# MILLER FARM SUBDIVISION

TRAFFIC IMPACT STUDY

W. EMORY ROAD (SR 131)
KNOX COUNTY, TENNESSEE

CCI PROJECT NO. 00773-0013

REV 2

PREPARED FOR:
Southland Engineering Consultants
4909 Ball Road
Knoxville, TN 37931

SUBMITTED BY
Cannon & Cannon, Inc.
8550 Kingston Pike
Knoxville, TN 37919
865.670.8555

CANNON & CANNON INC
CONSULTING ENGINEERS
FIELD SURVEYORS

REVISED
NOVEMBER 23
2020

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W. EMORY ROAD (SR 131)
KNOX COUNTY, TENNESSEE

CCI PROJECT NO. 00773-0013


**REVISION 2 (11/23/20)**
This report replaces the previous versions of the traffic impact study dated 06/26/20 and 11/06/20 prepared for this project in their entirety. The associated changes are a result of a revised site plan and site access.

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## EXECUTIVE SUMMARY

This report provides a summary of a traffic impact study that was performed for a proposed single-family residential subdivision to be located on W. Emory Road (SR 131) in north Knox County. The project site is located on the north side of W. Emory Road, approximately two and one-quarter miles west of the intersection of W. Emory with Clinton Highway. The conceptual development plan for this project, Miller Farm Subdivision, proposes a maximum of 95 residential lots. The project is proposed to have a single access roadway onto W. Emory Road.

The purpose of this study was the evaluation of the traffic operational and safety impacts of the proposed Miller Farm Subdivision development upon roadways in the vicinity of the project site. Of particular interest was the intersection of W. Emory Road with the site entrance roadway (Miller Farms Road "A"), which is considered the project study intersection. This intersection was the primary location for intersection evaluations which were conducted in order to determine the anticipated impacts of traffic generated from the project, and whether or not improvements will be justified to mitigate these impacts. These evaluations included intersection capacity analyses, turn lane assessments and a sight distance review.

The primary conclusion of this study is that the traffic generated from the proposed Miller Farm Subdivision will have a relatively minor impact on the study intersection of W. Emory Road and Miller Farms Road "A", which is the proposed single access point to this development. The primary impact will be the need for an eastbound left-turn lane on W. Emory Road.

The following listing is a summary of improvement recommendations that resulted from this study:

1. Install a 30-inch STOP sign on the Miller Farms Road "A" southbound approach to W. Emory Road in accordance with the requirements of the *Manual on Uniform Traffic Control Devices*.
2. Ensure that the intersection corner sight distances at the study intersection are maintained along W. Emory Road via the removal of any conflicting vegetation and the installation of all project signage and landscaping in proper locations.
3. Construct an eastbound left-turn lane on W. Emory Road at the study intersection with a minimum storage length of seventy-five feet and proper tapers in accordance with TDOT and Knox County standards. In addition, TDOT requests that a paved shoulder be constructed on the westbound side for the right-turn movement into the site. A sketch is provided in APPENDIX D showing these proposed improvements, including recommended dimensions.

## INTRODUCTION & PURPOSE OF STUDY

This report provides a summary of a traffic impact study that was performed for a proposed single-family residential subdivision to be located on W. Emory Road (SR 131) in north Knox County. The project site is located on the north side of W. Emory Road, approximately two and one-quarter miles west of the intersection of W. Emory with Clinton Highway. FIGURE 1 is a location map identifying the major roadways in the vicinity of the site.

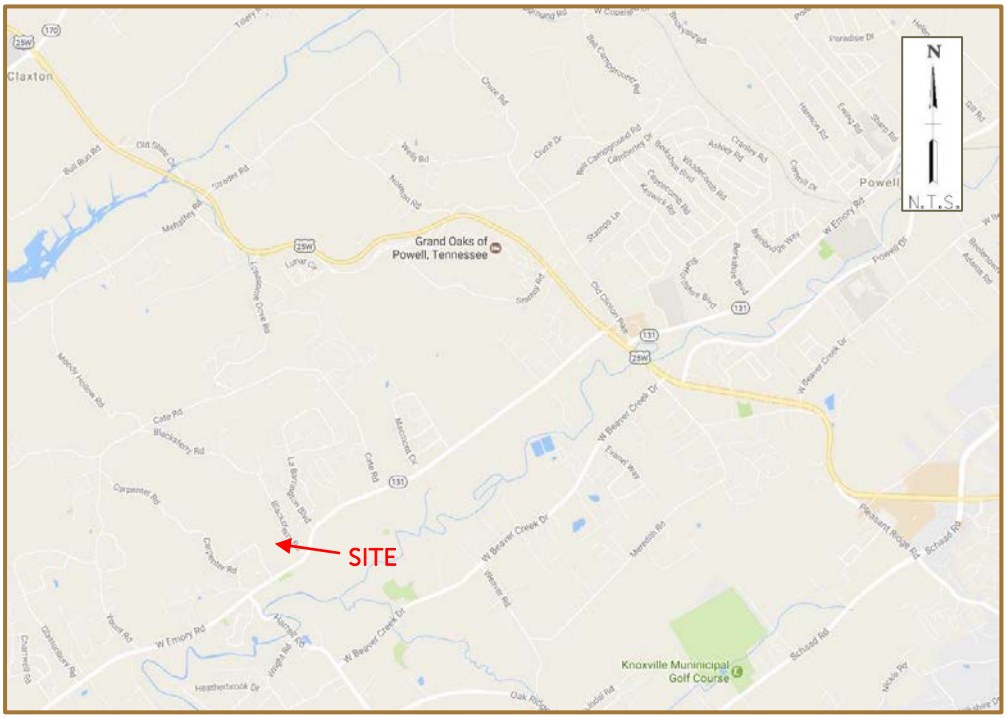


**FIGURE 1**
**LOCATION MAP**

The conceptual development plan for this project, Miller Farm Subdivision, proposes a maximum of 95 residential lots. The project is proposed to have a single access roadway onto W. Emory Road. FIGURE 2 is a Conceptual Site Plan which illustrates the proposed site configuration.

The purpose of this study was the evaluation of the traffic operational and safety impacts of the proposed Miller Farm Subdivision development upon roadways in the vicinity of the project site. Of particular interest was the intersection of W. Emory Road with the site entrance roadway (Miller Farms Road "A"), which is considered the project study intersection. This intersection was the primary location for intersection evaluations which were conducted in order to determine the anticipated impacts of traffic generated from the project, and whether or not improvements will be justified to mitigate these impacts. These evaluations included intersection capacity analyses, turn lane assessments and a sight distance review.

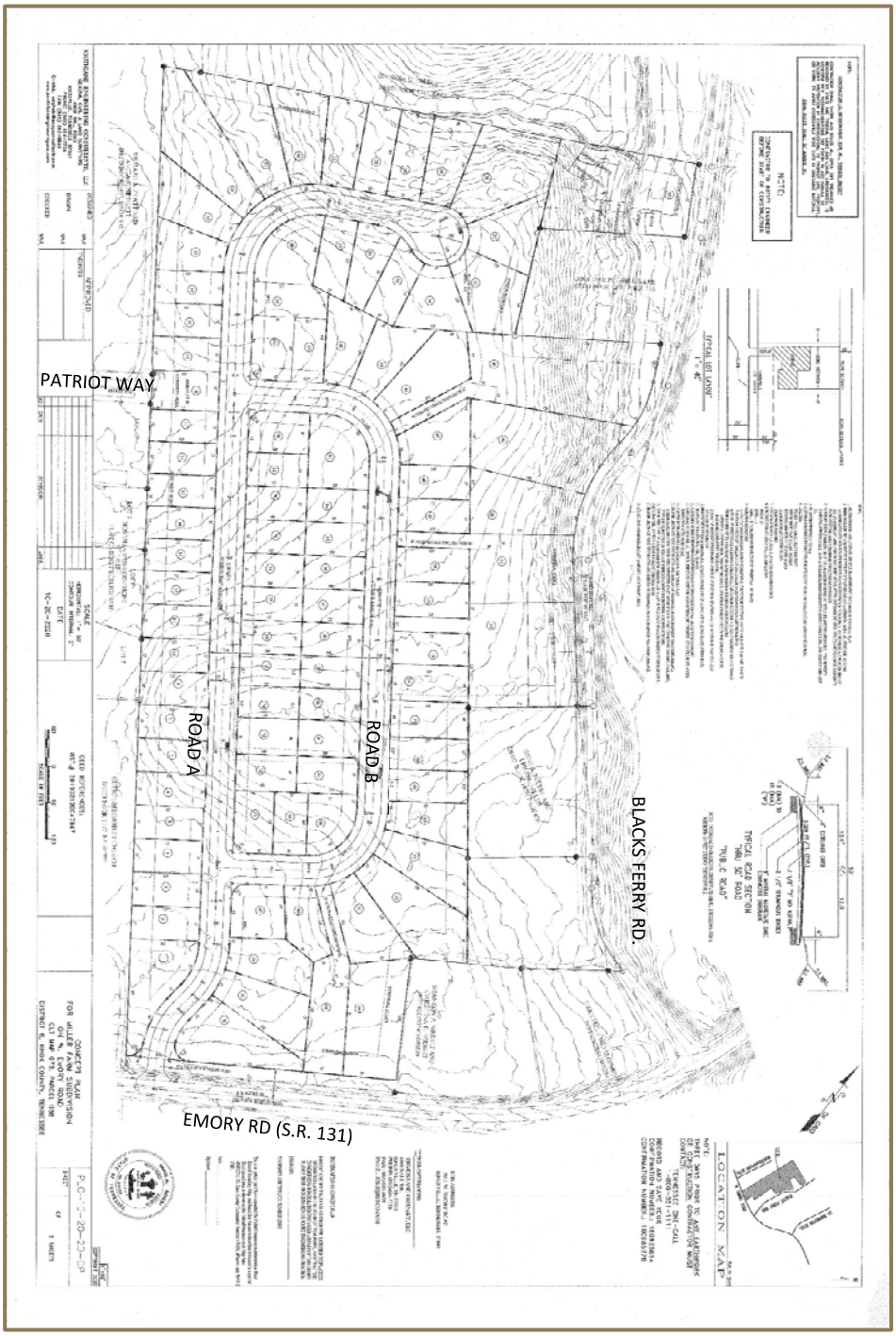


FIGURE 2
CONCEPTUAL SITE PLAN

# EXISTING CONDITIONS

## EXISTING ROADWAY CONDITIONS

W. Emory Road (SR 131) is a TDOT maintained state highway that is classified as a Major Arterial roadway by Knox County and the Knoxville/Knox County MPC. In the vicinity of the proposed development, the roadway consists of one through asphalt travel lane in each direction with a width of approximately eleven feet each. Varying shoulders that average about two feet on each side are also present. The speed limit in the vicinity of the proposed project is posted as 40 mph.

## EXISTING SITE CONDITIONS

The existing site is located on the north side of W. Emory Road, approximately two and one-quarter miles west of Clinton Highway. Blacks Ferry Road lies just to the east. The site is currently mostly undeveloped and is covered by some pasture land with some small areas of trees and brush. A few small structures are also located on the site. It is bordered to the west and south by Northampton Commons subdivision, with the general vicinity consisting of large lot single-family homes, small farms and other subdivisions. FIGURE 3 provides an overview of the study site and immediate surrounding area.


FIGURE 3
EXISTING SITE CONDITIONS

## EXISTING TRAFFIC DATA

Available traffic volume data was gathered for this study, including annual average daily traffic (AADT) data collected by the Tennessee Department of Transportation (TDOT). Two count stations were found in the vicinity of the project site that were felt to have particular relevance for this study. The most currently available data from these stations are contained in Table 1.

### TABLE 1: ANNUAL AVERAGE DAILY TRAFFIC COUNT SUMMARY

| COUNT YEAR | TDOT COUNT STATION 0047* SR 131 NEAR ANDERSON CO. LINE | TDOT COUNT STATION 0468** KARNS VALLEY DRIVE JUST N. OF SR 62 |
|---|---|---|
| 2019 | 10,440 | 6,814 |
| 2018 | 10,161 | 4,894 |
| 2017 | 10,620 | 4,336 |
| 2016 | 9,985 | 4,258 |
| 2015 | 10,074 | 4,216 |
| 2014 | 8,866 | 4,183 |
| 2013 | 9,480 | 4,061 |
| 2012 | 9,336 | 3,943 |

* This station is located on S.R. 131 about one and one-half miles east of the project site.
** This station is located on an extension of S.R. 131 about three and one-half miles west of the site.

In addition to the available AADT data, intersection turning movement traffic counts are typically collected for these types of studies. Because of the nationwide COVID-19 pandemic, it was determined that any counts taken during the time frame of this study would not be reflective of normal conditions. Therefore, it was decided to derive estimated traffic volumes for the study intersection by taking the most recent area traffic counts from a nearby study and "transferring" this data to the study intersection. This was done by starting with the old counts factored by an annual growth rate, then applying trip generation data for the subdivisions and housing located between the previously counted location and the study intersection. This process was used to establish the existing volumes at the study intersection and to establish trip distribution patterns. The existing traffic counts derived for the study intersection are summarized on FIGURE 4. The raw data traffic count summary sheets and sheets summarizing the traffic volume derivation process are contained in APPENDIX A.

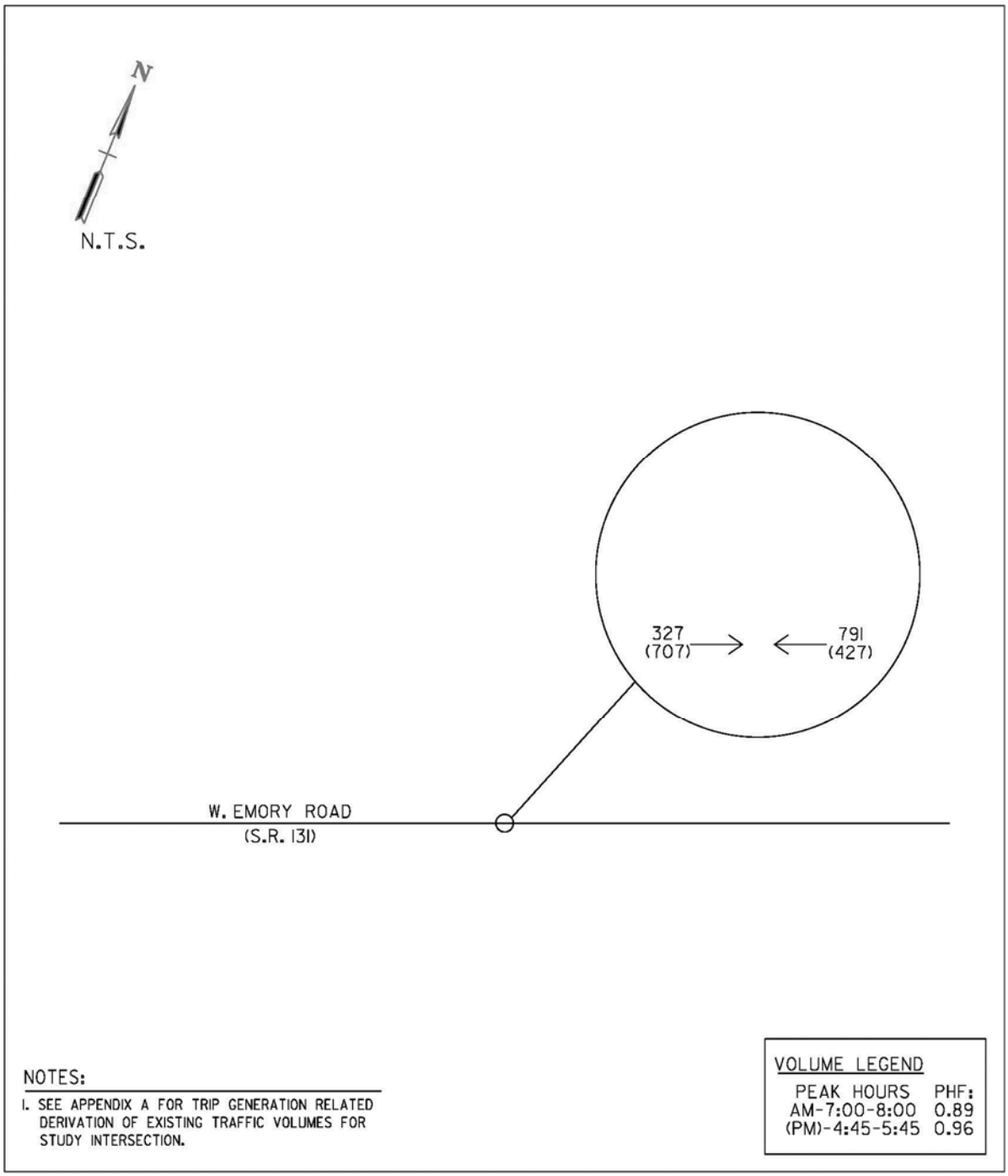


FIGURE 4
EXISTING TRAFFIC VOLUMES (2020)

# BACKGROUND CONDITIONS

## BACKGROUND TRAFFIC GROWTH

The proposed single-family subdivision development is anticipated to be constructed in one general phase with anticipated completion in approximately four years. Therefore, year 2024 was established as the appropriate analysis year for this study. In order to determine traffic volumes resulting solely from background traffic growth to year 2024, it was necessary to establish an annual growth rate for existing traffic. Based on the TDOT ADT traffic counts, as well as knowledge of the area, a background annual traffic growth rate of 2.0% was established. Figure 5 contains the background traffic volumes that would result from a 2.0% annual growth rate from year 2020, which is the existing traffic volume year, to year 2024. The background traffic volumes shown on FIGURE 5 represent year 2024 background growth conditions without traffic related to the proposed development.

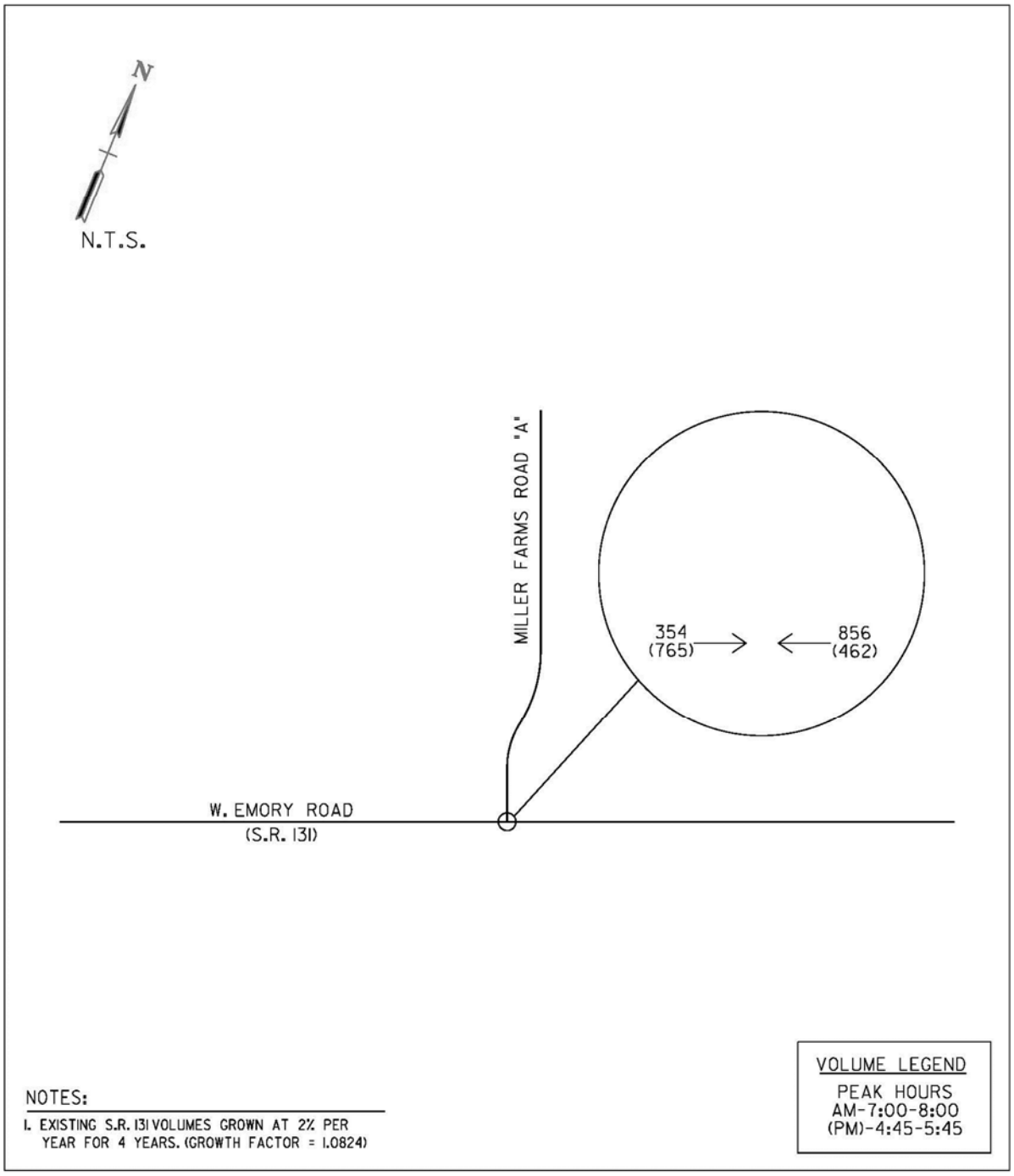


FIGURE 5
BACKGROUND TRAFFIC VOLUMES (2024)

# FUTURE CONDITIONS

## TRIP GENERATION

In order to estimate the expected traffic volumes to be generated by the proposed development, the procedures recommended by the Institute of Transportation Engineers (ITE) were utilized. Trip generation rates developed by ITE for single-family detached housing were employed to generate the estimated trips for the proposed subdivision. The generated traffic volumes were determined based on the data for the peak hours of adjacent street traffic. See TABLE 2 for a summary of the traffic generated for this project. More detailed information is contained in APPENDIX B.

TABLE 2: TRIP GENERATION SUMMARY

| LAND USE | NO. UNITS | TRIP DESCRIPTION | WEEKDAY (TRIPS/DAY) | AM PEAK HOUR (TRIPS/HR) | PM PEAK HOUR (TRIPS/HR) |
|---|---|---|---|---|---|
| Single Family Detached Housing (ITE CODE 210) | 95 | Entering Trips<br>Exiting Trips<br>TOTAL | 496 (50%)<br>496 (50%)<br>992 | 18 (25%)<br>54 (75%)<br>72 | 61 (63%)<br>36 (37%)<br>97 |

## TRIP DISTRIBUTION AND ASSIGNMENT

FIGURE 6 provides a summary of how the above site generated trips would be assigned to the study intersection. The basic trip distribution patterns were taken from the 2017 W. Emory Road at Cate Road traffic counts.

## FUTURE TRAFFIC VOLUMES

Future projected traffic volumes for the study intersection were developed by adding the generated and assigned trips shown in FIGURE 6 to the 2024 W. Emory Road background traffic volumes developed in the previous section and shown in FIGURE 5. These combined year 2024 volumes reflect the existing traffic, the background traffic growth, and the generated traffic from the proposed subdivision. These future volumes are shown on FIGURE 7, and are the combined volumes used in the analyses of future conditions with the proposed development.

## FUTURE CAPACITY ANALYSES / LEVELS-OF-SERVICE

Capacity analyses employing the methods of the Highway Capacity Manual (HCM2010) were conducted for the combined A.M. and P.M. peak hour traffic and existing roadway conditions at the study intersection of W. Emory Road and Miller Farms Road "A". The results of these analyses are contained in the EVALUATIONS section of this report, along with discussion of the implications of the results.

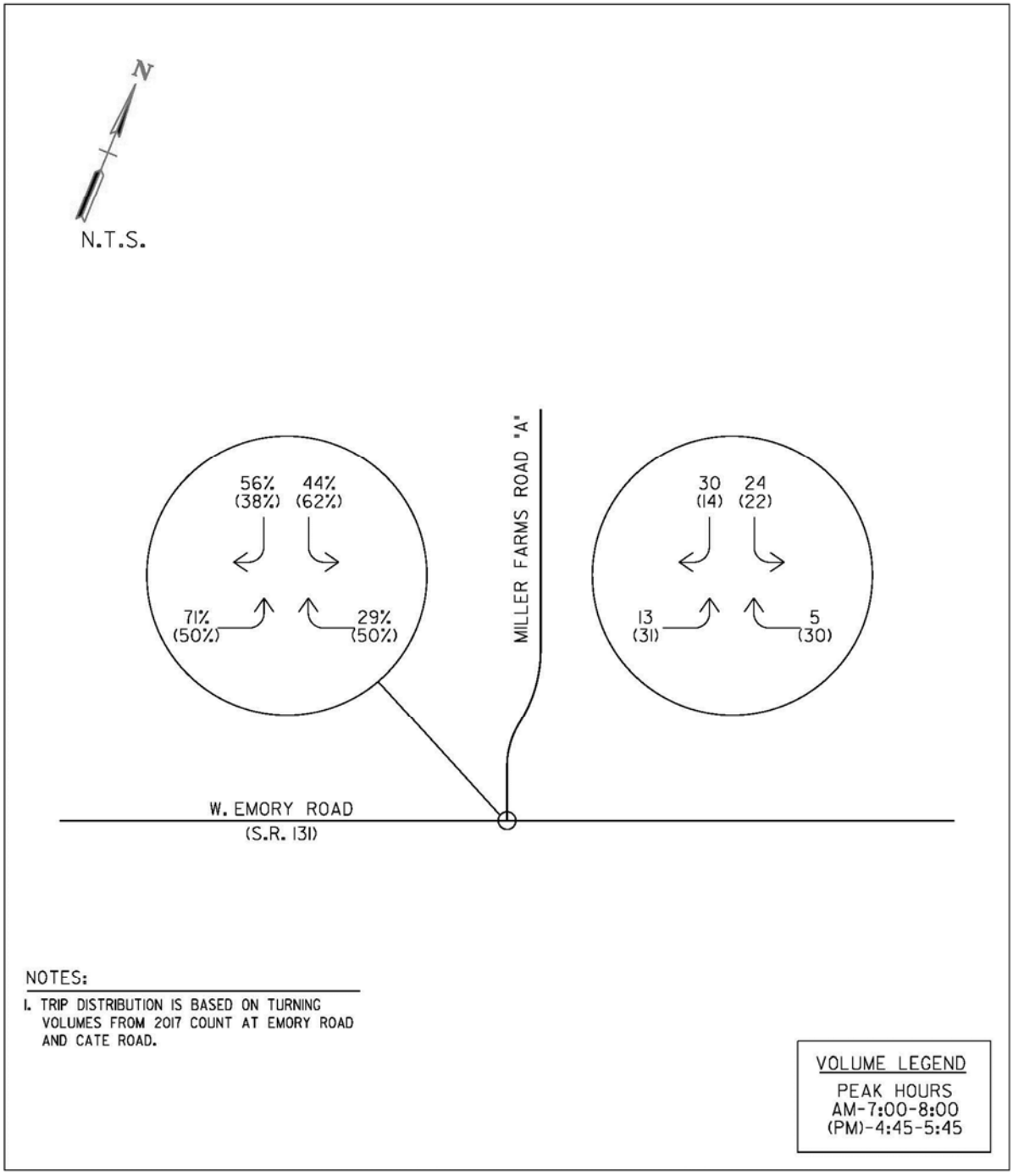


FIGURE 6
TRIP DISTRIBUTION AND ASSIGNMENT

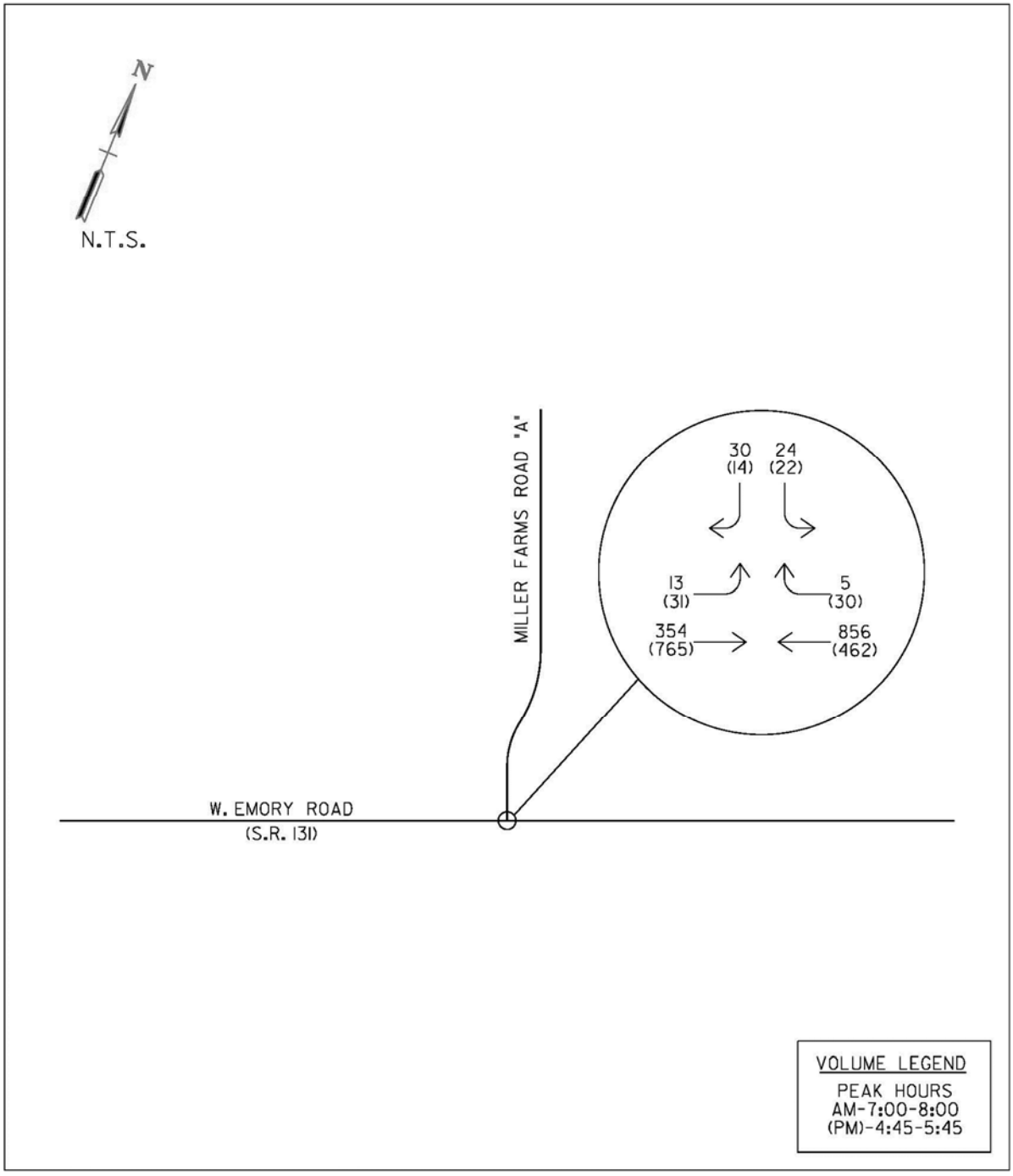


FIGURE 7
COMBINED TRAFFIC VOLUMES (2024)

# EVALUATIONS

## INTERSECTION CAPACITY ANALYSES

As discussed in the preceding section of this report, capacity analyses employing the methods of the Highway Capacity Manual (HCM) were conducted for the study intersection, for the combined traffic conditions. These analyses employed the existing roadway conditions, with the Miller Farms Road "A" added. A second set of analyses were also conducted which added an eastbound left-turn lane. A summary of the capacity analyses results is shown in TABLE 3.

TABLE 3: CAPACITY ANALYSES SUMMARY

| INTERSECTION | TIME PERIOD | YEAR 2024 COMBINED NO LEFT TURN LANE (LOS - DELAY) | YEAR 2024 COMBINED WITH EBLT LANE (LOS - DELAY) |
|---|---|---|---|
| W. Emory Road (SR 131) at Miller Farms Road "A" (SIDE-STREET STOP CONTROLLED)[1] | A.M.<br>P.M. | D - 28.8 s.<br>D - 25.2 s. | D - 28.7 s.<br>C - 24.7 s. |

[1] SIDE-STREET STOP CONTROLLED – Level-of-service and Average Vehicular Delay (seconds) for the southbound side street approach utilizing HCM methodology.
See Appendix C for detailed computer print-out summaries and discussion of Capacity and Level-of-Service concepts.

## SIGHT DISTANCE ASSESSMENT

A sight distance field review was performed and the sight distance appears to be more than adequate. The subdivision designer has placed the study intersection as far to the west on the project site as possible in order to maximize the sight distance looking east. Field measurements found that looking east from the study intersection the sight distance exceeds 450 feet, while looking west the sight distance is significantly greater. The posted speed limit is 40 mph, which makes the required minimum sight distance in accordance with Knoxville-Knox County MPC regulations to be 400 feet.

## TURN LANE ASSESSMENT

Left-turn lane and right-turn lane volume thresholds were evaluated for the study intersection using the combined traffic volumes shown in FIGURE 7, which assumes full build-out of the proposed development. These analyses employed TABLE 5A and TABLE 5B from the *Knox County Access Control and Driveway Design Policy*, which is based on turn lane criteria developed by Harmelink. The results were that an eastbound left-turn lane on W. Emory Road is anticipated to be justified, while a westbound right-turn lane is not. The turn lane warrant worksheets are located in APPENDIX C.

## CONCLUSIONS & RECOMMENDATIONS

The primary conclusion of this study is that the traffic generated from the proposed Miller Farm Subdivision will have a relatively minor impact on the study intersection of W. Emory Road and Miller Farms Road "A", which is the proposed single access point to this development. The primary impact will be the need for an eastbound left-turn lane on W. Emory Road.

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# APPENDICES

APPENDIX A – TRAFFIC DATA

APPENDIX B – TRIP GENERATION

APPENDIX C – ANALYSES

APPENDIX D – TURN LANE IMPROVEMENTS

# APPENDIX A – TRAFFIC DATA

Cannon & Cannon, Inc.
Consulting Engineers - Field Surveyors
8550 Kingston Pike
Knoxville, TN 37919

CCI Project Name: Emory Brooke TIS
CCI Project Number: 773-0008
Intersection: Emory @ Cate
Counted By: CCI

File Name : Emory_Cate_5-18-17
Site Code : 00000001
Start Date : 5/18/2017
Page No : 1

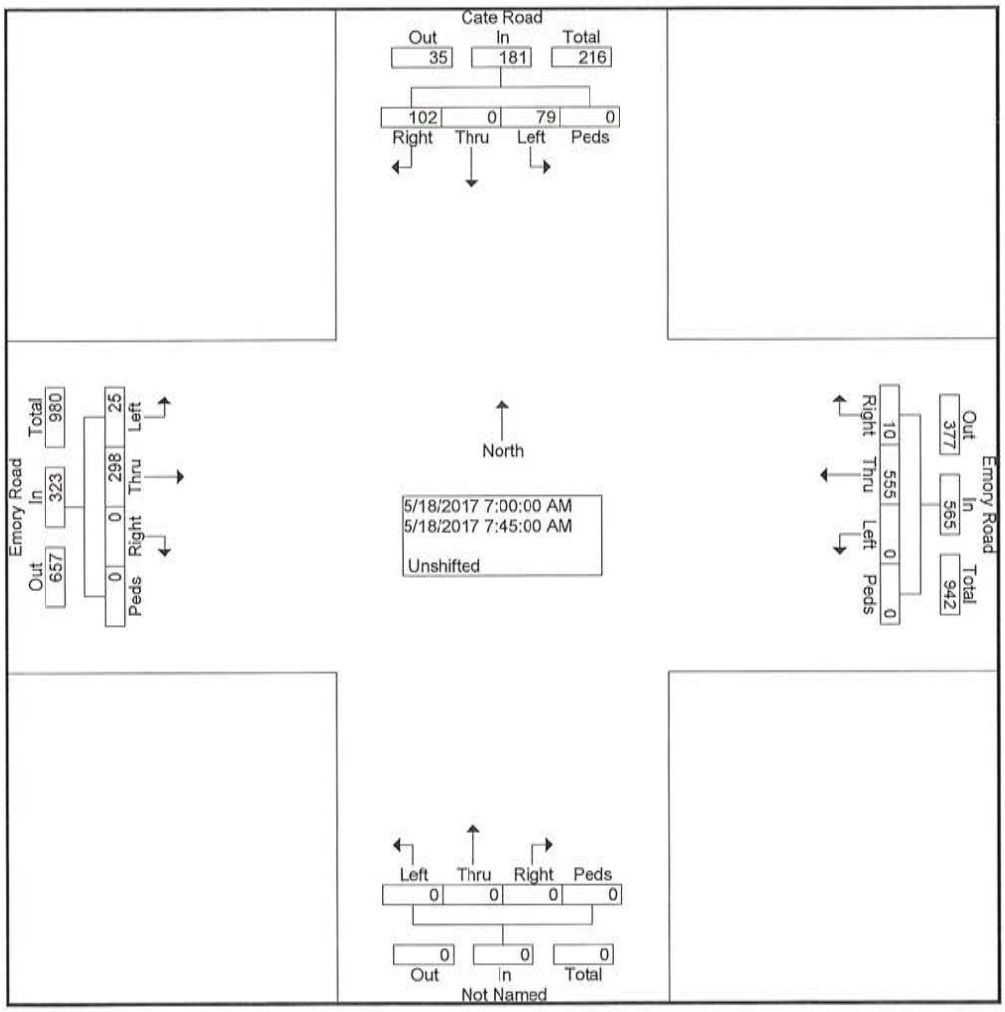
Groups Printed- Unshifted

| | Cate Road Southbound | | | | | Emory Road Westbound | | | | | Northbound | | | | | Emory Road Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Factor | 1.0 | 1.0 | 1.0 | 1.0 | | 1.0 | 1.0 | 1.0 | 1.0 | | 1.0 | 1.0 | 1.0 | 1.0 | | 1.0 | 1.0 | 1.0 | 1.0 | | |
| 07:00 AM | 20 | 0 | 27 | 0 | 47 | 0 | 117 | 1 | 0 | 118 | 0 | 0 | 0 | 0 | 0 | 4 | 59 | 0 | 0 | 63 | 228 |
| 07:15 AM | 22 | 0 | 43 | 0 | 65 | 0 | 146 | 4 | 0 | 150 | 0 | 0 | 0 | 0 | 0 | 10 | 68 | 0 | 0 | 78 | 293 |
| 07:30 AM | 17 | 0 | 16 | 0 | 33 | 0 | 164 | 3 | 0 | 167 | 0 | 0 | 0 | 0 | 0 | 5 | 95 | 0 | 0 | 100 | 300 |
| 07:45 AM | 20 | 0 | 16 | 0 | 36 | 0 | 128 | 2 | 0 | 130 | 0 | 0 | 0 | 0 | 0 | 6 | 76 | 0 | 0 | 82 | 248 |
| Total | 79 | 0 | 102 | 0 | 181 | 0 | 555 | 10 | 0 | 565 | 0 | 0 | 0 | 0 | 0 | 25 | 298 | 0 | 0 | 323 | 1069 |
| 08:00 AM | 13 | 0 | 23 | 0 | 36 | 0 | 89 | 7 | 0 | 96 | 0 | 0 | 0 | 0 | 0 | 5 | 64 | 0 | 0 | 69 | 201 |
| 08:15 AM | 8 | 0 | 8 | 0 | 16 | 0 | 77 | 4 | 0 | 81 | 0 | 0 | 0 | 0 | 0 | 2 | 63 | 0 | 0 | 65 | 162 |
| 08:30 AM | 10 | 0 | 11 | 0 | 21 | 0 | 63 | 4 | 0 | 67 | 0 | 0 | 0 | 0 | 0 | 4 | 61 | 0 | 0 | 65 | 153 |
| 08:45 AM | 13 | 0 | 13 | 0 | 26 | 0 | 51 | 3 | 0 | 54 | 0 | 0 | 0 | 0 | 0 | 1 | 55 | 0 | 0 | 56 | 136 |
| Total | 44 | 0 | 55 | 0 | 99 | 0 | 280 | 18 | 0 | 298 | 0 | 0 | 0 | 0 | 0 | 12 | 243 | 0 | 0 | 255 | 652 |
| *** BREAK *** | | | | | | | | | | | | | | | | | | | | | |
| 04:00 PM | 8 | 0 | 5 | 0 | 13 | 0 | 81 | 17 | 0 | 98 | 0 | 0 | 0 | 0 | 0 | 13 | 108 | 0 | 0 | 121 | 232 |
| 04:15 PM | 9 | 0 | 3 | 0 | 12 | 0 | 80 | 15 | 0 | 95 | 0 | 0 | 0 | 0 | 0 | 14 | 104 | 0 | 0 | 118 | 225 |
| 04:30 PM | 5 | 0 | 13 | 0 | 18 | 0 | 76 | 15 | 0 | 91 | 0 | 0 | 0 | 0 | 0 | 13 | 116 | 0 | 0 | 129 | 238 |
| 04:45 PM | 10 | 0 | 6 | 0 | 16 | 0 | 96 | 19 | 0 | 115 | 0 | 0 | 0 | 0 | 0 | 18 | 146 | 0 | 0 | 164 | 295 |
| Total | 32 | 0 | 27 | 0 | 59 | 0 | 333 | 66 | 0 | 399 | 0 | 0 | 0 | 0 | 0 | 58 | 474 | 0 | 0 | 532 | 990 |
| 05:00 PM | 7 | 0 | 8 | 0 | 15 | 0 | 100 | 12 | 0 | 112 | 0 | 0 | 0 | 0 | 0 | 23 | 131 | 0 | 0 | 154 | 281 |
| 05:15 PM | 14 | 0 | 9 | 0 | 23 | 0 | 109 | 23 | 0 | 132 | 0 | 0 | 0 | 0 | 0 | 19 | 132 | 0 | 0 | 151 | 306 |
| 05:30 PM | 19 | 0 | 7 | 0 | 26 | 0 | 101 | 23 | 0 | 124 | 0 | 0 | 0 | 0 | 0 | 17 | 130 | 0 | 0 | 147 | 297 |
| 05:45 PM | 8 | 0 | 9 | 0 | 17 | 0 | 90 | 8 | 0 | 98 | 0 | 0 | 0 | 0 | 0 | 21 | 111 | 0 | 0 | 132 | 247 |
| Total | 48 | 0 | 33 | 0 | 81 | 0 | 400 | 66 | 0 | 466 | 0 | 0 | 0 | 0 | 0 | 80 | 504 | 0 | 0 | 584 | 1131 |
| Grand Total | 203 | 0 | 217 | 0 | 420 | 0 | 1568 | 160 | 0 | 1728 | 0 | 0 | 0 | 0 | 0 | 175 | 1519 | 0 | 0 | 1694 | 3842 |
| Apprch % | 48.3 | 0.0 | 51.7 | 0.0 | | 0.0 | 90.7 | 9.3 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | | 10.3 | 89.7 | 0.0 | 0.0 | | |
| Total % | 5.3 | 0.0 | 5.6 | 0.0 | 10.9 | 0.0 | 40.8 | 4.2 | 0.0 | 45.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.6 | 39.5 | 0.0 | 0.0 | 44.1 | |

Cannon & Cannon, Inc.
Consulting Engineers - Field Surveyors
8550 Kingston Pike
Knoxville, TN 37919

File Name : Emory_Cate_5-18-17
Site Code : 00000001
Start Date : 5/18/2017
Page No : 2

| | Cate Road Southbound | | | | | Emory Road Westbound | | | | | Northbound | | | | | Emory Road Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Intersection | 07:00 AM | | | | | | | | | | | | | | | | | | | | |
| Volume | 79 | 0 | 102 | 0 | 181 | 0 | 555 | 10 | 0 | 565 | 0 | 0 | 0 | 0 | 0 | 25 | 298 | 0 | 0 | 323 | 1069 |
| Percent | 43.6 | 0.0 | 56.4 | 0.0 | | 0.0 | 98.2 | 1.8 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | | 7.7 | 92.3 | 0.0 | 0.0 | | |
| 07:30 Volume | 17 | 0 | 16 | 0 | 33 | 0 | 164 | 3 | 0 | 167 | 0 | 0 | 0 | 0 | 0 | 5 | 95 | 0 | 0 | 100 | 300 |
| Peak Factor | | | | | | | | | | | | | | | | | | | | | 0.891 |
| High Int. | 07:15 AM | | | | | 07:30 AM | | | | | 6:45:00 AM | | | | | 07:30 AM | | | | | |
| Volume | 22 | 0 | 43 | 0 | 65 | 0 | 164 | 3 | 0 | 167 | 0 | 0 | 0 | 0 | 0 | 5 | 95 | 0 | 0 | 100 | |
| Peak Factor | | | | | 0.696 | | | | | 0.846 | | | | | | | | | | 0.808 | |



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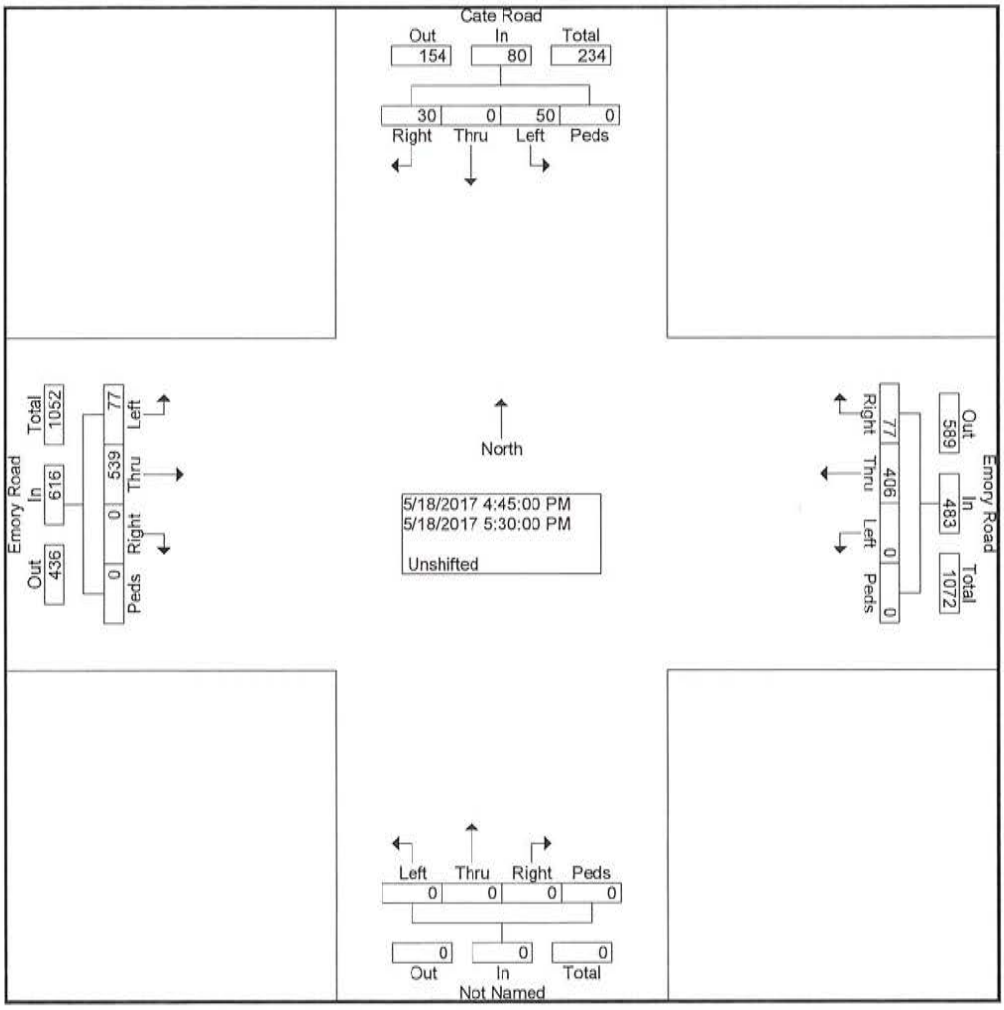
Knoxville, TN 37919

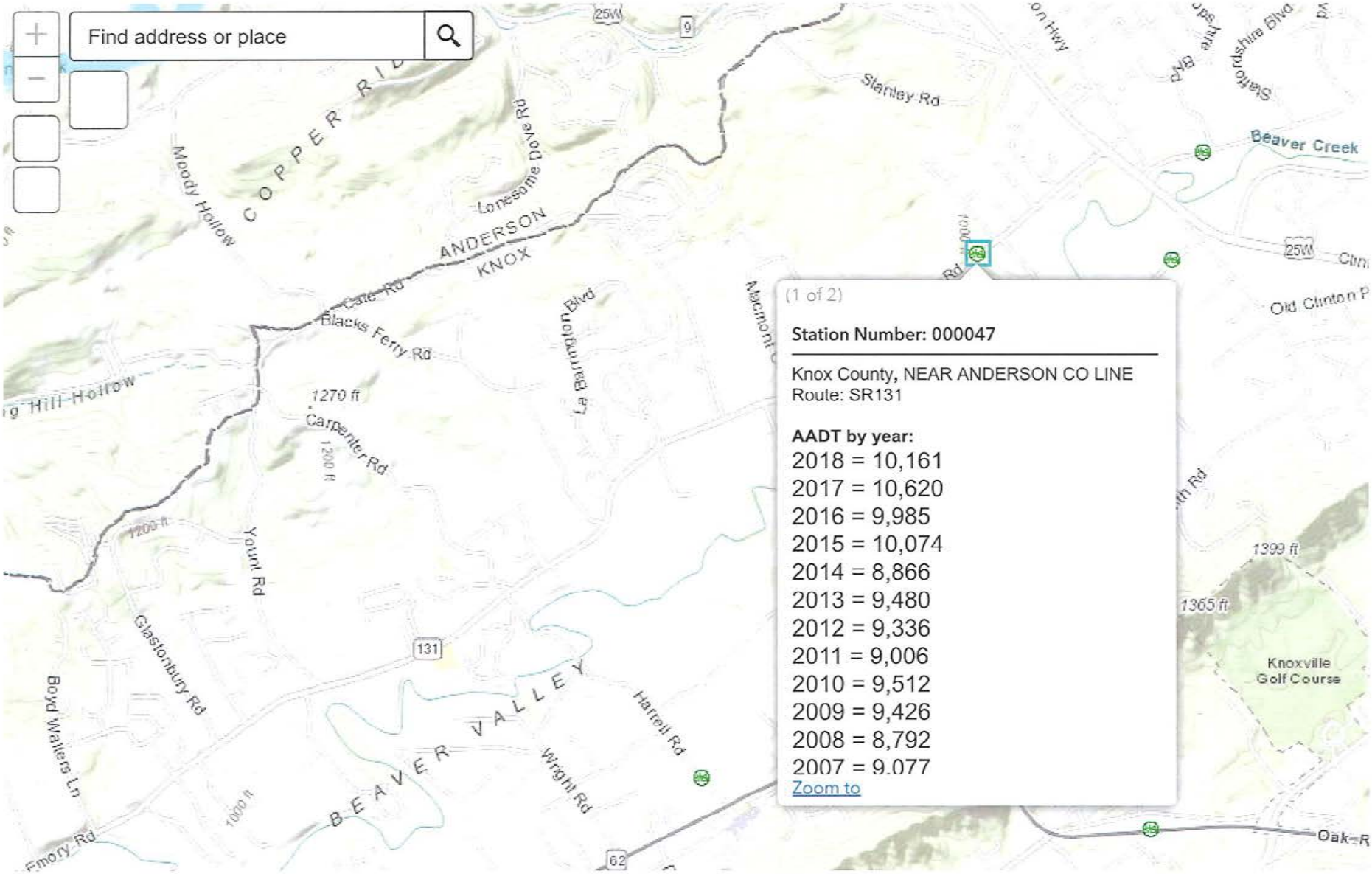
File Name : Emory_Cate_5-18-17
Site Code : 00000001
Start Date : 5/18/2017
Page No : 3

| | Cate Road Southbound | | | | | Emory Road Westbound | | | | | Northbound | | | | | Emory Road Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Intersection | 04:45 PM | | | | | | | | | | | | | | | | | | | | |
| Volume | 50 | 0 | 30 | 0 | 80 | 0 | 406 | 77 | 0 | 483 | 0 | 0 | 0 | 0 | 0 | 77 | 539 | 0 | 0 | 616 | 1179 |
| Percent | 62.5 | 0.0 | 37.5 | 0.0 | | 0.0 | 84.1 | 15.9 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | | 12.5 | 87.5 | 0.0 | 0.0 | | |
| 05:15 Volume | 14 | 0 | 9 | 0 | 23 | 0 | 109 | 23 | 0 | 132 | 0 | 0 | 0 | 0 | 0 | 19 | 132 | 0 | 0 | 151 | 306 |
| Peak Factor | | | | | | | | | | | | | | | | | | | | | 0.963 |
| High Int. | 05:30 PM | | | | | 05:15 PM | | | | | | | | | | 04:45 PM | | | | | |
| Volume | 19 | 0 | 7 | 0 | 26 | 0 | 109 | 23 | 0 | 132 | 0 | 0 | 0 | 0 | 0 | 18 | 146 | 0 | 0 | 164 | |
| Peak Factor | | | | | 0.769 | | | | | 0.915 | | | | | | | | | | 0.939 | |



# Traffic History

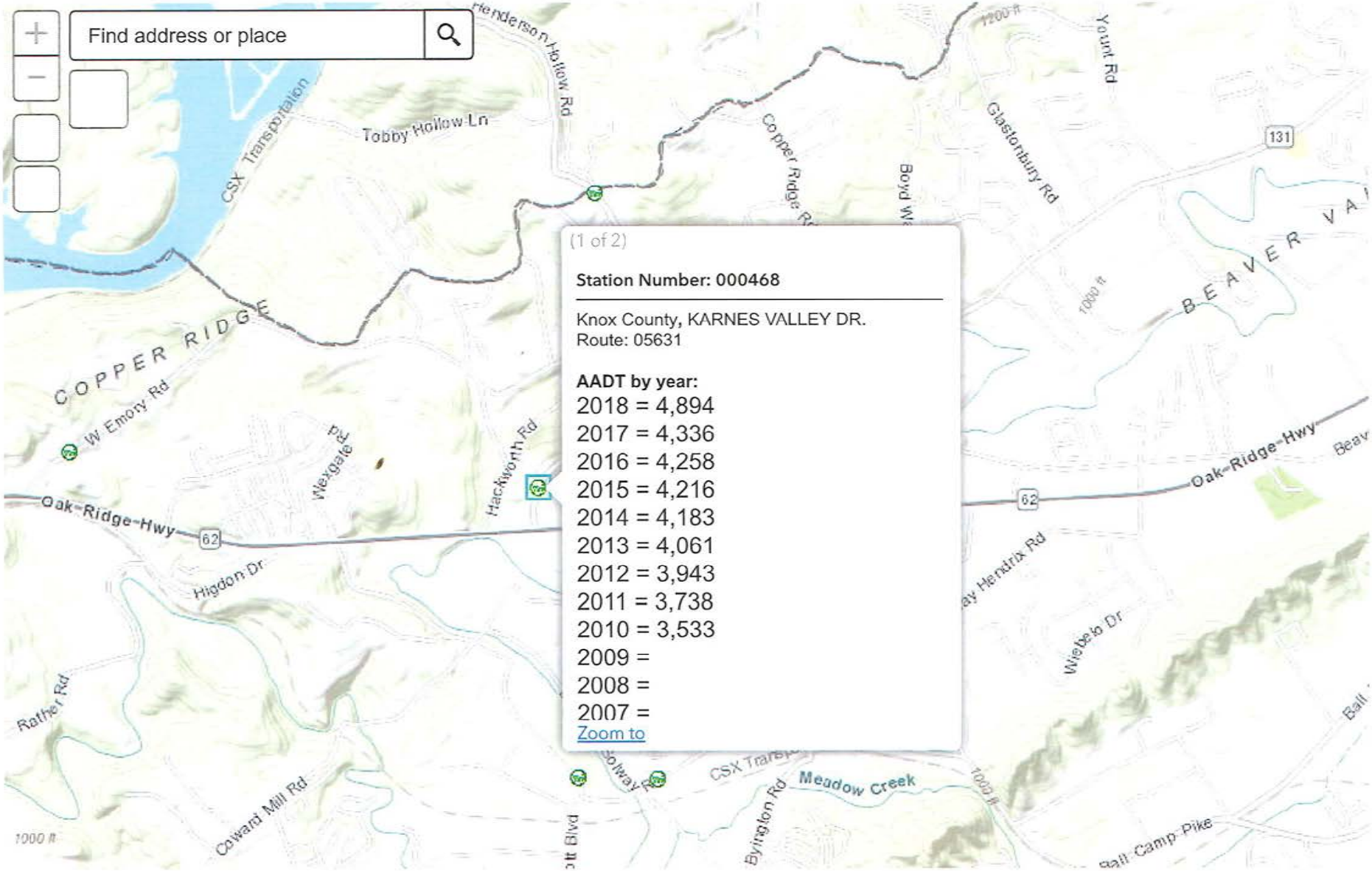
Help




A-5

# Traffic History

Help




A-6

# Derivation of Traffic Volumes for Study Intersection



4/30/20 by DRC

Begin w/ Emory & Cate Data: *

AM Peak - 7:00 - 8:00

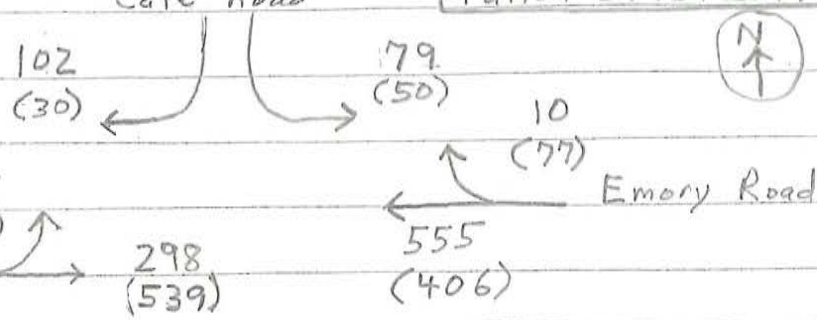
(PM Peak - 4:45 - 5:45)

PHF:

AM - 0.89

PM - 0.96

Taken 5/18/2017



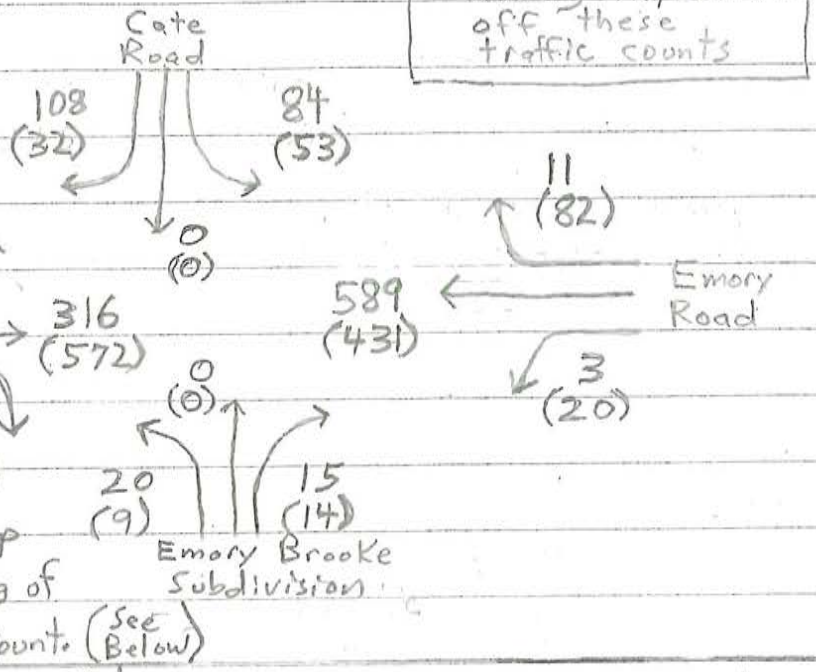

* MPC requested basing Trip Distn. off these traffic counts

Derive 2020 Existing Volumes:

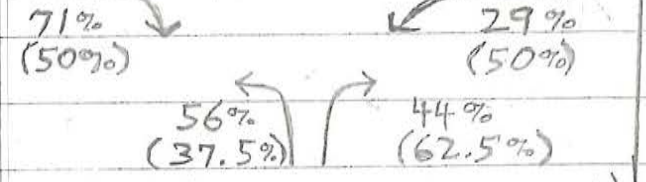
2 Steps

1) Expand above counts to 2020 using 2.0%/yr. growth for 3 years (1.0612)

2) Add Emory Brooke Trip Assignment - New 4th Leg of Intersection - Built after count. (See Below)

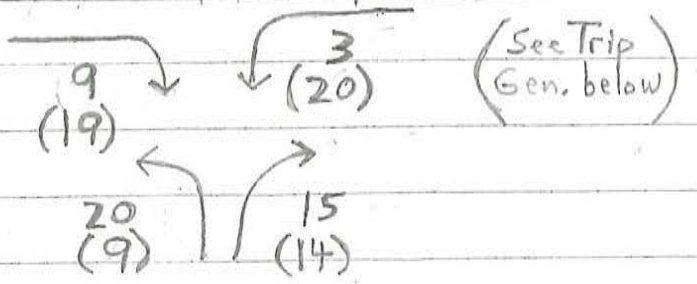



## Emory Brooke - Trip Distribution*




(Distribution to be used for all subdivisions)

## Emory Brooke - Trip Assignment




| Emory Brook Trip Generation (60 units): Single Family | Total | Enter | Exit |
|---|---|---|---|
| Weekday — 650 - 50% enter, 50% exit | 650 | 325 | 325 |
| AM Peak - 47 - 25% enter, 75% exit | 47 | 12 | 35 |
| PM Peak - 62 - 63% enter, 37% exit | 62 | 39 | 23 |

See Sheet 2 for continuation of derivation

5/4/20 by DLL

# Continuation of Derivation for Project Study Intersection

## 2020 Existing Volumes

→ Use MPC recommended methedology - See (1) at bottom of this sheet

Blacks Ferry Side Street Enter/Exit Volumes from Knox. County TMC Count

### Direct Emory Access Trip Gen

| | Enter | Exit |
|---|---|---|
| AM - | 4 | 14 |
| PM - | 13 | 8 |

### Barrington Subd. Trip Gen.

| | Enter | Exit |
|---|---|---|
| AM - | 32 | 96 |
| PM - | 109 | 64 |

See Sheet 3 For Trip Generation for each Subdivision

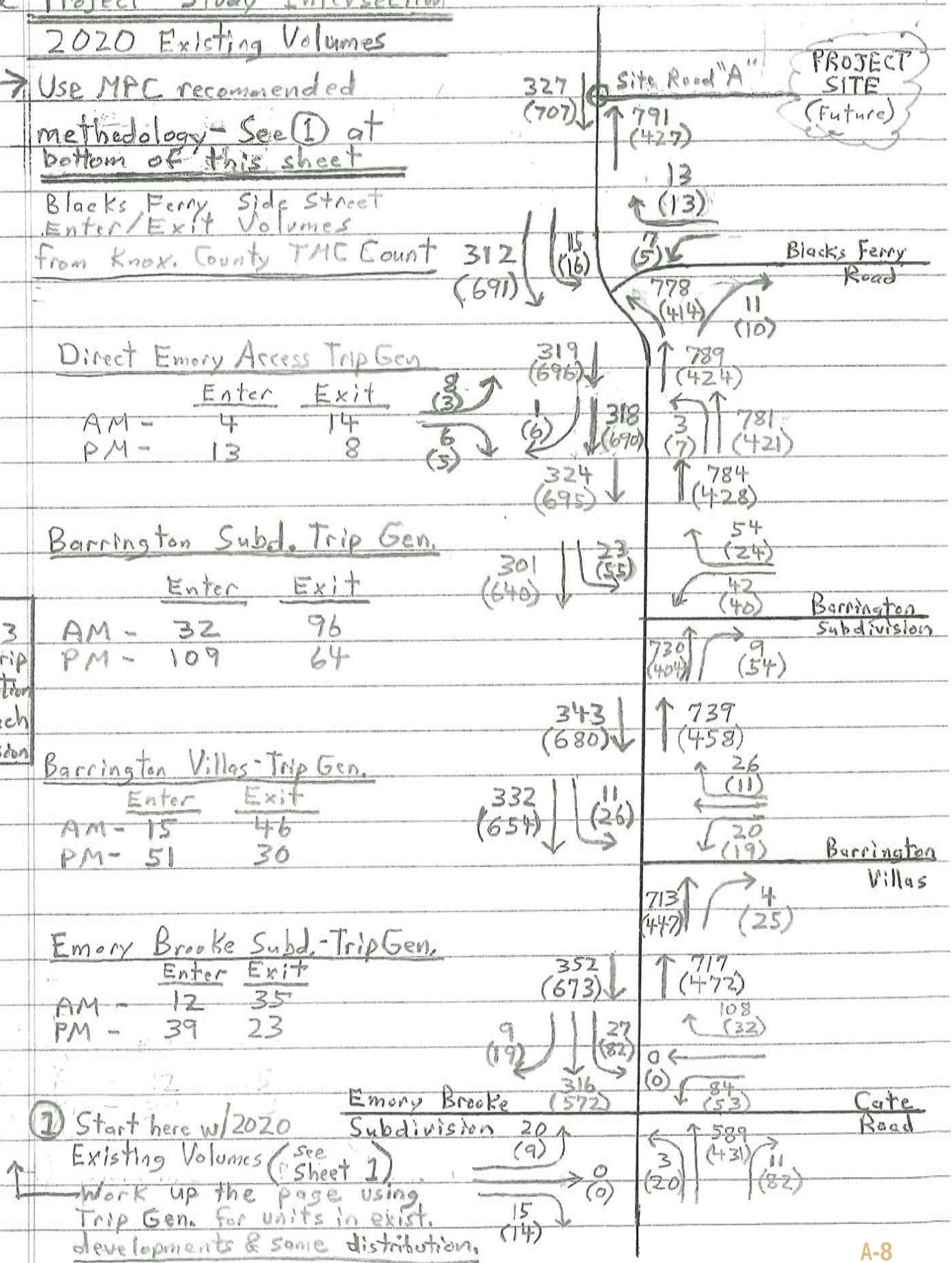
### Barrington Villas - Trip Gen.

| | Enter | Exit |
|---|---|---|
| AM - | 15 | 46 |
| PM - | 51 | 30 |

### Emory Brooke Subd. - TripGen.

| | Enter | Exit |
|---|---|---|
| AM - | 12 | 35 |
| PM - | 39 | 23 |

(1) Start here w/2020 Existing Volumes (See Sheet 1) Work up the page using Trip Gen. for units in exist. developments & some distribution.



4/30/20
by aec

# Trip Generation Summary for Deriving Miller Farms Volumes*

| | No. Units | Weekday Total | Weekday Enter | Weekday Exit | AM Peak Total | AM Peak Enter | AM Peak Exit |
|---|---|---|---|---|---|---|---|
| Miller Farms | 98 | 1021 | 510 | 511 | 74 | 18 | 56 |
| Emory Brooke | 60 | 650 | 325 | 325 | 47 | 12 | 35 |
| Barrington Villas | 79 | 837 | 418 | 419 | 61 | 15 | 46 |
| Barrington Subd. | 174 | 1731 | 865 | 866 | 128 | 32 | 96 |
| Direct Emory Access | 19 | 226 | 113 | 113 | 18 | 4 | 14 |
| Northhampton Commons | 42 | 468 | 234 | 234 | 35 | 9 | 26 |

Enter / Exit %:

| | Enter | Exit |
|---|---|---|
| Weekday - | 50% | 50% |
| AM Peak - | 25% | 75% |
| PM Peak - | 63% | 37% |

| PM Peak: | PM Peak | | |
|---|---|---|---|
| Miller Farms | 100 | 63 | 37 |
| Emory Brooke | 62 | 39 | 23 |
| Barrington Villas | 81 | 51 | 30 |
| Barrington Subd | 173 | 109 | 64 |
| Direct Emory Access | 21 | 13 | 8 |
| Northhampton Commons | 44 | 28 | 16 |

## Combined Miller Farms & Northampton Subdivisions

| No. Units | Weekday Total | Weekday Enter | Weekday Exit | AM Peak Total | AM Peak Enter | AM Peak Exit | PM Peak Total | PM Peak Enter | PM Peak Exit |
|---|---|---|---|---|---|---|---|---|---|
| 140 (98+42) | 1417 | 708 | 709 | 104 | 26 | 78 | 140 | 88 | 52 |

*Method as directed by MPC

# APPENDIX B – TRIP GENERATION

# 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. As expected, dwelling units that were larger in size, more expensive, or farther away from the central business district (CBD) had a higher rate of trip generation per unit than those smaller in size, less expensive, or closer to the CBD. 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 alternate modes of transportation available because they were typically not as concentrated as other residential land uses.

The peak hour of the generator typically coincided with the peak hour of the adjacent street traffic.

The sites were surveyed between the late 1960s and the 2000s throughout the United States and Canada.

## Source Numbers

1, 4, 5, 6, 7, 8, 11, 12, 13, 14, 16, 19, 20, 21, 26, 34, 35, 36, 38, 40, 71, 72, 84, 91, 98, 100, 105, 108, 110, 114, 117, 119, 157, 167, 177, 187, 192, 207, 211, 246, 275, 283, 293, 300, 319, 320, 357, 384, 435, 550, 552, 579, 598, 601, 603, 611, 614, 637

# Single-Family Detached Housing
(210)

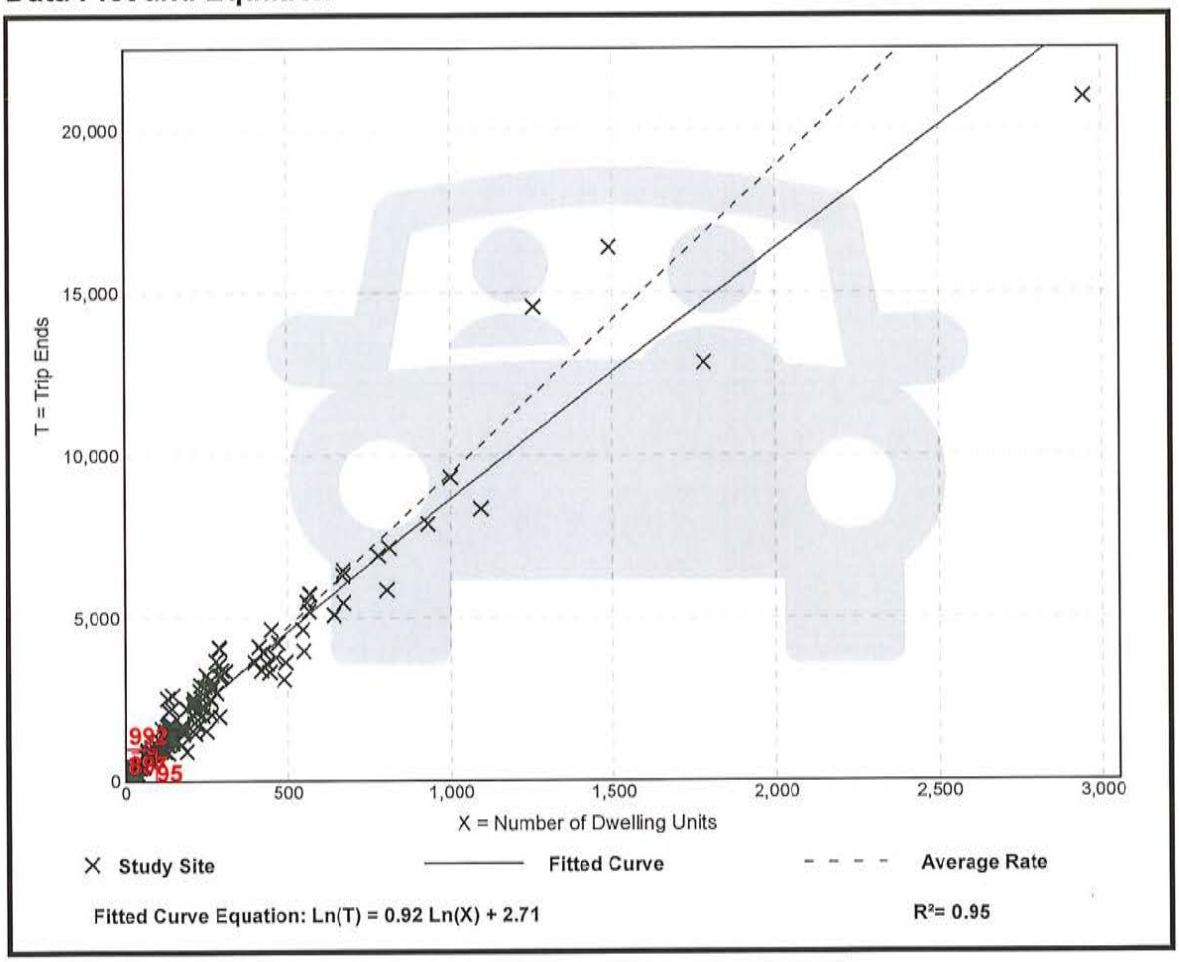
**Vehicle Trip Ends vs:** **Dwelling Units**
**On a:** **Weekday**

**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




*Trip Gen Manual,* 10th Edition • Institute of Transportation Engineers

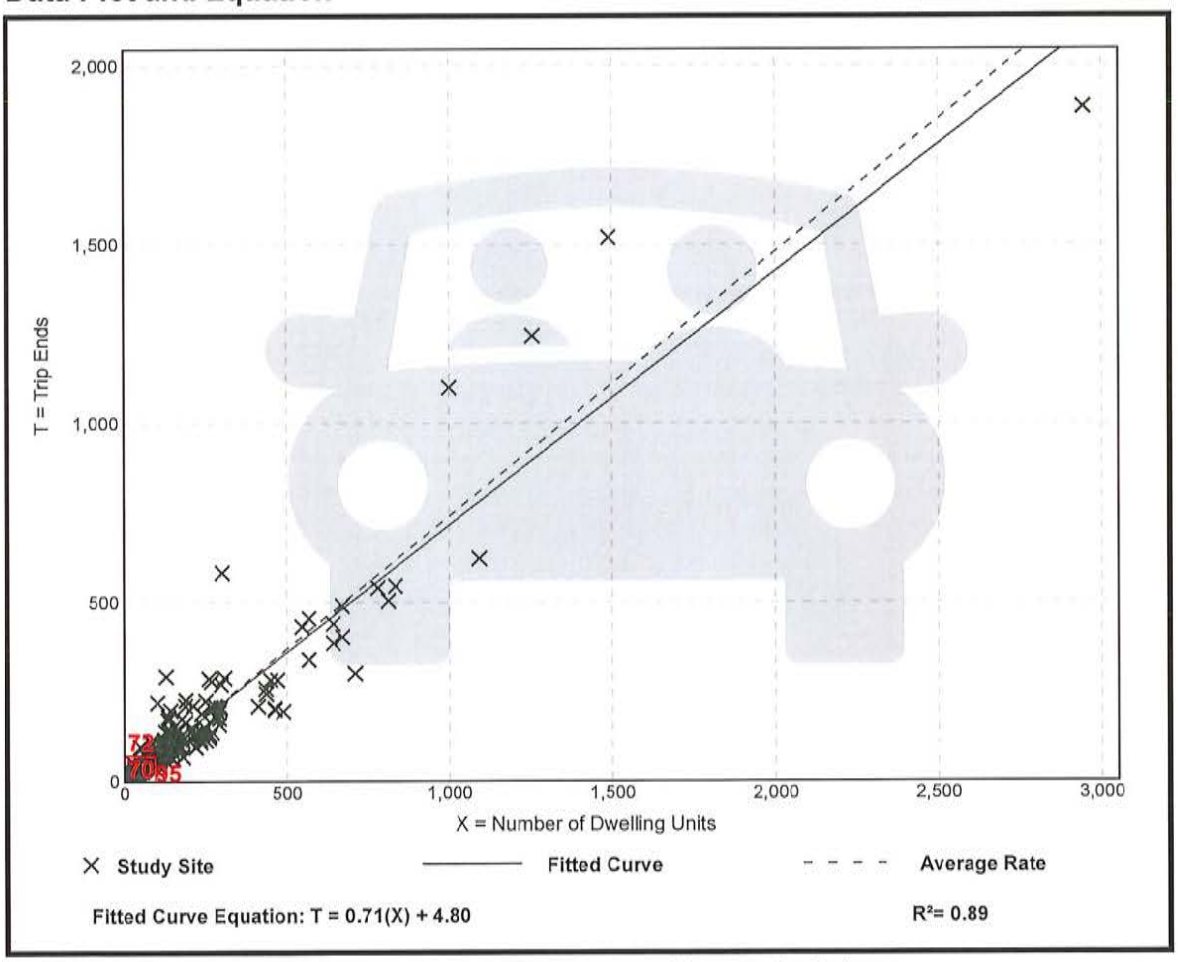
# Single-Family Detached Housing
(210)

| | |
|---|---|
| **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 | Range of Rates | Standard Deviation |
|---|---|---|
| 0.74 | 0.33 - 2.27 | 0.27 |

## Data Plot and Equation




*Trip Gen Manual,* 10th Edition • Institute of Transportation Engineers

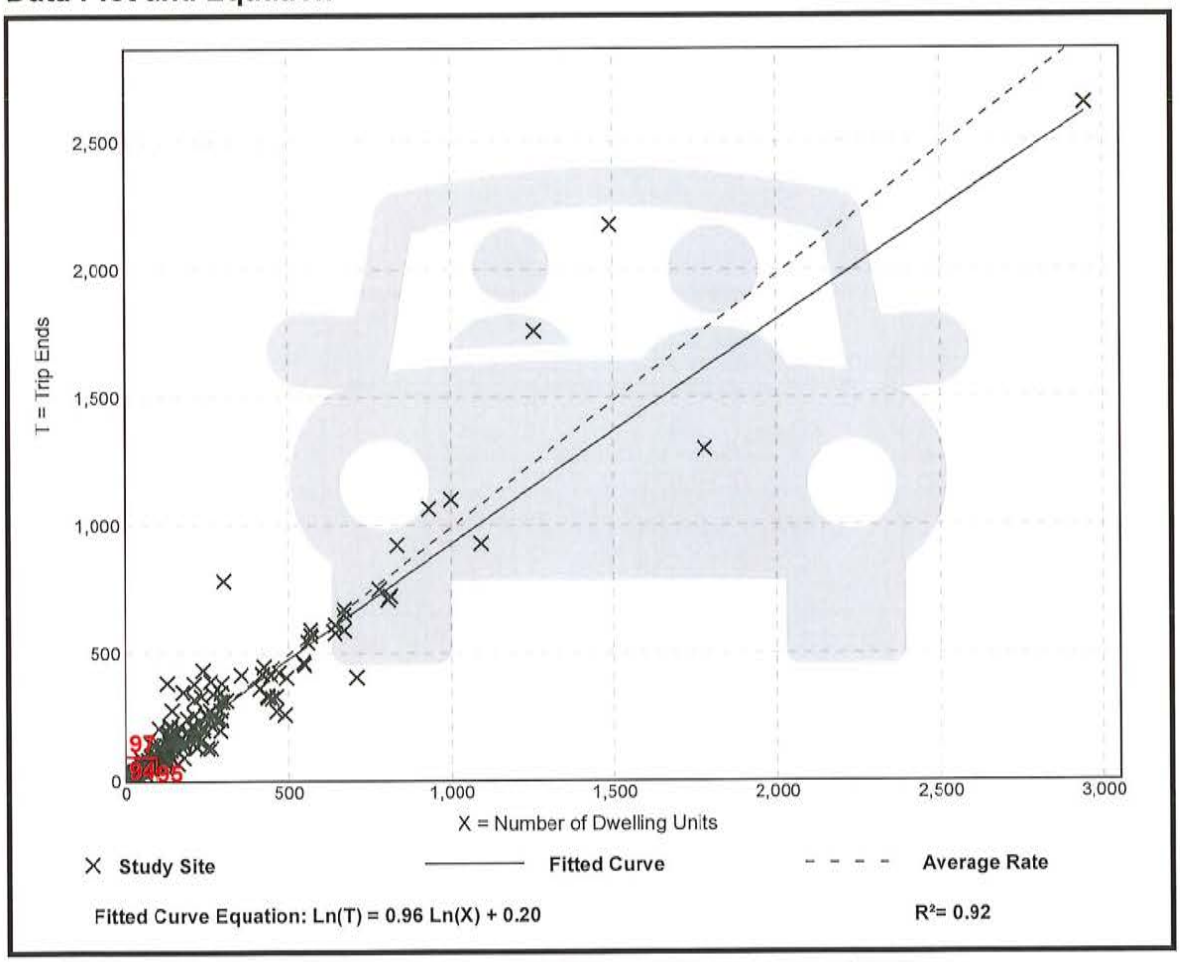
# Single-Family Detached Housing
(210)

| | |
|---|---|
| **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 | Range of Rates | Standard Deviation |
|---|---|---|
| 0.99 | 0.44 - 2.98 | 0.31 |

## Data Plot and Equation



4/30/20
by aec

# Trip Generation Summary for Deriving Miller Farms Volumes

| Subdivision | No. Units | Weekday Total | Weekday Enter | Weekday Exit | AM Peak Total | AM Peak Enter | AM Peak Exit |
|---|---|---|---|---|---|---|---|
| Miller Farms | 98 | 1021 | 510 | 511 | 74 | 18 | 56 |
| Emory Brooke | 60 | 650 | 325 | 325 | 47 | 12 | 35 |
| Barrington Villa | 79 | 837 | 418 | 419 | 61 | 15 | 46 |
| Barrington Subd. | 174 | 1731 | 865 | 866 | 128 | 32 | 96 |
| Direct Emory Access | 19 | 226 | 113 | 113 | 18 | 4 | 14 |
| Northhampton Commons | 42 | 468 | 234 | 234 | 35 | 9 | 26 |

Enter / Exit %:

| | Enter | Exit |
|---|---|---|
| Weekday - | 50% | 50% |
| AM Peak - | 25% | 75% |
| PM Peak - | 63% | 37% |

| Subdivision | PM Peak | | |
|---|---|---|---|
| Miller Farms | 100 | 63 | 37 |
| Emory Brooke | 62 | 39 | 23 |
| Barrington Villas | 81 | 51 | 30 |
| Barrington Subd | 173 | 109 | 64 |
| Direct Emory Access | 21 | 13 | 8 |
| Northhampton Commons | 44 | 28 | 16 |

## Combined Miller Farms & Northampton Subdivisions

| No. Units | Weekday Total | Weekday Enter | Weekday Exit | AM Peak Total | AM Peak Enter | AM Peak Exit | PM Peak Total | PM Peak Enter | PM Peak Exit |
|---|---|---|---|---|---|---|---|---|---|
| 140 (98+42) | 1417 | 708 | 709 | 104 | 26 | 78 | 140 | 88 | 52 |

# APPENDIX C – ANALYSES

## CAPACITY AND LEVEL-OF-SERVICE CONCEPTS

In a general sense, a roadway is similar to a pipeline or other material carrying conduit in that it has a certain capacity for the amount of material (vehicles) that it can efficiently carry. As the number of vehicles in a given time period gradually increases, the quality of traffic flow gradually decreases. On roadway sections this results in increasing turbulence in the traffic stream, and at intersections it results in increasing stops and delay. As the volumes begin to approach the capacity of the facility, these problems rapidly magnify, with resulting serious levels of congestion, stops, delay, excess fuel consumption, pollutant emissions, etc.

The Transportation Research Board has published the Year 2010 Highway Capacity Manual (HCM2010), which establishes theoretical techniques to quantify the capacity conditions on all types of roadways, intersections, ramps, pedestrian facilities, etc. A basic concept that is applicable to most of these techniques is the idea of level of service (LOS). This concept establishes a rating system that quantifies the quality of traffic flow, as perceived by motorists and/or passengers. The general system is similar to a school grade scale, and is outlined as follows:

| Level of Service (LOS) | General Quality of Traffic Flow | Description of Corresponding Conditions |
|---|---|---|
| A | Excellent | Roadways – Free flow, high maneuverability<br>Intersections – Very few stops, very low delay |
| B | Very Good | Roadways – Free flow, slightly lower maneuverability<br>Intersections – Minor stops, low delay |
| C | Good | Roadways – Stable flow, restricted maneuverability<br>Intersections – Significant stops, significant delay |
| D | Fair | Roadways – Marginally stable flow, congestion seriously restricts maneuverability<br>Intersections – High stops, long but tolerable delay |
| E | Poor | Roadways – Unstable flow*, lower operating speeds, congestion severely restricts maneuverability<br>Intersections – All vehicles stop, very long queues and very long intolerable delay |
| F | Very Poor | Roadways – Forced flow, stoppages may be lengthy, congestion severely restricts maneuverability<br>Intersections – All vehicles stop, extensive queues and extremely long intolerable delay |

*Unstable flow is such that minor fluctuations or disruptions can result in rapid degradation to LOS F.

LOS CRITERIA: SIGNALIZED & UNSIGNALIZED INTERSECTIONS

| LOS | CONTROL DELAY (S/VEH) | | |
|---|---|---|---|
| | SIGNALIZED | UNSIGNALIZED | ROUNDABOUT |
| A | ≤10 | ≤10 | ≤10 |
| B | >10-20 | >10-15 | >10-15 |
| C | >20-35 | >15-25 | >15-25 |
| D | >35-55 | >25-35 | >25-35 |
| E | >55-80 | >35-50 | >35-50 |
| F | >80 | >50 | >50 |

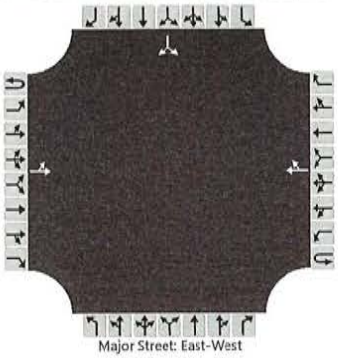
Another measure of intersection capacity that is often used in the evaluation of intersection operations is the volume to capacity (V/C) ratio. This ratio is defined as "the ratio of flow rate to capacity", and is a good measure of how much of an intersection's available capacity has been used up by the analysis volumes. Conversely, it also provides an indication of the reserve capacity available for future growth in traffic volumes.

The Intersection Capacity Utilization (ICU) is another measure that expresses a value similar to the V/C ratio. Specifically, the ICU method "sums the amount of the time required to serve all movements at saturation for a given cycle length and divides by that reference cycle length." The ICU is considered a more accurate measure of volume to capacity conditions for a signalized intersection, primarily because it accounts for the effects of the signal timing on intersection capacity.

# HCS7 Two-Way Stop-Control Report

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | ALC | Intersection | Emory Road at Road A |
| Agency/Co. | CCI | Jurisdiction | Knox County |
| Date Performed | 11/5/2020 | East/West Street | Emory Road |
| Analysis Year | 2024 | North/South Street | Miller Farms Road "A" |
| Time Analyzed | AM Peak - Combined | Peak Hour Factor | 0.89 |
| Intersection Orientation | East-West | Analysis Time Period (hrs) | 0.25 |
| Project Description | Miller Farms TIS - No Turn Lane | | |

## Lanes




## Vehicle Volumes and Adjustments

| Approach | Eastbound | | | | Westbound | | | | Northbound | | | | Southbound | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | U | L | T | R | U | L | T | R | U | L | T | R | U | L | T | R |
| Priority | 1U | 1 | 2 | 3 | 4U | 4 | 5 | 6 | | 7 | 8 | 9 | | 10 | 11 | 12 |
| Number of Lanes | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | | 0 | 0 | 0 | | 0 | 1 | 0 |
| Configuration | | LT | | | | | | TR | | | | | | | LR | |
| Volume (veh/h) | | 13 | 354 | | | | 856 | 5 | | | | | | 24 | | 30 |
| Percent Heavy Vehicles (%) | | 3 | | | | | | | | | | | | 3 | | 3 |
| Proportion Time Blocked | | | | | | | | | | | | | | | | |
| Percent Grade (%) | | | | | | | | | | | | | | 0 | | |
| Right Turn Channelized | | | | | | | | | | | | | | | | |
| Median Type \| Storage | | Undivided | | | | | | | | | | | | | | |

## Critical and Follow-up Headways

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Critical Headway (sec) | | 4.1 | | | | | | | | | | | | 7.1 | | 6.2 |
| Critical Headway (sec) | | 4.13 | | | | | | | | | | | | 6.43 | | 6.23 |
| Base Follow-Up Headway (sec) | | 2.2 | | | | | | | | | | | | 3.5 | | 3.3 |
| Follow-Up Headway (sec) | | 2.23 | | | | | | | | | | | | 3.53 | | 3.33 |

## Delay, Queue Length, and Level of Service

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow Rate, v (veh/h) | | 15 | | | | | | | | | | | | | 61 | |
| Capacity, c (veh/h) | | 708 | | | | | | | | | | | | | 211 | |
| v/c Ratio | | 0.02 | | | | | | | | | | | | | 0.29 | |
| 95% Queue Length, $Q_{95}$ (veh) | | 0.1 | | | | | | | | | | | | | 1.1 | |
| Control Delay (s/veh) | | 10.2 | | | | | | | | | | | | | 28.8 | |
| Level of Service (LOS) | | B | | | | | | | | | | | | | D | |
| Approach Delay (s/veh) | | 0.6 | | | | | | | | | | | | 28.8 | | |
| Approach LOS | | | | | | | | | | | | | | D | | |

# HCS7 Two-Way Stop-Control Report

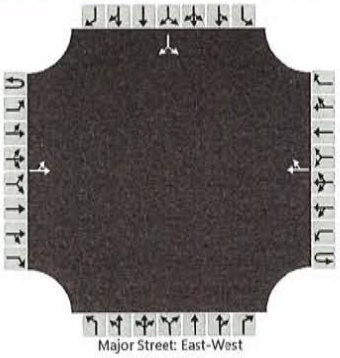
## General Information

| | |
|---|---|
| Analyst | ALC |
| Agency/Co. | CCI |
| Date Performed | 11/5/2020 |
| Analysis Year | 2024 |
| Time Analyzed | PM Peak - Combined |
| Intersection Orientation | East-West |
| Project Description | Miller Farms TIS - No Turn Lane |

## Site Information

| | |
|---|---|
| Intersection | Emory Road at Road A |
| Jurisdiction | Knox County |
| East/West Street | Emory Road |
| North/South Street | Miller Farms Road "A" |
| Peak Hour Factor | 0.96 |
| Analysis Time Period (hrs) | 0.25 |

## Lanes




## Vehicle Volumes and Adjustments

| Approach | Eastbound | | | | Westbound | | | | Northbound | | | | Southbound | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | U | L | T | R | U | L | T | R | U | L | T | R | U | L | T | R |
| Priority | 1U | 1 | 2 | 3 | 4U | 4 | 5 | 6 | | 7 | 8 | 9 | | 10 | 11 | 12 |
| Number of Lanes | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | | 0 | 0 | 0 | | 0 | 1 | 0 |
| Configuration | | LT | | | | | | TR | | | | | | | LR | |
| Volume (veh/h) | | 31 | 765 | | | | 462 | 30 | | | | | | 22 | | 14 |
| Percent Heavy Vehicles (%) | | 3 | | | | | | | | | | | | 3 | | 3 |
| Proportion Time Blocked | | | | | | | | | | | | | | | | |
| Percent Grade (%) | | | | | | | | | | | | | | 0 | | |
| Right Turn Channelized | | | | | | | | | | | | | | | | |
| Median Type \| Storage | Undivided | | | | | | | | | | | | | | | |

## Critical and Follow-up Headways

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Critical Headway (sec) | | 4.1 | | | | | | | | | | | | 7.1 | | 6.2 |
| Critical Headway (sec) | | 4.13 | | | | | | | | | | | | 6.43 | | 6.23 |
| Base Follow-Up Headway (sec) | | 2.2 | | | | | | | | | | | | 3.5 | | 3.3 |
| Follow-Up Headway (sec) | | 2.23 | | | | | | | | | | | | 3.53 | | 3.33 |

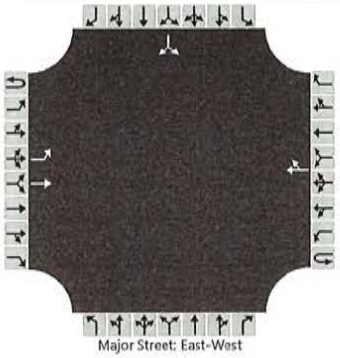
## Delay, Queue Length, and Level of Service

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow Rate, v (veh/h) | | 32 | | | | | | | | | | | | | 38 | |
| Capacity, c (veh/h) | | 1048 | | | | | | | | | | | | | 215 | |
| v/c Ratio | | 0.03 | | | | | | | | | | | | | 0.17 | |
| 95% Queue Length, $Q_{95}$ (veh) | | 0.1 | | | | | | | | | | | | | 0.6 | |
| Control Delay (s/veh) | | 8.5 | | | | | | | | | | | | | 25.2 | |
| Level of Service (LOS) | | A | | | | | | | | | | | | | D | |
| Approach Delay (s/veh) | 0.8 | | | | | | | | | | | | 25.2 | | | |
| Approach LOS | | | | | | | | | | | | | D | | | |

# HCS7 Two-Way Stop-Control Report

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | ALC | Intersection | Emory Road at Road A |
| Agency/Co. | CCI | Jurisdiction | Knox County |
| Date Performed | 11/5/2020 | East/West Street | Emory Road |
| Analysis Year | 2024 | North/South Street | Miller Farms Road "A" |
| Time Analyzed | AM Peak - Combined | Peak Hour Factor | 0.89 |
| Intersection Orientation | East-West | Analysis Time Period (hrs) | 0.25 |
| Project Description | Miller Farms TIS - EBLT Lane | | |

## Lanes




## Vehicle Volumes and Adjustments

| Approach | Eastbound | | | | Westbound | | | | Northbound | | | | Southbound | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | U | L | T | R | U | L | T | R | U | L | T | R | U | L | T | R |
| Priority | 1U | 1 | 2 | 3 | 4U | 4 | 5 | 6 | | 7 | 8 | 9 | | 10 | 11 | 12 |
| Number of Lanes | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | | 0 | 0 | 0 | | 0 | 1 | 0 |
| Configuration | | L | T | | | | | TR | | | | | | | LR | |
| Volume (veh/h) | | 13 | 354 | | | | 856 | 5 | | | | | | 24 | | 30 |
| Percent Heavy Vehicles (%) | | 3 | | | | | | | | | | | | 3 | | 3 |
| Proportion Time Blocked | | | | | | | | | | | | | | | | |
| Percent Grade (%) | | | | | | | | | | | | | | 0 | | |
| Right Turn Channelized | | | | | | | | | | | | | | | | |
| Median Type \| Storage | | | Undivided | | | | | | | | | | | | | |

## Critical and Follow-up Headways

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Critical Headway (sec) | | 4.1 | | | | | | | | | | | | 7.1 | | 6.2 |
| Critical Headway (sec) | | 4.13 | | | | | | | | | | | | 6.43 | | 6.23 |
| Base Follow-Up Headway (sec) | | 2.2 | | | | | | | | | | | | 3.5 | | 3.3 |
| Follow-Up Headway (sec) | | 2.23 | | | | | | | | | | | | 3.53 | | 3.33 |

## Delay, Queue Length, and Level of Service

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow Rate, v (veh/h) | | 15 | | | | | | | | | | | | | 61 | |
| Capacity, c (veh/h) | | 708 | | | | | | | | | | | | | 212 | |
| v/c Ratio | | 0.02 | | | | | | | | | | | | | 0.29 | |
| 95% Queue Length, $Q_{95}$ (veh) | | 0.1 | | | | | | | | | | | | | 1.1 | |
| Control Delay (s/veh) | | 10.2 | | | | | | | | | | | | | 28.7 | |
| Level of Service (LOS) | | B | | | | | | | | | | | | | D | |
| Approach Delay (s/veh) | | 0.4 | | | | | | | | | | | | 28.7 | | |
| Approach LOS | | | | | | | | | | | | | | D | | |

# HCS7 Two-Way Stop-Control Report

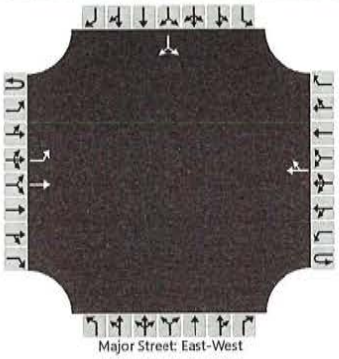
## General Information

| | |
|---|---|
| Analyst | ALC |
| Agency/Co. | CCI |
| Date Performed | 11/5/2020 |
| Analysis Year | 2024 |
| Time Analyzed | PM Peak - Combined |
| Intersection Orientation | East-West |
| Project Description | Miller Farms TIS - EBLT Lane |

## Site Information

| | |
|---|---|
| Intersection | Emory Road at Road A |
| Jurisdiction | Knox County |
| East/West Street | Emory Road |
| North/South Street | Miller Farms Road "A" |
| Peak Hour Factor | 0.96 |
| Analysis Time Period (hrs) | 0.25 |

## Lanes




## Vehicle Volumes and Adjustments

| Approach | Eastbound | | | | Westbound | | | | Northbound | | | | Southbound | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | U | L | T | R | U | L | T | R | U | L | T | R | U | L | T | R |
| Priority | 1U | 1 | 2 | 3 | 4U | 4 | 5 | 6 | | 7 | 8 | 9 | | 10 | 11 | 12 |
| Number of Lanes | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | | 0 | 0 | 0 | | 0 | 1 | 0 |
| Configuration | | L | T | | | | | TR | | | | | | | LR | |
| Volume (veh/h) | | 31 | 765 | | | | 462 | 30 | | | | | | 22 | | 14 |
| Percent Heavy Vehicles (%) | | 3 | | | | | | | | | | | | 3 | | 3 |
| Proportion Time Blocked | | | | | | | | | | | | | | | | |
| Percent Grade (%) | | | | | | | | | | | | | | 0 | | |
| Right Turn Channelized | | | | | | | | | | | | | | | | |
| Median Type \| Storage | Undivided | | | | | | | | | | | | | | | |

## Critical and Follow-up Headways

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Critical Headway (sec) | | 4.1 | | | | | | | | | | | | 7.1 | | 6.2 |
| Critical Headway (sec) | | 4.13 | | | | | | | | | | | | 6.43 | | 6.23 |
| Base Follow-Up Headway (sec) | | 2.2 | | | | | | | | | | | | 3.5 | | 3.3 |
| Follow-Up Headway (sec) | | 2.23 | | | | | | | | | | | | 3.53 | | 3.33 |

## Delay, Queue Length, and Level of Service

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow Rate, v (veh/h) | | 32 | | | | | | | | | | | | | 38 | |
| Capacity, c (veh/h) | | 1048 | | | | | | | | | | | | | 220 | |
| v/c Ratio | | 0.03 | | | | | | | | | | | | | 0.17 | |
| 95% Queue Length, $Q_{95}$ (veh) | | 0.1 | | | | | | | | | | | | | 0.6 | |
| Control Delay (s/veh) | | 8.5 | | | | | | | | | | | | | 24.7 | |
| Level of Service (LOS) | | A | | | | | | | | | | | | | C | |
| Approach Delay (s/veh) | 0.3 | | | | | | | | | | | | 24.7 | | | |
| Approach LOS | | | | | | | | | | | | | C | | | |

| TABLE 5A<br>KNOX COUNTY LEFT-TURN LANE VOLUME THRESHOLDS<br>FOR 2-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH | Project No: 00773-0013<br>Project Name: Miller Farm TIS<br>Notes: |
|---|---|

(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 | 250 | 180 | 140 | 110 | 80 | 70 |
| 150 - 199 | 200 | 140 | 105 | 90 | 70 | 60 |
| 200 - 249 | 160 | 115 | 85 | 75 | 65 | 55 |
| 250 - 299 | 130 | 100 | 75 | 65 | 60 | 50 |
| 300 - 349 | 110 | 90 | 70 | 60 | 55 | 45 |
| 350 - 399 | 100 | 80 | 65 | 55 | 50 | 40 |
| 400 - 449 | 90 | 70 | 60 | 50 | 45 | 35 |
| 450 - 499 | 80 | 65 | 55 | 45 | 40 | 30 |
| 500 - 549 | 70 | 60 | 45 | 35 | 35 | 25 |
| 550 - 599 | 65 | 55 | 40 | 35 | 30 | 25 |
| 600 - 649 | 60 | 45 | 35 | 30 | 25 | 25 |
| 650 - 699 | 55 | 35 | 35 | 30 | 25 | 20 |
| 700 - 749 | 50 | 35 | 30 | 25 | 20 | 20 |
| **750 or More** | 45 | 35 | 25 | 25 | 20 | **20 - AM** |

| OPPOSING VOLUME | THROUGH VOLUME PLUS RIGHT-TURN VOLUME * | | | | | |
|---|---|---|---|---|---|---|
| | 350 - 399 | 400 - 449 | 450 - 499 | 500 - 549 | 550 - 599 | **= / > 600** |
| 100 - 149 | 70 | 60 | 50 | 45 | 40 | 35 |
| 150 - 199 | 60 | 55 | 45 | 40 | 35 | 30 |
| 200 - 249 | 55 | 50 | 40 | 35 | 30 | 30 |
| 250 - 299 | 50 | 45 | 35 | 30 | 30 | 30 |
| 300 - 349 | 45 | 40 | 35 | 30 | 25 | 25 |
| 350 - 399 | 40 | 35 | 30 | 25 | 25 | 20 |
| 400 - 449 | 35 | 30 | 30 | 25 | 20 | 20 |
| **450 - 499** | 30 | 25 | 25 | 20 | 20 | **20 - PM** |
| 500 - 549 | 25 | 25 | 20 | 20 | 20 | 15 |
| 550 - 599 | 25 | 20 | 20 | 20 | 20 | 15 |
| 600 - 649 | 25 | 20 | 20 | 20 | 20 | 15 |
| 650 - 699 | 20 | 20 | 20 | 20 | 20 | 15 |
| 700 - 749 | 20 | 20 | 20 | 15 | 15 | 15 |
| 750 or More | 20 | 20 | 20 | 15 | 15 | 15 |

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

| Intersection | Time Period | Opposing Volume | Through Volume | Left-Turn Volume | Warrant Threshold | Left-Turn Lane Warranted (Yes / No) |
|---|---|---|---|---|---|---|
| Study | AM Peak | 861 | 354 | 13 | **20** | No |
| Study | PM Peak | 492 | 765 | 31 | **20** | Yes |
| | | | | | | |
| | | | | | | |

Source: Knox County Department of Engineering and Public Works "Access Control and Driveway Design Policy"

| TABLE 5B<br>KNOX COUNTY RIGHT-TURN LANE VOLUME THRESHOLDS<br>FOR 2-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH | Project No: 00773-0013<br>Project Name: Miller Farm TIS<br>Notes: |
|---|---|

| 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 | | | | | | Yes |
| 250 - 299 | | | | | Yes | Yes |
| 300 - 349 | | | | Yes | Yes | Yes |
| 350 - 399 | | | Yes | Yes | Yes | Yes |
| 400 - 449 | | | Yes | Yes | Yes | Yes |
| 450 - 499 | | Yes | Yes | Yes | Yes | Yes |
| 500 - 549 | | Yes | Yes | Yes | Yes | Yes |
| 550 - 599 | Yes | Yes | Yes | Yes | Yes | Yes |
| 600 or More | Yes | Yes | Yes | Yes | Yes | Yes |

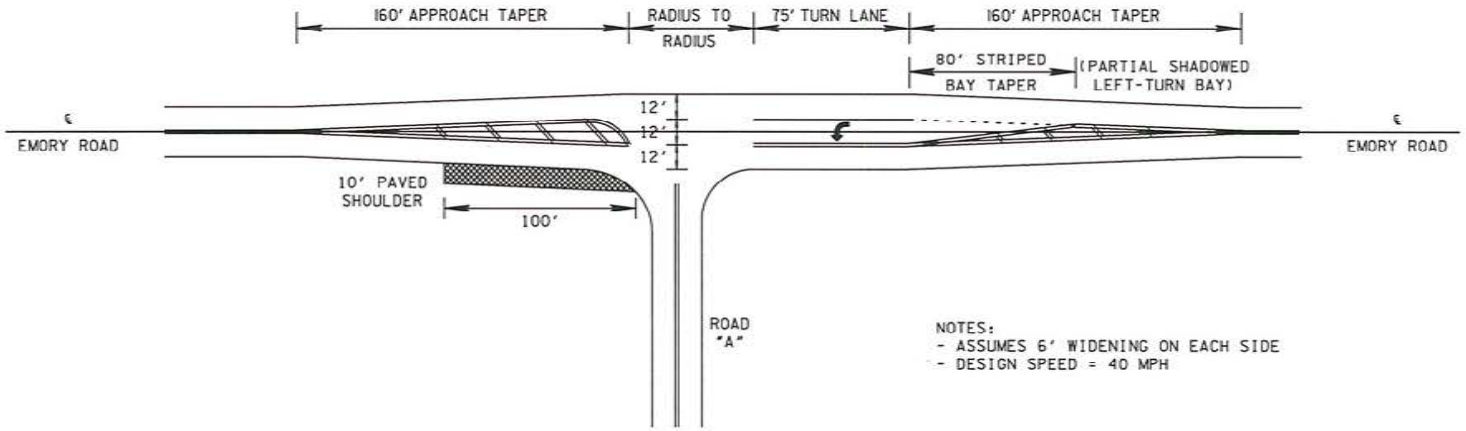
| RIGHT-TURN VOLUME | THROUGH VOLUME PLUS LEFT-TURN VOLUME * | | | | | |
|---|---|---|---|---|---|---|
| | 350 - 399 | 400 - 449 | **450 - 499** | 500 - 549 | 550 - 599 | **= / > 600** |
| **Fewer Than 25** | | | | | | **X - AM** |
| **25 - 49** | | | **X - PM** | | Yes | Yes |
| 50 - 99 | | | | Yes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

| Intersection | Time Period | Through Volume | Right-Turn Volume | Right-Turn Lane Warranted (Yes / No) |
|---|---|---|---|---|
| Study | AM Peak | 856 | 5 | No |
| Study | PM Peak | 462 | 30 | No |
| | | | | |
| | | | | |

Source: Knox County Department of Engineering and Public Works "Access Control and Driveway Design Policy"

# APPENDIX D – TURN LANE IMPROVEMENTS

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APPENDIX

TURN LANE IMPROVEMENT SKETCH