
TRAFFIC IMPACT LETTER

CATATOGA SUBDIVISION

KNOX COUNTY, TENNESSEE

-Prepared For-

HMH Development, Inc.
12125 Hardin Valley Road
Knoxville, TN 37932

-Prepared By-



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



10/26/20

October 2020



CIVIL ENGINEERING / TRAFFIC ENGINEERING

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

October 26, 2020

TO: Ms. Tarren Barrett, PE
Transportation Engineer, Knoxville-Knox County Planning

RE: Catatoga Subdivision – Traffic Impact Letter
Knox County, Tennessee

This Traffic Impact Letter (TIL) is being submitted for Catatoga Subdivision. Catatoga Subdivision is a proposed 196-unit single-family detached residential subdivision off North Campbell Station Road in West Knox County, Tennessee. This submittal addresses the Traffic Impact Letter requirements outlined in the "Transportation Impact Analysis Guidelines" as adopted by the Knoxville-Knox County Planning Commission on January 9, 2020.

The information in this TIL includes a project description summary, an overview of the adjacent road characteristics, proposed site plan, trip generation, traffic counts, data from a field review, and other pertinent data with supporting information in the Appendix. This submittal also provides a preliminary traffic analysis of intersection capacity on North Campbell Station Road at the proposed entrance.

If you have any questions or comments about this submittal, please feel free to contact me at any time. We look forward to your review and approval.

Sincerely,

A handwritten signature in black ink, appearing to read "Robert W. Jacks", written in a cursive style.

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

PROJECT DESCRIPTION

■ **GENERAL DESCRIPTION:**

Catatoga Subdivision is proposed to have 196 single-family detached homes on 62.6 +/- acres with a density of 3.13 units per acre. The subdivision will have a single access point off North Campbell Station Road in West Knox County between Yarnell Road and Hardin Valley Road. The proposed site includes two existing parcels, with one of them primarily forested and currently occupied by Catatoga Kennels. The other parcel is undeveloped with a mix of forest and open pasture.

The subdivision is proposed to have three internal roads that will meet Knox County Engineering specifications and design guidelines. The total length of these internal roads will be just over 8,900 feet (1.69 miles). The internal roadways for the development will be paved with asphalt, include 8" extruded concrete curbs, and the lane widths will be 13 feet for a total of 26-foot pavement width. The street right-of-way within the development will be 50 feet. Concrete sidewalks are not being proposed along the internal roads. Knox County will maintain the streets in the subdivision after construction.

In addition to home sites, the subdivision will contain common areas for the residents. It will also incorporate an existing 1.5-acre lake in the design and provide a lakeside clubhouse for subdivision residents. The schedule for completion of this new residential development is dependent on economic factors and construction timelines. For this review of the project, it was assumed that the total construction build-out of the development and full occupancy would occur within the next five years (2025).

■ **SITE LOCATION:**

The proposed single access point (entrance) for Catatoga Subdivision will be constructed at the current Catatoga Kennel driveway location at 1737 North Campbell Station Road. The location of this proposed subdivision is shown on a map in Figure 1. Figure 2 shows the proposed concept site plan for Catatoga Subdivision prepared by Urban Engineering, Inc.

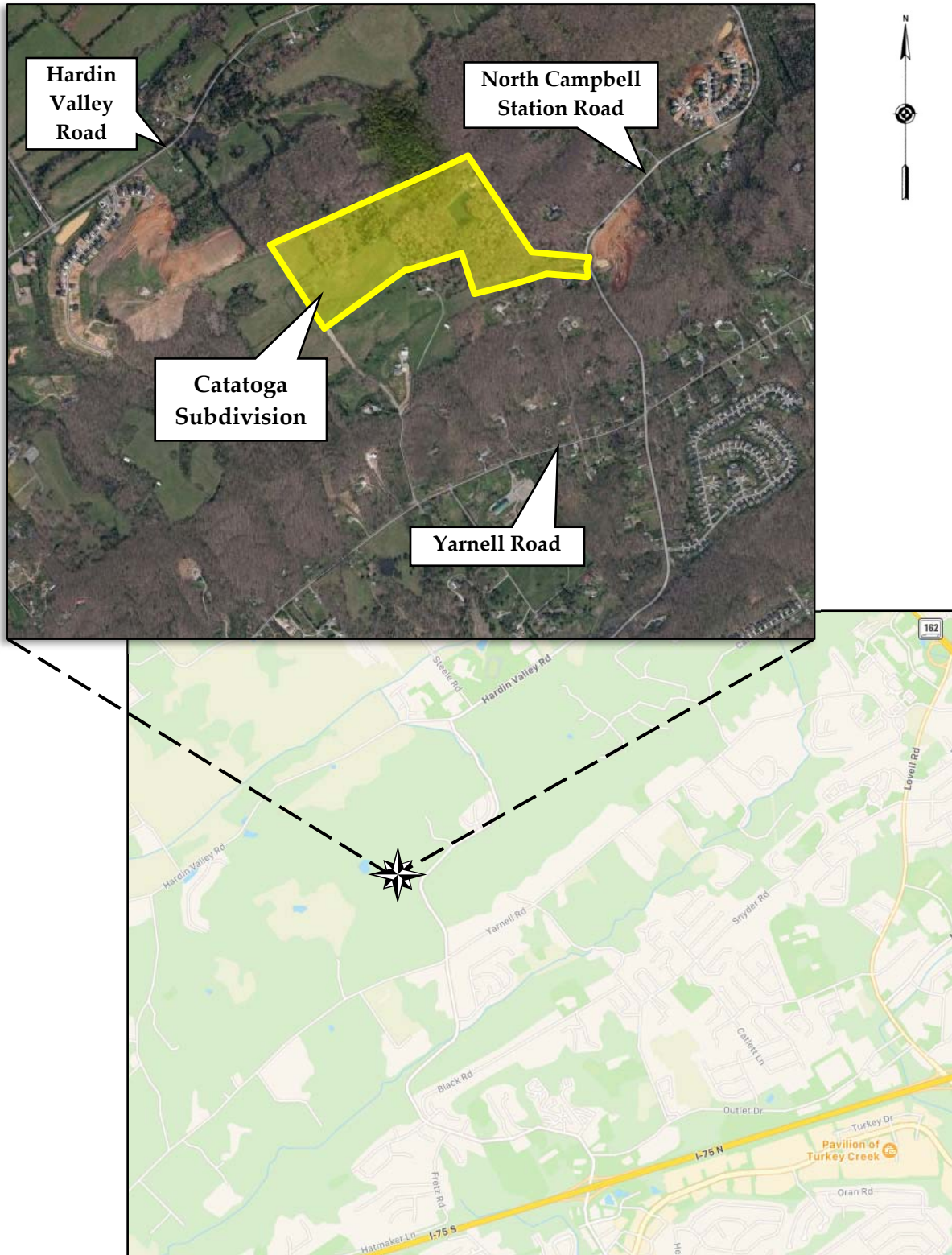


Figure 1
Location Map

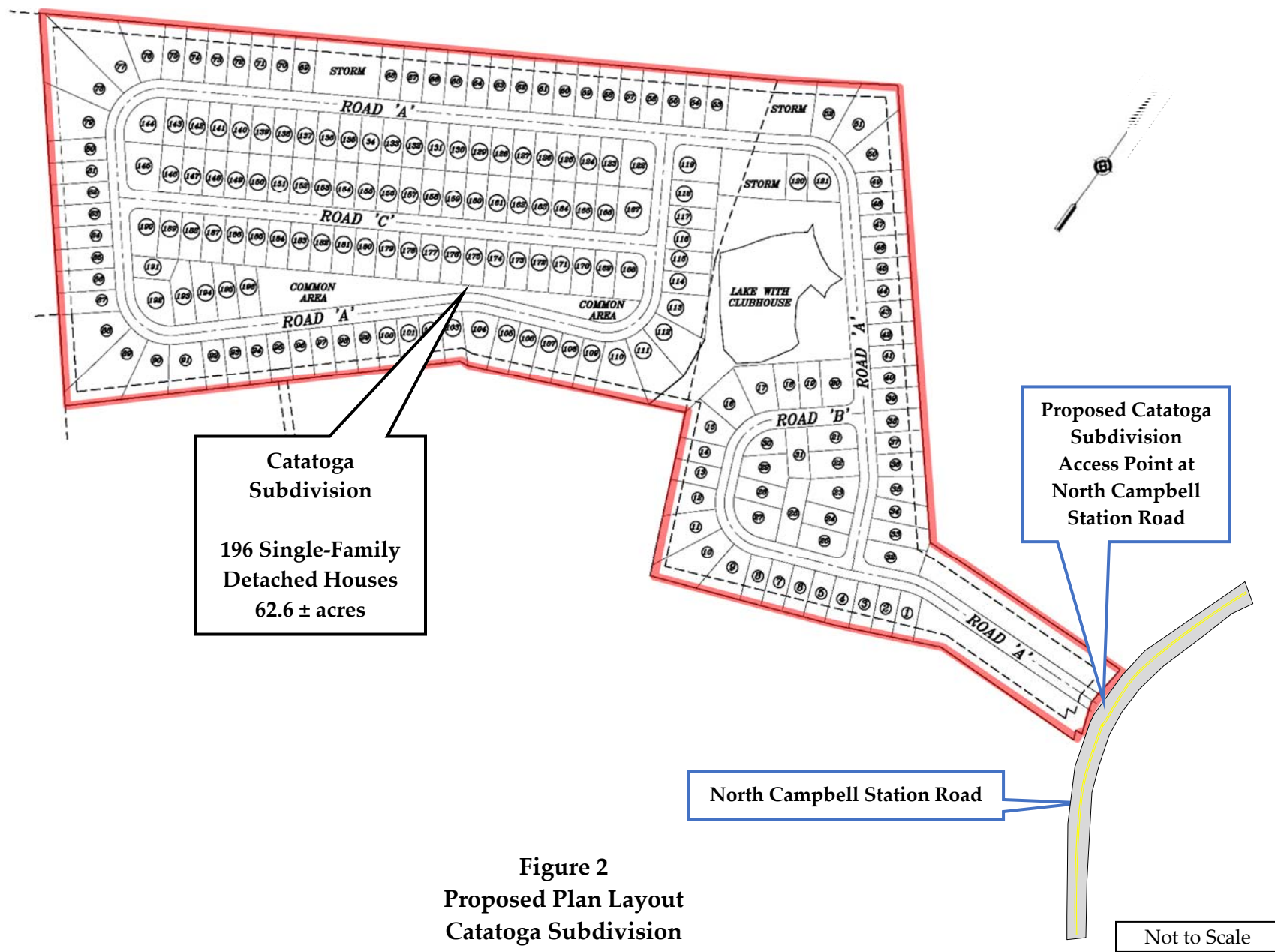


Figure 2
Proposed Plan Layout
Catatoga Subdivision

DESCRIPTION OF EXISTING TRANSPORTATION CONDITIONS

■ EXISTING ADJACENT ROADWAYS:

This proposed development will be located on the northwest side of North Campbell Station Road in between Yarnell Road and Hardin Valley Road. The proposed site access road for the subdivision at North Campbell Station Road will be located 1.0 mile to the south of Hardin Valley Road and 0.4 miles to the north of Yarnell Road.

There are a couple of other existing residential subdivisions in the study area, individual standalone residences, and undeveloped properties. In addition, two new residential subdivisions are currently under construction within a half-mile along North Campbell Station Road, Highlands at Hardin Valley and Brandywine at Pepper Ridge. Several homes are already occupied in the Highlands at Hardin Valley subdivision. Brandywine at Pepper Ridge will be located directly across North Campbell Station Road from the proposed entrance location for Catatoga Subdivision. The entrance for Brandywine at Pepper Ridge will be the closest adjacent public street off North Campbell Station Road to the Catatoga Subdivision entrance. This street, Pepper Ridge Lane, will be approximately 750 feet to the northeast on the south side of North Campbell Station Road.

Table 1 lists the characteristics of the existing roadway adjacent to the development property:

TABLE 1
STUDY CORRIDOR CHARACTERISTICS

NAME	CLASSIFICATION ¹	SPEED LIMIT	LANES	ROAD WIDTH ²	TRANSIT ³	PEDESTRIAN FACILITIES	BICYCLE FACILITIES
North Campbell Station Road	Minor Arterial	30 mph	2 undivided	21 feet	None	No sidewalks along roadway	No bike lanes

¹ 2018 Major Road Plan by Knoxville/Knox County Planning

² Edge of pavement near project site

³ According to Knoxville Area Transit System Map

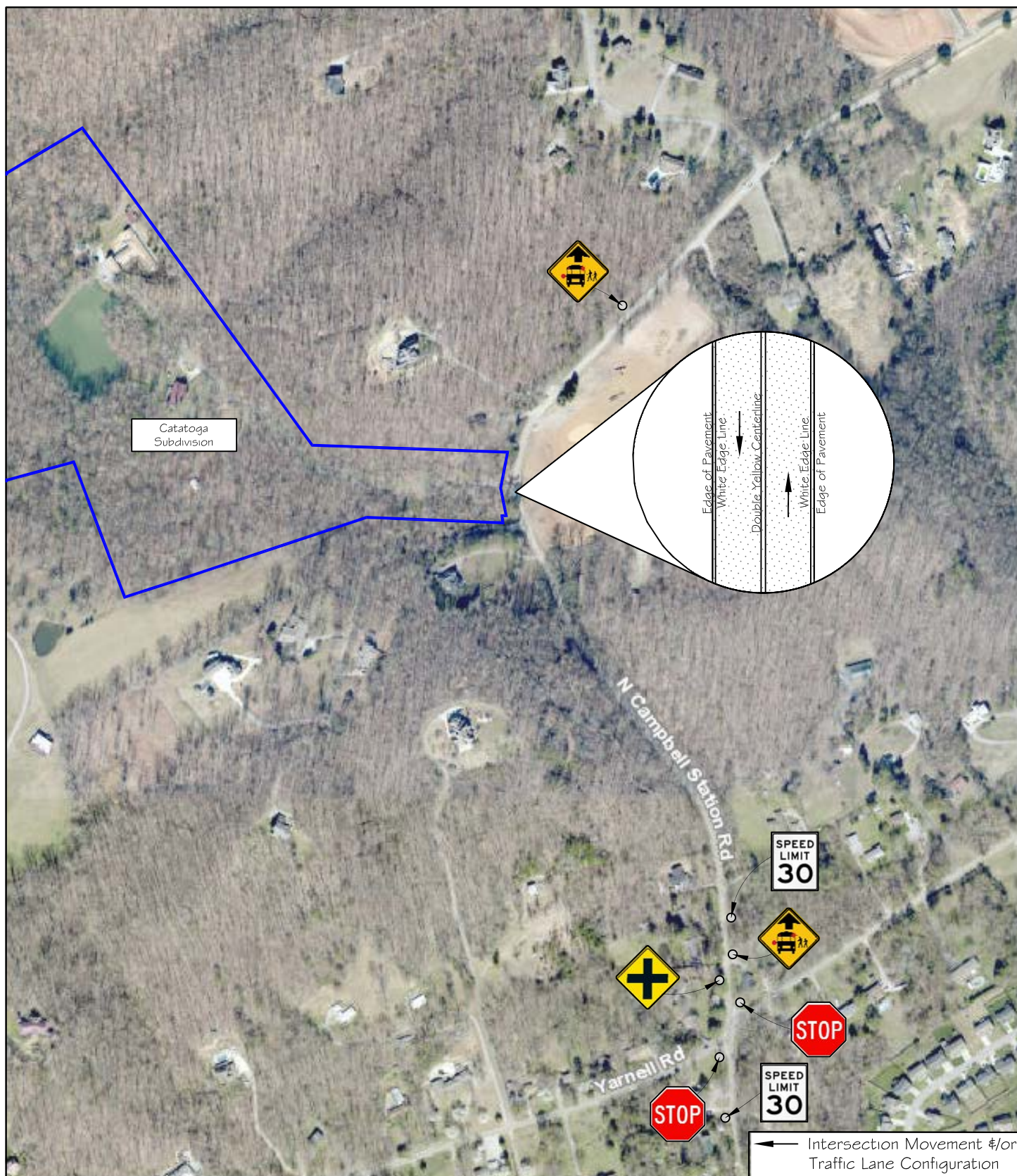
North Campbell Station Road is classified as a Minor Arterial and traverses in a general north-south direction but makes several turns in its length. On its south side, North Campbell Station Road begins at the signalized intersection of Kingston Pike (US 11/US 70/SR 1) in the Town of

Farragut, and on its north side, the road terminates at the intersection with Hardin Valley Road for a total length of 4.8 miles. North Campbell Station Road provides access to Interstate 40/75 at Exit 373. This Interstate access is 2.3 miles to the south of the proposed Catatoga Subdivision entrance on North Campbell Station Road.

At the location of the subdivision's proposed entrance, North Campbell Station Road currently consists of a 2-lane pavement section with faded white edge lines and a double yellow centerline. Pavement widths along North Campbell Road are assumed to be variable. Within several hundred feet of the subdivision's proposed access point, the pavement was measured to slightly fluctuate between 21 feet in width to just over 22 feet. Roadway lighting is not present in the adjacent area along North Campbell Station Road.

At the subdivision's proposed access point, North Campbell Station Road makes an approximately 75° horizontal turn at a substantial road curve. The subdivision's proposed access point will intersect North Campbell Station Road where the existing driveway is located for Catatoga Kennels at the center of this existing horizontal curve.

Figure 3 on the following page shows the lane configurations, pavement markings, and traffic signage on North Campbell Station Road near the project site location. The pages following Figure 3 provide an overview of the adjacent road area with photographs.



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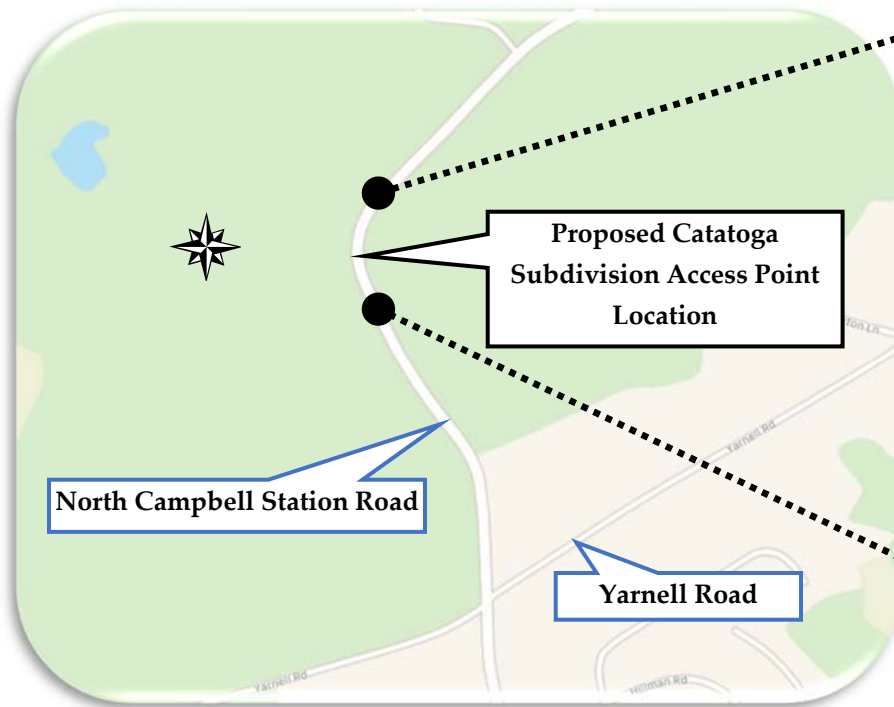


FIGURE 3

Catatoga Subdivision

Traffic Signage & Existing Lane Configurations

PHOTO EXHIBITS



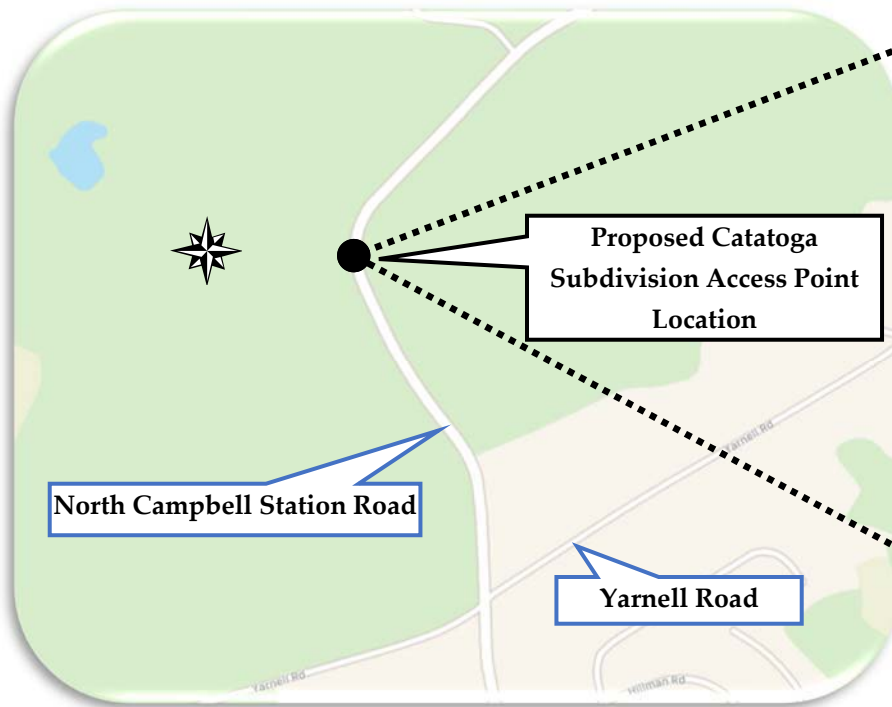
North Campbell Station Road



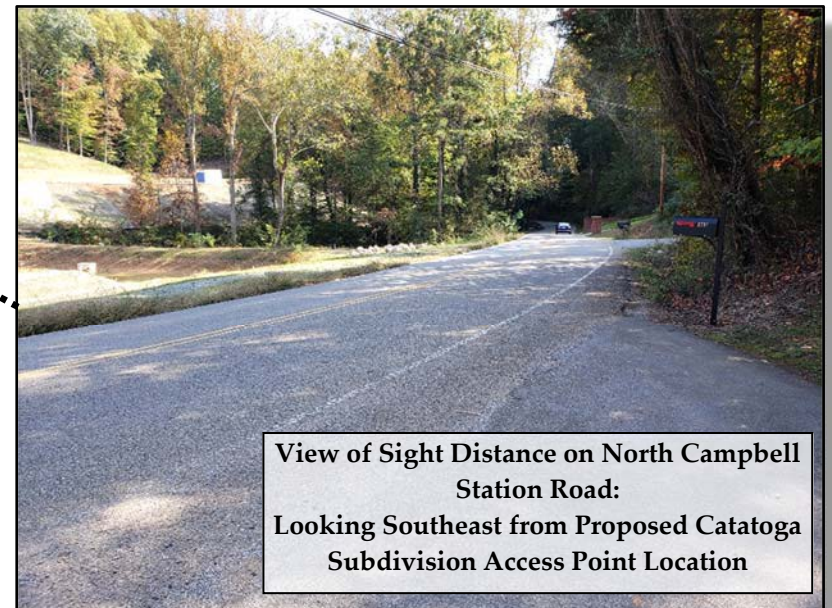
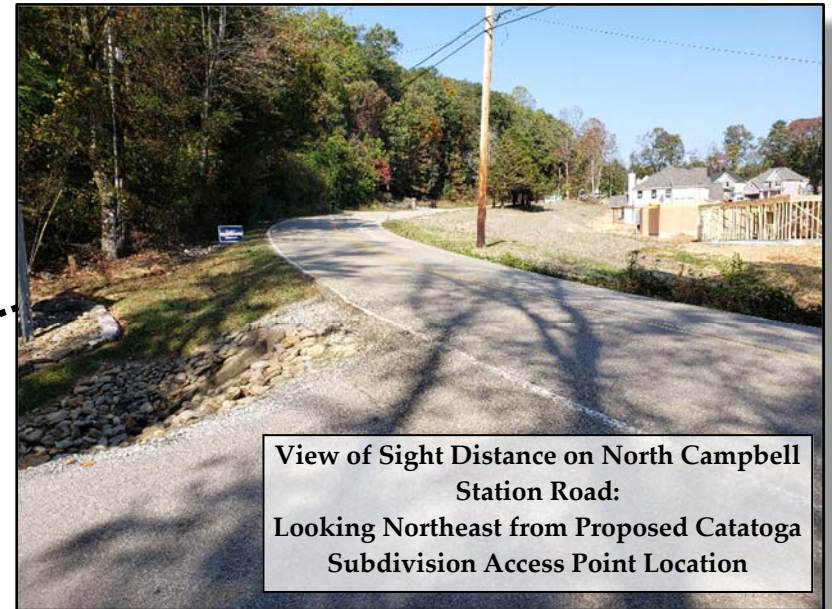
View of North Campbell Station Road:
Looking Southwest towards Proposed
Catatoga Subdivision Access Point

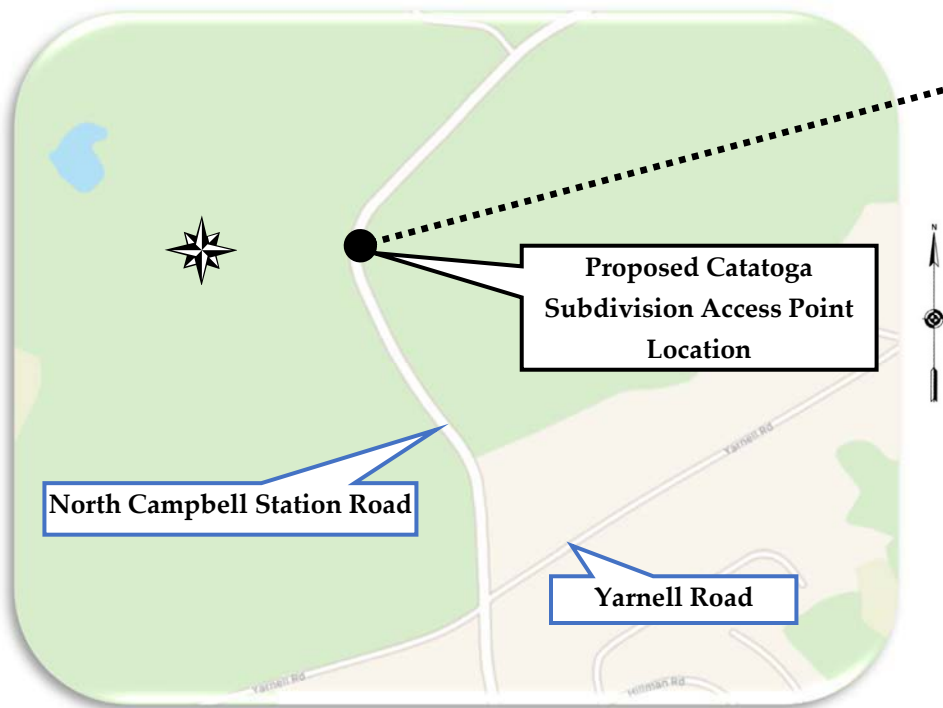


View of North Campbell Station Road:
Looking Northwest towards Proposed
Catatoga Subdivision Access Point

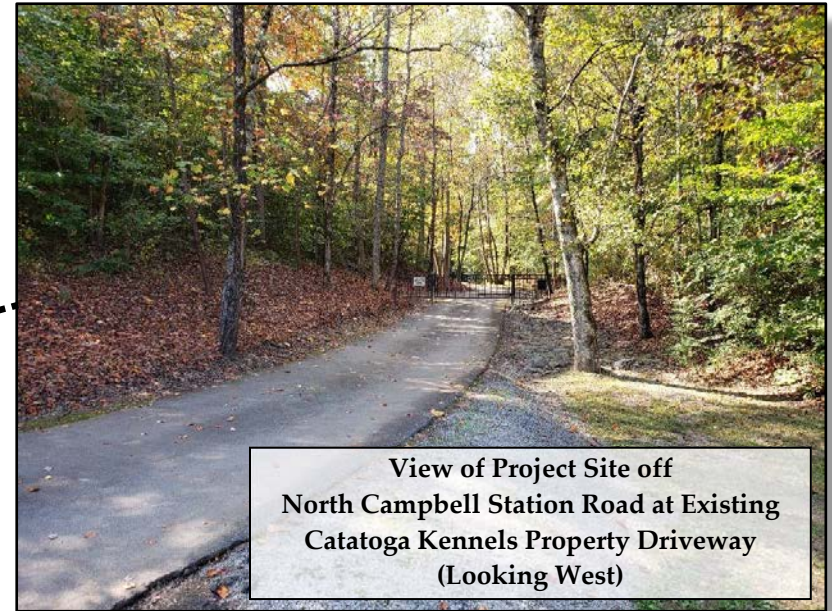


North Campbell Station Road





North Campbell Station Road



■ **EXISTING VEHICULAR TRAFFIC VOLUMES:**

There is one yearly vehicular traffic count location near the project site and one semi-yearly location. The yearly count is conducted by the Tennessee Department of Transportation (TDOT), and the Knoxville TPO conducts the other. The traffic count location data is the following:

- Existing vehicular roadway traffic:
 - TDOT reported an Average Annual Daily Traffic (AADT) on North Campbell Station Road, south of the project site and south of Yarnell Road, at 5,593 vehicles per day in 2018. From 2008 – 2018, this count station has indicated a 3.8% average annual growth rate.
 - The Knoxville TPO reported an Average Daily Traffic (ADT) on North Campbell Station Road, south of Hardin Valley Road and north of the project site, at 5,700 vehicles per day in 2019. This count location has had sporadic counts conducted every year. From 2010 – 2019, this count station has indicated a 6.3% average annual growth rate. All the researched historical traffic count data for this report can be viewed in the Appendix.

The data from the September 26, 2019 count conducted by the Knoxville TPO was obtained for this analysis. It included the hour-by-hour tabulation of northbound and southbound volumes on North Campbell Station Road. Based on this last count, it was determined that the AM Peak Hour was 7:15 – 8:15 AM and the PM Peak Hour was 3:15 – 4:15 PM. The data from this traffic count is also shown in the Appendix. The peak hour traffic counts at the count location were the following:

AM Peak Hour: 308 Southbound, 317 Northbound = 625 Total (~50%/50% Split)

PM Peak Hour: 390 Southbound, 248 Northbound = 638 Total (~60%/40% Split)

■ **INTERSECTION SIGHT DISTANCE:**

Sight distance on North Campbell Station Road was measured at the proposed site access road location by Urban Engineering, Inc. and was determined to be just over 400 feet to the north and just shy of 500 feet to the south. A letter from Urban Engineering, Inc. testifying to these measurements is located in the Appendix. The speed limit is posted at 30 mph on the adjacent section of North Campbell Station Road. Based on Knox County's policy of requiring 10 feet of

sight distance per 1-mph of speed, the available sight distance is more than adequate. With a posted speed limit of 30 mph on North Campbell Station Road, the required sight distance is 300 feet.



View of Sight Distance on North Campbell Station Road at Proposed Site Access Road Location (Looking Northeast)



View of Sight Distance on North Campbell Station Road at Proposed Site Access Road Location (Looking Southeast)

■ **VEHICLE CRASH HISTORY:**

Traffic crash information from 2015 to 2019 for North Campbell Station Road adjacent to the proposed site access location was obtained from Knox County Engineering. The accident data from the County included the number of occurrences, the location, date of occurrence, and vehicle crash type. Two vehicle crashes were identified, and the information is shown in Figure 4. The individual crash reports filed from the incidents were not obtained for further analysis in this review since the incident report numbers were not given.

According to John Sexton, PE at Knox County Engineering, "this section of roadway [North Campbell Station Road] is within a larger segment from Hardin Valley Road to Destiny Ridge Way". The study data for the County Strategic Transportation Plan, which was a high-level review of road safety needs, included crash data from 2012 to 2015. Based on the larger segment of North Campbell Station Road (2.9 miles) from 2012 to 2015, there were 40 reported crashes. This segment ranked #114 out of 554 segments reviewed based on the strategic plan study's crash score.

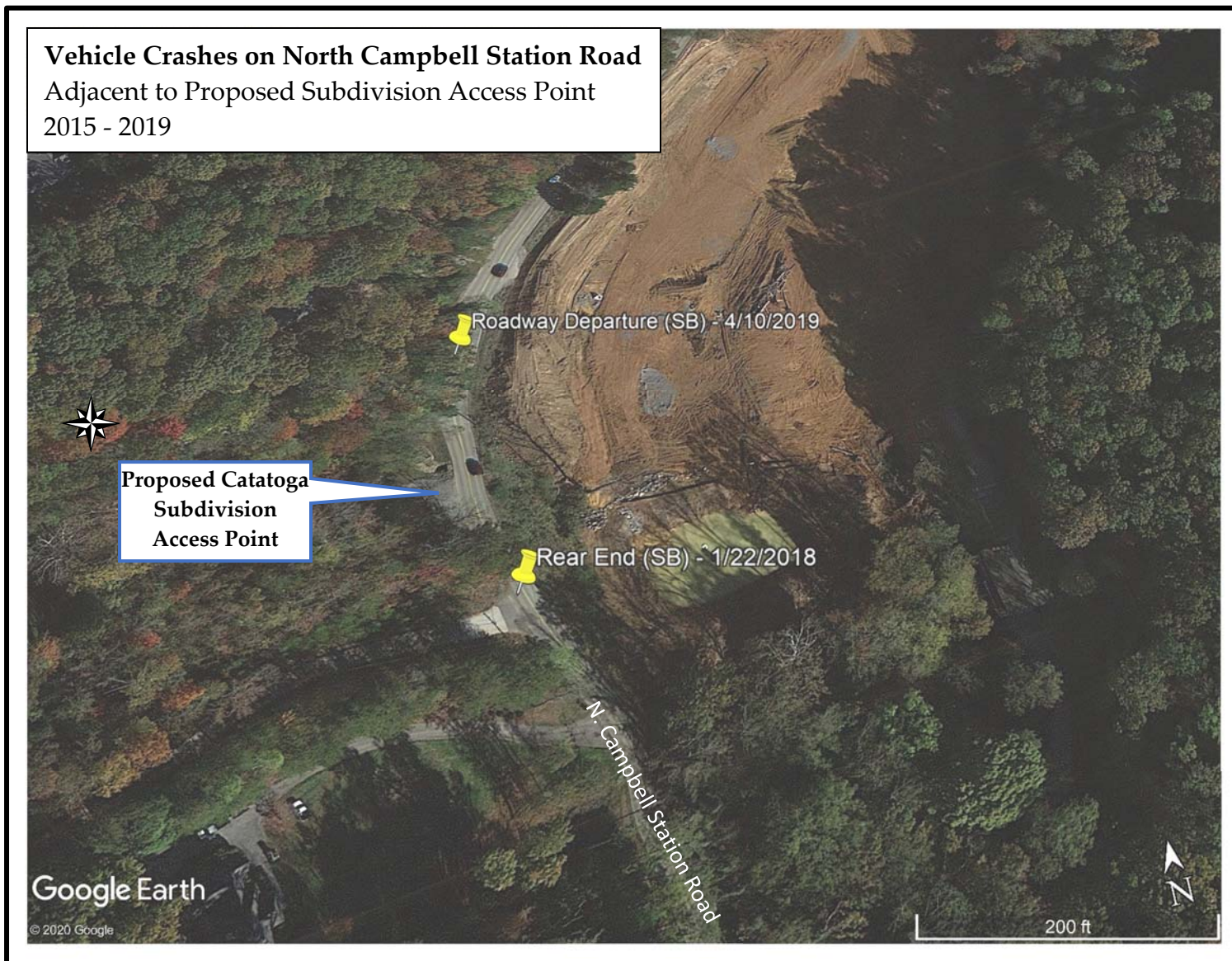


Figure 4
Vehicle Crash Map

PRELIMINARY TRAFFIC ANALYSIS OF PROJECTED CONDITIONS

■ TRIP GENERATION:

The estimated amount of traffic generated by the proposed residential development was calculated based upon rates and equations for peak hour trips provided by Trip Generation Manual, 10th Edition, a publication of the Institute of Transportation Engineers (ITE). A generated trip is a single or one-direction vehicle movement that is either entering or exiting the study site. The Trip Generation Manual is the traditional and most popular resource for determining trip generation rates when traffic impact studies are produced. The Manual lists and includes data for various land uses and correlates trips generated based on different variables such as dwelling units, square footage, etc. The data from ITE for the proposed land use is shown in the Appendix. A summary of this information is presented in the following table:

TABLE 1
TRIP GENERATION FOR CATATOOGA SUBDIVISION
196 Single-Family Detached Houses

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
#210	Single-Family Detached Housing	196 Houses	1,932	25%	75%		63%	37%	
				36	108	144	122	72	194
Total New Volume Site Trips			1,932	36	108	144	122	72	194

ITE Trip Generation Manual, 10th Edition

Trips calculated by using Fitted Curve Equation

For the proposed residential subdivision, with a maximum of 196 single-family detached houses, it is estimated that 36 vehicles will enter, and 108 will exit, for a total of 144 generated trips during the AM Peak Hour in the year 2025. Similarly, it is estimated that 122 vehicles will enter, and 72 will exit, for a total of 194 generated trips during the PM Peak Hour in the year 2025. The calculated trips generated for an average weekday could be approximately 1,932 vehicles for the proposed development in 2025. No trip reductions were included in the analysis.

■ **OPENING YEAR TRAFFIC CONDITIONS (WITHOUT PROJECT):**

Opening year traffic volumes represent the future condition the proposed study area is potentially subject to even without the proposed project (no-build option). As previously stated, the build-out and full occupancy for this proposed new residential development is assumed to occur in 2025. This horizon year corresponds to five years for the subdivision to reach full capacity and occupancy.

According to the adjacent reported count stations, traffic growth on North Campbell Station Road has been fairly substantial over the past ten years. For this analysis, a +5% annual growth rate was assumed to consider any future development in the area, potential rising travel volumes, and a reasonable estimate for this study analyzing the projected opening year traffic volumes for the year 2025 the AM and PM peak hours.

The traffic volumes collected at the location by the Knoxville TPO on North Campbell Station Road slightly to the north of the project site were assumed to be appropriate for this analysis. Based on this growth rate assumption, the traffic volumes from September 2019 were adjusted upwards to the year 2025 and resulted in the following volumes:

AM Peak Hour: 400 Southbound, 412 Northbound = 812 Total (~50%/50% Split)

PM Peak Hour: 507 Southbound, 322 Northbound = 829 Total (~60%/40% Split)

■ **TRIP DISTRIBUTION & ASSIGNMENT:**

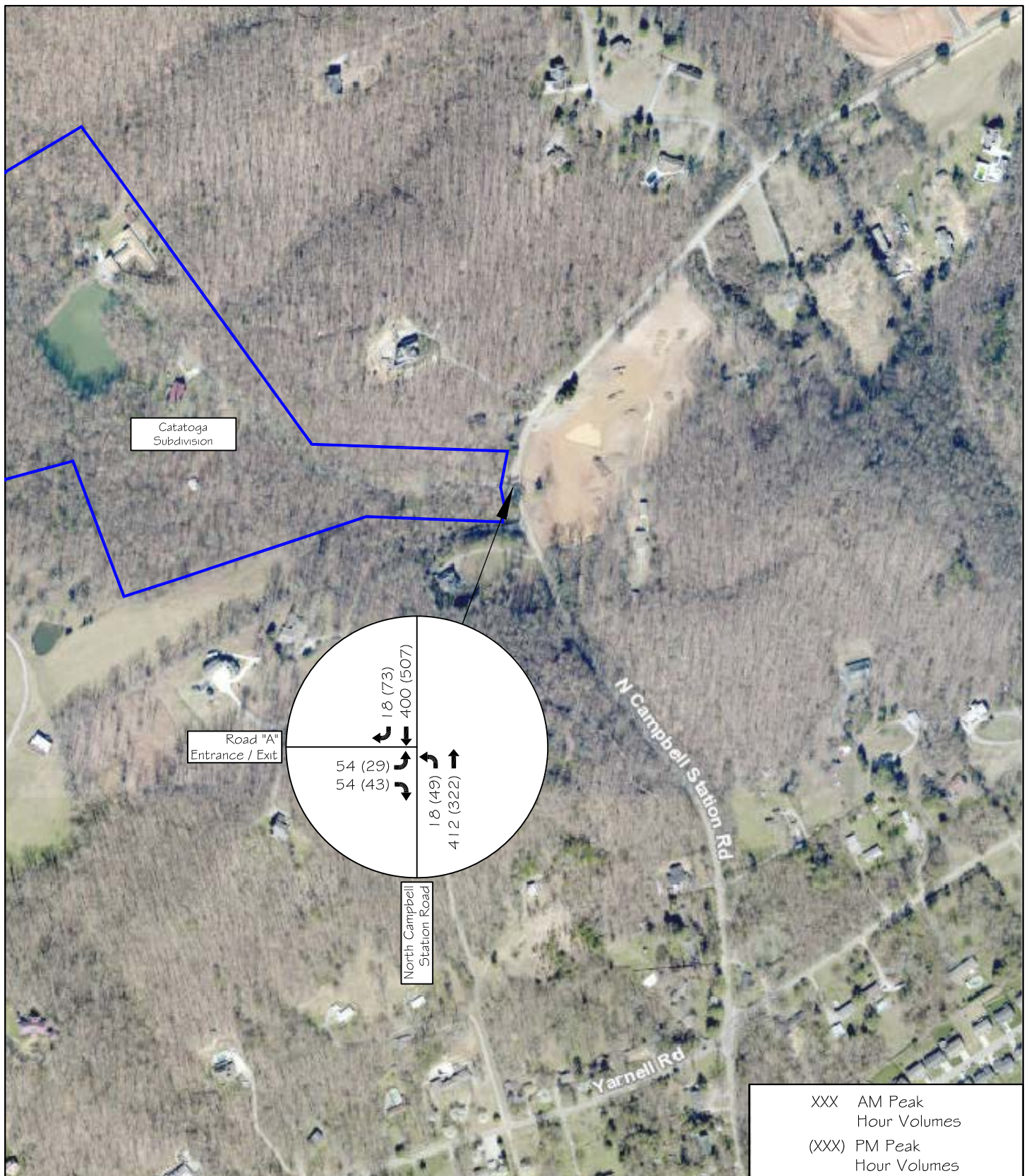
The traffic distribution (splits) tabulated by the Knoxville TPO on North Campbell Station Road was assumed to be appropriate for determining the project trip generation distribution to and from Catatoga Subdivision. Based on this assumption, the following can be determined:

Trips Generated in AM Peak Hour: 36 Entering = 18 from north, 18 from south

108 Exiting = 54 to north, 54 to south

Trips Generated in PM Peak Hour: 122 Entering = 73 from north, 49 from south

72 Exiting = 29 to north, 43 to south



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FIGURE 5


Catatoga Subdivision

2025 Peak Hour Traffic Volumes - OPENING YEAR TRAFFIC (WITH PROJECT)

Capacity analyses were undertaken to determine the projected Level of Service (LOS) for the proposed intersection of North Campbell Station Road at Road "A" (proposed entrance road) for vehicular traffic. The capacity analyses were calculated by following the methods outlined in the Highway Capacity Manual (HCM) and using Synchro Traffic Software (Version 8).

The projected peak hour vehicular traffic results can be seen in Table 2 for the intersection from the capacity calculations, with worksheets include in the Appendix. As shown in Table 2, the studied intersection is calculated to operate at acceptable levels with minimal to average vehicle delays for the traffic movements in the projected conditions.

TABLE 2
2025 INTERSECTION CAPACITY ANALYSIS RESULTS -
NORTH CAMPBELL STATION ROAD AT ROAD "A"
OPENING YEAR (WITH PROJECT)

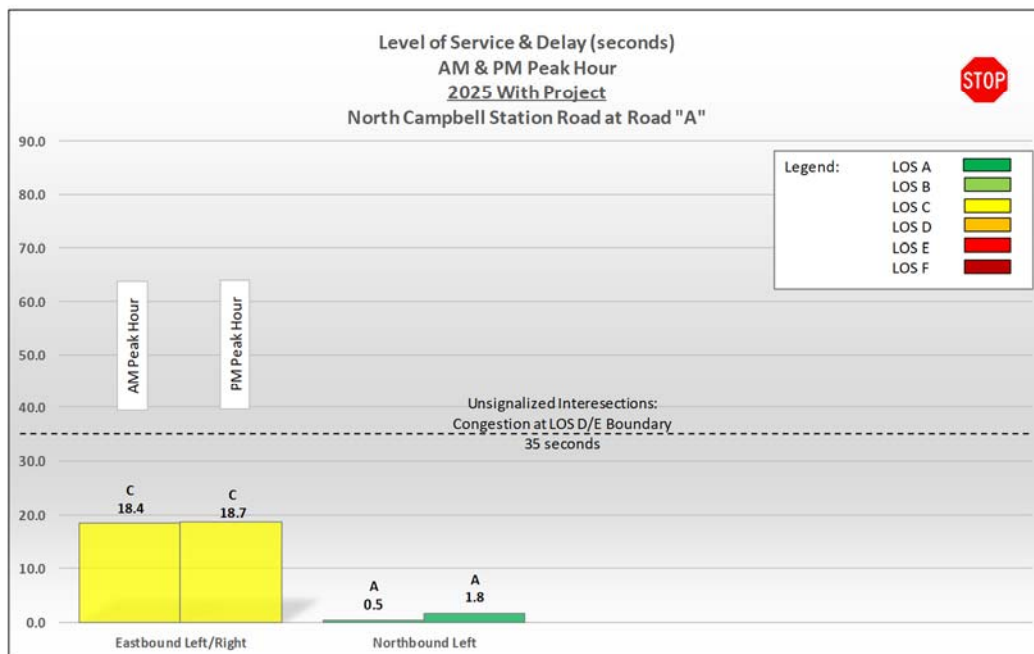
INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
North Campbell Station Road at Road "A"	 Unsignalized	Eastbound Left/Right	C	18.4	0.310	C	18.7	0.230
		Northbound Left	A	0.5	0.020	A	1.8	0.060

Note: All analyses were calculated in Synchro 8 software and reported using HCM 2000 intersection methodology

^a Level of Service

^b Average Delay (sec/vehicle)

^c Volume-to-Capacity Ratio



■ **EVALUATION OF TURN LANE THRESHOLDS:**

The proposed North Campbell Station Road at Road “A” intersection was evaluated for the need for separate turn lanes into the site development in 2025. The design policy used for these turn lane evaluations is based on “Knox County’s Access Control and Driveway Design Policy”.

Based on the preliminary projected peak hour 2025 traffic volumes at the proposed intersection of North Campbell Station Road at Road “A” and according to “Knox County’s Access Control and Driveway Design Policy”, a separate southbound right-turn lane will not be warranted. However, a northbound left-turn lane is potentially warranted on North Campbell Station Road for vehicles entering the subdivision. The projected estimated volumes are just under the threshold for a separate northbound left-turn lane.

This evaluation's speed classification was based on the posted speed limit of 30-mph on North Campbell Station Road. Therefore, this intersection evaluation used the Knox County classification for speeds of 35 mph or less with the calculated projected volumes. The worksheets from this preliminary analysis are included in the Appendix.

OVERVIEW OF FINDINGS

The following is an overview of the findings for the proposed Catatoga Subdivision on North Campbell Station Road based on the preliminary assessment of the existing and preliminary projected conditions:

- The sight distance at the proposed site access road location at North Campbell Station Road has been measured to be more than adequate.
- The initial review of the traffic crash data adjacent to the proposed site on North Campbell Station Road does not indicate any road or safety issues at the proposed site access road location. The proposed entrance will be located on an existing sharp horizontal curve on North Campbell Station Road, but sight distance appears to be more than adequate. Due to this curvature, road warning signage or other strategies on North Campbell Station Road may be recommended after conducting a more in-depth analysis provided in a Traffic Impact Analysis Study.
- The results of the level of service calculations for the projected conditions of Road “A” at North Campbell Station intersection in the year 2025 were determined to be more than adequate with respect to road capacity with minimal vehicle delay.
- Using the preliminary projected traffic volumes, the turn lane warrant analysis for the proposed intersection of Road “A” at North Campbell Station suggests a potential need for a separate northbound left-turn lane on North Campbell Station Road.
- Traffic calming measures might be needed for this development. Sections of the horizontal alignment for the proposed Road “A” and “C” within the development have long and straight road segments. The possible need for traffic calming measures inside the development will need to be coordinated with Knox County Engineering and Public Works during the detailed design phase.
- For residential subdivisions with a single access point and more than 150 units, the County has a long-standing unwritten design policy requiring a boulevard road typical section at the entrance. This is to ensure access to the subdivision

during potential emergencies. Since the proposed layout of the Catatoga Subdivision only includes one means of ingress and egress and will have 196-units, the subdivision entrance is recommended to be designed and constructed with a boulevard roadway section. At a minimum, the boulevard section should have a 10-foot median with 2 – 18-foot lanes within 60 feet of right-of-way. Typically, a boulevard road section is designed and constructed to the first intersecting street within the development.

- The County has indicated that they are in the planning stages of re-routing North Campbell Station Road in between Hardin Valley Road and the Interstate system to the south. This re-routing is to provide a more efficient and safer route between the two areas. It is not believed that a final route has been selected; however, three potential routes are under consideration. One of these routes is shown clipping the northwest corner of the proposed Catatoga Subdivision property. The three potential routes are shown in the Appendix for informational purposes.

APPENDIX

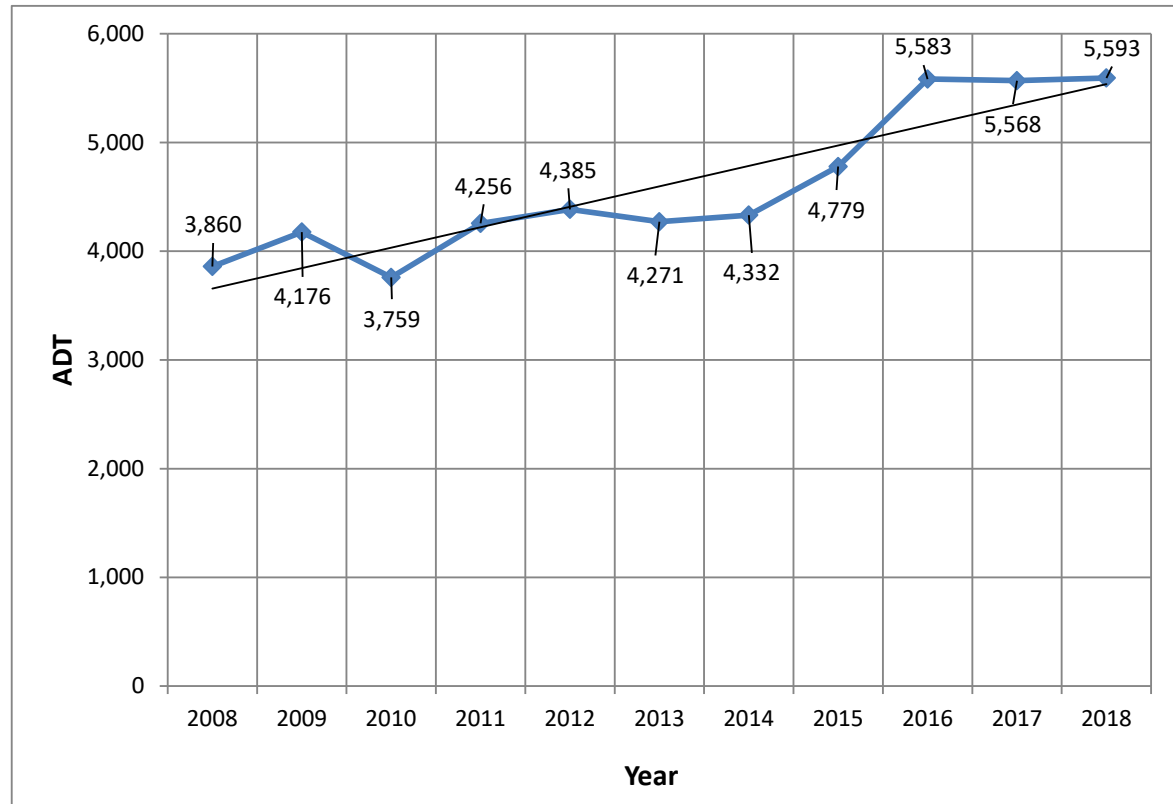
Historical Traffic Counts

Organization: TDOT

Station ID #: 000303

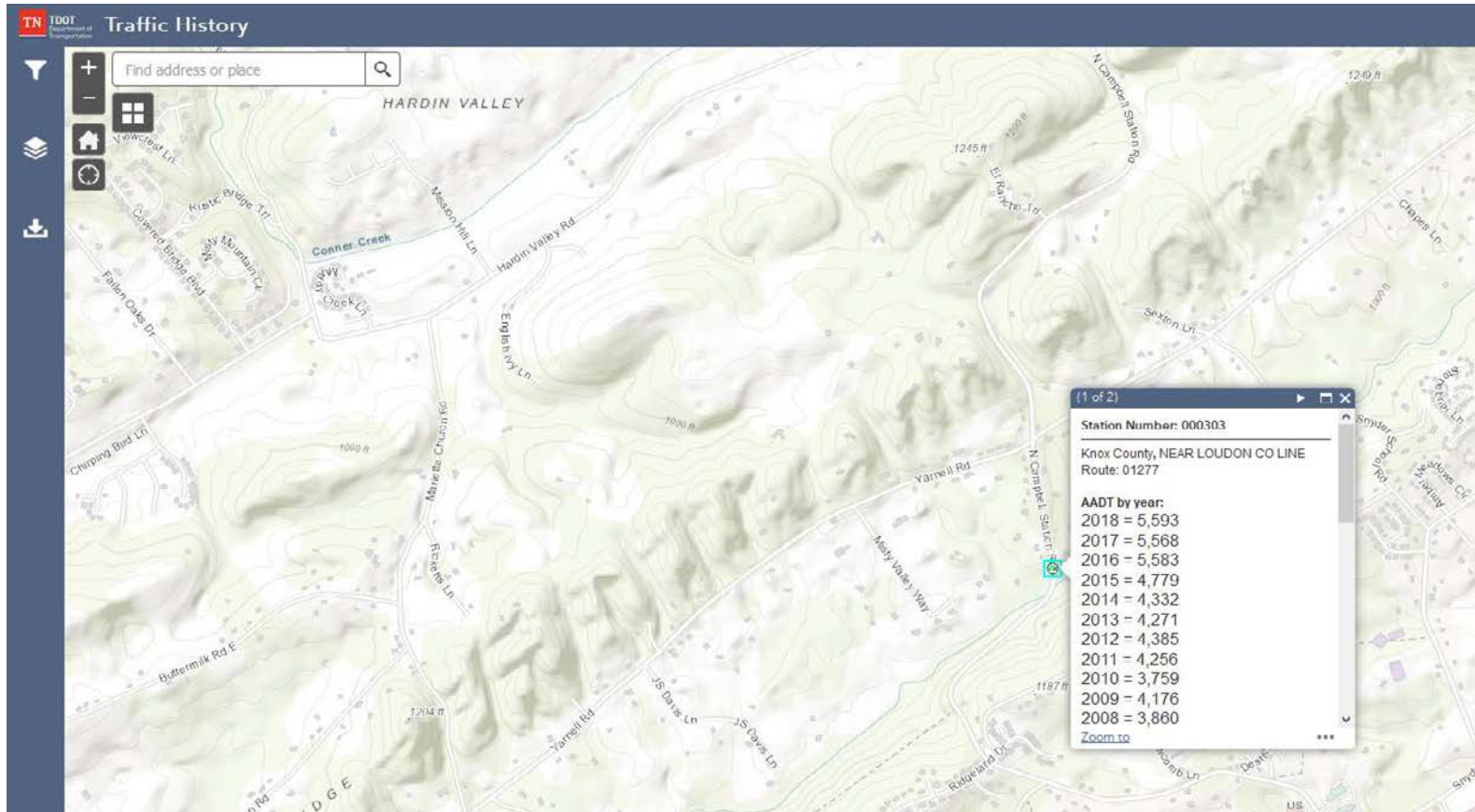
Location: North Campbell Station Road, south of Yarnell Road

YEAR	ADT	
2008	3,860	Trendline ↓
2009	4,176	
2010	3,759	
2011	4,256	
2012	4,385	
2013	4,271	
2014	4,332	
2015	4,779	
2016	5,583	
2017	5,568	
2018	5,593	



2008 - 2018 Growth Rate = 44.9%

Average Annual Growth Rate = 3.8%



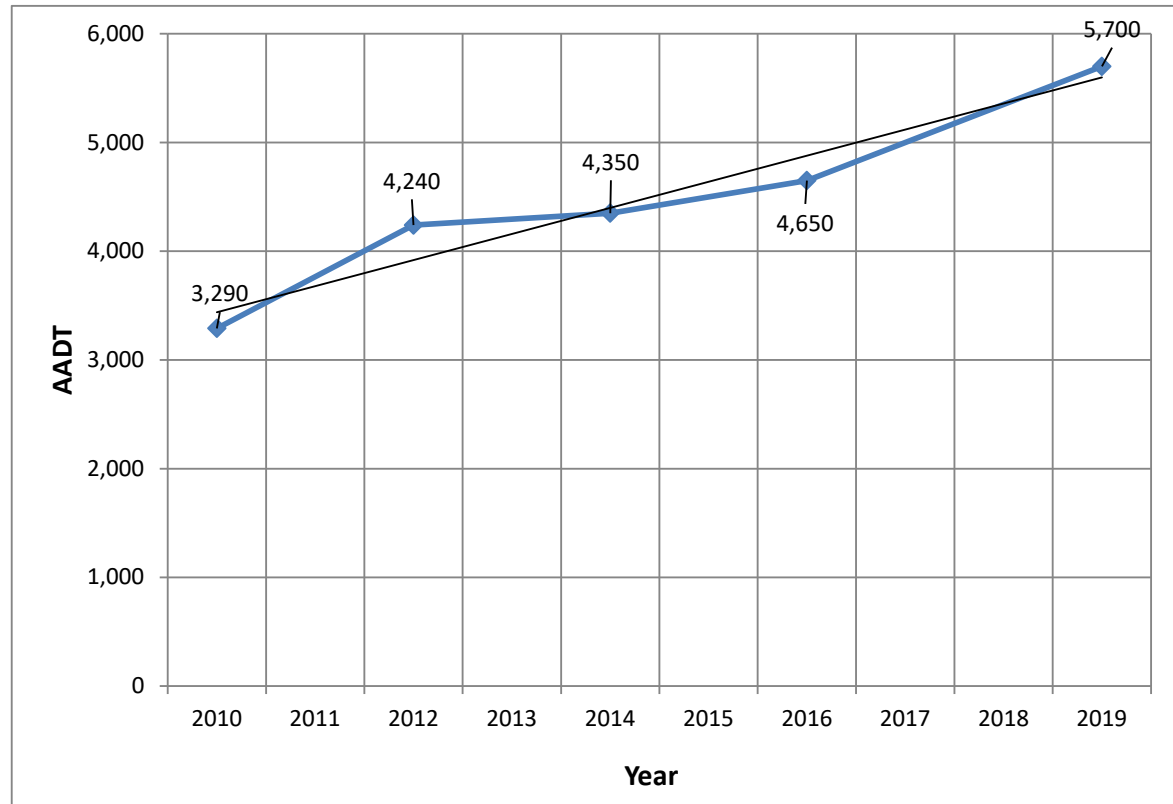
Historical Traffic Counts

Organization: Knoxville TPO

Station ID #: 093M354

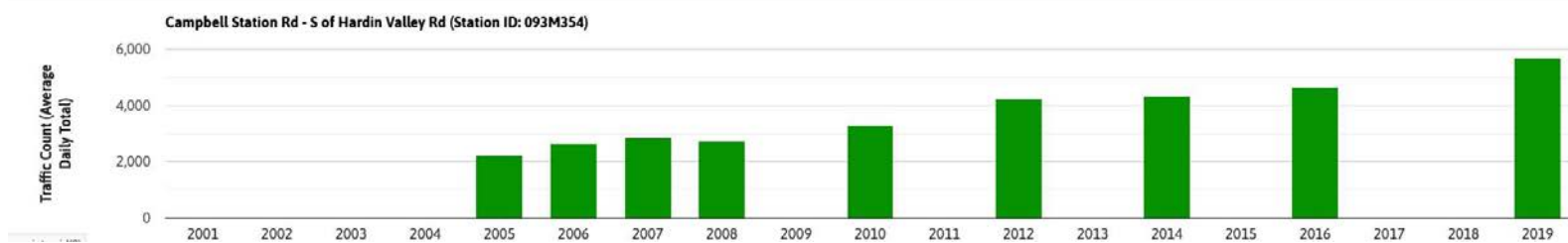
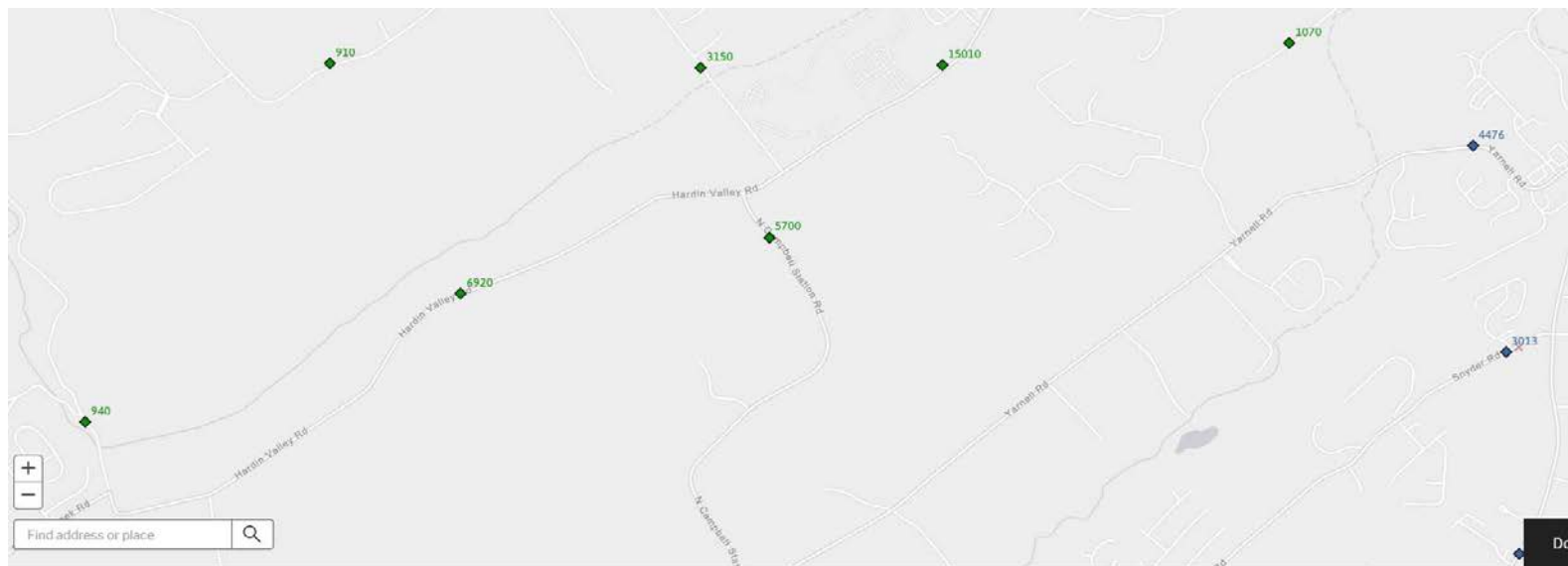
Location: North Campbell Station Road, south of Hardin Valley Road

YEAR	AADT	
2009	-	
2010	3,290	Trendline ↓
2011	-	
2012	4,240	
2013	-	
2014	4,350	
2015	-	
2016	4,650	
2017	-	
2018	-	
2019	5,700	



2010 - 2019 Growth Rate = 73.3%

Average Annual Growth Rate = 6.3%



VOLUME

Campbell Station Rd S/O Hardin Valley Rd(35.92853, -84.18534)

Day: Thursday
Date: 9/26/2019City: Knoxville
Site #: 093M354

DAILY TOTALS					NB	SB						EB	WB						Total
					2,897	2,801						0	0						5,698
AM Period	NB	SB	EB	WB	TOTAL		PM Period	NB	SB	EB	WB	TOTAL							TOTAL
0:00	1	4			5		12:00	52	53			105							105
0:15	1	0			1		12:15	45	51			96							96
0:30	0	1			1		12:30	36	45			81							81
0:45	1	3	2	7	3	10	12:45	34	167	37	186	71	353						353
1:00	1	0			1		13:00	35	31			66							66
1:15	1	0			1		13:15	40	35			75							75
1:30	2	1			3		13:30	35	37			72							72
1:45	1	5	0	1	1	6	13:45	40	150	47	150	87	300						300
2:00	1	2			3		14:00	51	71			122							122
2:15	0	0			0		14:15	42	50			92							92
2:30	0	0			0		14:30	59	46			105							105
2:45	1	2	0	2	1	4	14:45	61	213	63	230	124	443						443
3:00	1	0			1		15:00	50	52			102							102
3:15	1	1			2		15:15	72	58			130							130
3:30	0	1			1		15:30	56	113			169							169
3:45	0	2	3	5	3	7	15:45	69	247	142	365	211	612						612
4:00	1	0			1		16:00	51	77			128							128
4:15	2	0			2		16:15	57	57			114							114
4:30	5	2			7		16:30	65	66			131							131
4:45	1	9	0	2	1	11	16:45	63	236	52	252	115	488						488
5:00	2	1			3		17:00	94	81			175							175
5:15	4	2			6		17:15	76	65			141							141
5:30	6	2			8		17:30	77	66			143							143
5:45	8	20	7	12	15	32	17:45	54	301	39	251	93	552						552
6:00	5	2			7		18:00	65	65			130							130
6:15	6	6			12		18:15	59	47			106							106
6:30	23	7			30		18:30	40	41			81							81
6:45	46	80	12	27	58	107	18:45	37	201	40	193	77	394						394
7:00	66	45			111		19:00	38	25			63							63
7:15	101	52			153		19:15	39	51			90							90
7:30	69	78			147		19:30	39	39			78							78
7:45	83	319	92	267	175	586	19:45	35	151	32	147	67	298						298
8:00	64	86			150		20:00	29	16			45							45
8:15	41	71			112		20:15	36	18			54							54
8:30	50	27			77		20:30	30	18			48							48
8:45	85	240	26	210	111	450	20:45	12	107	21	73	33	180						180
9:00	29	26			55		21:00	11	24			35							35
9:15	33	23			56		21:15	15	17			32							32
9:30	26	26			52		21:30	5	4			9							9
9:45	25	113	38	113	63	226	21:45	11	42	6	51	17	93						93
10:00	29	23			52		22:00	7	2			9							9
10:15	33	27			60		22:15	5	5			10							10
10:30	28	24			52		22:30	5	4			9							9
10:45	29	119	24	98	53	217	22:45	6	23	2	13	8	36						36
11:00	27	25			52		23:00	4	1			5							5
11:15	29	28			57		23:15	3	3			6							6
11:30	52	35			87		23:30	1	1			2							2
11:45	30	138	50	138	80	276	23:45	1	9	3	8	4	17						17
TOTALS	1050	882			1932		TOTALS	1847	1919			3766							3766
SPLIT %	54.3%	45.7%			33.9%		SPLIT %	49.0%	51.0%			66.1%							66.1%

DAILY TOTALS					NB	SB						EB	WB						Total
					2,897	2,801						0	0						5,698
AM Peak Hour	7:00	7:30			7:15		PM Peak Hour	16:45	15:15			15:15							15:15
AM Pk Volume	319	327			625		PM Pk Volume	310	390			638							638
Pk Hr Factor	0.790	0.889			0.893		Pk Hr Factor	0.824	0.687			0.756							0.756
7 - 9 Volume	559	477	0	0	1036		4 - 6 Volume	537	503	0	0	1040							1040
7 - 9 Peak Hour	7:00	7:30			7:15		4 - 6 Peak Hour	16:45	16:30			16:45							16:45
7 - 9 Pk Volume	319	327	0	0	625		4 - 6 Pk Volume	310	264	0	0	574							574
Pk Hr Factor	0.790	0.889	0.000	0.000	0.893		Pk Hr Factor	0.824	0.815	0.000	0.000	0.820							0.820

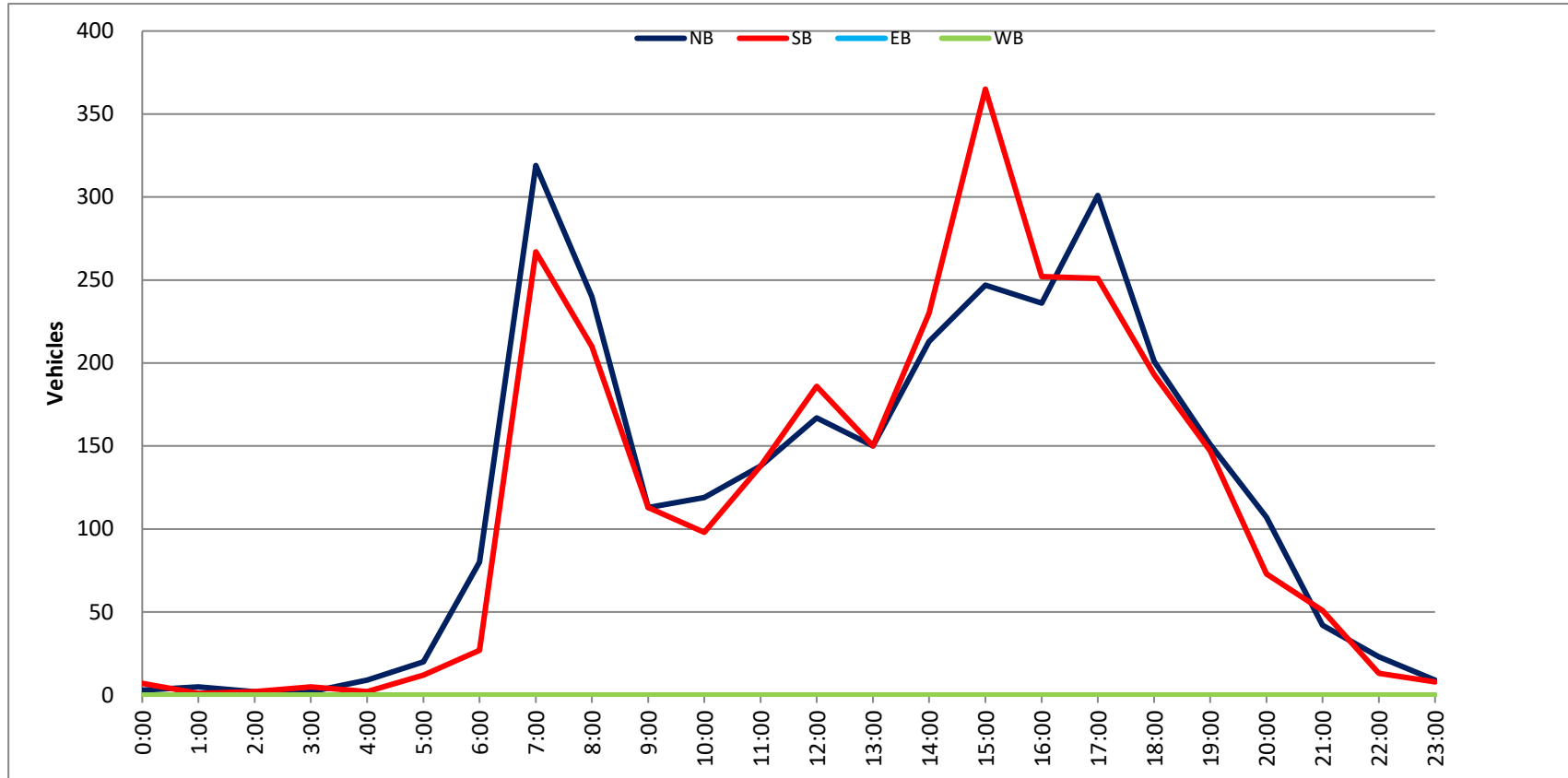
Prepared by NDS/ATD

Project #: 093M354

City: Knoxville

Location: Campbell Station Rd S/O Hardin Valley

Date: 9/26/2019





URBAN ENGINEERING, INC.

CIVIL ENGINEERS • LAND PLANNERS • LAND SURVEYORS

October 22, 2020

Knox County Engineering and Public Works
Mr. Leo LaCamera, P.E. and Mr. Aaron Fritz, P.E.
205 West Baxter Avenue
Knoxville, TN 37917

And

Ms. Tarren Barrett, P.E.
Knoxville Regional TPO and MPC
400 Main Street, Suite 403
Knoxville, TN 37902

Re: 11-C-20-RZ / 11-A-20-SP

Dear Leo, Aaron and Tarren:

Sight distance was evaluated facing north and south from the proposed ingress / egress location. The posted speed along N Campbell Station Road at the project site is 30 MPH. Per the Knox County Subdivision Regulations, the required minimum available sight distance is 300 feet. In both directions, the available sight distance will exceed the minimum distance.

Attached to this letter you will find line of sight profiles in both directions, along with photographs taken from the entrance location facing both directions. Please do not hesitate to contact me if you have questions or comments about this letter or attachments.

Sincerely,

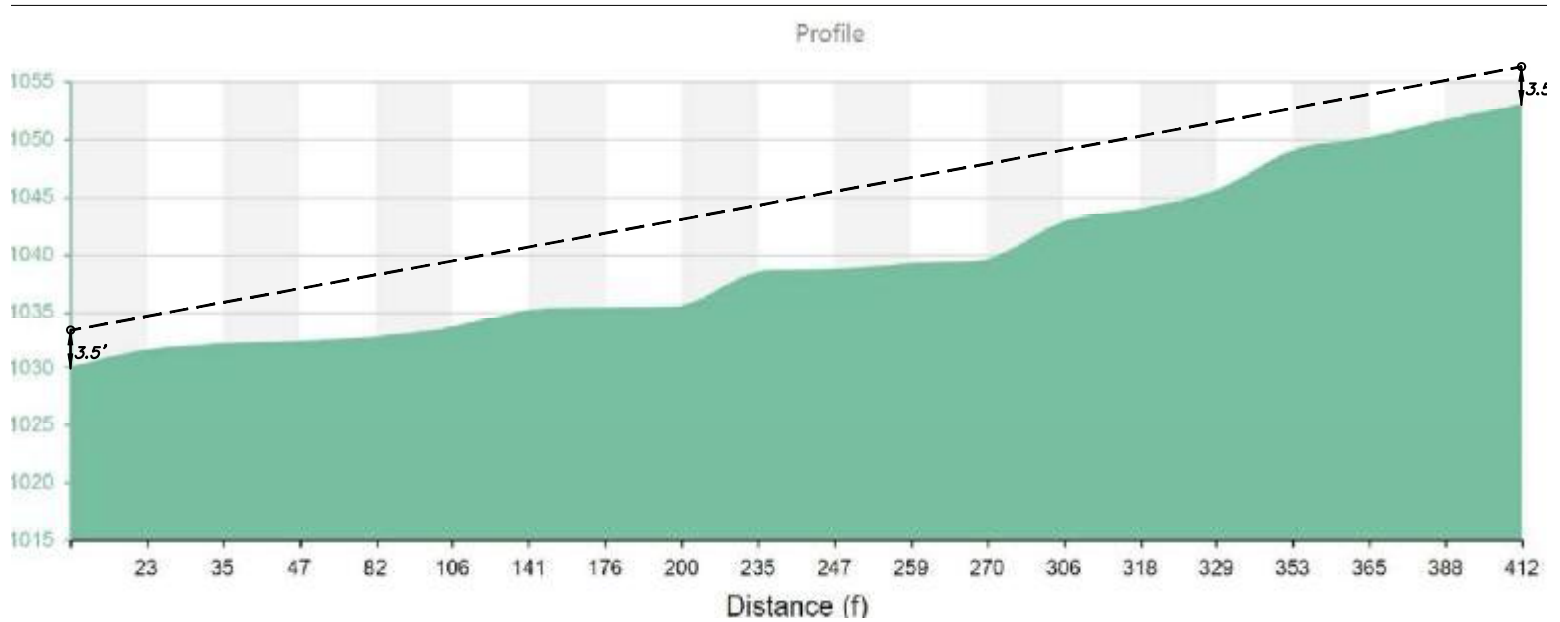
Urban Engineering, Inc.



Chris Sharp, P.E.



LINE OF SIGHT – N.T.S.



LINE OF SIGHT PROFILE – N.T.S.

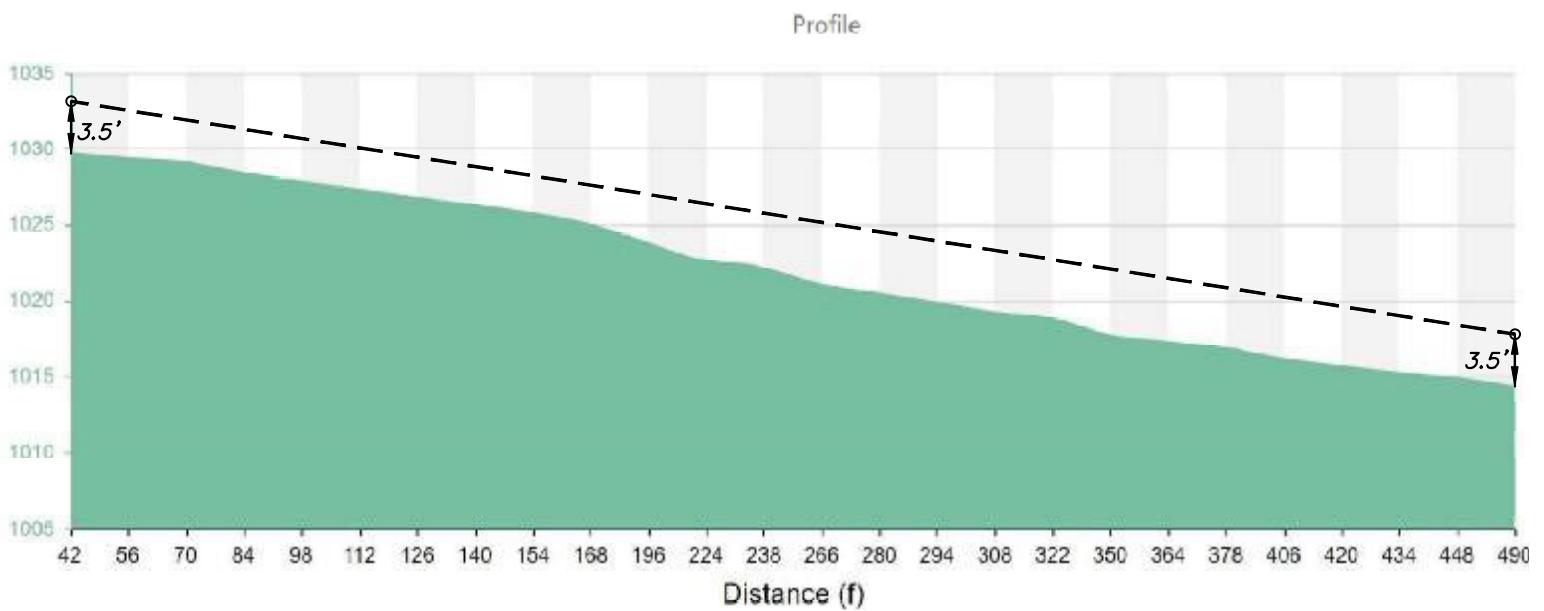
**SIGHT DISTANCE – NORTH
CATATOGA KENNELS**

DISTRICT W6
CLT MAP 117
SCALE: N.T.S.

KNOX COUNTY, TN
PARCEL 12.03
OCTOBER 21, 2020



LINE OF SIGHT – N.T.S.



LINE OF SIGHT PROFILE – N.T.S.

SIGHT DISTANCE – SOUTH
CATATOGA KENNELS

*DISTRICT W6
CLT MAP 117
SCALE: N.T.S.*

*KNOX COUNTY, TN
PARCEL 12.03
OCTOBER 21, 2020*



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Sight Distance From Ingress/Egress – North



Sight Distance From Ingress/Egress – South

Land Use: 210

Single-Family Detached Housing

Description

Single-family detached housing includes all single-family detached homes on individual lots. A typical site surveyed is a suburban subdivision.

Additional Data

The number of vehicles and residents had a high correlation with average weekday vehicle trip ends. The use of these variables was limited, however, because the number of vehicles and residents was often difficult to obtain or predict. The number of dwelling units was generally used as the independent variable of choice because it was usually readily available, easy to project, and had a high correlation with average weekday vehicle trip ends.

This land use included data from a wide variety of units with different sizes, price ranges, locations, and ages. Consequently, there was a wide variation in trips generated within this category. Other factors, such as geographic location and type of adjacent and nearby development, may also have had an effect on the site trip generation.

Single-family detached units had the highest trip generation rate per dwelling unit of all residential uses because they were the largest units in size and had more residents and more vehicles per unit than other residential land uses; they were generally located farther away from shopping centers, employment areas, and other trip attractors than other residential land uses; and they generally had fewer alternative modes of transportation available because they were typically not as concentrated as other residential land uses.

Time-of-day distribution data for this land use are presented in Appendix A. For the six general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:15 and 8:15 a.m. and 4:00 and 5:00 p.m., respectively. For the two sites with Saturday data, the overall highest vehicle volume was counted between 3:00 and 4:00 p.m. For the one site with Sunday data, the overall highest vehicle volume was counted between 10:15 and 11:15 a.m.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in California, Connecticut, Delaware, Illinois, Indiana, Maryland, Minnesota, Montana, New Jersey, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Vermont, and 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, 903, 925, 936

Single-Family Detached Housing (210)

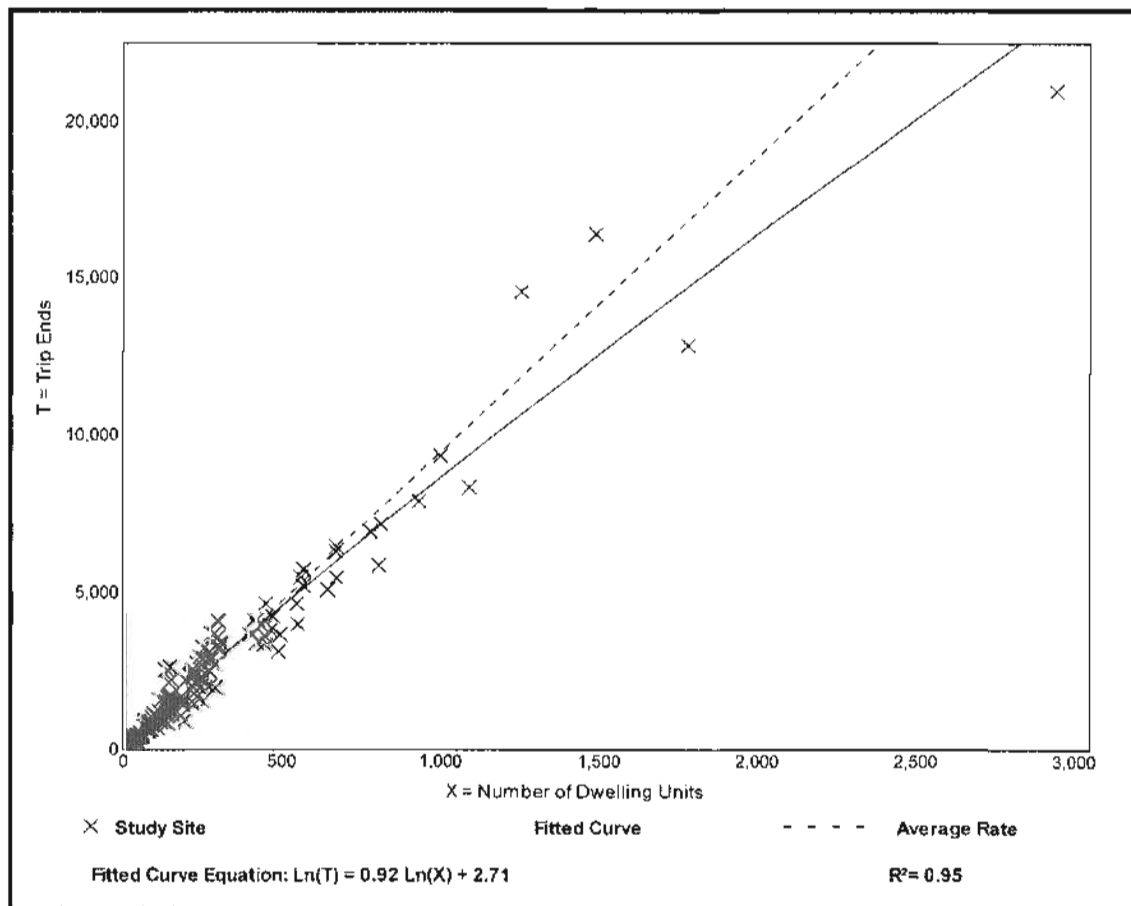
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 159
Avg. Num. of Dwelling Units: 264
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.44	4.81 - 19.39	2.10

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: 173

Avg. Num. of Dwelling Units: 219

Directional Distribution: 25% entering, 75% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate

0.74

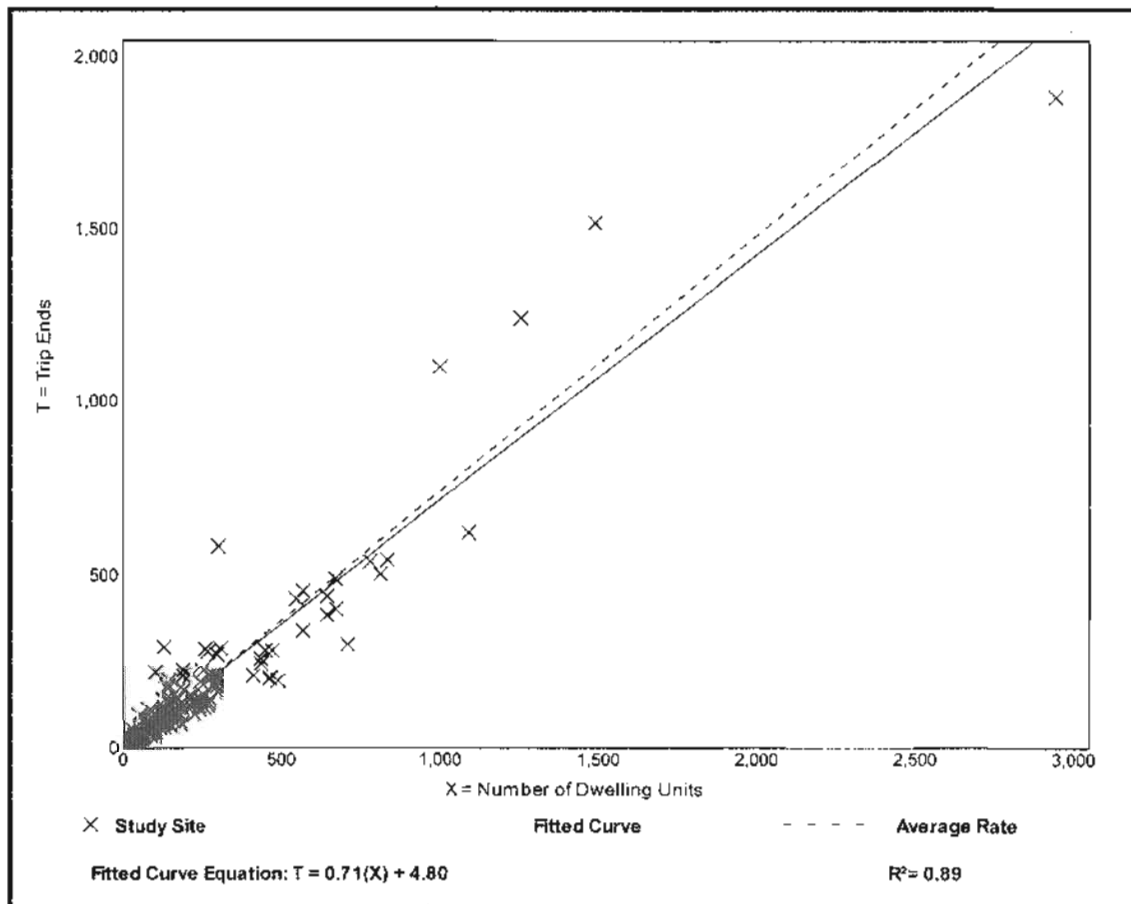
Range of Rates

0.33 - 2.27

Standard Deviation

0.27

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: 190

Avg. Num. of Dwelling Units: 242

Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate

0.99

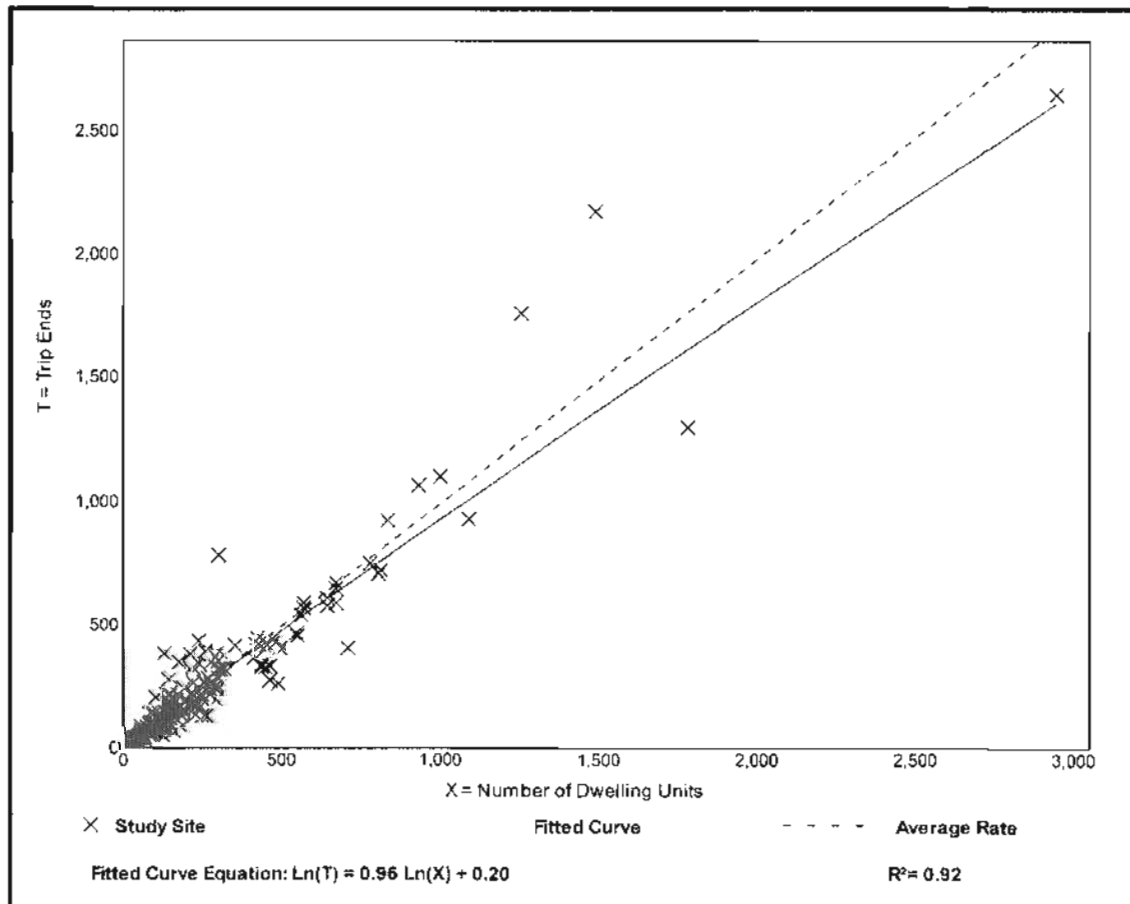
Range of Rates

0.44 - 2.98

Standard Deviation

0.31

Data Plot and Equation



TRIP GENERATION FOR CATATOGA SUBDIVISION

196 Single-Family Detached Houses

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
#210	Single-Family Detached Housing	196 Houses	1,932	25%	75%		63%	37%	
				36	108	144	122	72	194
Total New Volume Site Trips			1,932	36	108	144	122	72	194

ITE Trip Generation Manual, 10th Edition
Trips calculated by using Fitted Curve Equation

TRIP GENERATION FOR CATATOGA SUBDIVISION

196 Single-Family Detached Houses

196 Residential Houses = X

Weekday:

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

$$\ln(T) = 0.92 * 5.28 + 2.71$$

$$\ln(T) = 7.57$$

$$T = \underline{\underline{1,932 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

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

$$T = 0.71 * 196 + 4.80$$

$$T = \underline{\underline{144 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 4 and 6 pm:

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

$$\ln(T) = 0.96 * 5.28 + 0.20$$

$$\ln(T) = 5.27$$




$$T = \underline{\underline{194 \text{ trips}}}$$

HCM Unsignalized Intersection Capacity Analysis

2: North Campbell Station Road & Catatoga Subdivision Road "A"

10/23/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	54	54	18	412	400	18
Sign Control	Stop			Free	Free	
Grade	0%			5%	-5%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	60	60	20	458	444	20
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	952	454	464			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	952	454	464			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	79	90	98			
cM capacity (veh/h)	285	610	1107			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	120	478	464			
Volume Left	60	20	0			
Volume Right	60	0	20			
cSH	388	1107	1700			
Volume to Capacity	0.31	0.02	0.27			
Queue Length 95th (ft)	32	1	0			
Control Delay (s)	18.4	0.5	0.0			
Lane LOS	C	A				
Approach Delay (s)	18.4	0.5	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			2.3			
Intersection Capacity Utilization			49.3%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

2: North Campbell Station Road & Catatoga Subdivision Road "A"

10/23/2020






Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	29	43	49	322	507	73
Sign Control	Stop			Free	Free	
Grade	0%			5%	-5%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	32	48	54	358	563	81
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1071	604	644			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1071	604	644			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	86	90	94			
cM capacity (veh/h)	233	502	950			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	80	412	644			
Volume Left	32	54	0			
Volume Right	48	0	81			
cSH	342	950	1700			
Volume to Capacity	0.23	0.06	0.38			
Queue Length 95th (ft)	22	5	0			
Control Delay (s)	18.7	1.8	0.0			
Lane LOS	C	A				
Approach Delay (s)	18.7	1.8	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			2.0			
Intersection Capacity Utilization			65.0%	ICU Level of Service		C
Analysis Period (min)			15			

TABLE 4A

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

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

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

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

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

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

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

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

North Campbell
Station Road at
Road "A"

2025 Projected AM
SB Right Turns = 18

Turn Lane NOT
Warranted

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

TABLE 4A

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

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

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

North Campbell
Station Road at
Road "A"

2025 Projected PM
NB Left Turns = 49

Turn Lane Potentially
Warranted

$$507 + 73 = 580$$

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

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

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

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

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT 507 VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25 25 - 49 50 - 99					Yes	Yes Yes
100 - 149 150 - 199				Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

73

50 - 99

507

500 - 549

North Campbell
Station Road at
Road "A"

2025 Projected PM
SB Right Turns = 73

Turn Lane NOT
Warranted

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

Potential North Campbell Station Road Routes

