MALONEY ROAD MULTI FAMILY DEVELOPMENT

CITY OF KNOXVILLE, TENNESSEE

TRAFFIC IMPACT STUDY

MALONEY ROAD
KNOXVILLE, TENNESSEE

CCI PROJECT NO. 00269-0024

REV 1

PREPARED FOR:

S&ME
6515 Nightingale Lane
Knoxville, TN 37909

SUBMITTED BY:

Cannon & Cannon, Inc.
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Knoxville, TN 37919
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CONSULTING ENGINEERS
FIELD SURVEYORS

REVISED
October 25
2021

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TIS Version 2
10/25/2021

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REVISION 1 (10/25/21)
This report replaces the previous version of the traffic impact study dated 09/23/2021 prepared for this project in its entirety. The associated changes are related to comments received from Knoxville-Knox County Planning via an e-mail dated 10/25/21.

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EXECUTIVE SUMMARY

This report provides a summary of a traffic impact study that was performed for a proposed multi-family residential development to be located on Maloney Road in Knoxville, Tennessee. The project site is located on the north side of Maloney Road approximately 400 feet east of the intersection of Maloney Road at Dresser Road / Alcoa Highway Northbound Ramps. The development plan for this project proposes a multi-family residential development with 240 units. The proposed development will have one full access onto Maloney Road between the two southside access points of Sevier Heights Baptist Church.

The purpose of this study was the evaluation of the traffic operational and safety impacts of the proposed development upon roadways in the vicinity of the project site. Comments received from Knoxville-Knox County Planning resulted in the existing intersections of Maloney Road at Alcoa Highway Southbound Ramps and Maloney Road at Dresser Road / Alcoa Highway Northbound Ramps being identified for detailed study. Additionally, the proposed site access intersection on Maloney Road is included in the study. Appropriate intersection evaluations such as capacity analyses and turn lane warrant analyses were conducted at the study intersections for existing and future conditions, both with and without site generated traffic, in order to determine the anticipated impacts and to establish recommended measures to mitigate these impacts.

The primary conclusion of this study is that the traffic generated from the proposed development will not have a significant impact at the study intersections. The intersections of Maloney Road at Alcoa Highway Southbound Ramps and Maloney Road at Dresser Road / Alcoa Highway Northbound Ramps both currently operate at LOS "A", and both intersections will continue to operate at LOS "A" upon full buildout and occupancy of the development. Once complete, the side street approach at the site access intersection is expected to operate at LOS "B" during both peak traffic periods.

The recommendation from this study is to maintain intersection corner sight distance at the site access by ensuring that site grading, landscaping, signage, and other site features to not restrict intersection lines of sight.

INTRODUCTION & PURPOSE OF STUDY

This report provides a summary of a traffic impact study that was performed for a proposed multi-family residential development to be located on Maloney Road in Knoxville, Tennessee. The project site is located on the north side of Maloney Road approximately 400 feet east of the intersection of Maloney Road at Dresser Road / Alcoa Highway Northbound Ramps. FIGURE 1 is a location map showing the major roadways in the project site vicinity.

FIGURE 1
LOCATION MAP

The development plan for this project proposes a multi-family residential development with 240 units. The proposed development will have one full access onto Maloney Road between the two southside access points of Sevier Heights Baptist Church. FIGURE 2 is a Conceptual Site Plan detailing the proposed site.

The purpose of this study was the evaluation of the traffic operational and safety impacts of the proposed development upon roadways in the vicinity of the project site. Comments received from Knoxville-Knox County Planning resulted in the existing intersections of Maloney Road at Alcoa Highway Southbound Ramps and Maloney Road at Dresser Road / Alcoa Highway Northbound Ramps being identified for detailed study. Additionally, the proposed site access intersection on Maloney Road is included in the study. Appropriate intersection evaluations such as capacity analyses and turn lane warrant analyses were conducted at the study intersections for existing and future conditions, both with and without site generated traffic, in order to determine the anticipated impacts and to establish recommended measures to mitigate these impacts.

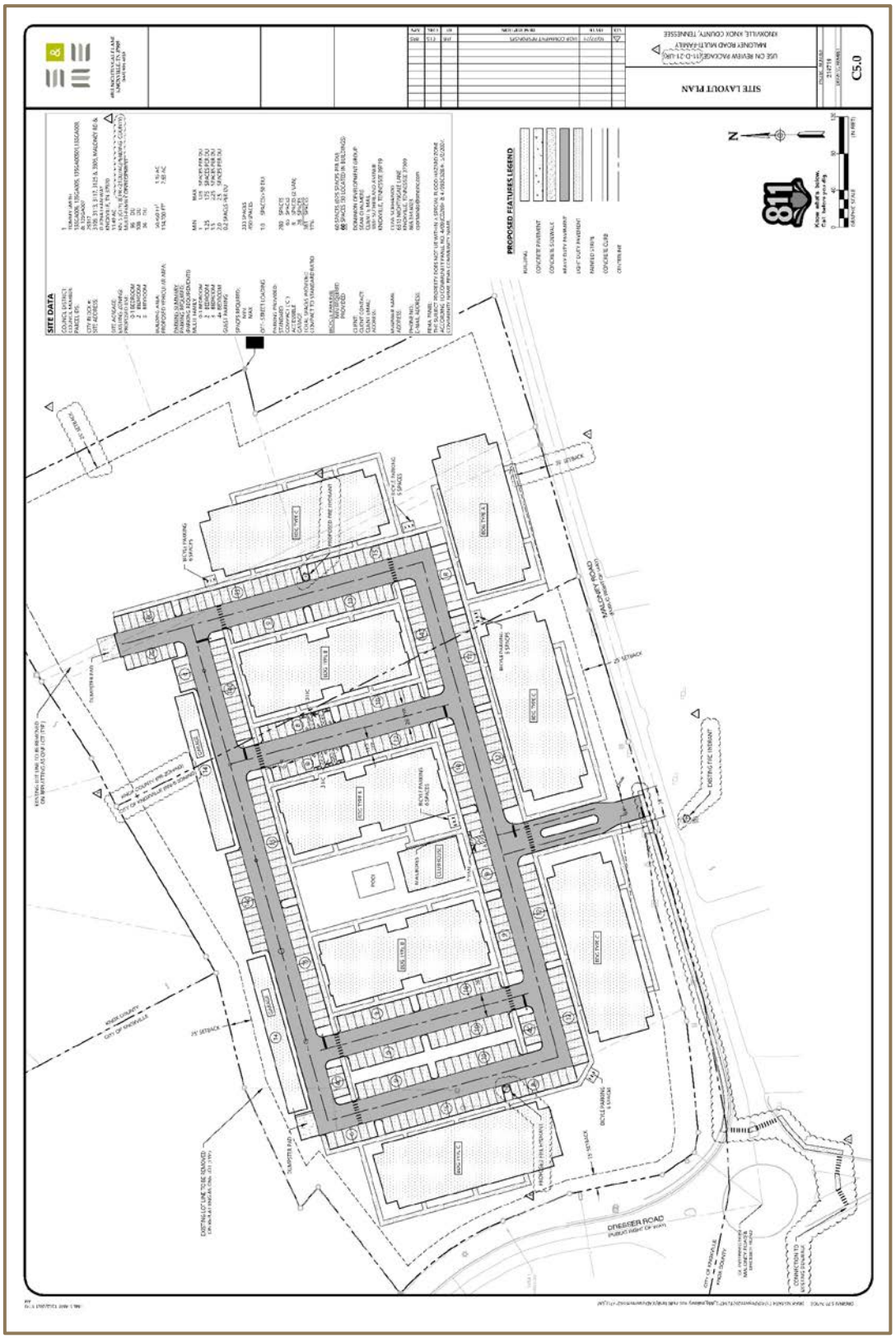


FIGURE 2
CONCEPTUAL SITE PLAN

EXISTING CONDITIONS

EXISTING ROADWAY CONDITIONS

Roadway conditions for the study roadways are summarized as follows:

- Maloney Road is a two-lane undivided roadway with one lane in each direction and is classified as a Major Collector per the Knoxville-Knox County Planning Major Road Plan. Lane widths are approximately ten feet and no curb, gutter, or sidewalk is present. The posted speed limit along this section of Maloney Road is 30 mph.

Traffic control for the study intersection is as follows:

- Maloney Road at Alcoa Highway Southbound Ramps is a four-legged single lane roundabout. Westbound Maloney Road has two lanes approaching the intersection, and the rightmost lane becomes a channelized right turn lane that bypasses the roundabout.
- Maloney Road at Dresser Road / Alcoa Highway Northbound Ramps is a four-legged single lane roundabout. The southbound approach has a right turn channelized island that bypasses the roundabout.

EXISTING SITE CONDITIONS

The project site is located the north side of Maloney Road across from Sevier Heights Baptist Church. The site is relatively flat and wooded, and several single-family residences currently occupy the properties. The site access point on Maloney Road is proposed as a new three-legged intersection. FIGURE 3 provides an aerial view of the project site and the surrounding area.

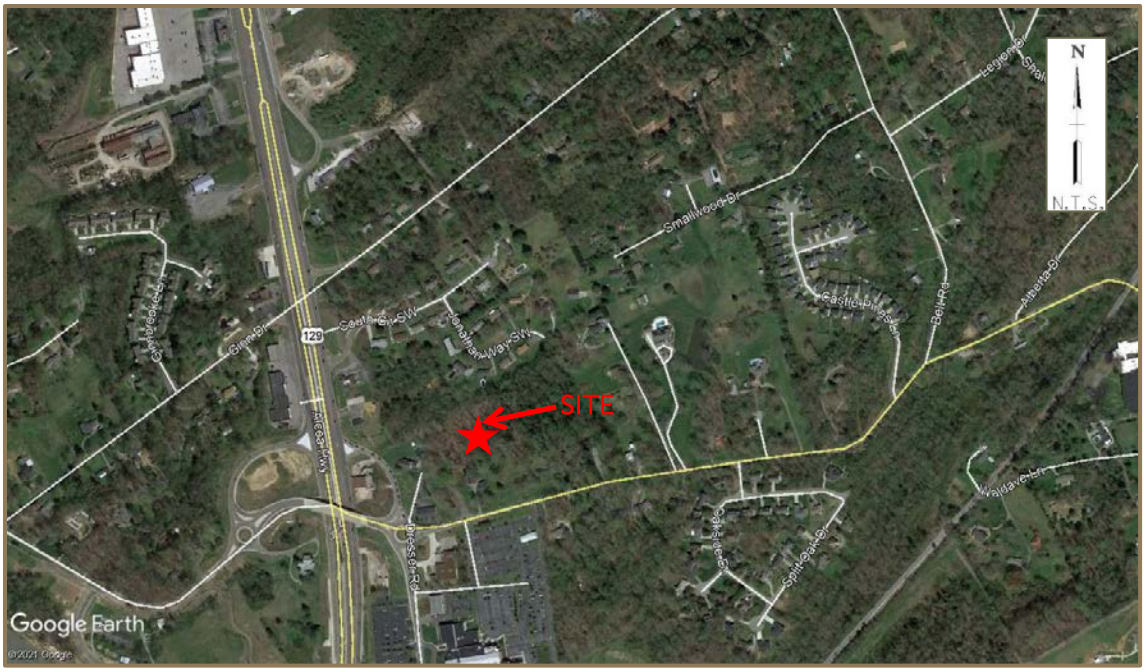


FIGURE 3
EXISTING SITE CONDITIONS

EXISTING TRAFFIC DATA

Two types of existing traffic data were gathered for this study. The Tennessee Department of Transportation (TDOT) collects annual average daily traffic (AADT) data on roadways in the study area. Two count stations were found near the project site that were felt to have particular relevance for this study. The most currently available data from this station is contained in Table 1.

TABLE 1: ANNUAL AVERAGE DAILY TRAFFIC COUNT SUMMARY

COUNT YEAR	TDOT COUNT STATION 47000529 MALONEY ROAD EAST OF ALOCA HIGHWAY	TDOT COUNT STATION 47000316 ALCOA HIGHWAY (US 129) SOUTH OF MALONEY ROAD
2014	N/A	47,014
2015	N/A	51,562
2016	825	49,655
2017	621	52,590
2018	1,010	49,666
2019	1,089	52,833

In addition to the available AADT data, intersection turning movement traffic counts were conducted at the existing study intersections to determine the current peak hour operating volumes. The traffic data were collected on August 31, 2021. During this time, regional traffic volumes and patterns were recovering from COVID-19 pandemic restrictions, including widespread telecommuting or working from home practices. In order to account for potential reductions in traffic volumes due to the pandemic, the August 2021 count data was increased by 20%.

The 2021 raw traffic data is summarized in FIGURE 4 and the factored traffic data is summarized in FIGURE 5. The raw data traffic count summary sheets are contained in APPENDIX A.

EXISTING CAPACITY ANALYSES / LEVELS-OF-SERVICE

Capacity analyses employing the methods of the *Highway Capacity Manual* were conducted for the existing conditions at the study intersections. These analyses were performed with the 2021 existing factored traffic volumes, shown in FIGURE 5, and existing intersection traffic control and lane configurations. The EVALUATIONS section of this report may be referenced for tabular summaries of these analyses, while more detailed summaries are presented on the computer printouts contained in APPENDIX C. Also contained in APPENDIX C is a section entitled "Capacity and Level of Service Concepts", which provides a description of the utilized procedures.

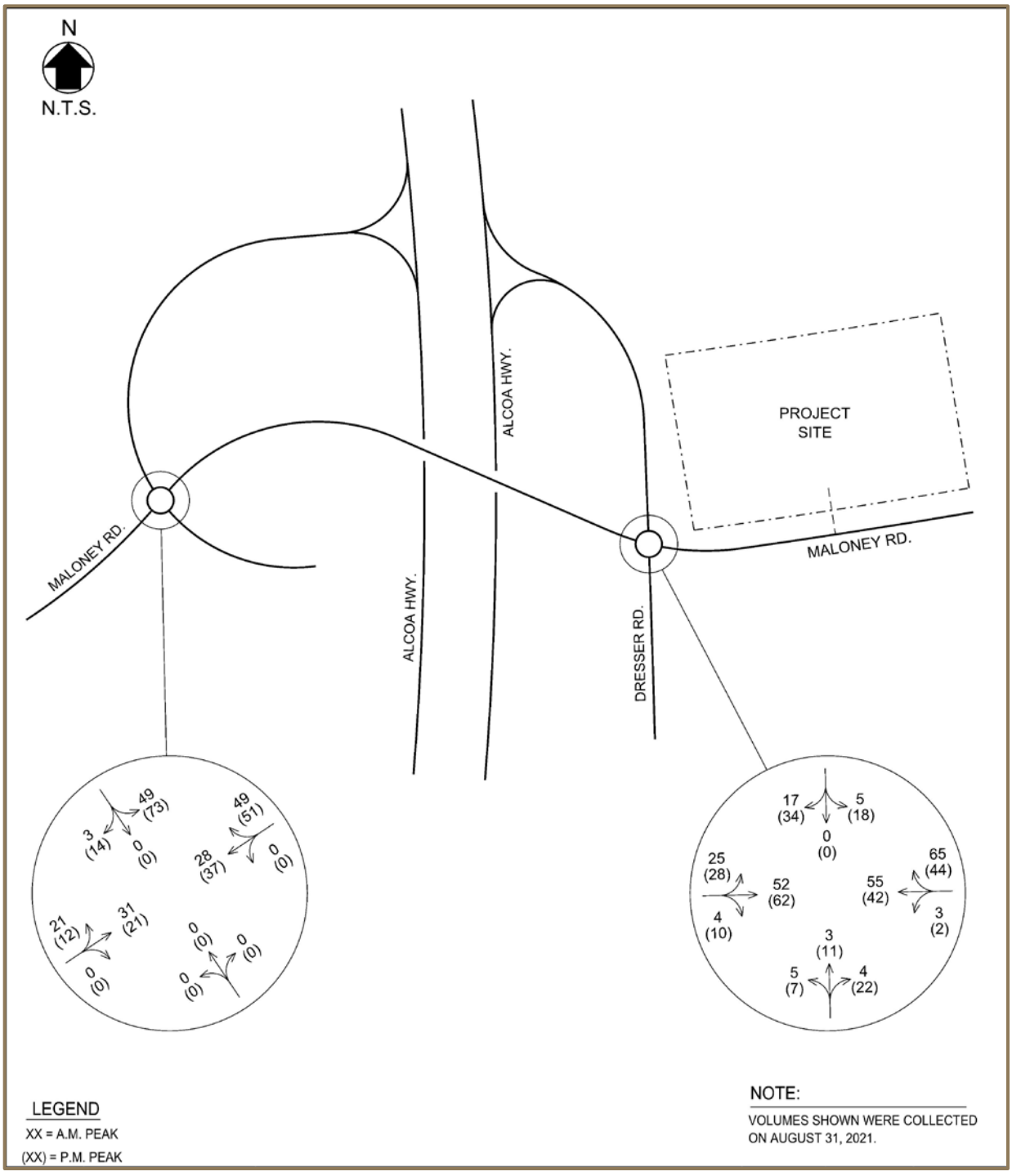


FIGURE 4
2021 EXISTING RAW TRAFFIC VOLUMES

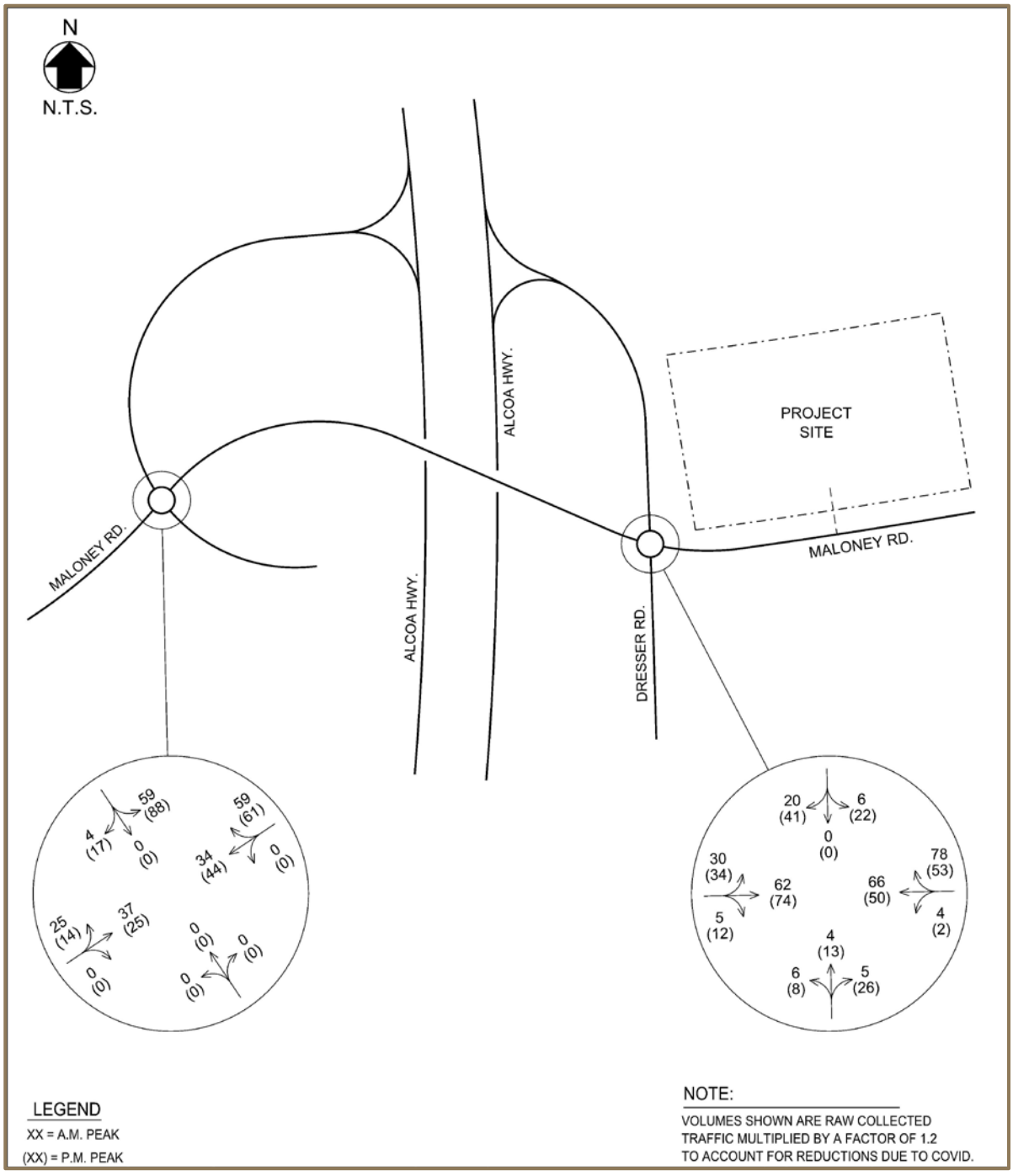


FIGURE 5
2021 EXISTING FACTORED TRAFFIC VOLUMES

BACKGROUND CONDITIONS

BACKGROUND TRAFFIC GROWTH

The proposed development is anticipated to be constructed in one general phase with completion anticipated by 2024. Therefore, year 2024 was established as the appropriate design / analysis year for the 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. The TDOT ADT values previously discussed, as well as knowledge of the area, were used to determine an approximate annual growth rate. Based on the available data, a background annual growth rate of 2.5% was assumed. FIGURE 6 contains the background traffic volumes that would result from this annual growth rate from year 2021, when the counts were conducted, to year 2024.

BACKGROUND CAPACITY ANALYSES / LEVELS-OF-SERVICE

Capacity analyses as described in the EXISTING CONDITIONS section of this report were conducted utilizing the Year 2024 background volumes shown in FIGURE 6 and existing intersection traffic control and lane configurations. The EVALUATIONS section of this report may be referenced for tabular summaries of these analyses, while more detailed summaries are presented on the computer printouts contained in APPENDIX C.

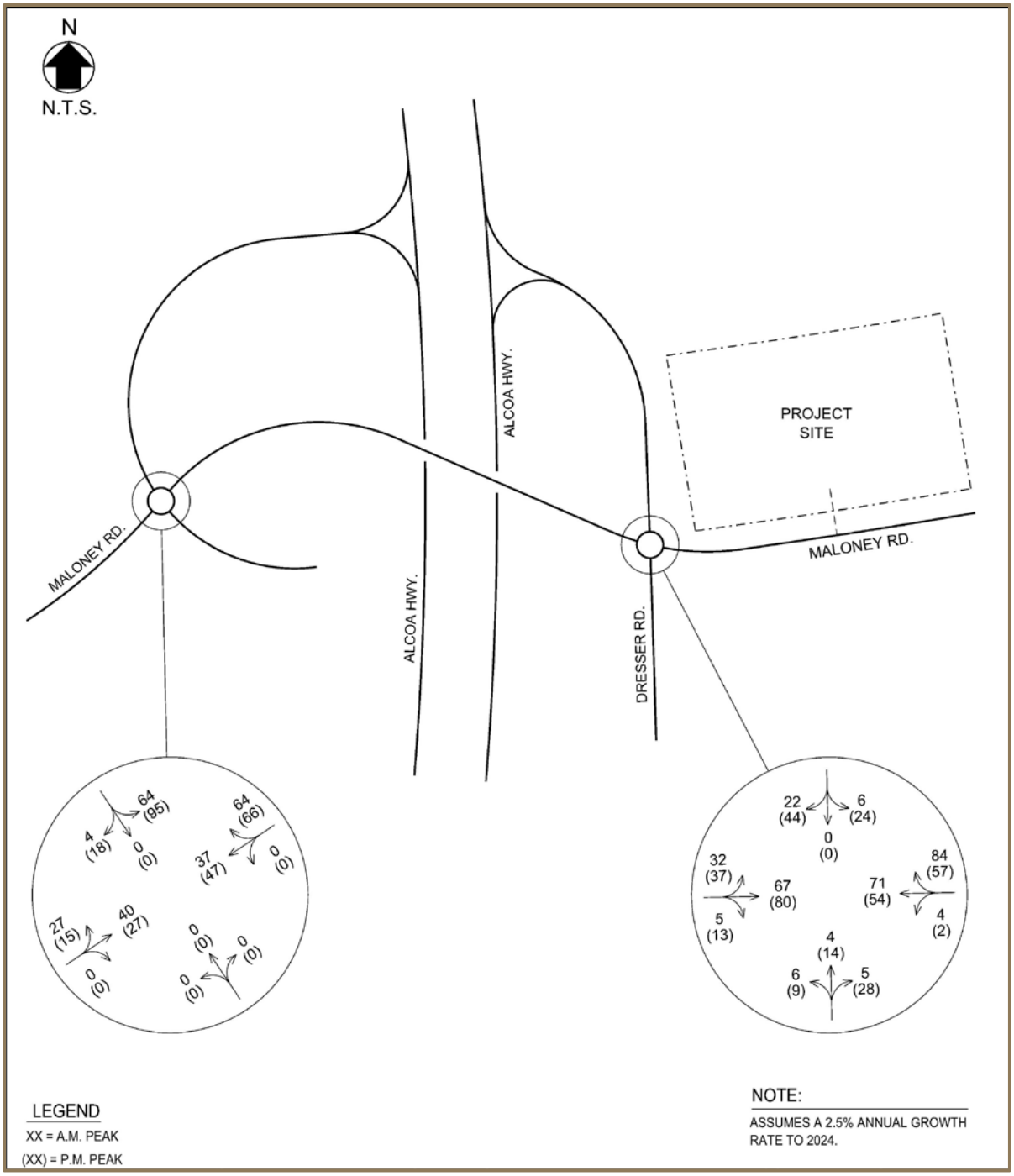


FIGURE 6
2024 BACKGROUND TRAFFIC VOLUMES

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 were utilized. The proposed development will include 240 multi-family residential apartment units. Local trip generation rates developed by the Knoxville-Knox County Metropolitan Planning Commission for multi-family apartment type developments within the region were utilized to generate the estimated trips. 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	ITE CODE	SIZE	WEEKDAY (TRIPS/DAY)	AM PEAK HOUR (TRIPS/HOUR)	PM PEAK HOUR (TRIPS/HOUR)
Multi-Family Residential	n/a	240 Dwelling Units	2,096	120	171
Entering Trips Exiting Trips			1,048 (50%) 1,048 (50%)	26 (22%) 94 (78%)	94 (55%) 77 (45%)

A.M. Peak Hour trip generation is based on Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.
P.M. Peak Hour trip generation is based on Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.

TRIP DISTRIBUTION AND ASSIGNMENT

The proposed trip distribution for this development was determined through a review of existing travel patterns, local knowledge of the study area, proposed site location in relation to surrounding roadway network, and engineering judgement. FIGURE 7 provides a summary of how the above site generated trips would be assigned to the study intersections. FIGURE 8 provides the proposed trip assignment volumes to the study intersections.

FUTURE TRAFFIC VOLUMES

Future projected traffic volumes for the study intersections were developed by adding the generated and assigned trips shown in FIGURE 8 to the 2024 background traffic volumes developed in the previous section and shown in FIGURE 6. These combined 2024 volumes reflect the existing traffic, the background traffic growth, and the generated traffic from the proposed development. These future volumes are shown on FIGURE 9 and are the combined volumes used in the analyses of future conditions with the proposed development.

FUTURE CAPACITY ANALYSES / LEVELS-OF-SERVICE

Capacity analyses, as described in the EXISTING CONDITIONS section of this report, were conducted for future conditions utilizing the traffic volumes shown in the build-out scenario. These analyses were performed with existing geometry and traffic control for the two existing intersections and with proposed geometry and traffic control for the site access intersection. Tabular summaries of the analyses results and associated discussion are also contained in the EVALUATIONS section. In addition, detailed computer printout summaries of the analyses are contained in APPENDIX C.

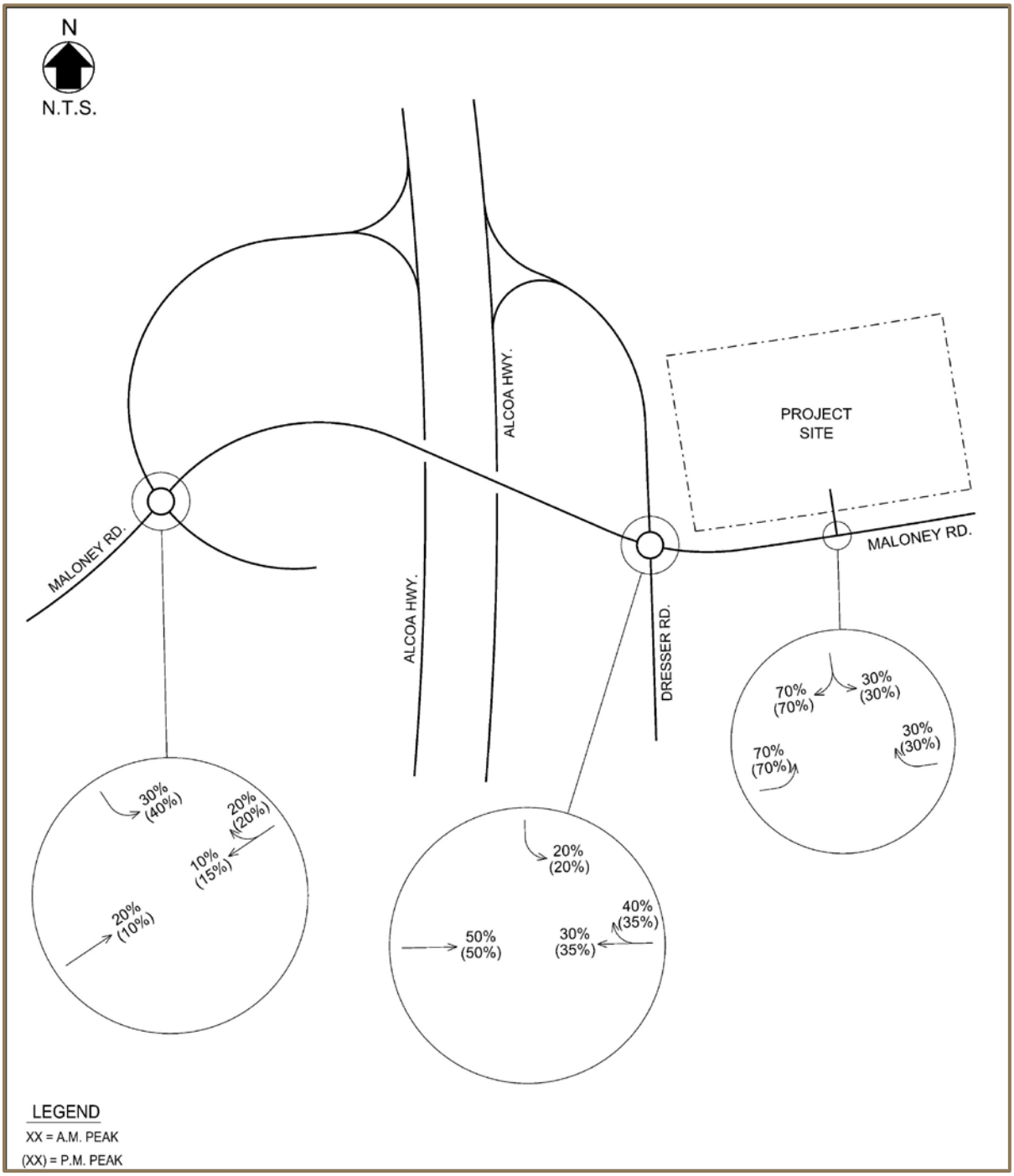


FIGURE 7
TRIP DISTRIBUTION

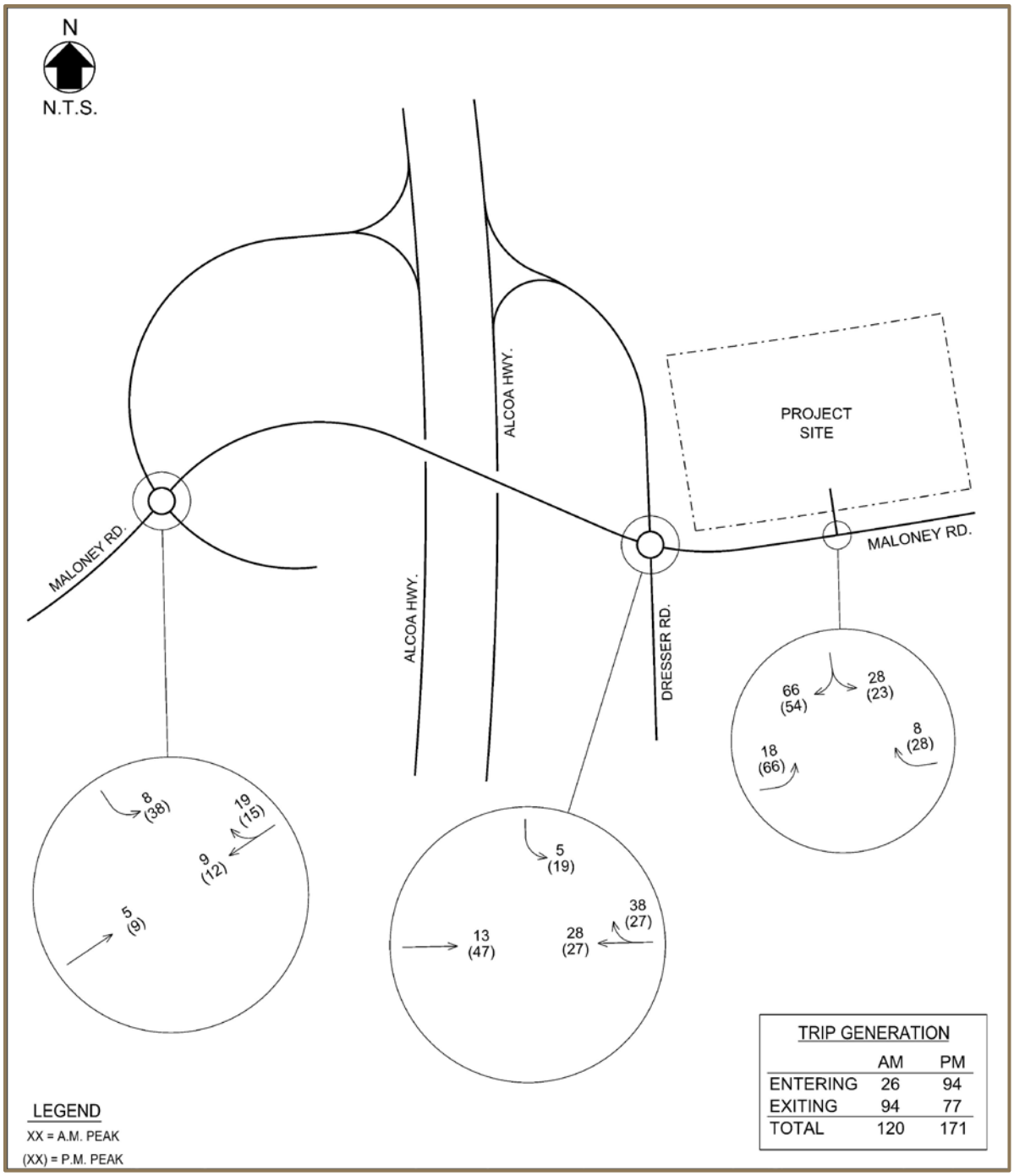


FIGURE 8
TRIP ASSIGNMENT

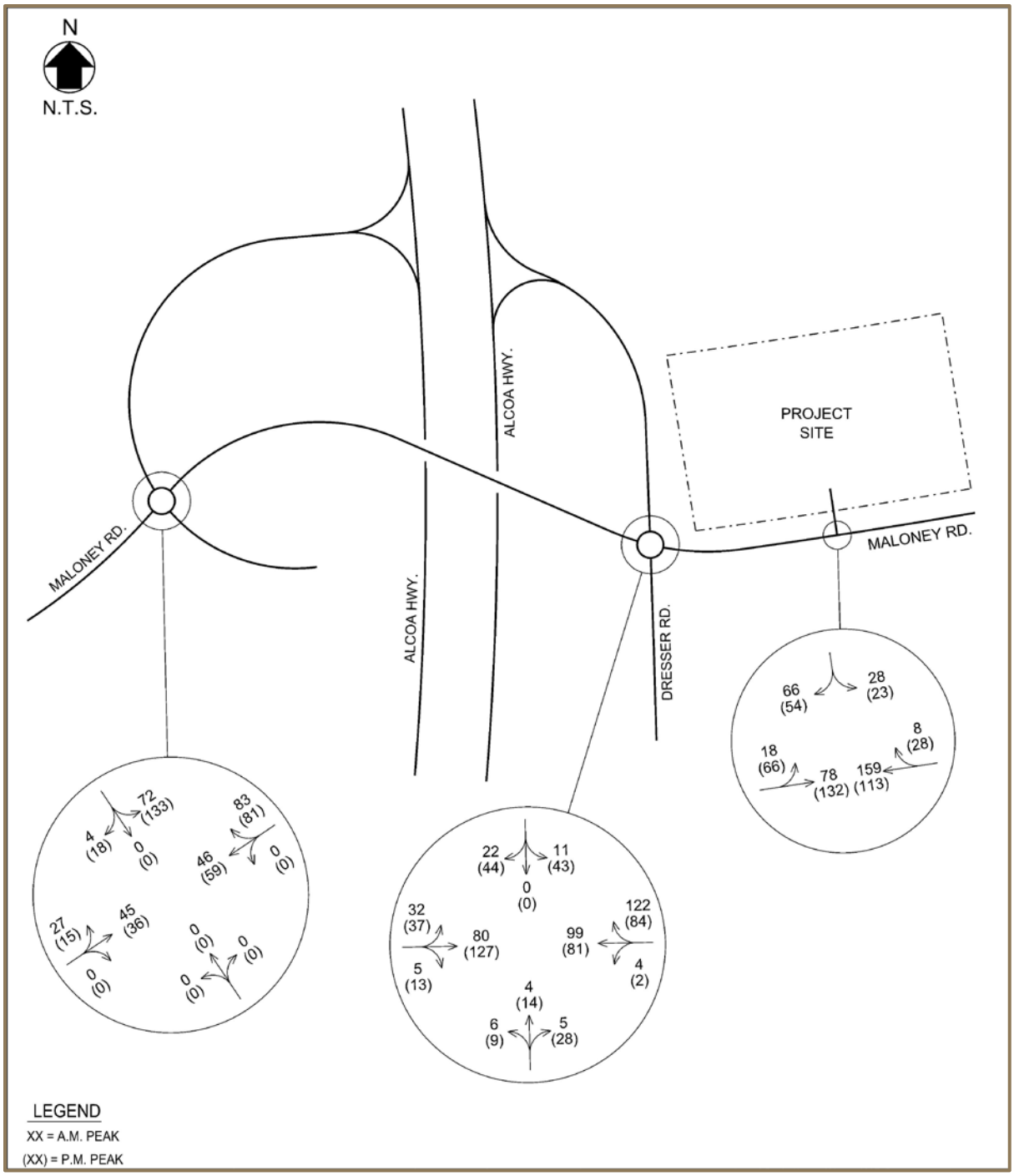


FIGURE 9
2024 COMBINED TRAFFIC VOLUMES

EVALUATIONS

INTERSECTION CAPACITY ANALYSES

As discussed in the preceding sections of this report, capacity analyses employing the methods of the Highway Capacity Manual (HCM 6th Edition) were conducted for the study intersections. These analyses were performed for the previously discussed development scenarios. A summary of the capacity analyses results is shown in TABLE 3, while the resulting conclusions and recommendations are covered in the CONCLUSIONS AND RECOMMENDATIONS section of this report.

TABLE 3: CAPACITY ANALYSES SUMMARY

INTERSECTION	TIME PERIOD	YEAR 2021 EXISTING (LOS/DELAY)	YEAR 2024 BACKGROUND (LOS/DELAY)	YEAR 2024 COMBINED (LOS/DELAY)
Maloney Rd. at Alcoa Hwy. SB Ramps [1]ROUNDABOUT CONTROL	A.M. P.M.	A 3.2 A 3.4	A 3.2 A 3.4	A 3.3 A 3.7
Maloney Rd. at Dresser Rd. / Alcoa Hwy. NB Ramps [1]ROUNDABOUT CONTROL	A.M. P.M.	A 3.7 A 3.6	A 3.8 A 3.6	A 4.2 A 4.1
Maloney Rd. at Dresser Rd. Site Access [2]SIDE STREET STOP CONTROL	A.M. P.M.			B 10.5 (SB) B 10.6 (SB)

[1]ROUNDABOUT CONTROL – Data shown are Level-of-Service and Average Vehicular Delay (seconds) for the complete intersection utilizing HCM methodology.
[2]SIDE STREET STOP CONTROL – Data shown are Level-of-Service and Average Vehicular Delay (seconds) for the critical side street approach utilizing HCM methodology.

TURN LANE ASSESSMENTS

A turn lane evaluation was conducted for a potential left turn and right turn lane to enter the project site at the proposed site access intersection along Maloney Road. This evaluation, which utilized Knox County turn lane warrants, found that turn lanes are not warranted at the site access intersection. The spreadsheets summarizing this evaluation are contained in APPENDIX D.

SIGHT DISTANCE ASSESSMENT

Intersection sight distance was assessed looking both directions from the proposed site access intersection. Based on Knox County sight distance requirements for 30 mph roadways, 300 feet of sight distance is required for vehicles exiting the project site onto Maloney Road. Field observations indicated that the available sight distance looking in either direction from the proposed site access is well in excess of the required 300 feet. Care should be taken during the site development process to ensure that site features such as building footprints, landscaping, and signage do not restrict sight distances.

PEDESTRIAN CONNECTION ASSESSMENT

Sidewalks do not currently exist along Maloney Road in the vicinity of the development; however, sidewalks will be constructed from the development to provide connectivity to Dresser Road.

CONCLUSIONS & RECOMMENDATIONS

The primary conclusion of this study is that the traffic generated from the proposed development will not have a significant impact at the study intersections. The intersections of Maloney Road at Alcoa Highway Southbound Ramps and Maloney Road at Dresser Road / Alcoa Highway Northbound Ramps both currently operate at LOS "A", and both intersections will continue to operate at LOS "A" upon full buildout and occupancy of the development. Once complete, the side street approach at the site access intersection is expected to operate at LOS "B" during both peak traffic periods.

The recommendation from this study is to maintain intersection corner sight distance at the site access by ensuring that site grading, landscaping, signage, and other site features to not restrict intersection lines of sight.

APPENDIX

APPENDIX ORDER:

A. TRAFFIC DATA

B. TRIP GENERATION INFORMATION

C. CAPACITY ANALYSES

D. TURN LANE WARRANT EVALUATIONS

APPENDIX A – TRAFFIC DATA

TRAFFIC GROWTH

Source:	TDOT
Location:	Maloney Road
	East of US-129
Route #:	Maloney Road
Route Type:	
Station:	T47000529
Capacity:	

Count Year	Volume	Growth Rate
2016	825	
2017	621	-24.73
2018	1010	62.64
2019	1089	7.82

Avg. 1 Year Rate 2016-2019	15.25

Source:	TDOT
Location:	Alcoa Highway
	south of Maloney
Route #:	US-129
Route Type:	
Station:	T47000316
Capacity:	

Count Year	Volume	Growth Rate
1999	44029	
2000	42299	-3.93
2001	45848	8.39
2002	47691	4.02
2003	42935	-9.97
2004	46951	9.35
2005	48064	2.37
2006	48369	0.63
2007	47274	-2.26
2008	46520	-1.59
2009	41273	-11.28
2010	44730	8.38
2011	46131	3.13
2012	41075	-10.96
2013	45691	11.24
2014	47014	2.90
2015	51562	9.67
2016	49655	-3.70
2017	52590	5.91
2018	49666	-5.56
2019	52833	6.38

Avg. 1 Year Rate 1999-2019	1.16
Avg. 1 Year Rate 2009-2019	1.46
Avg. 1 Year Rate 2014-2019	2.60

Prepared by National Data & Surveying Services

SR 115/US 129/Alcoa Hwy SB Ramp & Maloney Rd

Peak Hour Turning Movement Count

ID: 21-190047-001
City: Knoxville

Day: Tuesday
Date: 8/31/2021

PEAK HOURS
AM: 07:15 AM - 08:15 AM
NOON: NONE
PM: 04:30 PM - 05:30 PM

COUNT PERIODS
AM: 7:00 AM - 09:00 AM
NOON: NONE
PM: 4:00 PM - 06:00 PM

SR 115/US 129/Alcoa Hwy SB Ramp

SOUTHBOUND

AM	3	0	49	0	70	AM
NOON	0	0	0	0	0	NOON
PM	14	0	73	0	63	PM

EASTBOUND (Maloney Rd)

AM	NOON	PM	
31	0	51	
0	0	0	0
21	0	12	0
31	0	21	1
0	0	0	0
AM	NOON	PM	

WESTBOUND (Maloney Rd)

PM	NOON	AM	
51	0	49	0
37	0	28	1
0	0	0	0
0	0	0	0
94	0	80	
PM	NOON	AM	

CONTROL
3-Way Yield(SB/EB/WB)

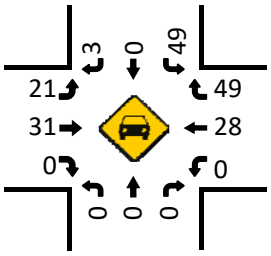
TEV	181 AM	0 NOON	208 PM
PHF	0.94		0.83

PM	0	0	0	0	0	PM
NOON	0	0	0	0	0	NOON
AM	0	0	0	0	0	AM

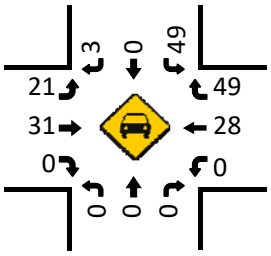
NORTHBOUND

SR 115/US 129/Alcoa Hwy SB Ramp

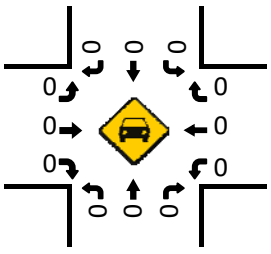
Totals (AM)



Totals (AM)



Totals (NOON)



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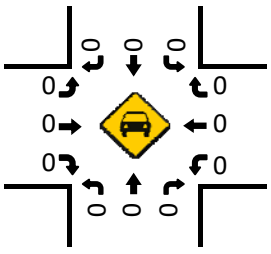
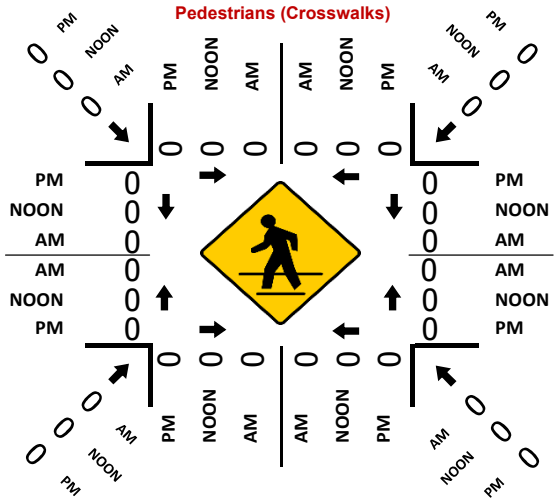


Pedestrians (Crosswalks)



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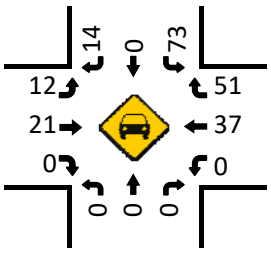

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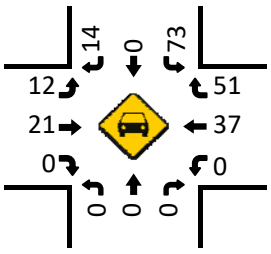

Project ID: 21-190047-001
Location: SR 115/US 129/Alcoa Hwy SB Ramp & Maloney Rd
City: Knoxville

Day: Tuesday
Date: 8/31/2021

Groups Printed - Cars, PU, Vans - Heavy Trucks

	SR 115/US 129/Alcoa Hwy SB Ramp Northbound						SR 115/US 129/Alcoa Hwy SB Ramp Southbound						Maloney Rd Eastbound						Maloney Rd Westbound						
Start Time	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Int. Total
7:00 AM	0	0	0	0	0	0	8	0	3	0	0	11	8	3	0	0	0	11	0	3	4	0	0	7	29
7:15 AM	0	0	0	0	0	0	11	0	0	0	0	11	5	8	0	0	0	13	0	2	18	0	0	20	44
7:30 AM	0	0	0	0	0	0	15	0	0	0	0	15	3	8	0	0	0	11	0	7	9	0	0	16	42
7:45 AM	0	0	0	0	0	0	11	0	0	0	0	11	9	9	0	0	0	18	0	9	10	0	0	19	48
Total	0	0	0	0	0	0	45	0	3	0	0	48	25	28	0	0	0	53	0	21	41	0	0	62	163
8:00 AM	0	0	0	0	0	0	12	0	3	0	0	15	4	6	0	0	0	10	0	10	12	0	0	22	47
8:15 AM	0	0	0	0	0	0	12	0	3	0	0	15	5	2	0	0	0	7	0	4	6	0	0	10	32
8:30 AM	0	0	0	0	0	0	4	0	0	0	0	4	3	6	0	1	0	10	0	5	6	0	0	11	25
8:45 AM	0	0	0	0	0	0	17	0	1	0	0	18	2	8	0	1	0	11	0	9	8	0	0	17	46
Total	0	0	0	0	0	0	45	0	7	0	0	52	14	22	0	2	0	38	0	28	32	0	0	60	150
BREAK																									
4:00 PM	0	0	0	0	0	0	20	0	4	0	0	24	4	4	0	0	0	8	0	5	7	0	0	12	44
4:15 PM	0	0	0	0	0	0	19	0	3	0	0	22	1	1	0	0	0	2	0	6	5	0	0	11	35
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4:45 PM	0	0	0	0	0	0	24	0	4	0	0	28	3	8	0	0	0	11	0	6	12	0	0	18	57
Total	0	0	0	0	0	0	81	0	13	0	0	94	13	17	0	0	0	30	0	22	35	0	0	57	181
5:00 PM	0	0	0	0	0	0	12	0	3	0	0	15	0	3	0	0	0	3	0	14	11	0	0	25	43
5:15 PM	0	0	0	0	0	0	19	0	5	0	0	24	4	6	0	0	0	10	0	12	17	0	0	29	63
5:30 PM	0	0	0	0	0	0	19	0	3	0	0	22	1	8	0	0	0	9	0	4	6	1	0	11	42
5:45 PM	0	0	0	0	0	0	17	0	2	0	0	19	1	0	0	0	0	1	0	7	3	0	0	10	30
Total	0	0	0	0	0	0	67	0	13	0	0	80	6	17	0	0	0	23	0	37	37	1	0	75	178
Grand Total	0	0	0	0	0	0	238	0	36	0	0	274	58	84	0	2	0	144	0	108	145	1	0	254	672
Apprch %	0.0	0.0	0.0	0.0	0.0		86.9	0.0	13.1	0.0	0.0		40.3	58.3	0.0	1.4	0.0		0.0	42.5	57.1	0.4	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	35.4	0.0	5.4	0.0	0.0	40.8	8.6	12.5	0.0	0.3	0.0	21.4	0.0	16.1	21.6	0.1	0.0	37.8	
Cars, PU, Vans	0	0	0	0		0	238	0	36	0		274	58	84	0	2		144	0	108	145	1		254	672
% Cars, PU, Vans	0.0	0.0	0.0	0.0		0.0	100.0	0.0	100.0	0.0		100.0	100.0	100.0	0.0	100.0		100.0	0.0	100.0	100.0	100.0		100.0	100.0

Project ID: 21-190047-001
Location: SR 115/US 129/Alcoa Hwy SB Ramp & Maloney Rd
City: Knoxville

PEAK HOURS

Day: Tuesday
Date: 8/31/2021

AM

	SR 115/US 129/Alcoa Hwy SB Ramp Northbound					SR 115/US 129/Alcoa Hwy SB Ramp Southbound					Maloney Rd Eastbound					Maloney Rd Westbound					
Start Time	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Int. Total
Peak Hour Analysis from 07:00 AM - 09:00 AM																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
7:15 AM	0	0	0	0	0	11	0	0	0	11	5	8	0	0	13	0	2	18	0	20	44
7:30 AM	0	0	0	0	0	15	0	0	0	15	3	8	0	0	11	0	7	9	0	16	42
7:45 AM	0	0	0	0	0	11	0	0	0	11	9	9	0	0	18	0	9	10	0	19	48
8:00 AM	0	0	0	0	0	12	0	3	0	15	4	6	0	0	10	0	10	12	0	22	47
Total Volume	0	0	0	0	0	49	0	3	0	52	21	31	0	0	52	0	28	49	0	77	181
% App. Total	0.0	0.0	0.0	0.0	0	94.2	0.0	5.8	0.0	100	40.4	59.6	0.0	0.0	100	0.0	36.4	63.6	0.0	100	
PHF										0.867					0.722					0.875	0.943
Cars, PU, Vans	0	0	0	0	0	49	0	3	0	52	21	31	0	0	52	0	28	49	0	77	181
% Cars, PU, Vans	0.0	0.0	0.0	0.0	0.0	100.0	0.0	100.0	0.0	100.0	100.0	100.0	0.0	0.0	100.0	0.0	100.0	100.0	0.0	100.0	100.0

PM

	SR 115/US 129/Alcoa Hwy SB Ramp Northbound					SR 115/US 129/Alcoa Hwy SB Ramp Southbound					Maloney Rd Eastbound					Maloney Rd Westbound					
Start Time	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Int. Total
Peak Hour Analysis from 04:00 PM - 06:00 PM																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
4:30 PM	0	0	0	0	0	18	0	2	0	20	5	4	0	0	9	0	5	11	0	16	45
4:45 PM	0	0	0	0	0	24	0	4	0	28	3	8	0	0	11	0	6	12	0	18	57
5:00 PM	0	0	0	0	0	12	0	3	0	15	0	3	0	0	3	0	14	11	0	25	43
5:15 PM	0	0	0	0	0	19	0	5	0	24	4	6	0	0	10	0	12	17	0	29	63
Total Volume	0	0	0	0	0	73	0	14	0	87	12	21	0	0	33	0	37	51	0	88	208
% App. Total	0.0	0.0	0.0	0.0	0	83.9	0.0	16.1	0.0	100	36.4	63.6	0.0	0.0	100	0.0	42.0	58.0	0.0	100	
PHF										0.777					0.750					0.759	0.825
Cars, PU, Vans	0	0	0	0	0	73	0	14	0	87	12	21	0	0	33	0	37	51	0	88	208
% Cars, PU, Vans	0.0	0.0	0.0	0.0	0.0	100.0	0.0	100.0	0.0	100.0	100.0	100.0	0.0	0.0	100.0	0.0	100.0	100.0	0.0	100.0	100.0

Prepared by National Data & Surveying Services

SR 115/US 129/Alcoa Hwy NB Ramp & Maloney Rd

Peak Hour Turning Movement Count

ID: 21-190047-002
City: Knoxville

Day: Tuesday
Date: 8/31/2021

PEAK HOURS
AM: 07:15 AM - 08:15 AM
NOON: NONE
PM: 04:45 PM - 05:45 PM

COUNT PERIODS
AM: 7:00 AM - 09:00 AM
NOON: NONE
PM: 4:00 PM - 06:00 PM

CONTROL: 4-Way Yield

	AM	NOON	PM
TEV	238	0	280
PHF	0.82		0.84

SOUTHBOUND (SR 115/US 129/Alcoa Hwy NB Ramp)

	Left	Thru	Right	U-Turn	Total
AM	17	0	5	0	93
NOON	0	0	0	0	0
PM	34	0	18	0	83

EASTBOUND (Maloney Rd)

	Left	Thru	Right	U-Turn	Total
AM	0	0	0	0	0
NOON	0	0	0	0	0
PM	0	1	0	0	1

	AM	NOON	PM
Left	0	0	0
Thru	25	0	28
Right	52	0	62
U-Turn	4	0	10
Total	77	0	83

WESTBOUND (Maloney Rd)

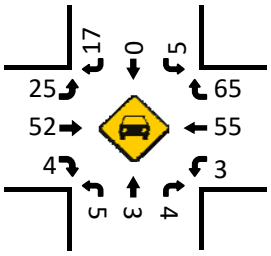
	Left	Thru	Right	U-Turn	Total
AM	0	1	0	0	102
NOON	0	0	0	0	0
PM	0	0	0	0	0

	PM	NOON	AM
Left	44	0	65
Thru	42	0	55
Right	2	0	3
U-Turn	0	0	0
Total	44	0	65

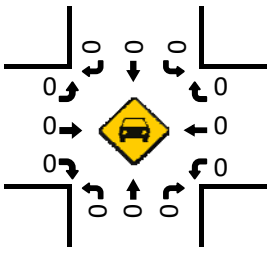
NORTHBOUND (SR 115/US 129/Alcoa Hwy NB Ramp)

	Left	Thru	Right	U-Turn	Total
AM	7	0	5	3	4
NOON	0	0	0	0	0
PM	12	0	7	11	22

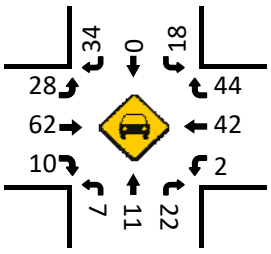
Totals (AM)



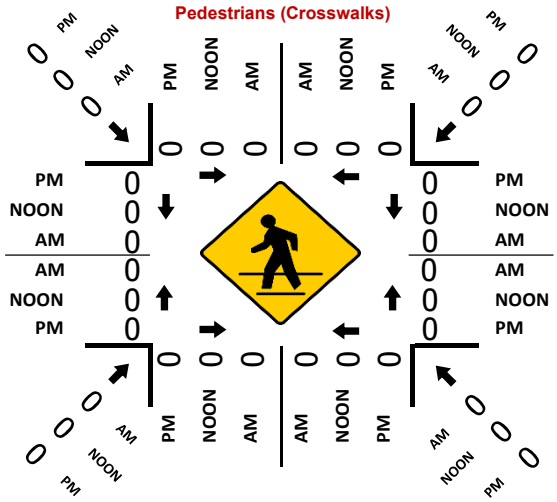
Totals (NOON)



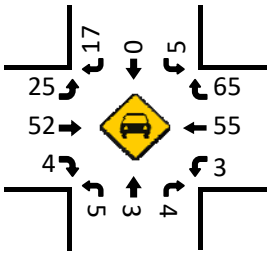
Totals (PM)



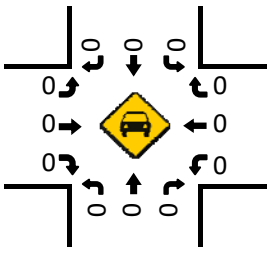
Pedestrians (Crosswalks)



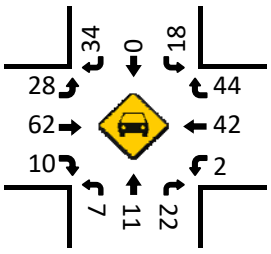
Totals (AM)



Totals (NOON)



Totals (PM)



Project ID: 21-190047-002
Location: SR 115/US 129/Alcoa Hwy NB Ramp & Maloney Rd
City: Knoxville

Day: Tuesday
Date: 8/31/2021

Groups Printed - Cars, PU, Vans - Heavy Trucks

	SR 115/US 129/Alcoa Hwy NB Ramp Northbound						SR 115/US 129/Alcoa Hwy NB Ramp Southbound						Maloney Rd Eastbound						Maloney Rd Westbound						
Start Time	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Int. Total
7:00 AM	2	1	2	0	0	5	2	1	3	0	0	6	5	4	1	0	0	10	0	2	12	0	0	14	35
7:15 AM	1	2	2	0	0	5	2	0	4	0	0	6	6	13	1	0	0	20	0	16	11	0	0	27	58
7:30 AM	0	1	1	0	0	2	2	0	4	0	0	6	6	17	0	0	0	23	0	11	31	0	0	42	73
7:45 AM	1	0	1	0	0	2	1	0	3	0	0	4	6	9	3	0	0	18	3	16	15	0	0	34	58
Total	4	4	6	0	0	14	7	1	14	0	0	22	23	43	5	0	0	71	3	45	69	0	0	117	224
8:00 AM	3	0	0	0	0	3	0	0	6	0	0	6	7	13	0	0	0	20	0	12	8	0	0	20	49
8:15 AM	0	2	1	0	0	3	3	0	4	0	0	7	5	6	3	0	0	14	2	6	14	0	0	22	46
8:30 AM	0	1	1	0	0	2	0	1	3	0	0	4	2	4	2	0	0	8	1	10	10	0	0	21	35
8:45 AM	2	0	0	0	0	2	1	0	4	0	0	5	12	10	3	1	0	26	1	8	8	0	0	17	50
Total	5	3	2	0	0	10	4	1	17	0	0	22	26	33	8	1	0	68	4	36	40	0	0	80	180
BREAK																									
4:00 PM	0	1	1	0	0	2	2	0	3	0	0	5	8	15	1	0	0	24	0	9	8	0	0	17	48
4:15 PM	0	1	1	0	0	2	3	0	1	0	0	4	6	13	1	0	0	20	0	10	5	0	0	15	41
4:30 PM	0	5	1	0	0	6	7	0	4	0	0	11	13	6	2	0	0	21	0	12	10	0	0	22	60
4:45 PM	5	3	3	0	0	11	3	0	5	0	0	8	11	20	2	0	0	33	0	8	11	0	0	19	71
Total	5	10	6	0	0	21	15	0	13	0	0	28	38	54	6	0	0	98	0	39	34	0	0	73	220
5:00 PM	0	5	6	0	0	11	5	0	13	0	0	18	5	9	1	0	0	15	0	12	10	0	0	22	66
5:15 PM	2	1	8	0	0	11	6	0	13	0	0	19	6	18	1	0	0	25	0	15	13	0	0	28	83
5:30 PM	0	2	5	0	0	7	4	0	3	0	0	7	6	15	6	0	0	27	2	7	10	0	0	19	60
5:45 PM	0	2	1	0	0	3	3	0	5	0	0	8	5	8	4	1	0	18	3	5	9	1	0	18	47
Total	2	10	20	0	0	32	18	0	34	0	0	52	22	50	12	1	0	85	5	39	42	1	0	87	256
Grand Total	16	27	34	0	0	77	44	2	78	0	0	124	109	180	31	2	0	322	12	159	185	1	0	357	880
Apprch %	20.8	35.1	44.2	0.0	0.0		35.5	1.6	62.9	0.0	0.0		33.9	55.9	9.6	0.6	0.0		3.4	44.5	51.8	0.3	0.0		
Total %	1.8	3.1	3.9	0.0	0.0	8.8	5.0	0.2	8.9	0.0	0.0	14.1	12.4	20.5	3.5	0.2	0.0	36.6	1.4	18.1	21.0	0.1	0.0	40.6	
Cars, PU, Vans	16	27	34	0		77	44	2	78	0		124	109	180	31	2		322	12	159	185	1		357	880
% Cars, PU, Vans	100.0	100.0	100.0	0.0		100.0	100.0	100.0	100.0	0.0		100.0	100.0	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0		100.0	100.0

Project ID: 21-190047-002
Location: SR 115/US 129/Alcoa Hwy NB Ramp & Maloney Rd
City: Knoxville

PEAK HOURS

Day: Tuesday
Date: 8/31/2021

AM

	SR 115/US 129/Alcoa Hwy NB Ramp Northbound					SR 115/US 129/Alcoa Hwy NB Ramp Southbound					Maloney Rd Eastbound					Maloney Rd Westbound					
Start Time	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Int. Total
Peak Hour Analysis from 07:00 AM - 09:00 AM																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
7:15 AM	1	2	2	0	5	2	0	4	0	6	6	13	1	0	20	0	16	11	0	27	58
7:30 AM	0	1	1	0	2	2	0	4	0	6	6	17	0	0	23	0	11	31	0	42	73
7:45 AM	1	0	1	0	2	1	0	3	0	4	6	9	3	0	18	3	16	15	0	34	58
8:00 AM	3	0	0	0	3	0	0	6	0	6	7	13	0	0	20	0	12	8	0	20	49
Total Volume	5	3	4	0	12	5	0	17	0	22	25	52	4	0	81	3	55	65	0	123	238
% App. Total	41.7	25.0	33.3	0.0	100	22.7	0.0	77.3	0.0	100	30.9	64.2	4.9	0.0	100	2.4	44.7	52.8	0.0	100	
PHF					0.600					0.917					0.880					0.732	0.815
Cars, PU, Vans	5	3	4	0	12	5	0	17	0	22	25	52	4	0	81	3	55	65	0	123	238
% Cars, PU, Vans	100.0	100.0	100.0	0.0	100.0	100.0	0.0	100.0	0.0	100.0	100.0	100.0	100.0	0.0	100.0	100.0	100.0	100.0	0.0	100.0	100.0

PM

	SR 115/US 129/Alcoa Hwy NB Ramp Northbound					SR 115/US 129/Alcoa Hwy NB Ramp Southbound					Maloney Rd Eastbound					Maloney Rd Westbound					
Start Time	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Int. Total
Peak Hour Analysis from 04:00 PM - 06:00 PM																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
4:45 PM	5	3	3	0	11	3	0	5	0	8	11	20	2	0	33	0	8	11	0	19	71
5:00 PM	0	5	6	0	11	5	0	13	0	18	5	9	1	0	15	0	12	10	0	22	66
5:15 PM	2	1	8	0	11	6	0	13	0	19	6	18	1	0	25	0	15	13	0	28	83
5:30 PM	0	2	5	0	7	4	0	3	0	7	6	15	6	0	27	2	7	10	0	19	60
Total Volume	7	11	22	0	40	18	0	34	0	52	28	62	10	0	100	2	42	44	0	88	280
% App. Total	17.5	27.5	55.0	0.0	100	34.6	0.0	65.4	0.0	100	28.0	62.0	10.0	0.0	100	2.3	47.7	50.0	0.0	100	
PHF					0.909					0.684					0.758					0.786	0.843
Cars, PU, Vans	7	11	22	0	40	18	0	34	0	52	28	62	10	0	100	2	42	44	0	88	280
% Cars, PU, Vans	100.0	100.0	100.0	0.0	100.0	100.0	0.0	100.0	0.0	100.0	100.0	100.0	100.0	0.0	100.0	100.0	100.0	100.0	0.0	100.0	100.0

APPENDIX B – TRIP GENERATION INFORMATION

Local Apartment
Trip Generation Study

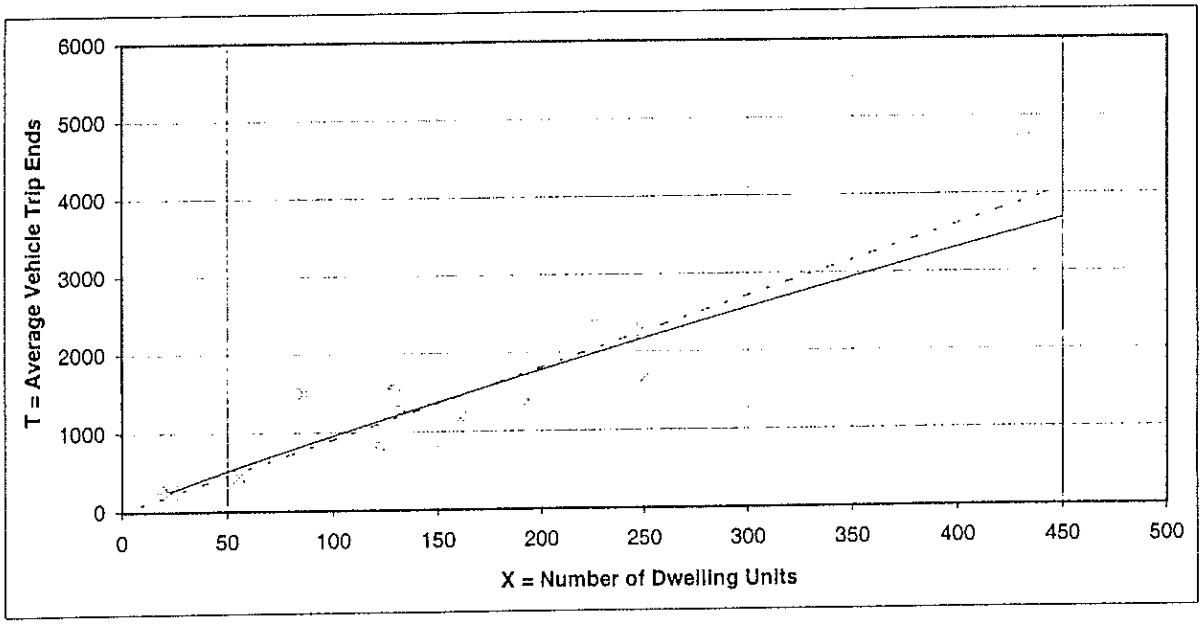
Average Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

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

Trip Generation Per Dwelling Unit

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

Data Plot and Equation



X Actual Data Points ——— Fitted Curve ····· Average Rate

Fitted Curve Equation: $T = 15.193(X)^{0.899}$ $R^2 = 0.88$

Local Apartment
Trip Generation Study

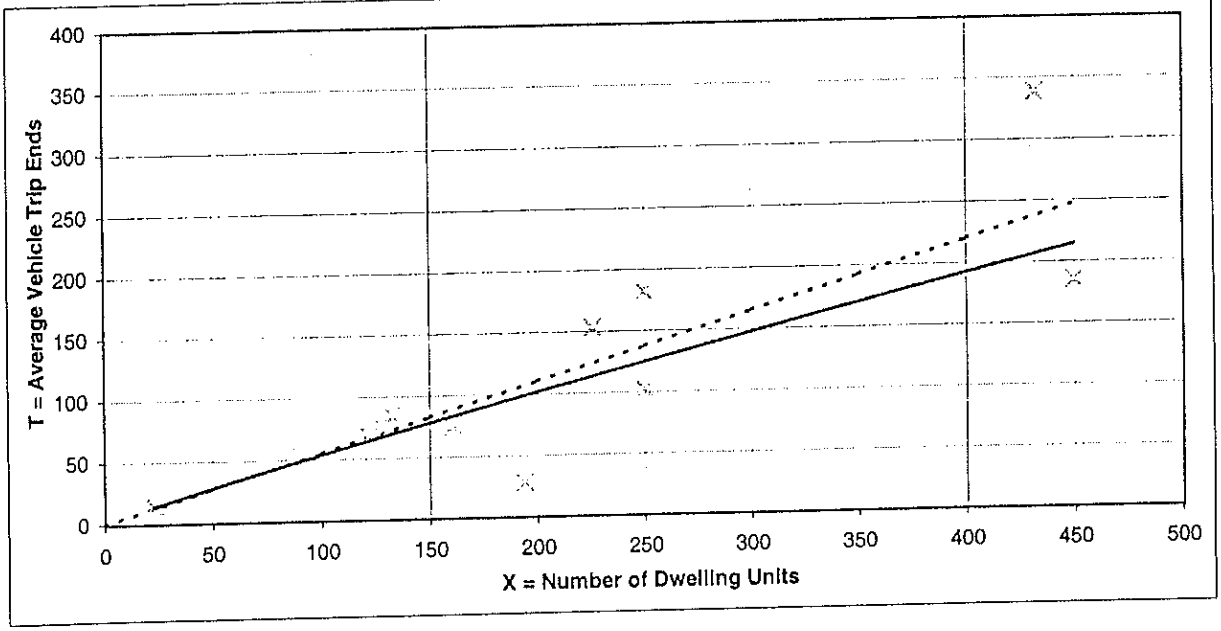
Average Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

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

Trip Generation Per Dwelling Unit

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

Data Plot and Equation



X Actual Data Points ——— Fitted Curve ····· Average Rate

Fitted Curve Equation: $T = 0.758(X)^{0.924}$ $R^2 = 0.75$

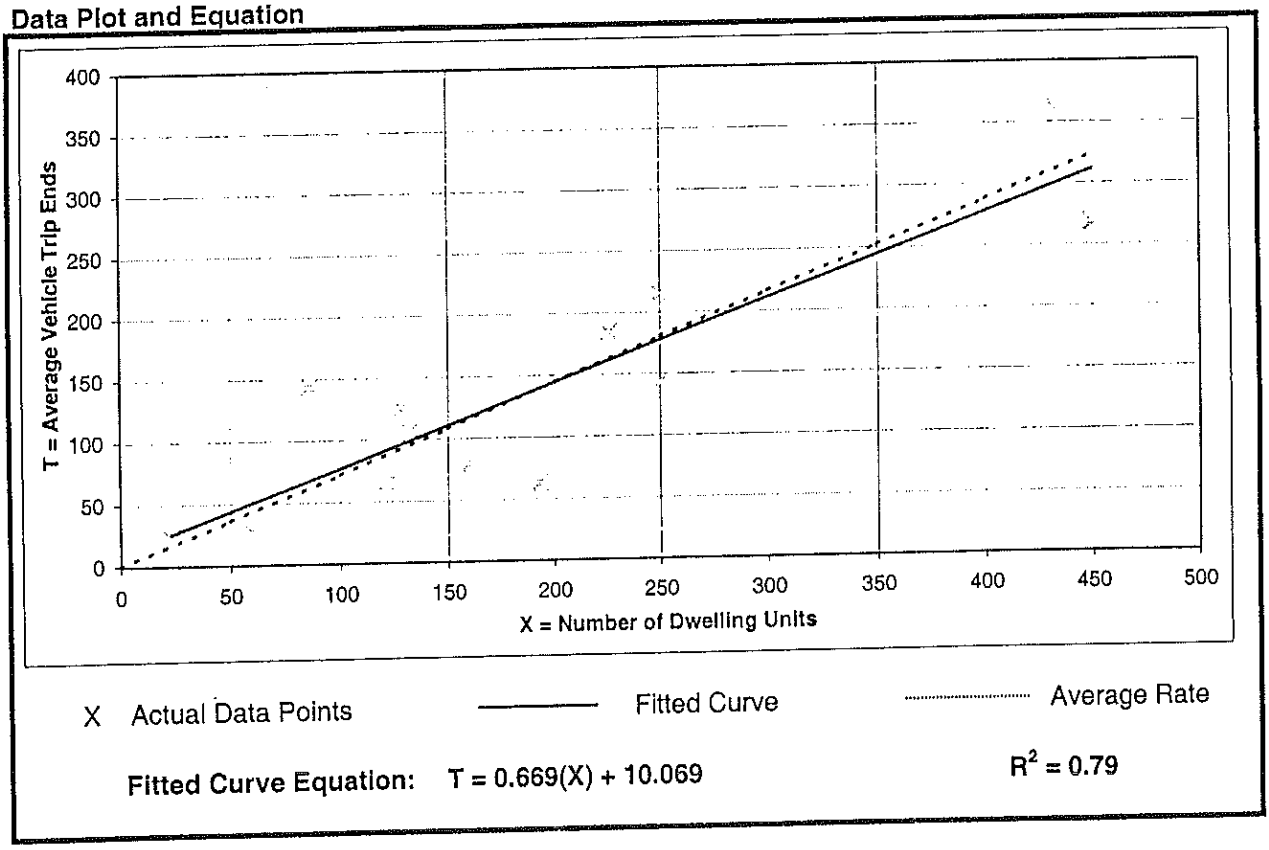
Local Apartment
Trip Generation Study

Average Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,** **Peak Hour of Adjacent Street Traffic,** **One Hour Between 4 and 6 p.m.**
Number of Studies:	13
Average Number of Dwelling Units:	193
Directional Distribution:	55% entering, 45% exiting

Trip Generation Per Dwelling Unit

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

Data Plot and Equation



Fitted Curve Equation: $T = 0.669(X) + 10.069$ $R^2 = 0.79$

APPENDIX C – CAPACITY 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 Intersections – Very few stops, very low delay
B	Very Good	Roadways – Free flow, slightly lower maneuverability Intersections – Minor stops, low delay
C	Good	Roadways – Stable flow, restricted maneuverability Intersections – Significant stops, significant delay
D	Fair	Roadways – Marginally stable flow, congestion seriously restricts maneuverability Intersections – High stops, long but tolerable delay
E	Poor	Roadways – Unstable flow*, lower operating speeds, congestion severely restricts maneuverability 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 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 Roundabouts Report

General Information

Analyst	BJH
Agency or Co.	Cannon & Cannon, Inc.
Date Performed	9/15/2021
Analysis Year	2021
Time Analyzed	AM Peak
Project Description	2021 Existing

Site Information

Intersection	Maloney at Alcoa SB
E/W Street Name	Maloney Road
N/S Street Name	Alcoa Highway SB Ramps
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.94
Jurisdiction	City of Knoxville

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LT				LTR				LTR	
Volume (V), veh/h	0	25	37	0	0	0	34	59	0	0	0	0	0	59	0	4
Percent Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Flow Rate (v_{PCE}), pc/h	0	27	41	0	0	0	37	65	0	0	0	0	0	65	0	4
Right-Turn Bypass	None				Yielding				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763	4.9763		4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087	2.6087		2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		68			37	65		0			69	
Entry Volume, veh/h		66			36	63		0			67	
Circulating Flow (v_c), pc/h	65			27			133			37		
Exiting Flow (v_{ex}), pc/h	106			41			27			0		
Capacity (c_{pce}), pc/h		1291			1343	1343		1205			1329	
Capacity (c), veh/h		1254			1303	1303		1170			1290	
v/c Ratio (x)		0.05			0.03	0.05		0.00			0.05	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.3			3.0	3.1		3.1			3.2	
Lane LOS		A			A	A		A			A	
95% Queue, veh		0.2			0.1	0.2		0.0			0.2	
Approach Delay, s/veh	3.3			3.1						3.2		
Approach LOS	A			A						A		
Intersection Delay, s/veh | LOS	3.2						A					

HCS7 Roundabouts Report

General Information

Analyst	BJH
Agency or Co.	Cannon & Cannon, Inc.
Date Performed	9/15/2021
Analysis Year	2021
Time Analyzed	PM Peak
Project Description	2021 Existing

Site Information

Intersection	Maloney at Alcoa SB
E/W Street Name	Maloney Road
N/S Street Name	Alcoa Highway SB Ramps
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.83
Jurisdiction	City of Knoxville

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LT				LTR				LTR	
Volume (V), veh/h	0	14	25	0	0	0	44	61	0	0	0	0	0	88	0	17
Percent Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Flow Rate (v_{PCE}), pc/h	0	17	31	0	0	0	55	76	0	0	0	0	0	109	0	21
Right-Turn Bypass	None				Yielding				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763	4.9763		4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087	2.6087		2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		48			55	76		0			130	
Entry Volume, veh/h		47			53	74		0			126	
Circulating Flow (v_c), pc/h	109			17			157			55		
Exiting Flow (v_{ex}), pc/h	140			76			17			0		
Capacity (c_{pce}), pc/h		1235			1356	1356		1176			1305	
Capacity (c), veh/h		1199			1317	1317		1142			1267	
v/c Ratio (x)		0.04			0.04	0.06		0.00			0.10	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.3			3.1	3.2		3.2			3.7	
Lane LOS		A			A	A		A			A	
95% Queue, veh		0.1			0.1	0.2		0.0			0.3	
Approach Delay, s/veh	3.3			3.1						3.7		
Approach LOS	A			A						A		
Intersection Delay, s/veh | LOS	3.4						A					

HCS7 Roundabouts Report

General Information

Analyst	BJH
Agency or Co.	Cannon & Cannon, Inc.
Date Performed	9/15/2021
Analysis Year	2021
Time Analyzed	AM Peak
Project Description	2021 Existing

Site Information

Intersection	Maloney at Alcoa NB
E/W Street Name	Maloney Road
N/S Street Name	Alcoa Highway NB Ramps
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.82
Jurisdiction	City of Knoxville

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LT	
Volume (V), veh/h	0	30	62	5	0	4	66	78	0	6	4	5	0	6	0	20
Percent Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Flow Rate (v_{PCE}), pc/h	0	38	78	6	0	5	83	98	0	8	5	6	0	8	0	25
Right-Turn Bypass	None				None				None				Yielding			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	4.9763
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	2.6087

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		122			186			19			8	25
Entry Volume, veh/h		118			181			18			8	24
Circulating Flow (v_c), pc/h	13			51			124			96		
Exiting Flow (v_{ex}), pc/h	92			91			141			11		
Capacity (c_{pce}), pc/h		1362			1310			1216			1251	1258
Capacity (c), veh/h		1322			1272			1181			1215	1221
v/c Ratio (x)		0.09			0.14			0.02			0.01	0.02

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.4			4.0			3.2			3.0	3.1
Lane LOS		A			A			A			A	A
95% Queue, veh		0.3			0.5			0.0			0.0	0.1
Approach Delay, s/veh	3.4			4.0			3.2			3.1		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	3.7						A					

HCS7 Roundabouts Report

General Information

Analyst	BJH
Agency or Co.	Cannon & Cannon, Inc.
Date Performed	9/15/2021
Analysis Year	2021
Time Analyzed	PM Peak
Project Description	2021 Existing

Site Information

Intersection	Maloney at Alcoa NB
E/W Street Name	Maloney Road
N/S Street Name	Alcoa Highway NB Ramps
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.84
Jurisdiction	City of Knoxville

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LT	
Volume (V), veh/h	0	34	74	12	0	2	50	53	0	8	13	26	0	22	0	41
Percent Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Flow Rate (v_{PCE}), pc/h	0	42	91	15	0	2	61	65	0	10	16	32	0	27	0	50
Right-Turn Bypass	None				None				None				Yielding			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	4.9763
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	2.6087

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		148			128			58			27	50
Entry Volume, veh/h		144			124			56			26	49
Circulating Flow (v_c), pc/h	29			68			160			73		
Exiting Flow (v_{ex}), pc/h	150			71			123			17		
Capacity (c_{pce}), pc/h		1340			1288			1172			1281	1284
Capacity (c), veh/h		1301			1250			1138			1244	1246
v/c Ratio (x)		0.11			0.10			0.05			0.02	0.04

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.7			3.7			3.6			3.1	3.2
Lane LOS		A			A			A			A	A
95% Queue, veh		0.4			0.3			0.2			0.1	0.1
Approach Delay, s/veh	3.7			3.7			3.6			3.2		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	3.6						A					

HCS7 Roundabouts Report

General Information

Analyst	BJH
Agency or Co.	Cannon & Cannon, Inc.
Date Performed	9/15/2021
Analysis Year	2024
Time Analyzed	AM Peak
Project Description	2024 Background

Site Information

Intersection	Maloney at Alcoa SB
E/W Street Name	Maloney Road
N/S Street Name	Alcoa Highway SB Ramps
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.94
Jurisdiction	City of Knoxville

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LT				LTR				LTR	
Volume (V), veh/h	0	27	40	0	0	0	37	64	0	0	0	0	0	64	0	4
Percent Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Flow Rate (v_{PCE}), pc/h	0	30	44	0	0	0	41	70	0	0	0	0	0	70	0	4
Right-Turn Bypass	None				Yielding				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763	4.9763		4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087	2.6087		2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		74			41	70		0			74	
Entry Volume, veh/h		72			40	68		0			72	
Circulating Flow (v_c), pc/h	70			30			144			41		
Exiting Flow (v_{ex}), pc/h	114			45			30			0		
Capacity (c_{pce}), pc/h		1285			1338	1338		1191			1323	
Capacity (c), veh/h		1247			1299	1299		1157			1285	
v/c Ratio (x)		0.06			0.03	0.05		0.00			0.06	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.4			3.0	3.2		3.1			3.2	
Lane LOS		A			A	A		A			A	
95% Queue, veh		0.2			0.1	0.2		0.0			0.2	
Approach Delay, s/veh	3.4			3.1						3.2		
Approach LOS	A			A						A		
Intersection Delay, s/veh | LOS	3.2						A					

HCS7 Roundabouts Report

General Information

Analyst	BJH
Agency or Co.	Cannon & Cannon, Inc.
Date Performed	9/15/2021
Analysis Year	2024
Time Analyzed	PM Peak
Project Description	2024 Background

Site Information

Intersection	Maloney at Alcoa SB
E/W Street Name	Maloney Road
N/S Street Name	Alcoa Highway SB Ramps
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.83
Jurisdiction	City of Knoxville

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LT				LTR				LTR	
Volume (V), veh/h	0	15	27	0	0	0	47	66	0	0	0	0	0	95	0	18
Percent Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Flow Rate (v_{PCE}), pc/h	0	19	34	0	0	0	58	82	0	0	0	0	0	118	0	22
Right-Turn Bypass	None				Yielding				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763	4.9763		4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087	2.6087		2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		53			58	82		0			140	
Entry Volume, veh/h		51			56	80		0			136	
Circulating Flow (v_c), pc/h	118			19			171			58		
Exiting Flow (v_{ex}), pc/h	152			80			19			0		
Capacity (c_{pce}), pc/h		1224			1354	1354		1159			1301	
Capacity (c), veh/h		1188			1314	1314		1125			1263	
v/c Ratio (x)		0.04			0.04	0.06		0.00			0.11	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.4			3.1	3.2		3.2			3.7	
Lane LOS		A			A	A		A			A	
95% Queue, veh		0.1			0.1	0.2		0.0			0.4	
Approach Delay, s/veh	3.4			3.2						3.7		
Approach LOS	A			A						A		
Intersection Delay, s/veh | LOS	3.4						A					

HCS7 Roundabouts Report

General Information

Analyst	BJH
Agency or Co.	Cannon & Cannon, Inc.
Date Performed	9/15/2021
Analysis Year	2024
Time Analyzed	AM Peak
Project Description	2024 Background

Site Information

Intersection	Maloney at Alcoa NB
E/W Street Name	Maloney Road
N/S Street Name	Alcoa Highway NB Ramps
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.82
Jurisdiction	City of Knoxville

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LT	
Volume (V), veh/h	0	32	67	5	0	4	71	84	0	6	4	5	0	6	0	22
Percent Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Flow Rate (v_{PCE}), pc/h	0	40	84	6	0	5	89	106	0	8	5	6	0	8	0	28
Right-Turn Bypass	None				None				None				Yielding			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	4.9763
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	2.6087

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		130			200			19			8	28
Entry Volume, veh/h		126			194			18			8	27
Circulating Flow (v_c), pc/h	13			53			132			102		
Exiting Flow (v_{ex}), pc/h	98			97			151			11		
Capacity (c_{pce}), pc/h		1362			1307			1206			1244	1250
Capacity (c), veh/h		1322			1269			1171			1207	1214
v/c Ratio (x)		0.10			0.15			0.02			0.01	0.02

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.5			4.1			3.2			3.0	3.1
Lane LOS		A			A			A			A	A
95% Queue, veh		0.3			0.5			0.0			0.0	0.1
Approach Delay, s/veh	3.5			4.1			3.2			3.1		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	3.8						A					

HCS7 Roundabouts Report

General Information

Analyst	BJH
Agency or Co.	Cannon & Cannon, Inc.
Date Performed	9/15/2021
Analysis Year	2024
Time Analyzed	PM Peak
Project Description	2024 Background

Site Information

Intersection	Maloney at Alcoa NB
E/W Street Name	Maloney Road
N/S Street Name	Alcoa Highway NB Ramps
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.84
Jurisdiction	City of Knoxville

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LT	
Volume (V), veh/h	0	37	80	13	0	2	54	57	0	9	14	28	0	24	0	44
Percent Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Flow Rate (v_{PCE}), pc/h	0	45	98	16	0	2	66	70	0	11	17	34	0	29	0	54
Right-Turn Bypass	None				None				None				Yielding			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	4.9763
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	2.6087

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		159			138			62			29	54
Entry Volume, veh/h		154			134			60			28	52
Circulating Flow (v_c), pc/h	31			73			172			79		
Exiting Flow (v_{ex}), pc/h	161			77			132			18		
Capacity (c_{pce}), pc/h		1337			1281			1158			1273	1276
Capacity (c), veh/h		1298			1244			1124			1236	1239
v/c Ratio (x)		0.12			0.11			0.05			0.02	0.04

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.7			3.8			3.7			3.1	3.2
Lane LOS		A			A			A			A	A
95% Queue, veh		0.4			0.4			0.2			0.1	0.1
Approach Delay, s/veh	3.7			3.8			3.7			3.2		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	3.6						A					

HCS7 Roundabouts Report

General Information

Analyst	BJH
Agency or Co.	Cannon & Cannon, Inc.
Date Performed	9/23/2021
Analysis Year	2024
Time Analyzed	AM Peak
Project Description	2024 Combined

Site Information

Intersection	Maloney at Alcoa SB
E/W Street Name	Maloney Road
N/S Street Name	Alcoa Highway SB Ramps
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.94
Jurisdiction	City of Knoxville

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LT				LTR				LTR	
Volume (V), veh/h	0	27	45	0	0	0	46	83	0	0	0	0	0	72	0	4
Percent Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Flow Rate (v_{PCE}), pc/h	0	30	49	0	0	0	50	91	0	0	0	0	0	79	0	4
Right-Turn Bypass	None				Yielding				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763	4.9763		4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087	2.6087		2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		79			50	91		0			83	
Entry Volume, veh/h		77			49	88		0			81	
Circulating Flow (v_c), pc/h	79			30			158			50		
Exiting Flow (v_{ex}), pc/h	128			54			30			0		
Capacity (c_{pce}), pc/h		1273			1338	1338		1175			1311	
Capacity (c), veh/h		1236			1299	1299		1140			1273	
v/c Ratio (x)		0.06			0.04	0.07		0.00			0.06	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.4			3.1	3.3		3.2			3.3	
Lane LOS		A			A	A		A			A	
95% Queue, veh		0.2			0.1	0.2		0.0			0.2	
Approach Delay, s/veh	3.4			3.2						3.3		
Approach LOS	A			A						A		
Intersection Delay, s/veh | LOS	3.3						A					

HCS7 Roundabouts Report

General Information

Analyst	BJH
Agency or Co.	Cannon & Cannon, Inc.
Date Performed	9/23/2021
Analysis Year	2024
Time Analyzed	PM Peak
Project Description	2024 Combined

Site Information

Intersection	Maloney at Alcoa SB
E/W Street Name	Maloney Road
N/S Street Name	Alcoa Highway SB Ramps
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.83
Jurisdiction	City of Knoxville

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LT				LTR				LTR	
Volume (V), veh/h	0	15	36	0	0	0	59	81	0	0	0	0	0	133	0	18
Percent Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Flow Rate (v_{PCE}), pc/h	0	19	45	0	0	0	73	101	0	0	0	0	0	165	0	22
Right-Turn Bypass	None				Yielding				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763	4.9763		4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087	2.6087		2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		64			73	101		0			187	
Entry Volume, veh/h		62			71	98		0			182	
Circulating Flow (v_c), pc/h	165			19			229			73		
Exiting Flow (v_{ex}), pc/h	210			95			19			0		
Capacity (c_{pce}), pc/h		1166			1354	1354		1093			1281	
Capacity (c), veh/h		1132			1314	1314		1061			1244	
v/c Ratio (x)		0.05			0.05	0.07		0.00			0.15	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.6			3.2	3.3		3.4			4.1	
Lane LOS		A			A	A		A			A	
95% Queue, veh		0.2			0.2	0.2		0.0			0.5	
Approach Delay, s/veh	3.6			3.3						4.1		
Approach LOS	A			A						A		
Intersection Delay, s/veh | LOS	3.7						A					

HCS7 Roundabouts Report

General Information

Analyst	BJH
Agency or Co.	Cannon & Cannon, Inc.
Date Performed	9/23/2021
Analysis Year	2024
Time Analyzed	AM Peak
Project Description	2024 Combined

Site Information

Intersection	Maloney at Alcoa NB
E/W Street Name	Maloney Road
N/S Street Name	Alcoa Highway NB Ramps
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.82
Jurisdiction	City of Knoxville

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LT	
Volume (V), veh/h	0	32	80	5	0	4	99	122	0	6	4	5	0	11	0	22
Percent Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Flow Rate (v_{PCE}), pc/h	0	40	100	6	0	5	124	153	0	8	5	6	0	14	0	28
Right-Turn Bypass	None				None				None				Yielding			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	4.9763
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	2.6087

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		146			282			19			14	28
Entry Volume, veh/h		142			274			18			14	27
Circulating Flow (v_c), pc/h	19			53			154			137		
Exiting Flow (v_{ex}), pc/h	120			132			198			11		
Capacity (c_{pce}), pc/h		1354			1307			1179			1200	1206
Capacity (c), veh/h		1314			1269			1145			1165	1171
v/c Ratio (x)		0.11			0.22			0.02			0.01	0.02

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.6			4.7			3.3			3.2	3.3
Lane LOS		A			A			A			A	A
95% Queue, veh		0.4			0.8			0.0			0.0	0.1
Approach Delay, s/veh	3.6			4.7			3.3			3.2		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	4.2						A					

HCS7 Roundabouts Report

General Information

Analyst	BJH
Agency or Co.	Cannon & Cannon, Inc.
Date Performed	9/23/2021
Analysis Year	2024
Time Analyzed	PM Peak
Project Description	2024 Combined

Site Information

Intersection	Maloney at Alcoa NB
E/W Street Name	Maloney Road
N/S Street Name	Alcoa Highway NB Ramps
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.84
Jurisdiction	City of Knoxville

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LT	
Volume (V), veh/h	0	37	127	13	0	2	81	84	0	9	14	28	0	43	0	44
Percent Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Flow Rate (v_{PCE}), pc/h	0	45	156	16	0	2	99	103	0	11	17	34	0	53	0	54
Right-Turn Bypass	None				None				None				Yielding			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	4.9763
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	2.6087

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		217			204			62			53	54
Entry Volume, veh/h		211			198			60			51	52
Circulating Flow (v_c), pc/h	55			73			254			112		
Exiting Flow (v_{ex}), pc/h	243			110			165			18		
Capacity (c_{pce}), pc/h		1305			1281			1065			1231	1234
Capacity (c), veh/h		1267			1244			1034			1195	1198
v/c Ratio (x)		0.17			0.16			0.06			0.04	0.04

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.2			4.2			4.0			3.4	3.4
Lane LOS		A			A			A			A	A
95% Queue, veh		0.6			0.6			0.2			0.1	0.1
Approach Delay, s/veh	4.2			4.2			4.0			3.4		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	4.1						A					

HCS7 Two-Way Stop-Control Report

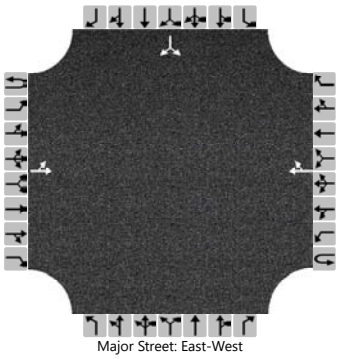
General Information

Analyst	BJH
Agency/Co.	Cannon & Cannon, Inc.
Date Performed	9/23/2021
Analysis Year	2024
Time Analyzed	AM Peak
Intersection Orientation	East-West
Project Description	2024 Combined

Site Information

Intersection	Maloney at Site Access
Jurisdiction	City of Knoxville
East/West Street	Maloney Road
North/South Street	Site Access
Peak Hour Factor	0.82
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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)		18	78				159	8						28		66
Percent Heavy Vehicles (%)		3												3		3
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage																

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)		22													115	
Capacity, c (veh/h)		1362													770	
v/c Ratio		0.02													0.15	
95% Queue Length, Q_{95} (veh)		0.0													0.5	
Control Delay (s/veh)		7.7													10.5	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)		1.5												10.5		
Approach LOS														B		

HCS7 Two-Way Stop-Control Report

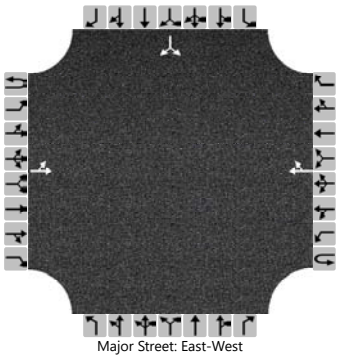
General Information

Analyst	BJH
Agency/Co.	Cannon & Cannon, Inc.
Date Performed	9/23/2021
Analysis Year	2024
Time Analyzed	PM Peak
Intersection Orientation	East-West
Project Description	2024 Combined

Site Information

Intersection	Maloney at Site Access
Jurisdiction	City of Knoxville
East/West Street	Maloney Road
North/South Street	Site Access
Peak Hour Factor	0.84
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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)		66	132				113	28						23		54
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)		79													92	
Capacity, c (veh/h)		1404													735	
v/c Ratio		0.06													0.12	
95% Queue Length, Q_{95} (veh)		0.2													0.4	
Control Delay (s/veh)		7.7													10.6	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)		2.9												10.6		
Approach LOS														B		

APPENDIX D – TURN LANE WARRANT EVALUATIONS

Maloney Road at Site Access
Combined 2024 AM Volumes
Left Turn Lane NOT Warranted

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

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	= / > 600
100 - 149 150 - 199	100 90	80 75	70 65	60 55	55 50	50 45
200 - 249 250 - 299	80 70	72 65	460 55	55 50	50 45	45 40
300 - 349 350 - 399	65 60	60 55	50 50	50 45	45 40	40 40
400 - 449 450 - 499	55 50	50 45	45 45	45 40	40 35	35 35
500 - 549 550 - 599	50 45	45 40	40 40	40 35	35 35	35 35
600 - 649 650 - 699	40 35	35 35	35 35	35 30	35 30	30 30
700 - 749 750 or More	30 30	30 30	30 30	30 30	30 30	30 30

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

Left Turn Volume = 18
Through Volume = 78
Opposing Volume = 167

D-2

Maloney Road at Site Access
Combined 2024 PM Volumes
Left Turn Lane NOT Warranted

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

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	= / > 600
100 - 149 150 - 199	100 90	80 75	70 65	60 55	55 50	50 45
200 - 249 250 - 299	80 70	72 65	460 55	55 50	50 45	45 40
300 - 349 350 - 399	65 60	60 55	50 50	50 45	45 40	40 40
400 - 449 450 - 499	55 50	50 45	45 45	45 40	40 35	35 35
500 - 549 550 - 599	50 45	45 40	40 40	40 35	35 35	35 35
600 - 649 650 - 699	40 35	35 35	35 35	35 30	35 30	30 30
700 - 749 750 or More	30 30	30 30	30 30	30 30	30 30	30 30

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

Left Turn Volume = 66
Through Volume = 132
Opposing Volume = 141

Maloney Road at Site Access
Combined 2024 AM Volumes
Right Turn Lane NOT Warranted

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		No				
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-TURN 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 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

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

Right Turn Volume = 8
Through Volume = 159

Maloney Road at Site Access
Combined 2024 PM Volumes
Right Turn Lane NOT Warranted

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		No				
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-TURN 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 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

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

Right Turn Volume = 28
Through Volume = 113