

Transportation Impact Letter Lennox Ridge Subdivision Knox County, Tennessee

Prepared For:

**Gregory Land Development, LLC
3712 Cunningham Road
Knoxville, TN 37918**

**1-B-24-RZ / 1-A-24-SP
TIL Version 1
12/15/2023**

Prepared By:

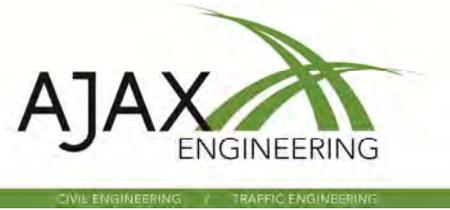


**Ajax Engineering, LLC
11812 Black Road
Knoxville, TN 37932
Robert W. Jacks, PE**



12/15/2023

December 2023



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December 15, 2023

TO: Knoxville-Knox County Planning

**RE: Lennox Ridge Subdivision – Transportation Impact Letter
Knox County, Tennessee**

This Transportation Impact Letter (TIL) is being submitted for Lennox Ridge Subdivision proposed by Gregory Land Development, LLC. The Lennox Ridge Subdivision is a proposed 103-unit residential subdivision off Heiskell Road in Northwest Knox County, Tennessee. This submittal addresses the Transportation Impact Letter requirements outlined in the “Transportation Impact Analysis Guidelines” adopted by the Knoxville-Knox County Planning Commission on January 9, 2020.

This TIL includes a project description summary, an existing conditions assessment, data from a field review, projected trip generation, road capacity analysis of Heiskell Road, and an overview of findings with supporting information in the Appendix.

If you have any questions or comments about this submittal, please feel free to contact me. Overall, this preliminary analysis shows that the proposed subdivision is not expected to affect traffic flow on Heiskell Road negatively.

We look forward to your review and approval.

Sincerely,

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

PROJECT DESCRIPTION

■ GENERAL DESCRIPTION:

Lennox Ridge Subdivision is proposed to have 103 multi-family attached townhomes on 34.58 +/- acres with a density of 2.98 units per acre if rezoning from Agricultural (A) to Planned Residential (PR) is approved. The subdivision will have a single access entrance at 8721 Heiskell Road in Northwest Knox County between East / West Brushy Valley Drive and East / West Copeland Drive. The proposed site will be located on one existing parcel, with a slight majority of the existing property covered with young forest and the other areas disturbed with open exposed soil. The ground surface is exposed since the property was used as a source of fill material for the Kroger's Marketplace on East Emory Road, approximately 2.5 miles to the south.

The subdivision is proposed to have one internal road that will meet Knox County Engineering specifications and design guidelines. The total length of this internal road will be just over 1,983 feet (0.38 miles). The internal roadway for the development will be paved with asphalt, have 8" extruded concrete curbs, and the lane widths will be 13 feet for a total 26-foot pavement width. The road right-of-way within the development will be 50 feet. Knox County will maintain the road in the subdivision after construction.

The schedule for completion of this new residential development is dependent on economic factors and construction timelines. For this project review, it was assumed that the total construction build-out of the development and full occupancy of the townhouses would occur within the next five years (2028).



**Disturbed Area on Existing Development Site
(Looking South)**

■ SITE LOCATION:

The proposed single entrance for Lennox Ridge Subdivision will be constructed near the existing gravel driveway at 8721 Heiskell Road. The location of this proposed subdivision is shown on a map in Figure 1. Figure 2 shows the proposed concept site plan for Lennox Ridge Subdivision prepared by Urban Engineering, Inc.

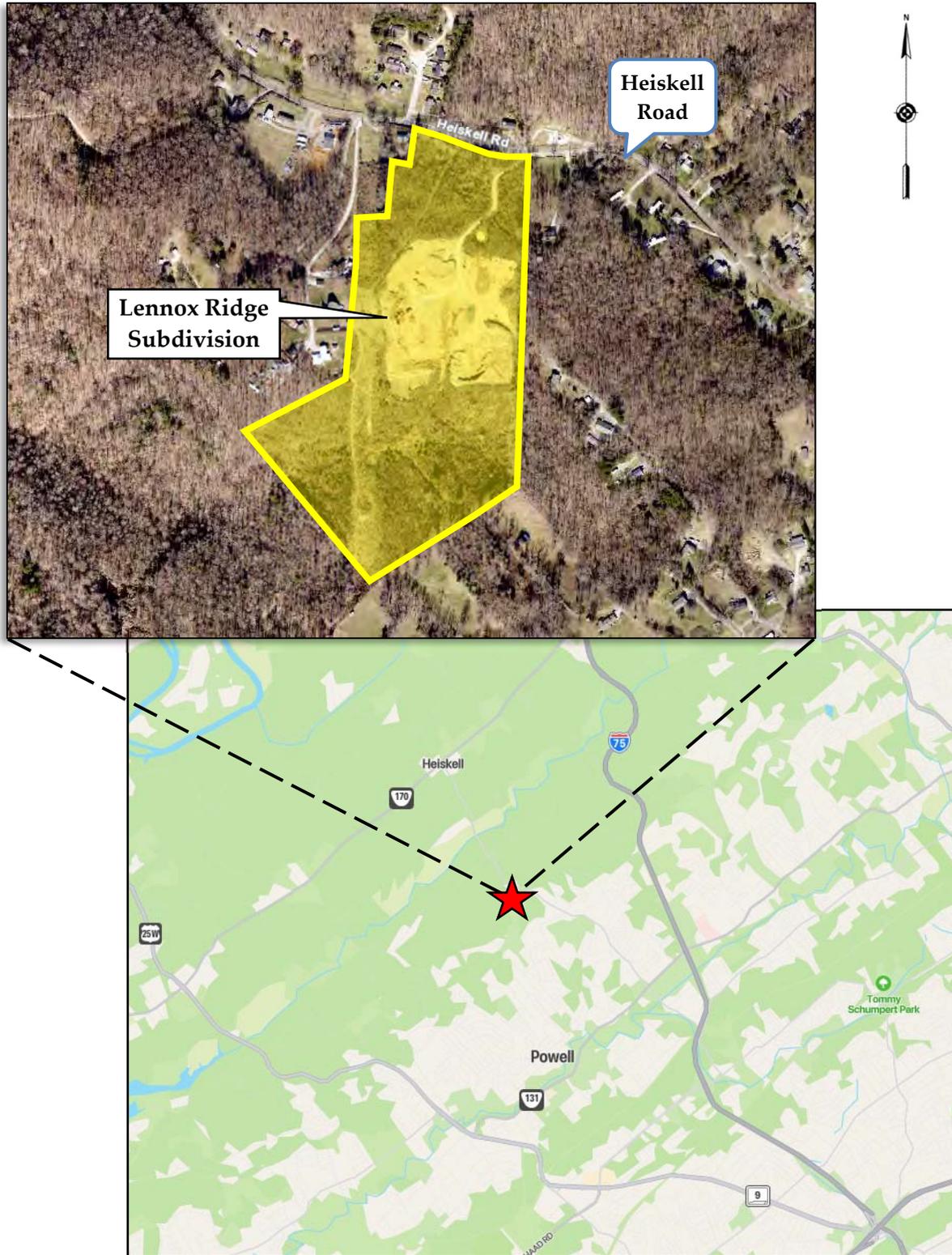
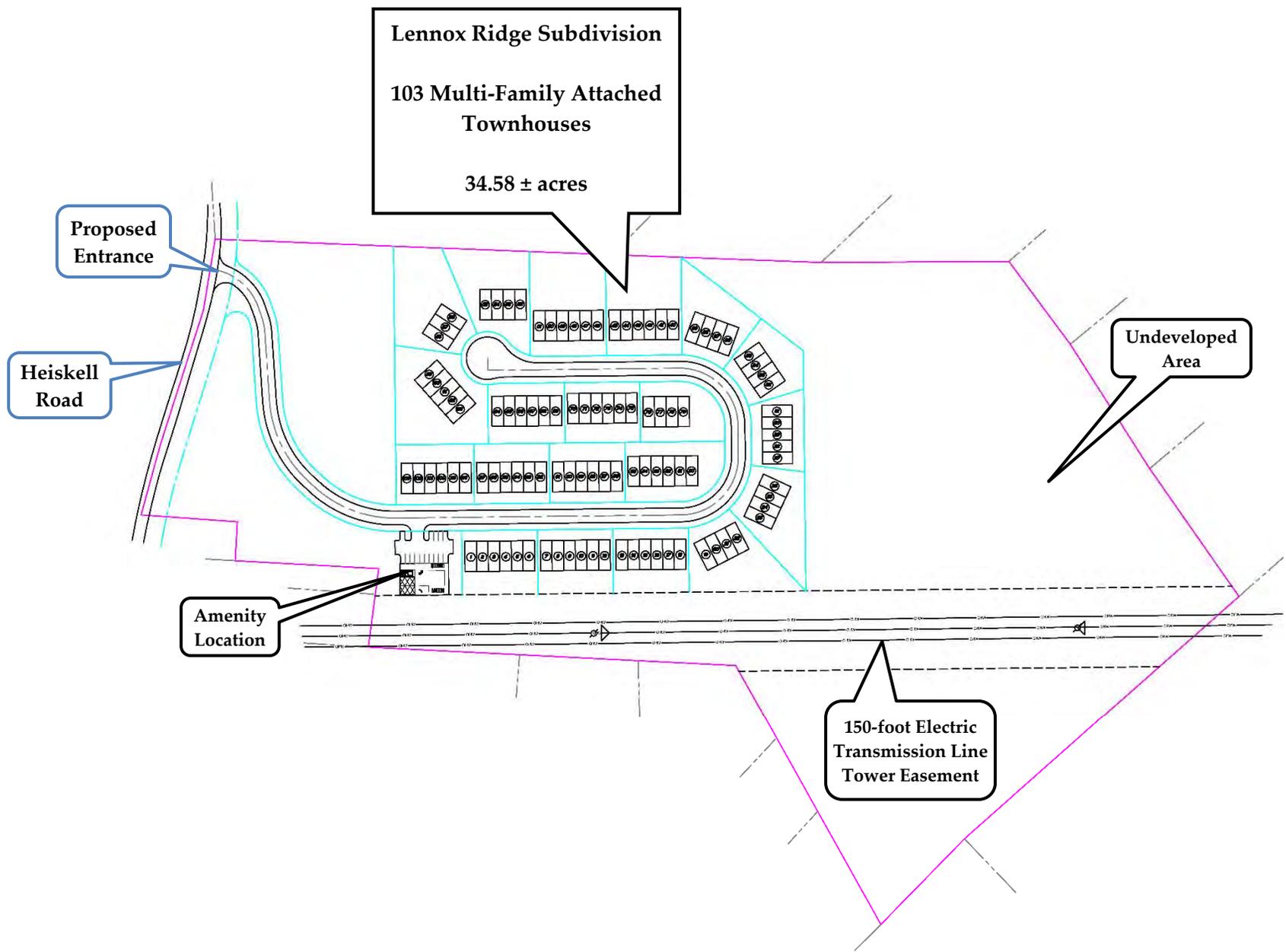


Figure 1
Location Map



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Figure 2
Preliminary Plan Layout
Lennox Ridge Subdivision

Not to Scale

EXISTING CONDITIONS ASSESSMENT

■ **EXISTING ADJACENT ROADWAYS:**

This proposed residential development will be located on the south side of Heiskell Road. The Proposed Entrance for the subdivision at 8721 Heiskell Road will be located 0.7 miles to the south of East / West Brushy Valley Drive and 0.6 miles to the north of East / West Copeland Drive. These roadways to the north and south are the closest collector streets to the Proposed Entrance to Lennox Ridge Subdivision.

Several other residential subdivisions exist in the study area, with the vast majority to the southeast of the proposed development property towards East / West Emory Road (SR 131). There are also many individual standalone residences, undeveloped properties, and a few non-residential properties, including a church and a daycare center.

Table 1 lists the characteristics of the existing roadway adjacent to the proposed development property, which will provide the sole road access to the site:

**TABLE 1
 STUDY CORRIDOR CHARACTERISTICS**

NAME	CLASSIFICATION ¹	SPEED LIMIT	LANES	ROAD WIDTH ²	TRANSIT ³	PEDESTRIAN FACILITIES	BICYCLE FACILITIES
Heiskell Road	Minor Arterial	40 mph	2	23.5 feet	None	None	No bike lanes

¹ 2018 Major Road Plan by Knoxville/Knox County Planning

² Edge of pavements near Proposed Entrance Location

³ According to Knoxville Area Transit System Map

Heiskell Road is classified as a Minor Arterial and traverses generally in a northwest-southeast direction. Heiskell Road begins at a signalized intersection with East / West Emory Road (SR 131) and Central Avenue Pike on its south side. On its north side, the road terminates at the intersection with East / West Wolf Valley Road in Anderson County for a total length of 6.5 miles. Along its length, Heiskell Road has many horizontal curves and a few notable vertical curves, but for the most part, the vertical elevation changes are gradual.

At the subdivision's Proposed Entrance location, Heiskell Road has a 2-lane pavement section with white edge lines and a double yellow centerline. Roadway lighting is not present in the

adjacent study area along Heiskell Road, but utility lighting located off the roadway and on private residences is present in some locations. Along Heiskell Road, other roadway features, including curbing, sidewalks, bike lanes, and greenway paths are not provided.

Heiskell Road makes a slight horizontal change at a large radius curve at the subdivision's Proposed Entrance location. The subdivision's Proposed Entrance will intersect Heiskell Road near an existing gravel driveway used during the past soil borrow operations.

■ **PAVEMENT WIDTH:**

Heiskell Road has relatively good pavement conditions between the proposed development site and East / West Emory Road to the south (approximately 2 miles). The asphalt pavement surface outside the white edge line on this section of Heiskell Road ranges from 6 inches to over a foot. Pavement widths along Heiskell Road between the proposed development site and East / West Emory Road are slightly variable and were measured to be between 20 to 24 feet overall. No paved shoulders are on Heiskell Road, with most of the shoulders outside the pavement consisting of grass surfaces.

For the most part, the majority of the subdivision's generated traffic is expected to travel on Heiskell Road to and from East / West Emory Road, south of the proposed subdivision. As part of the Transportation Impact Letter (TIL) scope of work, road width measurements were made on Heiskell Road between the proposed development site and the signalized intersection of East / West Emory Road to the south. The following pages list the road width measurements on Heiskell Road with pictures. Road width measurements on Heiskell Road were made every 500 feet.

Following these road width measurement pages, Figure 3 shows the Heiskell Road lane configuration, pavement markings, and road traffic signage along Heiskell Road.

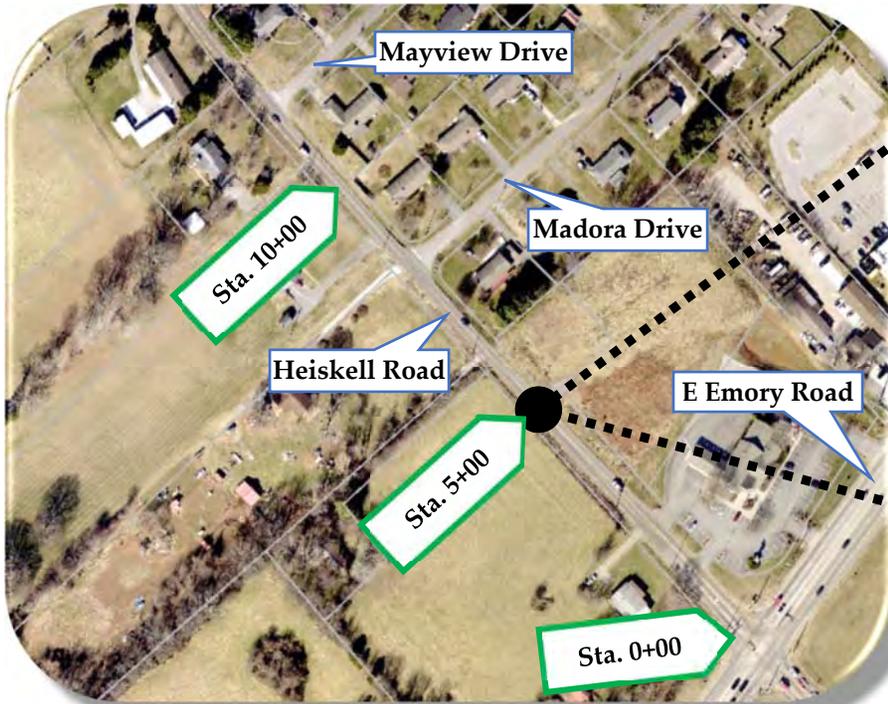
Section 1 Information:

Pavement Width of Heiskell Road @:

Station 0+00 = (Outside Edge of E Emory Road)

Station 5+00 = 22.5'

Station 10+00 = 22.1'



Heiskell Road
Station 5+00



View of Heiskell Road
(Looking Northwest)



View of Heiskell Road
(Looking Southeast)

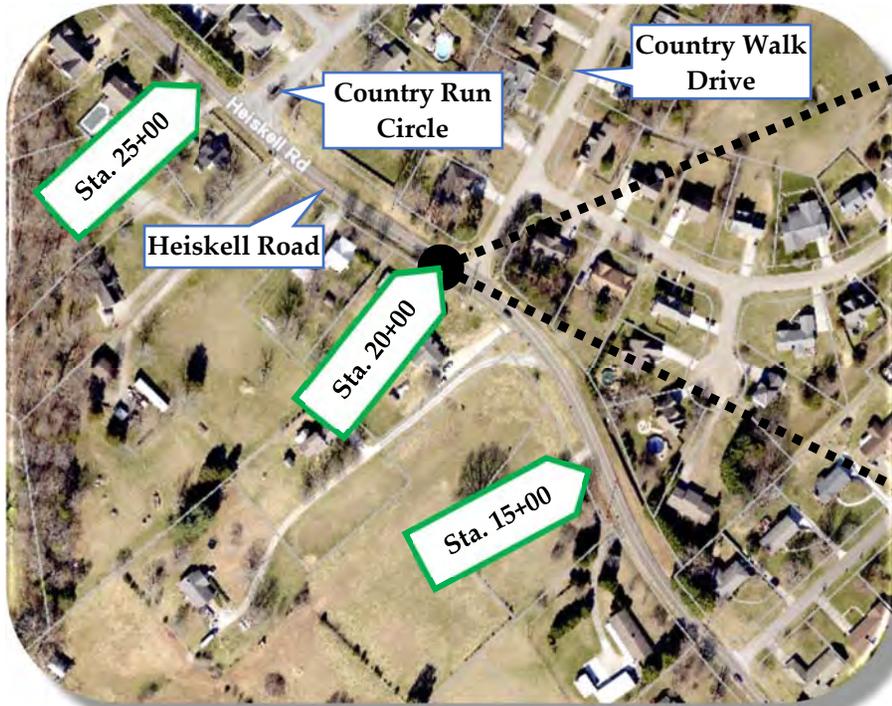
Section 2 Information:

Pavement Width of Heiskell Road @:

Station 15+00 = 22.4'

Station 20+00 = 22.8'

Station 25+00 = 21.8'



Heiskell Road
Station 20+00



View of Heiskell Road
(Looking Northwest)



View of Heiskell Road
(Looking Southeast)

Section 3 Information:

Pavement Width of Heiskell Road @:

Station 30+00 = 22.0'

Station 35+00 = 22.6'



Heiskell Road
Station 35+00



View of Heiskell Road
(Looking Northwest)



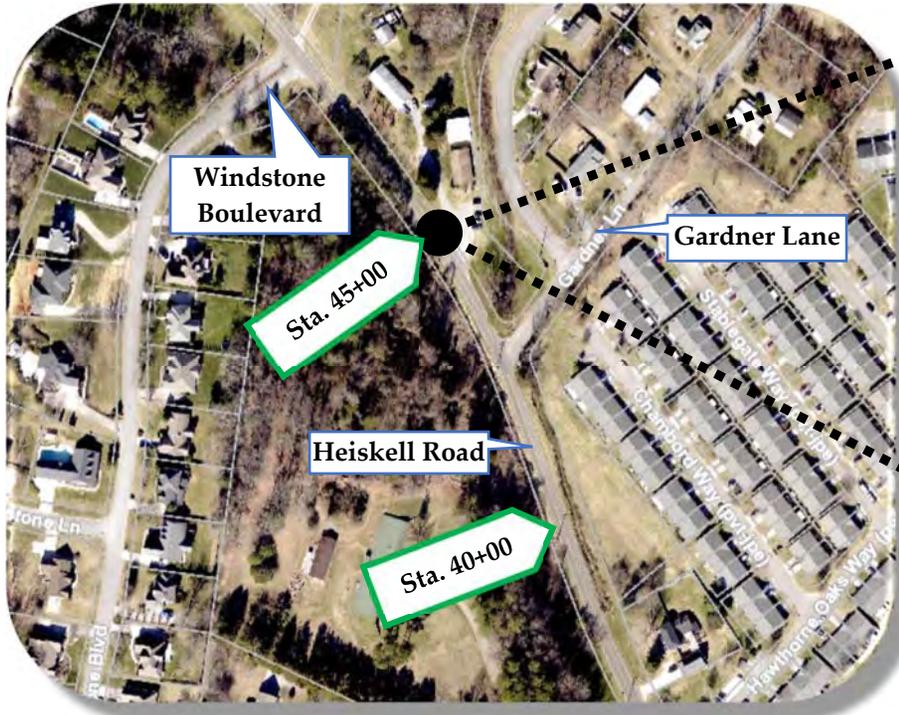
View of Heiskell Road
(Looking Southeast)

Section 4 Information:

Pavement Width of Heiskell Road @:

Station 40+00 = 21.3'

Station 45+00 = 24.6'



Heiskell Road
Station 45+00



View of Heiskell Road
(Looking Northwest)



View of Heiskell Road
(Looking Southeast)

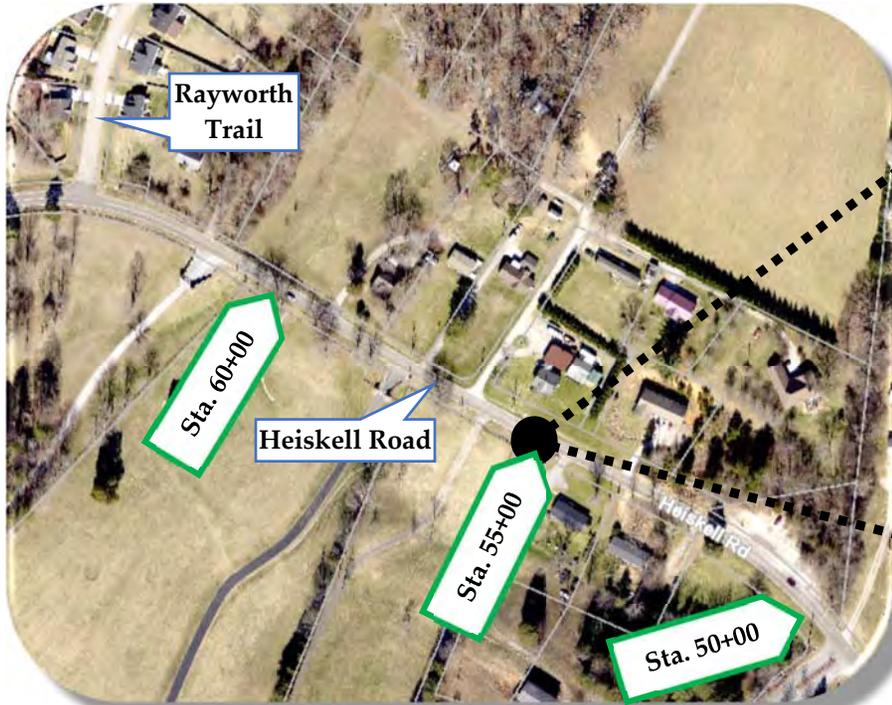
Section 5 Information:

Pavement Width of Heiskell Road @:

Station 50+00 = 23.9'

Station 55+00 = 20.8'

Station 60+00 = 21.8'



Heiskell Road
Station 55+00



View of Heiskell Road
(Looking Northwest)



View of Heiskell Road
(Looking Southeast)

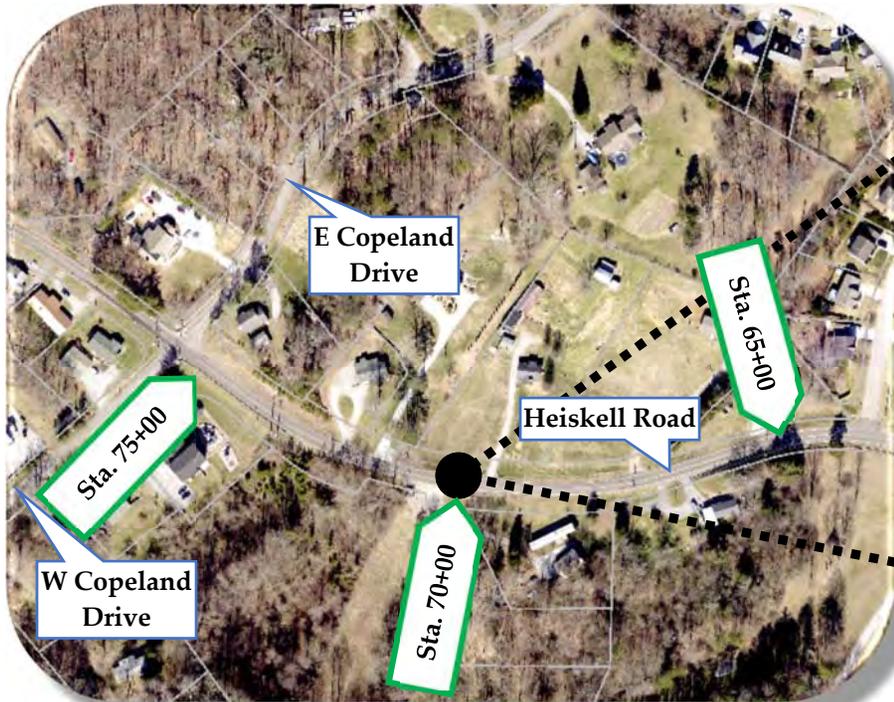
Section 6 Information:

Pavement Width of Heiskell Road @:

Station 65+00 = 23.3'

Station 70+00 = 21.8'

Station 75+00 = 22.6'



Heiskell Road
Station 70+00



View of Heiskell Road
(Looking Northwest)



View of Heiskell Road
(Looking Southeast)

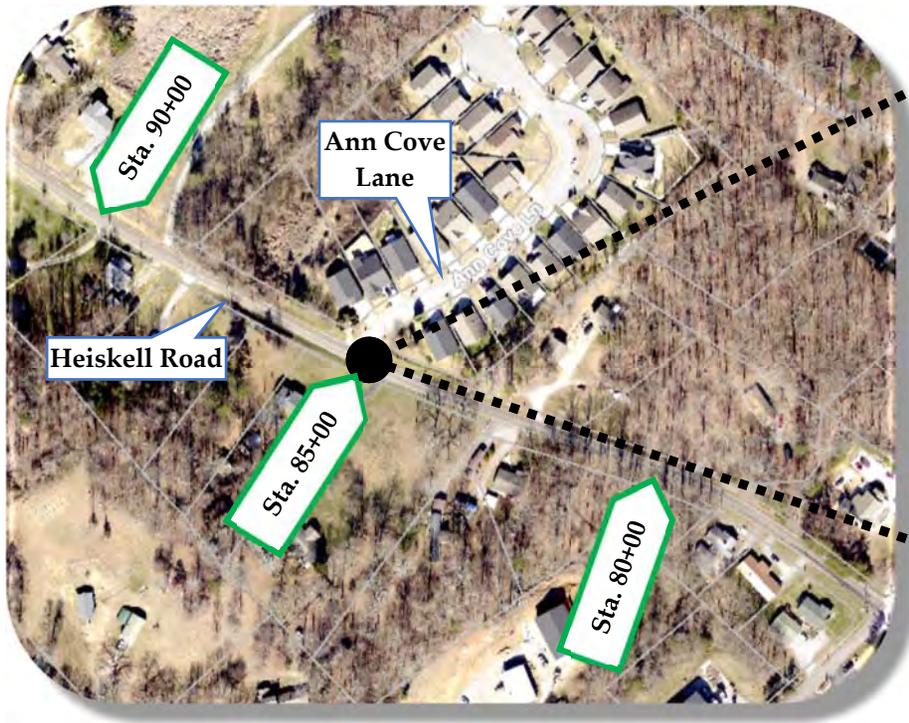
Section 7 Information:

Pavement Width of Heiskell Road @:

Station 80+00 = 23.1'

Station 85+00 = 23.0'

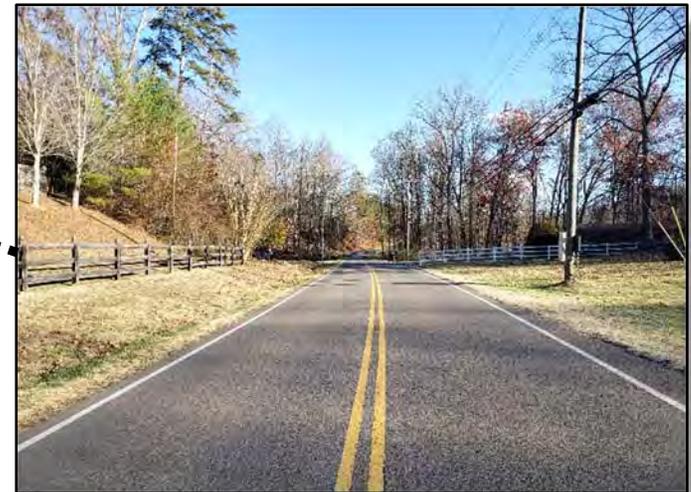
Station 90+00 = 23.0'



Heiskell Road
Station 85+00



View of Heiskell Road
(Looking Northwest)



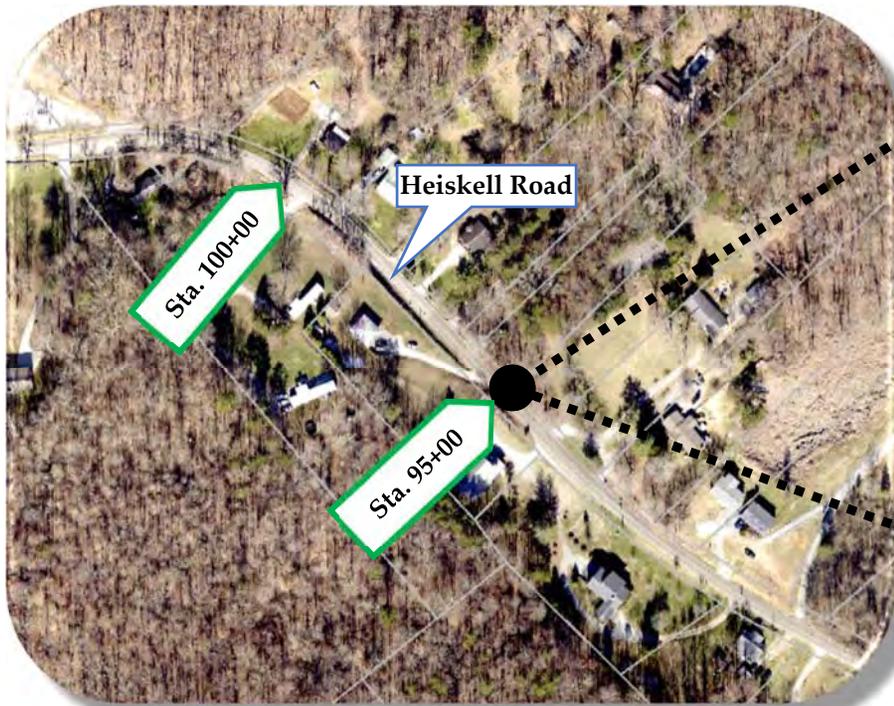
View of Heiskell Road
(Looking Southeast)

Section 8 Information:

Pavement Width of Heiskell Road @:

Station 95+00 = 21.8'

Station 100+00 = 21.7'



Heiskell Road
Station 95+00



View of Heiskell Road
(Looking Northwest)



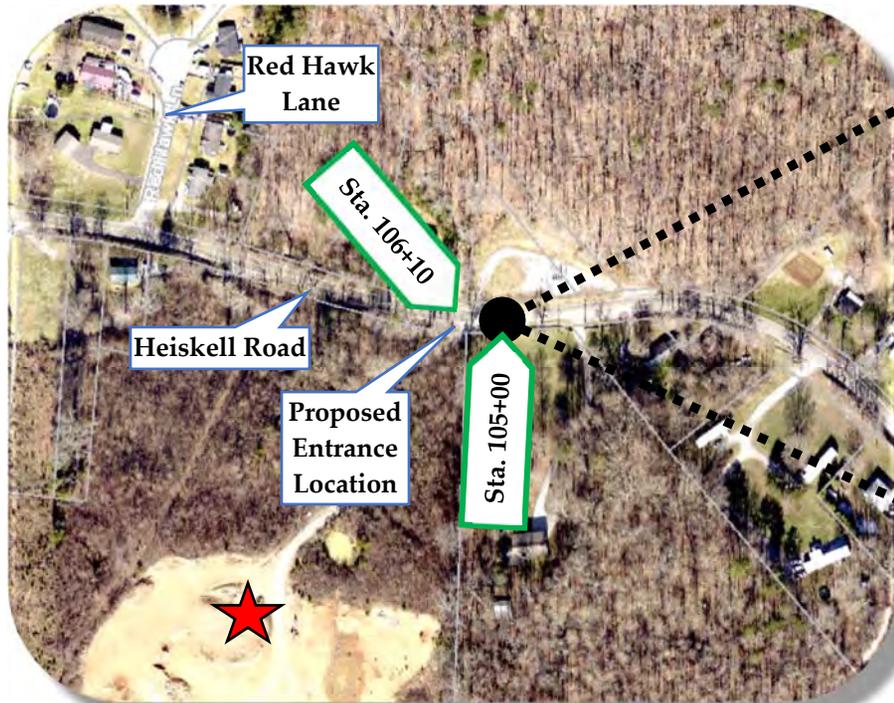
View of Heiskell Road
(Looking Southeast)

Section 9 Information:

Pavement Width of Heiskell Road @:

Station 105+00 = 21.9'

Station 106+10 = 23.5' (at Proposed Entrance Location)



Heiskell Road
Station 105+00



View of Heiskell Road
(Looking West)



View of Heiskell Road
(Looking East)

▪ **EXISTING TRANSPORTATION VEHICULAR VOLUMES:**

One annual vehicular traffic count location exists near the study area, and the Tennessee Department of Transportation (TDOT) conducts this count. TDOT reported an Average Daily Traffic (ADT) on Heiskell Road, southeast of Stonebreeze Drive, Wakebridge Boulevard, and the proposed development site, at 4,785 vehicles per day in 2022. From 2012 to 2022, this count station has indicated a -1.9% average annual traffic growth rate.

The 2022 TDOT traffic count was conducted from noon on February 1, 2022, to noon on February 2, 2022. During this count, the AM Peak Hour occurred from 7:00 to 8:00 a.m. with a total of 386 vehicles. The PM Peak Hour occurred from 4:30 to 5:30 p.m. with a total of 524 vehicles. The TDOT traffic count tabulated 2-way total volumes and did not include splits indicating the volumes of each direction of travel on the roadway.

TDOT Traffic Count Location on Heiskell Road (#47000045)

STATION DATA							
Location ID	47000045	MPO ID					
Type	SPOT	MPMS ID					
On RMS		On MPMS					
LRS ID	470126001	LRS Loc Pt	7.009				
SF Group	Urban Interstate	Route Type					
AF Group	Region 1 Urban Minor Arterial	Route					
GF Group	Knox	Active	Yes				
Class Dist Grp	Region 1 Urban Minor Arterial	Category	CC				
Seas Class Grp							
WMM Group							
QC Group	Default						
Fnc'l Class	Minor Arterial	Milepost					
Located On	01256						
Loc On Alias	HEISKELL RD.						
	NW KNOXVILLE						
More Detail >							
ADT							
Year	ADT	EMV-30	K %	D %	PA	BC	Src
2022	4,785	515	11	65	4,652 (97%)	133 (3%)	
2021	4,674 ¹		12	65	4,521 (97%)	153 (3%)	Grown from 2020
2020	4,451	534	12	65	4,282 (96%)	169 (4%)	
2019	4,907 ²		13	65			
2018	5,052		11	65			

■ **INTERSECTION SIGHT DISTANCE:**

Heiskell Road has a posted speed limit of 40-mph. Based on Knox County's policy of requiring 10 feet of sight distance per 1-mph of speed, the required intersection sight distance is 400 feet. On October 11th, 2023, Trueline Land Surveying, LLC measured the sight distance from the Proposed Entrance location and determined that the available sight distance is adequate. The sight distance was measured to be 599.9 feet to the northwest and 453.5 feet to the east. A horizontal curve on Heiskell Road east of the Proposed Entrance limits the visual distance beyond 453.5 feet.

Images of the existing sight distances at the Proposed Entrance location are labeled below with the ISD and land surveyor-measured sight distances.



View of Sight Distance on Heiskell Road at the Proposed Entrance Location (Looking Northwest)



View of Sight Distance on Heiskell Road at the Proposed Entrance Location (Looking East)

PRELIMINARY TRANSPORTATION ANALYSIS OF PROJECTED CONDITIONS

■ **TRIP GENERATION:**

The estimated amount of traffic that the proposed 103 multi-family attached townhouses will generate was calculated based on equations provided by Knoxville-Knox County Planning via a local study. The data from the local study for the proposed land use is shown in the Appendix. A summary of this information is presented in the following table:

TABLE 2
TRIP GENERATION FOR LENNOX RIDGE SUBDIVISION
 103 Multi-Family Attached Townhouses

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	Townhouses	103 Townhouses	980	22%	78%		55%	45%	
				12	43	55	43	36	79
Total New Volume Site Trips			980	12	43	55	43	36	79

Data from Local Trip Rates and calculated by using Fitted Curve Equations

For the proposed residential subdivision, it is estimated that 12 vehicles will enter and 43 will exit, for a total of 55 generated trips during the AM Peak Hour in the year 2028. Similarly, it is estimated that 43 vehicles will enter and 36 will exit, for a total of 79 generated trips during the PM Peak Hour in the year 2028. The trips generated for an average weekday are calculated to be approximately 980 vehicles for the proposed residential development in 2028.

These projected generated traffic volumes are based on an approved rezoning change to Planned Residential (PR), allowing a density of 2.98 units per acre. This property is currently zoned under Agricultural (A) zoning, which allows one dwelling unit per acre. The estimated amount of traffic that 34 single-family detached houses on the 34.57-acre parcel will generate based on Agricultural (A) zoning was calculated from equations provided by the Institute of Transportation Engineers (ITE). These calculations are also provided in the Appendix. A summary of this information based on the existing Agricultural (A) zoning is presented in the following table:

TABLE 3
TRIP GENERATION FOR LENNOX RIDGE SUBDIVISION

34 Single-Family Houses based on 1 dwelling unit/acre in Agricultural (A) zone on 34.57 acres

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
#210	Single-Family Detached Housing	34 Houses	386	25%	75%		63%	37%	
				7	22	29	23	14	37
Total New Volume Site Trips			386	7	22	29	23	14	37

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

The development would generate fewer trips if the 34.57-acre property maintained an Agricultural (A) zoning and only built one house per acre. The difference in generated trips between the proposed zoning at 2.98 units per acre versus the existing zoning at one unit per acre is shown in the following table:

TABLE 4
TRIP GENERATION FOR LENNOX RIDGE SUBDIVISION
 Results Comparison for Different Zoning and Housing Densities

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	Townhouses	103 Townhouses	980	22%	78%		55%	45%	
				12	43	55	43	36	79
Total New Volume Site Trips			980	12	43	55	43	36	79
#210	Single-Family Detached Housing	34 Houses	386	25%	75%		63%	37%	
				7	22	29	23	14	37
Total New Volume Site Trips			386	7	22	29	23	14	37
Difference Between Proposed and Existing Zoning			+ 594	+ 5	+ 21	+ 26	+ 20	+ 22	+ 42

Thus, if the requested Planned Residential (PR) zoning is allowed with a higher density, the results show an increase of 594 daily trips, 26 trips in the AM Peak Hour, and 42 trips in the PM Peak Hour compared to the density of one unit per acre if the existing Agricultural (A) zoning was maintained.

■ **PROJECTED HORIZON YEAR 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). As previously stated, the build-out and full occupancy of this proposed development are assumed to occur by 2028. This horizon year corresponds to five years for this development to reach full capacity and occupancy.

According to the nearby TDOT count station, traffic growth on Heiskell Road has shown negative growth over the past ten years (2012-2022). However, for this analysis, a +2% annual growth rate was assumed to consider any future development in the area, potential rising travel volumes, and result in a conservative estimate to analyze the projected opening year traffic volumes for 2028.

Based on this growth rate assumption, the 2022 TDOT traffic volumes on Heiskell Road were adjusted upwards to the year 2028 by a 2% annual average growth rate and resulted in the following 2-way traffic volumes:

- ADT = 5,264 vehicles
- AM Peak Hour = 425 vehicles
- PM Peak Hour = 576 vehicles

■ **TRIP DISTRIBUTION AND ASSIGNMENT:**

Based on the development site's location and surrounding development, it is estimated that most of the proposed subdivision's trips will travel to and from the south. To the south of the development site, East / West Emory Road provides access to numerous commercial, retail, and medical services. In addition, Interstate 75 is located 0.65 miles west of the Heiskell Road and East / West Emory Road signalized intersection. Overall, to the north of the development site, Heiskell Road primarily provides access to scattered residences, farm properties, and undeveloped properties. However, for future Lennox Ridge Subdivision residents working in Oak Ridge or Clinton, the most logical route would be to and from the north on Heiskell Road and utilizing Brushy Valley Road, Wolf Valley Road, or Racoon Valley Road to travel to and from these locations. Overall, however, the percentage of future residents traveling to these locations is expected to be in the minority.

This preliminary analysis of the proposed Lennox Ridge Subdivision assumes that 85% of traffic will travel to and from the south and 15% to and from the north on Heiskell Road. Based on this

assumption, the following traffic volumes can be determined:

- Subdivision Daily Trips: 833 trips to and from the south
 147 trips to and from the north
- AM Peak Hour Generated Trips: 12 Entering Subdivision = 2 from north, 10 from south
 43 Exiting Subdivision = 6 to north, 37 to south
- PM Peak Hour Generated Trips: 43 Entering Subdivision = 6 from north, 37 from south
 36 Exiting Subdivision = 5 to north, 31 to south

▪ **ROADWAY CAPACITY OF HEISKELL ROAD:**

Heiskell Road will be the sole and primary access road between the proposed subdivision and external destinations. In most cases, Transportation Impact Studies (and TIL's) do not analyze road segments since vehicle volumes and flow are most critical and impactful at intersections but was requested by Planning for this report. The following provides some context to the methodology used to estimate the future road capacity of Heiskell Road to the south of the development site.

Methodology:

Much research has been done to determine the capacity of two-lane roadways based on vehicle speeds, road geometry, and other parameters. Based on the analysis methods presented in the Highway Capacity Manual, the Florida Department of Transportation (FDOT) developed LOSPLAN, a group of software evaluation tools that provides computational methods for analyzing freeways, highways, and arterial road sections. The software provides conceptual-level planning results for determining roadway facilities' capacity and Level of Service (LOS). For this report, this software was regarded as appropriate for determining Heiskell Road's capacity at a planning level in the future conditions.

Various factors are used to calculate a roadway's actual "real world" capacity. In almost all cases, roadway capacity is reduced as more significant numbers of heavy vehicles comprise the traffic flow, road grades increase, and other aspects are introduced. For 2-lane highway segments in the LOSPLAN software, FDOT has set the maximum vehicle flow for 2-lane roadways in developed areas at 1,650 vehicles per hour per lane (vphpl).

Conservative values were inputted in the FDOT software to ensure prudent results for the Heiskell Road analysis. The analysis included Heiskell Road's segment between the Proposed Entrance and East / West Emory Road for a length of 2.0 miles since this segment will carry the vast majority of generated trips to and from the subdivision. The significant inputs in the LOSPLAN software for the Heiskell Road analysis were the following:

- Assumed a free-flow speed of 45 mph (posted speed limit = 40 mph)
- AADT (Average Annual Daily Traffic) of 6,097 vehicles in 2028
- 1% heavy truck traffic
- Left turn/blockage impact due to the lack of left-turn storage bays on Heiskell Road
- Rolling terrain
- No passing zones are present

The AADT of 6,097 vehicles was calculated based on the 4,785 vehicles on Heiskell Road as reported by TDOT in 2022, adjusting it upwards with 2% growth up to 2028 and by adding the estimated daily volumes generated by the proposed Lennox Ridge Subdivision (833 daily trips) to and from the south. The 833 additional daily traffic volumes on Heiskell Road generated by the proposed development were calculated by multiplying the 980 total daily generated trips by 85%, which is the assumed percentage of travel to and from the south on Heiskell Road.

Based on these factors and other inputs, the Level of Service for this segment of Heiskell Road was calculated to be LOS C in 2028. This result was based on the projected conditions when the proposed Lennox Ridge Subdivision will be fully built out and occupied in 2028. The results from the LOSPLAN software are shown in the Appendix.

The calculated LOS should be considered a worst-case for Heiskell Road in 2028. These projected volumes that produced LOS C are on the southern end of Heiskell Road, where the largest concentration of vehicles is present due to the influx of several streets and subdivisions along the southern end of Heiskell Road. Likewise, the further to the north on Heiskell Road, the lower the expected ADT and, theoretically, a higher LOS.

OVERVIEW OF FINDINGS

The following is an overview of the findings for the proposed Lennox Ridge Subdivision on Heiskell Road based on the initial assessment of the existing and projected conditions:

- Allowing the development property to be rezoned from Agricultural (A) with a density of one unit per acre to Planned Residential (PR) with a density of 2.98 units per acre will result in higher trips generated on Heiskell Road. As shown in Table 4, The difference between the two zones (and densities) will result in an additional 594 daily trips, 26 AM Peak Hour trips, and 42 PM Peak Hour trips if Planned Residential (PR) zoning is approved.
- Sight distance at the Proposed Entrance location at Heiskell Road has been measured to be adequate by Trueline Land Surveying, LLC, and exceeds the required intersection sight distance of 400 feet.
- As discussed previously, the Proposed Entrance at Heiskell Road will experience higher traffic volumes to and from the south. Based on this assumption, the highest turning volumes at the Proposed Entrance have been calculated to be 37 right-turning exiting volumes to the south in the AM Peak Hour and 37 left-turning entering volumes from the south in the PM Peak Hour. Furthermore, 37 left-turning vehicles on Heiskell Road into the subdivision will not likely meet the Knox County warrant threshold for a separate left-turn lane on Heiskell Road. Likewise, with only 15% of entering vehicles assumed to occur from the north, it is not likely that a separate right-turn lane will be warranted either. Further analysis in a Transportation Impact Study (TIS) will be able to thoroughly investigate the potential need for separate turn lanes on Heiskell Road.
- The Knox County requirement for intersection spacing on a minor arterial is 400 feet. This requirement will be met since the Proposed Entrance location on Heiskell Road will be 550 feet southeast of Red Hawk Lane and 2,110 feet northwest of Ann Cove Lane. These streets are the closest public roadways to the Proposed Entrance for the Lennox Ridge Subdivision.
- Utilizing a planning-level analysis of the 2-lane section of Heiskell Road between the Proposed Entrance and East / West Emory Road, the results presented in this

report suggest that the road will be adequate with respect to capacity in 2028, assuming a future 2% annual growth rate. The number of additional trips generated by the Lennox Ridge Subdivision based on allowing the rezoning from Agricultural (A) to Planned Residential (PR) will not be a sufficient detriment to the overall roadway capacity of Heiskell Road.

- During the field review of Heiskell Road between the Proposed Entrance and East / West Emory Road, three safety issues were observed, with two needing priority action and the other needing further investigation. The two priority issues are for missing and damaged traffic road signage. The first road sign issue is an existing 40-mph speed limit sign that was observed to have been struck and lying on the east side of Heiskell Road. This speed limit sign is located approximately 30 feet to the northwest of the Home Federal Bank's northernmost driveway. The sign is currently lying on the side of the road.



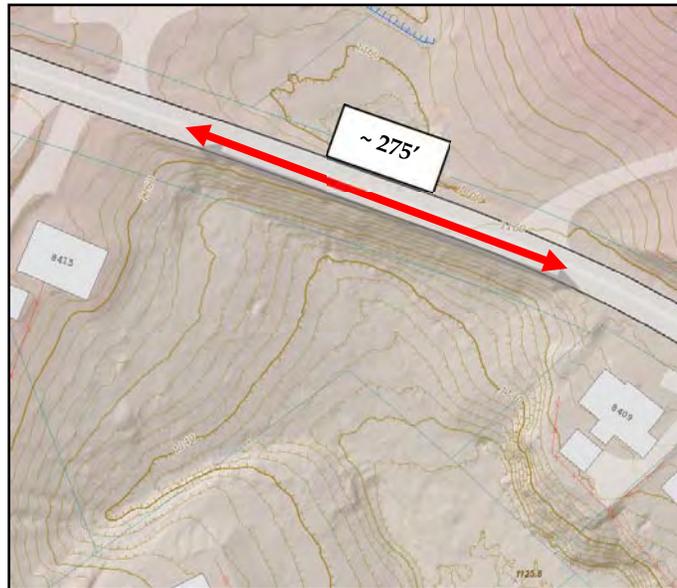
Knocked down Speed Limit Sign on East Side of Heiskell Road (Looking Southeast toward East / West Emory Road)

The other road sign issue is a missing Type 3 Object Marker on the east side of Heiskell Road, approximately 275 feet north of Hawthorne Oaks Way. A drainage sump is located adjacent to the roadway and is delineated by one Type 3 Object Marker sign (OM-3R) for northbound traffic, but the sign for southbound traffic (OM-3L) is missing.



Missing Object Marker Sign on East Side of Heiskell Road for Opposite Direction (Looking Northwest)

The final observed potential safety issue is a short Heiskell Road segment that has a steep drop-off slope. This steep slope is approximately 400 feet northwest of East / West Copeland Drive and on the south side of Heiskell Road between the residences at 8409 and 8415 Heiskell Road. This steep slope along Heiskell Road is approximately 275 feet



**Steep Side Slope on Southern Edge of Heiskell Road
(from KGIS.org)**

long and nearly 1.5:1, with very little lateral shoulder distance from the edge of the pavement to the drop-off. The elevation change is over 20 feet from the roadway to the toe of the slope. Due to this near-road hazard, there should be some consideration of investigating the need for installing a guardrail at this location, especially if there is any history of vehicles leaving the roadway.

APPENDIX

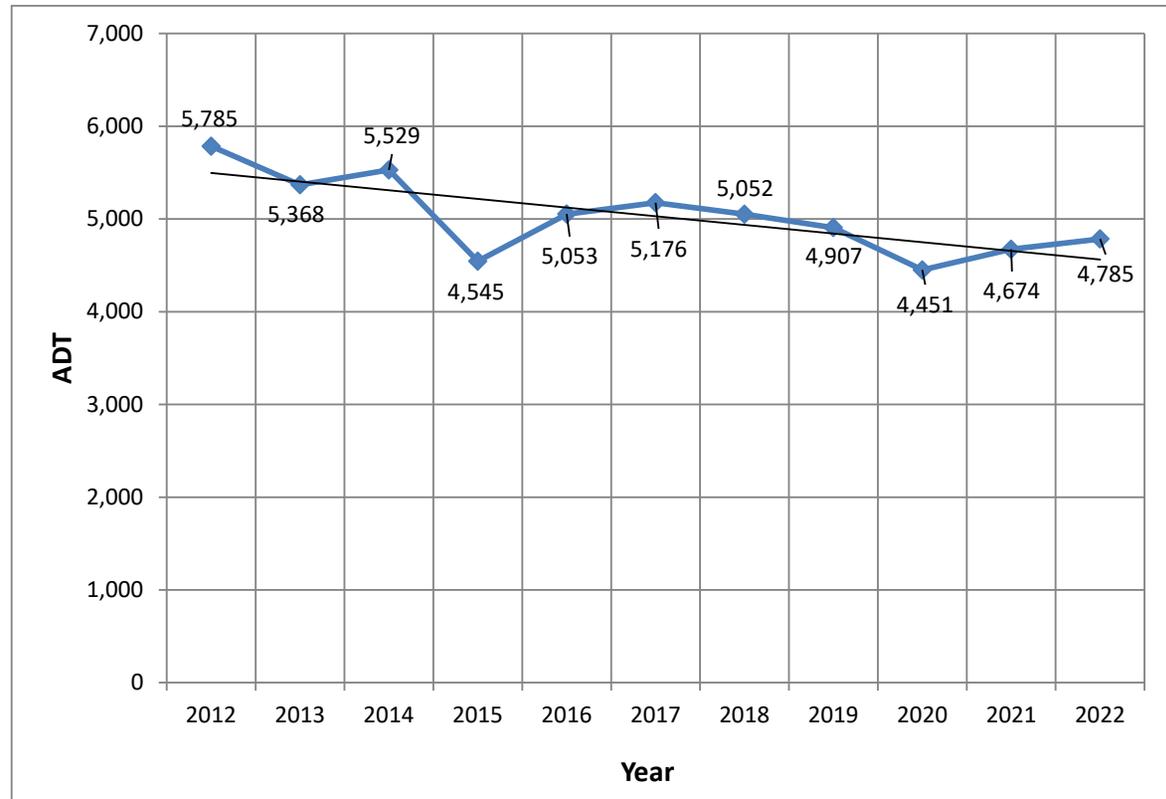
Historical Traffic Counts

Organization: TDOT

Station ID #: 47000045

Location: Heiskell Road, north of East Emory Road

YEAR	ADT	
2012	5,785	Trendline ↓
2013	5,368	
2014	5,529	
2015	4,545	
2016	5,053	
2017	5,176	
2018	5,052	
2019	4,907	
2020	4,451	
2021	4,674	
2022	4,785	



2012 - 2022 Growth Rate = -17.3%

Average Annual Growth Rate = -1.9%




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[Auto-Locate OFF](#)

[List View](#) | [All DIRs](#)

Record | 7270 | of 15834 | [Goto Record](#) | | [go](#)

Location ID	47000045	MPO ID	
Type	SPOT	HPMS ID	
On NHS		On HPMS	
LRS ID	4701256001	LRS Loc Pt.	7.869
SF Group	Urban Interstate	Route Type	
AF Group	Region 1 Urban Minor Arterial	Route	
GF Group	Knox	Active	Yes
Class Dist Grp	Region 1 Urban Minor Arterial	Category	CC
Seas Class Grp			
WIM Group			
QC Group	Default		
Functl Class	Minor Arterial	Milepost	
Located On	01256		
Loc On Alias	HEISKELL RD. NW KNOXVILLE		

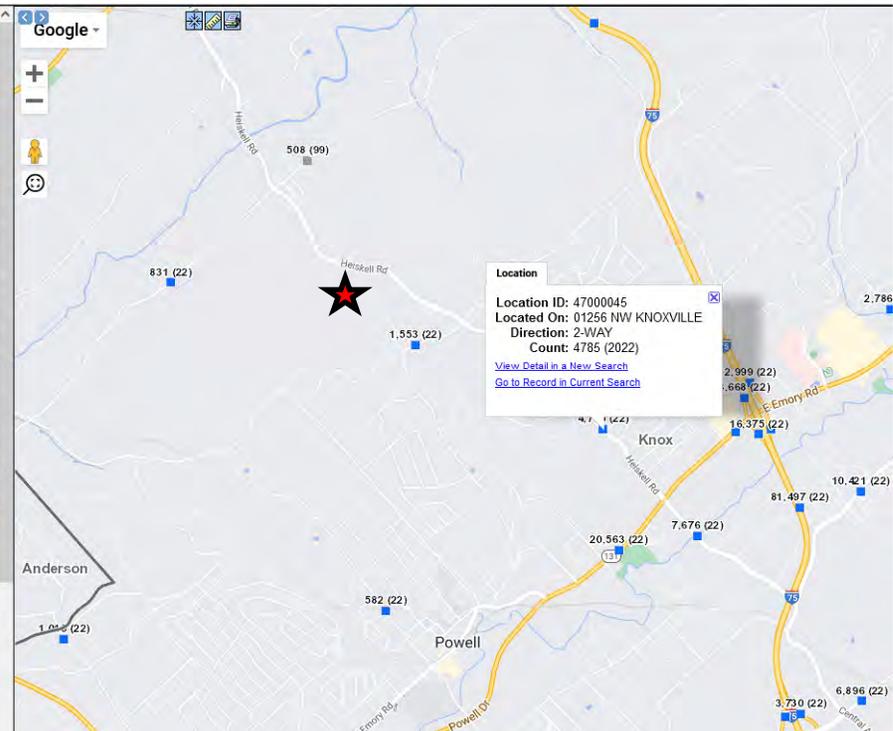
[More Detail](#)

STATION DATA

Directions: **2-WAY**

Year	AADT	DHV-30	K %	D %	PA	BC	Src
2022	4,785	515	11	65	4,652 (97%)	133 (3%)	
2021	4,674 ³		12	65	4,521 (97%)	153 (3%)	Grown from 2020
2020	4,451	534	12	65	4,282 (96%)	169 (4%)	
2019	4,907 ²		13	65			
2018	5,052		11	65			

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Local Apartment Trip Generation Study

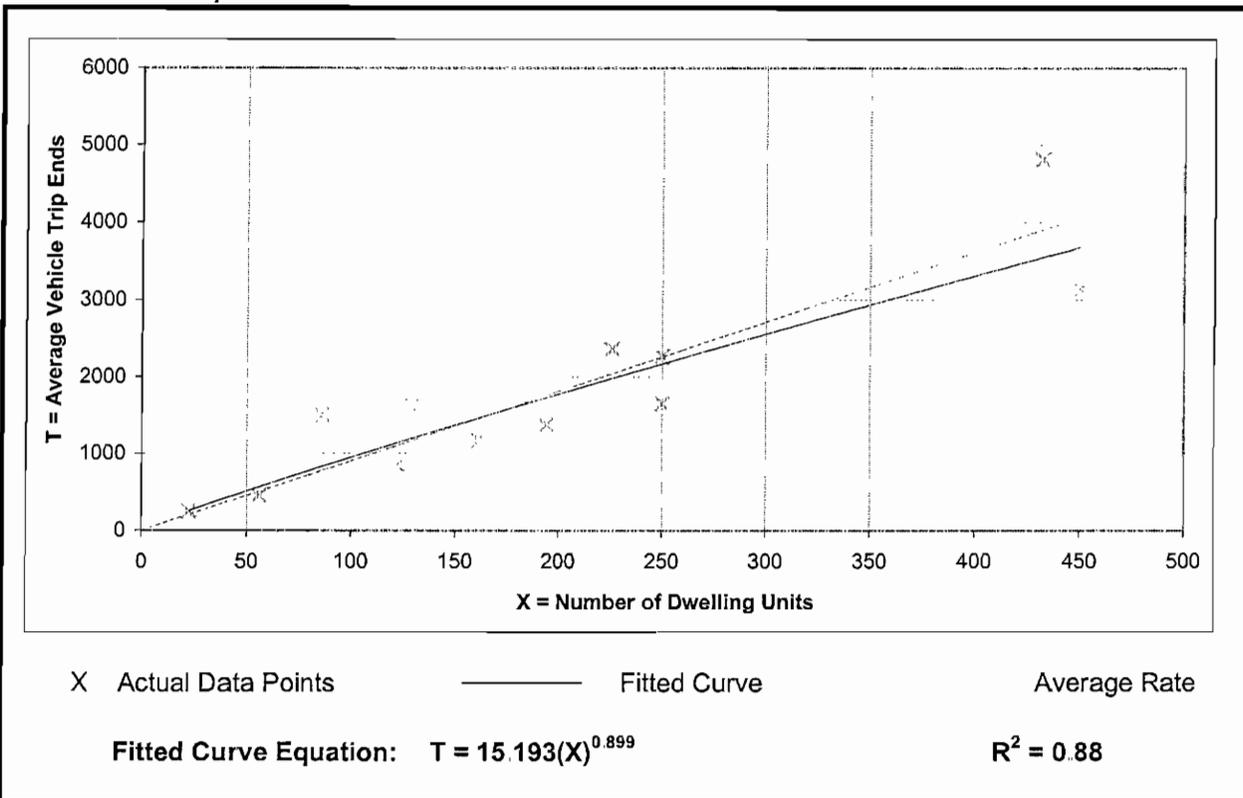
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

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

Trip Generation Per Dwelling Unit

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

Data Plot and Equation



Local Apartment Trip Generation Study

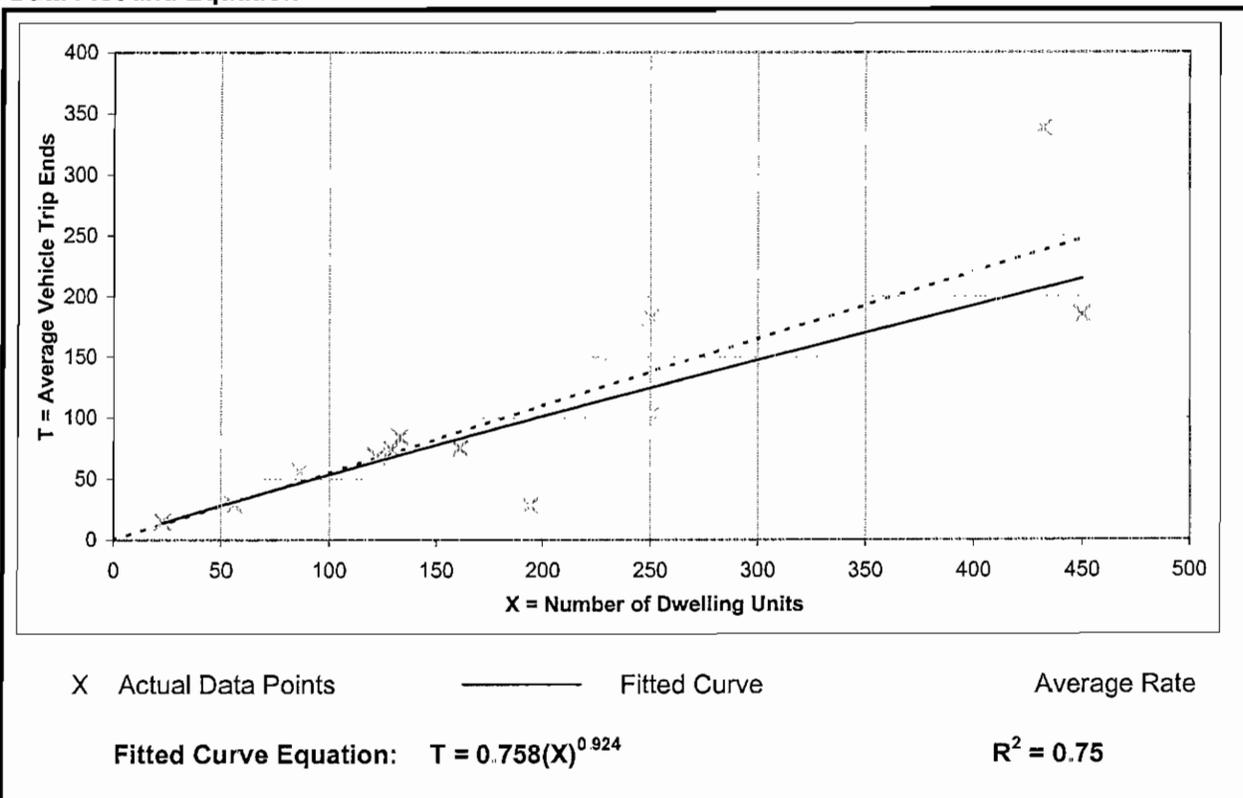
Average Vehicle Trip Ends vs: Dwelling Units
 On a: Weekday,
 Peak Hour of Adjacent Street Traffic,
 One Hour Between 7 and 9 a.m.

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

Trip Generation Per Dwelling Unit

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

Data Plot and Equation



Local Apartment Trip Generation Study

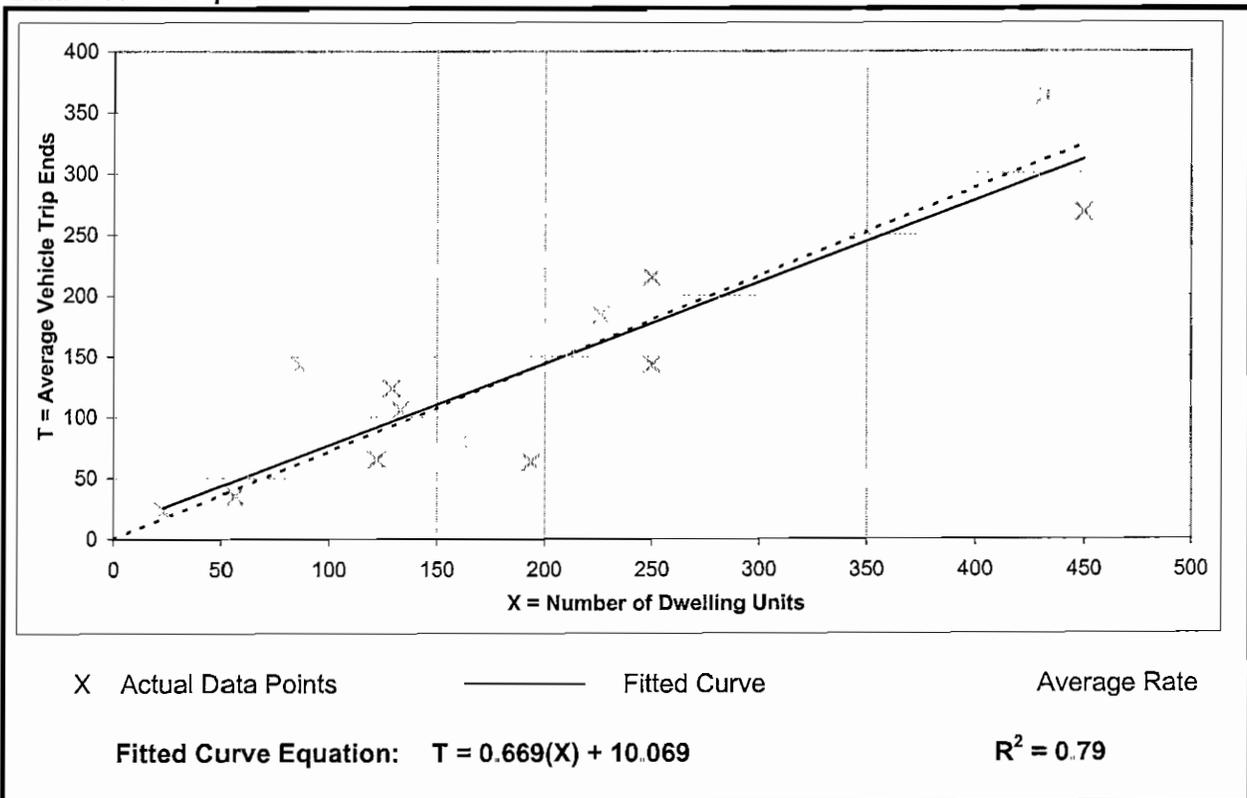
Average Vehicle Trip Ends vs: Dwelling Units
 On a: Weekday,
 Peak Hour of Adjacent Street Traffic,
 One Hour Between 4 and 6 p.m.

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

Trip Generation Per Dwelling Unit

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

Data Plot and Equation



Land Use: 210

Single-Family Detached Housing

Description

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

Specialized Land Use

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

Additional Data

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

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

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

Source Numbers

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

Single-Family Detached Housing (210)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban

Number of Studies: 174

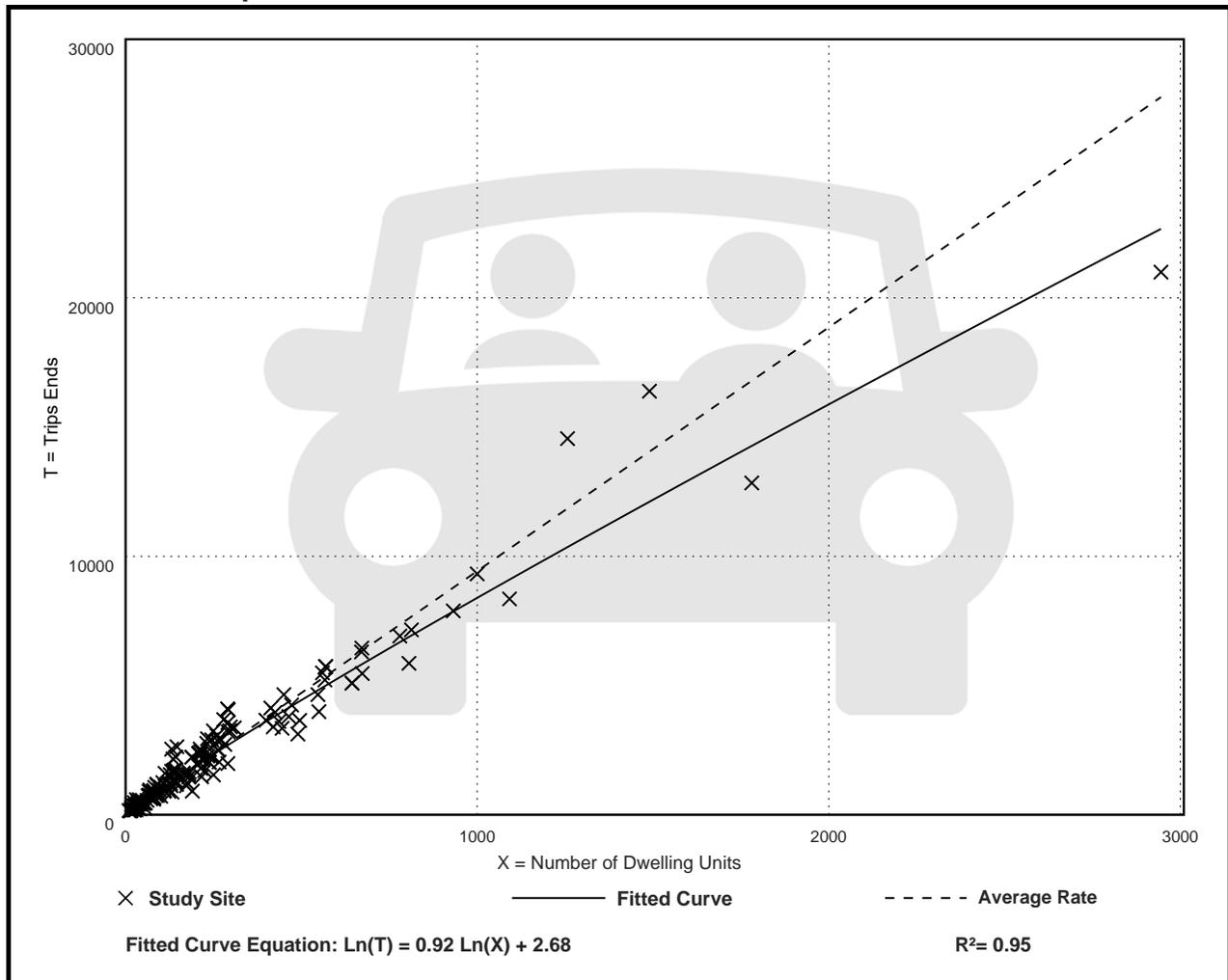
Avg. Num. of Dwelling Units: 246

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

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

Data Plot and Equation



Single-Family Detached Housing (210)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic,

One Hour Between 7 and 9 a.m.

Setting/Location: General Urban/Suburban

Number of Studies: 192

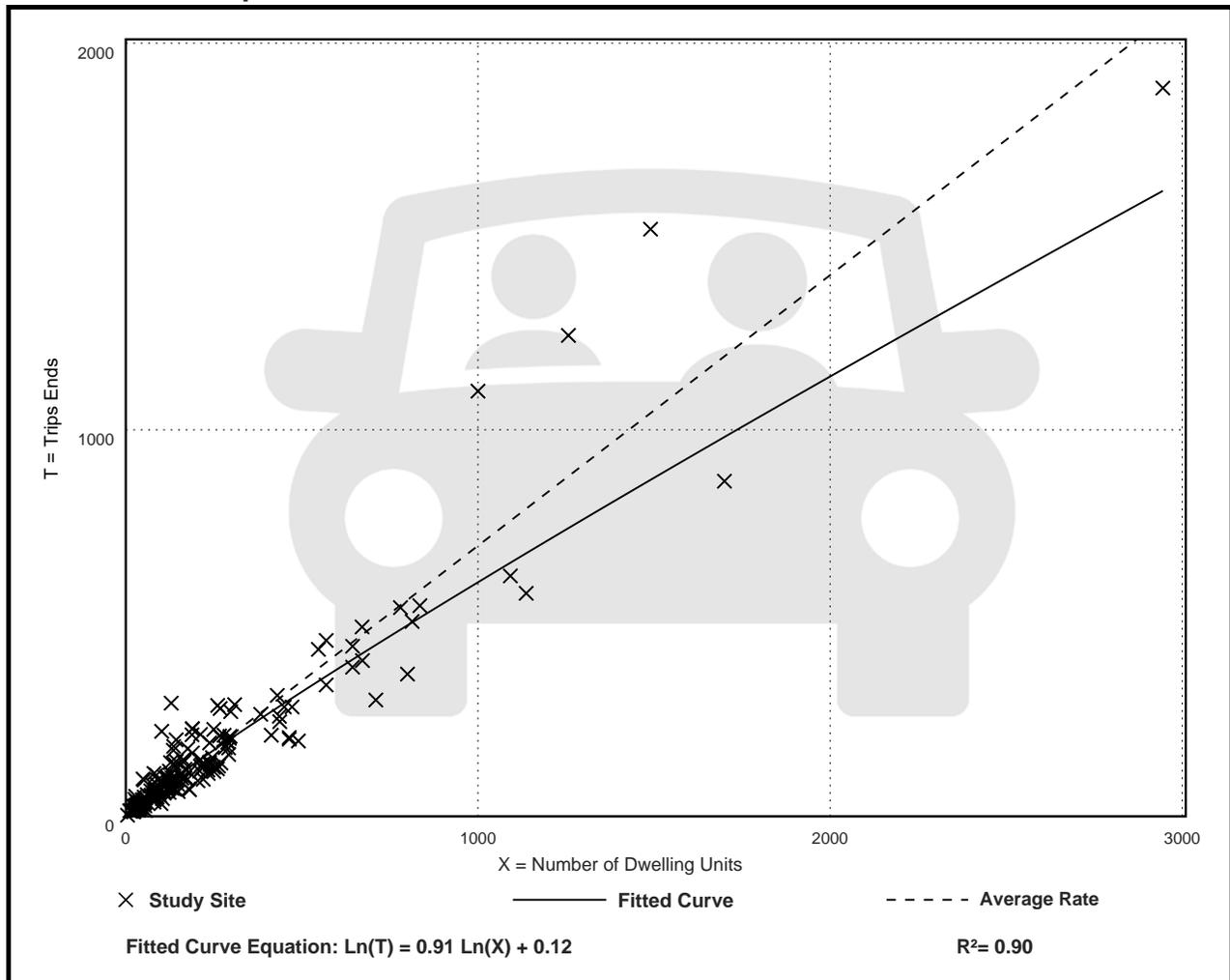
Avg. Num. of Dwelling Units: 226

Directional Distribution: 26% entering, 74% exiting

Vehicle Trip Generation per Dwelling Unit

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

Data Plot and Equation



Single-Family Detached Housing (210)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic,

One Hour Between 4 and 6 p.m.

Setting/Location: General Urban/Suburban

Number of Studies: 208

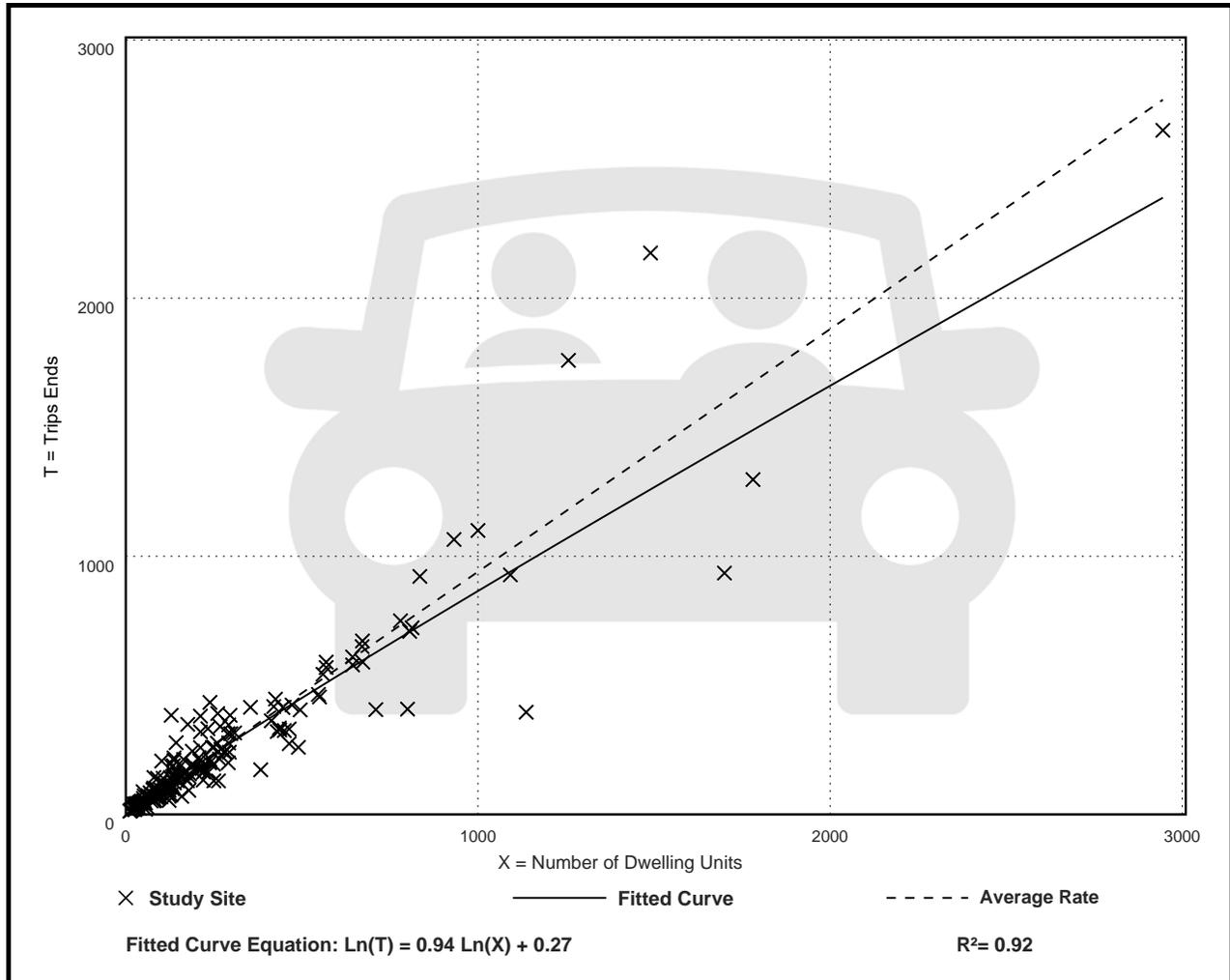
Avg. Num. of Dwelling Units: 248

Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

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

Data Plot and Equation



TRIP GENERATION FOR LENNOX RIDGE SUBDIVISION

103 Multi-Family Attached Townhouses

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	Townhouses	103 Townhouses	980	22%	78%		55%	45%	
				12	43	55	43	36	79
Total New Volume Site Trips			980	12	43	55	43	36	79

Data from Local Trip Rates and calculated by using Fitted Curve Equations

TRIP GENERATION FOR LENNOX RIDGE SUBDIVISION

103 Townhouses

$$103 \text{ Units} = X$$

Weekday:

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

$$T = 15 * 64.50$$

$$T = \underline{\underline{980 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

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

$$T = 0.758 * 72$$

$$T = \underline{\underline{55 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 4 and 6 pm:

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

$$T = 0.669 * 103 + 10.07$$

$$T = \underline{\underline{79 \text{ trips}}}$$

TRIP GENERATION FOR LENNOX RIDGE SUBDIVISION

34 Single-Family Houses based on 1 dwelling unit/acre in Agricultural (A) zone on 34.57 acres

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
#210	Single-Family Detached Housing	34 Houses	386	25%	75%		63%	37%	
				7	22	29	23	14	37
Total New Volume Site Trips			386	7	22	29	23	14	37

ITE Trip Generation Manual, 11th Edition

Trips calculated by using Fitted Curve Equation

TRIP GENERATION FOR LENNOX RIDGE SUBDIVISION

34 Single-Family Houses based on 1 dwelling unit/acre in Agricultural (A) zone
on 34.57 acres

34 Residential Houses = X

Weekday:

Fitted Curve Equation: $\ln(T) = 0.92 \ln(X) + 2.71$

$$\ln(T) = 0.92 * 3.53 + 2.71$$

$$\ln(T) = 5.95$$

$$\underline{\underline{T = 386 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

Fitted Curve Equation: $T = 0.71(X) + 4.80$

$$T = 0.71 * 34 + 4.80$$

$$\underline{\underline{T = 29 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 4 and 6 pm:

Fitted Curve Equation: $\ln(T) = 0.96 \ln(X) + 0.2$

$$\ln(T) = 0.96 * 3.53 + 0.20$$

$$\ln(T) = 3.59$$

$$\underline{\underline{T = 37 \text{ trips}}}$$

TRIP GENERATION FOR LENNOX RIDGE SUBDIVISION

Results Comparison for Different Zoning and Housing Densities

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	Townhouses	103 Townhouses	980	22%	78%		55%	45%	
				12	43	55	43	36	79
Total New Volume Site Trips			980	12	43	55	43	36	79
#210	Single-Family Detached Housing	34 Houses	386	25%	75%		63%	37%	
				7	22	29	23	14	37
Total New Volume Site Trips			386	7	22	29	23	14	37
Difference Between Proposed and Existing Zoning			+ 594	+ 5	+ 21	+ 26	+ 20	+ 22	+ 42

HIGHPLAN 2012 Conceptual Planning Analysis

Project Information

Analyst	RWJ	Highway Name	Heiskell Road	Study Period	Standard K
Date Prepared	12/7/2023 4:52:18 PM	From	Proposed Entrance	Analysis Type	Two-Lane Segment
Agency	Ajax Engineering, LLC	To	East / West Emory Road	Program	HIGHPLAN 2012
Area Type	Transitioning/Urban	Peak Direction	Southbound	Version Date	12/12/2012
File Name	C:\Land Projects 2009\2318 - Heiskell Road\heiskell road.xhp				
User Notes					

Highway Data

Roadway Variables				Traffic Variables			
Segment Length	2.000	Median	No	AADT	6097	PHF	0.900
# Thru Lanes	2	Left Turn Impact	Yes	K	0.090	% Heavy Vehicles	1.0
Terrain	Rolling	Pass Lane Length	N/A	D	0.750	Base Capacity	1700
Posted Speed	40	% NPZ	0	Peak Dir. Hrly. Vol.	412	Local Adj. Factor	0.90
Free Flow Speed	45	Class	3	Off Peak Dir. Hrly. Vol.	137	Adjusted Capacity	0

LOS Results

v/c Ratio	0.39	Density	N/A	PTSF	60.9	ATS	36.8	% FFS	81.8
FFS Delay	35.6	LOS Thresh. Delay	51.6	Service Measure	PctFFS	LOS	C		

Service Volumes

Note: The maximum normally acceptable directional service volume for LOS E in Florida for this facility type and area type is 1650 veh/h/ln.

	A	B	C	D	E
Lanes	Hourly Volume In Peak Direction				
1	160	360	610	870	1090
2					
3					
4					
Lanes	Hourly Volume In Both Directions				
2	220	480	820	1160	1460
4					
6					
8					
Lanes	Annual Average Daily Traffic				
2	2500	5400	9200	12900	16300
4					
6					
8					

* Cannot be achieved based on input data provided.

Performance measure results are no longer applicable with the presence of passing lanes. Refer to the service volume tables to obtain the LOS.

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