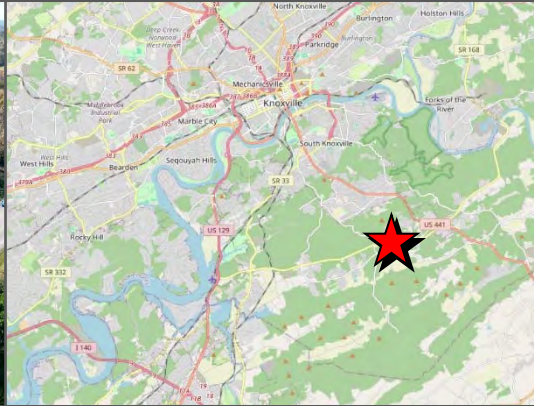


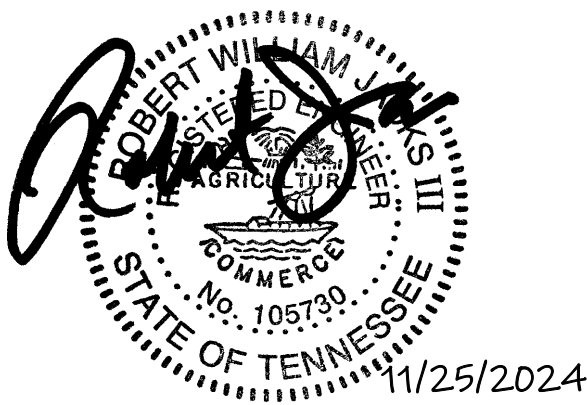


Transportation Impact Study 1413 Tipton Station Road Subdivision Knox County, Tennessee



November 2024

Prepared for:
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P.O. Box 11315
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EXECUTIVE SUMMARY

Preface:

Mesana Investments, LLC proposes a residential development adjacent to West Governor John Sevier Highway in South Knox County, TN. The proposed development will include constructing 69 multi-family attached townhouses and 69 single-family detached houses on 27.7 +/- acres. The development is named and referenced in this study as “1413 Tipton Station Road Subdivision” since a name has not yet been chosen. While this name suggests road access to Tipton Station Road will be provided, no road access is proposed. The development proposes a single entrance from the south to West Governor John Sevier Highway, between Neubert Springs Road and Marashi Road. The development is anticipated to be fully built and occupied by 2027.

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 road, the entrance intersection, and an existing adjacent intersection. This report 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 1413 Tipton Station Road Subdivision, with 69 multi-family attached townhouses and 69 single-family detached houses, is estimated to generate 1,401 vehicle trips at full build-out and occupancy on an average weekday. Of these daily trips, 91 are estimated to occur during the AM peak hour and 126 in the PM peak hour in 2027.
- With the 1413 Tipton Station Road Subdivision being fully completed and occupied by 2027, the exiting traffic lane at the Proposed Entrance is calculated to operate acceptably at Level of Service (LOS) C and D during the projected AM and PM peak hours with minimal vehicle queues. Westbound entering left turns on West Governor John Sevier Highway are calculated to operate at LOS B during peak hours.
- The projected 2027 eastbound right-turn entering volumes from West Governor John Sevier Highway into the subdivision are expected to meet warrants for a separate eastbound right-turn lane at the Proposed Entrance. Left turns from the

highway into the subdivision will be facilitated adequately by the existing center two-way left-turn lane.

Recommendations:

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

West Governor John Sevier Highway at Proposed Entrance:

- 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 West Governor John Sevier Highway. The stop bar should be applied a minimum of 4 feet away from the edge of West Governor John Sevier Highway and placed at the desired stopping point that maximizes the sight distance.
- Intersection sight distance from the Proposed Entrance at West Governor John Sevier Highway must not be impacted by future landscaping, signage, or vegetation. The existing sight distances at the Proposed Entrance location were estimated visually to be adequate in both directions. The site designer must ensure that the intersection sight distances are accounted for and provided in the design plans.
- A 12-foot eastbound right-turn lane on West Governor John Sevier Highway is recommended to be constructed at the Proposed Entrance with 265 feet of lane change and deceleration distance. A taper length of 180 feet (15:1) should be included within this 265-foot distance, leaving a full-width lane length of 85 feet. The right-turn lane should include the appropriate right-turn arrow pavement markings, as shown in TDOT Standard Drawing T-M-4. The designer must coordinate with TDOT to design and construct this eastbound right-turn lane.
- It is recommended that the center two-way left-turn lane (TWLTL) pavement markings on West Governor John Sevier Highway be modified to reflect an exclusive westbound left-turn lane at the Proposed Entrance. The existing center TWLTL markings should be removed to indicate a public road opening/intersection at the Proposed Entering intersection at West Governor John Sevier Highway. The existing pavement markings in the TWLTL should be re-stripped to accommodate a dedicated minimum storage length of 75 feet for

westbound left turns, and a white left-turn arrow should be applied to the pavement.

- The construction of the Proposed Entrance on West 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.

1413 Tipton Station Road Subdivision Internal Roads:

- A 25-mph Speed Limit Sign (R2-1) is recommended to be posted near the beginning of the Proposed Entrance, Road "A", off West 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.
- Stop Signs (R1-1) with 24" white stop bars are recommended to be installed at the internal road intersections, as shown in the study.
- Dual end-of-roadway object markers (OM4-1) should be installed at the end of subdivision Roads "B" and "C", as shown in the report.
- The proposed lots within the development adjacent to and south of West Governor John Sevier Highway should not be allowed direct access.
- Sight distance at the new internal intersections must not be impacted by new signage, parked cars, or future landscaping. With a proposed speed limit of 25-mph in the development, the required internal intersection sight distance is 250 feet. The site designer should ensure that this internal sight distance length is met.
- 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.
- Several internal roads in the proposed subdivision will have long, straight road segments. Straight road segments encourage higher vehicle speeds. It is recommended that the civil site designer consider including traffic calming measures on these 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 and intersection elements should be designed to AASHTO, TDOT, and Knox County specifications and guidelines to ensure proper operation.

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DESCRIPTION OF EXISTING CONDITIONS

▪ STUDY AREA:

The location of this proposed residential development is shown on a map in Figure 1. This development will be located on the south side of West Governor John Sevier Highway, approximately 1,070 feet east of the Access Road to Neubert Springs Road and 425 feet to the west of Marashi Road in South Knox County, TN. The Proposed Entrance will be located on West Governor John Sevier Highway, where the highway has a 3-lane section with one lane in each direction and a center two-way left-turn lane.

The development will be constructed from one existing parcel that spans an area between West Governor John Sevier Highway to the north and Tipton Station Road to the south. No road access to Tipton Station Road is proposed. As requested, transportation impacts associated with the development were analyzed at the Proposed Entrance at West Governor John Sevier Highway, where the development will have road access to and from external destinations.



The proposed development property is in a formerly rural area, very slowly transitioning to a more suburban area of South Knox County, TN. Many other residential subdivisions and stand-alone houses are in the surrounding area, especially directly north and across the highway. Nearby, Marashi Road provides the sole access to West Governor John Sevier Highway for five residential developments to the north of the highway, including Southridge, Wildwood Villas Condos, Marashi Heights, and Wildwood Gardens North and South. These five developments consist of a mix of multi-family attached condominiums and single-family detached houses.

Eighty-one condominiums and 235 single-family houses in these subdivisions use Marashi Road for external road access. About two and a half dozen undeveloped lots remain in these subdivisions, primarily in Wildwood Gardens North.

The 1413 Tipton Station Road Subdivision property is primarily cleared. The northwestern corner of the property is forested, with the open area used for hay production. A single-family detached house (1413 Tipton Station Road) with a shed is located on the property. This residence has roadway access via a concrete driveway to the south at Tipton Station Road. These structures will be removed during the construction of the subdivision. The topography for the subdivision property is mainly defined by rolling terrain and has an identified creek on its central western side.

West Governor John Sevier Highway provides major road access to this Knox County area, traversing east towards Chapman Highway and Alcoa Highway to the west. Neubert Springs Road, a bit further to the west of the development property, provides minor access to the area by traversing between West Martin Mill Pike to the north and Tipton Station Road to the south. West Governor John Sevier Highway is elevated above Neubert Springs Road, and a short, “clover-leaf” access road provides access to Neubert Springs Road.

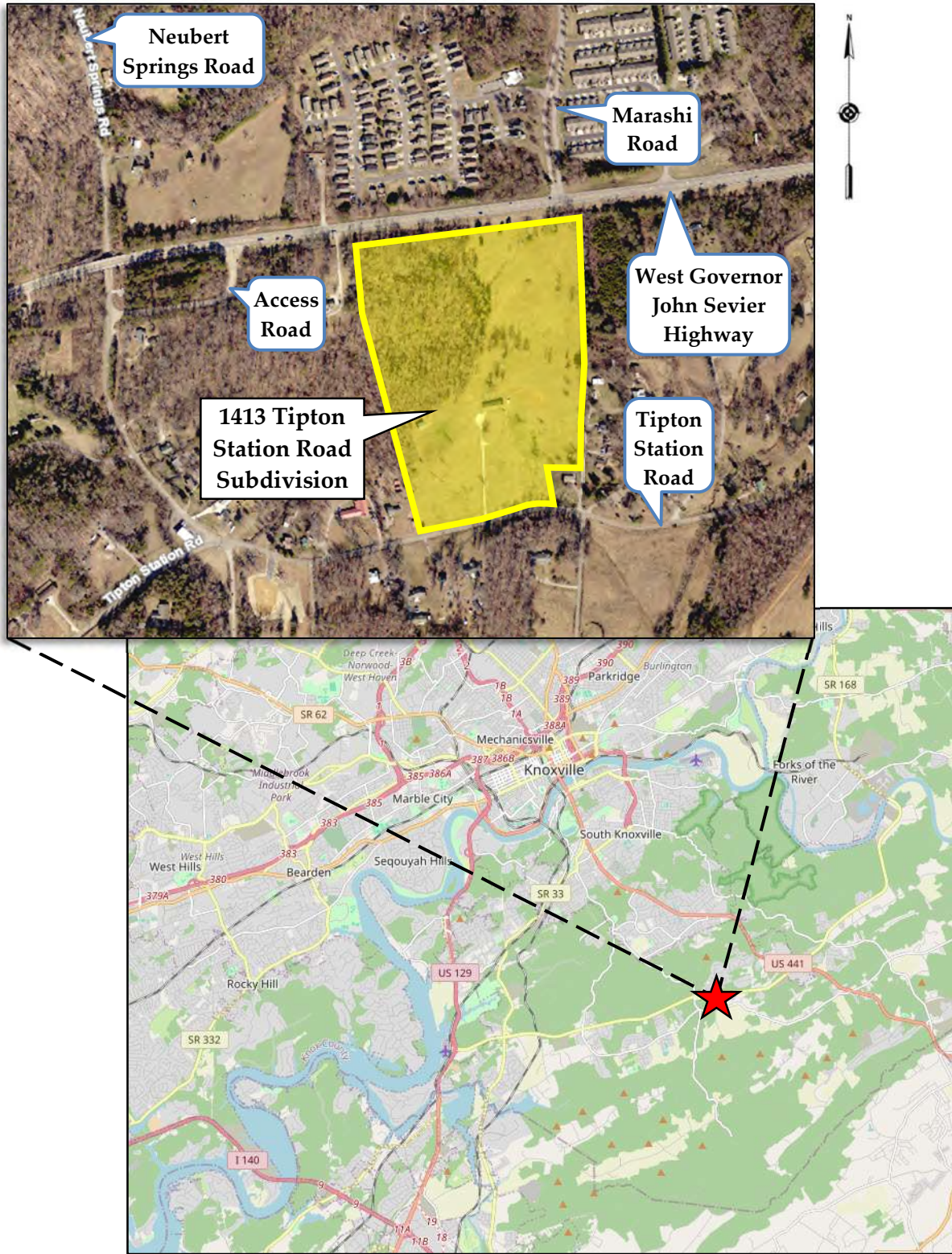


Figure 1
Location Map

▪ **EXISTING ROADWAYS:**

Table 1 lists the characteristics of the existing primary roadway near 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
W Governor John Sevier Highway (SR 168)	Major Arterial	50 mph	3 lanes with TWLTL	45 feet	None	None	No bike lanes

¹ 2018 Major Road Plan by Knoxville/Knox County Planning

² Edge of curb to edge of curb or edge of pavements near project site

³ According to Knoxville Area Transit System Map

West Governor John Sevier Highway (SR 168) is a 3-lane major arterial with a center two-way left-turn lane (TWLTL) and traverses in a generally northeast-southwest direction. The posted speed limit on West Governor John Sevier Highway is 50 mph at the Proposed Entrance. West Governor John Sevier Highway begins at the interchange with Alcoa Highway (US 129/SR 115) on its southwest end. On its northeast side, East Governor John Sevier Highway terminates at the intersection with Asheville Highway (US 11E/US 25/US 70/SR 9) for a total length of 18.1 miles. The delineation of the East/West designation of Governor John Sevier Highway occurs at the intersection with Chapman Highway (US 441/SR 71).

West Governor John Sevier Highway at the Proposed Entrance currently consists of asphalt pavement approximately 45 feet in total width. The provided lanes are 12 feet wide with a 3.5-foot paved asphalt surface outside the white edge lines. Grass side slopes are located immediately outside of the paved shoulders. Utility streetlights for roadway illumination are not provided on West Governor John Sevier Highway at the Proposed Entrance location but are currently provided on Marashi Road near the highway.

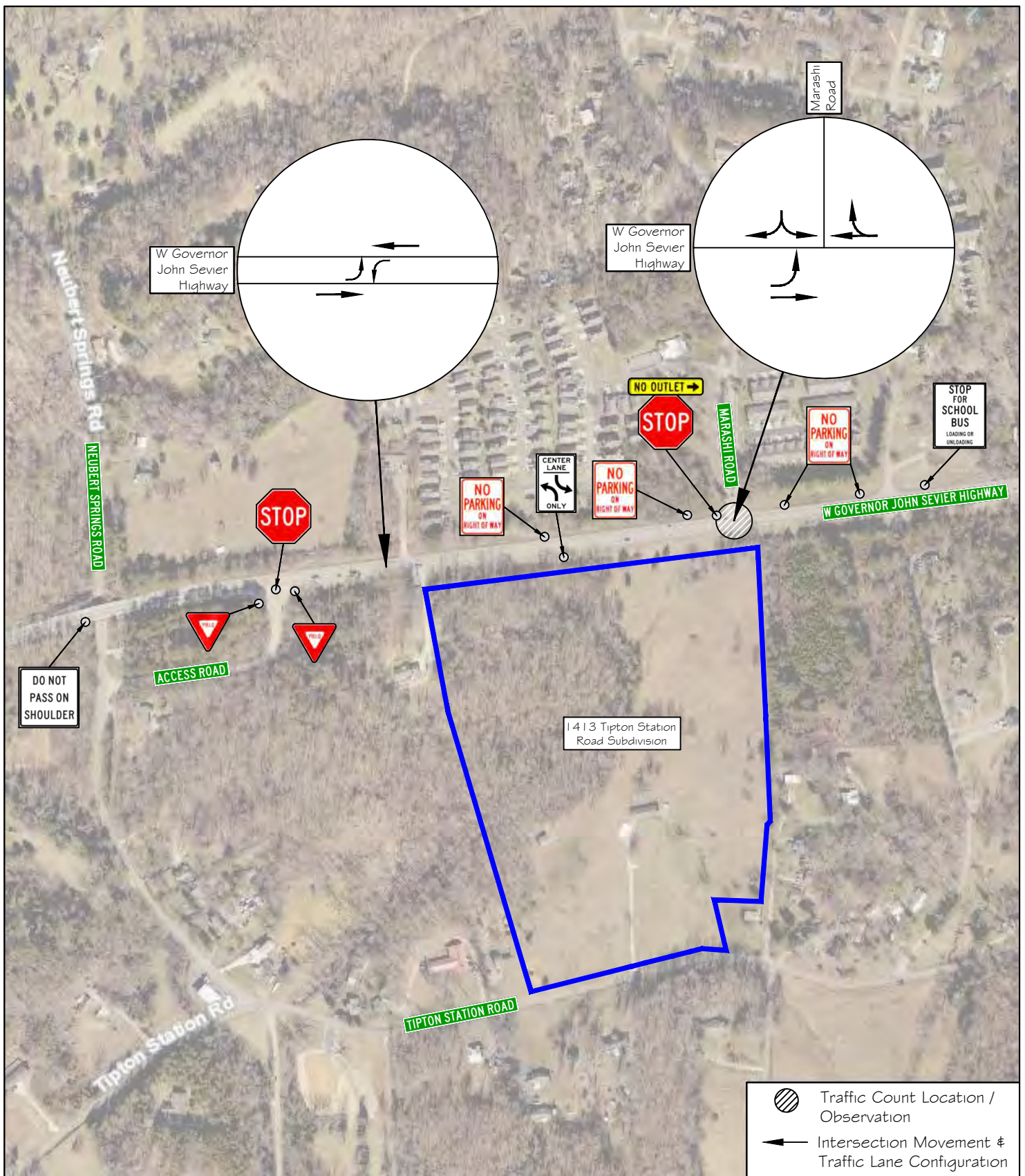


Bike lanes and sidewalks are also not provided on the highway. Long-term future expansion of

the highway includes plans by TDOT to widen the road from three lanes to a four-lane divided road section with a horizon year of 2040.

In both directions, grooved pavement rumble strips are located on top of the white edge lines along the shoulder of West Governor John Sevier Highway. Along the proposed road frontage of the development property, West Governor John Sevier Highway has a straight alignment with a mild downhill road grade from east to west. West Governor John Sevier Highway has relatively good pavement conditions and will be the primary road for future residents of the 1413 Tipton Station Road Subdivision to and from external destinations.

Figure 2 shows the lane configurations of the existing intersection included in the study, the traffic count location, and the current traffic signage along West Governor John Sevier Highway in the study area. The traffic signage shown in Figure 2 only includes warning and regulatory signage near the development site. The pages following Figure 2 give a further overview of the site study area with photographs.



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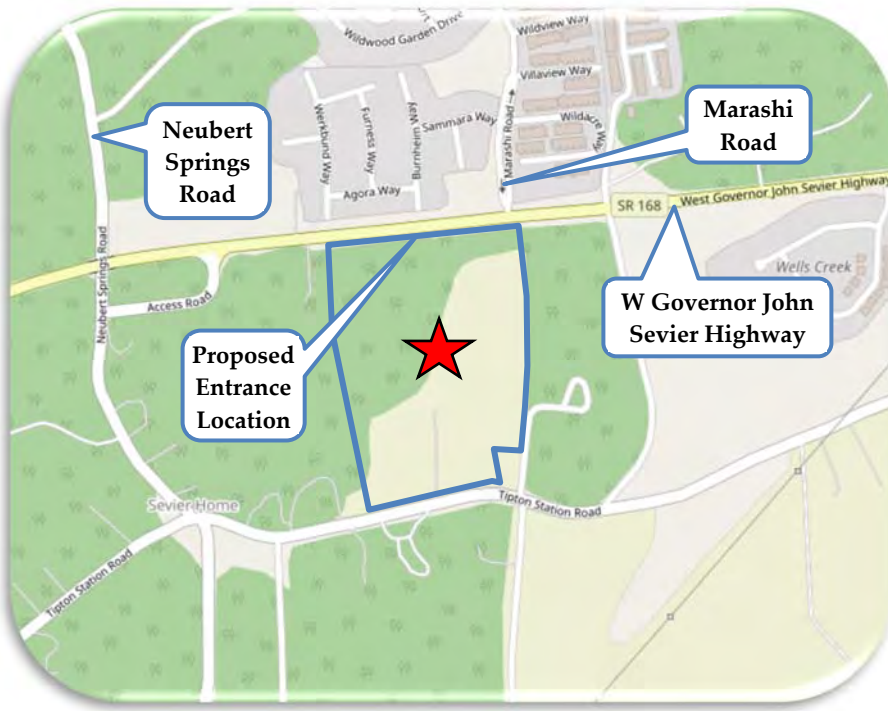


FIGURE 2

1413 Tipton Station Road Subdivision

Traffic Count Location, Traffic Signage & Existing Lane Configurations

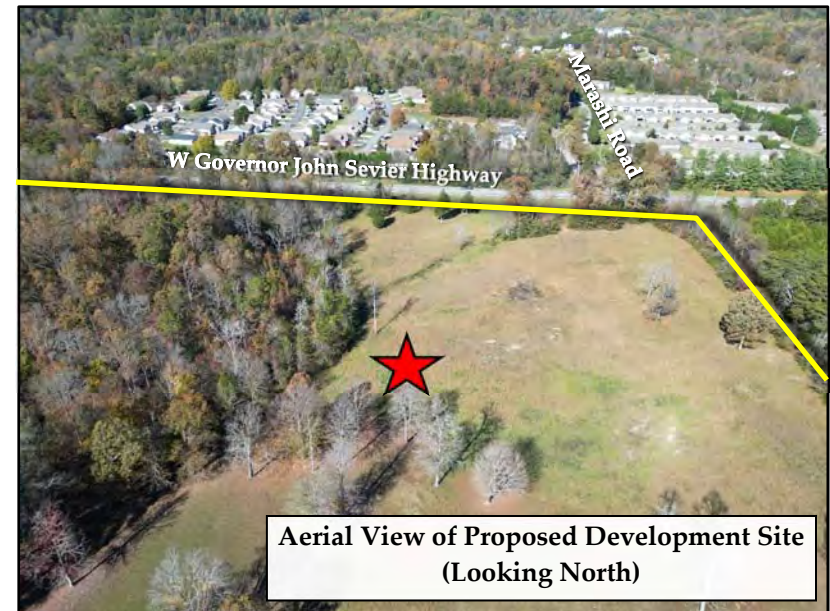
PHOTO EXHIBITS



Proposed Development Site

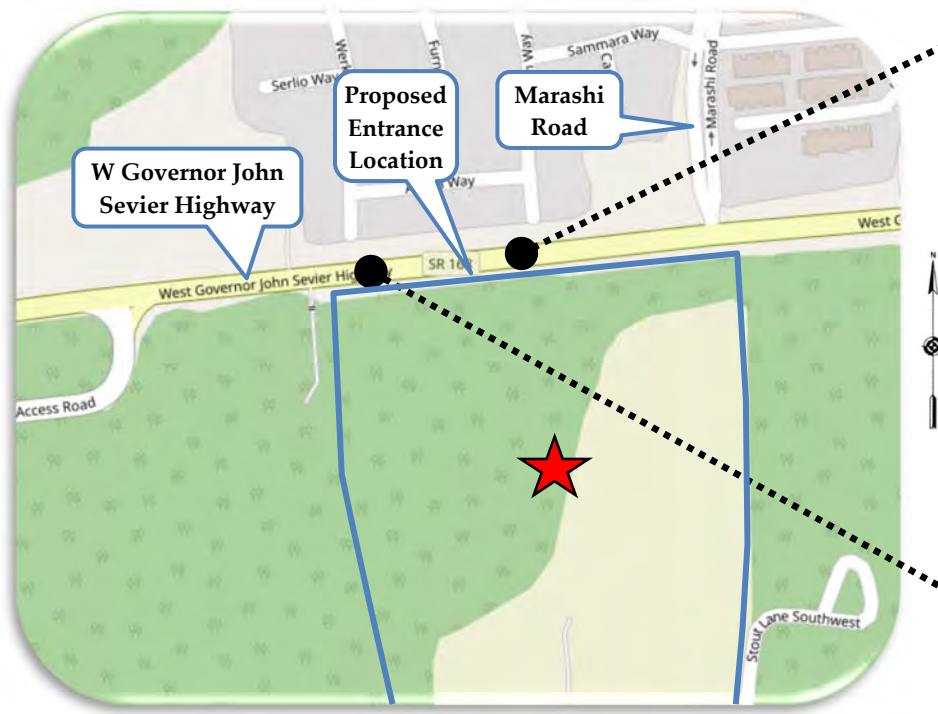


Aerial View of Proposed Development Site (Looking Southwest)



Aerial View of Proposed Development Site (Looking North)

11



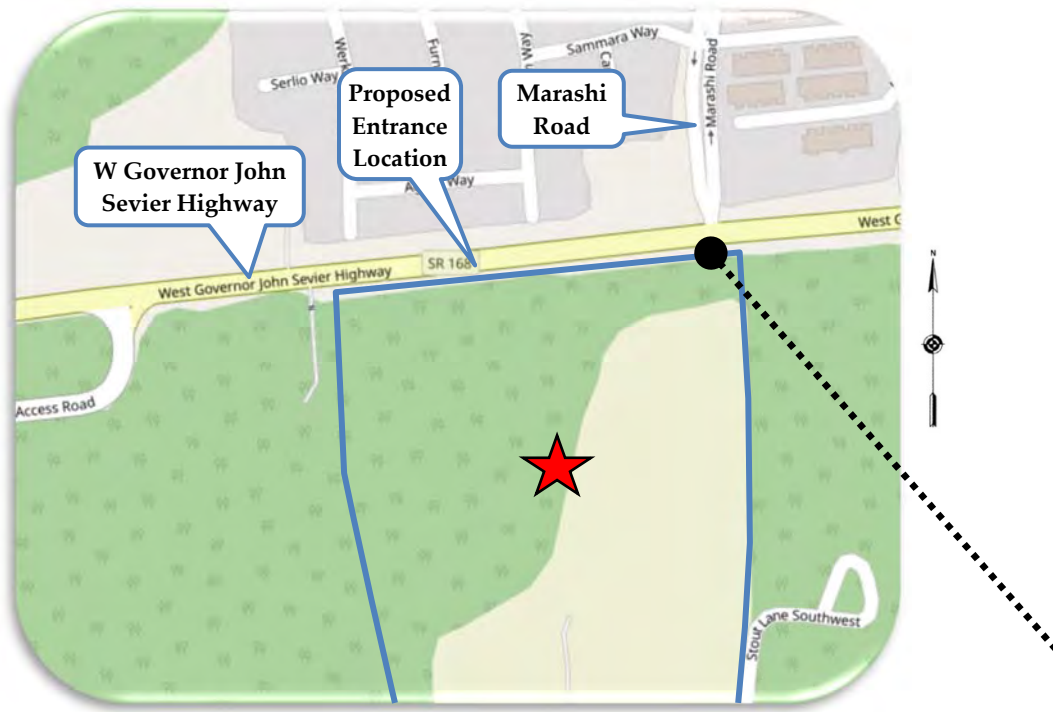
Proposed Development Site



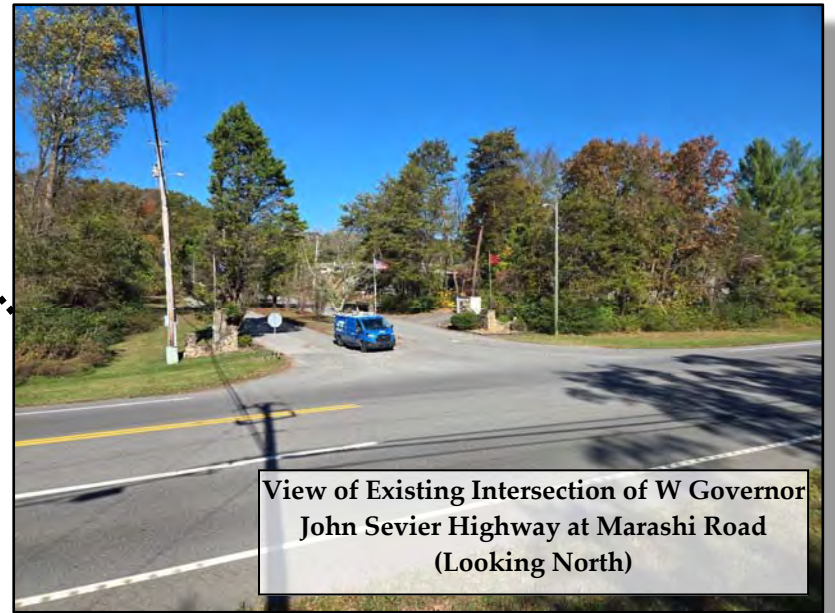
View of W Governor John Sevier Highway at Proposed Entrance Location (Looking West)



View of W Governor John Sevier Highway at Proposed Entrance Location (Looking East)



Proposed Development Site



View of Existing Intersection of W Governor John Sevier Highway at Marashi Road (Looking North)

▪ **EXISTING TRANSPORTATION VOLUMES PER MODE:**

One annual vehicular traffic count location is located near the study area, and the Tennessee Department of Transportation conducts this count on West Governor John Sevier Highway. The count location data is the following and can be viewed with further details in Appendix A:

- Existing vehicular roadway traffic:
The Tennessee Department of Transportation reported an Average Daily Traffic (ADT) on West Governor John Sevier Highway, west of the project site, at 15,186 vehicles per day in 2023. From 2013 – 2023, this count station has indicated a +0.5% average annual growth rate.

- Existing bicycle and pedestrian volumes:
The average daily pedestrian and bicycle traffic along West Governor John Sevier Highway is unknown. However, with the lack of sidewalks and bike lanes, as well as high vehicular volumes, this roadway is assumed to have minimal pedestrian and bicyclist activity. During the traffic counts for this project, no bicyclists and three pedestrians were observed. However, only one pedestrian was observed walking on the side of West Governor John Sevier Highway near the development site.

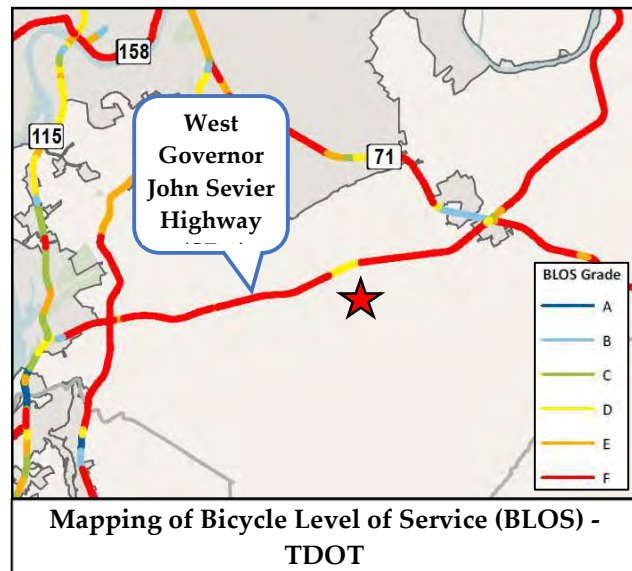
An online website, [strava.com](https://www.strava.com), provides “heat” maps detailing routes taken by pedestrians, joggers, and bicyclists. The provided heat maps show the last two years of data, are updated monthly, and are gathered from individuals allowing their smart devices to track and compile their routes (millions of users). The activities in the maps are shown on the



roads with color intensities with darker colors signifying higher activity. The Strava heat maps show little to no pedestrian activity, with a minor amount shown occurring in the subdivisions to the north across the highway. Much higher bicycle activity is shown, with a substantial amount along Neubert Springs Road and Tipton Station Road to the west and south of the development site.

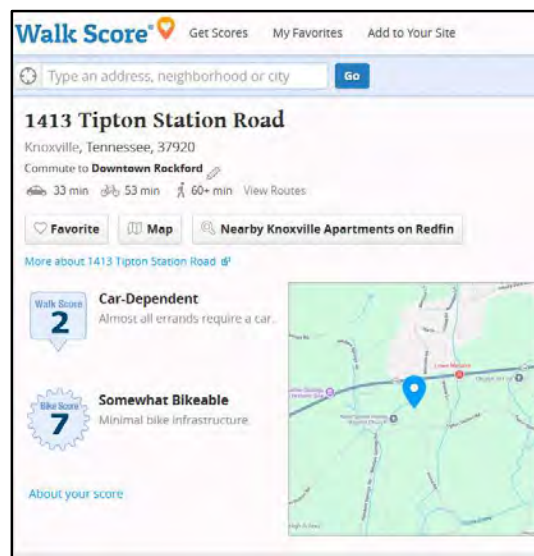
▪ **PEDESTRIAN AND BICYCLE FACILITIES:**

TDOT has published mapping illustrating the Bicycle Level of Service (BLOS) for State Routes. 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. At the development site, the BLOS for West Governor John Sevier Highway, State Route 168, has grades of D and F, suggesting that the highway is unsuitable for bicycle traffic near the proposed development site.



▪ **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.



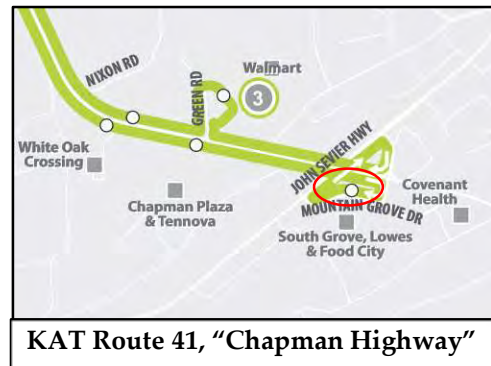
The project site location is graded with a Walk Score of 2 at the development property address. This Walk Score indicates that almost all errands currently require a vehicle for travel at the development

property. The Walk Score is graded very low due to the lack of sidewalks, lack of nearby amenities, and the high vehicular volumes on the highway adjacent to the site. The site is given a Bike Score of 7, meaning there is minimal bike infrastructure. The site is not given a Transit Score since no public transportation opportunities are near the development site. Overall, for this study, no vehicle trip reductions for pedestrian or bicyclist activity were used or assumed.

▪ **TRANSIT SERVICES:**

The City of Knoxville has a network of public transit opportunities offered by Knoxville Area Transit (KAT). However, bus service is not available near the development site.

The closest public transit bus stop to the development site is 1.8 miles to the east on Route 41, “Chapman Highway”, and is at Mountain Grove Drive in front of the Lowe’s Home Improvement Store in the South Grove Development. On August 26th, 2024, KAT made several changes and improvements to their routes. Only a minor route change was made during this recent update. This route has established bus service every 30 minutes at this



bus stop. It operates on weekdays and weekends; the route map is also included in Appendix B. The new schedule for this route is also included in Appendix B. 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.

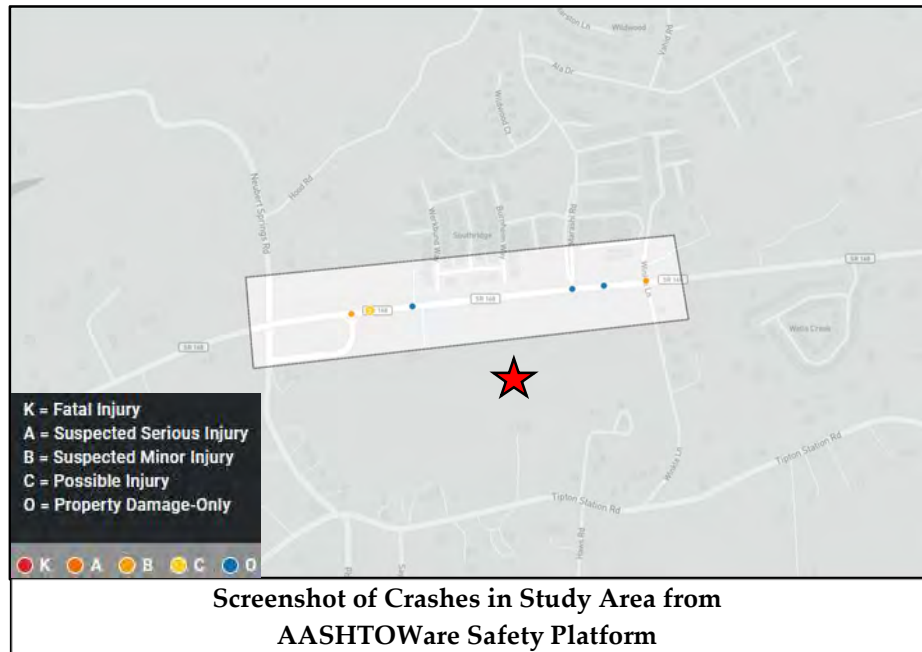
Since the distance to the nearest public bus service is several miles away, with no sidewalks or bike lanes available to access the bus stop without using a private vehicle, the proposed development is not expected to have any reduced vehicle trips due to public transit usage.

▪ **CRASH DATA:**

For this project, access to the AASHTOWare Safety online platform was provided. This AASHTO (American Association of State Highway and Transportation Officials) platform is a component of several offerings that include the compilation of crash data for local state DOTs to use in safety analyses. TDOT provides vehicle crash data to this system and is an extension of its existing E-TRIMS (Enhanced Tennessee Roadway Information Management System) database. The crash data in the E-TRIMS system is from the statewide TITAN (Tennessee Integrated Traffic Analysis

Network) database. The TITAN database includes all reportable vehicle crash data from Tennessee law enforcement agencies.

In the vicinity of the Proposed Entrance location on West Governor John Sevier Highway, seven crashes occurred in the past 3 years (between October 24th, 2021, and October 24th, 2024). These seven crashes occurred between the Access Road to Neubert Springs Road to the west and Winkle



Road to the east. Two rear-end, two angle, and three crashes with objects were recorded. Four crashes were property damage only, two had suspected minor injuries, and one involved a possible injury. The crashes with objects include a tree, a ditch, and an unidentified object.

One of the angle crashes occurred at the West Governor John Sevier Highway and Access Road to Neubert Springs Road intersection and one at Winkle Lane. Both resulted in the crashes with suspected minor injuries. The crash with a possible injury occurred during one of the recorded rear-end collisions.

The crash data near the proposed development site does not readily indicate potential issues or impediments with an additional road tying to the highway. Ultimately, TDOT continually monitors for high crash locations and conducts further investigations if a spot location or intersection experiences above-average crash rates.

PROJECT DESCRIPTION

▪ LOCATION AND SITE PLAN:

The proposed plan layout with 69 multi-family attached townhouses and 69 single-family detached houses on 27.7 +/- acres is designed by Urban Engineering and is shown in Figure 3. The design shows five new internal streets, Roads "A" through "E". As shown in the figure, the entrance for the development will be constructed on the south side of West Governor John Sevier Highway. Road "A" will be the entrance street for the Proposed Entrance off West Governor John Sevier Highway.



The 1413 Tipton Station Road Subdivision will have some open space and common areas for the subdivision residents, including areas for detention ponds and stormwater control. An identified creek on the central western side of the development property will remain undisturbed and provided buffers.

The townhouses will be located on the development site's northwest portion, and the single-family detached houses will be on the remaining portions. The

typical lot dimensions for the attached townhouses in the subdivision will be 90 feet deep and 22 feet wide, providing a typical townhouse lot area of 2,430 square feet. The typical lot dimensions for the single-family detached houses in the subdivision will be 120 feet deep and 55 feet wide, providing a typical single-family house lot area of 6,600 square feet. Each townhouse and single-family house will have a garage and driveway. The developer is not proposing on-site amenities for the future subdivision residents other than providing open common areas. Internal sidewalks are not proposed for this subdivision.

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. Overall, the local real estate market for new housing remains quite

competitive 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) to provide a conservative outlook.

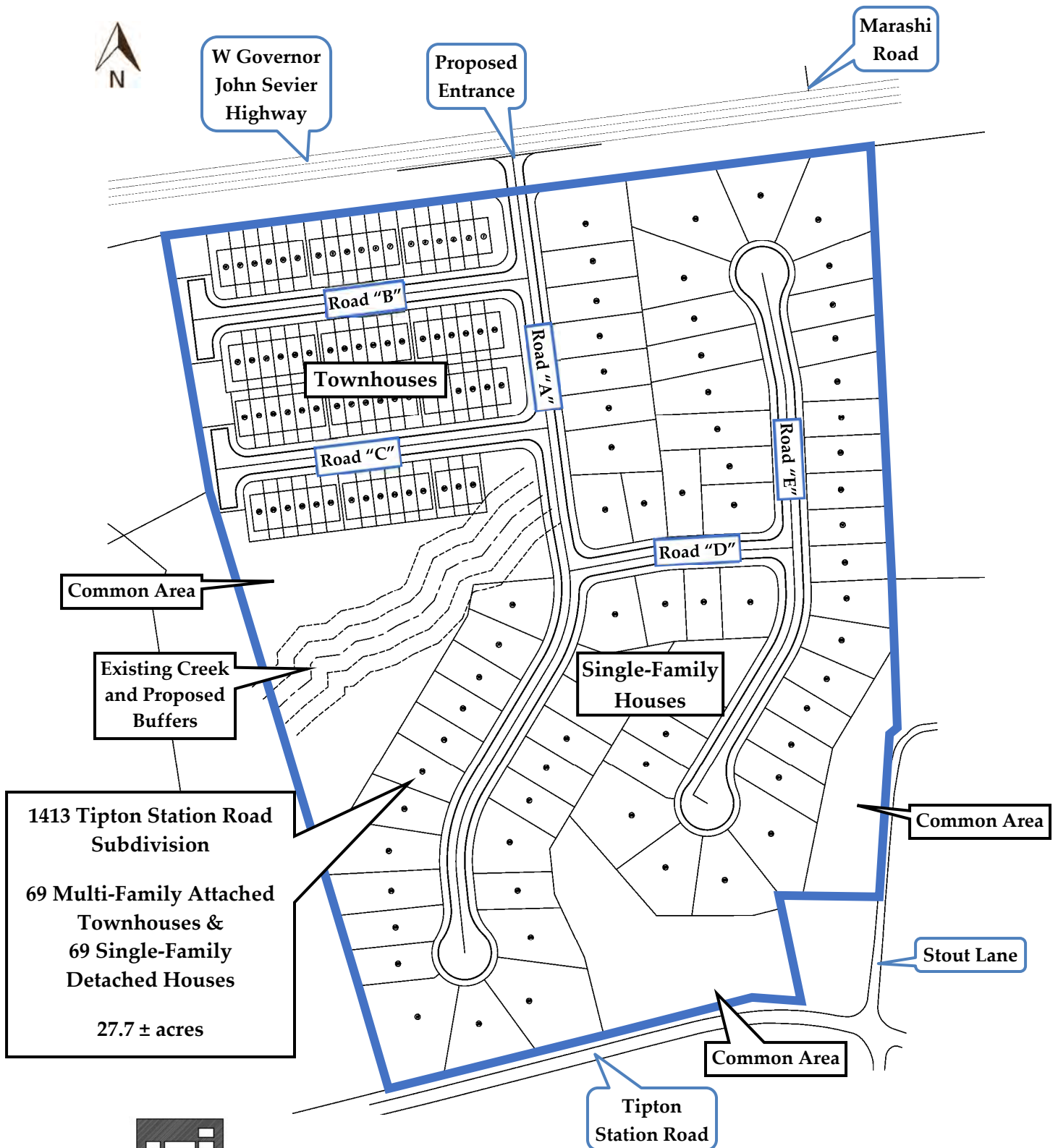
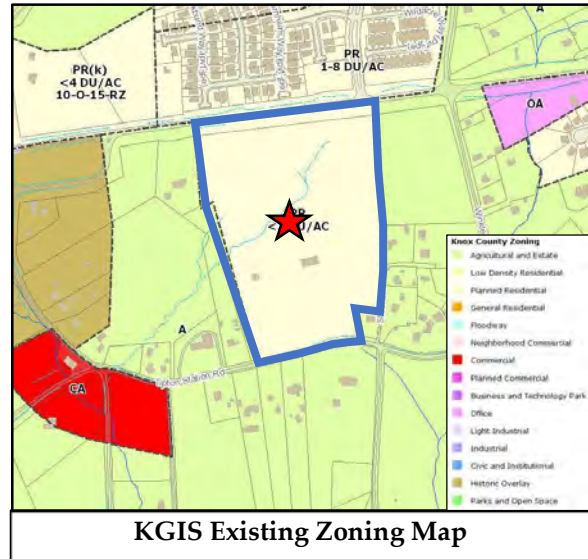


Figure 3
Proposed Plan Layout
1413 Tipton Station Road Subdivision

Not to Scale

▪ **PROPOSED USES AND ZONING REQUIREMENTS:**

The parcel comprising the 1413 Tipton Station Road Subdivision development property is in Knox County and was recently requested to be rezoned with a greater density. The Knoxville/Knox County Planning Commission approved this rezoning, and the Knox County Commission gave final approval on October 21st, 2024. In 2020, the property's zoning was changed from Agricultural (A) to Planned Residential (PR), with a density of up to 3 units per acre. The property rezoning recently requested was approved with a density of up to 5 units per acre.



Uses permitted in the Planned Residential (PR) zone include single-family dwellings, duplexes, and multi-dwelling structures and developments. The most recently published online KGIS zoning map is provided in Appendix C. The existing adjacent surrounding zoning and land uses are the following:

- West Governor John Sevier Highway binds the development property to the north. Across West Governor John Sevier Highway, the properties adjacent to the highway are zoned as Planned Residential (PR). These properties include single-family detached houses in the Southridge Subdivision. None of these properties on the other side of West Governor John Sevier Highway have direct access to the highway, and their only external access is provided by Marashi Road to the east.
- All the surrounding properties to the east and west are zoned as Agricultural (A). These properties are either occupied by stand-alone single-family detached houses or forested areas. The houses and properties to the west have road access to Tipton Station Road to the south. The houses and properties to the east have road access to Tipton Station Road via Winkle Lane or Stout Lane to the southeast.
- To the south, the development property is bound by Tipton Station Road, with three properties on the other side of the road occupied by single-family detached houses and zoned as Agricultural (A). These houses have external road access to the north at Tipton Station Road.

▪ **ON-SITE CIRCULATION:**

The total length of the five internal roads in the 1413 Tipton Station Road Subdivision will be 3,468 feet (0.66 miles), designed and constructed to Knox County specifications. The development will have asphalt-paved internal roadways with 8" extruded concrete curbs. The lane widths internally will be 13 feet each for a total 26-foot pavement width. The public right-of-way width within the development will be 50 feet. No sidewalks are proposed on the internal roads in this development. 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:**

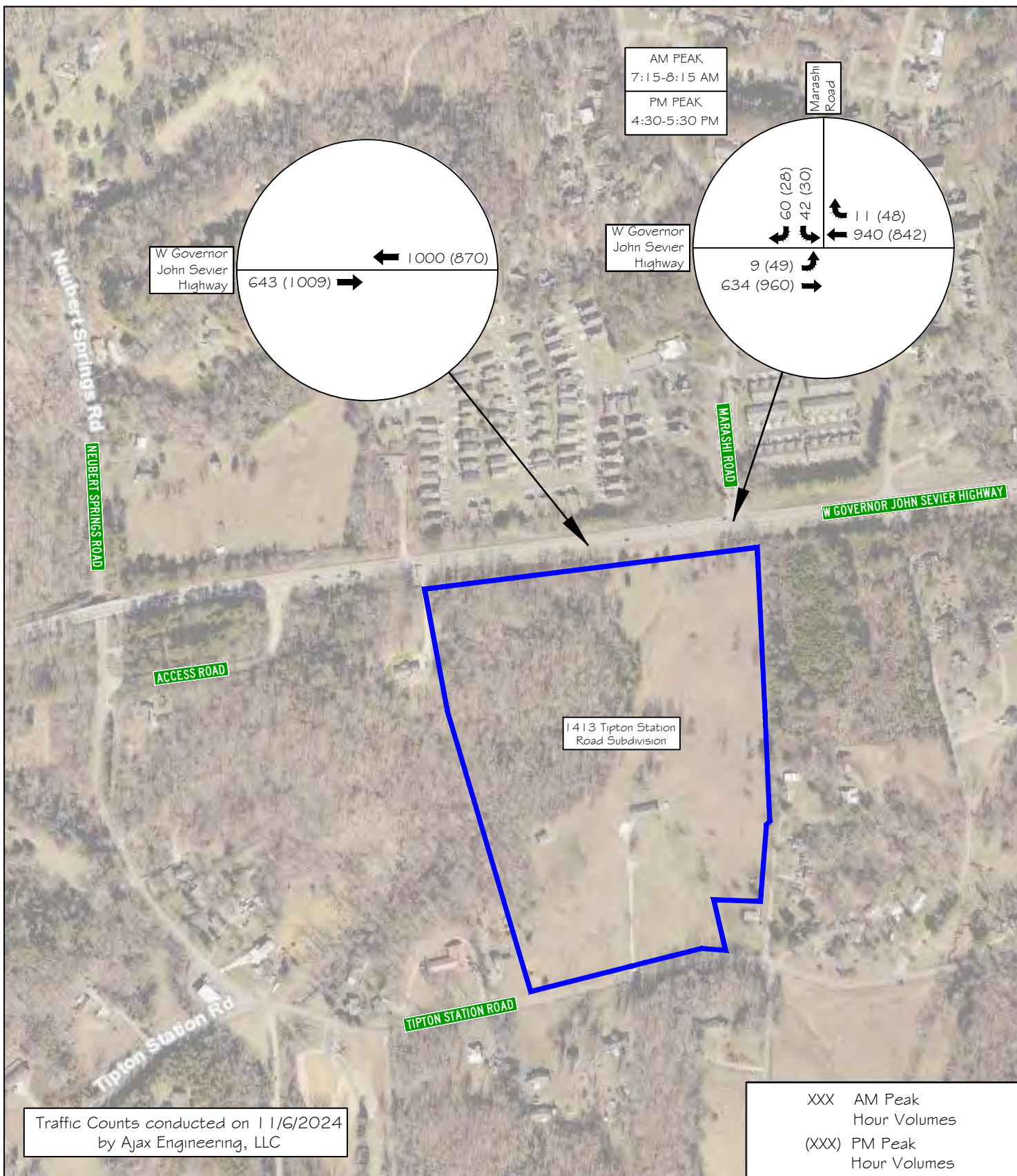
Besides residential passenger vehicles, the internal roadways will provide access for service, delivery, maintenance, and fire protection/rescue vehicles. These vehicle types will not impact roadway operations except when they occasionally enter and exit the development. Curbside private garbage collection 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 with cul-de-sacs or hammerhead turnarounds will accommodate the larger vehicle types and residents' standard passenger vehicles and be sufficiently sized to allow vehicles to turn around.

ANALYSIS OF EXISTING AND PROJECTED CONDITIONS

▪ EXISTING TRAFFIC CONDITIONS:

This study conducted a 5-hour traffic count at the intersection of West Governor John Sevier Highway at Marashi Road on Wednesday, November 6th, 2024. Manual traffic counts were conducted to identify and tabulate the morning and afternoon peak period volumes and the travel directions near the proposed development site. The intersection had an observed AM and PM peak hour at 7:15 – 8:15 a.m. and 4:30 – 5:30 p.m. The manual tabulated traffic counts can be reviewed in Figure 4 and Appendix D. The volumes shown in Figure 4 on the western end of West Governor John Sevier Highway were obtained from the intersection volumes. Some observations at the intersection and highway include the following:

- No bicyclists were observed during the morning or afternoon traffic counts. During the traffic count in the afternoon, one pedestrian was observed walking on the north side of West Governor John Sevier Highway towards the west and turned towards the north on Marashi Road. Later in the afternoon, a couple was observed walking their dogs on Marashi Road down to West Governor John Sevier Highway and then returned to the north.
- Most vehicles were passenger vehicles during the traffic count. School buses, semi-tractor trailer trucks, single-unit trucks, dump trucks, and construction vehicles with trailers were also observed, especially in the morning.
- Pairs of school buses were observed during the traffic count entering Marashi Road from West Governor John Sevier Highway and exiting several minutes later in the morning and afternoon.
- Much higher westbound volumes on West Governor John Sevier Highway and turning volumes towards the west were observed in the morning versus eastbound volumes. In the afternoon, the opposite occurred, but the split was more muted, with slightly more vehicles heading east versus west overall.
- Many of the observed exiting southbound left-turning motorists from Marashi Road at West Governor John Sevier Highway found a gap in traffic, crossed the westbound lane, used the center TWLTL as a temporary refuge, and then waited for an appropriate gap in the eastbound traffic stream before fully completing their turn.
- The eastbound and westbound thru volumes on West Governor John Sevier Highway were extremely uniform during the AM and PM peak hour 15-minute tabulated periods.



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FIGURE 4

1413 Tipton Station Road Subdivision

2024 Peak Hour Traffic Volumes -
EXISTING TRAFFIC CONDITIONS

Capacity analyses were undertaken to determine the Level of Service (LOS) for the existing 2024 intersection traffic volumes shown at West Governor John Sevier Highway and Marashi Road in Figure 4. The capacity analyses were calculated following the Highway Capacity Manual (HCM) methods and utilizing Synchro Traffic Software (Version 12).

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 the 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.

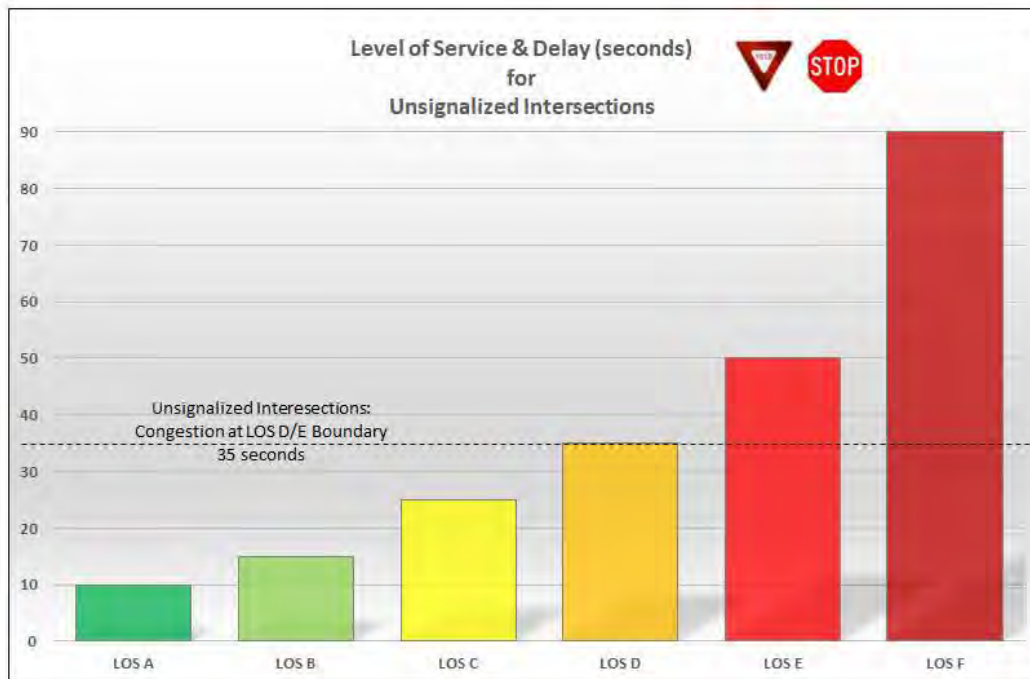
For unsignalized intersections, LOS is measured in terms of delay (in seconds). This measure attempts to quantify delay, including travel time, driver discomfort, and fuel consumption. For unsignalized intersections, the analysis assumes that the mainline thru and right-turn traffic does not stop and 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, 7th 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 E includes the worksheets for the existing 2024 peak hour capacity analyses.

As shown in Table 3, the intersection of West Governor John Sevier Highway at Marashi Road is calculated to operate with average to poor LOS and vehicle delays in the existing peak hour 2024 conditions. The southbound approach, Marashi Road, is shown operating at LOS E and D in the AM and PM peak hours, respectively. Capacity analyses for this intersection are provided in the report as a courtesy since this intersection was not requested to be included in the scope of work.

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
W Governor John Sevier Highway (WB & EB) at Marashi Road (SB)	 Unsignalized	Eastbound Left	B	10.6	0.018	B	10.4	0.072
		Southbound Left/Right	E	35.3	0.580	D	28.4	0.354

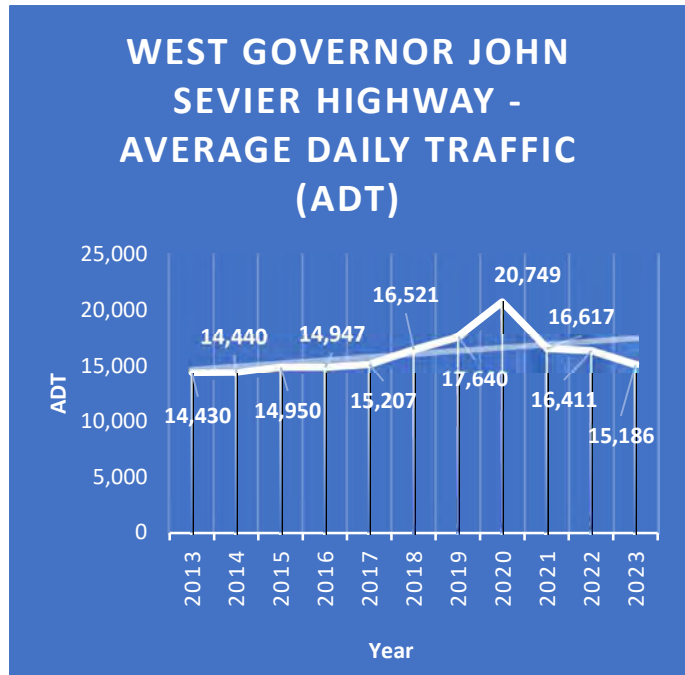
Note: All analyses were calculated in Synchro 12 software and reported using 7th Edition intersection methodology

^a Level of Service, ^b Average Delay (sec/vehicle), ^c Volume-to-Capacity Ratio

▪ **PROJECTED TRAFFIC CONDITIONS WITHOUT THE PROJECT:**

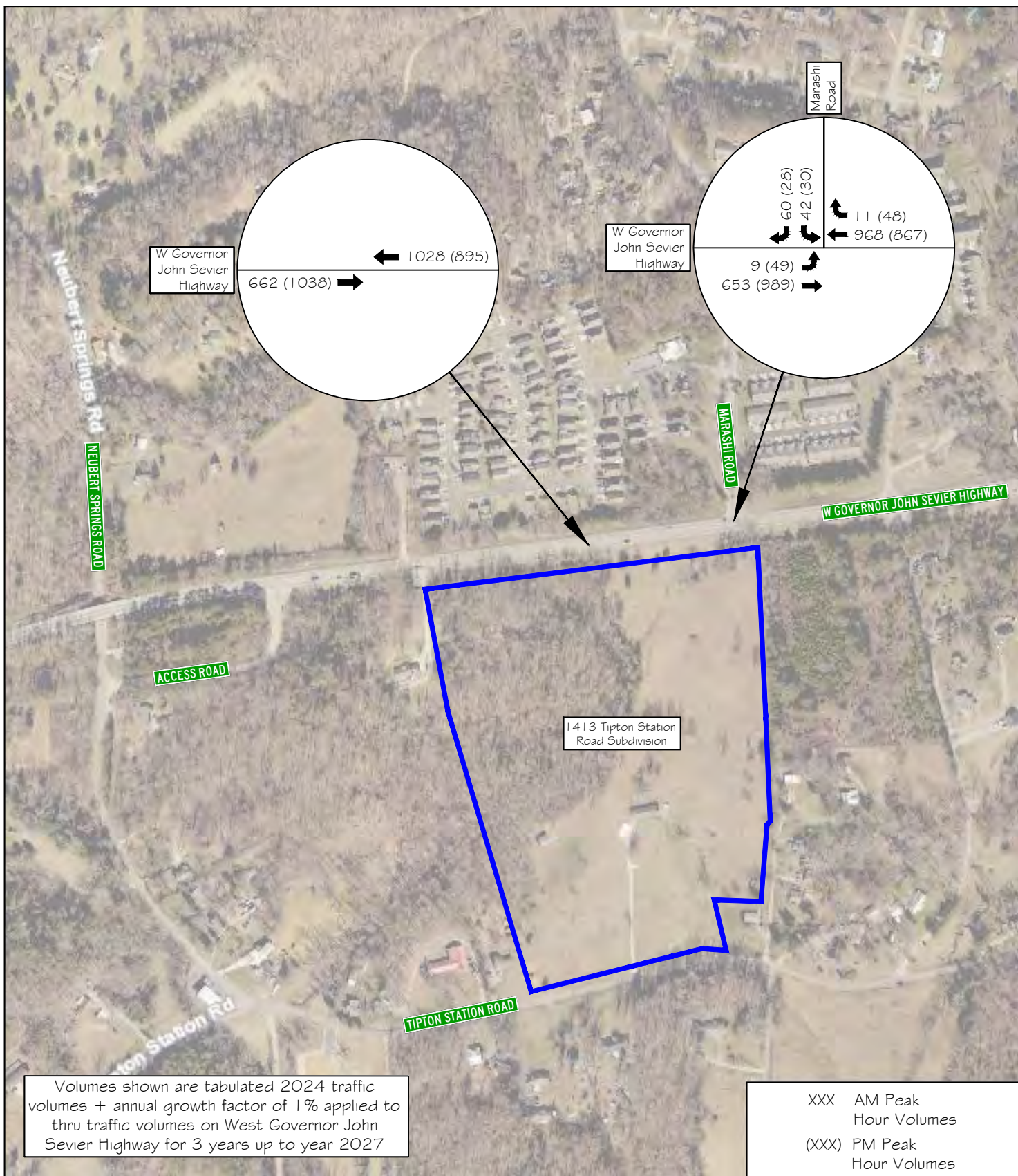
Horizon year traffic conditions represent the projected traffic volumes in the study area without the proposed project being developed (no-build option). This proposed development’s build-out and full occupancy are assumed to occur by 2027.

According to the nearby TDOT count station, West Governor John Sevier Highway's vehicular traffic has been flat over the past few years. Specifically, the TDOT data shown in Appendix A indicates that West Governor John Sevier Highway has experienced annual growth of only +0.5% over the past ten years. The traffic count station showed a crest in vehicular volumes in 2020 but has slowly decreased over the past three years from 2021 – 2023.



Nonetheless, this study used an annual growth rate of +1% to calculate future growth on West Governor John Sevier Highway up to 2027. The annual growth rate of 1% was applied to the existing 2024 thru volumes tabulated on West Governor John Sevier Highway to estimate the future volumes in the horizon year of 2027 without the proposed development traffic.

Figure 5 shows the projected horizon year traffic volumes without the project on West Governor John Sevier Highway at the Proposed Entrance location and the intersection of West Governor John Sevier Highway and Marashi Road during the 2027 AM and PM peak hours.



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FIGURE 5

1413 Tipton Station Road Subdivision

2027 Peak Hour Traffic Volumes -
PROJECTED TRAFFIC CONDITIONS
WITHOUT THE PROJECT

Capacity analyses were undertaken to determine the projected LOS in 2027 without the development’s trips at the existing adjacent intersection. The results are shown in Table 4, and Appendix E includes the capacity analysis worksheets from the software.

As expected, the results in Table 4 show slightly worse vehicle delays at the intersection in the 2027 projected conditions versus the existing 2024 conditions. This result is due to the slight increase in West Governor John Sevier Highway traffic volumes due to the assumed general growth.

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
W Governor John Sevier Highway (WB & EB) at Marashi Road (SB)	 Unsignalized	Eastbound Left	B	10.8	0.019	B	10.5	0.074
		Southbound Left/Right	E	38.0	0.603	D	29.8	0.368

Note: All analyses were calculated in Synchro 12 software and reported using 7th Edition intersection methodology

^a Level of Service, ^b Average Delay (sec/vehicle), ^c Volume-to-Capacity Ratio

▪ **TRIP GENERATION:**

A generated trip is a single or one-direction vehicle movement entering or exiting the study site. The estimated traffic the 1413 Tipton Station Road Subdivision will generate was based on the equations provided by two sources. The trips generated by the 69 single-family detached houses were calculated using rates and equations provided by the Trip Generation Manual, 11th Edition, an Institute of Transportation Engineers (ITE) publication. The trips generated by the 69 townhouses were based on equations provided by Knoxville/Knox County Planning. These equations from Knoxville/Knox County Planning were developed from an extensive local study to estimate townhouse (and apartment) trip generation in the surrounding area. For Knox County, this is the preferred rate to use for townhouses and apartments. This local rate calculates slightly higher trip rates than the similar land use in the ITE Trip Generation Manual.

The data and calculations from the ITE and local trip generation study for the proposed land uses are shown in Appendix F. A summary of this information is presented in Table 5:

TABLE 5
TRIP GENERATION FOR 1413 TIPTON STATION ROAD SUBDIVISION
69 Attached Townhouses and 69 Single-Family Detached Houses

ITE LAND USE CODE	LAND USE DESCRIPTION	# OF UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Local Trip Rate	Multi-Family Attached Townhouses	69	684	22%	78%		55%	45%	
				8	30	38	31	25	56
#210	Single-Family Detached Housing	69	717	26%	74%		63%	37%	
				14	39	53	44	26	70
Total New Volume Site Trips			1,401	22	69	91	75	51	126

ITE Trip Generation Manual, 11th Edition and Local Trip Rates
Trips calculated by using Fitted Curve Equations

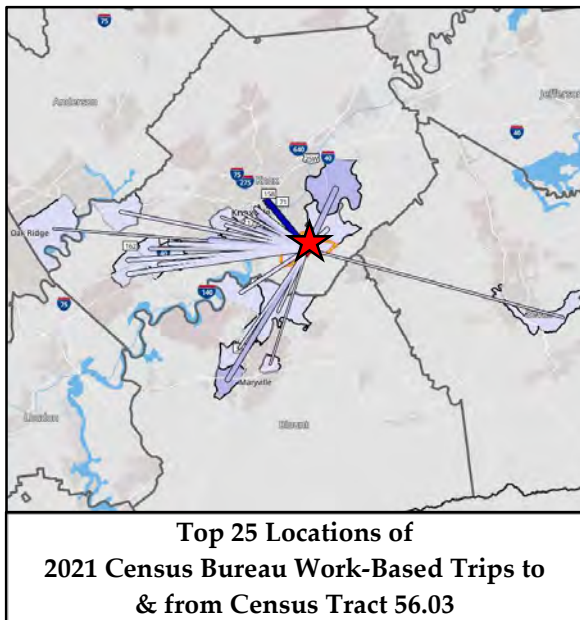
For the proposed 1413 Tipton Station Road Subdivision, it is estimated that 22 vehicles will enter and 69 will exit, for a total of 91 generated trips during the AM peak hour in the year 2027. Similarly, it is estimated that 75 vehicles will enter and 51 will exit, for a total of 126 generated trips during the PM peak hour in the year 2027. The calculated trips generated for an average

weekday are estimated to be 1,401 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 1413 Tipton Station Road 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 existing intersection of West Governor John Sevier Highway at Marashi Road.

Overall, during the traffic counts, West Governor John Sevier Highway motorists showed a distinct inclination for westbound travel towards Knoxville in the morning and slightly the opposite in the afternoon peak period. The adjacent intersection of West Governor John Sevier Highway at Marashi Road is a good analog for the projected distribution at the Proposed Entrance for the 1413 Tipton Station Road Subdivision since Marashi Road serves as a singular road access point to hundreds of residential homes. Most Marashi Road residents exited towards the west in the morning peak. In the afternoon peak, the entering and exiting traffic was nearly even for east and west travel directions.



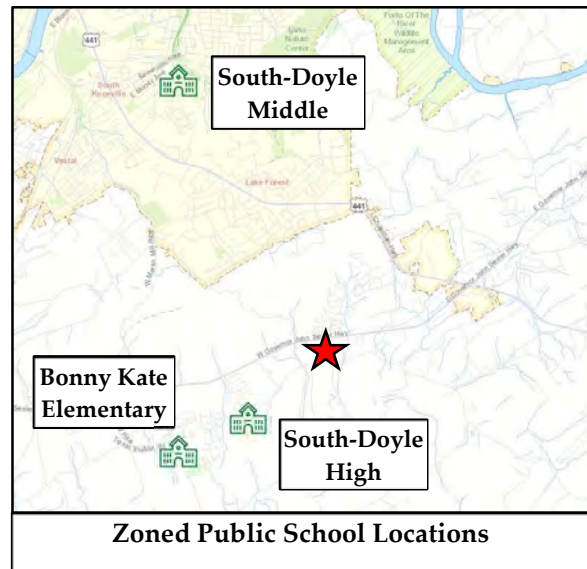
The second source for determining the projected trip distribution is based on work-related trips in the local area. Work-based trips will be a significant impetus for trips generated by the development, and these trips are more likely to travel to and from the northwest, west, and southwest. This assertion is based on data from the United States Bureau website for Census Tract 56.03, where the development property is located. Based on 2021 (latest available) census data and as presented in Appendix G, most work-based trips in the surrounding area correspond to Oak Ridge, TN, downtown Knoxville, the University of

Tennessee, and areas of West Knoxville. Some of these work-based trips also correspond to Alcoa and Maryville, TN areas. Less work-based trips are shown east and southeast of the development site.

In addition to employment centers, some generated traffic will travel to and from public and private schools. Schools will be another impetus for external trip-making. The development property is currently zoned for Bonny Kate Elementary, South-Doyle Middle, and South-Doyle

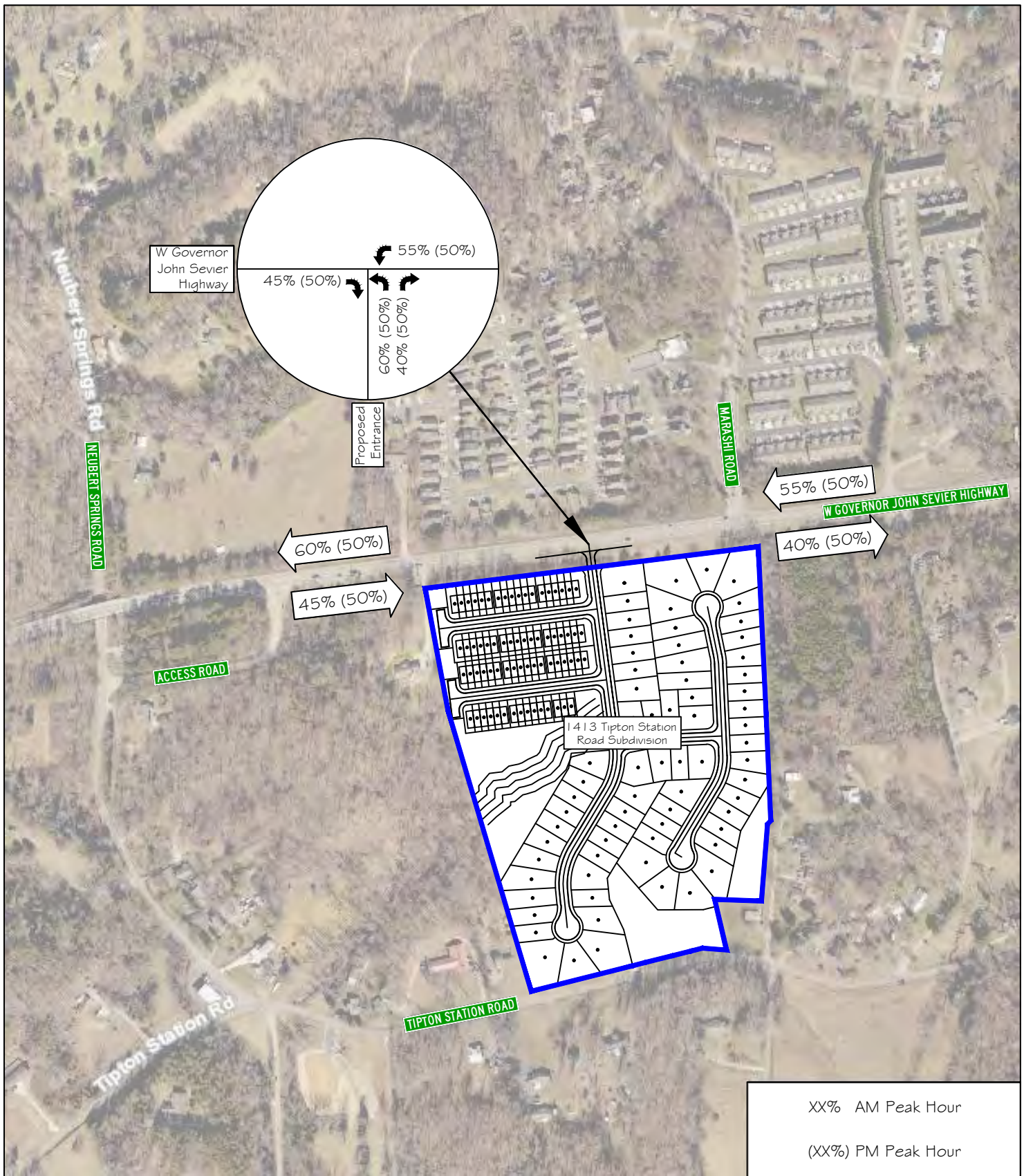
High School. The zoned public schools for this development property are located north and southwest of the development site. The zoned schools are between 1.6 and 4.7 miles from the proposed subdivision by roadway. The shortest and quickest routes from the proposed subdivision to and from these schools will be made by primarily traveling east and west on West Governor John Sevier Highway. The furthest school, South-Doyle Middle School, is located to the north and south of downtown Knoxville, and the quickest route to and from this school, according to map routing, would be via Neubert Springs Road. For the elementary and high schools, the quickest route to these schools is either by initially exiting left or right onto West Governor John Sevier Highway. During peak periods on West Governor John Sevier Highway, future residents exiting the proposed subdivision to these schools may find it most accessible and less stressful to exit to the right and then use Winkle Lane to the south to access Tipton Station Road rather than turning left onto West Governor John Sevier Highway. For return trips from these schools, most residents would be expected to enter the subdivision exclusively by making an eastbound right turn off West Governor John Sevier Highway since it would be the quickest and most accessible path.

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 all these factors, Figure 6 shows the projected distribution of traffic entering and exiting the proposed residential subdivision at the Proposed Entrance. Overall, the traffic generated by future residents in the subdivision was heavily assumed based on the observations at the West Governor John Sevier Highway intersection at Marashi Road.

Figure 7 shows the traffic assignment of the computed trips generated by the 1413 Tipton Station Road Subdivision and is based on the assumed distribution of trips shown in Figure 6.



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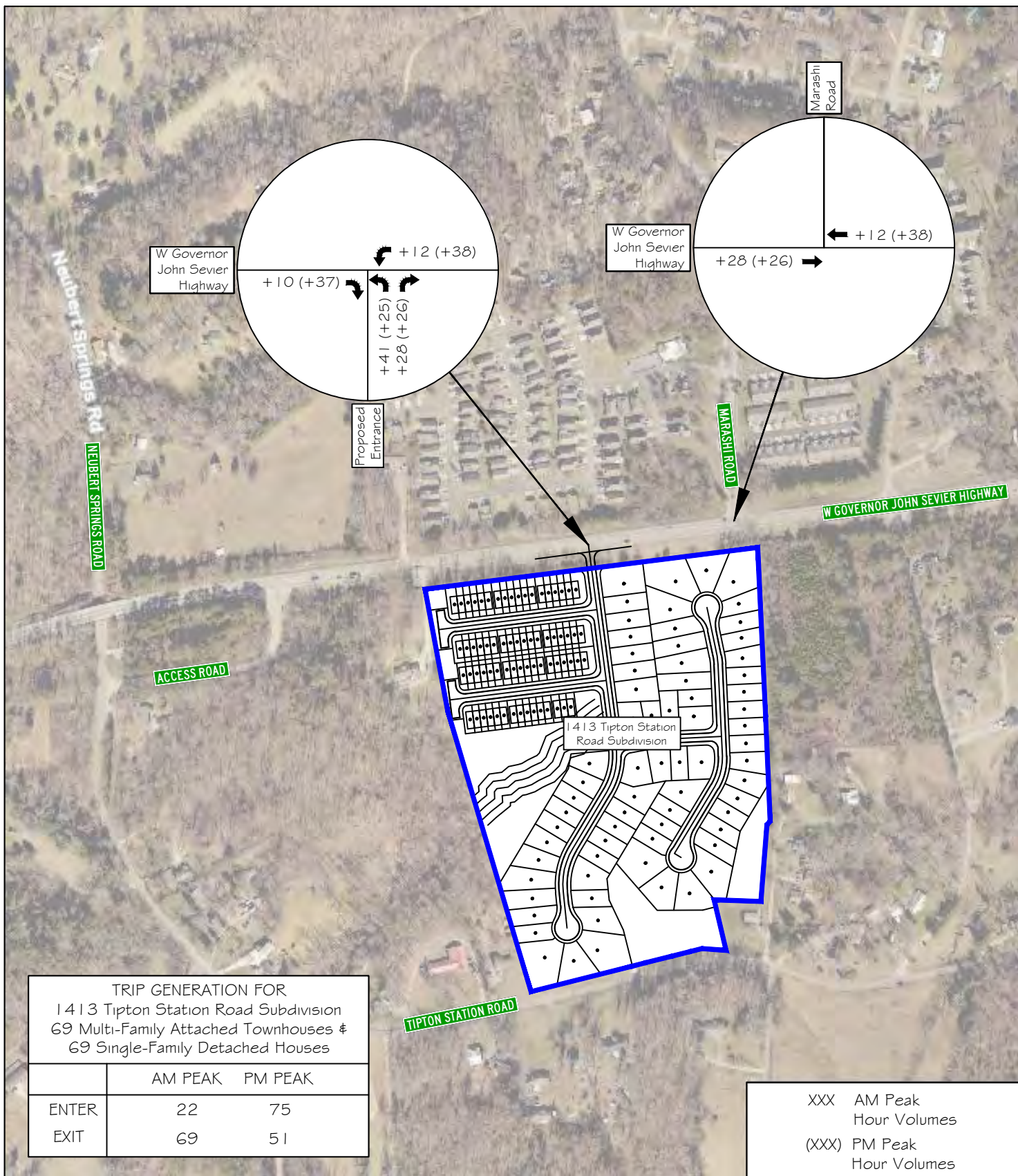
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FIGURE 6

1413 Tipton Station Road Subdivision

Directional Distribution of Generated Traffic during AM and PM Peak Hour



TRIP GENERATION FOR
 1413 Tipton Station Road Subdivision
 69 Multi-Family Attached Townhouses &
 69 Single-Family Detached Houses

	AM PEAK	PM PEAK
ENTER	22	75
EXIT	69	51

XXX AM Peak
 Hour Volumes
 (XXX) PM Peak
 Hour Volumes



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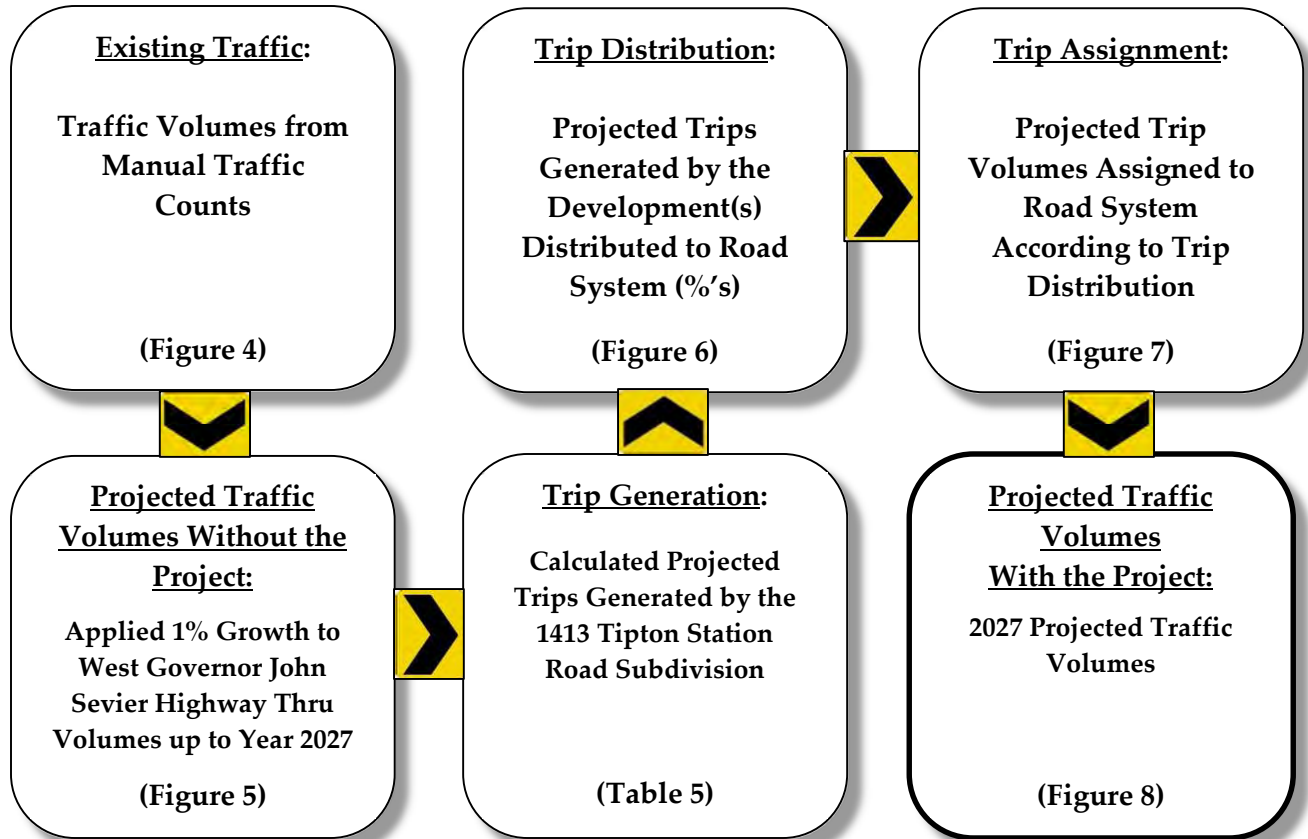


FIGURE 7

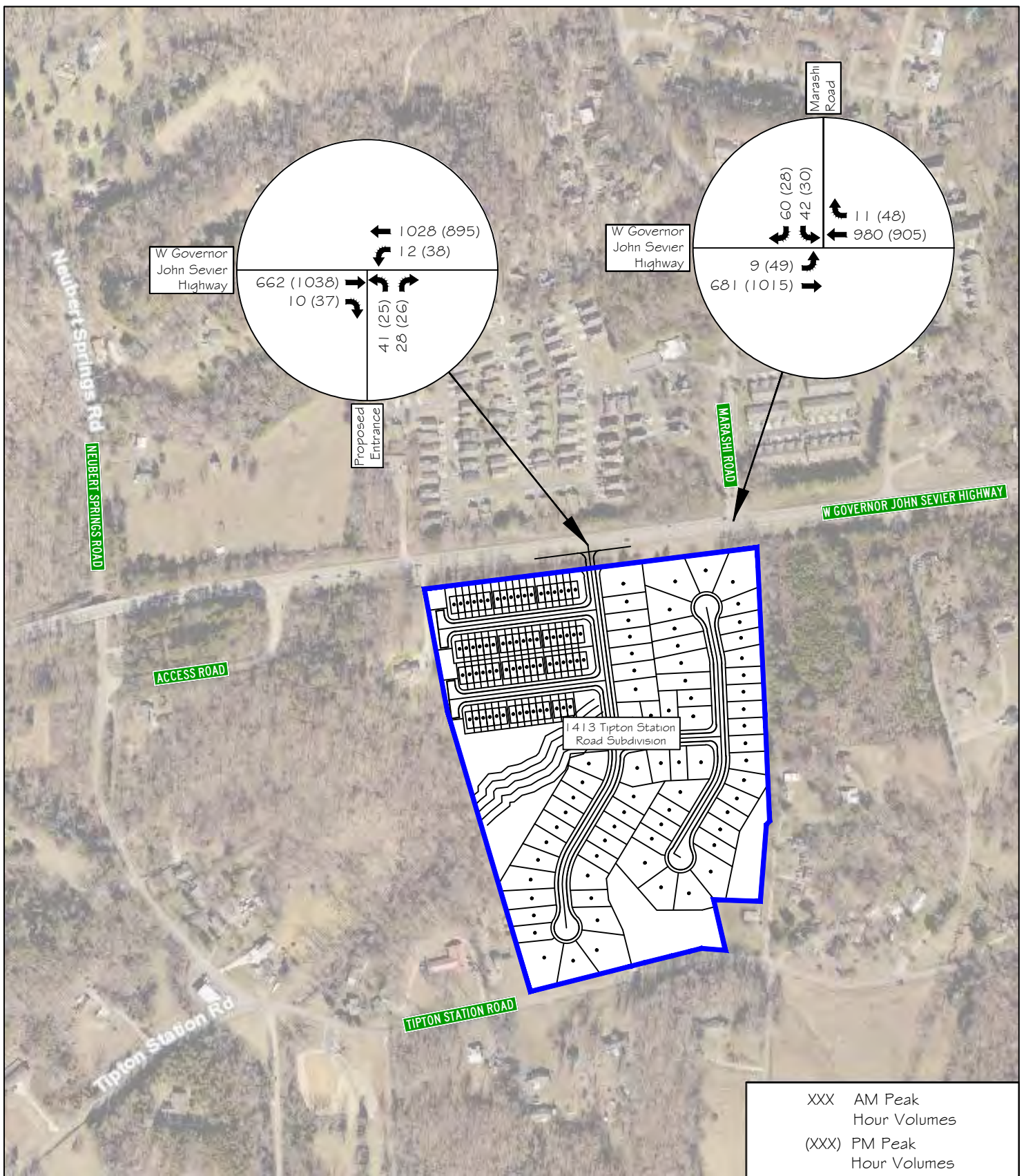
1413 Tipton Station Road Subdivision
 Traffic Assignment of Generated Traffic
 during AM and PM Peak Hour

▪ **PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT:**

Several additive steps were taken to estimate the total projected traffic volumes at the Proposed Entrance when the 1413 Tipton Station Road Subdivision is constructed and fully occupied in 2027. The steps are illustrated below for clarity and review:



The calculated peak hour traffic generated by the 1413 Tipton Station Road Subdivision was added to the 2027 horizon year traffic by following the predicted trip distributions and assignments. This procedure was completed to obtain the total projected traffic volumes at the Proposed Entrance (and at Marashi Road) when the 1413 Tipton Station Road Subdivision is fully built and occupied in 2027.



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FIGURE 8

1413 Tipton Station Road Subdivision

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

Capacity analyses were conducted to determine the projected LOS at the Proposed Entrance and the intersection of West Governor John Sevier Highway at Marashi Road with the development traffic in 2027, as shown in Figure 8. Intersection capacity results from the projected 2027 peak hour traffic are shown in Table 6. Appendix E includes the worksheets for the projected 2027 peak hour capacity analyses.

As shown in Table 6, the northbound exiting lane at the Proposed Entrance is projected to operate adequately at LOS C and D in the AM and PM peak hours, respectively. Entering westbound left turns into the development is projected to operate at LOS B in the peak hours.

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
W Governor John Sevier Highway (WB & EB) at Marashi Road (SB)		Eastbound Left	B	10.9	0.019	B	10.7	0.076
		Southbound Left/Right	E	39.5	0.615	D	31.7	0.387
W Governor John Sevier Highway (WB & EB) at Proposed Entrance (NB)		Northbound Left/Right	C	23.4	0.282	D	28.9	0.275
		Westbound Left	B	9.0	0.015	B	11.1	0.067

Note: All analyses were calculated in Synchro 12 software and reported using 7th 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.

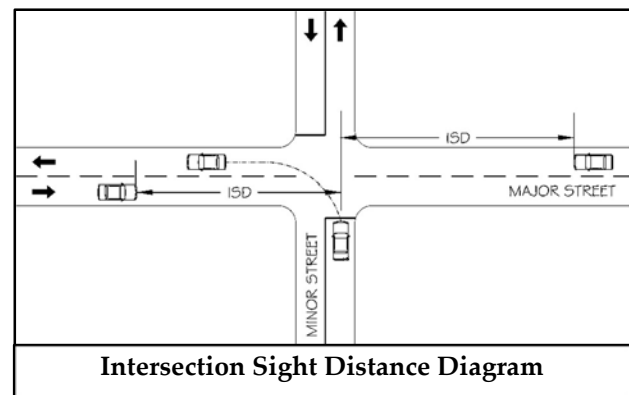
○ **EVALUATION OF SIGHT DISTANCE**

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. 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. Three traffic maneuvers are available for vehicles stopped on a minor street



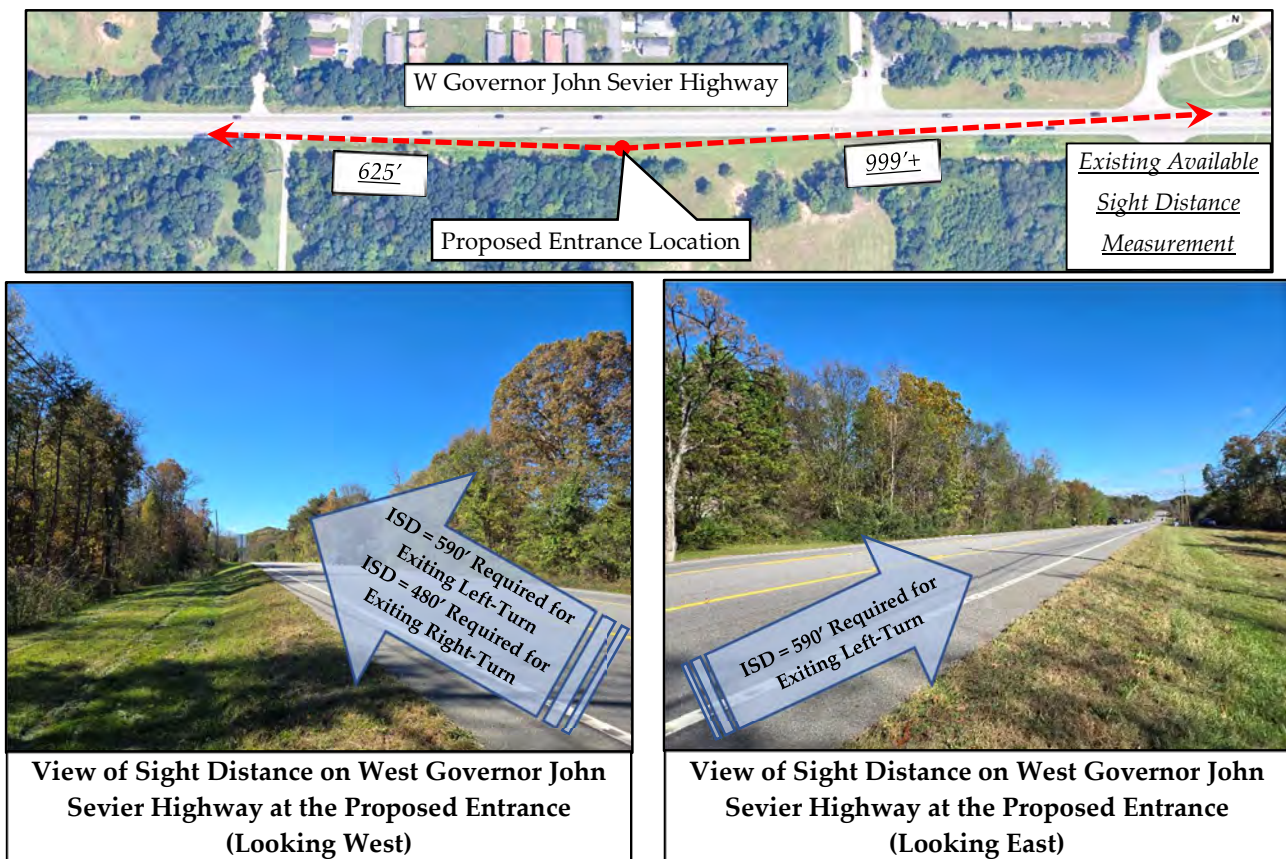
at a 4-way intersection: (1) left-turn, (2) right-turn, (3) or a crossing maneuver across the major street. For turns from the minor street, ISD is needed to allow a stopped motorist to turn onto a major street without being overtaken by an approaching vehicle. The most critical ISD is for left turns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

With a posted speed limit of 50 mph on West Governor John Sevier Highway with two lanes and a center TWLTL, the ISD is 590 feet for left turns exiting the development site. This value is

calculated based on AASHTO's (American Association of State Highway Transportation Officials) and TDOT's guidance. This distance is required for a motorist to safely exit to the left (westbound) onto West Governor John Sevier Highway from the Proposed Entrance. The ISD for a right-turn movement towards the east from the Proposed Entrance is 480 feet.

Visual observations of the sight distances at the Proposed Entrance location were undertaken. Using a Nikon Laser Rangefinder at the Proposed Entrance location, the available sight distance was visually estimated to be 625 feet to the west and 999+ feet (limit of the rangefinder) to the east. Based on these visual observations, the available sight distances from the Proposed Entrance are expected to be adequate for motorists exiting the subdivision. A vertical crest curve on West Governor John Sevier Highway restricts further distance to the west.

Images of the existing sight distances at the Proposed Entrance location are labeled in the following image with the required ISD and rangefinder-measured sight distances.



- **EVALUATION OF TURN LANE THRESHOLDS**

The need for a separate right-turn lane was evaluated in the projected 2027 conditions for the Proposed Entrance on West Governor John Sevier Highway. The evaluation did not include left turns on West Governor John Sevier Highway since a center TWLTL is already provided to separate and store left-turning vehicles.

The criteria used for the turn lane evaluation at the Proposed Entrance on West Governor John Sevier Highway was based on TDOT's "Highway System Access Manual" since it is located on a State Route. The evaluation was based on the posted speed limit of 50 mph on West Governor John Sevier Highway. This design policy relates vehicle volume thresholds based on prevailing speeds for two- and four-lane roadways.

According to TDOT's guidelines and based on the projected 2027 peak hour traffic volumes, the warrant threshold for a separate eastbound right-turn lane on West Governor John Sevier Highway at the Proposed Entrance will be met in the PM peak hours. The worksheets for these evaluations are provided in Appendix H.



- **PROJECTED VEHICLE QUEUES**

The Synchro traffic software also calculates the 95th percentile vehicle queues. The 95th percentile vehicle queue is the recognized measurement in the transportation engineering profession as the design standard used when considering vehicle queue lengths. Vehicle queues are another component of an intersection's assessment. A 95th percentile vehicle queue length means 95% certainty that the vehicle queue will not extend beyond that point. The assessment results for this study are shown in Table 7 and provided within the Synchro capacity worksheets in Appendix E.

The Synchro 95th percentile vehicle queue results account for two-stage left turns when the median is sufficient to store a vehicle temporarily. With a center TWLTL width of 12 feet on West Governor John Sevier Highway, Synchro was used to calculate the 95th percentile queues since adequate storage space for a single vehicle will be available as a temporary refuge before a motorist completes its entire movement. This maneuver was observed in the existing conditions at the Marashi Road intersection.

Table 7 shows that the longest vehicle queue during the AM and PM peak hours for the northbound exiting lane at the Proposed Entrance is calculated to be 28 feet. This length would be approximately one vehicle, assuming a vehicle length of 25 feet. Entering westbound left turns on West Governor John Sevier Highway at the Proposed Entrance is calculated to have a 95th percentile vehicle queue length of 5 feet. Likewise, entering eastbound left-turns on West Governor John Sevier Highway at nearby Marashi Road is also calculated to have a vehicle queue length of 5 feet.

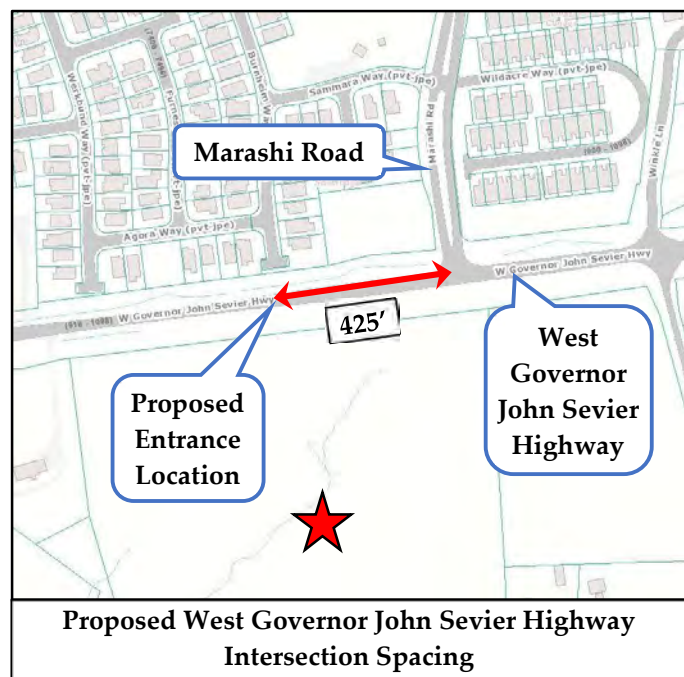
**TABLE 7
VEHICLE QUEUE SUMMARY -
2027 PROJECTED PEAK HOUR TRAFFIC WITH THE PROJECT**

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	SYNCHRO 95 th PERCENTILE QUEUE LENGTH (ft) ¹	
			AM PEAK HOUR	PM PEAK HOUR
W Governor John Sevier Highway (WB & EB) at Marashi Road (SB)	 Unsignalized	Eastbound Left	3	5
		Southbound Left/Right	93	43
W Governor John Sevier Highway (WB & EB) at Proposed Entrance (NB)	 Unsignalized	Northbound Left/Right	28	28
		Westbound Left	0	5

¹ Distances listed are based on vehicle length = 25 feet

○ EVALUATION OF INTERSECTION SPACING

Knox County and TDOT require specific minimum spacing between intersecting streets. Section 3.04.J.4 of the Knoxville-Knox County Subdivision Regulations states the Knox County standard. Since West Governor John Sevier Highway is designated as a Major Arterial at the Proposed Entrance location, the minimum intersection spacing for Knox County is 400 feet. TDOT's minimum offset intersection guidelines are listed in their Highway System Access Manual Volume



3 in Table 3-7. For a Principal Arterial, the minimum spacing of offset access points would be 330 feet in an urban setting.

The proposed spacing between Marashi Road and the Proposed Entrance for the 1413 Tipton Station Road Subdivision is approximately 425 feet from centerline to centerline, greater than the Knox County and TDOT minimum.

Furthermore, as shown in the previous section, the 95th percentile vehicle queues are calculated to be five feet at both intersections for left-turning vehicles in the center TWLTL. When a center TWLTL or opposite left lanes are present, there is a risk of a left-turn lockup occurring due to overlapping left turns conflicting with each other. However, as demonstrated, this is not projected to occur at this location because of the projected minimal queue lengths with the appropriate offset distance between the two intersections.

CONCLUSIONS & RECOMMENDATIONS

The following is an overview of recommendations to minimize the transportation impacts of the 1413 Tipton Station Road Subdivision on the adjacent transportation system while attempting to achieve an acceptable traffic flow and safety level.



West Governor John Sevier Highway at Proposed Entrance: This intersection is projected to operate with average vehicle delays and minimal vehicle queues for all movements.

- 1a) It is recommended that a Stop Sign (R1-1) be installed and a 24" white stop bar be applied to the Proposed Entrance approach at West Governor John Sevier Highway. The stop bar should be applied a minimum of 4 feet away from the edge of West Governor John Sevier Highway and placed at the desired stopping point that maximizes the sight distance.
- 1b) Intersection sight distance from the Proposed Entrance at West Governor John Sevier Highway must not be impacted by future landscaping, signage, or vegetation. Based on a posted speed limit of 50 mph on West Governor John Sevier Highway, the required intersection sight distance is 590 feet for exiting left-turning vehicles and 480 feet for exiting right-turning vehicles. The existing sight distances at the Proposed Entrance location were estimated visually to be adequate in both directions. The site designer must ensure that the intersection sight distances are accounted for and provided in the design plans.
- 1c) Based on TDOT's warrant thresholds and the projected 2027 traffic volumes, an eastbound right-turn lane is warranted to be constructed for the Proposed Entrance. A 12-foot eastbound right-turn lane on West Governor John Sevier Highway is recommended to be constructed at the Proposed Entrance with 265 feet of lane change and deceleration distance. A taper length of 180 feet (15:1) should be included within this 265-foot distance, leaving a full-width lane length of 85 feet. The right-turn lane should include the appropriate right-turn arrow pavement markings, as shown in TDOT Standard Drawing T-M-4. The designer must coordinate with TDOT to design and construct this eastbound right-turn lane.

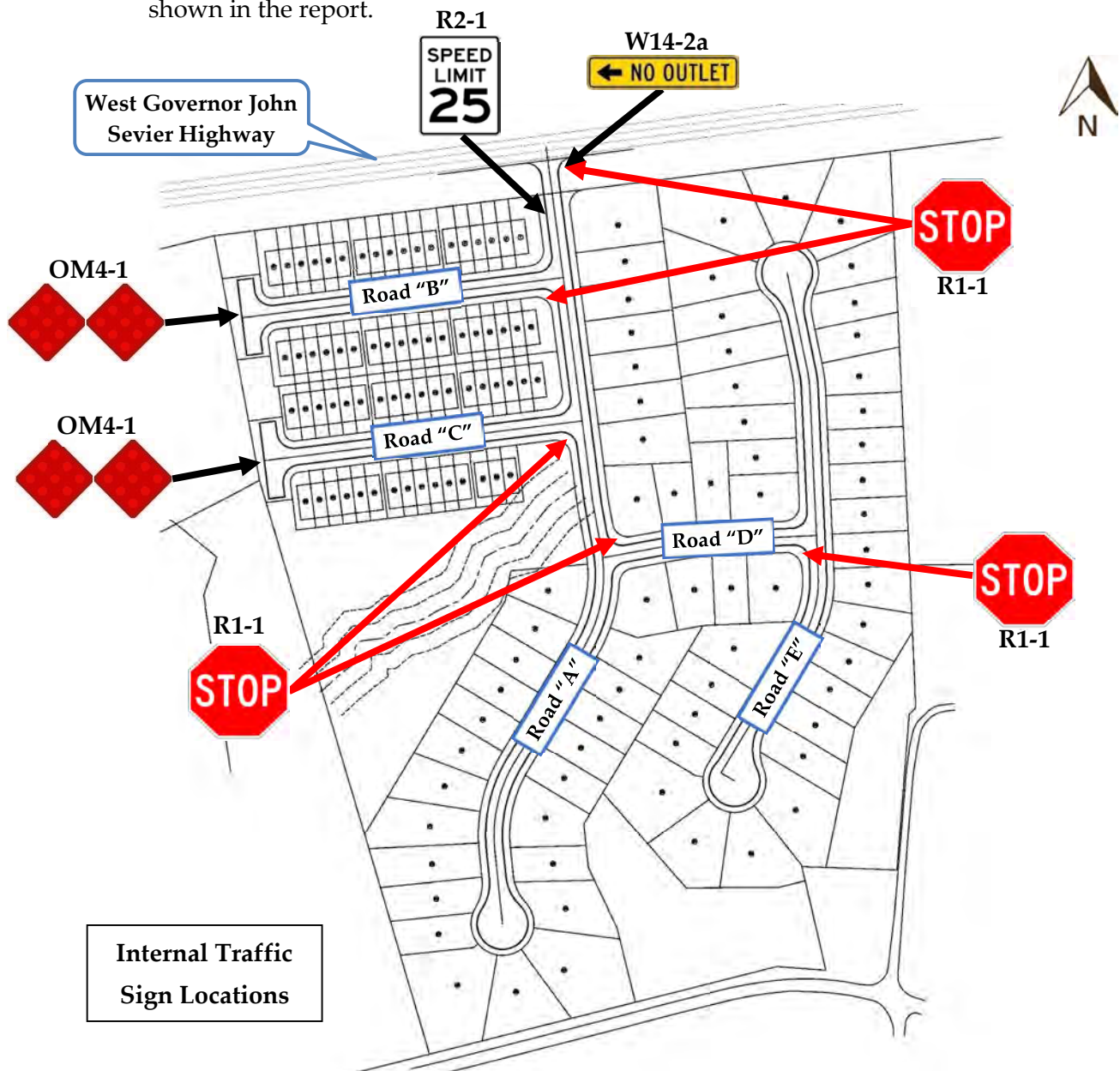
- 1d) It is recommended that the center two-way left-turn lane (TWLTL) pavement markings on West Governor John Sevier Highway be modified to reflect an exclusive westbound left-turn lane at the Proposed Entrance. The existing center TWLTL markings should be removed to indicate a public road opening/intersection at the Proposed Entering intersection at West Governor John Sevier Highway. The existing pavement markings in the TWLTL should be re-striped to accommodate a dedicated minimum storage length of 75 feet for westbound left turns, and a white left-turn arrow should be applied to the pavement.

- 1e) The construction of the Proposed Entrance on West 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.



1413 Tipton Station Road Subdivision Internal Roads: The layout plan shows six new streets, as shown in Figure 3.

- 2a) A 25-mph Speed Limit Sign (R2-1) is recommended to be posted near the beginning of the Proposed Entrance, Road "A", off West 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) Stop Signs (R1-1) with 24" white stop bars are recommended to be installed at the internal road intersections, as shown in the image below. Dual end-of-roadway object markers (OM4-1) should be installed at the end of subdivision Roads "B" and "C", as shown in the report.



- 2c) The proposed lots within the development adjacent to and south of West Governor John Sevier Highway should not be allowed direct access.

- 2d) Sight distance at the new internal intersections must not be impacted by new signage, parked cars, or future landscaping. With a proposed speed limit of 25-mph in the development, the required internal intersection sight distance is 250 feet. The site designer should ensure that this internal sight distance length is met.

- 2e) 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.

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

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

- 2h) All road and intersection elements should be designed to AASHTO, TDOT, and Knox County specifications and guidelines to ensure proper operation.

APPENDIX A

HISTORICAL TRAFFIC COUNT DATA

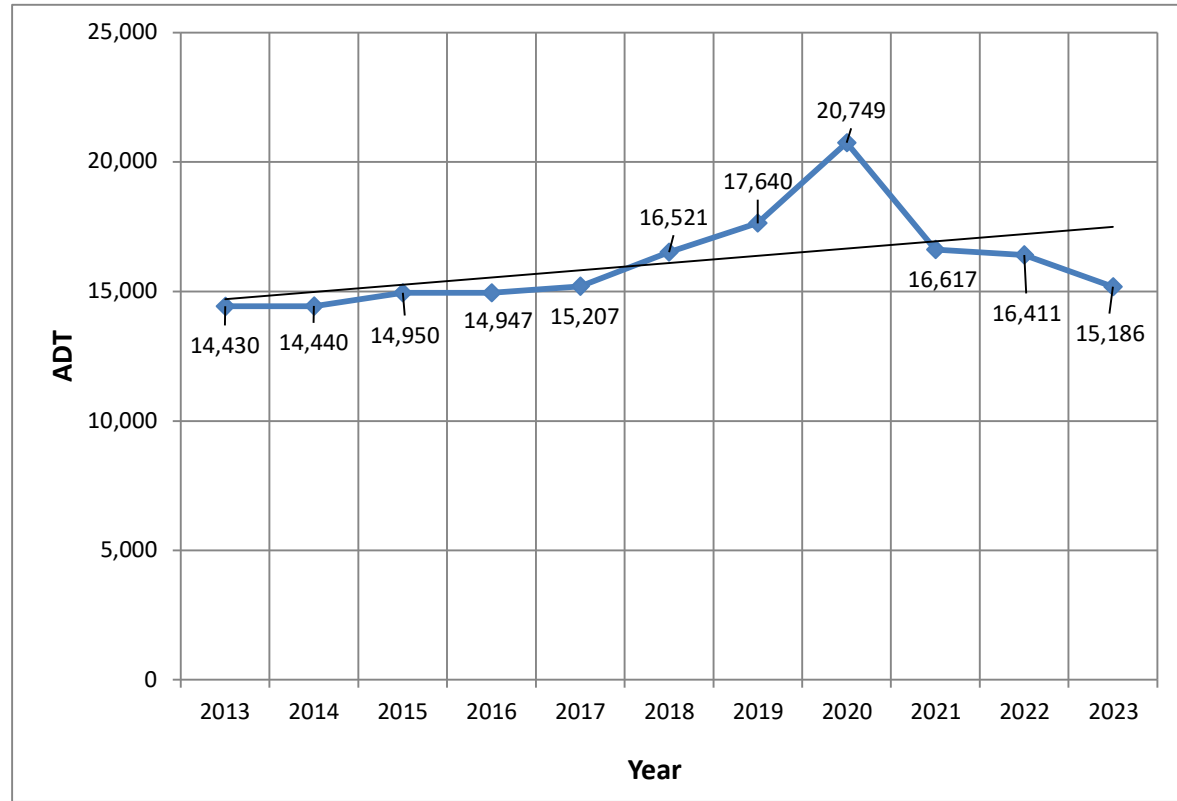
Historical Traffic Counts

Organization: TDOT

Station ID #: 47000290

Location: West Governor John Sevier Highway, west of Martin Mill Pike

YEAR	AADT	
2013	14,430	Trendline ↓
2014	14,440	
2015	14,950	
2016	14,947	
2017	15,207	
2018	16,521	
2019	17,640	
2020	20,749	
2021	16,617	
2022	16,411	
2023	15,186	



2013 - 2023 Growth Rate = 5.2%

Average Annual Growth Rate = 0.5%

TDOT
Department of
Transportation

Traffic Count (TCDS)

Home
Locate
Locate All
Email This
Auto-Locate:

List View
All DTRs

Record
7560
of 15935
Goto Record

go

Location ID	47000290	MPO ID	
Type	SPOT	HPMS ID	
On NHS		On HPMS	
LRS ID	47SR168001	LRS Loc Pt.	3.025
SF Group	Urban Minor Arterial (2024)	Route Type	
AF Group	Region 1 Urban Minor Arterial (2024)	Route	
GF Group	Knox (2024)	Active	Yes
Class Dist Grp	Region 1 Urban Minor Arterial (2024)	Category	CC
Seas Class Grp			
WIM Group			
QC Group	Default		
Funct'l Class	Minor Arterial	Milepost	
Located On	SR168		
Loc On Alias	W. GOV. JOHN SEVER HWY. SOUTH KNOXVILLE		

STATION DATA

Directions: 2-WAY
EB
WB

Year	AAADT	DHV-30	K %	D %	PA	BC	Src
2023	15,186	1,421	9	61	13,725 (90%)	1,461 (10%)	
2022	16,411	1,500	9	65	15,953 (97%)	458 (3%)	
2021	16,617	1,400	8	65	16,068 (97%)	549 (3%)	
2020	20,749	1,682	8	65	19,961 (96%)	788 (4%)	
2019	17,640		12	65	16,339 (93%)	1,300 (7%)	

<<
<
>
>>
1-5 of 39

Google

Location

Location ID: 47000290

Located On: SR168 SOUTH KNOXVILLE

Direction: 2-WAY

Count: 15186 (2023)

EB Count: 7370 (2023)

WB Count: 7816 (2023)

[View Detail in a New Search](#)

[Go to Record in Current Search](#)

APPENDIX B

KNOXVILLE AREA TRANSIT MAP AND INFORMATION

Due to the temporary closing of the Gay Street Bridge, Route 41 will remain on its current detour which uses the Henley Street Bridge until further notice.



Route 41 - Chapman Highway WEEKDAY

Going away from downtown		Going toward downtown		
Knoxville Station Bay P	Chapman Hwy after Moody Ave	Walmart	Chapman Hwy after Young High Pike	Knoxville Station Bay F*
			<i>Transfer to Rts. 40 & 45</i>	
1	2	3	4	5
		5:41 AM	5:50 AM	6:10 AM
6:15 AM	6:25 AM	6:41 AM	6:50 AM	7:10 AM
6:45 AM	6:55 AM	7:11 AM	7:20 AM	7:40 AM
7:15 AM	7:25 AM	7:41 AM	7:50 AM	8:10 AM
7:45 AM	7:55 AM	8:11 AM	8:20 AM	8:40 AM
8:15 AM	8:25 AM	8:41 AM	8:50 AM	9:10 AM
8:45 AM	8:55 AM	9:11 AM	9:20 AM	9:40 AM
9:15 AM	9:25 AM	9:41 AM	9:50 AM	10:10 AM
9:45 AM	9:55 AM	10:11 AM	10:20 AM	10:40 AM
10:15 AM	10:25 AM	10:41 AM	10:50 AM	11:10 AM
10:45 AM	10:55 AM	11:11 AM	11:20 AM	11:40 AM
11:15 AM	11:25 AM	11:41 AM	11:50 AM	12:10 PM
11:45 AM	11:55 AM	12:11 PM	12:20 PM	12:40 PM
12:15 PM	12:25 PM	12:41 PM	12:50 PM	1:10 PM
12:45 PM	12:55 PM	1:11 PM	1:20 PM	1:40 PM
1:15 PM	1:25 PM	1:41 PM	1:50 PM	2:10 PM
1:45 PM	1:55 PM	2:11 PM	2:20 PM	2:40 PM
2:15 PM	2:25 PM	2:41 PM	2:50 PM	3:10 PM
2:45 PM	2:55 PM	3:11 PM	3:20 PM	3:40 PM
3:15 PM	3:25 PM	3:41 PM	3:50 PM	4:10 PM
3:45 PM	3:55 PM	4:11 PM	4:20 PM	4:40 PM
4:15 PM	4:25 PM	4:41 PM	4:50 PM	5:10 PM
4:45 PM	4:55 PM	5:11 PM	5:20 PM	5:40 PM
5:15 PM	5:25 PM	5:41 PM	5:50 PM	6:10 PM
5:45 PM	5:55 PM	6:11 PM	6:20 PM	6:40 PM
6:15 PM	6:25 PM	6:41 PM	6:50 PM	7:10 PM
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7:45 PM	7:55 PM	8:11 PM	8:20 PM	8:40 PM
8:15 PM	8:25 PM	8:41 PM	8:50 PM	9:10 PM
8:45 PM	8:55 PM	9:11 PM	9:20 PM	9:40 PM
9:15 PM	9:25 PM	9:41 PM	9:50 PM	10:10 PM
9:45 PM	9:55 PM	10:11 PM	10:20 PM	10:40 PM
10:15 PM	10:25 PM	10:41 PM	10:50 PM	11:10 PM
11:15 PM	11:25 PM	11:41 PM	11:50 PM	

*bus goes on to serve another route

Due to the temporary closing of the Gay Street Bridge, Route 41 will remain on its current detour which uses the Henley Street Bridge until further notice.



Route 41 - Chapman Highway SATURDAY

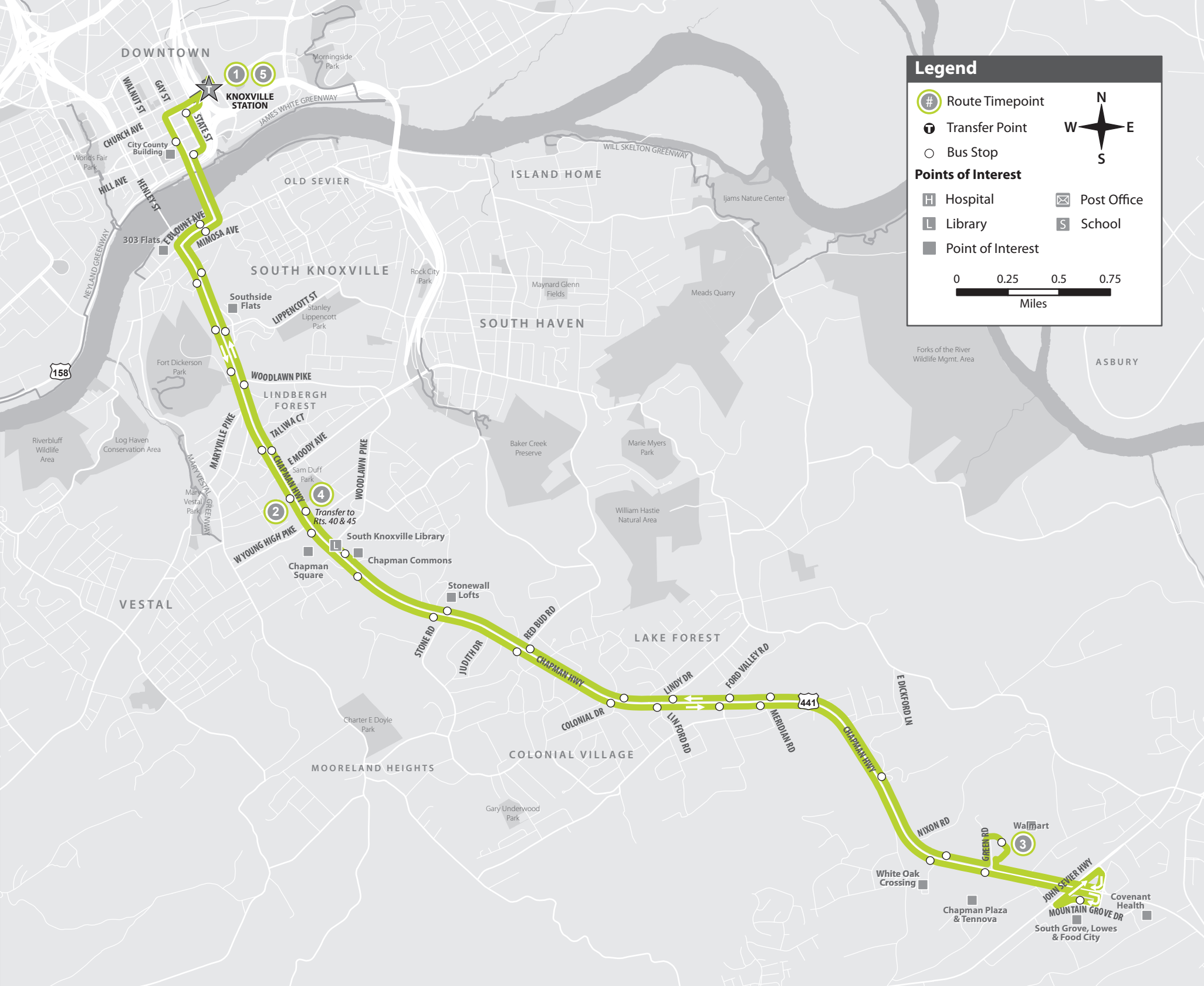
Going away from downtown		Going toward downtown		
Knoxville Station Bay P	Chapman Hwy after Moody Ave	Walmart	Chapman Hwy after Young High Pike	Knoxville Station Bay P
			<i>Transfer to Rts. 40 & 45</i>	
1	2	3	4	5
7:15 AM	7:25 AM	7:41 AM	7:50 AM	8:10 AM
7:45 AM	7:55 AM	8:11 AM	8:20 AM	8:40 AM
8:15 AM	8:25 AM	8:41 AM	8:50 AM	9:10 AM
8:45 AM	8:55 AM	9:11 AM	9:20 AM	9:40 AM
9:15 AM	9:25 AM	9:41 AM	9:50 AM	10:10 AM
9:45 AM	9:55 AM	10:11 AM	10:20 AM	10:40 AM
10:15 AM	10:25 AM	10:41 AM	10:50 AM	11:10 AM
10:45 AM	10:55 AM	11:11 AM	11:20 AM	11:40 AM
11:15 AM	11:25 AM	11:41 AM	11:50 AM	12:10 PM
11:45 AM	11:55 AM	12:11 PM	12:20 PM	12:40 PM
12:15 PM	12:25 PM	12:41 PM	12:50 PM	1:10 PM
12:45 PM	12:55 PM	1:11 PM	1:20 PM	1:40 PM
1:15 PM	1:25 PM	1:41 PM	1:50 PM	2:10 PM
1:45 PM	1:55 PM	2:11 PM	2:20 PM	2:40 PM
2:15 PM	2:25 PM	2:41 PM	2:50 PM	3:10 PM
2:45 PM	2:55 PM	3:11 PM	3:20 PM	3:40 PM
3:15 PM	3:25 PM	3:41 PM	3:50 PM	4:10 PM
3:45 PM	3:55 PM	4:11 PM	4:20 PM	4:40 PM
4:15 PM	4:25 PM	4:41 PM	4:50 PM	5:10 PM
4:45 PM	4:55 PM	5:11 PM	5:20 PM	5:40 PM
5:15 PM	5:25 PM	5:41 PM	5:50 PM	6:10 PM
5:45 PM	5:55 PM	6:11 PM	6:20 PM	6:40 PM
6:15 PM	6:25 PM	6:41 PM	6:50 PM	7:10 PM
6:45 PM	6:55 PM	7:11 PM	7:20 PM	7:40 PM
7:15 PM	7:25 PM	7:41 PM	7:50 PM	8:10 PM
7:45 PM	7:55 PM	8:11 PM	8:20 PM	8:40 PM
8:15 PM	8:25 PM	8:41 PM	8:50 PM	9:10 PM
8:45 PM	8:55 PM	9:11 PM	9:20 PM	9:40 PM
9:15 PM	9:25 PM	9:41 PM	9:50 PM	10:10 PM
9:45 PM	9:55 PM	10:11 PM	10:20 PM	10:40 PM
10:15 PM	10:25 PM	10:41 PM	10:50 PM	11:10 PM
10:45 PM	10:55 PM	11:11 PM	11:20 PM	11:40 PM
11:15 PM	11:25 PM	11:41 PM	11:50 PM	

Due to the temporary closing of the Gay Street Bridge, Route 41 will remain on its current detour which uses the Henley Street Bridge until further notice.



Route 41 - Chapman Highway SUNDAY

Going away from downtown		Going toward downtown		
Knoxville Station Bay P	Chapman Hwy after Moody Ave	Walmart	Chapman Hwy after Young High Pike	Knoxville Station Bay P
			<i>Transfer to Rts. 40 & 45</i>	
1	2	3	4	5
8:15 AM	8:25 AM	8:41 AM	8:50 AM	9:10 AM
8:45 AM	8:55 AM	9:11 AM	9:20 AM	9:40 AM
9:15 AM	9:25 AM	9:41 AM	9:50 AM	10:10 AM
9:45 AM	9:55 AM	10:11 AM	10:20 AM	10:40 AM
10:15 AM	10:25 AM	10:41 AM	10:50 AM	11:10 AM
10:45 AM	10:55 AM	11:11 AM	11:20 AM	11:40 AM
11:15 AM	11:25 AM	11:41 AM	11:50 AM	12:10 PM
11:45 AM	11:55 AM	12:11 PM	12:20 PM	12:40 PM
12:15 PM	12:25 PM	12:41 PM	12:50 PM	1:10 PM
12:45 PM	12:55 PM	1:11 PM	1:20 PM	1:40 PM
1:15 PM	1:25 PM	1:41 PM	1:50 PM	2:10 PM
1:45 PM	1:55 PM	2:11 PM	2:20 PM	2:40 PM
2:15 PM	2:25 PM	2:41 PM	2:50 PM	3:10 PM
2:45 PM	2:55 PM	3:11 PM	3:20 PM	3:40 PM
3:15 PM	3:25 PM	3:41 PM	3:50 PM	4:10 PM
3:45 PM	3:55 PM	4:11 PM	4:20 PM	4:40 PM
4:15 PM	4:25 PM	4:41 PM	4:50 PM	5:10 PM
4:45 PM	4:55 PM	5:11 PM	5:20 PM	5:40 PM
5:15 PM	5:25 PM	5:41 PM	5:50 PM	6:10 PM
5:45 PM	5:55 PM	6:11 PM	6:20 PM	6:40 PM
6:15 PM	6:25 PM	6:41 PM	6:50 PM	7:10 PM
7:15 PM	7:25 PM	7:41 PM	7:50 PM	8:10 PM
8:15 PM	8:25 PM	8:41 PM	8:50 PM	



Legend

- # Route Timepoint
- T Transfer Point
- Bus Stop
- H Hospital
- L Library
- Point of Interest
- ✉ Post Office
- S School

Miles

1 5
KNOXVILLE STATION

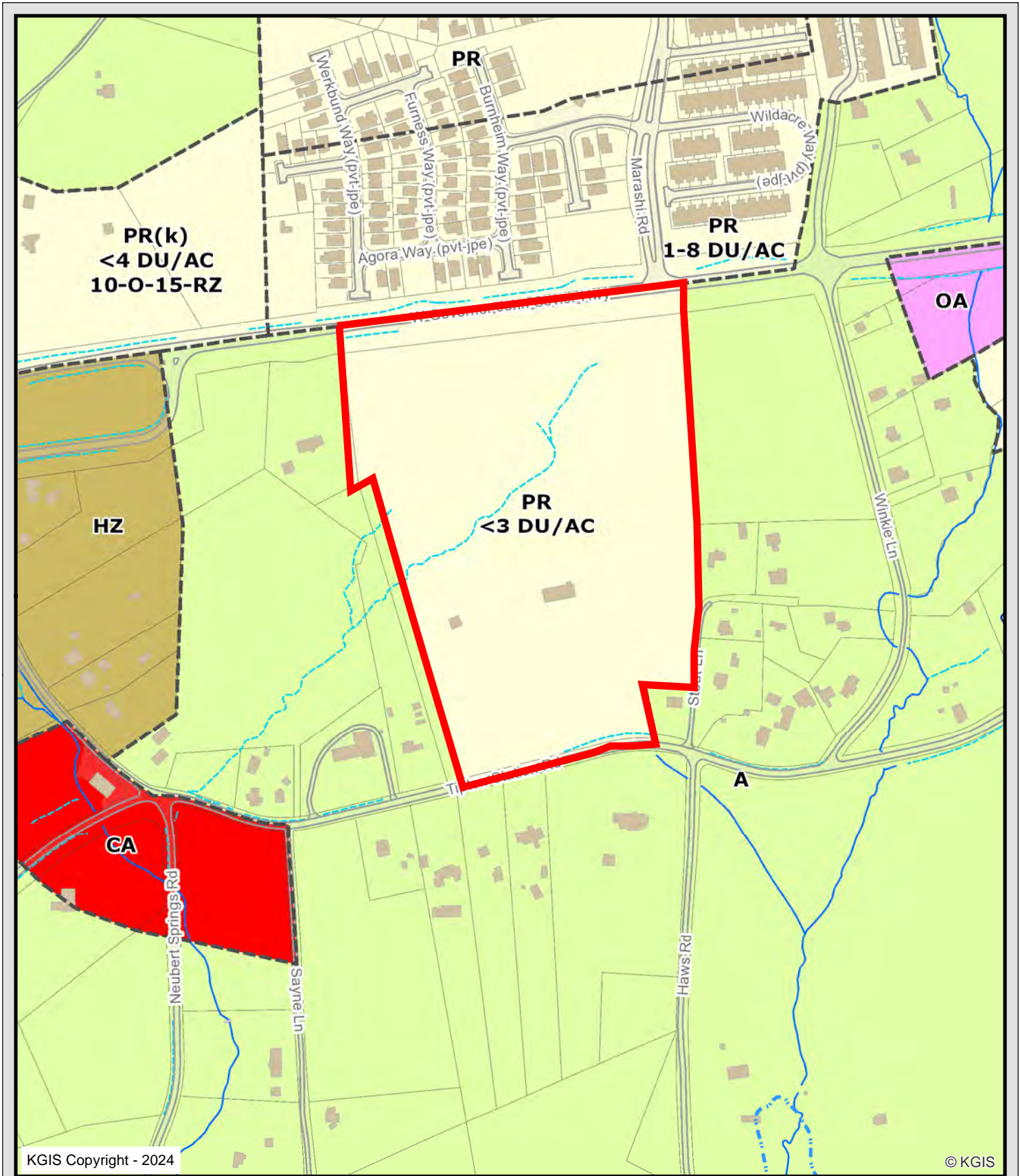
2 4
Transfer to Rts. 40 & 45

3
Walmart

Walmart
Covenant Health
South Grove, Lowes & Food City

APPENDIX C

ZONING MAP



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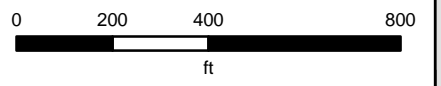
© KGIS

Zoning Map

11.1.24



Printed: 11/1/2024 at 2:10:05 PM



Knoxville - Knox County - KUB Geographic Information System

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APPENDIX D

MANUAL TRAFFIC COUNT DATA

TRAFFIC COUNT DATA

Major Street: West Governor John Sevier Highway (WB and EB)
 Minor Street: Marashi Road (SB)
 Traffic Control: Stop Conditions on Minor Street

11/6/2024 (Wednesday)
 Warm / Mostly Cloudy
 Conducted by: Ajax Engineering

TIME BEGIN	Marashi Road		W Governor John Sevier Highway		W Governor John Sevier Highway		VEHICLE TOTAL	PEAK HOUR
	SOUTHBOUND		WESTBOUND		EASTBOUND			
	LT	RT	THRU	RT	LT	THRU		
7:00 AM	12	14	182	5	4	90	307	
7:15 AM	10	25	239	0	3	152	429	7:15 AM - 8:15 AM
7:30 AM	14	14	248	1	2	158	437	
7:45 AM	14	9	231	4	2	164	424	
8:00 AM	4	12	222	6	2	160	406	
8:15 AM	8	9	189	3	4	172	385	
8:30 AM	7	8	164	8	2	104	293	
8:45 AM	5	4	158	4	0	127	298	
TOTAL	74	95	1633	31	19	1127	2979	
3:00 PM	7	6	132	7	4	142	298	
3:15 PM	12	6	168	7	10	181	384	
3:30 PM	7	7	169	9	6	237	435	
3:45 PM	6	4	166	15	11	216	418	
4:00 PM	6	6	166	6	12	202	398	
4:15 PM	4	1	177	13	7	220	422	
4:30 PM	8	5	218	7	13	238	489	4:30 PM - 5:30 PM
4:45 PM	9	6	192	11	12	240	470	
5:00 PM	3	11	223	13	11	232	493	
5:15 PM	10	6	209	17	13	250	505	
5:30 PM	9	7	180	16	15	215	442	
5:45 PM	12	11	185	10	18	193	429	
TOTAL	93	76	2185	131	132	2566	5183	

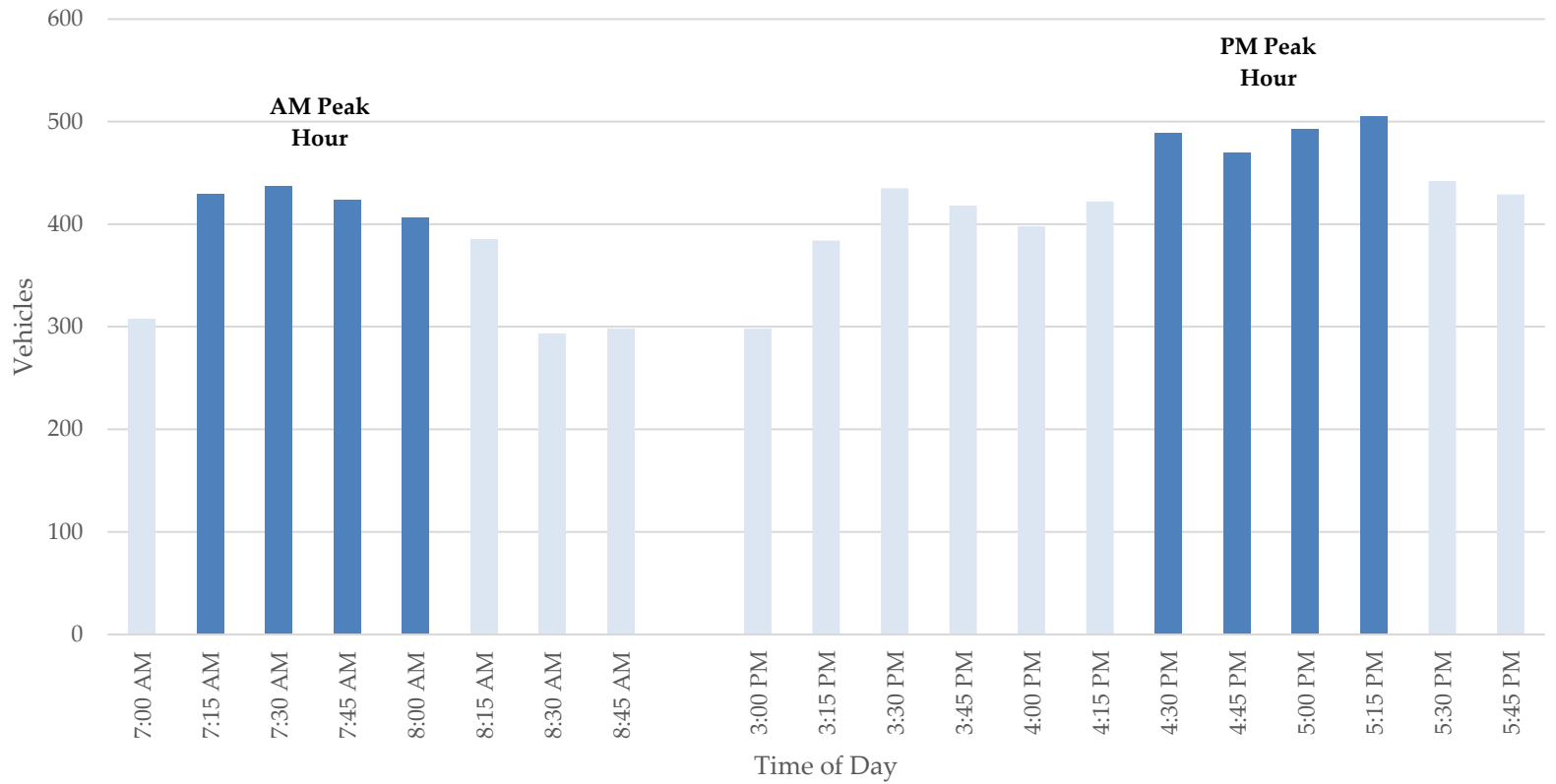
2024 AM Peak Hour **7:15 AM - 8:15 AM**

TIME BEGIN	Marashi Road		W Governor John Sevier Highway		W Governor John Sevier Highway	
	SOUTHBOUND		WESTBOUND		EASTBOUND	
	LT	RT	THRU	RT	LT	THRU
7:15 AM	10	25	239	0	3	152
7:30 AM	14	14	248	1	2	158
7:45 AM	14	9	231	4	2	164
8:00 AM	4	12	222	6	2	160
TOTAL	42	60	940	11	9	634
PHF	0.75	0.60	0.95	0.46	0.75	0.97
TRUCK %	2.4%	1.7%	4.1%	9.1%	11.1%	2.5%

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

TIME BEGIN	Marashi Road		W Governor John Sevier Highway		W Governor John Sevier Highway	
	SOUTHBOUND		WESTBOUND		EASTBOUND	
	LT	RT	THRU	RT	LT	THRU
4:30 PM	8	5	218	7	13	238
4:45 PM	9	6	192	11	12	240
5:00 PM	3	11	223	13	11	232
5:15 PM	10	6	209	17	13	250
TOTAL	30	28	842	48	49	960
PHF	0.75	0.64	0.94	0.71	0.94	0.96
TRUCK %	0.0%	0.0%	1.2%	0.0%	0.0%	1.7%

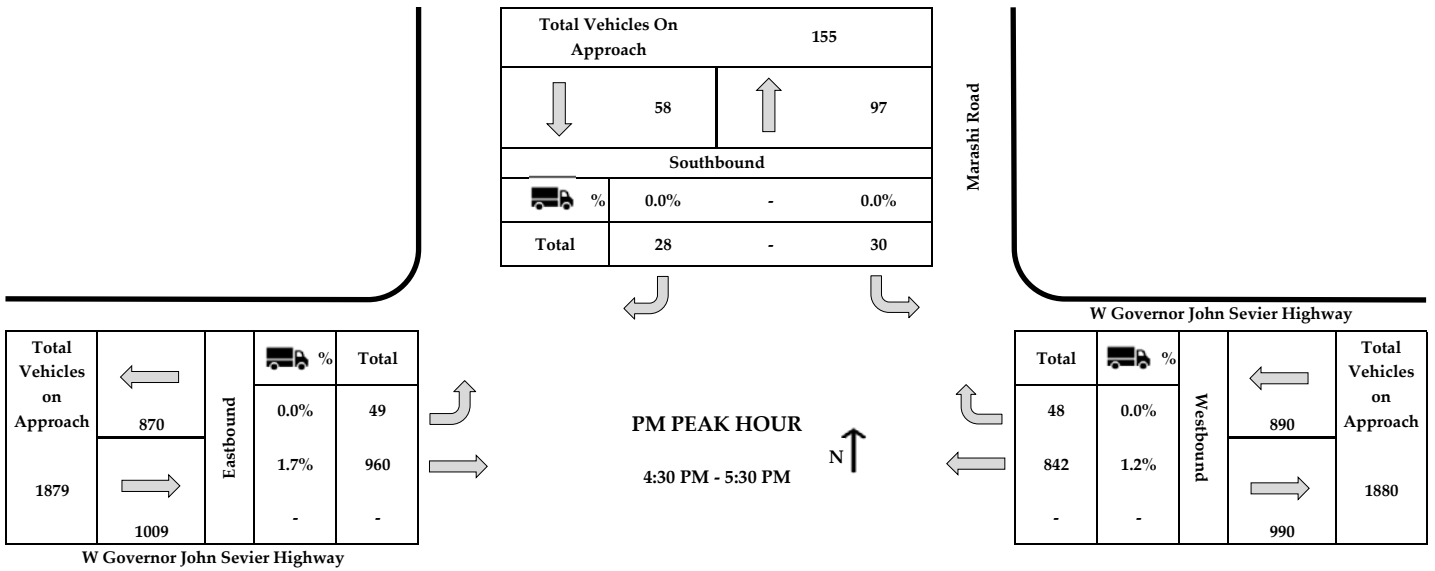
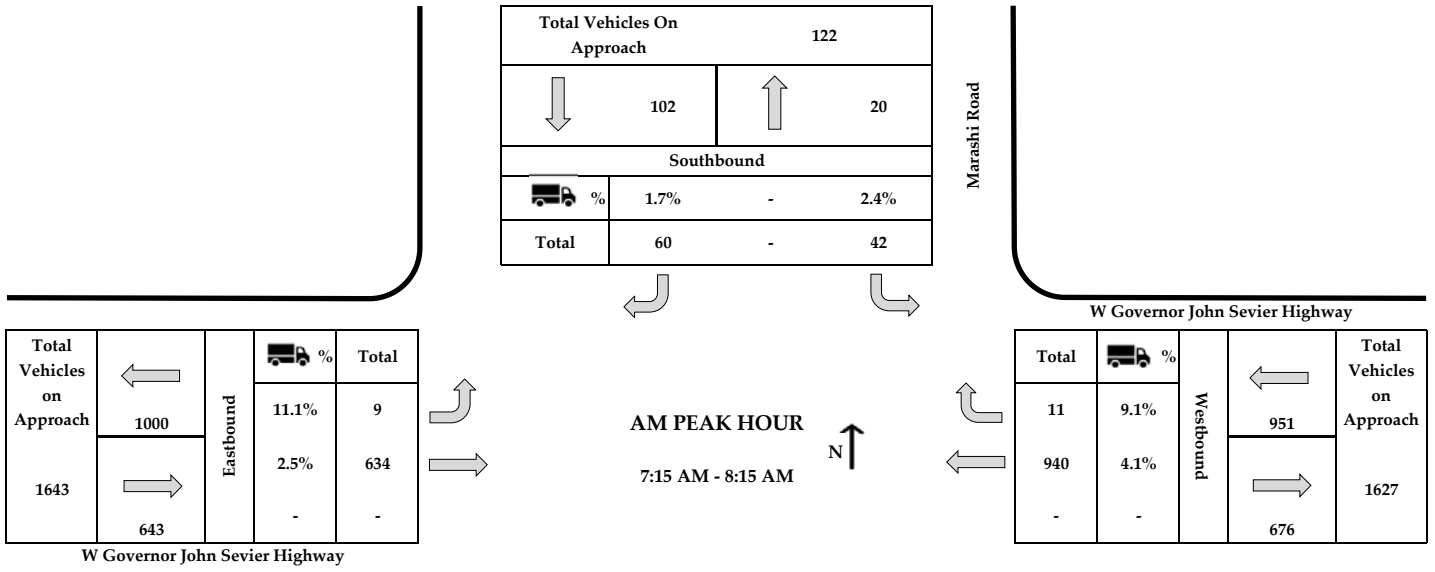
**W Governor John Sevier Highway at Marashi Road
Intersection Traffic Count Totals
10/6/2024**



PEAK HOUR DATA

Major Street: West Governor John Sevier Highway (WB and EB)
 Minor Street: Marashi Road (SB)
 Traffic Control: Stop Conditions on Minor Street

11/6/2024 (Wednesday)
 Warm / Mostly Cloudy
 Conducted by: Ajax Engineering



APPENDIX E

CAPACITY ANALYSES – HCM WORKSHEETS (SYNCHRO 12)

EXISTING CONDITIONS

HCM 7th TWSC
 4: W Governor John Sevier Highway & Marashi Road

Intersection						
Int Delay, s/veh	3.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↙	↑	↗		↘	
Traffic Vol, veh/h	9	634	940	11	42	60
Future Vol, veh/h	9	634	940	11	42	60
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	97	95	46	75	60
Heavy Vehicles, %	11	3	4	9	2	2
Mvmt Flow	12	654	989	24	56	100

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	1013	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.21	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.299	-	-
Pot Cap-1 Maneuver	650	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	650	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s/v	0.19	0	35.35
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	650	-	-	-	269
HCM Lane V/C Ratio	0.018	-	-	-	0.58
HCM Control Delay (s/veh)	10.6	-	-	-	35.3
HCM Lane LOS	B	-	-	-	E
HCM 95th %tile Q(veh)	0.1	-	-	-	3.3

HCM 7th TWSC
 4: W Governor John Sevier Highway & Marashi Road

Intersection						
Int Delay, s/veh	1.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↑	↗		↖	
Traffic Vol, veh/h	49	960	842	48	30	28
Future Vol, veh/h	49	960	842	48	30	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	96	94	71	75	64
Heavy Vehicles, %	0	2	1	0	0	0
Mvmt Flow	52	1000	896	68	40	44

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	963	0	-	0	2034 930
Stage 1	-	-	-	-	930 -
Stage 2	-	-	-	-	1104 -
Critical Hdwy	4.1	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.2	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	723	-	-	-	63 327
Stage 1	-	-	-	-	387 -
Stage 2	-	-	-	-	320 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	723	-	-	-	59 327
Mov Cap-2 Maneuver	-	-	-	-	181 -
Stage 1	-	-	-	-	360 -
Stage 2	-	-	-	-	320 -

Approach	EB	WB	SB
HCM Control Delay, s/v	0.51	0	28.36
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	723	-	-	-	236
HCM Lane V/C Ratio	0.072	-	-	-	0.354
HCM Control Delay (s/veh)	10.4	-	-	-	28.4
HCM Lane LOS	B	-	-	-	D
HCM 95th %tile Q(veh)	0.2	-	-	-	1.5

PROJECTED CONDITIONS WITHOUT THE PROJECT

HCM 7th TWSC
 4: W Governor John Sevier Highway & Marashi Road

Intersection						
Int Delay, s/veh	3.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑	↗		↘	
Traffic Vol, veh/h	9	653	968	11	42	60
Future Vol, veh/h	9	653	968	11	42	60
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	97	95	46	75	60
Heavy Vehicles, %	11	3	4	9	2	2
Mvmt Flow	12	673	1019	24	56	100

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	1043	0	0 1728 1031
Stage 1	-	-	- 1031 -
Stage 2	-	-	- 697 -
Critical Hdwy	4.21	-	- 6.42 6.22
Critical Hdwy Stg 1	-	-	- 5.42 -
Critical Hdwy Stg 2	-	-	- 5.42 -
Follow-up Hdwy	2.299	-	- 3.518 3.318
Pot Cap-1 Maneuver	633	-	- 97 283
Stage 1	-	-	- 344 -
Stage 2	-	-	- 494 -
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	633	-	- 95 283
Mov Cap-2 Maneuver	-	-	- 225 -
Stage 1	-	-	- 337 -
Stage 2	-	-	- 494 -

Approach	EB	WB	SB
HCM Control Delay, s/v	0.19	0	37.96
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	633	-	-	-	259
HCM Lane V/C Ratio	0.019	-	-	-	0.603
HCM Control Delay (s/veh)	10.8	-	-	-	38
HCM Lane LOS	B	-	-	-	E
HCM 95th %tile Q(veh)	0.1	-	-	-	3.6

HCM 7th TWSC
 4: W Governor John Sevier Highway & Marashi Road

Intersection						
Int Delay, s/veh	1.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	49	989	867	48	30	28
Future Vol, veh/h	49	989	867	48	30	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	96	94	71	75	64
Heavy Vehicles, %	0	2	1	0	0	0
Mvmt Flow	52	1030	922	68	40	44

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	990	0	0 2091 956
Stage 1	-	-	- - 956 -
Stage 2	-	-	- - 1134 -
Critical Hdwy	4.1	-	- - 6.4 6.2
Critical Hdwy Stg 1	-	-	- - 5.4 -
Critical Hdwy Stg 2	-	-	- - 5.4 -
Follow-up Hdwy	2.2	-	- - 3.5 3.3
Pot Cap-1 Maneuver	706	-	- - 58 316
Stage 1	-	-	- - 376 -
Stage 2	-	-	- - 310 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	706	-	- - 54 316
Mov Cap-2 Maneuver	-	-	- - 174 -
Stage 1	-	-	- - 349 -
Stage 2	-	-	- - 310 -

Approach	EB	WB	SB
HCM Control Delay, s/v	0.51	0	29.76
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	706	-	-	-	228
HCM Lane V/C Ratio	0.074	-	-	-	0.368
HCM Control Delay (s/veh)	10.5	-	-	-	29.8
HCM Lane LOS	B	-	-	-	D
HCM 95th %tile Q(veh)	0.2	-	-	-	1.6

PROJECTED CONDITIONS WITH THE PROJECT

HCM 7th TWSC
 4: W Governor John Sevier Highway & Marashi Road

Intersection						
Int Delay, s/veh	3.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	9	681	980	11	42	60
Future Vol, veh/h	9	681	980	11	42	60
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	97	95	46	75	60
Heavy Vehicles, %	11	3	4	9	2	2
Mvmt Flow	12	702	1032	24	56	100

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	1055	0	-	0	1770 1044
Stage 1	-	-	-	-	1044 -
Stage 2	-	-	-	-	726 -
Critical Hdwy	4.21	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.299	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	626	-	-	-	92 278
Stage 1	-	-	-	-	339 -
Stage 2	-	-	-	-	479 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	626	-	-	-	90 278
Mov Cap-2 Maneuver	-	-	-	-	219 -
Stage 1	-	-	-	-	333 -
Stage 2	-	-	-	-	479 -

Approach	EB	WB	SB
HCM Control Delay, s/v	0.18	0	39.55
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	626	-	-	-	253
HCM Lane V/C Ratio	0.019	-	-	-	0.615
HCM Control Delay (s/veh)	10.9	-	-	-	39.5
HCM Lane LOS	B	-	-	-	E
HCM 95th %tile Q(veh)	0.1	-	-	-	3.7

HCM 7th TWSC

6: Proposed Entrance & W Governor John Sevier Highway

Intersection						
Int Delay, s/veh	1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	662	10	12	1028	41	28
Future Vol, veh/h	662	10	12	1028	41	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	90	90	95	90	90
Heavy Vehicles, %	3	0	0	4	0	0
Mvmt Flow	682	11	13	1082	46	31

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	694	0	1797 688
Stage 1	-	-	-	-	688 -
Stage 2	-	-	-	-	1109 -
Critical Hdwy	-	-	4.1	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	-	-	2.2	-	3.5 3.3
Pot Cap-1 Maneuver	-	-	911	-	89 450
Stage 1	-	-	-	-	503 -
Stage 2	-	-	-	-	319 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	911	-	88 450
Mov Cap-2 Maneuver	-	-	-	-	214 -
Stage 1	-	-	-	-	503 -
Stage 2	-	-	-	-	314 -

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.11	23.39
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	272	-	-	911	-
HCM Lane V/C Ratio	0.282	-	-	0.015	-
HCM Control Delay (s/veh)	23.4	-	-	9	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	1.1	-	-	0	-

HCM 7th TWSC
 4: W Governor John Sevier Highway & Marashi Road

Intersection						
Int Delay, s/veh	1.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑	↗		↘	↗
Traffic Vol, veh/h	49	1015	905	48	30	28
Future Vol, veh/h	49	1015	905	48	30	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	96	94	71	75	64
Heavy Vehicles, %	0	2	1	0	0	0
Mvmt Flow	52	1057	963	68	40	44

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	1030	0	-	0	2158 997
Stage 1	-	-	-	-	997 -
Stage 2	-	-	-	-	1162 -
Critical Hdwy	4.1	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.2	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	682	-	-	-	53 299
Stage 1	-	-	-	-	360 -
Stage 2	-	-	-	-	301 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	682	-	-	-	49 299
Mov Cap-2 Maneuver	-	-	-	-	166 -
Stage 1	-	-	-	-	333 -
Stage 2	-	-	-	-	301 -

Approach	EB	WB	SB
HCM Control Delay, s/v	0.5	0	31.73
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	682	-	-	-	217
HCM Lane V/C Ratio	0.076	-	-	-	0.387
HCM Control Delay (s/veh)	10.7	-	-	-	31.7
HCM Lane LOS	B	-	-	-	D
HCM 95th %tile Q(veh)	0.2	-	-	-	1.7

HCM 7th TWSC

5: Proposed Entrance & W Governor John Sevier Highway

Intersection						
Int Delay, s/veh	1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1038	37	38	895	25	26
Future Vol, veh/h	1038	37	38	895	25	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	90	90	94	90	90
Heavy Vehicles, %	2	0	0	1	0	0
Mvmt Flow	1081	41	42	952	28	29

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	1122	0	2138
Stage 1	-	-	-	-	1102
Stage 2	-	-	-	-	1037
Critical Hdwy	-	-	4.1	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	-	-	2.2	-	3.5
Pot Cap-1 Maneuver	-	-	630	-	55
Stage 1	-	-	-	-	321
Stage 2	-	-	-	-	345
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	630	-	51
Mov Cap-2 Maneuver	-	-	-	-	170
Stage 1	-	-	-	-	321
Stage 2	-	-	-	-	322

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.47	28.93
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	206	-	-	630	-
HCM Lane V/C Ratio	0.275	-	-	0.067	-
HCM Control Delay (s/veh)	28.9	-	-	11.1	-
HCM Lane LOS	D	-	-	B	-
HCM 95th %tile Q(veh)	1.1	-	-	0.2	-

APPENDIX F

TRIP GENERATION DATA

Local Apartment Trip Generation Study

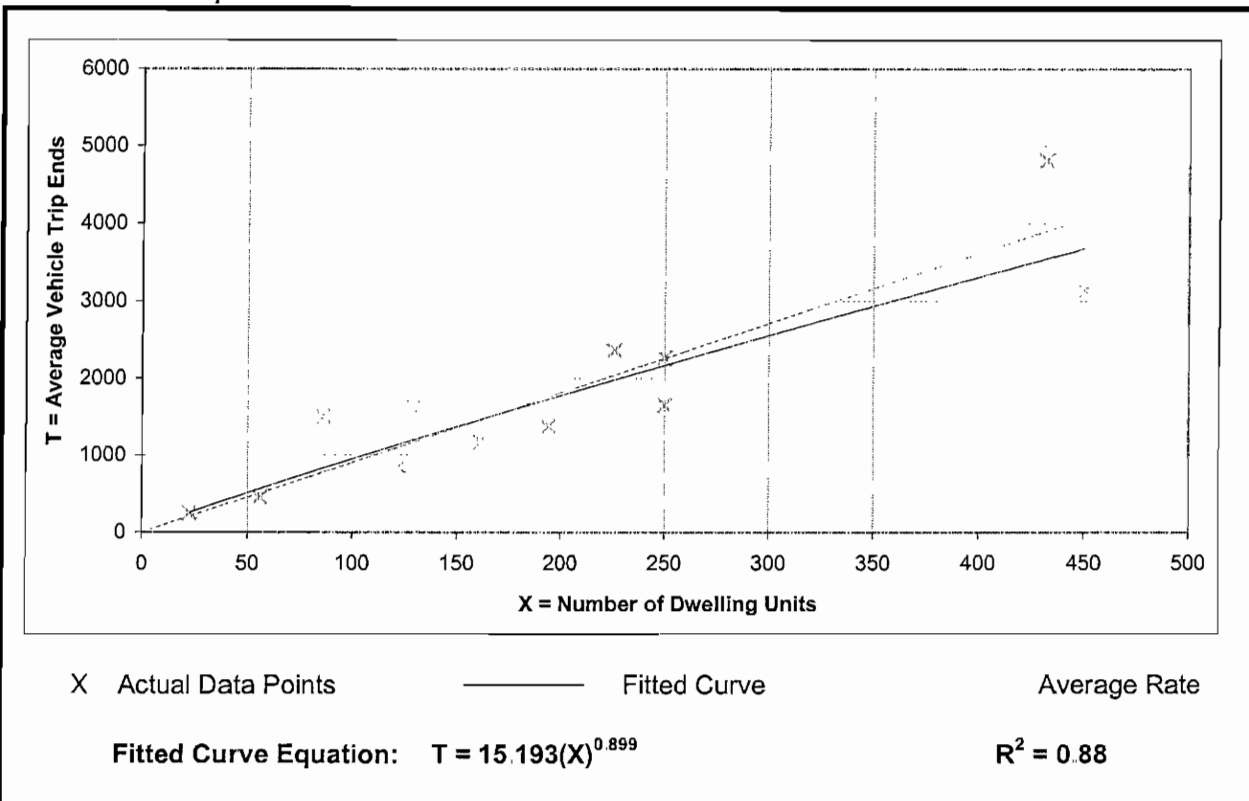
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Number of Studies: 13
Average Number of Dwelling Units: 193
Directional Distribution: 50% entering, 50% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
9.03	6.59 - 17.41	2.47

Data Plot and Equation



Local Apartment Trip Generation Study

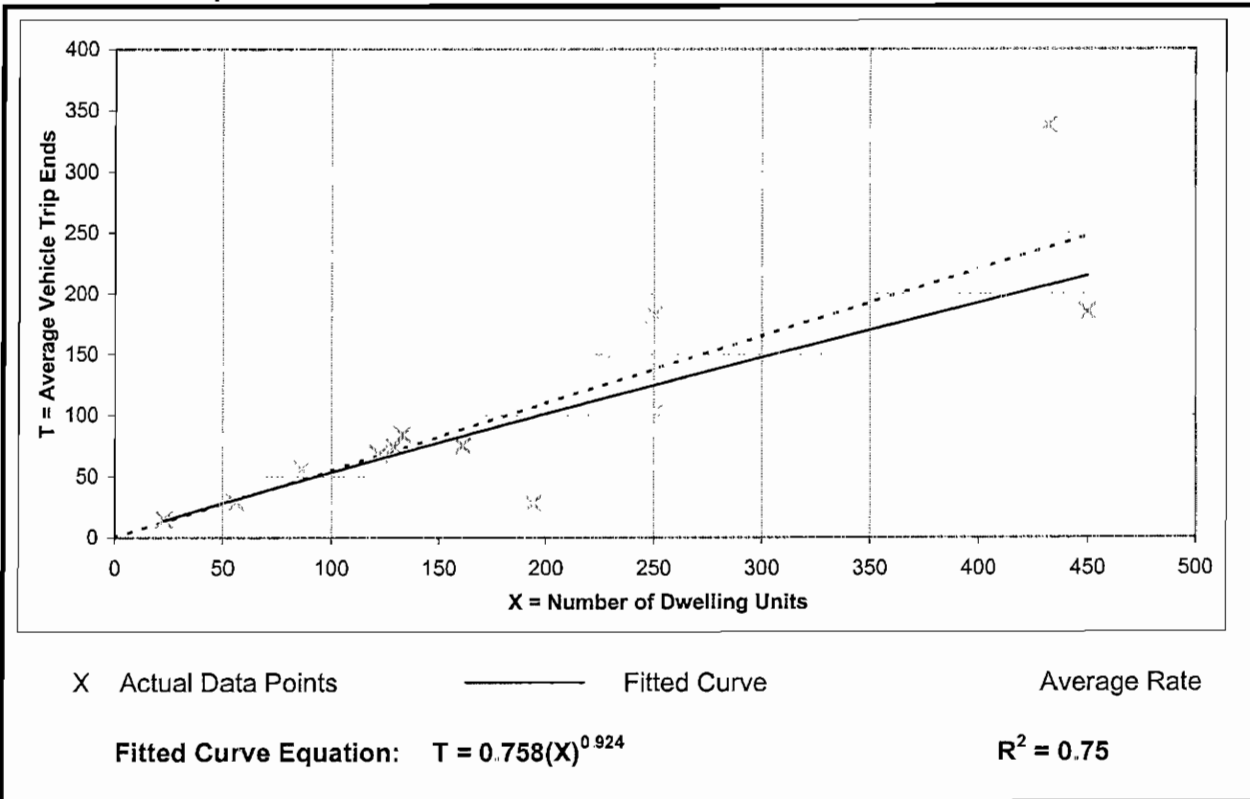
Average Vehicle Trip Ends vs: Dwelling Units
 On a: Weekday,
 Peak Hour of Adjacent Street Traffic,
 One Hour Between 7 and 9 a.m.

Number of Studies: 13
 Average Number of Dwelling Units: 193
 Directional Distribution: 22% entering, 78% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
0.55	0.14 - 0.78	0.18

Data Plot and Equation



Local Apartment Trip Generation Study

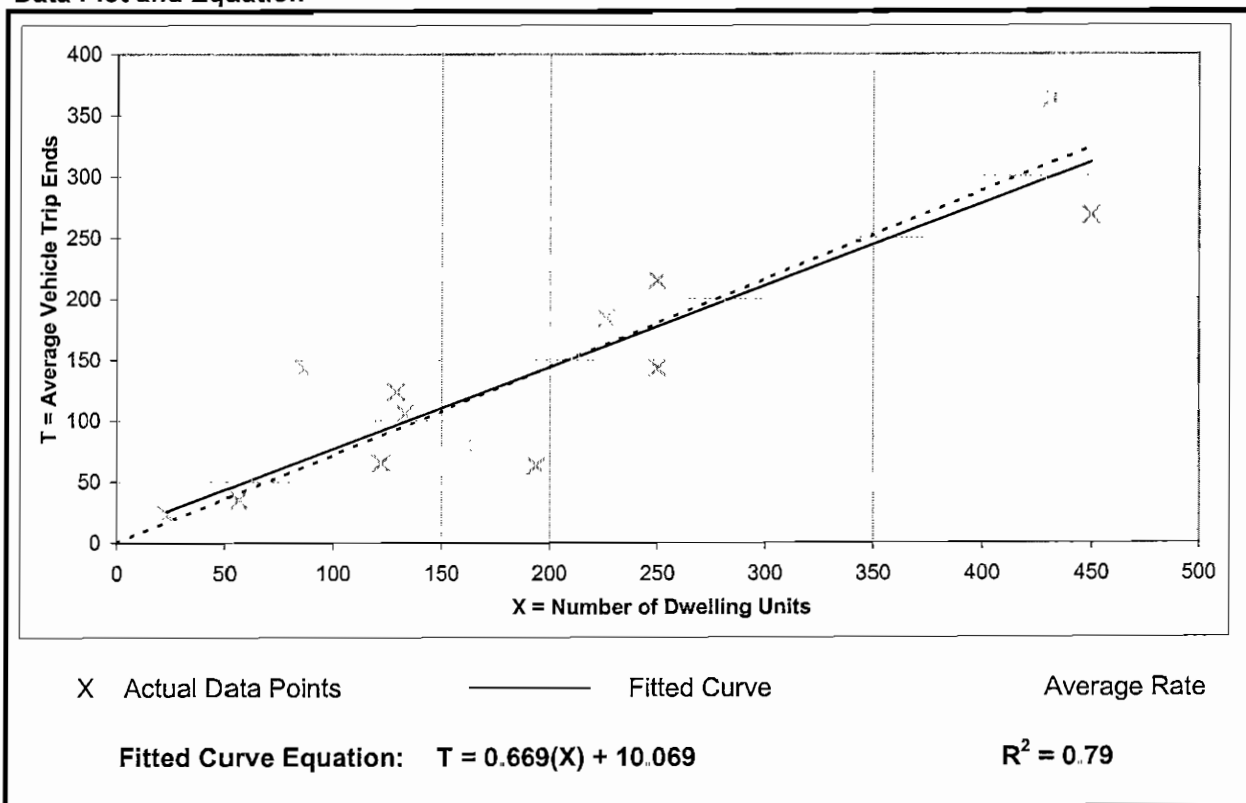
Average Vehicle Trip Ends vs: Dwelling Units
 On a: Weekday,
 Peak Hour of Adjacent Street Traffic,
 One Hour Between 4 and 6 p.m.

Number of Studies: 13
 Average Number of Dwelling Units: 193
 Directional Distribution: 55% entering, 45% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
0.72	0.32 - 1.66	0.25

Data Plot and Equation



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

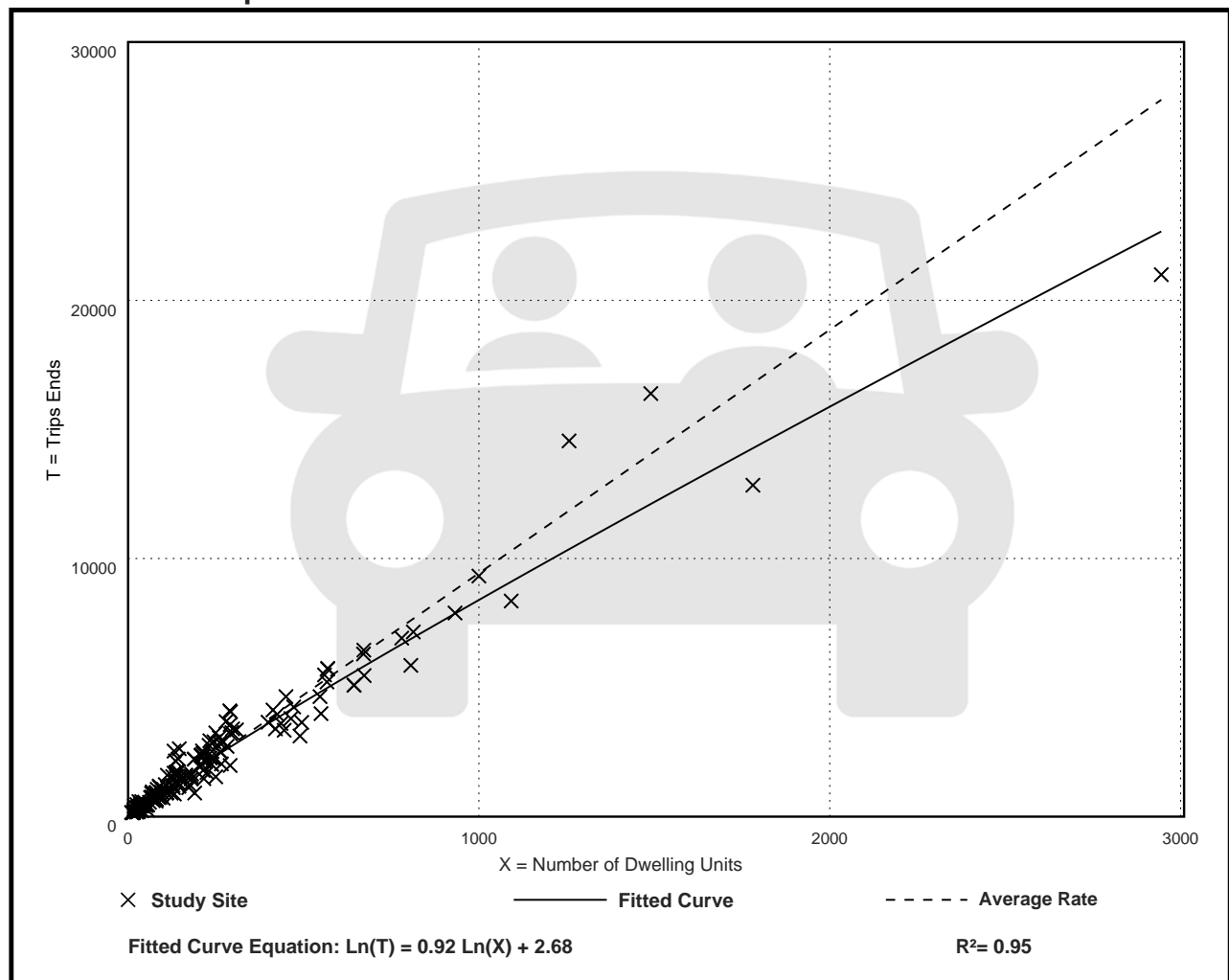
Avg. Num. of Dwelling Units: 246

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



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

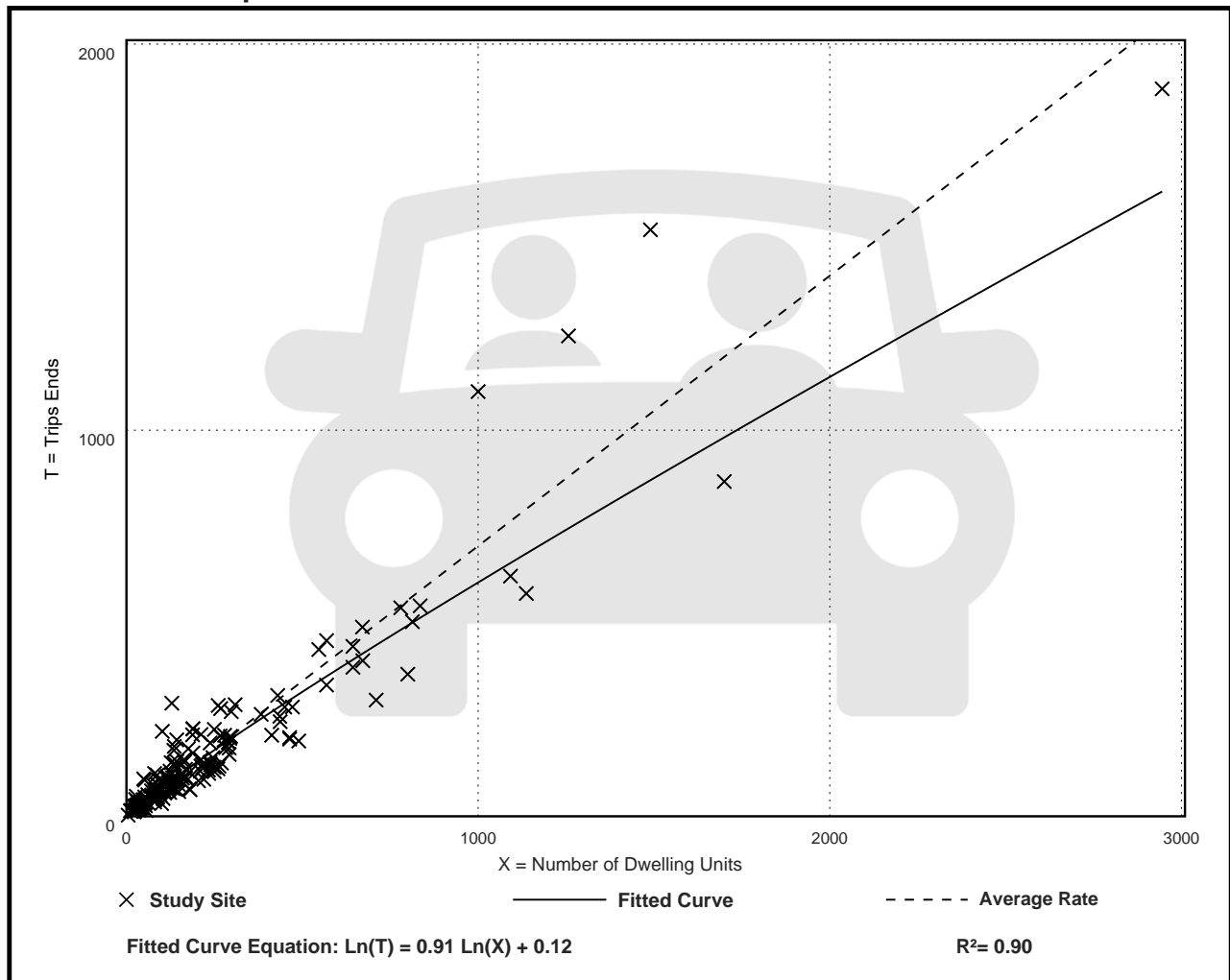
Avg. Num. of Dwelling Units: 226

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

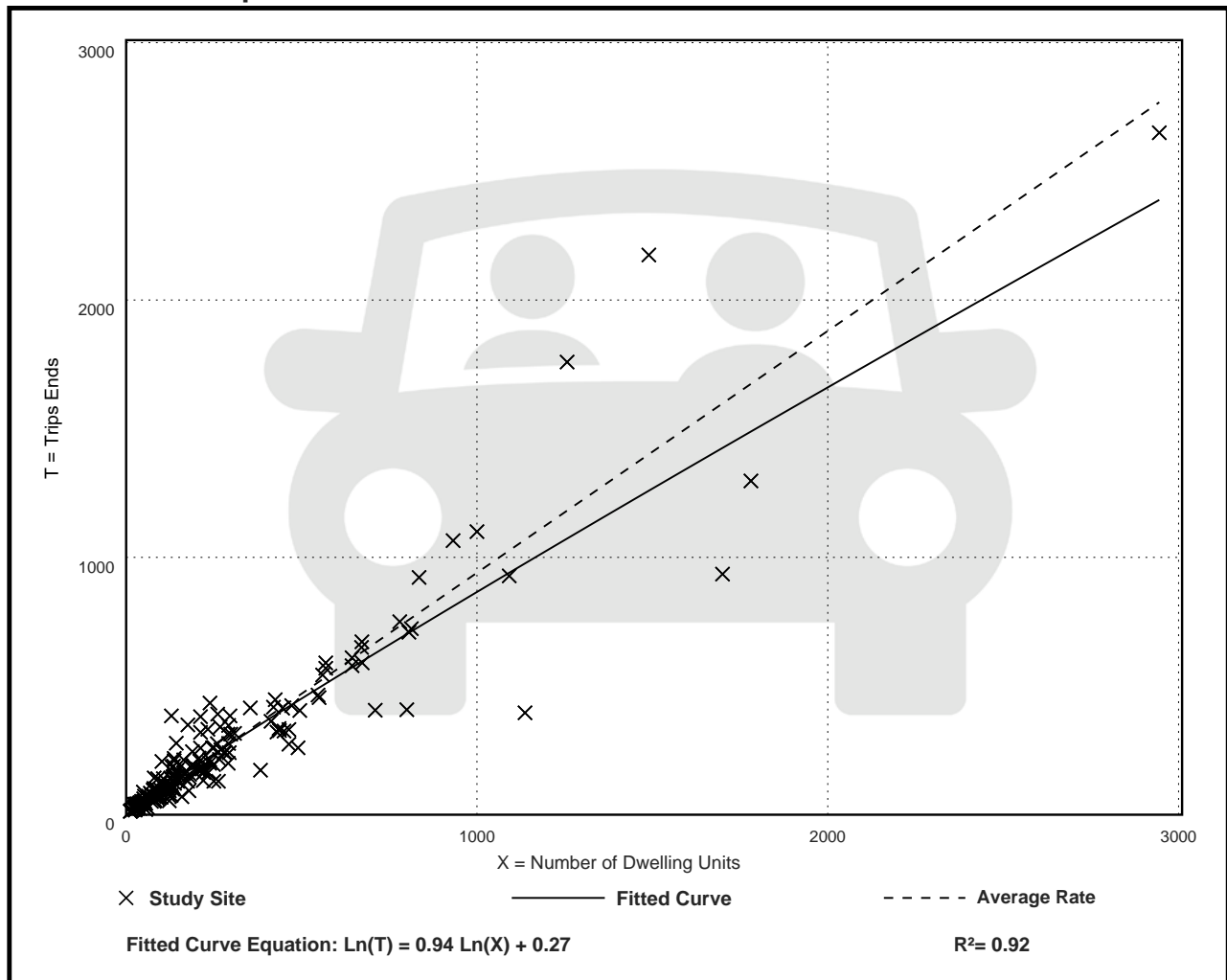
Avg. Num. of Dwelling Units: 248

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 1413 TIPTON STATION ROAD SUBDIVISION

69 Attached Townhouses and 69 Single-Family Detached Houses

ITE LAND USE CODE	LAND USE DESCRIPTION	# OF UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Local Trip Rate	Multi-Family Attached Townhouses	69	684	22%	78%		55%	45%	
				8	30	38	31	25	56
#210	Single-Family Detached Housing	69	717	26%	74%		63%	37%	
				14	39	53	44	26	70
Total New Volume Site Trips			1,401	22	69	91	75	51	126

ITE Trip Generation Manual, 11th Edition and Local Trip Rates

Trips calculated by using Fitted Curve Equations

TRIP GENERATION FOR 1413 TIPTON STATION ROAD SUBDIVISION
69 Attached Townhouses

$$69 \text{ Units} = X$$

Weekday:

Fitted Curve Equation: $T = 15.193(X)^{0.899}$

$$T = 15 * 44.99$$

$$T = \underline{\underline{684 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

Fitted Curve Equation: $T = 0.758(X)^{0.924}$

$$T = 0.758 * 50$$

$$T = \underline{\underline{38 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 4 and 6 pm:

Fitted Curve Equation: $T = 0.669(X)+10.069$

$$T = 0.669 * 69 + 10.07$$

$$T = \underline{\underline{56 \text{ trips}}}$$

TRIP GENERATION FOR 1413 TIPTON STATION ROAD SUBDIVISION

69 Single-Family Detached Houses

69 Residential Houses = X

Weekday:

Fitted Curve Equation: $\text{Ln}(T) = 0.92 \text{Ln}(X) + 2.68$

$$\text{Ln}(T) = 0.92 * 4.23 + 2.68$$

$$\text{Ln}(T) = 6.58$$

$$\underline{\underline{T = 717 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

Fitted Curve Equation: $\text{Ln}(T) = 0.91 \text{Ln}(X) + 0.12$

$$T = 0.91 * 4 + 0.12$$

$$\text{Ln}(T) = 3.97$$

$$\underline{\underline{T = 53 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 4 and 6 pm:

Fitted Curve Equation: $\text{Ln}(T) = 0.94 \text{Ln}(X) + 0.27$

$$\text{Ln}(T) = 0.94 * 4.23 + 0.27$$

$$\text{Ln}(T) = 4.25$$

$$\underline{\underline{T = 70 \text{ trips}}}$$

APPENDIX G

2021 CENSUS BUREAU DATA

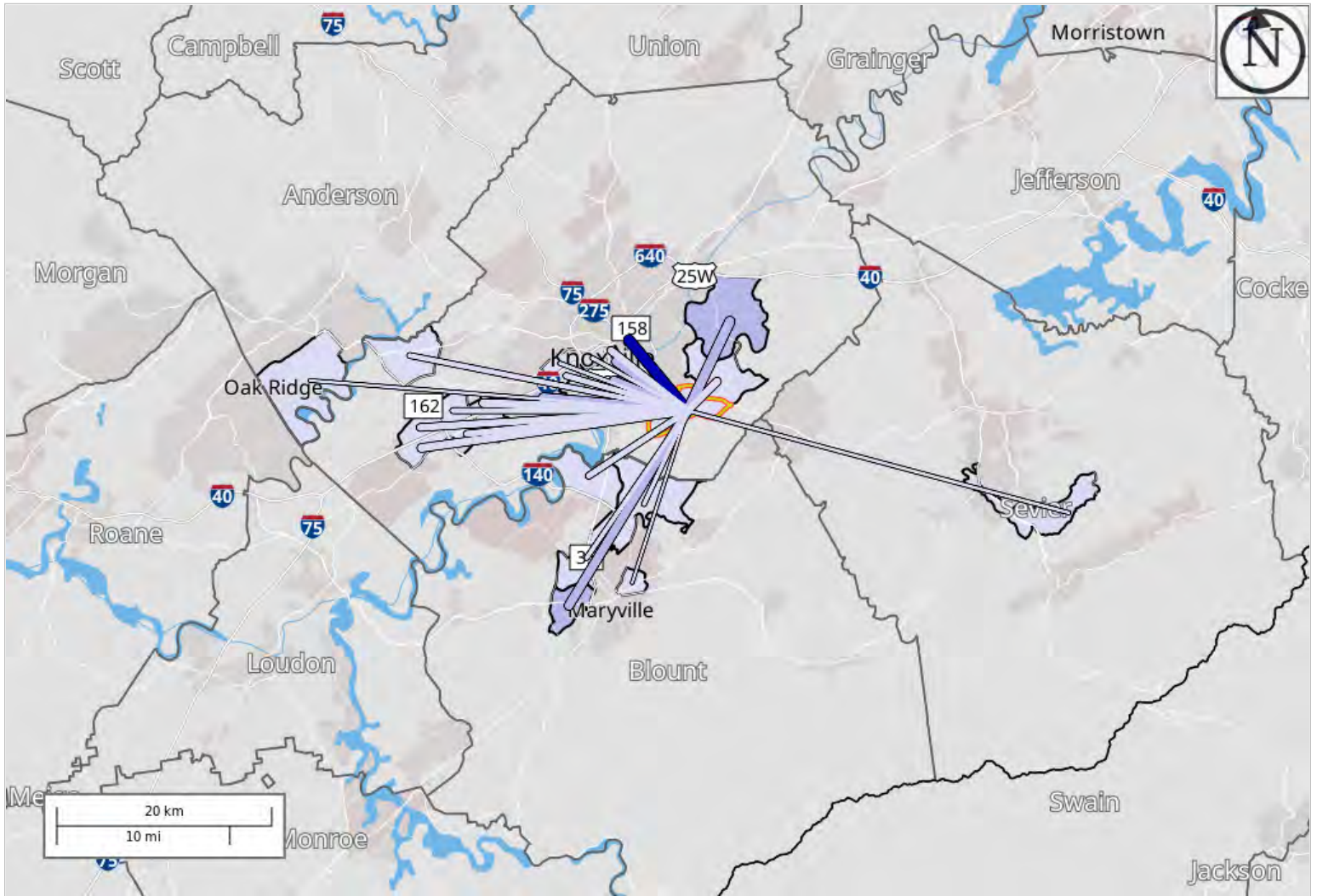
Destination Analysis

Workers: Living in 56.03 (Knox, TN)

Showing: Employment locations grouped by Census Tracts

Created by the U.S. Census Bureau's OnTheMap <https://onthemap.ces.census.gov> on 11/01/2024

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



Map Legend

Job Count

- 183 - 210
- 156 - 182
- 129 - 155
- 101 - 128
- 74 - 100
- 47 - 73
- 19 - 46

Selection Areas

- ▭ Home Area

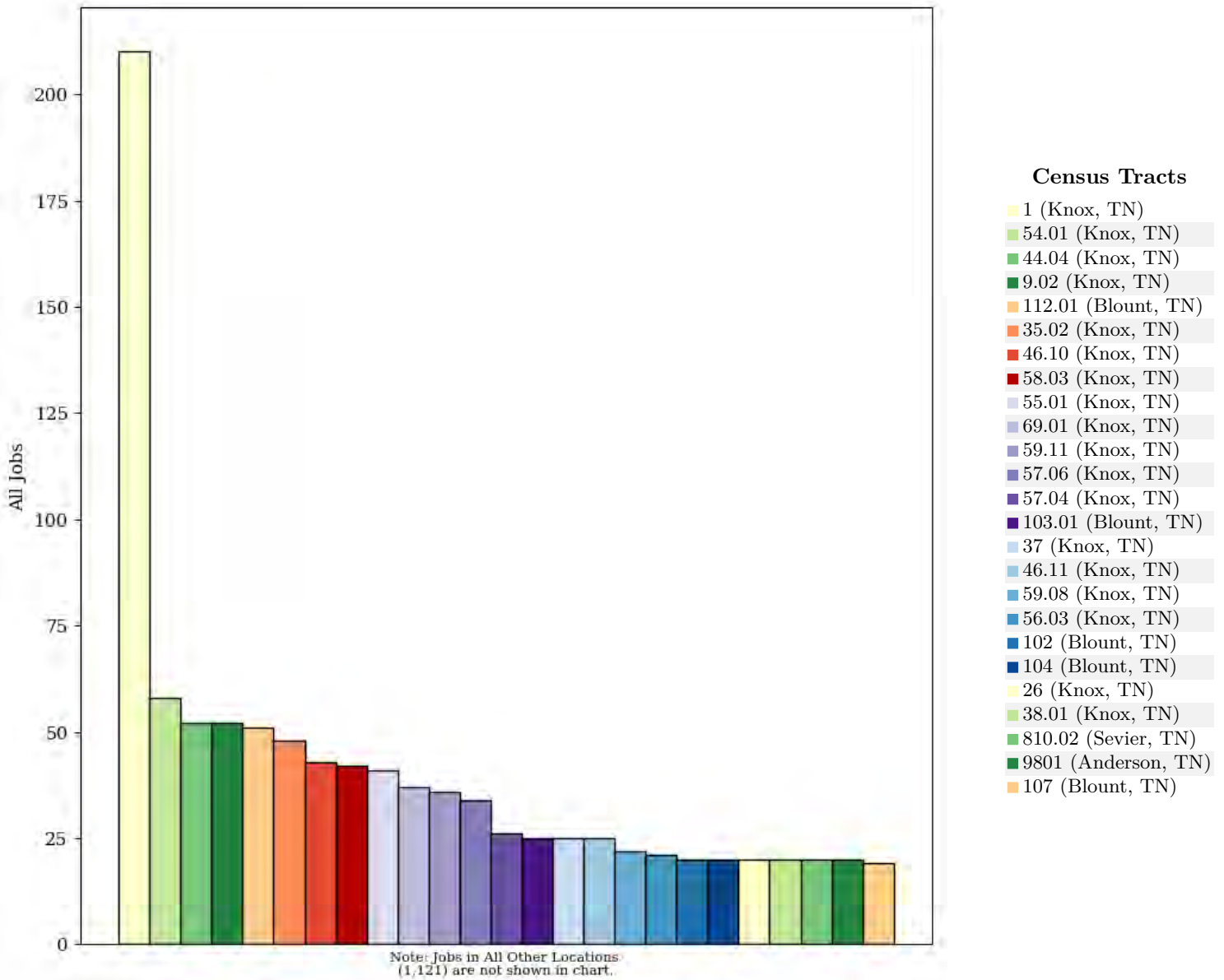
Job Count

- ▭ 183 - 210
- ▭ 156 - 182
- ▭ 129 - 155
- ▭ 101 - 128
- ▭ 74 - 100
- ▭ 47 - 73
- ▭ 19 - 46



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	2,108	100.0%
1 (Knox, TN)	210	10.0%
54.01 (Knox, TN)	58	2.8%
44.04 (Knox, TN)	52	2.5%
9.02 (Knox, TN)	52	2.5%
112.01 (Blount, TN)	51	2.4%
35.02 (Knox, TN)	48	2.3%
46.10 (Knox, TN)	43	2.0%
58.03 (Knox, TN)	42	2.0%
55.01 (Knox, TN)	41	1.9%
69.01 (Knox, TN)	37	1.8%

Census Tracts as Work Destination Area	2021	
	Count	Share
59.11 (Knox, TN)	36	1.7%
57.06 (Knox, TN)	34	1.6%
57.04 (Knox, TN)	26	1.2%
103.01 (Blount, TN)	25	1.2%
37 (Knox, TN)	25	1.2%
46.11 (Knox, TN)	25	1.2%
59.08 (Knox, TN)	22	1.0%
56.03 (Knox, TN)	21	1.0%
102 (Blount, TN)	20	0.9%
104 (Blount, TN)	20	0.9%
26 (Knox, TN)	20	0.9%
38.01 (Knox, TN)	20	0.9%
810.02 (Sevier, TN)	20	0.9%
9801 (Anderson, TN)	20	0.9%
107 (Blount, TN)	19	0.9%
All Other Locations	1,121	53.2%

Additional Information

Analysis Settings

Analysis Type	Destination
Destination Type	Census Tracts
Selection area as	Home
Year(s)	2021
Job Type	All Jobs
Selection Area	56.03 (Knox, TN) from Census Tracts
Selected Census Blocks	81
Analysis Generation Date	11/01/2024 13:50 - OnTheMap 6.24.1
Code Revision	bc639735180b6b7ade65403c2bedfe53b70b1e56
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 H

TDOT TURN LANE VOLUME THRESHOLD WORKSHEETS

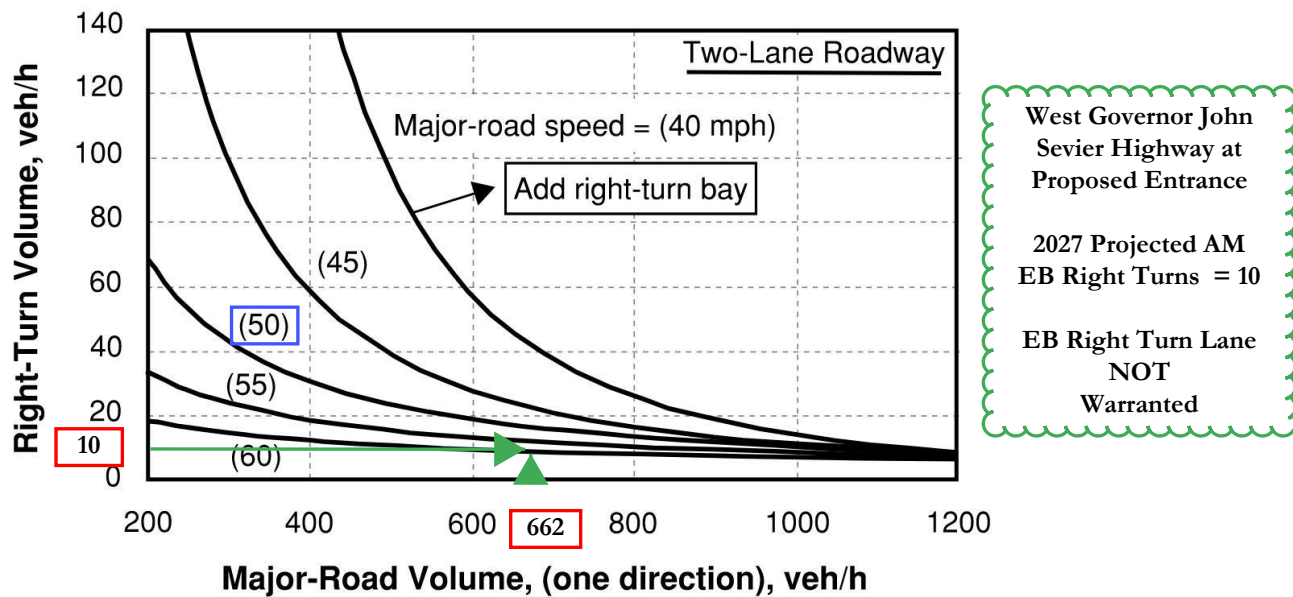


Figure 3-18: Right-Turn Lane Warrant along Two-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁴

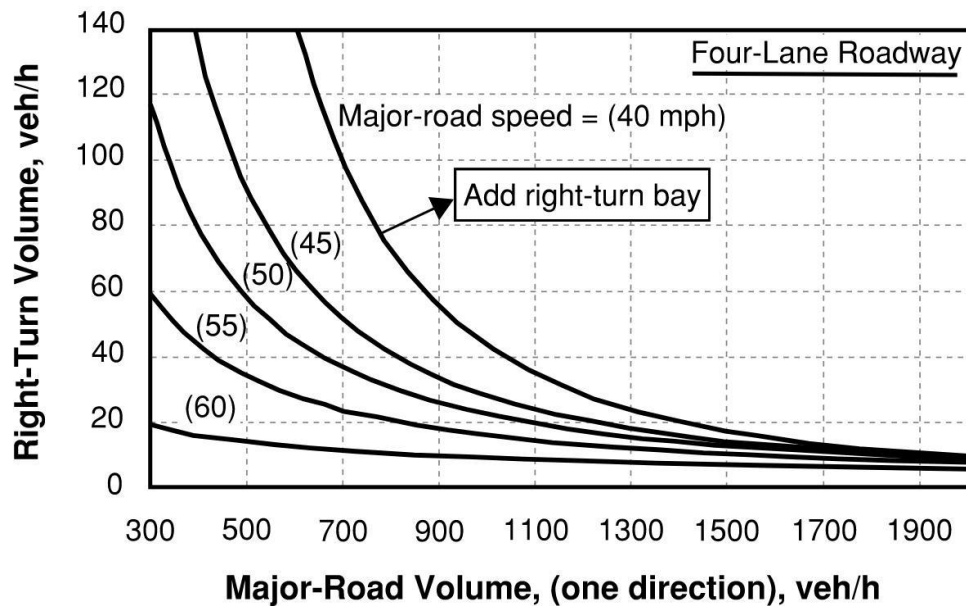


Figure 3-19: Right-Turn Lane Warrant along Four-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁵

²⁴ TRB, NCHRP 457, Evaluating Intersection Improvements (2001)

²⁵ TRB, NCHRP 457, Evaluating Intersection Improvements (2001)

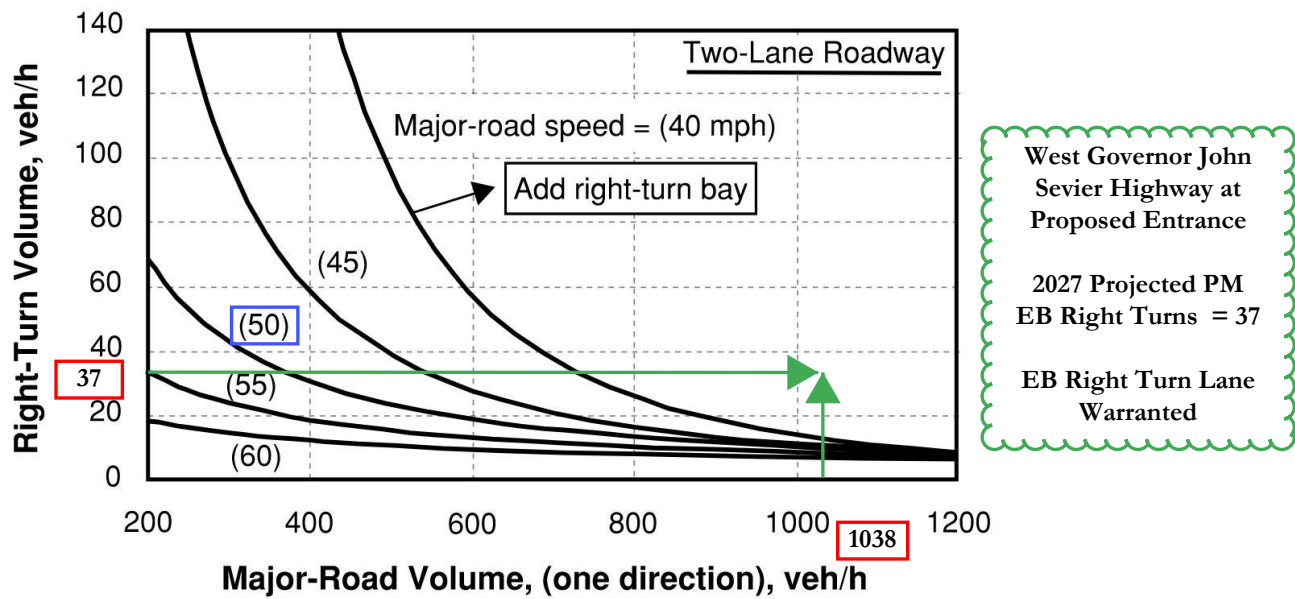


Figure 3-18: Right-Turn Lane Warrant along Two-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁴

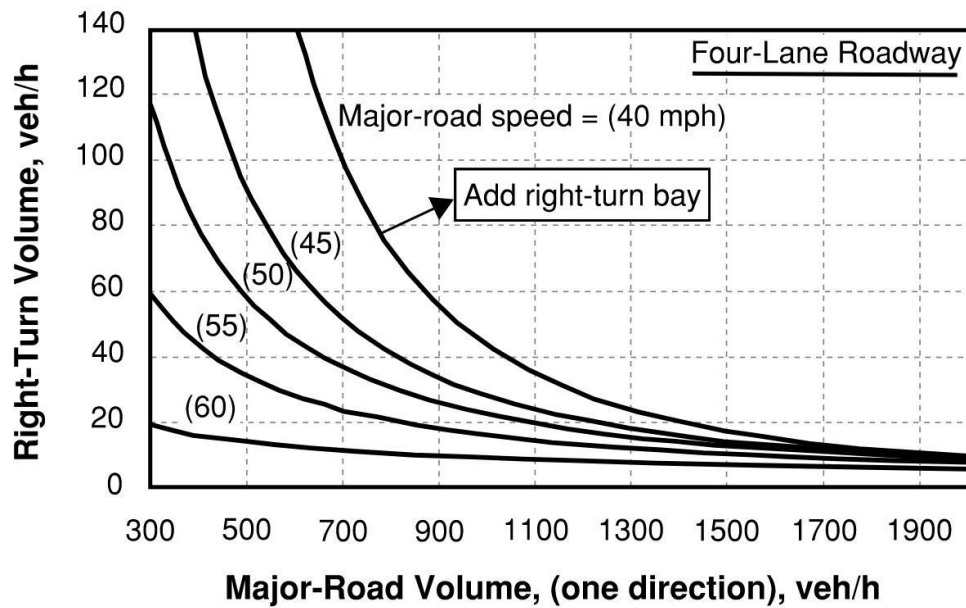


Figure 3-19: Right-Turn Lane Warrant along Four-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁵

²⁴ TRB, NCHRP 457, Evaluating Intersection Improvements (2001)

²⁵ TRB, NCHRP 457, Evaluating Intersection Improvements (2001)

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