RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

RAMEY KEMP & ASSOCIATES, INC.
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Raleigh, NC 27609
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November 14, 2018

Michael Clark, AICP, CZO
Town of Knightdale
950 Steeple Square Court
Knightdale, NC 27545
(919) 217-2243
michael.clark@knightdalenc.gov

Subject: **The Lawson of Knightdale Traffic Assessment**
Knightdale, North Carolina

Dear Mr. Clark:

This letter provides the findings of the traffic study prepared by Ramey Kemp & Associates, Inc. (RKA) for the proposed Lawson of Knightdale development to be located along McKnight Drive, west of Smithfield Road in Knightdale, North Carolina. The purpose of the study is to determine how traffic generated by the proposed development is expected to impact surrounding roadways and intersections.

The proposed development, anticipated to be completed in 2021, is assumed to consist of a retirement community with 100 units and a 9,000 s.f. medical outparcel. Access to the proposed site will be provided via a connection to Mulford Court to the east and a connection to the existing McKnight Professional Center driveway to the west. Refer to Figure 1 for the site location map. Refer to Figure 2 for the preliminary site plan.

The scope for this study was determined through coordination with the North Carolina Department of Transportation (NCDOT) and the Town of Knightdale (Town). Refer to Appendix A for the scoping information. The proposed study consists of the following intersections:

- McKnight Drive and Smithfield Road
- McKnight Drive and Village Park Drive
- McKnight Drive and Knightdale Boulevard

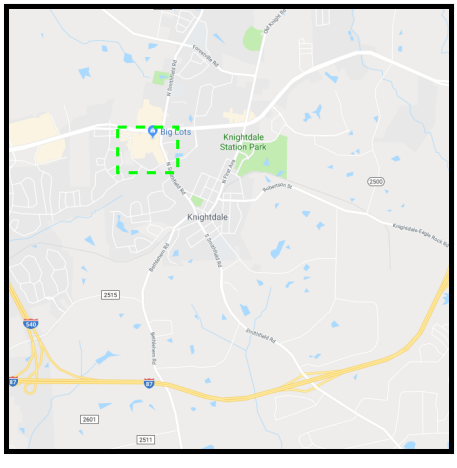
The study analyzes traffic conditions for the study intersections during the weekday AM and PM peak hours for the following scenarios:

- Existing (2018) Traffic Conditions
- Background (2021) Traffic Conditions
- Combined (2021) Traffic Conditions
- Future (2031) Traffic Conditions (10 years beyond buildout per UDO)

Existing Roadways

Existing lane configurations (number of traffic lanes on each intersection approach), lane widths, storage capacities, and other intersection and roadway information was collected through field reconnaissance by Ramey Kemp & Associates, Inc. (RKA). Table 1 provides a summary of the field data collected. Refer to Figure 3 for an illustration of the existing lane configurations within the study area. Signal plans were obtained from NCDOT and signal timings were collected in the field by RKA. Refer to Appendix B for the signal plans and timings.

Road Name	Route Number	Typical Cross Section	Speed Limit	Maintained By	2017 AADT (vpd)
Knightdale Boulevard	US 64	4-lane, divided	45 mph	NCDOT	37,000
Smithfield Road	SR 2233	2-lane undivided	35 mph	NCDOT	11,000
McKnight Drive	N/A	2-lane undivided	25 mph	Town	6,800



N

LEGEND

- Proposed Site Location
- Study Intersection
- Study Area

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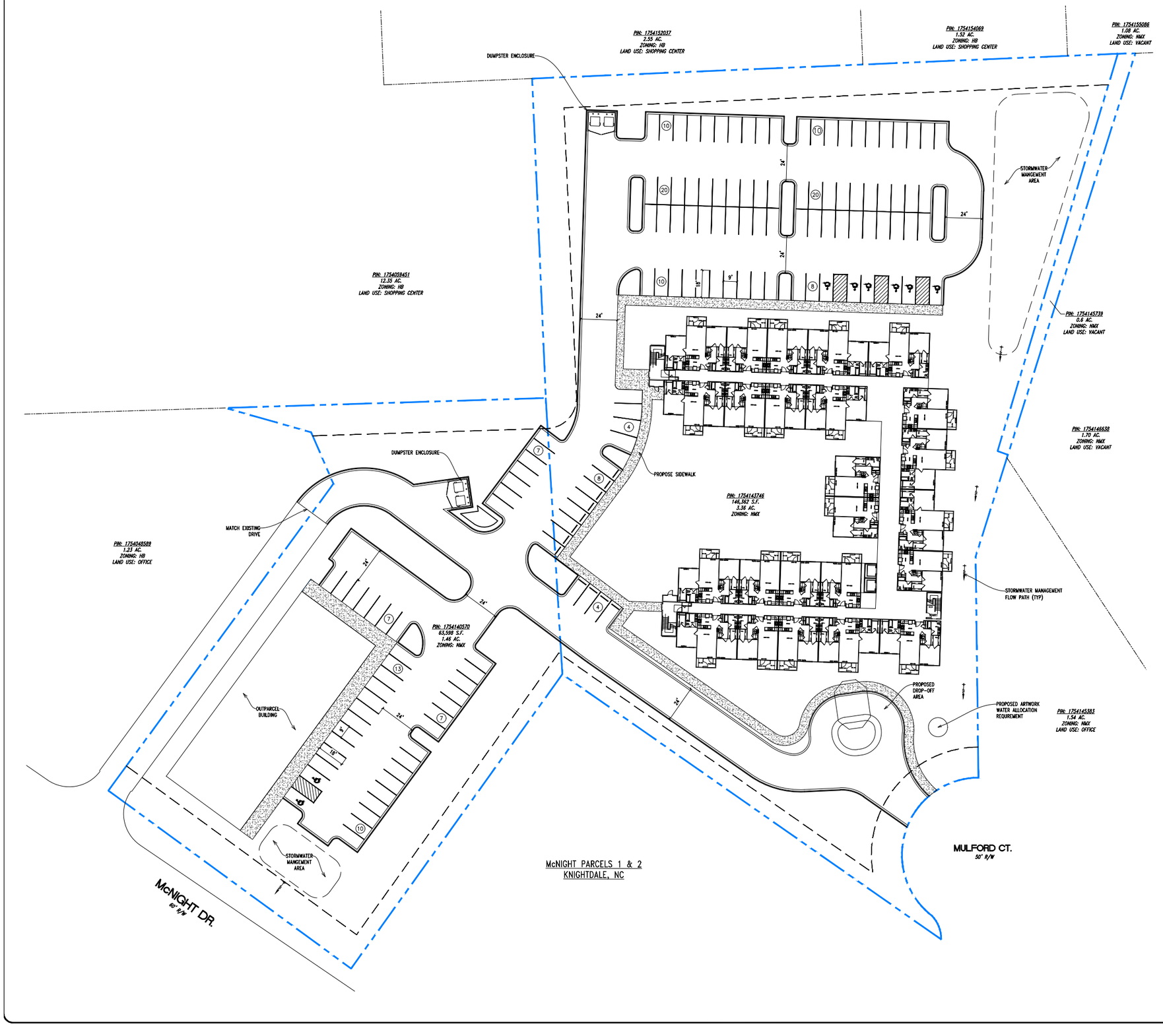
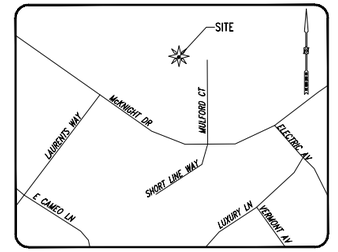
The Lawson of Knightdale
Knightdale, NC

Site Location Map

Scale: Not to Scale

Figure 1





VICINITY MAP

NOT TO SCALE

PROPERTY INFORMATION

OWNER:	NORMAN L. PARKER 7515 JEFFERSON HIGHWAY UNIT 42 BATON ROUGE, LA 70806-8308 225-975-2244
ACREAGE:	4.82
ZONING:	HMX

WATER ALLOCATION

HOUSING SERVICES FOR THE ELDERLY	41 BASE POINTS
PROPOSED:	
STORMWATER-BIORETENTION	5 POINTS
OUTDOOR DISPLAY OF PUBLIC ART	4 POINTS
TOTAL:	50 POINTS

TRIANGLE SITE DESIGN

CONSULTANT:
Triangle Site Design, PLLC
4004 Barrett Drive
Suite 101
Raleigh, NC 27609
(919)553-6570
mlowder@trianglesitedesign.com
NC LICENSE #P-0619

SEAL:

PRELIMINARY
DO NOT USE
FOR CONSTRUCTION
FOR PERMITTING ONLY

The Lawson of Knightdale

Mulford Court
Knightdale, North Carolina
Wake County

OWNER/DEVELOPER:

IGB INCORPORATED
DANIEL THARRINGTON
252-432-1172
www.igbinc.com

REVISIONS:

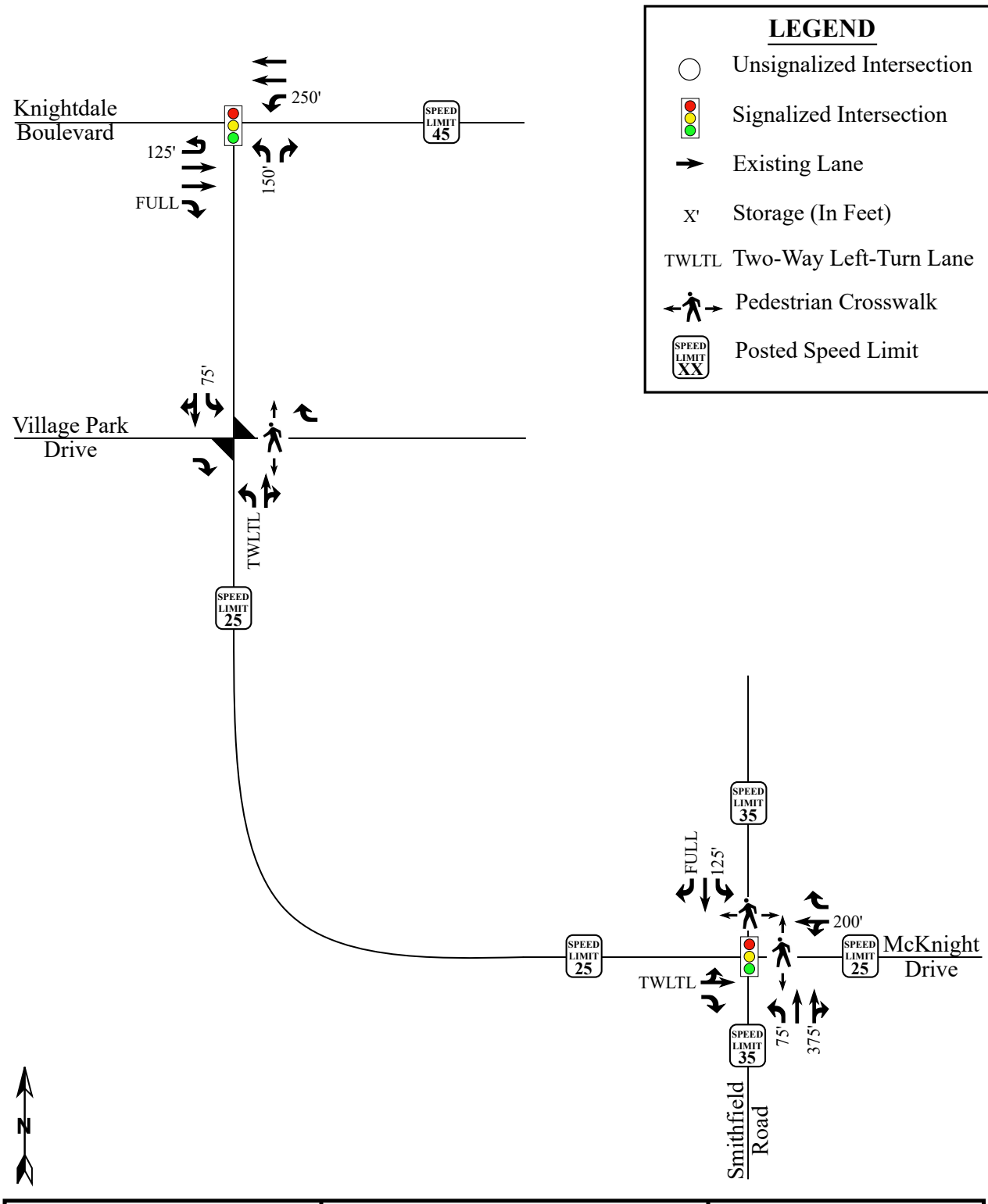
LAYOUT COORD:	MEL
PLANNING MGR.	MEL
DRAWING BY:	MEL
DATE:	July 20, 2018
JOB NUMBER:	001

TITLE:

SITE PLAN

SHEET NUMBER:

C-1



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The Lawson of Knightdale
Knightdale, NC

Existing
Lane Configurations

Scale: Not to Scale

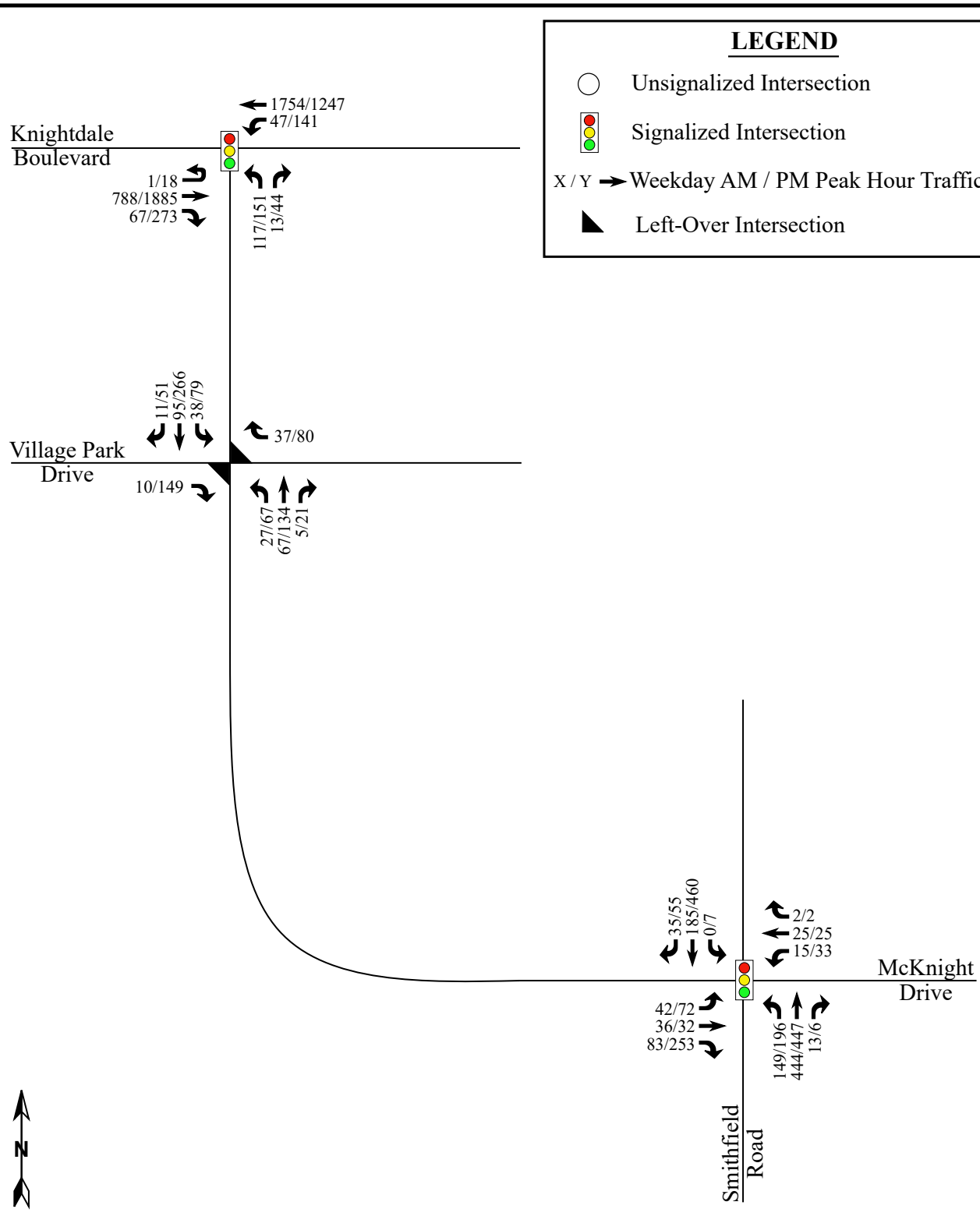
Figure 3

Existing (2018) Traffic Volumes

Existing peak hour traffic volumes were determined based on traffic counts conducted at the study intersections listed below, in October of 2018 by RKA during a typical weekday AM (7:00 AM – 9:00 AM) and PM (4:00 PM – 6:00 PM) peak period:

- McKnight Drive and Smithfield Road
- McKnight Drive and Village Park Drive
- McKnight Drive and Knightdale Boulevard

It should be noted that Wake County Public Schools were in session and operating on a typical schedule on the day of the data collection. A copy of the traffic count data can be found in Appendix C. Refer to Figure 4 for existing (2018) weekday AM and PM peak hour traffic volumes.



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The Lawson of Knightdale
Knightdale, NC

Existing (2018)
Peak Hour Traffic

Scale: Not to Scale

Figure 4

Background (2021) Traffic Volumes

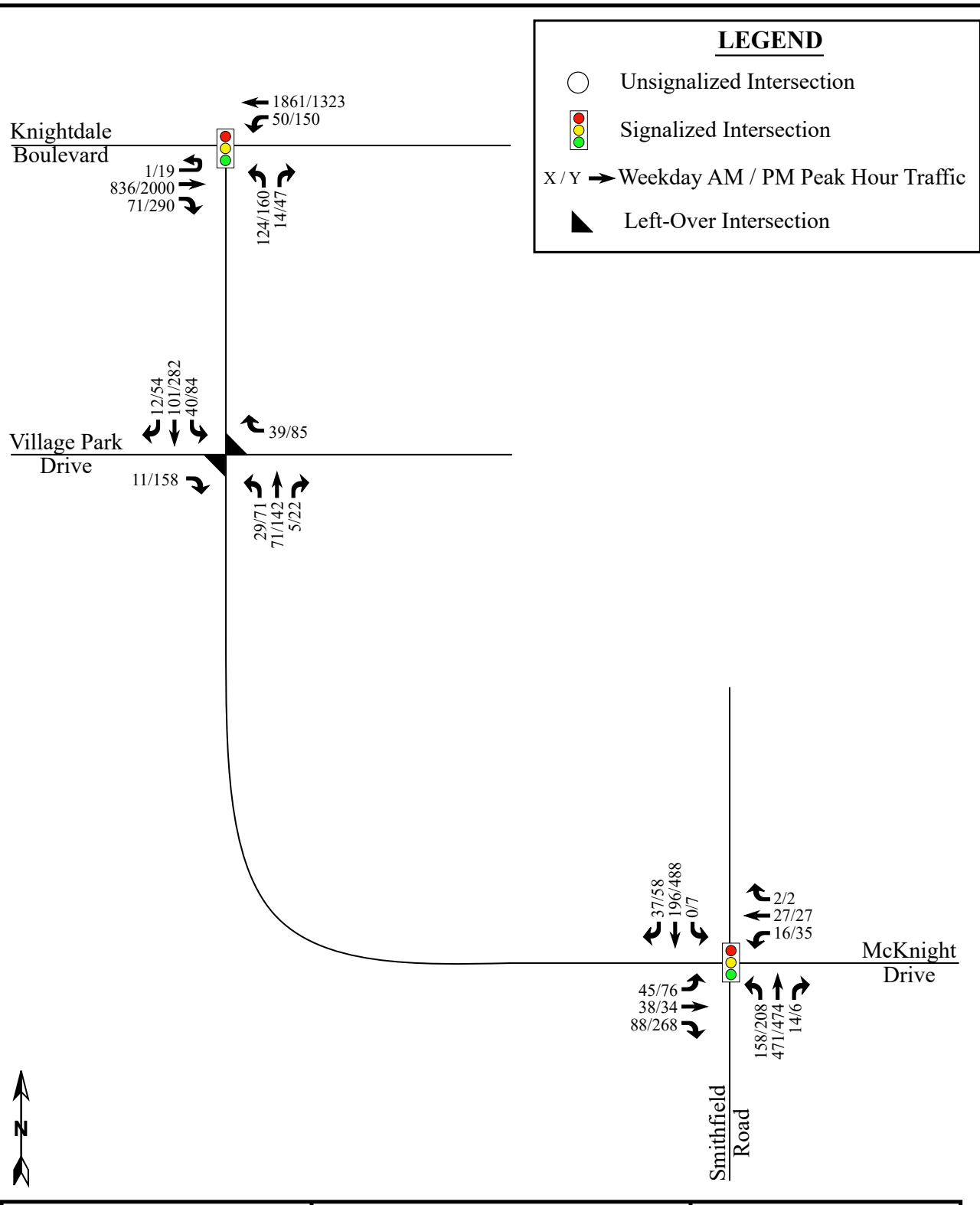
Based on coordination with the Town and NCDOT, it was determined that an annual growth rate of 2% would be applied to the existing (2018) peak hour traffic in order to generate the background (2021) peak hour traffic. Refer to Figure 5 for background (2021) weekday AM and PM peak hour traffic volumes.

Adjacent Developments

Through coordination with the Town and the NCDOT and after reviewing the Knightdale Interactive Project Map, it was determined that there were no adjacent developments to be included in this study.

Future Roadway Improvements

Through coordination with the Town and the NCDOT, it was determined that there are no future roadway improvements to be considered in this study area.



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Knightdale, NC

Background (2021)
Peak Hour Traffic

Scale: Not to Scale

Figure 5

Trip Generation

Average weekday AM and PM peak hour trips for the proposed development were estimated using methodology contained within the ITE *Trip Generation Manual*, 10th Edition. It should be noted that the retirement community was analyzed as LUC 221: Multi-Family (Mid-Rise), based on the description and anticipated operation of the site. This methodology presents a conservative analysis. Table 2 provides a summary of the trip generation potential for the site.

Table 2: Site Trip Generation Summary

Land Use (ITE Code)	Intensity	Daily Traffic (vpd)	AM Peak Hour Trips (vph)		PM Peak Hour Trips (vph)	
			Enter	Exit	Enter	Exit
Multifamily Housing (Mid-Rise) (221)	100 units	550	9	25	27	17
Medical-Dental Office Building (720)	9,000 s.f.	320	20	5	9	22
Total Trips		**870**	**29**	**30**	**36**	**39**

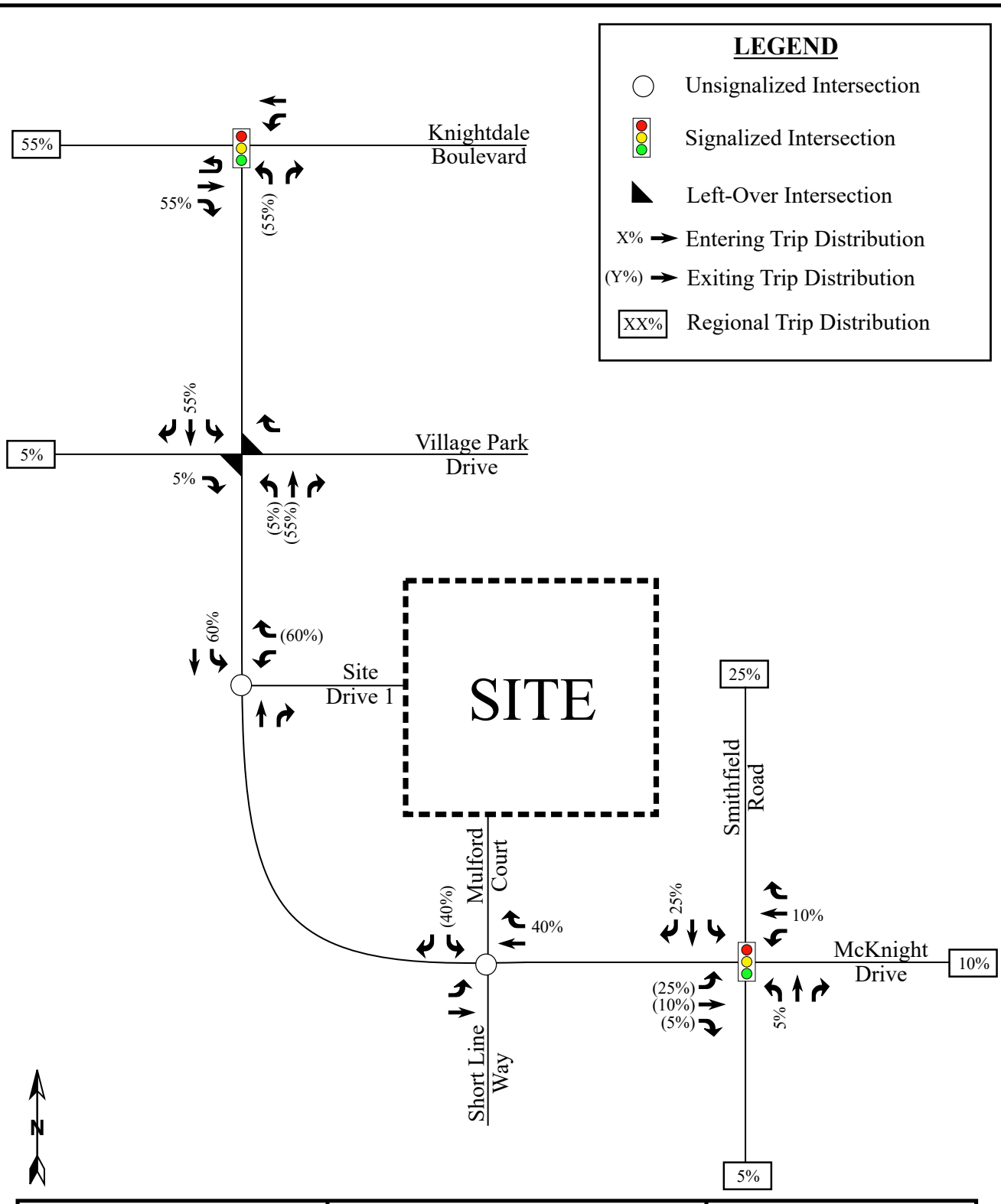
It is estimated at full build-out, the proposed development will generate approximately 870 total site trips on the roadway network during a typical 24-hour weekday period. Of the daily traffic volume, it is anticipated that 59 total trips (29 entering and 30 exiting) will occur during the weekday AM peak hour and 75 total trips (36 entering and 39 exiting) will occur during the weekday PM peak hour.

Trip Distribution and Assignment

Trip distribution percentages used in assigning site traffic for this development were estimated based on a combination of existing traffic patterns, population centers adjacent to the study area, and engineering judgment. It is estimated that trips will be distributed as follows:

- 55% to/from the west via Knightdale Boulevard
- 5% to/from the west via Village Park Drive
- 25% to/from the north via Smithfield Road
- 5% to/from the south via Smithfield Road
- 10% to/from the east via McKnight Drive

Refer to Figure 6 for the site trip distribution and Figure 7 for the site trip assignment.



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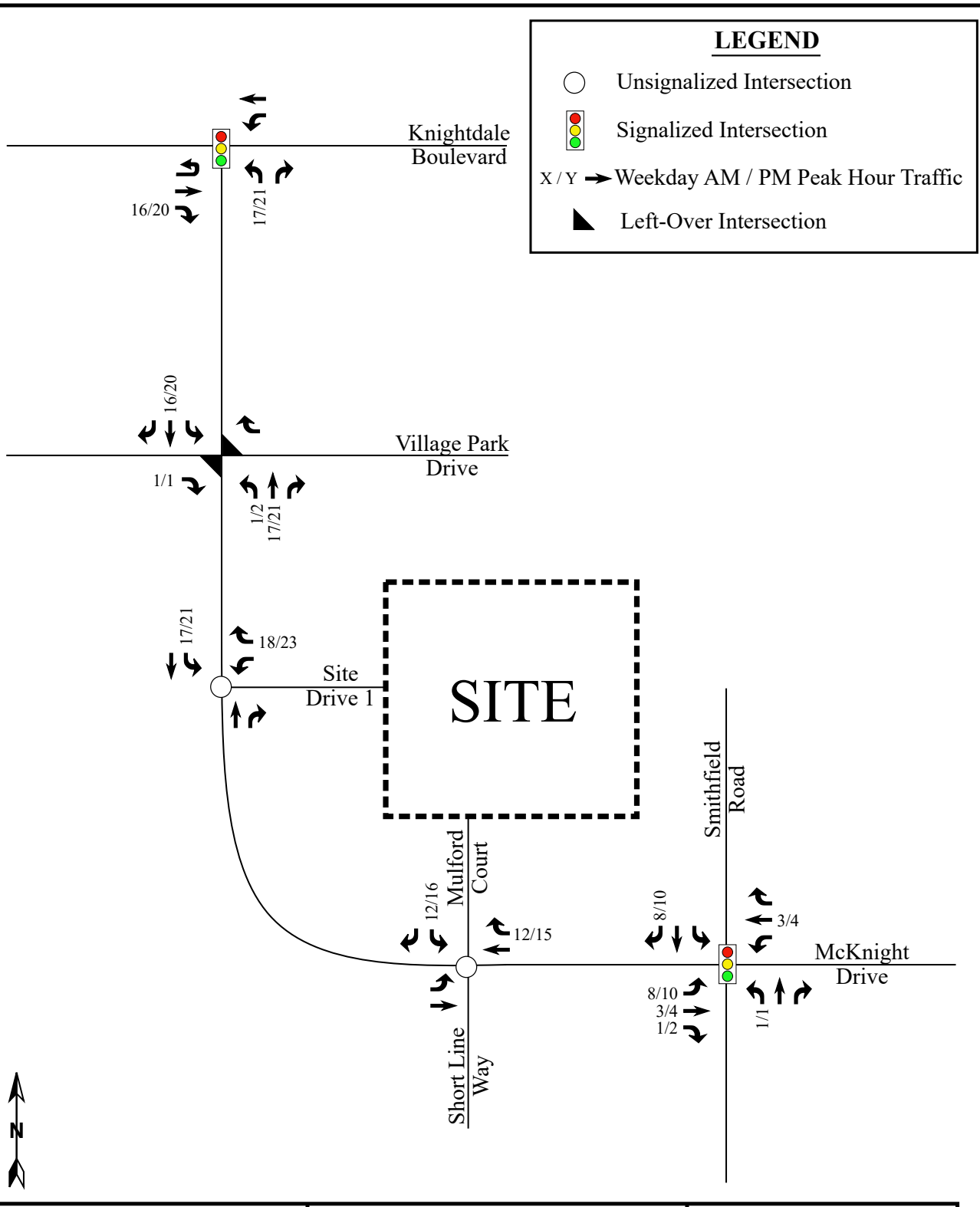
The Lawson of Knightdale
Knightdale, NC

Site Trip Distribution

Scale: Not to Scale

Figure 6



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Knightdale, NC

Primary Site Trip Assignment

Scale: Not to Scale

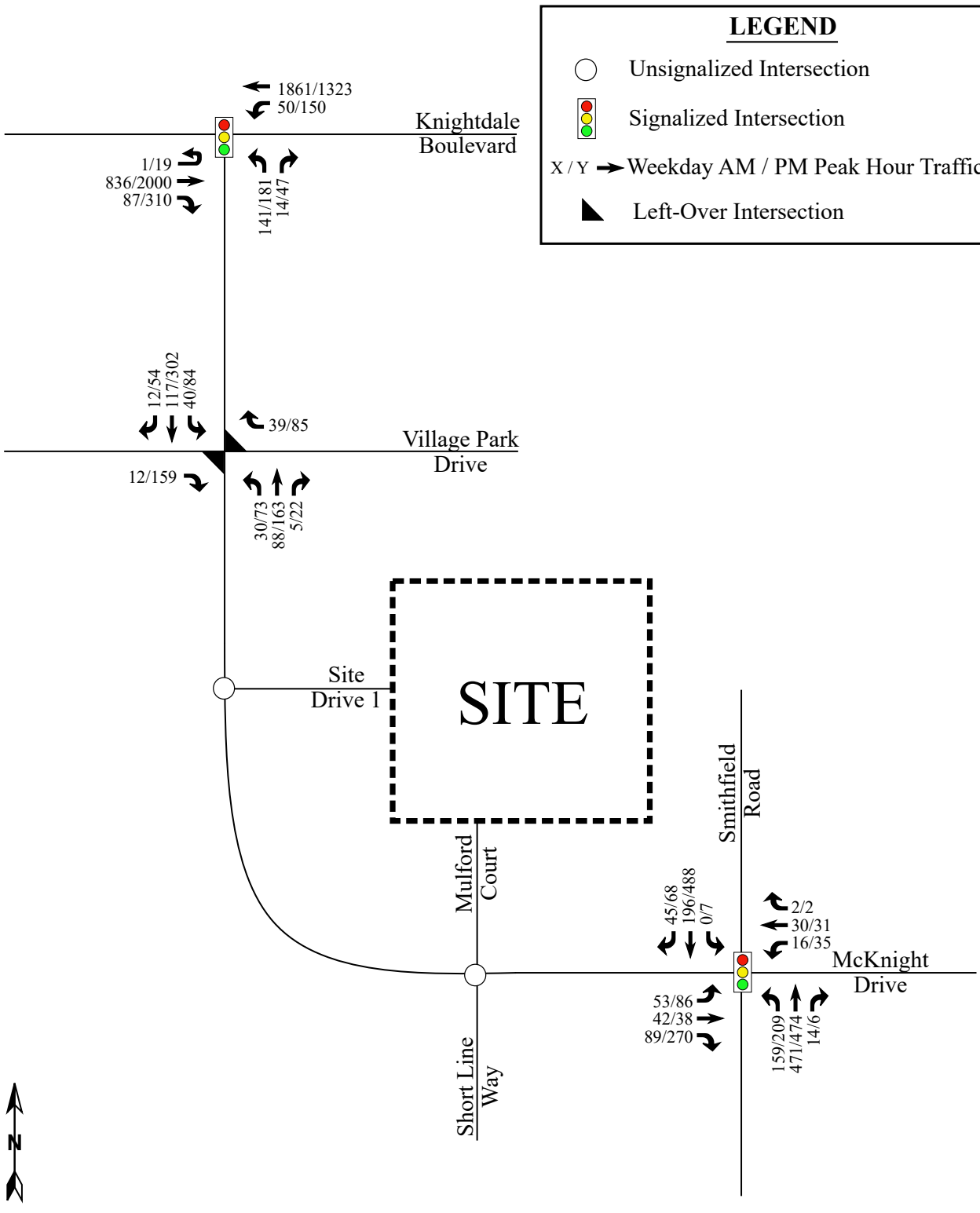
Figure 7

Combined (2021) Traffic Volumes

To estimate traffic conditions with the site fully built-out, the total site trips were added to the background (2021) traffic volumes to determine combined (2021) traffic volumes. Refer to Figure 8 for an illustration of the combined (2021) peak hour traffic volumes with the site fully developed.

Future (2031) Traffic Volumes

Future traffic conditions were determined by projecting the existing (2018) traffic volumes to the year 2031 and adding the total site trips. Refer to Figure 9 for an illustration of the future (2031) peak hour traffic volumes with the proposed site fully developed.



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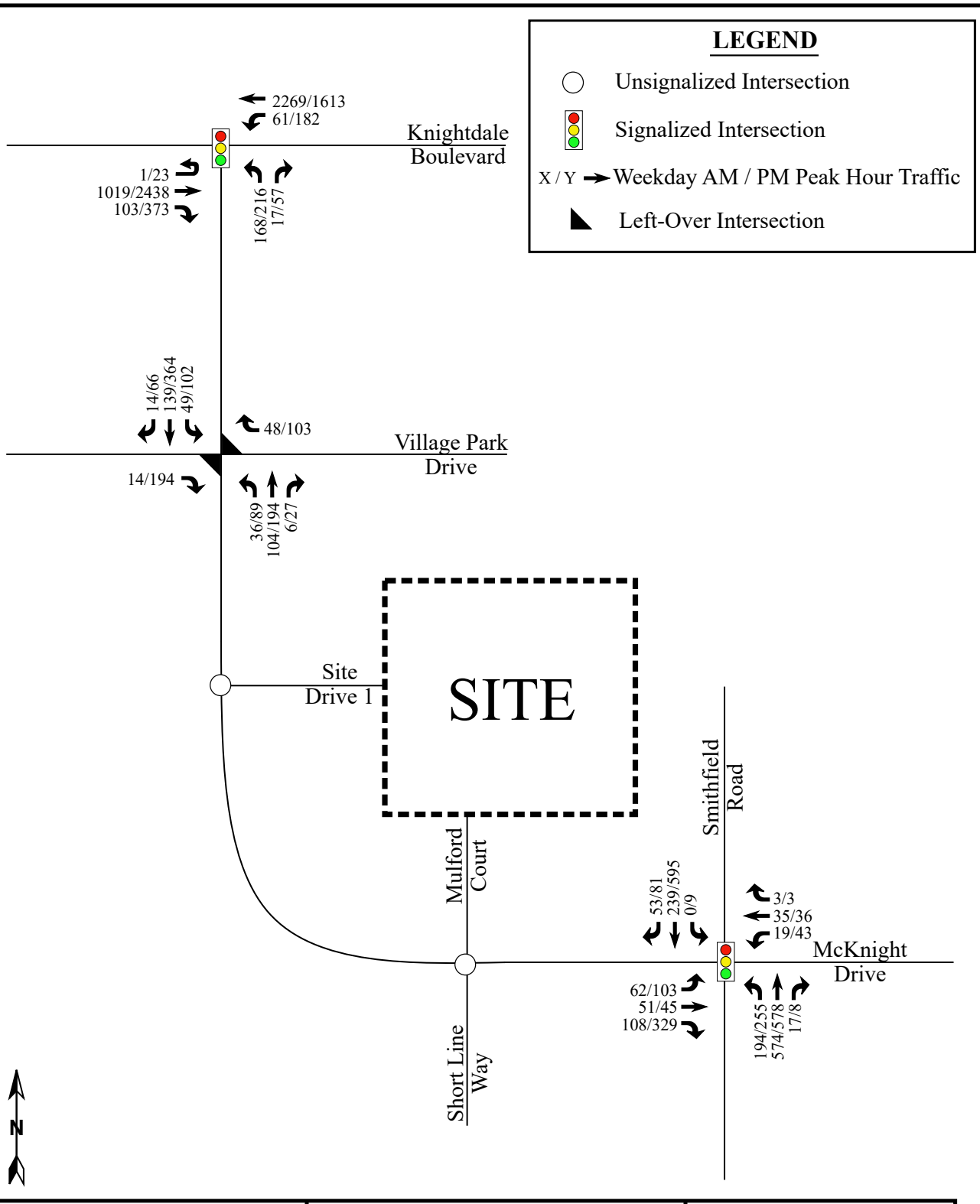
Combined (2021)
Peak Hour Traffic

Scale: Not to Scale

Figure 8



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Knightdale, NC

Future (2031)
Peak Hour Traffic

Scale: Not to Scale

Figure 9

Capacity Analysis

Study intersections were analyzed using the methodology outlined in the *2010 Highway Capacity Manual* (HCM) published by the Transportation Research Board. Capacity and level of service are the design criteria for this traffic study. A computer software package, Synchro (Version 9.2), was used to complete the analyses for most of the study area intersections. Please note that the unsignalized capacity analysis does not provide an overall level of service for an intersection; only delay for an approach with a conflicting movement.

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 Level "A" representing free flow, to Level "F" where breakdown conditions are evident. Refer to Table 3 for HCM levels of service and related average control delay per vehicle for both signalized and unsignalized intersections. Control delay as defined by the HCM includes "initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay". An average control delay of 50 seconds at a signalized intersection results in LOS "D" operation at the intersection.

Table 3: Highway Capacity Manual – Levels-of-Service and Delay

UNSIGNALIZED INTERSECTION		SIGNALIZED INTERSECTION	
LEVEL OF SERVICE	**AVERAGE CONTROL DELAY PER VEHICLE (SECONDS)**	**LEVEL OF SERVICE**	**AVERAGE CONTROL DELAY PER VEHICLE (SECONDS)**
A	0-10	A	0-10
B	10-15	B	10-20
C	15-25	C	20-35
D	25-35	D	35-55
E	35-50	E	55-80
F	>50	F	>80

Capacity analysis at all study intersections was completed according to the NCDOT Congestion Management Guidelines.

McKnight Drive and Smithfield Road

The existing signalized intersection of McKnight Drive and Smithfield Road was analyzed under existing (2018), background (2021), combined (2021), and future (2031) traffic conditions with existing lane configurations and traffic control. It should be noted that this intersection operates with signalized control as part of a coordinated signal system (US 64 CLS); however, through field reconnaissance by RKA, it was determined the intersection is currently operating under free-run timings. The intersection was analyzed as an actuated-uncoordinated signal because it is not expected to be coordinated with any other signals studied in this report. Refer to Table 4 for a summary of the capacity analysis results. The Synchro capacity analysis reports can be found in Appendix D.

Table 4: Analysis Summary of McKnight Drive and Smithfield Road

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Existing (2018) Conditions	EB WB NB SB	1 LT-TH, 1 RT 1 LT-TH, 1 RT 1 LT, 1 TH, 1 TH-RT 1 LT, 1 TH, 1 RT	C C A A	A (9)	C C A B	B (14)
Background (2021) Conditions	EB WB NB SB	1 LT-TH, 1 RT 1 LT-TH, 1 RT 1 LT, 1 TH, 1 TH-RT 1 LT, 1 TH, 1 RT	C C A A	A (10)	C C A B	B (15)
Combined (2021) Conditions	EB WB NB SB	1 LT-TH, 1 RT 1 LT-TH, 1 RT 1 LT, 1 TH, 1 TH-RT 1 LT, 1 TH, 1 RT	C C A A	B (10)	C C A B	B (16)
Future (2031) Conditions	EB WB NB SB	1 LT-TH, 1 RT 1 LT-TH, 1 RT 1 LT, 1 TH, 1 TH-RT 1 LT, 1 TH, 1 RT	C C A B	B (11)	C D A C	B (19)

Capacity analysis of existing (2018), background (2021), combined (2021), and future (2031) traffic conditions indicates the intersection of McKnight Drive and Smithfield Road is expected to operate at an overall LOS B or better during both weekday AM and PM peak hours.

McKnight Drive and Village Park Drive

The existing unsignalized intersection of McKnight Drive and Village Park Drive was analyzed under existing (2018), background (2021), combined (2021), and future (2031) traffic conditions with existing lane configurations and traffic control. Refer to Table 5 for a summary of the capacity analysis results. The Synchro capacity analysis reports can be found in Appendix E.

Table 5: Analysis Summary of McKnight Drive and Village Park Drive

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Existing (2018) Conditions	EB WB NB SB	1 RT 1 RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	A[2] A[2] A[1] A[1]	N/A	B[2] A[2] A[1] A[1]	N/A
Background (2021) Conditions	EB WB NB SB	1 RT 1 RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	A[2] A[2] A[1] A[1]	N/A	B[2] A[2] A[1] A[1]	N/A
Combined (2021) Conditions	EB WB NB SB	1 RT 1 RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	A[2] A[2] A[1] A[1]	N/A	B[2] A[2] A[1] A[1]	N/A
Future (2031) Conditions	EB WB NB SB	1 RT 1 RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	A[2] A[2] A[1] A[1]	N/A	B[2] B[2] A[1] A[1]	N/A

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

Capacity analysis of existing (2018), background (2021), combined (2021), and future (2031) traffic conditions indicates that all minor-street approaches and all major-street left-turn movements are expected to operate at LOS B or better during both weekday AM and PM peak hours.

McKnight Drive and Knightdale Boulevard

The existing signalized intersection of McKnight Drive and Knightdale Boulevard was analyzed under existing (2018), background (2021), combined (2021), background (2031), and future (2031) traffic conditions with existing lane configurations and traffic control. It should be noted that this intersection operates with signalized control as part of a coordinated signal system (US 64 Business Knightdale CLS) and the signal timing data was collected during field reconnaissance by RKA. Refer to Table 6 for a summary of the capacity analysis results. The Synchro capacity analysis reports can be found in Appendix F.

Table 6: Analysis Summary of McKnight Drive and Knightdale Boulevard

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Existing (2018) Conditions	EB WB NB	1 UT, 2 TH, 1 RT 1 LT, 2 TH 1 LT, 1 RT	B C D	C (23)	D B D	C (32)
Background (2021) Conditions	EB WB NB	1 UT, 2 TH, 1 RT 1 LT, 2 TH 1 LT, 1 RT	B C D	C (25)	E B D	D (43)
Combined (2021) Conditions	EB WB NB	1 UT, 2 TH, 1 RT 1 LT, 2 TH 1 LT, 1 RT	B C D	C (25)	E B D	D (43)
Future (2031) Conditions	EB WB NB	1 UT, 2 TH, 1 RT 1 LT, 2 TH 1 LT, 1 RT	B E D	D (52)	F C E	F (98)

Capacity analysis of existing (2018), background (2021), and combined (2021) traffic conditions indicates that the intersection of McKnight Drive and Knightdale Boulevard is expected to operate at an overall LOS D or better during both weekday AM and PM peak hours. Under future (2031) traffic conditions, the intersection is expected to operate at an overall LOS D during the weekday AM peak hour and an overall LOS F during the weekday PM peak hour.

It should be noted that the overall delay does not increase at this intersection between the background (2021) and combined (2021) traffic conditions during the weekday AM and PM peak hours. The overall LOS F in the future (2031) weekday PM peak hour is due to background growth expected in the next 13 years and is not due to the traffic from the proposed development.

Conclusions

This traffic study was conducted to determine the potential traffic impacts for the proposed 100-unit retirement community and 9,000 s.f. medical parcel to be located along McKnight Drive, west of Smithfield Road in Knightdale, North Carolina.

It is estimated at full build-out, the proposed development will generate approximately 870 total site trips on the roadway network during a typical 24-hour weekday period. Of the daily traffic volume, it is anticipated that 59 total trips (29 entering and 30 exiting) will occur during the weekday AM peak hour and 75 total trips (36 entering and 39 exiting) will occur during the weekday PM peak hour.

This study analyzed the traffic conditions during the weekday AM and PM peak hour for the following scenarios:

- Existing (2018) Traffic Conditions
- Background (2021) Traffic Conditions
- Combined (2021) Traffic Conditions
- Future (2031) Traffic Conditions

Based on the analysis results of this study, traffic expected to be generated by the proposed development is not anticipated to cause significant negative impacts on the surrounding roadway network. Due to the negligible impacts, no roadway improvements are recommended for this site.

If you should have any questions, please feel free to contact me at (919) 872-5115.

Sincerely,

Joshua Reinke, P.E.
Transportation Manager
RAMEY KEMP & ASSOCIATES, INC.
NC Corporate License # C-0910

Attachments: Appendix

cc: Scott Wheeler, NCDOT