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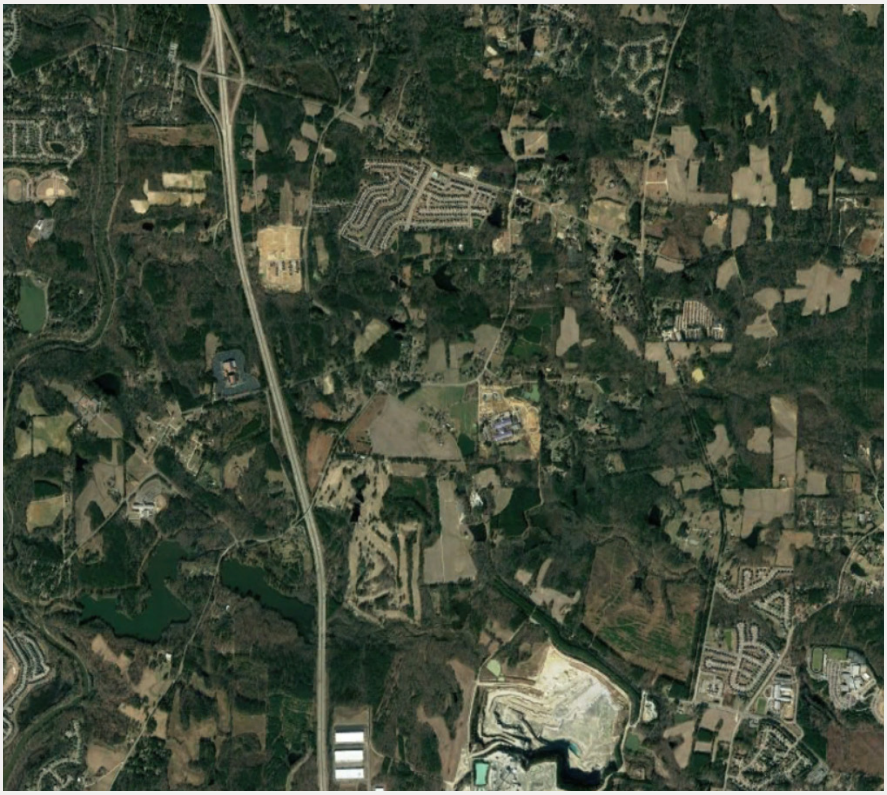

Buffaloe Road Assemblage
Traffic Impact Analysis
Knightdale, North Carolina

RKA

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Transportation
Consulting
that moves us
forward.

TRAFFIC IMPACT ANALYSIS

FOR

BUFFALOE ROAD ASSEMBLAGE

LOCATED

IN

KNIGHTDALE, NORTH CAROLINA

Prepared For:
Suncrest Real Estate & Land
2701 East Camelback Rd #180
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5/18/2021

May 2021

RKA Project No. 21024

Prepared By: JTR

Reviewed By: MLS

TRAFFIC IMPACT ANALYSIS
BUFFALOE ROAD ASSEMBLAGE
KNIGHTDALE, NORTH CAROLINA

EXECUTIVE SUMMARY

1. Development Overview

A Traffic Impact Analysis (TIA) was conducted for the proposed Buffaloe Road Assemblage development in accordance with the Knightdale (Town) Unified Development Ordinance (UDO) and North Carolina Department of Transportation (NCDOT) capacity analysis guidelines. The proposed development is to be located south of Buffaloe Road and east of Old Crews Road in Knightdale, North Carolina. The proposed development, anticipated to be completed in 2027. Site access is proposed via three (3) full movement driveways along Old Crews Road and future connections to residential development to the south, two (2) full movement driveways along Buffaloe Road, and one (1) full movement driveway along Lucas Road. Based on coordination with the site team there are two (2) land use options for this development, as follows:

- Alternative 1:
  - 394 single-family homes
  - 514 townhomes
  - 405 age-restricted homes

Or

- Alternative 2:
  - 799 single-family homes
  - 514 townhomes

Per the Town UDO, future analysis should include the build year + 1 year, as well as a future (build year + 10 years) scenario. The study analyzes traffic conditions during the weekday AM and PM peak hours for the following scenarios:

- Existing (2021) Traffic Conditions
- No-Build (2028) Traffic Conditions
- Build (2028) Traffic Conditions – Alternative 1
- Build (2028) Traffic Conditions – Alternative 2

- Build (2028) with Improvements Traffic Conditions – Alternative 1
- Build (2028) with Improvements Traffic Conditions – Alternative 2
- Build (2037) Traffic Conditions – Alternative 1
- Build (2037) Traffic Conditions – Alternative 2

2. Existing Traffic Conditions

The study area for the TIA was determined through coordination with the Town and NCDOT and consists of the following existing intersections:

- Forestville Road and Horton Road (September 2019)
- Buffaloe Road and I-540 Northbound Ramps (June 2018)
- Buffaloe Road and I-540 Southbound Ramps (June 2018)
- Buffaloe Road and Forestville Road (September 2018)
- Buffaloe Road and Old Milburnie Road (June 2018)
- Buffaloe Road and Old Crews Road (September 2018 and February 2021)
- *Buffaloe Road and Lucas Road (February 2021)*
- *Lucas Road / Mama's Way and Horton Road (February 2021)*
- *Old Crews Road and Forestville Road (February 2021)*

Existing peak hour traffic volumes were determined based on traffic counts conducted at the above intersections during typical weekday AM (7:00 AM – 9:00 AM) and PM (4:00 PM – 6:00 PM) peak periods. Any counts performed prior to 2021 were grown to 2021 utilizing a 2% annually compounded growth rate. This growth rate was discussed during scoping. New data was needed at three (3) of the study intersections (included in *italics* above). Due to the COVID-19 pandemic, data collection was additionally collected at a study intersection (included in bold above) that had previous counts to determine an adjustment factor for the new data.

Based on a comparison of old Buffaloe Road and Old Crews Road counts (September of 2018) grown to 2021 and new Buffaloe Road and Old Crews Road counts (February of 2021), there was minimal difference in turning movement traffic volumes. Overall, the weekday AM and PM peak hour trends were fairly consistent, and the northbound approach was actually higher under the counts collected under the effects of COVID-19. This is not uncommon in more rural areas. To provide a conservative estimate of traffic conditions, a 3% growth rate was applied to the

intersection counts collected during the effects of COVID-19 (included in italics above) based on a comparison of the overall intersection volumes at Buffaloe Road and Old Crews Road.

3. Site Trip Generation

Average weekday daily, AM peak hour, and PM peak hour trips for the proposed development were estimated using methodology contained within the ITE Trip Generation Manual, 10th Edition. Table E-1 provides a summary of the trip generation potential for Alternative 1, and Table E-2 provides a summary of the trip generation potential for Alternative 2.

Table E-1: Site Trip Generation – Alternative 1

Land Use (ITE Code)	Intensity	Daily Traffic (vpd)	Weekday AM Peak Hour Trips (vph)		Weekday PM Peak Hour Trips (vph)	
			Enter	Exit	Enter	Exit
Single-Family Detached Housing (210)	394 units	3,670	71	214	239	140
Multifamily Low-Rise Housing (220)	514 units	3,850	52	174	160	94
Age Restricted Detached Housing (251)	405 units	1,930	39	79	87	56
Total Trips		9,450	162	467	486	290

Table E-2: Site Trip Generation – Alternative 2

Land Use (ITE Code)	Intensity	Daily Traffic (vpd)	Weekday AM Peak Hour Trips (vph)		Weekday PM Peak Hour Trips (vph)	
			Enter	Exit	Enter	Exit
Single-Family Detached Housing (210)	799 units	7,040	143	429	471	276
Multifamily Low-Rise Housing (220)	514 units	3,850	52	174	160	94
Total Trips		10,890	195	603	631	370

4. Future Traffic Conditions

Through coordination with the Town and NCDOT, it was determined that an annual growth rate of 2% would be used to generate projected (2028) and projected (2037) weekday AM and PM

peak hour traffic volumes. The following adjacent developments were identified to be considered under future conditions:

- Old Milburnie Road Residential
- East Wake Middle School Expansion
- Buffaloe Shoals
- Forestville Road Townhomes
- Blue Run Lane Townhomes
- Knightdale Soccer Park

5. Capacity Analysis Summary

The analysis considered weekday AM and PM peak hour traffic for existing (2021), no-build (2028), build (2028) – Alternative 1 and Alternative 2, and build (2037) – Alternative 1 and Alternative 2 conditions. Refer to Section 7 of the TIA for the capacity analysis summary performed at each study intersection.

6. Recommendations

Based on the findings of this study, specific geometric and traffic control improvements have been identified at study intersections. The improvements are summarized below and are illustrated in Figure E-1 and Figure E-2 for Alternative 1 and Alternative 2, respectively.

Improvements by Buffaloe Shoals

<u>Buffaloe Road and Forestville Road</u>

- Provide a southbound right-turn lane with a minimum of 200 feet of storage with appropriate deceleration and taper length.
- Provide signal modifications to accommodate the southbound right-turn lane.

Recommended Improvements by Developer – Alternative 1

<u>Buffaloe Road and I-540 Southbound Ramps</u>

- Provide signal timing adjustments along the Buffaloe Road corridor.

<u>Buffaloe Road and I-540 Northbound Ramps</u>

- Provide signal timing adjustments along the Buffaloe Road corridor.

Buffaloe Road and Forestville Road

- Provide signal timing adjustments along the Buffaloe Road corridor.

Buffaloe Road and Old Milburnie Road

- Provide an exclusive southbound right-turn lane with a minimum of 250 feet of storage with appropriate deceleration and taper length. *
- Provide signal modifications, as necessary.

**This improvement was also recommended of Old Milburnie Residential.*

Buffaloe Road and Old Crews Road

- Provide an exclusive eastbound right-turn lane with a minimum of 150 feet of storage with appropriate deceleration and taper length.

N Smithfield Road / Horton Road and Forestville Road

- Extend the existing northbound left-turn lane to a minimum of 300 feet with appropriate deceleration and taper length.

Buffaloe Road and Site Drive 1

- Construct northbound approach with one ingress lane and one egress lane.
- Provide an exclusive eastbound right-turn lane with a minimum of 75 feet of storage with appropriate deceleration and taper length.
- Provide stop control for the northbound approach.

Buffaloe Road and Site Drive 2

- Construct northbound approach with one ingress lane and one egress lane.
- Provide an exclusive eastbound right-turn lane with a minimum of 75 feet of storage with appropriate deceleration and taper length.
- Provide stop control for the northbound approach.

Lucas Road and Site Drive 3

- Construct eastbound approach with one ingress lane and one egress lane.
- Provide stop control for the eastbound approach.

Old Crews Road and Site Drive 4

- Construct westbound approach with one ingress lane and one egress lane.
- Provide an exclusive southbound left-turn lane with a minimum of 100 feet of storage with appropriate deceleration and taper length.
- Provide stop control for the westbound approach.

Old Crews Road and Site Drive 5

- Construct westbound approach with one ingress lane and one egress lane.
- Provide an exclusive southbound left-turn lane with a minimum of 100 feet of storage with appropriate deceleration and taper length.
- Provide stop control for the westbound approach.

Old Crews Road and Site Drive 6

- Construct westbound approach with one ingress lane and one egress lane.
- Provide stop control for the westbound approach.

Recommended Improvements by Developer – Alternative 2

Buffaloe Road and I-540 Southbound Ramps

- Provide signal timing adjustments along the Buffaloe Road corridor.

Buffaloe Road and I-540 Northbound Ramps

- Provide signal timing adjustments along the Buffaloe Road corridor.

Buffaloe Road and Forestville Road

- Provide signal timing adjustments along the Buffaloe Road corridor.

Buffaloe Road and Old Milburnie Road

- Provide an exclusive southbound right-turn lane with a minimum of 250 feet of storage with appropriate deceleration and taper length. *
- Provide signal modifications, as necessary.

**This improvement was also recommended of Old Milburnie Residential.*

Buffaloe Road and Old Crews Road

- Monitor the intersection for signalization and install a traffic signal once warranted and approved by NCDOT and the Town.

N Smithfield Road / Horton Road and Forestville Road

- Extend the existing northbound left-turn lane to a minimum of 300 feet with appropriate deceleration and taper length.

Buffaloe Road and Site Drive 1

- Construct northbound approach with one ingress lane and one egress lane.
- Provide an exclusive eastbound right-turn lane with a minimum of 100 feet of storage with appropriate deceleration and taper length.
- Provide stop control for the northbound approach.

Buffaloe Road and Site Drive 2

- Construct northbound approach with one ingress lane and one egress lane.
- Provide an exclusive eastbound right-turn lane with a minimum of 100 feet of storage with appropriate deceleration and taper length.
- Provide stop control for the northbound approach.

Lucas Road and Site Drive 3

- Construct eastbound approach with one ingress lane and one egress lane.
- Provide stop control for the eastbound approach.

Old Crews Road and Site Drive 4

- Construct westbound approach with one ingress lane and one egress lane.
- Provide an exclusive southbound left-turn lane with a minimum of 150 feet of storage with appropriate deceleration and taper length.
- Provide stop control for the westbound approach.

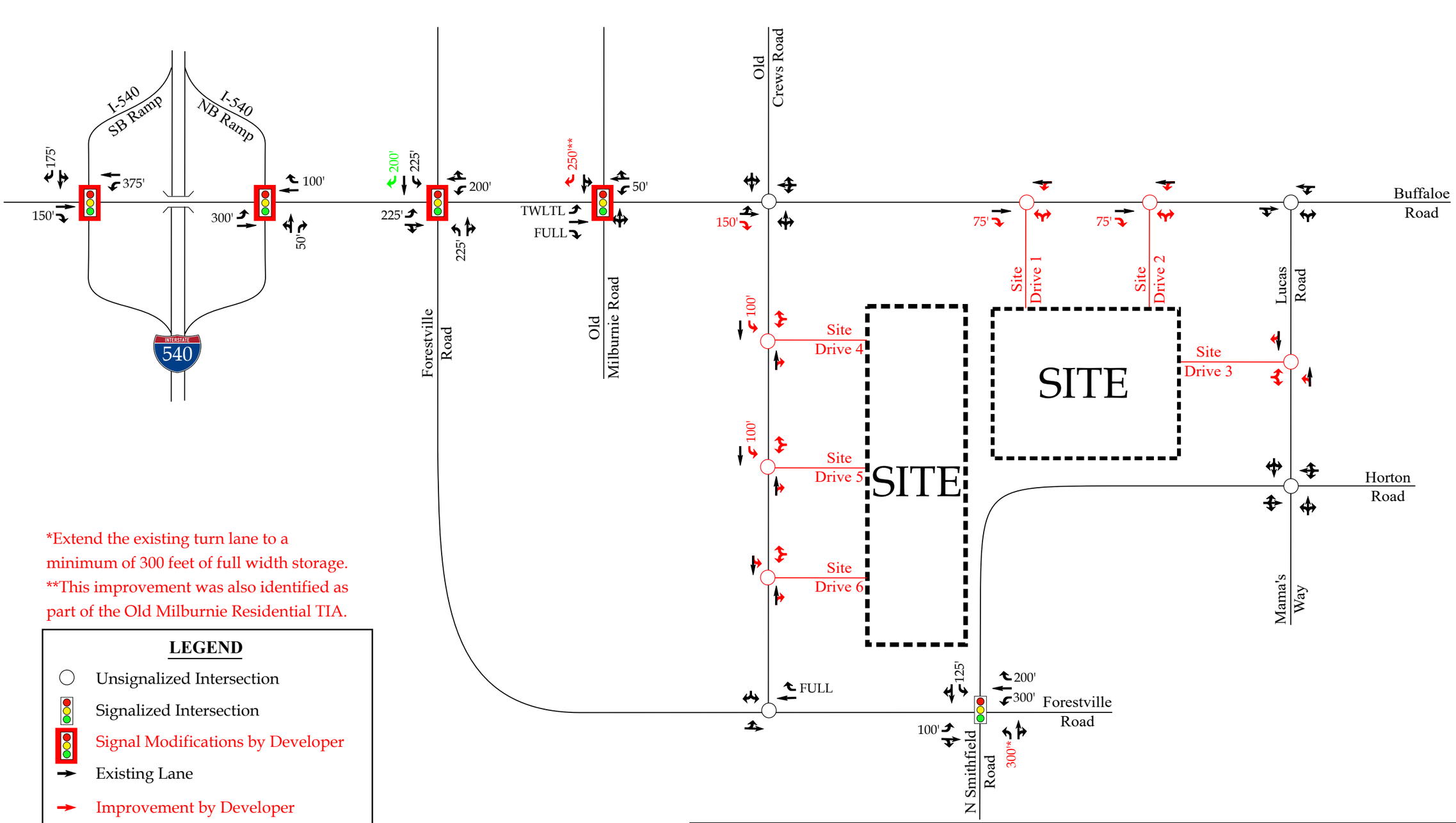
Old Crews Road and Site Drive 5

- Construct westbound approach with one ingress lane and one egress lane.

- Provide an exclusive southbound left-turn lane with a minimum of 150 feet of storage with appropriate deceleration and taper length.
- Provide stop control for the westbound approach.

Old Crews Road and Site Drive 6

- Construct westbound approach with one ingress lane and one egress lane.
- Provide stop control for the westbound approach.



*Extend the existing turn lane to a minimum of 300 feet of full width storage.
**This improvement was also identified as part of the Old Milburnie Residential TIA.

LEGEND

- Unsignalized Intersection
- Signalized Intersection
- Signal Modifications by Developer
- Existing Lane
- Improvement by Developer
- Adjacent Development Improvement
- X' Storage (In Feet)

Moving forward.
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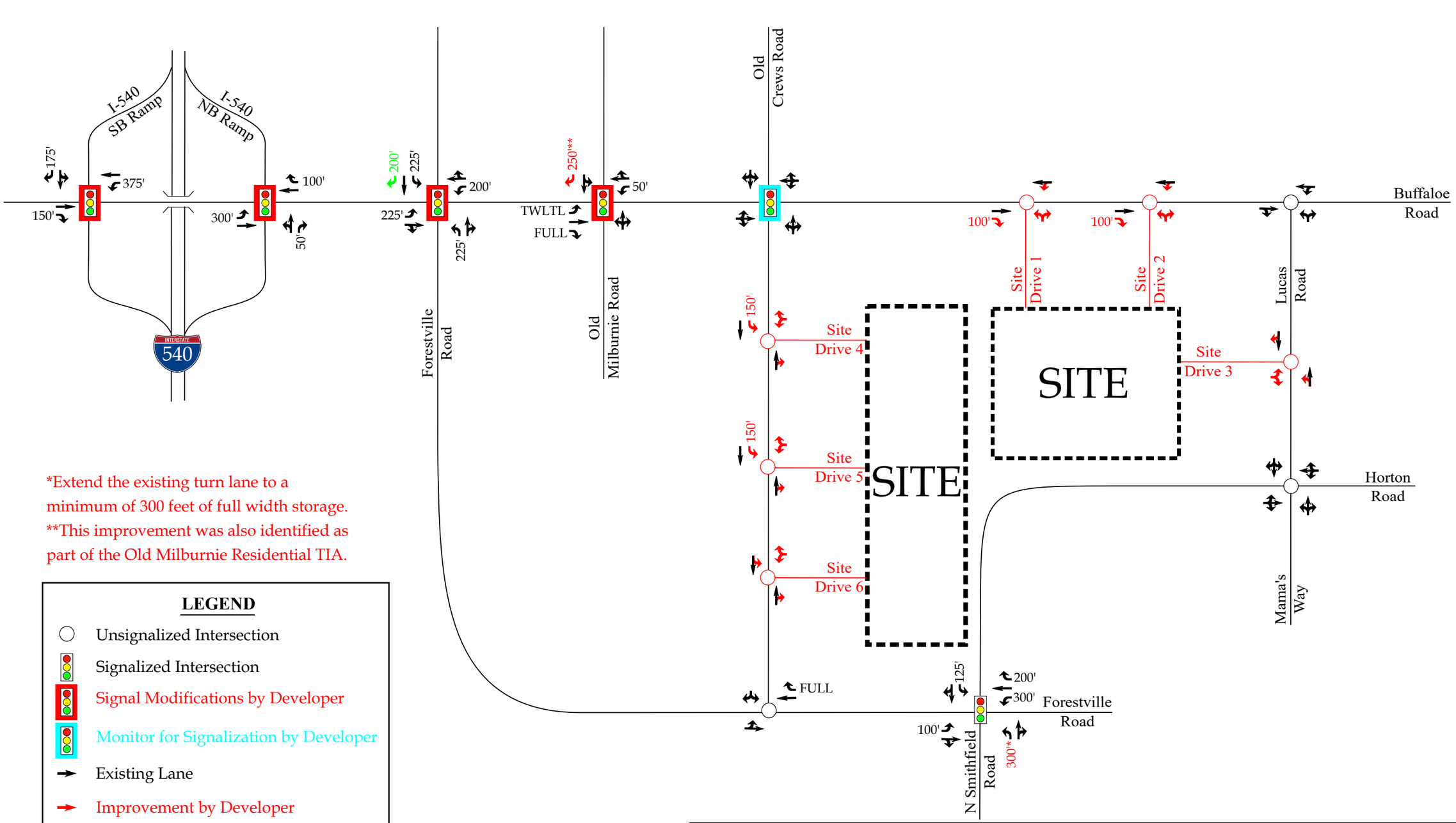
Buffaloe Road Assemblage
Knightdale, NC

Recommended Lane Configurations - Alternative 1

Scale: Not to Scale | Figure E-1



*Extend the existing turn lane to a minimum of 300 feet of full width storage.
**This improvement was also identified as part of the Old Milburnie Residential TIA.

LEGEND

- Unsignalized Intersection
- Signalized Intersection
- Signal Modifications by Developer
- Monitor for Signalization by Developer
- Existing Lane
- Improvement by Developer
- Adjacent Development Improvement
- X' Storage (In Feet)

Moving forward.
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Buffaloe Road Assemblage
Knightdale, NC

Recommended Lane Configurations - Alternative 2

Scale: Not to Scale | Figure E-2

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TECHNICAL APPENDIX

TRAFFIC IMPACT ANALYSIS
BUFFALOE ROAD ASSEMBLAGE
KNIGHTDALE, NORTH CAROLINA

1. INTRODUCTION

The contents of this report present the findings of the Traffic Impact Analysis (TIA) conducted for the proposed residential development to be located south of Buffaloe Road and east of Old Crews Road in Knightdale, North Carolina. The purpose of this study is to determine the potential impacts to the surrounding transportation system created by traffic generated by the proposed development, as well as recommend improvements to mitigate the impacts.

The proposed development, anticipated to be completed in 2027. Based on coordination with the site team there are two (2) land use options for this development, as follows:

- Alternative 1:
  - 394 single-family homes
  - 514 townhomes
  - 405 age-restricted homes

Or

- Alternative 2:
  - 799 single-family homes
  - 514 townhomes

Per the Town of Knightdale (Town) Unified Development Ordinance (UDO), future analysis should include the build year + 1 year, as well as a future (build year + 10 years) scenario. The study analyzes traffic conditions during the weekday AM and PM peak hours for the following scenarios:

- Existing (2021) Traffic Conditions
- No-Build (2028) Traffic Conditions
- Build (2028) Traffic Conditions – Alternative 1
- Build (2028) Traffic Conditions – Alternative 2
- Build (2028) with Improvements Traffic Conditions – Alternative 1

- Build (2028) with Improvements Traffic Conditions – Alternative 2
- Build (2037) Traffic Conditions – Alternative 1
- Build (2037) Traffic Conditions – Alternative 2

1.1. Site Location and Study Area

The development is proposed to be located south of Buffaloe Road and east of Old Crews Road in Knightdale, North Carolina. Refer to Figure 1 for the site location map.

The study area for the TIA was determined through coordination with the North Carolina Department of Transportation (NCDOT) and the Town of Knightdale (Town) and consists of the following existing intersections:

- Buffaloe Road and Old Crews Road
- Old Crews Road and Forestville Road
- Forestville Road and Horton Road
- Lucas Road and Buffaloe Road
- Buffaloe Road and I-540 Northbound Ramps
- Buffaloe Road and I-540 Southbound Ramps
- Buffaloe Road and Forestville Road
- Buffaloe Road and Old Milburnie Road
- Lucas Road / Mama's Way and Horton Road

Refer to Appendix A for the approved scoping documentation.

1.2. Proposed Land Use and Site Access

The site is expected to be located south of Buffaloe Road and east of Old Crews Road. The proposed development, anticipated to be completed in 2027, is assumed to consist of the following uses:

- Alternative 1:
  - 394 single-family homes
  - 514 townhomes
  - 405 age-restricted homes

Or

- Alternative 2:
  - 799 single-family homes
  - 514 townhomes

Site access is proposed via three (3) full movement driveways along Old Crews Road and future connections to residential development to the south, two (2) full movement driveways along Buffaloe Road, and one (1) full movement driveway along Lucas Road. Refer to Figure 2 for a copy of the preliminary site plan.

1.3. Adjacent Land Uses

The proposed development is located in an area consisting primarily undeveloped land and residential development.

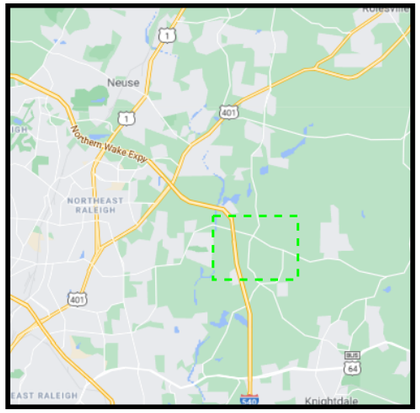
1.4. Existing Roadways

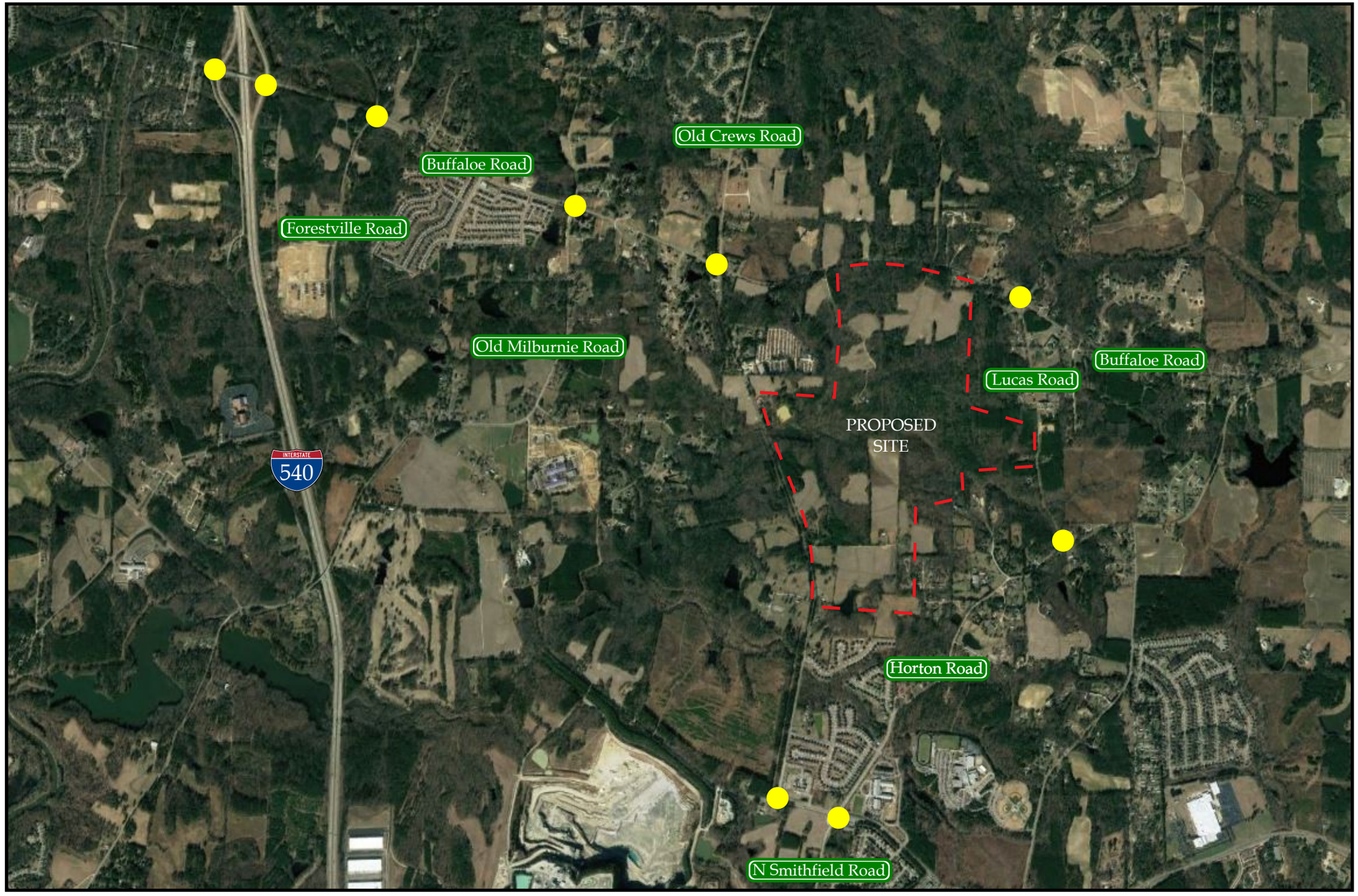
Existing lane configurations (number of traffic lanes on each intersection approach), speed limits, storage capacities, and other intersection and roadway information within the study area are shown in Figure 3. Table 1, on the following page, provides a summary of this information, as well.

Table 1: Existing Roadway Inventory

Road Name	Route Number	Typical Cross Section	Speed Limit	Maintained By	2019 AADT (vpd)
Buffaloe Road	SR 2215	2-lane undivided	45 mph	NCDOT	19,000[1]
I-540	I-540	6-lane divided	70 mph	NCDOT	72,500
Forestville Road	SR 2049	2-lane undivided	45 mph	NCDOT	3,100[1]
Old Milburnie Road	SR 2217	2-lane undivided	45 mph	NCDOT	4,000[1]
Old Crews Road	SR 2228	2-lane undivided	45 mph	NCDOT	1,700[2]
Lucas Road	SR 2260	2-lane undivided	45 mph	NCDOT	860[1]
Horton Road	SR 2231	2-lane undivided	35 mph	NCDOT	3,900
N Smithfield Road	SR 2233	2-lane undivided	35 mph	NCDOT	12,500
Mama's Way	N / A	1-lane	25 mph (assumed)	Private	400[3]

1. ADT from 2017
2. ADT from 2015
3. ADT based on traffic counts from 2021, grown due to the COVID-19 pandemic, and assuming the weekday PM peak hour is 10% of the daily trips.





LEGEND

- Proposed Site Location
- Study Intersection
- Study Area

N

Moving forward.
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Buffaloe Road Assemblage
Knightdale, NC

Site Location Map

Scale: Not to Scale | Figure 1

BUFFALOE ROAD

COLLECTOR
(74' ROW)

AMENITY
(5.00 AC)

MULTI-FAMILY

- 60' FRONT-LOAD SFD – 105 LOTS
- 40' REAR-LOAD SFD – 289 LOTS
- 22' REAR-LOAD TOWNHOME (END UNIT) – 110 UNITS
- 20' REAR-LOAD TOWNHOME (INTERIOR UNIT) – 219 UNITS
- 60' FRONT-LOAD AGE-RESTRICTED SFD – 199 LOTS
- 50' FRONT-LOAD AGE-RESTRICTED SFD – 206 LOTS

MULTIFAMILY UNITS (DESIGN BY OTHERS) – 185 UNITS

PROPOSED TOTAL DWELLING UNITS – 1,313 DWELLING UNITS

TOTAL OPEN SPACE REQUIRED – +/–48.72 ACRES

TOTAL RECREATIONAL OPEN SPACE REQUIRED – +/–24.36 ACRES

COLLECTOR
(74' ROW)

COLLECTOR
(74' ROW)

OLD CREWS ROAD

COLLECTOR
(74' ROW)

AMENITY
(5.50 AC)

NOTES

1. All information taken from GIS subject to change.
2. Additional sewer analysis needed to understand improvements required.
3. Streams and wetlands shown are subject to change.
4. Storm drainage analysis required to verify storm drainage requirements and improvements.

McAdams

PREPARED FOR:
Suncrest

2020110062

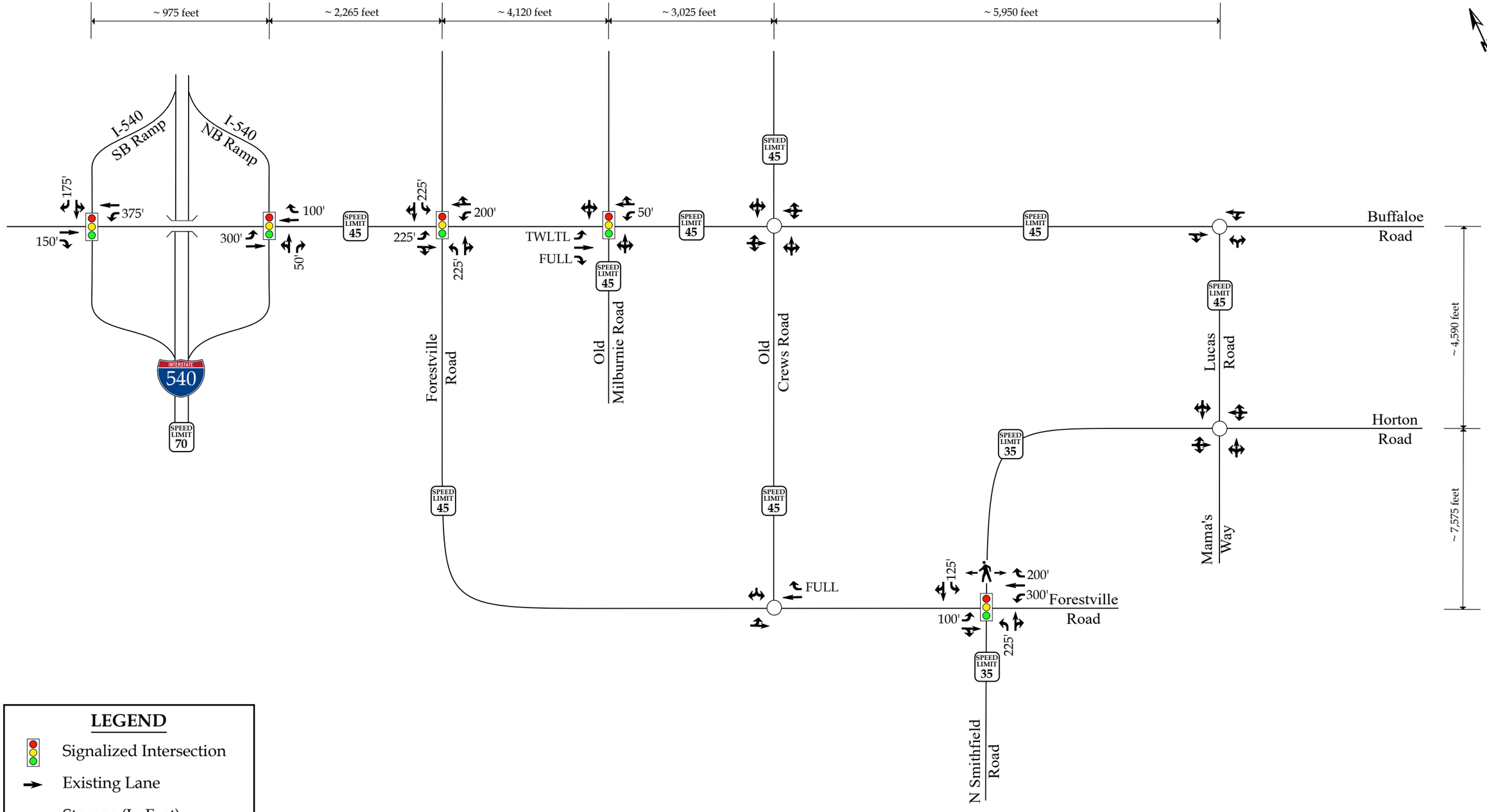
Buffaloe Road Assemblage Concept Layout

KNIGHTDALE, NORTH CAROLINA

0' 200'
SCALE: 1" = 200'

1

02. 16. 2021



LEGEND

- Signalized Intersection
- Existing Lane
- X' Storage (In Feet)
- TWLTL Two-Way Left-Turn Lane
- Pedestrian Crosswalk
- SPEED LIMIT XX Posted Speed Limit

Moving forward.
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Buffaloe Road Assemblage
Knightdale, NC

Existing (2021)
Lane Configurations

Scale: Not to Scale | Figure 3

2. EXISTING (2021) PEAK HOUR CONDITIONS

2.1. Existing (2021) Peak Hour Traffic

Existing peak hour traffic volumes were determined based on traffic counts conducted at the study intersections listed below during a typical weekday AM (7:00 AM – 9:00 AM) and PM (4:00 PM – 6:00 PM) peak periods:

- Forestville Road and Horton Road (September 2019)
- Buffaloe Road and I-540 Northbound Ramps (June 2018)
- Buffaloe Road and I-540 Southbound Ramps (June 2018)
- Buffaloe Road and Forestville Road (September 2018)
- Buffaloe Road and Old Milburnie Road (June 2018)
- Buffaloe Road and Old Crews Road (September 2018 and February 2021)
- *Buffaloe Road and Lucas Road (February 2021)*
- *Lucas Road / Mama's Way and Horton Road (February 2021)*
- *Old Crews Road and Forestville Road (February 2021)*

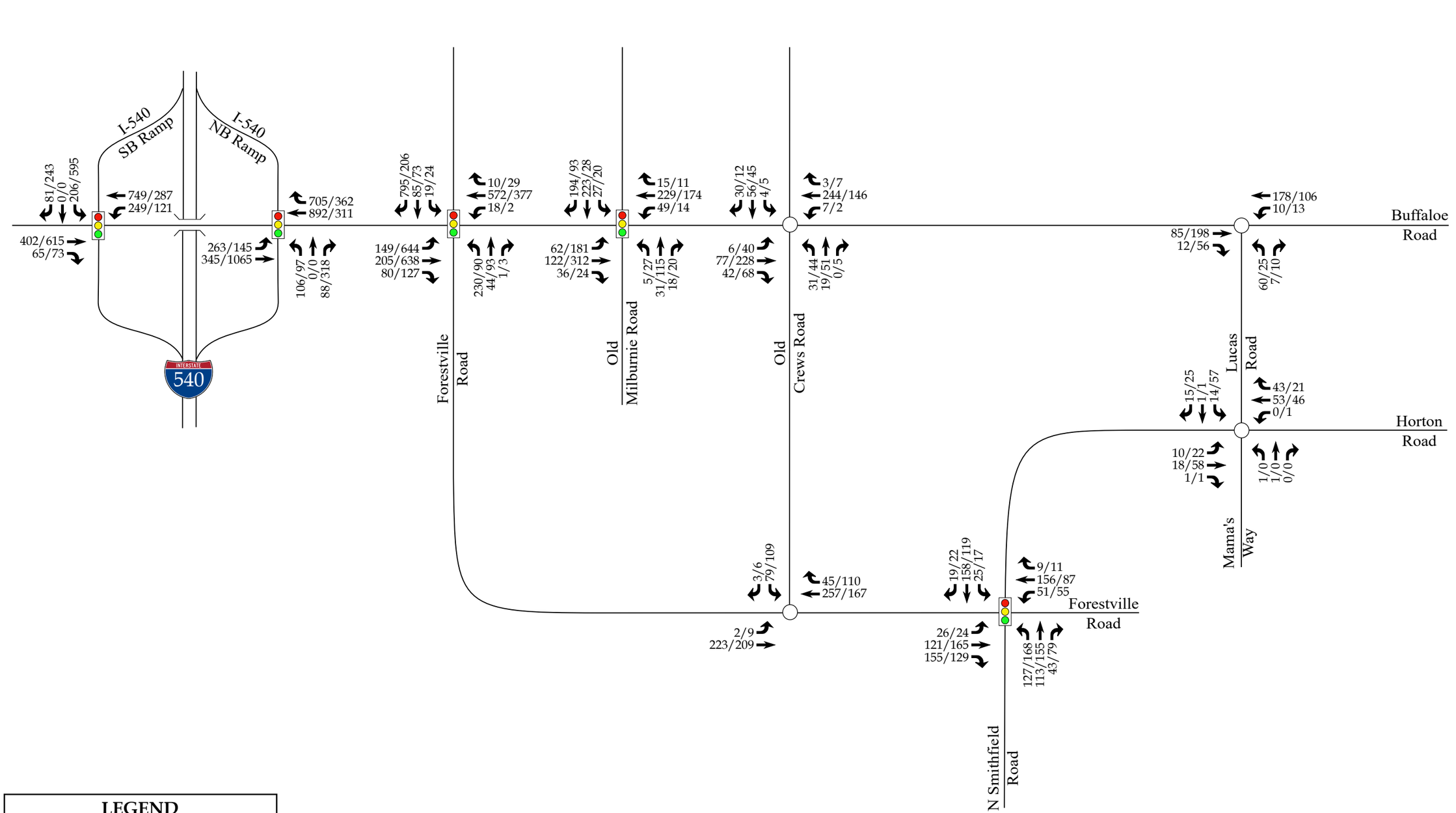
Any counts performed prior to 2021 were grown to 2021 utilizing a 2% annually compounded growth rate. This growth rate was discussed during scoping. New data was needed at three (3) of the study intersections (included in *italics* above). Due to the COVID-19 pandemic, data collection was additionally collected at a study intersection (included in bold above) that had previous counts to determine an adjustment factor for the new data.

Based on a comparison of old Buffaloe Road and Old Crews Road counts (September of 2018) grown to 2021 and new Buffaloe Road and Old Crews Road counts (February of 2021), there was minimal difference in turning movement traffic volumes. Overall, the weekday AM and PM peak hour trends were fairly consistent, and the northbound approach was actually higher under the counts collected under the effects of COVID-19. This is not uncommon in more rural areas. To provide a conservative estimate of traffic conditions, a 3% growth rate was applied to the intersection counts collected during the effects of COVID-19 (included in italics above) based on a comparison of the overall intersection volumes at Buffaloe Road and Old Crews Road.

Weekday AM and PM traffic volumes were balanced between study intersections, where appropriate. Refer to Figure 4 for existing (2021) weekday AM and PM peak hour traffic volumes. A copy of the count data is in Appendix B of this report.

2.2. Analysis of Existing (2021) Peak Hour Traffic

The existing (2021) weekday AM and PM peak hour traffic volumes were analyzed to determine the current levels of service at the study intersections under existing roadway conditions. Signal information was obtained from NCDOT and is included in Appendix C. The results of the analysis are presented in Section 7 of this report.



LEGEND

- Unsignalized Intersection
- Signalized Intersection
- X / Y → Weekday AM / PM Peak Hour Traffic

Moving forward.
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Buffaloe Road Assemblage
Knightdale, NC

Existing (2021)
Peak Hour Traffic

Scale: Not to Scale | Figure 4

3. NO-BUILD (2028) PEAK HOUR CONDITIONS

In order to account for growth of traffic and subsequent traffic conditions at a future year, no-build traffic projections are needed. No-build traffic is the component of traffic due to the growth of the community and surrounding area that is anticipated to occur regardless of whether or not the proposed development is constructed. No-build traffic is comprised of existing traffic growth within the study area and additional traffic created as a result of adjacent approved developments.

3.1. Ambient Traffic Growth

Through coordination with the Town and NCDOT, it was determined that an annual growth rate of 2% would be used to generate projected (2028) weekday AM and PM peak hour traffic volumes. Refer to Figure 5 for projected (2028) peak hour traffic.

3.2. Adjacent Development Traffic

Through coordination with the Town and NCDOT, the following adjacent developments were identified to be included as an approved adjacent development in this study:

- Old Milburnie Road Residential
- East Wake Middle School Expansion
- Buffaloe Shoals
- Forestville Road Townhomes
- Blue Run Lane Townhomes
- Knightdale Soccer Park

Table 2 provides a summary of the adjacent developments. Additional adjacent development information can be found in Appendix D.

Table 2: Adjacent Development Information

Development Name	Location	Build-Out Year	Land Use / Intensity	TIA Performed
Old Milburnie Road Residential	North of Buffaloe Road and west of Old Milburnie Road	2022	177 single-family homes and 93 townhomes	March 2021 by RKA
East Wake Middle School Expansion	2700 Old Milburnie Road	2020	287 students added to the existing 1,163 student enrollment	September 2016 by AMT
Buffaloe Shoals	Southwest quadrant at the intersection of Buffaloe Road and Forestville Road	2023	414 apartment units	January of 2021 by RKA
Forestville Road Townhomes	Northwestern quadrant of the intersection of Forestville Road and Needham Road	2024	284 Townhomes	August of 2020 by Timmons Group
Blue Run Lane	West of Blue Run Lane	2026	207 Townhomes	January of 2020 by RKA
Knightdale Soccer Park	North of Forestville Road and west of Horton Road	N/A*	10 Soccer Fields	N/A *(trip generation)*

*Assumed prior to the build-out of the proposed Saluda Tract development
**The TIA for this development has not yet been approved; therefore, the improvements recommended for this development were not included in future analysis (without improvements) to provide conservative results.

A trip generation and assignment were provided for the Town of Knightdale Soccer Park as a part of the Old Milburnie Residential TIA. There were no changes to the assignment as a part of this study. All other adjacent developments have approved TIAs that were utilized in obtaining adjacent development volumes.

It should be noted that including trips from the above adjacent developments on top of an annually compounded growth rate is anticipated to provide conservative results in this area, as local development growth is the most impactful for more rural areas. Additionally, there is expected to be interaction between some of the adjacent developments and the proposed

development based on the different land uses; however, no reduction in adjacent development trips was proposed to provide a conservative estimation of future traffic volumes. The adjacent developments were approved, during scoping, by the Town and NCDOT. Adjacent development trips are shown in Figure 6. Adjacent development information can be found in Appendix D. Refer to Appendix A for a copy of the approved MOU.

3.3. Future Roadway Improvements

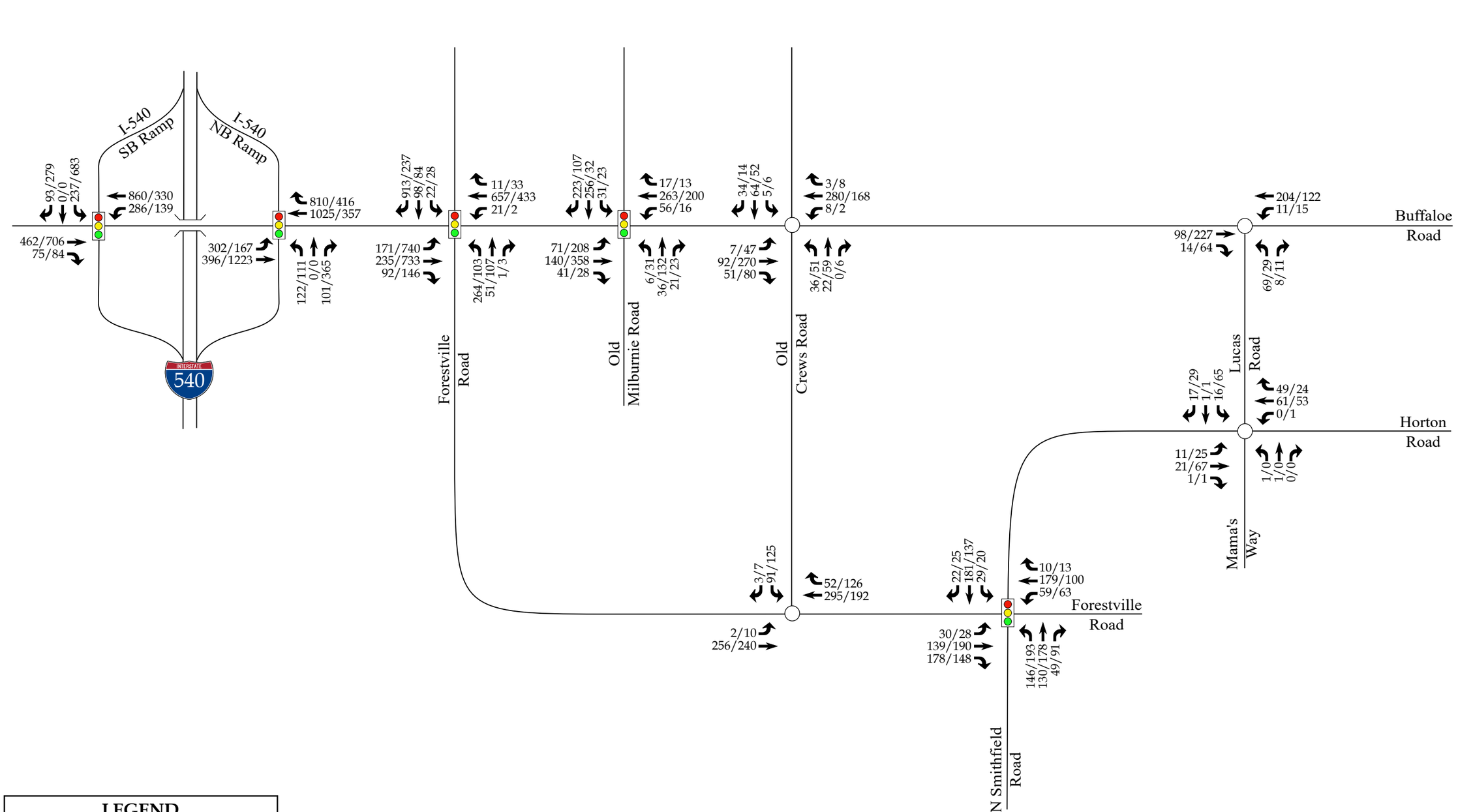
Based on coordination with the NCDOT and the Town, it was determined there were no future roadway improvements to consider with this study. NCDOT indicated that there will be a southbound right-turn lane at the intersection of Forestville Road and Buffaloe Road. Additionally, this turn lane has been recommended and committed to by the Buffaloe Shoals adjacent development; therefore, this improvement was included under all future traffic conditions.

3.4. No-Build (2028) Peak Hour Traffic Volumes

The no-build (2028) traffic volumes were determined by projecting the existing (2021) peak hour traffic to the year 2028 and adding the adjacent development trips. Refer to Figure 7 for an illustration of the no-build (2028) peak hour traffic volumes at the study intersections.

3.5. Analysis of No-Build (2028) Peak Hour Traffic Conditions

The no-build (2028) AM and PM peak hour traffic volumes at the study intersections were analyzed with future geometric roadway conditions and traffic control. The analysis results are presented in Section 7 of this report.



LEGEND

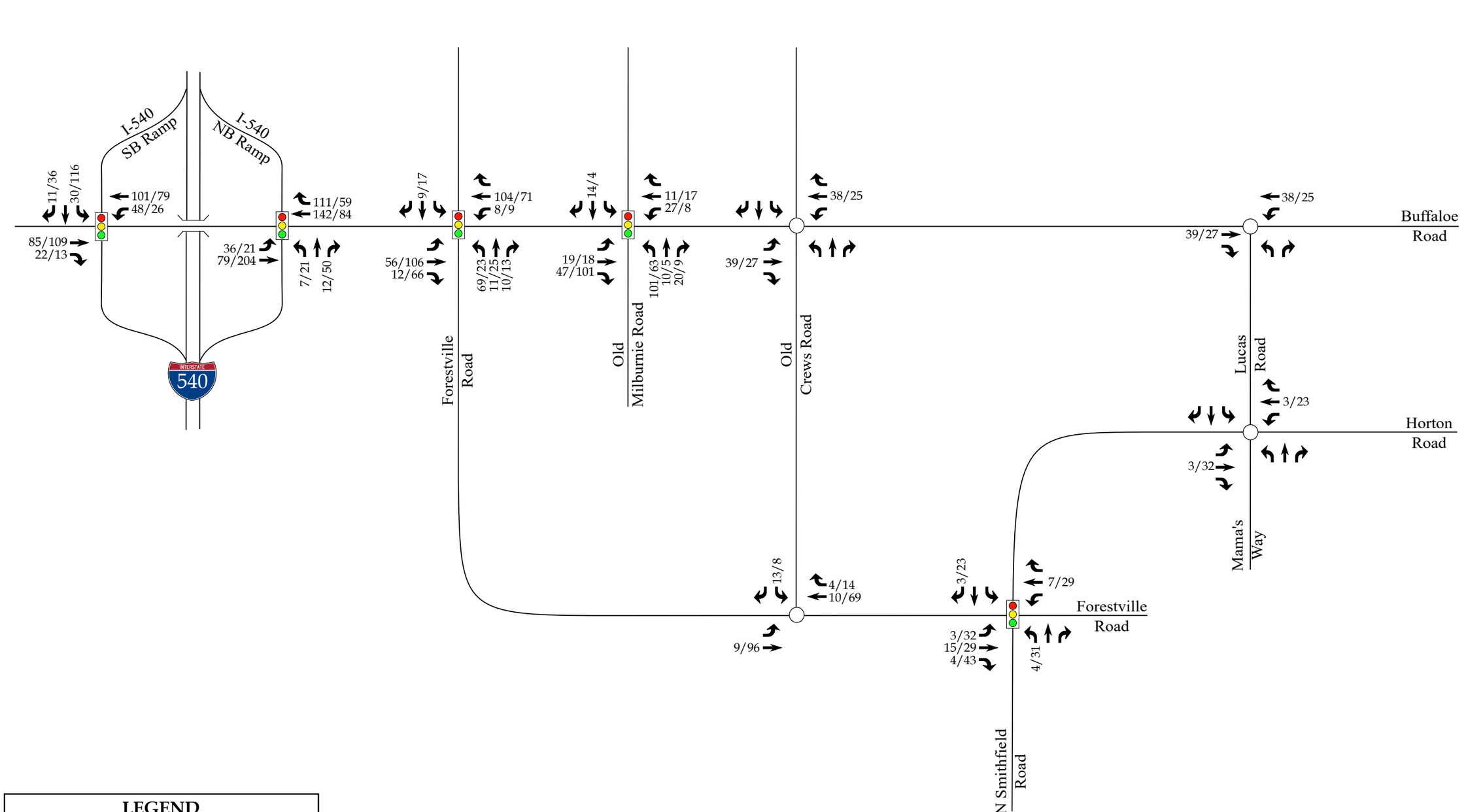
- Unsignalized Intersection
- Signalized Intersection
- X / Y → Weekday AM / PM Peak Hour Traffic

Moving forward.
RKA
RAMEY KEMP ASSOCIATES

Buffaloe Road Assemblage
Knightdale, NC

Projected (2028)
Peak Hour Traffic

Scale: Not to Scale | Figure 5



LEGEND

- Unsignalized Intersection
- Signalized Intersection
- X / Y → Weekday AM / PM Peak Hour Adjacent Development Trips

Moving forward.
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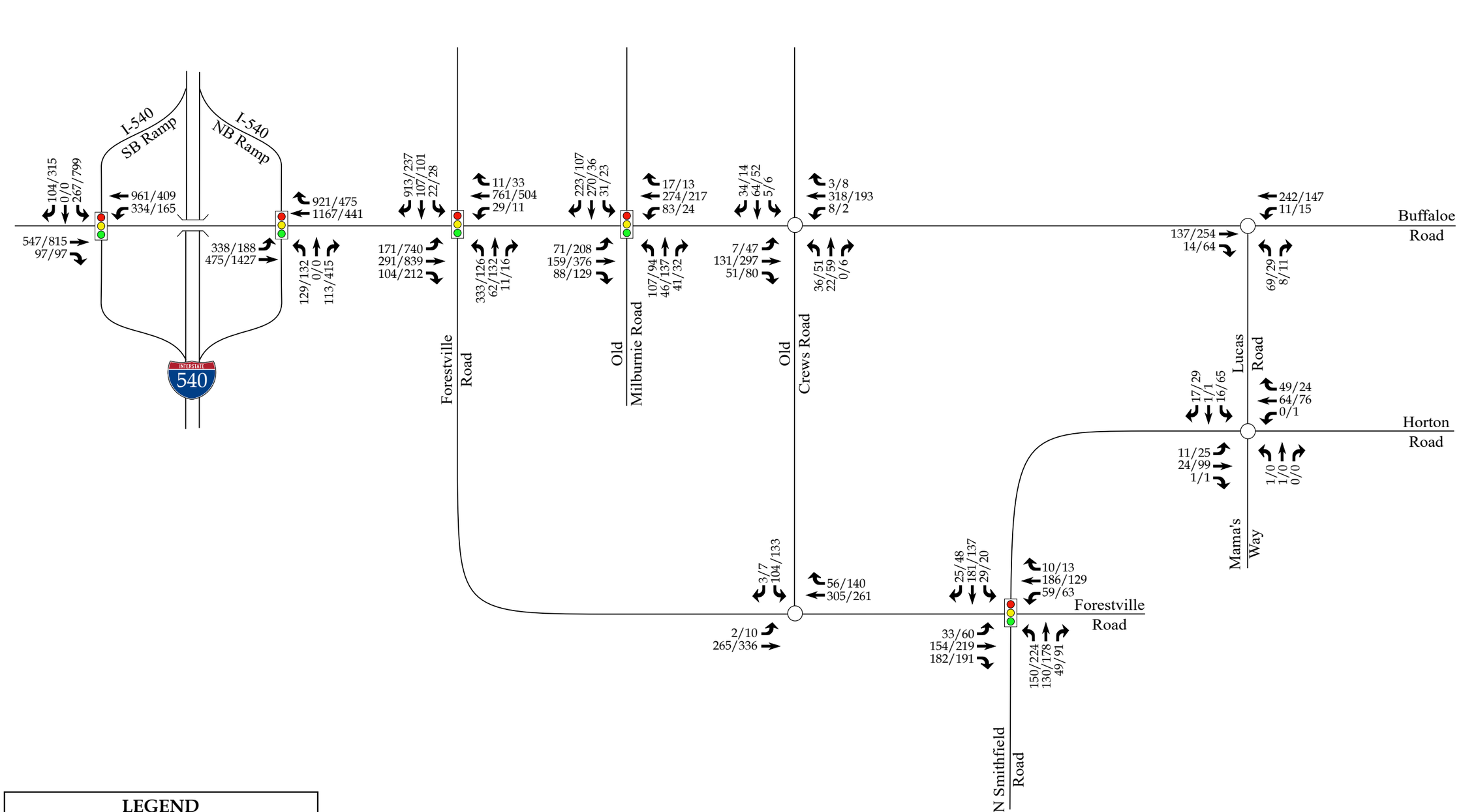
Buffaloe Road Assemblage
Knightdale, NC

Peak Hour Adjacent Development Trips

Scale: Not to Scale | Figure 6



LEGEND

- Unsignalized Intersection
- Signalized Intersection
- X / Y → Weekday AM / PM Peak Hour Traffic

Moving forward.
RKA
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Buffaloe Road Assemblage
Knightdale, NC

No-Build (2028)
Peak Hour Traffic

Scale: Not to Scale | Figure 7

4. SITE TRIP GENERATION AND DISTRIBUTION

4.1. Trip Generation

The proposed development is assumed to consist of 394 single-family homes, 514 townhomes, and 405 age restricted homes (Alternative 1) or 799 single-family homes and 514 townhomes (Alternative 2). Average weekday daily, AM peak hour, and PM peak hour trips for the proposed development were estimated using methodology contained within the ITE *Trip Generation Manual*, 10th Edition. Table 3 and 4 provides a summary of the trip generation potential for the site for Alternative 1 and Alternative 2, respectively.

Table 3: Trip Generation Summary – Alternative 1

Land Use (ITE Code)	Intensity	Daily Traffic (vpd)	Weekday AM Peak Hour Trips (vph)		Weekday PM Peak Hour Trips (vph)	
			Enter	Exit	Enter	Exit
Single-Family Detached Housing (210)	394 units	3,670	71	214	239	140
Multifamily Low-Rise Housing (220)	514 units	3,850	52	174	160	94
Age Restricted Detached Housing (251)	405 units	1,930	39	79	87	56
Total Trips		9,450	162	467	486	290

It is estimated that the proposed development will generate approximately 9,450 total site trips on the roadway network during a typical 24-hour weekday period under Alternative 1. Of the daily traffic volume, it is anticipated that 629 trips (162 entering and 467 exiting) will occur during the weekday AM peak hour and 776 (486 entering and 290 exiting) will occur during the weekday PM peak hour under Alternative 1.

Table 4: Trip Generation Summary – Alternative 2

Land Use (ITE Code)	Intensity	Daily Traffic (vpd)	Weekday AM Peak Hour Trips (vph)		Weekday PM Peak Hour Trips (vph)	
			Enter	Exit	Enter	Exit
Single-Family Detached Housing (210)	799 units	7,040	143	429	471	276
Multifamily Low-Rise Housing (220)	514 units	3,850	52	174	160	94
Total Trips		10,890	195	603	631	370

It is estimated that the proposed development will generate approximately 10,890 total site trips on the roadway network during a typical 24-hour weekday period under Alternative 2. Of the daily traffic volume, it is anticipated that 798 trips (195 entering and 603 exiting) will occur during the weekday AM peak hour and 1,001 (631 entering and 370 exiting) will occur during the weekday PM peak hour under Alternative 2.

4.2. Site 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.

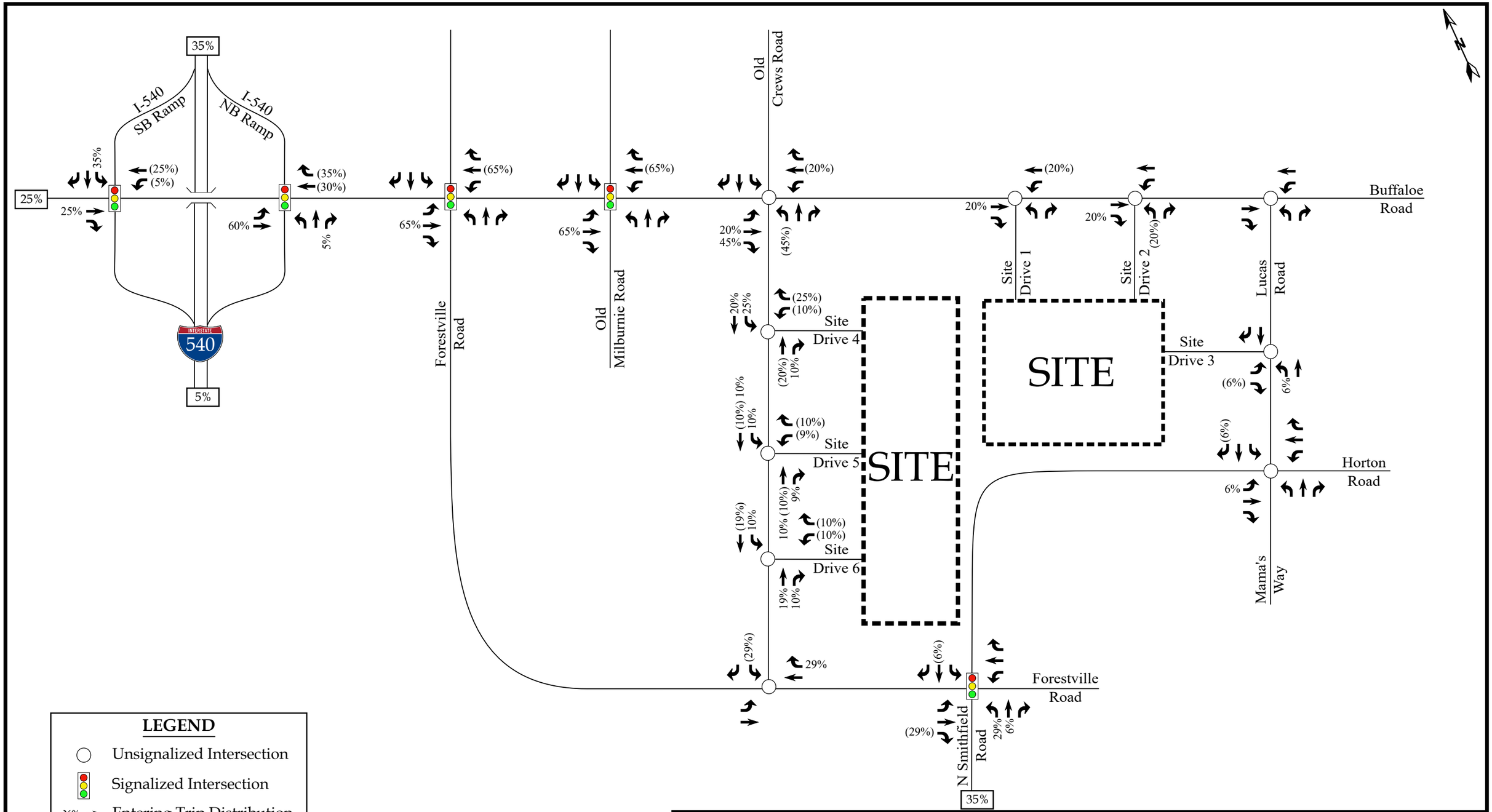
It is estimated that the site trips will be regionally distributed as follows:

- 25% to / from the west via Buffaloe Road
- 35% to / from the north via I-540
- 5% to / from the south via I-540
- 35% to / from the south via N Smithfield Road

It should be noted that the overall distributions for both the single-family homes, townhomes, and age-restricted homes are the same; however, internally they differ based on the locations of the different land uses on-site. Site trip distribution figures have been attached for your reference.

The townhomes site trip distribution is shown in Figure 8A, the single-family and age restricted homes site trip distribution is shown in Figure 8B. Refer to Figure 9A for the townhome site trip assignment, Figure 9B for the single-family alternative 1 site trip assignment, Figure 9C for the age-restricted site trip assignment, and Figure 9D for the single-family alternative 2 site trip assignment.

The total site trips were determined by adding the primary site trips together. Refer to Figure 10A and Figure 10B for the total peak hour site trips at the study intersections for Alternative 1 and Alternative 2.



LEGEND

- Unsignalized Intersection
- Signalized Intersection
- X% → Entering Trip Distribution
- (Y%) → Exiting Trip Distribution
- XX% Regional Trip Distribution

Moving forward.
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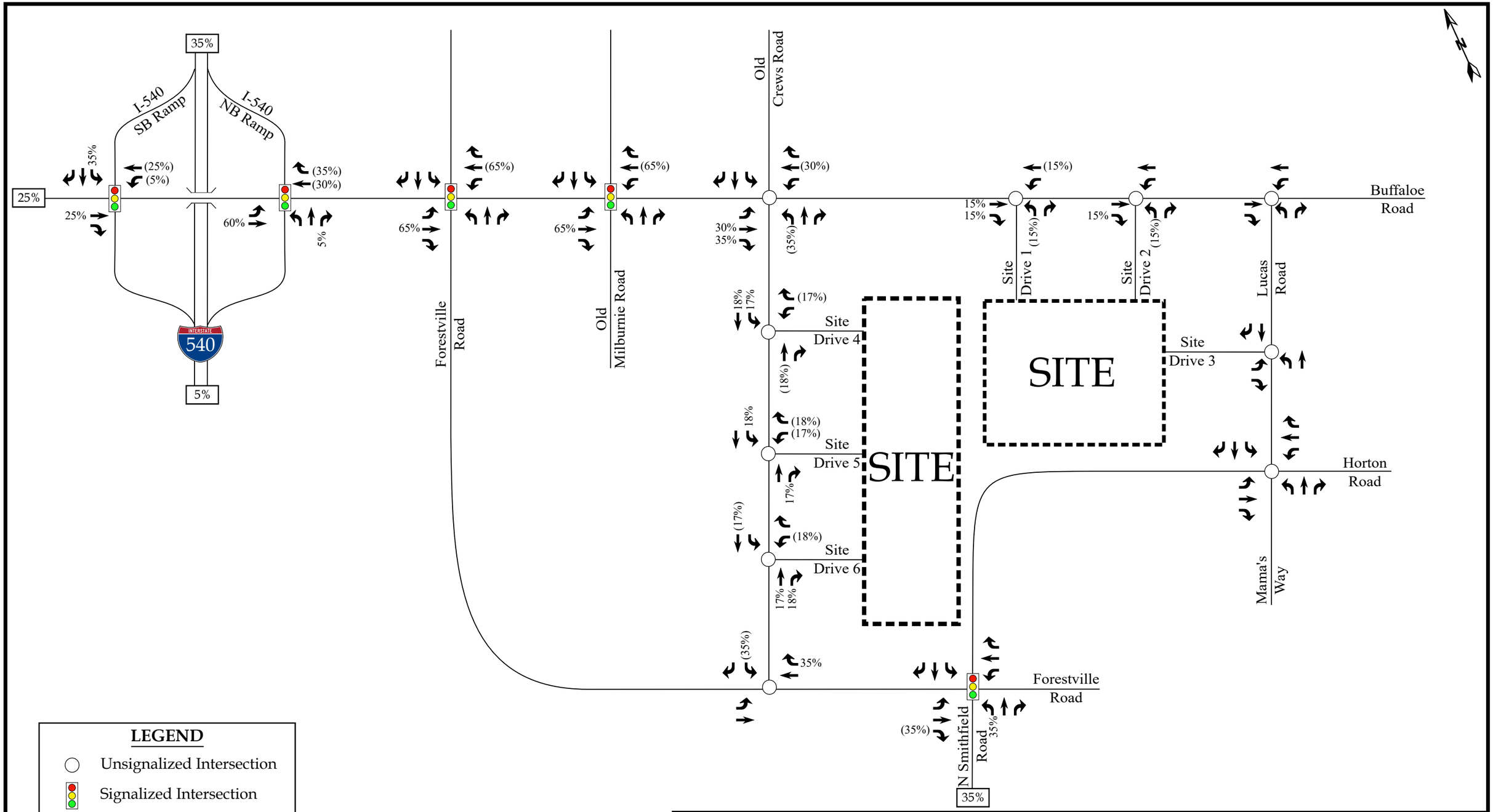
Buffaloe Road Assemblage
Knightdale, NC

Site Trip Distribution - Townhomes

Scale: Not to Scale | Figure 8A



Moving forward.
RKA
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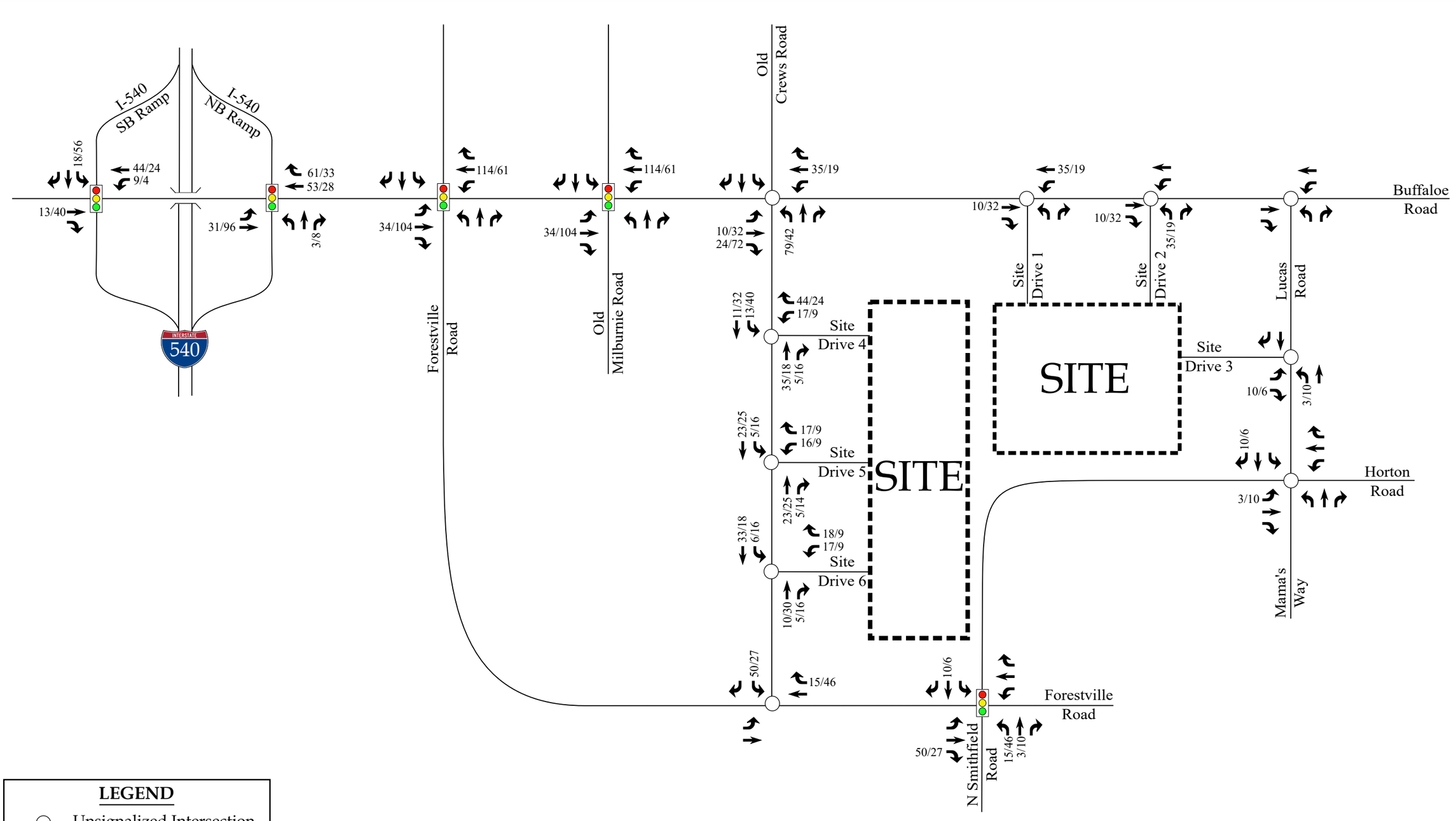
Buffaloe Road Assemblage
Knightdale, NC

Site Trip Distribution - Single-Family Homes

Scale: Not to Scale | Figure 8B



LEGEND

- ○ Unsignalized Intersection
- Signalized Intersection
- X / Y → Weekday AM / PM Peak Hour Site Trips

Moving forward.
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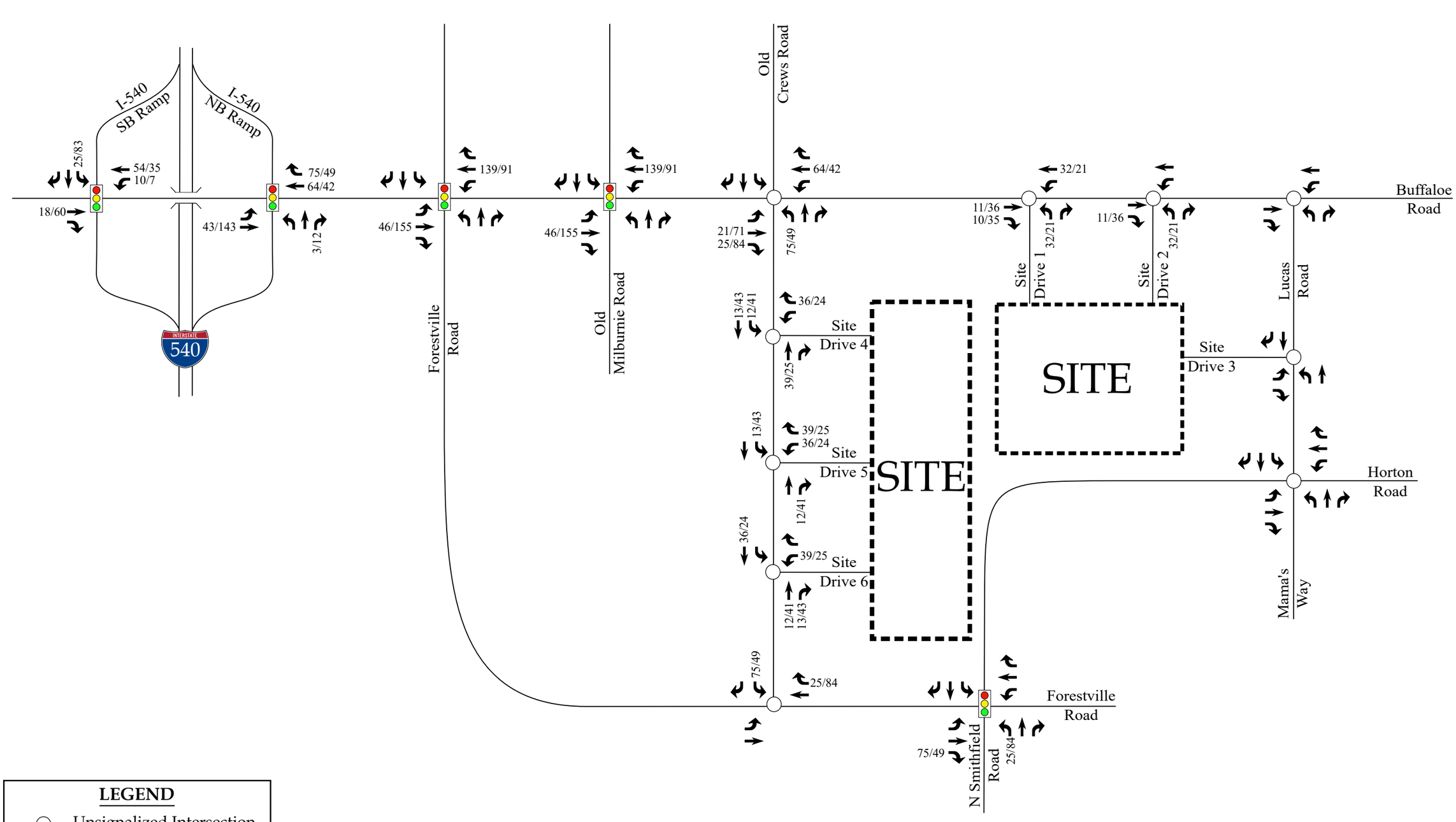
Buffaloe Road Assemblage
Knightdale, NC

Townhome Site Trip Assignment

Scale: Not to Scale | Figure 9A



LEGEND

- ○ Unsignalized Intersection
- Signalized Intersection
- X / Y → Weekday AM / PM Peak Hour Site Trips

Moving forward.
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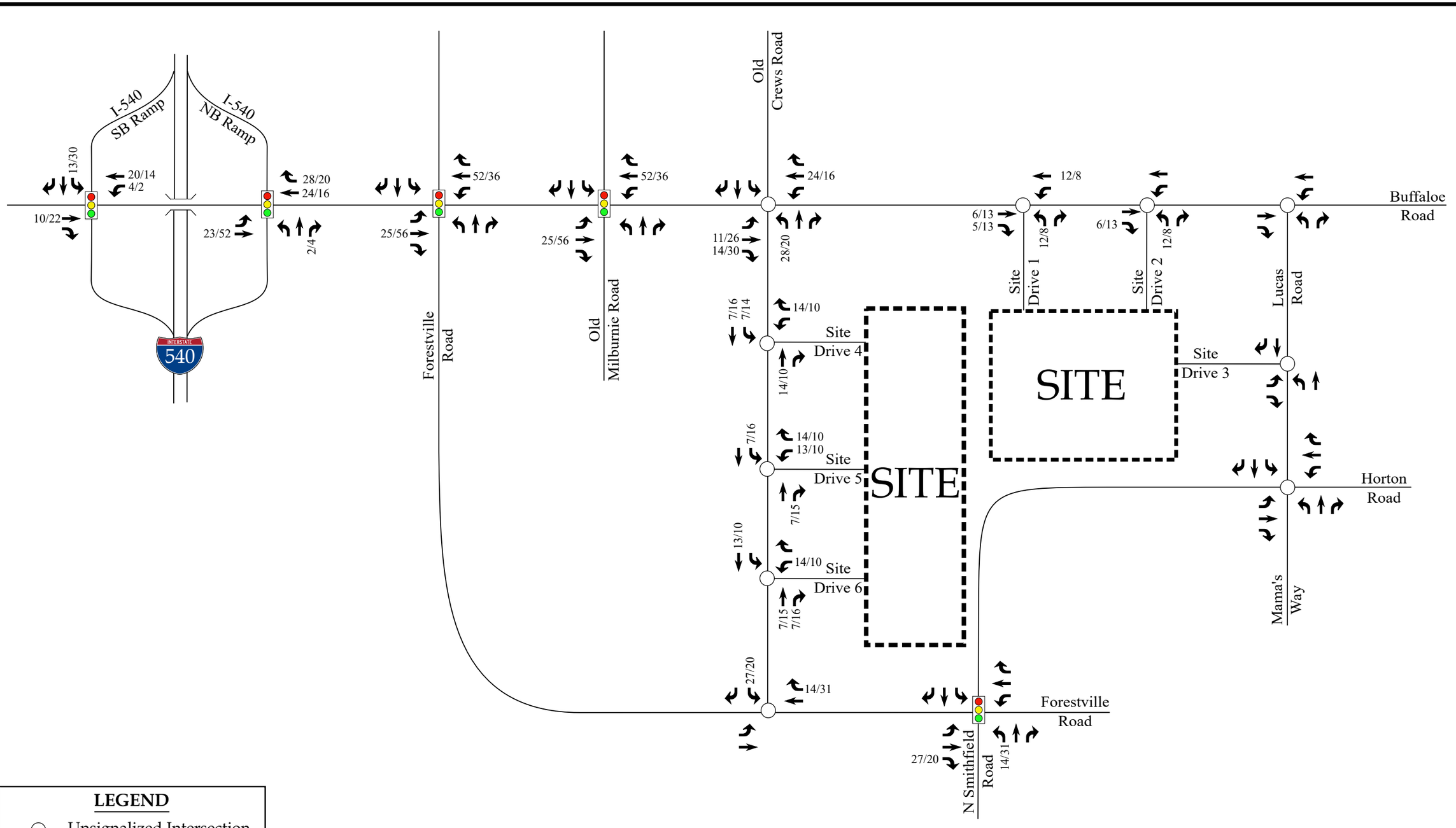
Buffaloe Road Assemblage
Knightdale, NC

Single Family Site Trip Assignment Alternative 1

Scale: Not to Scale | Figure 9B



LEGEND

- ○ Unsignalized Intersection
- Signalized Intersection
- X / Y → Weekday AM / PM Peak Hour Site Trips

Moving forward.
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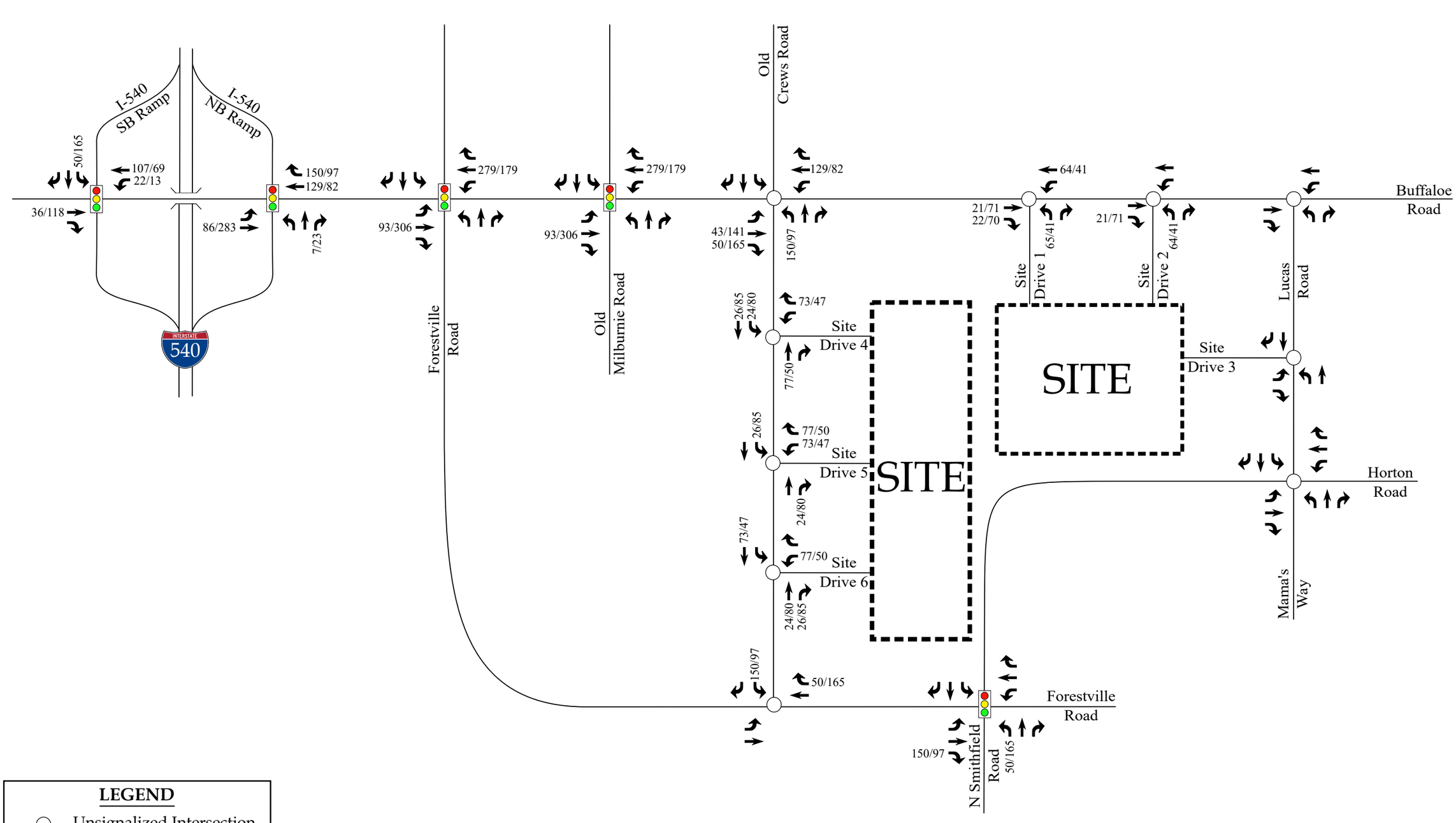
Buffaloe Road Assemblage
Knightdale, NC

Age Restricted Site Trip Assignment

Scale: Not to Scale | Figure 9C



LEGEND

- ○ Unsignalized Intersection
- Signalized Intersection
- X / Y → Weekday AM / PM Peak Hour Site Trips

Moving forward.
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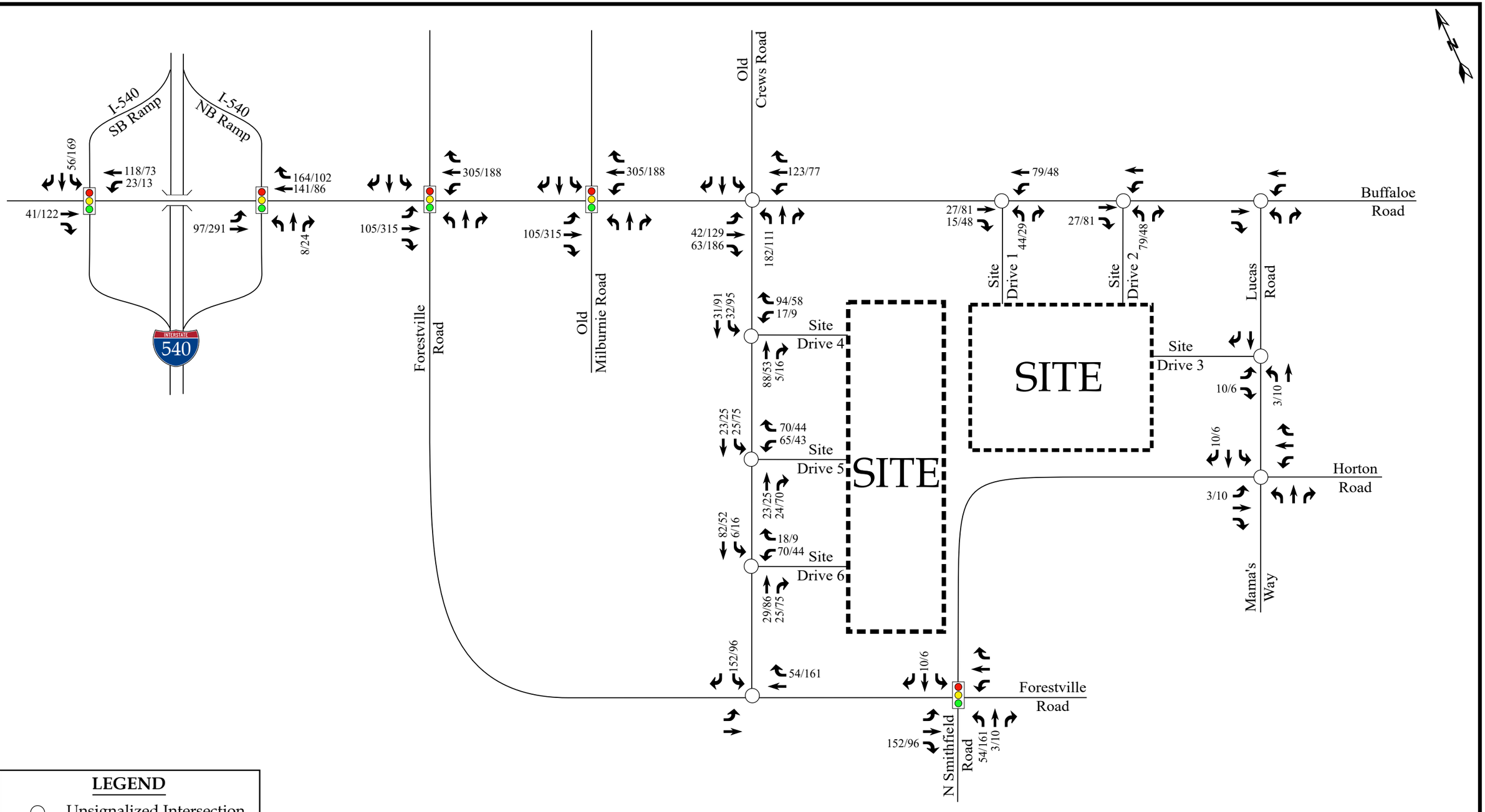
Buffaloe Road Assemblage
Knightdale, NC

Single Family Site
Trip Assignment
Alternative 2

Scale: Not to Scale | Figure 9D



LEGEND

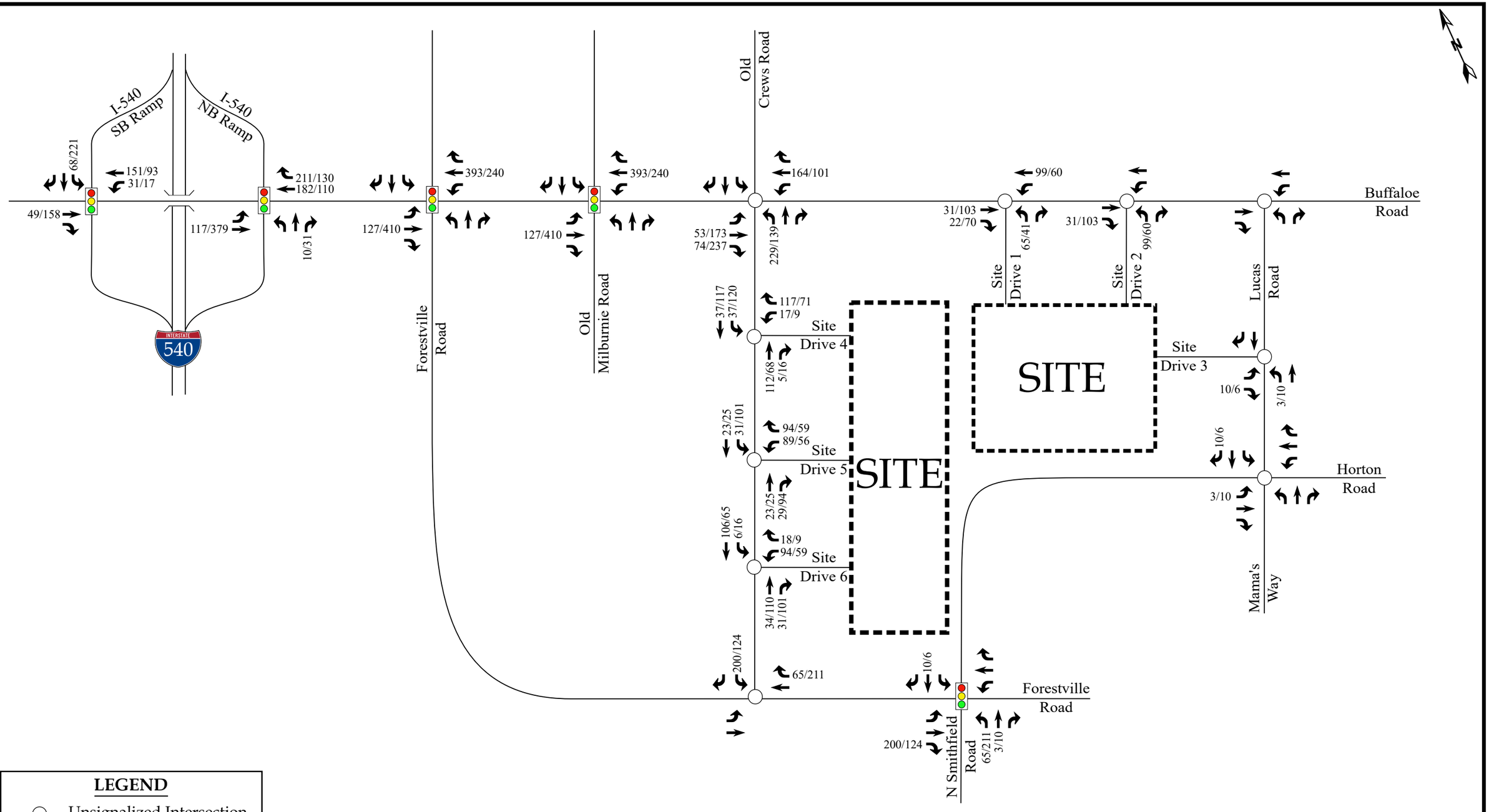
- ○ Unsignalized Intersection
- Signalized Intersection
- X / Y → Weekday AM / PM Peak Hour Site Trips

Moving forward. RKA RAMEY KEMP ASSOCIATES

Buffaloe Road Assemblage
Knightdale, NC

Total Site Trip Assignment Alternative 1

Scale: Not to Scale | Figure 10A



LEGEND

- ○ Unsignalized Intersection
- Signalized Intersection
- X / Y → Weekday AM / PM Peak Hour Site Trips

Moving forward.
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Buffaloe Road Assemblage
Knightdale, NC

Total Site Trip Assignment
Alternative 2

Scale: Not to Scale | Figure 10B

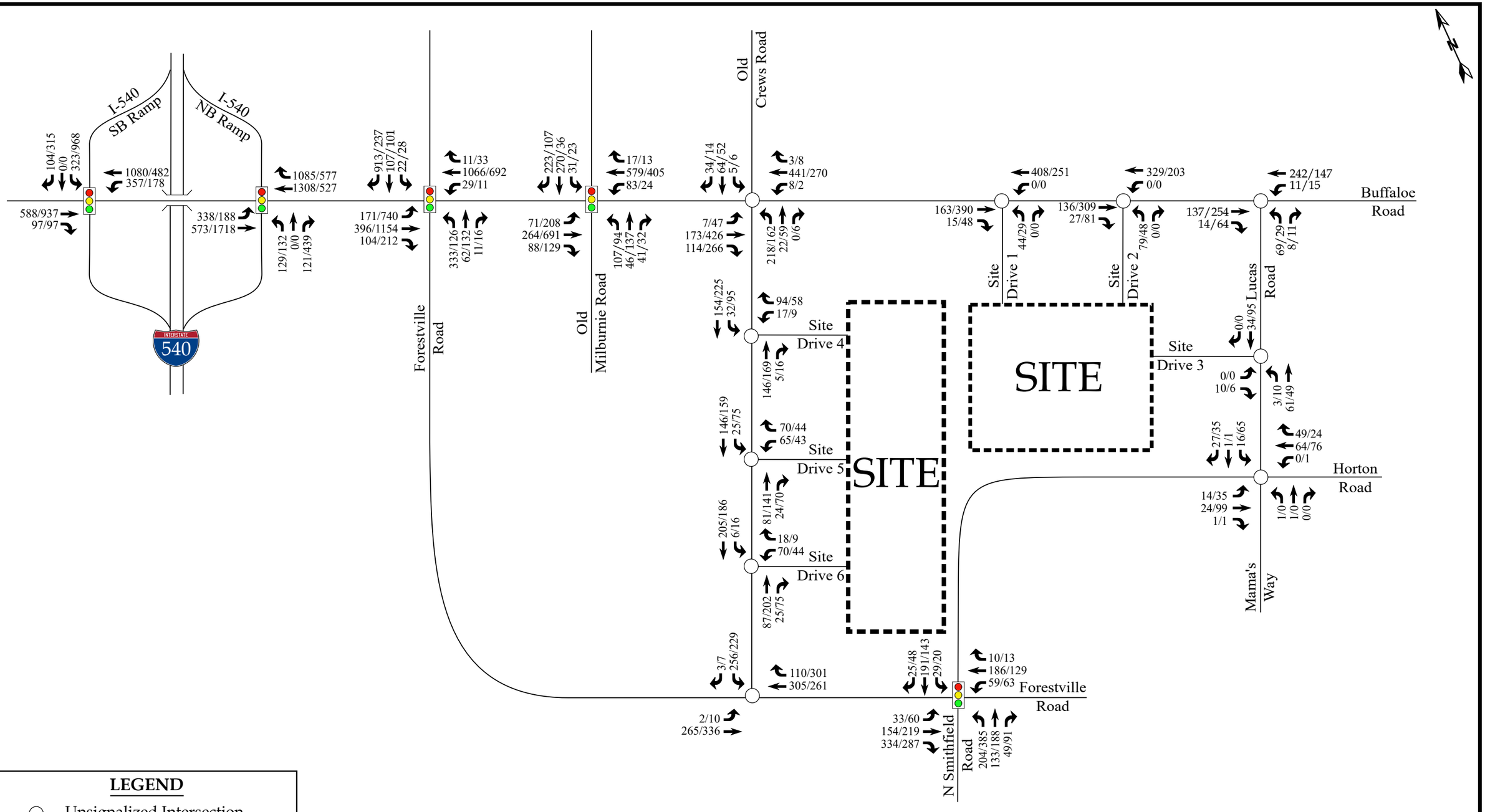
5. BUILD (2028/2037) TRAFFIC CONDITIONS

5.1. Build (2028/2037) Peak Hour Traffic Volumes

To estimate traffic conditions with the site fully built-out, the total site trips for Alternative 1 and Alternative 2, respectively, were added to the no-build (2028/2037) traffic volumes to determine the build (2028/2037) traffic volumes. Refer to Figure 11A and Figure 11B for an illustration of the build (2028) peak hour traffic volumes with the proposed site fully developed under Alternative 1 and Alternative 2, respectively. Refer to Figure 12A and Figure 12B for an illustration of the build (2037) peak hour traffic volumes with the proposed site fully developed under Alternative 1 and Alternative 2, respectively.

5.2. Analysis of Build (2028/2037) Peak Hour Traffic

Study intersections were analyzed with the build (2028/2037) traffic volumes using the same methodology previously discussed for existing and no-build traffic conditions. Intersections were analyzed with improvements necessary to accommodate future traffic volumes. The results of the capacity analysis for each intersection are presented in Section 7 of this report.



LEGEND

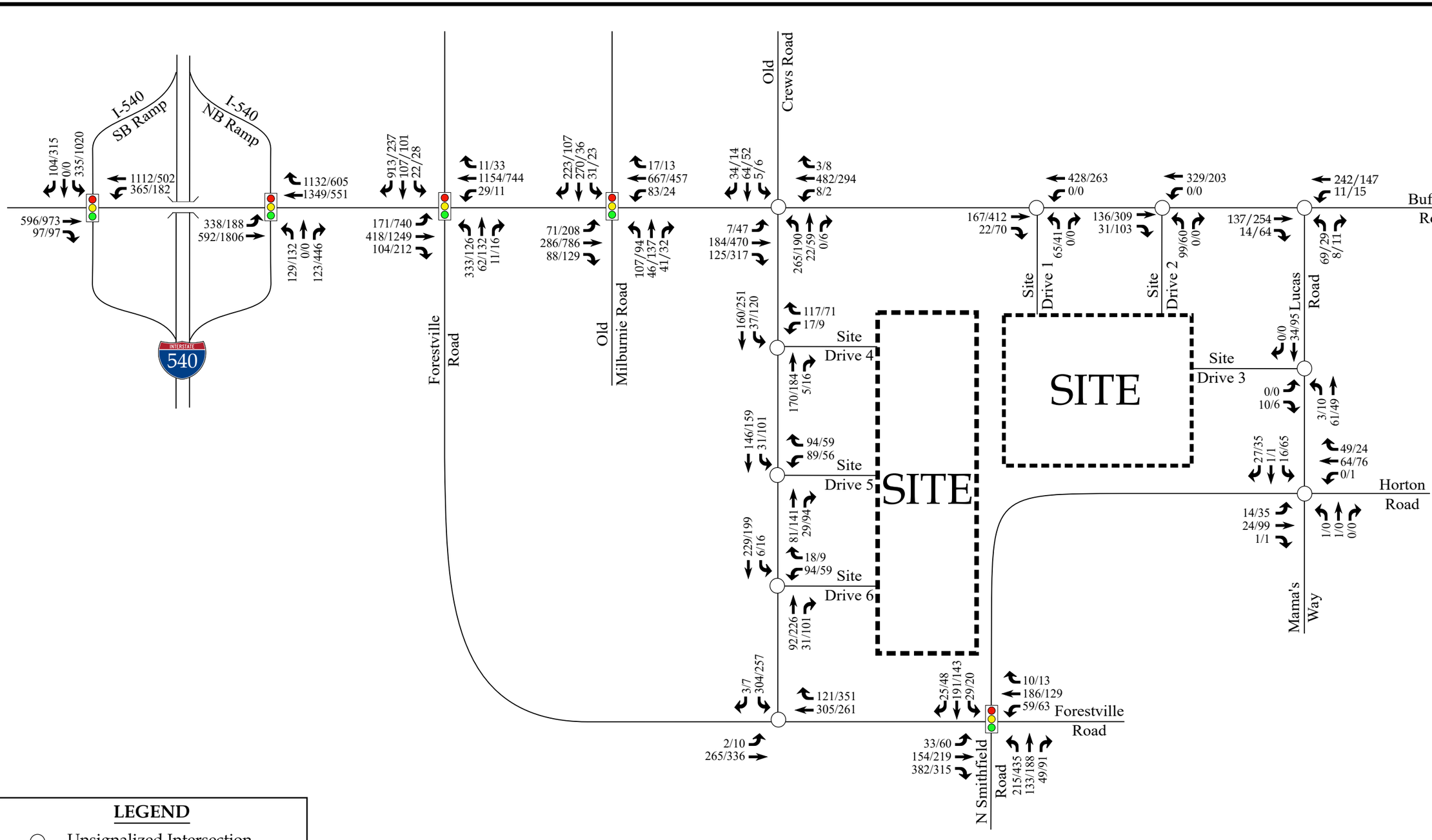
- ○ Unsignalized Intersection
- Signalized Intersection
- X / Y → Weekday AM / PM Peak Hour Traffic

Moving forward. RKA RAMEY KEMP ASSOCIATES

Buffaloe Road Assemblage
Knightdale, NC

Build (2028)
Peak Hour Traffic - Alternative 1

Scale: Not to Scale | Figure 11A



LEGEND

- ○ Unsignalized Intersection
- Signalized Intersection
- X / Y → Weekday AM / PM Peak Hour Traffic

Moving forward.
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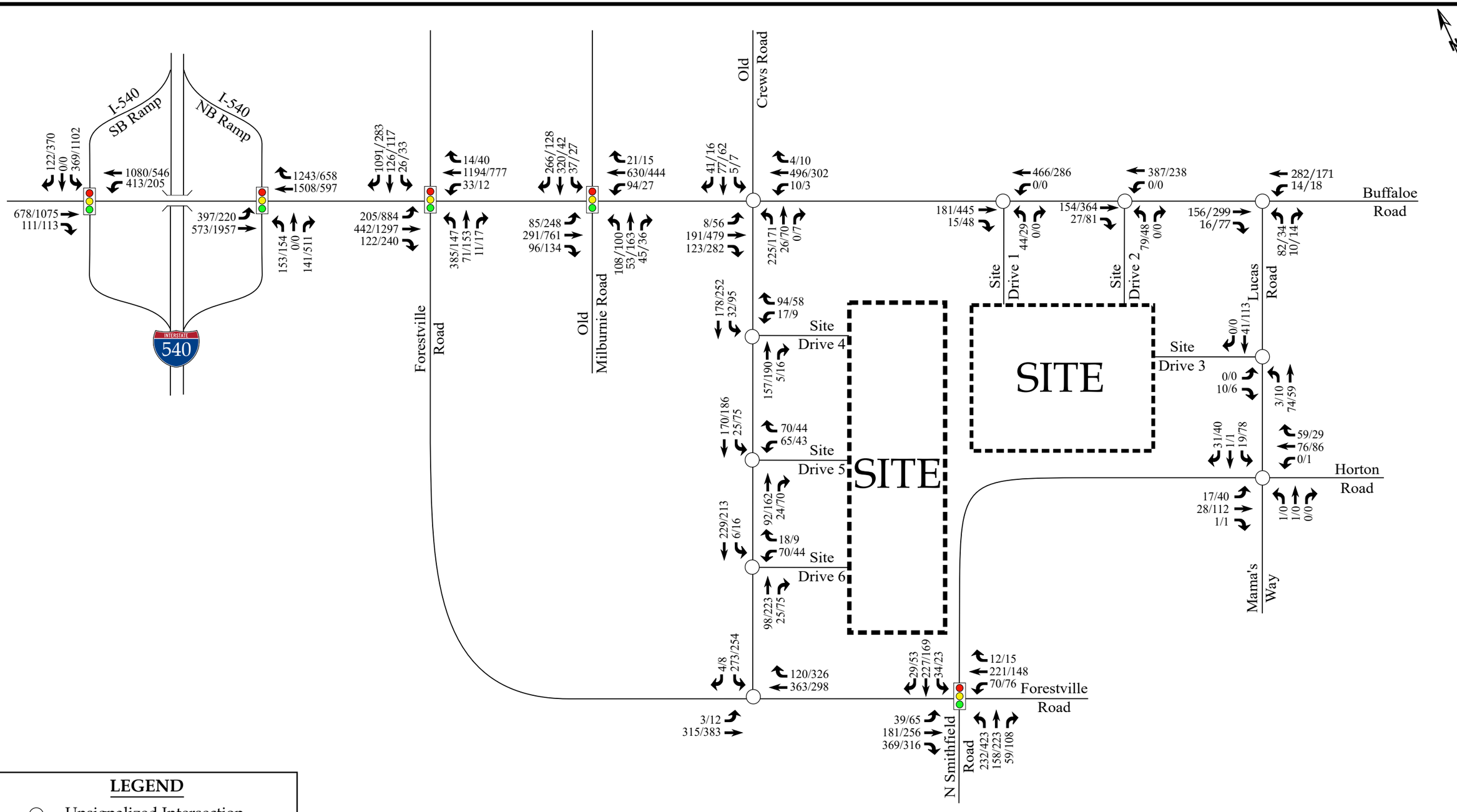
Buffaloe Road Assemblage
Knightdale, NC

Build (2028)
Peak Hour Traffic - Alternative 2

Scale: Not to Scale | Figure 11B



LEGEND

- ○ Unsignalized Intersection
- Signalized Intersection
- X / Y → Weekday AM / PM Peak Hour Traffic

Moving forward.
RKA
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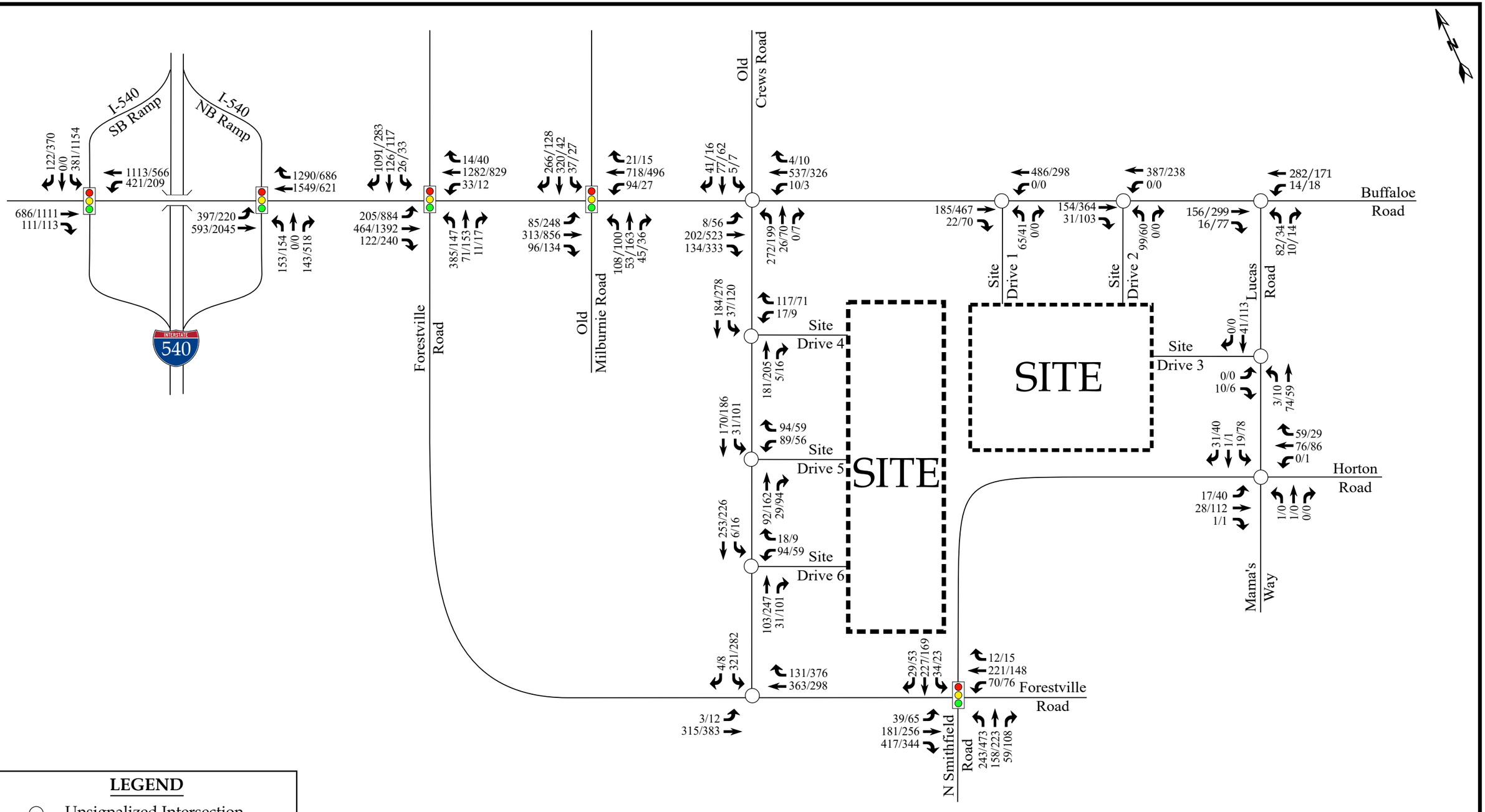
Buffaloe Road Assemblage
Knightdale, NC

Build (2037)
Peak Hour Traffic - Alternative 1

Scale: Not to Scale | Figure 12A



LEGEND

- ○ Unsignalized Intersection
- Signalized Intersection
- X / Y → Weekday AM / PM Peak Hour Traffic

Moving forward.
RKA
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Buffaloe Road Assemblage
Knightdale, NC

Build (2037)
Peak Hour Traffic - Alternative 2

Scale: Not to Scale | Figure 12B

6. TRAFFIC ANALYSIS PROCEDURE

Study intersections were analyzed using the methodology outlined in the *Highway Capacity Manual* (HCM), 6th Edition 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 10.3), was used to complete the analyses for 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 5 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 5: 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

6.1. Adjustments to Analysis Guidelines

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

7. CAPACITY ANALYSIS

7.1. Buffaloe Road and I-540 Southbound Ramps

The existing signalized intersection of Buffaloe Road and I-540 Southbound Ramps was analyzed under existing (2021), no-build (2028), build (2028), and build (2037) traffic conditions with lane configurations and traffic control shown in Table 6 on the following page. Based on coordination with the site team there are two (2) land use options for this development, as follows:

- Alternative 1:
  - 394 single-family homes
  - 514 townhomes
  - 405 age-restricted homes

Or

- Alternative 2:
  - 799 single-family homes
  - 514 townhomes

Each of these alternatives were analyzed under build (2028) and build (2037) conditions. Refer to Table 6 on the following page for a summary of the analysis results. Refer to Appendix F for the Synchro capacity analysis reports and Appendix U for the SimTraffic queuing reports.

Table 6: Analysis Summary of Buffaloe Road and I-540 Southbound Ramps

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 (2021) Conditions	EB WB SB	1 TH, 1 RT 1 LT, 1 TH 1 LT-TH, 1 RT	B B D	C (21)	D C D	D (45)
No-Build (2028) Conditions	EB WB SB	1 TH, 1 RT 1 LT, 1 TH 1 LT-TH, 1 RT	C C D	C (27)	F D F	F (110)
Build (2028) Conditions Alternative 1	EB WB SB	1 TH, 1 RT 1 LT, 1 TH 1 LT-TH, 1 RT	C D D	D (40)	F D F	F (175)
Build (2028) Conditions Alternative 2	EB WB SB	1 TH, 1 RT 1 LT, 1 TH 1 LT-TH, 1 RT	C D D	D (46)	F D F	F (195)
Build (2028) Conditions Alternative 1 with Signal Modifications*	EB WB SB	1 TH, 1 RT 1 LT, 1 TH 1 LT-TH, 1 RT	C B F	C (33)	F E F	F (160)
Build (2028) Conditions Alternative 2 with Signal Modifications*	EB WB SB	1 TH, 1 RT 1 LT, 1 TH 1 LT-TH, 1 RT	C C F	D (40)	F E F	F (179)
Build (2028) Conditions Alternative 1 Per Town UDO	EB WB SB	1 TH, 1 RT 1 LT, 2 TH 1 LT, 1 LT-TH, 1 RT	C B F	C (27)	F D E	E (80)
Build (2028) Conditions Alternative 2 Per Town UDO	EB WB SB	1 TH, 1 RT 1 LT, 2 TH 1 LT, 1 LT-TH, 1 RT	B A E	B (20)	F D E	F (107)
Build (2037) Conditions Alternative 1	EB WB SB	1 TH, 1 RT 1 LT, 1 TH 1 LT-TH, 1 RT	D E E	E (62)	F D F	F (234)
Build (2037) Conditions Alternative 2	EB WB SB	1 TH, 1 RT 1 LT, 1 TH 1 LT-TH, 1 RT	D F E	E (72)	F D F	F (256)

Alternative 1 is shown in orange.
Alternative 2 is shown in blue.
Improvements by the developer are shown in bold.
Improvements needed to meet the Town UDO are shown in green.
*Due to heavy queuing along the Buffaloe Road corridor, coordinated signal timing adjustments and intersection offset adjustments were considered at the Buffaloe Road and I-540 ramps intersections.

Capacity analysis of existing (2021), no-build (2028), and build (2028) traffic conditions indicates the intersection of Buffaloe Road and I-540 Southbound Ramps is expected to operate at an overall LOS D or better during the weekday AM peak hour. During the weekday PM peak hour, the intersection currently operates at an overall LOS D under existing (2021) conditions and is expected to operate at an overall LOS F under all future conditions. Under build (2037) conditions, the intersection is expected to operate at an overall LOS E during the weekday AM peak hour. The heavy overall delays under build (2037) conditions are anticipated to be due to the background growth expected in the next 16 years and is not anticipated to be primarily due to the traffic from the proposed Buffaloe Road Assemblage development. Based on SimTraffic queuing results, heavy queuing is anticipated on the southbound approach of the I-540 Southbound Ramps under no-build (2028) and build (2028) conditions.

It should be noted that background growth (adjacent developments and the annually compounded growth rate) is anticipated to amount to approximately 25% of the overall no-build (2028) traffic volumes at this intersection; whereas, the proposed development is only anticipated to amount to approximately 13% of the overall no-build (2028) traffic volumes at this intersection under Alternative 1 and approximately 16% of the overall no-build (2028) traffic volumes at this intersection under Alternative 2.

Because the intersection is anticipated to degrade by an overall level-of-service between existing (2021) and no-build (2023) conditions during the weekday PM peak hour and due to the heavy queuing results, improvements were considered at the study intersection. Exclusive turn lanes exist on all approaches. Additional geometric improvements would be expected to require bridge widening on the eastern leg of the intersection; therefore, signal modifications were considered. With signal coordination adjustments along the Buffaloe Road corridor, SimTraffic queuing and Synchro capacity results indicated that the study intersection is anticipated to significantly improve; however, a failing level-of-service and heavy queuing was still anticipated during the weekday PM peak hour.

Additional improvements were considered to meet the Town's Unified Development

Ordinance (UDO). An additional southbound left-turn lane and widening the existing bridge to allow for an additional receiving lane were needed to bring the intersection to no-build levels-of-service with minimal queuing. It should be noted that based on the City of Raleigh Comprehensive Transportation Plan, this improvement would build out Buffaloe Road to a 4-lane section, consistent with future plans.

Due to the low comparative impact of the proposed Buffaloe Road Assemblage development at this study area intersection compared with the anticipated background growth in this area, it is recommended that signal coordination adjustments be provided along the Buffaloe Road corridor within the study area and no additional improvements be provided at this study intersection. It is recommended that this corridor be considered in future NCDOT projects.

7.2. Buffaloe Road and I-540 Northbound Ramps

The existing signalized intersection of Buffaloe Road and I-540 Northbound Ramps was analyzed under existing (2021), no-build (2028), build (2028), build (2037) traffic conditions with the lane configurations and traffic control shown in Table 7 on the following page. Based on coordination with the site team there are two (2) land use options for this development, as follows:

- Alternative 1:
  - 394 single-family homes
  - 514 townhomes
  - 405 age-restricted homes

Or

- Alternative 2:
  - 799 single-family homes
  - 514 townhomes

Each of these alternatives were analyzed under build (2028) and build (2037) conditions. Refer to Table 7 on the following page for a summary of the analysis results. Refer to Appendix G for the Synchro capacity analysis reports and Appendix U for the SimTraffic queuing reports.

Table 7: Analysis Summary of Buffaloe Road and I-540 Northbound Ramps

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 (2021) Conditions	EB WB NB	1 LT, 1 TH 1 TH, 1 RT 1 LT-TH, 1 RT	B C E	C (27)	B A F	D (42)
No-Build (2028) Conditions	EB WB NB	1 LT, 1 TH 1 TH, 1 RT 1 LT-TH, 1 RT	C F E	F (104)	E A F	F (94)
Build (2028) Conditions Alternative 1	EB WB NB	1 LT, 1 TH 1 TH, 1 RT 1 LT-TH, 1 RT	B F E	F (157)	F A F	F (146)
Build (2028) Conditions Alternative 2	EB WB NB	1 LT, 1 TH 1 TH, 1 RT 1 LT-TH, 1 RT	B F E	F (174)	F C F	F (168)
Build (2028) Conditions Alternative 1 with Signal Modifications*	EB WB NB	1 LT, 1 TH 1 TH, 1 RT 1 LT-TH, 1 RT	E F F	F (87)	F A F	F (136)
Build (2028) Conditions Alternative 2 with Signal Modifications*	EB WB NB	1 LT, 1 TH 1 TH, 1 RT 1 LT-TH, 1 RT	E F F	F (98)	F A F	F (153)
Build (2028) Conditions Alternative 1 Per Town UDO	EB WB NB	1 LT, 2 TH 2 TH, 1 RT 1 LT-TH, 1 RT	C D F	D (50)	B B E	C (21)
Build (2028) Conditions Alternative 2 Per Town UDO	EB WB NB	1 LT, 2 TH 2 TH, 1 RT 1 LT-TH, 1 RT	D D F	D (50)	B C E	C (26)
Build (2037) Conditions Alternative 1	EB WB NB	1 LT, 1 TH 1 TH, 1 RT 1 LT-TH, 1 RT	C F E	F (268)	F C F	F (210)
Build (2037) Conditions Alternative 2	EB WB NB	1 LT, 1 TH 1 TH, 1 RT 1 LT-TH, 1 RT	C F E	F (286)	F C F	F (226)

Alternative 1 is shown in orange.
Alternative 2 is shown in blue.
Improvements by the developer are shown in bold.
Improvements needed to meet the Town UDO are shown in green.
*Due to heavy queuing along the Buffaloe Road corridor, coordinated signal timing adjustments and intersection offset adjustments were considered at the Buffaloe Road and I-540 ramps intersections.

Capacity analysis of existing (2021) traffic conditions indicates the intersection of Buffaloe Road and I-540 Northbound Ramps currently operates at an overall LOS C during the weekday AM peak hour and LOS D during the weekday PM peak hour. Under no-build (2028) and build (2028) conditions, the intersection is expected to operate at an overall LOS F during the weekday AM and PM peak hours. Under build (2037) conditions, the intersection is expected to continue to operate at an overall LOS F during the weekday AM and PM peak hours. The heavy overall delays under future (2037) conditions are anticipated to be primarily due to the background growth expected in the next 16 years and is not anticipated to be due to the traffic from the proposed development. Based on SimTraffic queuing results, heavy queuing is anticipated on I-540 Northbound Ramps during the weekday PM peak hour.

It should be noted that background growth (adjacent developments and the annually compounded growth rate) is anticipated to amount to approximately 25% of the overall no-build (2028) traffic volumes at this intersection; whereas, the proposed development is only anticipated to amount to approximately 15% of the overall no-build (2028) traffic volumes at this intersection under Alternative 1 and approximately 19% of the overall no-build (2028) traffic volumes at this intersection under Alternative 2.

Due to the heavy queuing results, improvements were considered at the study intersection. Exclusive turn lanes exist on all approaches. Additional geometric improvements would be expected to require bridge widening on the western leg of the intersection; therefore, signal modifications were considered. With signal coordination adjustments along the Buffaloe Road corridor, SimTraffic queuing and Synchro capacity results indicated that the study intersection is anticipated to significantly improve; however, a failing level-of-service and heavy queuing was still anticipated during the weekday PM peak hour. It is anticipated that the intersection currently operates with vehicles turning right on red, as there is not current signage to indicate that this movement is not allowable. With right-turn on-red, queuing on the I-540 Northbound Ramps would be anticipated to be significantly improved.

Additional improvements were considered to meet the Town's Unified Development Ordinance (UDO). Widening the existing bridge to allow for an additional eastbound and

westbound through lane was needed to bring the intersection to no-build levels-of-service with minimal queuing. It should be noted that based on the City of Raleigh Comprehensive Transportation Plan, this improvement would build out Buffaloe Road to a 4-lane section, consistent with future plans. Future developments to the east of this study intersection may provide these additional through lanes as the developments are built out.

Due to the low comparative impact of the proposed Buffaloe Road Assemblage development at this study area intersection compared with the anticipated background growth in this area, it is recommended that signal coordination adjustments be provided along the Buffaloe Road corridor within the study area and no additional improvements be provided at this study intersection. It is recommended that this corridor be considered in future NCDOT projects.

7.3. Buffaloe Road and Forestville Road

The existing signalized intersection of Buffaloe Road and Forestville Road was analyzed under existing (2021), no-build (2028), build (2028), build (2037) traffic conditions with the lane configurations and traffic control shown in Table 8 on the following page. It should be noted that based on the committed improvements by the Buffaloe Shoals adjacent development, an exclusive southbound right-turn lane with permitted/overlap phasing was included under all future analysis. Based on coordination with the site team there are two (2) land use options for this development, as follows:

- Alternative 1:
  - 394 single-family homes
  - 514 townhomes
  - 405 age-restricted homes

Or

- Alternative 2:
  - 799 single-family homes
  - 514 townhomes

Each of these alternatives were analyzed under build (2028) and build (2037) conditions. Refer to Table 8 on the following page for a summary of the analysis results. Refer to Appendix H for the Synchro capacity analysis reports and Appendix U for the SimTraffic queuing reports.

Table 8: Analysis Summary of Buffaloe Road and Forestville 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 (2021) Conditions	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	A C F F	F (652)	E E D F	E (66)
No-Build (2028) Conditions	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT	A F F F	F (174)	E F D C	E (62)
Build (2028) Conditions Alternative 1	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT	A F F F	F (245)	F F D C	F (123)
Build (2028) Conditions Alternative 2	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT	A F F F	F (272)	F F D C	F (150)
Build (2028) Conditions Alternative 1 with Signal Modifications	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT	B F F F	F (252) *	E F F E	E (76)
Build (2028) Conditions Alternative 2 with Signal Modifications	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT	B F F F	F (267)	F F F E	F (91)

Alternative 1 is shown in orange.
Alternative 2 is shown in blue.
*Overall delay is shown higher with signal modifications, because it is part of a coordinated system along Buffaloe Road and is not necessarily optimized to this intersection.
Improvements by the developer are shown in bold.
Improvements by adjacent developments are shown underlined.

Table 8 *continued*: Analysis Summary of Buffaloe Road and Forestville 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)
Build (2028) Conditions Alternative 1 Per Town UDO	EB WB NB SB	1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH, 2 RT	B F F F	F (137)	E F E E	E (73)
Build (2028) Conditions Alternative 2 Per Town UDO	EB WB NB SB	1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH, 2 RT**	B F F F	F (165)	E F F E	E (76)
Build (2037) Conditions Alternative 1	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT	A F F F	F (325)	F F D C	F (192)
Build (2037) Conditions Alternative 2	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT	A F F F	F (351)	F F D C	F (217)

Alternative 1 is shown in orange.
Alternative 2 is shown in blue.
**An additional receiving lane on the western leg is recommended to accommodate the dual southbound right-turn lanes.
Improvements needed to meet the Town UDO are shown in green.
Improvements by adjacent developments are shown underlined.

Capacity analysis of existing (2021) and no-build (2028) traffic conditions indicates the intersection of Buffaloe Road and Forestville Road is expected to operate at an overall LOS F during the weekday AM peak hour and LOS E during the weekday PM peak hour. Under build (2028) and build (2037) traffic conditions, the intersection is expected to operate at an overall LOS F during the weekday AM and PM peak hours.

It should be noted that background growth (adjacent developments and the annually compounded growth rate) is anticipated to amount to approximately 22% of the overall no-build (2028) traffic volumes at this intersection; whereas, the proposed development is only anticipated to amount to approximately 16% of the overall no-build (2028) traffic volumes at this intersection under Alternative 1 and approximately 20% of the overall no-build (2028)

traffic volumes at this intersection under Alternative 2. Additionally, the proposed development is only anticipated to add traffic volume to the mainline along Buffaloe Road and is not anticipated to contribute to any turning movements.

Due to the heavy queuing results at the I-540 ramps, signal coordination adjustments were considered. With signal coordination adjustments along the Buffaloe Road corridor, Synchro capacity results indicated that the study intersection is expected to operate better than existing conditions during the weekday AM peak hour and was significantly improved during the weekday PM peak hour. It is anticipated that the intersection currently operates with vehicles turning right on red, as there is not current signage to indicate that this movement is not allowable. With right-turn on-red, the heavily traveled southbound right-turn movement is anticipated to be significantly improved.

Additional improvements were considered to meet the Town's Unified Development Ordinance (UDO). With an additional southbound right-turn lane, an additional receiving lane on the western leg of the intersection, and an exclusive eastbound right-turn lane, the intersection is anticipated to operate at significantly better than existing conditions during the weekday AM peak hour and with comparable delay to the weekday PM peak hour under existing conditions. It should be noted that based on the City of Raleigh Comprehensive Transportation Plan, this improvement would build out Buffaloe Road to a 4-lane section, consistent with future plans. Future developments along this corridor may provide these additional through lanes as the developments are built out.

Due to the low comparative impact of the proposed Buffaloe Road Assemblage development at this study area intersection compared with the anticipated background growth in this area, it is recommended that signal coordination adjustments be provided along the Buffaloe Road corridor within the study area and no additional improvements be provided at this study intersection. It is recommended that this corridor be considered in future NCDOT projects.

7.4. Buffaloe Road and Old Milburnie Road

The existing signalized intersection of Buffaloe Road and Old Milburnie Road was analyzed under existing (2021), no-build (2028), build (2028), build (2037) traffic conditions with the lane configurations and traffic control shown in Table 9 on the following page. It should be noted that as part of the Old Milburnie Residential TIA, an exclusive southbound right-turn lane was recommended at this intersection. Because the TIA for this adjacent development has not yet been reviewed, the improvement was not included in future analysis conditions (without improvements). Based on coordination with the site team there are two (2) land use options for this development, as follows:

- Alternative 1:
  - 394 single-family homes
  - 514 townhomes
  - 405 age-restricted homes

Or

- Alternative 2:
  - 799 single-family homes
  - 514 townhomes

Each of these alternatives were analyzed under build (2028) and build (2037) conditions. Refer to Table 9 on the following page for a summary of the analysis results. Refer to Appendix I for the Synchro capacity analysis reports and Appendix U for the SimTraffic queuing reports.

Table 9: Analysis Summary of Buffaloe Road and Old Milburnie 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 (2021) Conditions	EB WB NB SB	1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT-TH-RT 1 LT-TH-RT	B C B C	B (20)	B B C B	B (15)
No-Build (2028) Conditions	EB WB NB SB	1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT-TH-RT 1 LT-TH-RT	B C C C	C (27)	B C C C	B (20)
Build (2028) Conditions Alternative 1	EB WB NB SB	1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT-TH-RT 1 LT-TH-RT	B B F F	F (99)	B B F D	C (28)
Build (2028) Conditions Alternative 2	EB WB NB SB	1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT-TH-RT 1 LT-TH-RT	B B F F	F (155)	B B F D	C (32)
Build (2028) Conditions Alternative 1 with Improvements	EB WB NB SB	1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT-TH-RT 1 LT-TH, 1 RT*	B C F D	D (43)	B C E D	C (27)
Build (2028) Conditions Alternative 2 with Improvements	EB WB NB SB	1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT-TH-RT 1 LT-TH, 1 RT*	B C F D	D (45)	B C E D	C (27)
Build (2037) Conditions Alternative 1	EB WB NB SB	1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT-TH-RT 1 LT-TH-RT	B C F F	F (131)	C B E D	C (30)
Build (2037) Conditions Alternative 2	EB WB NB SB	1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT-TH-RT 1 LT-TH-RT	B C F F	F (165)	C B F D	D (36)

Alternative 1 is shown in orange.
Alternative 2 is shown in blue.
Improvements by the developer are shown in bold.
*Old Milburnie Residential was also recommended to provide an exclusive southbound right-turn lane as part of its TIA.

Capacity analysis of existing (2021) and no-build (2028) traffic conditions indicates the intersection of Buffaloe Road and Old Milburnie Road currently operates at an overall LOS C or better during the weekday AM and PM peak hours. Under build (2028) and build (2037) traffic conditions, the intersection is expected to operate at an overall LOS F during the weekday AM peak hour and LOS C during the weekday PM peak hour.

Under build (2028) with improvement scenarios, an exclusive southbound right-turn lane with permitted/overlap phasing was considered. With this improvement, the intersection is expected to operate at an overall LOS D or better during the weekday AM and PM peak hours. It should be noted that this improvement was also recommended of Old Milburnie Residential.

7.5. Buffaloe Road and Old Crews Road

The existing all-way stop-controlled intersection of Buffaloe Road and Old Crews Road was analyzed under existing (2021), no-build (2028), build (2028), and build (2037) traffic conditions with the lane configurations and traffic control shown in Table 10 on the following page. Based on coordination with the site team there are two (2) land use options for this development, as follows:

- Alternative 1:
  - 394 single-family homes
  - 514 townhomes
  - 405 age-restricted homes

Or

- Alternative 2:
  - 799 single-family homes
  - 514 townhomes

Each of these alternatives were analyzed under build (2028) and build (2037) conditions. Refer to Table 10 on the following page for a summary of the analysis results. Refer to Appendix J for the Synchro capacity analysis reports and Appendix U for the SimTraffic queuing reports.

Table 10: Analysis Summary of Buffaloe Road and Old Crews 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 (2021) Conditions	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A[3] A[3] A[3] A[3]	A (9)	B[3] A[3] A[3] A[3]	B (11)
No-Build (2028) Conditions	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A[3] B[3] A[3] A[3]	B (11)	C[3] B[3] B[3] A[3]	B (13)
Build (2028) Conditions Alternative 1	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	C[3] D[3] C[3] B[3]	C (23)	F[3] C[3] C[3] B[3]	F (90)
Build (2028) Conditions Alternative 2	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	C[3] F[3] C[3] B[3]	E (38)	F[3] C[3] C[3] B[3]	F (145)
Build (2028) Conditions Alternative 1 with Improvements	EB WB NB SB	1 LT-TH, 1 RT 1 LT- TH-RT 1 LT- TH-RT 1 LT- TH-RT	B[3] D[3] C[3] B[3]	C (22)	D[3] C[3] C[3] B[3]	D (26)
Build (2028) Conditions Alternative 2 with Signalization	EB WB NB SB	1 LT-TH-RT 1 LT- TH-RT 1 LT- TH-RT 1 LT- TH-RT	B B C B	B (20)	C A D C	C (26)
Build (2037) Conditions Alternative 1	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	C[3] F[3] C[3] B[3]	E (41)	F[3] C[3] C[3] B[3]	F (141)
Build (2037) Conditions Alternative 2	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	D[3] F[3] D[3] C[3]	F (61)	F[3] D[3] C[3] B[3]	F (204)

Alternative 1 is shown in orange.
Alternative 2 is shown in blue.
3. Level of service for stop-controlled approach.

Capacity analysis of existing (2021) and no-build (2028) traffic conditions indicates the intersection of Buffaloe Road and Old Crews Road is expected to operate at LOS B or better during the weekday AM and PM peak hours. Under build (2028) conditions, the intersection

is expected to operate at an overall LOS C under Alternative 1 and an overall LOS E under Alternative 2 during the weekday AM peak hour. During the weekday PM peak hour, the intersection is expected to operate at an overall LOS F during both Alternative 1 and Alternative 2.

Improvements were considered for each alternative. It should be noted that the intersection is anticipated to operate with significantly less delay under a two-way stop-control configuration with the eastbound and westbound approaches (Buffaloe Road) operating under free-flowing conditions; however, based on Google Earth, there may be sight distance concerns or other constraints that may prevent this control from being reasonable.

Under Alternative 1, an exclusive eastbound right-turn lane is anticipated to mitigate the impacts at this intersection to an acceptable overall level-of-service.

Under Alternative 2, geometric improvements were considered; however, were not anticipated to provide significant improvement to capacity at the study intersection. A traffic signal was considered at this intersection, and build (2028) Alternative 2 peak hour traffic volumes were analyzed utilizing the criteria contained in the MUTCD. A traffic signal is not anticipated to be warranted during the weekday AM peak hour due to low minor-street approach volumes; however, is anticipated to be warranted during the weekday PM peak hour. Based on the amount of residential development and anticipated commuter traffic within the roadway network that typically generate traffic during two distinct weekday peak periods, it is unlikely that the 4- and 8-hour warrants, that NCDOT typically prefers, would be met. With a traffic signal, the intersection is anticipated to operate at acceptable overall levels-of-service.

It is recommended that the developer provide an exclusive eastbound right-turn lane at this intersection if Alternative 1 is pursued or monitor this intersection for signalization if Alternative 2 is pursued.

7.6. Buffaloe Road and Lucas Road

The existing unsignalized intersection of Buffaloe Road and Lucas Road was analyzed under existing (2021), no-build (2028), build (2028), and build (2037) traffic conditions the lane configurations and traffic control shown in Table 11 on the following page. Based on coordination with the site team there are two (2) land use options for this development, as follows:

- Alternative 1:
  - 394 single-family homes
  - 514 townhomes
  - 405 age-restricted homes

Or

- Alternative 2:
  - 799 single-family homes
  - 514 townhomes

Each of these alternatives were analyzed under build (2028) and build (2037) conditions. Refer to Table 11 on the following page for a summary of the analysis results. Refer to Appendix K for the Synchro capacity analysis reports and Appendix U for the SimTraffic queuing reports.

Table 11: Analysis Summary of Buffaloe Road and Lucas 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 (2021) Conditions	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A[1] B[2]	N / A	-- A[1] B[2]	N / A
No-Build (2028) Conditions	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A[1] B[2]	N / A	-- A[1] B[2]	N / A
Build (2028) Conditions Alternative 1	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A[1] B[2]	N / A	-- A[1] B[2]	N / A
Build (2028) Conditions Alternative 2	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A[1] B[2]	N / A	-- A[1] B[2]	N / A
Build (2037) Conditions Alternative 1	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A[1] B[2]	N / A	-- A[1] B[2]	N / A
Build (2037) Conditions Alternative 2	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A[1] B[2]	N / A	-- A[1] B[2]	N / A

Alternative 1 is shown in orange.
Alternative 2 is shown in blue.
1. Level of service for major-street left-turn movement.
2. Level of service for minor-street approach.

Capacity analysis of existing (2021), no-build (2028), build (2028), and build (2037) traffic conditions indicates the minor-street approach at the intersection of Buffaloe Road and Lucas Road is expected to operate at LOS B during both weekday AM and PM peak hours. The major-street left-turn movement is expected to operate at LOS A during the weekday AM and PM peak hours. Based on SimTraffic simulations, minimal queuing is anticipated at this study intersection.

7.7. Old Crews Road and Forestville Road

The existing unsignalized intersection of Old Crews Road and Forestville Road was analyzed under existing (2021), no-build (2028), build (2028), and build (2037) traffic conditions with the lane configurations and traffic control shown in Table 12 on the following page. Based on coordination with the site team there are two (2) land use options for this development, as follows:

- Alternative 1:
  - 394 single-family homes
  - 514 townhomes
  - 405 age-restricted homes

Or

- Alternative 2:
  - 799 single-family homes
  - 514 townhomes

Each of these alternatives were analyzed under build (2028) conditions. Refer to Table 12 on the following page for a summary of the analysis results. Refer to Appendix L for the Synchro capacity analysis reports and Appendix U for the SimTraffic queuing reports.

Table 12: Analysis Summary of Old Crews Road and Forestville 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 (2021) Conditions	EB WB SB	1 LT-TH 1 TH, 1 RT 1 LT-RT	A[1] -- B[2]	N / A	A[1] -- B[2]	N / A
No-Build (2028) Conditions	EB WB SB	1 LT-TH 1 TH, 1 RT 1 LT-RT	A[1] -- C[2]	N / A	A[1] -- C[2]	N / A
Build (2028) Conditions Alternative 1	EB WB SB	1 LT-TH 1 TH, 1 RT 1 LT-RT	A[1] -- D[2]	N / A	A[1] -- D[2]	N / A
Build (2028) Conditions Alternative 2	EB WB SB	1 LT-TH 1 TH, 1 RT 1 LT-RT	A[1] -- E[2]	N / A	A[1] -- D[2]	N / A
Build (2028) Conditions Alternative 2 Per Town UDO (Signalization)	EB WB SB	1 LT-TH 1 TH, 1 RT 1 LT-RT	E D B	C (35)	E B B	C (29)
Build (2037) Conditions Alternative 1	EB WB SB	1 LT-TH 1 TH, 1 RT 1 LT-RT	A[1] -- E[2]	N / A	A[1] -- E[2]	N / A
Build (2037) Conditions Alternative 2	EB WB SB	1 LT-TH 1 TH, 1 RT 1 LT-RT	A[1] -- F[2]	N / A	A[1] -- F[2]	N / A

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

Improvements needed to meet the Town UDO are shown in green.

Capacity analysis of existing (2021), no-build (2028), and build (2028) Alternative 1 traffic conditions indicates the minor-street approach at the intersection of Old Crews Road and Forestville Road is expected to operate at LOS D or better during the weekday AM and PM peak hours. Under build (2028) Alternative 2 conditions, the minor-street approach is anticipated to operate at LOS E during the weekday AM peak hour and LOS D during the weekday PM peak hour. Under build (2037) Alternative 1 conditions, the minor-street approach is anticipated to operate at LOS E and under Alternative 2 conditions, the minor-street approach is anticipated to operate at LOS F during the weekday AM and PM peak

hours. The major-street left-turn movement is expected to operate at LOS A during the weekday AM and PM peak hours under all analysis scenarios.

Under Alternative 2, geometric improvements were considered; however, were not anticipated to provide significant improvement to capacity at the study intersection. A traffic signal was considered at this intersection, and build (2028) Alternative 2 peak hour traffic volumes were analyzed utilizing the criteria contained in the MUTCD. A traffic signal is not anticipated to be warranted during the weekday AM and PM peak hours due to low minor-street approach volumes. It should be noted that Knightdale United Methodist Church is located in the northeast quadrant at this intersection. This church does have a preschool that operates during the week. Based on the amount of residential development, the proximity of the preschool, and anticipated commuter traffic within the roadway network that typically generate traffic during two distinct weekday peak periods, it is unlikely that the 4- and 8-hour warrants, that NCDOT typically prefers, would be met. With a traffic signal, the intersection is anticipated to operate at acceptable overall levels-of-service.

No improvements are recommended at the study intersection for Alternative 1 or Alternative 2 due to the low impact of the site on the study intersection.

7.8. Lucas Road / Mama's Way and Horton Road

The existing unsignalized intersection of Lucas Road / Mama's Way and Horton Road was analyzed under existing (2021), no-build (2028), build (2028), and build (2037) traffic conditions with the lane configurations and traffic control shown in Table 13 on the following page. Based on coordination with the site team there are two (2) land use options for this development, as follows:

- Alternative 1:
  - 394 single-family homes
  - 514 townhomes
  - 405 age-restricted homes

Or

- Alternative 2:
  - 799 single-family homes
  - 514 townhomes

Each of these alternatives were analyzed under build (2028) and build (2037) conditions. Refer to Table 13 on the following page for a summary of the analysis results. Refer to Appendix M for the Synchro capacity analysis reports and Appendix U for the SimTraffic queuing reports.

Table 13: Analysis Summary of Lucas Road / Mama's Way and Horton 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 (2021) Conditions	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A[1] A[1] A[2] A[2]	N / A	A[1] A[1] A[2] B[2]	N / A
No-Build (2028) Conditions	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A[1] A[1] A[2] A[2]	N / A	A[1] A[1] B[2] B[2]	N / A
Build (2028) Conditions Alternative 1	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A[1] A[1] A[2] A[2]	N / A	A[1] A[1] B[2] B[2]	N / A
Build (2028) Conditions Alternative 2	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A[1] A[1] A[2] A[2]	N / A	A[1] A[1] B[2] B[2]	N / A
Build (2037) Conditions Alternative 1	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A[1] A[1] A[2] A[2]	N / A	A[1] A[1] B[2] B[2]	N / A
Build (2037) Conditions Alternative 2	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A[1] A[1] A[2] A[2]	N / A	A[1] A[1] B[2] B[2]	N / A

Alternative 1 is shown in orange.
Alternative 2 is shown in blue.
1. Level of service for major-street left-turn movement.
2. Level of service for minor-street approach.

Capacity analysis of existing (2021), no-build (2028), build (2028), and build (2037) traffic conditions indicates the minor-street approaches and major-street left-turn movements at the intersection of Lucas Road / Mama's Way and Horton Road are expected to operate at LOS A during the weekday AM and PM peak hours. Based on SimTraffic simulations, minimal queuing is anticipated at the study intersection.

7.9. N Smithfield Road / Horton Road and Forestville Road

The existing signalized intersection of N Smithfield Road / Horton Road and Forestville Road was analyzed under existing (2021), no-build (2028), build (2028), and build (2037) traffic conditions with the lane configurations and traffic control shown in Table 14 on the following page. Based on coordination with the site team there are two (2) land use options for this development, as follows:

- Alternative 1:
  - 394 single-family homes
  - 514 townhomes
  - 405 age-restricted homes

Or

- Alternative 2:
  - 799 single-family homes
  - 514 townhomes

Each of these alternatives were analyzed under build (2028) conditions. Refer to Table 14 on the following page. for a summary of the analysis results. Refer to Appendix N for the Synchro capacity analysis reports and Appendix U for the SimTraffic queuing reports.

Table 14: Analysis Summary of N Smithfield Road / Horton Road and Forestville 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 (2021) Conditions	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	D D B B	C (33)	E E B A	C (32)
No-Build (2028) Conditions	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	D D B B	C (35)	D D B B	C (34)
Build (2028) Conditions Alternative 1	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT 1 LT*, 1 TH-RT 1 LT, 1 TH-RT	D C C C	C (33)	D C D C	D (36)
Build (2028) Conditions Alternative 2	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT 1 LT*, 1 TH-RT 1 LT, 1 TH-RT	C C D C	C (33)	C C E C	D (45)
Build (2037) Conditions Alternative 1	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT 1 LT*, 1 TH-RT 1 LT, 1 TH-RT	C C D C	C (34)	C C F C	D (53)
Build (2037) Conditions Alternative 2	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT 1 LT*, 1 TH-RT 1 LT, 1 TH-RT	C C D D	D (36)	C C F D	E (76)

Alternative 1 is shown in orange.
Alternative 2 is shown in blue.
*It is recommended that the northbound left-turn lane be extended based on SimTraffic simulations.

Capacity analysis of existing (2021), no-build (2028), and build (2028) traffic conditions indicates the intersection of N Smithfield Road / Horton Road and Forestville Road is expected to operate at an overall LOS D or better during the weekday AM and PM peak hours. Based on SimTraffic simulations, queuing is anticipated on the northbound left-turn movement that is anticipated to exceed the existing storage. It is recommended that this turn lane be extended to a minimum of 300 feet of full width storage with appropriate deceleration and taper length to accommodate the northbound left-turning volume. Based on SimTraffic simulations, minimal queuing is anticipated on the other approaches.

Under build (2037) conditions, the intersection is anticipated to operate at an overall LOS C during the weekday AM peak hour and LOS E during the weekday PM peak hour. The poor overall level-of-service during the weekday PM peak hour is anticipated to be primarily due to the background growth over 16 years.

7.10. Buffaloe Road and Site Drive 1

The proposed unsignalized intersection of Buffaloe Road and Site Drive 1 was analyzed under build (2028) and build (2037) traffic conditions with lane configurations and traffic control shown in Table 15 on the following page. Based on coordination with the site team there are two (2) land use options for this development, as follows:

- Alternative 1:
  - 394 single-family homes
  - 514 townhomes
  - 405 age-restricted homes

Or

- Alternative 2:
  - 799 single-family homes
  - 514 townhomes

Each of these alternatives were analyzed under build (2028) and build (2037) conditions. Refer to Table 15 on the following page for a summary of the analysis results. Refer to Appendix O for the Synchro capacity analysis reports and Appendix U for the SimTraffic queuing reports.

Table 15: Analysis Summary of Buffaloe Road and Site Drive 1

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)
Build (2028) Conditions Alternative 1	EB WB NB	1 TH, 1 RT 1 LT-TH 1 LT-RT	-- A[1] B[2]	N / A	-- A[1] B[2]	N / A
Build (2028) Conditions Alternative 2	EB WB NB	1 TH, 1 RT 1 LT-TH 1 LT-RT	-- A[1] C[2]	N / A	-- A[1] C[2]	N / A
Build (2037) Conditions Alternative 1	EB WB NB	1 TH, 1 RT 1 LT-TH 1 LT-RT	-- A[1] C[2]	N / A	-- A[1] C[2]	N / A
Build (2037) Conditions Alternative 2	EB WB NB	1 TH, 1 RT 1 LT-TH 1 LT-RT	-- A[1] C[2]	N / A	-- A[1] C[2]	N / A

Alternative 1 is shown in orange.
Alternative 2 is shown in blue.
Improvements 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 (2028) Alternative 1 traffic conditions indicates the minor-street approach and major-street left-turn movement at the proposed intersection of Buffaloe Road and Site Drive 1 are expected to operate at LOS B or better during the weekday AM and PM peak hours. Under build (2028) Alternative 2 and build (2037) conditions, the minor-street approach and major-street left-turn movement are anticipated to operate at LOS C or better during the weekday AM and PM peak hours.

Left and right-turn lanes were considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways*. Based on the minimal amount of westbound left-turning trips into the site (a traffic volume of 4 vehicles per hour per Congestion Management guidelines), only an eastbound right-turn lane is recommended.

7.11. Buffaloe Road and Site Drive 2

The proposed unsignalized intersection of Buffaloe Road and Site Drive 2 was analyzed under build (2028) and build (2037) traffic conditions with lane configurations and traffic control shown in Table 16 on the following page. Based on coordination with the site team there are two (2) land use options for this development, as follows:

- Alternative 1:
  - 394 single-family homes
  - 514 townhomes
  - 405 age-restricted homes

Or

- Alternative 2:
  - 799 single-family homes
  - 514 townhomes

Each of these alternatives were analyzed under build (2028) and build (2037) conditions. Refer to Table 16 on the following page. for a summary of the analysis results. Refer to Appendix P for the Synchro capacity analysis reports and Appendix U for the SimTraffic queuing reports.

Table 16: Analysis Summary of Buffaloe Road and Site Drive 2

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)
Build (2028) Conditions Alternative 1	EB WB NB	1 TH, 1 RT 1 LT-TH 1 LT-RT	-- A[1] B[2]	N / A	-- A[1] B[2]	N / A
Build (2028) Conditions Alternative 2	EB WB NB	1 TH, 1 RT 1 LT-TH 1 LT-RT	-- A[1] B[2]	N / A	-- A[1] B[2]	N / A
Build (2037) Conditions Alternative 1	EB WB NB	1 TH, 1 RT 1 LT-TH 1 LT-RT	-- A[1] B[2]	N / A	-- A[1] B[2]	N / A
Build (2037) Conditions Alternative 2	EB WB NB	1 TH, 1 RT 1 LT-TH 1 LT-RT	-- A[1] C[2]	N / A	-- A[1] C[2]	N / A

Alternative 1 is shown in orange.
Alternative 2 is shown in blue.
Improvements 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 (2028) and build (2037) Alternative 1 traffic conditions indicates the minor-street approach and major-street left-turn movement at the proposed intersection of Buffaloe Road and Site Drive 2 are expected to operate at LOS B or better during the weekday AM and PM peak hours. Under build (2037) Alternative 2 conditions, the minor-street approach and major-street left-turn movement are anticipated to operate at LOS C or better during the weekday AM and PM peak hours.

Left and right-turn lanes were considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways*. Based on the minimal amount of westbound left-turning trips into the site (a traffic volume of 4 vehicles per hour per Congestion Management guidelines), only an eastbound right-turn lane is recommended.

7.12. Lucas Road and Site Drive 3

The proposed unsignalized intersection of Lucas Road and Site Drive 3 was analyzed under build (2028) and build (2037) traffic conditions with lane configurations and traffic control shown in Table 17 on the following page. Based on coordination with the site team there are two (2) land use options for this development, as follows:

- Alternative 1:
  - 394 single-family homes
  - 514 townhomes
  - 405 age-restricted homes

Or

- Alternative 2:
  - 799 single-family homes
  - 514 townhomes

Each of these alternatives were analyzed under build (2028) and build (2037) conditions. Refer to Table 17 on the following page for a summary of the analysis results. Refer to Appendix Q for the Synchro capacity analysis reports and Appendix U for the SimTraffic queuing reports.

Table 17: Analysis Summary of Lucas Road and Site Drive 3

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)
Build (2028) Conditions Alternative 1	EB NB SB	1 LT-RT 1 LT-TH 1 TH-RT	A[2] A[1] --	N / A	A[2] A[1] --	N / A
Build (2028) Conditions Alternative 2	EB NB SB	1 LT-RT 1 LT-TH 1 TH-RT	A[2] A[1] --	N / A	A[2] A[1] --	N / A
Build (2037) Conditions Alternative 1	EB NB SB	1 LT-RT 1 LT-TH 1 TH-RT	A[2] A[1] --	N / A	A[2] A[1] --	N / A
Build (2037) Conditions Alternative 2	EB NB SB	1 LT-RT 1 LT-TH 1 TH-RT	A[2] A[1] --	N / A	A[2] A[1] --	N / A

Alternative 1 is shown in orange.
Alternative 2 is shown in blue.
Improvements 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 (2028) and build (2037) traffic conditions indicates the minor-street approach and major-street left-turn movement at the proposed intersection of Lucas Road and Site Drive 3 are expected to operate at LOS A during the weekday AM and PM peak hours.

Left and right-turn lanes were considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways*. Due to the low volumes along Lucas Road, no exclusive turn lanes are recommended at this intersection.

7.13. Old Crews Road and Site Drive 4

The proposed unsignalized intersection of Old Crews Road and Site Drive 4 was analyzed under build (2028) and build (2037) traffic conditions with lane configurations and traffic control shown in Table 18 on the following page. Based on coordination with the site team there are two (2) land use options for this development, as follows:

- Alternative 1:
  - 394 single-family homes
  - 514 townhomes
  - 405 age-restricted homes

Or

- Alternative 2:
  - 799 single-family homes
  - 514 townhomes

Each of these alternatives were analyzed under build (2028) and build (2037) conditions. Refer to Table 18 on the following page for a summary of the analysis results. Refer to Appendix R for the Synchro capacity analysis reports and Appendix U for the SimTraffic queuing reports.

Table 18: Analysis Summary of Old Crews Road and Site Drive 4

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)
Build (2028) Conditions Alternative 1	WB NB SB	1 LT-RT 1 TH-RT 1 LT, 1 TH	B[2] -- A[1]	N / A	B[2] -- A[1]	N / A
Build (2028) Conditions Alternative 2	WB NB SB	1 LT-RT 1 TH-RT 1 LT, 1 TH	B[2] -- A[1]	N / A	B[2] -- A[1]	N / A
Build (2037) Conditions Alternative 1	WB NB SB	1 LT-RT 1 TH-RT 1 LT, 1 TH	B[2] -- A[1]	N / A	B[2] -- A[1]	N / A
Build (2037) Conditions Alternative 2	WB NB SB	1 LT-RT 1 TH-RT 1 LT, 1 TH	B[2] -- A[1]	N / A	B[2] -- A[1]	N / A

Alternative 1 is shown in orange.
Alternative 2 is shown in blue.
Improvements 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 (2028) and build (2037) traffic conditions indicates the minor-street approach and major-street left-turn movement at the proposed intersection of Old Crews Road and Site Drive 4 are expected to operate at LOS B or better during the weekday AM and PM peak hours.

Left and right-turn lanes were considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways*. Based on the low amount of northbound right-turning trips into the site, only a southbound left-turn lane is recommended.

7.14. Old Crews Road and Site Drive 5

The proposed unsignalized intersection of Old Crews Road and Site Drive 5 was analyzed under build (2028) and build (2037) traffic conditions with lane configurations and traffic control shown in Table 19 on the following page. Based on coordination with the site team there are two (2) land use options for this development, as follows:

- Alternative 1:
  - 394 single-family homes
  - 514 townhomes
  - 405 age-restricted homes

Or

- Alternative 2:
  - 799 single-family homes
  - 514 townhomes

Each of these alternatives were analyzed under build (2028) and build (2037) conditions. Refer to Table 19 on the following page for a summary of the analysis results. Refer to Appendix S for the Synchro capacity analysis reports and Appendix U for the SimTraffic queuing reports.

Table 19: Analysis Summary of Old Crews Road and Site Drive 5

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)
Build (2028) Conditions Alternative 1	WB NB SB	1 LT-RT 1 TH-RT 1 LT, 1 TH	B[2] -- A[1]	N / A	B[2] -- A[1]	N / A
Build (2028) Conditions Alternative 2	WB NB SB	1 LT-RT 1 TH-RT 1 LT, 1 TH	B[2] -- A[1]	N / A	B[2] -- A[1]	N / A
Build (2037) Conditions Alternative 1	WB NB SB	1 LT-RT 1 TH-RT 1 LT, 1 TH	B[2] -- A[1]	N / A	B[2] -- A[1]	N / A
Build (2037) Conditions Alternative 2	WB NB SB	1 LT-RT 1 TH-RT 1 LT, 1 TH	B[2] -- A[1]	N / A	B[2] -- A[1]	N / A

Alternative 1 is shown in orange.
Alternative 2 is shown in blue.
Improvements 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 (2028) and build (2037) traffic conditions indicates the minor-street approach and major-street left-turn movement at the proposed intersection of Old Crews Road and Site Drive 5 are expected to operate at LOS B or better during the weekday AM and PM peak hours.

Left and right-turn lanes were considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways*. Based on the low amount of northbound right-turning trips into the site, only a southbound left-turn lane is recommended.

7.15. Old Crews Road and Site Drive 6

The proposed unsignalized intersection of Old Crews Road and Site Drive 6 was analyzed under build (2028) and build (2037) traffic conditions with lane configurations and traffic control shown in Table 20 on the following page. Based on coordination with the site team there are two (2) land use options for this development, as follows:

- Alternative 1:
  - 394 single-family homes
  - 514 townhomes
  - 405 age-restricted homes

Or

- Alternative 2:
  - 799 single-family homes
  - 514 townhomes

Each of these alternatives were analyzed under build (2028) and build (2037) conditions. Refer to Table 20 on the following page for a summary of the analysis results. Refer to Appendix T for the Synchro capacity analysis reports and Appendix U for the SimTraffic queuing reports.

Table 20: Analysis Summary of Old Crews Road and Site Drive 6

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)
Build (2028) Conditions Alternative 1	WB NB SB	1 LT-RT 1 TH-RT 1 LT-TH	B[2] -- A[1]	N/A	B[2] -- A[1]	N/A
Build (2028) Conditions Alternative 2	WB NB SB	1 LT-RT 1 TH-RT 1 LT-TH	B[2] -- A[1]	N/A	B[2] -- A[1]	N/A
Build (2037) Conditions Alternative 1	WB NB SB	1 LT-RT 1 TH-RT 1 LT-TH	B[2] -- A[1]	N/A	B[2] -- A[1]	N/A
Build (2037) Conditions Alternative 2	WB NB SB	1 LT-RT 1 TH-RT 1 LT-TH	B[2] -- A[1]	N/A	B[2] -- A[1]	N/A

Alternative 1 is shown in orange.
Alternative 2 is shown in blue.
Improvements 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 (2028) and build (2037) traffic conditions indicates the minor-street approach and major-street left-turn movement at the proposed intersection of Old Crews Road and Site Drive 6 are expected to operate at LOS B or better during the weekday AM and PM peak hours.

Left and right-turn lanes were considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways*. Based on the low amount of northbound right-turning trips into the site and low amount of southbound left-turning trips into the site at this study intersection, no exclusive turn lanes are recommended.

8. CONCLUSIONS

This Traffic Impact Analysis was conducted to determine the potential traffic impacts of the proposed residential development, to be located south of Buffaloe Road and east of Old Crews Road in Knightdale, North Carolina. The proposed development is expected to be a mixed-use development and be built out in 2027. Access to the development is proposed via three (3) full movement along Old Crews Road and future connections to residential development to the south, two (2) full movement driveways along Buffaloe Road, and one (1) full movement driveway along Lucas Road. Based on coordination with the site team there are two (2) land use options for this development, as follows:

- Alternative 1:
  - 394 single-family homes
  - 514 townhomes
  - 405 age-restricted homes

Or

- Alternative 2:
  - 799 single-family homes
  - 514 townhomes

Per the Town of Knightdale (Town) Unified Development Ordinance (UDO), future analysis should include the build year + 1 year, as well as a future (build year + 10 years) scenario. The study analyzes traffic conditions during the weekday AM and PM peak hours for the following scenarios:

- Existing (2021) Traffic Conditions
- No-Build (2028) Traffic Conditions
- Build (2028) Traffic Conditions – Alternative 1
- Build (2028) Traffic Conditions – Alternative 2
- Build (2028) with Improvements Traffic Conditions – Alternative 1
- Build (2028) with Improvements Traffic Conditions – Alternative 2
- Build (2037) Traffic Conditions – Alternative 1
- Build (2037) Traffic Conditions – Alternative 2

Trip Generation

Under Alternative 1, it is estimated that the proposed development will generate approximately 629 primary trips (162 entering and 467 exiting) during the weekday AM peak hour and 776 primary trips (486 entering and 290 exiting) during the weekday PM peak hour. Under Alternative 2, it is estimated that the proposed development will generate approximately 798 primary trips (195 entering and 603 exiting) during the weekday AM peak hour and 1,001 primary trips (631 entering and 370 exiting) during the weekday PM peak hour.

Adjustments to Analysis Guidelines

Capacity analysis at all study intersections was completed according to NCDOT Congestion Management Guidelines. Refer to section 6.1 of this report for a detailed description of any adjustments to these guidelines made throughout the analysis.

Intersection Capacity Analysis Summary

All the study area intersections (including the proposed site driveways) are expected to operate at acceptable levels-of-service under existing and future year conditions with the exception of the intersections listed below. A summary of the study area intersections that are expected to need improvements are as follows:

Buffaloe Road and I-540 Southbound Ramps

During the weekday PM peak hour, the intersection is expected to operate at an overall LOS F under all future conditions. Based on SimTraffic queuing results, heavy queuing is anticipated on the southbound approach of the I-540 Southbound Ramps under no-build (2028) and build (2028) conditions.It should be noted that background growth (adjacent developments and the annually compounded growth rate) is anticipated to amount to approximately 25% of the overall no-build (2028) traffic volumes at this intersection; whereas, the proposed development is only anticipated to amount to approximately 13% of the overall no-build (2028) traffic volumes at this intersection under Alternative 1 and approximately 16% of the overall no-build (2028) traffic volumes at this intersection under Alternative 2.

Because the intersection is anticipated to degrade by an overall level-of-service between existing (2021) and no-build (2023) conditions during the weekday PM peak hour and due to the heavy queuing results, improvements were considered at the study intersection. Exclusive turn lanes exist on all approaches. Additional geometric improvements would be expected to require bridge widening on the eastern leg of the intersection; therefore, signal modifications were considered. With signal coordination adjustments along the Buffaloe Road corridor, SimTraffic queuing and Synchro capacity results indicated that the study intersection is anticipated to significantly improve; however, a failing level-of-service and heavy queuing was still anticipated during the weekday PM peak hour. Additional improvements were considered to meet the Town's UDO. An additional southbound left-turn lane and widening the existing bridge to allow for an additional receiving lane were needed to bring the intersection to no-build levels-of-service with minimal queuing. It should be noted that based on the City of Raleigh Comprehensive Transportation Plan, this improvement would build out Buffaloe Road to a 4-lane section, consistent with future plans.

Due to the low comparative impact of the proposed Buffaloe Road Assemblage development at this study area intersection compared with the anticipated background growth in this area, it is recommended that signal coordination adjustments be provided along the Buffaloe Road corridor within the study area and no additional improvements be provided at this study intersection. It is recommended that this corridor be considered in future NCDOT projects.

Buffaloe Road and I-540 Northbound Ramps

Under no-build (2028) and build (2028) conditions, the intersection is expected to operate at an overall LOS F during the weekday AM and PM peak hours. Based on SimTraffic queuing results, heavy queuing is anticipated on I-540 Northbound Ramps during the weekday PM peak hour. Background growth (adjacent developments and the annually compounded growth rate) is anticipated to amount to approximately 25% of the overall no-build (2028) traffic volumes at this intersection; whereas, the proposed development is only anticipated to amount to approximately 15% of the overall no-build (2028) traffic volumes at this intersection under Alternative 1 and approximately 19% of the overall no-build (2028) traffic volumes at this intersection under Alternative 2.

Due to the heavy queuing results, improvements were considered at the study intersection. Exclusive turn lanes exist on all approaches. Additional geometric improvements would be expected to require bridge widening on the western leg of the intersection; therefore, signal modifications were considered. With signal coordination adjustments along the Buffaloe Road corridor, SimTraffic queuing and Synchro capacity results indicated that the study intersection is anticipated to significantly improve; however, a failing level-of-service and heavy queuing was still anticipated during the weekday PM peak hour. It is anticipated that the intersection currently operates with vehicles turning right on red, as there is not current signage to indicate that this movement is not allowable. With right-turn on-red, queuing on the I-540 Northbound Ramps would be anticipated to be significantly improved. Additional improvements were considered to meet the Town's Unified Development Ordinance (UDO). Widening the existing bridge to allow for an additional eastbound and westbound through lane was needed to bring the intersection to no-build levels-of-service with minimal queuing. It should be noted that based on the City of Raleigh Comprehensive Transportation Plan, this improvement would build out Buffaloe Road to a 4-lane section, consistent with future plans. Future developments to the east of this study intersection may provide these additional through lanes as the developments are built out.

Due to the low comparative impact of the proposed Buffaloe Road Assemblage development at this study area intersection compared with the anticipated background growth in this area, it is recommended that signal coordination adjustments be provided along the Buffaloe Road corridor within the study area and no additional improvements be provided at this study intersection. It is recommended that this corridor be considered in future NCDOT projects.

Buffaloe Road and Forestville Road

Under build (2028) and build (2037) traffic conditions, the intersection is expected to operate at an overall LOS F during the weekday AM and PM peak hours. Background growth (adjacent developments and the annually compounded growth rate) is anticipated to amount to approximately 22% of the overall no-build (2028) traffic volumes at this intersection; whereas, the proposed development is only anticipated to amount to approximately 16% of the overall no-build (2028) traffic volumes at this intersection under Alternative 1 and

approximately 20% of the overall no-build (2028) traffic volumes at this intersection under Alternative 2. Additionally, the proposed development is only anticipated to add traffic volume to the mainline along Buffaloe Road and is not anticipated to contribute to any turning movements.

Due to the heavy queuing results at the I-540 ramps, signal coordination adjustments were considered. With signal coordination adjustments along the Buffaloe Road corridor, Synchro capacity results indicated that the study intersection is expected to operate better than existing conditions during the weekday AM peak hour and was significantly improved during the weekday PM peak hour. It is anticipated that the intersection currently operates with vehicles turning right on red, as there is not current signage to indicate that this movement is not allowable. With right-turn on-red, the heavily traveled southbound right-turn movement is anticipated to be significantly improved. Additional improvements were considered to meet the Town's UDO. With an additional southbound right-turn lane, an additional receiving lane on the western leg of the intersection, and an exclusive eastbound right-turn lane, the intersection is anticipated to operate at significantly better than existing conditions during the weekday AM peak hour and with comparable delay to the weekday PM peak hour under existing conditions. It should be noted that based on the City of Raleigh Comprehensive Transportation Plan, this improvement would build out Buffaloe Road to a 4-lane section, consistent with future plans. Future developments along this corridor may provide these additional through lanes as the developments are built out.

Due to the low comparative impact of the proposed Buffaloe Road Assemblage development at this study area intersection compared with the anticipated background growth in this area, it is recommended that signal coordination adjustments be provided along the Buffaloe Road corridor within the study area and no additional improvements be provided at this study intersection. It is recommended that this corridor be considered in future NCDOT projects.

Buffaloe Road and Old Milburnie Road

Under build (2028) and build (2037) traffic conditions, the intersection is expected to operate at an overall LOS F during the weekday AM peak hour. Under build (2028) with improvement scenarios, an exclusive southbound right-turn lane with permitted/overlap phasing was considered. With this improvement, the intersection is expected to operate at an overall LOS D or better during the weekday AM and PM peak hours. It should be noted that this improvement was also recommended of Old Milburnie Residential.

Buffaloe Road and Old Crews Road

During the weekday PM peak hour, the intersection is expected to operate at an overall LOS F during both Alternative 1 and Alternative 2. Improvements were considered for each alternative. It should be noted that the intersection is anticipated to operate with significantly less delay under a two-way stop-control configuration with the eastbound and westbound approaches (Buffaloe Road) operating under free-flowing conditions; however, based on Google Earth, there may be sight distance concerns or other constraints that may prevent this control from being reasonable.

Under Alternative 1, an exclusive eastbound right-turn lane is anticipated to mitigate the impacts at this intersection to an acceptable overall level-of-service. Under Alternative 2, geometric improvements were considered; however, were not anticipated to provide significant improvement to capacity at the study intersection. A traffic signal was considered at this intersection, and build (2028) Alternative 2 peak hour traffic volumes were analyzed utilizing the criteria contained in the MUTCD. A traffic signal is not anticipated to be warranted during the weekday AM peak hour due to low minor-street approach volumes; however, is anticipated to be warranted during the weekday PM peak hour. Based on the amount of residential development and anticipated commuter traffic within the roadway network that typically generate traffic during two distinct weekday peak periods, it is unlikely that the 4- and 8-hour warrants, that NCDOT typically prefers, would be met. With a traffic signal, the intersection is anticipated to operate at acceptable overall levels-of-service.

It is recommended that the developer provide an exclusive eastbound right-turn lane at this intersection if Alternative 1 is pursued or monitor this intersection for signalization if Alternative 2 is pursued.

N Smithfield Road / Horton Road and Forestville Road

Based on SimTraffic simulations, queuing is anticipated on the northbound left-turn movement that is anticipated to exceed the existing storage. It is recommended that this turn lane be extended to a minimum of 300 feet of full width storage with appropriate deceleration and taper length to accommodate the northbound left-turning volume.

9. RECOMMENDATIONS

Based on the findings of this study, specific geometric improvements have been identified and are recommended to accommodate future traffic conditions. See a more detailed description of the recommended improvements below. Refer to Figure 13a and 13b for an illustration of the recommended lane configuration for the proposed development under Alternative 1 and Alternative 2, respectively.

Improvements by Buffaloe Shoals

Buffaloe Road and Forestville Road

- Provide a southbound right-turn lane with a minimum of 200 feet of storage with appropriate deceleration and taper length.
- Provide signal modifications to accommodate the southbound right-turn lane.

Recommended Improvements by Developer – Alternative 1

Buffaloe Road and I-540 Southbound Ramps

- Provide signal timing adjustments along the Buffaloe Road corridor.

Buffaloe Road and I-540 Northbound Ramps

- Provide signal timing adjustments along the Buffaloe Road corridor.

Buffaloe Road and Forestville Road

- Provide signal timing adjustments along the Buffaloe Road corridor.

Buffaloe Road and Old Milburnie Road

- Provide an exclusive southbound right-turn lane with a minimum of 250 feet of storage with appropriate deceleration and taper length. *
- Provide signal modifications, as necessary.

**This improvement was also recommended of Old Milburnie Residential.*

Buffaloe Road and Old Crews Road

- Provide an exclusive eastbound right-turn lane with a minimum of 150 feet of storage with appropriate deceleration and taper length.

N Smithfield Road / Horton Road and Forestville Road

- Extend the existing northbound left-turn lane to a minimum of 300 feet with appropriate deceleration and taper length.

Buffaloe Road and Site Drive 1

- Construct northbound approach with one ingress lane and one egress lane.
- Provide an exclusive eastbound right-turn lane with a minimum of 75 feet of storage with appropriate deceleration and taper length.
- Provide stop control for the northbound approach.

Buffaloe Road and Site Drive 2

- Construct northbound approach with one ingress lane and one egress lane.
- Provide an exclusive eastbound right-turn lane with a minimum of 75 feet of storage with appropriate deceleration and taper length.
- Provide stop control for the northbound approach.

Lucas Road and Site Drive 3

- Construct eastbound approach with one ingress lane and one egress lane.
- Provide stop control for the eastbound approach.

Old Crews Road and Site Drive 4

- Construct westbound approach with one ingress lane and one egress lane.
- Provide an exclusive southbound left-turn lane with a minimum of 100 feet of storage with appropriate deceleration and taper length.
- Provide stop control for the westbound approach.

Old Crews Road and Site Drive 5

- Construct westbound approach with one ingress lane and one egress lane.
- Provide an exclusive southbound left-turn lane with a minimum of 100 feet of storage with appropriate deceleration and taper length.
- Provide stop control for the westbound approach.

Old Crews Road and Site Drive 6

- Construct westbound approach with one ingress lane and one egress lane.
- Provide stop control for the westbound approach.

Recommended Improvements by Developer – Alternative 2

Buffaloe Road and I-540 Southbound Ramps

- Provide signal timing adjustments along the Buffaloe Road corridor.

Buffaloe Road and I-540 Northbound Ramps

- Provide signal timing adjustments along the Buffaloe Road corridor.

Buffaloe Road and Forestville Road

- Provide signal timing adjustments along the Buffaloe Road corridor.

Buffaloe Road and Old Milburnie Road

- Provide an exclusive southbound right-turn lane with a minimum of 250 feet of storage with appropriate deceleration and taper length. *
- Provide signal modifications, as necessary.

**This improvement was also recommended of Old Milburnie Residential.*

Buffaloe Road and Old Crews Road

- Monitor the intersection for signalization and install a traffic signal once warranted and approved by NCDOT and the Town.

N Smithfield Road / Horton Road and Forestville Road

- Extend the existing northbound left-turn lane to a minimum of 300 feet with appropriate deceleration and taper length.

Buffaloe Road and Site Drive 1

- Construct northbound approach with one ingress lane and one egress lane.
- Provide an exclusive eastbound right-turn lane with a minimum of 100 feet of storage with appropriate deceleration and taper length.

- Provide stop control for the northbound approach.

Buffaloe Road and Site Drive 2

- Construct northbound approach with one ingress lane and one egress lane.
- Provide an exclusive eastbound right-turn lane with a minimum of 100 feet of storage with appropriate deceleration and taper length.
- Provide stop control for the northbound approach.

Lucas Road and Site Drive 3

- Construct eastbound approach with one ingress lane and one egress lane.
- Provide stop control for the eastbound approach.

Old Crews Road and Site Drive 4

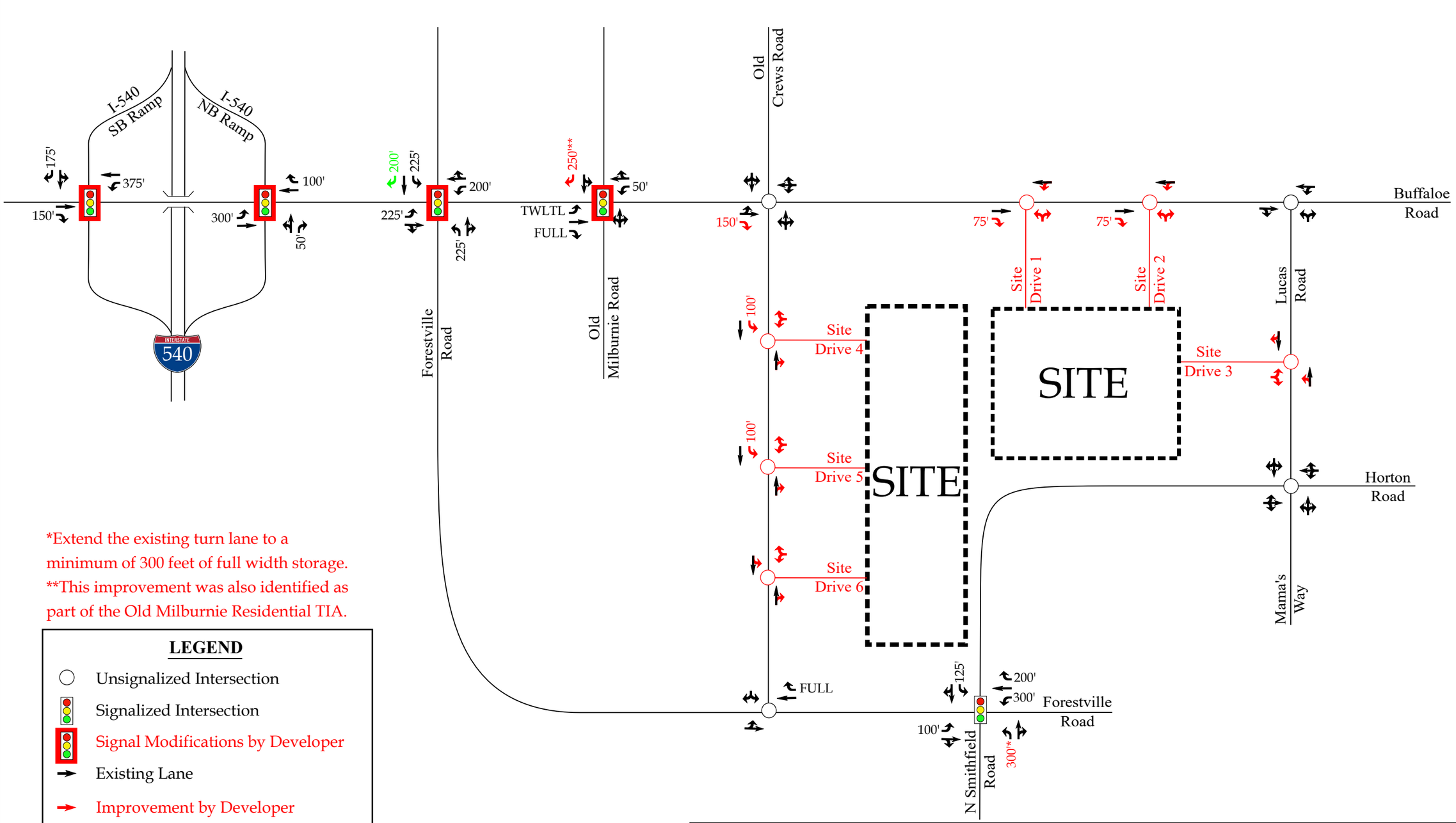
- Construct westbound approach with one ingress lane and one egress lane.
- Provide an exclusive southbound left-turn lane with a minimum of 150 feet of storage with appropriate deceleration and taper length.
- Provide stop control for the westbound approach.

Old Crews Road and Site Drive 5

- Construct westbound approach with one ingress lane and one egress lane.
- Provide an exclusive southbound left-turn lane with a minimum of 150 feet of storage with appropriate deceleration and taper length.
- Provide stop control for the westbound approach.

Old Crews Road and Site Drive 6

- Construct westbound approach with one ingress lane and one egress lane.
- Provide stop control for the westbound approach.



*Extend the existing turn lane to a minimum of 300 feet of full width storage.
**This improvement was also identified as part of the Old Milburnie Residential TIA.

LEGEND

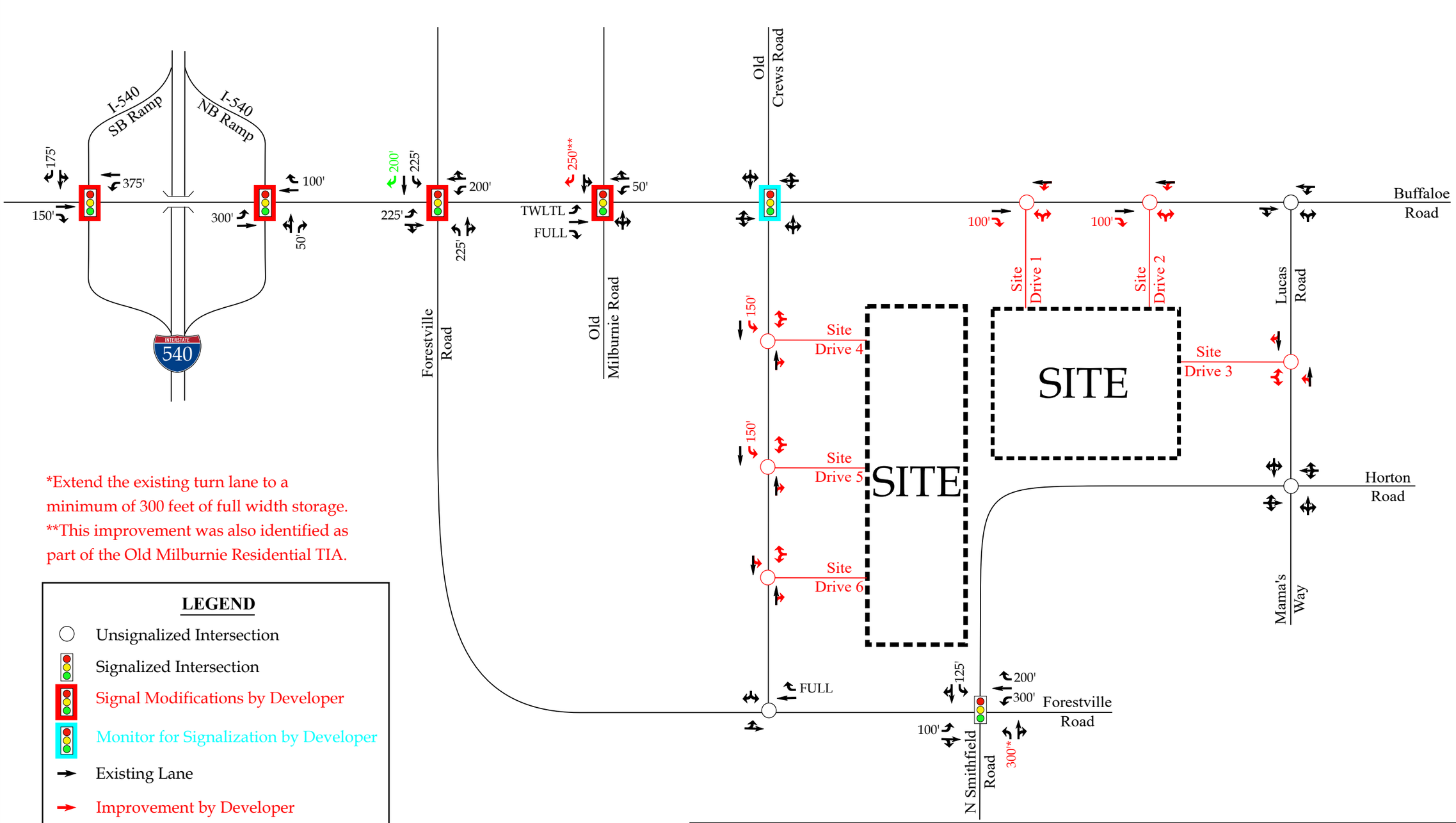
- Unsignalized Intersection
- Signalized Intersection
- Signal Modifications by Developer
- Existing Lane
- Improvement by Developer
- Adjacent Development Improvement
- X' Storage (In Feet)

Moving forward.
RKA
RAMEY KEMP ASSOCIATES

Buffaloe Road Assemblage
Knightdale, NC

Recommended Lane Configurations - Alternative 1

Scale: Not to Scale | Figure 13A



*Extend the existing turn lane to a minimum of 300 feet of full width storage.
**This improvement was also identified as part of the Old Milburnie Residential TIA.

LEGEND

- Unsignalized Intersection
- Signalized Intersection
- Signal Modifications by Developer
- Monitor for Signalization by Developer
- Existing Lane
- Improvement by Developer
- Adjacent Development Improvement
- X' Storage (In Feet)

Moving forward.
RKA
RAMEY KEMP ASSOCIATES

Buffaloe Road Assemblage
Knightdale, NC

Recommended Lane Configurations - Alternative 2

Scale: Not to Scale | Figure 13B