

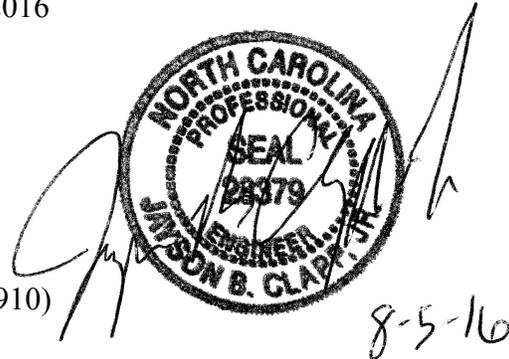
August 5, 2016

Technical Memorandum

To: Megan Ledbetter, Village Planner
Village of Clemmons

From: Jayson B. Clapp, Jr., P.E., PTOE
Ramey Kemp & Associates, Inc. (License # C-0910)

Subject: Elms Independent Living at Tanglewood
Clemmons, North Carolina



This technical memorandum has been prepared by Ramey Kemp & Associates, Inc. (RKA) to determine the potential impacts to the adjacent transportation network created by the additional traffic generated by the proposed independent living facility that is to be located on Fair Oaks Drive in Clemmons, NC. This analysis consists of the collection of existing traffic data and the projection of traffic volumes, generating and distributing traffic for the proposed development, capacity analysis, and the recommendation of any necessary improvements to accommodate the anticipated traffic generated by the proposed development.

This memo summarizes the analysis that was performed for the existing (2016) and future (2018) 'no-build' and 'build' traffic conditions during the weekday AM and PM peak hours at the following intersections:

- Harper Road and Fair Oaks Drive
- Fair Oaks Drive and Proposed Driveway Locations

Site Information

A 54-unit independent living facility is proposed to be constructed on the north side of Fair Oaks Drive between Gardenspring Drive and Harper Road in Clemmons, North Carolina and is expected to be open in the year 2018. Access to the development is to be provided via two (2) new full movement driveways on Fair Oaks Drive located approximately 600 feet and 1,020 feet west of Harper Road, respectively. The study area was determined per our discussions. Refer to the attached appendix for the site location map and a copy of the preliminary site plan.

Study Area Conditions

Harper Road (SR 1101) is a 4-lane facility with a posted speed limit of 45 miles per hour (mph) within the study area. An exclusive left turn lane is provided on the northbound approach at Fair Oaks Drive. Classified as a minor thoroughfare, Harper Road carries approximately 4,000 vehicles per day (vpd) north of Fair Oaks Drive according to 2013 NCDOT Annual Average Daily Traffic (AADT) data [which is the most recent available].

Fair Oaks Drive (SR 1100) is a 2-lane facility with a posted speed limit of 35 mph within the study area. Classified as a collector street, Fair Oaks Drive carries approximately 3,100 vpd in the vicinity of the site according to 2013 NCDOT AADT data.

Existing lane configurations (number of traffic lanes on the intersection approach), storage capacities, and other intersection and roadway information was collected through field reconnaissance by RKA. Refer to the attached appendix for an illustration of the existing geometrics and traffic control within the study area.

Trip Generation

Trip generation for the proposed development was completed utilizing methodology contained within the 9th Edition of the Institute of Transportation Engineering (ITE) *Trip Generation* manual. Traffic was generated according to the peak hour of adjacent street traffic, utilizing the number of occupied dwelling units as the independent variable for the land use of senior adult housing-attached (ITE Code 252). Trips were generated utilizing rates for the proposed land use. Refer to Table 1 for a breakdown of the site generated traffic volumes.

TABLE 1
TRIP GENERATION

ITE Land Use (Code)	Independent Variable	Average Daily Traffic (vpd)	AM Peak Hour (vph)		PM Peak Hour (vph)	
			Enter	Exit	Enter	Exit
Senior Adult Housing - Attached (252)	54 Occupied Dwelling Units	186	4	7	7	5
Existing Zoning (RS15)						
Single-Family Detached Housing (210)	7 Dwelling Units	67	1	4	4	3

It is estimated that the proposed development could generate up to 186 trips (in and out) during a typical weekday with 11 trips (4 entering and 7 exiting) during the AM peak hour and 12 trips (7 entering and 5 exiting) during the PM peak hour.

The proposed site is currently zoned RS15 (residential single family). According to the civil engineer for this project, the current lot size of 3.14 acres could potentially yield up to seven (7) single-family lots. For comparative purposes, traffic was generated according to the peak hour of adjacent street traffic, utilizing the number of dwelling units as the independent variable for the land use of single-family detached housing (ITE Code 210). Trips were generated utilizing rates for the existing zoning. It is estimated that seven (7) single family homes could generate 5 trips (1 entering and 4 exiting) during the AM peak hour and 7 trips (4 entering and 3 exiting) during the PM peak hour of a typical weekday. The proposed development could be expected to generate up to six (6) additional vehicles (an average of 1 vehicle every ten minutes) during the AM peak hour and five (5) additional vehicles (an average of 1 vehicle every twelve minutes) during the PM peak hour when compared to the existing zoning.

Site Trip Distribution & Assignment

The following primary trip distribution percentages were developed through coordination with the Village of Clemmons, and were determined based on existing traffic patterns and engineering judgment. The trip distributions for the AM and PM peak hours are summarized below:

- 35% to/from the north via Harper Road
- 65% to/from the south via Harper Road

Refer to attached appendix for illustrations of the site trip distribution and assignment.

Traffic Conditions

Existing weekday AM and PM peak hour traffic volumes for the study intersections were determined from turning movement counts that were conducted on a weekday during the AM (7:00 AM to 9:00 AM) and PM (4:00 PM to 6:00 PM) peak periods. Refer to the attached appendix for an illustration of the existing weekday AM and PM peak hour traffic volumes as well as a copy of the raw traffic count data. Since school was not in session when the existing traffic data was collected, it was determined the existing traffic volumes were increased by 5% per our discussions to model a typical weekday. In order to account for traffic associated with Morgan Elementary School (located north of the proposed development on Harper Road) it was assumed that 10% of the entering and exiting traffic generated by the school during the AM peak hour would utilize Fair Oaks Drive. Utilizing the latest version of the NCDOT's Municipal and School Transportation Assistance (MSTA) School Calculator, a total of 691 trips (398 entering and 293 exiting) could be generated during the AM peak hour. The school traffic is assumed to add approximately 29 vehicles to the southbound right turn movement on Harper Road at Fair Oaks Drive and 40 vehicles to the eastbound left turn movement on Fair Oaks Drive at Harper Road. Refer to the attached appendix for the MSTA calculation for the elementary school traffic, as well as an illustration of the adjusted (2016) traffic volumes that take into account the assumption of school related traffic.

To account for the growth of traffic and subsequent traffic conditions at a future year, background traffic projections are needed. Background traffic is that component of traffic due to growth of the community and surrounding area that is anticipated to occur regardless of whether the proposed site is developed. The adjusted (2016) traffic volumes were projected to the horizon year 2018 by applying an annual growth of 1.5%. The future (2018) peak hour traffic volumes are illustrated in the attached appendix.

In order to estimate the traffic conditions with the proposed site developed, the total site traffic was combined with the 'no-build' peak hour traffic volumes. Refer to the attached appendix for an illustration of the future (2018) 'build' peak hour traffic volumes.

Capacity Analysis

The study intersections were analyzed using Synchro (Version 9.1). Synchro is a comprehensive software package that allows unsignalized analysis to be performed utilizing methodologies outlined in the Highway Capacity Manual (HCM). Therefore, all analysis was performed using Synchro exclusively.

Capacity analysis results for unsignalized intersections do not provide an overall level of service, but rather a level of service for movements and/or approaches that have a conflicting movement. Delay and level of service are the design criteria for this traffic analysis.

The HCM defines capacity as "the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under prevailing roadway, traffic, and control conditions." Level of service (LOS) is a term used to represent different driving conditions, and is defined as a "qualitative measure describing operational conditions within a traffic stream,

and their perception by motorists and/or passengers.” Level of service varies from LOS A representing free flow to LOS F where greater vehicle delays are evident.

Refer to Table 2 for HCM levels of service and related average control delay for unsignalized intersections. Control delay as defined by the HCM includes “initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.” As shown in Table 2, levels of service are stated in terms of average control delay. An average control delay of 30 seconds at an unsignalized intersection corresponds to LOS D.

TABLE 2
HIGHWAY CAPACITY MANUAL LEVELS OF SERVICE AND DELAY

Unsignalized Intersection	
Level Of Service	Average Control Delay (Sec/Veh)
A	≤ 10
B	$> 10 - 15$
C	$> 15 - 25$
D	$> 25 - 35$
E	$> 35 - 50$
F	> 50

Existing and future ‘no-build’ traffic conditions were analyzed utilizing the existing lane configurations and a peak hour factor (PHF) of 0.90 with the exception of the southbound right turn movement and the eastbound left turn movement at intersection of Harper Road and Fair Oaks Drive where school traffic was added during the AM peak hour. For these exceptions, as well as the eastbound and westbound through movements at the proposed site access locations on Fair Oaks Drive under future ‘build’ traffic conditions during the AM peak hour, the PHFs were based on a weighted average between the PHFs of 0.50 [for school traffic] and 0.90 [for existing and projected traffic volumes]. The results of the capacity analysis for the existing study intersection and the proposed site access locations are presented in Tables 3 and 4. Copies of the detailed capacity analysis reports can be found in the attached appendix.

Intersection of Harper Road and Fair Oaks Drive

Under existing conditions (with the addition of the assumed school related traffic) and all future traffic conditions, capacity analysis indicates that the northbound left turn movement on Harper Road at Fair Oaks Drive is expected to experience minor delays [of less than 9.0 seconds per vehicle] and operate at LOS A during the AM and PM peak hours. Under all traffic conditions, the eastbound stop-controlled approach of Fair Oaks Drive is expected to experience minor to moderate delays [of 15.0 seconds per vehicle or less] and operate at an acceptable LOS C or better during the peak hours. Refer to Table 3 for a summary of the capacity analysis results. Detailed capacity analysis reports can be found in the attached appendix.

TABLE 3
ANALYSIS SUMMARY OF HARPER ROAD AND FAIR OAKS DRIVE

Scenario	A p p r o a c h	Lane Configurations	AM Peak Hour Level Of Service (Delay)		PM Peak Hour Level Of Service (Delay)	
			LOS	Delay	LOS	Delay
Existing (2016)	NB ¹	1 LT, 2-TH	A	8.1	A	8.6
	SB	1 TH, 1 TH-RT	A	-	A	-
	EB ²	1 LT-RT	B	14.4	B	11.2
'No-Build' (2018)	NB ¹	1 LT, 2-TH	A	8.1	A	8.7
	SB	1 TH, 1 TH-RT	A	-	A	-
	EB ²	1 LT-RT	B	14.8	B	11.2
'Build' (2018)	NB ¹	1 LT, 2-TH	A	8.1	A	8.7
	SB	1 TH, 1 TH-RT	A	-	A	-
	EB ²	1 LT-RT	C	15.0	B	11.6

1. Level of service for left turn movement on major approach.
2. Level of service for minor approach.

Based on the 95th percentile queues [calculated by Synchro], the queues on the eastbound approach of Fair Oaks Drive are not expected to exceed three (3) vehicles under 'build' conditions.

Intersection of Fair Oaks Drive and Proposed Site Access Locations

Under future 'build' conditions, capacity analysis indicates that the stop-controlled approaches of the site access locations are expected to experience minor delays [of less than 12.0 seconds per vehicle] and operate at LOS B during the AM and PM peak hours.. Refer to Table 4 for a summary of the capacity analysis results. Detailed capacity analysis reports can be found in the attached appendix.

Based on the 95th percentile queues [calculated by Synchro], the queues on the southbound approaches of the proposed site access locations are expected to be minimal due to relatively low volumes on Fair Oaks Drive and low volumes entering and exiting the site.

TABLE 4
ANALYSIS SUMMARY OF FAIR OAKS DRIVE AND PROPOSED SITE ACCESS LOCATIONS

Access Location	Approach	Lane Configurations	AM Peak Hour Level Of Service (Delay)		PM Peak Hour Level Of Service (Delay)	
			LOS	Delay	LOS	Delay
Site Drive 1 (Eastern)	EB ¹	1 LT-TH	A	0.0	A	0.0
	WB	1 TH-RT	A	-	A	-
	SB ²	1 LT-RT	B	11.6	B	11.9
Site Drive 2 (Western)	EB ¹	1 LT-TH	A	0.0	A	0.0
	WB	1 TH-RT	A	-	A	-
	SB ²	1 LT-RT	B	11.5	B	11.9

1. Level of service for left turn movement on major approach.
2. Level of service for minor approach.

Conclusions

In conclusion, our analysis results indicate that the additional traffic generated by Elms Independent Living at Tanglewood is not expected to have a significant impact on the study area.

At a current ADT of 3,100 vehicles per day, Fair Oaks Drive has sufficient capacity to accommodate the additional 186 vehicles per day generated by the proposed development. In addition, the peak hour of the senior adult housing land use does not tend to coincide with the typical peak hour of the adjacent street traffic. Therefore, although the proposed development could generate up to 11 vehicles during the AM peak hour and 12 vehicles during the PM peak hour, the majority of these trips are not likely to occur at the busiest times during the morning and afternoon.

The following improvements are being required by NCDOT at the access points on Fair Oaks Drive to accommodate vehicles entering the proposed development:

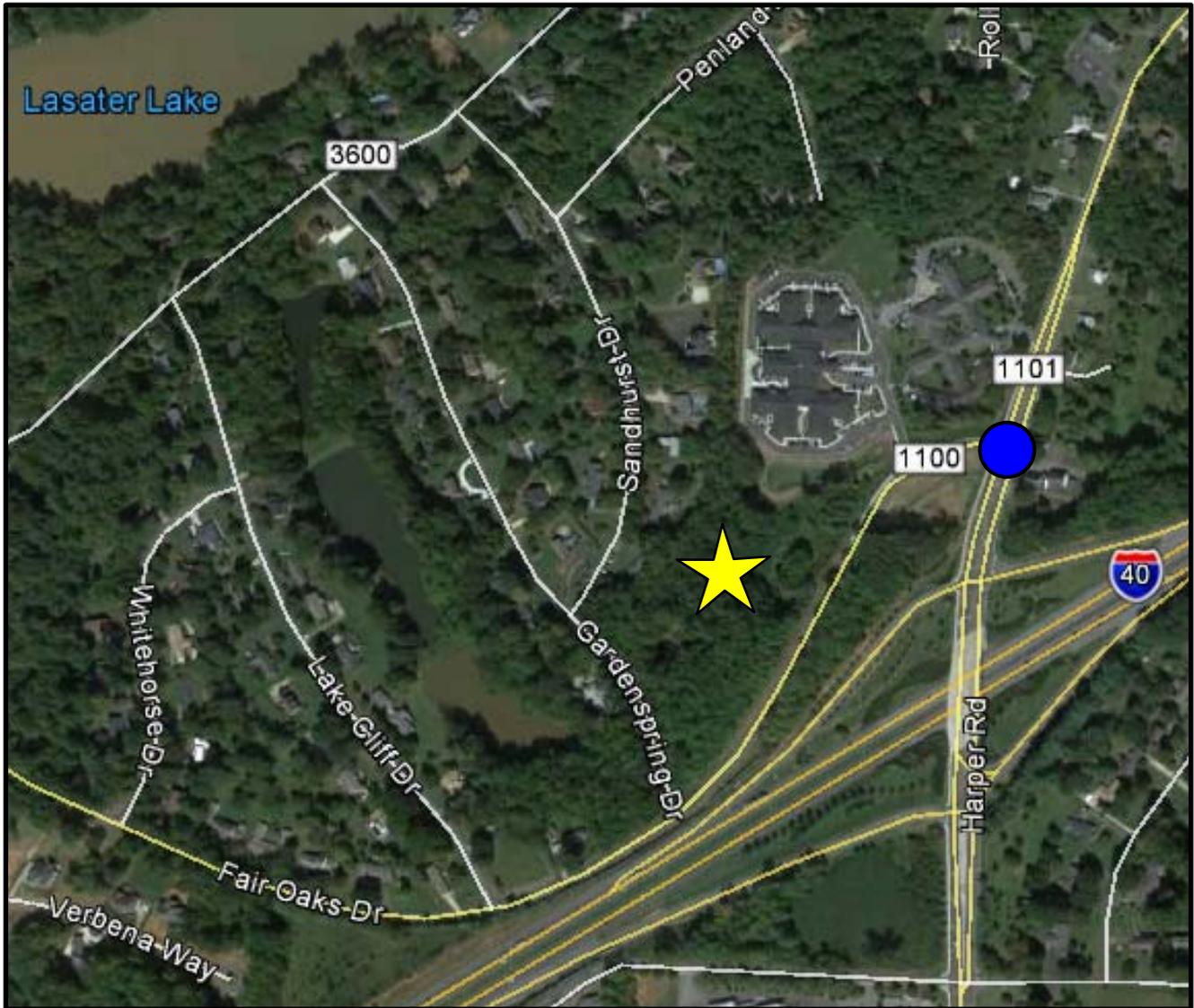
- Provide right turn tapers at each of the proposed site access locations measuring at least 100 feet in length.

If you should have any questions regarding this analysis, please contact me at (336)-725-5470.

Attachments

TECHNICAL APPENDIX

FIGURES

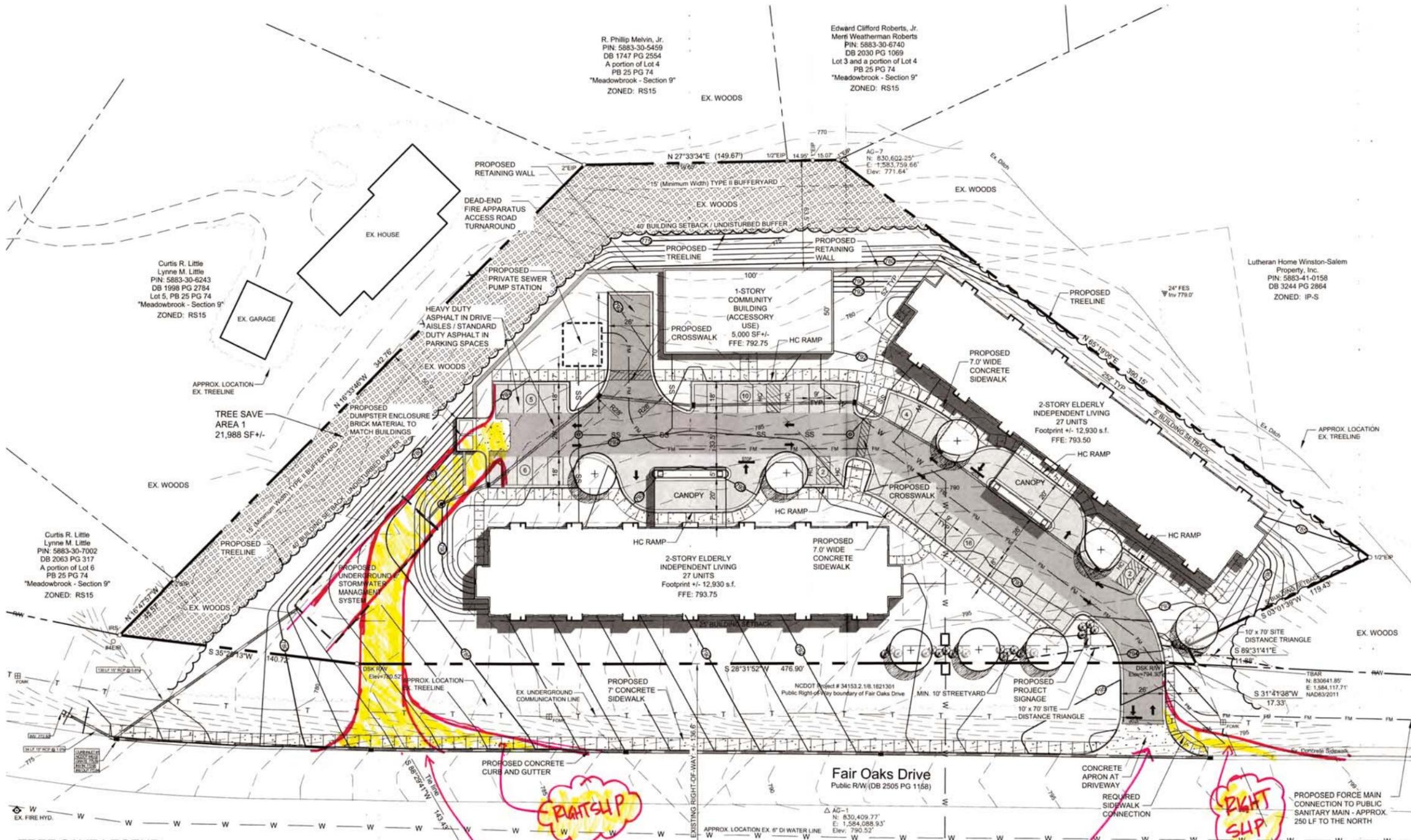


LEGEND

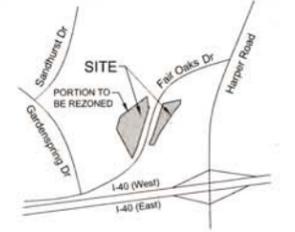
-  Site Location
-  Existing Study Intersection



 RAMEY KEMP & ASSOCIATES <small>TRANSPORTATION ENGINEERS</small>	
<i>Elms Independent Living at Tanglewood Clemmons, NC</i>	
<i>Site Location Map</i>	
Not to Scale	Figure



VICINITY MAP NOT TO SCALE



SITE DATA

Jurisdiction
Clemmons, NC

Purpose Statement
The purpose of this request is to rezone from RS15 to IP-S to allow for the use of Life Care Community.

Zoning
Existing Zoning: RS15
Proposed Zoning: IP-S

Proposed Use
Life Care Community

Site Acreage
Existing Site: 3.142 Acres +/- (per survey)

Building Data
Max. Building Height: 60'

Maximum Density
Max. Density = 18 units per acre x 3.142 acres = 56.56 units max.
Number of Units Proposed: 54 units

Watershed Data
Site is in The Yadkin River Watershed Protection Area WS-IV

Site Coverage

Maximum Impervious Area Permitted	60%
Building To Land	0.710 Acres +/- 22.60 %
Pavement To Land	0.752 Acres +/- 23.93 %
Open Space	1.680 Acres +/- 53.47 %
Parcel Total	3.142 Acres +/- 100.00%
Total Impervious	1.462 Acres +/- 46.53%

Infrastructure

Water	Public
Sewer	Private On-Site to Public Main
Road	N/A 0 LF +/-

Parking Calculations

Parking Required - 54 units (0.75 spaces per unit)	41 Spaces
Parking Required - 5000 SF +/- Accessory Use Building	0 Spaces
Total Required	41 Spaces
Parking Provided	45 Spaces

Building Setbacks

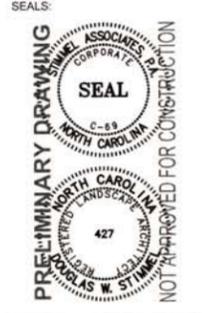
Front:	25'
Rear:	10'
Side:	5'
Street:	20'
Adjacent to Residential:	40'

Bufferyards

Adjacent To Residential:	15' (Min.) Type II & 40' Undisturbed
Provided:	15' (Min.) Type II & 40' Undisturbed

Streetyards

Type Required	10' Min.
Type Provided	10'



PROJECT:

ELMS INDEPENDENT LIVING AT TANGLEWOOD

CLEMMONS, NC

CLIENT:
ABATTOIR PROPERTIES, LLC
5489 HERITAGE OAKS LANE
WINSTON-SALEM, NC 27106

NOTES

Topographic & Boundary Information
Topographic and boundary information provided from survey dated 04.06.2016 by: Allen Geomatics, P.C., P.O. Box 89, Advance, NC 27006 (336) 998-0218

PETITIONER / OWNER:
Portion of PIN # 5883-30-9405-00
Abattoir Properties, LLC
5489 Heritage Oaks Lane
Winston-Salem, NC 27106
P: 336-940-6627

DRAWN: JAL / JKB
DATE: 07/07/16
REVISIONS:

JOB NO: 16-025
SHEET TITLE:

TREE SAVE LEGEND

New Development Total Site Size (in square feet) 136,852 SF +/- Total Site Area Excluded From TSA: Square Feet of Proposed R.O.W.s: 0 SF +/- Square Feet of Existing Utility Easements: 0 SF +/-	Additions to Existing Development Total Limits of Land Disturbance (in Square Feet): 0 SF +/- Square Feet of Existing Water Bodies and Stormwater Ponds: 0 SF +/- Total Excluded Area = 0 SF +/-
Minimum Tree Save Area Required:	
Commercial, Institutional and Industrial (Including Multifamily and Schools)	Residential (Note: These requirements apply to major residential subdivisions not minor subdivisions or individual lots.)
Size of Parcel: 0-55,000 square feet 55,001 square feet - 5 acres 5.01 - 10 acres Greater than 10 acres	Tree Save Area Required to Include: 0-55,000 square feet 55,001 square feet - 5 acres 5.01 - 10 acres Greater than 10 acres
Eight percent (8%) of parcel area	Ten percent (10%) of parcel area
Nine percent (9%) of parcel area	Eleven percent (11%) of parcel area
Ten percent (10%) of parcel area	Twelve percent (12%) of parcel area
Twelve percent (12%) of parcel area	Fourteen percent (14%) of parcel area
Total Required Tree Save Area (in square feet) 136,852 SF +/- x 9% = 12,317 SF +/- Total Required Tree Save Area	
Individual Trees Method Used: Yes X No Number of Trees 6-9" DBH: 0 X 500 SF = 0 SF Number of Trees 9.01-12" DBH: 0 X 750 SF = 0 SF Number of Trees 12.01-24" DBH: 0 X 1800 SF = 0 SF Number of Trees 24.01-30" DBH: 0 X 3000 SF = 0 SF Number of Trees Larger Than 36.01" DBH: 0 X 4000 SF = 0 SF	Tree Stand Method Used: X Yes No List the Area of Each Tree Stand Being Saved: Area 1: 21,988 SF +/- Describe Each Tree Stand (Age, Health, Species Mix) Tree Stand consists of a mix of mature hardwoods and evergreens with the majority being healthy poplars and maples.
Total Square Footage of Individual Trees Used to Satisfy Minimum TSA: 0 SF +/-	Total Square Footage of Tree Stands Being Saved to Satisfy Minimum TSA: 21,988 SF +/-
Total Required TSA (in square feet) 12,317 SF +/-	Total TSA Provided (in square feet) 21,988 SF +/-

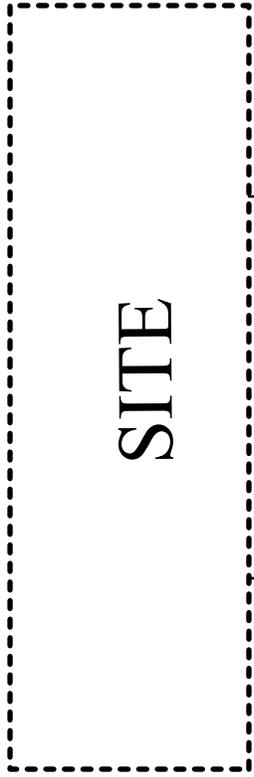
NOTE:
BUILDING FOOTPRINT AND SIDEWALK CONNECTIONS ARE A GENERAL REPRESENTATION AND MAY SHIFT PER FINAL ARCHITECTURAL PLANS.

PREPARED BY:
Stimmel Associates, P.A.
LANDSCAPE ARCHITECTURE CIVIL ENGINEERING LAND PLANNING
601 N. TRADE STREET, SUITE 200
WINSTON-SALEM, NC 27101
www.stimmelpa.com 336.723.1067

SCALE: 1" = 30'

North

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SITE

Harper Road

*360'

~600'

~420'

Fair Oaks Drive

Site Drive 1

Site Drive 2

135'

Harper Road

***Note:**
Due to limitations of Synchro software, the maximum input for taper lengths is 300'; therefore any taper length over 300' was added to the storage length.



LEGEND

Lane Configuration and Storage Length (in feet)

X' →

<p><i>Elms Independent Living at Tanglewood Clemmons, NC</i></p>	
<p><i>Existing Lane Geometrics and Traffic Control</i></p>	
Not to Scale	Figure



SITE

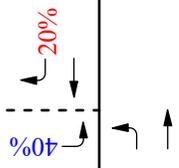
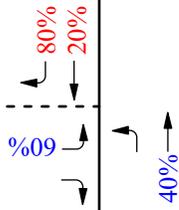
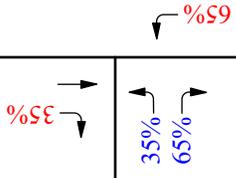
Site Drive 2

Site Drive 1

Fair Oaks Drive

Harper Road

Harper Road



LEGEND

X% Entering Trips

X% Exiting Trips

X% Regional Distribution

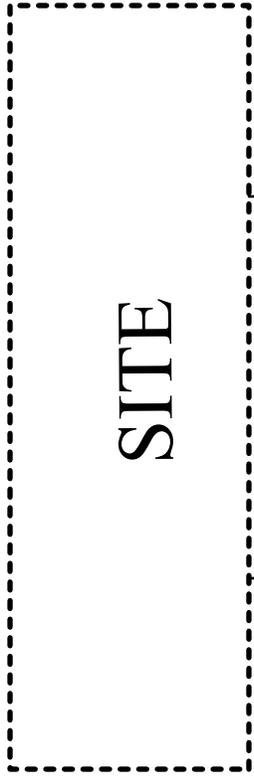


<i>Elms Independent Living at Tanglewood Clemmons, NC</i>	
<i>Site Trip Distribution</i>	
Not to Scale	Figure

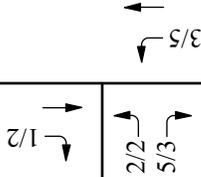
35%

65%

X%



Harper Road



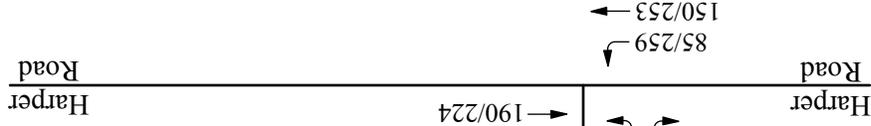
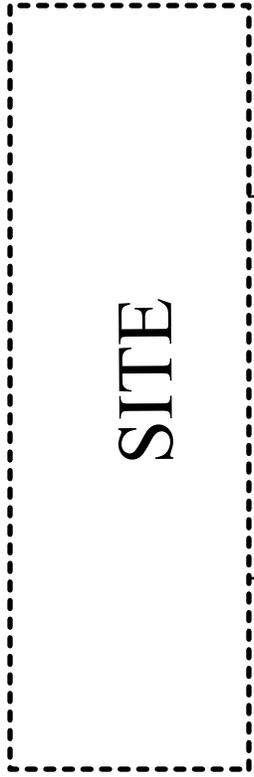
Fair Oaks Drive

<i>Elms Independent Living at Tanglewood Clemmons, NC</i>	
<i>Site-Generated Traffic Volumes</i>	
Not to Scale	Figure



LEGEND

X/Y AM/PM Peak Hour Traffic

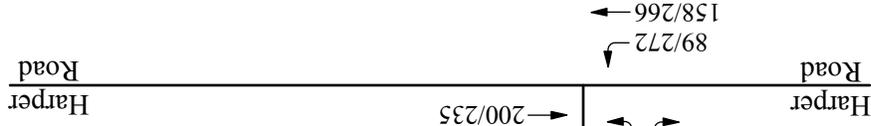
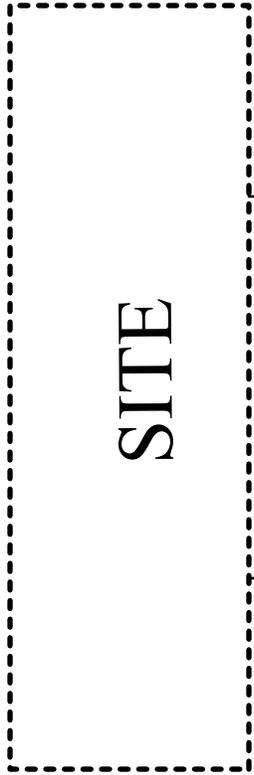


LEGEND

X/Y AM/PM Peak Hour Traffic



<i>Elms Independent Living at Tanglewood Clemmons, NC</i>		
<i>Existing (2016) Traffic Volumes</i>		
Not to Scale	Figure	



Fair Oaks Drive

Harper Road

45/6
209/161
33/2
200/235

89/272
158/266

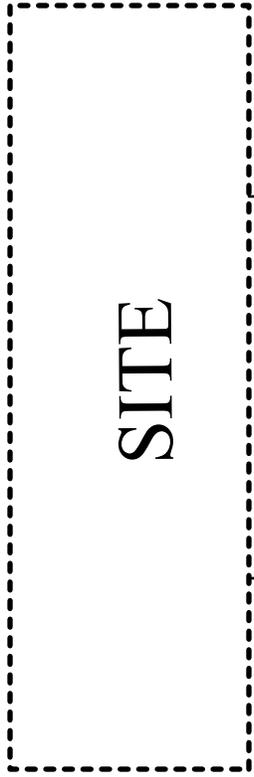
Harper Road

LEGEND

X/Y AM/PM Peak Hour Traffic

		
<p><i>Elms Independent Living at Tanglewood Clemmons, NC</i></p>		
<p><i>Adjusted (2016) Traffic Volumes</i></p>		
Not to Scale	Figure	





Harper Road

34/2
206/242

Fair Oaks Drive

46/6
99/9
215/166

Harper Road

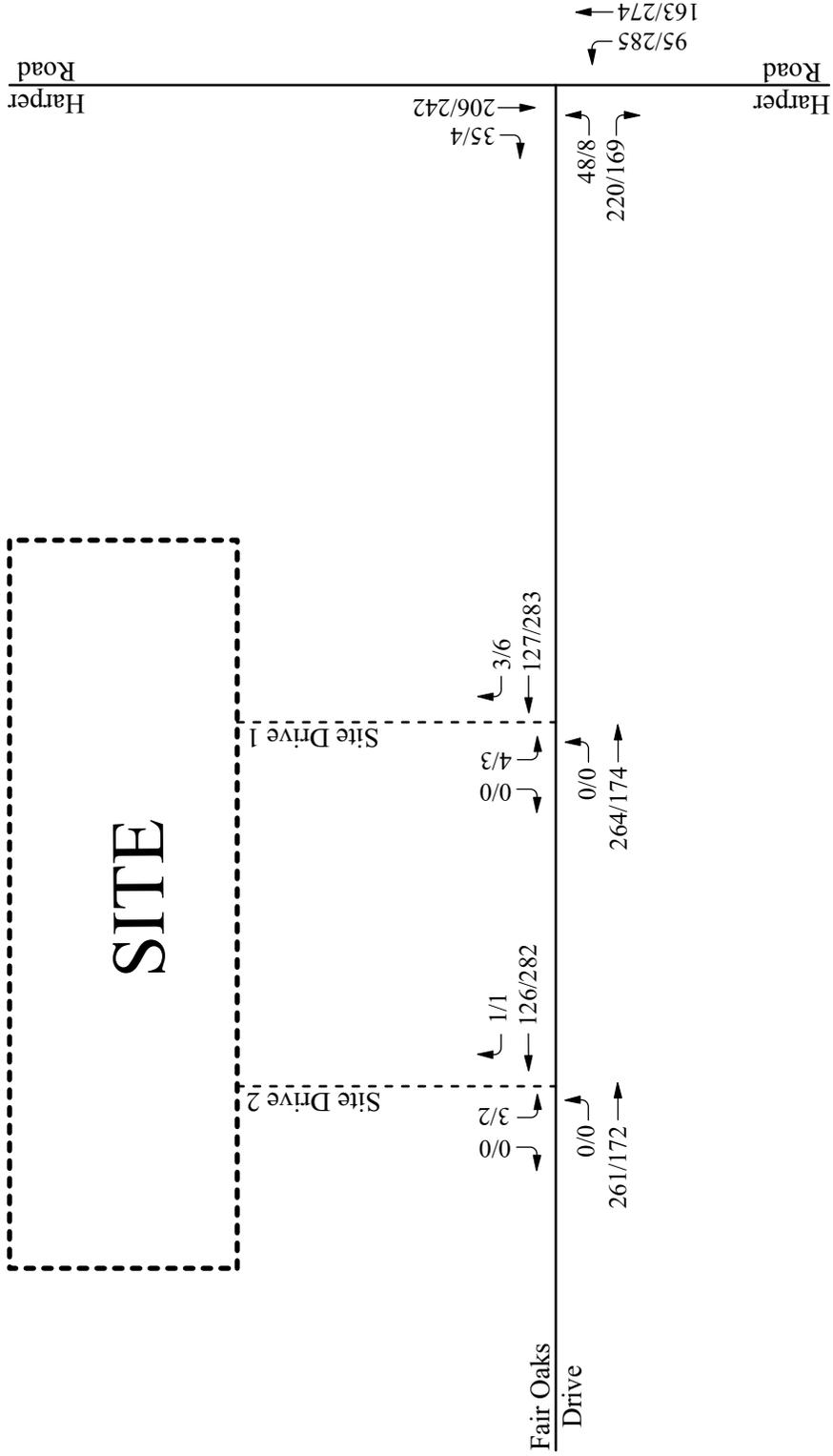
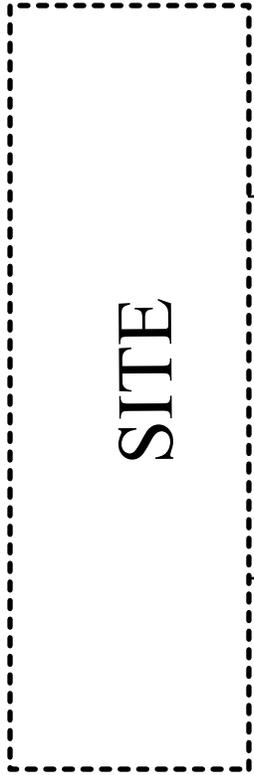
92/280
163/274

LEGEND

X/Y AM/PM Peak Hour Traffic

 <p>RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS</p>	
<p><i>Elms Independent Living at Tanglewood Clemmons, NC</i></p>	
<p><i>Future (2018)</i></p>	
<p><i>'No-Build' Traffic Volumes</i></p>	
Not to Scale	Figure





LEGEND

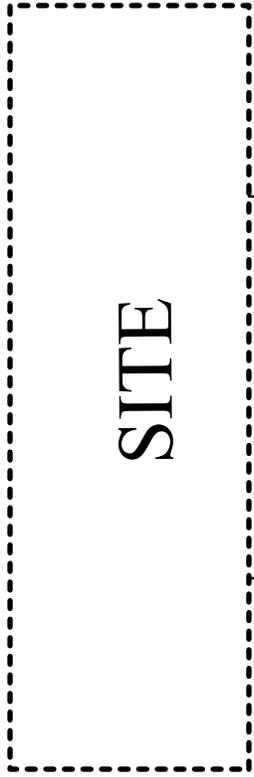
X/Y AM/PM Peak Hour Traffic

*Elms Independent Living at Tanglewood
Clemmons, NC*

*Future (2018)
'Build' Traffic Volumes*

Not to Scale Figure





Harper Road

Harper Road

Fair Oaks Drive

Site Drive 1

Site Drive 2

~600'

~420'

*360'

135°

***Note:**
Due to limitations of Synchro software, the maximum input for taper lengths is 300'; therefore any taper length over 300' was added to the storage length.

****Note:**
The westbound right-thru lane of Fair Oaks Drive at both driveways is proposed to include a minimum of 100 feet of taper.

LEGEND

- X' → Existing Lane Configuration and Storage Length (in feet)
- Recommended Lane Configuration and Storage Length (in feet)



<p><i>Elms Independent Living at Tanglewood</i> Clemmons, NC</p>	
<p><i>Proposed Lane Geometrics and Traffic Control</i></p>	
Not to Scale	Figure

TRAFFIC COUNT DATA

Burns Service, Inc.

1202 Langdon Terrace Drive
Indian Trail, North Carolina

File Name : Harper Road and Fair Oaks Drive (AM Peak)

Site Code :

Start Date : 8/2/2016

Page No : 1

Groups Printed- Cars +

Start Time	Harper Road From North			Harper Road From South			Fair Oaks Drive From West			Int. Total
	Right	Thru	Peds	Thru	Left	Peds	Right	Left	Peds	
07:00 AM	1	42	0	30	8	0	40	0	0	121
07:15 AM	0	37	0	28	11	0	50	2	0	128
07:30 AM	0	44	0	27	11	0	61	1	0	144
07:45 AM	0	63	0	40	21	0	60	3	0	187
Total	1	186	0	125	51	0	211	6	0	580
08:00 AM	0	43	0	46	23	0	48	2	0	162
08:15 AM	1	33	0	33	24	0	44	0	0	135
08:30 AM	3	51	0	31	17	0	47	0	0	149
08:45 AM	2	35	0	30	26	0	41	2	0	136
Total	6	162	0	140	90	0	180	4	0	582
Grand Total	7	348	0	265	141	0	391	10	0	1162
Apprch %	2	98	0	65.3	34.7	0	97.5	2.5	0	
Total %	0.6	29.9	0	22.8	12.1	0	33.6	0.9	0	

Burns Service, Inc.

1202 Langdon Terrace Drive
Indian Trail, North Carolina

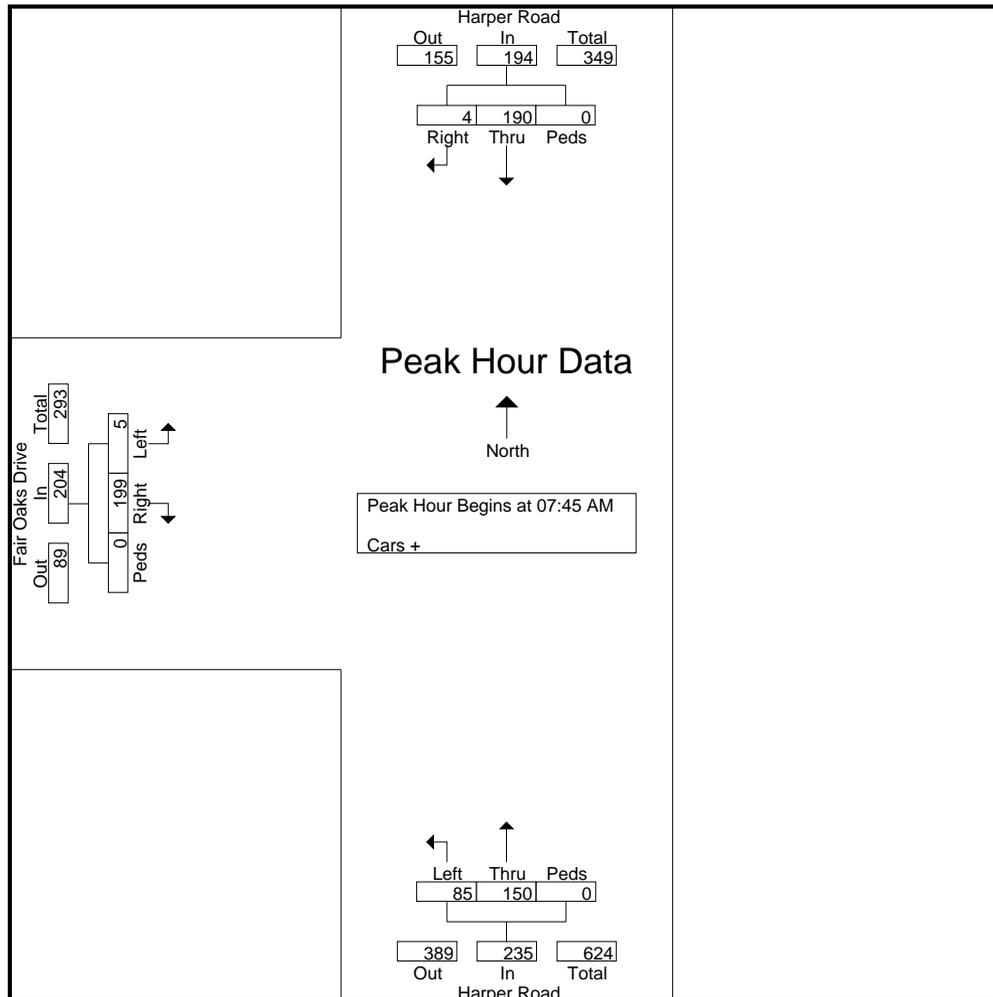
File Name : Harper Road and Fair Oaks Drive (AM Peak)

Site Code :

Start Date : 8/2/2016

Page No : 2

Start Time	Harper Road From North				Harper Road From South				Fair Oaks Drive From West				Int. Total
	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:45 AM													
07:45 AM	0	63	0	63	40	21	0	61	60	3	0	63	187
08:00 AM	0	43	0	43	46	23	0	69	48	2	0	50	162
08:15 AM	1	33	0	34	33	24	0	57	44	0	0	44	135
08:30 AM	3	51	0	54	31	17	0	48	47	0	0	47	149
Total Volume	4	190	0	194	150	85	0	235	199	5	0	204	633
% App. Total	2.1	97.9	0		63.8	36.2	0		97.5	2.5	0		
PHF	.333	.754	.000	.770	.815	.885	.000	.851	.829	.417	.000	.810	.846



Burns Service, I nc.

1202 Langdon Terrace Drive
Indian Trail, North Carolina

File Name : Harper Road and Fair Oaks Drive (PM Peak)

Site Code :

Start Date : 8/2/2016

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Groups Printed- Cars +

Start Time	Harper Road From North			Harper Road From South			Fair Oaks Drive From West			Int. Total
	Right	Thru	Peds	Thru	Left	Peds	Right	Left	Peds	
04:00 PM	5	41	0	56	40	0	30	0	0	172
04:15 PM	1	43	0	41	34	0	27	2	0	148
04:30 PM	2	32	0	49	46	0	24	2	0	155
04:45 PM	2	44	0	39	40	0	25	1	0	151
Total	10	160	0	185	160	0	106	5	0	626
05:00 PM	1	44	0	56	57	0	42	2	0	202
05:15 PM	0	72	0	68	64	0	42	2	0	248
05:30 PM	0	73	0	71	72	0	39	1	0	256
05:45 PM	1	35	0	58	66	0	30	1	0	191
Total	2	224	0	253	259	0	153	6	0	897
Grand Total	12	384	0	438	419	0	259	11	0	1523
Apprch %	3	97	0	51.1	48.9	0	95.9	4.1	0	
Total %	0.8	25.2	0	28.8	27.5	0	17	0.7	0	

Burns Service, Inc.

1202 Langdon Terrace Drive
Indian Trail, North Carolina

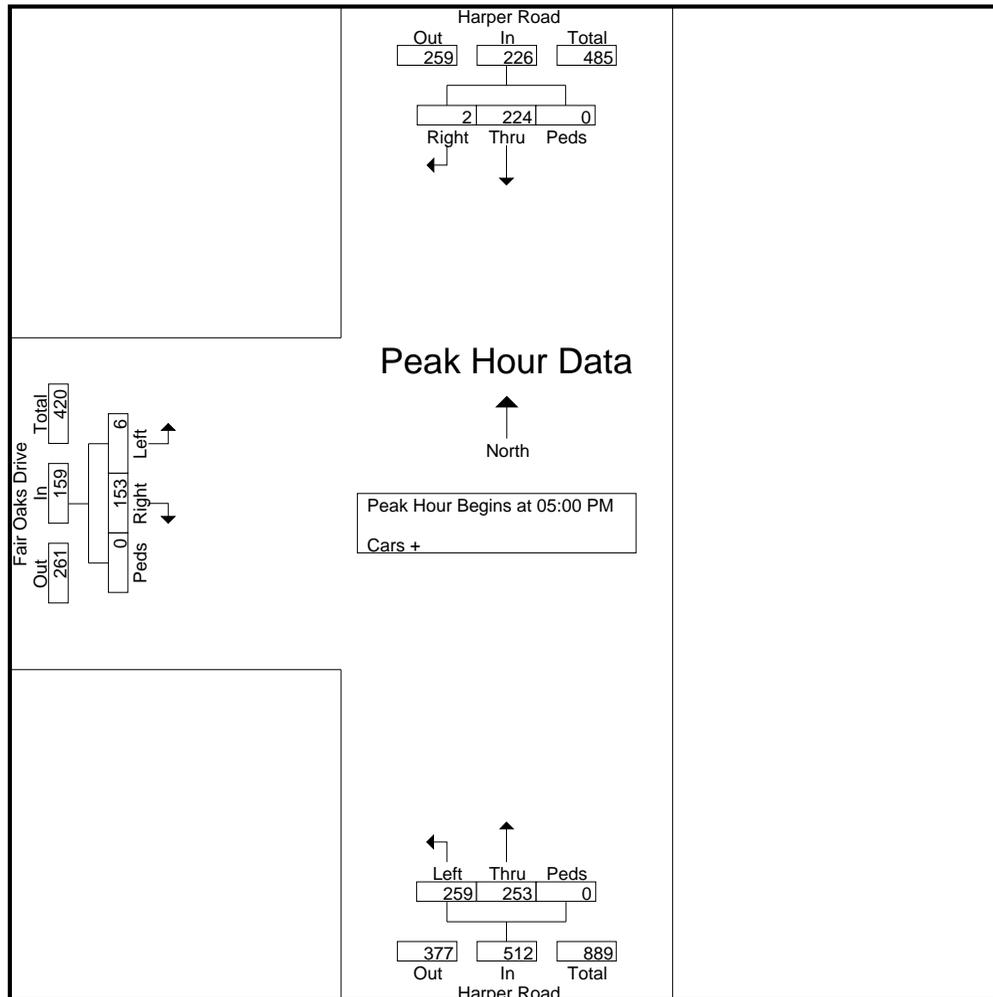
File Name : Harper Road and Fair Oaks Drive (PM Peak)

Site Code :

Start Date : 8/2/2016

Page No : 2

Start Time	Harper Road From North				Harper Road From South				Fair Oaks Drive From West				Int. Total
	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	1	44	0	45	56	57	0	113	42	2	0	44	202
05:15 PM	0	72	0	72	68	64	0	132	42	2	0	44	248
05:30 PM	0	73	0	73	71	72	0	143	39	1	0	40	256
05:45 PM	1	35	0	36	58	66	0	124	30	1	0	31	191
Total Volume	2	224	0	226	253	259	0	512	153	6	0	159	897
% App. Total	0.9	99.1	0		49.4	50.6	0		96.2	3.8	0		
PHF	.500	.767	.000	.774	.891	.899	.000	.895	.911	.750	.000	.903	.876



MSTA SCHOOL CALCULATOR

MORGAN ELEMENTARY SCHOOL

CAPACITY ANALYSIS REPORTS

**HARPER ROAD
AND
FAIR OAKS DRIVE**

Elms Independent Living at Tanglewood
1: Harper Road & Fair Oaks Drive

Existing
Timing Plan: AM Peak

Intersection

Int Delay, s/veh 6.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	45	209	89	158	200	33
Future Vol, veh/h	45	209	89	158	200	33
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	135	-	-	360
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	54	90	90	90	90	55
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	83	232	99	176	222	60

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	538	141	282	0	-	0
Stage 1	252	-	-	-	-	-
Stage 2	286	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	473	881	1277	-	-	-
Stage 1	767	-	-	-	-	-
Stage 2	737	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	436	881	1277	-	-	-
Mov Cap-2 Maneuver	436	-	-	-	-	-
Stage 1	767	-	-	-	-	-
Stage 2	680	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.4	2.9	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1277	-	694	-	-
HCM Lane V/C Ratio	0.077	-	0.455	-	-
HCM Control Delay (s)	8.1	-	14.4	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.3	-	2.4	-	-

Elms Independent Living at Tanglewood
 1: Harper Road & Fair Oaks Drive

Existing
 Timing Plan: PM Peak

Intersection

Int Delay, s/veh	4.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	161	272	266	235	2
Future Vol, veh/h	6	161	272	266	235	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	135	-	-	360
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	179	302	296	261	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1014	132	263	0	-	0
Stage 1	262	-	-	-	-	-
Stage 2	752	-	-	-	-	-
Critical Hdwy	7.54	6.94	4.14	-	-	-
Critical Hdwy Stg 1	6.54	-	-	-	-	-
Critical Hdwy Stg 2	6.54	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	193	893	1298	-	-	-
Stage 1	720	-	-	-	-	-
Stage 2	368	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	158	893	1298	-	-	-
Mov Cap-2 Maneuver	158	-	-	-	-	-
Stage 1	552	-	-	-	-	-
Stage 2	282	-	-	-	-	-

Approach	EB		NB		SB
HCM Control Delay, s	11.2		4.4		0
HCM LOS	B				

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1298	-	765	-	-
HCM Lane V/C Ratio	0.233	-	0.243	-	-
HCM Control Delay (s)	8.6	-	11.2	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.9	-	0.9	-	-

Elms Independent Living at Tanglewood
 1: Harper Road & Fair Oaks Drive

Future 'No-Build'
 Timing Plan: AM Peak

Intersection

Int Delay, s/veh 6.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	46	215	92	163	206	34
Future Vol, veh/h	46	215	92	163	206	34
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	135	-	-	360
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	55	90	90	90	90	56
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	84	239	102	181	229	61

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	554	145	290	0	-	0
Stage 1	259	-	-	-	-	-
Stage 2	295	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	462	876	1269	-	-	-
Stage 1	761	-	-	-	-	-
Stage 2	730	-	-	-	-	-
Platoon blocked, %						
Mov Cap-1 Maneuver	425	876	1269	-	-	-
Mov Cap-2 Maneuver	425	-	-	-	-	-
Stage 1	761	-	-	-	-	-
Stage 2	671	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.8	2.9	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1269	-	687	-	-
HCM Lane V/C Ratio	0.081	-	0.469	-	-
HCM Control Delay (s)	8.1	-	14.8	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.3	-	2.5	-	-

Elms Independent Living at Tanglewood
 1: Harper Road & Fair Oaks Drive

Future 'No-Build'
 Timing Plan: PM Peak

Intersection

Int Delay, s/veh 4.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	166	280	274	242	2
Future Vol, veh/h	6	166	280	274	242	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	135	-	-	360
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	184	311	304	269	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1044	136	271	0	-	0
Stage 1	270	-	-	-	-	-
Stage 2	774	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	225	888	1289	-	-	-
Stage 1	751	-	-	-	-	-
Stage 2	415	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	171	888	1289	-	-	-
Mov Cap-2 Maneuver	171	-	-	-	-	-
Stage 1	751	-	-	-	-	-
Stage 2	315	-	-	-	-	-

Approach	EB		NB		SB
HCM Control Delay, s	11.2		4.4		0
HCM LOS	B				

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1289	-	775	-	-
HCM Lane V/C Ratio	0.241	-	0.247	-	-
HCM Control Delay (s)	8.7	-	11.2	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.9	-	1	-	-

Elms Independent Living at Tanglewood
1: Harper Road & Fair Oaks Drive

Future 'Build'
Timing Plan: AM Peak

Intersection

Int Delay, s/veh 6.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	48	220	95	163	206	35
Future Vol, veh/h	48	220	95	163	206	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	135	-	-	360
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	57	90	90	90	90	57
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	84	244	106	181	229	61

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	562	145	290	0	-	0
Stage 1	260	-	-	-	-	-
Stage 2	302	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	457	876	1269	-	-	-
Stage 1	760	-	-	-	-	-
Stage 2	724	-	-	-	-	-
Platoon blocked, %						
Mov Cap-1 Maneuver	419	876	1269	-	-	-
Mov Cap-2 Maneuver	419	-	-	-	-	-
Stage 1	760	-	-	-	-	-
Stage 2	664	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15	3	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1269	-	685	-	-
HCM Lane V/C Ratio	0.083	-	0.48	-	-
HCM Control Delay (s)	8.1	-	15	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0.3	-	2.6	-	-

Elms Independent Living at Tanglewood
 1: Harper Road & Fair Oaks Drive

Future 'Build'
 Timing Plan: PM Peak

Intersection

Int Delay, s/veh 4.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	8	169	285	274	242	4
Future Vol, veh/h	8	169	285	274	242	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	135	-	-	360
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	188	317	304	269	4

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1057	137	273	0	-	0
Stage 1	271	-	-	-	-	-
Stage 2	786	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	220	886	1287	-	-	-
Stage 1	750	-	-	-	-	-
Stage 2	410	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	166	886	1287	-	-	-
Mov Cap-2 Maneuver	166	-	-	-	-	-
Stage 1	750	-	-	-	-	-
Stage 2	309	-	-	-	-	-

Approach	EB		NB		SB
HCM Control Delay, s	11.6		4.4		0
HCM LOS	B				

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1287	-	741	-	-
HCM Lane V/C Ratio	0.246	-	0.265	-	-
HCM Control Delay (s)	8.7	-	11.6	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	1	-	1.1	-	-

**FAIR OAKS DRIVE
AND
SITE ACCESS LOCATIONS**

Elms Independent Living at Tanglewood
2: Fair Oaks Drive & Site Drive 1

Future 'Build'
Timing Plan: AM Peak

Intersection

Int Delay, s/veh 0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	264	127	3	4	0
Future Vol, veh/h	0	264	127	3	4	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	84	81	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	314	157	3	4	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	160	0	158
Stage 1	-	-	158
Stage 2	-	-	314
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1419	-	887
Stage 1	-	-	871
Stage 2	-	-	741
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1419	-	887
Mov Cap-2 Maneuver	-	-	551
Stage 1	-	-	871
Stage 2	-	-	741

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1419	-	-	-	551
HCM Lane V/C Ratio	-	-	-	-	0.008
HCM Control Delay (s)	0	-	-	-	11.6
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

Elms Independent Living at Tanglewood
 2: Fair Oaks Drive & Site Drive 1

Future 'Build'
 Timing Plan: PM Peak

Intersection

Int Delay, s/veh 0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↗		↘	
Traffic Vol, veh/h	0	174	283	6	3	0
Future Vol, veh/h	0	174	283	6	3	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	193	314	7	3	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	321	0	318
Stage 1	-	-	318
Stage 2	-	-	193
Critical Hdwy	4.12	-	6.22
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.318
Pot Cap-1 Maneuver	1239	-	723
Stage 1	-	-	738
Stage 2	-	-	840
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1239	-	723
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	738
Stage 2	-	-	840

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1239	-	-	-	523
HCM Lane V/C Ratio	-	-	-	-	0.006
HCM Control Delay (s)	0	-	-	-	11.9
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

Elms Independent Living at Tanglewood
 3: Fair Oaks Drive & Site Drive 2

Future 'Build'
 Timing Plan: AM Peak

Intersection

Int Delay, s/veh 0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↗		↘	
Traffic Vol, veh/h	0	261	126	1	3	0
Future Vol, veh/h	0	261	126	1	3	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	84	81	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	311	156	1	3	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	157	0	156
Stage 1	-	-	156
Stage 2	-	-	311
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1423	-	890
Stage 1	-	-	872
Stage 2	-	-	743
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1423	-	890
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	872
Stage 2	-	-	743

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1423	-	-	-	554
HCM Lane V/C Ratio	-	-	-	-	0.006
HCM Control Delay (s)	0	-	-	-	11.5
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

Elms Independent Living at Tanglewood
 3: Fair Oaks Drive & Site Drive 2

Future 'Build'
 Timing Plan: PM Peak

Intersection

Int Delay, s/veh 0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↗		↘	
Traffic Vol, veh/h	0	172	282	1	2	0
Future Vol, veh/h	0	172	282	1	2	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	191	313	1	2	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	314	0	314
Stage 1	-	-	314
Stage 2	-	-	191
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1246	-	726
Stage 1	-	-	741
Stage 2	-	-	841
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1246	-	726
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	741
Stage 2	-	-	841

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1246	-	-	-	527
HCM Lane V/C Ratio	-	-	-	-	0.004
HCM Control Delay (s)	0	-	-	-	11.9
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0