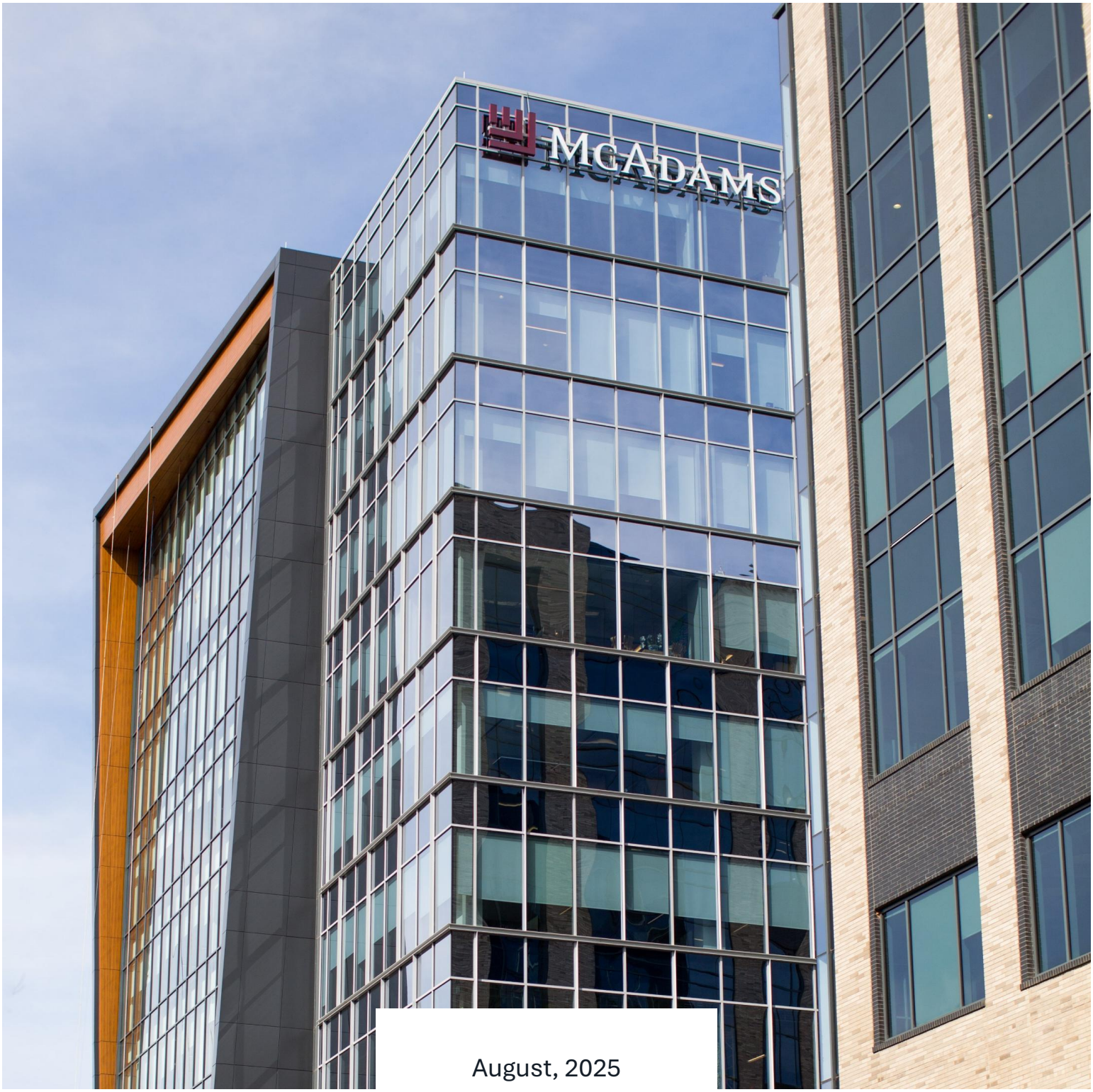


August, 2025

Boulder Ridge Mixed-Use

Traffic Impact Analysis, Knightdale, North Carolina

McADAMS

Boulder Ridge Mixed-Use

Knightdale, North Carolina

Traffic Impact Analysis

NC Lic. # C-0293

Digitally signed by Nate Bouquin
Date: 2025.08.22 13:05:28 -04'00'

Project Number:	DSV23003	Date:	August 2025
Prepared By:	Emerson Walston	Reviewed By:	Nate Bouquin, PE, PTOE

Executive Summary

The proposed residential and retail mixed-use development will be located north of Old Faison Road and east of Hodge Road in Knightdale, North Carolina. Site access will be served via two (2) full movement driveways on Old Faison Road and one (1) right-in/right-out driveway on Old Faison Road. The site is currently undeveloped and is expected to consist of a maximum of 564 mid-rise multifamily housing units and 57,500 sq. ft. of retail space at full buildout. The proposed site is expected to be phased with Phase 1 expected to be completed in 2028, Phase 2 expected to be completed in 2030, and Phase 3 of the development expected to be completed by 2032; however future year analysis is based on Build+1 (2029, 2031, 2033) and Build+10 (2042) conditions per Town of Knightdale (Town) Traffic Impact Analysis (TIA) requirements. The purpose of this TIA is to determine the potential traffic impacts of this development and to identify transportation improvements that may be required to mitigate the impacts on the roadway network.

A Memorandum of Understanding (MOU) was reviewed and approved by the North Carolina Department of Transportation (NCDOT) and the Town, outlining the TIA scope and assumptions. The MOU and approval correspondence is provided in the appendix of this study. Based on the approved scoping, the following intersections are included in this TIA study area:

- US 64 Business (Knightdale Boulevard) and Hodge Road
- Hodge Road and Mingo Bluff Boulevard
- Hodge Road and Old Faison Road / I-87 Westbound Ramps
- Hodge Road and I-87 Eastbound Ramps
- Bethlehem Road and Old Faison Road
- Old Faison Road and Site Access #1 (*Proposed*)
- Old Faison Road and Site Access #2 (*Proposed*)
- Old Faison Road and Site Access #3 (*Proposed*)

To determine the traffic impacts of the proposed development, the following analysis scenarios are included in this study:

- Existing (2025) Traffic Conditions
- No-Build (2029) Traffic Conditions – Phase 1
- Build (2029) Traffic Conditions – Phase 1
- No-Build (2031) Traffic Conditions – Phase 2
- Build (2031) Traffic Conditions – Phase 2
- No-Build (2033) Traffic Conditions – Phase 3
- Build (2033) Traffic Conditions – Phase 3
- No-Build (2042) Traffic Conditions
- Build (2042) Traffic Conditions

Peak hour traffic counts were conducted at the existing study intersections in May 2025 and balanced between study intersections, as appropriate to determine Existing (2025) traffic volumes.

To account for background development growth, a 3% annual growth rate was applied to the existing traffic volumes to determine Projected (2029), Projected (2031), Projected (2033), and Projected (2042) traffic volumes. Adjacent development traffic from seven (7) approved nearby developments were also applied to determine the No-Build (2029), No-Build (2031), No-Build (2033), and No-Build (2042) traffic volumes. These adjacent developments were:

- Lyndon Oaks
- Creekview Crossing
- Legacy Oaks PUD
- StoneRiver
- SilverStone
- Riverview Commons
- River Pointe

Based on the Institute for Transportation Engineers (ITE) *Trip Generation Manual*, 11th Edition, and the suggested method of trip calculations provided in NCDOT's *Rate vs. Equation spreadsheet* trips for the proposed development were calculated for weekday daily, weekday AM peak hour, and weekday PM peak hour. A summary of this trip generation is provided in Table ES-1.

TABLE ES-1: TRIP GENERATION

Land Use (ITE Code)	Density	Calculation Methodology	Daily Trips	AM Peak Hour			PM Peak Hour		
				Enter	Exit	Total	Enter	Exit	Total
Phase 1									
Mid-Rise Multifamily Housing (221)	188 units	Adjacent / Equation	850	16	55	71	45	29	74
Phase 2									
Mid-Rise Multifamily Housing (221)	376 units	Adjacent / Equation	1,747	35	119	154	90	57	147
Strip Retail Plaza (822)	6.5 KSF	Adjacent / Rate	354	9	6	15	21	22	43
Phase 1 + 2 Total Trips			**2,951**	**60**	**180**	**240**	**156**	**108**	**264**
Phase 3									
Shopping plaza (821)[1]	51 KSF	Generator / Equation	5,338	112*	68*	180*	245	265	510
Full Buildout Total Trips			**8,289**	**172**	**248**	**420**	**401**	**373**	**774**
Internal Capture (1% AM, 19% PM)			--	*-3*	*-3*	*-6*	*-74*	*-74*	*-148*
Total			**8,289**	**169**	**245**	**414**	**327**	**299**	**626**
Pass-By Trips (LUC 821: 31% AM, 40% PM)			--	*-27*	*-27*	*-54*	*-88*	*-88*	*176*
			8,289	**142**	**218**	**360**	**239**	**211**	**450**

*Rate was used as the calculation methodology due to limited ITE data.

1. The trip generation for LUC 821 utilizes the "supermarket" subcategory.

The peak hour site traffic was distributed throughout the network according to the site trip distribution approved by NCDOT and Town staff within the MOU. This site traffic was added onto the No-Build (2029), No-Build (2031), No-Build (2033), and

No-Build (2042) traffic volumes to determine the Build (2029), Build (2031), Build (2033), and Build (2042) traffic volumes, respectively, for the capacity analysis.

Capacity analysis was conducted at all study intersections according to NCDOT and Town guidelines utilizing the methodology contained in the *Highway Capacity Manual*, 6th Edition, published by the Transportation Research Board. Refer to Table ES-2 for a summary of the capacity analysis results.

TABLE ES-2: CAPACITY ANALYSIS SUMMARY

Intersection	Conditions	APPROACH	Weekday AM Peak Hour		Weekday PM Peak Hour	
			LOS and Approach Delay (seconds)	Overall Delay (seconds)	LOS and Approach Delay (seconds)	Overall Delay (seconds)
US 64 Business (Knightdale Boulevard) and Hodge Road	Existing (2025)	EB WB NB SB	C (28) C (26) D (40) D (39)	C (30)	D (41) C (28) E (63) D (50)	D (38)
	No-Build (2029)	EB WB NB SB	E (78) F (86) F (100) D (53)	F (82)	F (210) F (601) C (33) E (74)	F (345)
	Build (2029)	EB WB NB SB	E (78) F (88) F (106) D (53)	F (84)	F (210) F (606) C (33) E (74)	F (346)
	No-Build (2031)	EB WB NB SB	F (91) F (92) F (111) D (54)	F (91)	F (240) F (641) C (33) E (77)	F (374)
	Build (2031)	EB WB NB SB	F (90) F (96) F (134) D (54)	F (97)	F (239) F (662) C (34) E (77)	F (381)
	No-Build (2033)	EB WB NB SB	F (107) F (100) F (122) D (54)	F (100)	F (271) F (682) C (33) F (82)	F (405)
	Build (2033)	EB WB NB SB	F (106) F (104) F (149) D (54)	F (107)	F (270) F (705) D (36) F (82)	F (411)
	Build (2033) – Improved Signal Phasing	EB WB NB SB	D (35) D (37) E (59) D (53)	D (42)	E (55) D (46) F (117) F (83)	E (60)

TABLE ES-2: CAPACITY ANALYSIS SUMMARY (CONT)

Intersection	Conditions	APPROACH	Weekday AM Peak Hour		Weekday PM Peak Hour	
			LOS and Approach Delay (seconds)	Overall Delay (seconds)	LOS and Approach Delay (seconds)	Overall Delay (seconds)
US 64 Business (Knightdale Boulevard) and Hodge Road	No-Build (2042)	EB WB NB SB	F (131) F (109) F (138) E (74)	F (116)	F (313) F (736) C (34) F (87)	F (445)
	Build (2042)	EB WB NB SB	F (130) F (113) F (165) E (74)	F (122)	F (312) F (759) D (37) F (87)	F (452)
Hodge Road and Mingo Bluff Boulevard	Existing (2025)	WB[2] NB SB[1]	D (30) -- A (9)	N/A	C (23) -- A (9)	N/A
	No-Build (2029)	WB[2] NB SB[1]	F (136) -- A (9)	N/A	F (59) -- A (10)	N/A
	Build (2029)	WB[2] NB SB[1]	F (144) -- A (10)	N/A	F (62) -- A (10)	N/A
	No-Build (2031)	WB[2] NB SB[1]	F (186) -- A (10)	N/A	F (85) -- B (10)	N/A
	Build (2031)	WB[2] NB SB[1]	F (222) -- A (10)	N/A	F (100) -- B (10)	N/A
	No-Build (2033)	WB[2] NB SB[1]	F (256) -- A (10)	N/A	F (123) -- B (10)	N/A
	Build (2033)	WB[2] NB SB[1]	F (325) -- B (10)	N/A	F (202) -- B (11)	N/A
	No-Build (2042)	WB[2] NB SB[1]	F (358) -- B (10)	N/A	F (189) -- B (11)	N/A
	Build (2042)	WB[2] NB SB[1]	F (443) -- B (10)	N/A	F (295) -- B (11)	N/A

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

TABLE ES-2: CAPACITY ANALYSIS SUMMARY (CONT)

Intersection	Conditions	APPROACH	Weekday AM Peak Hour		Weekday PM Peak Hour	
			LOS and Approach Delay (seconds)	Overall Delay (seconds)	LOS and Approach Delay (seconds)	Overall Delay (seconds)
Hodge Road and Old Faison Road / I-87 Westbound Ramps	Existing (2025)	EB WB NB SB	C (20) D (55) B (15) B (12)	C (24)	D (42) E (60) B (10) B (11)	C (24)
	No-Build (2029)	EB WB NB SB	C (25) D (49) B (13) B (13)	C (23)	C (31) C (31) B (17) C (23)	C (24)
	Build (2029)	EB WB NB SB	C (24) D (49) B (13) B (13)	C (24)	C (24) C (28) C (25) C (29)	C (26)
	No-Build (2031)	EB WB NB SB	C (24) D (51) B (13) B (14)	C (24)	C (32) C (31) B (20) C (24)	C (25)
	Build (2031)	EB WB NB SB	C (20) D (47) B (16) B (16)	C (26)	C (27) C (30) C (28) C (31)	C (29)
	No-Build (2033)	EB WB NB SB	C (22) D (52) B (14) B (15)	C (25)	C (31) C (31) C (24) C (27)	C (27)
	Build (2033)	EB WB NB SB	C (20) D (51) B (18) B (19)	C (28)	D (51) D (45) C (28) C (28)	D (36)
	No-Build (2042)	EB WB NB SB	C (21) D (55) B (17) B (18)	C (27)	C (31) C (31) C (30) C (32)	C (31)
	Build (2042)	EB WB NB SB	C (25) E (62) B (20) C (21)	C (33)	E (77) D (52) C (30) C (31)	D (45)

TABLE ES-2: CAPACITY ANALYSIS SUMMARY (CONT)

Intersection	Conditions	APPROACH	Weekday AM Peak Hour		Weekday PM Peak Hour	
			LOS and Approach Delay (seconds)	Overall Delay (seconds)	LOS and Approach Delay (seconds)	Overall Delay (seconds)
Hodge Road and I-87 Eastbound Ramps	Existing (2025)	EB NB SB	C (25) A (4) A (4)	A (7)	C (32) A (7) B (11)	B (17)
	No-Build (2029)	EB NB SB	C (27) B (13) B (16)	B (16)	C (32) C (22) C (26)	C (27)
	Build (2029)	EB NB SB	C (27) C (27) A (10)	C (22)	C (31) C (31) C (21)	C (28)
	No-Build (2031)	EB NB SB	C (27) B (15) B (18)	B (18)	C (32) C (26) C (28)	C (29)
	Build (2031)	EB NB SB	C (30) B (17) B (19)	B (20)	D (37) C (29) C (28)	C (31)
	No-Build (2033)	EB NB SB	C (27) B (18) B (19)	B (20)	C (34) C (31) C (30)	C (32)
	Build (2033)	EB NB SB	C (33) C (20) C (23)	C (23)	D (43) C (31) D (40)	D (38)
	No-Build (2042)	EB NB SB	C (28) C (22) C (21)	C (23)	D (35) C (32) C (34)	C (34)
	Build (2042)	EB NB SB	C (34) C (24) C (26)	C (26)	E (57) C (32) D (46)	D (45)

TABLE ES-2: CAPACITY ANALYSIS SUMMARY (CONT)

Intersection	Conditions	APPROACH	Weekday AM Peak Hour		Weekday PM Peak Hour	
			LOS and Approach Delay (seconds)	Overall Delay (seconds)	LOS and Approach Delay (seconds)	Overall Delay (seconds)
Bethlehem Road and Old Faison Road	Existing (2025)	EB[2] NB[1] SB	C (20) A (8) --	N/A	E (46) A (9) --	N/A
	No-Build (2029)	EB NB SB	C (23) B (12) C (22)	B (18)	C (25) B (14) C (26)	C (22)
	Build (2029)	EB NB SB	C (23) B (12) C (23)	B (18)	C (25) B (14) C (26)	C (22)
	No-Build (2031)	EB NB SB	C (24) B (12) C (23)	B (19)	C (26) B (15) C (27)	C (23)
	Build (2031)	EB NB SB	C (24) B (13) C (24)	B (19)	C (26) B (15) C (28)	C (24)
	No-Build (2033)	EB NB SB	C (24) B (13) C (24)	B (19)	C (27) B (16) C (28)	C (24)
	Build (2033)	EB NB SB	C (27) B (14) C (26)	C (21)	C (31) B (19) C (34)	C (29)
	No-Build (2042)	EB NB SB	C (26) B (13) C (25)	C (20)	C (28) B (17) C (30)	C (26)
	Build (2042)	EB NB SB	C (28) B (15) C (27)	C (22)	C (33) C (20) D (36)	C (30)

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

TABLE ES-2: CAPACITY ANALYSIS SUMMARY (CONT)

Intersection	Conditions	APPROACH	Weekday AM Peak Hour		Weekday PM Peak Hour	
			LOS and Approach Delay (seconds)	Overall Delay (seconds)	LOS and Approach Delay (seconds)	Overall Delay (seconds)
Old Faison Road and Site Access #1	Build (2029)	EB[1] WB SB[2]	A (9) -- C (15)	N/A	A (8) -- B (14)	N/A
	Build (2031)	EB[1] WB SB[2]	A (9) -- C (22)	N/A	A (9) -- C (16)	N/A
	Build (2033)	EB[1] WB SB[2]	A (10) -- D (29)	N/A	B (10) -- D (26)	N/A
	Build (2042)	EB[1] WB SB[2]	B (10) -- D (32)	N/A	B (10) -- D (28)	N/A
Old Faison Road and Site Access #2	Build (2033)	EB WB SB[2]	-- -- C (16)	N/A	-- -- C (16)	N/A
	Build (2042)	EB WB SB[2]	-- -- C (17)	N/A	-- -- C (16)	N/A
Old Faison Road and Site Access #3	Build (2031)	EB[1] WB SB[2]	A (9) -- C (16)	N/A	A (8) -- C (18)	N/A
	Build (2033) - Signalized	EB WB SB	B (12) B (16) D (38)	B (16)	B (12) C (27) D (36)	B (19)
	Build (2042) - Signalized	EB WB SB	B (13) B (16) D (41)	B (16)	B (12) C (27) D (38)	B (19)

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

Based on review of adjacent development and background information provided by NCDOT and the Town, the following improvements are expected to be constructed by **others** and were included in the future year analyses:

Hodge Road and Old Faison Road / I-87 Westbound Ramps

- Extend the existing eastbound shared left-through lane on I-87 Westbound Ramps to a minimum of 275 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks
- Construct an exclusive westbound left-turn lane on Old Faison Road with a minimum of 125 feet of full width storage and appropriate deceleration and taper. – StoneRiver and SilverStone
- Construct an exclusive westbound right-turn lane on Old Faison Road with a minimum of 100 feet of full width storage and appropriate deceleration and taper. – STIP W-5705AK
- Extend the westbound left-turn lane on Old Faison Road to a minimum of 175 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks
- Construct an exclusive northbound right-turn lane on Hodge Road with a minimum of 200 feet of full width storage and appropriate deceleration and taper. – StoneRiver and SilverStone
- Extend the existing northbound right-turn lane on Hodge Road to the maximum amount of full width storage and appropriate deceleration and taper prior to the start of the bridge over I-87. – Lyndon Oaks
- Extend the existing southbound left-turn lane on Hodge Road to a minimum of 275 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks

Hodge Road and I-87 Eastbound Ramps

- Construct an exclusive eastbound right-turn lane on I-87 Eastbound Ramps with a minimum of 150 feet of full width storage and appropriate deceleration and taper. – StoneRiver and SilverStone
- Restripe the existing exclusive southbound right-turn lane on Hodge Road to that of a shared through-right lane. – StoneRiver and SilverStone

Bethlehem Road and Old Faison Road

- Construct an exclusive southbound right-turn lane on Bethlehem Road with a minimum of 250 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks
- Construct an exclusive northbound left-turn lane on Bethlehem Road with a minimum of 175 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks
- Construct an exclusive eastbound left-turn lane on Old Faison Road with a minimum of 250 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks
- Install a signal once warranted and approved by NCDOT. – Lyndon Oaks

Based on the findings in the TIA, the improvements below have been recommended to be constructed by the **developer** to mitigate traffic impacts by the proposed development:

Old Faison Road and Site Access #1

- Constructed Site Access #1 as the southbound approach with one (1) ingress lane and one (1) egress lane. – Phase 1
- Provide stop control on the southbound approach of the proposed site driveway. – Phase 1
- Construct an exclusive eastbound left-turn lane on Old Faison Road with a minimum of 100 feet of full width storage and appropriate deceleration and taper. – Phase 1

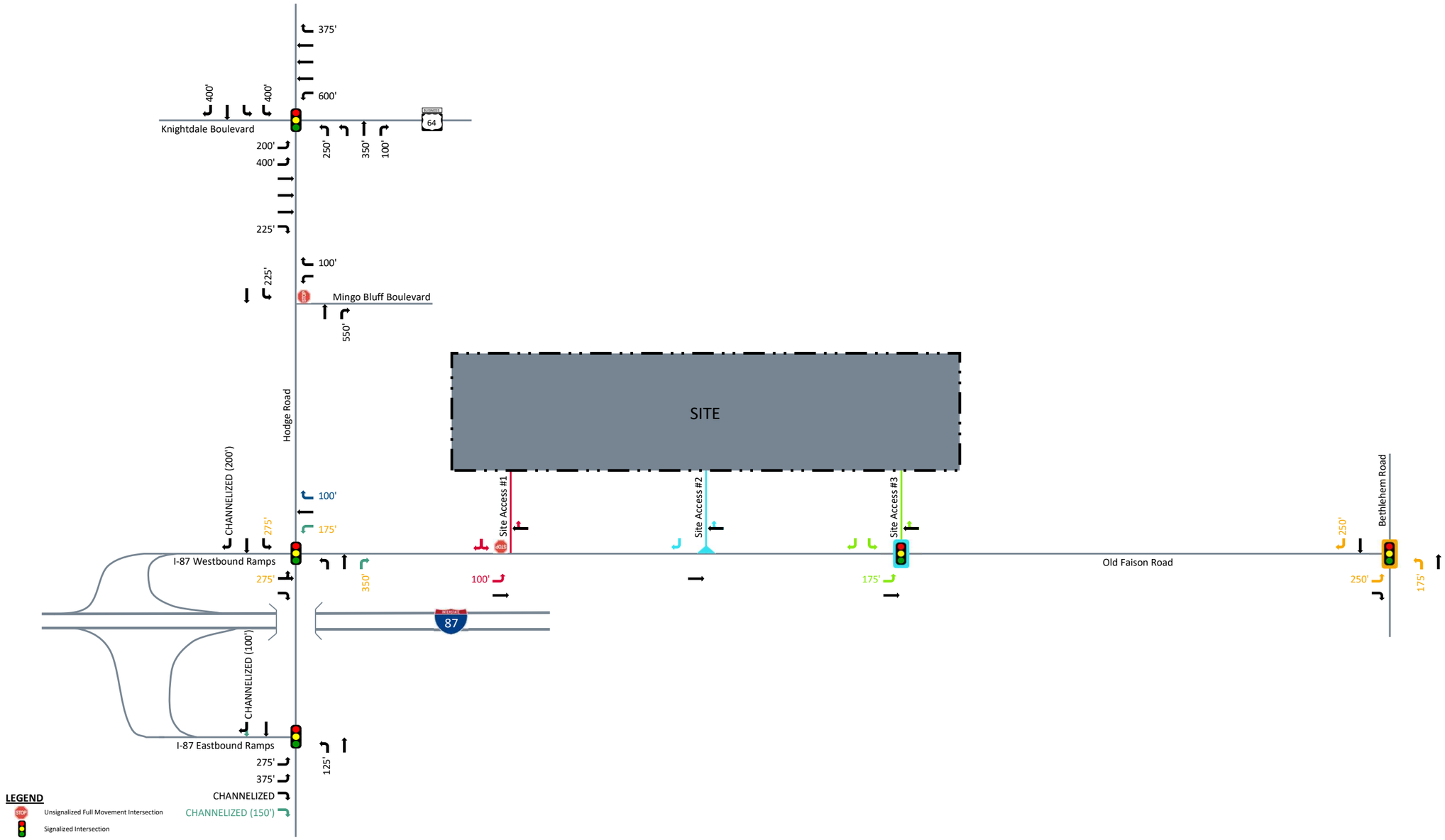
Old Faison Road and Site Access #2

- Constructed Site Access #2 as the southbound approach with one (1) ingress lane and one (1) egress lane striped as a right-turn only. – Phase 3

Old Faison Road and Site Access #3

- Constructed Site Access #3 as the southbound approach with one (1) ingress lane and two (2) egress lanes striped as a left and right-turn lane. – Phase 2
- Provide stop control on the southbound approach of the proposed site driveway. – Phase 2
- Construct an exclusive eastbound left-turn lane on Old Faison Road with a minimum of 175 feet of full width storage and appropriate deceleration and taper. – Phase 2
- Install a signal once warranted and approved by NCDOT. – Phase 3

Figure ES-1, on the following page, provides a graphical representation of recommended improvements at the study intersections.



Boulder Ridge Mixed-Use

Knightdale, NC

Recommended Lane Configurations

Scale: Not to Scale | Figure ES-1

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Traffic Impact Analysis

Boulder Ridge Mixed-Use
Knightdale, North Carolina

INTRODUCTION

The proposed residential and retail mixed-use development will be located north of Old Faison Road and east of Hodge Road in Knightdale, North Carolina. Site access will be served via two (2) full movement driveways on Old Faison Road and one (1) right-in/right-out driveway on Old Faison Road. The purpose of this Traffic Impact Analysis (TIA) is to determine the potential traffic impacts of this development and to identify transportation improvements that may be required to mitigate the impacts on the roadway network. The site is currently undeveloped and is expected to consist of the following land uses at full buildout:

- Phase 1
  - 188 mid-rise multifamily housing units
- Phase 2
  - 376 mid-rise multifamily housing units
  - 6,500 square feet (sq. ft.) of retail space
- Phase 3
  - 51,000 sq. ft. of retail space

The proposed site is expected to be phased with Phase 1 expected to be completed in 2028, Phase 2 expected to be completed in 2030, and Phase 3 (Full Buildout) of the development expected to be completed by 2032; however future year analysis is based on Build+1 (2029, 2031, 2033) and Build+10 (2042) conditions per Town of Knightdale (Town) TIA requirements. A Memorandum of Understanding (MOU) was reviewed and approved by the North Carolina Department of Transportation (NCDOT) and the Town, outlining the TIA scope and assumptions. The MOU and approval correspondence is provided in Appendix A. Based on the approved scoping; the following intersections are included in this TIA study area:

- US 64 Business (Knightdale Boulevard) and Hodge Road
- Hodge Road and Mingo Bluff Boulevard
- Hodge Road and Old Faison Road / I-87 Westbound Ramps
- Hodge Road and I-87 Eastbound Ramps
- Bethlehem Road and Old Faison Road
- Old Faison Road and Site Access #1 (*Proposed*)
- Old Faison Road and Site Access #2 (*Proposed*)
- Old Faison Road and Site Access #3 (*Proposed*)

Refer to Figure 1 for a map of the study area. Figure 2 provides the most up to date preliminary site plan available at time of preparation of this study.

To determine the traffic impacts of the proposed development, the following analysis scenarios are included in this study:

- Existing (2025) Traffic Conditions
- No-Build (2029) Traffic Conditions – Phase 1
- Build (2029) Traffic Conditions – Phase 1
- No-Build (2031) Traffic Conditions – Phase 2
- Build (2031) Traffic Conditions – Phase 2
- No-Build (2033) Traffic Conditions – Phase 3
- Build (2033) Traffic Conditions – Phase 3
- No-Build (2042) Traffic Conditions
- Build (2042) Traffic Conditions

LEGEND

- Existing Study Intersection
- Site Access
- Site Location

Boulder Ridge Mixed-Use

Knightdale, NC

Site Location Map

Scale: Not to Scale | Figure 1

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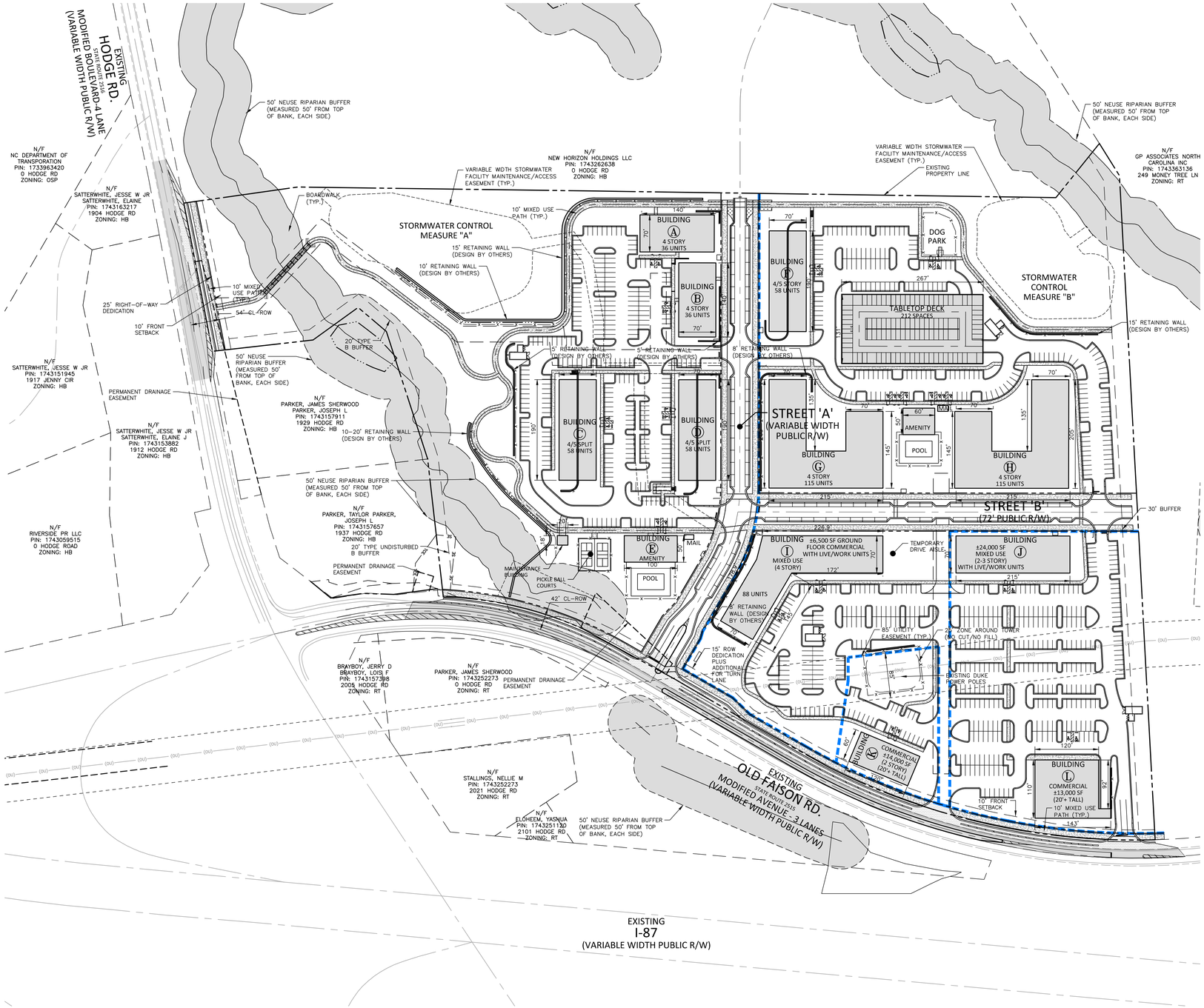

SITE LEGEND

- SIGNAGE
- YARD LIGHTS
- LIGHT POLE
- POWER POLE
- TRAFFIC DIRECTIONAL ARROW
- ACC / VAN — ACCESSIBLE PARKING STALL
- VAN ACCESSIBLE PARKING STALL
- (XX) — PARKING SPACE COUNT
- ACCESSIBLE RAMPS (TYPE A, TYPE B, TYPE C)
- 10' MIXED USE PATH
- ACCESSIBLE ROUTE
- PHASE LINE
- PROPERTY LINE
- RIGHT-OF-WAY LINE
- LOT LINE
- EASEMENT LINE
- CENTERLINE
- PHASE LINE
- HEAVY DUTY ASPHALT PAVEMENT
- STREAM BUFFER (50')
- POTENTIAL WETLANDS

ROAD WIDENING LEGEND

- NEW FULL DEPTH PAVEMENT
- MILLING LIMITS

NOTE: SECTION OF ROAD WITHIN EXISTING EDGE OF PAVEMENTS TO BE OVERLAID.

PHASE	BUILDING	UNITS	RATIO	PARKING	TOTAL
	Street	–	–	87	87
1	A	36	1.40	51	266
	B	36		51	
	C	58		82	
	D	58		82	
2	F	58	1.40	83	509
	G	115		161	
	H	115		161	
2/3	I	88	1.18	104	104
	Future I	–	1.40	19	19
3	I	6500	1/200	33	288
	J	24000		120	
	K	14000		70	
	L	13000		65	
TOTAL PARKING ON SITE					1169
TOTAL PARKING IN DECK					212

GRAPHIC SCALE
0 50 100 200
1 inch = 100 ft.

PRELIMINARY DRAWING - NOT RELEASED FOR CONSTRUCTION

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WHITE PLAINS, NY 10604
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BOULDER RIDGE MIXED USE

PRICING SET

0 HODGE ROAD

KNIGHTDALE, NC 27545

REVISIONS

NO. DATE

PLAN INFORMATION

PROJECT NO.	DSV23003
FILENAME	DSV23003-PRICINGSET-OAS1
CHECKED BY	JRB
DRAWN BY	ILFP
SCALE	1" = 100'
DATE	08. 13. 2024

SHEET

OVERALL SITE PLAN

C2.00

X:\Projects\DSV\DSV23003\04-Production\Engineering\Current Drawing\02-Pricing Set\DSV23003-PricingSet-OAS1.dwg, 7/9/2025 3:12:18 PM, Bella Patrocinio

EXISTING CONDITIONS

The proposed development is located in an area primarily consisting of residential development and undeveloped land. Figure 3 provides a graphical representation of the existing lane configuration, storage capacity, traffic control type, and intersection spacing within the study area. Roadway characteristics within the study area is shown in Table 1. Average Annual Daily Traffic (AADT) data is provided based on the most recent count data provided by NCDOT. This AADT data provides the average Vehicles Per Day (vpd) for the subject facility based on typical operations. This AADT data is provided for informational purposes only and is not utilized for capacity analysis calculations within this study.

TABLE 1: ROADWAY CHARACTERISTICS

Road Name	Route #	Maintained By	Typical Cross Section	Speed Limit	AADT (year of data)
Knightdale Boulevard	US 64 BUS	NCDOT	4-lane median divided	45 mph	35,000 vpd (2023)
Hodge Road	SR 2516	NCDOT	2-lane undivided	35 mph / 45 mph	9,500 vpd (2023)
Mingo Bluff Boulevard	N/A	Town	2-lane undivided	25 mph	3,470 vpd (2025)*
Old Faison Road	SR 2515	NCDOT	2-lane undivided	45 mph	6,200 vpd (2023)
Bethlehem Road	SR 5270	NCDOT	2-lane undivided	45 mph	6,600 vpd (2023)

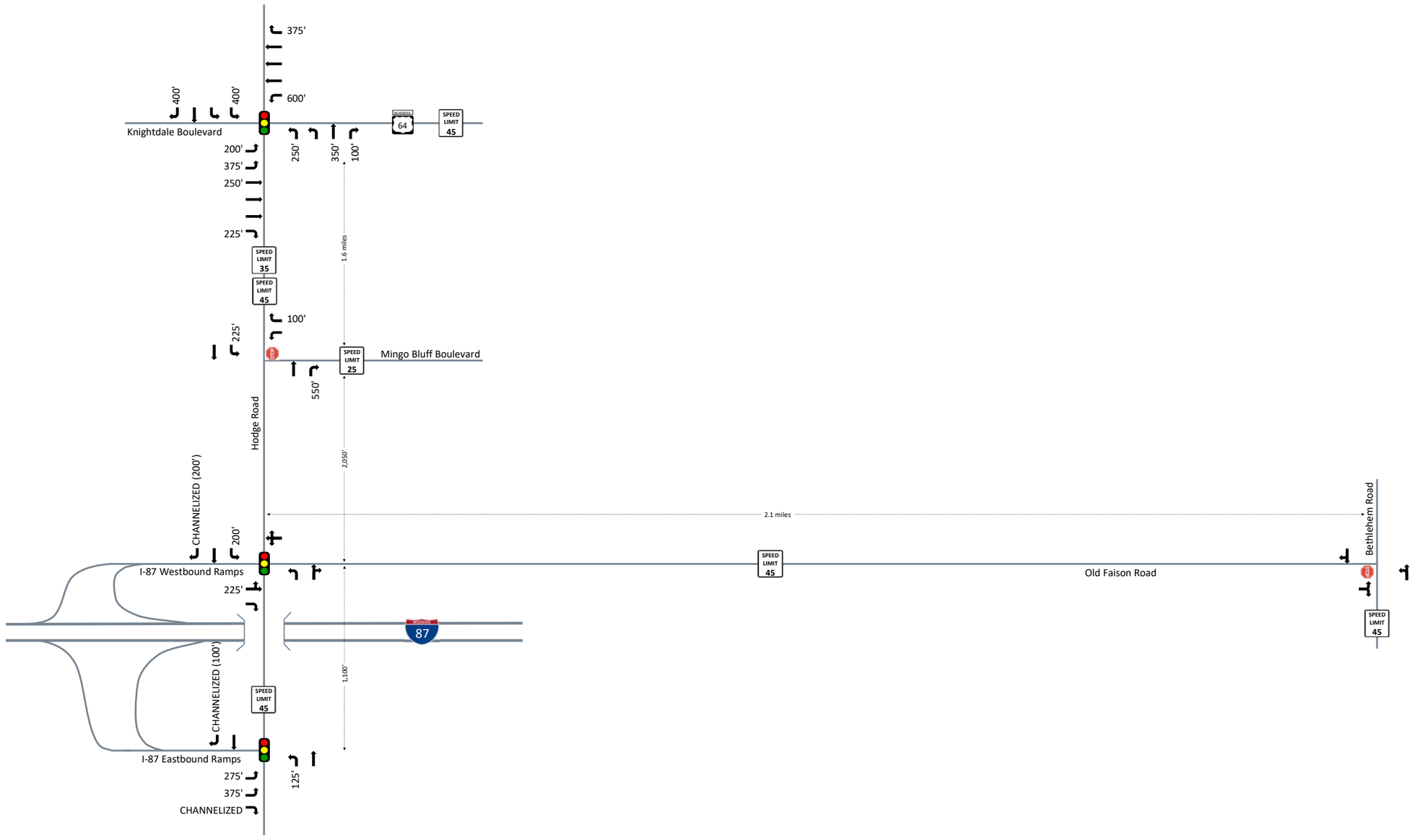
*AADT determined based on Existing (2025) traffic volumes assuming that the weekday PM peak hour accounts for approximately 10% of the daily traffic on the roadway.

Existing peak hour turning movement counts were conducted in May 2025 during typical weekday AM (7:00 – 9:00 AM) and weekday PM (4:00 – 6:00 PM) peak hours while Wake County Public Schools were in session. This data was collected at the following existing study intersections:

- US 64 Business (Knightdale Boulevard) and Hodge Road
- Hodge Road and Mingo Bluff Boulevard
- Hodge Road and Old Faison Road / I-87 Westbound Ramps
- Hodge Road and I-87 Eastbound Ramps
- Bethlehem Road and Old Faison Road

Peak hour traffic volumes were determined from these traffic counts and balanced between study intersections, where appropriate. Traffic count data is provided in Appendix B. Refer to Figure 4 for the Existing (2025) peak hour traffic volumes. Current signal plans were obtained from NCDOT and are included in Appendix C.

The Existing (2025) traffic volumes were analyzed utilizing the current lane configurations to determine existing operations for the study area.



LEGEND

- Unsignalized Full Movement Intersection
- Signalized Intersection
- X' Storage Length (In Feet)
- Y' Intersection Spacing

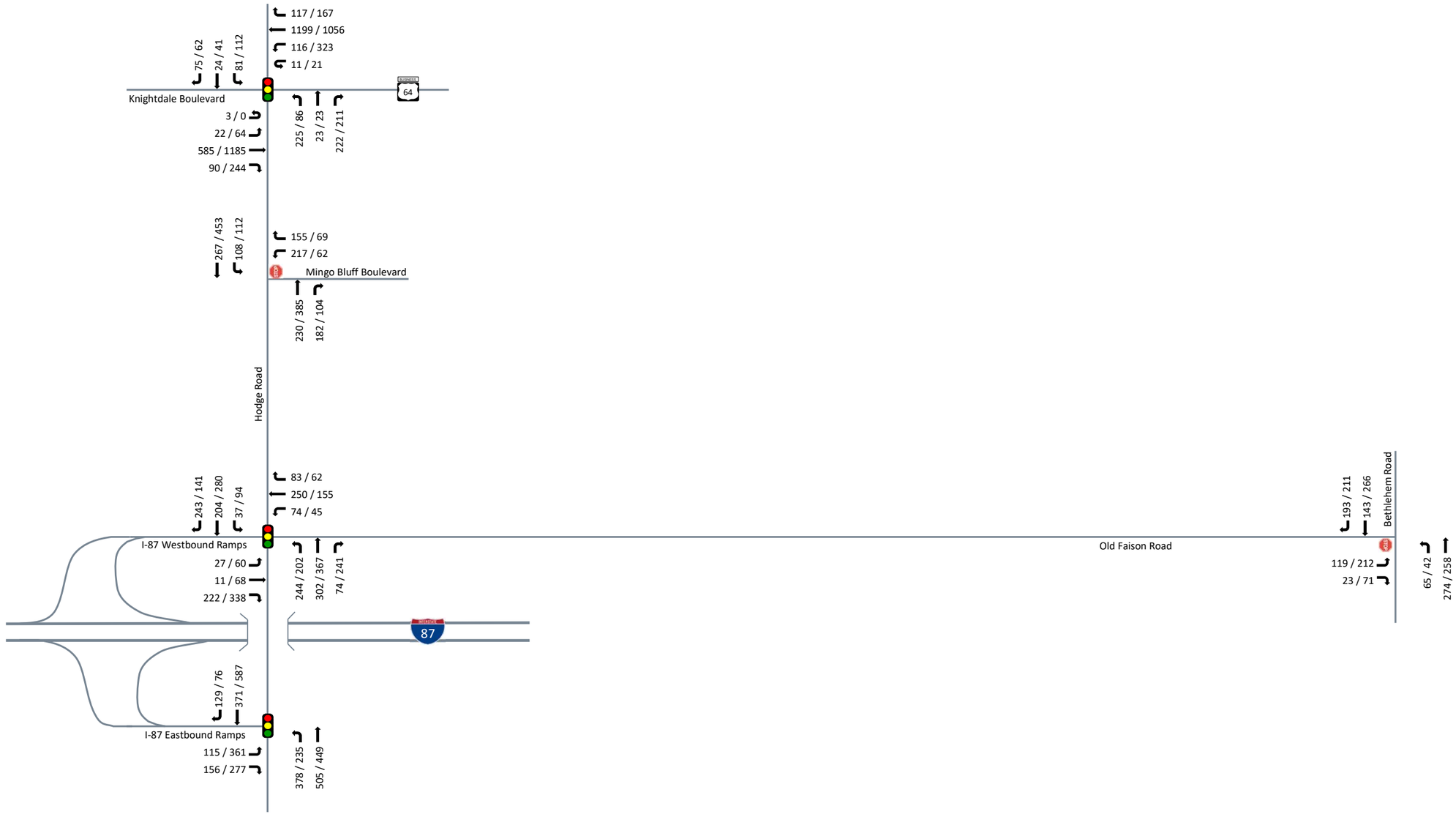
Boulder Ridge Mixed-Use

Knightdale, NC

Existing Lane Configurations

Scale: Not to Scale | Figure 3

McAdams



Boulder Ridge Mixed-Use

Knightdale, NC

Existing (2025) Peak Hour Traffic Volumes

Scale: Not to Scale | Figure 4

McAdams

NO-BUILD CONDITIONS

In order to account for background growth in the study area prior to the proposed developments buildout year of 2032, the existing traffic count volumes were grown at a set growth rate and nearby approved adjacent development traffic was added to the study area based on their approved TIA's. Per the approved MOU, the existing traffic counts were grown at a 3% annual growth rate to determine projected (2029, 2031, and 2033) traffic volumes, then a 1% annual growth rate was applied to the 2033 projected traffic volumes to determine Projected (2042) traffic volumes. Refer to Figure 5A, 5B, 5C, and 5D for the Projected (2029), Projected (2031), Projected (2033), and Projected (2042) traffic volumes, respectively.

To account for the traffic volumes of the adjacent developments approved in the area, the traffic from those developments were also compiled and added to the analysis. The adjacent development traffic volumes are provided on Figure 6. Based on the approved MOU, the adjacent developments included in this analysis are provided in Table 2.

TABLE 2: ADJACENT DEVELOPMENTS

Development Name	Location	Land Use / Density	Build-out Year	Firm Completing TIA
Lyndon Oaks*	Along the western side of Bethlehem Road and between I-87 and Old Faison Road	308 single family homes 192 townhomes 10,000 sq. ft. of retail space 5,000 sq. ft. of restaurant space	2031	RKA
Creekview Crossing	South of Laurens Way and west of St. Johns Street	151 single family homes 68 townhomes 72 multifamily units	2026	Exult Engineering
Legacy Oaks PUD	Along Hodge Road and north of US 64 Business (Knightdale Boulevard)	217 single family homes 93 townhomes 72 multifamily units 130-room hotel 16,000 sq. ft. of retail space	2023	Kimley Horn
StoneRiver[1]	West of Hodge Road and south of I-87	286 single family homes 98 townhomes	2021	RKA
SilverStone[2]	Northwest quadrant of the intersection of Hodge Road and Kemp Drive	282 single family homes 108 townhomes	2022	RKA

*Lyndon Oaks development trips and improvements were applied to all future year analysis scenarios (2029, 2031, 2033, 2042).

1. Assuming approximately 50% built-out based on current CO's permitted.
2. Assuming approximately 10% built-out based on current CO's permitted.

TABLE 2: ADJACENT DEVELOPMENTS (CONT)				
Development Name	**Location**	**Land Use / Density**	**Build-out Year**	**Firm Completing TIA**
Riverview Commons	Northwest quadrant of the intersection of Hodge Road and Poole Road	30 low-rise multifamily units 364 mid-rise multifamily units	2023	Davenport
River Pointe	West of Hodge Road and at Colchester Drive	50 single family homes	N/A**	N/A

**Assumed prior to buildout of the proposed development.

According to the Town and NCDOT, the following roadway improvements are expected within the study area by the adjacent developments:

Hodge Road and Old Faison Road / I-87 Westbound Ramps

- Extend the existing eastbound shared left-through lane on I-87 Westbound Ramps to a minimum of 275 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks
- Construct an exclusive westbound left-turn lane on Old Faison Road with a minimum of 125 feet of full width storage and appropriate deceleration and taper. – StoneRiver and SilverStone
- Construct an exclusive westbound right-turn lane on Old Faison Road with a minimum of 100 feet of full width storage and appropriate deceleration and taper. – STIP W-5705AK
- Extend the westbound left-turn lane on Old Faison Road to a minimum of 175 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks
- Construct an exclusive northbound right-turn lane on Hodge Road with a minimum of 200 feet of full width storage and appropriate deceleration and taper. – StoneRiver and SilverStone
- Extend the existing northbound right-turn lane on Hodge Road to the maximum amount of full width storage and appropriate deceleration and taper prior to the start of the bridge over I-87. – Lyndon Oaks
- Extend the existing southbound left-turn lane on Hodge Road to a minimum of 275 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks

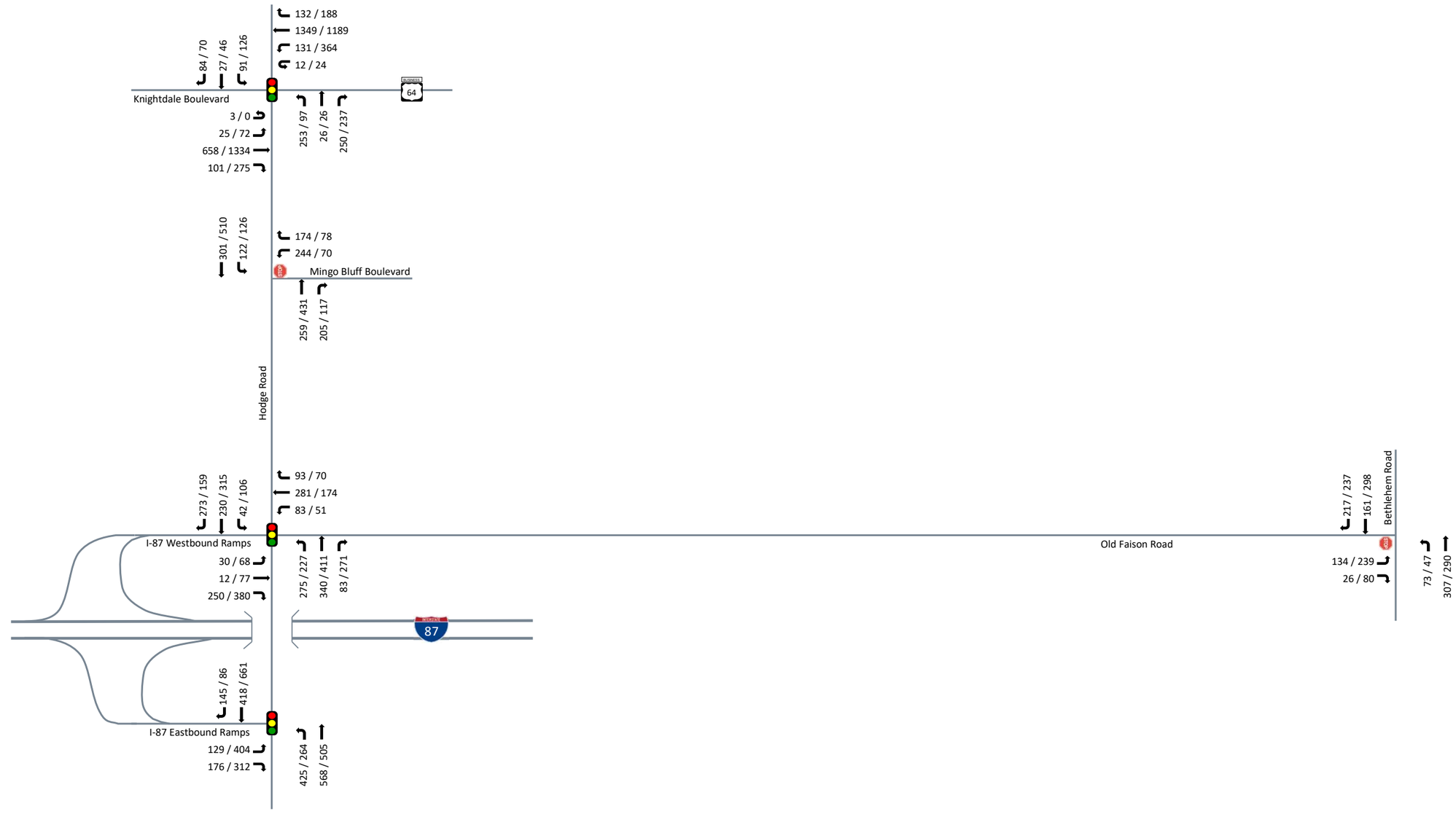
Hodge Road and I-87 Eastbound Ramps

- Construct an exclusive eastbound right-turn lane on I-87 Eastbound Ramps with a minimum of 150 feet of full width storage and appropriate deceleration and taper. – StoneRiver and SilverStone
- Restripe the existing exclusive southbound right-turn lane on Hodge Road to that of a shared through-right lane. – StoneRiver and SilverStone

Bethlehem Road and Old Faison Road

- Construct an exclusive southbound right-turn lane on Bethlehem Road with a minimum of 250 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks
- Construct an exclusive northbound left-turn lane on Bethlehem Road with a minimum of 175 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks
- Construct an exclusive eastbound left-turn lane on Old Faison Road with a minimum of 250 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks
- Install a signal once warranted and approved by NCDOT. – Lyndon Oaks

Appendix D provides a full summary of the adjacent developments included in this analysis. In order to account for future year analysis without the proposed development, the Projected (2029), Projected (2031), Projected (2033), and Projected (2042) traffic volumes were added to the adjacent development trips to determine the No-Build (2029), No-Build (2031), No-Build (2033), and No-Build (2042) traffic volumes, respectively. Figure 7A, 7B, 7C, and 7D provides the No-Build (2029), No-Build (2031), No-Build (2033), and No-Build (2042) traffic volumes, respectively.



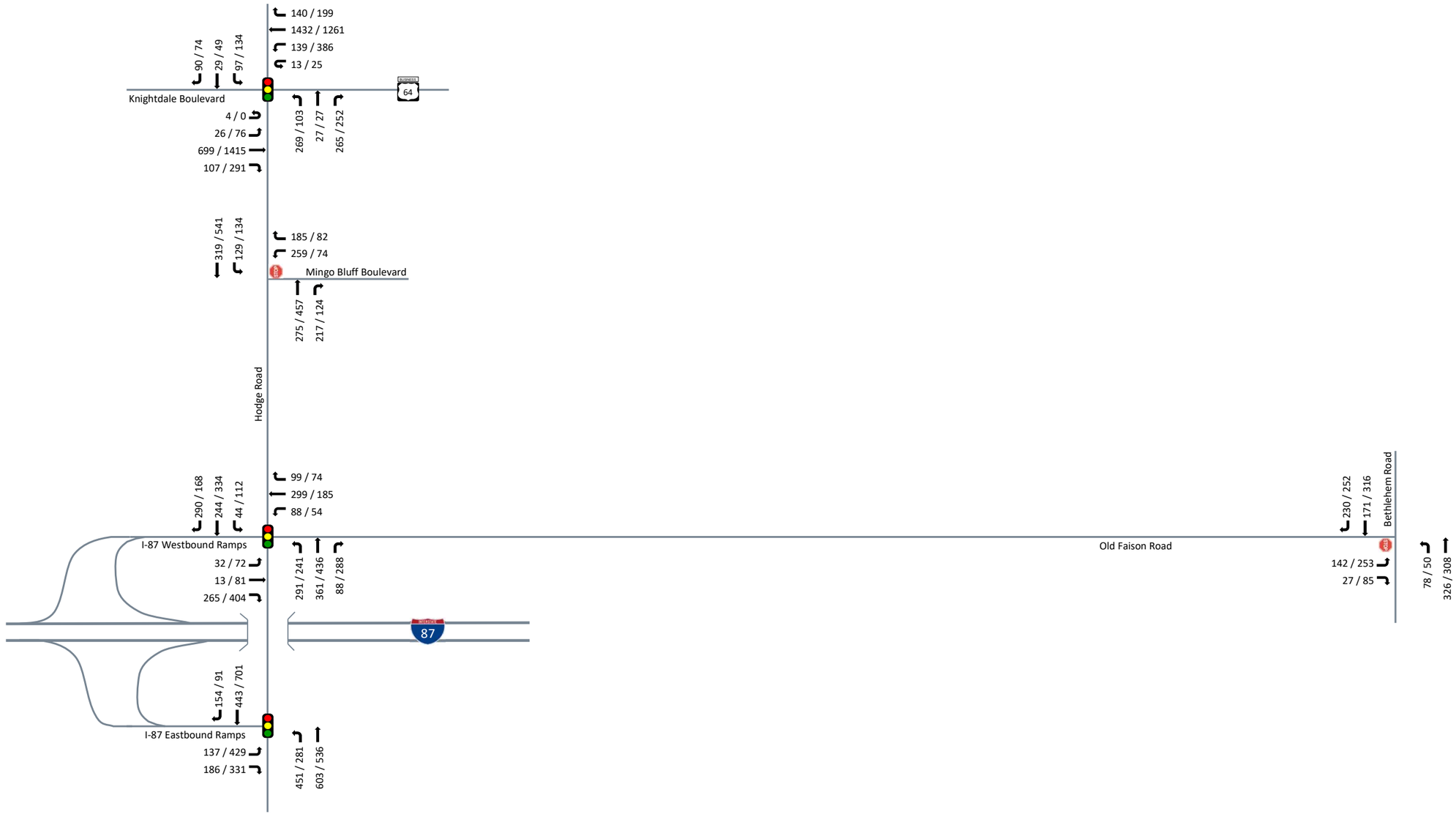
Boulder Ridge Mixed-Use

Knightdale, NC

Projected (2029) Peak Hour Traffic Volumes

Scale: Not to Scale | Figure 5A

McAdams



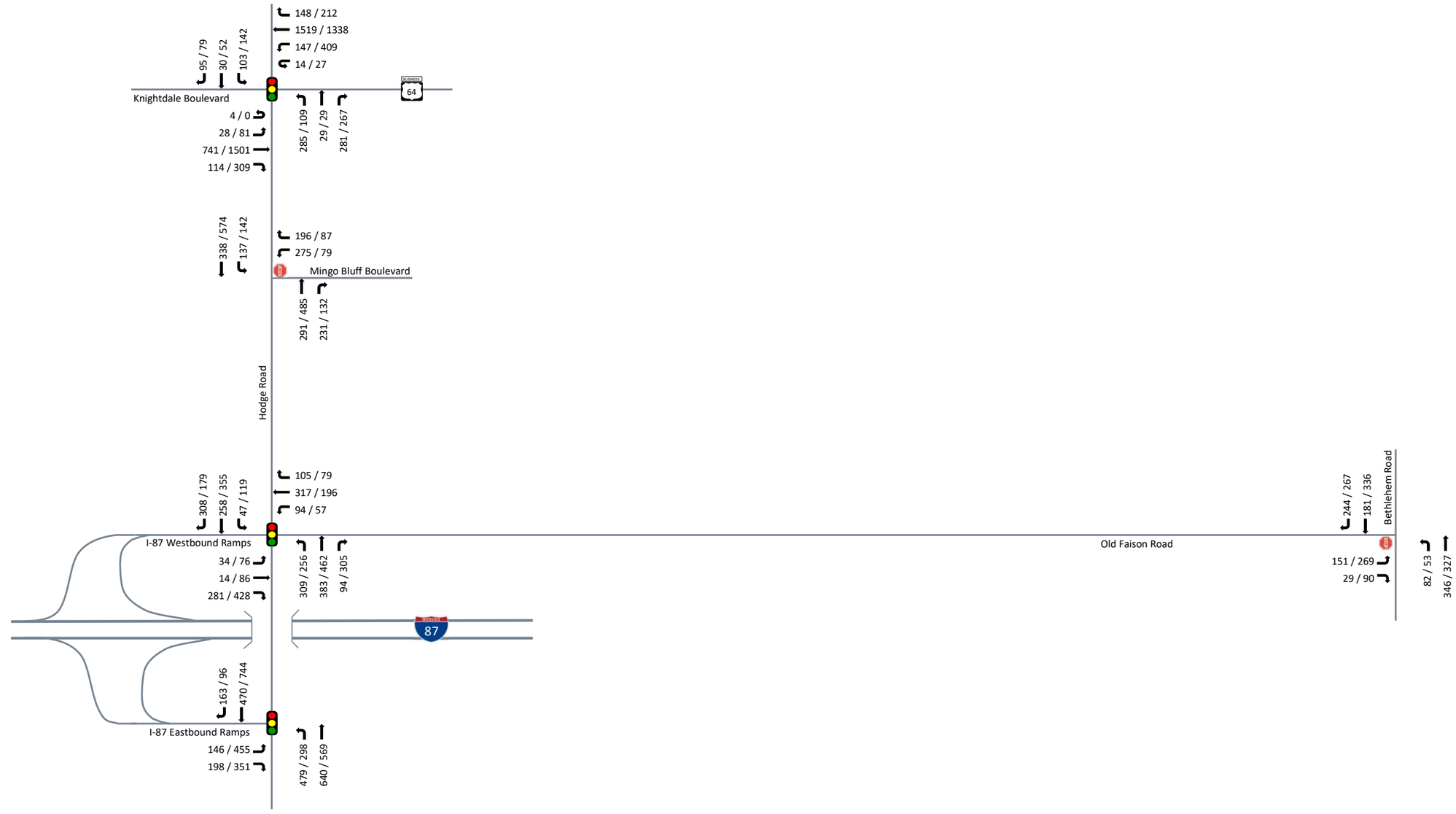
Boulder Ridge Mixed-Use

Knightdale, NC

Projected (2031) Peak Hour Traffic Volumes

Scale: Not to Scale | Figure 5B

McAdams



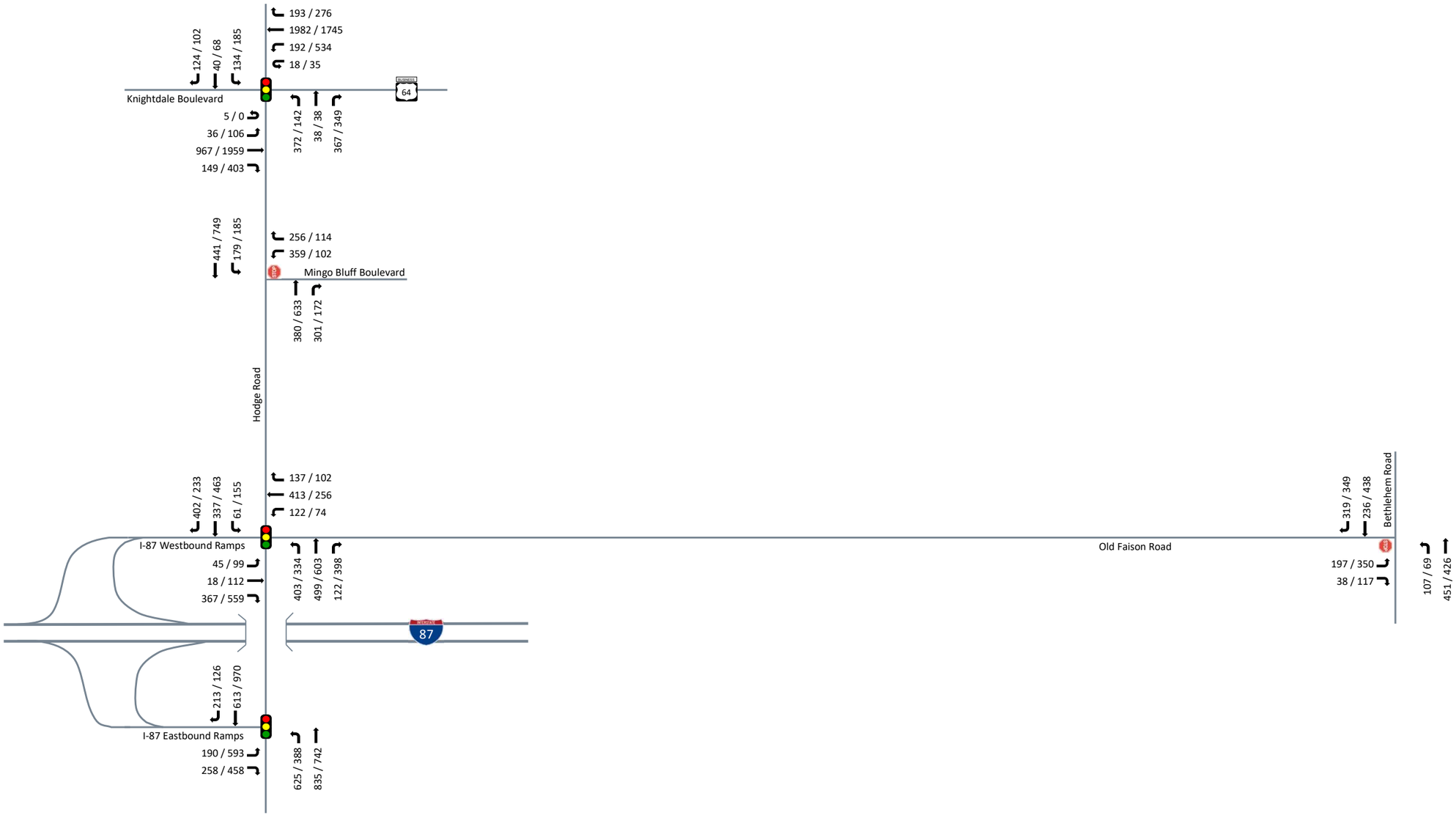
Boulder Ridge Mixed-Use

Knightdale, NC

Projected (2033) Peak Hour Traffic Volumes

Scale: Not to Scale | Figure 5C

McAdams



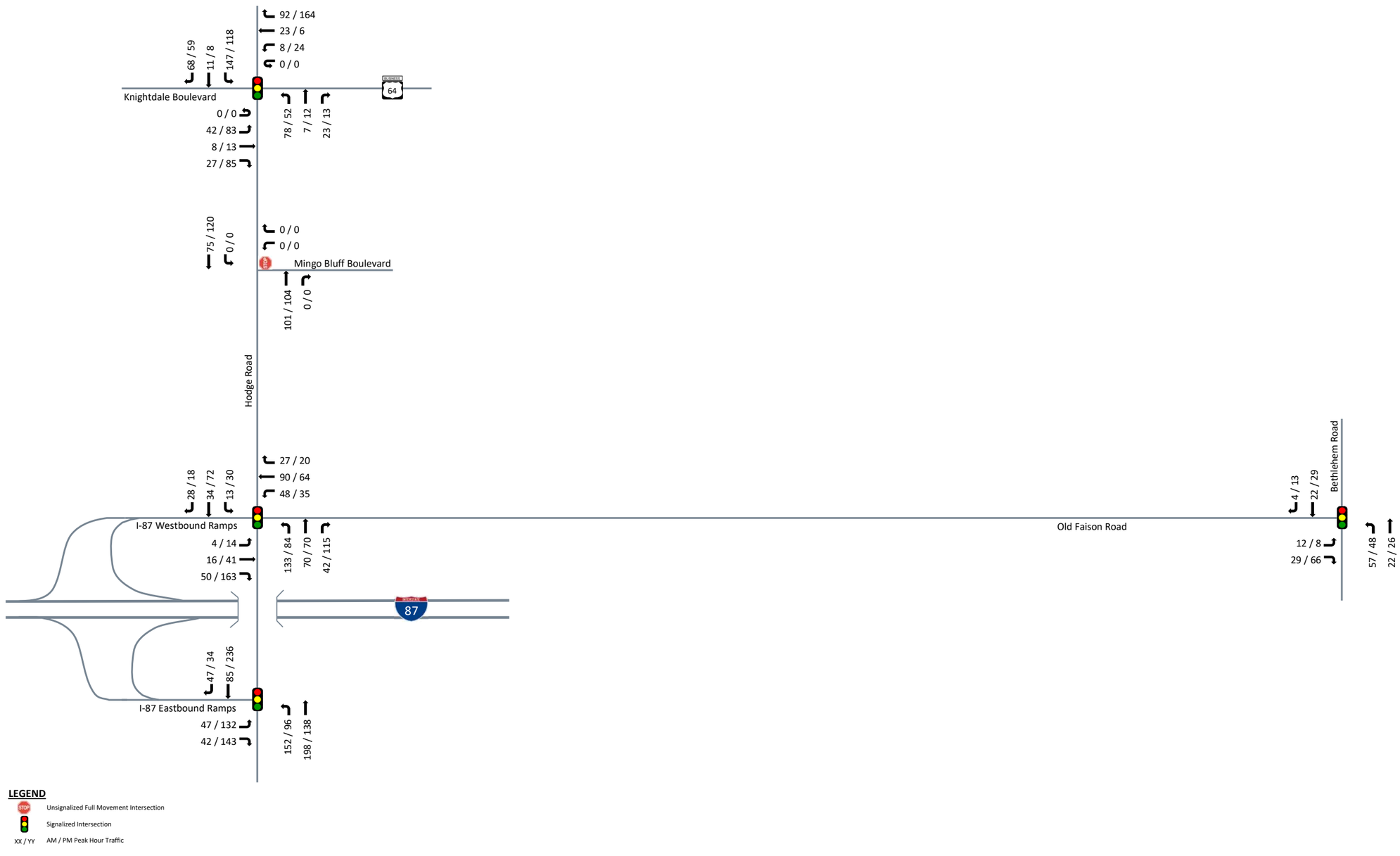
Boulder Ridge Mixed-Use

Knightdale, NC

Projected (2042) Peak Hour Traffic Volumes

Scale: Not to Scale | Figure 5D

McAdams



Boulder Ridge Mixed-Use

Knightdale, NC

Adjacent Development Trips

Scale: Not to Scale | Figure 6

McAdams

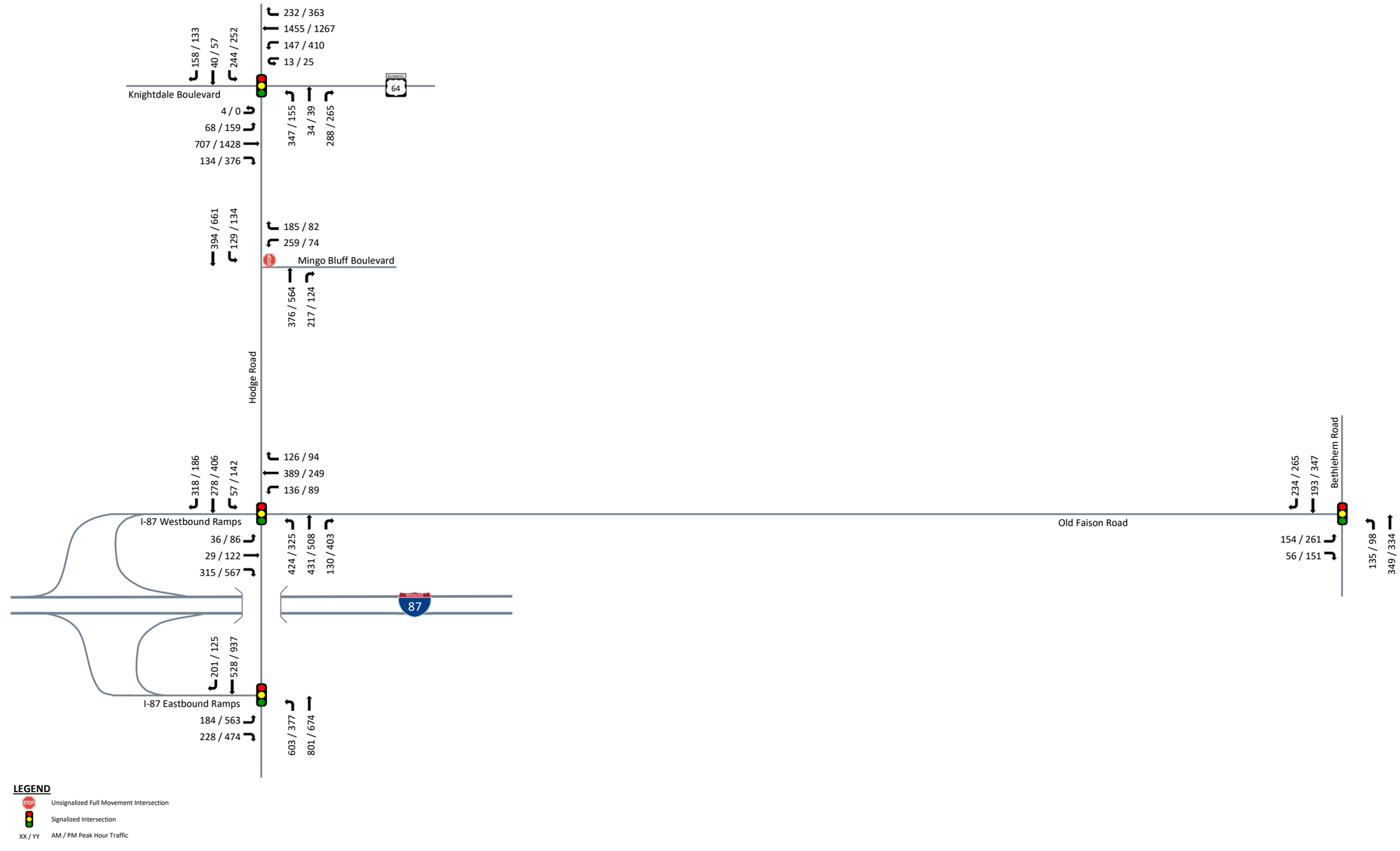
Boulder Ridge Mixed-Use

Knightdale, NC

No-Build (2029) Peak Hour Traffic Volumes

Scale: Not to Scale | Figure 7A

McAdams



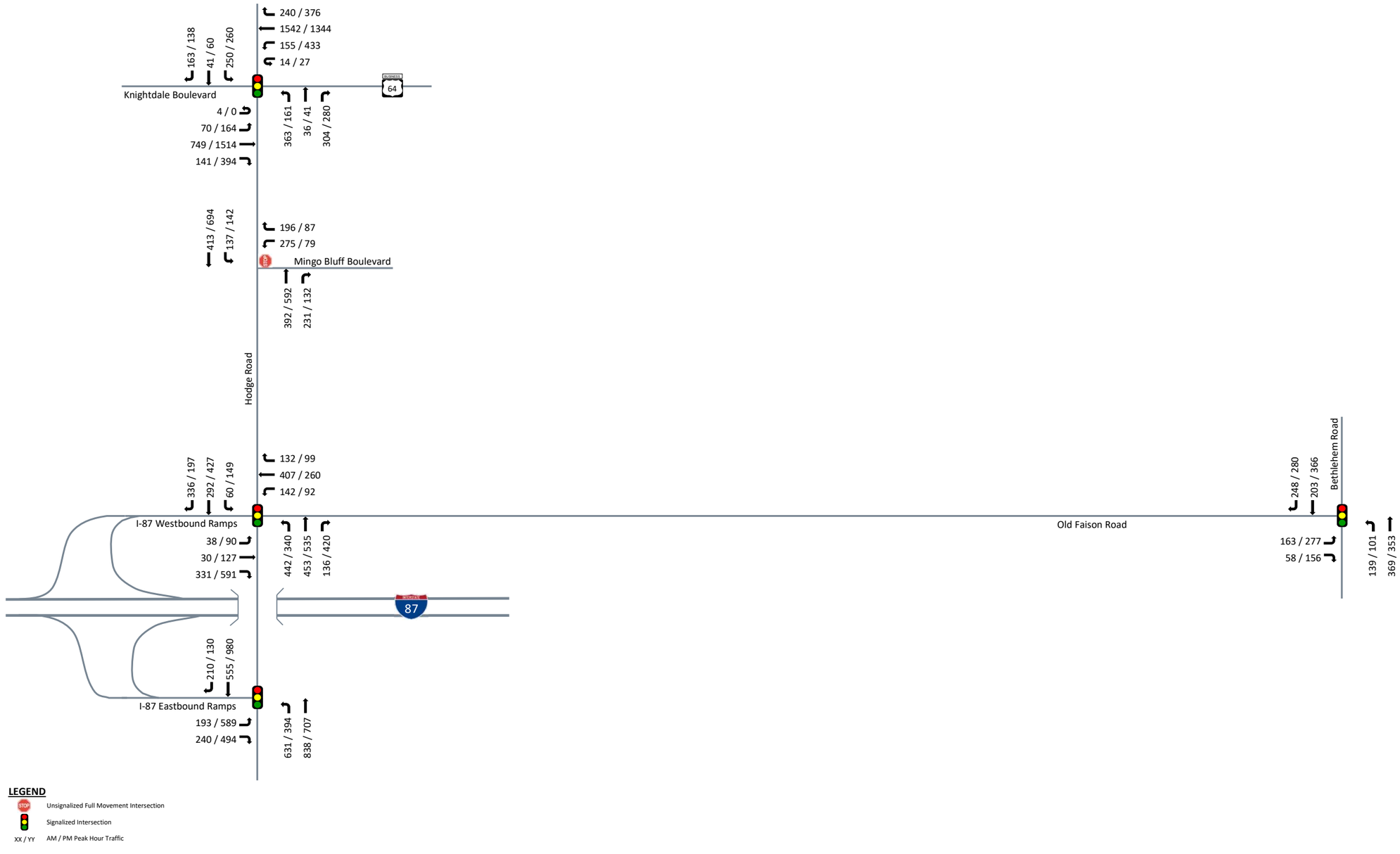
Boulder Ridge Mixed-Use

Knightdale, NC

No-Build (2031) Peak Hour Traffic Volumes

Scale: Not to Scale | Figure 7B

McAdams



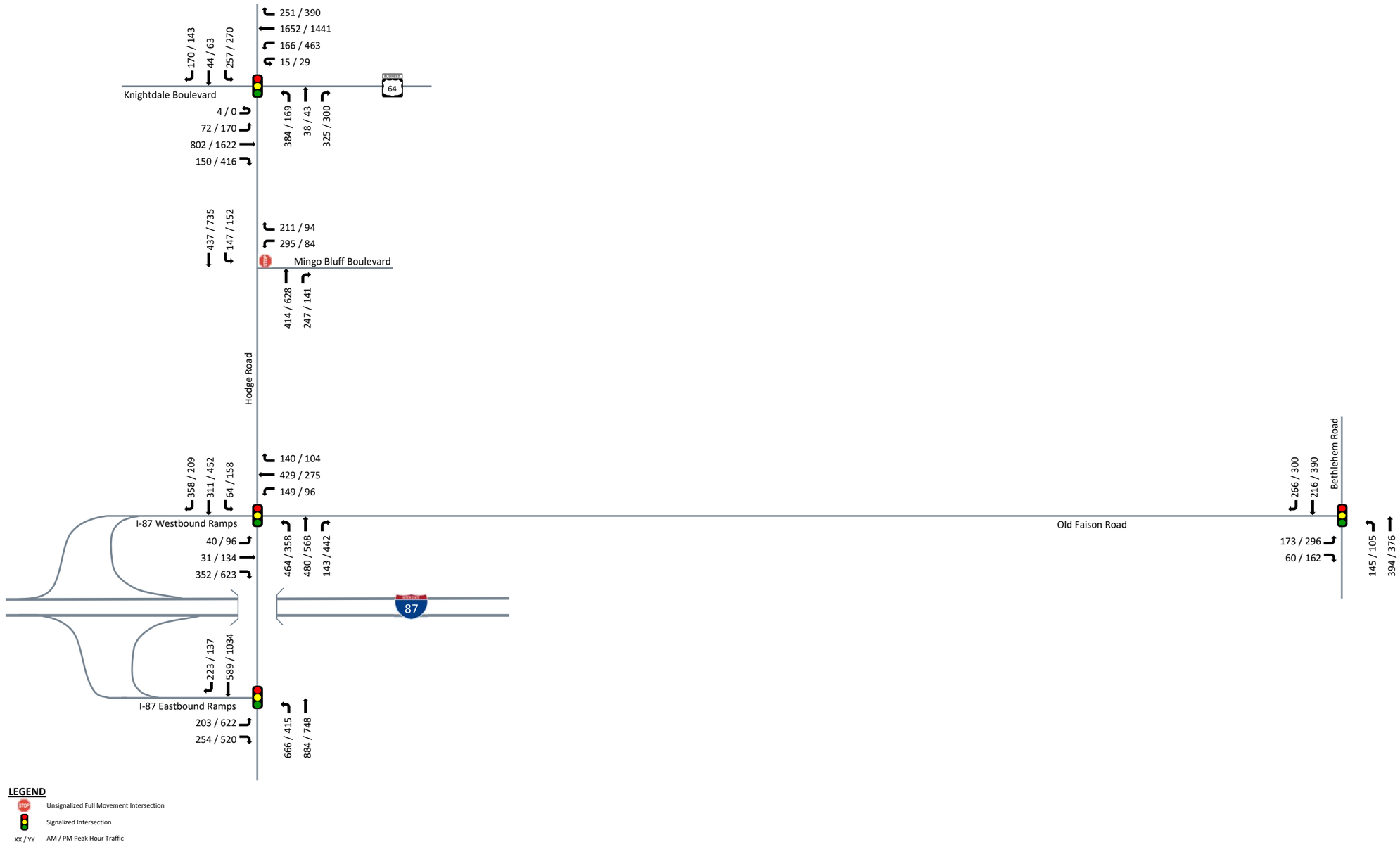
Boulder Ridge Mixed-Use

Knightdale, NC

No-Build (2033) Peak Hour Traffic Volumes

Scale: Not to Scale | Figure 7C

McADAMS



LEGEND

- Unsignalized Full Movement Intersection
- Signalized Intersection
- XX / YY — AM / PM Peak Hour Traffic

Boulder Ridge Mixed-Use

Knightdale, NC

No-Build (2042) Peak Hour Traffic Volumes

Scale: Not to Scale | Figure 7D

McAdams

BUILD CONDITIONS

The proposed development is expected to consist of a maximum of 564 mid-rise multifamily housing units and 57,500 sq. ft. of retail space at full buildout. Based on the Institute for Transportation Engineers (ITE) *Trip Generation Manual*, 11th Edition, and the suggested method of trip calculations provided in NCDOT's *Rate vs. Equation spreadsheet*, trips for the proposed development were calculated for weekday daily, weekday AM peak hour, and weekday PM peak hour. Due to the mixed-use nature of the proposed development, internal capture was also calculated according to the methodology contained in the National Cooperative Highway Research Program (NCHRP) Report 684. The internal capture assumptions were approved in the MOU and are provided in Appendix A. A summary of this trip generation is provided in Table 3.

TABLE 3: TRIP GENERATION

Land Use (ITE Code)	Density	Calculation Methodology	Daily Trips	AM Peak Hour			PM Peak Hour		
				Enter	Exit	Total	Enter	Exit	Total
Phase 1									
Mid-Rise Multifamily Housing (221)	188 units	Adjacent / Equation	850	16	55	71	45	29	74
Phase 2									
Mid-Rise Multifamily Housing (221)	376 units	Adjacent / Equation	1,747	35	119	154	90	57	147
Strip Retail Plaza (822)	6.5 KSF	Adjacent / Rate	354	9	6	15	21	22	43
Phase 1 + 2 Total Trips			**2,951**	**60**	**180**	**240**	**156**	**108**	**264**
Phase 3									
Shopping plaza (821)[1]	51 KSF	Generator / Equation	5,338	112*	68*	180*	245	265	510
Full Buildout Total Trips			**8,289**	**172**	**248**	**420**	**401**	**373**	**774**
Internal Capture (1% AM, 19% PM)			--	*-3*	*-3*	*-6*	*-74*	*-74*	*-148*
Total			**8,289**	**169**	**245**	**414**	**327**	**299**	**626**
Pass-By Trips (LUC 821: 31% AM, 40% PM)			--	*-27*	*-27*	*-54*	*-88*	*-88*	*176*
			8,289	**142**	**218**	**360**	**239**	**211**	**450**

*Rate was used as the calculation methodology due to limited ITE data.

1. The trip generation for LUC 821 utilizes the "supermarket" subcategory.

Based on the existing traffic patterns, population centers surrounding the development, and engineering judgment the site trips were distributed according to the regional distributions listed as follows:

Phase 1 + 2

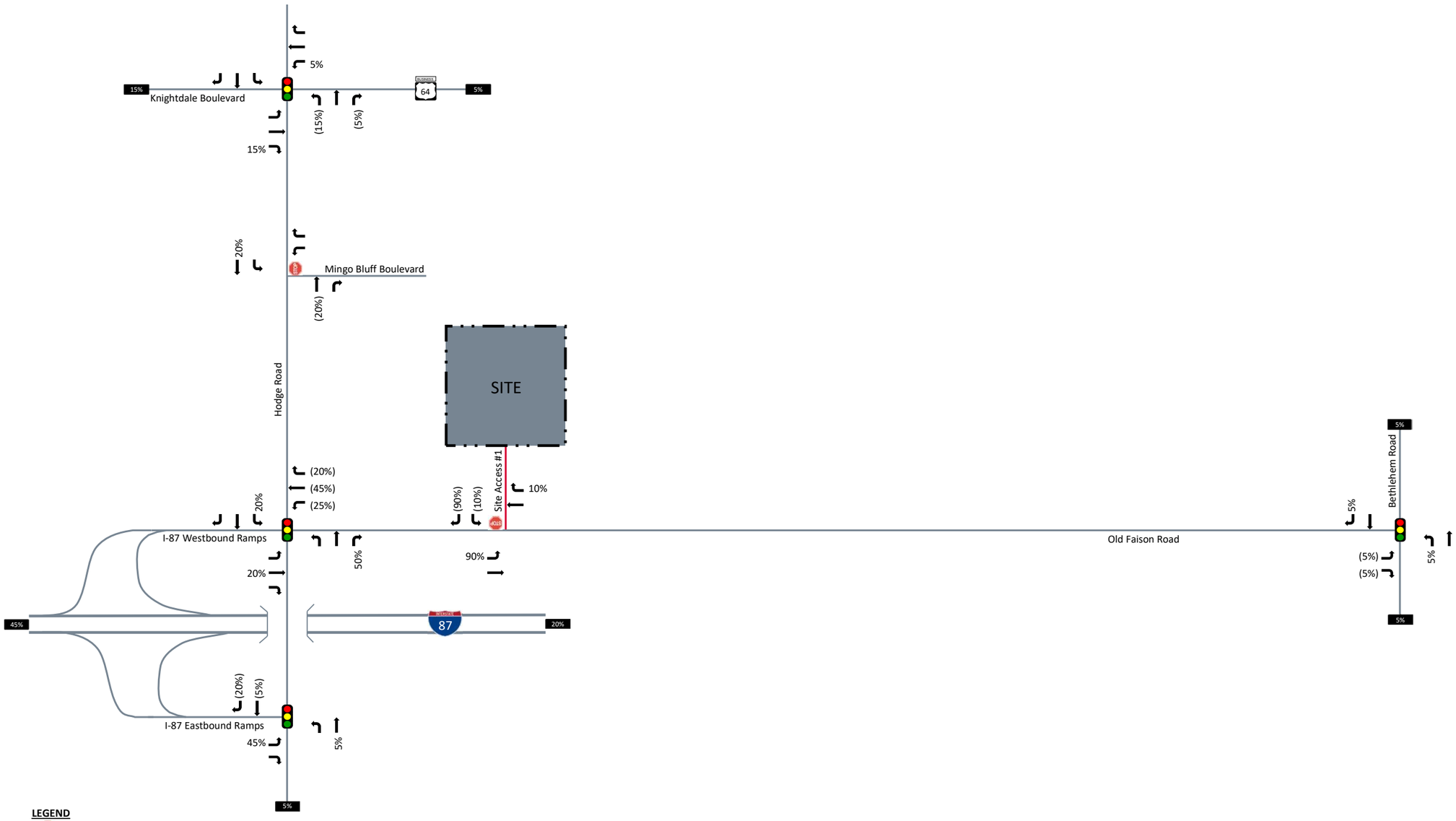
- 45% to/from the west via I-87
- 20% to/from the east via I-87
- 15% to/from the west via US 64 Business (Knightdale Boulevard)
- 5% to/from the east via US 64 Business (Knightdale Boulevard)
- 5% to/from the south via Hodge Road
- 5% to/from the north via Bethlehem Road
- 5% to/from the south via Bethlehem Road

Phase 3

- 20% to/from the west via I-87
- 5% to/from the east via I-87
- 5% to/from the west via US 64 Business (Knightdale Boulevard)
- 5% to/from residential developments along Hodge Road
- 25% to/from the south via Hodge Road
- 20% to/from the north via Bethlehem Road
- 15% to/from the south via Bethlehem Road
- 5% to/from the east via Mingo Bluff Boulevard

Refer to Figure 8A, 8B, and 8C for the detailed trip distribution percentages within the study area for Phase 1, Phase 2, and Phase 3, respectively. The trip generation and distribution were approved by NCDOT and the Town within the MOU provided in Appendix A.

The trip distribution was applied to the trip generation to determine the trip assignment for the proposed development site trips at all study intersections. Refer to Figure 9A, 9B, and 9C for the primary site trip assignment for Phase 1, Phase 2, and Phase 3, respectively. Refer to Figure 10 for the detailed pass-by site trip distribution and Figure 11 for the pass-by site trip assignment. Refer to Figure 12 for the total site trip assignment. To determine the future traffic volumes at the study intersections with buildout of the proposed site, the No-Build (2029), No-Build (2031), No-Build (2033), and No-Build (2042) traffic volumes were added to the site trip assignment to determine Build (2029), Build (2031), Build (2033), and Build (2042) traffic volumes, respectively. Refer to Figure 13A, 13B, 13C, and 13D for the Build (2029), Build (2031), Build (2033), and Build (2042) traffic volumes, respectively.



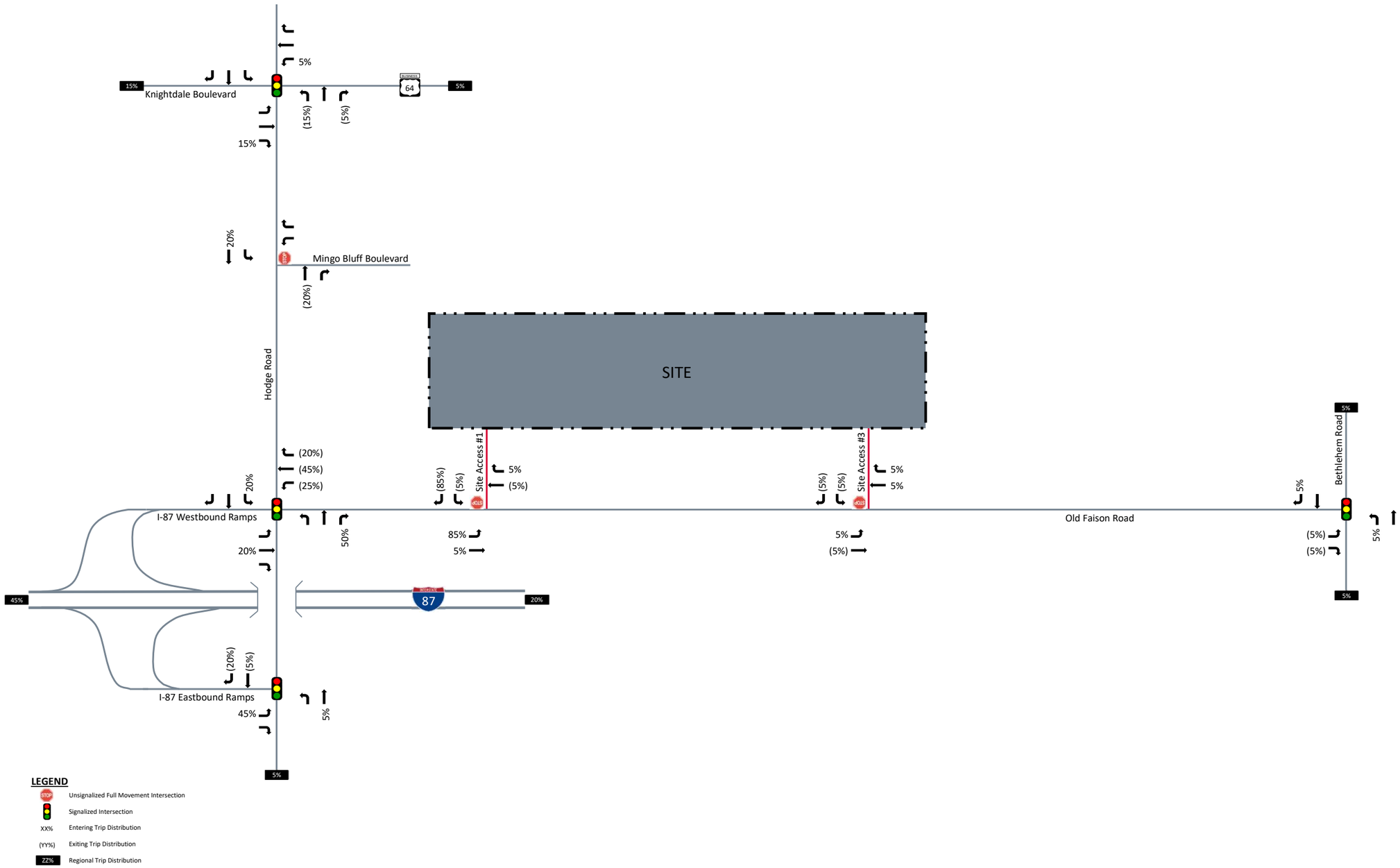
Boulder Ridge Mixed-Use

Knightdale, NC

Site Trip Distribution - Phase 1

Scale: Not to Scale | Figure 8A

McAdams



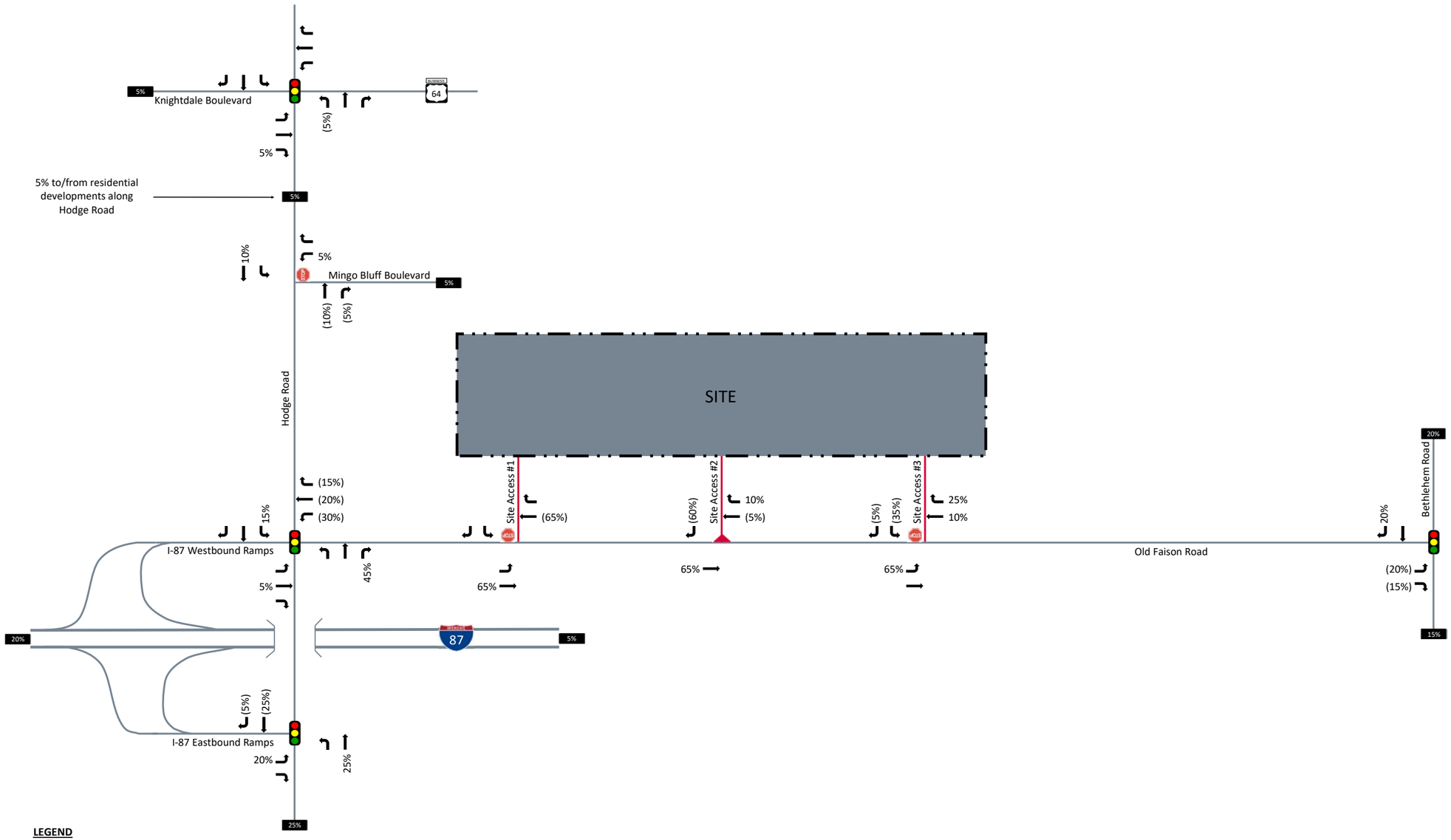
Boulder Ridge Mixed-Use

Knightdale, NC

Site Trip Distribution - Phase 2

Scale: Not to Scale | Figure 8B

McAdams



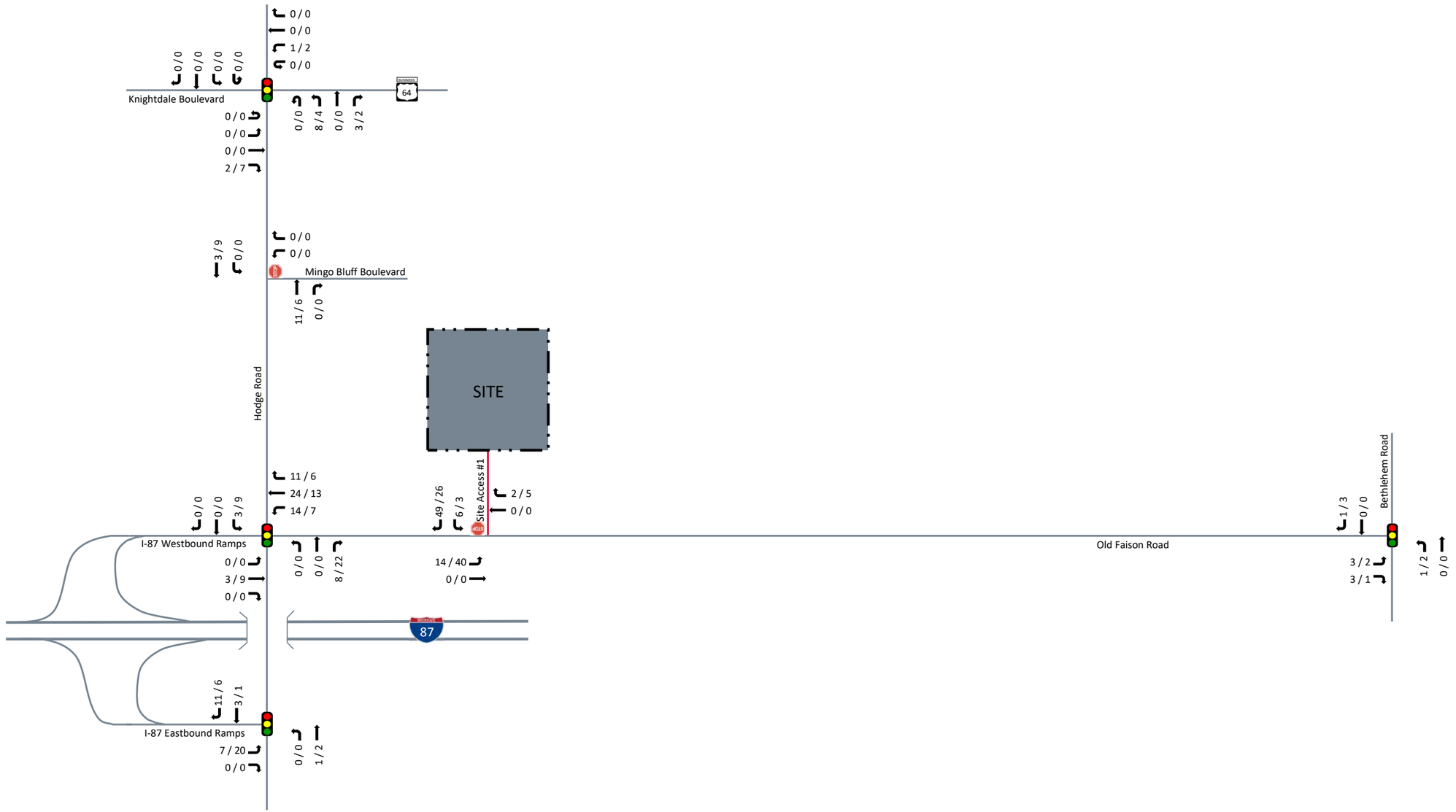
Boulder Ridge Mixed-Use

Knightdale, NC

Site Trip Distribution - Phase 3

Scale: Not to Scale | Figure 8C

McAdams



LEGEND

- Unsignalized Full Movement Intersection
- Signalized Intersection
- Right-In/Right-Out Intersection
- XX / YY — AM / PM Site Trips

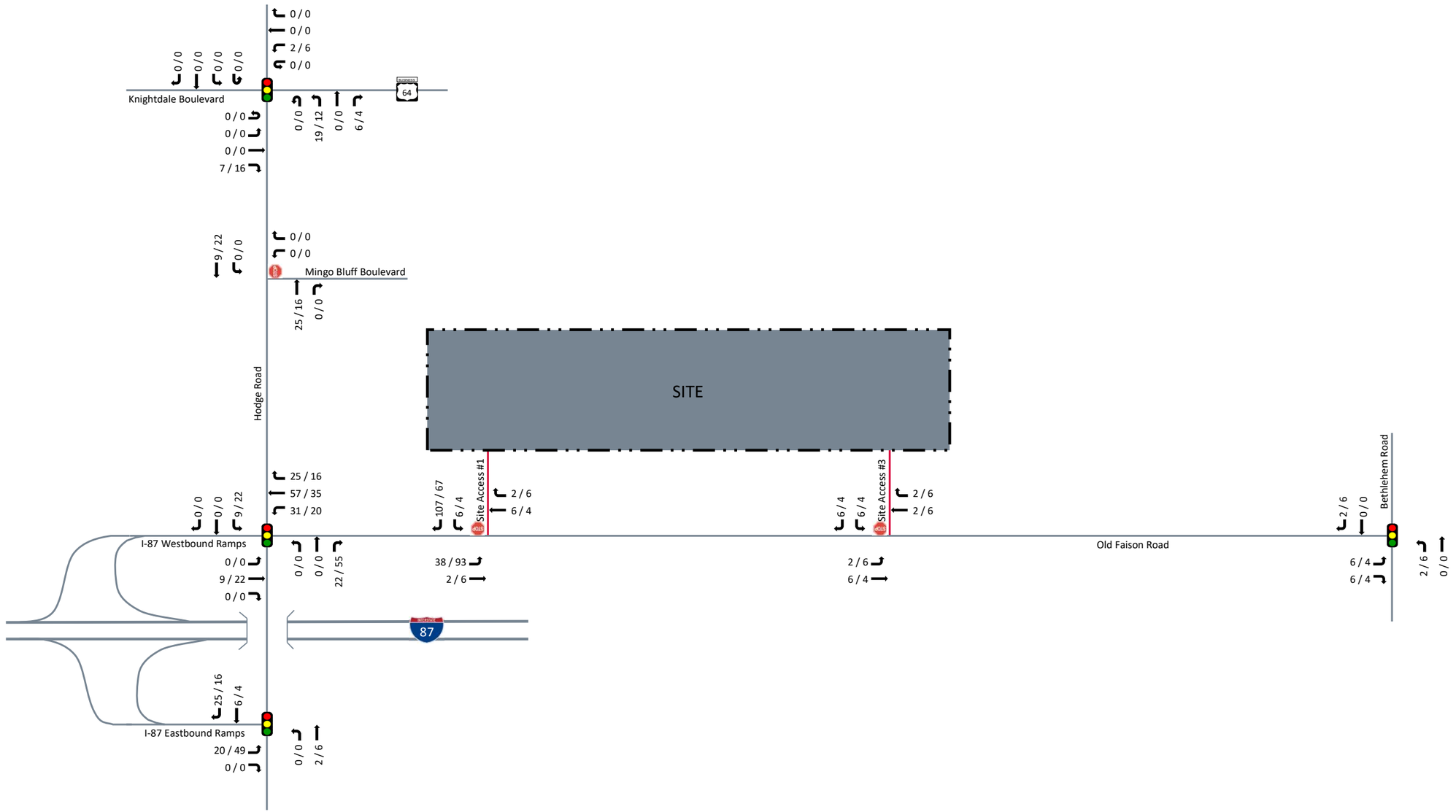
Boulder Ridge Mixed-Use

Knightdale, NC

Primary Site Trip Assignment - Phase 1

Scale: Not to Scale | Figure 9A

McAdams



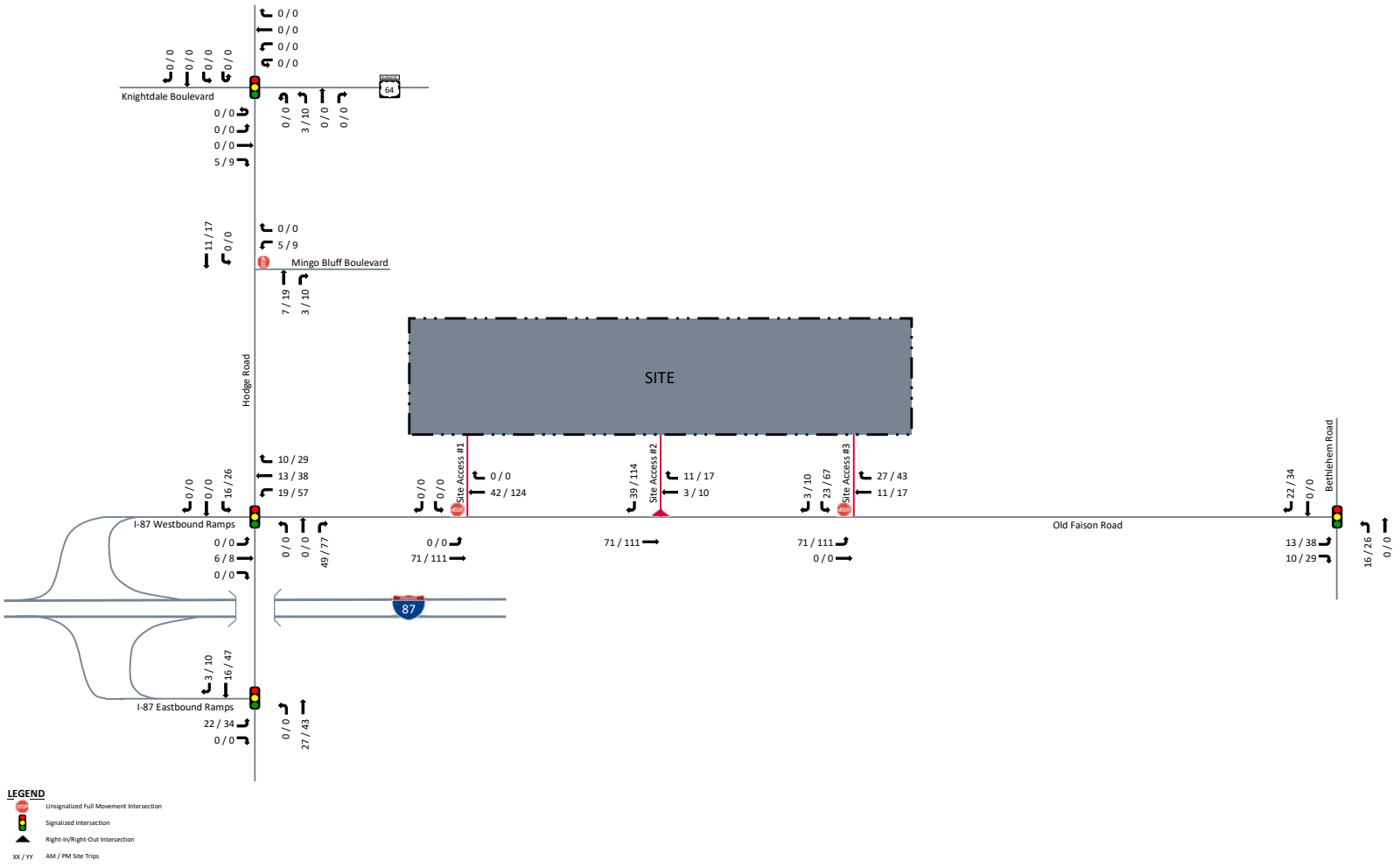
Boulder Ridge Mixed-Use

Knightdale, NC

Primary Site Trip Assignment - Phase 2

Scale: Not to Scale | Figure 9B

McAdams



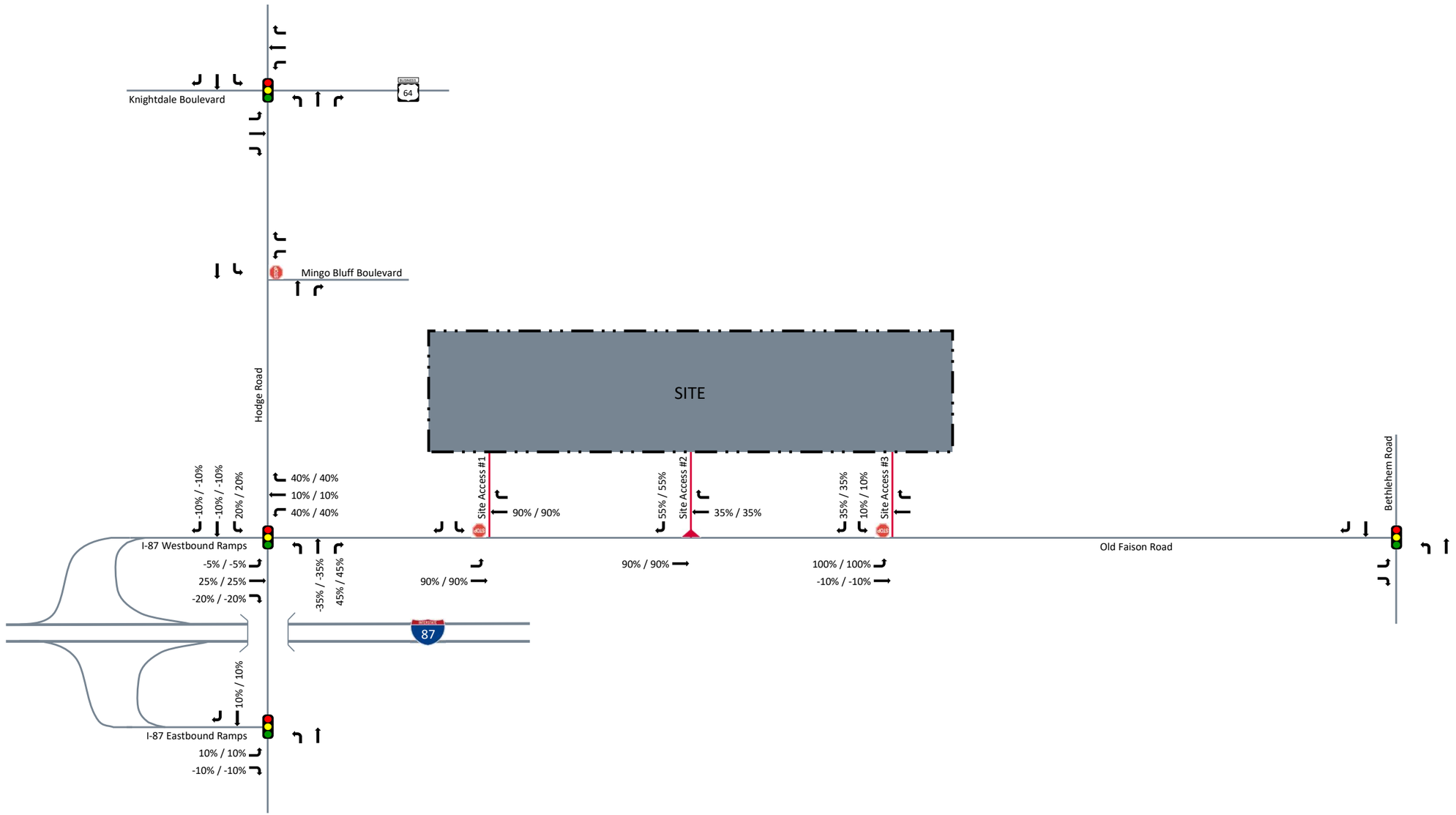
Boulder Ridge Mixed-Use

Knightdale, NC

Primary Site Trip Assignment - Phase 3

Scale: Not to Scale | Figure 9C

McAdams



LEGEND

- Unsignalized Full Movement Intersection
- Signalized Intersection
- Right-In/Right-Out Intersection
- XX% / YY% AM / PM Pass-By Trip Distribution

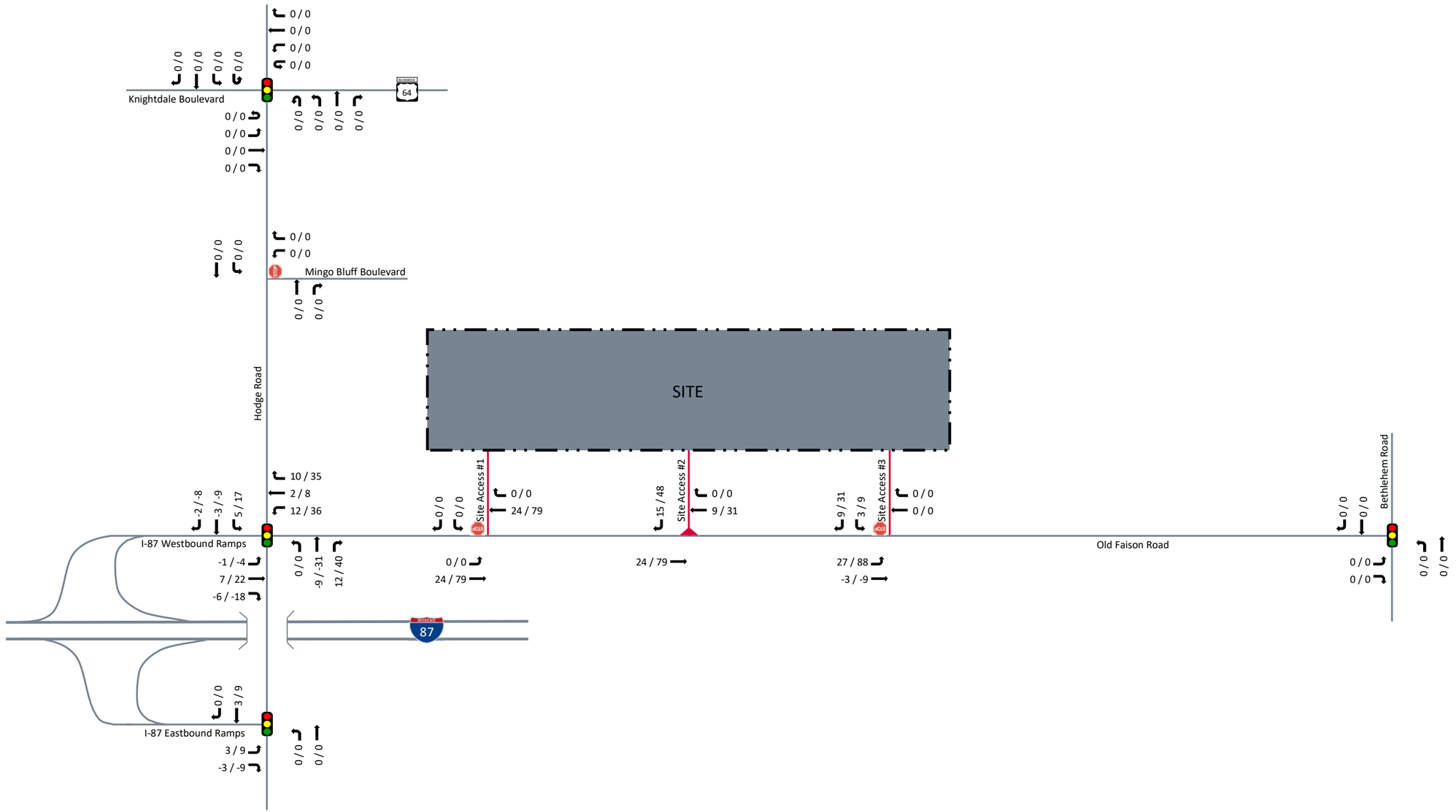
Boulder Ridge Mixed-Use

Knightdale, NC

Pass-By Site Trip Distribution

Scale: Not to Scale | Figure 10

McAdams



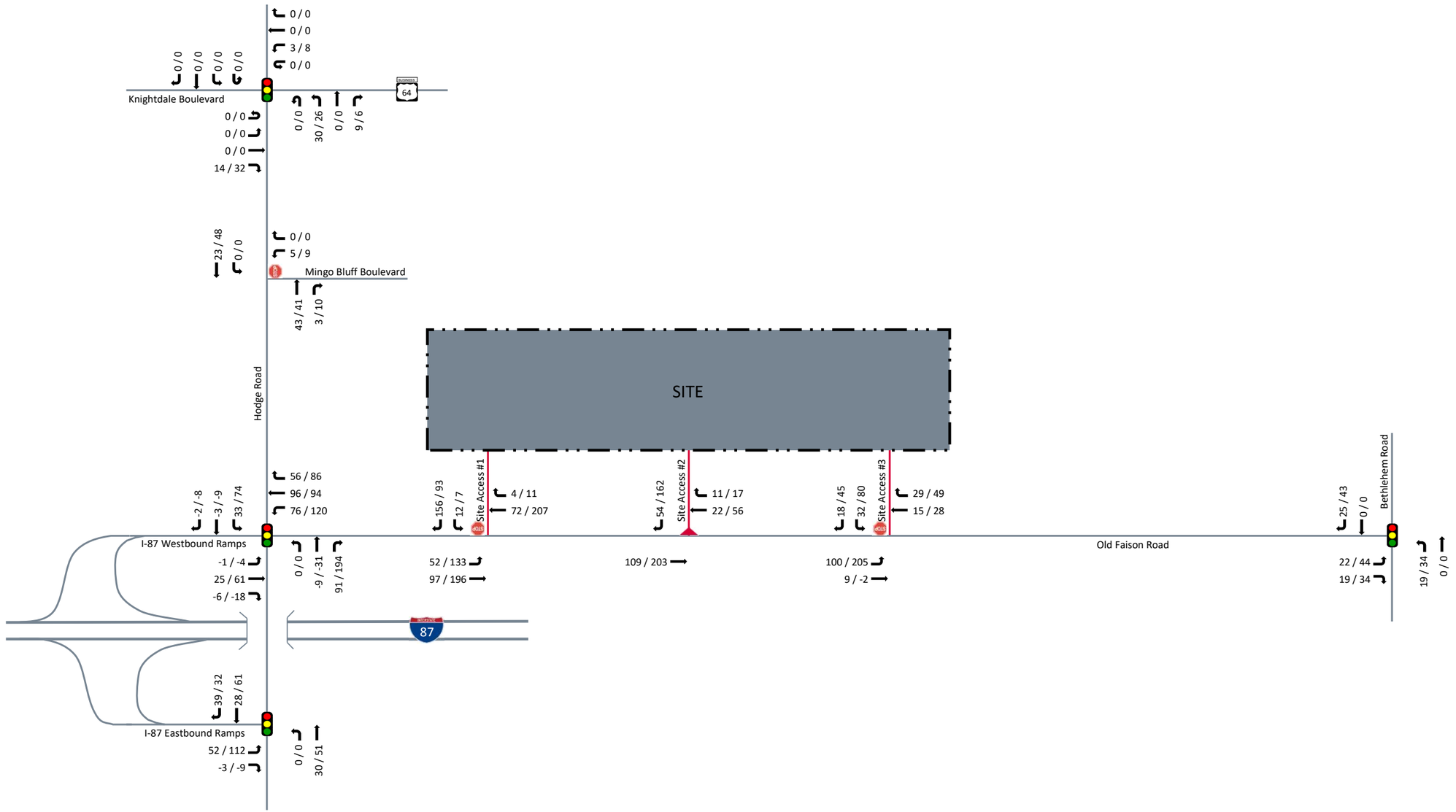
Boulder Ridge Mixed-Use

Knightdale, NC

Pass-By Site Trip Assignment

Scale: Not to Scale | Figure 11

McAdams



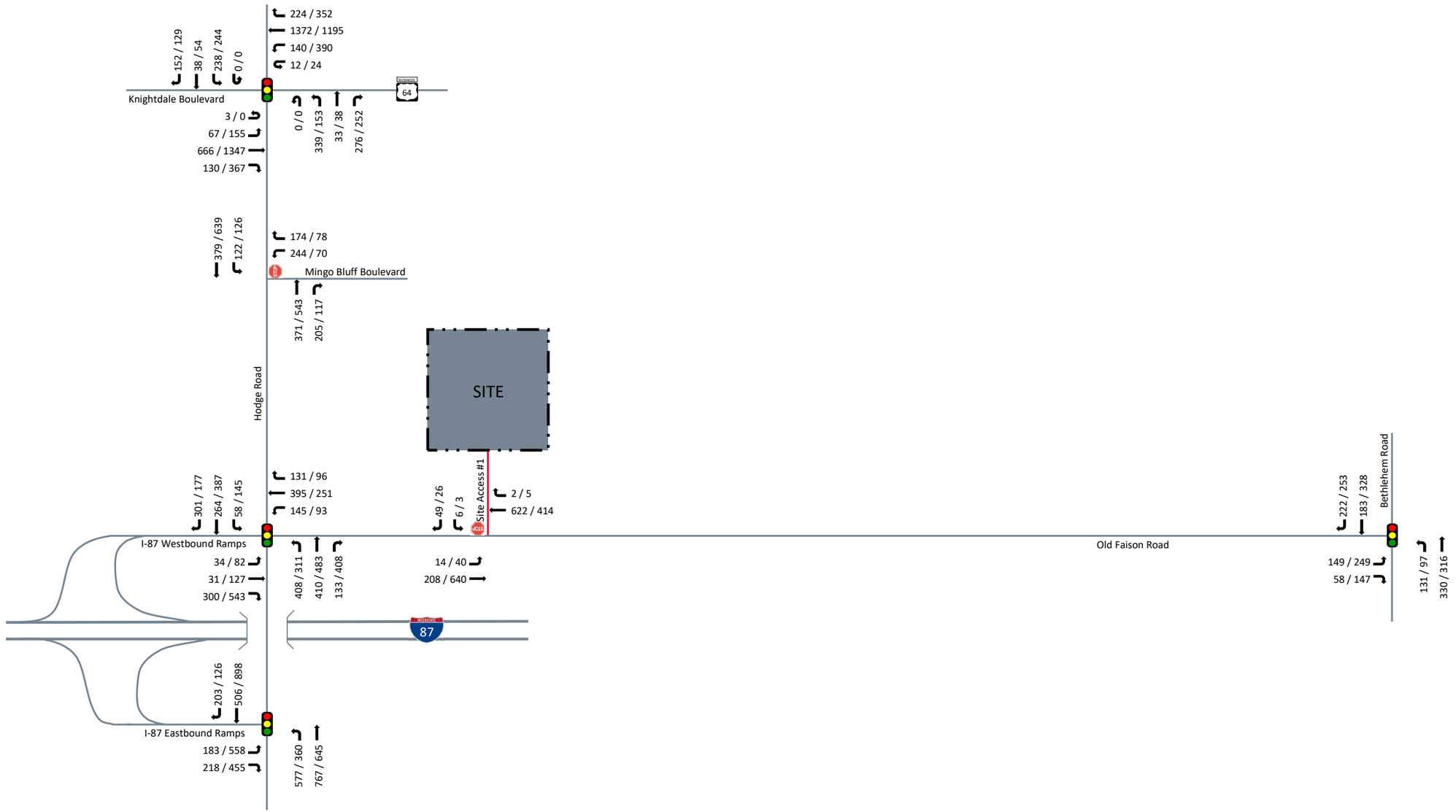
Boulder Ridge Mixed-Use

Knightdale, NC

Total Site Trip Assignment

Scale: Not to Scale | Figure 12

McAdams



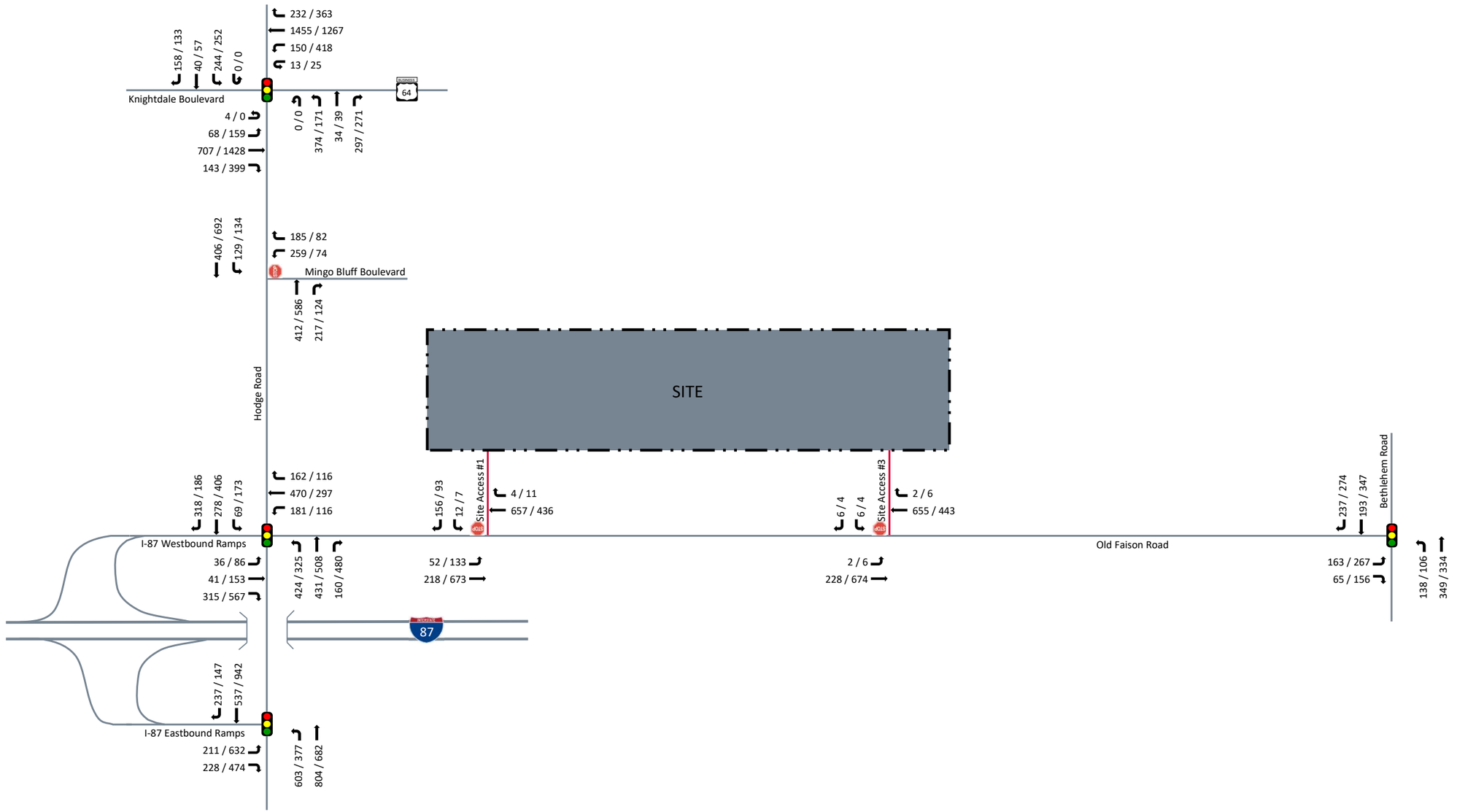
Boulder Ridge Mixed-Use

Knightdale, NC

Build (2029) Peak Hour
Traffic Volumes - Phase 1

Scale: Not to Scale | Figure 13A

McAdams



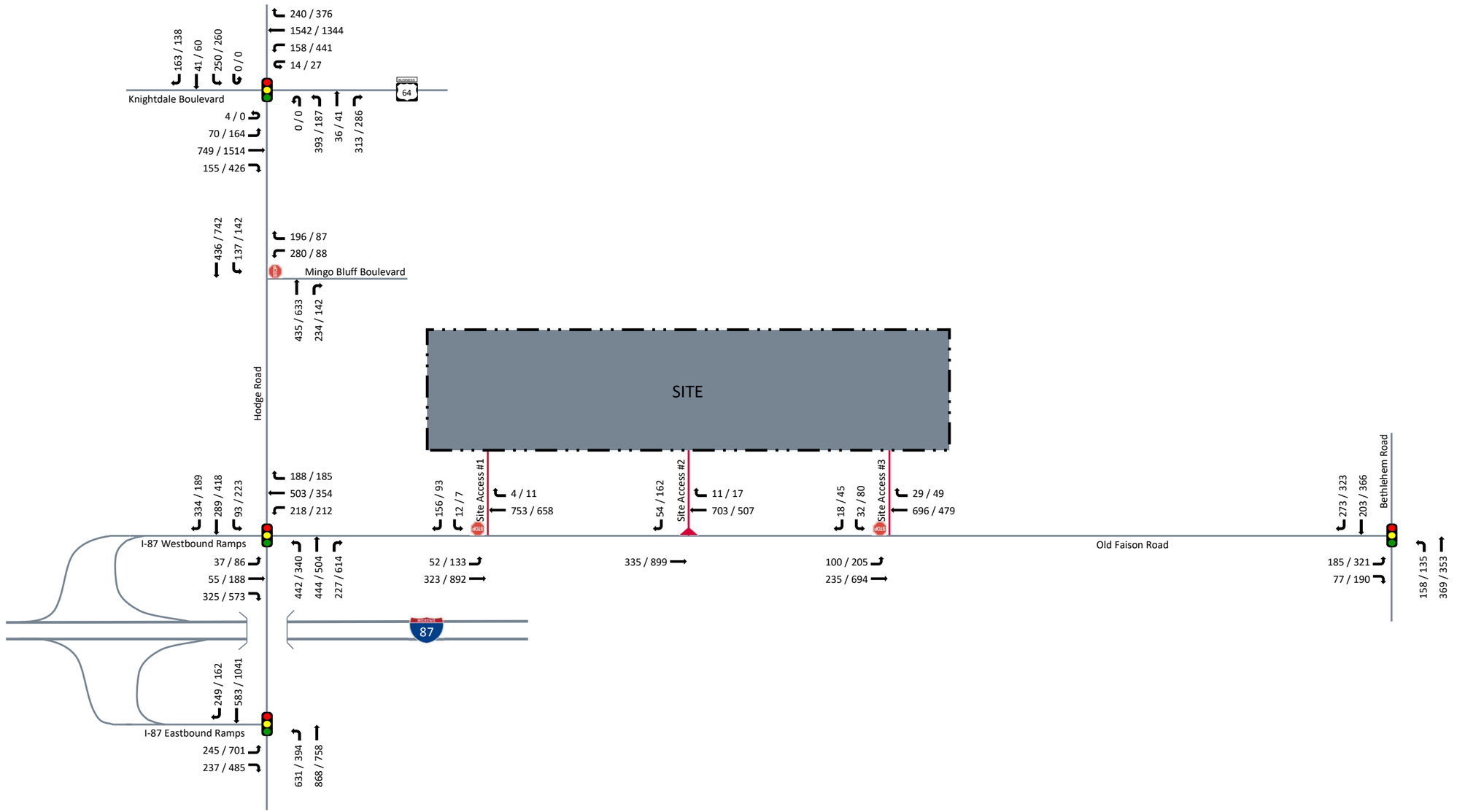
Boulder Ridge Mixed-Use

Knightdale, NC

Build (2031) Peak Hour
Traffic Volumes - Phase 2

Scale: Not to Scale | Figure 13B

McAdams



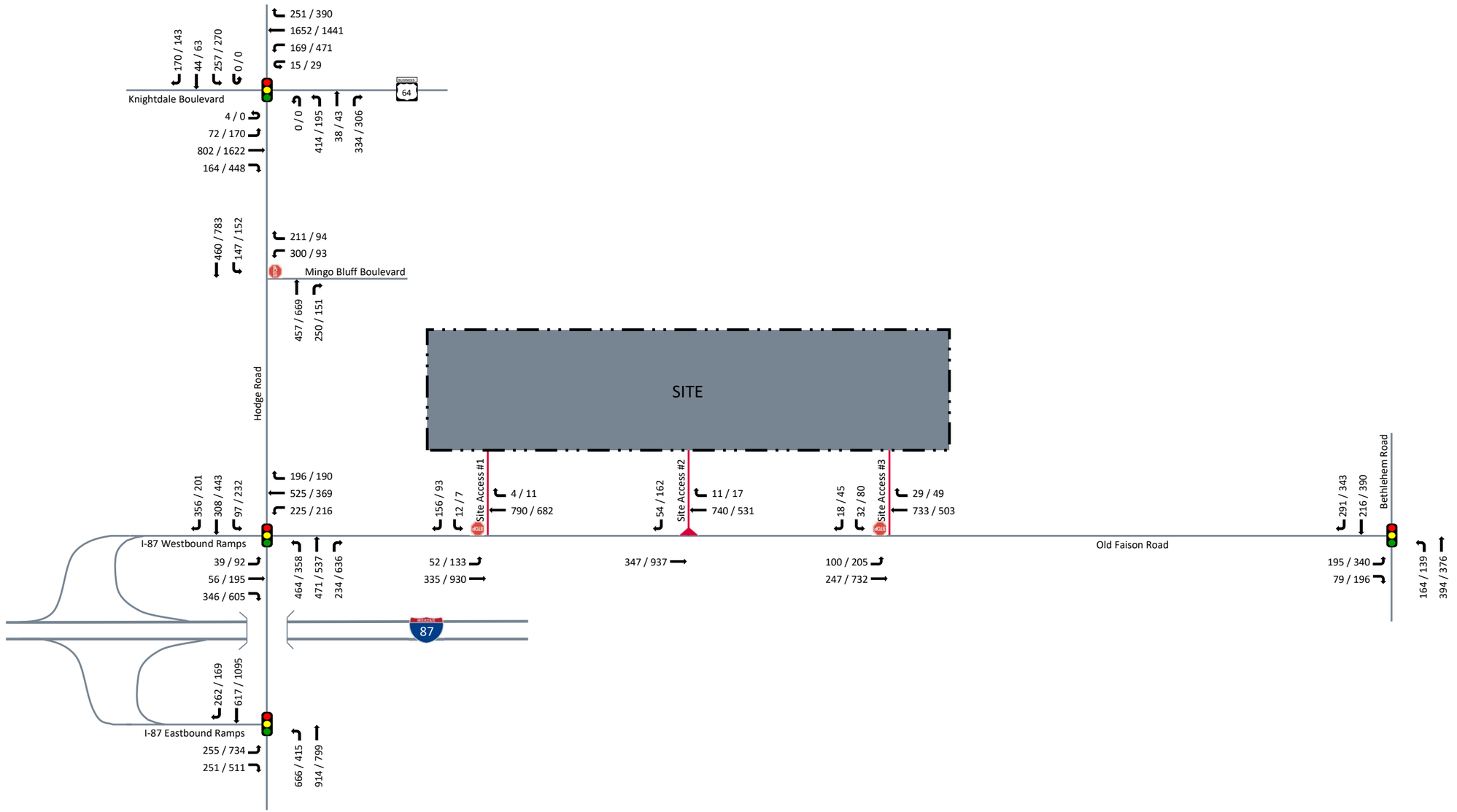
Boulder Ridge Mixed-Use

Knightdale, NC

Build (2033) Peak Hour
Traffic Volumes - Phase 3

Scale: Not to Scale | Figure 13C

McADAMS



Boulder Ridge Mixed-Use

Knightdale, NC

Build (2042) Peak Hour
Traffic Volumes - Future Year

Scale: Not to Scale | Figure 13D

McAdams

CAPACITY ANALYSIS

The intersections and analysis scenarios included in this study were analyzed to determine the potential impact by the proposed development and to recommend improvements to mitigate any potential impacts. The capacity analysis reviews the level of service (LOS), delay, and vehicle queues expected under each analysis scenario utilizing the methodology contained in the *Highway Capacity Manual* (HCM), 6th Edition, published by the Transportation Research Board.

LOS is a qualitative measurement of traffic operations based on the average total vehicle delay of the movement, approach, or intersection. The HCM includes six levels of service, ranging from level "A" (free flow conditions) to level "F" (where over-saturated conditions are evident). Table 4 provides a summary of the thresholds for each LOS under both unsignalized (stop-control) and signalized operations.

TABLE 4: HIGHWAY CAPACITY MANUAL – LEVELS OF SERVICE + DELAY CRITERIA

Level of Service (LOS)	Unsignalized	Signalized
	Average Control Delay (Seconds per vehicle)	Average Control Delay (Seconds per vehicle)
A	≤ 10	≤ 10
B	> 10 and ≤ 15	> 10 and ≤ 20
C	> 15 and ≤ 25	> 20 and ≤ 35
D	> 25 and ≤ 35	> 35 and ≤ 55
E	> 35 and ≤ 50	> 55 and ≤ 80
F	> 50	> 80

A computer software package, Synchro (version 11.1), was utilized for the analysis of operations within this study. Within this software package, SimTraffic was also used to review queue lengths and the operations of intersections within the context of location and spacing in the study area. The capacity analysis summary table for each study intersection provides the delay and LOS for each approach and overall intersection, when appropriate. More detailed queues and delay information is provided in the appendix.

Per the NCDOT *Congestion Management Capacity Analysis Guidelines*, several assumptions were applied to the full study. A summary of these assumptions is provided below:

- A Peak Hour Factor (PHF) of 0.90 was used for all analysis scenarios and intersections.
- A heavy vehicle percentage of 2% was applied to all analysis scenarios and intersections.
- For allowable movements with volumes less than four (4), a volume of four (4) was applied in the capacity analysis. In order to present accurate information within the traffic volume figures, this was not applied to those conditions.

US 64 BUSINESS (KNIGHTDALE BOULEVARD) + HODGE ROAD

The intersection of US 64 Business (Knightdale Boulevard) and Hodge Road is currently a signalized, four-leg intersection. This intersection was analyzed under Existing (2025), No-Build (2029), Build (2029), No-Build (2031), Build (2031), No-Build (2033), Build (2033), No-Build (2042), and Build (2042) conditions.

Table 5 provides the capacity analysis for the subject intersection with the lane configurations and traffic control shown in the table. Refer to Appendix F for the Synchro capacity analysis reports. Copies of the SimTraffic queueing and performance reports can be found in Appendix N.

TABLE 5: CAPACITY ANALYSIS SUMMARY OF US 64 BUSINESS (KNIGHTDALE BOULEVARD) + HODGE ROAD

Conditions	APPROACH	Lane Configurations	Weekday AM Peak Hour		Weekday PM Peak Hour	
			LOS and Approach Delay (seconds)	Overall Delay (seconds)	LOS and Approach Delay (seconds)	Overall Delay (seconds)
Existing (2025)	EB WB NB SB	2 LT, 3 TH, 1 RT 1 LT, 3 TH, 1 RT 2 LT, 1 TH, 1 RT 2 LT, 1 TH, 1 RT	C (28) C (26) D (40) D (39)	C (30)	D (41) C (28) E (63) D (50)	D (38)
No-Build (2029)	EB WB NB SB	2 LT, 3 TH, 1 RT 1 LT, 3 TH, 1 RT 2 LT, 1 TH, 1 RT 2 LT, 1 TH, 1 RT	E (78) F (86) F (100) D (53)	F (82)	F (210) F (601) C (33) E (74)	F (345)
Build (2029)	EB WB NB SB	2 LT, 3 TH, 1 RT 1 LT, 3 TH, 1 RT 2 LT, 1 TH, 1 RT 2 LT, 1 TH, 1 RT	E (78) F (88) F (106) D (53)	F (84)	F (210) F (606) C (33) E (74)	F (346)
No-Build (2031)	EB WB NB SB	2 LT, 3 TH, 1 RT 1 LT, 3 TH, 1 RT 2 LT, 1 TH, 1 RT 2 LT, 1 TH, 1 RT	F (91) F (92) F (111) D (54)	F (91)	F (240) F (641) C (33) E (77)	F (374)
Build (2031)	EB WB NB SB	2 LT, 3 TH, 1 RT 1 LT, 3 TH, 1 RT 2 LT, 1 TH, 1 RT 2 LT, 1 TH, 1 RT	F (90) F (96) F (134) D (54)	F (97)	F (239) F (662) C (34) E (77)	F (381)
No-Build (2033)	EB WB NB SB	2 LT, 3 TH, 1 RT 1 LT, 3 TH, 1 RT 2 LT, 1 TH, 1 RT 2 LT, 1 TH, 1 RT	F (107) F (100) F (122) D (54)	F (100)	F (271) F (682) C (33) F (82)	F (405)
Build (2033)	EB WB NB SB	2 LT, 3 TH, 1 RT 1 LT, 3 TH, 1 RT 2 LT, 1 TH, 1 RT 2 LT, 1 TH, 1 RT	F (106) F (104) F (149) D (54)	F (107)	F (270) F (705) D (36) F (82)	F (411)

TABLE 5: CAPACITY ANALYSIS SUMMARY OF US 64 BUSINESS (KNIGHTDALE BOULEVARD) + HODGE ROAD (CONT)						
Conditions	**APPROACH**	**Lane Configurations**	**Weekday AM Peak Hour**		**Weekday PM Peak Hour**	
			LOS and Approach Delay (seconds)	**Overall Delay (seconds)**	**LOS and Approach Delay (seconds)**	**Overall Delay (seconds)**
Build (2033) – **Improved Signal Phasing**	EB WB NB SB	2 LT, 3 TH, 1 RT 1 LT, 3 TH, 1 RT 2 LT, 1 TH, 1 RT 2 LT, 1 TH, 1 RT	D (35) D (37) E (59) D (53)	D (42)	E (55) D (46) F (117) F (83)	E (60)
No-Build (2042)	EB WB NB SB	2 LT, 3 TH, 1 RT 1 LT, 3 TH, 1 RT 2 LT, 1 TH, 1 RT 2 LT, 1 TH, 1 RT	F (131) F (109) F (138) E (74)	F (116)	F (313) F (736) C (34) F (87)	F (445)
Build (2042)	EB WB NB SB	2 LT, 3 TH, 1 RT 1 LT, 3 TH, 1 RT 2 LT, 1 TH, 1 RT 2 LT, 1 TH, 1 RT	F (130) F (113) F (165) E (74)	F (122)	F (312) F (759) D (37) F (87)	F (452)

Capacity analysis of Existing (2025) traffic conditions indicates that the intersection of US 64 Business (Knightdale Boulevard) and Hodge Road is currently operating at an overall LOS D or better during the weekday AM and PM peak hours. Capacity analysis of No-Build (2029), Build (2029), No-Build (2031), Build (2031), No-Build (2033), Build (2033), No-Build (2042), and Build (2042) traffic conditions indicates that this intersection is expected to operate at an overall LOS F during the weekday AM and PM peak hours.

Due to the poor operations seen from the u-turn movements at this intersection, an additional analysis scenario is provided demonstrating these u-turns operating under the same signal control as the left-turn approaches, protected phasing. Under these conditions, the intersection is expected to operate at an overall LOS D during the weekday AM peak hour and LOS E during the weekday PM peak hour. It should be noted that per intersection signage, these u-turn movements currently operate under permitted traffic control as they yield to the right-turn traffic, however, if future operational issues arise, these u-turn movements could be restricted due to the low u-turning volumes. This modified signal phasing was only shown under full build conditions, but the interim buildout phases would be expected to see better delay with similar phasing changes.

The proposed development is expected to account for less than 2% of the overall total traffic volume at this intersection. Due to the minor impacts in the operations by the proposed development and low percentage of overall intersection traffic, no improvements are recommended at this intersection.

HODGE ROAD + MINGO BLUFF BOULEVARD

The intersection of Hodge Road and Mingo Bluff Boulevard is currently an unsignalized, three-leg intersection. This intersection was analyzed under Existing (2025), No-Build (2029), Build (2029), No-Build (2031), Build (2031), No-Build (2033), Build (2033), No-Build (2042), and Build (2042) conditions.

Table 6 provides the capacity analysis for the subject intersection with the lane configurations and traffic control shown in the table. Refer to Appendix G for the Synchro capacity analysis reports. Copies of the SimTraffic queueing and performance reports can be found in Appendix N.

TABLE 6: CAPACITY ANALYSIS SUMMARY OF HODGE ROAD + MINGO BLUFF BOULEVARD

Conditions	APPROACH	Lane Configurations	Weekday AM Peak Hour		Weekday PM Peak Hour	
			LOS and Approach Delay (seconds)	Overall Delay (seconds)	LOS and Approach Delay (seconds)	Overall Delay (seconds)
Existing (2025)	WB[2]	1 LT, 1 TH	D (30)	N/A	C (23)	N/A
	NB	1 TH, 1 RT	--		--	
	SB[1]	1 LT, 1 RT	A (9)		A (9)	
No-Build (2029)	WB[2]	1 LT, 1 TH	F (136)	N/A	F (59)	N/A
	NB	1 TH, 1 RT	--		--	
	SB[1]	1 LT, 1 RT	A (9)		A (10)	
Build (2029)	WB[2]	1 LT, 1 TH	F (144)	N/A	F (62)	N/A
	NB	1 TH, 1 RT	--		--	
	SB[1]	1 LT, 1 RT	A (10)		A (10)	
No-Build (2031)	WB[2]	1 LT, 1 TH	F (186)	N/A	F (85)	N/A
	NB	1 TH, 1 RT	--		--	
	SB[1]	1 LT, 1 RT	A (10)		B (10)	
Build (2031)	WB[2]	1 LT, 1 TH	F (222)	N/A	F (100)	N/A
	NB	1 TH, 1 RT	--		--	
	SB[1]	1 LT, 1 RT	A (10)		B (10)	
No-Build (2033)	WB[2]	1 LT, 1 TH	F (256)	N/A	F (123)	N/A
	NB	1 TH, 1 RT	--		--	
	SB[1]	1 LT, 1 RT	A (10)		B (10)	
Build (2033)	WB[2]	1 LT, 1 TH	F (325)	N/A	F (202)	N/A
	NB	1 TH, 1 RT	--		--	
	SB[1]	1 LT, 1 RT	B (10)		B (11)	

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

TABLE 6: CAPACITY ANALYSIS SUMMARY OF HODGE ROAD + MINGO BLUFF BOULEVARD (CONT)						
			Weekday AM Peak Hour		Weekday PM Peak Hour	
Conditions	APPROACH	Lane Configurations	LOS and Approach Delay (seconds)	Overall Delay (seconds)	LOS and Approach Delay (seconds)	Overall Delay (seconds)
No-Build (2042)	WB[2] NB SB[1]	1 LT, 1 TH 1 TH, 1 RT 1 LT, 1 RT	F (358) -- B (10)	N/A	F (189) -- B (11)	N/A
Build (2042)	WB[2] NB SB[1]	1 LT, 1 TH 1 TH, 1 RT 1 LT, 1 RT	F (443) -- B (10)	N/A	F (295) -- B (11)	N/A

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

Capacity analysis of Existing (2025) traffic conditions indicates that the major-street left-turn movement at the intersection of Hodge Road and Mingo Bluff Boulevard is currently operating at LOS A during the weekday AM and PM peak hours and the minor-street approach is currently operating at LOS D or better during the weekday AM and PM peak hours. Capacity analysis of No-Build (2029), Build (2029), No-Build (2031), Build (2031), No-Build (2033), Build (2033), No-Build (2042), and Build (2042) traffic conditions indicates that the major-street left-turn movement is expected to operate at LOS B or better during the weekday AM and PM peak hours and the minor-street approach is expected to operate at LOS F during the weekday AM and PM peak hours.

The potential need for signalization of this intersection was evaluated based on the criteria contained within the *Manual on Uniform Traffic Control Devices* (MUTCD) published by the Federal Highway Administration (FHWA). Build (2033) peak hour traffic volumes from this analysis were utilized to evaluate the peak hour warrant (warrant 3) from the MUTCD and based on the results this intersection is expected to satisfy the peak hour warrant during both the weekday AM and PM peak hours. However, due to Mingo Bluff Boulevard serving predominantly residential developments with well-defined peak hours it is not expected that this intersection would satisfy the longer period 8-hour (warrant 1) and 4-hour (warrant) warrants, which are typically preferred for signalization. It should also be noted, due to the methodology of a general 3% compounded growth rate utilized for projected future volumes, traffic growth on the minor-street approach was seen with no substantiated future developments to generate these trips as may be expected along corridors such as Hodge Road. Under 2033 conditions, this 3% growth rate accounts for an additional 99 AM peak hour exiting trips from Mingo Bluff Boulevard. This background growth is the predominant cause for the increase in minor-street approach delay between Existing and No-Build conditions when the approach degrades to LOS F. Refer to Appendix O for a copy of the MUTCD peak hour signal warrants at this intersection.

The proposed development is expected to account for less than 6% of the overall total traffic volume at this intersection. Due to the minor impacts at this intersection by the proposed development and significant background traffic growth leading to the poor minor-street approach conditions seen in the analysis, no improvements are recommended

HODGE ROAD + OLD FAISON ROAD / I-87 WESTBOUND RAMPS

The intersection of Hodge Road and Old Faison Road / I-87 Westbound Ramps is currently a signalized, four-leg intersection. This intersection was analyzed under Existing (2025), No-Build (2029), Build (2029), No-Build (2031), Build (2031), No-Build (2033), Build (2033), No-Build (2042), and Build (2042) conditions. Based on coordination with Town and NCDOT staff, multiple adjacent developments are expected to construct improvements at the subject intersection prior to the phase 1 buildout (2029) of the proposed development. These improvements were included under all future year analyses (No-Build and Build conditions). The improvements included as adjacent development improvements are:

- Extend the existing eastbound shared left-through lane on I-87 Westbound Ramps to a minimum of 275 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks
- Construct an exclusive westbound left-turn lane on Old Faison Road with a minimum of 125 feet of full width storage and appropriate deceleration and taper. – StoneRiver and SilverStone
- Construct an exclusive westbound right-turn lane on Old Faison Road with a minimum of 100 feet of full width storage and appropriate deceleration and taper. – STIP W-5705AK
- Extend the westbound left-turn lane on Old Faison Road to a minimum of 175 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks
- Construct an exclusive northbound right-turn lane on Hodge Road with a minimum of 200 feet of full width storage and appropriate deceleration and taper. – StoneRiver and SilverStone
- Extend the existing northbound right-turn lane on Hodge Road to the maximum amount of full width storage and appropriate deceleration and taper prior to the start of the bridge over I-87. – Lyndon Oaks
- Extend the existing southbound left-turn lane on Hodge Road to a minimum of 275 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks

Table 7 provides the capacity analysis for the subject intersection with the lane configurations and traffic control shown in the table. Refer to Appendix H for the Synchro capacity analysis reports. Copies of the SimTraffic queueing and performance reports can be found in Appendix N.

TABLE 7: CAPACITY ANALYSIS SUMMARY OF HODGE ROAD + OLD FAISON ROAD / I-87 WESTBOUND RAMPS

Conditions	APPROACH	Lane Configurations	Weekday AM Peak Hour		Weekday PM Peak Hour	
			LOS and Approach Delay (seconds)	Overall Delay (seconds)	LOS and Approach Delay (seconds)	Overall Delay (seconds)
Existing (2025)	EB	1 LT-TH, 1 RT	C (20)	C (24)	D (42)	C (24)
	WB	1 LT-TH-RT	D (55)		E (60)	
	NB	1 LT, 1 TH-RT	B (15)		B (10)	
	SB	1 LT, 1 TH, 1 RT	B (12)		B (11)	
No-Build (2029)	EB	1 LT-TH, 1 RT	C (25)	C (23)	C (31)	C (24)
	WB	1 LT, 1 TH, 1 RT	D (49)		C (31)	
	NB	1 LT, 1 TH, 1 RT	B (13)		B (17)	
	SB	1 LT, 1 TH, 1 RT	B (13)		C (23)	

Background Improvements by adjacent developments are shown underlined.

TABLE 7: CAPACITY ANALYSIS SUMMARY OF HODGE ROAD + OLD FAISON ROAD / I-87 WESTBOUND RAMPS (CONT)

Conditions	APPROACH	Lane Configurations	Weekday AM Peak Hour		Weekday PM Peak Hour	
			LOS and Approach Delay (seconds)	Overall Delay (seconds)	LOS and Approach Delay (seconds)	Overall Delay (seconds)
Build (2029)	EB	1 LT-TH, 1 RT	C (24)	C (24)	C (24)	C (26)
	WB	1 LT, 1 TH, 1 RT	D (49)		C (28)	
	NB	1 LT, 1 TH, 1 RT	B (13)		C (25)	
	SB	1 LT, 1 TH, 1 RT	B (13)		C (29)	
No-Build (2031)	EB	1 LT-TH, 1 RT	C (24)	C (24)	C (32)	C (25)
	WB	1 LT, 1 TH, 1 RT	D (51)		C (31)	
	NB	1 LT, 1 TH, 1 RT	B (13)		B (20)	
	SB	1 LT, 1 TH, 1 RT	B (14)		C (24)	
Build (2031)	EB	1 LT-TH, 1 RT	C (20)	C (26)	C (27)	C (29)
	WB	1 LT, 1 TH, 1 RT	D (47)		C (30)	
	NB	1 LT, 1 TH, 1 RT	B (16)		C (28)	
	SB	1 LT, 1 TH, 1 RT	B (16)		C (31)	
No-Build (2033)	EB	1 LT-TH, 1 RT	C (22)	C (25)	C (31)	C (27)
	WB	1 LT, 1 TH, 1 RT	D (52)		C (31)	
	NB	1 LT, 1 TH, 1 RT	B (14)		C (24)	
	SB	1 LT, 1 TH, 1 RT	B (15)		C (27)	
Build (2033)	EB	1 LT-TH, 1 RT	C (20)	C (28)	D (51)	D (36)
	WB	1 LT, 1 TH, 1 RT	D (51)		D (45)	
	NB	1 LT, 1 TH, 1 RT	B (18)		C (28)	
	SB	1 LT, 1 TH, 1 RT	B (19)		C (28)	
No-Build (2042)	EB	1 LT-TH, 1 RT	C (21)	C (27)	C (31)	C (31)
	WB	1 LT, 1 TH, 1 RT	D (55)		C (31)	
	NB	1 LT, 1 TH, 1 RT	B (17)		C (30)	
	SB	1 LT, 1 TH, 1 RT	B (18)		C (32)	
Build (2042)	EB	1 LT-TH, 1 RT	C (25)	C (33)	E (77)	D (45)
	WB	1 LT, 1 TH, 1 RT	E (62)		D (52)	
	NB	1 LT, 1 TH, 1 RT	B (20)		C (30)	
	SB	1 LT, 1 TH, 1 RT	C (21)		C (31)	

Background Improvements by adjacent developments are shown underlined.

Capacity analysis of Existing (2025), No-Build (2029), Build (2029), No-Build (2031), Build (2031), No-Build (2033), Build (2033), No-Build (2042), and Build (2042) traffic conditions indicates that the intersection of Hodge Road and Old Faison Road / I-87 Westbound Ramps is expected to operate at and overall LOS D or better during the weekday AM and PM peak hours.

The proposed development is expected to account for a maximum of 7% of the overall total traffic volume at this intersection and the addition of development traffic is expected to account for three (3) seconds of additional delay during the weekday AM peak hour and nine (9) seconds of additional delay during the weekday PM peak hour under Build (2033)

conditions. Due to the minor impacts and acceptable future operations upon buildout of the proposed development in 2033, no improvements are recommended.

Based on a review of the maximum queue lengths as reported from SimTraffic at this intersection under Build (2029) traffic conditions, queues for the westbound approach are not expected to queue past Site Access #1 upon buildout of Phase 1 of the development.

HODGE ROAD + I-87 EASTBOUND RAMPS

The intersection of Hodge Road and I-87 Eastbound Ramps is currently a signalized, three-leg intersection. This intersection was analyzed under Existing (2025), No-Build (2029), Build (2029), No-Build (2031), Build (2031), No-Build (2033), Build (2033), No-Build (2042), and Build (2042) conditions. Based on coordination with Town and NCDOT staff, multiple adjacent developments are expected to construct improvements at the subject intersection prior to the phase 1 buildout (2029) of the proposed development. These improvements were included under all future year analyses (No-Build and Build conditions). The improvements included as adjacent development improvements are:

- Construct an exclusive eastbound right-turn lane on I-87 Eastbound Ramps with a minimum of 150 feet of full width storage and appropriate deceleration and taper. – StoneRiver and SilverStone
- Restripe the existing exclusive southbound right-turn lane on Hodge Road to that of a shared through-right lane. – StoneRiver and SilverStone

Table 8 provides the capacity analysis for the subject intersection with the lane configurations and traffic control shown in the table. Refer to Appendix I for the Synchro capacity analysis reports. Copies of the SimTraffic queueing and performance reports can be found in Appendix N.

TABLE 8: CAPACITY ANALYSIS SUMMARY OF HODGE ROAD + I-87 EASTBOUND RAMPS

Conditions	APPROACH	Lane Configurations	Weekday AM Peak Hour		Weekday PM Peak Hour	
			LOS and Approach Delay (seconds)	Overall Delay (seconds)	LOS and Approach Delay (seconds)	Overall Delay (seconds)
Existing (2025)	EB	2 LT, 1 RT	C (25)	A (7)	C (32)	B (17)
	NB	1 LT, 1 TH	A (4)		A (7)	
	SB	1 TH, 1 RT	A (4)		B (11)	
No-Build (2029)	EB	2 LT, 2 RT	C (27)	B (16)	C (32)	C (27)
	NB	1 LT, 1 TH	B (13)		C (22)	
	SB	1 TH, 1 TH-RT	B (16)		C (26)	
Build (2029)	EB	2 LT, 2 RT	C (27)	C (22)	C (31)	C (28)
	NB	1 LT, 1 TH	C (27)		C (31)	
	SB	1 TH, 1 TH-RT	A (10)		C (21)	
No-Build (2031)	EB	2 LT, 2 RT	C (27)	B (18)	C (32)	C (29)
	NB	1 LT, 1 TH	B (15)		C (26)	
	SB	1 TH, 1 TH-RT	B (18)		C (28)	
Build (2031)	EB	2 LT, 2 RT	C (30)	B (20)	D (37)	C (31)
	NB	1 LT, 1 TH	B (17)		C (29)	
	SB	1 TH, 1 TH-RT	B (19)		C (28)	

Background Improvements by adjacent developments are shown underlined.

TABLE 8: CAPACITY ANALYSIS SUMMARY OF BETHLEHEM ROAD + OLD FAISON ROAD (CONT)						
Conditions	**APPROACH**	**Lane Configurations**	**Weekday AM Peak Hour**		**Weekday PM Peak Hour**	
			LOS and Approach Delay (seconds)	**Overall Delay (seconds)**	**LOS and Approach Delay (seconds)**	**Overall Delay (seconds)**
No-Build (2033)	EB	2 LT, 2 RT	C (27)	B (20)	C (34)	C (32)
	NB	1 LT, 1 TH	B (18)		C (31)	
	SB	1 TH, 1 TH-RT	B (19)		C (30)	
Build (2033)	EB	2 LT, 2 RT	C (33)	C (23)	D (43)	D (38)
	NB	1 LT, 1 TH	C (20)		C (31)	
	SB	1 TH, 1 TH-RT	C (23)		D (40)	
No-Build (2042)	EB	2 LT, 2 RT	C (28)	C (23)	D (35)	C (34)
	NB	1 LT, 1 TH	C (22)		C (32)	
	SB	1 TH, 1 TH-RT	C (21)		C (34)	
Build (2042)	EB	2 LT, 2 RT	C (34)	C (26)	E (57)	D (45)
	NB	1 LT, 1 TH	C (24)		C (32)	
	SB	1 TH, 1 TH-RT	C (26)		D (46)	

Background Improvements by adjacent developments are shown underlined.

Capacity analysis of Existing (2025), No-Build (2029), Build (2029), No-Build (2031), Build (2031), No-Build (2033), Build (2033), No-Build (2042), and Build (2042) traffic conditions indicates that the intersection of Hodge Road and I-87 Eastbound Ramps is expected to operate at and overall LOS D or better during the weekday AM and PM peak hours.

The proposed development is expected to account for a maximum of 7% of the overall total traffic volume at this intersection and the addition of development traffic is expected to account for three (3) seconds of additional delay during the weekday AM peak hour and seven (7) seconds of additional delay during the weekday PM peak hour under Build (2033) conditions. Due to the minor impacts and acceptable future operations upon buildout of the proposed development in 2033, no improvements are recommended.

BETHLEHEM ROAD + OLD FAISON ROAD

The intersection of Bethlehem Road and Old Faison Road is currently an unsignalized, three-leg intersection. This intersection was analyzed under Existing (2025), No-Build (2029), Build (2029), No-Build (2031), Build (2031), No-Build (2033), Build (2033), No-Build (2042), and Build (2042) conditions. Based on coordination with Town and NCDOT staff, Lyndon Oaks development is expected to construct improvements at the subject intersection prior to the phase 1 buildout (2029) of the proposed development. These improvements were included under all future year analyses (No-Build and Build conditions). The improvements included as adjacent development improvements are:

- Construct an exclusive southbound right-turn lane on Bethlehem Road with a minimum of 250 feet of full width storage and appropriate deceleration and taper.
- Construct an exclusive northbound left-turn lane on Bethlehem Road with a minimum of 175 feet of full width storage and appropriate deceleration and taper.
- Construct an exclusive eastbound left-turn lane on Old Faison Road with a minimum of 250 feet of full width storage and appropriate deceleration and taper.
- Install a signal once warranted and approved by NCDOT.

Table 9 provides the capacity analysis for the subject intersection with the lane configurations and traffic control shown in the table. Refer to Appendix J for the Synchro capacity analysis reports. Copies of the SimTraffic queueing and performance reports can be found in Appendix N.

TABLE 9: CAPACITY ANALYSIS SUMMARY OF BETHLEHEM ROAD + OLD FAISON ROAD

Conditions	APPROACH	Lane Configurations	Weekday AM Peak Hour		Weekday PM Peak Hour	
			LOS and Approach Delay (seconds)	Overall Delay (seconds)	LOS and Approach Delay (seconds)	Overall Delay (seconds)
Existing (2025)	EB[2] NB[1] SB	1 LT-RT 1 LT-TH 1 TH-RT	C (20) A (8) --	N/A	E (46) A (9) --	N/A
No-Build (2029) [Signalization]	EB NB SB	1 LT, 1 RT 1 LT, 1 TH 1 TH, 1 RT	C (23) B (12) C (22)	B (18)	C (25) B (14) C (26)	C (22)
Build (2029) [Signalization]	EB NB SB	1 LT, 1 RT 1 LT, 1 TH 1 TH, 1 RT	C (23) B (12) C (23)	B (18)	C (25) B (14) C (26)	C (22)
No-Build (2031) [Signalization]	EB NB SB	1 LT, 1 RT 1 LT, 1 TH 1 TH, 1 RT	C (24) B (12) C (23)	B (19)	C (26) B (15) C (27)	C (23)
Build (2031) [Signalization]	EB NB SB	1 LT, 1 RT 1 LT, 1 TH 1 TH, 1 RT	C (24) B (13) C (24)	B (19)	C (26) B (15) C (28)	C (24)

Background Improvements by adjacent developments are shown underlined.

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

TABLE 9: CAPACITY ANALYSIS SUMMARY OF BETHLEHEM ROAD + OLD FAISON ROAD (CONT)

Conditions	APPROACH	Lane Configurations	Weekday AM Peak Hour		Weekday PM Peak Hour	
			LOS and Approach Delay (seconds)	Overall Delay (seconds)	LOS and Approach Delay (seconds)	Overall Delay (seconds)
No-Build (2033) [Signalization]	EB	1 LT, 1 RT	C (24)	B (19)	C (27)	C (24)
	NB	1 LT, 1 TH	B (13)		B (16)	
	SB	1 TH, 1 RT	C (24)		C (28)	
Build (2033) [Signalization]	EB	1 LT, 1 RT	C (27)	C (21)	C (31)	C (29)
	NB	1 LT, 1 TH	B (14)		B (19)	
	SB	1 TH, 1 RT	C (26)		C (34)	
No-Build (2042) [Signalization]	EB	1 LT, 1 RT	C (26)	C (20)	C (28)	C (26)
	NB	1 LT, 1 TH	B (13)		B (17)	
	SB	1 TH, 1 RT	C (25)		C (30)	
Build (2042) [Signalization]	EB	1 LT, 1 RT	C (28)	C (22)	C (33)	C (30)
	NB	1 LT, 1 TH	B (15)		C (20)	
	SB	1 TH, 1 RT	C (27)		D (36)	

Background Improvements by adjacent developments are shown underlined.

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

Capacity analysis of Existing (2025) traffic conditions indicates that the major-street left-turn movement at the intersection of Bethlehem Road and Old Faison Road currently operates at LOS A during the weekday AM and PM peak hours while the minor-street approach currently operates at LOS C during the weekday AM peak hour and LOS E during the weekday PM peak hour.

With signalization and construction of exclusive turn lanes, this intersection is expected to operate at an overall LOS C or better during the weekday AM and PM peak hours under No-Build (2029), Build (2029), No-Build (2031), Build (2031), No-Build (2033), Build (2033), No-Build (2042), and Build (2042) traffic conditions.

The proposed development is expected to account for less than 10% of the overall total traffic volume at this intersection and the addition of development traffic is expected to account for two (2) seconds of additional delay during the weekday AM peak hour and five (5) seconds of additional delay during the weekday PM peak hour under Build (2033) conditions. Due to the minor impacts and acceptable future operations upon buildout of the proposed development in 2033, no improvements are recommended.

OLD FAISON ROAD + SITE ACCESS #1

The future intersection of Old Faison Road and Site Access #1 is expected to operate as an unsignalized, three-leg intersection. This intersection was analyzed under Build (2029), Build (2031), Build (2033), and Build (2042) conditions. Based on review of the capacity analysis and NCDOT Driveway Manual guidelines for left and right-turn lanes at site driveways the following improvements are recommended to be constructed by the developer:

- Constructed Site Access #1 as the southbound approach with one (1) ingress lane and two (2) egress lanes striped as a right and left-turn lane.
- Provide stop control on the southbound approach of the proposed site driveway.
- Construct an exclusive eastbound left-turn lane on Old Faison Road with a minimum of 100 feet of full width storage and appropriate deceleration and taper.

Table 10 provides the capacity analysis for the subject intersection with the lane configurations and traffic control shown in the table. Refer to Appendix K for the Synchro capacity analysis reports. Copies of the SimTraffic queueing and performance reports can be found in Appendix N.

TABLE 10: CAPACITY ANALYSIS SUMMARY OF OLD FAISON ROAD + SITE ACCESS #1

Conditions	APPROACH	Lane Configurations	Weekday AM Peak Hour		Weekday PM Peak Hour	
			LOS and Approach Delay (seconds)	Overall Delay (seconds)	LOS and Approach Delay (seconds)	Overall Delay (seconds)
Build (2029)	EB[1]	**1 LT**, 1 TH	A (9)	N/A	A (8)	N/A
	WB	1 TH-**RT**	--		--	
	SB[2]	**1 LT-RT**	C (15)		B (14)	
Build (2031)	EB[1]	**1 LT**, 1 TH	A (9)	N/A	A (9)	N/A
	WB	1 TH-**RT**	--		--	
	SB[2]	**1 LT-RT**	C (22)		C (16)	
Build (2033)	EB[1]	**1 LT**, 1 TH	A (10)	N/A	B (10)	N/A
	WB	1 TH-**RT**	--		--	
	SB[2]	**1 LT-RT**	D (29)		D (26)	
Build (2042)	EB[1]	**1 LT**, 1 TH	B (10)	N/A	B (10)	N/A
	WB	1 TH-**RT**	--		--	
	SB[2]	**1 LT-RT**	D (32)		D (28)	

Improvements recommended by the Developer are shown in **bold.**

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

Capacity analysis of Build (2029), Build (2031), Build (2033), and Build (2042) traffic conditions indicates that both the major-street left-turn movement and the minor-street approach at the intersection of Old Faison Road and Site Access #1 is expected to operate at LOS D or better during the weekday AM and PM peak hours.

Exclusive left and right-turn lanes were considered at this intersection based on methodology outlined in the *Policy on Street and Driveway Access to North Carolina Highways* (published by NCDOT). Based on the findings from that turn lane warrant analysis, an exclusive eastbound left-turn lane on Old Faison Road is expected to be warranted at this location.

However, an exclusive westbound right-turn lane is not expected to be warranted due to the expected low volumes of turning vehicles into the site at this location. Refer to Appendix P for a copy of the turn lane warrants at this intersection.

Based on a review of the maximum queue lengths as reported from SimTraffic at this intersection under Build (2029) traffic conditions, queues for the westbound approach from the intersection of Hodge Road and I-87 Westbound Ramps / Old Faison Road are not expected to queue past Site Access #1 upon buildout of Phase 1 of the development. It is crucial for Site Access #1 to be a full movement access in Phase 1 due to it being the only access to the site and that Old Faison Road does not easily accommodate u-turn traffic to allow for vehicles to enter the site from the west or exit to the east of Site Access #1.

OLD FAISON ROAD + SITE ACCESS #2

The future intersection of Old Faison and Site Access #2 is expected to operate as an unsignalized, three-leg intersection operating under right-in/right-out (RIRO) conditions. This intersection was analyzed under Build (2033), and Build (2042) conditions. Based on review of the capacity analysis and NCDOT Driveway Manual guidelines for left and right-turn lanes at site driveways the following improvements are recommended to be constructed by the developer:

- Constructed Site Access #2 as the southbound approach with one (1) ingress lane and one (1) egress lane striped as a right-turn only.

Table 11 provides the capacity analysis for the subject intersection with the lane configurations and traffic control shown in the table. Refer to Appendix L for the Synchro capacity analysis reports. Copies of the SimTraffic queueing and performance reports can be found in Appendix N.

TABLE 11: CAPACITY ANALYSIS SUMMARY OF OLD FAISON ROAD + SITE ACCESS #2

Conditions	APPROACH	Lane Configurations	Weekday AM Peak Hour		Weekday PM Peak Hour	
			LOS and Approach Delay (seconds)	Overall Delay (seconds)	LOS and Approach Delay (seconds)	Overall Delay (seconds)
Build (2033)	EB	1 TH	--	N/A	--	N/A
	WB	1 TH-**RT**	--		--	
	SB[1]	**1 RT**	C (16)		C (16)	
Build (2042)	EB	1 TH	--	N/A	--	N/A
	WB	1 TH-**RT**	--		--	
	SB[1]	**1 RT**	C (17)		C (16)	

Improvements recommended by the Developer are shown in **bold.**

1. Level of service for minor-street approach.

Capacity analysis of Build (2033) and Build (2042) traffic conditions indicates that the minor-street approach at the intersection of Old Faison Road and Site Access #2 is expected to operate at LOS C during the weekday AM and PM peak hours.

An exclusive right-turn lane was considered at this intersection based on methodology outlined in the *Policy on Street and Driveway Access to North Carolina Highways* (published by NCDOT). Based on the findings from that turn lane warrant analysis, an exclusive westbound right-turn lane is not expected to be warranted due to the expected low volumes of turning vehicles into the site at this location. Refer to Appendix P for a copy of the turn lane warrants at this intersection.

OLD FAISON ROAD + SITE ACCESS #3

The future intersection of Old Faison and Site Access #3 is expected to operate as an unsignalized, three-leg intersection. This intersection was analyzed under Build (2031), Build (2033), and Build (2042) conditions. Based on review of the capacity analysis and NCDOT Driveway Manual guidelines for left and right-turn lanes at site driveways the following improvements are recommended to be constructed by the developer:

- Constructed Site Access #3 as the southbound approach with one (1) ingress lane and two (2) egress lanes striped as a left and right-turn lane. – Phase 2
- Provide stop control on the southbound approach of the proposed site driveway. – Phase 2
- Construct an exclusive eastbound left-turn lane on Old Faison Road with a minimum of 175 feet of full width storage and appropriate deceleration and taper. – Phase 2
- Install a signal once warranted and approved by NCDOT. – Phase 3

Table 12 provides the capacity analysis for the subject intersection with the lane configurations and traffic control shown in the table. Refer to Appendix M for the Synchro capacity analysis reports. Copies of the SimTraffic queueing and performance reports can be found in Appendix N.

TABLE 12: CAPACITY ANALYSIS SUMMARY OF OLD FAISON ROAD + SITE ACCESS #3

Conditions	APPROACH	Lane Configurations	Weekday AM Peak Hour		Weekday PM Peak Hour	
			LOS and Approach Delay (seconds)	Overall Delay (seconds)	LOS and Approach Delay (seconds)	Overall Delay (seconds)
Build (2031)	EB[1] WB **SB[2]**	**1 LT**, 1 TH 1 TH-**RT** **1 LT, 1 RT**	A (9) -- C (16)	N/A	A (8) -- C (18)	N/A
Build (2033) - **Signalized**	EB WB **SB**	**1 LT**, 1 TH 1 TH-**RT** **1 LT, 1 RT**	B (12) B (16) D (38)	B (16)	B (12) C (27) D (36)	B (19)
Build (2042) - **Signalized**	EB WB **SB**	**1 LT**, 1 TH 1 TH-**RT** **1 LT, 1 RT**	B (13) B (16) D (41)	B (16)	B (12) C (27) D (38)	B (19)

Improvements recommended by the Developer are shown in **bold.**

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

Capacity analysis of Build (2031) traffic conditions indicates that the major-street left-turn movement and the minor-street approach at the intersection of Old Faison Road and Site Access #3 are expected to operate at LOS C or better during the weekday AM and PM peak hours.

Exclusive left and right-turn lanes were considered at this intersection based on methodology outlined in the *Policy on Street and Driveway Access to North Carolina Highways* (published by NCDOT). Based on the findings from that turn lane warrant analysis, an exclusive eastbound left-turn lane on Old Faison Road is expected to be warranted at this location. However, an exclusive westbound right-turn lane is not expected to be warranted due to the expected low volumes of turning vehicles into the site at this location. Refer to Appendix P for a copy of the turn lane warrants at this intersection.

Due to the poor operation expected for the minor-street approach upon full buildout of the proposed development, the potential need for signalization of this intersection was evaluated based on the criteria contained within the *Manual on Uniform Traffic Control Devices* (MUTCD) published by the Federal Highway Administration (FHWA). Build (2033) peak hour traffic volumes from this analysis were utilized to evaluate the peak hour warrant (warrant 3) from the MUTCD and based on the results this intersection is expected to satisfy the peak hour warrant during the weekday PM peak hour. It is recommended that this intersection be monitored for signalization and installed once warranted and approved by NCDOT. Refer to Appendix O for a copy of the MUTCD peak hour signal warrants at this intersection.

With signalization of this intersection, this intersection is expected to operate at an overall LOS B during the weekday AM and PM peak hours under Build (2033) and Build (2042) conditions.

PROPOSED DRIVEWAY SIGHT DISTANCE

Per the Town's Unified Development Ordinance (UDO), sight distance was also reviewed at the proposed site driveways along Old Faison Road. Sight distance is the metric used to describe the ability of a motorist to physically see, via a direct line of sight, objects and/or other vehicles to a degree sufficient to allow safe and efficient use of a roadway in the intended manner. Sight distance is a function of the major roadway's geometric characteristics (including both horizontal and vertical constraints) and design speed. Provided Intersection Sight Distance (ISD) values were determined via field data collection at the future intersections of Old Faison Road and Site Accesses and evaluated based on required values for this roadway based on criteria contained within the American Association of State Highway and Transportation Officials (AAHSTO) *A Policy on Geometric Design of Highways and Streets* (Green Book), 7th Edition. Refer to Table 14 below for a summary of the provided and required sight distance values at these intersections.

TABLE 13: PROPOSED DRIVEWAY SIGHT DISTANCE SUMMARY

Intersections	Requirements	Speed Limit	Height	Left-Turn		Right-Turn	
				Required	Provided	Required	Provided
Old Faison Road and Site Access #1	AASHTO	45 mph	3.5 feet	625 feet	625 feet	480 feet	480 feet
Old Faison Road and Site Access #2	AASHTO	45 mph	3.5 feet	N/A	N/A	480 feet	480 feet
Old Faison Road and Site Access #3	AASHTO	45 mph	3.5 feet	625 feet	625 feet	480 feet	480 feet

Based on AASHTO ISD guidelines, the locations of the proposed site driveways are expected to provide sufficient sight distance for left and right-turns.

It should be noted that there is a potential concern for vegetation on the property south of Old Faison Road and east of Hodge Road obscuring sight distance for Site Access #1 when looking right to make a left-turn. Any vegetation obscuring this view should be removed to provide adequate sight distance.

CONCLUSION / RECOMMENDATIONS

The purpose of this Traffic Impact Analysis is to determine the potential traffic impacts of this development and to identify transportation improvements that may be required to mitigate the impacts on the roadway network. The proposed residential and retail mixed-use development will be located north of Old Faison Road and east of Hodge Road in Knightdale, North Carolina. Site access will be served via two (2) full movement driveways on Old Faison Road and one (1) right-in/right-out driveway on Old Faison Road. The site is currently undeveloped and is expected to consist of a maximum of 564 mid-rise multifamily housing units and 57,500 sq. ft. of retail space at full buildout. The proposed site is expected to be phased with Phase 1 expected to be completed in 2028, Phase 2 expected to be completed in 2030, and Phase 3 of the development expected to be completed by 2032.

Based on the approved scoping, the following intersections were included in this TIA study area:

- US 64 Business (Knightdale Boulevard) and Hodge Road
- Hodge Road and Mingo Bluff Boulevard
- Hodge Road and Old Faison Road / I-87 Westbound Ramps
- Hodge Road and I-87 Eastbound Ramps
- Bethlehem Road and Old Faison Road
- Old Faison Road and Site Access #1 (*Proposed*)
- Old Faison Road and Site Access #2 (*Proposed*)
- Old Faison Road and Site Access #3 (*Proposed*)

Capacity analysis was conducted at all study intersections according to NCDOT and Town guidelines utilizing the methodology contained in the *Highway Capacity Manual* (HCM), 6th Edition, published by the Transportation Research Board. Based on review of adjacent development and background information provided by NCDOT and the Town, the following improvements have been identified or are recommended to accommodate future traffic conditions. Figure 14 provides a graphical representation of recommended improvements at the study intersections.

Improvements by Adjacent Developments

Hodge Road and Old Faison Road / I-87 Westbound Ramps

- Extend the existing eastbound shared left-through lane on I-87 Westbound Ramps to a minimum of 275 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks
- Construct an exclusive westbound left-turn lane on Old Faison Road with a minimum of 125 feet of full width storage and appropriate deceleration and taper. – StoneRiver and SilverStone
- Construct an exclusive westbound right-turn lane on Old Faison Road with a minimum of 100 feet of full width storage and appropriate deceleration and taper. – STIP W-5705AK
- Extend the westbound left-turn lane on Old Faison Road to a minimum of 175 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks
- Construct an exclusive northbound right-turn lane on Hodge Road with a minimum of 200 feet of full width storage and appropriate deceleration and taper. – StoneRiver and SilverStone
- Extend the existing northbound right-turn lane on Hodge Road to the maximum amount of full width storage and appropriate deceleration and taper prior to the start of the bridge over I-87. – Lyndon Oaks
- Extend the existing southbound left-turn lane on Hodge Road to a minimum of 275 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks

Hodge Road and I-87 Eastbound Ramps

- Construct an exclusive eastbound right-turn lane on I-87 Eastbound Ramps with a minimum of 150 feet of full width storage and appropriate deceleration and taper. – StoneRiver and SilverStone
- Restripe the existing exclusive southbound right-turn lane on Hodge Road to that of a shared through-right lane. – StoneRiver and SilverStone

Bethlehem Road and Old Faison Road

- Construct an exclusive southbound right-turn lane on Bethlehem Road with a minimum of 250 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks
- Construct an exclusive northbound left-turn lane on Bethlehem Road with a minimum of 175 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks
- Construct an exclusive eastbound left-turn lane on Old Faison Road with a minimum of 250 feet of full width storage and appropriate deceleration and taper. – Lyndon Oaks
- Install a signal once warranted and approved by NCDOT. – Lyndon Oaks

Based on the findings in the TIA, the improvements below have been recommended to be constructed by the **developer** to mitigate traffic impacts by the proposed development:

Old Faison Road and Site Access #1

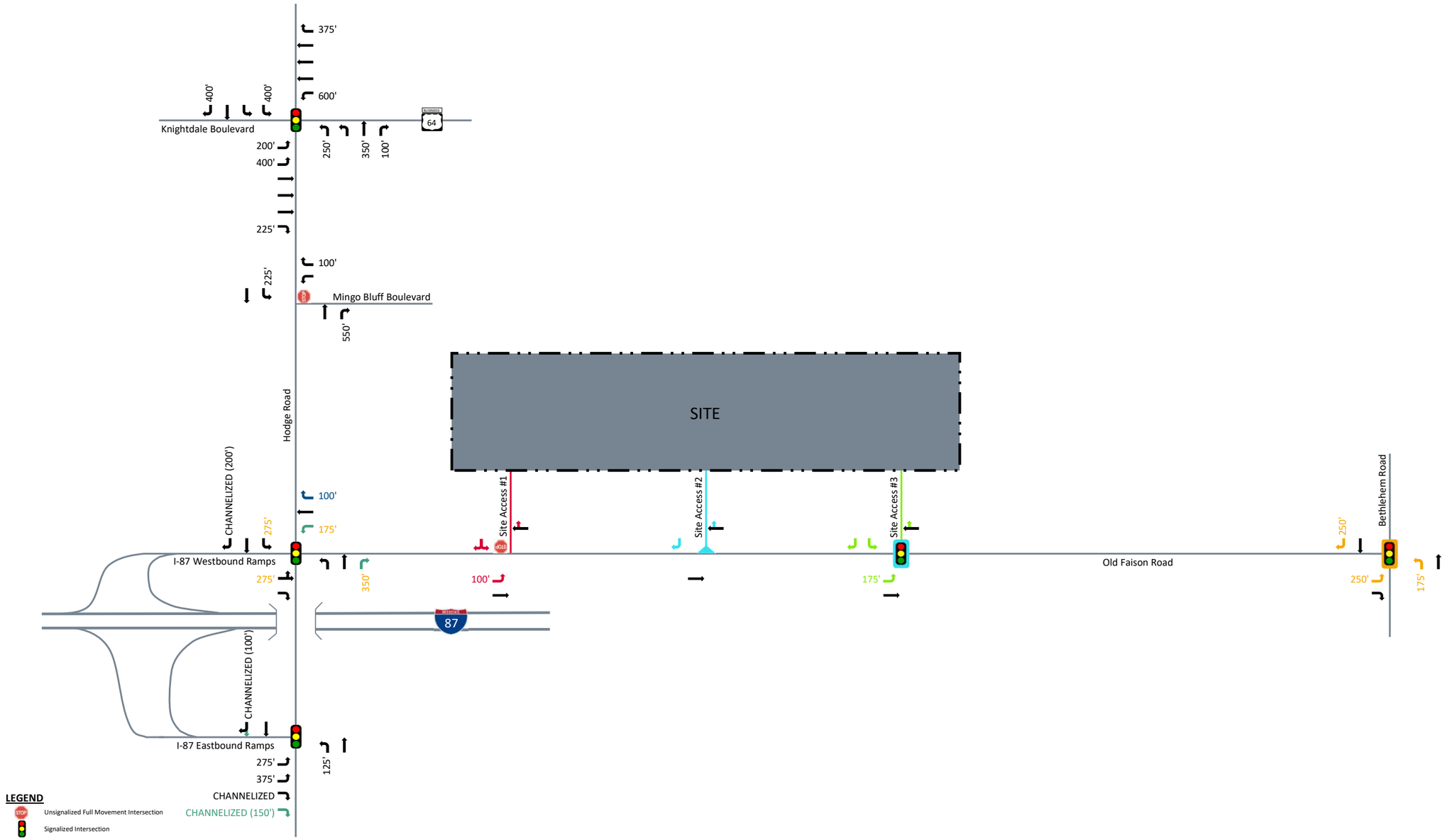
- Constructed Site Access #1 as the southbound approach with one (1) ingress lane and one (1) egress lane. – Phase 1
- Provide stop control on the southbound approach of the proposed site driveway. – Phase 1
- Construct an exclusive eastbound left-turn lane on Old Faison Road with a minimum of 100 feet of full width storage and appropriate deceleration and taper. – Phase 1

Old Faison Road and Site Access #2

- Constructed Site Access #2 as the southbound approach with one (1) ingress lane and one (1) egress lane striped as a right-turn only. – Phase 3

Old Faison Road and Site Access #3

- Constructed Site Access #3 as the southbound approach with one (1) ingress lane and two (2) egress lanes striped as a left and right-turn lane. – Phase 2
- Provide stop control on the southbound approach of the proposed site driveway. – Phase 2
- Construct an exclusive eastbound left-turn lane on Old Faison Road with a minimum of 175 feet of full width storage and appropriate deceleration and taper. – Phase 2
- Install a signal once warranted and approved by NCDOT. – Phase 3



LEGEND

- Unsignalized Full Movement Intersection
- Signalized Intersection
- Right-In/Right-Out Intersection
- Existing Lane
- Improvement by Developer - Phase 1
- Improvement by Developer - Phase 2
- Signal Installation by Developer - Phase 3
- Improvement by Developer - Phase 3
- Improvement by NCDOT STIP W-5705AK
- Signal Installation by Lyndon Oaks
- Improvement by Lyndon Oaks
- Improvement by StoneRiver and SilverStone

Boulder Ridge Mixed-Use

Knightdale, NC

Recommended Lane Configurations

Scale: Not to Scale | Figure 14

McAdams