

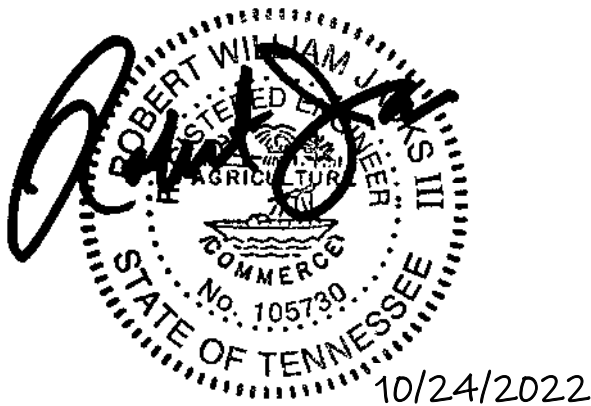


Transportation Impact Study Ascend at South Knoxville Knox County, Tennessee



Revised October 2022

Prepared for:
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EXECUTIVE SUMMARY

Preface:

SK Apartments 1, LLC is proposing a residential development at West Governor John Sevier Highway in South Knox County, TN. The proposed development will include 306 multi-family apartments on 20.4 +/- acres and is named and referenced in this study as “Ascend at South Knoxville”. The development will be built in two phases, with the first phase constructing 238 apartments and the second phase constructing an additional 68 apartments. The first phase is anticipated to be fully built and occupied by 2025, and the second phase in 2027. The development proposes two entrances on West Governor John Sevier Highway. One of these entrances will be new, and the other will be provided by tying into an existing entrance for a Weigel’s convenience store. The proposed development has been analyzed in this report for the projected conditions in 2025 and 2027. This separate analysis ensures that any potential transportation issues are addressed in the interim before the project reaches final completion and occupancy in 2027.

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

Study Results:

The findings of this study include the following:

- The Ascend at South Knoxville development, with a total of 306 apartments in 2027, is estimated to generate 2,608 trips at full build-out and occupancy on an average weekday. Of these daily trips, 151 are estimated to occur during the AM peak hour and 215 in the PM peak hour in 2027.
- The existing signalized intersection of West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road is projected to be minimally impacted by the proposed Ascend at South Knoxville development. The intersection will operate acceptably in 2025 and 2027 using the existing timing and phasing of the traffic signal.

- The Proposed East Entrance at the Weigel's Driveway is expected to operate with reasonable vehicle delays in the projected AM and PM peak hours. At this existing driveway at West Governor John Sevier Highway, left-turns from the minor approach are prohibited; however, illegal left-turns presently occur. Modifications to the driveway will be required to aid in reducing these illegal left-turns.
- The Proposed West Entrance at West Governor John Sevier Highway is expected to operate with reasonable vehicle delays in the projected AM and PM peak hours. This proposed entrance will have two exiting lanes and will be a new intersection on West Governor John Sevier Highway. This entrance will require a separate eastbound right-turn lane to be constructed on West Governor John Sevier Highway for entering vehicles.

Recommendations:

The following recommendations are offered based on the study analyses. More details regarding the recommendations and conclusions are discussed at the end of the report. The recommendations are offered to minimize the impacts of the proposed development on the adjacent transportation system while attempting to achieve an acceptable traffic flow and improved safety. The recommendations marked with an asterisk indicate an existing transportation need and are not associated with the proposed development's projected impacts.

- * • The traffic sign showing the lane designation for the northbound approach of Mountain Grove Drive at the signalized intersection of West Governor John Sevier Highway at West Norton Road has been knocked off its post. During a field review, the sign was observed lying on the side of the road adjacent to the Sonic Restaurant. This sign needs to be either repaired or replaced.
- * • The vegetation and landscaping at the southwest corner of the signalized intersection of West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road desperately need attention. The vegetation needs to be removed for access and sight distance purposes.
- * • At the Proposed East Entrance at the existing Weigel's Driveway, a raised concrete median is recommended to be constructed to prohibit motorists from crossing the double yellow centerline when exiting. The median should be designed to deter crossing into the entering lane but allow delivery trucks to and from the Weigel's convenience store to drive over. The center median should extend far enough that a vehicle facing west on the Weigel's Driveway cannot easily navigate around and

travel into the entering lane but still allow entering vehicles to turn left towards the Weigel's convenience store. At a minimum, it is recommended that the center median be 4 feet in width, be delineated with yellow pavement markings, and be mountable by heavy trucks. Pavement markings in advance of the center median should delineate the gore area.

- * • At the Proposed East Entrance at the Weigel's Driveway, it is also recommended that the existing raised island potentially be enlarged and its geometry changed to help dissuade motorists from turning left from this approach as currently prohibited. TDOT should provide guidance for potentially increasing the footprint and revising the geometrics of the island adjacent to the state route. It is also recommended that the word "ONLY" be applied to the pavement in advance of the right-turn arrow on this exiting lane.
- Sight distances at the Proposed East Entrance approach must not be impacted by future landscaping, signage, or vegetation. This approach currently has the appropriate amount of sight distance. The site designer must ensure that the intersection and stopping sight distances are accounted for and maintained in the design plans.
- Intersection street lighting is recommended to be provided at the Proposed East Entrance at the Weigel's Driveway to improve visibility and conspicuity.
- At the Proposed West Entrance on West Governor John Sevier Highway, the current site plan shows the proposed exiting northbound right-turn lane with a storage length of 50 feet. Based on the calculations presented in the study, the northbound right-turn lane is recommended to have a minimum storage length of 75 feet.
- After reviewing this report by TDOT, they recommended that the eastbound right-turn lane on West Governor John Sevier Highway at the Proposed West Entrance be constructed with a 200-foot storage lane and a 200-foot taper. This length corresponds to roughly the entire calculated stopping sight distance. Constructing this turn lane will require an agreement with the adjacent property owner due to the encroachment the eastbound right-turn lane will create. An agreement could include allowing the adjacent property owner in the future to access the Proposed West Entrance since this is the current setup at the existing gravel entrance on West Governor John Sevier Highway. If this were to occur, it is recommended that a minimum throat length of 100 feet be established between West Governor John Sevier Highway and any proposed access connection to the adjacent property owner via the Proposed West Entrance. The designer must coordinate with TDOT

to design and construct the recommended eastbound right-turn lane at the Proposed West Entrance.

- A Stop Sign (R1-1) is recommended to be installed, and a 24" white stop bar be applied to the Proposed West Entrance approach at West Governor John Sevier Highway.
- Sight distances at the Proposed West Entrance approach must not be impacted by future landscaping, signage, or vegetation. The site designer must ensure that the intersection and stopping sight distances are accounted for and provided in the design plans.
- Intersection street lighting is recommended to be provided at the Proposed West Entrance at West Governor John Sevier Highway to improve visibility and conspicuity.
- The construction of the Proposed West 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.
- 15-mph Speed Limit Signs (R2-1) are recommended to be posted near the beginning of the development entrance driveways off West Governor John Sevier Highway. Since the entrance and internal aisleways will not be public roads, a posted speed limit of less than 25-mph is acceptable.
- Stop Signs (R1-1) with 24" white stop bars will need to be installed on the internal drive and aisleways. Additional signage will be needed for the proposed internal roundabout and will also require pavement markings, as shown in Figure 2B-22 of the MUTCD, 2009 edition.
- Sight distance at the new internal intersections must not be impacted by new signage, parked cars, or future landscaping. With a speed limit of 15-mph in the development, the internal intersection sight distance is 170 feet. The required stopping sight distance is 80 feet for a level road grade. The site designer should ensure that internal sight distance lengths are met and account for different proposed road grades.
- The main east-west internal drive/aisleway is very long and straight. It is recommended that speed humps or tables be considered to reduce internal traffic speeds in the development. Alternatively, the parking lot islands could be extended toward the aisleways. Extending the parking lot islands a few feet would narrow the aisleway widths and reduce the available driving surface. A narrower aisleway design would reduce driver comfort and internal vehicle

speeds.

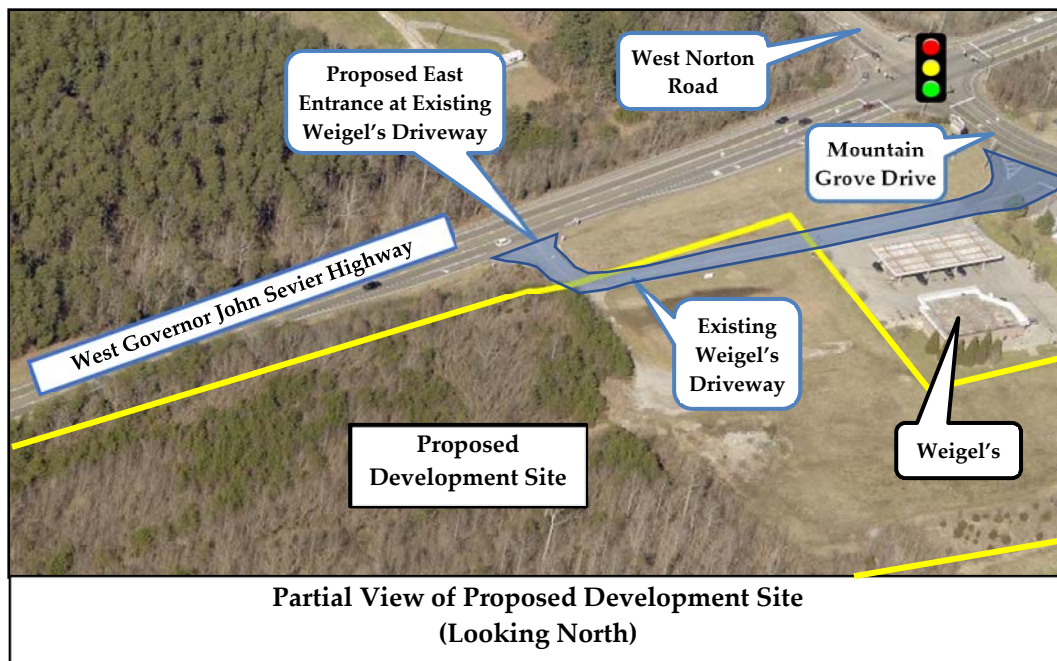
- All drainage grates and covers for the residential development must be pedestrian and bicycle safe.
- Sidewalks should have appropriate ADA-compliant ramps at intersection corners, and the internal sidewalks are recommended to be 5 feet minimum in width to meet Knox County and City of Knoxville regulations. White crosswalks should be marked on the road pavement internally where pedestrians are expected to cross. Pedestrian signs (W11-2) should also be installed where the crosswalks cross the development's main east-west internal drive/aisleway.
- The requested Knox County rezoning for the property included a recommendation by the Knoxville/Knox County Planning staff that the development “provide a pedestrian connection to the large adjacent commercial node to the east that is served by transit.” Details regarding this connection should be coordinated with the governing authorities. Due to the proximity to the South Grove shopping center and the KAT bus stop in the shopping center, it is further recommended in this study that the internal sidewalk system be constructed with a pedestrian connection to this adjacent development.
- All road grade and intersection elements should be designed to AASHTO, TDOT, and Knox County and City of Knoxville specifications and guidelines to ensure proper transportation operations.
- * • It is recommended that speed humps be considered on the section of the Weigel’s Driveway that runs parallel to West Governor John Sevier Highway to combat high-speed cut-thru traffic on the Weigel’s Driveway. These speed humps should be installed between the Proposed East Entrance for the Ascend at South Knoxville development and the existing open pavement area in front of the Weigel’s convenience store. However, the legality and potentiality of this recommendation depend on what entity formally owns this driveway and whether they would allow this installation. Any speed humps on this road section must consider large and heavy trucks that travel to and from the Weigel’s convenience store.

DESCRIPTION OF EXISTING CONDITIONS

▪ STUDY AREA:

The proposed location of this new residential development is shown on a map in Figure 1. This proposed development will be located at West Governor John Sevier Highway, 1,250 feet southwest of Chapman Highway in South Knox County, TN. The development will have two entrances on West Governor John Sevier Highway, and the site is west and adjacent to a large shopping center. This shopping center, “South Grove”, contains a Lowe’s Home Improvement Center, a Food City grocery store, a bank, a car wash, several standalone fast-food restaurants, and other businesses.

As Knoxville/Knox County Planning requested, transportation impacts associated with the proposed development were analyzed at the signalized intersection of West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road and the Proposed Entrances at the highway. One of these entrances currently exists on West Governor John Sevier Highway, providing access to a Weigel’s convenience store. The Weigel’s convenience store is the furthest west of the developed outparcels of the South Grove shopping center.



The proposed development property is in a quasi-rural area that is gradually being transformed into a more suburbanized area due to increased development along Chapman Highway to the east and increased residential development in the surrounding area. Governor John Sevier

Highway has become more attractive to developers and residents over the past few years due to the dwindling availability of developable and affordable property in other parts of Knox County and due to its proximity to other major roads.

The development property has 1,650 feet of road frontage along West Governor John Sevier Highway on the south side. The proposed development site is currently undeveloped, with nearly all the property covered with forest. The far eastern part of the development property is an open-maintained field located adjacent to and partially behind the Weigel's convenience store.

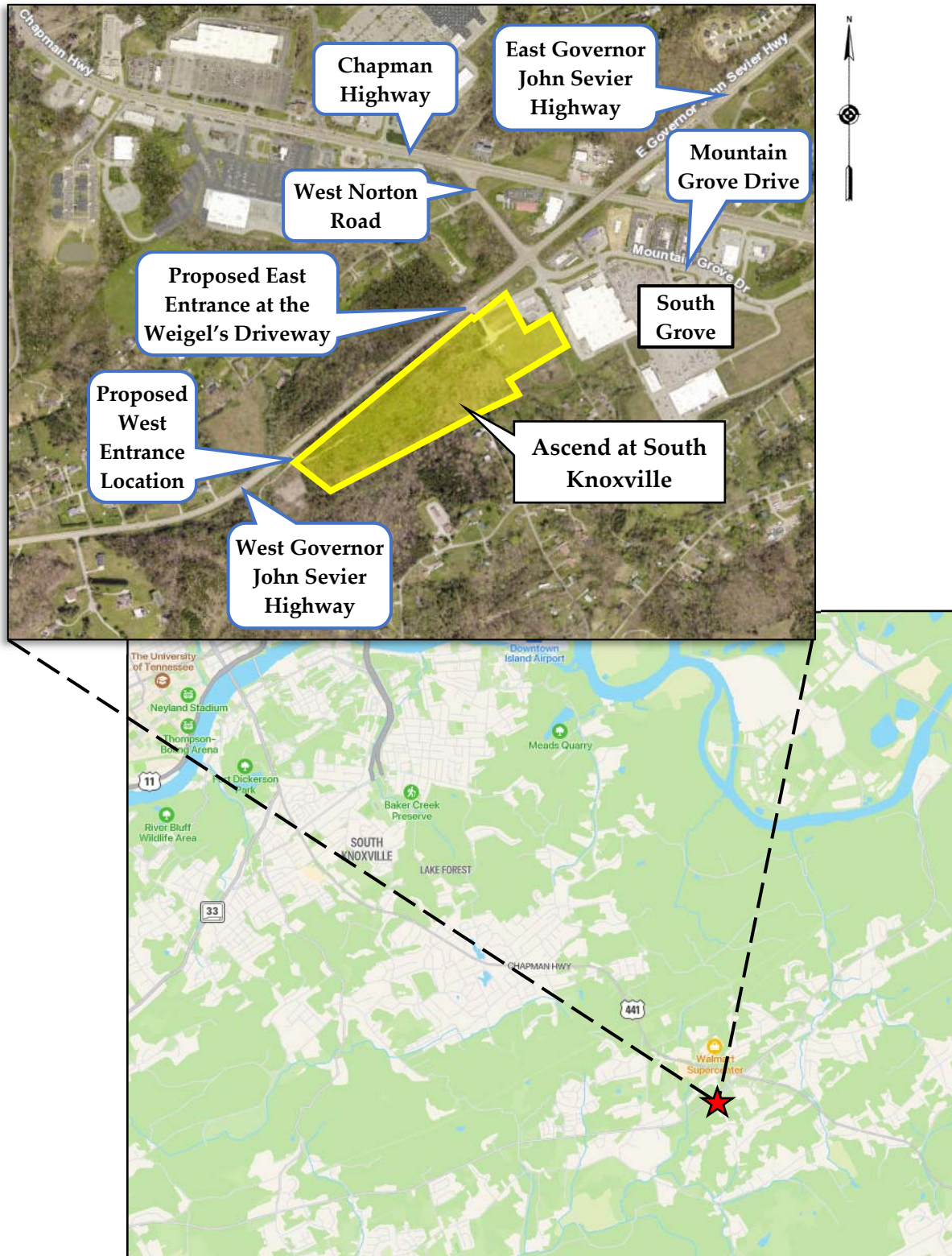


Figure 1
Location Map

▪ **EXISTING ROADWAYS:**

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

**TABLE 1
STUDY CORRIDOR CHARACTERISTICS**

NAME	CLASSIFICATION ¹	SPEED LIMIT	LANES	ROAD WIDTH ²	TRANSIT ³	PEDESTRIAN FACILITIES	BICYCLE FACILITIES
West Governor John Sevier Highway (SR 168)	Major Arterial	50 mph	3 (with TWLTL)	46 feet	None	No sidewalks along roadway	No bike lanes
Mountain Grove Drive	Minor Collector	Not Posted	3 (with TWLTL)	40 feet	KAT / Route 41	No sidewalks along roadway	No bike lanes
West Norton Road	Local Street	Not Posted	2 undivided	48 feet	None	No sidewalks along roadway	No bike lanes
Weigel's Driveway	Private Driveway	Not Posted	2 undivided	23 - 30 feet	None	No sidewalks along roadway	No bike lanes

¹ 2018 Major Road Plan by Knoxville/Knox County Planning

² From edges of pavement or face of curbs

³ According to Knoxville Area Transit (KAT) System Map

West Governor John Sevier Highway (SR 168) is classified as a Major Arterial and traverses in a general northeast-southwest direction in the study area. West Governor John Sevier Highway traverses over Chapman Highway (US 441/SR 71) via an overpass 1,250 feet east of the development site. West Governor John Sevier Highway begins at the interchange with Alcoa Highway (US 129/SR 115) on its southwest end. On its northeast end, East Governor John Sevier Highway terminates at the intersection with Asheville Highway (US 11E/US 25/US 70/SR 9), with a total length of 18.1 miles. The delineation of the East/West designation of Governor John Sevier Highway occurs at the overpass intersection with Chapman Highway.

West Governor John Sevier Highway at the project site currently consists of a 3-lane pavement section that includes a continuous center two-way left-turn lane (TWLTL). The pavement surface is approximately 46 feet in total width. The lanes are 12 feet wide with a 5-foot



**West Governor John Sevier Highway at
Development Site Property
(Looking West)**

paved surface outside the white edge lines. Grass side slopes are located immediately outside of the 5-foot paved shoulders. At the project site, utility streetlights are not provided on West Governor John Sevier Highway, and the speed limit is posted at 50 mph. The white edge lines of the highway are delineated with skip rumble strips.

The Knoxville Regional Transportation Planning Organization (TPO) has a website for the Mobility Plan 2045. The organization has identified a future widening project for West Governor John Sevier Highway on this website. This project is listed for the year 2035 at the cost of \$69.3 million and will widen the highway to four lanes. The proposed road widening will occur between Alcoa Highway and Chapman Highway, with a total length of 6.5 miles, and the development site will be within this widening corridor.

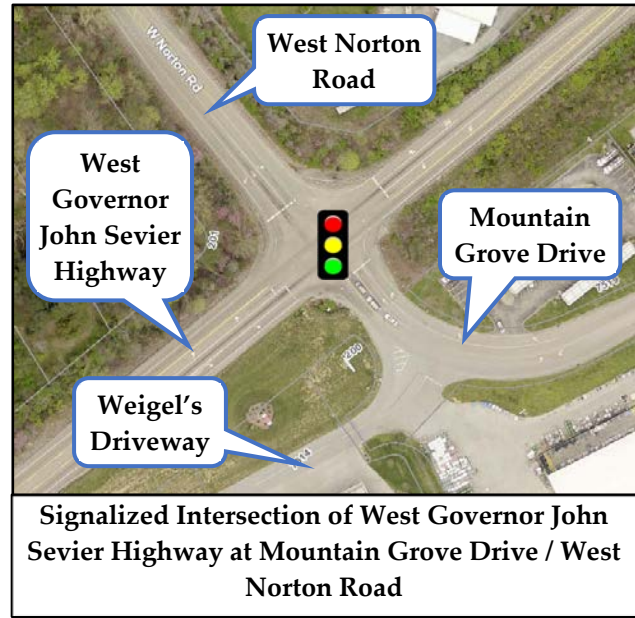
Mountain Grove Drive is classified as a Minor Collector and is the main roadway through the South Grove shopping center. This road does not have a posted speed limit and has three lanes that include a continuous center TWLTL along the entire length of the development. Mountain Grove Drive provides access to numerous retail and commercial businesses within the South Grove shopping center. Mountain Grove Drive has a 30" combined concrete curb and gutter at its edges, and roadway lighting is provided on its entire length. A Knoxville Area Transit (KAT) bus stop is located on Mountain Grove Drive in front of Lowe's Home Improvement Center.



**Western End of Mountain Grove Drive near
Lowe's Home Improvement Center and Sonic
Drive-In Restaurant
(Looking East)**

Mountain Grove Drive begins at the 4-way signalized intersection of West Governor John Sevier Highway at West Norton Road. It ends on its east side at a signalized intersection with Chapman Highway and has a total length of 0.5 miles. In between its length, another traffic signal is located mid-way on Mountain Grove Drive at the intersection with Majestic Grove Boulevard. Several parcels are still available for development within the South Grove shopping center. One of these parcels near the Chapman Highway intersection is currently undergoing construction. On this parcel, Covenant Health is building a 36,000-square-foot facility. Mountain Grove Drive also provides access to the Weigel's Driveway adjacent to the development site.

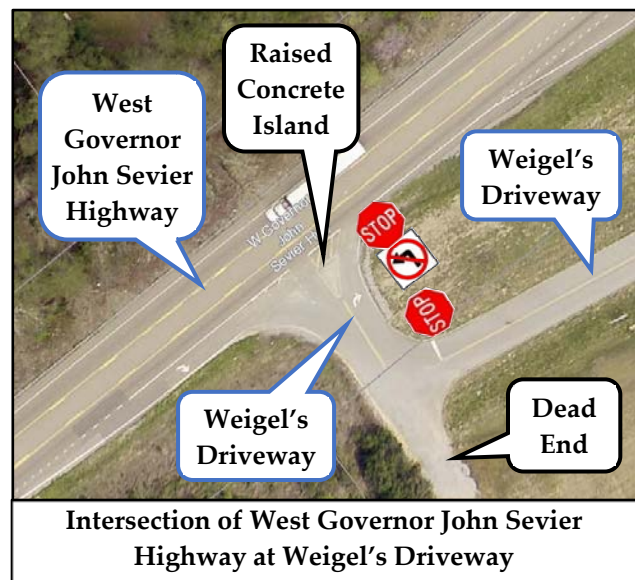
West Norton Road is a short Local Street. This road primarily connects West Governor John Sevier Highway and Chapman Highway. The road also provides access to Abner Cruze Road, which runs north and parallel to West Governor John Sevier Highway. West Norton Road begins at Chapman Highway and ends at the signalized intersection of West Governor John Sevier Highway and Mountain Grove Drive, with a total length of 840 feet. East Norton Road exists across Chapman Highway to the northeast, and this section of the road runs between Chapman Highway



and Sevierville Pike further to the northeast. At its intersection with Chapman Highway, left-turns from the highway to West Norton Road are prohibited, and left-turns from West Norton Road onto the highway are prohibited. At the signalized intersection of West Governor John Sevier Highway at Mountain Grove Drive, West Norton Road is ringed by guardrails on both sides and has separate lanes for left, thru, and right vehicle movements. West Norton Road does not have a posted speed limit.

Weigel's Driveway is a short private roadway providing a secondary access point from West Governor John Sevier Highway to the Weigel's convenience store. It traverses between the proposed development site and Mountain Grove Drive. This road does not have a posted speed limit. The width of the driveway pavement perpendicular to West Governor John Sevier Highway is 30 feet, and the driveway width parallel to the highway is 23 feet.

An exclusive eastbound right-turn lane is provided on West Governor John Sevier Highway for entering right-turns off the highway at this driveway. Left-turns entering this driveway from West Governor John Sevier Highway are served by the center TWLTL. Vehicles exiting this driveway are prohibited from turning left onto West Governor John Sevier Highway towards the

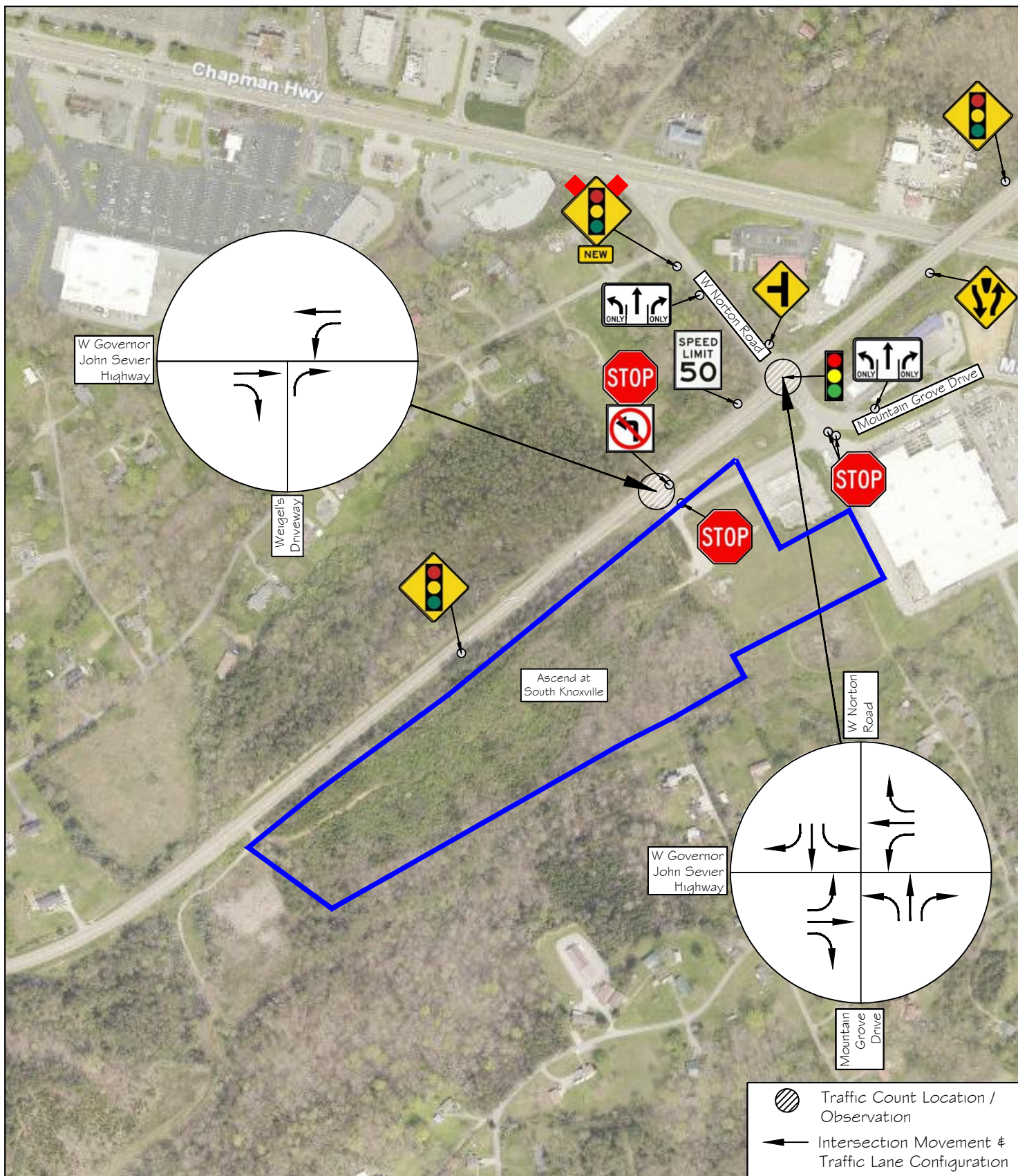


west. This turn prohibition is delineated by traffic road signage and a raised concrete island. A brief query tried to determine why this intersection was constructed with a left-turn prohibition but was unsuccessful. The original transportation impact study in 2005 did not show or propose the left-turn prohibition. It is thus assumed that this prohibition was established when the Weigel's Driveway was constructed.

In this report, the Weigel's Driveway is referenced as the existing roadway that runs in front of the convenience store between Mountain Grove Drive and West Governor John Sevier Highway. As illustrated above, this driveway consists of two segments, one in front of the store that runs parallel to West Governor John Sevier Highway and directly in front of the Weigel's store. The other short section intersects West Governor John Sevier Highway at a right angle with the left-turn prohibition. The section of the Weigel's Driveway parallel to the highway is controlled by a Stop Sign (R1-1) at each end. A short stub currently dead-ends to the south. In the future, this stub to the south will provide access to the Ascend at South Knoxville development, as shown in the adjacent image.



Figure 2 shows the existing lane configurations of the intersections examined in the study, the traffic count locations for the study, and the current traffic road signage in the study area. The road signage shown in Figure 2 only includes warning and regulatory signage near the development site and adjacent to the studied intersections. The pages following Figure 2 give a further overview of the site study area with photographs.



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NOT TO SCALE



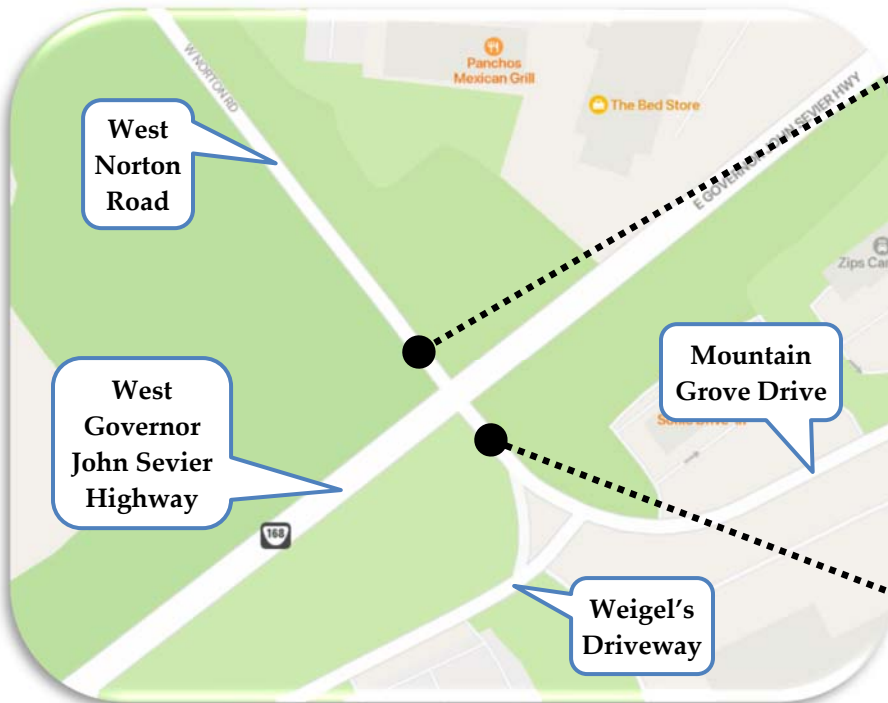
FIGURE 2

Ascend at South Knoxville

Traffic Count Locations, Traffic Signage &
 Existing Lane Configurations

PHOTO EXHIBITS

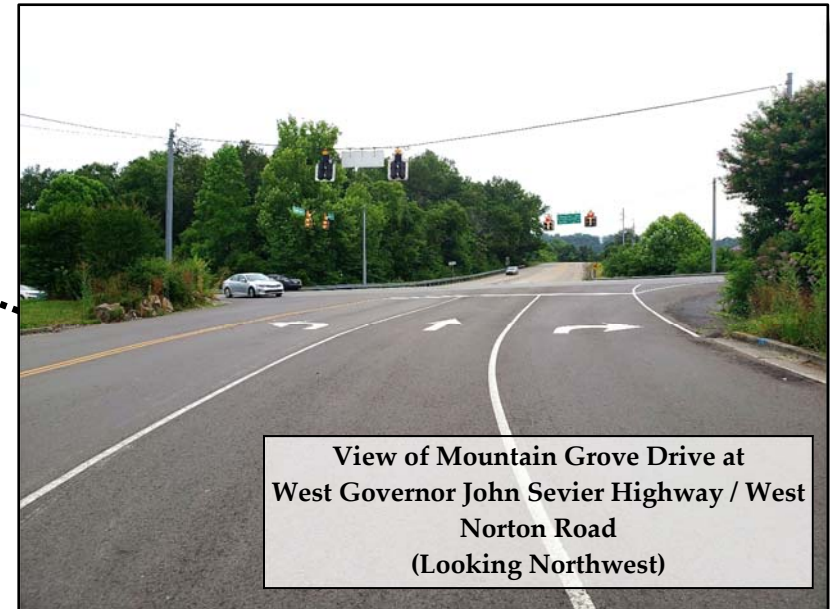
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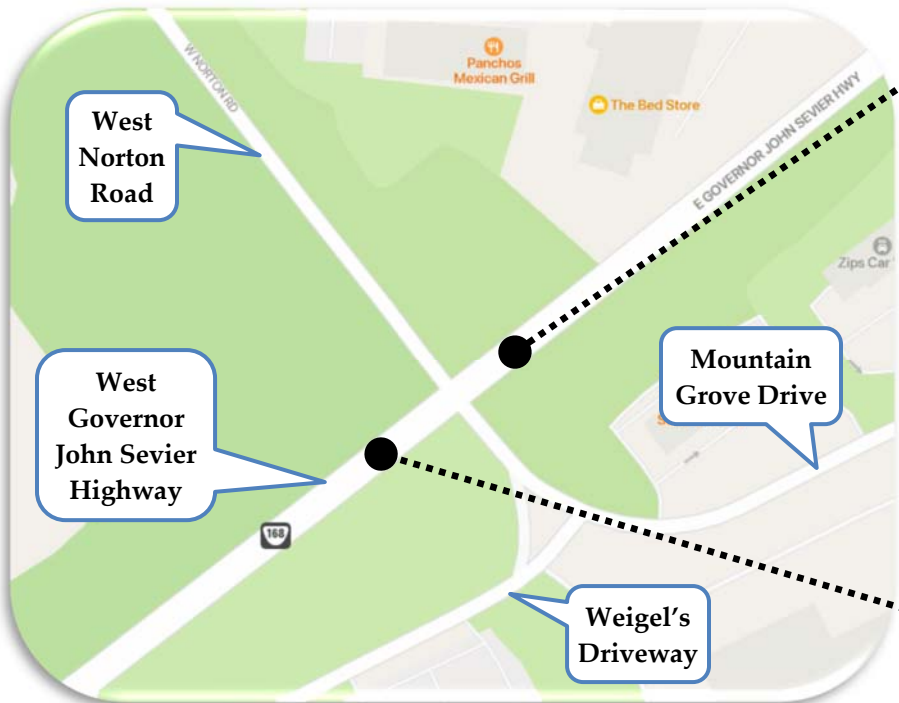
Intersection of West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road



View of West Norton Road at West Governor John Sevier Highway / Mountain Grove Drive (Looking Southeast)



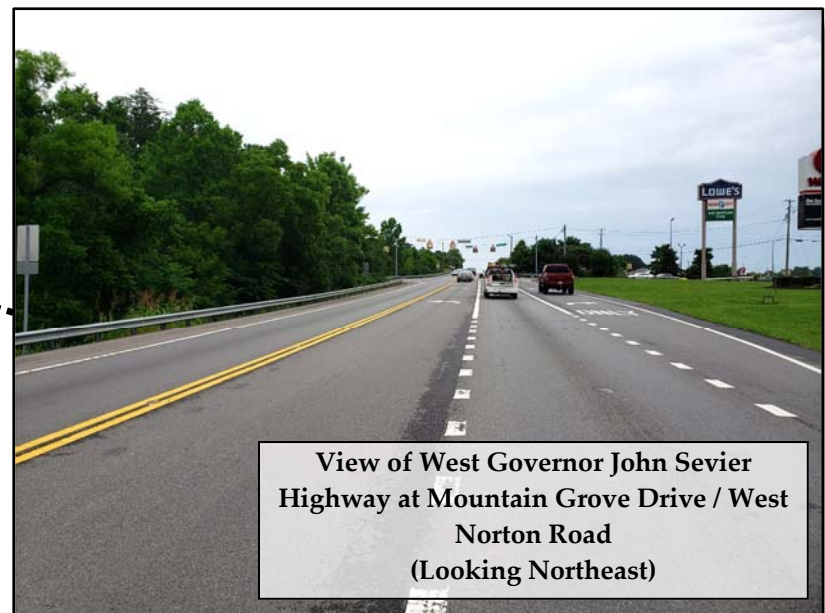
View of Mountain Grove Drive at West Governor John Sevier Highway / West Norton Road (Looking Northwest)



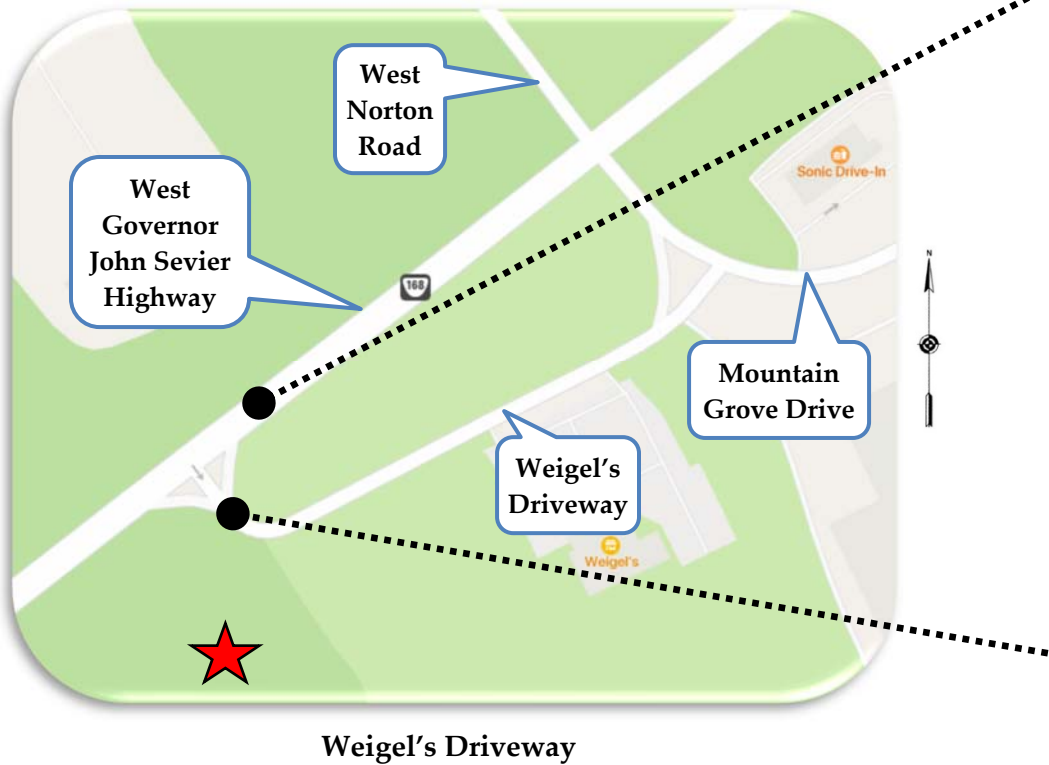
Intersection of West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road



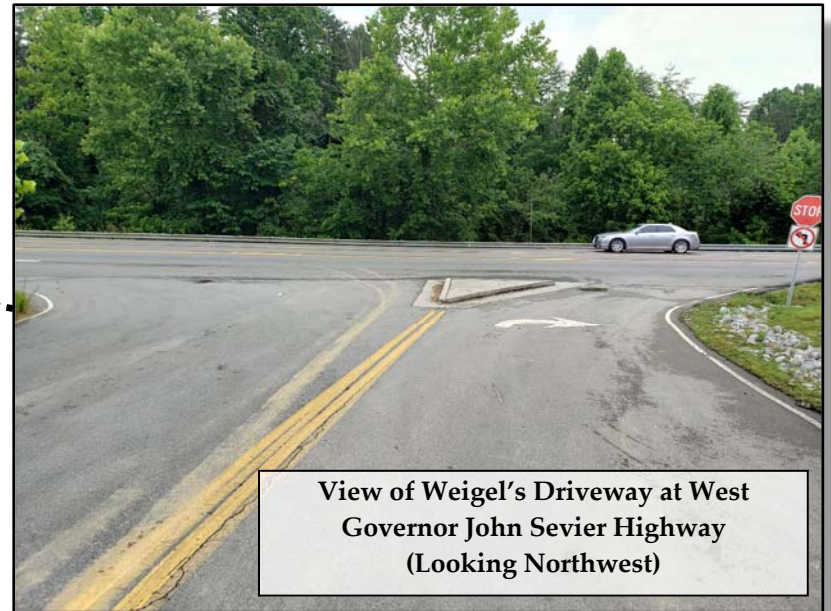
View of West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road (Looking Southwest)



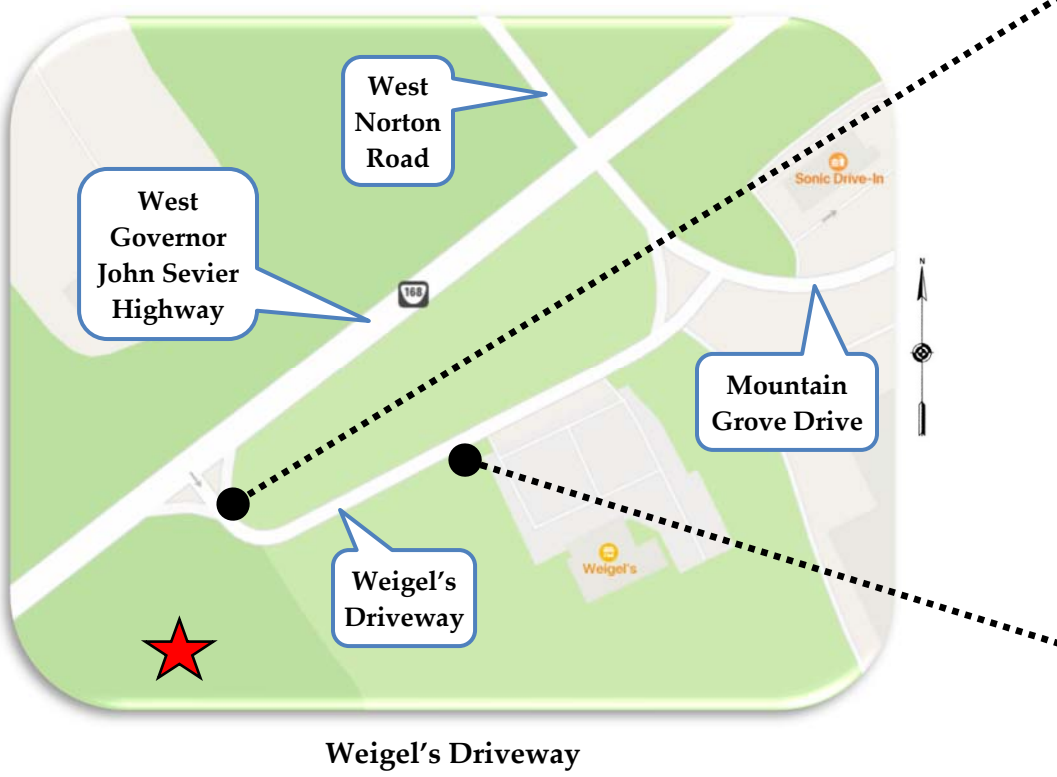
View of West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road (Looking Northeast)



View of West Governor John Sevier Highway at Weigel's Driveway (Looking Southwest)



View of Weigel's Driveway at West Governor John Sevier Highway (Looking Northwest)



▪ **EXISTING TRANSPORTATION VOLUMES PER MODE:**

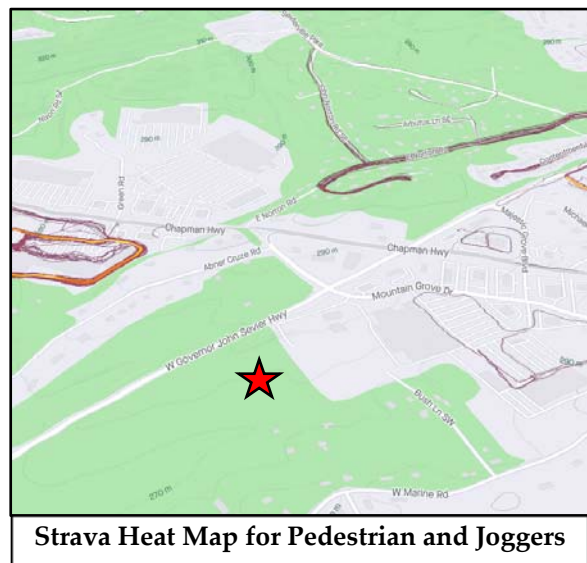
One annual vehicular traffic count location exists nearby the study area, and this count is conducted by the Tennessee Department of Transportation (TDOT). The count location data is the following and can be viewed with further details in Appendix A:

- Existing vehicular roadway traffic:
The TDOT reported an Average Daily Traffic (ADT) on West Governor John Sevier Highway, east of Martin Mill Pike, at 16,617 vehicles per day in 2021. From 2011 to 2021, this count station has indicated a 0.6% average annual traffic growth rate.

- Existing bicycle and pedestrian volumes:
The average daily pedestrian and bicycle traffic is unknown along the studied roadways. Due to the lack of facilities, it is assumed that there is a minimal number of pedestrians and bicyclists on these roads in the study area. During the traffic counts for this project at West Governor John Sevier Highway, no pedestrians or bicyclists were observed over 6 hours at either intersection.



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



higher activity. The Strava heat map data shows no pedestrian traffic along West Governor John Sevier Highway. Some pedestrian traffic is recorded in the nearby shopping centers. Minimal bicycle traffic is recorded on the section of West Governor John Sevier Highway adjacent to the development site. More significant bicycle traffic is shown on Abner Cruze Road just north of the highway. The heat map shows that bicyclists likely use Abner Cruze Road as a parallel route to avoid West Governor John Sevier Highway since there are fewer vehicles and lower speeds on Abner Cruze Road. Abner Cruze Road at West Norton Road is marked explicitly with signage stating that the road is inappropriate for truck traffic.



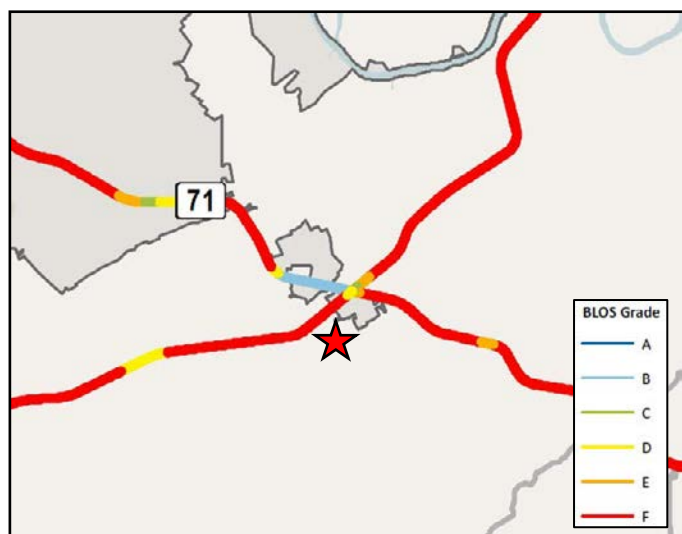
Road Signage at Beginning of Abner Cruze Road at West Norton Road

▪ **ON-STREET PARKING:**

On-street parking was not observed during the site review and is not allowed on any studied roadways adjacent to the project site. Parking lot facilities, however, are provided throughout the South Grove shopping center and at the adjacent Weigel's convenience store.

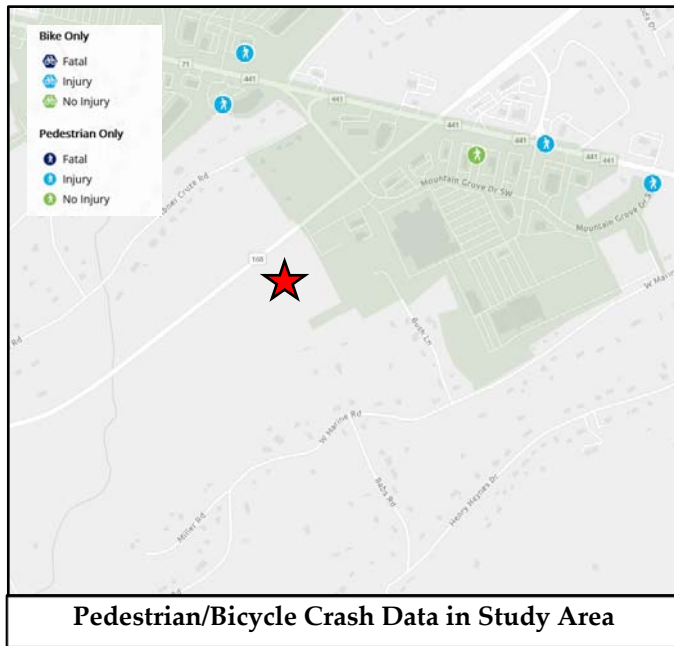
▪ **PEDESTRIAN AND BICYCLE FACILITIES:**

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

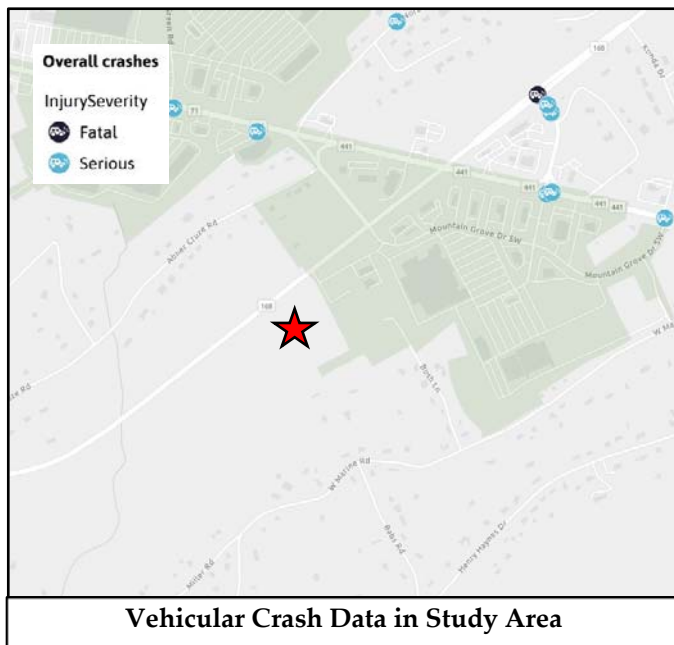


Mapping of Bicycle Level of Service (BLOS) - TDOT

and BLOS F as the least suitable. The BLOS mapping for West Governor John Sevier Highway (SR 168) in the study area at the development site shows F grades.



The Knoxville TPO provided a 2020 update to bicycle and pedestrian crash data for Knox County, Blount County, and other surrounding counties. According to the data, none of these incidents occurred near the development site or at the studied intersections in the past couple of years. The closest incidents occurred in and around Chapman Highway, and one crash occurred in the adjacent South Grove shopping center. All these crashes involved pedestrians, causing injuries, except for the one crash in the South Grove shopping center.



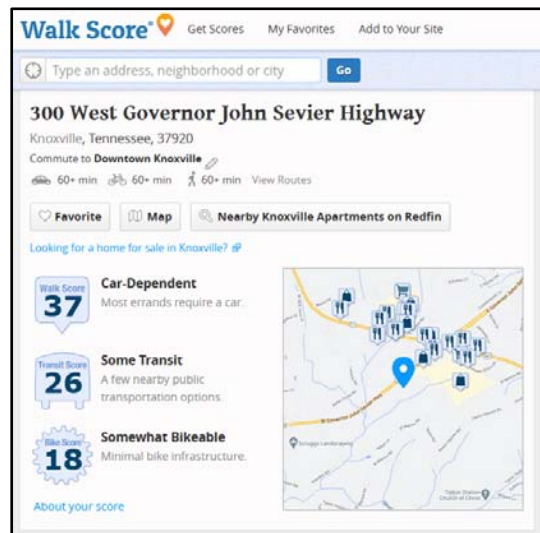
The Knoxville TPO also provides data related to “Life-Altering Traffic Crashes”. This data lists “the location of 2,326 traffic crashes in the Knoxville region that resulted in a fatality or serious injury between January 2016 and June 2019.” Several “Serious” crashes are shown on this TPO mapping along Chapman Highway in the vicinity of the proposed development site, but none are adjacent to the site. The closest fatal crash to the development site occurred at the intersection of East Governor John Sevier Highway at Majestic Grove Boulevard.

During the preparation of this report, a significant crash occurred at the signalized intersection of West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road. This crash occurred at approximately 3:20 pm on June 27th, 2022, and involved a dump truck hitting four

cars and five motorcycles. Media pictures and videos showed that the crash occurred on West Governor John Sevier Highway's westbound approach at the intersection. Several people were taken to the hospital, and one of the motorcyclists suffered a life-threatening injury. From the story from wbir.com, "Police said the dump truck tried to slow down for stopped traffic but couldn't stop before crashing into the other vehicles."

▪ **WALK SCORE:**

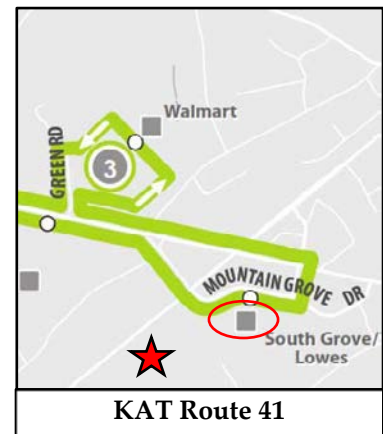
A private company offers an online website at walkscore.com that grades and gives scores to locations within the United States based on "walkability", "bikeability", and transit availability based on a patented system. According to the website, the numerical values assigned for the Walk Score and the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



Appendix B shows maps and other information for the Walk Score, Bike Score, and Transit Score at the approximate development property address (300 West Governor John Sevier Highway). The project site location is graded with a Walk Score of 37. This Walk Score indicates that most errands currently require a vehicle for travel at the development property. The Walk Score is graded somewhat higher than the average City of Knoxville score (31) due to the relative closeness of many amenities but could be higher if sidewalks were provided. The site is graded with a Bike Score of 18, which means there is minimal bike infrastructure, but it is somewhat bikeable. The site is given a Transit Score of 26 due to the proximity of public transportation.

▪ **TRANSIT SERVICES:**

The City of Knoxville has a network of public transit opportunities offered by Knoxville Area Transit (KAT). Bus service is available in the study area, and the overall KAT bus system map is provided in Appendix C. The closest public transit bus stop is 1,200 feet



away from the development site by roadway. The bus stop is located on Mountain Grove Drive in front of the Lowe’s Home Improvement Center and is on Route 41, “Chapman Highway”. It operates on weekdays and weekends; this route map is also included in Appendix C. Other transit services in the area include the East Tennessee Human Resource Agency (ETHRA) and the Community Action Committee (CAC), which provides transportation services when requested.



**Bus Stop in Front of Lowe’s
Home Improvement Center
on Mountain Grove Drive –
KAT Route 41**

PROJECT DESCRIPTION

▪ LOCATION AND SITE PLAN:

The proposed plan layout with 306 multi-family apartments on 20.4 +/- acres is designed by MBI Companies, Inc. and is shown in Figure 3. The development property is a re-subdivision of four parcels, three located within Knox County and one within the City of Knoxville. The one parcel in the City of Knoxville is adjacent to the Weigel's convenience store and the South Grove shopping center. This parcel is on the proposed development site's eastern end. As shown in the figure, two driveways are proposed for the development. One of the driveways, the Proposed East Entrance, will tie into West Governor John Sevier Highway at the existing entrance for the Weigel's Driveway. The second entry point for the development, the Proposed West Entrance, will be provided on the far western edge of the property at West Governor John Sevier Highway. The development will construct both entrances in Phase 1.

The Proposed West Entrance on West Governor John Sevier Highway will be approximately 1,650 southwest of the existing Weigel's Driveway unsignalized intersection. The Weigel's Driveway at West Governor John Sevier Highway is 550 feet southwest of the signalized intersection with Mountain Grove Drive / West Norton Road.

The plan shown in Figure 3 shows six buildings containing 238 apartment units in Phase 1. In Phase 1, the apartment complex will offer 105 – 1 bedroom apartments, 109 – 2 bedroom apartments, and 24 – 3 bedroom apartments. Phase 2 will offer a similar mixture of bedroom units but has not been decided at this time. Phase 2 will construct two additional apartment unit buildings on the western end of the site with an additional 68 apartment units for a total of 308 units in both phases.

One small building on the property's northeast side will be used for property maintenance and provide an area for trash collection. Another building at the front of the property near the Proposed East Entrance at West Governor John Sevier Highway will be a clubhouse constructed for numerous uses for the residents. These uses include an exercise room, conference room, mail center, and cyber cafe. It will also contain the development leasing office and restrooms.

The internal driveways and parking area aisleways will have a width of 26 feet. Concrete sidewalks are being proposed along the internal parking lots and in front of the apartment

buildings. An internal roundabout is also proposed just south of the Proposed East Entrance.

Overall, a total of 525 parking spaces will be provided in several internal parking lots, including the appropriate number of ADA-accessible parking spaces. In addition to traditional parking spaces, the development will also provide “tucked under” parking spaces. “Tucked under” parking spaces are garages provided under the dwellings, and there will be three on each end of the apartment unit buildings. Twenty covered parking spaces will be available for rent in a detached garage on the east side of the development property.

The schedule for completing the Ascend at South Knoxville development depends on economic factors and construction timelines. This project is contingent on permitting, design, and other regulatory approvals. The area's real estate and housing markets are experiencing tremendous activity and growth. Phase 1 is proposed to begin construction in the Summer of 2023, with full occupancy by 2025. Phase 2 will begin construction in 2026, with full occupancy by 2027. Both time periods are analyzed in this study.

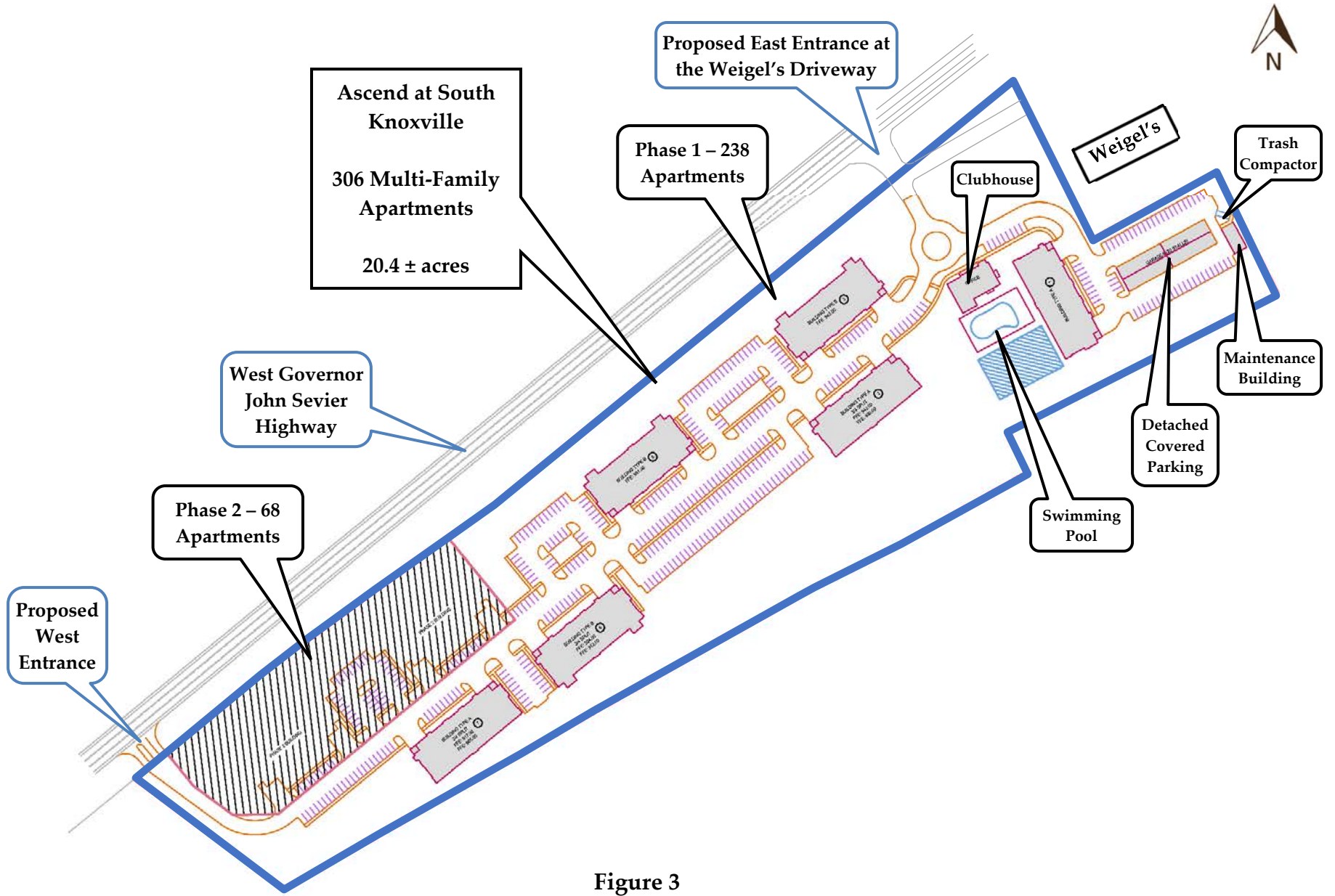


Figure 3
Proposed Plan Layout
Ascend at South Knoxville

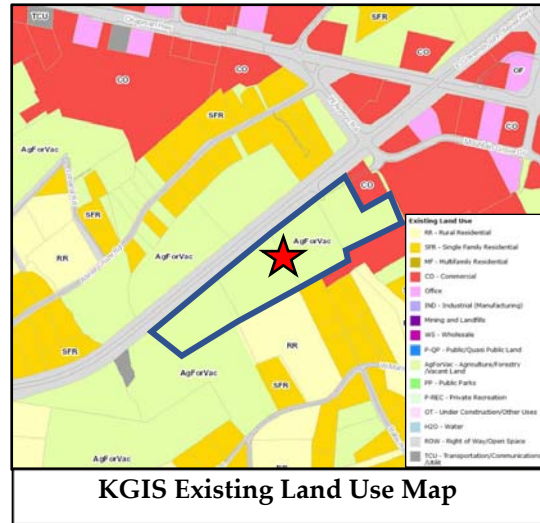
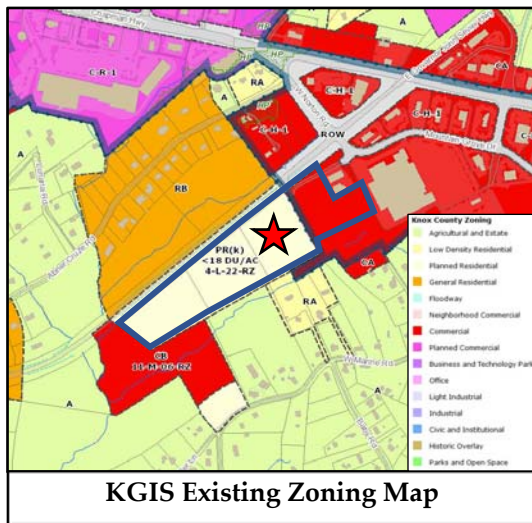
Not to Scale

▪ **PROPOSED USES AND ZONING REQUIREMENTS:**

Three of the Ascend at South Knoxville development property parcels were zoned as Agricultural (A) within Knox County, TN. These parcels were recently requested and approved to be rezoned to the Planned Residential (PR) zone with up to 18 units per acre. The Planned Residential (PR) zone allows for various land uses primarily within the residential realm. Uses permitted in this zone include single-family dwellings, duplexes, and multi-dwelling structures and developments. The most recently published online KGIS zoning map is provided in Appendix D. The fourth parcel of the development property is in the City of Knoxville and is adjacent to the Weigel's convenience store. This parcel is zoned as Highway Commercial (C-H-2) and will remain zoned as currently designated in the City of Knoxville. The existing adjacent surrounding zoning and land uses are the following:

- Two large parcels are located north and across West Governor John Sevier Highway from the development property. These parcels are undeveloped, in Knox County, completely forested, and zoned as General Residential (RB). On the northwest side and across West Governor John Sevier Highway, four properties are in the City of Knoxville and zoned as Highway Commercial (C-H-1). Two of these parcels have single-family residential houses with road access to Abner Cruze Road, and the other two parcels are undeveloped.
- To the northeast and east, two parcels are zoned as Highway Commercial (C-H-2) in the City of Knoxville. The parcels are occupied by the Weigel's convenience store and a Lowe's Home Improvement store. These two businesses are a part of the South Grove shopping center.
- The property immediately to the south of the development parcel in the City of Knoxville and adjacent to the Weigel's convenience store is also zoned in the Highway Commercial District (C-H-2). This parcel is occupied by stormwater facilities for the South Grove shopping center. Further south and outside the City of Knoxville, a single property is zoned as General Business (CA) with road access to Bush Lane. Other properties to the south are zoned as Agriculture (A) and are occupied by single-family detached houses. These properties to the south of the proposed development site all have road access to West Marine Road.
- On the south side of the development property and midway along its length, a handful of parcels are zoned as Low-Density Residential (RA) and occupied with single-family detached houses with road access to West Marine Road.

- One parcel exists to the southwest, is entirely forested, and zoned as Business and Manufacturing (CB) in Knox County.



▪ **DEVELOPMENT DENSITY:**

The Ascend at South Knoxville development’s proposed density is based on a maximum of 306 multi-family apartments on 20.4 acres. Three hundred and six apartment units over 20.4 acres compute to 15 dwelling units per acre, less than the requested and approved rezoning to Planned Residential (PR) with a density of up to 18 units per acre.

▪ **ON-SITE CIRCULATION:**

The entrances, internal drives, and aisleways will be designed and constructed to Knox County and the City of Knoxville specifications. The internal roads will be asphalt paved and include concrete curbs. Concrete sidewalks are being proposed along the internal parking lots and in front of the apartment buildings. The lane widths will be 13 feet each for a total 26-foot pavement driveway and parking lot aisle width. The driveway entrances and internal aisleways will be private and maintained in the future by the development.

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

Besides residential passenger vehicles, the apartment driveway and aisleways will provide access to service, delivery, maintenance, and fire protection/rescue vehicles. None of these vehicle types will impact roadway operations other than when they occasionally enter and exit the development.

A trash collection area is designed for the apartment residents on the eastern side of the complex. Residents will park and drop trash over a wall into a top-loaded compactor chute. A concrete pad will be provided in front of the trash collection area to resist surface damage from trash collection trucks.

The new driveways and parking lot aisleways will be designed and constructed to Knox County and City of Knoxville specifications and are expected to be adequate for fire protection and rescue vehicles, truck collection trucks, and single-unit delivery trucks. The development's internal drives will accommodate the larger vehicle types and residents' standard passenger vehicles.

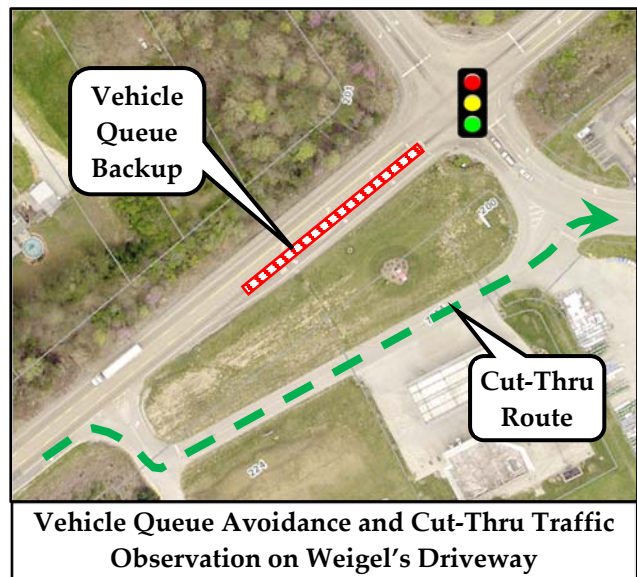
ANALYSIS OF EXISTING AND PROJECTED CONDITIONS

▪ EXISTING TRAFFIC CONDITIONS:

For this study, a 6-hour traffic count was conducted at the signalized intersection of West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road and the unsignalized intersection of West Governor John Sevier Highway at the Weigel's Driveway on Tuesday, May 24th, 2022. The manual traffic counts were conducted to tabulate the morning and afternoon peak period volumes and travel directions near the proposed development site. Based on the traffic volumes collected, the AM and PM peak hours were observed at 7:15 – 8:15 am and 4:45 – 5:45 pm at both intersections. Local county public schools were in session when the traffic counts were conducted.

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

- No bicyclists or pedestrians were observed during the traffic counts at either intersection.
- Most of the observed traffic was passenger vehicles. However, the traffic stream included several semi-tractor-trailers, public school and KAT buses, and other larger vehicles.
- During the peak periods, vehicle queues occasionally backed up from the signalized intersection of West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road westward to the Weigel's Driveway but would quickly dissipate.
- Several times, motorists were observed using the Weigel's Driveway to enter the South Grove shopping center. This cut-thru maneuver typically occurred when the eastbound vehicle queue at the traffic signal blocked the exclusive right-turn lane for vehicles turning and entering the South Grove shopping center. This maneuver appeared to occur when the motorists assumed they could more quickly



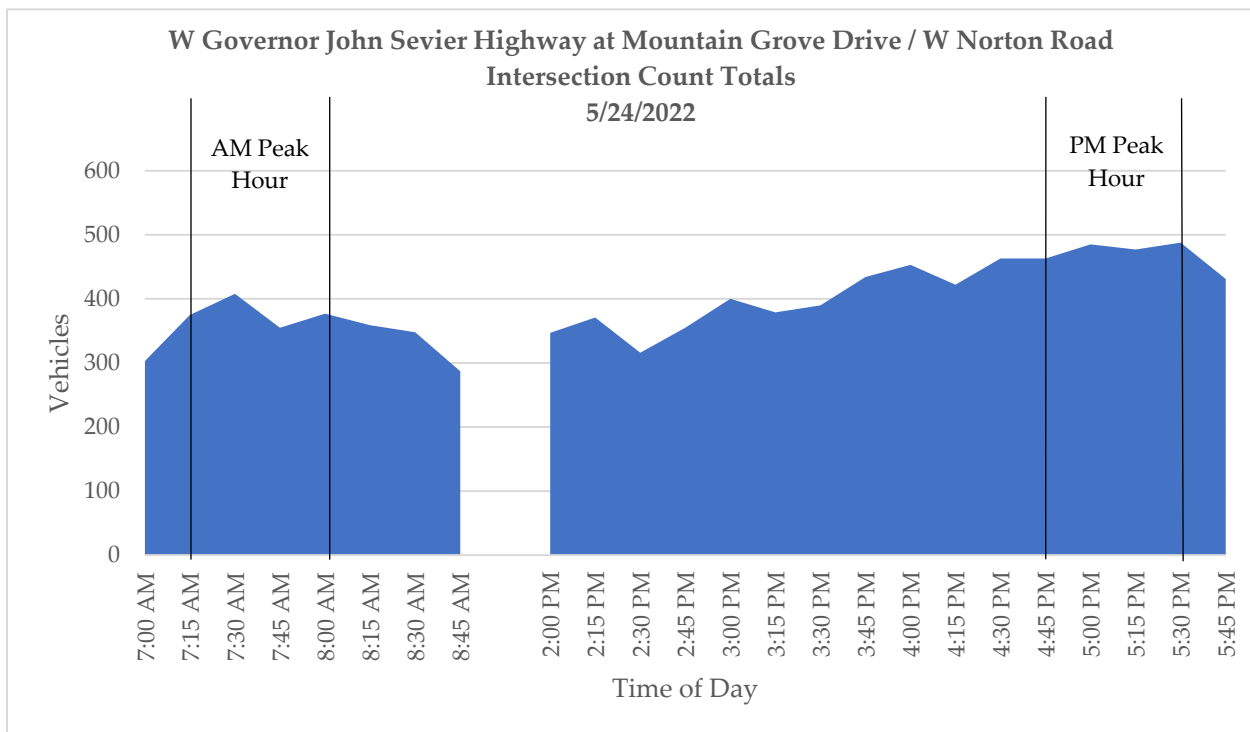
enter the South Grove shopping center via the Weigel's Driveway versus waiting for the queue to subside on West Governor John Sevier Highway.

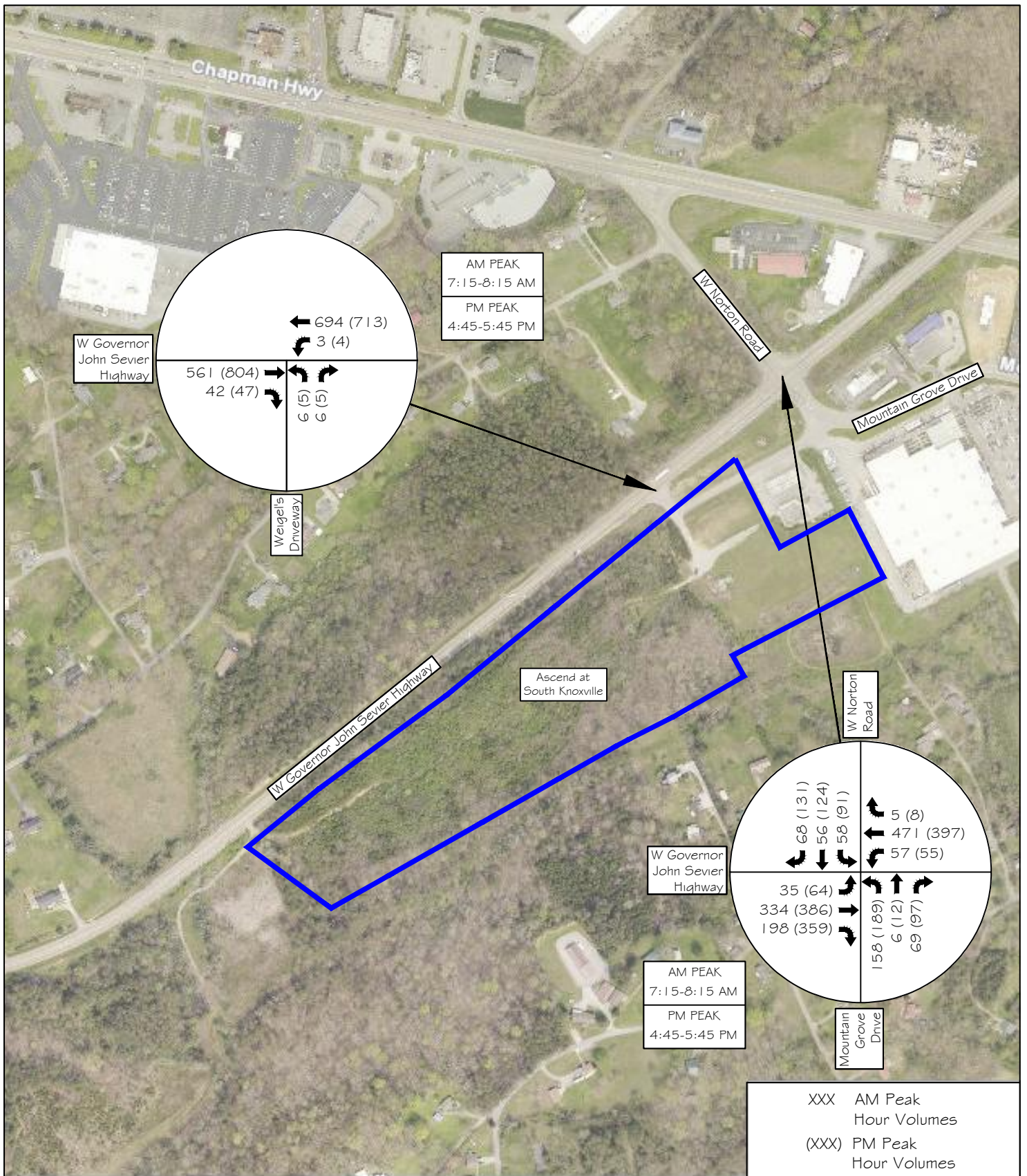
- The northbound approach of the Weigel's Driveway at West Governor John Sevier Highway is marked with signage and a raised concrete island that designates this approach as a right-turn only. However, many motorists were observed turning left from this approach onto West Governor John Sevier Highway. In fact, over the entire 6 hours, more motorists were observed turning left than right at this approach. During the AM and PM peak hours, the exact same number of motorists turned left and right. Most of



Mud Tracks on Entering Lane from Motorists Illegally Turning Left onto West Governor John Sevier Highway from the Weigel's Driveway Approach

these illegal maneuvers occurred from the exiting lane by ignoring the signage and avoiding the raised concrete island when turning left. However, some motorists at this approach were observed crossing the double yellow line and exited from the entering lane. Over a quarter (8 of 28) of the illegal left turns observed during the AM and PM peak hours were completed by crossing the double yellow line. As shown above, evidence of this unsafe maneuver is visible on the pavement.





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FIGURE 4

Ascend at South Knoxville

2022 Peak Hour Traffic Volumes -
 EXISTING TRAFFIC CONDITIONS

Capacity analyses were undertaken to determine the Level of Service (LOS) for the existing 2022 traffic volumes shown in Figure 4 at the studied intersections. The capacity analyses were calculated following the Highway Capacity Manual (HCM) methods and Synchro Traffic Software (Version 11). The illegal northbound left-turns at the Weigel's Driveway were ignored in the calculations.

Methodology:

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



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

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

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

LOS is based upon delay (in seconds) for approaches within the intersection and vehicles' overall operation entering an intersection for signalized intersections. This delay measures driver discomfort, frustration, fuel consumption, and lost travel time and depends on traffic signal cycle lengths, lengths of green phases, and traffic progression quality. This control delay includes deceleration/acceleration delay, queue move-up time, and stopped delay time. In most instances, the upper limit of acceptable delay during peak hours is the LOS D/E boundary at 55 seconds for signalized intersections. Table 3 lists the level of service criteria for signalized intersections.

Intersection capacity results from the existing 2022 peak hour traffic are shown in Table 4. The intersection in the table is shown with a LOS designation, delay (in seconds), and v/c ratio (volume/capacity) for the AM and PM peak hours. Appendix F includes the worksheets for the existing 2022 peak hour capacity analyses. Appendix F also contains the signal timing information that the City of Knoxville provided and used in the analyses for the signalized intersection. All analyses in this report for the existing and projected conditions used the current signal timing.

As shown in Table 4, all the existing 2022 movements and approaches are calculated to operate with average LOS and vehicle delays in the AM and PM peak hours.

TABLE 2
LEVEL OF SERVICE AND DELAY FOR UNSIGNALIZED INTERSECTIONS



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

Source: Highway Capacity Manual, 6th Edition

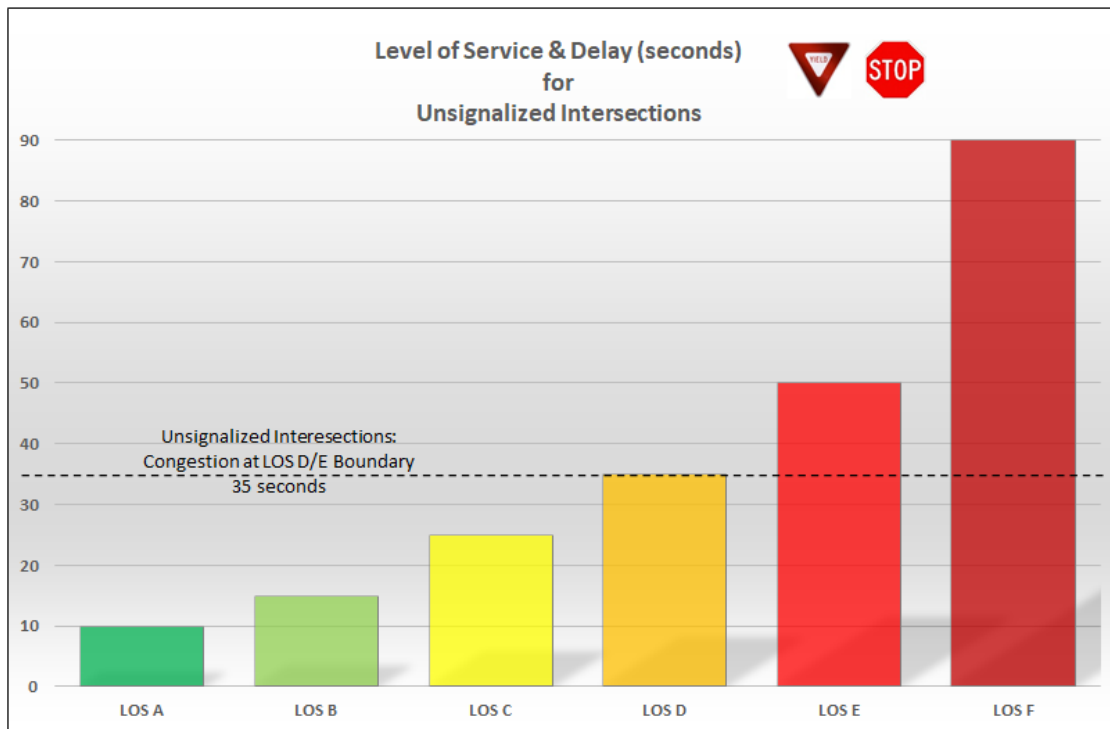


TABLE 3
LEVEL OF SERVICE AND DELAY FOR SIGNALIZED INTERSECTIONS



LEVEL OF SERVICE	DESCRIPTION	CONTROL DELAY (seconds/vehicle)
A	Operation with very low control delay. Progression is extremely favorable and most vehicles do not stop at all.	≤10.0
B	Generally good level of progression. More vehicles stop than with LOS A, causing higher levels of average delay.	> 10 - 20
C	Higher delays with individual cycle failures may begin at this level. Many vehicles may still pass through without stopping.	> 20 - 35
D	Approaching unstable flow. The influence of congestion becomes more noticeable. Many vehicles stop.	> 35 - 55
E	Considered the limit of acceptable delay. High delays indicated by poor progression, long cycle lengths, and high v/c ratios.	> 55 - 80
F	Unacceptable delay occurs. Progression is extremely poor with long cycle lengths and high v/c ratios.	>80

Source: Highway Capacity Manual, 6th Edition

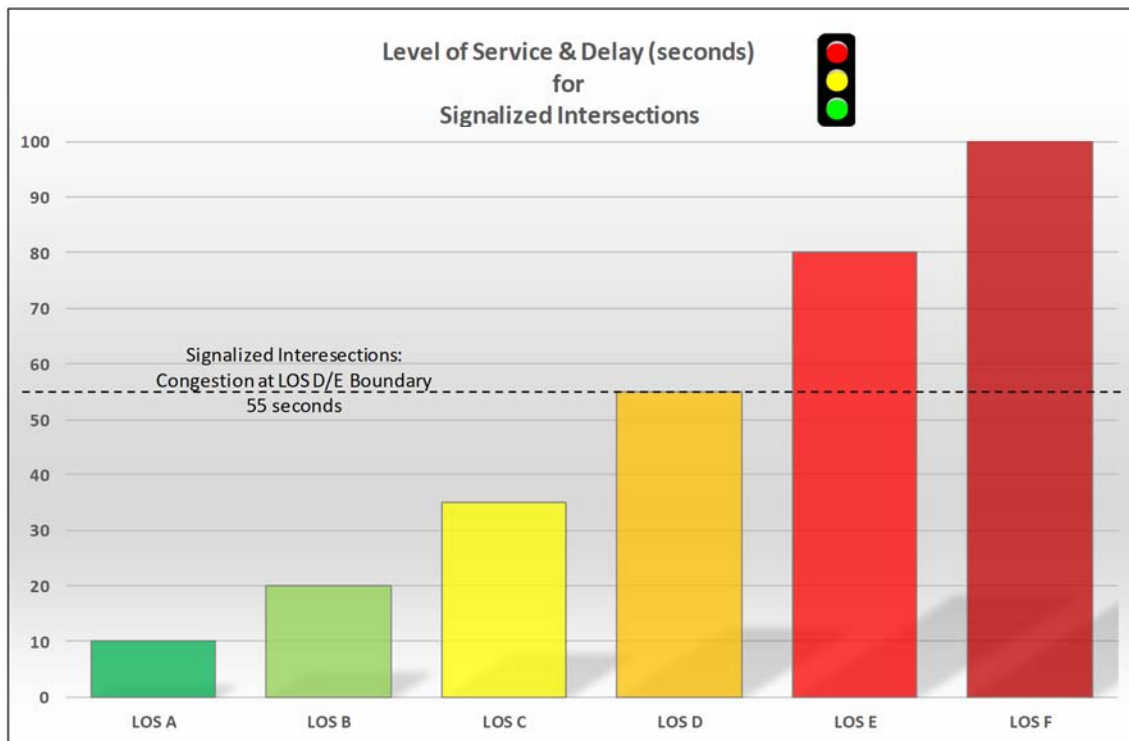




TABLE 4
2022 INTERSECTION CAPACITY ANALYSIS RESULTS -
EXISTING TRAFFIC CONDITIONS

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS ^a	DELAY ^b (seconds)	v/c ^c	LOS ^a	DELAY ^b (seconds)	v/c ^c
West Governor John Sevier Highway (EB & WB) at Mountain Grove Drive (NB) / W Norton Road (SB)	 Signalized	Eastbound	B	17.2		C	23.4	
		Westbound	C	21.1		C	26.1	
		Northbound	C	26.0		C	23.9	
		Southbound	C	34.7		C	32.8	
		Summary	C	22.3		0.630	C	
West Governor John Sevier Highway (EB & WB) at Weigel's Driveway (NB)	 Unsignalized	Westbound Left	A	8.9	0.000	A	9.9	0.010
		Northbound Right	B	12.6	0.040	C	15.9	0.050

Note: All analyses were calculated in Synchro 11 software and reported with HCM 2000 methodology

^a Level of Service

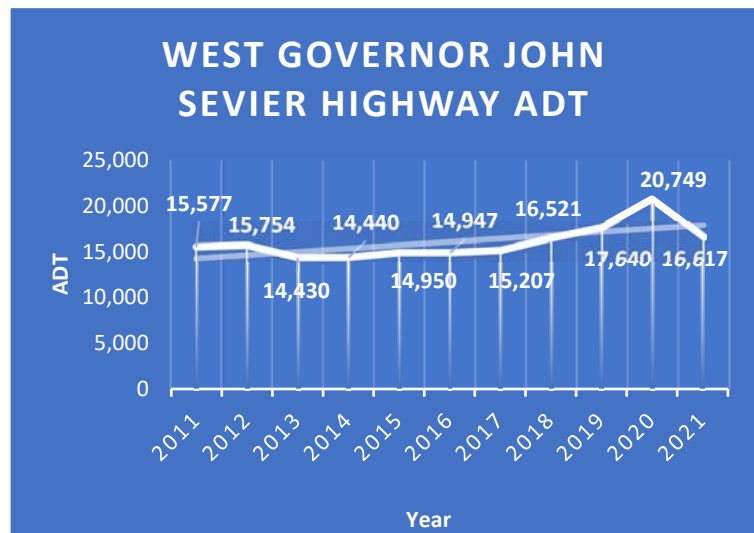
^b Average Delay (sec/vehicle)

^c Volume-to-Capacity Ratio

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

Horizon year traffic conditions represent the projected traffic volumes in the study area without the proposed project being developed (no-build option). The build-out and full occupancy for this proposed development is assumed to occur by 2025 for Phase 1 and 2027 for Phase 2.

Vehicular traffic on West Governor John Sevier Highway in the study area has shown low annual growth over the past ten years (0.6%), according to the TDOT traffic count station and as shown in Appendix A. A temporary increase was experienced in 2020, but all other years showed flat growth. For this study, a higher annual growth rate of 2.0% was used to calculate future growth on the studied roadways up to 2025 and 2027 to account for potential traffic growth in the study area and provide a conservative analysis.



After the initial review of this study, it was requested that further discussion be included to address the selection of the 2% future growth factor and why it was not assumed in the study to be more significant. The following is a discussion regarding this issue and is a synopsis of comments made by Mike Conger, PE, a Senior Transportation Engineering with Knoxville/Knox County Planning, and his investigation into the TDOT count factors.

As shown in the above image, there was a significant spike in the ADT in 2020, potentially suggesting that future growth could be higher than the assumed 2%. When TDOT conducts traffic counts, they apply factors to the raw collected volumes to adjust for the day of the week and the month of the year. TDOT collected the 2020 data at the traffic count station on Governor John Sevier Highway on March 3rd, 2020, just weeks before the widespread shutdowns due to the Covid pandemic. However, in March of that year, they only developed one set of factors, whereas there should have been two sets - one pre-Covid shutdown in early March and one post-Covid shutdown later in March of 2020. In essence, it appears that TDOT applied factors to the raw data to adjust for the drop-off in traffic due to the Covid shutdowns collected on March 3rd when the traffic stream was operating under normal conditions and not impacted by the pandemic. This

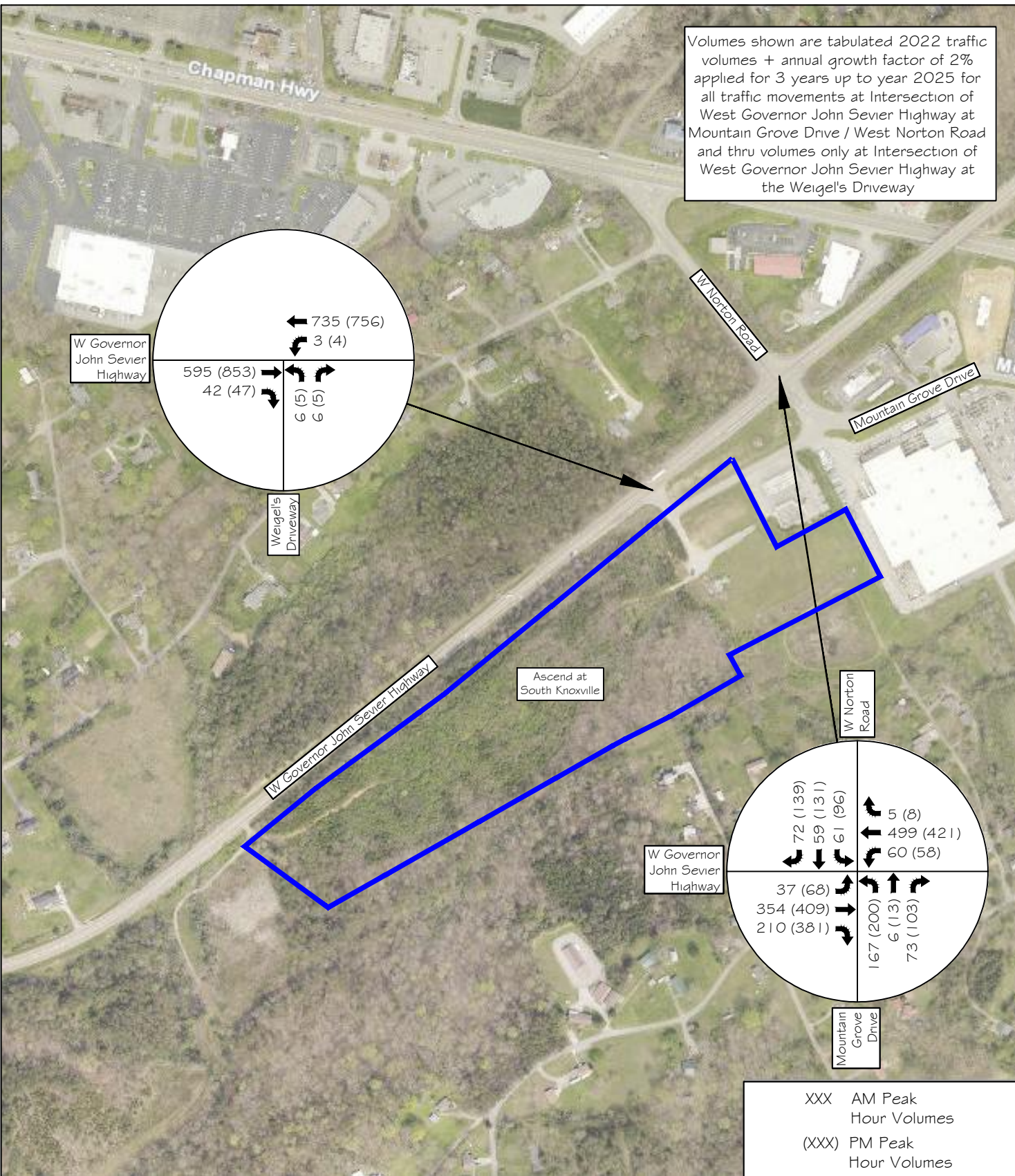
action overestimated the 2020 ADT since the traffic counts at this location occurred early in the month and before the Covid shutdowns.

If the raw collected volumes on March 3rd, 2020, were applied with the previously used factors by TDOT, the ADT would have been closer to around 17,400 vehicles. This ADT would be more in line with the observed long-term growth pattern over the past ten years at this traffic count location and suggests that the assumed growth rate of 2% to project future volumes is reasonable and justifiable.

The 2% annual growth rate was applied to the existing 2022 volumes obtained at the intersections to calculate the future volumes in the horizon years of 2025 and 2027. The growth rate was used for all the approaches at the signalized intersection of West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road and the thru movements only on West Governor John Sevier Highway at the Weigel's Driveway. Growth was not applied to the entering and exiting turning movements at the Weigel's Driveway intersection since these movements are assumed will not experience future potential traffic growth between now and 2025 and 2027.

Figure 5a shows the projected 2025 traffic volumes without the project at the intersections during the AM and PM peak hours, and Figure 5b shows the 2027 traffic volumes. Capacity analyses were undertaken to determine the projected LOS in 2025 and 2027 without the project at the intersections. The results are shown in Tables 5a and 5b, and Appendix F includes the capacity analysis worksheets. The results in Tables 5a and 5b are similar to the existing 2022 results shown in Table 4.

Volumes shown are tabulated 2022 traffic volumes + annual growth factor of 2% applied for 3 years up to year 2025 for all traffic movements at Intersection of West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road and thru volumes only at Intersection of West Governor John Sevier Highway at the Weigel's Driveway



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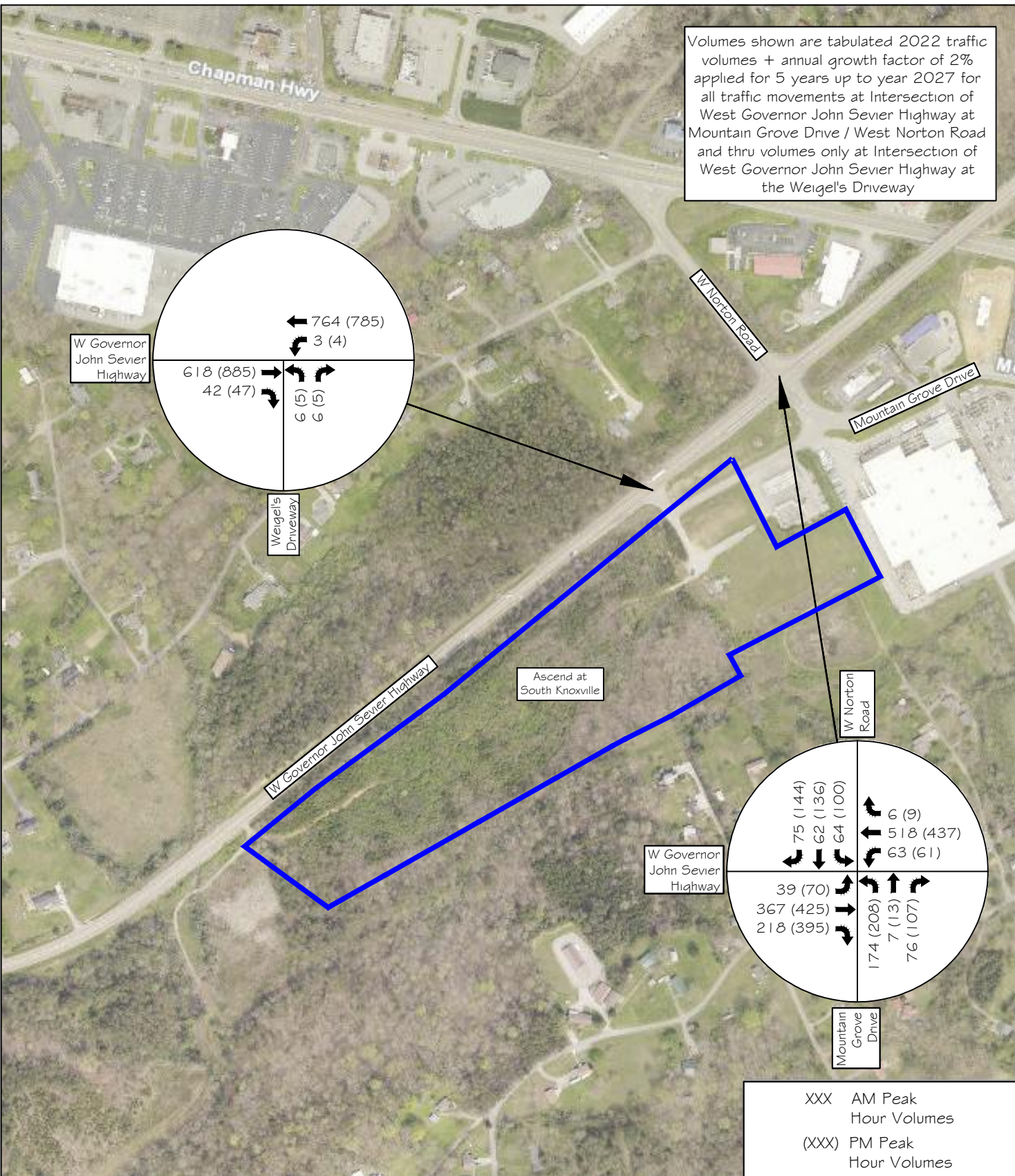


FIGURE 5a

Ascend at South Knoxville

2025 Peak Hour Traffic Volumes -
 PROJECTED TRAFFIC CONDITIONS
 (WITHOUT THE PROJECT)

Volumes shown are tabulated 2022 traffic volumes + annual growth factor of 2% applied for 5 years up to year 2027 for all traffic movements at Intersection of West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road and thru volumes only at Intersection of West Governor John Sevier Highway at the Weigel's Driveway



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



FIGURE 5b

Ascend at South Knoxville

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

TABLE 5a
2025 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS (WITHOUT THE PROJECT)

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS ^a	DELAY ^b (seconds)	v/c ^c	LOS ^a	DELAY ^b (seconds)	v/c ^c
West Governor John Sevier Highway (EB & WB) at Mountain Grove Drive (NB) / West Norton Road (SB)	 Signalized	Eastbound	B	17.8		C	24.6	
		Westbound	C	22.7		C	28.0	
		Northbound	C	26.1		C	24.2	
		Southbound	D	35.0		C	33.2	
		Summary	C	23.1		0.670	C	
West Governor John Sevier Highway (EB & WB) at Weigel's Driveway (NB)	 Unsignalized	Westbound Left	A	9.0	0.000	B	10.1	0.010
		Northbound Right	B	13.0	0.040	C	16.7	0.050



Note: All analyses were calculated in Synchro 11 software and reported with HCM 2000 methodology

^a Level of Service

^b Average Delay (sec/vehicle)

^c Volume-to-Capacity Ratio

TABLE 5b
2027 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS (WITHOUT THE PROJECT)

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS ^a	DELAY ^b (seconds)	v/c ^c	LOS ^a	DELAY ^b (seconds)	v/c ^c
West Governor John Sevier Highway (EB & WB) at Mountain Grove Drive (NB) / West Norton Road (SB)	 Signalized	Eastbound	C	20.9		C	25.6	
		Westbound	C	30.7		C	29.4	
		Northbound	C	23.9		C	24.4	
		Southbound	C	32.3		C	33.5	
		Summary	C	26.3		0.690	C	
West Governor John Sevier Highway (EB & WB) at Weigel's Driveway (NB)	 Unsignalized	Westbound Left	A	9.1	0.000	B	10.3	0.010
		Northbound Right	B	13.3	0.040	C	17.3	0.060

Note: All analyses were calculated in Synchro 11 software and reported with HCM 2000 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 number of trips the multi-family apartments will generate was calculated based on Knoxville/Knox County Planning equations. These equations were developed from a local study to estimate apartment (and townhouse) trip generation in the surrounding area and were published in December 1999. For Knox County, these are the preferred trip generation rates to use for apartments and townhouses.

The data and calculations from the local study for the proposed land use are shown in Appendix G. The generated trips were calculated for Phase 1 with 238 apartments for the expected completion in 2025. The generated trips were also calculated for 2027 when Phase 2 is constructed and occupied with an additional 68 units, totaling 306 units. A summary of this information is presented in the following table:

TABLE 6
TRIP GENERATION FOR ASCEND AT SOUTH KNOXVILLE

238 Apartment Units in Phase 1

308 Apartment Units in Phase 1 & 2

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Local Trip Rate	Apartments - Phase 1	238 Apartments	2,081	22%	78%		55%	45%	
				26	94	120	94	76	170
Local Trip Rate	Apartments - Phase 1 & 2	306 Apartments	2,608	22%	78%		55%	45%	
				33	118	151	118	97	215

From Local Trip Rates and Trips calculated by using Fitted Curve Equation

For the proposed residential development with 238 apartments in Phase 1, it is estimated that 26 vehicles will enter and 94 will exit, for a total of 120 generated trips during the AM peak hour in the year 2025. It is estimated that 94 vehicles will enter and 76 will exit, for a total of 170 generated trips during the PM peak hour in 2025.

Similarly, for the proposed residential development with 306 apartments in Phases 1 and 2, it is estimated that 33 vehicles will enter and 118 will exit, for a total of 151 generated trips during the

AM peak hour in the year 2027. It is estimated that 118 vehicles will enter and 97 will exit, for a total of 215 generated trips during the PM peak hour in the year 2027.

The calculated trips generated for an average weekday are estimated to be 2,081 vehicles for the proposed development in 2025 and 2,608 in 2027. Due to the proximity to the shopping center and the KAT transit system, some of the development trips may be completed by walking, riding a bike, or using a KAT bus, which would reduce the number of vehicle trips. However, no trip reductions were applied to the calculations or analysis, resulting in a conservative analysis.

▪ **TRIP DISTRIBUTION AND ASSIGNMENT:**

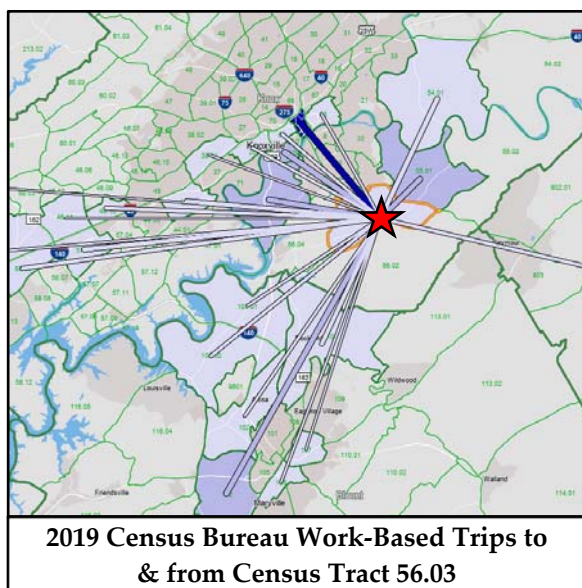
The projected trip distribution and assignment for the Ascend at South Knoxville development are based on several sources and engineering judgments. The first source is based on the existing traffic count volumes and the observed travel directions collected at the West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road intersection adjacent to the proposed development site.

The observed direction of thru travel on West Governor John Sevier Highway in the AM and PM peak hours was 45% / 55%, with 45% heading eastbound in the AM peak hour and 55% heading westbound. In the PM peak hour, nearly the opposite occurred, with 45% of thru traffic headed westbound and 55% eastbound.

At the intersection of West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road, the observed inbound and outbound traffic to and from the proposed development site traveled in the following percentages during the AM and PM peak hours:

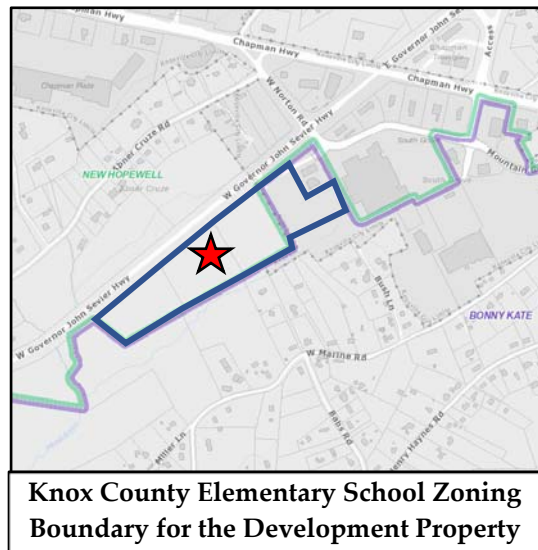
Towards the Development Site / From the Development Site: AM Peak % (PM Peak %)

- West Norton Road: TO = 6% (8%) / FROM = 10% (18%)
- East Governor John Sevier Highway: TO = 59% (48%) / FROM = 68% (55%)
- Mountain Grove Drive: TO = 35% (44%) / FROM = 23% (26%)



The second source for projected trip distribution is based on work-related trips in the local area. Work-based trips will be a significant impetus for generated trips by the development, and these trips are more likely to travel to and from the 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 2019 (latest available) census data and as shown in Appendix H, most work-based trips in the surrounding area correspond to downtown Knoxville, the University of Tennessee, West Knoxville, and Alcoa and Maryville.

In addition to employment centers, some generated traffic will travel to and from public and private schools. Schools will be another impetus for external trip-making. The school zone boundary for New Hopewell Elementary and Bonny Kate Elementary is along the southern property line for the three parcels in Knox County. The single development parcel located in the City of Knoxville adjacent to the Weigel's is currently zoned for Bonny Kate Elementary. The three development parcels in Knox County are zoned for New Hopewell Elementary. It is assumed that all elementary-age school children will attend New Hopewell Elementary. The development property is zoned for South Doyle Middle and High School for older school-age children.



New Hopewell Elementary is 2.5 miles away by roadway to the northwest from the development site and via East Governor John Sevier Highway. South Doyle Middle is located 5.5 miles away by roadway to the north, closer to downtown Knoxville via Chapman Highway. South Doyle High School is located 3.2 miles southwest of the development site and via West Governor John Sevier Highway.

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.

Finally, several other critical pieces of information contributed to help determine and assume the trip distribution. These items included the existing road configurations and layout, vehicle turning prohibitions, and expected trip routes based on distance and time. It also included reasonable expectations of future travel based on the location of the Proposed Entrances on West Governor John Sevier Highway and the proposed internal layout of the development. These other critical pieces of information are listed and discussed further in the following:

- The developer plans on constructing both entrances during Phase 1. The Proposed East Entrance at the existing Weigel’s Driveway has already been constructed with a left-turn prohibition, and this prohibition will be maintained in future conditions. Due to this turn prohibition, all the exiting left-turns from the development towards the west are assumed will occur at the Proposed West Entrance.
- It is assumed that most residents will use the Proposed East Entrance at the existing Weigel’s Driveway for exiting right-turns towards the east. This assumption is based on the proposed internal layout of the development. With more units located on the eastern portion of the site, it is correctly assumed that future residents will take the most direct route and will use the Proposed East Entrance rather than back-tracking to the Proposed West Entrance.
- Since the proposed development will have a direct road connection to the South Grove shopping center via the existing Weigel’s Driveway, it is assumed that all residents accessing the shopping center will avoid traveling on West Governor John Sevier Highway. These trips will occur for travel to and from the shopping center's restaurants, shops, and other commercial businesses. These trips may also include some travel by residents to and from the south further on Chapman Highway. It is assumed that 10% of all generated trips by the apartment development during the AM and PM peak hours will travel to and from the shopping center. These trips will utilize the Weigel’s Driveway and thus were not distributed to the studied intersections and are designated as “Lost”.
- Left turns are prohibited on the north side of West Norton Road at Chapman Highway. Future apartment residents wanting to head north on Chapman Highway will most likely travel east on Governor John Sevier Highway, turn right onto Majestic Grove Boulevard, and then right onto Chapman Highway, as shown in the Google Map routing image.



- Some residents' travel to the south on Chapman Highway will be "Lost", as described above. However, some residents will travel south by avoiding the South Grove shopping center. These trips will be completed by turning left from West Governor John Sevier Highway onto West Norton Road and then right onto Chapman Highway, as shown in the Google Map routing image.

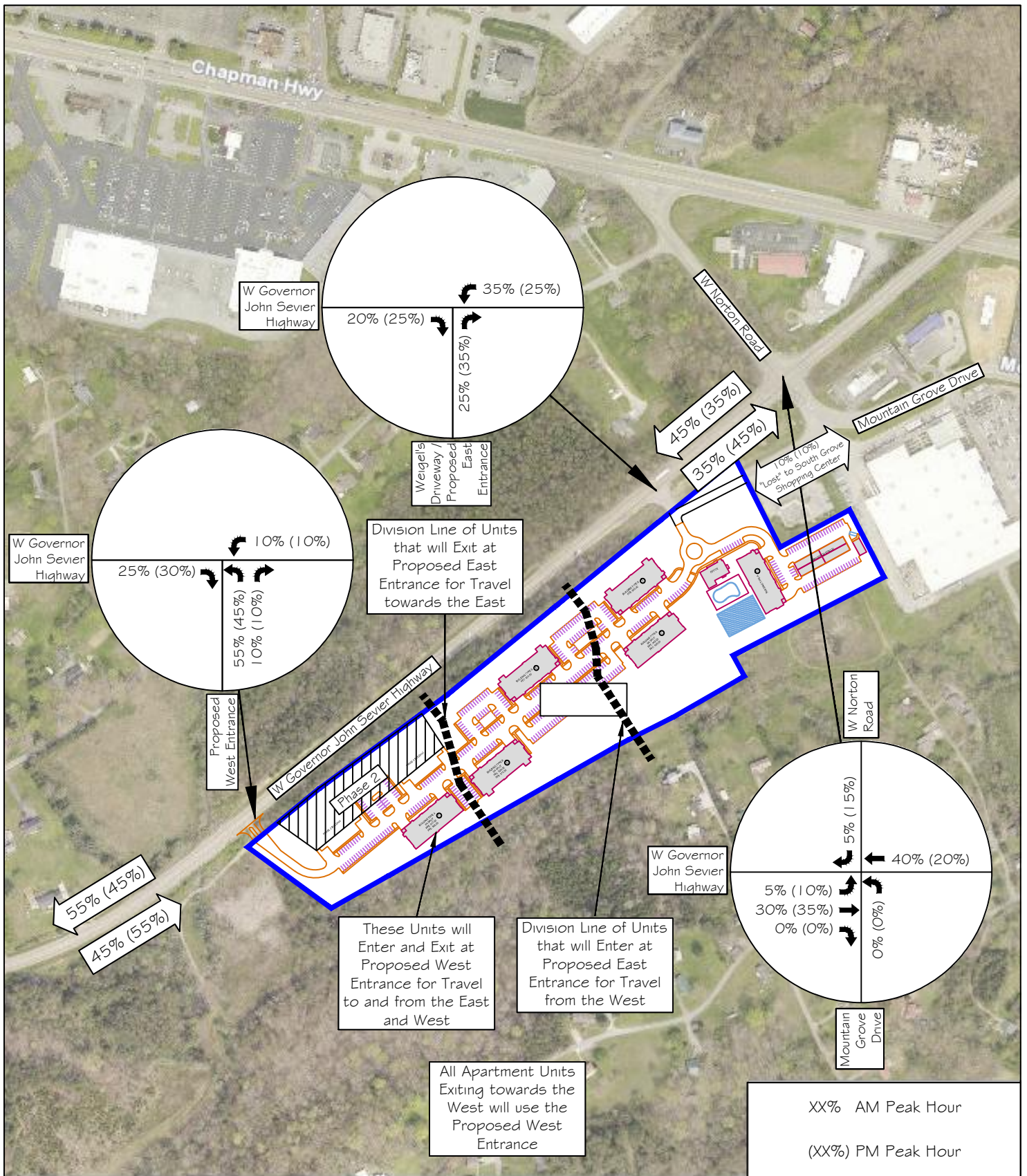


Google Map Routing: From Site to South on Chapman Highway

- For entering vehicles, the assumed distribution was based on the proposed internal layout of the site and the location of the apartment unit buildings. For example, for travel from the east, more trips were distributed to the Proposed East Entrance rather than the West Entrance, and vice versa for travel from the west.
- The generated trips were distributed at the West Governor John Sevier Highway intersection at Mountain Grove Drive / West Norton Road and were based on the observed distribution of traffic.

Figures 6a and 6b show the projected distribution of traffic entering and exiting the proposed development at the studied intersections based on the site plan. The percentages shown in the figures only pertain to the trips generated by the proposed dwellings in the development calculated from the local trip rates. Figure 6a shows the distribution of generated traffic based on Phase 1 in the year 2025, and Figure 6b provides the distribution of traffic for the year 2027 when Phase 2 is completed. The percentages slightly changed between the two figures (and time periods) due to the increase of apartment units constructed on the western end of the property in Phase 2. Figures 6a and 6b also show the 10% of trips assumed "Lost" due to internal travel to and from the South Grove shopping center.

Figures 7a and 7b show the traffic assignment of the computed trips generated by the development and are based on the assumed distribution of trips shown in Figures 6a and 6b. Figure 7a shows the trip assignment of vehicles for Phase 1 in 2025, and Figure 7b is for Phase 2 in 2027.



11812 Black Road
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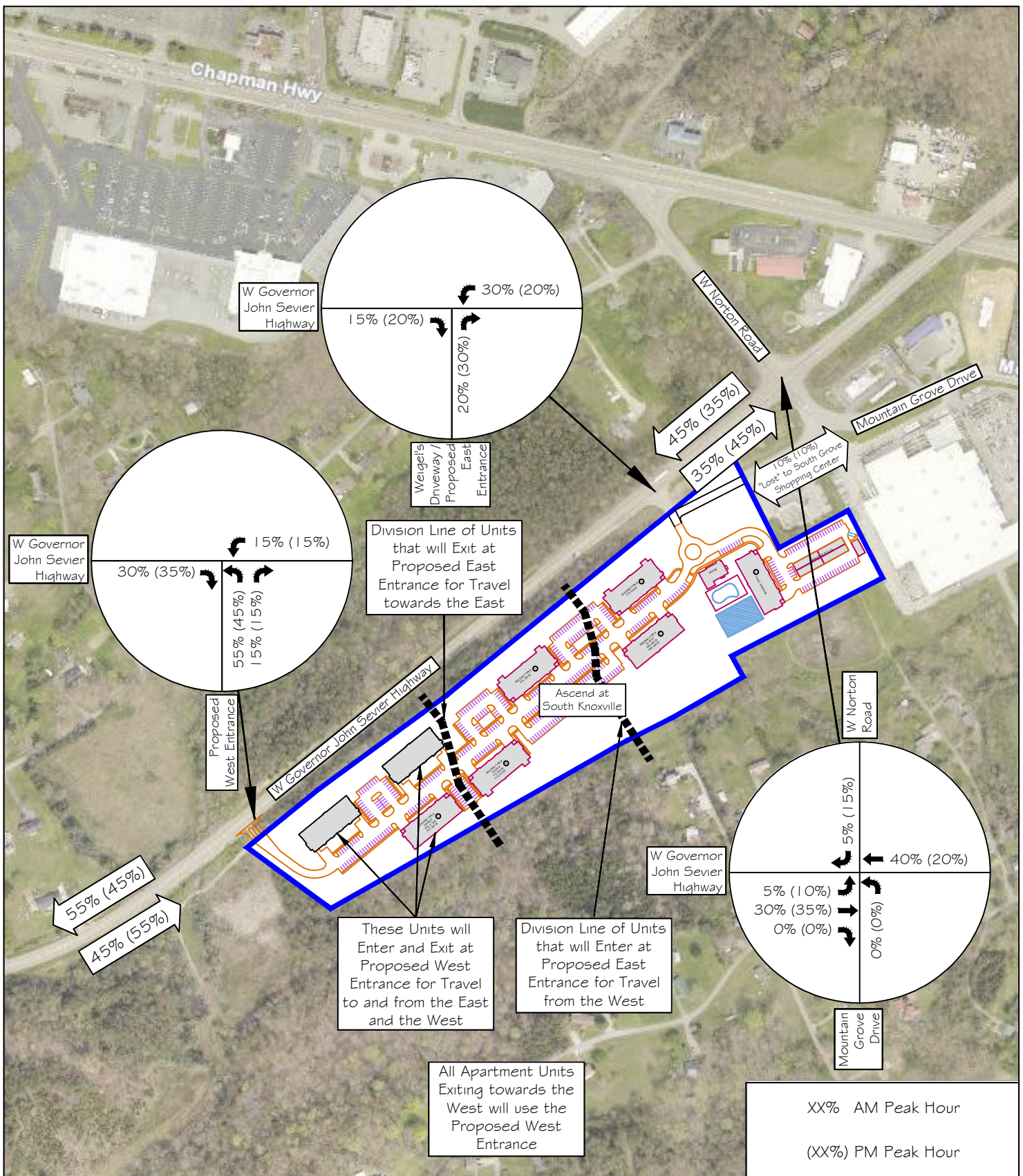
NOT TO SCALE



FIGURE 6a

Ascend at South Knoxville

Directional Distribution of Generated Traffic during AM and PM Peak Hour for Phase 1



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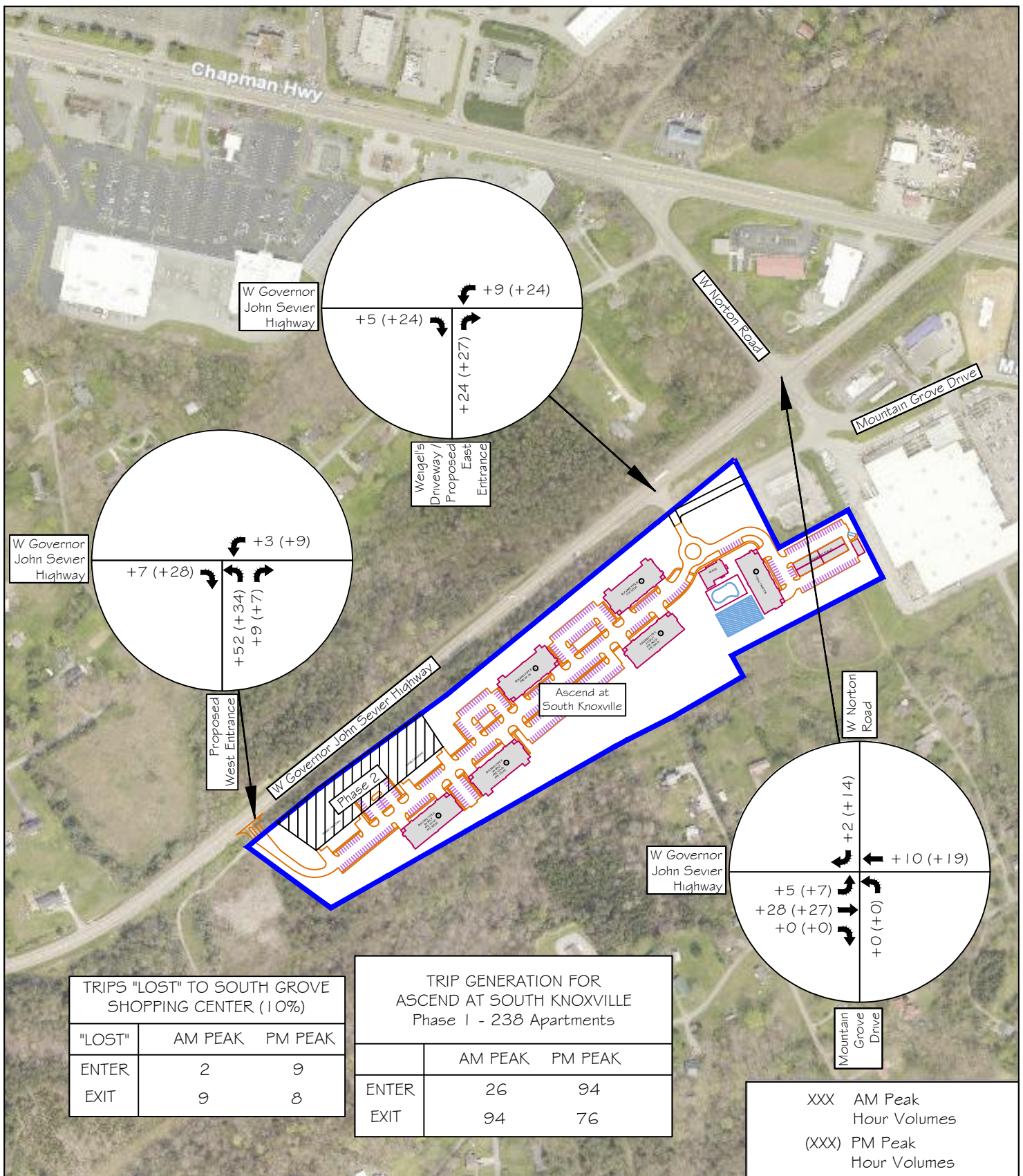
NOT TO SCALE



FIGURE 6b

Ascend at South Knoxville

Directional Distribution of Generated Traffic during AM and PM Peak Hour for Phase 1 & 2



TRIPS "LOST" TO SOUTH GROVE SHOPPING CENTER (10%)		
"LOST"	AM PEAK	PM PEAK
ENTER	2	9
EXIT	9	8

TRIP GENERATION FOR ASCEND AT SOUTH KNOXVILLE Phase I - 238 Apartments		
	AM PEAK	PM PEAK
ENTER	26	94
EXIT	94	76

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



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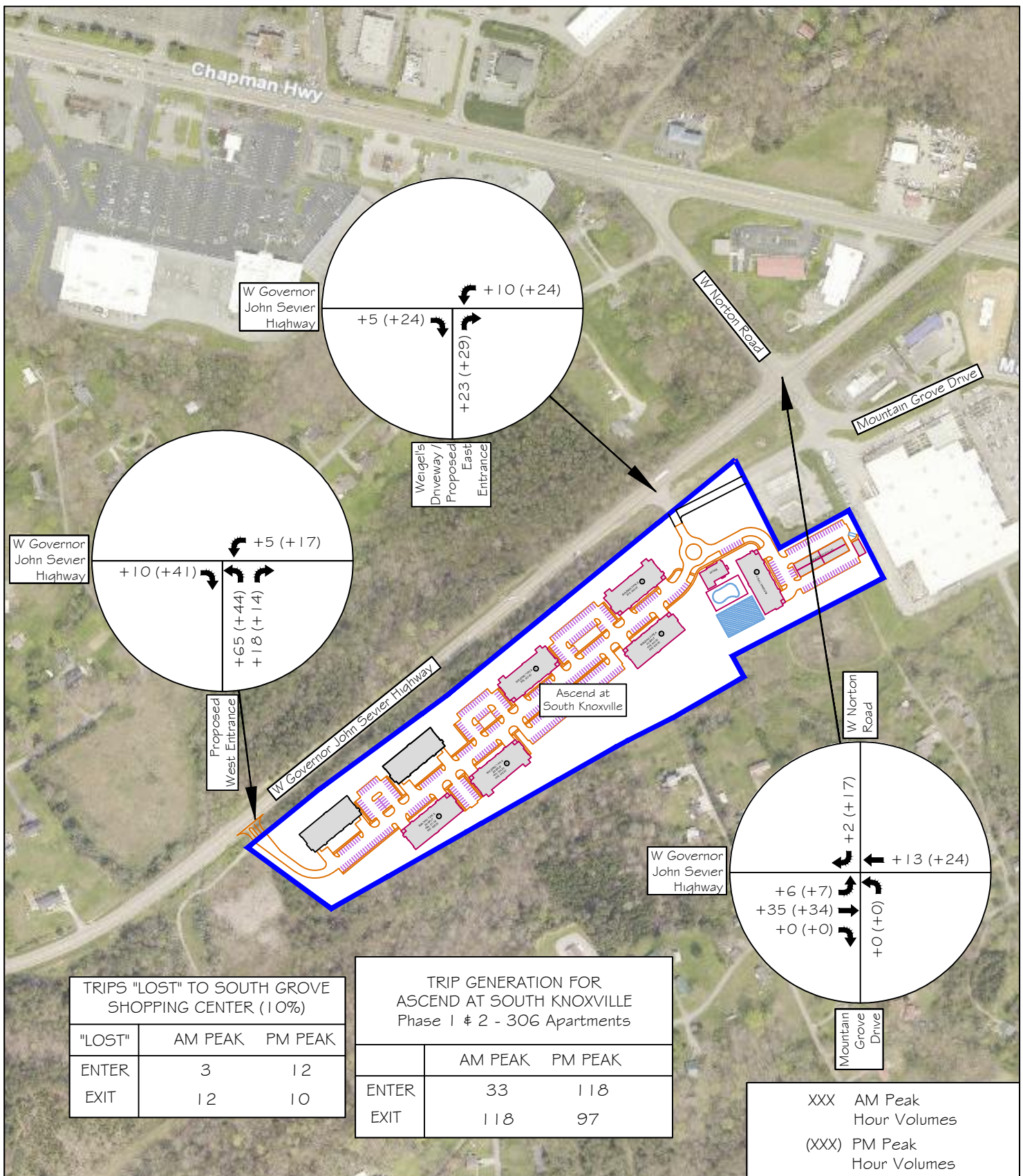
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FIGURE 7a

Ascend at South Knoxville

Traffic Assignment of Generated Traffic during AM and PM Peak Hour for Phase I



TRIPS "LOST" TO SOUTH GROVE SHOPPING CENTER (10%)		
"LOST"	AM PEAK	PM PEAK
ENTER	3	12
EXIT	12	10

TRIP GENERATION FOR ASCEND AT SOUTH KNOXVILLE Phase 1 # 2 - 306 Apartments		
	AM PEAK	PM PEAK
ENTER	33	118
EXIT	118	97

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



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NOT TO SCALE



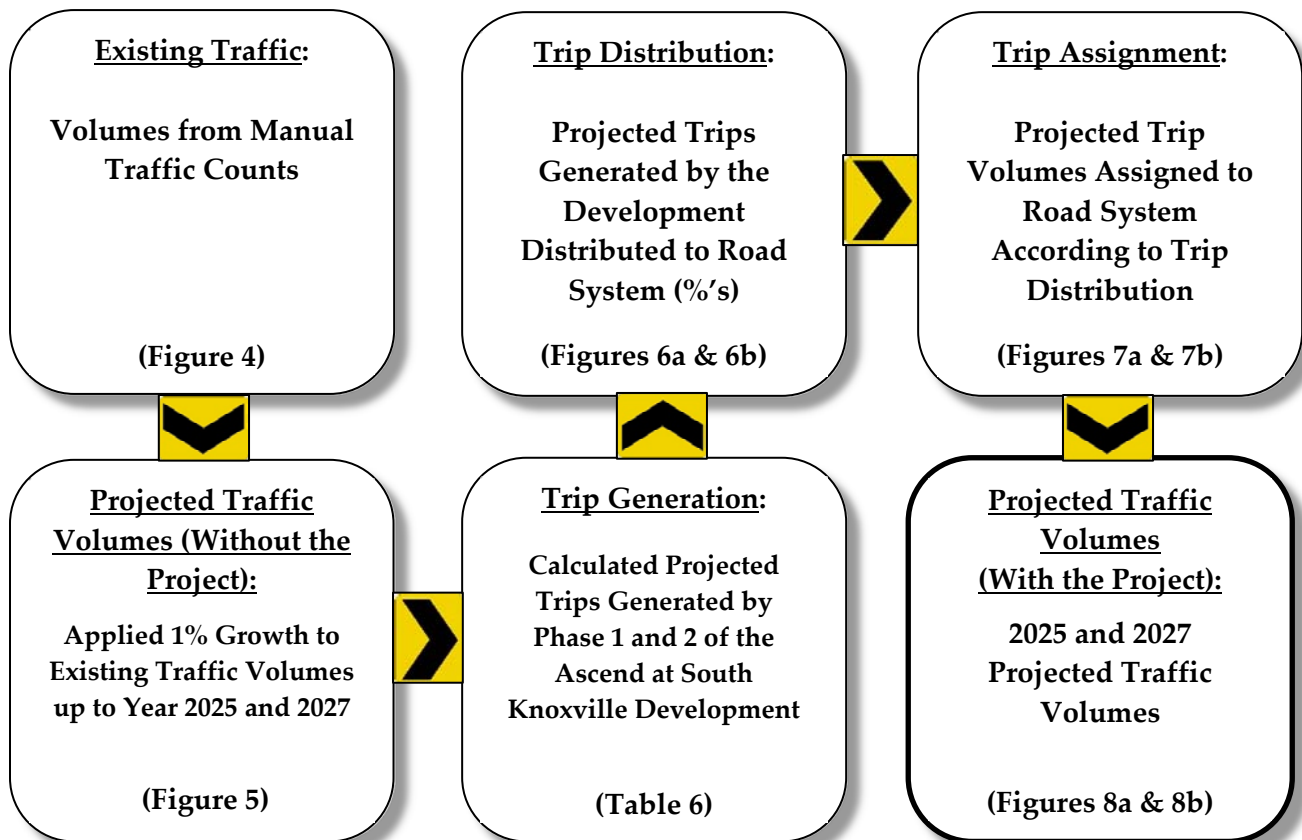
FIGURE 7b

Ascend at South Knoxville

Traffic Assignment of Generated Traffic during AM and PM Peak Hour for Phase 1 # 2

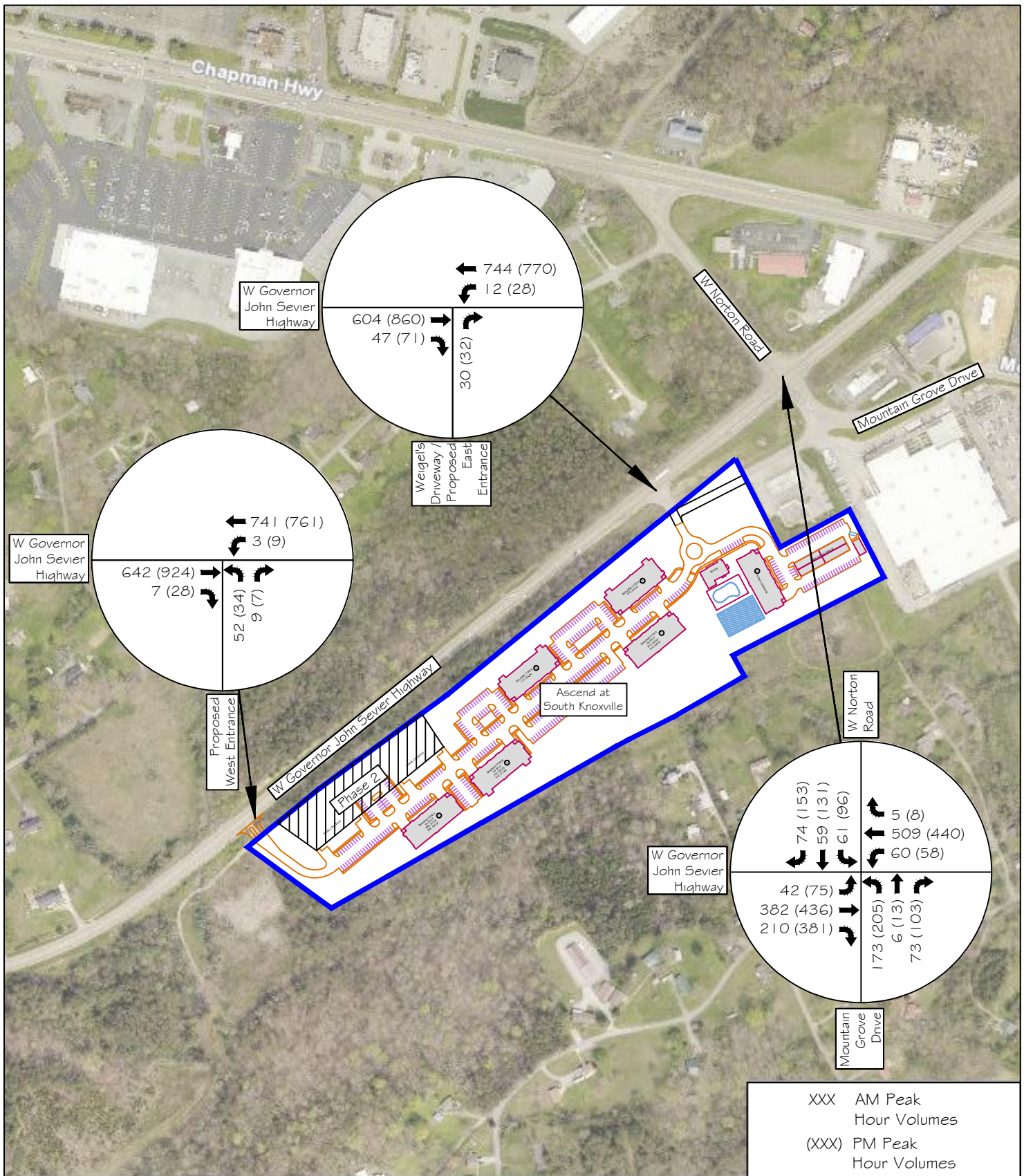
▪ **PROJECTED TRAFFIC CONDITIONS (WITH THE PROJECT):**

Overall, several additive steps were taken to estimate the total projected traffic volumes at the studied intersections when Phases 1 and 2 of the Ascend at South Knoxville development are constructed and occupied in 2025 and 2027. The steps are illustrated below for clarity and review:



The calculated peak hour traffic (Table 6) for Phase 1 and 2 generated by the Ascend at South Knoxville development was added to the 2025 and 2027 horizon year traffic (Figure 5) by following the predicted trip distributions and assignments (Figures 6a, 6b, 7a, and 7b). This procedure was completed to obtain the total projected traffic volumes when the proposed development is fully built out and occupied for Phase 1 in 2025 and Phase 2 in 2027. Figures 8a and 8b show the projected 2025 and 2027 AM and PM peak hours with the generated development traffic at the studied intersections.

The handful of vehicles currently illegally turning left onto West Governor John Sevier Highway at the Weigel’s Driveway was accounted for in the projected conditions in Figures 8a and 8b. This accounting was accomplished by re-routing these vehicles to the northbound left-turn movement on Mountain Grove Drive at the West Governor John Sevier Highway intersection and then distributed to the westbound thru movements at the downstream studied intersections.



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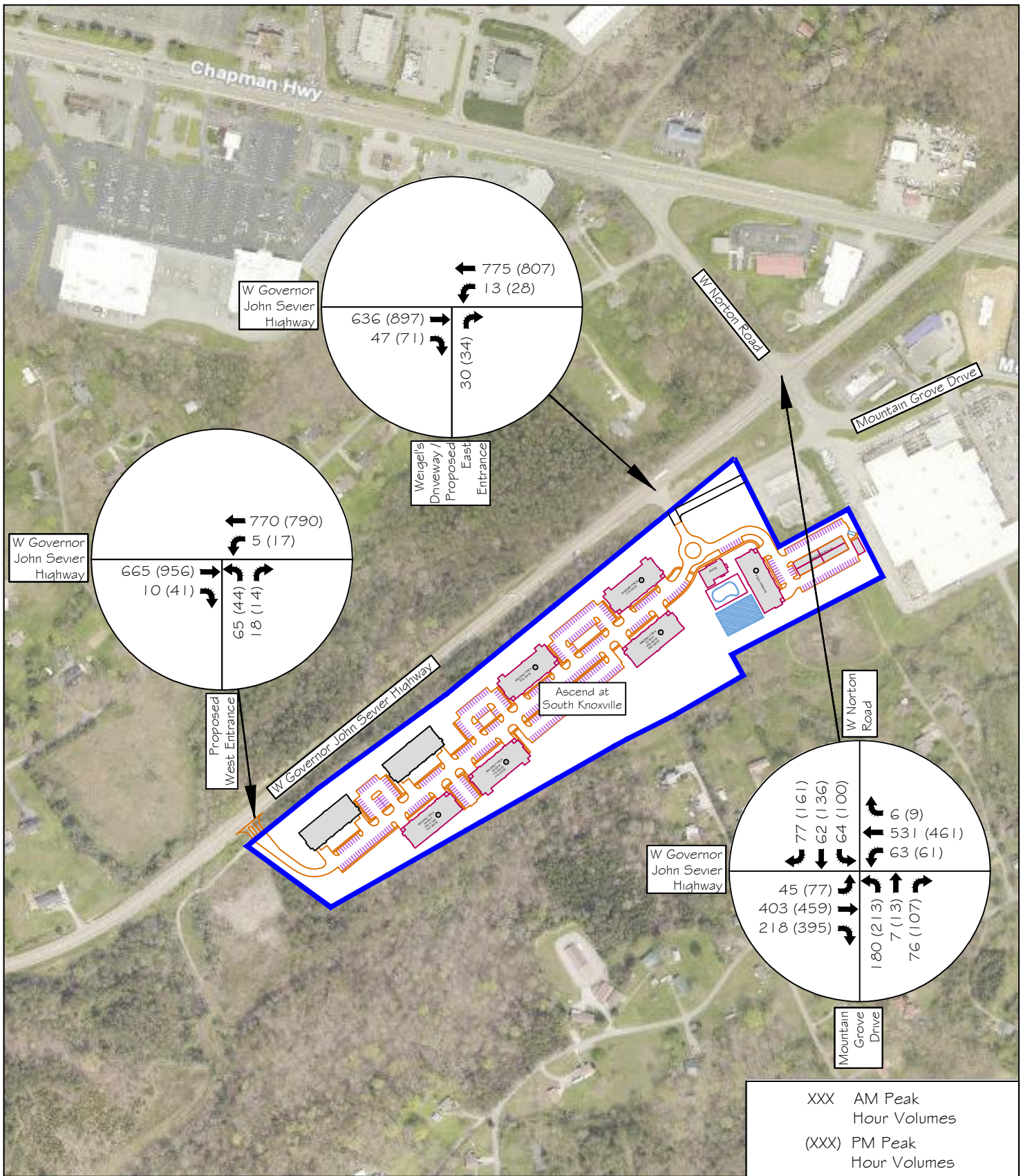
NOT TO SCALE



FIGURE 8a

Ascend at South Knoxville

2025 Peak Hour Traffic Volumes -
 PROJECTED TRAFFIC CONDITIONS
 (WITH THE PROJECT)



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NOT TO SCALE






FIGURE 8b

Ascend at South Knoxville

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

Capacity analyses were conducted to determine the projected LOS at the studied intersections with the development traffic in 2025 and 2027. The results indicated minimal degradation between the existing and projected conditions with the project in 2025 and 2027. The projected 2025 and 2027 peak hour capacity for the intersections resulted in very reasonable LOS and vehicle delays. These results can be seen in Table 7a for Phase 1 in 2025 and Table 7b for Phase 2 in 2027. Appendix F includes the worksheets for these capacity analyses.

TABLE 7a
2025 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS (WITH THE PROJECT)

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS ^a	DELAY ^b (seconds)	v/c ^c	LOS ^a	DELAY ^b (seconds)	v/c ^c
West Governor John Sevier Highway (EB & WB) at Mountain Grove Drive (NB) / West Norton Road (SB)	 Signalized	Eastbound	B	18.8		C	24.5	
		Westbound	C	25.5		C	25.4	
		Northbound	C	25.6		C	24.0	
		Southbound	C	34.7		C	32.9	
		Summary	C	24.3		0.690	C	
West Governor John Sevier Highway (EB & WB) at Weigel's Driveway / Proposed East Entrance (NB)	 Unsignalized	Westbound Left	A	9.1	0.020	B	10.8	0.120
		Northbound Right	B	14.9	0.220	C	18.5	0.220
West Governor John Sevier Highway (EB & WB) at Proposed West Entrance (NB)	 Unsignalized	Westbound Left	A	9.0	0.000	B	10.2	0.010
		Northbound Left/Right	C	17.2	0.170	C	19.2	0.130




Note: All analyses were calculated in Synchro 11 software and reported with HCM 2000 methodology

^a Level of Service

^b Average Delay (sec/vehicle)

^c Volume-to-Capacity Ratio

TABLE 7b
2027 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS (WITH THE PROJECT)

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS ^a	DELAY ^b (seconds)	v/c ^c	LOS ^a	DELAY ^b (seconds)	v/c ^c
West Governor John Sevier Highway (EB & WB) at Mountain Grove Drive (NB) / West Norton Road (SB)	 Signalized	Eastbound	C	22.3		C	25.8	
		Westbound	C	32.7		C	26.6	
		Northbound	C	23.9		C	24.2	
		Southbound	C	32.4		C	33.2	
		Summary	C	27.3		0.720	C	
West Governor John Sevier Highway (EB & WB) at Weigel's Driveway / Proposed East Entrance (NB)	 Unsignalized	Westbound Left	A	9.2	0.020	B	11.1	0.130
		Northbound Right	C	15.5	0.230	C	19.7	0.250
West Governor John Sevier Highway (EB & WB) at Proposed West Entrance (NB)	 Unsignalized	Westbound Left	A	9.1	0.010	B	10.5	0.030
		Northbound Left/Right	C	18.2	0.220	C	20.7	0.180

Note: All analyses were calculated in Synchro 11 software and reported with HCM 2000 methodology

^a Level of Service

^b Average Delay (sec/vehicle)

^c Volume-to-Capacity Ratio

A summary of the West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road intersection and the intersection of West Governor John Sevier Highway at the Weigel's Driveway (and Proposed East Entrance) capacity analyses results are presented in Tables 8a and 8b. This table provides a side-by-side summary and comparison of the intersections for the 2022 existing conditions, projected conditions in the year 2027 without the project, and the projected conditions in the year 2027 with the project. The West Governor John Sevier Highway intersection at the Proposed West Entrance is not included since this intersection only exists in future conditions.

TABLE 8a
INTERSECTION CAPACITY ANALYSIS SUMMARY
West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road



LOCATION / PEAK HOUR MOVEMENT	2022 EXISTING			2027 WITHOUT THE PROJECT			2027 WITH THE PROJECT		
	LOS ^a	Delay ^b	v/c ^c	LOS ^a	Delay ^b	v/c ^c	LOS ^a	Delay ^b	v/c ^c
AM Peak									
Eastbound	B	17.2		C	20.9		C	22.3	
Westbound	C	21.1		C	30.7		C	32.7	
Northbound	C	26.0		C	23.9		C	23.9	
Southbound	C	34.7		C	32.3		C	32.4	
Summary	C	22.3	0.630	C	26.3	0.690	C	27.3	0.720
PM Peak									
Eastbound	C	22.4		C	24.3		C	25.8	
Westbound	C	23.3		C	25.4		C	26.6	
Northbound	C	23.7		C	24.1		C	24.2	
Southbound	C	32.4		C	33.1		C	33.2	
Summary	C	24.7	0.580	C	26.2	0.640	C	27.1	0.680

Note: All analyses were calculated in Synchro 11 software and reported with HCM 2000 methodology

^a Level of Service

^b Average Delay (sec/vehicle)

^c Volume-to-Capacity Ratio

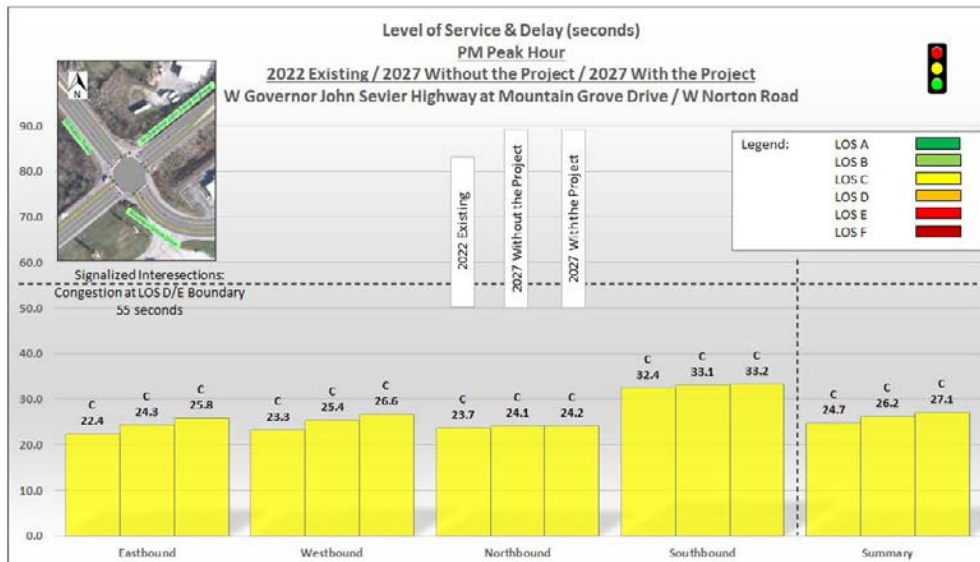
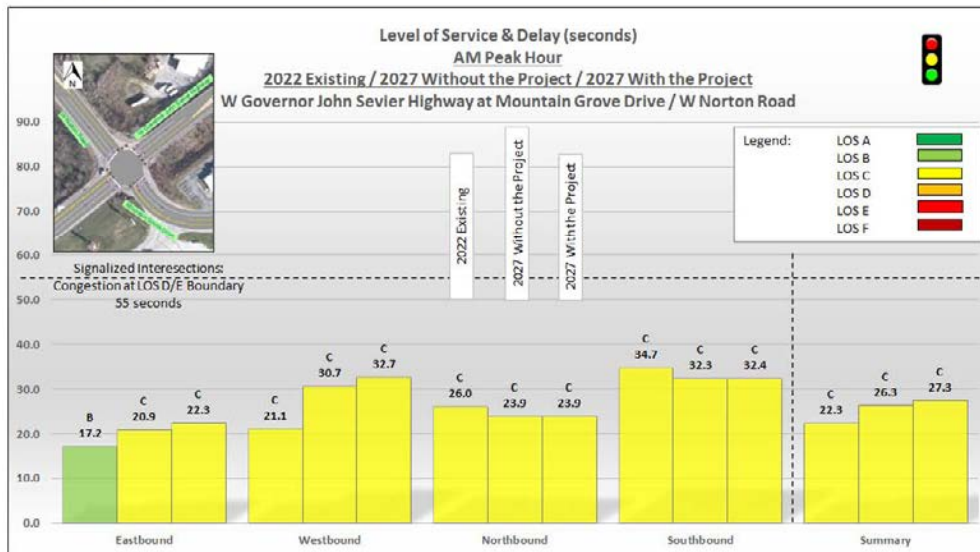


TABLE 8b
INTERSECTION CAPACITY ANALYSIS SUMMARY
West Governor John Sevier Highway at Weigel's Driveway / Proposed East Entrance 

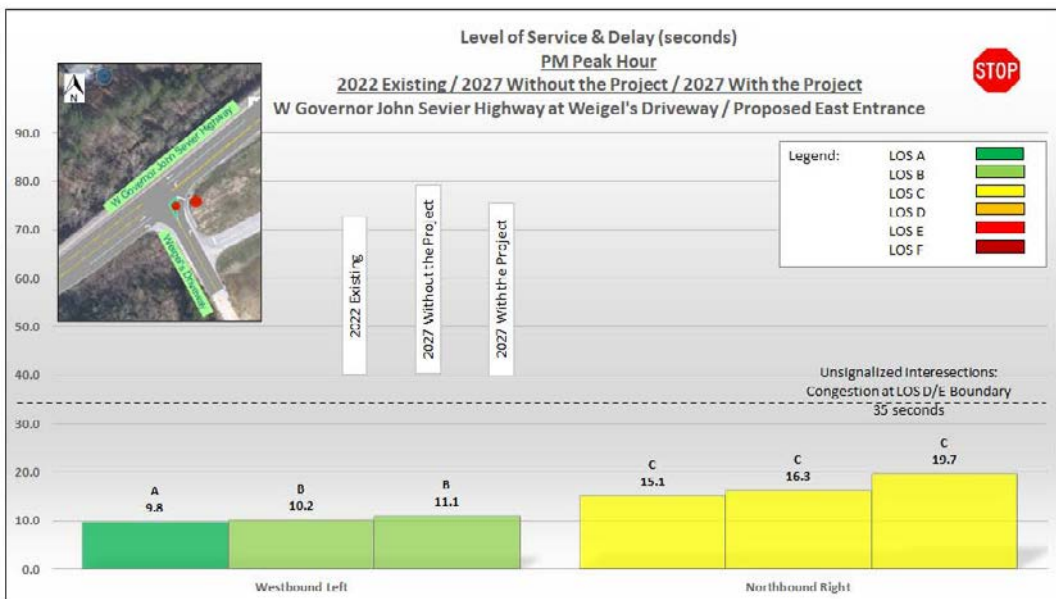
LOCATION / PEAK HOUR MOVEMENT	2022 EXISTING			2027 WITHOUT THE PROJECT			2027 WITH THE PROJECT		
	LOS ^a	Delay ^b	v/c ^c	LOS ^a	Delay ^b	v/c ^c	LOS ^a	Delay ^b	v/c ^c
AM Peak									
Westbound Left	A	8.9	0.000	A	9.1	0.000	A	9.2	0.020
Northbound Right	B	12.6	0.040	B	13.3	0.040	C	15.5	0.230
PM Peak									
Westbound Left	A	9.8	0.020	B	10.2	0.020	B	11.1	0.130
Northbound Right	C	15.1	0.030	C	16.3	0.040	C	19.7	0.250

Note: All analyses were calculated in Synchro 11 software and reported with HCM 2000 methodology

^a Level of Service

^b Average Delay (sec/vehicle)

^c Volume to Capacity Ratio



▪ **POTENTIAL TRANSPORTATION SAFETY ISSUES:**

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

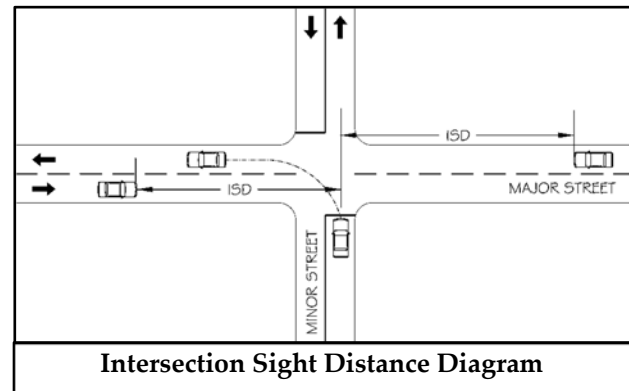
➤ **EVALUATION OF SIGHT DISTANCE**

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

Methodology:

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

ISD is considered the desirable 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.

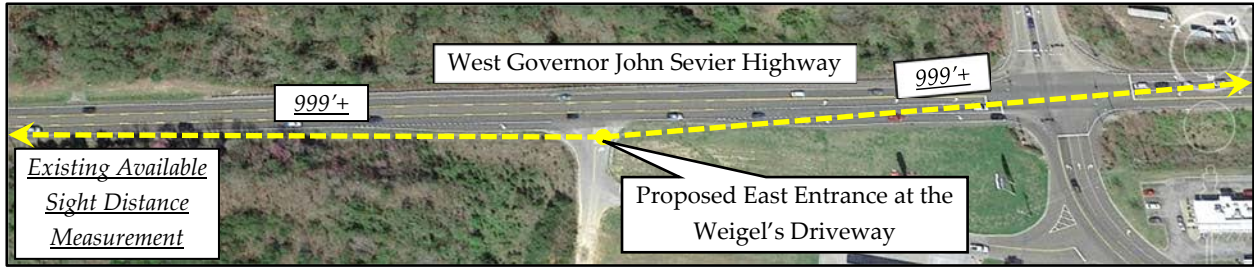
With a posted speed limit of 50-mph on West Governor John Sevier Highway, the ISD is 625 feet calculated based on AASHTO's (American Association of State Highway Transportation Officials) guidance.

At the Proposed East Entrance location at the existing Weigel's Driveway, on the east side, West Governor John Sevier Highway has a 3% road grade downhill to the west. On the east side of the intersection, West Governor John Sevier Highway has a 1% road grade downhill to the west (difference due to being located at an existing vertical curve). Based on the posted speed limit of 50-mph on West Governor John Sevier Highway and the existing road grades, the SSD is calculated to be 450 feet to the east and 420 feet to the west.

At the Proposed West Entrance location, on the east side, West Governor John Sevier Highway has a 4% road grade downhill to the west. On the east side of the proposed intersection, West Governor John Sevier Highway has a 2% road grade downhill to the west (difference due to being located at an existing vertical curve). Based on the posted speed limit of 50-mph on West Governor John Sevier Highway and the existing road grades, the SSD is calculated to be 455 feet to the east and 415 feet to the west.

Visual observations of the sight distances at the Proposed Entrance locations on West Governor John Sevier Highway were undertaken. Using a Nikon Laser Rangefinder at the Proposed East Entrance location at the Weigel's Driveway, the available sight distance was visually estimated to be 999'+ feet (limit of the rangefinder) to the east and 999'+ feet to the west. The available sight distance at the Proposed West Entrance location was visually estimated to be 650 feet to the east and 800 feet to the west. Based on visual observation, the intersection and stopping sight distances from the Proposed Entrances will be adequate.

Images of the existing sight distances at the Proposed Entrance locations are presented in the following, labeled with the ISD, SSD, and the rangefinder measured sight distances.



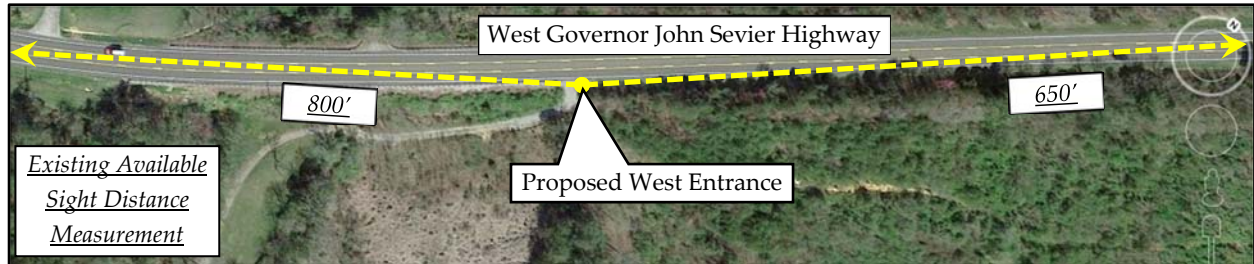
Existing Available
Sight Distance
Measurement



View of Sight Distance on West Governor John Sevier Highway at Proposed East Entrance at the Weigel's Driveway (Looking West)



View of Sight Distance on West Governor John Sevier Highway at Proposed East Entrance at the Weigel's Driveway (Looking East)



Existing Available
Sight Distance
Measurement



View of Sight Distance on West Governor John Sevier Highway at the Proposed West Entrance (Looking West)



View of Sight Distance on West Governor John Sevier Highway at the Proposed West Entrance (Looking East)

➤ **EVALUATION OF TURN LANE THRESHOLDS**

An evaluation of the need for separate turn lanes into the development in the projected 2025 and 2027 conditions was conducted for the Proposed West Entrance on West Governor John Sevier Highway. The evaluation did not include left-turn movements at either Proposed Entrance since an existing TWLTL is already provided in the center of the highway. The evaluation also did not include a right-turn lane evaluation of the Proposed East Entrance since an exclusive right-turn lane is already constructed at this intersection.

The criteria used for this turn lane evaluation were based on Knox County's "Access Control and Driveway Design Policy" and TDOT's "Highway System Access Manual". These design policies relate vehicle volume thresholds based on prevailing speeds for two-lane and four-lane roadways.

According to Knox County's and TDOT's guidelines, with a posted speed limit of 50-mph, a separate eastbound right-turn lane on West Governor John Sevier Highway is warranted at the Proposed West Entrance based on both the projected 2025 and 2027 PM peak hour traffic volumes. The worksheets for these evaluations are provided in Appendix I.

➤ **PROJECTED VEHICLE QUEUES**

An additional software program was used to calculate the 2025 and 2027 AM and PM peak hour projected vehicle queues at the studied intersections to determine if the existing and proposed vehicle storage lengths are adequate. The previously mentioned Synchro Traffic Software includes SimTraffic. The Synchro portion of the software performs the macroscopic calculations for intersections, and SimTraffic performs micro-simulation and animation of vehicular traffic. SimTraffic (Version 11) software was utilized to estimate the projected vehicle queues.

The 95th percentile vehicle queue is the recognized measurement in the traffic engineering profession as the design standard used when considering vehicle queue lengths. A 95th percentile vehicle queue length means 95% certainty that the vehicle queue will not extend beyond that point. The calculated vehicle queue results were based on averaging the outcome obtained during ten traffic simulations. The 95th percentile vehicle queue lengths at the studied intersections for the 2025 and 2027 projected conditions are shown in Tables 9a and 9b. The vehicle queue worksheet results from the SimTraffic software are in Appendix J.

TABLE 9a
TURN LANE STORAGE & VEHICLE QUEUE SUMMARY -
2025 PROJECTED PEAK HOUR TRAFFIC (WITH THE PROJECT)

INTERSECTION	APPROACH/ MOVEMENT	STORAGE LENGTH (ft)	ADEQUATE LENGTH?	SIMTRAFFIC 95 th PERCENTILE QUEUE LENGTH (ft)	
				AM PEAK HOUR	PM PEAK HOUR
West Governor John Sevier Highway (EB & WB) at Mountain Grove Drive (NB) / West Norton Road (SB)	Eastbound Left	215	Yes	62	86
	Eastbound Right	215	Yes	65	150
	Westbound Left	150	Yes	76	88
	Westbound Right	120	Yes	9	37
	Northbound Left	100 *	Yes	134	154
	Northbound Right	265	Yes	51	59
	Southbound Left	180	Yes	78	90
	Southbound Right	195	Yes	73	87
West Governor John Sevier Highway (EB & WB) at Weigel's Driveway / Proposed East Entrance (NB)	Eastbound Right	115	Yes	0	0
	Westbound Left	150	Yes	21	46
	Northbound Right	n/a	Yes	6	11
West Governor John Sevier Highway (EB & WB) at Proposed West Entrance (NB)	Westbound Left	75	Yes	11	24
	Northbound Left	n/a	Yes	69	64
	Northbound Right	50	Yes	34	28

Note: 95th percentile queues were calculated in SimTraffic 11 software

* 100 feet of left turn storage designated by painted pavement markings (additional storage provided in TWLTL)

TABLE 9b
TURN LANE STORAGE & VEHICLE QUEUE SUMMARY -
2027 PROJECTED PEAK HOUR TRAFFIC (WITH THE PROJECT)

INTERSECTION	APPROACH/ MOVEMENT	STORAGE LENGTH (ft)	ADEQUATE LENGTH?	SIMTRAFFIC 95 th PERCENTILE QUEUE LENGTH (ft)	
				AM PEAK HOUR	PM PEAK HOUR
West Governor John Sevier Highway (EB & WB) at Mountain Grove Drive (NB) / West Norton Road (SB)	Eastbound Left	215	Yes	70	88
	Eastbound Right	215	Yes	104	168
	Westbound Left	150	Yes	103	106
	Westbound Right	120	Yes	13	14
	Northbound Left	100 *	Yes	140	152
	Northbound Right	265	Yes	50	65
	Southbound Left	180	Yes	79	86
	Southbound Right	195	Yes	78	88
West Governor John Sevier Highway (EB & WB) at Weigel's Driveway / Proposed East Entrance (NB)	Eastbound Right	115	Yes	0	7
	Westbound Left	150	Yes	26	44
	Northbound Right	n/a	Yes	4	15
West Governor John Sevier Highway (EB & WB) at Proposed West Entrance (NB)	Westbound Left	75	Yes	15	33
	Northbound Left	n/a	Yes	98	147
	Northbound Right	50	No	52	53

Note: 95th percentile queues were calculated in SimTraffic 11 software

* 100 feet of left turn storage designated by painted pavement markings (additional storage provided in TWLTL)

Tables 9a and 9b show that all the existing turn lane storage lengths are adequate in the projected 2025 and 2027 conditions. It should be noted that the northbound left-turn lane on Mountain Grove Drive has 100 feet of storage designated by painted pavement markings. However, the

end of this storage length directly transitions to the center TWLTL and thus has more than enough storage available for this turning movement. Based on the calculations, the proposed northbound right-turn lane at the Proposed West Entrance is the only turn lane without adequate storage capacity. The current site plan shows a vehicle storage length of 50 feet; however, the largest vehicle queue is estimated to be 53 feet in the projected 2027 PM peak hour.

CONCLUSIONS & RECOMMENDATIONS

The following is an overview of recommendations to minimize the transportation impacts of the proposed Ascend at South Knoxville development on the adjacent transportation system while attempting to achieve an acceptable traffic flow and improved safety. Figure 9, at the end of this section, provides an overview of the external road recommendations.



West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road:

The projected 2025 and 2027 level of service calculations for the intersection of West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road resulted in reasonable vehicle delays. The provided existing turn lanes at this intersection will adequately contain the projected 2025 and 2027 vehicle queues. The trips generated by the proposed development are not expected to impact this intersection in the future appreciably. No specific recommendations are offered for this intersection based on the study analyses; however, a few existing observed issues are recommended to be addressed by the City of Knoxville as soon as possible.

- 1a) As documented during a field review, a traffic road sign for the northbound approach on Mountain Grove Drive was damaged. The traffic sign for the northbound approach showing the lane designation of the approach had been knocked off its post and was lying on the side of the road adjacent to the Sonic Restaurant. This sign needs to be either repaired or replaced.



Damaged Traffic Road Sign on Mountain Grove Drive

- 1b) The vegetation and landscaping at the southwest corner of this intersection desperately need attention. The sight distance is severely impacted by the uncontrolled growth at this corner and hampers access to the traffic signal cabinet. Currently, this uncontrolled vegetation reduces the visibility of vehicles turning right from West Governor John Sevier Highway onto Mountain Grove Drive. Removing this vegetation would significantly improve the sight distance for motorists attempting to turn left from Mountain Grove Drive to the Weigel's Driveway. In addition, large landscaping rocks are placed near the outside lane edge on Mountain Grove Drive and present a hazard.



Reduced Sight Distance at Southwest Corner of Intersection of West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road due to Uncontrolled Vegetation



Traffic Signal Cabinet Surrounded by Uncontrolled Vegetation at Southwest Corner of Intersection of West Governor John Sevier Highway at Mountain Grove Drive / West Norton Road

- 1c) The recent crash at this intersection, as described previously, was very devastating. Based on the initial reports, the dump truck could not stop in time and crashed into several vehicles, including five motorcyclists. It has not been reported if this occurred due to a vehicle mechanical issue or driver error. If any roadway issues are discovered during the investigation, it is correctly assumed that TDOT will address these and determine a solution to prevent this from occurring in the future. However, no readily identifiable issue was observed during the field review for this study.



West Governor John Sevier Highway at Proposed East Entrance at the Weigel's Driveway:

The projected 2025 and 2027 level of service calculations for the intersection of West Governor John Sevier Highway at Proposed East Entrance at the Weigel's Driveway resulted in reasonable vehicle delays. The trips generated by the proposed development are not expected to impact this intersection in the future appreciably.

The provided existing turn lanes at this intersection will contain the projected 2025 and 2027 vehicle queues. For entering vehicles, the existing westbound right-turn lane and the center TWLTL on West Governor John Sevier Highway were determined to be adequate for the projected conditions. All exiting vehicles will be required to turn right due to the left-turn prohibition, and the longest vehicle queue for this lane was calculated to be 15 feet in the 2027 PM peak hour. This existing



Intersection of West Governor John Sevier Highway at Proposed East Entrance at the Weigel's Driveway

northbound lane has a total storage length of approximately 80 feet between the West Governor John Sevier Highway travel lanes and the portion of the Weigel's Driveway that runs parallel to the highway. A vehicle queue length of 15 feet would not impact vehicle movements at this other intersection just south of the highway.

Several other existing issues documented and discussed earlier in the report are recommended to be addressed. The following recommendations should be completed when Phase 1 is constructed.

- 2a) This intersection is relatively isolated from other development and primarily serves as a secondary outlet for the Weigel's convenience store. Vehicular activity is currently limited to Weigel's customers and the occasional motorist using the intersection as a cut-thru to the South Grove shopping center to avoid the vehicle queues from the traffic signal at Mountain Grove Drive.

As documented during the traffic counts, many motorists made illegal left-turns from the northbound approach towards the west on West Governor John Sevier Highway. Dangerously, many of these illegal turns were made after the motorist crossed the

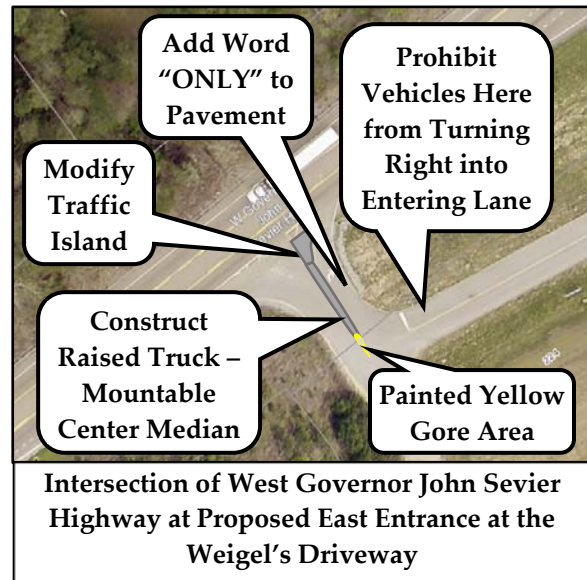
double yellow centerline to avoid the raised concrete island. The passive forms of traffic control provided by the traffic signage, pavement markings, and the raised island are obviously not particularly effective at preventing illegal left-turns. However, it is difficult to prevent illegal left-turning movements, especially with a provided TWLTL or without physical median treatments such as raised medians and barriers. Motorists will take the most direct route and often ignore left-turn restrictions, especially when sight distance is reasonable and travel time is potentially reduced.

It is surmised that as the proposed development is constructed and the intersection becomes more populated by additional motorists, the propensity of motorists to attempt this illegal movement may be reduced. However, the consequences of the illegal turning movement by crossing the double yellow centerline could be disastrous. A raised concrete median is recommended to be constructed to prevent motorists from crossing the double yellow centerline.



This concrete median is recommended to begin at the existing raised concrete island and extend back to the intersection where the section of Weigel's Driveway runs parallel to the highway. The center median should extend enough that a vehicle facing west on the Weigel's Driveway cannot easily navigate around it and travel into the entering lane. It should not restrict entering vehicles from turning left towards the Weigel's convenience store. At a minimum, it is recommended that the center median be 4 feet in width, be delineated with yellow pavement markings, and be mountable by heavy trucks. The median should be designed to deter crossing into the entering lane but still allow delivery trucks to and from the Weigel's convenience store. Pavement markings in advance of the center median should delineate the gore area. Typical signage, such as a Keep Right Symbol sign (R4-7), should not be installed due to the potential for damage from truck traffic.

The recommended raised center median would be approximately 55 feet long and should include painted yellow lines to delineate the separation. It is also recommended that the existing raised island be enlarged and its geometry changed to help dissuade motorists from turning left from this approach. This current island does not command enough attention or dissuade motorists not to turn left illegally. TDOT should provide guidance for potentially



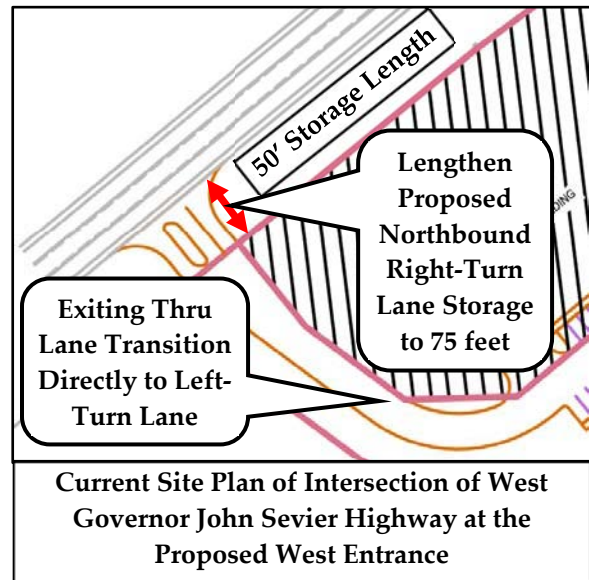
increasing the footprint and revising the geometrics of the island adjacent to the state route. It is believed that modifying the island geometry could demand more attention from motorists and reduce the inclination to navigate illegally around the traffic island. However, any changes to the geometry of the island should maintain sight visibility and not force motorists to increase head-turning to view oncoming traffic from the west. Nor should it extend further towards the travel lanes of West Governor John Sevier Highway. It is also recommended that the word "ONLY" be applied to the pavement in advance of the right-turn arrow on this exiting lane.

- 2b) Sight distances at the Proposed East Entrance approach 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 desirable ISD is 625 feet looking in each direction at the entrance, and the required SSD is calculated to be 450 feet to the east and 420 feet to the west at the Proposed East Entrance. A visual inspection determined that these sight distances are currently available. The site designer must ensure that the intersection and stopping sight distances are accounted for and maintained in the design plans.
- 2c) Due to the semi-isolated nature of this entrance on West Governor John Sevier Highway, combined with turning prohibitions, it is recommended that intersection street lighting be provided at this entrance. A streetlight at this intersection will allow motorists at nighttime to recognize the entrance location on West Governor John Sevier Highway and help ensure that wrong-way entry maneuvers are eliminated and illegal left-turns are potentially dissuaded.



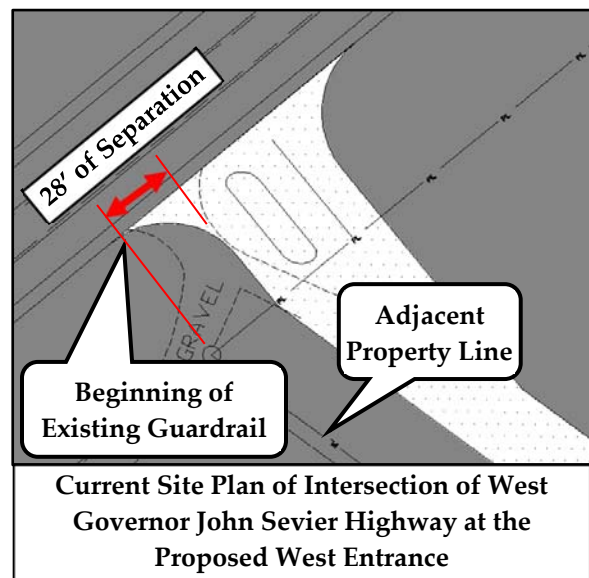
West Governor John Sevier Highway at the Proposed West Entrance: The projected 2025 and 2027 level of service calculations for the intersection of West Governor John Sevier Highway at the Proposed West Entrance resulted in reasonable vehicle delays for this new proposed intersection. The following recommendations should be completed when Phase 1 is constructed.

- 3a) The proposed exiting lanes at this intersection are currently shown in the site plan with separate left and right northbound lanes. The site plan shows the proposed exiting northbound right-turn lane with a storage length of 50 feet. Based on the calculations presented in the study, it is recommended that the proposed northbound right-turn lane have a minimum storage length of 75 feet since the longest calculated queue in the 2027 PM peak hour is 53 feet.



- 3b) For left-turn entering traffic, the existing center TWLTL on West Governor John Sevier Highway will provide the necessary vehicle storage and be adequate in the projected conditions. Since all the exiting apartment traffic towards the west is expected to exit at this approach, the travel lane from the apartment buildings to the entrance at West Governor John Sevier Highway is recommended to be transitioned directly to the left-turn exit lane at the highway.

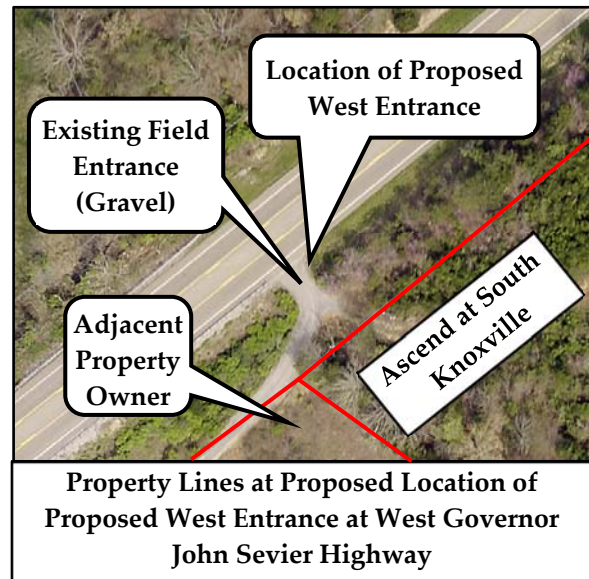
Based on the projected volumes, a separate eastbound right-turn lane on West Governor John Sevier Highway is warranted and recommended for vehicles entering the development at the Proposed West Entrance. However, existing features will hinder the construction of the eastbound right-turn lane on West Governor John Sevier Highway. The property line dividing



the development property and the adjacent property to the west is very close to the Proposed West Entrance location. The site plan shows the outside edge of the entering lane approximately 28 feet away from the adjacent property line. Furthermore, an existing guardrail begins on the south side of the highway just west of the Proposed West Entrance location. This guardrail is installed due to the steep side slopes in advance of a box culvert under West Governor John Sevier Highway.

Typically, the length of a right-turn lane would be determined by calculating the stopping sight distance based on the observed operating speed. The stopping sight distance for this approach is calculated to be 415 feet for eastbound vehicles to decelerate and stop from a posted speed limit of 50 mph. However, this recommended length is based on vehicles coming to a complete stop, and the right-turning vehicles coming off West Governor John Sevier Highway at the Proposed West Entrance will not completely stop. After reviewing this report by TDOT, they recommended that the eastbound right-turn lane on West Governor John Sevier Highway at the Proposed West Entrance be constructed with a 200-foot storage lane and a 200-foot taper. This length corresponds to roughly the entire calculated stopping sight distance.

The construction of the TDOT recommended length for the eastbound right-turn lane will be hindered by the existing guardrail system, steep side slopes, a box culvert, and a lack of separation between the proposed entrance location and the adjacent property. This recommended lane will require significant modifications. The right-turn lane should include the appropriate right-turn arrow pavement markings as shown in TDOT standard drawing T-M-4.



The Proposed West Entrance location could be shifted further to the east to allow the eastbound right-turn lane to limit the impact on the road frontage of the adjacent property owner. If the Proposed West Entrance location remains where shown on the site plan, an agreement between the two property owners will need to be worked out

due to the road frontage encroachment the eastbound right-turn lane will create. The adjacent property owner to the west only has approximately 215 feet of road frontage on West Governor John Sevier Highway and has access to the highway via a gravel field entrance on the western end of the Ascend at South Knoxville development property. This adjacent owner also has access to West Marine Road on its south side. An agreement could include allowing the adjacent property owner in the future to access the Proposed West Entrance since this is the current setup at the existing gravel entrance on West Governor John Sevier Highway. If this were to occur, it is recommended that a minimum throat length of 100 feet be established between West Governor John Sevier Highway and any proposed access connection to the adjacent property owner via the Proposed West Entrance.

The designer must also coordinate with TDOT to design and construct the recommended eastbound right-turn lane at the Proposed West Entrance. In the future, this warranted and recommended right-turn lane will be incorporated into the road widening of West Governor John Sevier Highway when constructed. The additional capacity/lanes on West Governor John Sevier Highway may adequately serve this turning movement. This road widening project will need to re-evaluate this intersection in future conditions to determine if a separate right-turn lane will still be required.

- 3c) It is recommended that a Stop Sign (R1-1) be installed, and a 24" white stop bar be applied to the Proposed West 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.
- 3d) Sight distances at the Proposed West Entrance approach 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 desirable ISD is 625 feet looking in each direction at the entrance, and the required SSD is calculated to be 455 feet to the east and 415 feet to the west at the Proposed West Entrance. A visual inspection determined that these sight distances are available. The site designer must ensure that the intersection and stopping sight distances are accounted for and provided in the design plans.
- 3e) Due to the isolated nature of this entrance on West Governor John Sevier Highway, it is recommended that intersection street lighting be provided at this entrance. A streetlight

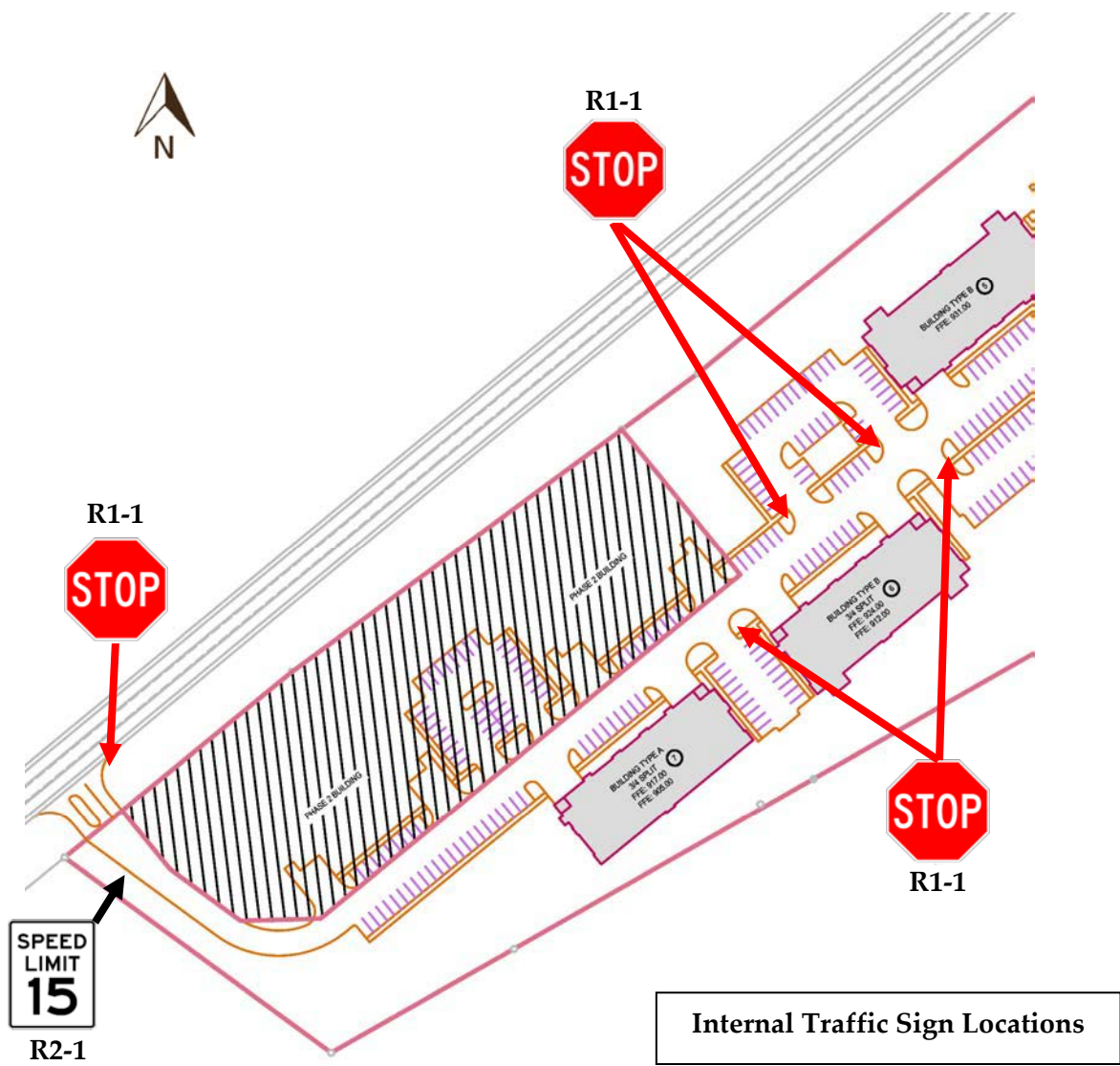
at this intersection will allow motorists at nighttime to recognize the entrance location on West Governor John Sevier Highway and correctly enter and exit the development.

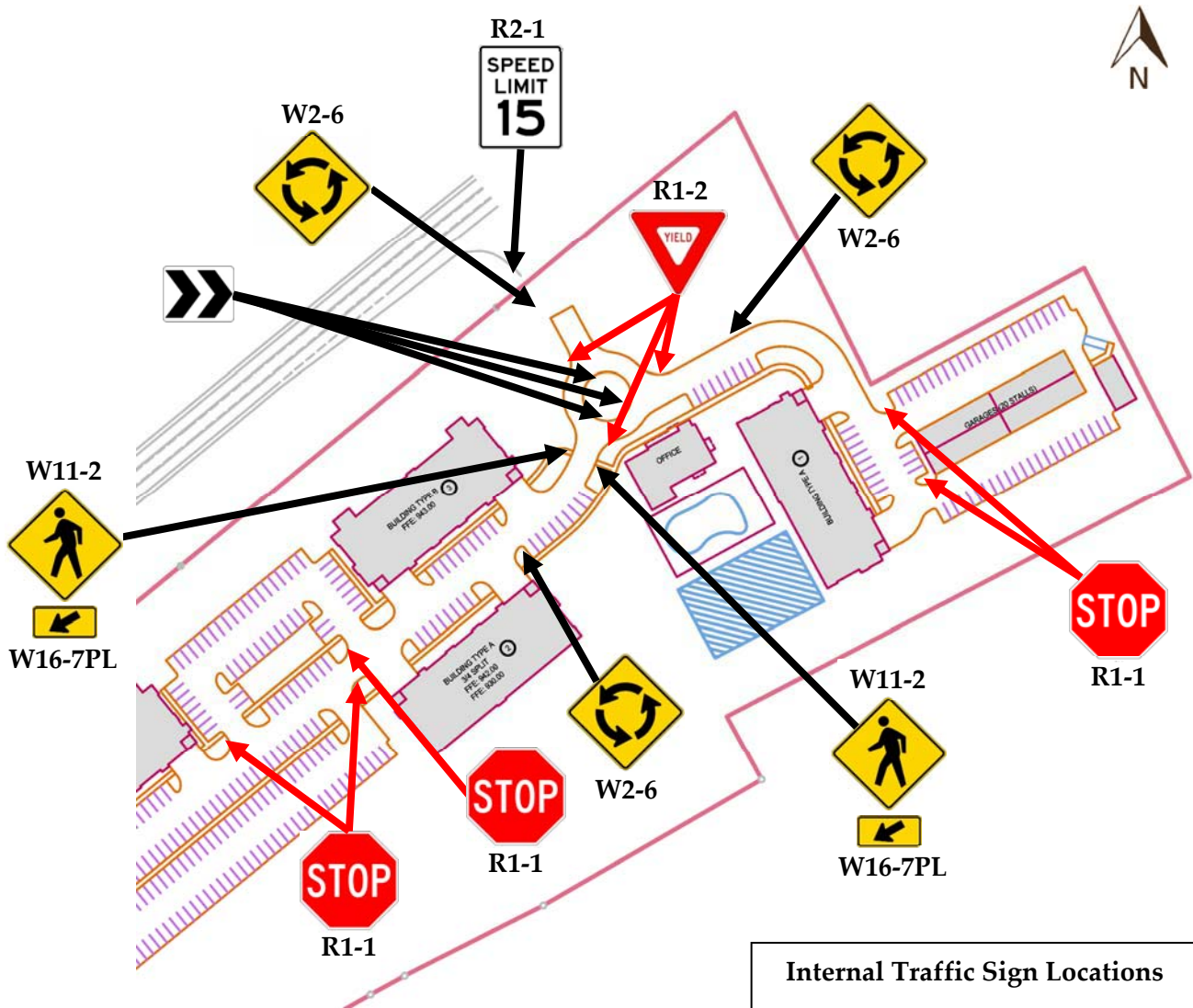
- 3f) The construction of the Proposed West Entrance on West Governor John Sevier Highway will require a TDOT Highway Entrance Permit. The developer will need to apply for this permit and coordinate with TDOT regarding their specific requirements for this entrance.



Ascend at South Knoxville Internal Drive / Parking Lot Aisleways: The current site plan shows two entrance driveways with several parking lot aisleways constructed for the development, as shown in Figure 3 and below.

- 4a) 15-mph Speed Limit Signs (R2-1) are recommended to be posted near the beginning of the development entrance driveways off West Governor John Sevier Highway. Since the entrances and internal aisleways will not be public roads, a posted speed limit of less than 25-mph is acceptable.
- 4b) As shown in the following images, Stop Signs (R1-1) with 24" white stop bars will need to be installed on the internal drive and aisleways. Additional signage will be needed for the proposed internal roundabout and will also require pavement markings, as shown in Figure 2B-22 of the MUTCD, 2009 edition.





- 4c) Sight distance at the new internal intersections must not be impacted by new signage, parked cars, or future landscaping. With a speed limit of 15-mph in the development, the internal intersection sight distance is 170 feet. The required stopping sight distance is 80 feet for a level road grade. The site designer should ensure that internal sight distance lengths are met and account for different proposed road grades.
- 4d) The main east-west internal drive/aisleway is very long and straight. It is recommended that speed humps or tables be considered to reduce internal traffic speeds in the development. Alternatively, the parking lot islands could be extended toward the aisleways. Extending the parking lot islands a few feet would narrow the aisleway widths and reduce the available driving surface. A narrower aisleway design would

reduce driver comfort and internal vehicle speeds.

- 4e) All drainage grates and covers for the residential development must be pedestrian and bicycle safe.
- 4f) Sidewalks are being proposed along the internal parking lots and in front of the apartment unit buildings. Sidewalks should have appropriate ADA-compliant ramps at intersection corners, and the internal sidewalks are recommended to be 5 feet minimum in width to meet Knox County and City of Knoxville regulations. Sidewalk ramps must include detectable surfaces to meet ADA requirements. White crosswalks should be marked on the road pavement internally where pedestrians are expected to cross. Pedestrian signs (W11-2) should also be installed where the crosswalks cross the development's main east-west internal drive/aisleway.

- 4g) The requested Knox County rezoning for the property included a recommendation by the Knoxville/Knox County Planning staff that the development “provide a pedestrian connection to the large adjacent commercial node to the east that is served by transit.” Details regarding this connection should be coordinated with the governing authorities. Due to the proximity to the South Grove shopping center and the KAT bus stop in the shopping center, it is further recommended in this study that the internal sidewalk system is connected to this adjacent development. Potential sidewalk routes from the proposed development to the South Grove shopping center will require cooperation and coordination. The potential route, however, should avoid directing pedestrians in front of the significant incoming and outgoing vehicular traffic near the gas pumps at the Weigel’s convenience store. A sidewalk on the north side of the Weigel’s Driveway would be the safest path in this area.



North Side of Weigel’s Driveway (Parallel to West Governor John Sevier Highway)

- 4h) All road grade and intersection elements should be designed to AASHTO, TDOT, and Knox County and City of Knoxville specifications and guidelines to ensure proper transportation operations.

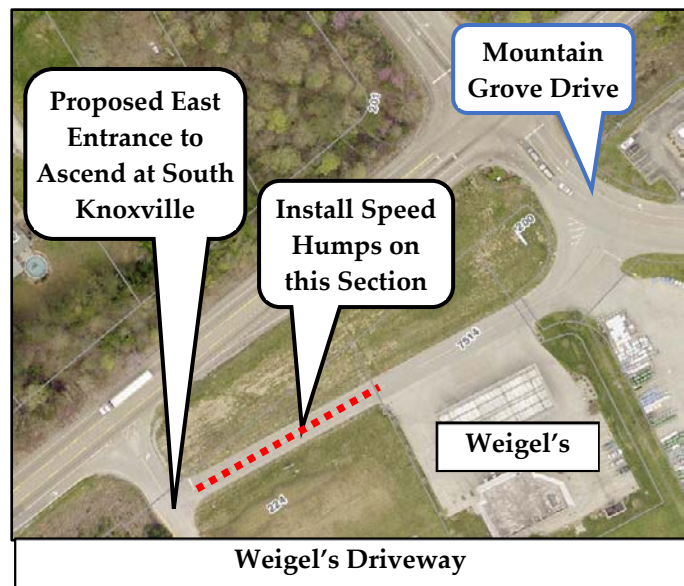


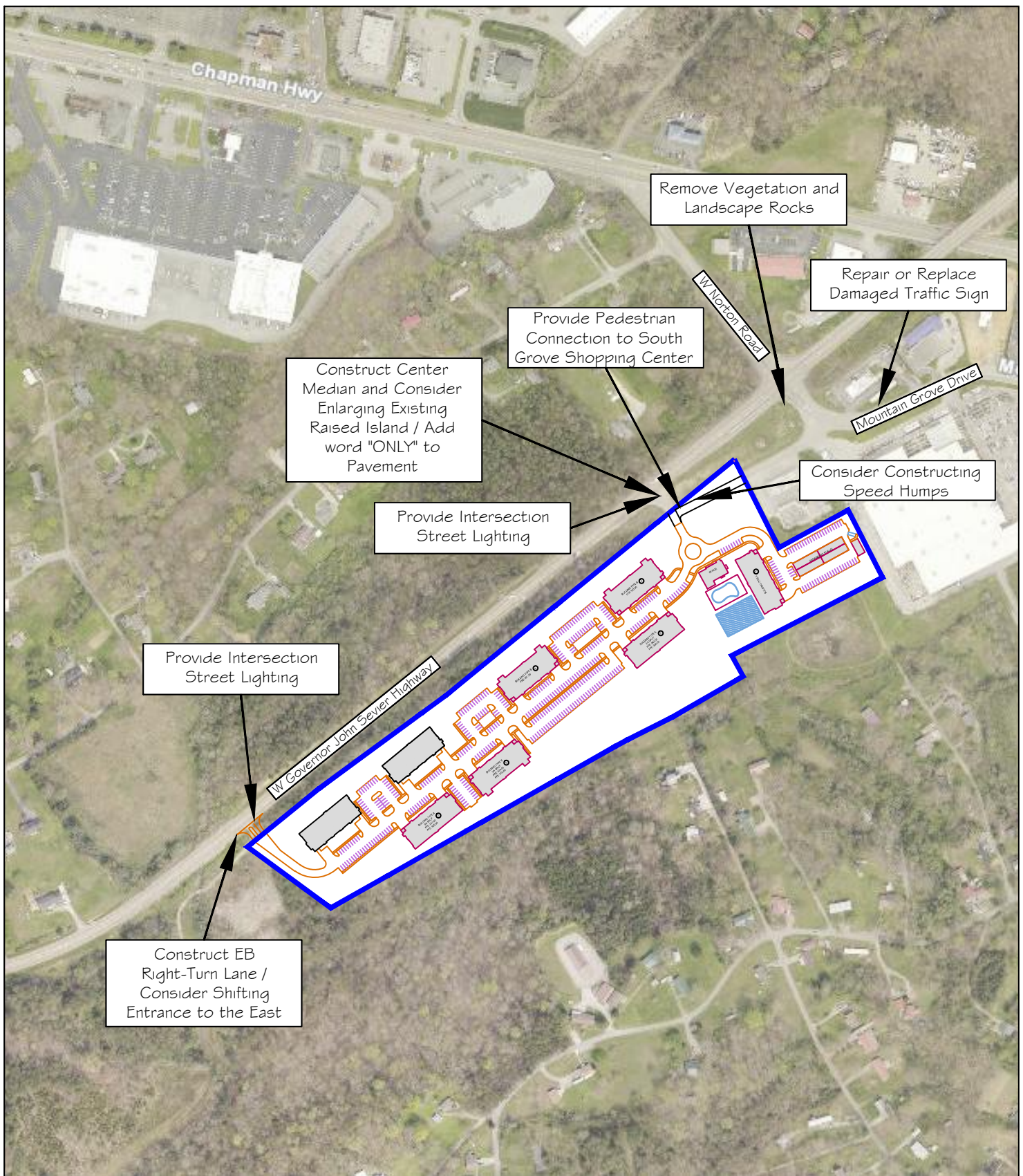
Other Transportation Consideration: Another transportation-related concern includes the cut-thru traffic observed on the Weigel's Driveway.

As documented and observed during the traffic counts, several motorists used the Weigel's Driveway to avoid the eastbound vehicle queue from the traffic signal on West Governor John Sevier Highway. This cut-thru maneuver occurred when motorists assumed they could more quickly enter the South Grove shopping center via the Weigel's Driveway versus waiting for the queue to subside on West Governor John Sevier Highway.

Since this cut-thru maneuver was initiated by motorists attempting to save travel time, the vehicles were observed traveling at a higher speed than what should be appropriate. These cut-thru motorists with higher speeds were comingled with customers entering and exiting the Weigel's convenience store. These cut-thru motorists would also comingle with the proposed development's residents. Future residents in the apartment development may also be tempted to speed on this driveway when traveling to and from the South Grove shopping center. Speed humps should be considered on the section of the Weigel's Driveway that runs parallel to West Governor John Sevier Highway to combat this safety issue. These speed humps should be installed between the Proposed East Entrance for the Ascend at South Knoxville development and the existing open pavement area in front of the Weigel's convenience store, as shown below. They are not recommended on the large open pavement area in front of the gas pumps at the Weigel's convenience store or the pavement area near Mountain Grove Drive.

However, the legality and potentiality of this recommendation depend on what entity formally owns this driveway and whether they would allow this installation. Any speed humps on this road section must consider large and heavy trucks that travel to and from the Weigel's convenience store.





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

NOT TO SCALE



FIGURE 9
 Ascend at South Knoxville
 Summary of Recommended External
 Road Improvements

APPENDIX A

HISTORICAL TRAFFIC COUNT DATA

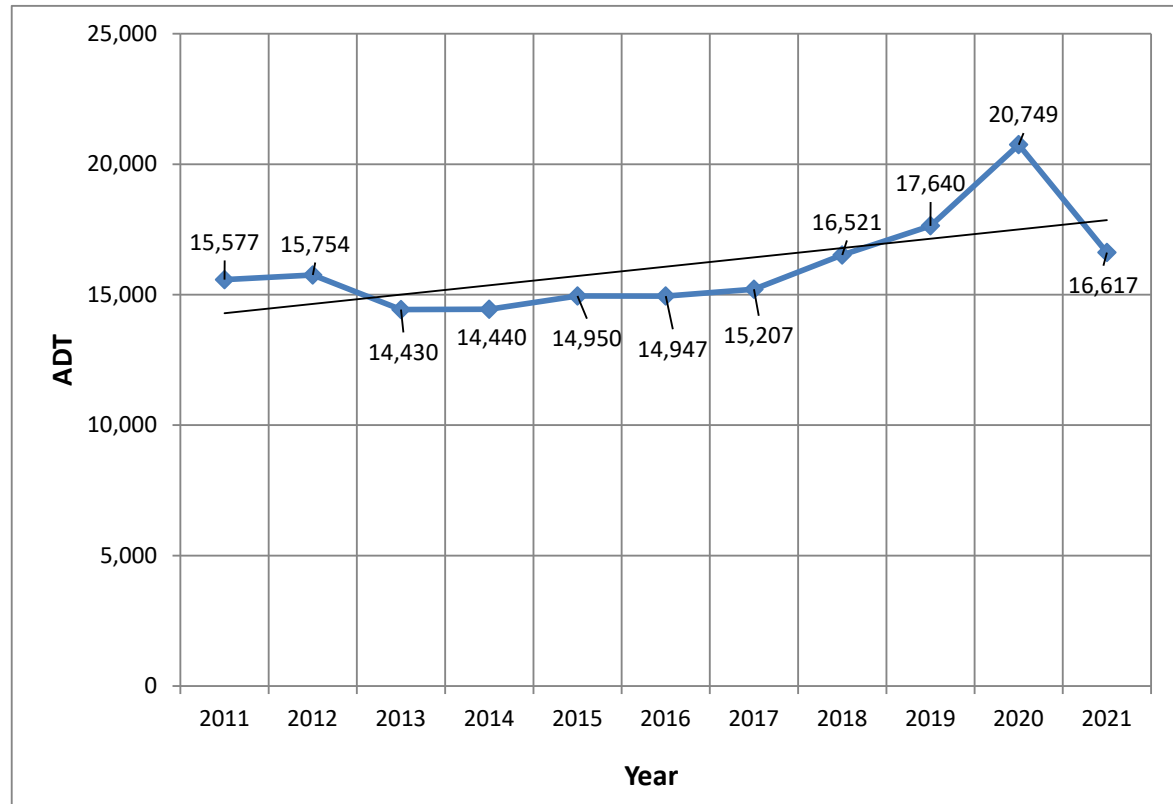
Historical Traffic Counts

Organization: TDOT

Station ID #: 47000290

Location: W Governor John Sevier Highway, east of Martin Mill Pike

YEAR	AADT	Trendline
2011	15,577	
2012	15,754	
2013	14,430	
2014	14,440	
2015	14,950	
2016	14,947	
2017	15,207	
2018	16,521	
2019	17,640	
2020	20,749	
2021	16,617	



2011 - 2021 Growth Rate = 6.7%

Average Annual Growth Rate = 0.6%

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List View All DTRs

Record 1 of 1 Goto Record

Location ID	47000290	MPO ID	
Type	SPOT	HPMS ID	
On NHS		On HPMS	
LRS ID	4/SR168001	LRS Loc Pt.	3.025
SF Group	Urban	Route Type	
AF Group	16	Route	
GF Group	Knox	Active	Yes
Class Dist Grp	16	Category	CC
Seas Class Grp			
WIM Group			
QC Group	Default		
Funct'l Class	Minor Arterial	Milepost	
Located On	W. GOV. JOHN SEVIER HWY.		
Loc On Alias	SOUTH KNOXVILLE		

More Detail

STATION DATA

Directions: **2-WAY**

Year	AADT	DHV-30	K %	D %	PA	BC	Src
2021	16,617	1,400	8	65	16,068 (97%)	549 (3%)	
2020	20,749	1,682	8	65	19,901 (96%)	788 (4%)	
2019	17,640		12	65	16,339 (93%)	1,300 (7%)	
2018	16,521		10	65			
2017	15,207 ²						


Location ID: 47000290
 Located On: W. GOV. JOHN SEVIER HWY. SOUTH KNOXVILLE
 Direction: 2-WAY
 AADI: 16617 (2021)
[View Detail in a New Search](#)
[Go to Record in Current Search](#)

APPENDIX B

WALK SCORE

WALKSCORE


(from walkscore.com)




Walk Score  [Get Scores](#) [My Favorites](#) [Add to Your Site](#)

Type an address, neighborhood or city


300 West Governor John Sevier Highway

Knoxville, Tennessee, 37920

Commute to **Downtown Knoxville** 

 60+ min  60+ min  60+ min [View Routes](#)

[Favorite](#) [Map](#) [Nearby Knoxville Apartments on Redfin](#)

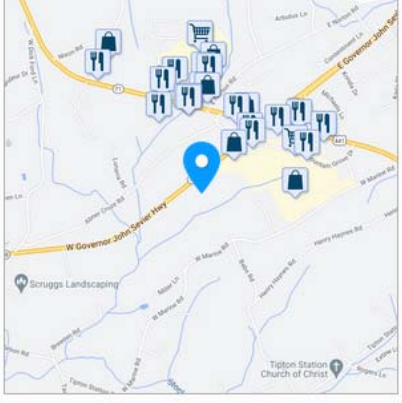
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Walk Score
37
Car-Dependent
Most errands require a car.

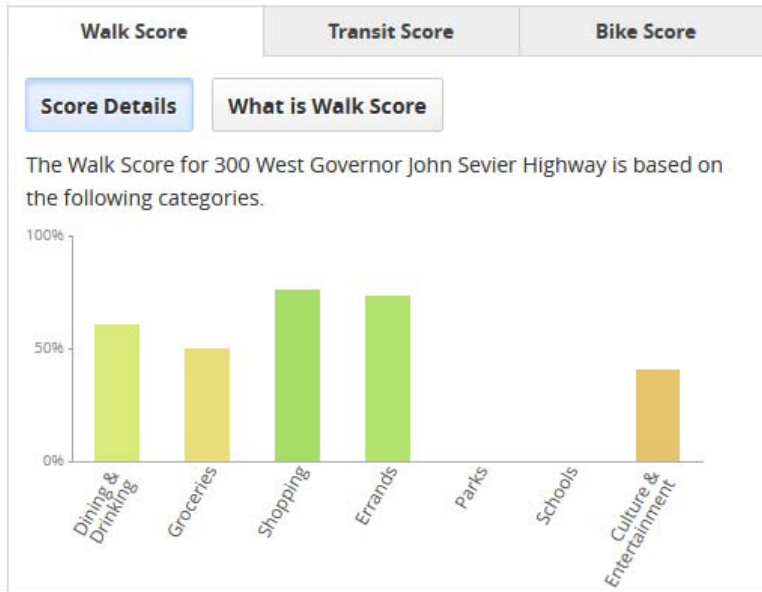
Transit Score
26
Some Transit
A few nearby public transportation options.

Bike Score
18
Somewhat Bikeable
Minimal bike infrastructure.

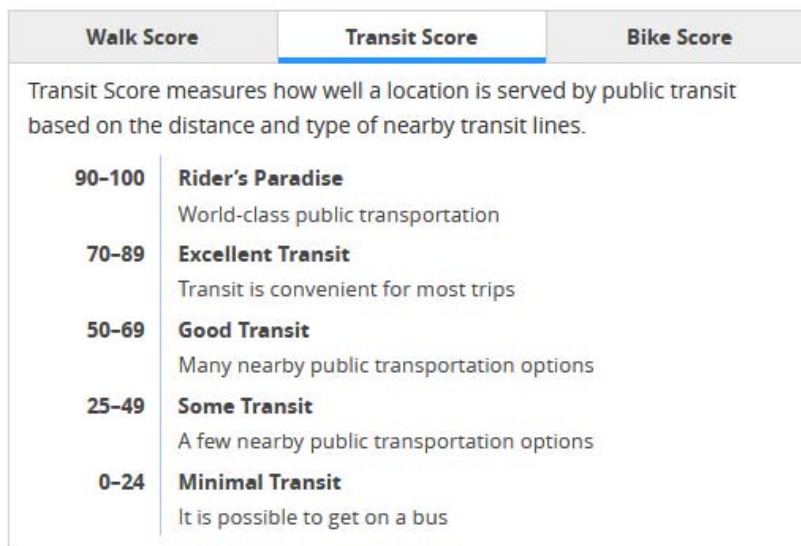
[About your score](#)



Scores for 300 West Governor John Sevier Highway ×



Scores for 300 West Governor John Sevier Highway ×



Scores for 300 West Governor John Sevier Highway



Walk Score	Transit Score	Bike Score
Bike Score measures whether an area is good for biking based on bike lanes and trails, hills, road connectivity, and destinations.		
90-100	Biker's Paradise	Daily errands can be accomplished on a bike
70-89	Very Bikeable	Biking is convenient for most trips
50-69	Bikeable	Some bike infrastructure
0-49	Somewhat Bikeable	Minimal bike infrastructure

Travel Time Map

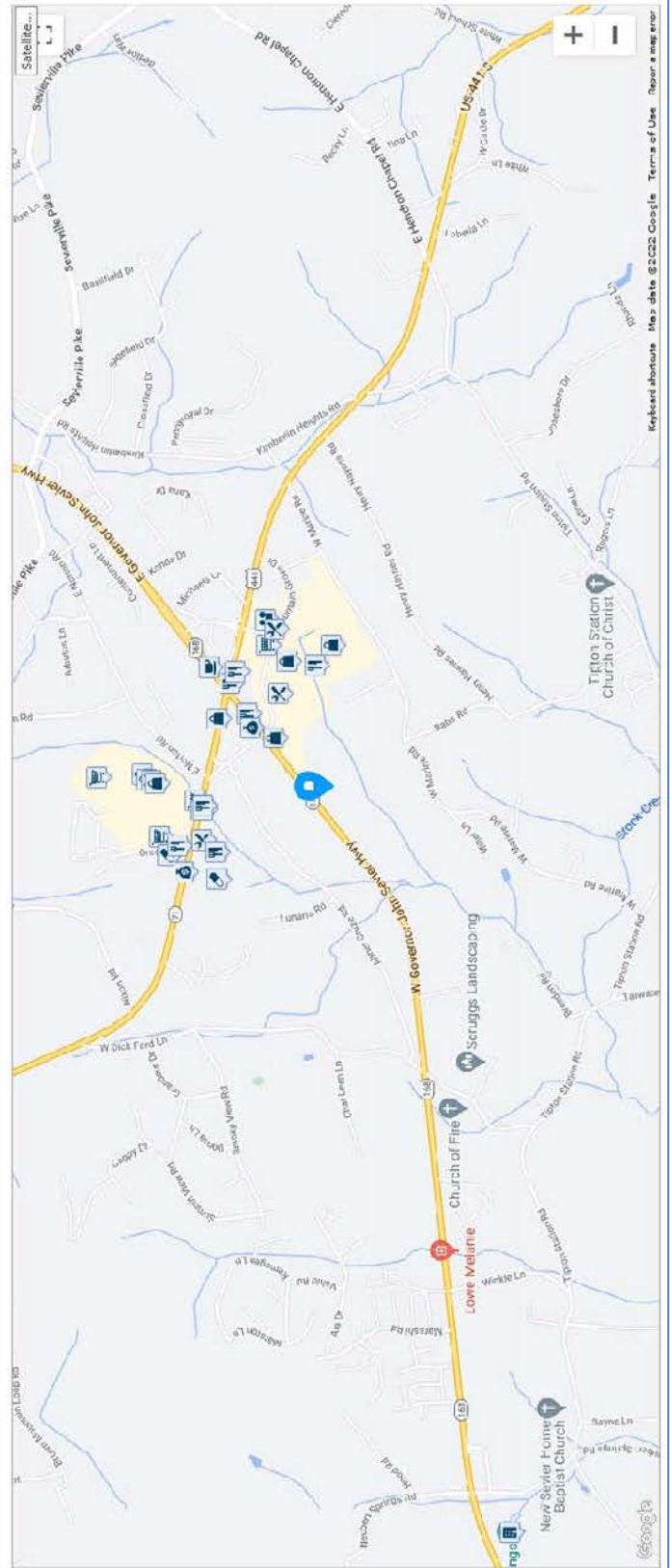
[Add to your site](#)

Explore how far you can travel by car, bus, bike and foot from 300 West Governor John Sevier Highway.



What's Nearby

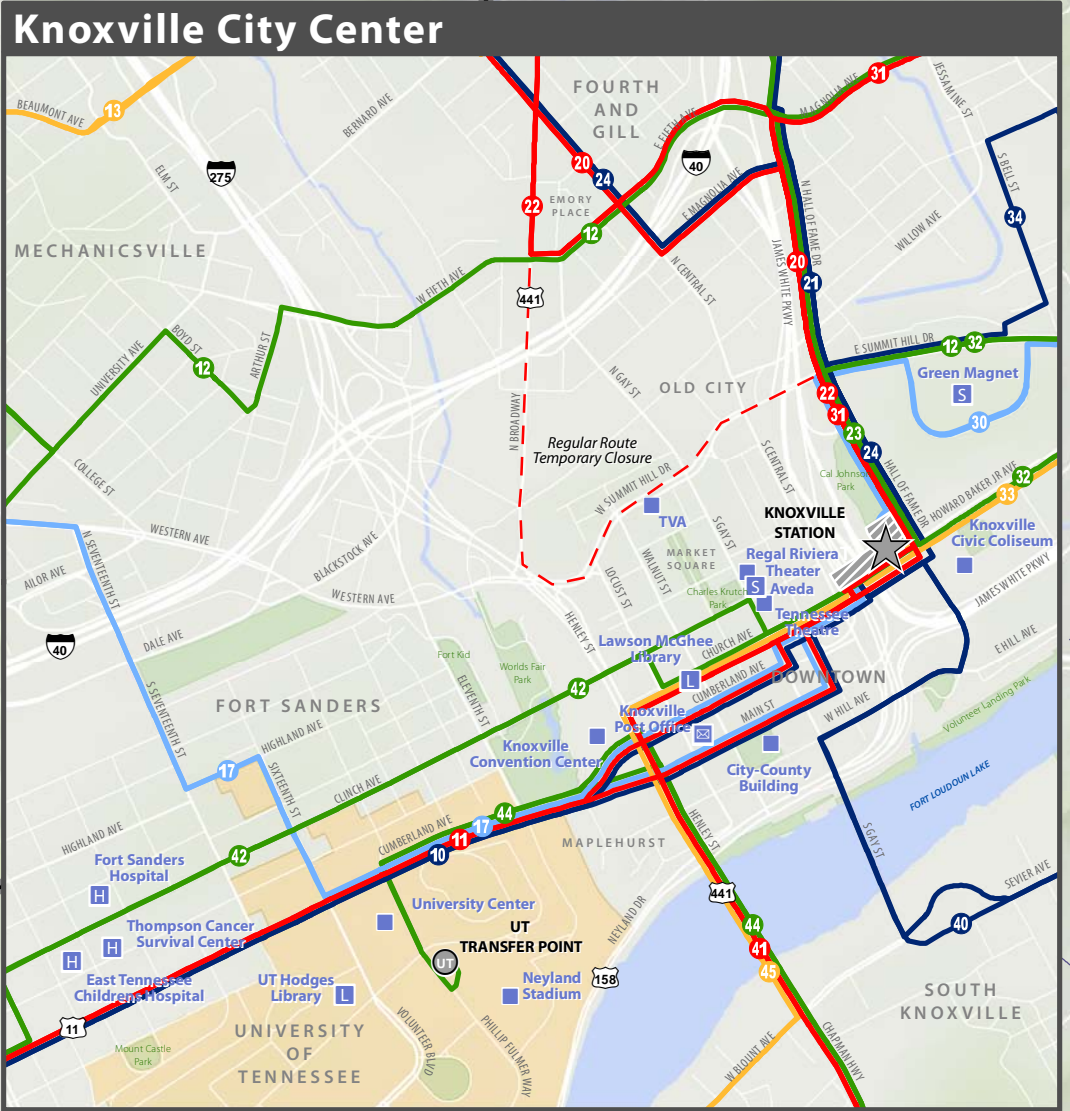
- Restaurants: 2mi
- Coffee: 4mi
- Bars: 2.4mi
- Groceries: 3mi
- Parks: Eastern State Wildlife Manage. 3.2mi
- Schools: New Hopewell Elementary Sc... 2.1mi
- Shopping: 4mi
- Entertainment: 4mi
- Errands: U.S. Bank Branch 2mi
- Search Nearby: >



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APPENDIX C

KNOXVILLE AREA TRANSIT MAP AND INFORMATION



Legend

- Transfer Point
- Lift Service Area Boundary

Points of Interest

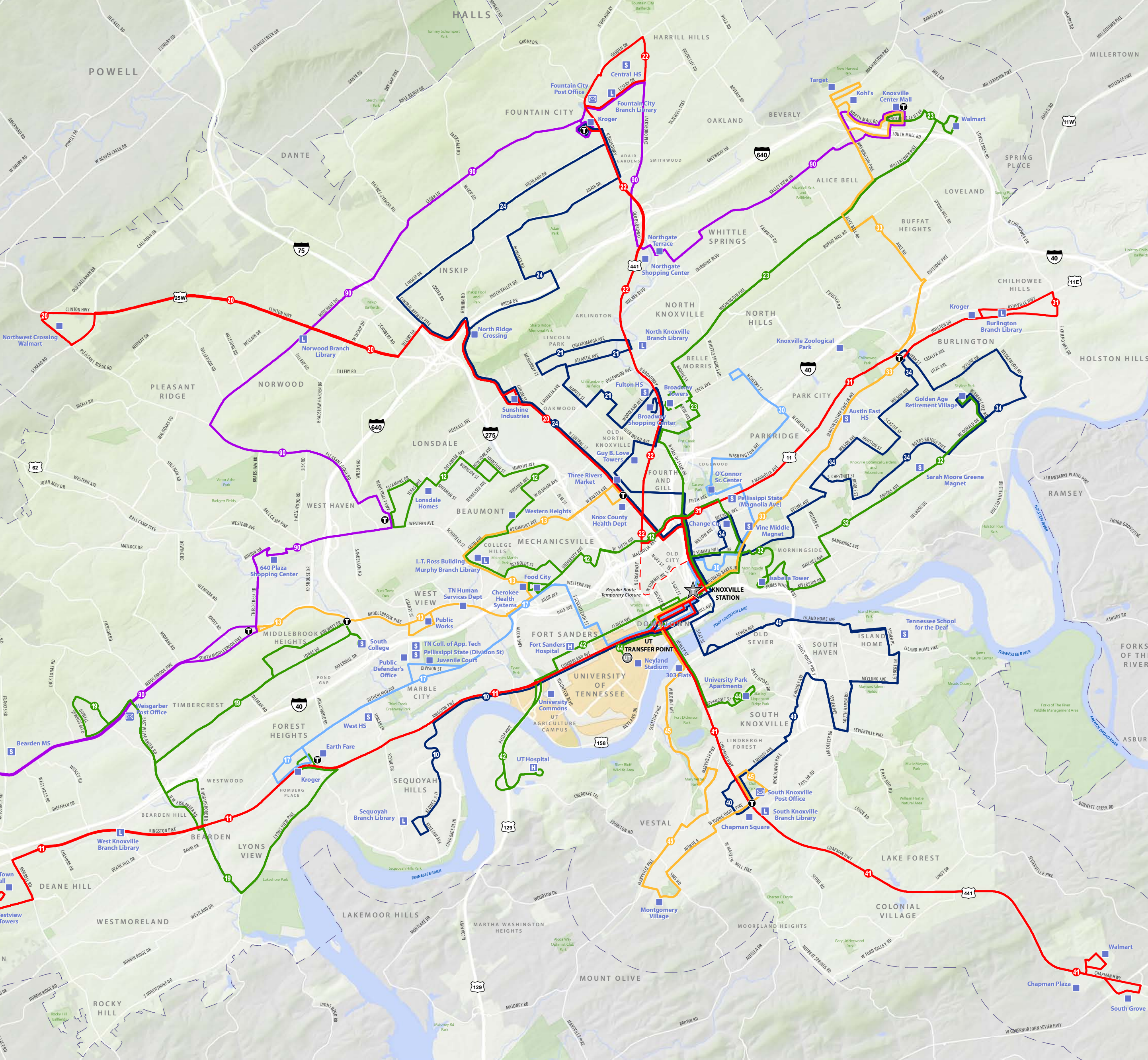
- Hospital
- Library
- Post Office
- School
- Point of Interest

Distances

0 5 10 Minutes Walking

0 5 10 Minutes Biking

0 0.5 1 Map Scale in Miles



FARE INFORMATION

With a base fare of \$1.50, KAT offers a variety of passes. Please note that only the fares marked with an asterisk can be purchased when boarding the bus. Others are available at KAT's Customer Service Counter at Knoxville Station (301 Church Ave.) or by mail via katbus.com.

FARE TYPE	REGULAR FARE	REDUCED FARE
One-Ride Pass*	\$1.50	\$0.75
1 Day Pass*	\$4.00	\$2.00
7 Day Pass	\$15.00	\$7.50
30 Day Pass	\$50.00	\$25.00
20 Ride Pass	\$25.00	\$12.50
Transfer*	\$0.50	\$0.25

REDUCED FARE INFORMATION

A reduced fare is available to those who qualify. Qualifying individuals include seniors age 65 or over, Medicare card holders, students under the age of 18, and persons with disabilities. Proper identification (Medicare card or a valid KAT I.D. card) is required before boarding. For more information on how to obtain a discounted-fare I.D. visit katbus.com/fares or call 637-3000.

BUS STOPS ONLY!

KAT buses stop ONLY at locations designated by bus stop signs. Generally, bus stops are located at least every 1/4 mile along the route.

KAT HOLIDAYS

KAT buses do not run on the following holidays:

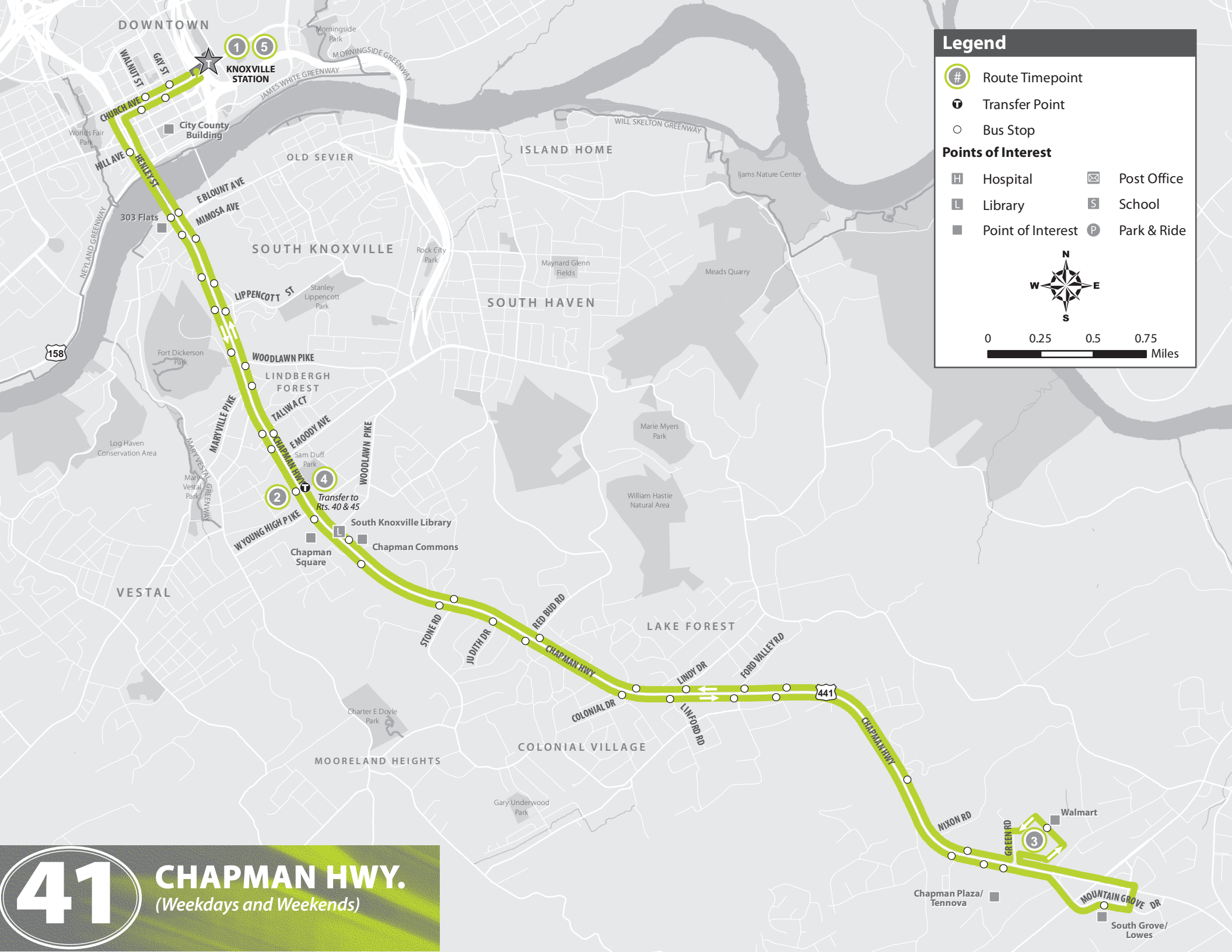
- New Year's Day
- Thanksgiving
- Independence Day
- Christmas

Please note that KAT's Knoxville Station Customer Service counter is also closed during those days.

KAT buses run on a Saturday schedule on the following holidays:

- Martin Luther King, Jr. Day
- Day after Thanksgiving
- Memorial Day
- Christmas Eve
- Labor Day

KAT's administrative offices are closed on all holidays listed above.



Legend

- Route Timepoint
 - Transfer Point
 - Bus Stop
- Points of Interest**
- Hospital
 - Library
 - Point of Interest
 - Post Office
 - School
 - Park & Ride



41

CHAPMAN HWY.

(Weekdays and Weekends)

1 **5**
KNOXVILLE STATION

2 **4**
Transfer to Rts. 40 & 45

3

158

441

Walmart

Chapman Plaza/
Tennova

South Grove/
Loves

DOWNTOWN

CITY COUNTY BUILDING

OLD SEVIER

ISLAND HOME

SOUTH KNOXVILLE

SOUTH HAVEN

VESTAL

LAKE FOREST

MOORELAND HEIGHTS

COLONIAL VILLAGE

Walmart

South Grove/
Loves

E BLOUNT AVE

MIMOSA AVE

LIPPENCOTT ST

WOODLAWN PIKE

LINDBERGH FOREST

TALIWA CT

EMOODY AVE

MARYVILLE PIKE

WYONG HIGH PIKE

WOODLAWN PIKE

STONE RD

JU DITH DR

RED BUD RD

CHAPMAN HWY

COLONIAL DR

LINDY DR

LIN FORD RD

FORD VALLEY RD

CHAPMAN HWY

NIXON RD

GREEN RD

GREEN RD

GREEN RD

GREEN RD

MOUNTAIN GROVE DR

GREEN RD

GREEN RD

GREEN RD

GREEN RD

41

CHAPMAN HIGHWAY

(Weekdays and Weekends)

SERVES:

- ★ Chapman Commons
- ★ Chapman Plaza
- ★ Chapman Square
- ★ Knoxville Station/Downtown
- ★ South Grove Shopping Center

South Knoxville Branch Library
Tennova South
Walmart



Effective Date: January 6, 2020

	Going away from Downtown			Going toward Downtown	
	Knoxville Station—Platform P	Chapman Hwy. past Moody	Walmart	Chapman Hwy. past Young High Pike	Knoxville Station
	1	2	3	4	5
WEEKDAY SCHEDULE					
A.M.			5:41	5:50	6:10
	6:15	6:26	6:41	6:50	7:10
	6:45	6:56	7:11	7:20	7:40
	7:15	7:26	7:41	7:50	8:10
	7:45	7:56	8:11	8:20	8:40
	8:15	8:26	8:41	8:50	9:10
	8:45	8:56	9:11	9:20	9:40
	9:15	9:26	9:41	9:50	10:10
	9:45	9:56	10:11	10:20	10:40
	10:15	10:26	10:41	10:50	11:10
	10:45	10:56	11:11	11:20	11:40
	11:15	11:26	11:41	11:50	12:10
	11:45	11:56	12:11	12:20	12:40
P.M.	12:15	12:26	12:41	12:50	1:10
	12:45	12:56	1:11	1:20	1:40
	1:15	1:26	1:41	1:50	2:10
	1:45	1:56	2:11	2:20	2:40
	2:15	2:26	2:41	2:50	3:10
	2:45	2:56	3:11	3:20	3:40
	3:15	3:26	3:41	3:50	4:10
	3:45	3:56	4:11	4:20	4:40
	4:15	4:26	4:41	4:50	5:10
	4:45	4:56	5:11	5:20	5:40
	5:15	5:26	5:41	5:50	6:10
	5:45	5:56	6:11	6:20	6:40
	6:15	6:26	6:41	6:50	7:10
	6:45	6:56	7:11	7:20	7:40
	7:15	7:26	7:41	7:50	8:10
	7:45	7:56	8:11	8:20	8:40
	8:15	8:26	8:41	8:50	9:10
	8:45	8:56	9:11	9:20	9:40
	9:15	9:26	9:41	9:50	10:10
	9:45	9:56	10:11	10:20	10:40
	10:15	10:26	10:41	10:50	11:10
	11:15	11:26	11:41	11:50	To Garage

	Going away from Downtown			Going toward Downtown	
	Knoxville Station—Platform P	Chapman Hwy. past Moody	Walmart	Chapman Hwy. past Young High Pike	Knoxville Station
	1	2	3	4	5
SATURDAY SCHEDULE					
A.M.	7:15	7:26	7:41	7:50	8:10
	7:45	7:56	8:11	8:20	8:40
	8:15	8:26	8:41	8:50	9:10
	8:45	8:56	9:11	9:20	9:40
	9:15	9:26	9:41	9:50	10:10
	9:45	9:56	10:11	10:20	10:40
	10:15	10:26	10:41	10:50	11:10
	10:45	10:56	11:11	11:20	11:40
	11:15	11:26	11:41	11:50	12:10
	11:45	11:56	12:11	12:20	12:40
P.M.	12:15	12:26	12:41	12:50	1:10
	12:45	12:56	1:11	1:20	1:40
	1:15	1:26	1:41	1:50	2:10
	1:45	1:56	2:11	2:20	2:40
	2:15	2:26	2:41	2:50	3:10
	2:45	2:56	3:11	3:20	3:40
	3:15	3:26	3:41	3:50	4:10
	3:45	3:56	4:11	4:20	4:40
	4:15	4:26	4:41	4:50	5:10
	4:45	4:56	5:11	5:20	5:40
	5:15	5:26	5:41	5:50	6:10
	5:45	5:56	6:11	6:20	6:40
	6:15	6:26	6:41	6:50	7:10
	6:45	6:56	7:11	7:20	7:40
	7:15	7:26	7:41	7:50	8:10
	7:45	7:56	8:11	8:20	8:40
	8:15	8:26	8:41	8:50	9:10
	8:45	8:56	9:11	9:20	9:40
	9:15	9:26	9:41	9:50	10:10
	9:45	9:56	10:11	10:20	10:40
	10:15	10:26	10:41	10:50	11:10
	10:45	10:56	11:11	11:20	11:40
	11:15	11:26	11:41	11:50	To Garage
SUNDAY SCHEDULE					
A.M.	8:15	8:26	8:41	8:50	9:10
	9:15	9:26	9:41	9:50	10:10
	10:15	10:26	10:41	10:50	11:10
	11:15	11:26	11:41	11:50	12:10
P.M.	12:15	12:26	12:41	12:50	1:10
	1:15	1:26	1:41	1:50	2:10
	2:15	2:26	2:41	2:50	3:10
	3:15	3:26	3:41	3:50	4:10
	4:15	4:26	4:41	4:50	5:10
	5:15	5:26	5:41	5:50	6:10
	6:15	6:26	6:41	6:50	7:10
	7:15	7:26	7:41	7:50	8:10
	8:15	8:26	8:41	To Garage	

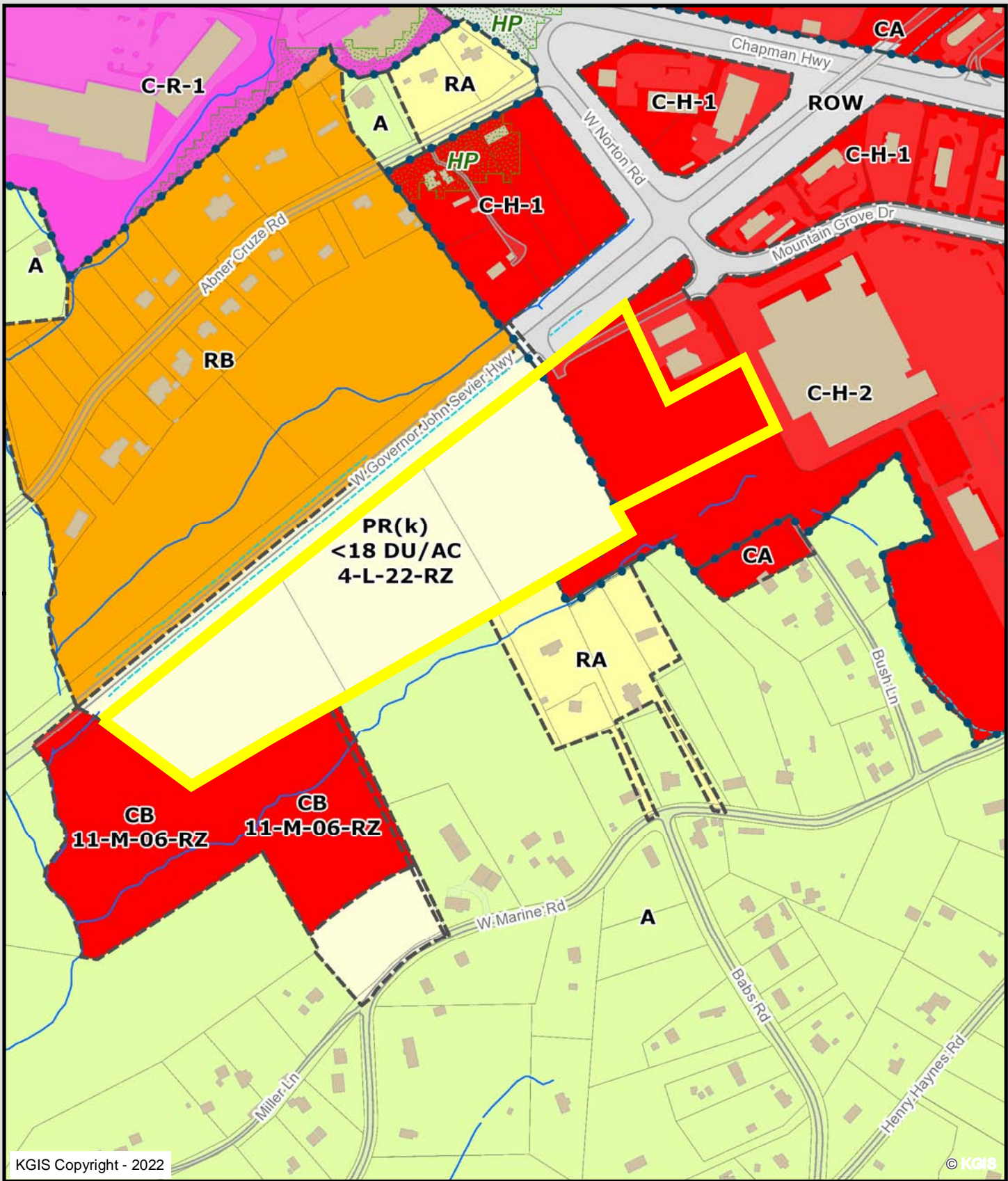
Need help reading this schedule?

Need other general information on how to ride?

[Click here to Download the General Schedule Information pdf](#) available from [katbus.com](#)

APPENDIX D

ZONING MAP



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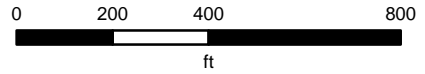
Zoning Map

Ascend at South Knoxville

Knoxville - Knox County - KUB Geographic Information System



Printed: 6/27/2022 at 1:21:34 PM



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APPENDIX E

MANUAL TRAFFIC COUNT DATA

TRAFFIC COUNT DATA

Major Street: W Governor John Sevier Highway (WB-EB)
 Minor Street: W Norton Road (SB) / Mountain Grove Drive (NB)
 Traffic Control: Traffic Signal

5/24/2022 (Tuesday)
 Morning: Overcast & Rain / Afternoon: Cloudy
 Conducted by: Ajax Engineering

TIME BEGIN	W Norton Road			W Governor John Sevier Highway			Mountain Grove Drive			W Governor John Sevier Highway			VEHICLE TOTAL	PEAK HOUR
	SOUTHBOUND			WESTBOUND			NORTHBOUND			EASTBOUND				
	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT		
7:00 AM	12	9	8	7	105	1	44	1	7	8	60	41	303	
7:15 AM	13	16	8	18	119	1	28	0	18	3	93	58	375	7:15 AM - 8:15 AM
7:30 AM	15	9	12	15	135	1	49	4	22	13	90	43	408	
7:45 AM	18	14	22	12	93	2	34	1	11	11	91	46	355	
8:00 AM	12	17	26	12	124	1	47	1	18	8	60	51	377	
8:15 AM	10	17	16	20	111	0	37	5	16	10	79	38	359	
8:30 AM	15	16	13	10	92	3	42	1	20	7	84	45	348	
8:45 AM	8	19	11	7	72	2	27	3	15	16	68	39	287	
TOTAL	103	117	116	101	851	11	308	16	127	76	625	361	2812	
2:00 PM	17	28	21	6	63	1	46	0	16	14	80	55	347	
2:15 PM	17	21	18	15	73	1	49	4	10	12	80	71	371	
2:30 PM	18	21	30	10	65	4	34	2	13	12	65	42	316	
2:45 PM	10	34	18	5	79	4	26	1	21	16	70	71	355	
3:00 PM	21	22	26	12	94	3	45	1	30	12	59	75	400	
3:15 PM	22	24	28	8	78	1	35	6	19	17	89	52	379	
3:30 PM	19	30	19	13	87	3	43	2	20	18	79	57	390	
3:45 PM	27	29	23	13	103	1	32	3	19	16	85	83	434	
4:00 PM	19	28	29	15	96	3	38	5	21	16	107	76	453	
4:15 PM	29	28	28	12	70	4	47	5	15	15	89	80	422	
4:30 PM	28	37	42	15	97	1	37	5	17	17	80	87	463	
4:45 PM	16	39	31	8	105	1	38	2	21	18	91	93	463	4:45 PM - 5:45 PM
5:00 PM	27	29	33	20	100	2	44	6	24	20	91	89	485	
5:15 PM	22	32	32	13	91	4	51	4	32	10	99	87	477	
5:30 PM	26	24	35	14	101	1	56	0	20	16	105	90	488	
5:45 PM	18	28	27	12	81	1	47	1	13	15	106	82	431	
TOTAL	336	454	440	191	1383	35	668	47	311	244	1375	1190	6674	

2022 AM Peak Hour **7:15 AM - 8:15 AM**

TIME BEGIN	W Norton Road			W Governor John Sevier Highway			Mountain Grove Drive			W Governor John Sevier Highway		
	SOUTHBOUND			WESTBOUND			NORTHBOUND			EASTBOUND		
	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT
7:15 AM	13	16	8	18	119	1	28	0	18	3	93	58
7:30 AM	15	9	12	15	135	1	49	4	22	13	90	43
7:45 AM	18	14	22	12	93	2	34	1	11	11	91	46
8:00 AM	12	17	26	12	124	1	47	1	18	8	60	51
TOTAL	58	56	68	57	471	5	158	6	69	35	334	198
PHF	0.81	0.82	0.65	0.79	0.87	0.63	0.81	0.38	0.78	0.67	0.90	0.85

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

TIME BEGIN	W Norton Road			W Governor John Sevier Highway			Mountain Grove Drive			W Governor John Sevier Highway		
	SOUTHBOUND			WESTBOUND			NORTHBOUND			EASTBOUND		
	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT
4:45 PM	16	39	31	8	105	1	38	2	21	18	91	93
5:00 PM	27	29	33	20	100	2	44	6	24	20	91	89
5:15 PM	22	32	32	13	91	4	51	4	32	10	99	87
5:30 PM	26	24	35	14	101	1	56	0	20	16	105	90
TOTAL	91	124	131	55	397	8	189	12	97	64	386	359
PHF	0.84	0.79	0.94	0.69	0.95	0.50	0.84	0.50	0.76	0.80	0.92	0.97

TRAFFIC COUNT DATA

Major Street: W Governor John Sevier Highway (WB and EB)
 Minor Street: Weigel's Driveway (NB)
 Traffic Control: Stop Sign on Weigel's Driveway

5/24/2022 (Tuesday)
 Morning: Overcast & Rain / Afternoon: Cloudy
 Conducted by: Ajax Engineering

TIME BEGIN	W Gover John Sevier Highway WESTBOUND		Weigel's Driveway NORTHBOUND		W Governor John Sevier Highway EASTBOUND		VEHICLE TOTAL	PEAK HOUR
	LT	THRU	LT	RT	THRU	RT		
7:00 AM	0	157	1	0	109	6	273	
7:15 AM	0	155	0	0	154	12	321	7:15 AM - 8:15 AM
7:30 AM	1	195	1	5	141	12	355	
7:45 AM	1	148	4	1	147	10	311	
8:00 AM	1	196		0	119	8	325	
8:15 AM	2	162	5	0	127	9	305	
8:30 AM	0	147	1	0	136	14	298	
8:45 AM	2	108	0	0	123	10	243	
TOTAL	7	1268	13	6	1056	81	2431	
2:00 PM	0	130	1	1	148	7	287	
2:15 PM	0	140	0	0	163	12	315	
2:30 PM	0	129	1	0	119	7	256	
2:45 PM	2	121	0	0	157	14	294	
3:00 PM	0	165	0	0	146	10	321	
3:15 PM	0	141	2	0	158	10	311	
3:30 PM	2	147		2	152	10	313	
3:45 PM	2	156	3	1	183	4	349	
4:00 PM	0	163	1	1	198	14	377	
4:15 PM	0	145	1	2	182	8	338	
4:30 PM	0	176	1	0	184	13	374	
4:45 PM	1	173	1	0	202	9	386	4:45 PM - 5:45 PM
5:00 PM	0	177	2	3	197	16	395	
5:15 PM	3	171	1	1	195	17	388	
5:30 PM	0	192	1	1	210	5	409	
5:45 PM	1	154	0	5	198	11	369	
TOTAL	11	2480	15	17	2792	167	5482	

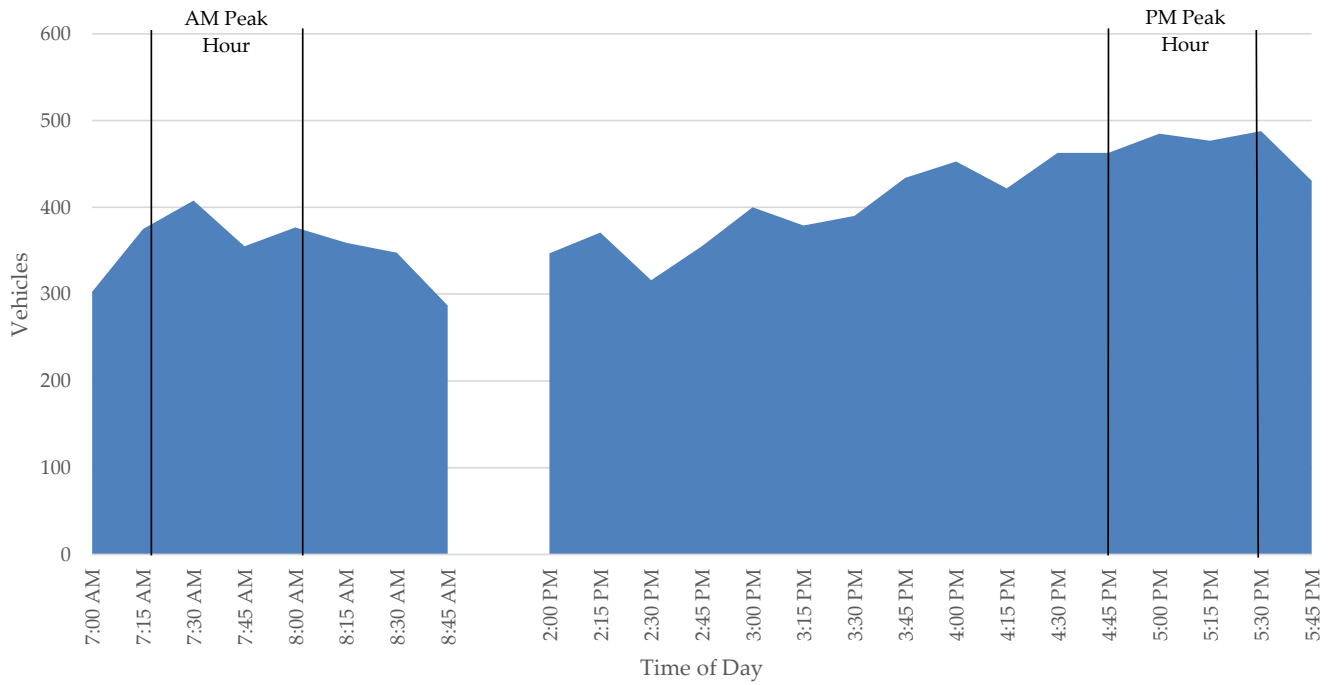
2022 AM Peak Hour **7:15 AM - 8:15 AM**

TIME BEGIN	W Gover John Sevier Highway WESTBOUND		Weigel's Driveway NORTHBOUND		W Governor John Sevier Highway EASTBOUND	
	LT	THRU	LT	RT	THRU	RT
7:15 AM	0	155	0	0	154	12
7:30 AM	1	195	1	5	141	12
7:45 AM	1	148		1	147	10
8:00 AM	1	196	1	0	119	8
TOTAL	3	694	6	6	561	42
PHF	0.75	0.89	0.38	0.30	0.91	0.88

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

TIME BEGIN	W Gover John Sevier Highway WESTBOUND		Weigel's Driveway NORTHBOUND		W Governor John Sevier Highway EASTBOUND	
	LT	THRU	LT	RT	THRU	RT
4:45 PM	1	173	1	0	202	9
5:00 PM	0	177	2	3	197	16
5:15 PM	3	171		1	195	17
5:30 PM	0	192	1	1	210	5
TOTAL	4	713	5	5	804	47
PHF	0.33	0.93	0.63	0.42	0.96	0.69

**W Governor John Sevier Highway at Mountain Grove Drive / W Norton Road
Intersection Count Totals
5/24/2022**



APPENDIX F

CAPACITY ANALYSES – HCM WORKSHEETS (SYNCHRO 11)

EXISTING CONDITIONS

HCM Signalized Intersection Capacity Analysis

3: Mountain Grove Drive/W Norton Road & W Governor John Sevier Highway

06/23/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↘	↖	↗	↘	↖	↗	↘	↖	↗	↘
Traffic Volume (vph)	35	334	198	57	471	5	158	6	69	58	56	68
Future Volume (vph)	35	334	198	57	471	5	158	6	69	58	56	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			3%			-3%	
Total Lost time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1623	1757	1537	1770	1828	1647	1710	1872	1575	1607	1769	1389
Flt Permitted	0.30	1.00	1.00	0.44	1.00	1.00	0.40	1.00	1.00	0.75	1.00	1.00
Satd. Flow (perm)	519	1757	1537	824	1828	1647	723	1872	1575	1264	1769	1389
Peak-hour factor, PHF	0.67	0.90	0.85	0.79	0.87	0.63	0.81	0.38	0.78	0.81	0.82	0.65
Adj. Flow (vph)	52	371	233	72	541	8	195	16	88	72	68	105
RTOR Reduction (vph)	0	0	132	0	0	4	0	0	74	0	0	96
Lane Group Flow (vph)	52	371	101	72	541	4	195	16	14	72	68	9
Heavy Vehicles (%)	9%	6%	3%	4%	6%	0%	4%	0%	1%	14%	9%	18%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	38.5	35.8	35.8	40.5	36.8	36.8	25.3	13.3	13.3	13.6	7.1	7.1
Effective Green, g (s)	38.5	35.8	35.8	40.5	36.8	36.8	25.3	13.3	13.3	13.6	7.1	7.1
Actuated g/C Ratio	0.46	0.43	0.43	0.49	0.44	0.44	0.31	0.16	0.16	0.16	0.09	0.09
Clearance Time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Vehicle Extension (s)	4.0	5.0	5.0	4.0	5.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	277	759	664	445	812	732	372	300	252	234	151	119
v/s Ratio Prot	0.01	0.21		c0.01	c0.30		c0.08	0.01		0.02	0.04	
v/s Ratio Perm	0.08		0.07	0.07		0.00	c0.08		0.01	0.03		0.01
v/c Ratio	0.19	0.49	0.15	0.16	0.67	0.00	0.52	0.05	0.06	0.31	0.45	0.08
Uniform Delay, d1	13.2	16.9	14.3	11.6	18.2	12.8	22.8	29.4	29.4	30.3	36.0	34.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	2.2	0.5	0.2	4.3	0.0	1.3	0.1	0.1	0.8	2.1	0.3
Delay (s)	13.7	19.2	14.8	11.8	22.5	12.8	24.1	29.5	29.5	31.0	38.1	35.1
Level of Service	B	B	B	B	C	B	C	C	C	C	D	D
Approach Delay (s)		17.2			21.1			26.0			34.7	
Approach LOS		B			C			C			C	

Intersection Summary

HCM 2000 Control Delay	22.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	82.8	Sum of lost time (s)	23.5
Intersection Capacity Utilization	59.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

6: Weigel's Driveway & W Governor John Sevier Highway

06/23/2022



























Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↑	↑		↑
Traffic Volume (veh/h)	561	42	3	694	0	6
Future Volume (Veh/h)	561	42	3	694	0	6
Sign Control	Free			Free	Stop	
Grade	1%			-3%	-2%	
Peak Hour Factor	0.91	0.88	0.75	0.89	0.90	0.30
Hourly flow rate (vph)	616	48	4	780	0	20
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL		TWLTL			
Median storage (veh)	2		2			
Upstream signal (ft)			536			
pX, platoon unblocked					0.67	
vC, conflicting volume			664	1404	616	
vC1, stage 1 conf vol				616		
vC2, stage 2 conf vol				788		
vCu, unblocked vol			664	1358	616	
tC, single (s)			4.1	6.4	6.2	
tC, 2 stage (s)				5.4		
tF (s)			2.2	3.5	3.3	
p0 queue free %			100	100	96	
cM capacity (veh/h)			935	349	494	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	616	48	4	780	20	
Volume Left	0	0	4	0	0	
Volume Right	0	48	0	0	20	
cSH	1700	1700	935	1700	494	
Volume to Capacity	0.36	0.03	0.00	0.46	0.04	
Queue Length 95th (ft)	0	0	0	0	3	
Control Delay (s)	0.0	0.0	8.9	0.0	12.6	
Lane LOS	A			B		
Approach Delay (s)	0.0		0.0		12.6	
Approach LOS				B		
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			39.9%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

3: Mountain Grove Drive/W Norton Road & W Governor John Sevier Highway

06/23/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	64	386	359	55	397	8	189	12	97	91	124	131
Future Volume (vph)	64	386	359	55	397	8	189	12	97	91	124	131
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			3%				-3%
Total Lost time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1769	1773	1583	1841	1900	1647	1778	1872	1575	1832	1909	1623
Flt Permitted	0.37	1.00	1.00	0.36	1.00	1.00	0.43	1.00	1.00	0.74	1.00	1.00
Satd. Flow (perm)	680	1773	1583	704	1900	1647	809	1872	1575	1430	1909	1623
Peak-hour factor, PHF	0.80	0.92	0.97	0.69	0.95	0.50	0.84	0.50	0.76	0.84	0.79	0.94
Adj. Flow (vph)	80	420	370	80	418	16	225	24	128	108	157	139
RTOR Reduction (vph)	0	0	228	0	0	10	0	0	99	0	0	117
Lane Group Flow (vph)	80	420	142	80	418	6	225	24	29	108	157	22
Heavy Vehicles (%)	0%	5%	0%	0%	2%	0%	0%	0%	1%	0%	1%	1%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	37.8	34.0	34.0	37.8	34.0	34.0	32.8	19.9	19.9	21.3	13.9	13.9
Effective Green, g (s)	37.8	34.0	34.0	37.8	34.0	34.0	32.8	19.9	19.9	21.3	13.9	13.9
Actuated g/C Ratio	0.43	0.38	0.38	0.43	0.38	0.38	0.37	0.22	0.22	0.24	0.16	0.16
Clearance Time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Vehicle Extension (s)	4.0	5.0	5.0	4.0	5.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	336	680	607	349	729	632	446	420	353	377	299	254
v/s Ratio Prot	c0.01	c0.24		0.01	0.22		c0.08	0.01		0.02	0.08	
v/s Ratio Perm	0.09		0.09	0.09		0.00	c0.11		0.02	0.04		0.01
v/c Ratio	0.24	0.62	0.23	0.23	0.57	0.01	0.50	0.06	0.08	0.29	0.53	0.09
Uniform Delay, d1	15.9	22.0	18.5	15.9	21.6	16.9	20.4	27.0	27.1	27.2	34.3	31.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	4.2	0.9	0.5	3.3	0.0	0.9	0.1	0.1	0.4	1.7	0.1
Delay (s)	16.4	26.2	19.4	16.3	24.8	16.9	21.3	27.0	27.2	27.6	36.0	32.1
Level of Service	B	C	B	B	C	B	C	C	C	C	D	C
Approach Delay (s)		22.4			23.3			23.7			32.4	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			24.7			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			88.6			Sum of lost time (s)			23.5			
Intersection Capacity Utilization			61.8%			ICU Level of Service			B			
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

6: Weigel's Driveway & W Governor John Sevier Highway

06/23/2022



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↑	↑		↑
Traffic Volume (veh/h)	804	47	4	713	0	5
Future Volume (Veh/h)	804	47	4	713	0	5
Sign Control	Free			Free	Stop	
Grade	1%			-3%	-2%	
Peak Hour Factor	0.96	0.69	0.33	0.93	0.90	0.42
Hourly flow rate (vph)	838	68	12	767	0	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL		TWLTL			
Median storage (veh)	2		2			
Upstream signal (ft)			536			
pX, platoon unblocked					0.72	
vC, conflicting volume			906	1629	838	
vC1, stage 1 conf vol				838		
vC2, stage 2 conf vol				791		
vCu, unblocked vol			906	1680	838	
tC, single (s)			4.1	6.4	6.2	
tC, 2 stage (s)				5.4		
tF (s)			2.2	3.5	3.3	
p0 queue free %			98	100	97	
cM capacity (veh/h)			759	303	369	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	838	68	12	767	12	
Volume Left	0	0	12	0	0	
Volume Right	0	68	0	0	12	
cSH	1700	1700	759	1700	369	
Volume to Capacity	0.49	0.04	0.02	0.45	0.03	
Queue Length 95th (ft)	0	0	1	0	3	
Control Delay (s)	0.0	0.0	9.8	0.0	15.1	
Lane LOS			A	C		
Approach Delay (s)	0.0		0.2	15.1		
Approach LOS				C		
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			52.3%	ICU Level of Service	A	
Analysis Period (min)			15			

PROJECTED CONDITIONS (WITHOUT THE PROJECT)

HCM Signalized Intersection Capacity Analysis

3: Mountain Grove Drive/W Norton Road & W Governor John Sevier Highway

06/23/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↘	↖	↗	↘	↖	↗	↘	↖	↗	↘
Traffic Volume (vph)	37	354	210	60	499	5	167	6	73	61	59	72
Future Volume (vph)	37	354	210	60	499	5	167	6	73	61	59	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			3%			-3%	
Total Lost time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1623	1757	1537	1770	1828	1647	1710	1872	1575	1607	1769	1389
Flt Permitted	0.27	1.00	1.00	0.42	1.00	1.00	0.40	1.00	1.00	0.75	1.00	1.00
Satd. Flow (perm)	461	1757	1537	779	1828	1647	724	1872	1575	1264	1769	1389
Peak-hour factor, PHF	0.67	0.90	0.85	0.79	0.87	0.63	0.81	0.38	0.78	0.81	0.82	0.65
Adj. Flow (vph)	55	393	247	76	574	8	206	16	94	75	72	111
RTOR Reduction (vph)	0	0	141	0	0	4	0	0	79	0	0	101
Lane Group Flow (vph)	55	393	106	76	574	4	206	16	15	75	72	10
Heavy Vehicles (%)	9%	6%	3%	4%	6%	0%	4%	0%	1%	14%	9%	18%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	38.5	35.8	35.8	40.5	36.8	36.8	25.8	13.7	13.7	13.8	7.2	7.2
Effective Green, g (s)	38.5	35.8	35.8	40.5	36.8	36.8	25.8	13.7	13.7	13.8	7.2	7.2
Actuated g/C Ratio	0.46	0.43	0.43	0.49	0.44	0.44	0.31	0.16	0.16	0.17	0.09	0.09
Clearance Time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Vehicle Extension (s)	4.0	5.0	5.0	4.0	5.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	250	755	660	422	807	727	379	307	259	236	152	120
v/s Ratio Prot	0.01	0.22		c0.01	c0.31		c0.09	0.01		0.03	0.04	
v/s Ratio Perm	0.09		0.07	0.08		0.00	c0.08		0.01	0.03		0.01
v/c Ratio	0.22	0.52	0.16	0.18	0.71	0.00	0.54	0.05	0.06	0.32	0.47	0.08
Uniform Delay, d1	13.8	17.4	14.5	11.9	18.9	13.0	22.8	29.3	29.4	30.4	36.2	35.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	2.6	0.5	0.3	5.3	0.0	1.6	0.1	0.1	0.8	2.3	0.3
Delay (s)	14.4	20.0	15.1	12.2	24.2	13.0	24.4	29.4	29.5	31.2	38.6	35.3
Level of Service	B	C	B	B	C	B	C	C	C	C	D	D
Approach Delay (s)		17.8			22.7			26.1			35.0	
Approach LOS		B			C			C			D	

Intersection Summary

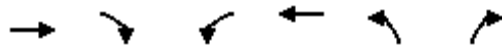
HCM 2000 Control Delay	23.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	83.3	Sum of lost time (s)	23.5
Intersection Capacity Utilization	61.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

6: Weigel's Driveway & W Governor John Sevier Highway

06/23/2022



























Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↖	↑		↗
Traffic Volume (veh/h)	595	42	3	735	0	6
Future Volume (Veh/h)	595	42	3	735	0	6
Sign Control	Free			Free	Stop	
Grade	1%			-3%	-2%	
Peak Hour Factor	0.91	0.88	0.75	0.89	0.90	0.30
Hourly flow rate (vph)	654	48	4	826	0	20
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL		TWLTL			
Median storage veh)	2		2			
Upstream signal (ft)			536			
pX, platoon unblocked					0.64	
vC, conflicting volume			702		1488 654	
vC1, stage 1 conf vol					654	
vC2, stage 2 conf vol					834	
vCu, unblocked vol			702		1481 654	
tC, single (s)			4.1		6.4 6.2	
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5 3.3	
p0 queue free %			100		100 96	
cM capacity (veh/h)			905		324 470	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	654	48	4	826	20	
Volume Left	0	0	4	0	0	
Volume Right	0	48	0	0	20	
cSH	1700	1700	905	1700	470	
Volume to Capacity	0.38	0.03	0.00	0.49	0.04	
Queue Length 95th (ft)	0	0	0	0	3	
Control Delay (s)	0.0	0.0	9.0	0.0	13.0	
Lane LOS			A		B	
Approach Delay (s)	0.0		0.0		13.0	
Approach LOS					B	
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			42.0%		ICU Level of Service A	
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

3: Mountain Grove Drive/W Norton Road & W Governor John Sevier Highway

06/23/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	409	381	58	421	8	200	13	103	96	131	139
Future Volume (vph)	68	409	381	58	421	8	200	13	103	96	131	139
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			3%			-3%	
Total Lost time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1769	1773	1583	1841	1900	1647	1778	1872	1575	1832	1909	1623
Flt Permitted	0.33	1.00	1.00	0.33	1.00	1.00	0.42	1.00	1.00	0.74	1.00	1.00
Satd. Flow (perm)	622	1773	1583	643	1900	1647	777	1872	1575	1428	1909	1623
Peak-hour factor, PHF	0.80	0.92	0.97	0.69	0.95	0.50	0.84	0.50	0.76	0.84	0.79	0.94
Adj. Flow (vph)	85	445	393	84	443	16	238	26	136	114	166	148
RTOR Reduction (vph)	0	0	243	0	0	10	0	0	105	0	0	125
Lane Group Flow (vph)	85	445	150	84	443	6	238	26	31	114	166	23
Heavy Vehicles (%)	0%	5%	0%	0%	2%	0%	0%	0%	1%	0%	1%	1%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	37.9	34.1	34.1	37.9	34.1	34.1	33.6	20.6	20.6	21.7	14.2	14.2
Effective Green, g (s)	37.9	34.1	34.1	37.9	34.1	34.1	33.6	20.6	20.6	21.7	14.2	14.2
Actuated g/C Ratio	0.42	0.38	0.38	0.42	0.38	0.38	0.38	0.23	0.23	0.24	0.16	0.16
Clearance Time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Vehicle Extension (s)	4.0	5.0	5.0	4.0	5.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	312	675	603	323	723	627	447	430	362	380	302	257
v/s Ratio Prot	c0.01	c0.25		0.01	0.23		c0.08	0.01		0.03	0.09	
v/s Ratio Perm	0.10		0.09	0.10		0.00	c0.12		0.02	0.05		0.01
v/c Ratio	0.27	0.66	0.25	0.26	0.61	0.01	0.53	0.06	0.09	0.30	0.55	0.09
Uniform Delay, d1	16.4	22.9	18.9	16.4	22.4	17.2	20.5	26.9	27.1	27.4	34.7	32.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	5.0	1.0	0.6	3.9	0.0	1.2	0.1	0.1	0.4	2.0	0.2
Delay (s)	17.1	27.9	19.9	17.0	26.2	17.2	21.7	27.0	27.2	27.8	36.7	32.3
Level of Service	B	C	B	B	C	B	C	C	C	C	D	C
Approach Delay (s)		23.5			24.5			23.9			32.8	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			25.6				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			89.5				Sum of lost time (s)		23.5			
Intersection Capacity Utilization			63.9%				ICU Level of Service		B			
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 6: Weigel's Driveway & W Governor John Sevier Highway

06/23/2022



























Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↑	↑		↑
Traffic Volume (veh/h)	853	47	4	756	0	5
Future Volume (Veh/h)	853	47	4	756	0	5
Sign Control	Free			Free	Stop	
Grade	1%			-3%	-2%	
Peak Hour Factor	0.96	0.69	0.33	0.93	0.90	0.30
Hourly flow rate (vph)	889	68	12	813	0	17
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL		TWLTL			
Median storage (veh)	2		2			
Upstream signal (ft)					536	
pX, platoon unblocked					0.69	
vC, conflicting volume			957		1726	889
vC1, stage 1 conf vol					889	
vC2, stage 2 conf vol					837	
vCu, unblocked vol			957		1826	889
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			98		100	95
cM capacity (veh/h)			727		281	345
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	889	68	12	813	17	
Volume Left	0	0	12	0	0	
Volume Right	0	68	0	0	17	
cSH	1700	1700	727	1700	345	
Volume to Capacity	0.52	0.04	0.02	0.48	0.05	
Queue Length 95th (ft)	0	0	1	0	4	
Control Delay (s)	0.0	0.0	10.0	0.0	16.0	
Lane LOS			B		C	
Approach Delay (s)	0.0		0.1		16.0	
Approach LOS					C	
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			54.9%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

3: Mountain Grove Drive/W Norton Road & W Governor John Sevier Highway

06/23/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	39	367	218	63	518	6	174	7	76	64	62	75
Future Volume (vph)	39	367	218	63	518	6	174	7	76	64	62	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			3%			-3%	
Total Lost time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1623	1757	1537	1770	1828	1647	1710	1872	1575	1607	1769	1389
Flt Permitted	0.19	1.00	1.00	0.39	1.00	1.00	0.47	1.00	1.00	0.75	1.00	1.00
Satd. Flow (perm)	332	1757	1537	727	1828	1647	846	1872	1575	1261	1769	1389
Peak-hour factor, PHF	0.67	0.90	0.85	0.79	0.87	0.63	0.81	0.38	0.78	0.81	0.82	0.65
Adj. Flow (vph)	58	408	256	80	595	10	215	18	97	79	76	115
RTOR Reduction (vph)	0	0	154	0	0	6	0	0	77	0	0	100
Lane Group Flow (vph)	58	408	102	80	595	4	215	18	20	79	76	15
Heavy Vehicles (%)	9%	6%	3%	4%	6%	0%	4%	0%	1%	14%	9%	18%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	37.7	33.9	33.9	37.7	33.9	33.9	29.7	17.3	17.3	17.8	10.9	10.9
Effective Green, g (s)	37.7	33.9	33.9	37.7	33.9	33.9	29.7	17.3	17.3	17.8	10.9	10.9
Actuated g/C Ratio	0.44	0.40	0.40	0.44	0.40	0.40	0.35	0.20	0.20	0.21	0.13	0.13
Clearance Time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Vehicle Extension (s)	4.0	5.0	5.0	4.0	5.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	204	697	610	367	725	653	428	379	319	290	225	177
v/s Ratio Prot	c0.01	0.23		0.01	c0.33		c0.08	0.01		0.02	0.04	
v/s Ratio Perm	0.11		0.07	0.09		0.00	c0.10		0.01	0.03		0.01
v/c Ratio	0.28	0.59	0.17	0.22	0.82	0.01	0.50	0.05	0.06	0.27	0.34	0.08
Uniform Delay, d1	16.1	20.2	16.6	14.4	23.0	15.6	21.0	27.4	27.5	28.1	34.0	32.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0	3.6	0.6	0.4	10.1	0.0	0.9	0.1	0.1	0.5	0.9	0.2
Delay (s)	17.1	23.8	17.2	14.8	33.1	15.6	21.9	27.5	27.6	28.6	34.9	33.0
Level of Service	B	C	B	B	C	B	C	C	C	C	C	C
Approach Delay (s)		20.9			30.7			23.9			32.3	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			26.3				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			85.4				Sum of lost time (s)		23.5			
Intersection Capacity Utilization			62.7%				ICU Level of Service		B			
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 6: Weigel's Driveway & W Governor John Sevier Highway

06/23/2022



























Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↖	↑		↗
Traffic Volume (veh/h)	618	42	3	764	0	6
Future Volume (Veh/h)	618	42	3	764	0	6
Sign Control	Free			Free	Stop	
Grade	1%			-3%	-2%	
Peak Hour Factor	0.91	0.88	0.75	0.89	0.90	0.30
Hourly flow rate (vph)	679	48	4	858	0	20
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL		TWLTL			
Median storage (veh)	2		2			
Upstream signal (ft)			536			
pX, platoon unblocked					0.61	
vC, conflicting volume			727	1545	679	
vC1, stage 1 conf vol				679		
vC2, stage 2 conf vol				866		
vCu, unblocked vol			727	1574	679	
tC, single (s)			4.1	6.4	6.2	
tC, 2 stage (s)				5.4		
tF (s)			2.2	3.5	3.3	
p0 queue free %			100	100	96	
cM capacity (veh/h)			886	308	455	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	679	48	4	858	20	
Volume Left	0	0	4	0	0	
Volume Right	0	48	0	0	20	
cSH	1700	1700	886	1700	455	
Volume to Capacity	0.40	0.03	0.00	0.50	0.04	
Queue Length 95th (ft)	0	0	0	0	3	
Control Delay (s)	0.0	0.0	9.1	0.0	13.3	
Lane LOS			A	B		
Approach Delay (s)	0.0		0.0	13.3		
Approach LOS				B		
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			43.5%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

3: Mountain Grove Drive/W Norton Road & W Governor John Sevier Highway

06/23/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	425	395	61	437	9	208	13	107	100	136	144
Future Volume (vph)	70	425	395	61	437	9	208	13	107	100	136	144
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			3%			-3%	
Total Lost time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1769	1773	1583	1841	1900	1647	1778	1872	1575	1832	1909	1623
Flt Permitted	0.31	1.00	1.00	0.31	1.00	1.00	0.40	1.00	1.00	0.74	1.00	1.00
Satd. Flow (perm)	582	1773	1583	602	1900	1647	757	1872	1575	1428	1909	1623
Peak-hour factor, PHF	0.80	0.92	0.97	0.69	0.95	0.50	0.84	0.50	0.76	0.84	0.79	0.94
Adj. Flow (vph)	88	462	407	88	460	18	248	26	141	119	172	153
RTOR Reduction (vph)	0	0	253	0	0	11	0	0	108	0	0	129
Lane Group Flow (vph)	88	462	154	88	460	7	248	26	33	119	172	24
Heavy Vehicles (%)	0%	5%	0%	0%	2%	0%	0%	0%	1%	0%	1%	1%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	37.9	34.1	34.1	37.9	34.1	34.1	34.1	20.9	20.9	22.1	14.4	14.4
Effective Green, g (s)	37.9	34.1	34.1	37.9	34.1	34.1	34.1	20.9	20.9	22.1	14.4	14.4
Actuated g/C Ratio	0.42	0.38	0.38	0.42	0.38	0.38	0.38	0.23	0.23	0.25	0.16	0.16
Clearance Time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Vehicle Extension (s)	4.0	5.0	5.0	4.0	5.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	295	671	599	305	719	624	447	434	365	385	305	259
v/s Ratio Prot	c0.01	c0.26		0.01	0.24		c0.09	0.01		0.03	0.09	
v/s Ratio Perm	0.11		0.10	0.11		0.00	c0.12		0.02	0.05		0.02
v/c Ratio	0.30	0.69	0.26	0.29	0.64	0.01	0.55	0.06	0.09	0.31	0.56	0.09
Uniform Delay, d1	16.9	23.5	19.2	16.8	22.9	17.4	20.6	26.9	27.1	27.4	34.9	32.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	5.7	1.0	0.7	4.3	0.0	1.5	0.1	0.1	0.5	2.4	0.2
Delay (s)	17.6	29.2	20.3	17.6	27.2	17.5	22.1	27.0	27.2	27.9	37.3	32.4
Level of Service	B	C	C	B	C	B	C	C	C	C	D	C
Approach Delay (s)		24.3			25.4			24.1			33.1	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			26.2				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)		23.5			
Intersection Capacity Utilization			65.4%				ICU Level of Service		C			
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

6: Weigel's Driveway & W Governor John Sevier Highway

06/23/2022



























Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↑	↑		↑
Traffic Volume (veh/h)	885	47	4	785	0	5
Future Volume (Veh/h)	885	47	4	785	0	5
Sign Control	Free			Free	Stop	
Grade	1%			-3%	-2%	
Peak Hour Factor	0.96	0.69	0.33	0.93	0.90	0.42
Hourly flow rate (vph)	922	68	12	844	0	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL		TWLTL			
Median storage (veh)	2		2			
Upstream signal (ft)			536			
pX, platoon unblocked					0.68	
vC, conflicting volume			990	1790	922	
vC1, stage 1 conf vol				922		
vC2, stage 2 conf vol				868		
vCu, unblocked vol			990	1928	922	
tC, single (s)			4.1	6.4	6.2	
tC, 2 stage (s)				5.4		
tF (s)			2.2	3.5	3.3	
p0 queue free %			98	100	96	
cM capacity (veh/h)			706	267	330	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	922	68	12	844	12	
Volume Left	0	0	12	0	0	
Volume Right	0	68	0	0	12	
cSH	1700	1700	706	1700	330	
Volume to Capacity	0.54	0.04	0.02	0.50	0.04	
Queue Length 95th (ft)	0	0	1	0	3	
Control Delay (s)	0.0	0.0	10.2	0.0	16.3	
Lane LOS			B	C		
Approach Delay (s)	0.0		0.1	16.3		
Approach LOS				C		
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			56.6%	ICU Level of Service	B	
Analysis Period (min)			15			

PROJECTED CONDITIONS (WITH THE PROJECT)

HCM Signalized Intersection Capacity Analysis

3: Mountain Grove Drive/W Norton Road & W Governor John Sevier Highway

10/21/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	382	210	60	509	5	173	6	73	61	59	74
Future Volume (vph)	42	382	210	60	509	5	173	6	73	61	59	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			3%			-3%	
Total Lost time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1623	1757	1537	1770	1828	1647	1710	1872	1575	1607	1769	1389
Flt Permitted	0.23	1.00	1.00	0.39	1.00	1.00	0.40	1.00	1.00	0.75	1.00	1.00
Satd. Flow (perm)	398	1757	1537	733	1828	1647	724	1872	1575	1264	1769	1389
Peak-hour factor, PHF	0.67	0.90	0.85	0.79	0.87	0.63	0.81	0.38	0.78	0.81	0.82	0.65
Adj. Flow (vph)	63	424	247	76	585	8	214	16	94	75	72	114
RTOR Reduction (vph)	0	0	143	0	0	5	0	0	78	0	0	104
Lane Group Flow (vph)	63	424	104	76	585	3	214	16	16	75	72	10
Heavy Vehicles (%)	9%	6%	3%	4%	6%	0%	4%	0%	1%	14%	9%	18%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	38.5	34.8	34.8	38.5	34.8	34.8	26.1	14.1	14.1	13.7	7.2	7.2
Effective Green, g (s)	38.5	34.8	34.8	38.5	34.8	34.8	26.1	14.1	14.1	13.7	7.2	7.2
Actuated g/C Ratio	0.47	0.42	0.42	0.47	0.42	0.42	0.32	0.17	0.17	0.17	0.09	0.09
Clearance Time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Vehicle Extension (s)	4.0	5.0	5.0	4.0	5.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	240	740	647	388	770	693	388	319	268	236	154	121
v/s Ratio Prot	c0.01	0.24		0.01	c0.32		c0.09	0.01		0.02	0.04	
v/s Ratio Perm	0.11		0.07	0.08		0.00	c0.08		0.01	0.03		0.01
v/c Ratio	0.26	0.57	0.16	0.20	0.76	0.00	0.55	0.05	0.06	0.32	0.47	0.08
Uniform Delay, d1	14.0	18.2	14.8	12.7	20.3	13.9	22.3	28.6	28.7	30.1	35.9	34.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	3.2	0.5	0.3	6.9	0.0	1.7	0.1	0.1	0.8	2.2	0.3
Delay (s)	14.8	21.4	15.4	13.1	27.3	13.9	24.0	28.7	28.8	30.9	38.1	35.0
Level of Service	B	C	B	B	C	B	C	C	C	C	D	C
Approach Delay (s)		18.8			25.5			25.6			34.7	
Approach LOS		B			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			24.3				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			82.6				Sum of lost time (s)			23.5		
Intersection Capacity Utilization			62.2%				ICU Level of Service			B		
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

6: Weigel's Driveway & W Governor John Sevier Highway

10/21/2022



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↘	↑		↗
Traffic Volume (veh/h)	604	47	12	744	0	30
Future Volume (Veh/h)	604	47	12	744	0	30
Sign Control	Free			Free	Stop	
Grade	1%			-3%	-2%	
Peak Hour Factor	0.91	0.88	0.75	0.89	0.90	0.30
Hourly flow rate (vph)	664	53	16	836	0	100
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL		TWLTL			
Median storage (veh)	2		2			
Upstream signal (ft)			536			
pX, platoon unblocked					0.63	
vC, conflicting volume			717		1532	
vC1, stage 1 conf vol					664	
vC2, stage 2 conf vol					868	
vCu, unblocked vol			717		1551	
tC, single (s)			4.1		6.4	
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	
p0 queue free %			98		100	
cM capacity (veh/h)			893		307	
					464	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	664	53	16	836	100	
Volume Left	0	0	16	0	0	
Volume Right	0	53	0	0	100	
cSH	1700	1700	893	1700	464	
Volume to Capacity	0.39	0.03	0.02	0.49	0.22	
Queue Length 95th (ft)	0	0	1	0	20	
Control Delay (s)	0.0	0.0	9.1	0.0	14.9	
Lane LOS			A		B	
Approach Delay (s)	0.0		0.2		14.9	
Approach LOS					B	
Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization			42.5%		ICU Level of Service	
Analysis Period (min)			15		A	

HCM Unsignalized Intersection Capacity Analysis

9: Proposed West Entrance & W Governor John Sevier Highway

10/21/2022



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻		↻	↻	↻	↻
Traffic Volume (veh/h)	642	7	3	741	52	9
Future Volume (Veh/h)	642	7	3	741	52	9
Sign Control	Free			Free	Stop	
Grade	4%			-4%	0%	
Peak Hour Factor	0.91	0.90	0.90	0.89	0.90	0.90
Hourly flow rate (vph)	705	8	3	833	58	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	TWLTL		TWLTL			
Median storage (veh)	2		2			
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			713		1548	709
vC1, stage 1 conf vol					709	
vC2, stage 2 conf vol					839	
vCu, unblocked vol			713		1548	709
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			100		83	98
cM capacity (veh/h)			896		337	438
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	713	3	833	68		
Volume Left	0	3	0	58		
Volume Right	8	0	0	10		
cSH	1700	896	1700	395		
Volume to Capacity	0.42	0.00	0.49	0.17		
Queue Length 95th (ft)	0	0	0	15		
Control Delay (s)	0.0	9.0	0.0	17.2		
Lane LOS	A		C			
Approach Delay (s)	0.0	0.0	17.2			
Approach LOS	C					
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			49.0%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

3: Mountain Grove Drive/W Norton Road & W Governor John Sevier Highway

10/21/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑	↗	↘	↑	↗	↘	↑	↗	↘	↑	↗
Traffic Volume (vph)	75	436	381	58	440	8	205	13	103	96	131	153
Future Volume (vph)	75	436	381	58	440	8	205	13	103	96	131	153
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			3%				-3%
Total Lost time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1769	1773	1583	1841	1900	1647	1778	1872	1575	1832	1909	1623
Flt Permitted	0.31	1.00	1.00	0.30	1.00	1.00	0.41	1.00	1.00	0.74	1.00	1.00
Satd. Flow (perm)	579	1773	1583	579	1900	1647	776	1872	1575	1428	1909	1623
Peak-hour factor, PHF	0.80	0.92	0.97	0.69	0.95	0.50	0.84	0.50	0.76	0.84	0.79	0.94
Adj. Flow (vph)	94	474	393	84	463	16	244	26	136	114	166	163
RTOR Reduction (vph)	0	0	244	0	0	10	0	0	104	0	0	137
Lane Group Flow (vph)	94	474	149	84	463	6	244	26	32	114	166	26
Heavy Vehicles (%)	0%	5%	0%	0%	2%	0%	0%	0%	1%	0%	1%	1%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	37.9	34.1	34.1	37.9	34.1	34.1	33.8	20.8	20.8	21.7	14.2	14.2
Effective Green, g (s)	37.9	34.1	34.1	37.9	34.1	34.1	33.8	20.8	20.8	21.7	14.2	14.2
Actuated g/C Ratio	0.42	0.38	0.38	0.42	0.38	0.38	0.38	0.23	0.23	0.24	0.16	0.16
Clearance Time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Vehicle Extension (s)	4.0	5.0	5.0	4.0	5.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	295	674	601	298	722	626	449	434	365	379	302	256
v/s Ratio Prot	c0.01	c0.27		0.01	0.24		c0.09	0.01		0.03	0.09	
v/s Ratio Perm	0.12		0.09	0.11		0.00	c0.12		0.02	0.05		0.02
v/c Ratio	0.32	0.70	0.25	0.28	0.64	0.01	0.54	0.06	0.09	0.30	0.55	0.10
Uniform Delay, d1	16.8	23.5	19.0	16.8	22.8	17.3	20.5	26.8	27.0	27.5	34.8	32.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	6.1	1.0	0.7	4.3	0.0	1.3	0.1	0.1	0.4	2.0	0.2
Delay (s)	17.7	29.6	20.0	17.5	27.1	17.3	21.9	26.9	27.1	27.9	36.8	32.5
Level of Service	B	C	C	B	C	B	C	C	C	C	D	C
Approach Delay (s)		24.5			25.4			24.0			32.9	
Approach LOS		C			C			C			C	

Intersection Summary		
HCM 2000 Control Delay	26.2	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.64	C
Actuated Cycle Length (s)	89.7	Sum of lost time (s)
Intersection Capacity Utilization	65.2%	23.5
Analysis Period (min)	15	ICU Level of Service
		C

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

6: Weigel's Driveway & W Governor John Sevier Highway

10/21/2022



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↘	↑		↗
Traffic Volume (veh/h)	860	71	28	770	0	32
Future Volume (Veh/h)	860	71	28	770	0	32
Sign Control	Free			Free	Stop	
Grade	1%			-3%	-2%	
Peak Hour Factor	0.96	0.69	0.33	0.93	0.90	0.42
Hourly flow rate (vph)	896	103	85	828	0	76
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL		TWLTL			
Median storage veh)	2		2			
Upstream signal (ft)					536	
pX, platoon unblocked					0.69	
vC, conflicting volume			999		1894	896
vC1, stage 1 conf vol					896	
vC2, stage 2 conf vol					998	
vCu, unblocked vol			999		2070	896
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			88		100	78
cM capacity (veh/h)			701		223	342
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	896	103	85	828	76	
Volume Left	0	0	85	0	0	
Volume Right	0	103	0	0	76	
cSH	1700	1700	701	1700	342	
Volume to Capacity	0.53	0.06	0.12	0.49	0.22	
Queue Length 95th (ft)	0	0	10	0	21	
Control Delay (s)	0.0	0.0	10.8	0.0	18.5	
Lane LOS			B		C	
Approach Delay (s)	0.0		1.0		18.5	
Approach LOS					C	
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			55.3%		ICU Level of Service	B
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis

9: Proposed West Entrance & W Governor John Sevier Highway

10/21/2022



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻		↻	↻	↻	↻
Traffic Volume (veh/h)	924	28	9	761	34	7
Future Volume (Veh/h)	924	28	9	761	34	7
Sign Control	Free			Free	Stop	
Grade	4%			-4%	0%	
Peak Hour Factor	0.96	0.90	0.90	0.93	0.90	0.90
Hourly flow rate (vph)	962	31	10	818	38	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	TWLTL		TWLTL			
Median storage (veh)	2		2			
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			993		1816	978
vC1, stage 1 conf vol					978	
vC2, stage 2 conf vol					838	
vCu, unblocked vol			993		1816	978
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			99		87	97
cM capacity (veh/h)			704		283	307
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	993	10	818	46		
Volume Left	0	10	0	38		
Volume Right	31	0	0	8		
cSH	1700	704	1700	342		
Volume to Capacity	0.58	0.01	0.48	0.13		
Queue Length 95th (ft)	0	1	0	12		
Control Delay (s)	0.0	10.2	0.0	19.2		
Lane LOS	B		C			
Approach Delay (s)	0.0	0.1	19.2			
Approach LOS					C	
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			60.3%	ICU Level of Service		B
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

3: Mountain Grove Drive/W Norton Road & W Governor John Sevier Highway

10/21/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	403	218	63	531	6	180	7	76	64	62	77
Future Volume (vph)	45	403	218	63	531	6	180	7	76	64	62	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			3%				-3%
Total Lost time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1623	1757	1537	1770	1828	1647	1710	1872	1575	1607	1769	1389
Flt Permitted	0.18	1.00	1.00	0.34	1.00	1.00	0.47	1.00	1.00	0.75	1.00	1.00
Satd. Flow (perm)	302	1757	1537	642	1828	1647	849	1872	1575	1261	1769	1389
Peak-hour factor, PHF	0.67	0.90	0.85	0.79	0.87	0.63	0.81	0.38	0.78	0.81	0.82	0.65
Adj. Flow (vph)	67	448	256	80	610	10	222	18	97	79	76	118
RTOR Reduction (vph)	0	0	155	0	0	6	0	0	77	0	0	103
Lane Group Flow (vph)	67	448	101	80	610	4	222	18	20	79	76	15
Heavy Vehicles (%)	9%	6%	3%	4%	6%	0%	4%	0%	1%	14%	9%	18%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	37.7	33.9	33.9	37.7	33.9	33.9	30.1	17.7	17.7	17.9	11.0	11.0
Effective Green, g (s)	37.7	33.9	33.9	37.7	33.9	33.9	30.1	17.7	17.7	17.9	11.0	11.0
Actuated g/C Ratio	0.44	0.40	0.40	0.44	0.40	0.40	0.35	0.21	0.21	0.21	0.13	0.13
Clearance Time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Vehicle Extension (s)	4.0	5.0	5.0	4.0	5.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	191	694	607	332	722	650	434	386	324	290	226	178
v/s Ratio Prot	c0.02	0.26		0.01	c0.33		c0.08	0.01		0.02	0.04	
v/s Ratio Perm	0.14		0.07	0.10		0.00	c0.10		0.01	0.03		0.01
v/c Ratio	0.35	0.65	0.17	0.24	0.84	0.01	0.51	0.05	0.06	0.27	0.34	0.08
Uniform Delay, d1	16.7	21.1	16.8	14.8	23.6	15.7	21.0	27.3	27.4	28.3	34.1	33.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.5	4.6	0.6	0.5	11.6	0.0	1.0	0.1	0.1	0.5	0.9	0.2
Delay (s)	18.2	25.7	17.4	15.4	35.2	15.8	22.0	27.3	27.5	28.8	35.0	33.2
Level of Service	B	C	B	B	D	B	C	C	C	C	C	C
Approach Delay (s)		22.3			32.7			23.9			32.4	
Approach LOS		C			C			C			C	

Intersection Summary		
HCM 2000 Control Delay	27.3	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.72	C
Actuated Cycle Length (s)	85.8	Sum of lost time (s)
Intersection Capacity Utilization	63.8%	23.5
Analysis Period (min)	15	ICU Level of Service
		B

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

6: Weigel's Driveway & W Governor John Sevier Highway

10/21/2022



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↘	↑		↗
Traffic Volume (veh/h)	636	47	13	775	0	30
Future Volume (Veh/h)	636	47	13	775	0	30
Sign Control	Free			Free	Stop	
Grade	1%			-3%	-2%	
Peak Hour Factor	0.91	0.88	0.75	0.89	0.90	0.30
Hourly flow rate (vph)	699	53	17	871	0	100
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL		TWLTL			
Median storage (veh)	2		2			
Upstream signal (ft)			536			
pX, platoon unblocked					0.59	
vC, conflicting volume			752		1604 699	
vC1, stage 1 conf vol					699	
vC2, stage 2 conf vol					905	
vCu, unblocked vol			752		1675 699	
tC, single (s)			4.1		6.4 6.2	
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5 3.3	
p0 queue free %			98		100 77	
cM capacity (veh/h)			867		287 443	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	699	53	17	871	100	
Volume Left	0	0	17	0	0	
Volume Right	0	53	0	0	100	
cSH	1700	1700	867	1700	443	
Volume to Capacity	0.41	0.03	0.02	0.51	0.23	
Queue Length 95th (ft)	0	0	1	0	21	
Control Delay (s)	0.0	0.0	9.2	0.0	15.5	
Lane LOS			A		C	
Approach Delay (s)	0.0		0.2		15.5	
Approach LOS					C	
Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization			44.1%		ICU Level of Service A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

9: Proposed West Entrance & W Governor John Sevier Highway

10/21/2022



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩		↩	↩	↩	↩
Traffic Volume (veh/h)	665	10	5	770	65	18
Future Volume (Veh/h)	665	10	5	770	65	18
Sign Control	Free			Free	Stop	
Grade	4%			-4%	0%	
Peak Hour Factor	0.91	0.90	0.90	0.89	0.90	0.90
Hourly flow rate (vph)	731	11	6	865	72	20
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	TWLTL		TWLTL			
Median storage (veh)	2		2			
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			742		1614	736
vC1, stage 1 conf vol					736	
vC2, stage 2 conf vol					877	
vCu, unblocked vol			742		1614	736
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			99		78	95
cM capacity (veh/h)			874		322	422
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	742	6	865	92		
Volume Left	0	6	0	72		
Volume Right	11	0	0	20		
cSH	1700	874	1700	411		
Volume to Capacity	0.44	0.01	0.51	0.22		
Queue Length 95th (ft)	0	1	0	21		
Control Delay (s)	0.0	9.1	0.0	18.2		
Lane LOS	A		C			
Approach Delay (s)	0.0	0.1	18.2			
Approach LOS					C	
Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization			50.8%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

3: Mountain Grove Drive/W Norton Road & W Governor John Sevier Highway

10/21/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↑	↗	↖	↑	↗	↖	↑	↗
Traffic Volume (vph)	77	459	395	61	461	9	213	13	107	100	136	161
Future Volume (vph)	77	459	395	61	461	9	213	13	107	100	136	161
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			3%				-3%
Total Lost time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1769	1773	1583	1841	1900	1647	1778	1872	1575	1832	1909	1623
Flt Permitted	0.28	1.00	1.00	0.27	1.00	1.00	0.40	1.00	1.00	0.74	1.00	1.00
Satd. Flow (perm)	529	1773	1583	521	1900	1647	756	1872	1575	1428	1909	1623
Peak-hour factor, PHF	0.80	0.92	0.97	0.69	0.95	0.50	0.84	0.50	0.76	0.84	0.79	0.94
Adj. Flow (vph)	96	499	407	88	485	18	254	26	141	119	172	171
RTOR Reduction (vph)	0	0	253	0	0	11	0	0	108	0	0	144
Lane Group Flow (vph)	96	499	154	88	485	7	254	26	33	119	172	27
Heavy Vehicles (%)	0%	5%	0%	0%	2%	0%	0%	0%	1%	0%	1%	1%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	37.9	34.1	34.1	37.9	34.1	34.1	34.3	21.1	21.1	22.1	14.4	14.4
Effective Green, g (s)	37.9	34.1	34.1	37.9	34.1	34.1	34.3	21.1	21.1	22.1	14.4	14.4
Actuated g/C Ratio	0.42	0.38	0.38	0.42	0.38	0.38	0.38	0.23	0.23	0.25	0.16	0.16
Clearance Time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.0	6.0	5.5	6.0	6.0
Vehicle Extension (s)	4.0	5.0	5.0	4.0	5.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	274	670	598	274	718	622	450	437	368	384	304	259
v/s Ratio Prot	c0.01	c0.28		0.01	0.26		c0.09	0.01		0.03	0.09	
v/s Ratio Perm	0.13		0.10	0.12		0.00	c0.12		0.02	0.05		0.02
v/c Ratio	0.35	0.74	0.26	0.32	0.68	0.01	0.56	0.06	0.09	0.31	0.57	0.11
Uniform Delay, d1	17.3	24.3	19.3	17.3	23.4	17.5	20.6	26.8	27.0	27.5	35.0	32.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1	7.4	1.0	0.9	5.0	0.0	1.6	0.1	0.1	0.5	2.4	0.2
Delay (s)	18.3	31.7	20.4	18.2	28.5	17.6	22.2	26.9	27.1	28.0	37.4	32.6
Level of Service	B	C	C	B	C	B	C	C	C	C	D	C
Approach Delay (s)		25.8			26.6			24.2			33.2	
Approach LOS		C			C			C			C	

Intersection Summary		
HCM 2000 Control Delay	27.1	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.68	C
Actuated Cycle Length (s)	90.2	Sum of lost time (s)
Intersection Capacity Utilization	67.1%	23.5
Analysis Period (min)	15	ICU Level of Service
		C

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

6: Weigel's Driveway & W Governor John Sevier Highway

10/21/2022



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↑	↑		↑
Traffic Volume (veh/h)	897	71	28	807	0	34
Future Volume (Veh/h)	897	71	28	807	0	34
Sign Control	Free			Free	Stop	
Grade	1%			-3%	-2%	
Peak Hour Factor	0.96	0.69	0.33	0.93	0.90	0.42
Hourly flow rate (vph)	934	103	85	868	0	81
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL		TWLTL			
Median storage (veh)	2		2			
Upstream signal (ft)			536			
pX, platoon unblocked					0.67	
vC, conflicting volume			1037		1972 934	
vC1, stage 1 conf vol			934			
vC2, stage 2 conf vol			1038			
vCu, unblocked vol			1037		2204 934	
tC, single (s)			4.1		6.4 6.2	
tC, 2 stage (s)			5.4			
tF (s)			2.2		3.5 3.3	
p0 queue free %			87		100 75	
cM capacity (veh/h)			678		207 325	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	934	103	85	868	81	
Volume Left	0	0	85	0	0	
Volume Right	0	103	0	0	81	
cSH	1700	1700	678	1700	325	
Volume to Capacity	0.55	0.06	0.13	0.51	0.25	
Queue Length 95th (ft)	0	0	11	0	24	
Control Delay (s)	0.0	0.0	11.1	0.0	19.7	
Lane LOS			B		C	
Approach Delay (s)	0.0		1.0		19.7	
Approach LOS					C	
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			57.2%		ICU Level of Service B	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 9: Proposed West Entrance & W Governor John Sevier Highway

10/21/2022



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻		↻	↻	↻	↻
Traffic Volume (veh/h)	956	41	17	790	44	14
Future Volume (Veh/h)	956	41	17	790	44	14
Sign Control	Free			Free	Stop	
Grade	4%			-4%	0%	
Peak Hour Factor	0.96	0.90	0.90	0.93	0.90	0.90
Hourly flow rate (vph)	996	46	19	849	49	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	TWLTL		TWLTL			
Median storage (veh)	2		2			
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1042		1906	1019
vC1, stage 1 conf vol					1019	
vC2, stage 2 conf vol					887	
vCu, unblocked vol			1042		1906	1019
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			97		82	94
cM capacity (veh/h)			675		266	290
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	1042	19	849	65		
Volume Left	0	19	0	49		
Volume Right	46	0	0	16		
cSH	1700	675	1700	352		
Volume to Capacity	0.61	0.03	0.50	0.18		
Queue Length 95th (ft)	0	2	0	17		
Control Delay (s)	0.0	10.5	0.0	20.7		
Lane LOS	B		C			
Approach Delay (s)	0.0	0.2	20.7			
Approach LOS	C					
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			62.8%	ICU Level of Service	B	
Analysis Period (min)			15			

APPENDIX G

LOCAL TRIP GENERATION RATES

Local Apartment Trip Generation Study

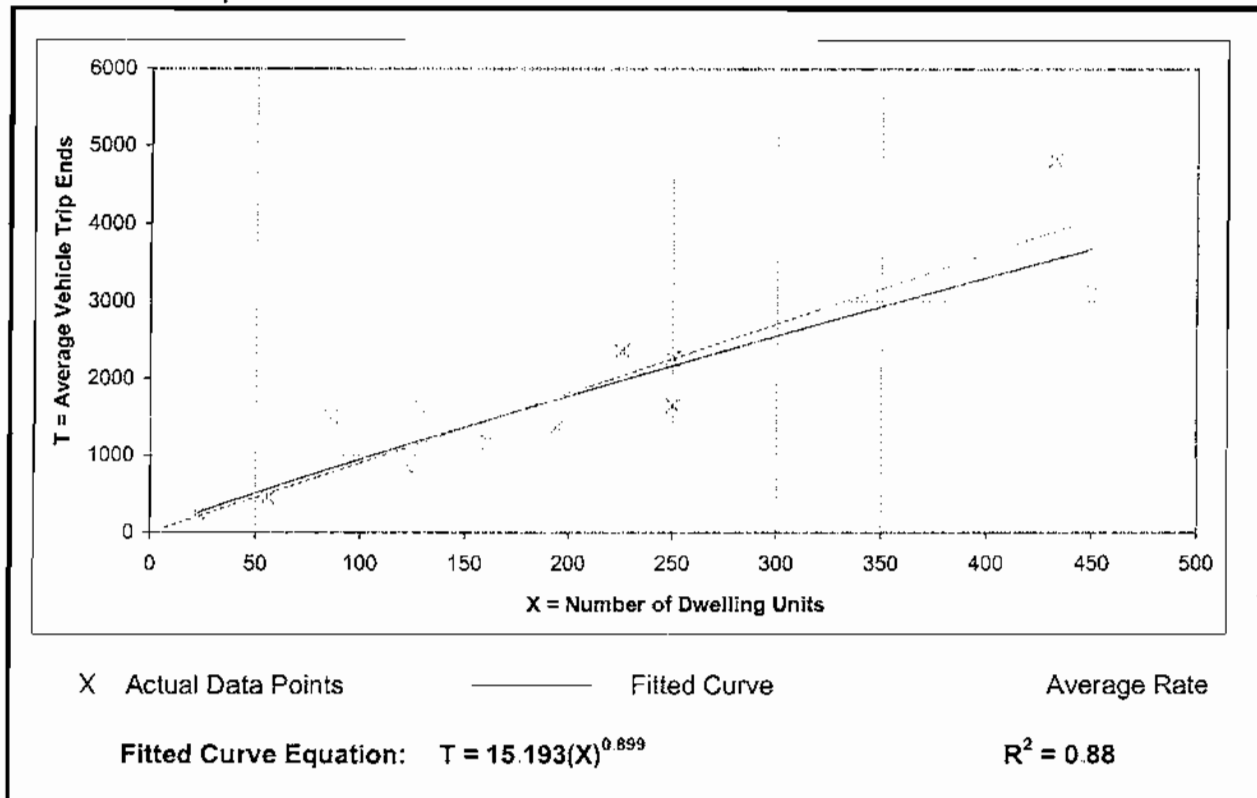
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

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

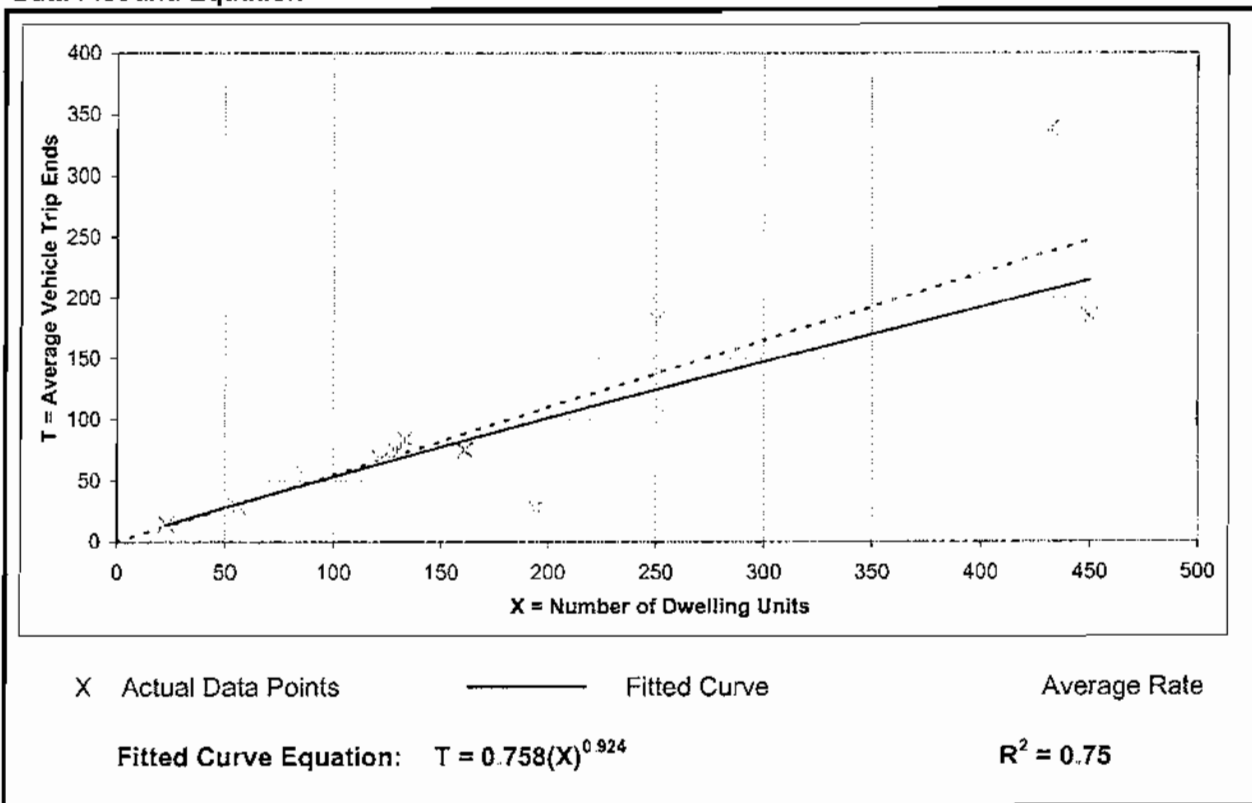
Average Vehicle Trip Ends vs: Dwelling Units
 On a: Weekday,
 Peak Hour of Adjacent Street Traffic,
 One Hour Between 7 and 9 a.m.

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

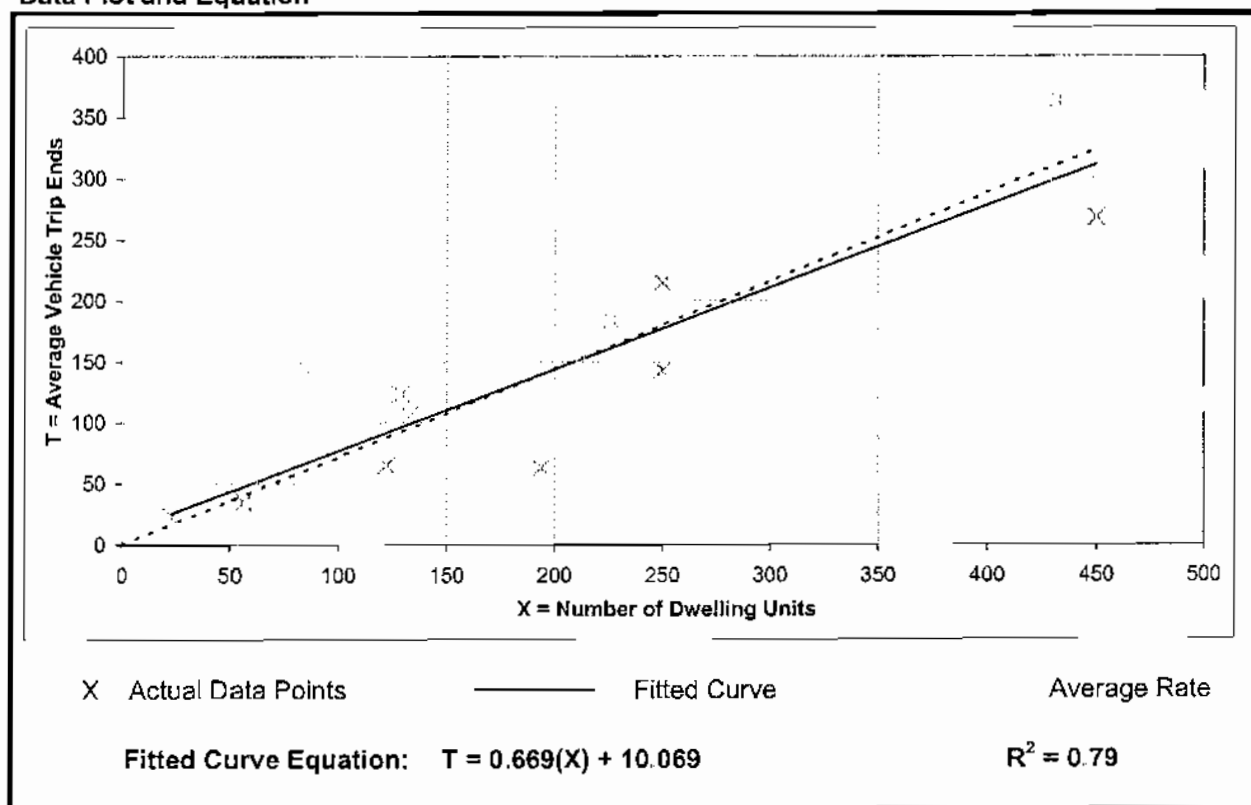
Average Vehicle Trip Ends vs: Dwelling Units
 On a: Weekday,
 Peak Hour of Adjacent Street Traffic,
 One Hour Between 4 and 6 p.m.

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



TRIP GENERATION FOR ASCEND AT SOUTH KNOXVILLE

238 Apartment Units in Phase 1

308 Apartment Units in Phase 1 & 2

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Local Trip Rate	Apartments - Phase 1	238 Apartments	2,081	22%	78%		55%	45%	
				26	94	120	94	76	170
Local Trip Rate	Apartments - Phase 1 & 2	306 Apartments	2,608	22%	78%		55%	45%	
				33	118	151	118	97	215

From Local Trip Rates and Trips calculated by using Fitted Curve Equation

TRIP GENERATION FOR ASCEND AT SOUTH KNOXVILLE

238 Apartment Units in Phase 1

$$238 \text{ Apartments} = X$$

Weekday:

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

$$T = 15 * 136.94$$

$$T = \underline{\underline{2081 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

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

$$T = 0.758 * 157$$

$$T = \underline{\underline{120 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 4 and 6 pm:

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

$$T = 0.669 * 238 + 10.07$$

$$T = \underline{\underline{170 \text{ trips}}}$$

TRIP GENERATION FOR ASCEND AT SOUTH KNOXVILLE

306 Apartment Units in Phase 1 & 2

306 Apartments = X

Weekday:

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

$$T = 15 * 171.66$$

$$T = \underline{\underline{2608 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

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

$$T = 0.758 * 198$$

$$T = \underline{\underline{151 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 4 and 6 pm:

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

$$T = 0.669 * 306 + 10.07$$

$$T = \underline{\underline{215 \text{ trips}}}$$

APPENDIX H

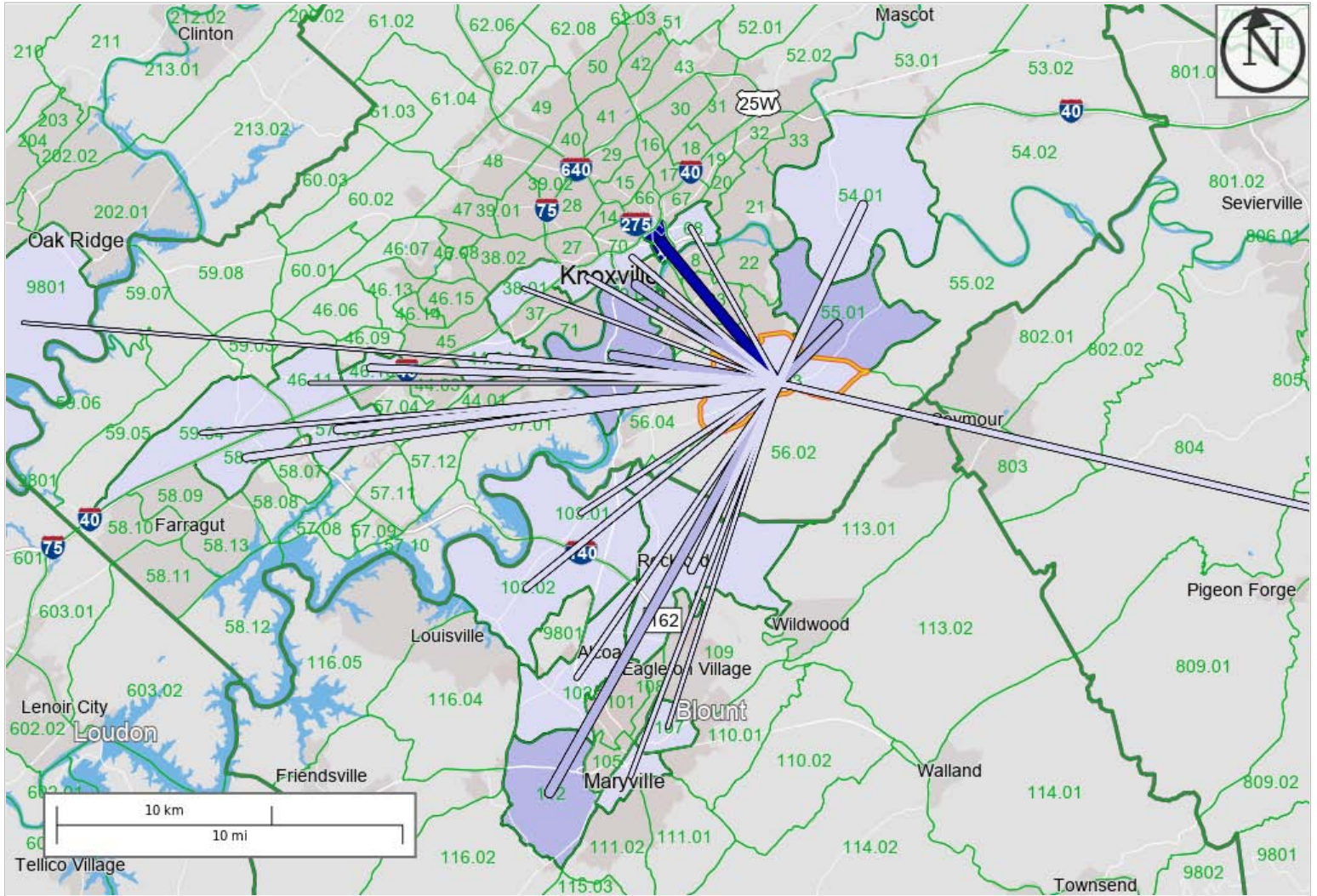
2019 CENSUS BUREAU DATA

Work Destination Report - Home Selection Area to Work Census Tracts All Jobs for All Workers in 2019

Created by the U.S. Census Bureau's OnTheMap <https://onthemap.ces.census.gov> on 06/15/2022

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

All Workers



Map Legend

Job Count

- 197 - 226
- 168 - 196
- 139 - 167
- 109 - 138
- 80 - 108
- 51 - 79
- 21 - 50

Selection Areas

- ✦ Analysis Selection

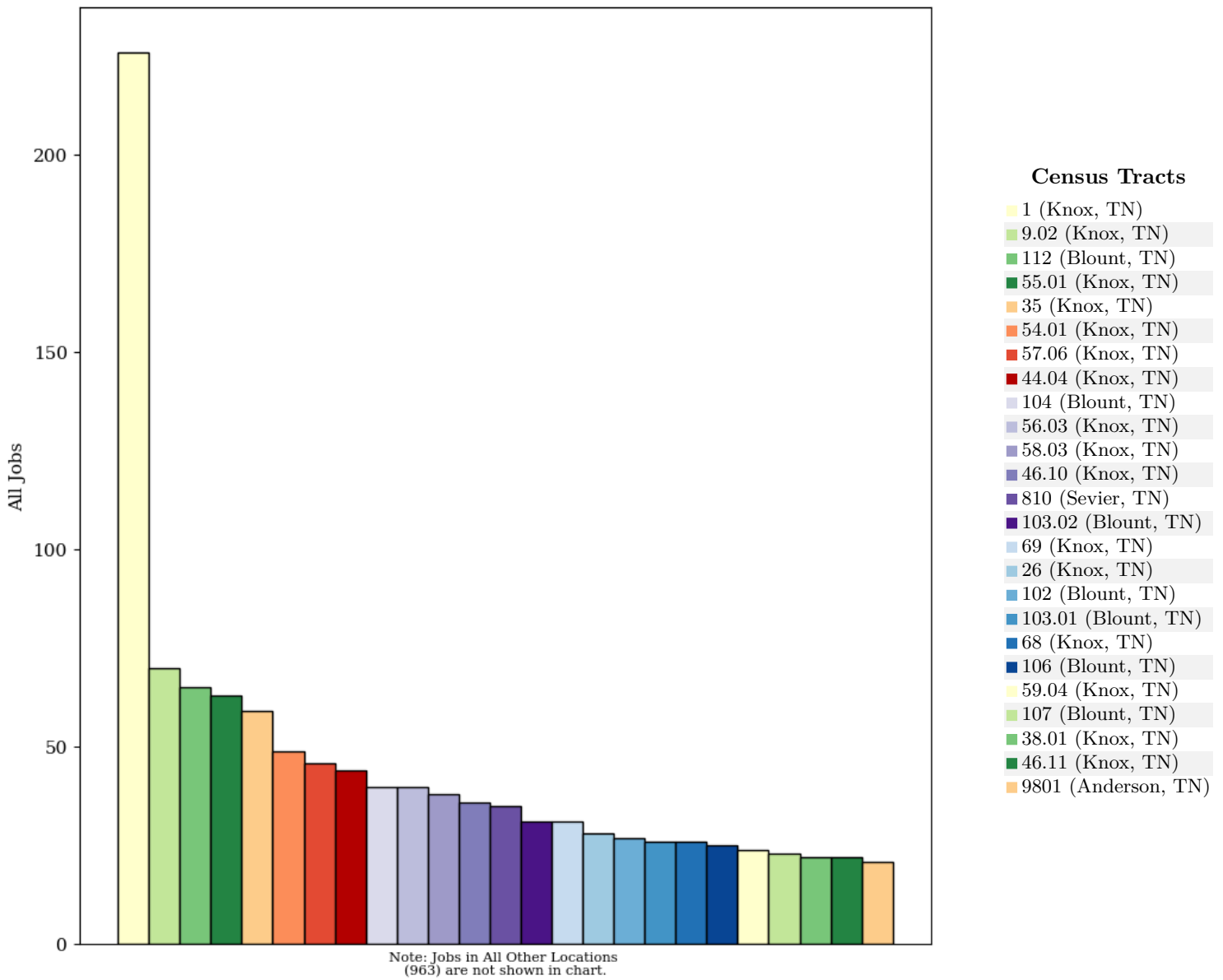
Job Count

- ✦ 197 - 226
- ✦ 168 - 196
- ✦ 139 - 167
- ✦ 109 - 138
- ✦ 80 - 108
- ✦ 51 - 79
- ✦ 21 - 50



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

All Workers



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

All Workers

Census Tracts as Work Destination Area	2019	
	Count	Share
All Census Tracts	2,080	100.0
1 (Knox, TN)	226	10.9
9.02 (Knox, TN)	70	3.4
112 (Blount, TN)	65	3.1
55.01 (Knox, TN)	63	3.0
35 (Knox, TN)	59	2.8
54.01 (Knox, TN)	49	2.4
57.06 (Knox, TN)	46	2.2
44.04 (Knox, TN)	44	2.1
104 (Blount, TN)	40	1.9
56.03 (Knox, TN)	40	1.9

Census Tracts as Work Destination Area	2019	
	Count	Share
58.03 (Knox, TN)	38	1.8
46.10 (Knox, TN)	36	1.7
810 (Sevier, TN)	35	1.7
103.02 (Blount, TN)	31	1.5
69 (Knox, TN)	31	1.5
26 (Knox, TN)	28	1.3
102 (Blount, TN)	27	1.3
103.01 (Blount, TN)	26	1.2
68 (Knox, TN)	26	1.2
106 (Blount, TN)	25	1.2
59.04 (Knox, TN)	24	1.2
107 (Blount, TN)	23	1.1
38.01 (Knox, TN)	22	1.1
46.11 (Knox, TN)	22	1.1
9801 (Anderson, TN)	21	1.0
All Other Locations	963	46.3

Additional Information

Analysis Settings

Analysis Type	Destination
Destination Type	Census Tracts
Selection area as	Home
Year(s)	2019
Job Type	All Jobs
Selection Area	56.03 (Knox, TN) from Census Tracts
Selected Census Blocks	81
Analysis Generation Date	06/15/2022 14:02 - OnTheMap 6.8.1
Code Revision	f9358819d46a60bb89052036516a1c8fe8bbbbeac
LODES Data Version	20211018_1647

Data Sources

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

Notes

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

APPENDIX I

KNOX COUNTY AND TDOT TURN LANE VOLUME THRESHOLD WORKSHEETS

TABLE 6B

RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 46 TO 55 MPH

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

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME * 642					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25 25 - 49 50 - 99			Yes	Yes Yes	Yes Yes	Yes Yes
100 - 149 150 - 199	Yes			Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes			Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes			Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes			Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes	Yes	Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

West Governor John Sevier Highway at Proposed West Entrance

2025 Projected AM EB Right Turns = 7

Right Turn Lane NOT Warranted

A green arrow points from the 'Fewer Than 25' row to the '+ / > 600' column.

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

TABLE 6B

RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 46 TO 55 MPH

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

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME * 924					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25 25 - 49 50 - 99			Yes	Yes Yes	Yes Yes	Yes Yes
100 - 149 150 - 199	Yes	<div style="border: 2px dashed green; padding: 5px; text-align: center;"> West Governor John Sevier Highway at Proposed West Entrance 2025 Projected PM EB Right Turns = 28 Right Turn Lane Warranted </div>		Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes			Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes			Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes			Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes			Yes	Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

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

TABLE 6B

RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 46 TO 55 MPH

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

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME * 665					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25 25 - 49 50 - 99			Yes	Yes Yes	Yes Yes	Yes Yes
100 - 149 150 - 199	Yes			Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes			Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes			Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes			Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes			Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

West Governor John Sevier Highway at Proposed West Entrance

2027 Projected AM EB Right Turns = 10

Right Turn Lane NOT Warranted

Fewer Than 25 → + / > 600

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

TABLE 6B

RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 46 TO 55 MPH

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

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME * 956					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25 25 - 49 50 - 99			Yes	Yes Yes	Yes Yes	Yes Yes
100 - 149 150 - 199	Yes	West Governor John Sevier Highway at Proposed West Entrance 2027 Projected PM EB Right Turns = 41 Right Turn Lane Warranted		Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes			Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes			Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes			Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes	Yes	Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

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

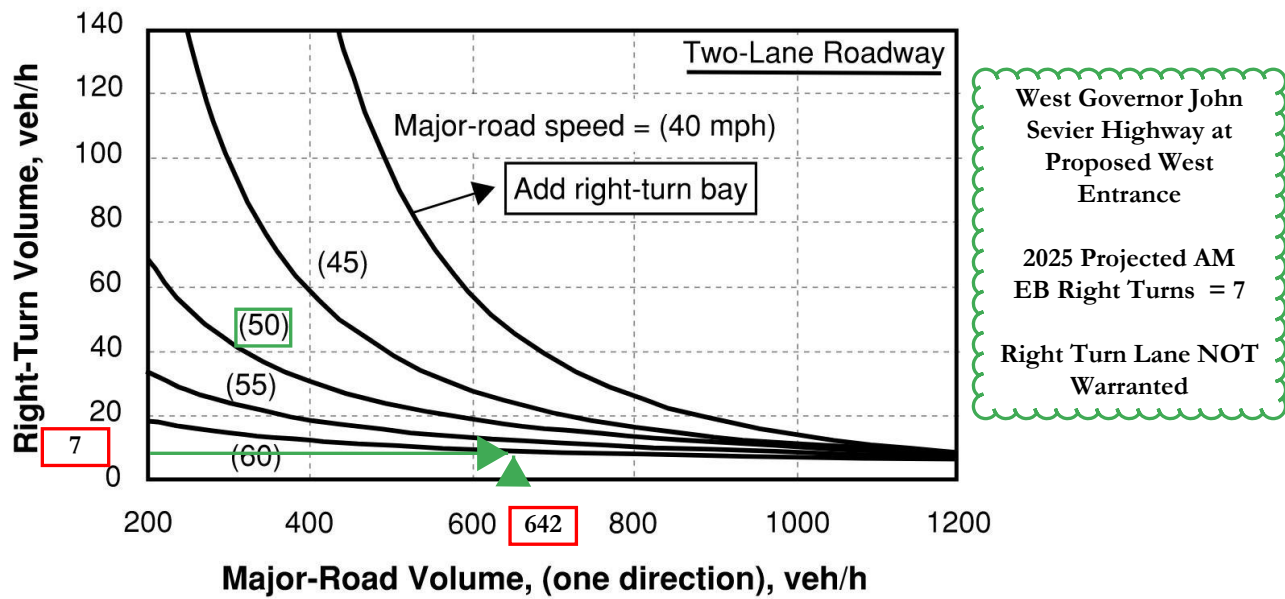


Figure 3-18: Right-Turn Lane Warrant along Two-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁴

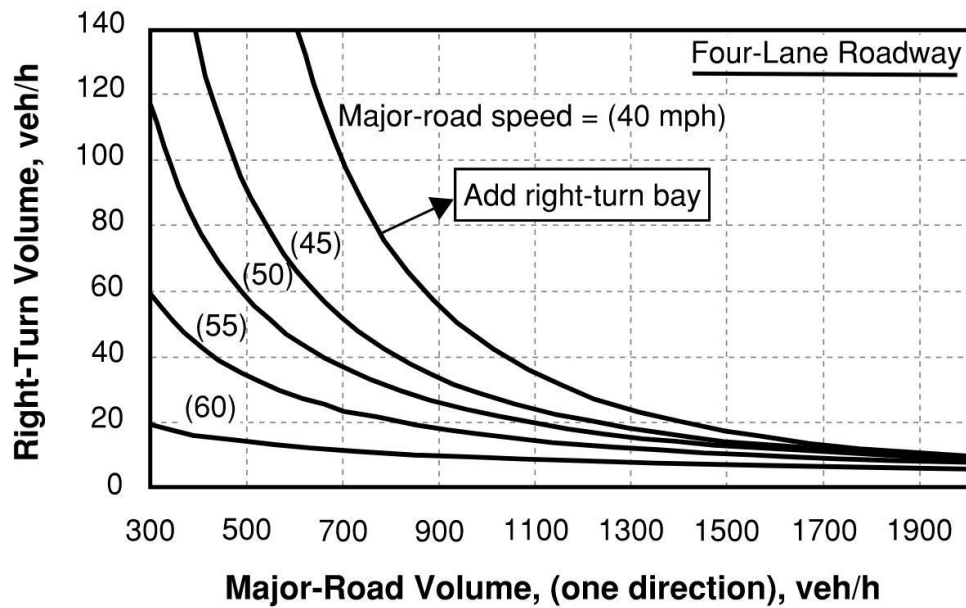


Figure 3-19: Right-Turn Lane Warrant along Four-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁵

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

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

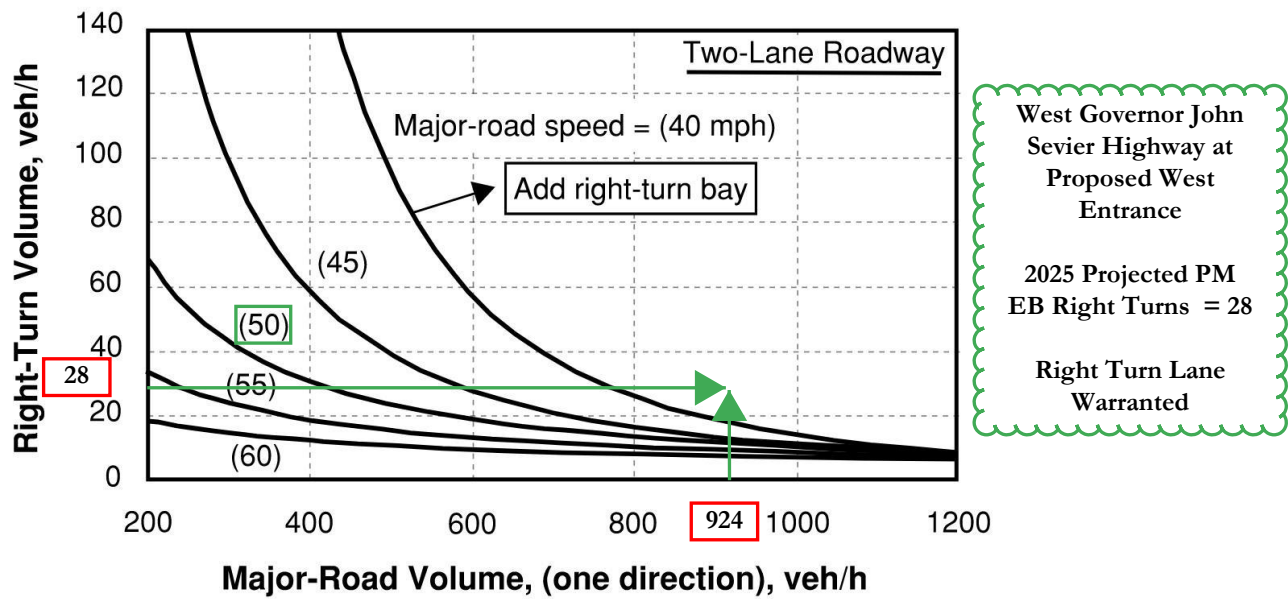


Figure 3-18: Right-Turn Lane Warrant along Two-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁴

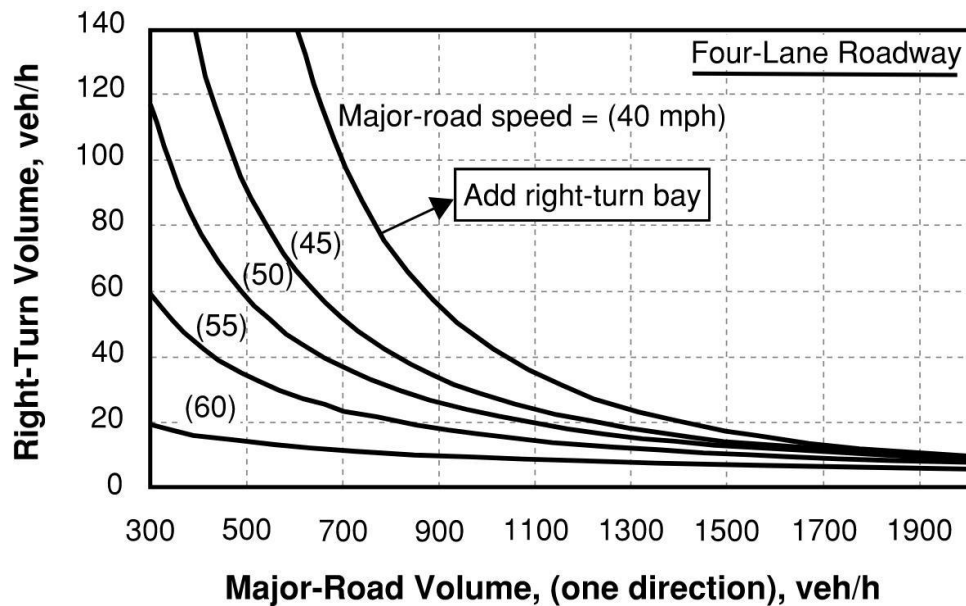


Figure 3-19: Right-Turn Lane Warrant along Four-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁵

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

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

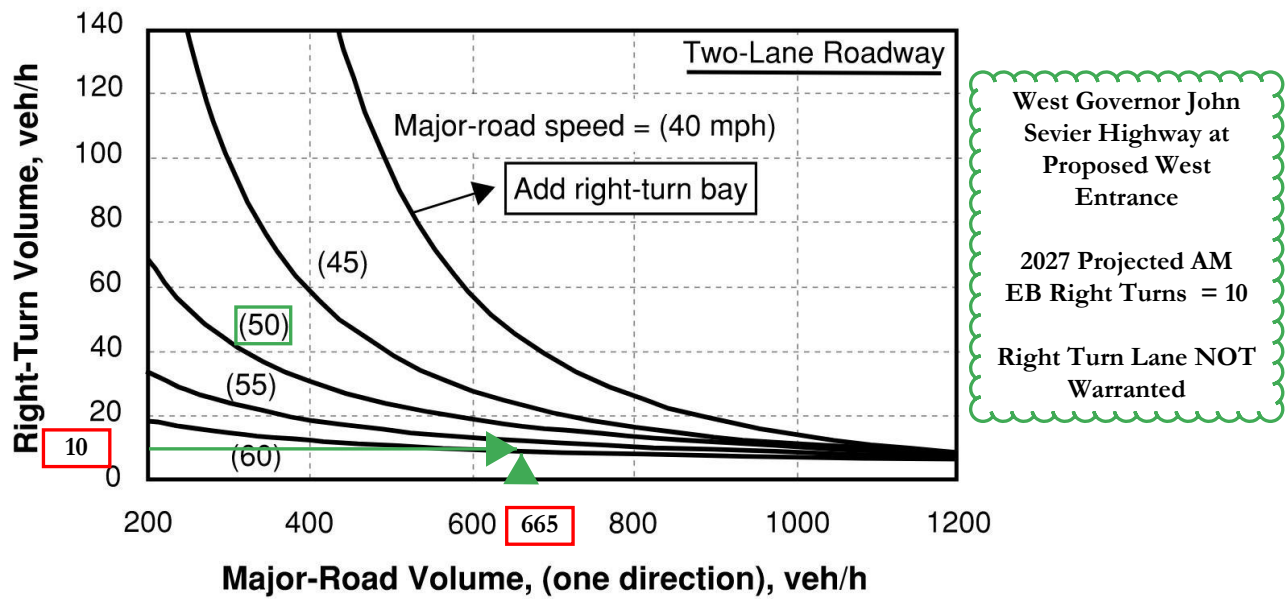


Figure 3-18: Right-Turn Lane Warrant along Two-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁴

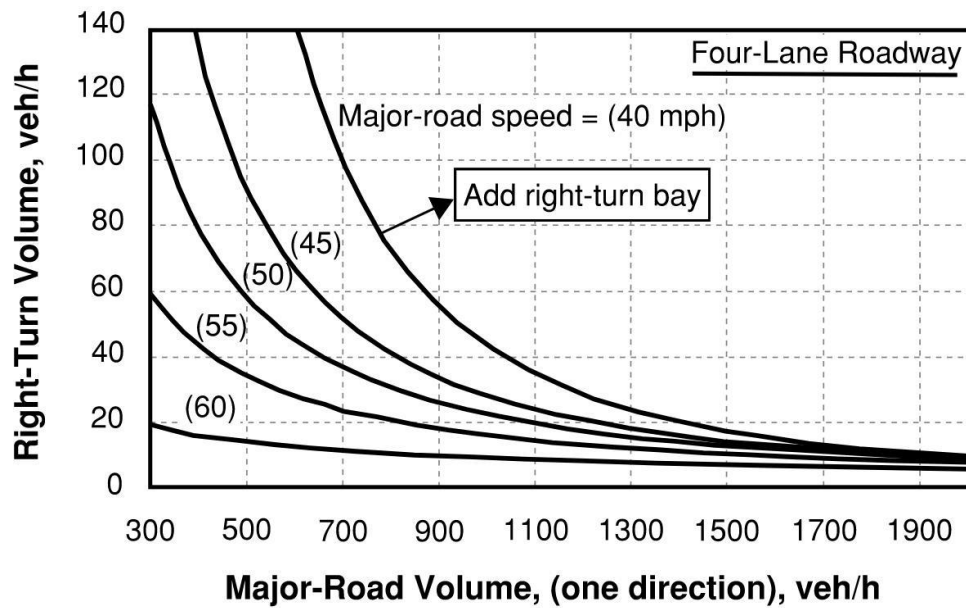


Figure 3-19: Right-Turn Lane Warrant along Four-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁵

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

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

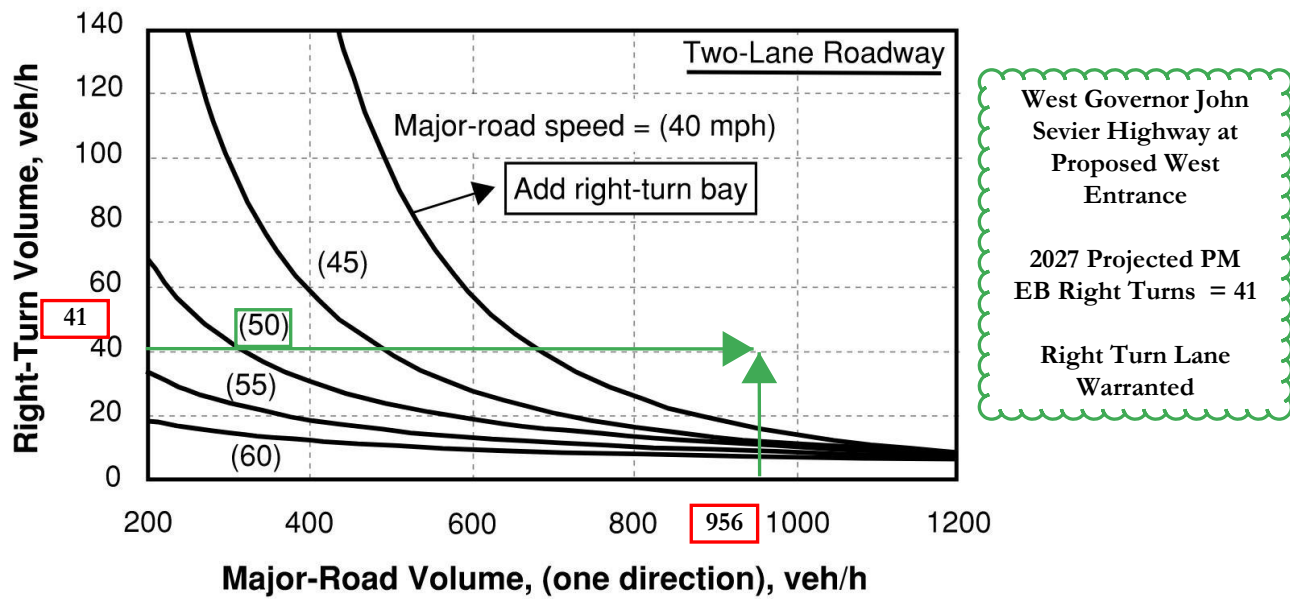


Figure 3-18: Right-Turn Lane Warrant along Two-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁴

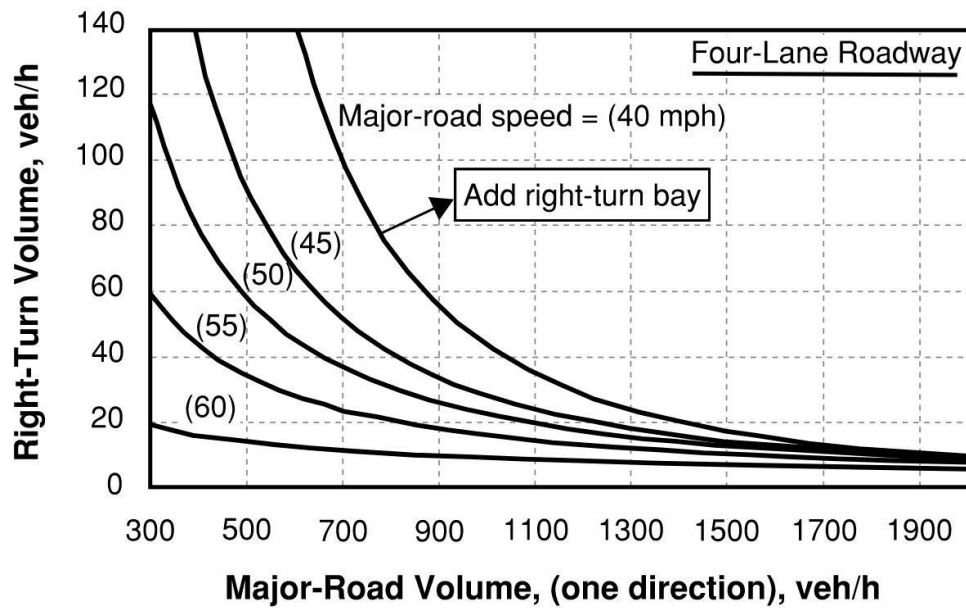


Figure 3-19: Right-Turn Lane Warrant along Four-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁵

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

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

APPENDIX J

SIMTRAFFIC VEHICLE QUEUE WORKSHEETS

Queuing and Blocking Report

10/21/2022

Intersection: 3: Mountain Grove Drive/W Norton Road & W Governor John Sevier Highway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	79	222	84	120	292	20	153	87	68	98	121	88
Average Queue (ft)	28	115	37	30	139	1	81	6	25	38	39	35
95th Queue (ft)	62	195	65	76	239	9	134	42	51	78	86	73
Link Distance (ft)		477			586			507			480	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	215		215	150		120	100		265	180		195
Storage Blk Time (%)		0			8		5	0				
Queuing Penalty (veh)		1			6		4	0				

Intersection: 6: Weigel's Driveway & W Governor John Sevier Highway

Movement	WB	NB
Directions Served	L	R
Maximum Queue (ft)	30	6
Average Queue (ft)	4	0
95th Queue (ft)	21	6
Link Distance (ft)		104
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: Proposed West Entrance & W Governor John Sevier Highway

Movement	WB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	22	88	50
Average Queue (ft)	1	34	9
95th Queue (ft)	11	69	34
Link Distance (ft)		218	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	75		50
Storage Blk Time (%)		10	0
Queuing Penalty (veh)		1	0

Network Summary

Network wide Queuing Penalty: 11

Queuing and Blocking Report

10/21/2022

Intersection: 3: Mountain Grove Drive/W Norton Road & W Governor John Sevier Highway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	99	318	224	140	317	53	170	154	77	104	147	110
Average Queue (ft)	41	155	71	36	148	3	94	15	31	48	72	47
95th Queue (ft)	86	261	150	88	257	37	154	75	59	90	127	87
Link Distance (ft)		477			586			507			480	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	215		215	150		120	100		265	180		195
Storage Blk Time (%)		2			13		8	0				0
Queuing Penalty (veh)		11			8		9	0				0

Intersection: 6: Weigel's Driveway & W Governor John Sevier Highway

Movement	EB	WB	NB
Directions Served	T	L	R
Maximum Queue (ft)	14	50	19
Average Queue (ft)	0	18	1
95th Queue (ft)	10	46	11
Link Distance (ft)	1477		104
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		150	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 9: Proposed West Entrance & W Governor John Sevier Highway

Movement	EB	WB	NB	NB
Directions Served	TR	L	L	R
Maximum Queue (ft)	2	32	76	34
Average Queue (ft)	0	6	27	7
95th Queue (ft)	2	24	64	28
Link Distance (ft)	382		218	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		75		50
Storage Blk Time (%)			11	0
Queuing Penalty (veh)			1	0

Network Summary

Network wide Queuing Penalty: 29

Intersection: 3: Mountain Grove Drive/W Norton Road & W Governor John Sevier Highway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	99	275	179	176	334	24	165	55	65	98	113	100
Average Queue (ft)	29	125	44	39	155	2	82	6	25	40	42	37
95th Queue (ft)	70	223	104	103	272	13	140	40	50	79	89	78
Link Distance (ft)		477			586			507			480	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	215		215	150		120	100		265	180		195
Storage Blk Time (%)		1			12		5					0
Queuing Penalty (veh)		3			8		4					0

Intersection: 6: Weigel's Driveway & W Governor John Sevier Highway

Movement	WB	NB
Directions Served	L	R
Maximum Queue (ft)	34	5
Average Queue (ft)	6	0
95th Queue (ft)	26	4
Link Distance (ft)		104
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: Proposed West Entrance & W Governor John Sevier Highway

Movement	WB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	23	122	85
Average Queue (ft)	2	47	16
95th Queue (ft)	15	98	52
Link Distance (ft)		218	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	75		50
Storage Blk Time (%)		21	0
Queuing Penalty (veh)		4	0

Network Summary

Network wide Queuing Penalty: 19

Queuing and Blocking Report

10/21/2022

Intersection: 3: Mountain Grove Drive/W Norton Road & W Governor John Sevier Highway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	107	329	248	171	329	21	165	134	90	102	165	107
Average Queue (ft)	41	168	79	38	163	3	94	14	33	47	77	49
95th Queue (ft)	88	276	168	106	279	14	152	69	65	86	139	88
Link Distance (ft)		477			586			507			480	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	215		215	150		120	100		265	180		195
Storage Blk Time (%)		3			16		9	0				0
Queuing Penalty (veh)		16			11		10	0				0

Intersection: 6: Weigel's Driveway & W Governor John Sevier Highway

Movement	EB	WB	NB
Directions Served	R	L	R
Maximum Queue (ft)	10	47	25
Average Queue (ft)	0	17	2
95th Queue (ft)	7	44	15
Link Distance (ft)			104
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	115	150	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 9: Proposed West Entrance & W Governor John Sevier Highway

Movement	EB	WB	NB	NB
Directions Served	TR	L	L	R
Maximum Queue (ft)	4	38	160	72
Average Queue (ft)	0	10	61	13
95th Queue (ft)	3	33	147	53
Link Distance (ft)	382		218	
Upstream Blk Time (%)	2			
Queuing Penalty (veh)	0			
Storage Bay Dist (ft)		75		50
Storage Blk Time (%)	41			
Queuing Penalty (veh)	6			

Network Summary

Network wide Queuing Penalty: 43

APPENDIX K

RESPONSE DOCUMENT TO ADDRESS REVIEW COMMENTS



CIVIL ENGINEERING / TRAFFIC ENGINEERING

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

October 24, 2022

PROJECT NAME: Ascend at South Knoxville (11-C-22-DP)

TO: Knoxville/Knox County Planning

SUBJECT: Comment Response Document for Ascend at South Knoxville TIS -
From Review Comment Letter dated October 17, 2022

Knoxville/Knox County Planning, Knox County Engineering, City of Knoxville, & TDOT Staff:

The following response document addresses comments from a letter from Mike Conger, PE, dated October 17, 2022. This letter is added to the end of the revised report in Appendix K.

- 1. Page 3, the 5th paragraph – Please include the word “proposed” in front of “exiting” to avoid any confusion about whether this is an existing or proposed turn lane.**

Response: This comment has been addressed on Page 3 in the 4th bullet point. It was also updated in the discussion on Page 70 under Point 3a.

- 2. Page 4, the 5th paragraph – A wording change/revised sentence is recommended since this appears to read as recommending stop control on the roundabout itself.**

Response: This comment has been addressed on Page 4 in the 6th bullet point and on Page 74 under #4. The wording was revised to differentiate between the need for Stop Signs on the internal driveways and the need for additional signage and pavement markings for the internal roundabout.

- 3. Page 18 – An annual growth rate of 0.6% is proposed from data between 2011 and 2021. Prior to 2021 the growth rate from the traffic count station was approximately 3.6%. Please provide further justification for the use of 1% background growth or reevaluate the assumed growth.**

Response: First, even though the original discussion on Page 37 stated that the existing volumes were increased by 1% in the projected conditions,

Figures 5a and 5b (correctly) showed the existing volumes increased by 2%. The discussion on Page 37 and the notes in Figures 5a and 5b have been corrected to state that the existing volumes were increased by 2% for the projected conditions. Second, a discussion has been added to the report in the Projected Traffic Conditions (Without the Project) section on Page 37. This discussion further details the TDOT traffic counts and the suspected anomaly in 2020 due to Covid. Overall, the initial analysis that used a 2% growth rate was incorrectly listed but has been corrected.

- 4. Page 23 – Study states a maintenance building will be located on the property’s northwest side. Figure 3 shows this building located on the northeast side of the property.**

Response: This comment has been addressed on Page 23 to correct the error stating that the building will be located on the property’s northwest side.

- 5. Page 62 – The study does not address northbound right queuing at the proposed east entrance. Please specify the require storage length and address if the storage blocks Weigel’s driveway.**

Response: The original report showed the projected vehicle queue lengths for this northbound lane on Page 63 (originally Page 62) in Tables 9a and 9b. This result was further discussed later in the report in the Recommendations under #2 (originally on Page 66, now Page 67) and stated that at this intersection: “All exiting vehicles will be required to turn right due to the left-turn prohibition, and the longest vehicle queue for this lane was calculated to be 25 feet (*updated to 15 feet*) in the 2027 PM peak hour. This existing northbound lane has a total storage length of approximately 80 feet between the West Governor John Sevier Highway travel lanes and the portion of the Weigel’s Driveway that runs parallel to the highway. A vehicle queue length of 25 feet (*updated to 15 feet*) would not impact vehicle movements at this other intersection just south of the highway.” Thus, the projected vehicle queue is not expected to block the Weigel’s driveway.

- 6. Traffic volumes are reported with allowing for the illegal left turns at the Weigel’s, if recommendations are followed, what will be the effect of this redirected traffic? The background growth of 6 left turning vehicles (page 39) does not seem to have been added to the 2025 or 2027. These vehicle trips are lost without justification.**

Response: This comment has been addressed and discussed at the bottom of Page 52. The few vehicles that are currently illegally turning left were accounted for in the projected conditions in revised Figures 8a and 8b by re-routing these vehicles to the northbound left-turn movement on Mountain Grove Drive at the West Governor John Sevier Highway intersection and then distributed to the westbound thru movements on

West Governor John Sevier Highway at the downstream studied intersections.

7. **The TIS correctly references that TDOT will need to be coordinated with regarding the permitting and design of the new western access point for this development. TDOT has indicated that they will be requiring a minimum of 200' storage + 200' taper length for the EB right turn-lane at this location, but further discussions during the design plan stage can determine specifics including the possibility of a joint-access for the adjoining parcels to the west. Regarding the joint-access – please provide a recommendation for a minimum throat depth needed between it and SR-168 that would allow for safe and efficient operations.**

Response: The discussion and revised recommendation regarding the eastbound right-turn lane have been updated on Page 3 and Pages 71-72. On Page 72, a recommendation has also been added to address the minimum throat length for any potential access point for the adjacent property owner.

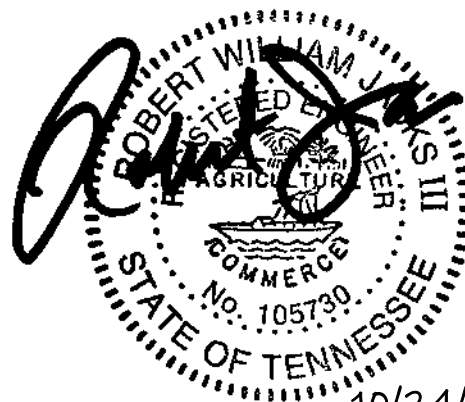
In addition to the revisions listed above, other changes in the report include the following:

- Updated Title Page
- Updated Table of Contents
- Updated Page Footers
- Made minor grammatical changes
- Revised Page Numbers (38 -)
- Updated Tables 7a, 7b, 8a, 8b, 9a, and 9b
- Updated discussion of northbound right turn lane length on the Proposed West Entrance at West Governor John Sevier Highway:
 - On Page 3, revised recommendation of storage length from 100 feet to 75 feet
 - On Page 64, revised discussion regarding the results of vehicle queue calculations
 - One Page 70, revised recommendation of storage length from 100 feet to 75 feet
- Updated LOS Worksheets in Appendix F
- Updated Turn Lane Worksheets in Appendix I
- Updated Vehicle Queue Worksheets in Appendix J
- Added Appendix K to include this response letter

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

Sincerely,

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



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