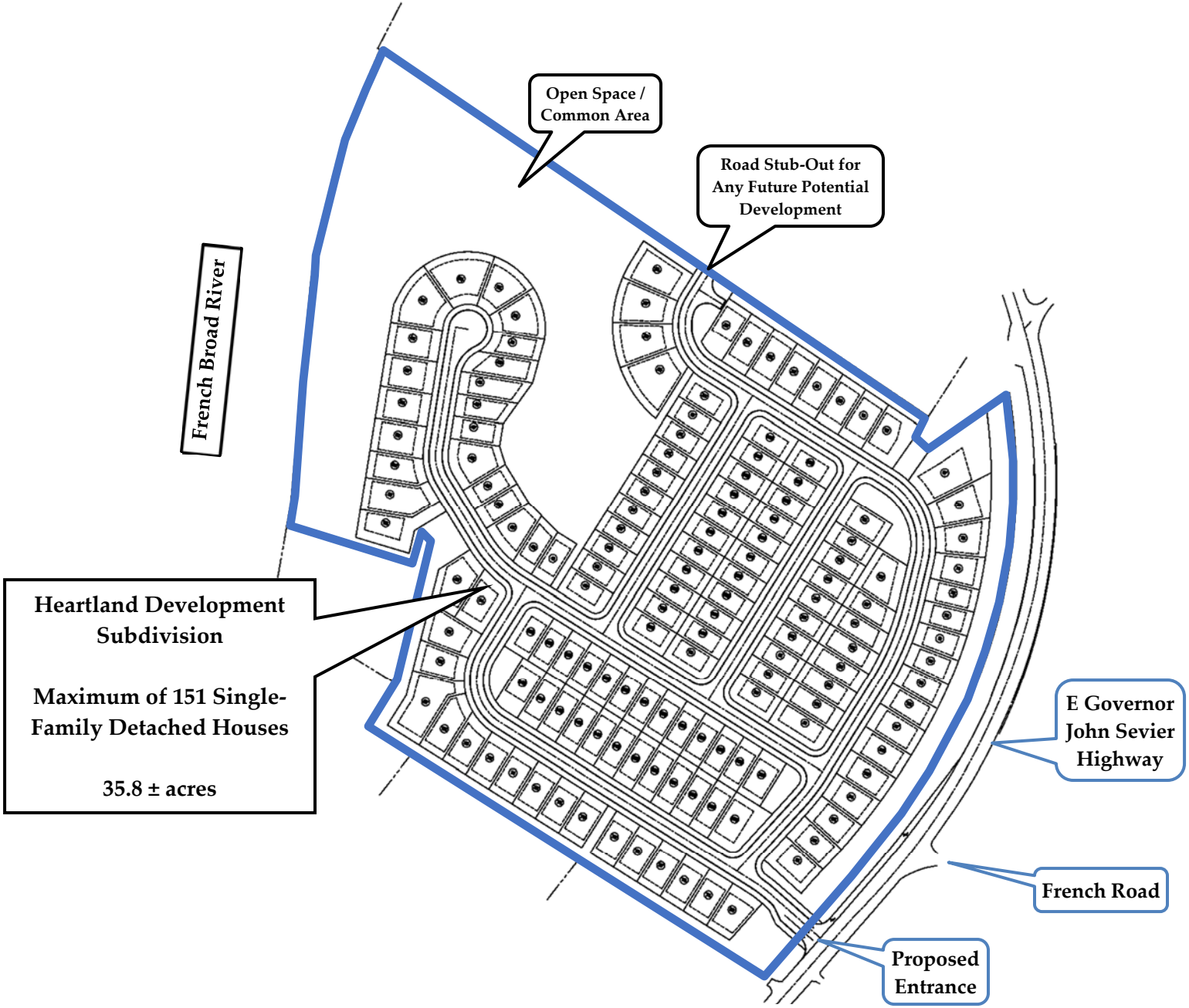


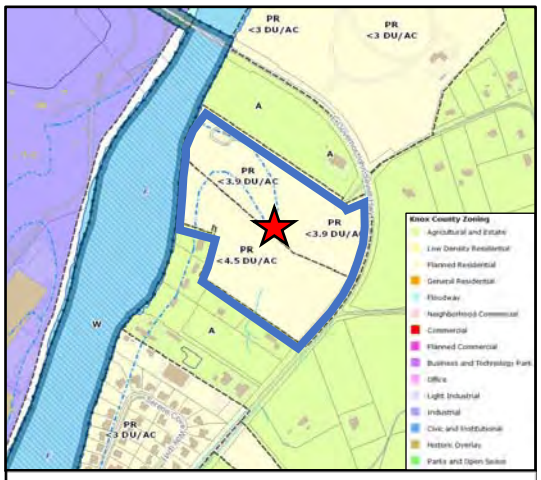
Figure 3
Proposed Plan Layout
Heartland Development Subdivision

Not to Scale

- **PROPOSED USES AND ZONING REQUIREMENTS:**

The two parcels comprising the Heartland Development Subdivision property were rezoned to Planned Residential (PR) in 2022. The southern parcel was approved with a density of up to 4.5 units per acre. The northern parcel was approved with a density of up to 3.9 units per acre. The Planned Residential (PR) zone in Knox County allows for various land uses primarily within the residential realm. Uses permitted in this 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. The existing adjacent surrounding zoning and land uses are the following:

- A single large parcel is located directly to the development property's north side and zoned as Agricultural (A). Crosswalk Community Church occupies this parcel, with most of the property being an open-maintained field.
- E Governor John Sevier Highway binds the development property to the east. A few large parcels across the highway to the east are mostly undeveloped except for a few standalone single-family detached houses. The large parcels across the highway are zoned as Agricultural (A).
- The adjacent properties to the south and southwest are occupied by single-family detached houses and are zoned as Agricultural (A). These parcels have access to the highway via a joint permanent easement.
- The French Broad River binds the development on the west side, and the river is zoned as Floodway (F).



KGIS Existing Zoning Map

KGIS Existing Land Use Map

- **ON-SITE CIRCULATION:**

The total length of the five new streets within the development will be 5,087 feet (0.96 miles), designed and constructed to the Knox County, TN specifications. The development will have asphalt paved internal roadways and 6" concrete curbs. The lane widths internally will be 13 feet each for a total 26-foot pavement width. The Proposed Entrance is shown in the design with a width of 39 feet with two exiting lanes and one entering lane. The two exiting lanes are shown as one for left-turn movements and one for right-turns. The right-turn lane in the design plan has a vehicle storage length of 75 feet. The street 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. These vehicle types will not impact roadway operations except when they occasionally enter and exit the development. Curbside private garbage collection services are expected to be available for this residential subdivision if desired. 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.

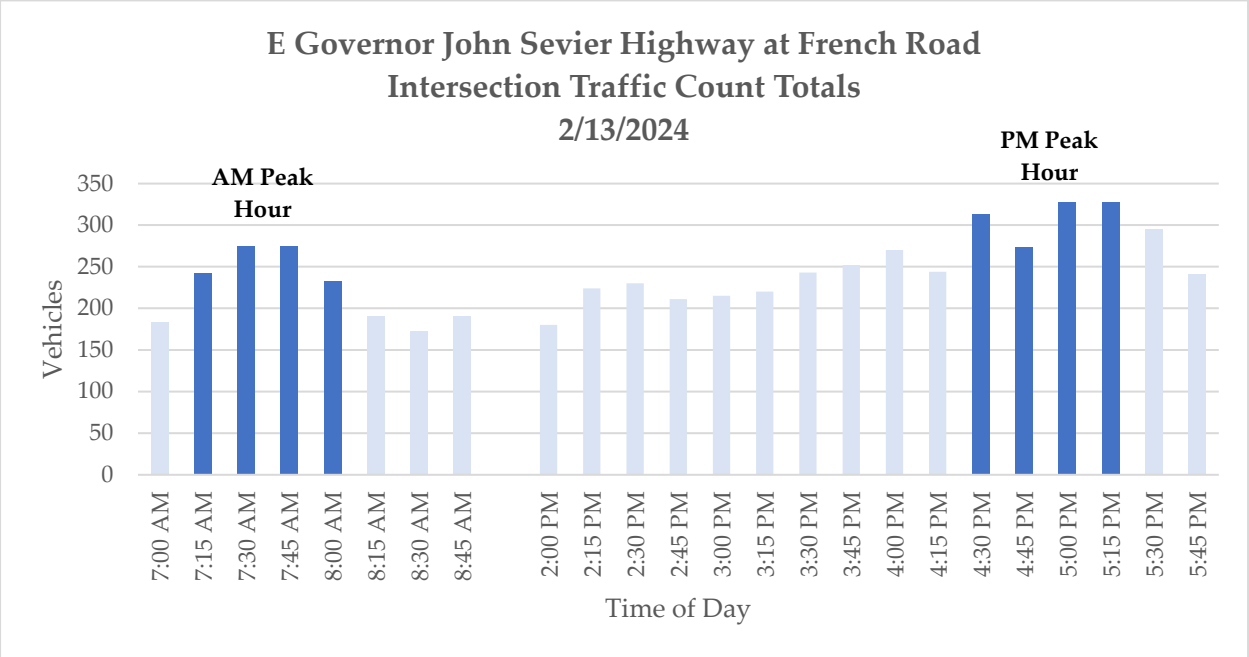
ANALYSIS OF EXISTING AND PROJECTED CONDITIONS

- **EXISTING TRAFFIC CONDITIONS:**

This study conducted a 6-hour traffic count at the unsignalized t-intersection of E Governor John Sevier Highway at French Road on Tuesday, February 13th, 2024. 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 7:15 – 8:15 am and 4:30 – 5:30 pm at the intersection. Local county public schools were in session when the traffic counts were conducted.

The manual tabulated traffic counts can be reviewed in Figure 4 and Appendix E; some observations from the count are listed below.

- No bicyclists or pedestrians were observed during the traffic counts at the intersection.
- Most of the observed traffic was passenger vehicles. However, the traffic stream included a moderate number of semi-tractor-trailers. Other large and heavy vehicles included dump trucks, school buses, construction vehicles, and trash collection trucks.
- Some motorists on French Road turning left towards the south on E Governor John Sevier Highway used the center TWLTL as a merging lane to enter the southbound traffic stream.



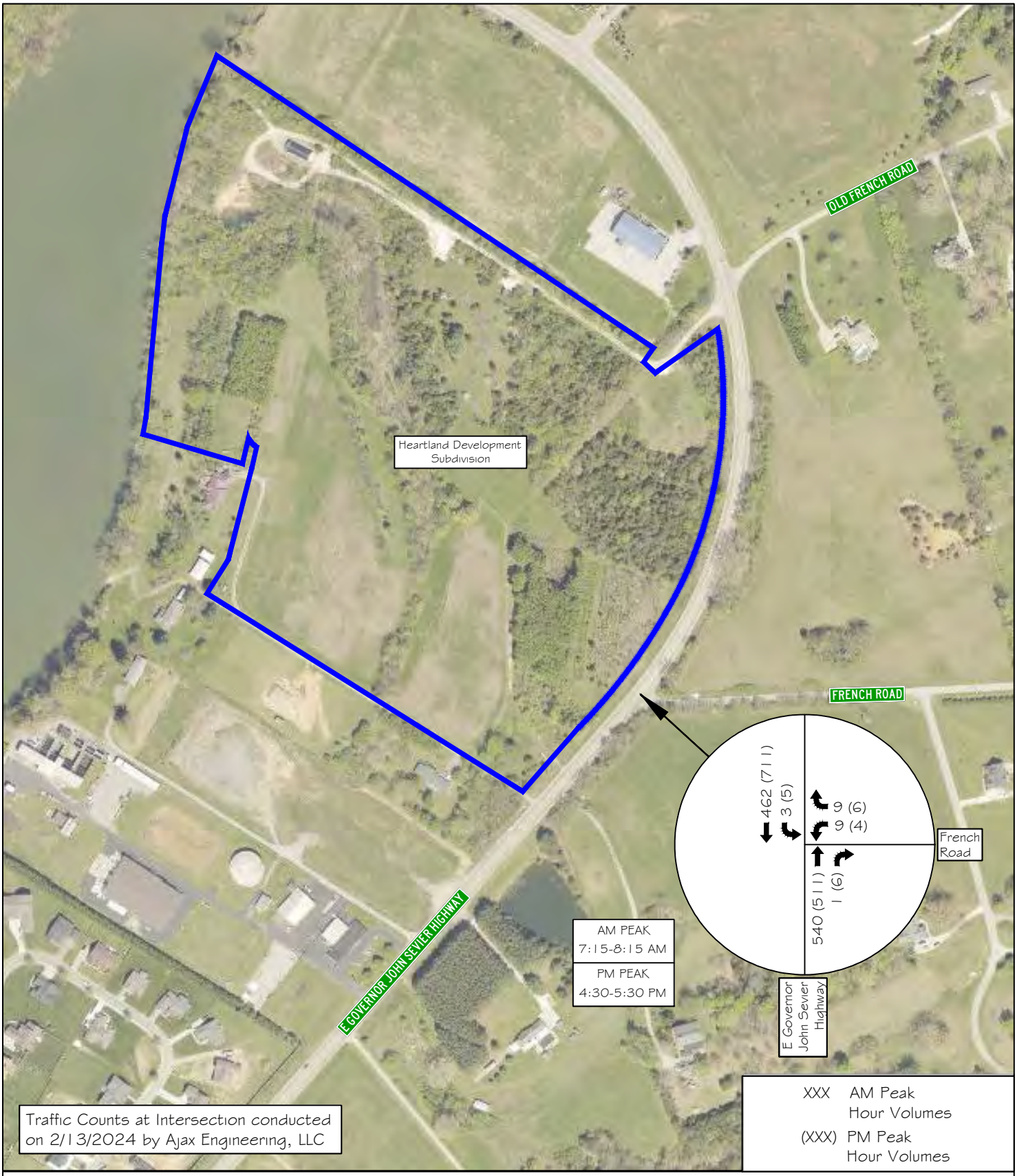


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FIGURE 4

Heartland Development Subdivision

2024 Peak Hour Traffic Volumes - EXISTING TRAFFIC CONDITIONS

Capacity analyses were undertaken to determine the Level of Service (LOS) for the existing 2024 traffic volumes shown in Figure 4 at the studied intersection. 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, representing 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.

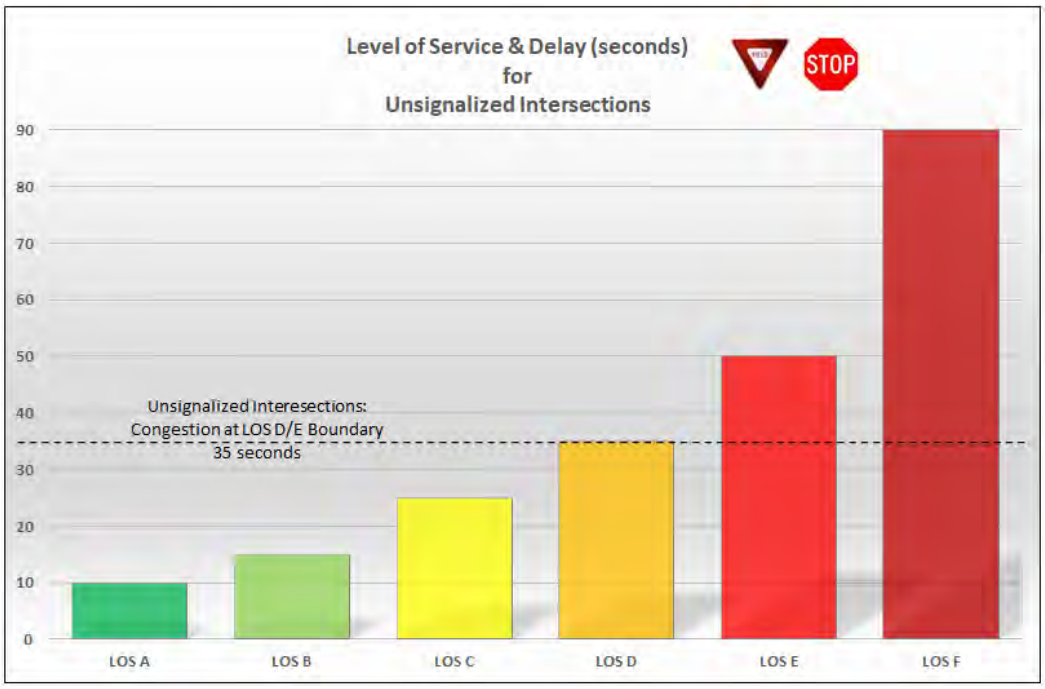
For unsignalized intersections, LOS is measured in terms of delay (in seconds). This measure is an attempt to quantify delay, including travel time, driver discomfort, and fuel consumption. For unsignalized intersections, the analysis assumes that the mainline thru and right-turn traffic does not stop 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 2024 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 2024 peak hour capacity analyses.

As shown in Table 3, all the 2024 vehicle movements are calculated to be operating with good LOS and low vehicle delays in the AM and PM peak hours.

TABLE 3
2024 INTERSECTION CAPACITY ANALYSIS RESULTS -
EXISTING TRAFFIC CONDITIONS

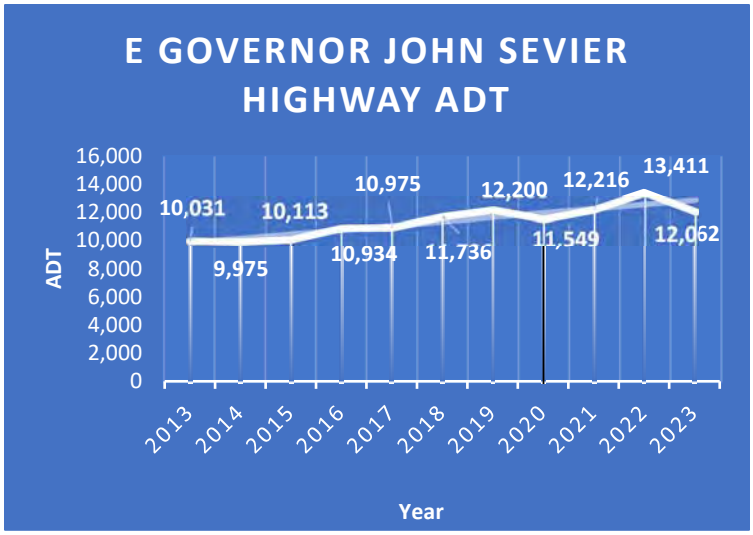
INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
E Governor John Sevier Highway (SB & NB) at French Road (WB)	STOP Unsignalized	Westbound Left/Right	B	13.2	0.052	B	12.7	0.049
		Southbound Left	A	8.8	0.004	A	8.5	0.011

Note: All analyses were calculated in Synchro 11 software and reported using 6th Edition 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 of this proposed development are assumed to occur by 2027.

Vehicular traffic on E Governor John Sevier Highway in the study area has shown low annual growth over the past ten years (1.9%), according to the TDOT traffic count station and as shown in Appendix A. For this study, a slightly higher annual growth rate of 2.0% was used to calculate future growth on the studied roadways up to 2027 to account for potential traffic growth in the study area and provide a conservative analysis.



A growth rate of 2% was applied to the intersection approach volumes obtained from the traffic count to calculate the future intersection volumes in 2027 without the projected development traffic. Capacity analyses were undertaken to determine the projected LOS in 2027 without the project at the intersection. The results are shown in Table 4, and Appendix F includes the capacity analysis worksheets. The results in Table 4 are similar but slightly increased compared to the 2024 results shown in Table 3. Figure 5 shows the projected 2027 traffic volumes without the project at the intersection during the AM and PM peak hours.

TABLE 4
2027 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS WITHOUT THE PROJECT

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
E Governor John Sevier Highway (SB & NB) at French Road (WB)	STOP Unsignalized	Westbound Left/Right	B	13.7	0.060	B	13.1	0.051
		Southbound Left	A	9.0	0.004	A	8.6	0.012

Note: All analyses were calculated in Synchro 11 software and reported using 6th Edition intersection methodology
[a] Level of Service , [b] Average Delay (sec/vehicle) , [c] Volume-to-Capacity Ratio

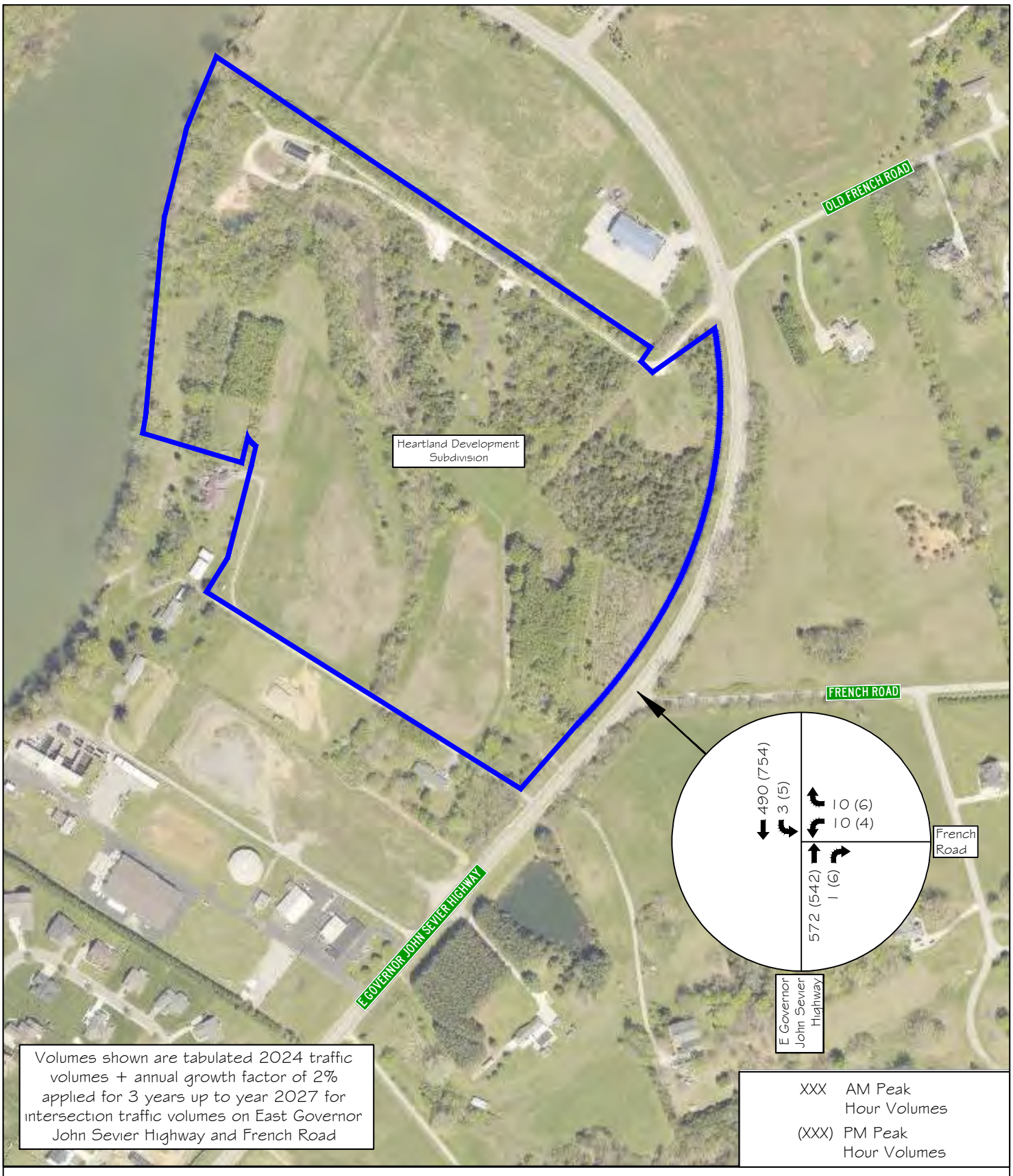


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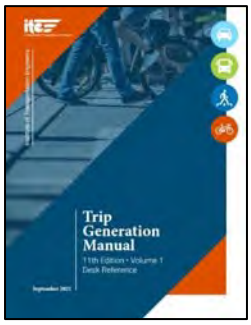
FIGURE 5

Heartland Development Subdivision

2027 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 the proposed 151 (maximum) single-family detached houses will generate was calculated based on rates and equations provided by the Trip Generation Manual, 11th Edition, an Institute of Transportation Engineers (ITE) publication. 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 5
TRIP GENERATION FOR HEARTLAND DEVELOPMENT SUBDIVISION
Maximum of 151 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	151 Houses	1,474	25%	75%		63%	37%	
				27	81	108	92	54	146
Total New Volume Site Trips			**1,474**	**27**	**81**	**108**	**92**	**54**	**146**

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

For the proposed residential development, with a maximum of 151 single-family detached houses, it is estimated that 27 vehicles will enter and 81 will exit, for a total of 108 generated trips during the AM peak hour in the year 2027. Similarly, it is estimated that 92 vehicles will enter and 54 will exit, for a total of 146 generated trips during the PM peak hour in the year 2027. The calculated trips generated for an average weekday are estimated to be 1,474 vehicles for the proposed development. No vehicle trip reductions were included in the calculations or analysis.

- **TRIP DISTRIBUTION AND ASSIGNMENT:**

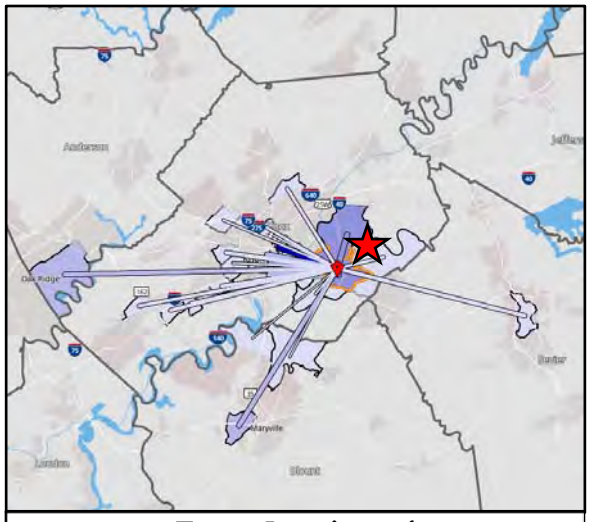
The projected trip distribution and assignment for the Heartland Development Subdivision are based on several sources and engineering judgment. The first source is based on the existing traffic count volumes and the observed travel directions collected at the E Governor John Sevier Highway intersection adjacent to the proposed development site at French Road.

During the traffic count, the observed direction of thru travel on E Governor John Sevier Highway was roughly 45% / 55% in the AM peak hour, with 45% heading southbound and 55% heading northbound. The travel split in the PM peak hour was near 60% / 40% southbound and northbound.

A supplementary traffic count was also conducted on February 13th, 2024, at the intersection of E Governor John Sevier Highway at Stonesilo Way. Stonesilo Way provides the singular road access to the highway for Serenity River Subdivision, which currently has 44 single-family detached houses. This brief count tabulated the entering and exiting volumes to and from the adjacent subdivision during the AM and PM peak hours identified at the intersection at French Road (7:15 – 8:15 am / 4:30 – 5:30 pm). The observed entering and exiting splits on Stonesilo Way are projected to be a good analog for the future residents of the Heartland Development Subdivision since this road serves a similar residential land use as the one proposed for the development site. The entering and exiting percentages during the observed AM and PM peak hours to and from Stonesilo Way were the following:

Observed Entering and Exiting Vehicle Distribution
at Stonesilo Way on E Governor John Sevier Highway

AM PEAK HOUR		
ENTER FROM NORTH	29%	
ENTER FROM SOUTH		71%
EXIT TO NORTH	21%	
EXIT TO SOUTH		79%
PM PEAK HOUR		
ENTER FROM NORTH	60%	
ENTER FROM SOUTH		40%
EXIT TO NORTH	33%	
EXIT TO SOUTH		67%

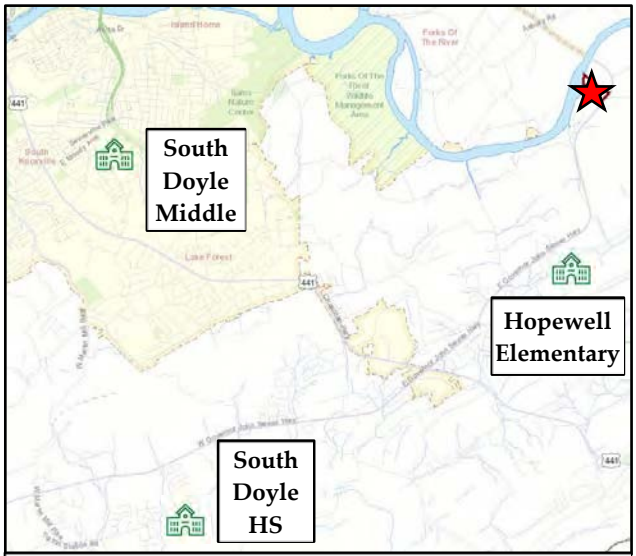


Top 25 Locations of 2021 Census Bureau Work-Based Trips to & from Census Tract 55.01

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 north, northwest, west, and southwest. This assertion is based on data from the United States Bureau website for Census Tract 55.01, where the development property is located. Based on 2021 (latest available) census data and as shown in Appendix H, most work-based trips in the surrounding area correspond to the Forks of the River Industrial Park, downtown Knoxville, the University of Tennessee, West Knoxville, Alcoa, Maryville, and Sevierville.

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 school zone boundary for Carter Middle and High School and South Doyle Middle and High School is designated along the French Broad River. The development property is currently zoned for New Hopewell Elementary, South Doyle Middle, and South Doyle High School.

New Hopewell Elementary is 2.1 miles away by roadway to the south of the development site via E Governor John Sevier Highway. South Doyle Middle is 8.6 miles away by roadway to the west, closer to downtown Knoxville. The shortest and quickest route to this school will be via E Governor John Sevier Highway to the south and then Chapman Highway back to the north. South Doyle High School is located 7.1 miles southwest of the development site via East and West Governor John Sevier Highway. All these schools will generate traffic from the subdivision to the south on E Governor John Sevier Highway in the morning.



Zoned Public School Locations

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.

Based on these factors, data, and engineering judgment, Figure 6 shows the projected distribution of traffic entering and exiting the proposed development at the studied intersection. 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.

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.

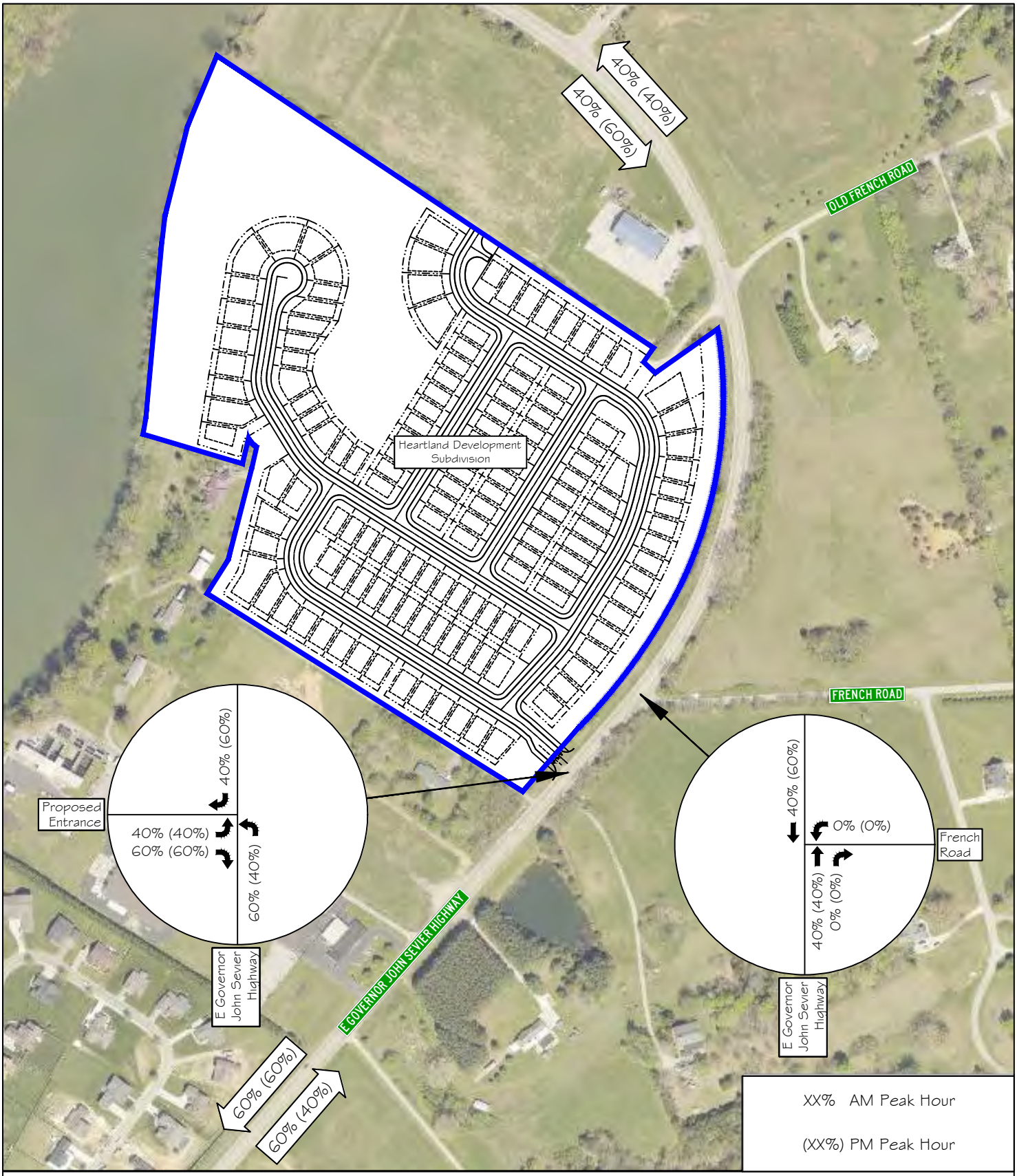


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FIGURE 6

Heartland Development Subdivision

Directional Distribution of Generated Traffic during AM and PM Peak Hour

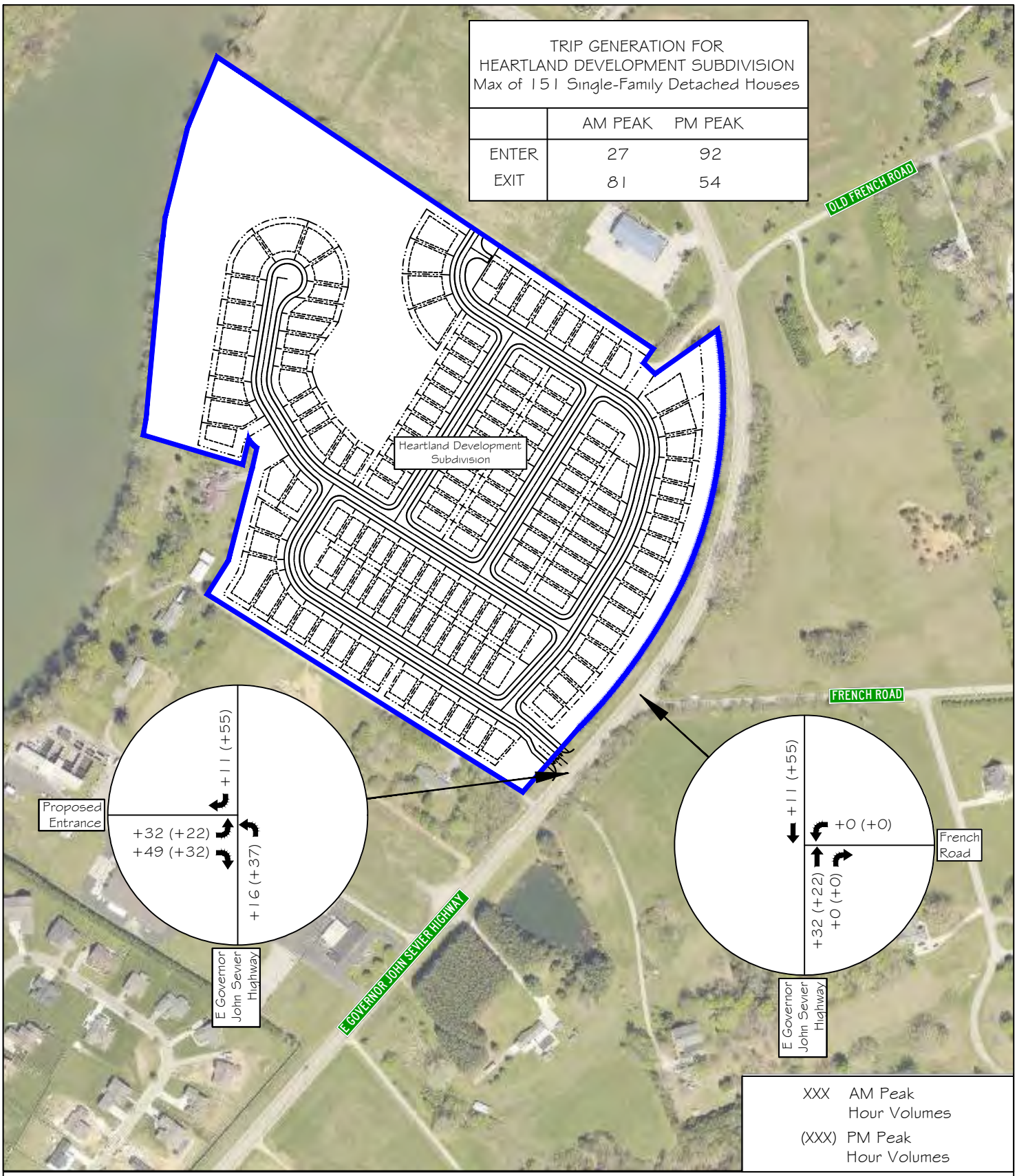

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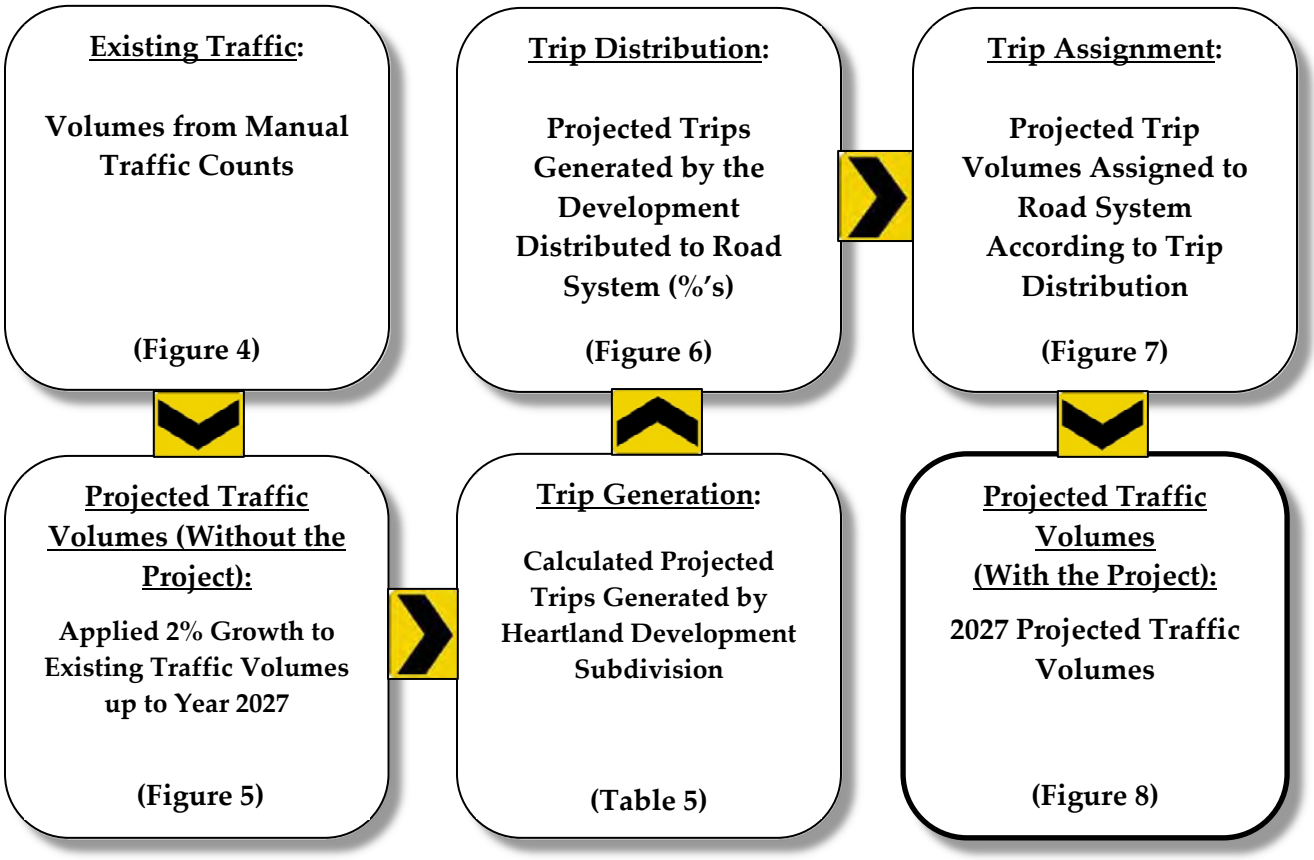
FIGURE 7

Heartland Development 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 studied intersections when the Heartland Development Subdivision is constructed and occupied in 2027. The steps are illustrated below for clarity and review:



The calculated peak hour traffic (Table 5) generated by the Heartland Development Subdivision was added to the 2027 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 and occupied in 2027. Figure 8 shows the projected 2027 AM and PM peak hours with the generated development traffic at the studied intersections.

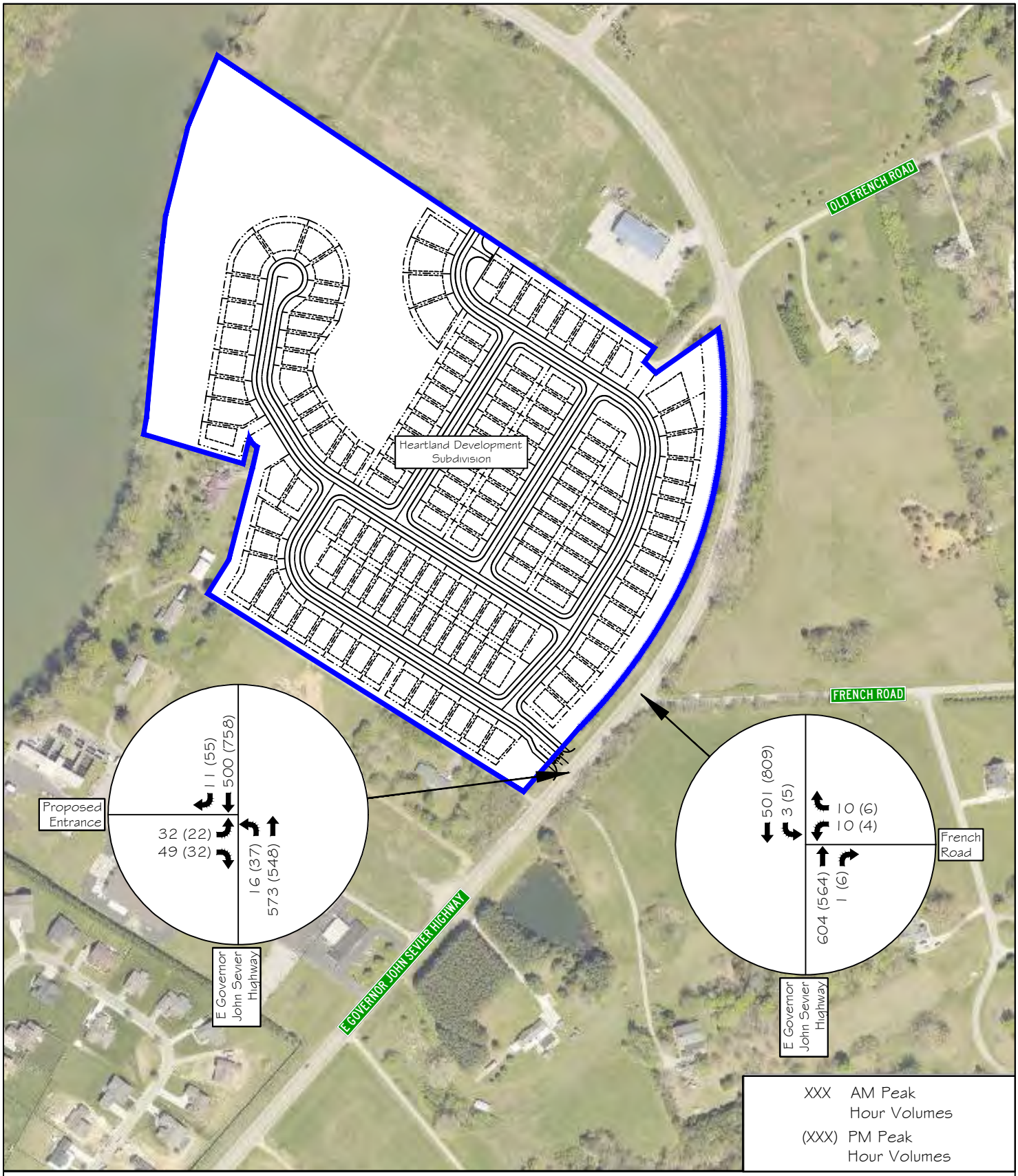


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FIGURE 8

Heartland Development Subdivision

2027 Peak Hour Traffic Volumes - PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT

Capacity analyses were conducted to determine the projected LOS at the studied intersections with the development traffic in 2027. The results indicated minimal degradation between the existing and projected conditions with the project in 2027 for the existing approaches at the French Road intersection. The Proposed Entrance intersection at E Governor John Sevier Highway is projected to operate adequately in the 2027 AM and PM peak hours with reasonable vehicle delays. These results can be seen in Table 6, and Appendix F includes the worksheets for these capacity analyses. Note: These results include a proposed southbound exclusive right-turn lane on E Governor John Sevier Highway at the Proposed Entrance, as documented in the following section of the report in the "Evaluation of Turn Lane Thresholds".

TABLE 6
2027 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
E Governor John Sevier Highway (SB & NB) at French Road (WB)	Unsignalized	Westbound Left/Right	B	14.0	0.063	B	13.4	0.053
		Southbound Left	A	9.1	0.005	A	8.7	0.012
E Governor John Sevier Highway (SB & NB) at Proposed Entrance (EB)	Unsignalized	Northbound Left	A	8.5	0.017	A	9.9	0.053
		Eastbound Left	C	17.3	0.108	C	19.7	0.091
		Eastbound Right	B	12.1	0.097	C	15.6	0.095

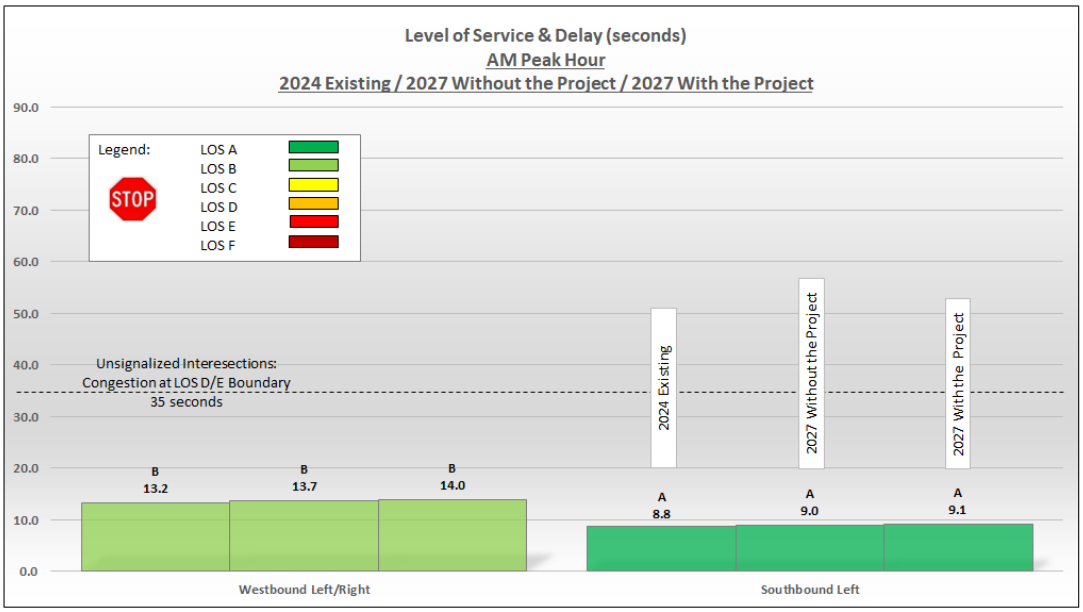
Note: All analyses were calculated in Synchro 11 software and reported using 6th Edition intersection methodology
[a] Level of Service , [b] Average Delay (sec/vehicle) , [c] Volume-to-Capacity Ratio

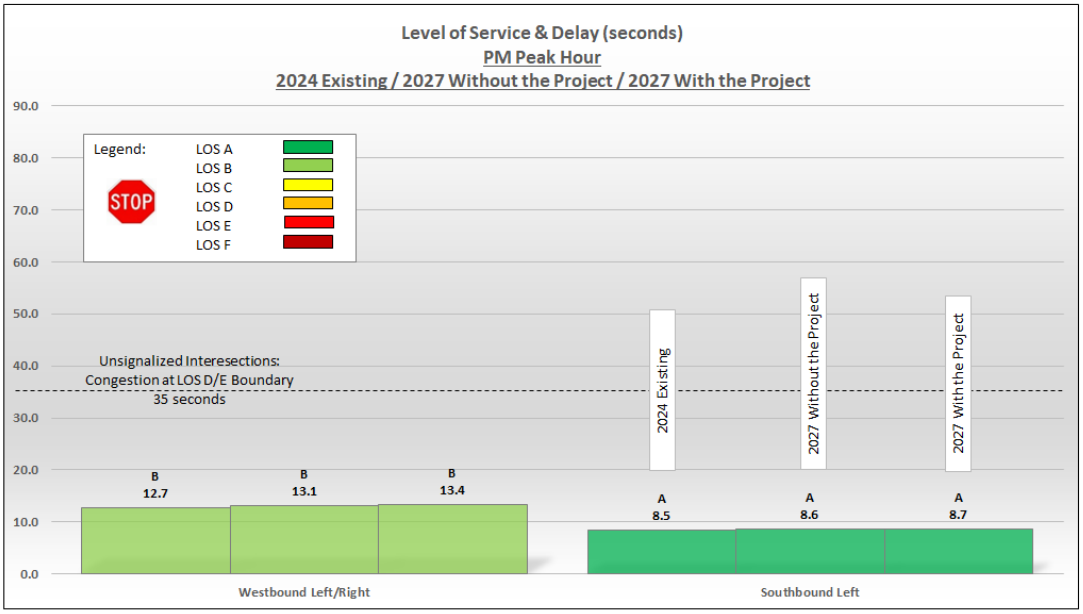
A summary of the results of the E Governor John Sevier Highway at French Road intersection capacity analyses are presented in Table 7. This table provides a side-by-side summary and comparison of the intersection for the 2024 existing conditions, projected conditions in 2027 without the project, and the projected conditions in 2027 with the project. Minimal degradation in vehicle delays is shown during these studied periods.

TABLE 7
INTERSECTION CAPACITY ANALYSIS SUMMARY
E GOVERNOR JOHN SEVIER HIGHWAY AT FRENCH ROAD STOP

LOCATION / PEAK HOUR MOVEMENT	2024 EXISTING			2027 WITHOUT THE PROJECT			2027 WITH THE PROJECT		
	LOS[a]	Delay[b]	v/c[c]	LOS[a]	Delay[b]	v/c[c]	LOS[a]	Delay[b]	v/c[c]
AM Peak									
Westbound Left/Right	B	13.2	0.052	B	13.7	0.060	B	14.0	0.063
Southbound Left	A	8.8	0.004	A	9.0	0.004	A	9.1	0.005
PM Peak									
Westbound Left/Right	B	12.7	0.049	B	13.1	0.051	B	13.4	0.053
Southbound Left	A	8.5	0.011	A	8.6	0.012	A	8.7	0.012

Note: All analyses were calculated in Synchro 11 software and reported using 6th Edition intersection methodology
[a] Level of Service , [b] Average Delay (sec/vehicle) , [c] Volume-to-Capacity Ratio





- **POTENTIAL TRANSPORTATION SAFETY ISSUES:**

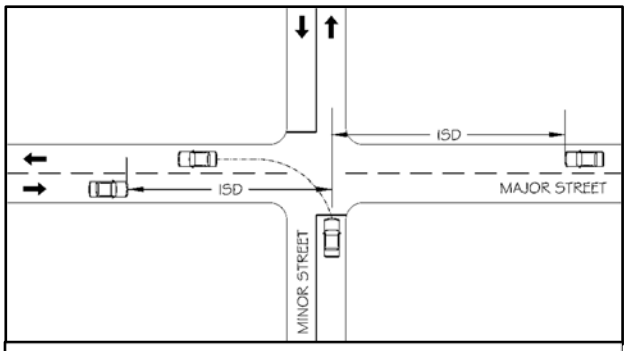
The study area was investigated for potential existing and future safety issues when the development is constructed. These transportation features are discussed in the following pages.

o 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.

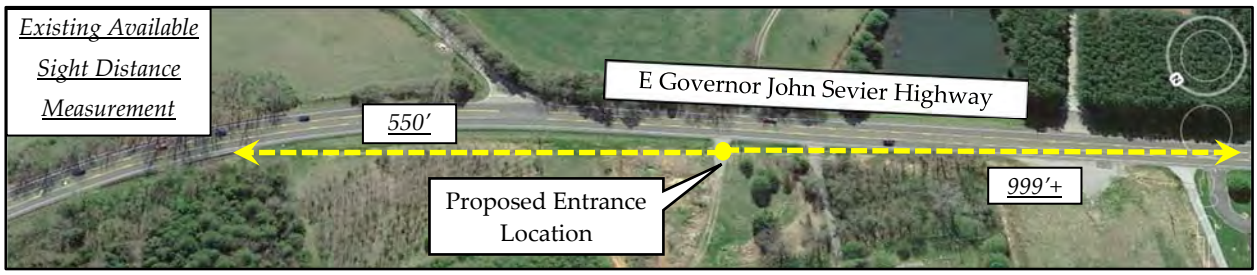


Intersection Sight Distance Diagram

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.

Due to concerns from TDOT regarding the location of the Proposed Entrance on E Governor John Sevier Highway and the sight distance to the north, a spot speed study was requested. E Governor John Sevier Highway has a posted speed limit of 45-mph at the Proposed Entrance location. The spot speed study calculated an 85th percentile speed of 56 mph for southbound traffic on E Governor John Sevier Highway. The data is included in Appendix I. For an 85th percentile speed of 56 mph, the ISD is 660 feet calculated based on AASHTO's (American Association of State Highway Transportation Officials) guidance and TDOT's standards. This distance is required for a motorist in a passenger car to safely make a left turn from the Proposed Entrance at E Governor John Sevier Highway. The ISD for exiting right turns is 580 feet. Based on the observed 85th percentile speed of 56 mph for southbound traffic on E Governor John Sevier Highway and the existing road grades, the SSD is calculated to be 520 feet to the north.

Visual observations of the sight distances at the Proposed Entrance location on E Governor John Sevier Highway were undertaken. Using a Nikon Laser Rangefinder at the Proposed Entrance location, the available sight distance was visually estimated to be 999'+ feet (limit of the rangefinder) to the south and 550 feet to the north. The sight distances from the Proposed Entrance will be adequate based on visual observation to the south but less to the north. Images of the existing sight distances at the Proposed Entrance location are labeled below with the ISD and the rangefinder measured sight distances.



View of Sight Distance on E Governor John Sevier Highway at Proposed Entrance (Looking North)

View of Sight Distance on E Governor John Sevier Highway at Proposed Entrance (Looking South)

- **EVALUATION OF TURN LANE THRESHOLDS**

An evaluation of the need for separate turn lanes on E Governor John Sevier Highway at the Proposed Entrance in the projected 2027 conditions was conducted. The evaluation did not include left turn-entering movements at the Proposed Entrance since an existing TWLTL is already provided in the center of the highway.

The criteria used for this turn lane evaluation were based on TDOT's "Highway System Access Manual". This design policy relates vehicle volume thresholds based on prevailing speeds for two-lane and four-lane roadways. The projected volumes were evaluated based on the posted speed limit of 45 mph on E Governor John Sevier Highway at the Proposed Entrance.

According to TDOT's guidelines, a separate southbound right-turn lane on E Governor John Sevier Highway is warranted at the Proposed Entrance based on the projected 2027 PM peak hour traffic volumes. The worksheets for these evaluations are provided in Appendix J.

- **PROJECTED VEHICLE QUEUES**

An additional software program was used to calculate the projected 2027 AM and PM peak hour vehicle queues at the studied intersection to determine if the existing and proposed vehicle storage lengths are adequate. The previously mentioned Synchro Traffic Software includes SimTraffic. The Synchro portion of the software performs the macroscopic calculations for intersections, and SimTraffic performs micro-simulation and animation of vehicular traffic. SimTraffic (Version 11) software was utilized to estimate the projected vehicle queues.

The 95th percentile vehicle queue is the recognized measurement in the traffic engineering profession as the design standard used when considering vehicle queue lengths. A 95th percentile vehicle queue length means 95% certainty that the vehicle queue will not extend beyond that point. The calculated vehicle queue results were based on averaging the outcome obtained during ten traffic simulations. The 95th percentile vehicle queue lengths at the studied intersections for the 2027 projected conditions are shown in Table 8. The vehicle queue worksheet results from the SimTraffic software are in Appendix K. These results include the proposed southbound exclusive right-turn lane on E Governor John Sevier Highway for the Proposed Entrance.

TABLE 8
TURN LANE STORAGE & VEHICLE QUEUE SUMMARY -
2027 PROJECTED PEAK HOUR TRAFFIC WITH THE PROJECT

INTERSECTION	APPROACH/ MOVEMENT	STORAGE LENGTH (ft)	ADEQUATE LENGTH?	SIMTRAFFIC 95th PERCENTILE QUEUE LENGTH (ft)	
				AM PEAK HOUR	PM PEAK HOUR
East Governor John Sevier Highway (NB & SB) at French Road (WB)	Westbound Left/Right	n/a	n/a	37	28
	Southbound Left	110 *	Yes	6	12
East Governor John Sevier Highway (NB & SB) at Proposed Entrance (EB)	Eastbound Left	n/a	n/a	46	46
	Eastbound Right	75	YES	44	44
	Northbound Left	TWLTL	n/a	28	47

Note: 95th percentile queues were calculated in SimTraffic 11 software
* 110 feet of left turn storage designated by painted pavement markings (additional storage provided in TWLTL)

Table 8 shows that all the projected 2027 vehicle queues will be reasonable and adequately contained in the existing and proposed turn lanes.

CONCLUSIONS & RECOMMENDATIONS

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

E Governor John Sevier Highway at the Proposed Entrance: The projected 2027 level of service calculations for the intersections of E Governor John Sevier Highway at French Road and at the Proposed Entrance resulted in reasonable LOS and vehicle delays for the existing and proposed approaches. Overall, the exiting left and right-turning vehicles from the subdivision will experience minimal queue lengths, with a calculated maximum of about two passenger vehicles in the 2027 AM and PM peak hours.

1a) The proposed internal roadway is shown in the site plan, transitioning to an exclusive left-turn lane at the intersection with E Governor John Sevier Highway. The site plan shows the exiting eastbound right-turn lane with a storage length of 75 feet, which will be adequate based on the projected 2027 vehicle queues. The projected 2027 left-turn lane vehicle queue was calculated to have a maximum of 46 feet and is not expected to block exiting vehicles from accessing the separate right-turn lane. The separate left and right exiting lanes for the development at E Governor John Sevier Highway should be marked on the pavement with the appropriate white turn arrows and delineated with white lane lines.

1b) For left turn entering traffic, the existing center TWLTL on E Governor John Sevier Highway will provide the necessary vehicle storage and be adequate in the projected conditions. The longest northbound left-turn queue entering the development is projected to be 47 feet in 2027. It is recommended that the center two-way left-turn lane (TWLTL) pavement markings on E Governor John Sevier Highway be modified to reflect an exclusive northbound left-turn lane at the Proposed Entrance. The existing pavement markings in the TWLTL should be re-striped to accommodate a dedicated minimum storage length of 50 feet for northbound left turns, and a white left-turn arrow should be applied to the pavement. Additionally, within the extent of the Proposed Entrance intersection at E Governor John Sevier Highway, the existing center TWLTL markings should be removed to indicate a public road opening/intersection.

1c) Based on the projected 2027 volumes, a separate southbound right-turn lane on E Governor John Sevier Highway is warranted for vehicles entering the development at the Proposed Entrance. A 12-foot southbound right-turn lane on E Governor John Sevier Highway is recommended to be constructed at the Proposed Entrance with 340 feet of lane change and deceleration distance. This distance should include a taper length of 180 feet (15:1). The right-turn lane should include the appropriate right-turn arrow pavement markings, as shown in the Tennessee Department of Transportation (TDOT) standard drawing T-M-4. The designer must coordinate with TDOT to design and construct this southbound right-turn lane.

1d) 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 E Governor John Sevier Highway. The stop bar should be applied a minimum of 4 feet away from the edge of E Governor John Sevier Highway and placed at the desired stopping point that maximizes the sight distance.

1e) Sight distances at the Proposed Entrance approach must not be impacted by future landscaping, signage, or vegetation. The site designer must ensure that the intersection sight distances are accounted for and provided in the design plans. Based on an observed 85th percentile speed of 56 mph for southbound traffic on E Governor John Sevier Highway, the required ISD is 660 feet. A visual inspection determined that these sight distances are available to the south. The sight distance to the north appears adequate for the stopping sight distance but does not appear to meet the required intersection sight distance. It is recommended that a registered land surveyor measure the available sight distance to the north at the Proposed Entrance location on E Governor John Sevier Highway and determine what must be removed to attain the required distance.

It is believed that the additional 110 feet of sight distance needed (660′ required – 550′ observed = 110′) could be gained by reducing the existing cut slope and vegetation on the west side of E Governor John Sevier Highway to the north of the Proposed Entrance location.

Existing Sight Distance to the North on E Governor John Sevier Highway North of the Proposed Entrance

The cut slope and vegetation are believed to be within the TDOT right-of-way. However, any earth grading or vegetation removal to increase the sight distance will require permitting and permission from TDOT.

1f) It is recommended that an advance intersection warning sign be installed on E Governor John Sevier Highway for southbound motorists. This warning signage should be an Offset Road Intersection Sign (W2-7l) with a Street Name Plaque Sign (W16-8aP) below. The Street Name Plaque Sign should denote the intersecting roads, French Road, and the chosen name for the Proposed Entrance Road. The sign should be installed on a single post for the southbound lane on E Governor John Sevier Highway, preferably 500 feet north of French Road.

1g) The existing advance intersection warning sign for northbound traffic on E Governor John Sevier Highway must be replaced with an Offset Road Intersection Sign (W2-7l). It should include a Street Name Plaque Sign (W16-8aP) below denoting the intersecting roads, French Road, and the chosen name for the Proposed Entrance Road. This existing sign on E Governor John Sevier Highway is approximately 850 feet south of the intersection of French Road and is currently posted with a Side Road Intersection (W2-2r) sign.

1h) Due to the isolated nature of this entrance on E Governor John Sevier Highway, it is recommended that intersection street lighting be provided. The developer should consider installing a single overhead roadway light to delineate the Proposed Entrance at E Governor John Sevier Highway for travel at night or in low-light conditions. This lighting would be ideally placed adjacent to the Proposed Entrance driveway and off E Governor John Sevier Highway and would fully illuminate the intersection.

1i) The construction of the Proposed Entrance on E Governor John Sevier Highway will require a TDOT Highway Entrance Permit. The developer will need to apply for this permit and coordinate with TDOT regarding their specific requirements for this entrance.

1j) Knox County requires a 400-foot minimum intersection spacing distance on Arterial roads. The intersection of E Governor John Sevier Highway at the Proposed Entrance will be 250 feet away to the southwest from French Road (centerline to centerline).

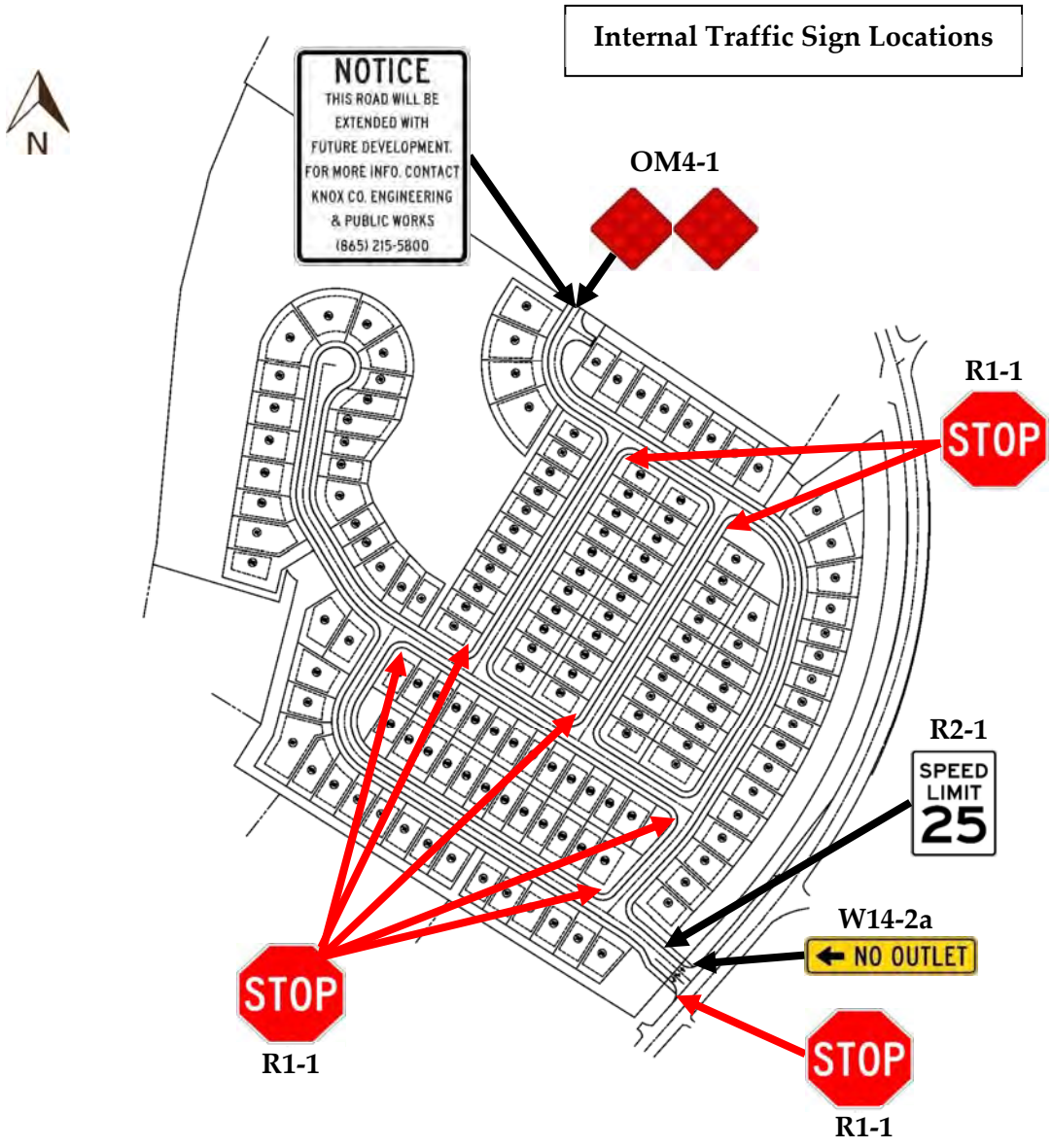
The site designer must request a variance to allow the proposed intersection spacing to be less than the minimum required. This variance should be requested since the development property has a limited access point on E Governor John Sevier Highway that will allow the required sight distance. Shifting the Proposed Entrance further to the south and away from French Road will allow the subdivision to increase the sight distance to the north.

Southbound right-turn movements from E Governor John Sevier Highway into the proposed subdivision will not create vehicle queues on E Governor John Sevier Highway since it is a free-flow movement and will be provided a separate right-turn lane. Thus, these movements will not interfere with turning movements on E Governor John Sevier Highway at French Road. These offset intersections will not have any conflicting movements, will have low turning movements from each, and vehicle queues are not expected to impact operations at either intersection. Furthermore, the few left turns from French Road onto southbound E Governor John Sevier Highway observed using the center TWLTL will still have an adequate length available to use as a temporary refuge if desired.

2 **Heartland Development Subdivision Internal Roads:** The layout plan shows one entrance on E Governor John Sevier Highway constructed for the development, as shown in Figure 3 and below.

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

2b) The image below shows the recommended internal road signage for the proposed subdivision.



Dual end-of-roadway object markers (OM4-1) should be installed at the end of the subdivision stub-out road if constructed as shown in the concept plan. An additional sign should be posted at the end of the stub-out road to follow Knoxville-Knox County Subdivision Regulations. This sign is for notification of a possible future street connection. It should state, "NOTICE – This road will be extended with future development – for more info. contact Knox Co. Engineering & Public Works (865) 215-5800".

Stop Signs (R1-1) with 24" white stop bars and other traffic signage are recommended to be installed at the internal road locations, as shown in the above image.

2c) Sight distance at the new internal intersections must not be impacted by new signage, parked cars, or future landscaping. With a 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 internal sight distance lengths are met and account for different proposed road grades.

2d) If directed by the local post office, the site designer should include a parking area and a centralized mail delivery center within the development for the subdivision residents.

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

2f) Some of the new internal roads will have long, straight road segments. Straight road segments encourage higher vehicle speeds. It is recommended that the site designer consider including traffic calming measures on the internal roads, such as speed humps or tables. Specifics regarding this recommendation should be discussed in the design phase with Knox County Engineering.

2g) All road grade and intersection elements should be designed to AASHTO, TDOT, and Knox County specifications and guidelines to ensure proper transportation operations.

Other Transportation Recommendations: Other transportation-related considerations include the following:

3a) The northbound lane of E Governor John Sevier Highway has a Reduced Speed Limit Ahead (W3-5) sign posted to the south of French Road that indicates an upcoming reduction of the speed limit from 50-mph to 45-mph. However, a 45-mph Speed Limit (R2-1) sign is not posted to the north of this sign, designating the start of the 45-mph speed zone. According to the Manual of Uniform Traffic Control Devices (MUTCD) in Section 2C.38, it states that "if used, Reduced Speed Limit Ahead signs shall be followed by a Speed Limit (R2-1) sign installed at the beginning of the zone where the speed limit applies." Since this is located on a state route, TDOT should install a 45-mph Speed Limit (R2-1) sign where the 45-mph speed zone officially begins on the highway.

3b) TDOT should consider installing a Two-Way Left Turn Only (R3-9b) sign for southbound traffic on E Governor John Sevier Highway. It would be appropriate to install this sign just south of the bridge crossing the French Broad River, where the TWLTL begins. It is recommended that this sign be installed to notify and remind motorists of the purpose of the TWLTL and that the center lane should not be used for passing other vehicles.

Two-Way Left Turn Only (R3-9b)

3c) Knox County is recommended to install a 30-mph Speed Limit (R2-1) sign on French Road off E Governor John Sevier Highway for motorists traveling east on French Road due to the lack of a speed limit sign in this direction.

3d) As part of the revised study and during the site revisit for the spot speed study, it was noted that the existing 50 mph Speed Limit Sign (R2-1) on the west of E Governor John Sevier Highway adjacent to the development property for southbound highway traffic had been knocked down and the sign was missing. TDOT should replace this sign.

APPENDIX A

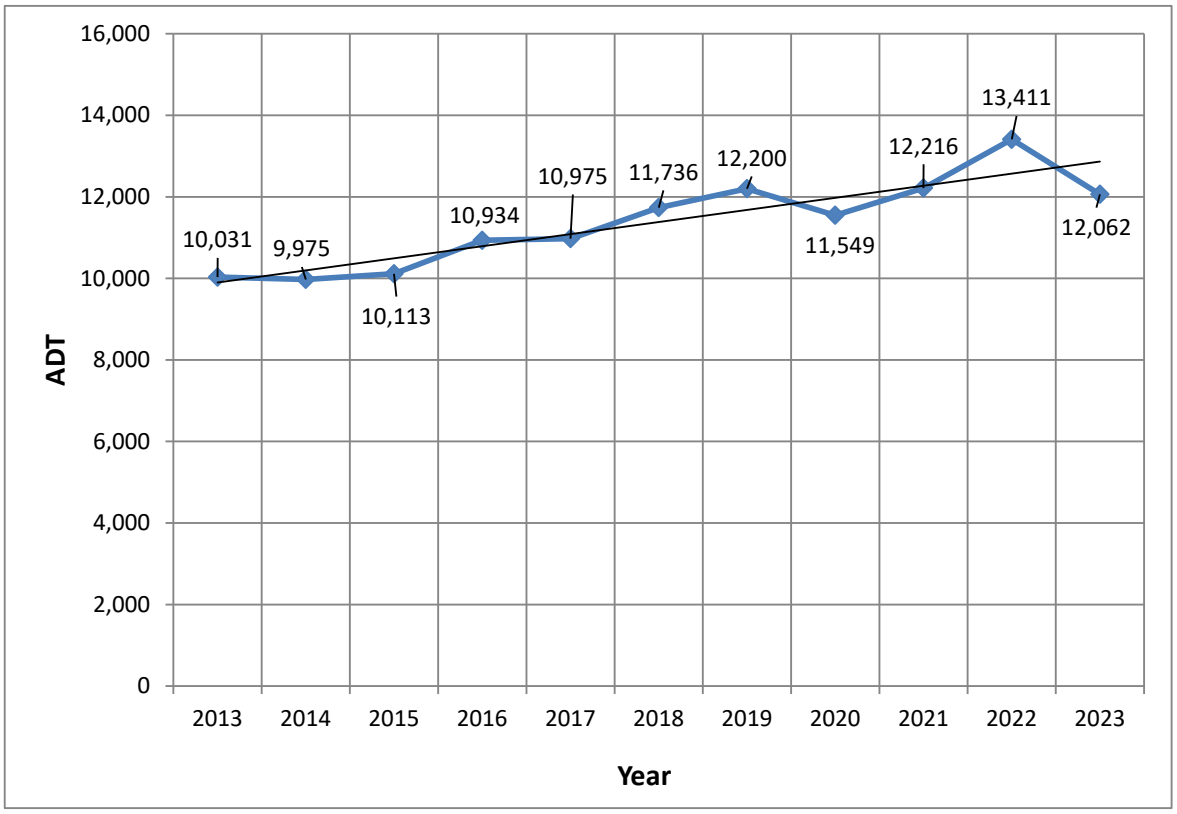
HISTORICAL TRAFFIC COUNT DATA

Historical Traffic Counts

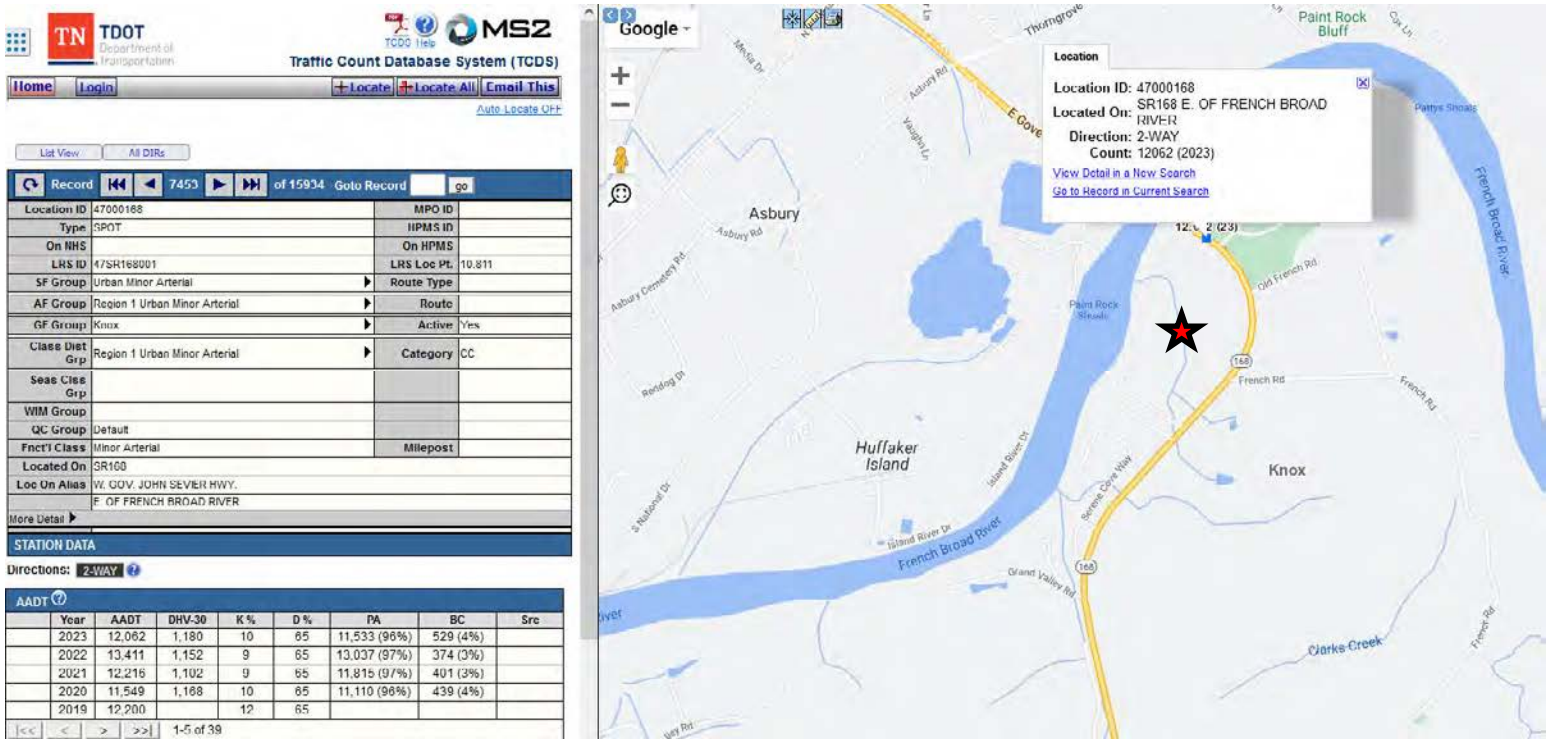
Organization: TDOT
Station ID #: 47000168
Location: East Governor John Sevier Highway, north of Old French Road

YEAR	AADT
2013	10,031
2014	9,975
2015	10,113
2016	10,934
2017	10,975
2018	11,736
2019	12,200
2020	11,549
2021	12,216
2022	13,411
2023	12,062

Trendline



2013 - 2023 Growth Rate = 20.2%
Average Annual Growth Rate = 1.9%


TN TDOT Department of Transportation
MS2
TCDS Help
Traffic Count Database System (TCDS)
Home
Login
+Locate
+Locate All
Email This
Auto Locate OFF
List View
All DIRs
Record
7453
of 15934
Goto Record
go
Location ID 47000168
Type SPOT
On NHS
LRS ID 47SR168001
SF Group Urban Minor Arterial
AF Group Region 1 Urban Minor Arterial
GF Group Knox
Class Dist Grp Region 1 Urban Minor Arterial
Seas Clss Grp
WIM Group
QC Group Default
Fnct'l Class Minor Arterial
Located On SR168
Loc On Alias W. GOV. JOHN SEVIER HWY.
F. OF FRENCH BROAD RIVER
More Detail
MPO ID
HPMS ID
On HPMS
LRS Loc Pt. 10.811
Route Type
Route
Active Yes
Category CC
Milepost
STATION DATA
Directions: 2-WAY
AADT
Year AADT DHV-30 K % D % PA BC Src
2023 12,062 1,180 10 65 11,533 (96%) 529 (4%)
2022 13,411 1,152 9 65 13,037 (97%) 374 (3%)
2021 12,216 1,102 9 65 11,815 (97%) 401 (3%)
2020 11,549 1,168 10 65 11,110 (96%) 439 (4%)
2019 12,200 12 65
1-5 of 39
Google
Location
Location ID: 47000168
Located On: SR168 E. OF FRENCH BROAD RIVER
Direction: 2-WAY
Count: 12062 (2023)
View Detail in a New Search
Go to Record in Current Search
Paint Rock Bluff
Asbury
Huffaker Island
Knox
French Broad River
Clarks Creek
Old French Rd
French Rd
Asbury Rd
Asbury Cemetery Rd
Island River Dr
Grand Valley Rd
Paint Rock Shoals

APPENDIX B

WALK SCORE

WALKSCORE

(from walkscore.com)

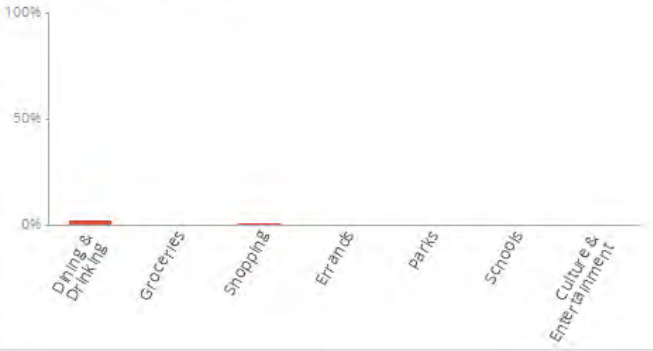
Scores for 2000 East Governor John Sevier Highway

Bike Score
13

Walk Score | Transit Score | Bike Score

Score Details | What is Walk Score

The Walk Score for 2000 East Governor John Sevier Highway is based on the following categories.



Scores for 2000 East Governor John Sevier Highway

Bike Score
13

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 2000 East Governor John Sevier Highway

Bike Score
13

Walk Score	Transit Score	Bike Score

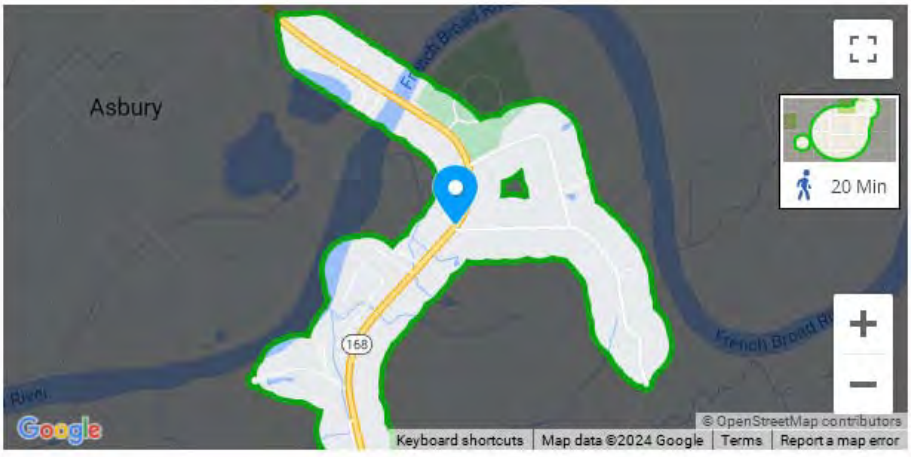
Bike Score measures whether an area is good for biking based on bike lanes and trails, hills, road connectivity, and destinations.

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 2000 East Governor John Sevier Highway.



What's Nearby

Restaurants:
Cruze Farm Pizza Barn 1.3mi

Coffee:
Green Mountain Coffee Roast... 1mi

Bars:
Ozzy's 4.5mi

Groceries:
Riverdale Nursery 1.2mi

Parks:
Eastern State Wildlife Manage... 2.7mi

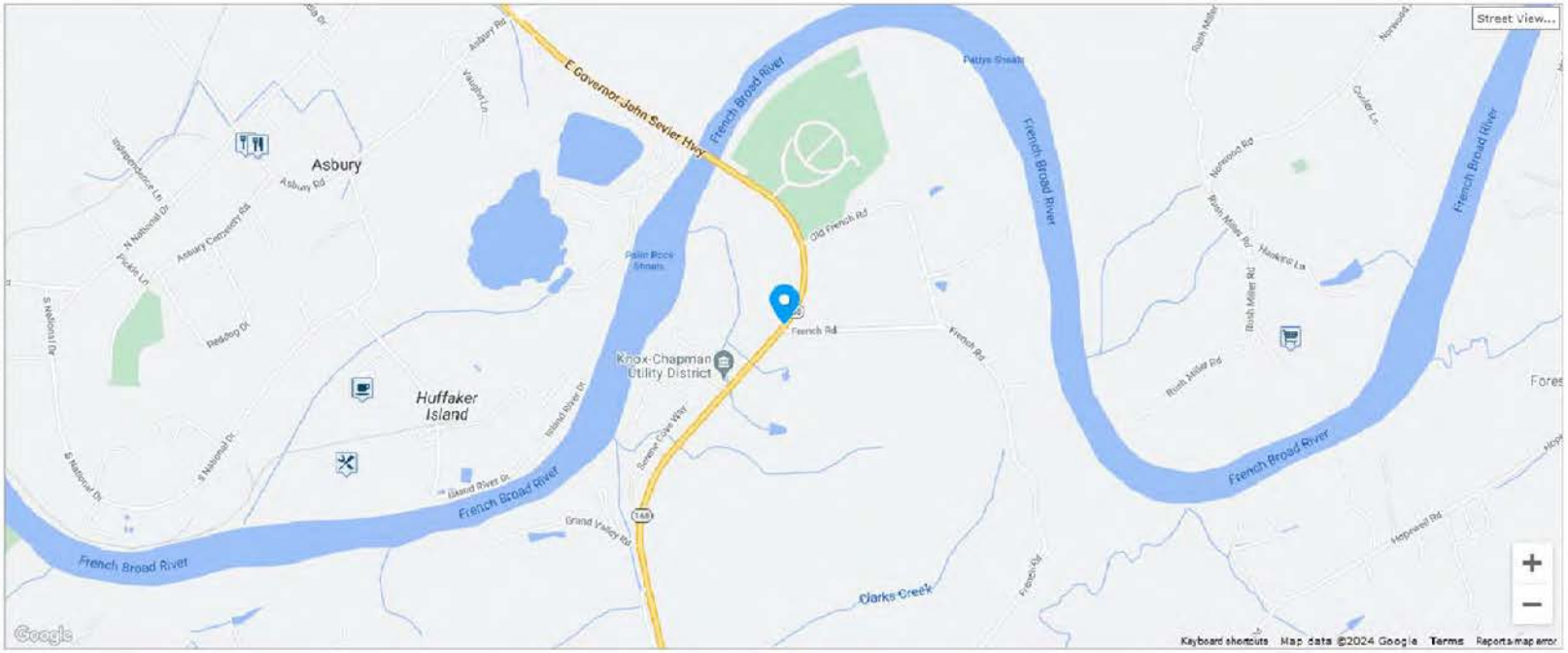
Schools:
New Hopewell Elementary Sc... 1.7mi

Shopping:
Pilot Flying J 1.3mi

Entertainment:
Redbox 3.4mi

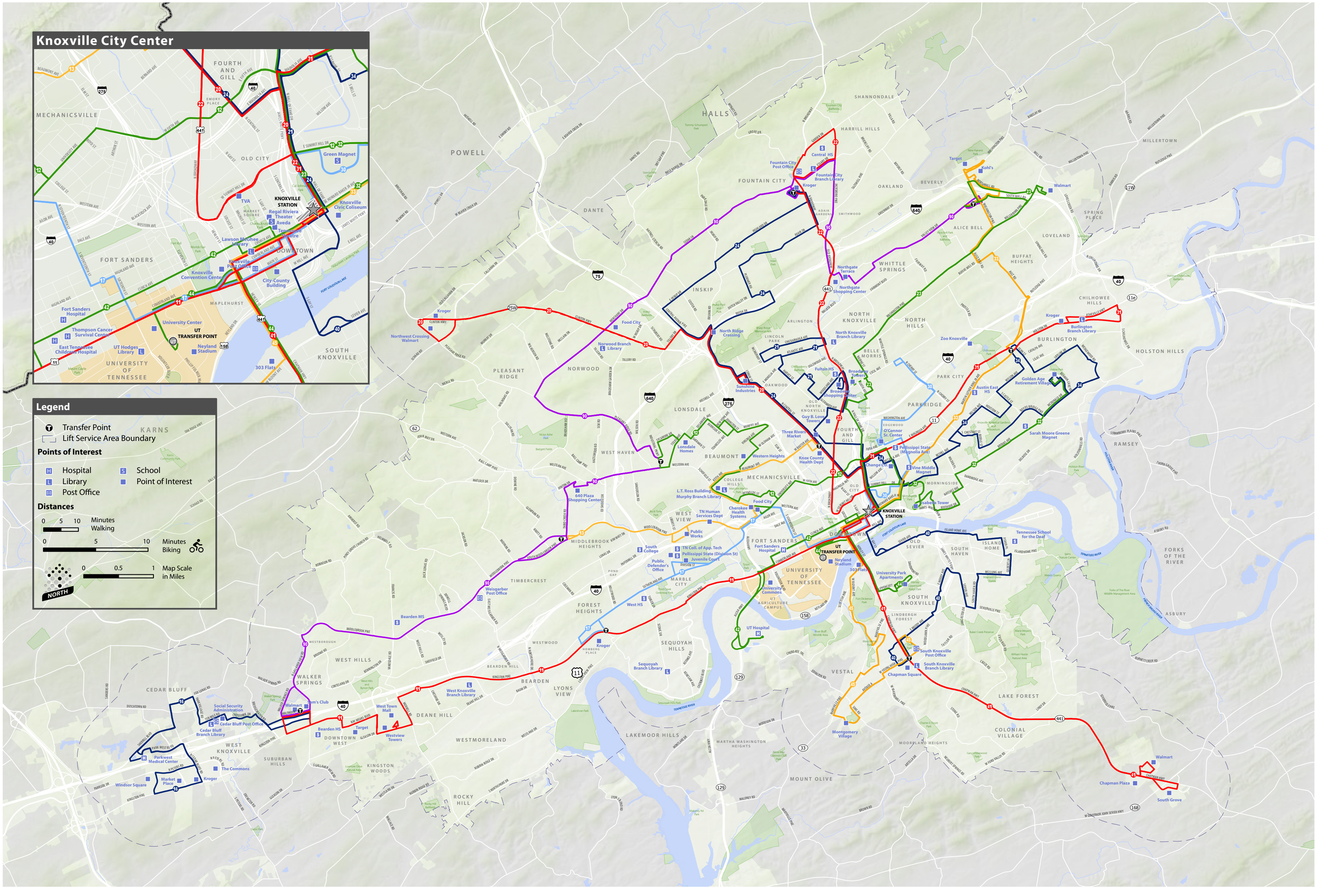
Errands:
House Hasson Hardware Co. 1.1mi

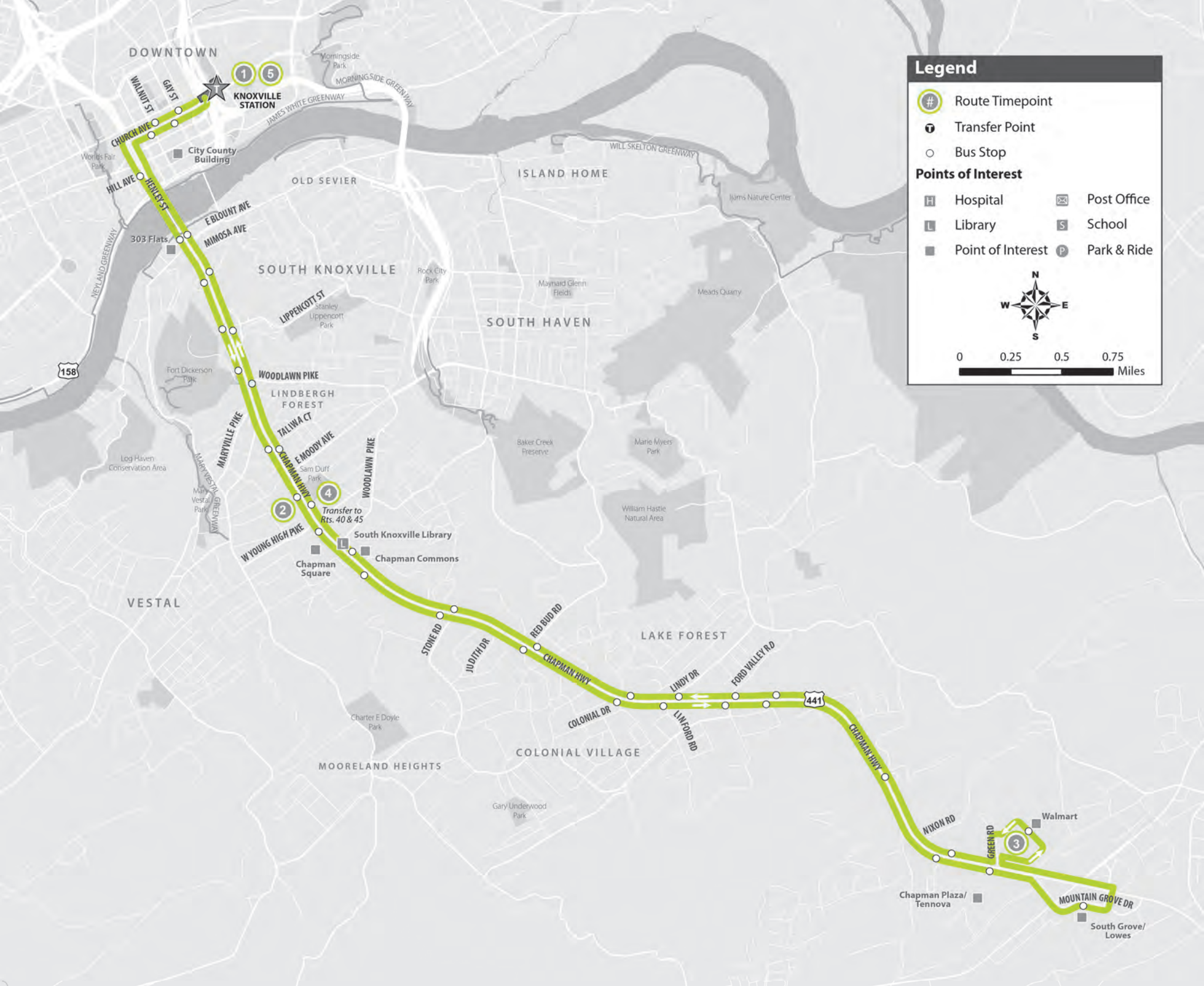
Search Nearby:



APPENDIX C

KNOXVILLE AREA TRANSIT MAP AND INFORMATION


Knoxville City Center
KNOXVILLE STATION
UT TRANSFER POINT
Legend
Transfer Point
Lift Service Area Boundary
Points of Interest
Hospital
Library
Post Office
School
Point of Interest
Distances
0 5 10 Minutes Walking
0 5 10 Minutes Biking
0 0.5 1 Map Scale in Miles
NORTH
MECHANICSVILLE
FOURTH AND GILL
OLD CITY
DOWNTOWN
FORT SANDERS
MAPLEHURST
UNIVERSITY OF TENNESSEE
SOUTH KNOXVILLE
POWELL
HALLS
SHANNONDALE
HARRILL HILLS
FOUNTAIN CITY
DANTE
OAKLAND
BEVERLY
MILLERTOWN
SPRING PLACE
LOVELAND
ALICE BELL
BUFFAT HEIGHTS
WHITTLE SPRINGS
INSKIP
ARLINGTON
NORTH KNOXVILLE
NORTH HILLS
CHILHOWEE HILLS
BURLINGTON
HOLSTON HILLS
PARK CITY
PARKRIDGE
OAKWOOD
LINCOLN PARK
BELLE MORRIS
OLD NORTH KNOXVILLE
LONSDALE
NORWOOD
PLEASANT RIDGE
WEST HAVEN
BEAUMONT
COLLEGE HILLS
WEST VIEW
MIDDLEBROOK HEIGHTS
TIMBERCREST
FOREST HEIGHTS
WESTWOOD
SEQUOYAH HILLS
MARBLE CITY
LYONS VIEW
BEARDEN
DEANE HILL
WESTMORELAND
WEST HILLS
WALKER SPRINGS
CEDAR BLUFF
WEST KNOXVILLE
SUBURBAN HILLS
KINGSTON WOODS
ROCKY HILL
LAKEMOOR HILLS
MARTHA WASHINGTON HEIGHTS
MOUNT OLIVE
VESTAL
LAKE FOREST
COLONIAL VILLAGE
MOORELAND HEIGHTS
RAMSEY
FORKS OF THE RIVER
ASBURY
ISLAND HOME
SOUTH HAVEN
OLD SEVIER
LINDBERGH FOREST
KARNS
Green Magnet
Knoxville Civic Coliseum
Regal Riviera Theater
Aveda
Tennessee Theatre
TVA
Lawson McGhee Library
Knoxville Police Dept
Knoxville Convention Center
City-County Building
Fort Sanders Hospital
Thompson Cancer Survival Center
East Tennessee Children's Hospital
UT Hodges Library
University Center
Neyland Stadium
303 Flats
Fountain City Post Office
Fountain City Branch Library
Central HS
Kroger
Target
Kohl's
Walmart
Northgate Terrace
Northgate Shopping Center
Food City
Northwest Crossing Walmart
Norwood Branch Library
North Ridge Crossing
Sunshine Industries
Fulton HS
Broadway Towers
Broadway Shopping Center
North Knoxville Branch Library
Zoo Knoxville
Burlington Branch Library
Golden Age Retirement Village
Austin East HS
Sarah Moore Greene Magnet
Three Rivers Market
Knox County Health Dept
Guy B. Love Towers
O'Connor Sr. Center
Pellissippi State (Magnolia Ave)
Change Ctr
Vine Middle Magnet
Isabella Tower
Lonsdale Homes
Western Heights
L.T. Ross Building Murphy Branch Library
640 Plaza Shopping Center
Cherokee Health Systems
TN Human Services Dept
Public Works
South College
TN Coll. of App. Tech
Pellissippi State (Division St)
Juvenile Court
Public Defender's Office
West HS
Weisgarber Post Office
Bearden MS
Kroger
Sequoyah Branch Library
University Commons
UT Agriculture Campus
UT Hospital
University Park Apartments
South Knoxville Post Office
South Knoxville Branch Library
Chapman Square
Montgomery Village
Tennessee School for the Deaf
Sam's Club
West Knoxville Branch Library
West Town Mall
Bearden HS
Target
Westview Towers
Social Security Administration
Cedar Bluff Post Office
Cedar Bluff Branch Library
Parkwest Medical Center
The Commons
Windsor Square
Market Place
Kroger
Walmart
Chapman Plaza
South Grove


DOWNTOWN
KNOXVILLE STATION
WALNUT ST
GAY ST
CHURCH AVE
HILL AVE
HENLEY ST
E BLOUNT AVE
MIMOSA AVE
303 Flats
City County Building
Worlds Fair Park
Morningside Park
MORNINGSIDE GREENWAY
JAMES WHITE GREENWAY
WILL SKELTON GREENWAY
OLD SEVIER
ISLAND HOME
Ijams Nature Center
NEYLAND GREENWAY
SOUTH KNOXVILLE
Rock City Park
Maynard Glenn Fields
Meads Quarry
LIPPENCOTT ST
Stanley Lippencott Park
SOUTH HAVEN
158
Fort Dickerson Park
WOODLAWN PIKE
LINDBERGH FOREST
TALIWA CT
E MOODY AVE
MARYVILLE PIKE
CHAPMAN HWY
WOODLAWN PIKE
Log Haven Conservation Area
Mary Vestal Park
MARY VESTAL GREENWAY
Sam Duff Park
Baker Creek Preserve
Marie Myers Park
William Hastie Natural Area
Transfer to Rts. 40 & 45
W YOUNG HIGH PIKE
South Knoxville Library
Chapman Commons
Chapman Square
VESTAL
STONE RD
JUDITH DR
RED BUD RD
CHAPMAN HWY
LAKE FOREST
LINDY DR
FORD VALLEY RD
441
COLONIAL DR
LINFORD RD
Charter E Doyle Park
MOORELAND HEIGHTS
COLONIAL VILLAGE
Gary Underwood Park
CHAPMAN HWY
NIXON RD
GREEN RD
Walmart
Chapman Plaza/ Tennova
MOUNTAIN GROVE DR
South Grove/ Lowes
Legend
Route Timepoint
Transfer Point
Bus Stop
Points of Interest
Hospital
Post Office
Library
School
Point of Interest
Park & Ride
N
W
E
S
0
0.25
0.5
0.75
Miles

Route 41 - Chapman Highway: Weekdays

Going away from downtown			*Going toward downtown*	
Knoxville Station Bay P	Chapman Hwy past Moody	Walmart	Chapman Hwy past Young High Pike	Knoxville Station Bay P
1	2	3	4	5
		5:41 AM	5:50 AM	6:10 AM
6:15 AM	6:26 AM	6:41 AM	6:50 AM	7:10 AM
6:45 AM	6:56 AM	7:11 AM	7:20 AM	7:40 AM
7:15 AM	7:26 AM	7:41 AM	7:50 AM	8:10 AM
7:45 AM	7:56 AM	8:11 AM	8:20 AM	8:40 AM
8:15 AM	8:26 AM	8:41 AM	8:50 AM	9:10 AM
8:45 AM	8:56 AM	9:11 AM	9:20 AM	9:40 AM
9:15 AM	9:26 AM	9:41 AM	9:50 AM	10:10 AM
9:45 AM	9:56 AM	10:11 AM	10:20 AM	10:40 AM
10:15 AM	10:26 AM	10:41 AM	10:50 AM	11:10 AM
10:45 AM	10:56 AM	11:11 AM	11:20 AM	11:40 AM
11:15 AM	11:26 AM	11:41 AM	11:50 AM	12:10 PM
11:45 AM	11:56 AM	12:11 PM	12:20 PM	12:40 PM
12:15 PM	12:26 PM	12:41 PM	12:50 PM	1:10 PM
12:45 PM	12:56 PM	1:11 PM	1:20 PM	1:40 PM
1:15 PM	1:26 PM	1:41 PM	1:50 PM	2:10 PM
1:45 PM	1:56 PM	2:11 PM	2:20 PM	2:40 PM
2:15 PM	2:26 PM	2:41 PM	2:50 PM	3:10 PM
2:45 PM	2:56 PM	3:11 PM	3:20 PM	3:40 PM
3:15 PM	3:26 PM	3:41 PM	3:50 PM	4:10 PM
3:45 PM	3:56 PM	4:11 PM	4:20 PM	4:40 PM
4:15 PM	4:26 PM	4:41 PM	4:50 PM	5:10 PM
4:45 PM	4:56 PM	5:11 PM	5:20 PM	5:40 PM
5:15 PM	5:26 PM	5:41 PM	5:50 PM	6:10 PM
5:45 PM	5:56 PM	6:11 PM	6:20 PM	6:40 PM
6:15 PM	6:26 PM	6:41 PM	6:50 PM	7:10 PM
6:45 PM	6:56 PM	7:11 PM	7:20 PM	7:40 PM
7:15 PM	7:26 PM	7:41 PM	7:50 PM	8:10 PM
7:45 PM	7:56 PM	8:11 PM	8:20 PM	8:40 PM
8:15 PM	8:26 PM	8:41 PM	8:50 PM	9:10 PM
8:45 PM	8:56 PM	9:11 PM	9:20 PM	9:40 PM
9:15 PM	9:26 PM	9:41 PM	9:50 PM	10:10 PM
9:45 PM	9:56 PM	10:11 PM	10:20 PM	10:40 PM
10:15 PM	10:26 PM	10:41 PM	10:50 PM	11:10 PM
11:15 PM	11:26 PM	11:41 PM	11:50 PM	

Route 41 - Chapman Highway: SATURDAYS

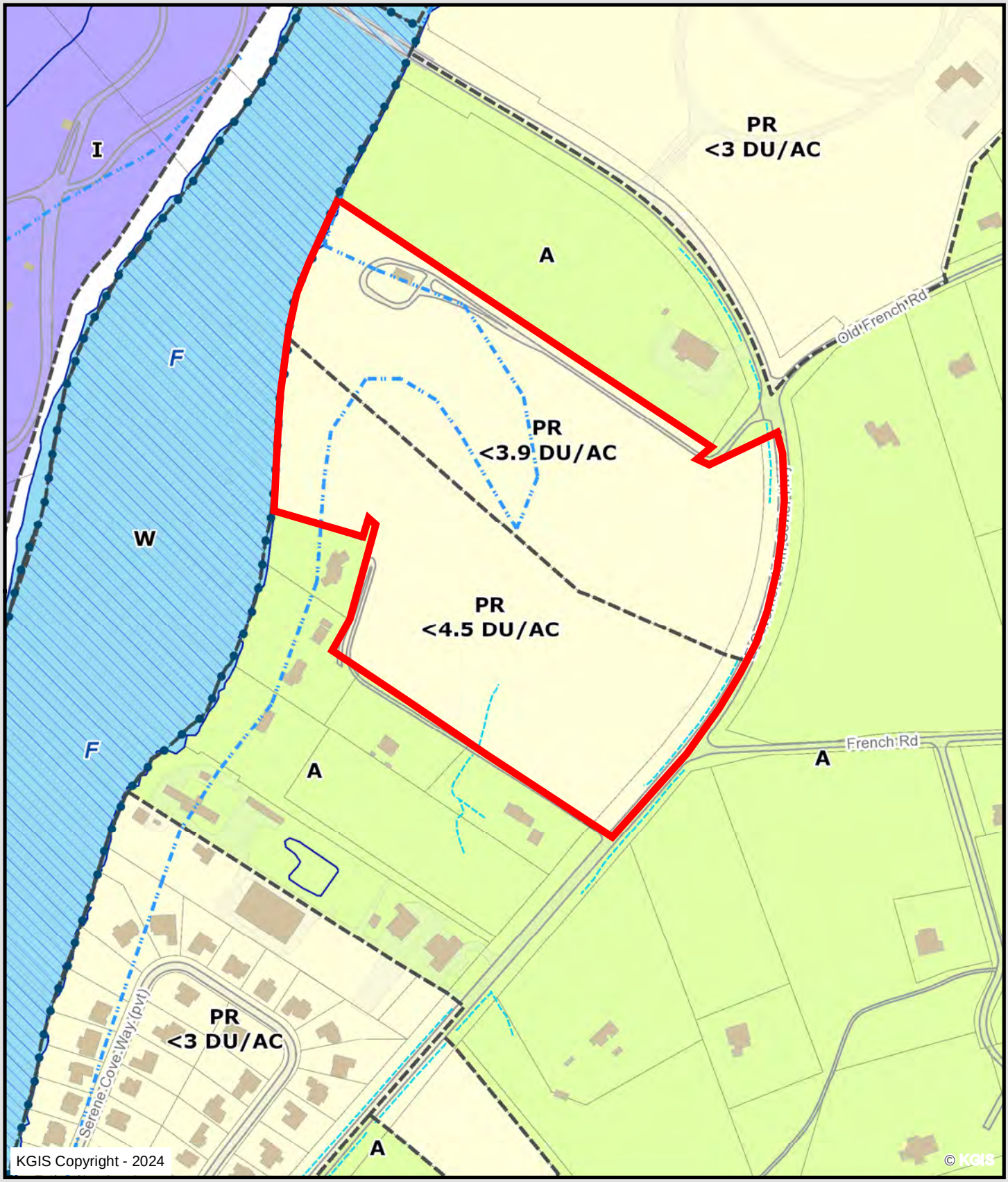
Going away from downtown			*Going toward downtown*	
Knoxville Station Bay P	Chapman Hwy past Moody	Walmart	Chapman Hwy past Young High Pike	Knoxville Station Bay P
1	2	3	4	5
7:15 AM	7:26 AM	7:41 AM	7:50 AM	8:10 AM
7:45 AM	7:56 AM	8:11 AM	8:20 AM	8:40 AM
8:15 AM	8:26 AM	8:41 AM	8:50 AM	9:10 AM
8:45 AM	8:56 AM	9:11 AM	9:20 AM	9:40 AM
9:15 AM	9:26 AM	9:41 AM	9:50 AM	10:10 AM
9:45 AM	9:56 AM	10:11 AM	10:20 AM	10:40 AM
10:15 AM	10:26 AM	10:41 AM	10:50 AM	11:10 AM
10:45 AM	10:56 AM	11:11 AM	11:20 AM	11:40 AM
11:15 AM	11:26 AM	11:41 AM	11:50 AM	12:10 PM
11:45 AM	11:56 AM	12:11 PM	12:20 PM	12:40 PM
12:15 PM	12:26 PM	12:41 PM	12:50 PM	1:10 PM
12:45 PM	12:56 PM	1:11 PM	1:20 PM	1:40 PM
1:15 PM	1:26 PM	1:41 PM	1:50 PM	2:10 PM
1:45 PM	1:56 PM	2:11 PM	2:20 PM	2:40 PM
2:15 PM	2:26 PM	2:41 PM	2:50 PM	3:10 PM
2:45 PM	2:56 PM	3:11 PM	3:20 PM	3:40 PM
3:15 PM	3:26 PM	3:41 PM	3:50 PM	4:10 PM
3:45 PM	3:56 PM	4:11 PM	4:20 PM	4:40 PM
4:15 PM	4:26 PM	4:41 PM	4:50 PM	5:10 PM
4:45 PM	4:56 PM	5:11 PM	5:20 PM	5:40 PM
5:15 PM	5:26 PM	5:41 PM	5:50 PM	6:10 PM
5:45 PM	5:56 PM	6:11 PM	6:20 PM	6:40 PM
6:15 PM	6:26 PM	6:41 PM	6:50 PM	7:10 PM
6:45 PM	6:56 PM	7:11 PM	7:20 PM	7:40 PM
7:15 PM	7:26 PM	7:41 PM	7:50 PM	8:10 PM
7:45 PM	7:56 PM	8:11 PM	8:20 PM	8:40 PM
8:15 PM	8:26 PM	8:41 PM	8:50 PM	9:10 PM
8:45 PM	8:56 PM	9:11 PM	9:20 PM	9:40 PM
9:15 PM	9:26 PM	9:41 PM	9:50 PM	10:10 PM
9:45 PM	9:56 PM	10:11 PM	10:20 PM	10:40 PM
10:15 PM	10:26 PM	10:41 PM	10:50 PM	11:10 PM
10:45 PM	10:56 PM	11:11 PM	11:20 PM	11:40 PM
11:15 PM	11:26 PM	11:41 PM	11:50 PM	12:10 AM

Route 41 - Chapman Highway: SUNDAYS

Going away from downtown			*Going toward downtown*	
Knoxville Station Bay P	Chapman Hwy past Moody	Walmart	Chapman Hwy past Young High Pike	Knoxville Station Bay P
1	2	3	4	5
8:15 AM	8:26 AM	8:41 AM	8:50 AM	9:10 AM
9:15 AM	9:26 AM	9:41 AM	9:50 AM	10:10 AM
10:15 AM	10:26 AM	10:41 AM	10:50 AM	11:10 AM
11:15 AM	11:26 AM	11:41 AM	11:50 AM	12:10 PM
12:15 PM	12:26 PM	12:41 PM	12:50 PM	1:10 PM
1:15 PM	1:26 PM	1:41 PM	1:50 PM	2:10 PM
2:15 PM	2:26 PM	2:41 PM	2:50 PM	3:10 PM
3:15 PM	3:26 PM	3:41 PM	3:50 PM	4:10 PM
4:15 PM	4:26 PM	4:41 PM	4:50 PM	5:10 PM
5:15 PM	5:26 PM	5:41 PM		

APPENDIX D

ZONING MAP



Zoning Map

(as of 2.18.24)

Knoxville - Knox County - KUB Geographic Information System

Printed: 2/18/2024 at 3:31:33 PM

0 200 400 800

ft

APPENDIX E

MANUAL TRAFFIC COUNT DATA

TRAFFIC COUNT DATA

Major Street: E Governor John Sevier Highway (SB and NB)
Minor Street: French Road (WB)
Traffic Control: Stop Sign on Minor Street

2/13/2024 (Tuesday)
Partly Cloudy and Mild
Conducted by: Ajax Engineering

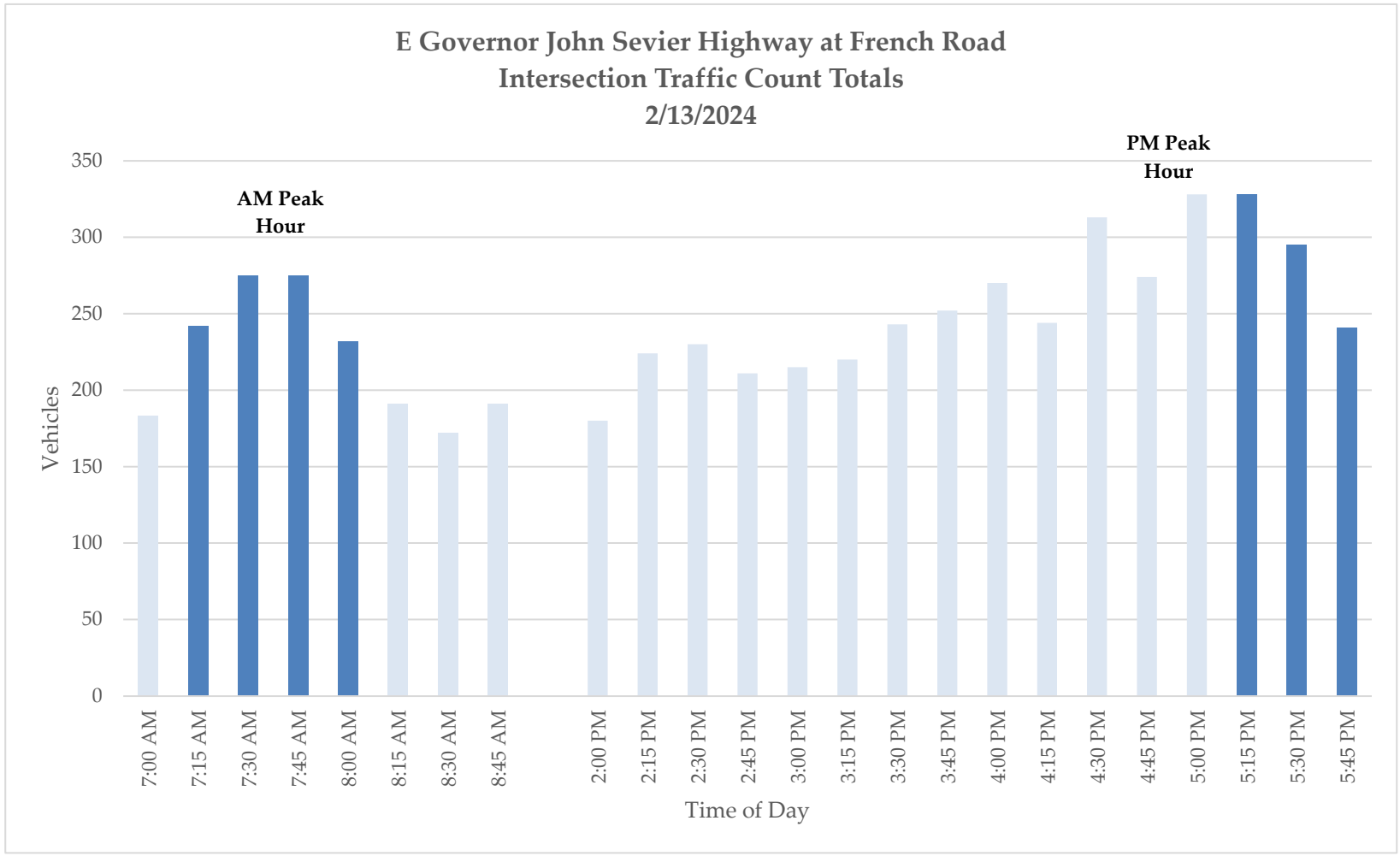
	E Governor John Sevier Highway		French Road		E Governor John Sevier Highway			
TIME	SOUTHBOUND		WESTBOUND		NORTHBOUND		VEHICLE	PEAK
BEGIN	LT	THRU	LT	RT	THRU	RT	TOTAL	HOUR
7:00 AM	0	85	1	4	93	0	183	
7:15 AM	1	116	3	3	119	0	242	**7:15 AM - 8:15 AM**
7:30 AM	0	109	3	1	162	0	275	
7:45 AM	1	118	2	2	152	0	275	
8:00 AM	1	119	1	3	107	1	232	
8:15 AM	0	93	2	0	95	1	191	
8:30 AM	0	84	0	1	87	0	172	
8:45 AM	0	97	0	2	91	1	191	
TOTAL	3	821	12	16	906	3	1761	
2:00 PM	1	90	4	0	84	1	180	
2:15 PM	2	100	3	1	116	2	224	
2:30 PM	1	129	1	0	98	1	230	
2:45 PM	1	114	0	0	96	0	211	
3:00 PM	2	114	2	0	97	0	215	
3:15 PM	3	126	0	0	88	3	220	
3:30 PM	1	140	1	1	98	2	243	
3:45 PM	3	133	1	0	112	3	252	
4:00 PM	1	144	0	1	124	0	270	
4:15 PM	1	138	0	1	103	1	244	
4:30 PM	1	183	0	1	126	2	313	**4:30 PM - 5:30 PM**
4:45 PM	0	141	2	0	130	1	274	
5:00 PM	1	193	1	1	132	0	328	
5:15 PM	3	194	1	4	123	3	328	
5:30 PM	3	138	2	1	151	0	295	
5:45 PM	0	136	1	1	101	2	241	
TOTAL	24	2213	19	12	1779	21	4068	

2024 AM Peak Hour **7:15 AM - 8:15 AM**

	E Governor John Sevier Highway		French Road		E Governor John Sevier Highway	
TIME	SOUTHBOUND		WESTBOUND		NORTHBOUND	
BEGIN	LT	THRU	LT	RT	THRU	RT
7:15 AM	1	116	3	3	119	0
7:30 AM	0	109	3	1	162	0
7:45 AM	1	118	2	2	152	0
8:00 AM	1	119	1	3	107	1
TOTAL	**3**	**462**	**9**	**9**	**540**	**1**
PHF	**0.75**	**0.97**	**0.75**	**0.75**	**0.83**	**0.25**
TRUCK %	**0.0%**	**9.3%**	**0.0%**	**0.0%**	**2.8%**	**0.0%**

2024 PM Peak Hour **4:30 PM - 5:30 PM**

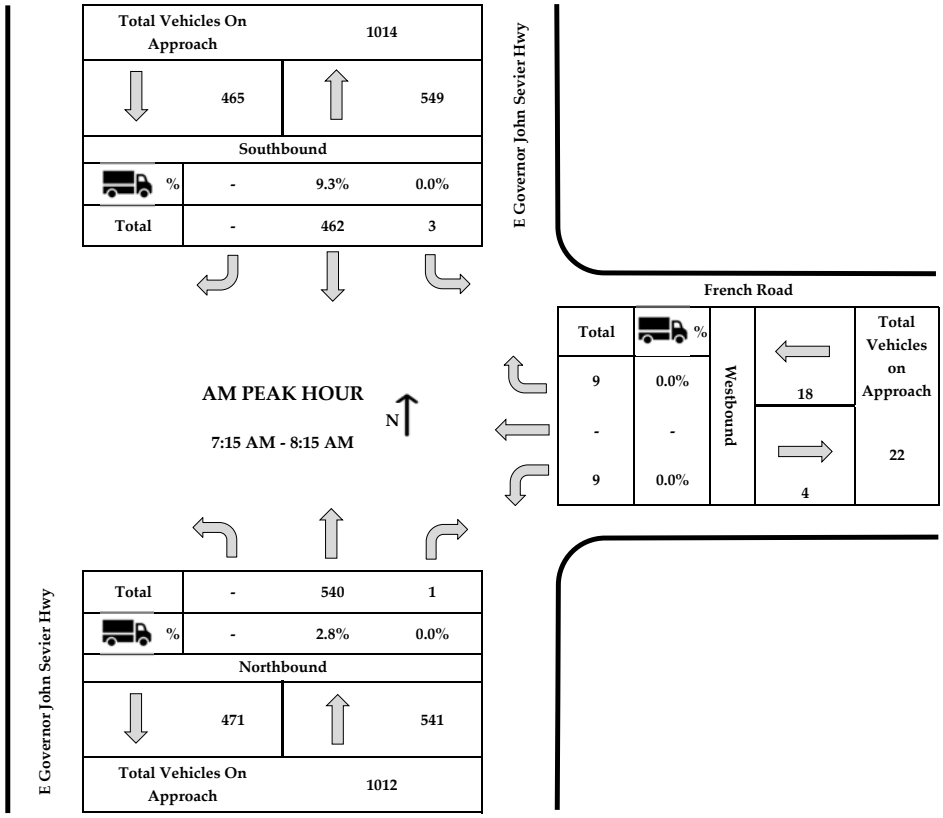
	E Governor John Sevier Highway		French Road		E Governor John Sevier Highway	
TIME	SOUTHBOUND		WESTBOUND		NORTHBOUND	
BEGIN	LT	THRU	LT	RT	THRU	RT
4:30 PM	1	183	0	1	126	2
4:45 PM	0	141	2	0	130	1
5:00 PM	1	193	1	1	132	0
5:15 PM	3	194	1	4	123	3
TOTAL	**5**	**711**	**4**	**6**	**511**	**6**
PHF	**0.42**	**0.92**	**0.50**	**0.38**	**0.97**	**0.50**
TRUCK %	**0.0%**	**2.0%**	**0.0%**	**0.0%**	**4.9%**	**0.0%**

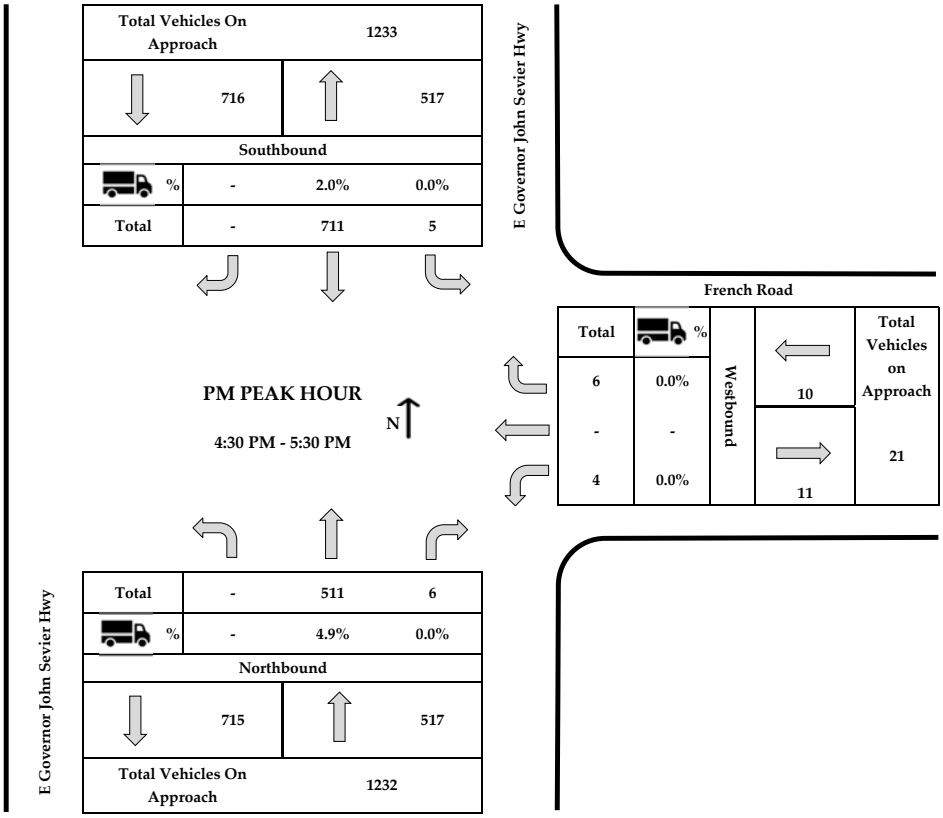

E Governor John Sevier Highway at French Road
Intersection Traffic Count Totals
2/13/2024
AM Peak Hour
PM Peak Hour
Vehicles
350
300
250
200
150
100
50
0
7:00 AM
7:15 AM
7:30 AM
7:45 AM
8:00 AM
8:15 AM
8:30 AM
8:45 AM
2:00 PM
2:15 PM
2:30 PM
2:45 PM
3:00 PM
3:15 PM
3:30 PM
3:45 PM
4:00 PM
4:15 PM
4:30 PM
4:45 PM
5:00 PM
5:15 PM
5:30 PM
5:45 PM
Time of Day

PEAK HOUR DATA

Major Street: E Governor John Sevier Highway (SB and NB)
Minor Street: French Road (WB)
Traffic Control: Stop Sign on Minor Street

2/13/2024 (Tuesday)
Partly Cloudy and Mild
Conducted by: Ajax Engineering





TRAFFIC COUNT DATA

Major Street: E Governor John Sevier Highway (SB and NB)
Minor Street: Stonesilo Way (EB)
Traffic Control: Stop Sign on Minor Street

2/13/2024 (Tuesday)
Partly Cloudy and Mild
Conducted by: Ajax Engineering

2024 AM Peak Hour

	E Govenor John Sevier Highway		E Govenor John Sevier Highway		Stone Silo Way	
TIME	SOUTHBOUND		NORTHBOUND		EASTBOUND	
BEGIN	THRU	RT	LT	THRU	LT	RT
7:15 AM	-	1	2	-	3	4
7:30 AM	-	0	2	-	2	7
7:45 AM	-	1	1	-	0	2
8:00 AM	-	0	0	-	0	6
TOTAL	**-**	**2**	**5**	**-**	**5**	**19**
% ENTER	**-**	**29%**	**71%**	**-**	**-**	**-**
% EXIT	**-**	**-**	**-**	**-**	**21%**	**79%**

2024 PM Peak Hour

	E Govenor John Sevier Highway		E Govenor John Sevier Highway		Stone Silo Way	
TIME	SOUTHBOUND		NORTHBOUND		EASTBOUND	
BEGIN	THRU	RT	LT	THRU	LT	RT
4:30 PM	-	2	1	-	1	1
4:45 PM	-	1	3	-	0	0
5:00 PM	-	2	1	-	0	0
5:15 PM	-	4	1	-	0	1
TOTAL	**-**	**9**	**6**	**-**	**1**	**2**
% ENTER	**-**	**60%**	**40%**	**-**	**-**	**-**
% EXIT	**-**	**-**	**-**	**-**	**33%**	**67%**

APPENDIX F

CAPACITY ANALYSES – HCM WORKSHEETS (SYNCHRO 11)

EXISTING CONDITIONS

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	9	9	540	1	3	462
Future Vol, veh/h	9	9	540	1	3	462
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	-	-	-	110	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-4	-	1	-	-	-1
Peak Hour Factor	75	75	83	25	75	97
Heavy Vehicles, %	0	0	3	0	0	9
Mvmt Flow	12	12	651	4	4	476

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1137	653	0	0	655	0
Stage 1	653	-	-	-	-	-
Stage 2	484	-	-	-	-	-
Critical Hdwy	5.6	5.8	-	-	4.1	-
Critical Hdwy Stg 1	4.6	-	-	-	-	-
Critical Hdwy Stg 2	4.6	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	290	506	-	-	942	-
Stage 1	603	-	-	-	-	-
Stage 2	695	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	289	506	-	-	942	-
Mov Cap-2 Maneuver	425	-	-	-	-	-
Stage 1	603	-	-	-	-	-
Stage 2	692	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.2	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	462	942	-
HCM Lane V/C Ratio	-	-	0.052	0.004	-
HCM Control Delay (s)	-	-	13.2	8.8	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	6	511	6	5	711
Future Vol, veh/h	4	6	511	6	5	711
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	-	-	-	110	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-4	-	1	-	-	-1
Peak Hour Factor	50	38	97	50	42	92
Heavy Vehicles, %	0	0	5	0	0	2
Mvmt Flow	8	16	527	12	12	773

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1330	533	0	0	539	0
Stage 1	533	-	-	-	-	-
Stage 2	797	-	-	-	-	-
Critical Hdwy	5.6	5.8	-	-	4.1	-
Critical Hdwy Stg 1	4.6	-	-	-	-	-
Critical Hdwy Stg 2	4.6	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	232	584	-	-	1040	-
Stage 1	667	-	-	-	-	-
Stage 2	534	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	229	584	-	-	1040	-
Mov Cap-2 Maneuver	371	-	-	-	-	-
Stage 1	667	-	-	-	-	-
Stage 2	528	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.7	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	489	1040	-
HCM Lane V/C Ratio	-	-	0.049	0.011	-
HCM Control Delay (s)	-	-	12.7	8.5	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-

PROJECTED CONDITIONS WITHOUT THE PROJECT

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	10	572	1	3	490
Future Vol, veh/h	10	10	572	1	3	490
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	-	-	-	110	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-4	-	1	-	-	-1
Peak Hour Factor	75	75	83	25	75	97
Heavy Vehicles, %	0	0	3	0	0	9
Mvmt Flow	13	13	689	4	4	505

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1204	691	0	0	693	0
Stage 1	691	-	-	-	-	-
Stage 2	513	-	-	-	-	-
Critical Hdwy	5.6	5.8	-	-	4.1	-
Critical Hdwy Stg 1	4.6	-	-	-	-	-
Critical Hdwy Stg 2	4.6	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	268	484	-	-	912	-
Stage 1	584	-	-	-	-	-
Stage 2	678	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	267	484	-	-	912	-
Mov Cap-2 Maneuver	407	-	-	-	-	-
Stage 1	584	-	-	-	-	-
Stage 2	675	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.7	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	442	912	-
HCM Lane V/C Ratio	-	-	0.06	0.004	-
HCM Control Delay (s)	-	-	13.7	9	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	6	542	6	5	754
Future Vol, veh/h	4	6	542	6	5	754
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	-	-	-	110	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-4	-	1	-	-	-1
Peak Hour Factor	50	38	97	50	42	92
Heavy Vehicles, %	0	0	5	0	0	2
Mvmt Flow	8	16	559	12	12	820

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1409	565	0	0	571	0
Stage 1	565	-	-	-	-	-
Stage 2	844	-	-	-	-	-
Critical Hdwy	5.6	5.8	-	-	4.1	-
Critical Hdwy Stg 1	4.6	-	-	-	-	-
Critical Hdwy Stg 2	4.6	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	211	562	-	-	1012	-
Stage 1	649	-	-	-	-	-
Stage 2	513	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	208	562	-	-	1012	-
Mov Cap-2 Maneuver	353	-	-	-	-	-
Stage 1	649	-	-	-	-	-
Stage 2	507	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.1	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	469	1012	-
HCM Lane V/C Ratio	-	-	0.051	0.012	-
HCM Control Delay (s)	-	-	13.1	8.6	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-

PROJECTED CONDITIONS WITH THE PROJECT

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	10	604	1	3	501
Future Vol, veh/h	10	10	604	1	3	501
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	-	-	-	110	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-4	-	1	-	-	-1
Peak Hour Factor	75	75	83	25	75	97
Heavy Vehicles, %	0	0	3	0	0	9
Mvmt Flow	13	13	728	4	4	516

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1254	730	0	0	732	0
Stage 1	730	-	-	-	-	-
Stage 2	524	-	-	-	-	-
Critical Hdwy	5.6	5.8	-	-	4.1	-
Critical Hdwy Stg 1	4.6	-	-	-	-	-
Critical Hdwy Stg 2	4.6	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	253	462	-	-	882	-
Stage 1	565	-	-	-	-	-
Stage 2	672	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	252	462	-	-	882	-
Mov Cap-2 Maneuver	393	-	-	-	-	-
Stage 1	565	-	-	-	-	-
Stage 2	669	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	425	882	-
HCM Lane V/C Ratio	-	-	0.063	0.005	-
HCM Control Delay (s)	-	-	14	9.1	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	32	49	16	573	500	11
Future Vol, veh/h	32	49	16	573	500	11
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	75	75	-	-	240
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	1	-1	-
Peak Hour Factor	90	90	90	83	97	90
Heavy Vehicles, %	0	0	0	3	9	0
Mvmt Flow	36	54	18	690	515	12

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1241	515	527	0	-	0
Stage 1	515	-	-	-	-	-
Stage 2	726	-	-	-	-	-
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	195	564	1050	-	-	-
Stage 1	604	-	-	-	-	-
Stage 2	483	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	192	564	1050	-	-	-
Mov Cap-2 Maneuver	329	-	-	-	-	-
Stage 1	594	-	-	-	-	-
Stage 2	483	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.2	0.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1050	-	329	564	-	-
HCM Lane V/C Ratio	0.017	-	0.108	0.097	-	-
HCM Control Delay (s)	8.5	-	17.3	12.1	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.4	0.3	-	-

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	6	564	6	5	809
Future Vol, veh/h	4	6	564	6	5	809
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	-	-	-	110	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-4	-	1	-	-	-1
Peak Hour Factor	50	38	97	50	42	92
Heavy Vehicles, %	0	0	5	0	0	2
Mvmt Flow	8	16	581	12	12	879

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1490	587	0	0	593	0
Stage 1	587	-	-	-	-	-
Stage 2	903	-	-	-	-	-
Critical Hdwy	5.6	5.8	-	-	4.1	-
Critical Hdwy Stg 1	4.6	-	-	-	-	-
Critical Hdwy Stg 2	4.6	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	192	548	-	-	993	-
Stage 1	638	-	-	-	-	-
Stage 2	487	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	190	548	-	-	993	-
Mov Cap-2 Maneuver	334	-	-	-	-	-
Stage 1	638	-	-	-	-	-
Stage 2	481	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.4	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	451	993	-
HCM Lane V/C Ratio	-	-	0.053	0.012	-
HCM Control Delay (s)	-	-	13.4	8.7	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	22	32	37	548	758	55
Future Vol, veh/h	22	32	37	548	758	55
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	75	75	-	-	240
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	1	-1	-
Peak Hour Factor	90	90	90	97	92	90
Heavy Vehicles, %	0	0	0	5	2	0
Mvmt Flow	24	36	41	565	824	61

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1471	824	885	0	-	0
Stage 1	824	-	-	-	-	-
Stage 2	647	-	-	-	-	-
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	141	376	773	-	-	-
Stage 1	434	-	-	-	-	-
Stage 2	525	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	134	376	773	-	-	-
Mov Cap-2 Maneuver	270	-	-	-	-	-
Stage 1	411	-	-	-	-	-
Stage 2	525	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.3	0.7	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	773	-	270	376	-	-
HCM Lane V/C Ratio	0.053	-	0.091	0.095	-	-
HCM Control Delay (s)	9.9	-	19.7	15.6	-	-
HCM Lane LOS	A	-	C	C	-	-
HCM 95th %tile Q(veh)	0.2	-	0.3	0.3	-	-

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)

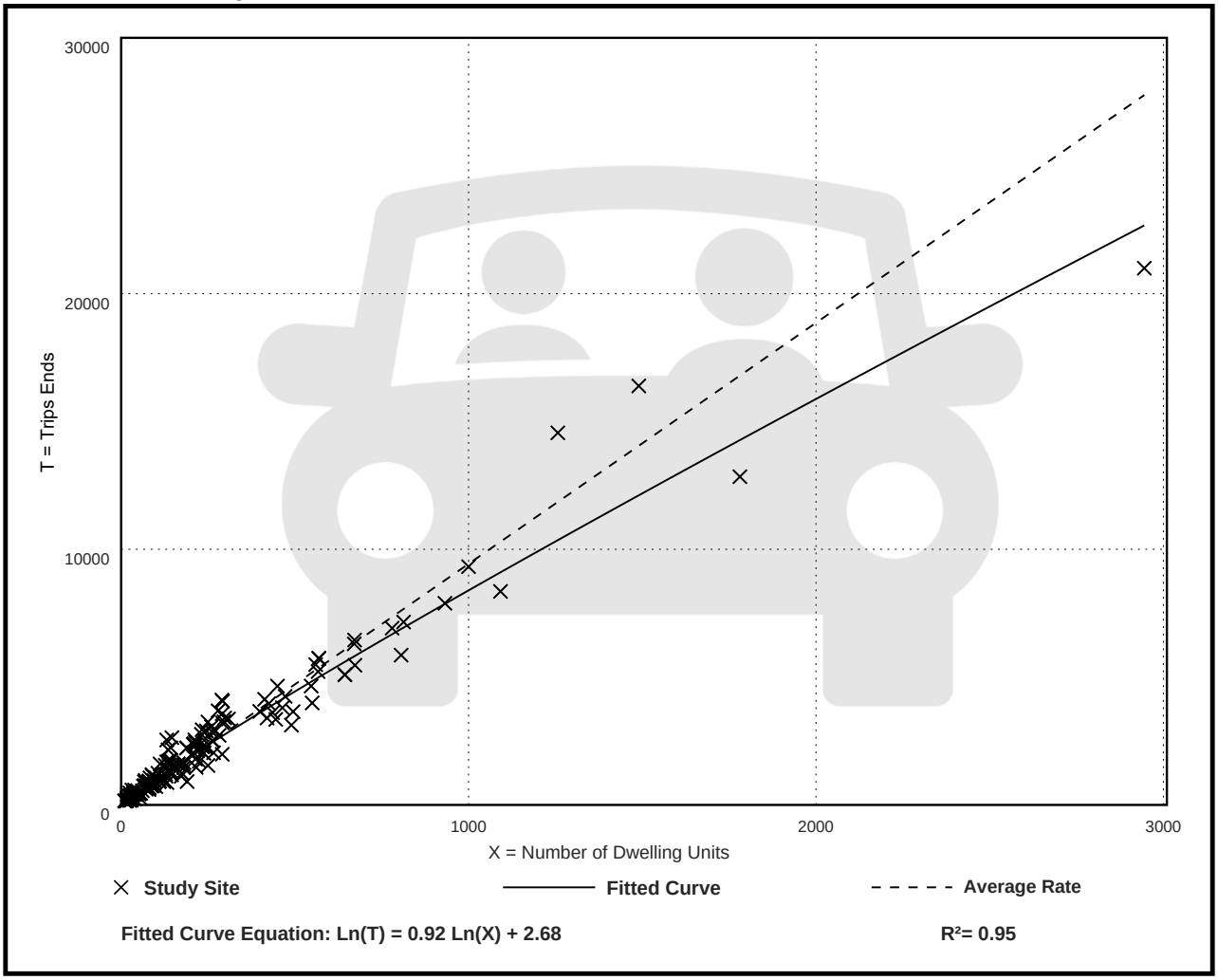
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

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

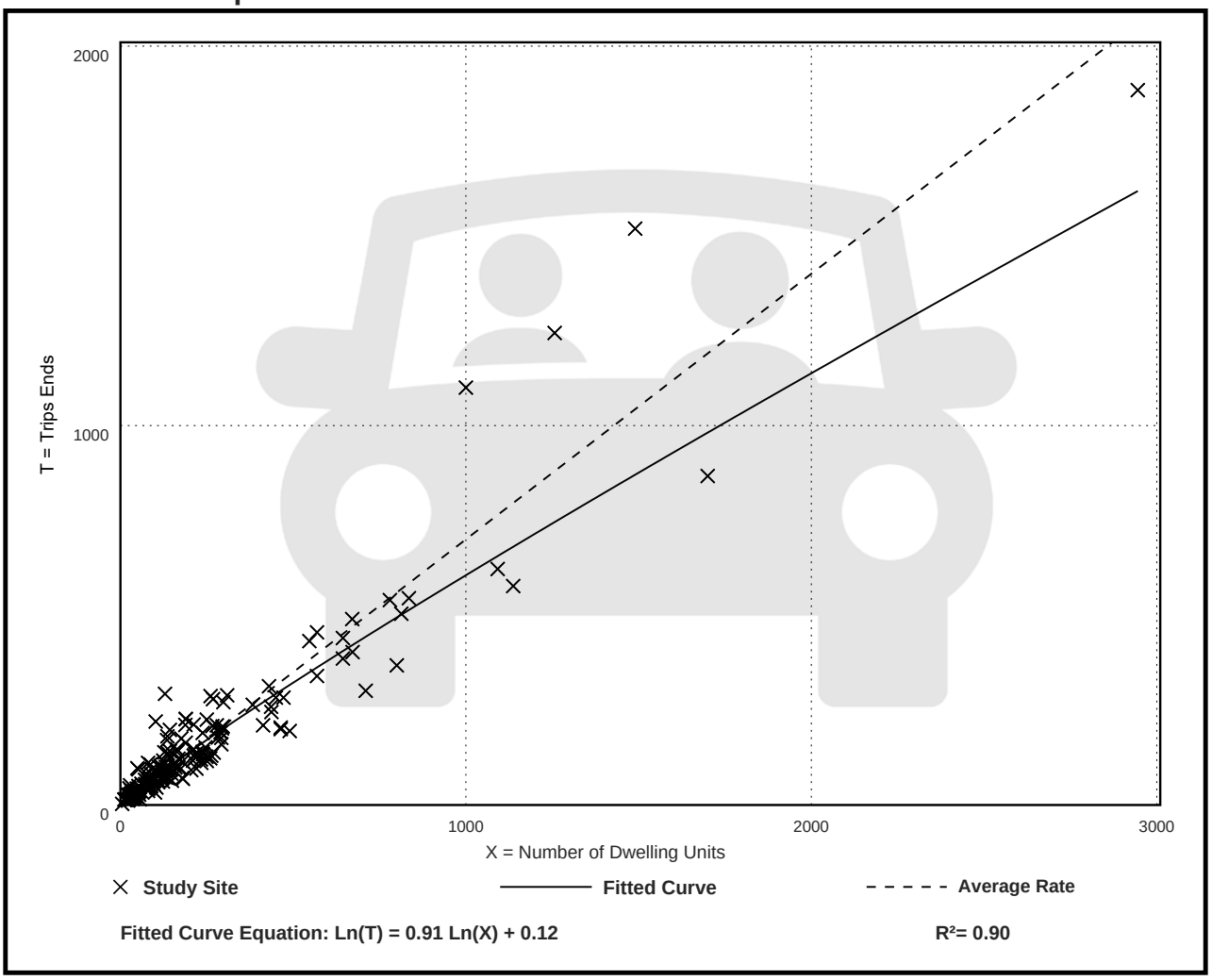
Single-Family Detached Housing
(210)

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



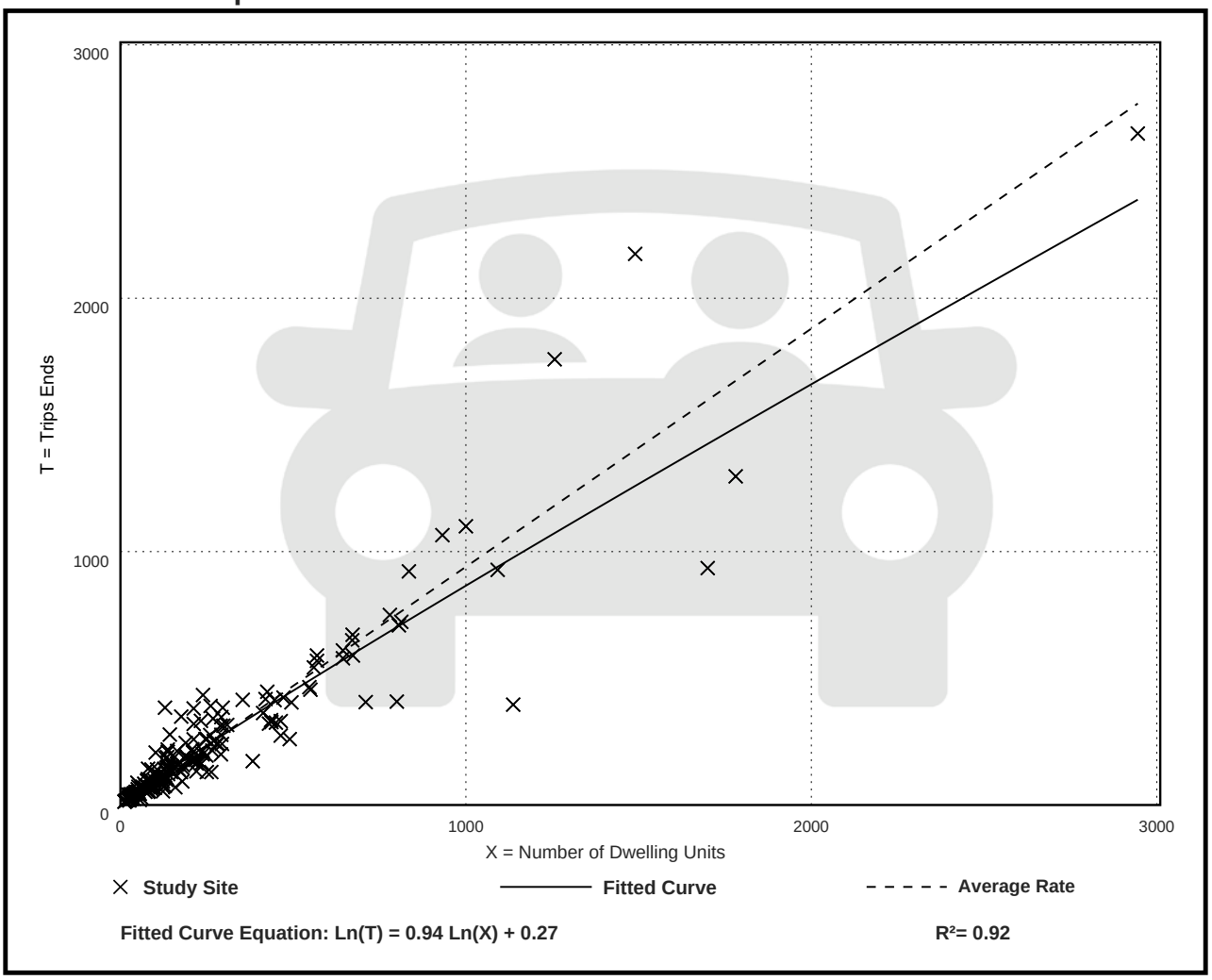
Single-Family Detached Housing
(210)

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 HEARTLAND DEVELOPMENT SUBDIVISION

Maximum of 151 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	151 Houses	1,474	25%	75%		63%	37%	
				27	81	108	92	54	146
Total New Volume Site Trips			**1,474**	**27**	**81**	**108**	**92**	**54**	**146**

ITE Trip Generation Manual, 11th Edition

Trips calculated by using Fitted Curve Equation

TRIP GENERATION FOR HEARTLAND DEVELOPMENT SUBDIVISION

Maximum of 151 Single-Family Detached Houses

151 Residential Houses = X

Weekday:

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

Ln(T) =	0.92	*	5.02	+	2.68
Ln(T) =	7.30				
T =	**1,474 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) =	4.69				
T =	**108 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	*	5.02	+	0.27
Ln(T) =	4.99				
T =	**146 trips**				

APPENDIX H

2021 CENSUS BUREAU DATA

OnTheMap

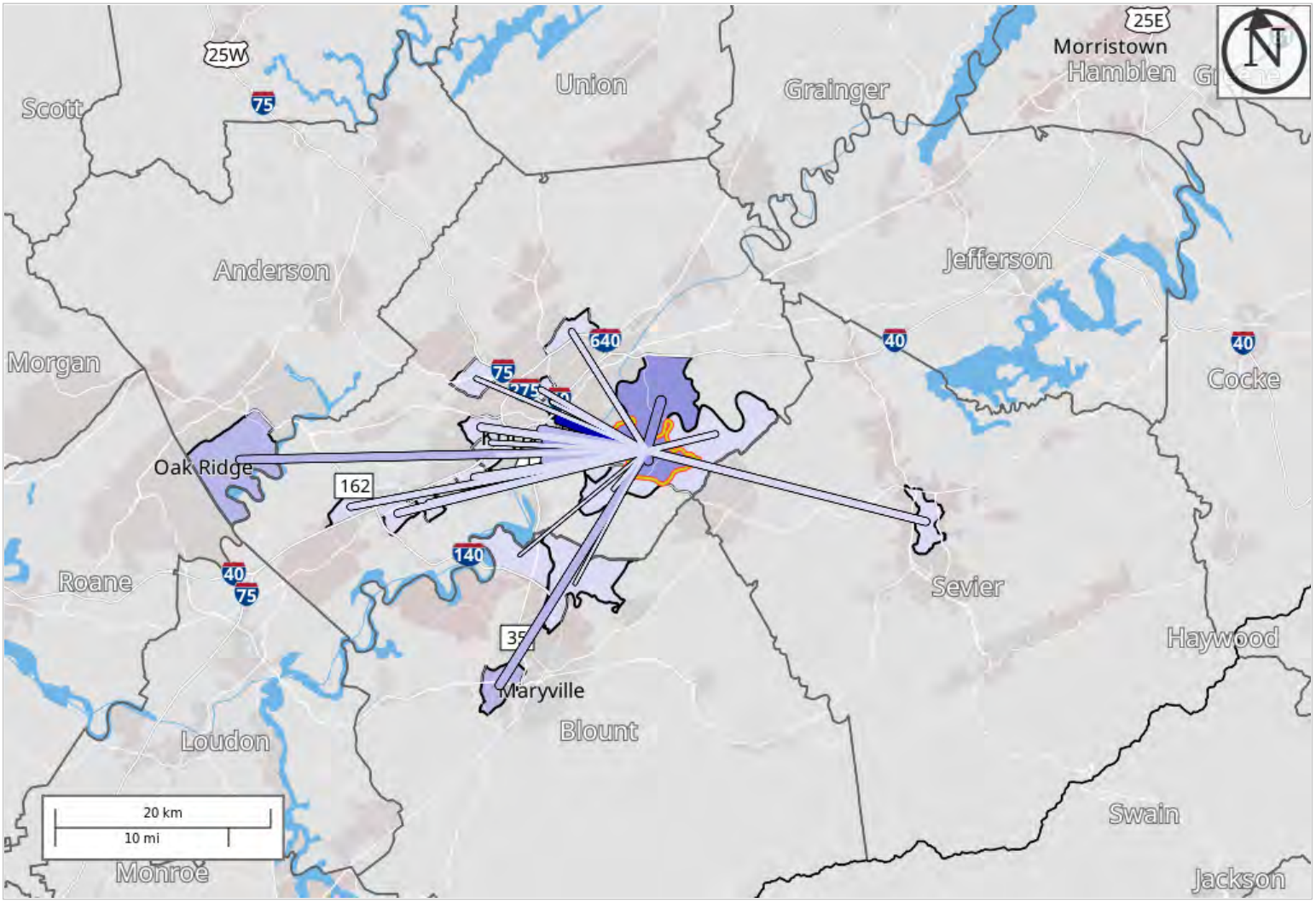
Work Destination Report - Home Selection Area to Work Census Tracts

All Jobs for All Workers in 2021

Created by the U.S. Census Bureau's OnTheMap https://onthemap.ces.census.gov on 02/17/2024

Counts of All Jobs from Home Selection Area to Work Census Tracts in 2021

All Workers



Map Legend

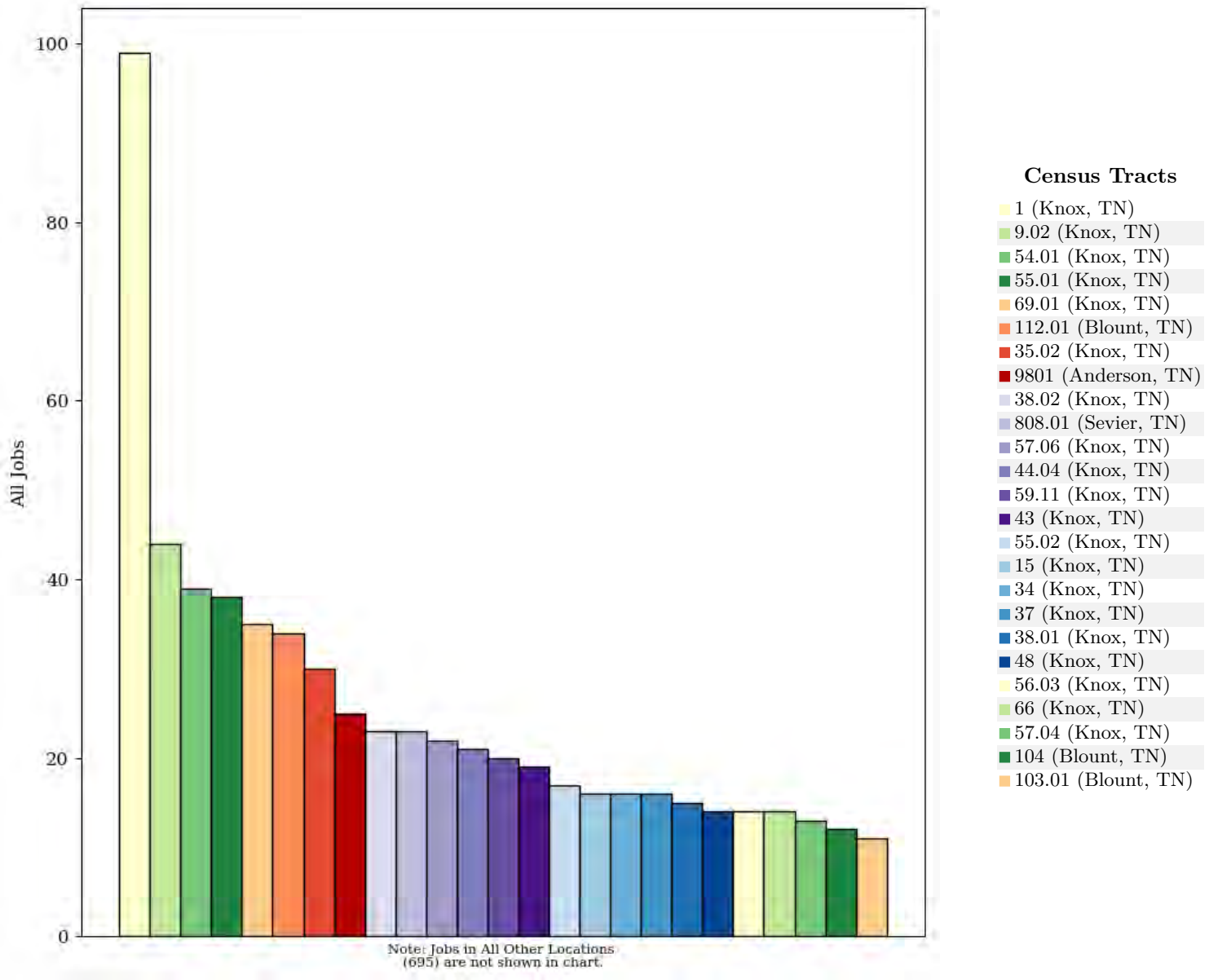
Job Count
- 87 - 99
- 74 - 86
- 62 - 73
- 49 - 61
- 37 - 48
- 24 - 36
- 11 - 23

Selection Areas
- Home Area

Job Count
- 87 - 99
- 74 - 86
- 62 - 73
- 49 - 61
- 37 - 48
- 24 - 36
- 11 - 23

All Jobs from Home Selection Area to Work Census Tracts in 2021

All Workers



All Jobs from Home Selection Area to Work Census Tracts in 2021

All Workers

Census Tracts as Work Destination Area	2021 Count	Share
All Census Tracts	1,325	100.0\%
1 (Knox, TN)	99	7.5\%
9.02 (Knox, TN)	44	3.3\%
54.01 (Knox, TN)	39	2.9\%
55.01 (Knox, TN)	38	2.9\%
69.01 (Knox, TN)	35	2.6\%
112.01 (Blount, TN)	34	2.6\%
35.02 (Knox, TN)	30	2.3\%
9801 (Anderson, TN)	25	1.9\%
38.02 (Knox, TN)	23	1.7\%
808.01 (Sevier, TN)	23	1.7\%

Census Tracts as Work Destination Area	2021 Count	Share
57.06 (Knox, TN)	22	1.7\%
44.04 (Knox, TN)	21	1.6\%
59.11 (Knox, TN)	20	1.5\%
43 (Knox, TN)	19	1.4\%
55.02 (Knox, TN)	17	1.3\%
15 (Knox, TN)	16	1.2\%
34 (Knox, TN)	16	1.2\%
37 (Knox, TN)	16	1.2\%
38.01 (Knox, TN)	15	1.1\%
48 (Knox, TN)	14	1.1\%
56.03 (Knox, TN)	14	1.1\%
66 (Knox, TN)	14	1.1\%
57.04 (Knox, TN)	13	1.0\%
104 (Blount, TN)	12	0.9\%
103.01 (Blount, TN)	11	0.8\%
All Other Locations	695	52.5\%

Additional Information

Analysis Settings

Analysis Type	Destination
Destination Type	Census Tracts
Selection area as	Home
Year(s)	2021
Job Type	All Jobs
Selection Area	55.01 (Knox, TN) from Census Tracts
Selected Census Blocks	64
Analysis Generation Date	02/17/2024 15:29 - OnTheMap 6.23.4
Code Revision	b83319a02a70b14bc14ccfe9d9a4e81022acdb73
LODES Data Vintage	20231016_1512

Data Sources

Source: U.S. Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics (Beginning of Quarter Employment, 2nd Quarter of 2002-2021).

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

SPOT SPEED STUDY DATA

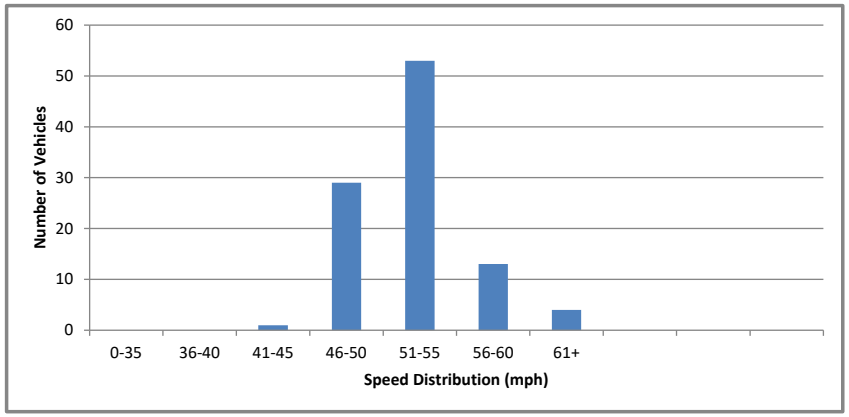
SPOT SPEED STUDY

Location: E Governor John Sevier Highway near French Road
Posted Speed Limit: 45 mph
Equipment: Bushnell Speedster III Radar Speed Gun
Direction: Southbound

Date: 3/27/2024
Weather: Mostly Cloudy / 55˚
Time: 10:00 - 10:45 a.m.
Pavement Conditions: Dry

Vehicle #	Speed (mph)
1	52
2	52
3	63
4	53
5	54
6	51
7	51
8	52
9	47
10	47
11	51
12	54
13	55
14	54
15	55
16	52
17	50
18	46
19	55
20	56
21	53
22	51
23	53
24	54
25	58
26	53
27	49
28	58
29	51
30	52
31	54

Vehicle #	Speed (mph)
51	67
52	56
53	58
54	60
55	52
56	44
57	52
58	49
59	50
60	52
61	49
62	50
63	53
64	51
65	53
66	53
67	54
68	50
69	49
70	60
71	47
72	52
73	53
74	52
75	50
76	53
77	48
78	52
79	48
80	61
81	65



Vehicle #	Speed (mph)
32	53
33	51
34	53
35	52
36	55
37	51
38	53
39	56
40	48
41	46
42	50
43	49
44	48
45	54
46	55
47	49
48	58
49	57
50	53

Vehicle #	Speed (mph)
82	60
83	47
84	51
85	57
86	53
87	50
88	48
89	53
90	50
91	54
92	53
93	55
94	49
95	53
96	47
97	50
98	51
99	48
100	56

Average speed = **52.6 mph**

85th percentile speed = **56.0 mph**

APPENDIX J

TDOT TURN LANE VOLUME THRESHOLD WORKSHEETS

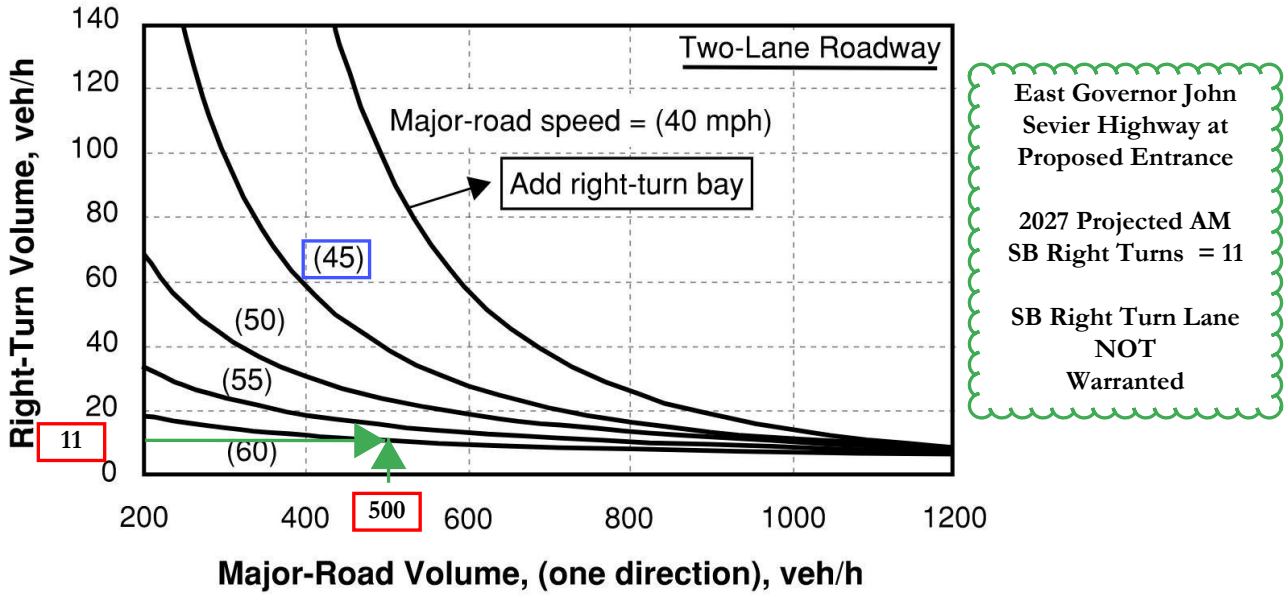


Figure 3-18: Right-Turn Lane Warrant along Two-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)[24]

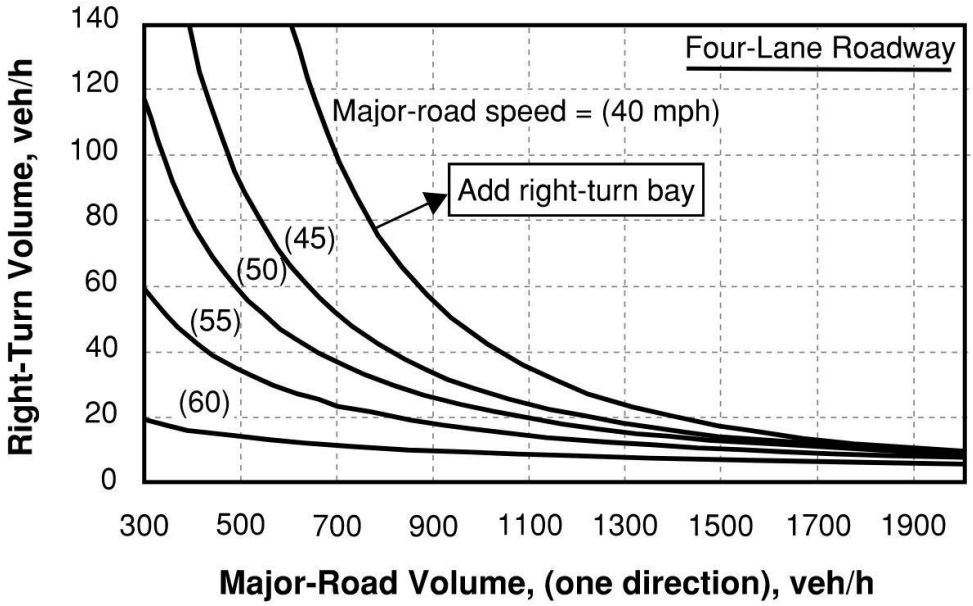


Figure 3-19: Right-Turn Lane Warrant along Four-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control) [25]

[24] TRB, NCHRP 457, Evaluating Intersection Improvements (2001)
[25] TRB, NCHRP 457, Evaluating Intersection Improvements (2001)

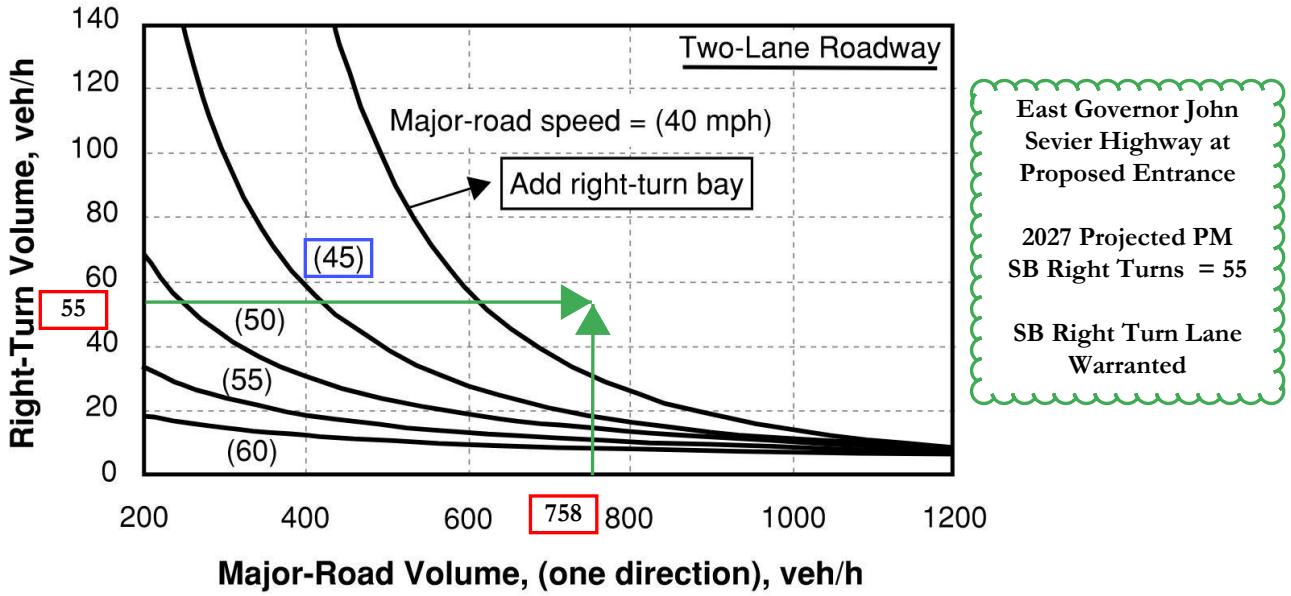


Figure 3-18: Right-Turn Lane Warrant along Two-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)[24]

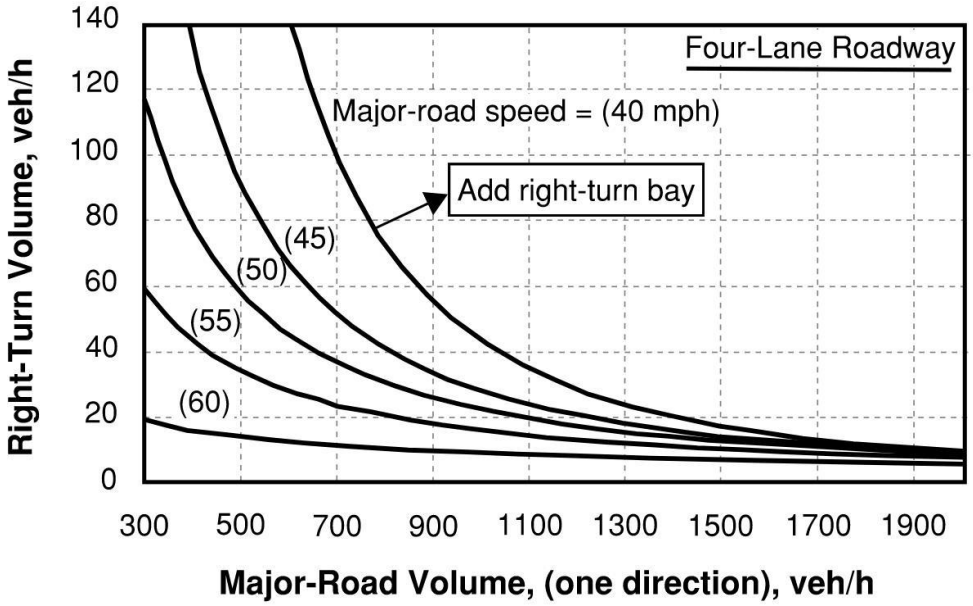


Figure 3-19: Right-Turn Lane Warrant along Four-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control) [25]

[24] TRB, NCHRP 457, Evaluating Intersection Improvements (2001)
[25] TRB, NCHRP 457, Evaluating Intersection Improvements (2001)

APPENDIX K

SIMTRAFFIC VEHICLE QUEUE WORKSHEETS

Intersection: 4: E Governor John Sevier Highway & French Road

Movement	WB	SB
Directions Served	LR	L
Maximum Queue (ft)	39	13
Average Queue (ft)	14	0
95th Queue (ft)	37	6
Link Distance (ft)	702	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		110
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: E Governor John Sevier Highway & Proposed Entrance

Movement	EB	EB	NB
Directions Served	L	R	L
Maximum Queue (ft)	48	52	34
Average Queue (ft)	20	23	7
95th Queue (ft)	46	44	28
Link Distance (ft)	197		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		75	75
Storage Blk Time (%)	0	0	
Queuing Penalty (veh)	0	0	

Network Summary

Network wide Queuing Penalty: 0

Intersection: 4: E Governor John Sevier Highway & French Road

Movement	WB	SB
Directions Served	LR	L
Maximum Queue (ft)	38	22
Average Queue (ft)	7	2
95th Queue (ft)	28	12
Link Distance (ft)	702	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		110
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: E Governor John Sevier Highway & Proposed Entrance

Movement	EB	EB	NB
Directions Served	L	R	L
Maximum Queue (ft)	56	55	47
Average Queue (ft)	17	20	20
95th Queue (ft)	46	44	47
Link Distance (ft)	197		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		75	75
Storage Blk Time (%)	0	0	0
Queuing Penalty (veh)	0	0	0

Network Summary

Network wide Queuing Penalty: 0

APPENDIX L

RESPONSE LETTER TO ADDRESS COMMENTS

AJAX ENGINEERING
CIVIL ENGINEERING / TRAFFIC ENGINEERING

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

March 27, 2024

PROJECT NAME: Heartland Development Subdivision (4-SE-24-C / 4-G-24-DP)
TO: Knoxville-Knox County Planning
SUBJECT: Response Document for Heartland Development Subdivision TIS Review Comments

Knoxville-Knox County Planning, Knox County Engineering, and TDOT Staff:

The following response document addresses the comments in an email from Mike Conger, PE, dated March 25, 2024. This letter is added to the end of the revised report in Appendix L.

1. **The major concern from our review is the potential deficient intersection sight distance noted in the TIS in the north direction from the entrance. The 85th percentile speed, based on our observations, exceeds the posted speed limit and based on the higher percentage of large truck traffic, sight distance needs to be the greatest achievable to reduce the risk of entering and exiting the development. Furthermore, the development access would need to meet or exceed the intersection sight distance, simply installing an intersection warning sign would not be approvable for the access point to have full access for all movements. Therefore, please address the following items related to sight distance:**
    - **It is suggested to review other potential entrance locations that would maximize available sight distance such as the existing driveway/field entrance. If an alternate location provides better sight distance but would create an intersection spacing variance then provide an analysis to demonstrate if the variance can be supported, i.e. will not create a traffic hazard if allowed.**
    - **A speed study is requested to be conducted to determine the 85th percentile speed. TDOT will require the minimum sight distance to be based on this speed study results and per their methodology. Any turn lane designs such as the proposed decel lane should be based on posted speed limit however.**

Response: The Proposed Entrance location has been revised in the site plan and throughout the TIS. The new location is further to the south on E Governor John Sevier Highway and is no longer shown to tie into the existing intersection with French Road. The new location will provide adequate sight distance to the south and is expected to meet the required intersection sight distance to the north once vegetation and cut slopes are reduced. Relocating the Proposed Entrance will require a variance due to its new location being less than Knox

County's required road separation, and is discussed in the revised report. The discussion regarding this variance is located on Pages 4 and 48. Also, a spot speed study was conducted as requested to determine the 85th percentile speed for vehicles traveling southbound on E Governor John Sevier Highway. The results of this spot speed study are discussed in the revised report on Page 42, and the data is included in the Appendix. The 85th percentile speed for southbound traffic on E Governor John Sevier Highway adjacent to the proposed development site was calculated to be 56 mph.

2. **A "No Turnaround" sign needs to be installed at the stub-out road to prevent people from needing to turn around in a private driveway.**

   Response: The site designer has revised the site plan and is providing a paved turnaround area at the end of the stub-out road. Thus, this recommendation was not included in the revised traffic study.

3. **Based on the proposed plan layout speeds may be an issue within the development - discuss the need for potential traffic calming devices that should be considered or alternative road design to reduce speed.**

   Response: On Pages 4 and 50, an item regarding this issue has been added in the recommendations for the potential need for traffic calming devices on the internal roads and should be discussed in the detailed design phase.

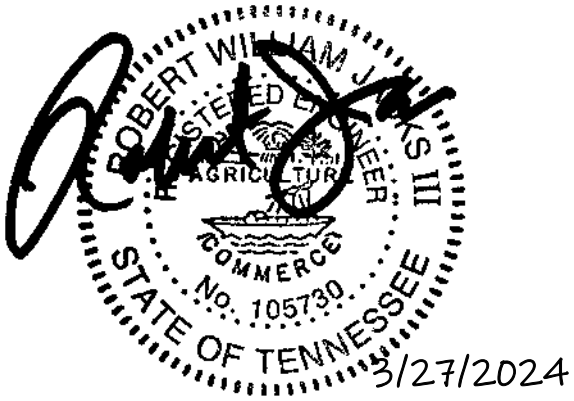
In addition to the revisions listed above, other changes in the report include the following:

- Updated Title Page
- Updated Table of Contents
- Updated Page Footers
- Updated Photo Exhibits
- Updated Figures and Tables
- Revised the report in numerous locations to denote and reflect that the Proposed Entrance is no longer designed to line up with French Road
- Added Appendix I to include spot speed study data
- Added Appendix L to include this response letter

If you have any questions or further comments, don't hesitate to contact me. We look forward to your approval.

Sincerely,

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



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