

Poole and Smithfield
Traffic Impact Analysis
Knightdale, North Carolina

TRAFFIC IMPACT ANALYSIS

FOR

POOLE AND SMITHFIELD

LOCATED

IN

KNIGHTDALE, NC

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RKA Project No. 22071

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TRAFFIC IMPACT ANALYSIS
POOLE AND SMITHFIELD
KNIGHTDALE, NORTH CAROLINA

1. INTRODUCTION

The contents of this report present the findings of the Traffic Impact Analysis (TIA) conducted for the proposed Poole and Smithfield development to be located north of Poole Road and along both sides of Smithfield 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 is anticipated to be completed in 2031. Prior to full build-out, the proposed development is expected to have two interim phases. It should be noted that Phase 1 is anticipated to be completed in 2025 and Phase 2 is anticipated to be completed in 2028. The following land uses are proposed for each phase of the development:

Phase 1:

- 47 single-family homes
- 187 townhomes

Phase 2:

- 308 single-family homes (in addition to Phase 1)
- 85 townhomes (in addition to Phase 1)

Full Build

- A maximum of 355 single-family homes
- A maximum of 373 townhomes
- A maximum of 306 apartments
- A maximum of 250,000 square feet (s.f.) of retail land use

It should be noted that the Town of Knightdale (Town) requires a no-build/build analysis year one (1) year beyond the anticipated build-out year and a future analysis year ten (10)

years beyond the anticipated build-out year for the proposed development; therefore, the analysis years considered for this study under full-build conditions are 2032 and 2041. An additional analysis scenario will be included in the study to analyze improvements associated with STIP I-6007. The study analyzes traffic conditions during the weekday AM and PM peak hours for the following scenarios:

- 2022 Existing Traffic Conditions
- 2025+1 No-Build Traffic Conditions
- 2028+1 No-Build Traffic Conditions
- 2031+1 No-Build Traffic Conditions
- 2025+1 Build Traffic Conditions - Phase 1
- 2028+1 Build Traffic Conditions - Phase 2
- 2031+1 Build Traffic Conditions - Full Build
- 2031+10 Future Traffic Conditions - Per Town UDO
- 2045 Future Traffic Conditions - (with STIP I-6007 Improvements)

1.1. Site Location and Study Area

The development is proposed to be located north of Poole Road and along both sides of Smithfield 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 and consists of the following existing intersections:

- Poole Road and Smithfield Road
- Smithfield Road and Sandy Run
- Smithfield Road and US 64 Eastbound Ramps
- Smithfield Road and US 64 Westbound Ramps
- Smithfield Road and Major Slade Road
- Poole Road and Bethlehem Road
- Poole Road and Major Slade 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 north of Poole Road and along both sides of Smithfield Road in Knightdale, North Carolina. The proposed development, anticipated to be completed in 2031. Prior to full build-out, the proposed development is expected to have two interim phases. It should be noted that Phase 1 is anticipated to be completed in 2025 and Phase 2 is anticipated to be completed in 2028. The following land uses are proposed for each phase of the development:

Phase 1:

- 47 single-family homes
- 187 townhomes

Phase 2:

- 308 single-family homes (in addition to Phase 1)
- 85 townhomes (in addition to Phase 1)

Full Build

- A maximum of 355 single-family homes
- A maximum of 373 townhomes
- A maximum of 306 apartments
- A maximum of 250,000 square feet (s.f.) of retail land use

Access to the site is proposed via two (2) full-movement driveways along Poole Road and via two (2) full movement driveways, three (3) right-in/right-out driveways, and one (1) full movement intersection along Smithfield 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 of undeveloped land and residential development.

1.4. Existing Roadways

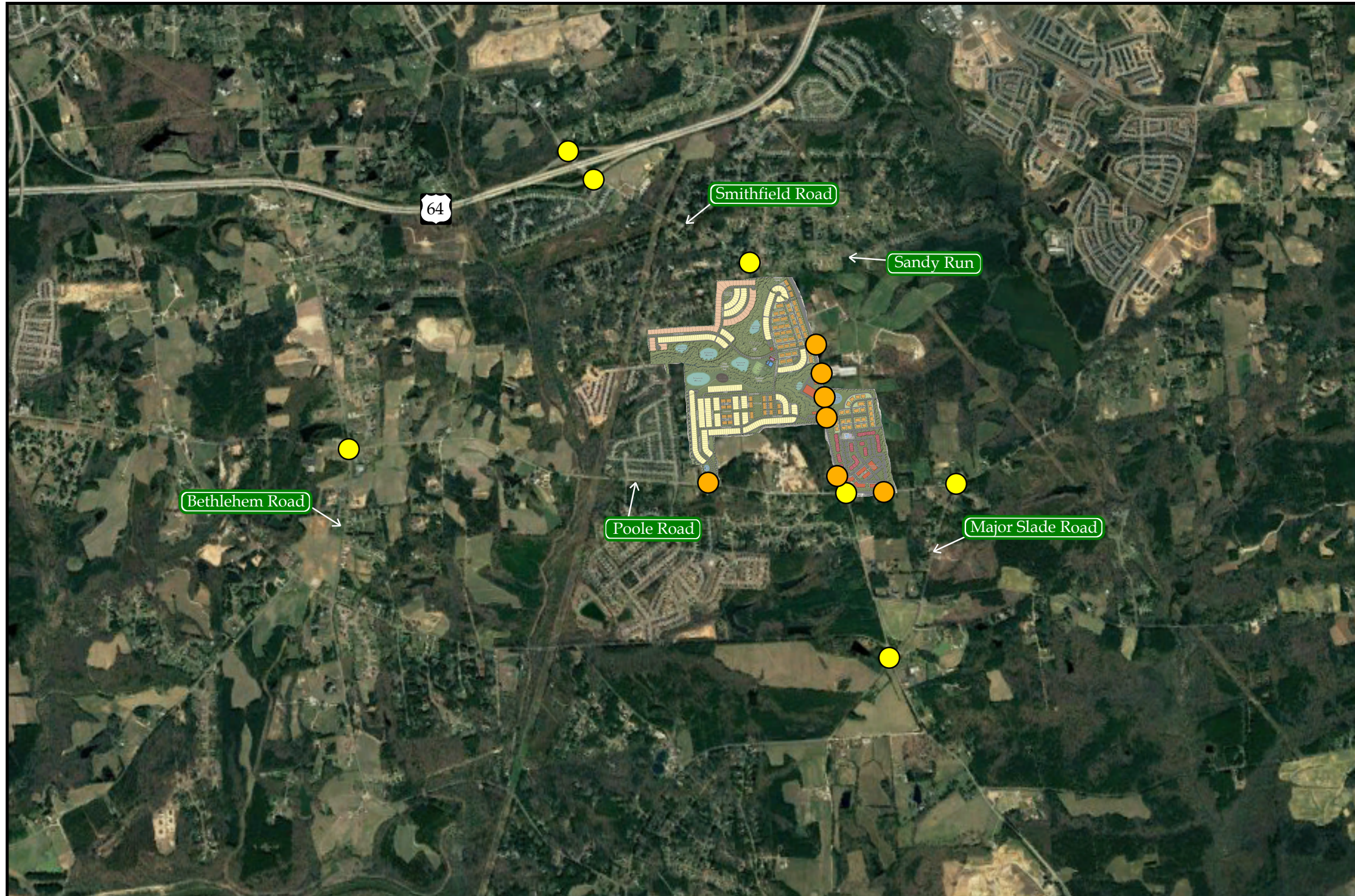
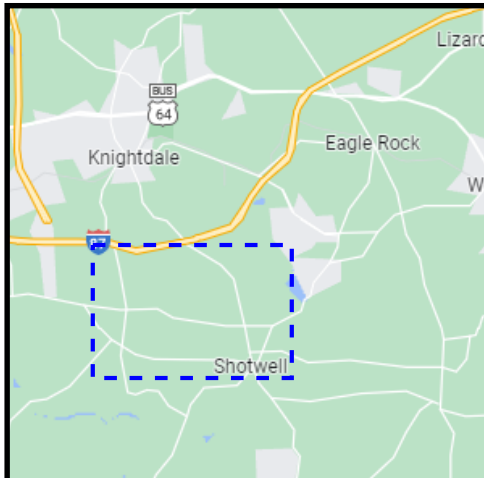
Existing lane configurations (number of traffic lanes on each intersection approach), lane widths, storage capacities, and other intersection and roadway information within the study area are shown in Figure 3. Table 1 provides a summary of this information, as well.

Table 1: Existing Roadway Inventory

Road Name	Route Number	Typical Cross Section	Speed Limit	2019 AADT (vpd)
Poole Road	SR 1007	2-lane undivided	55 mph	3,000
Smithfield Road	SR 2233	2-lane undivided	45 mph	14,000*
Sandy Run	SR 2685	2-lane undivided	25 mph	2,800**
I-87 (US 64 / US 264)		6-lane divided	70 mph	71,000
Major Slade Road	SR 2506	2-lane undivided	Not Posted	4,620**
Bethlehem Road	SR 2049	2-lane undivided	45 mph	5,700

*ADT from 2017

**ADT based on the traffic counts from 2022 and assuming the weekday PM peak hour volume is 10% of the average daily traffic.



LEGEND

- Study Intersection
- Proposed Site Access
- Study Area



RKA

RAMEY KEMP ASSOCIATES

Poole and Smithfield
Knightdale, NC

Site Location Map

Scale: Not to Scale Figure 1

MASTERPLAN



NOTES

- SEE STREET TYPOLOGIES FOR RIGHT OF WAY DIMENSIONS & STANDARDS.
- POOLE & SMITHFIELD ROADS SHALL BOTH BE IMPROVED TO HALF THE BOULEVARD STANDARD RIGHT OF WAY ALONG THE FRONTAGE OF THE DEVELOPMENT. WHERE THE DEVELOPMENT ENCOMPASSES BOTH SIDES OF THE RIGHT OF WAY, THE ROAD SHALL BE IMPROVED THE FULL WIDTH.
- ROAD IMPROVEMENTS NOTED ARE SUBJECT TO CHANGE PER FINDINGS OF TIA AND NCDOT.
- COMMERCIAL LAYOUTS SHOWN ARE ILLUSTRATIVE IN NATURE. EXACT CONFIGURATION OF BUILDINGS AND PARKINGS TO BE DETERMINED AT SITE PLAN.
- ALL RESIDENTIAL LOTS SHALL BE MASS GRADED TO PROVIDE APPROPRIATE DRAINAGE TO STORMWATER FACILITIES.
- AMENITY CENTER SERVING SINGLE FAMILY LOTS SHALL BE CONSTRUCTED PRIOR TO ISSUANCE OF 88TH CERTIFICATE OF OCCUPANCY
- AMENITY CENTER SERVING APARTMENTS SHALL BE CONSTRUCTED PRIOR TO ISSUANCE OF 1ST CERTIFICATE OF OCCUPANCY
- MIX OF USES SHALL BE IN ACCORDANCE WITH UDO 11.1.B.
- TREE COVERAGE CALCULATIONS:
SITE AREA (EXCLUDING POOLE RD. & SMITHFIELD RD.) - 203.70 AC
REQUIRED TREE COVER (19,459' PERIMETER X 20') - 8.93 AC
TREE COVER PROVIDED (NEUSE RIVER BUFFERS) - 15.86 AC.
- PARKING CALCULATIONS:
FRONT LOADED SINGLE FAMILY LOTS - 2 SPACES/LOT
REAR LOADED SINGLE FAMILY LOTS - 2 SPACES / LOT
TOWNHOUSES - 2.5 SPACES/LOT (2 SPACES ON LOT & 0.5 SPACES IN PARKING LOTS + MARKED STREET PARKING)
APARTMENTS - 1 SPACE FOR STUDIO & 1 BEDROOM UNITS + 2 SPACES FOR 2 & 3 BEDROOM UNITS (INCLUDES ADJACENT ON-STREET PARKING)
COMMERCIAL CENTER - 4 SPACES / 1,000SF OF GROUND FLOOR COMMERCIAL + 1 SPACE / 1,000SF OF UPPER FLOOR OFFICE
NEIGHBORHOOD COMMERCIAL - 3.5 SPACES / 1,000 SF OF COMMERCIAL
- PARK & RIDE SPACES AND TRANSIT SHELTER SHALL BE PROVIDED AT COMMERCIAL CENTER IN ACCORDANCE WITH UDO 7.1.E
- ELECTRIC VEHICLE PARKING AND CHARGING STATIONS SHALL BE PROVIDED IN ACCORDANCE WITH UDO 7.1.1.2
- BICYCLE PARKING SHALL BE PROVIDED IN ACCORDANCE WITH UDO 7.1.F
- CUL-DE-SACS SHALL ONLY BE PERMITTED WHERE TRAIL HEADS CONTINUE THE PEDESTRIAN CIRCULATION, ALLOWING PEDESTRIAN CONNECTIVITY, WHILE LIMITING IMPACTS TO ENVIRONMENTALLY SENSITIVE AREAS SUCH AS STREAMS AND WETLANDS.
- SEWER SHALL BE SERVED VIA PROPOSED GRAVITY OUTFALL TO EXISTING POPLAR CREEK GRAVITY LINE. DOWNSTREAM SEWER CAPACITY ANALYSIS SHALL BE PROVIDED WITH ZONING.
- PUBLIC WATER SHALL BE INSTALLED IN ALL PUBLIC RIGHTS OF WAY INCLUDING SMITHFIELD RD. TO SERVE DEVELOPMENT.
- STREET RIGHT OF WAY DEDICATION SHALL BE PERMITTED IN THE FALL ZONE OF THE EXISTING CELL TOWER, HOWEVER NO SUBDIVISION SHALL OCCUR IN THIS ZONE FOR SINGLE FAMILY OR COMMERCIAL USES.

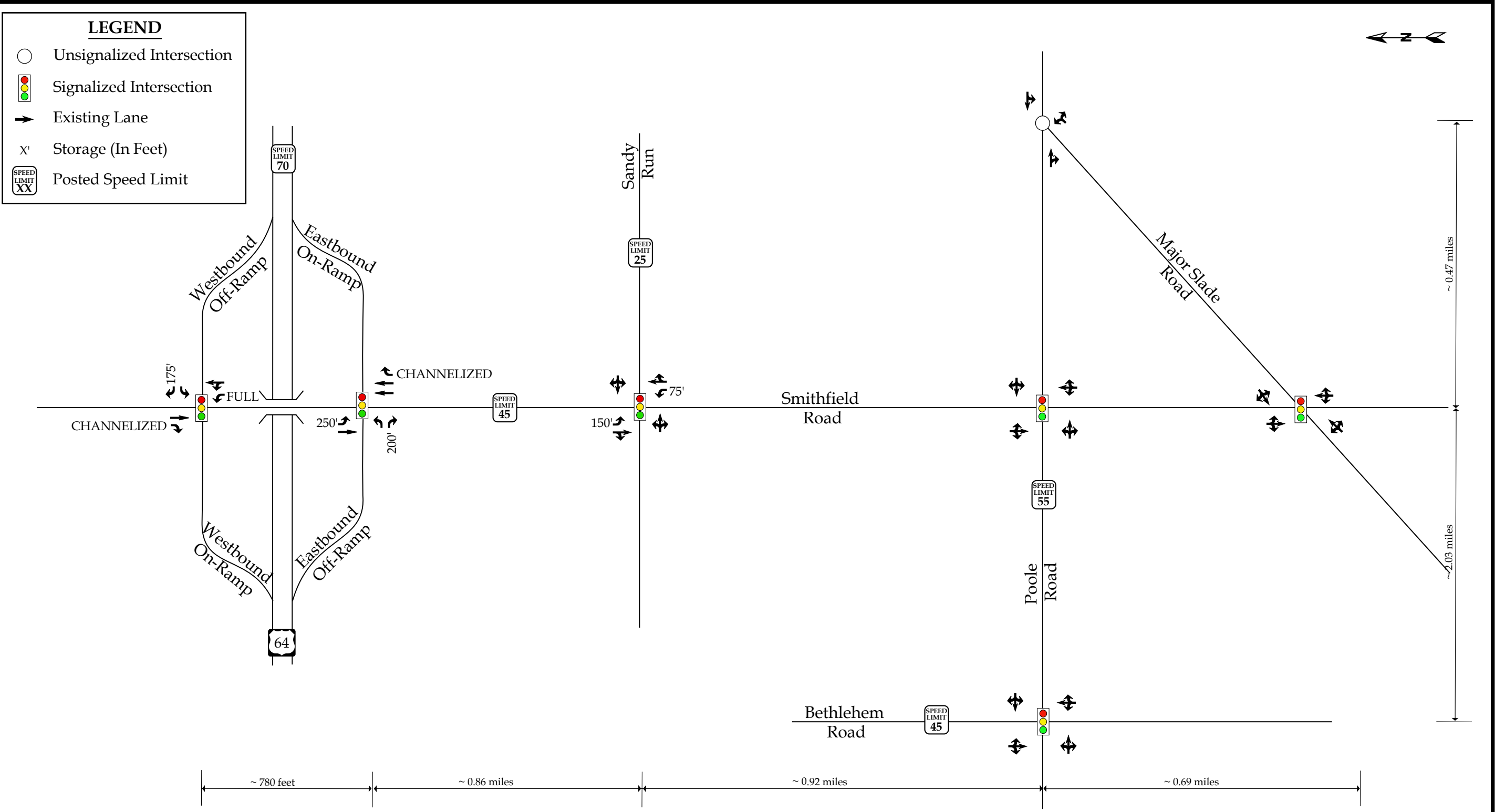
USE DISTRIBUTION

USE TYPE	AREA IN AC.	PERCENT DEVELOPMENT
SINGLE FAMILY DWELLING	41.46	48.1%
TOWNHOUSE DWELLING	22.69	26.4%
MULTIFAMILY DWELLING	9.12	10.6%
MIXED USE	6.93	8.0%
COMMERCIAL/OFFICE	5.90	6.9%

UNIT LEGEND

- FRONT LOADED SINGLE FAMILY LOT (80)
- REAR LOADED SINGLE FAMILY LOT (260)
- TOWNHOUSES (366)
- APARTMENTS (356)
- COMMERCIAL
- VERTICALLY MIXED USE





Poole and Smithfield
Knightdale, NC

2022 Existing
Lane Configurations

Scale: Not to Scale Figure 3

2. 2022 EXISTING PEAK HOUR CONDITIONS

2.1. 2022 Existing Peak Hour Traffic Volumes

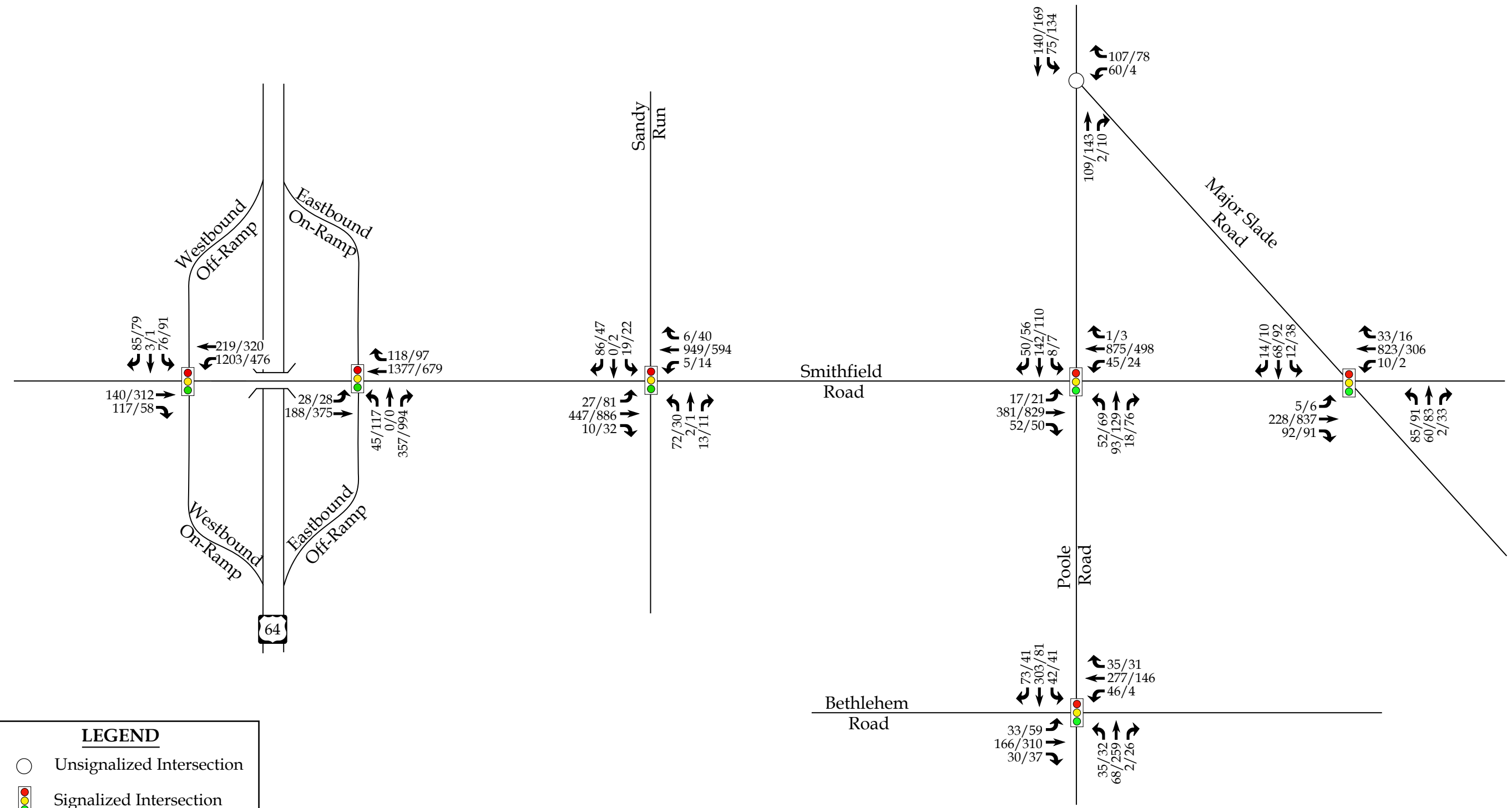
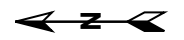
Existing peak hour traffic volumes were determined based on traffic counts conducted at the study intersections listed below, in January, March, and September of 2022 during a typical weekday AM (7:00 AM – 9:00 AM) and PM (4:00 PM – 6:00 PM) peak periods while schools were in session for in-person learning:

- Poole Road and Smithfield Road
- Smithfield Road and Sandy Run
- Smithfield Road and I-87 (US 64 / US 264) Eastbound Ramps
- Smithfield Road and I-87 (US 64 / US 264) Westbound Ramps
- Smithfield Road and Major Slade Road
- Poole Road and Major Slade Road
- Poole Road and Bethlehem Road

Weekday AM and PM traffic volumes were balanced between study intersections, where appropriate. Refer to Figure 4 for 2022 existing weekday AM and PM peak hour traffic volumes. A copy of the count data is located in Appendix B of this report.

2.2. Analysis of 2022 Existing Peak Hour Traffic Conditions

The 2022 existing 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 8 of this report.



LEGEND

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

Note: Based on NCDOT Congestion Management guidelines, a volume of 4 vehicles per hour (vph) was analyzed for any movement with less than 4 vph.



Pooler and Smithfield
Knightdale, NC

2022 Existing
Peak Hour Traffic

Scale: Not to Scale Figure 4

3. 2026/2029/2032 NO-BUILD 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 3% would be used to generate 2026/2029/2032 projected weekday AM and PM peak hour traffic volumes. Refer to Figure 5a, 5b, and 5c for 2026/2029/2032 projected peak hour traffic volumes, respectively.

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:

- Baker Roofing
- Poole Road Assemblage

Table 2, on the following page, provides a summary of the adjacent developments.

Table 2: Adjacent Development Information

Development Name	Location	Build-Out Year	Land Use / Intensity	TIA Performed
Baker Roofing	Northwest quadrant of the US 64-264 at Smithfield Road interchange	2026	220,000 Warehouse 145,000 Specialty Trade 16 f.p. gas station 22,000 general retail 20,000 general office 4,000 s.f. FF w/ DT 200-room hotel	March 2022 by KHA
Poole Road Assemblage	Northeast quadrant at the intersection of Poole Road and Smithfield Road	2026	246 single family homes	October 2022 by RKA

It should be noted that 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.

3.3. Future Roadway Improvements

Based on coordination with the NCDOT and the Town, it was determined that the roadway improvements associated with the State Transportation Improvement Program (STIP) projects I-6007 and HL-0031 are to be considered in this study. STIP I-6007 is expected to convert the US 264 interchange at Smithfield Road to a diverging diamond interchange, while STIP HL-0031 is expected to improve the intersection of Poole Road and Smithfield Road by adding exclusive left-turn lanes at the intersection. Future roadway improvements associated with STIP I-6007 project will be analyzed under 2045 future traffic conditions, as the project is not currently funded for construction. Additionally, future roadway improvements associated with the adjacent developments will be analyzed under future conditions.

Per the Comprehensive Transportation Plan (CTP), Smithfield Road is expected to be widened to a four-lane divided section. The proposed development is expected to provide approximately 0.6 miles of widening along their frontage on either side of Smithfield Road prior to the full build-out of the development. Based on coordination with the Town and

NCDOT, the four-lane divided section was analyzed under future conditions (2032, Full Build).

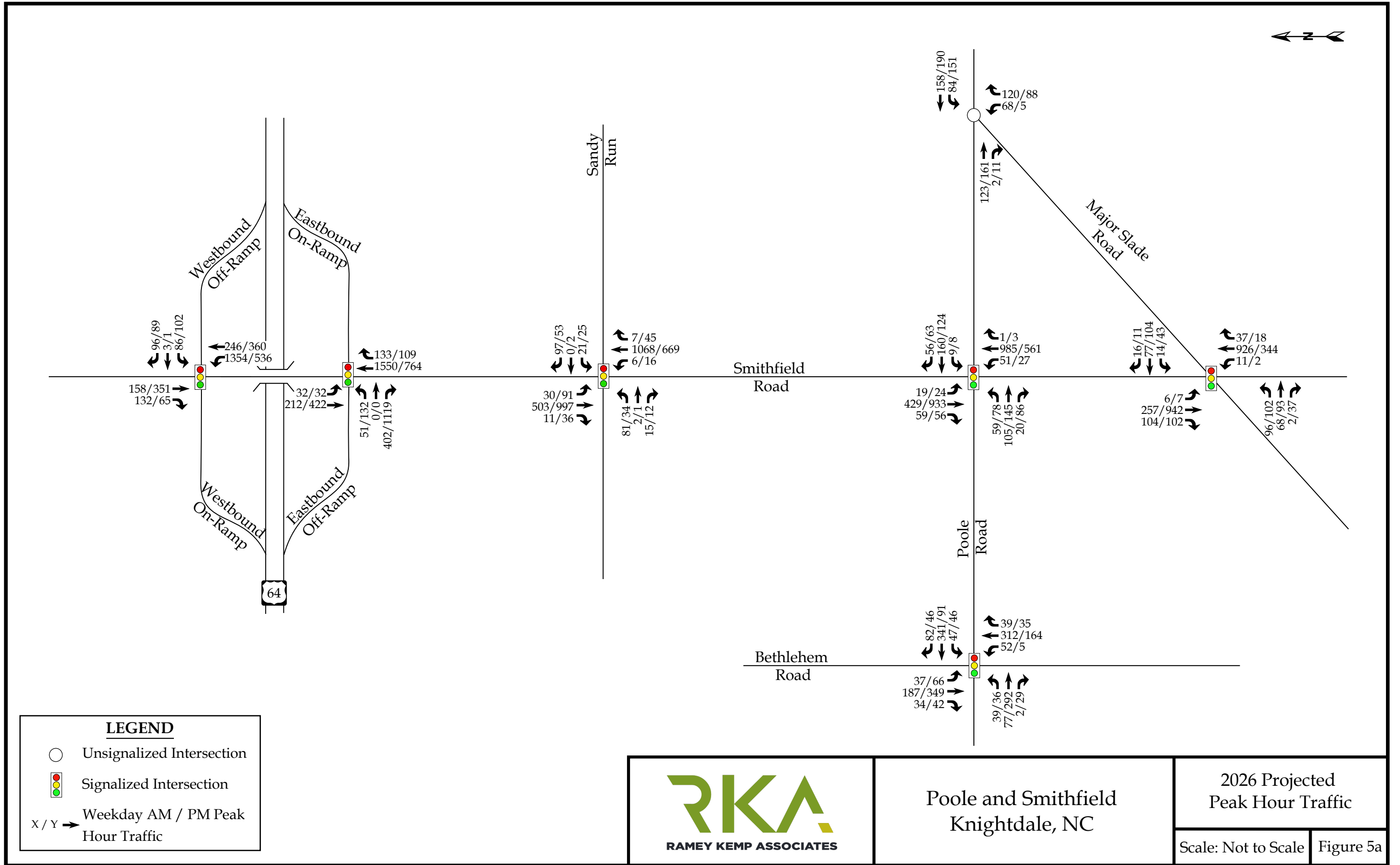
The STIP I-6007 plans can be found in Appendix E.

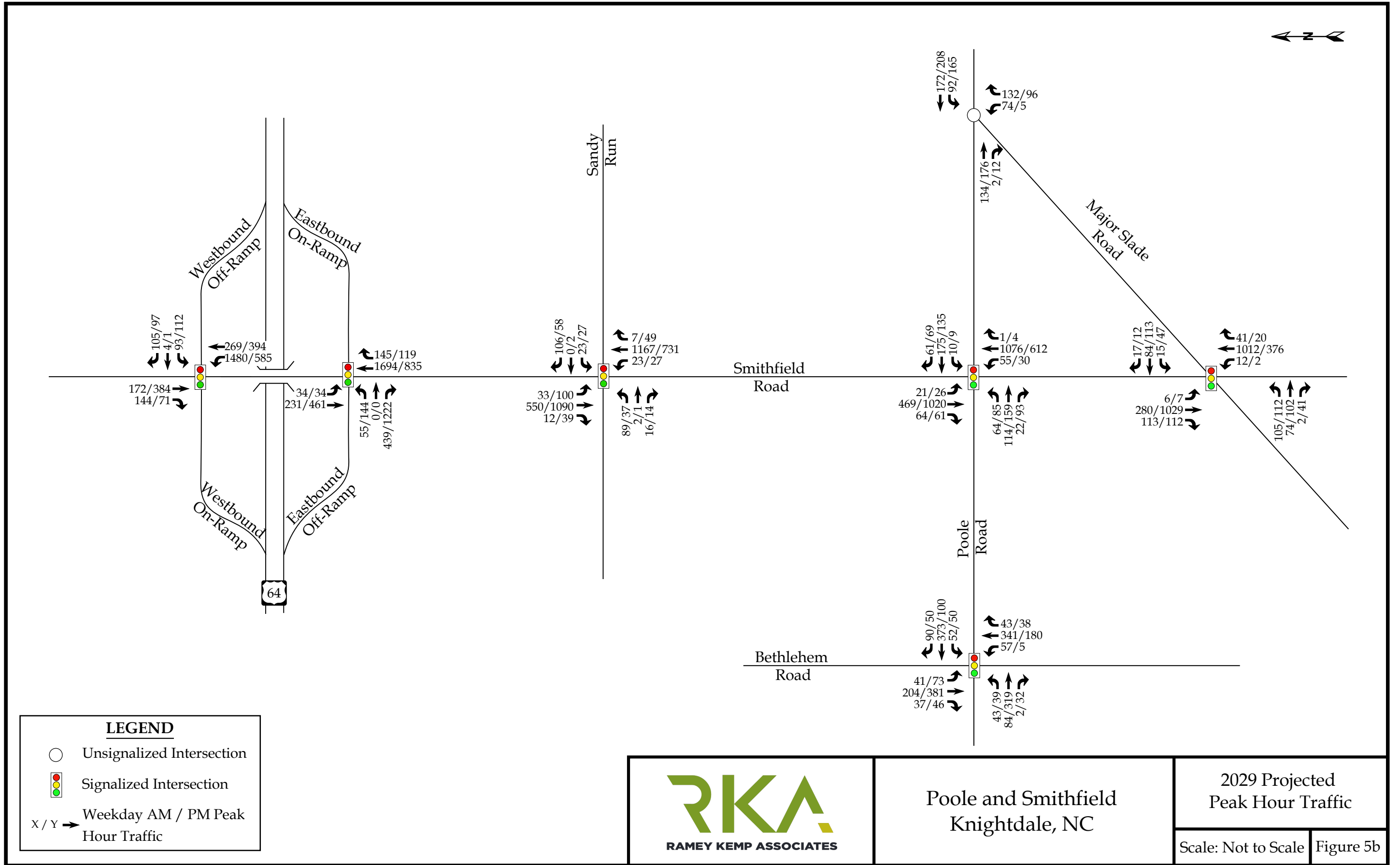
3.4. 2026/2029/2032 No-Build Peak Hour Traffic Volumes

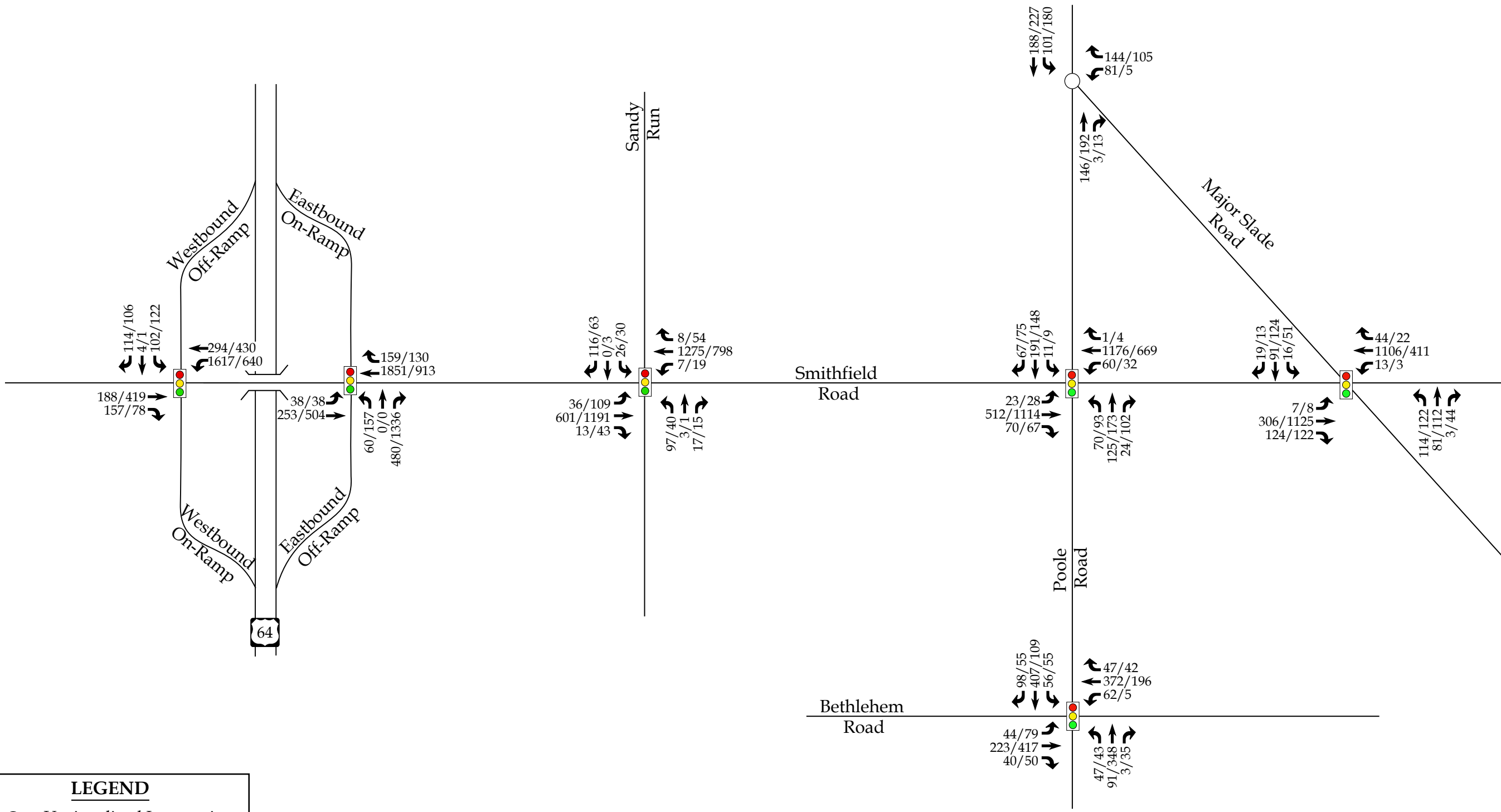
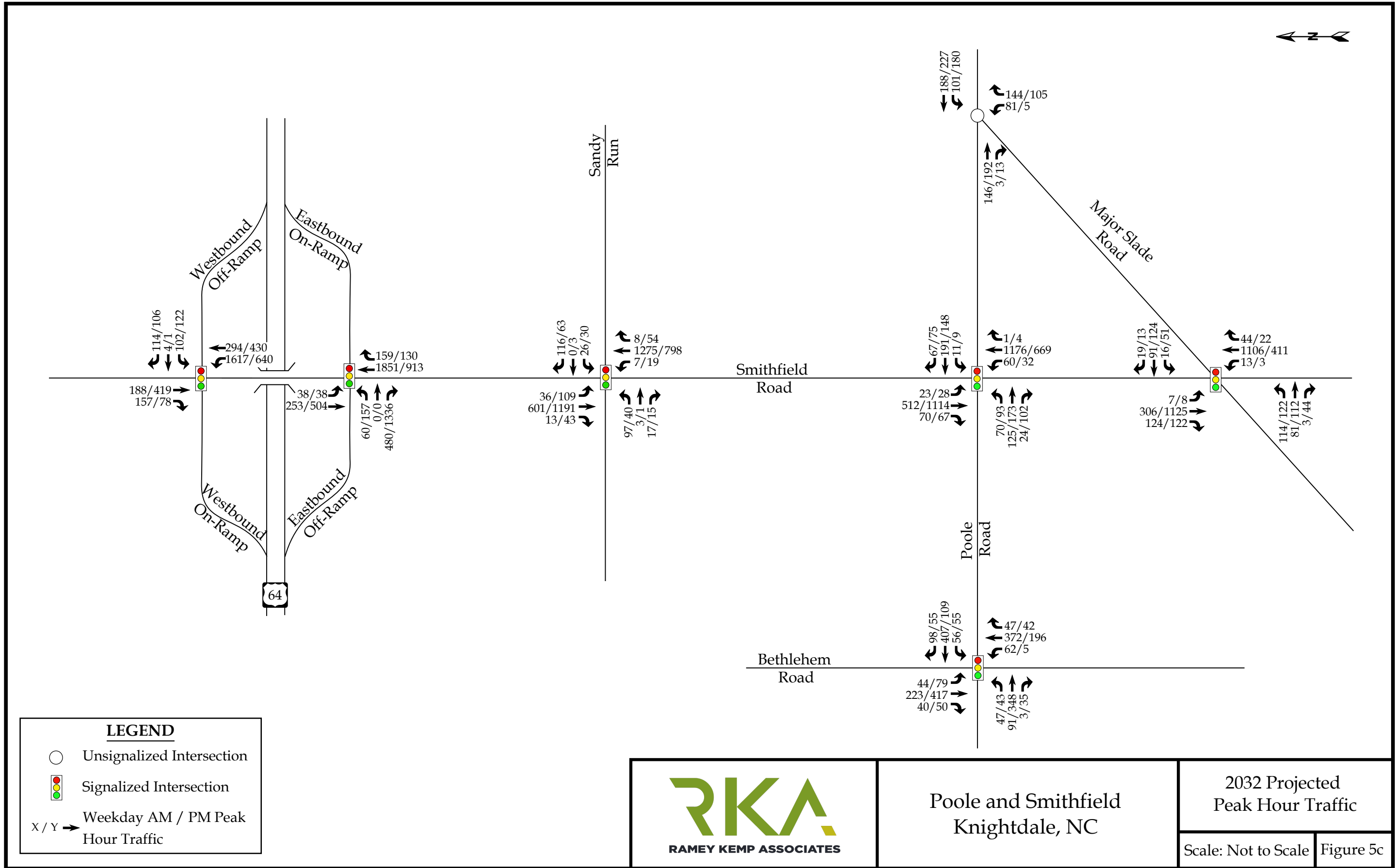
The 2026/2029/2032 no-build traffic volumes were determined by projecting the 2022 existing peak hour traffic to the build year and adding the adjacent development trips. Refer to Figure 7a, 7b, and 7c for an illustration of the 2026/2029/2032 no-build peak hour traffic volumes at the study intersections, respectively.

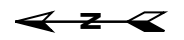
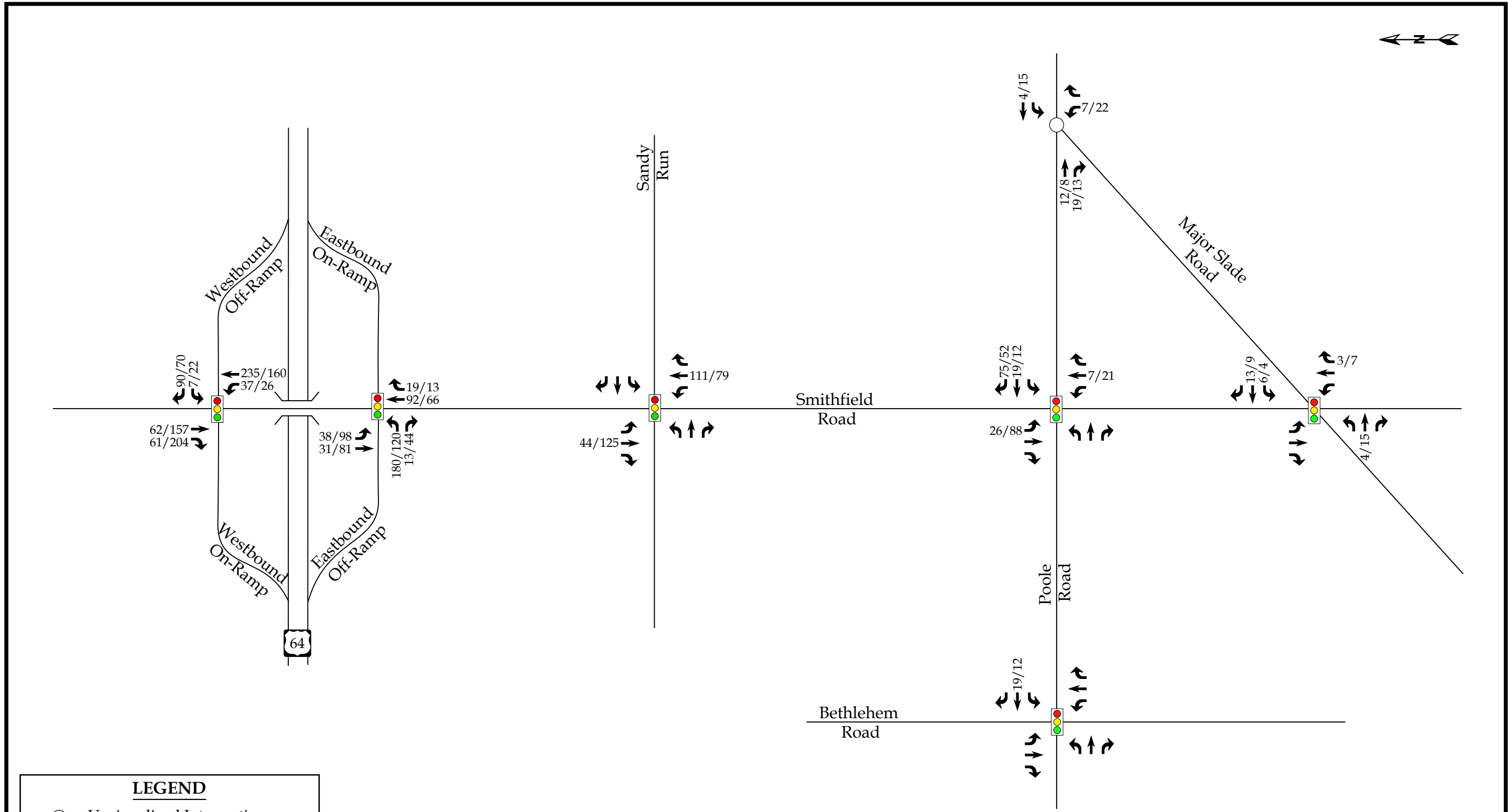
3.5. Analysis of 2026/2029/2032 No-Build Peak Hour Traffic Conditions

The 2026/2029/2032 no-build 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 8 of this report.









LEGEND

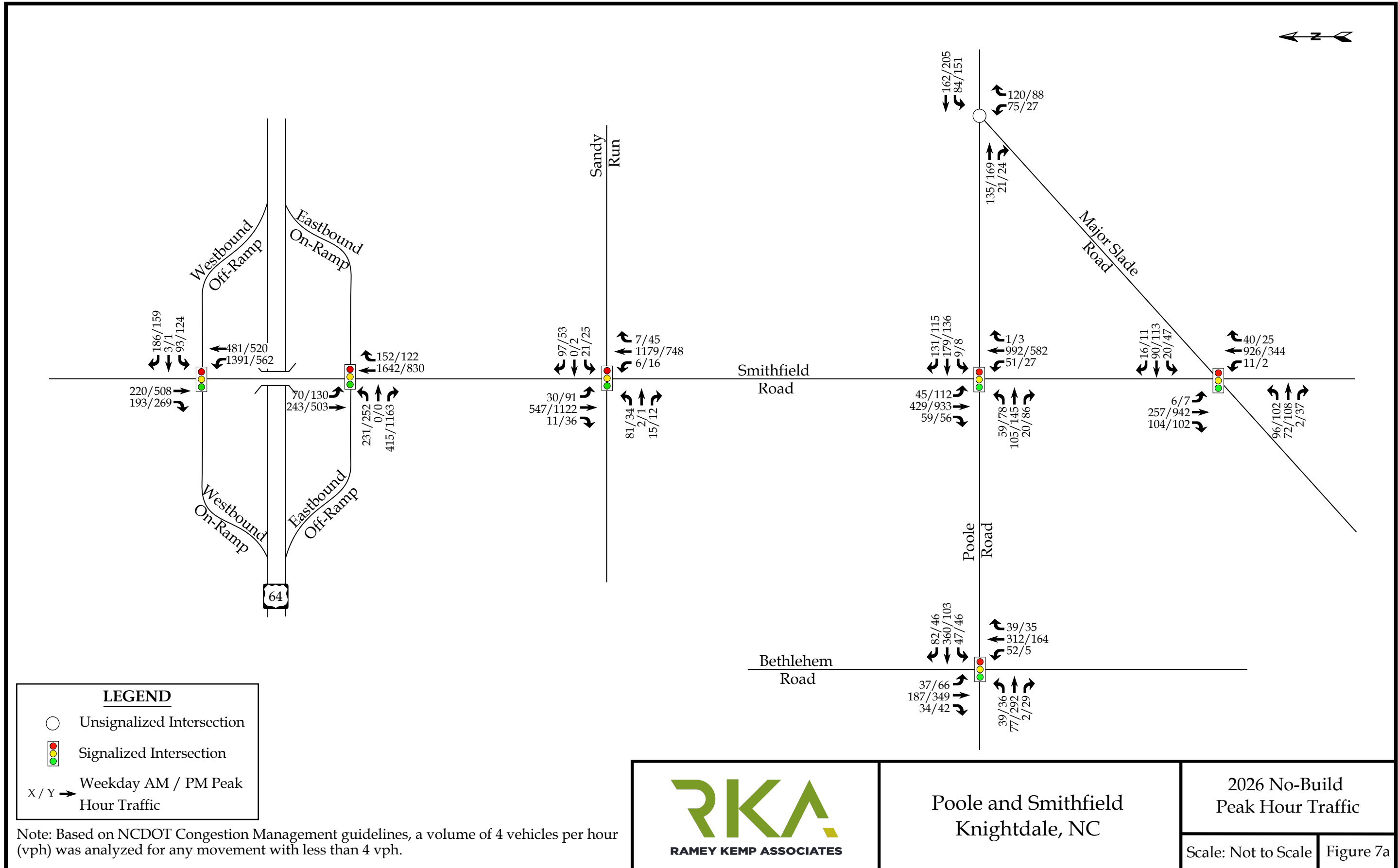
- Unsignalized Intersection
- 🚦 Signalized Intersection
- X / Y → Weekday AM / PM Peak Hour Adjacent Development Trips



Poole and Smithfield
Knightdale, NC

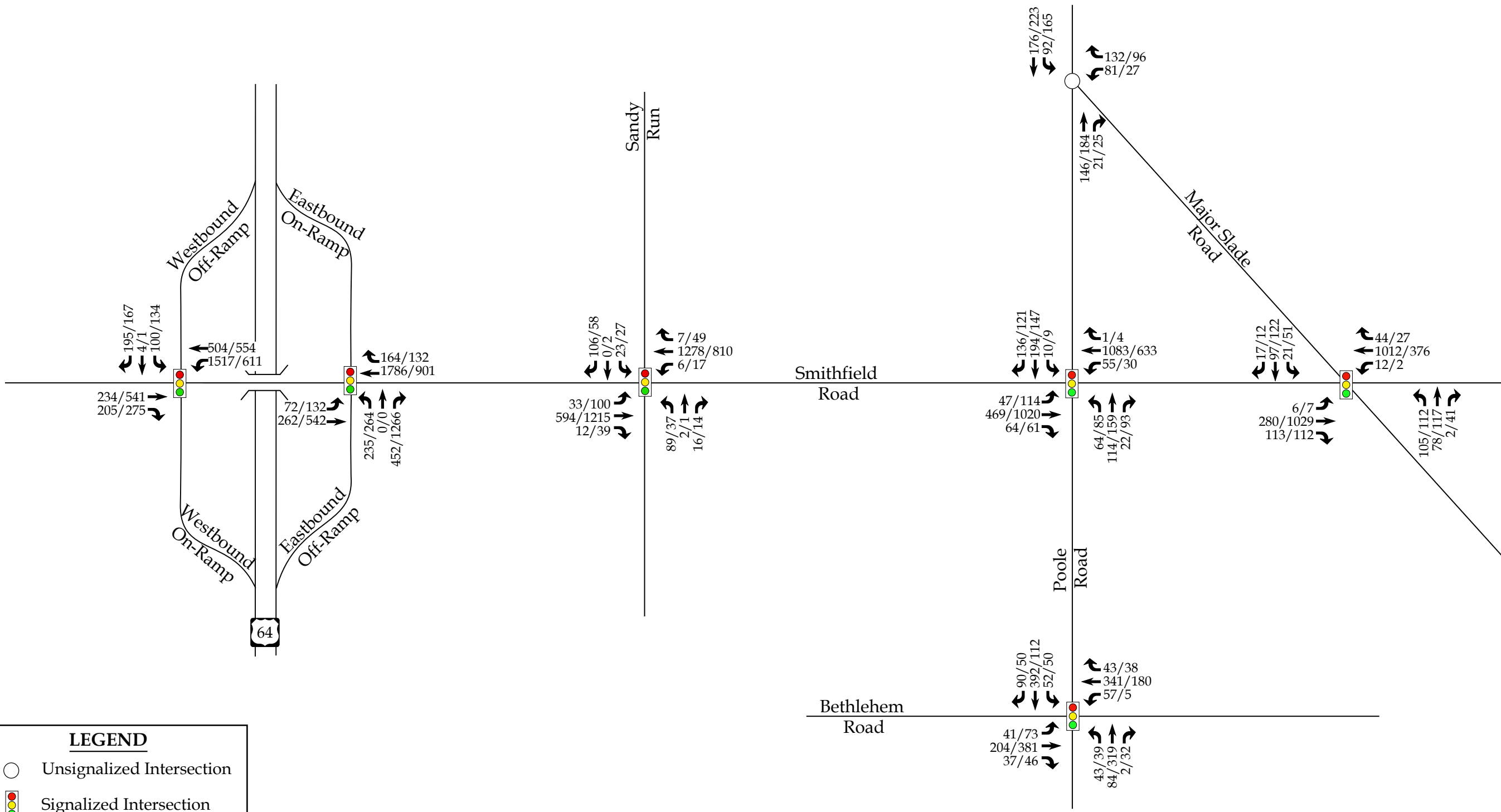
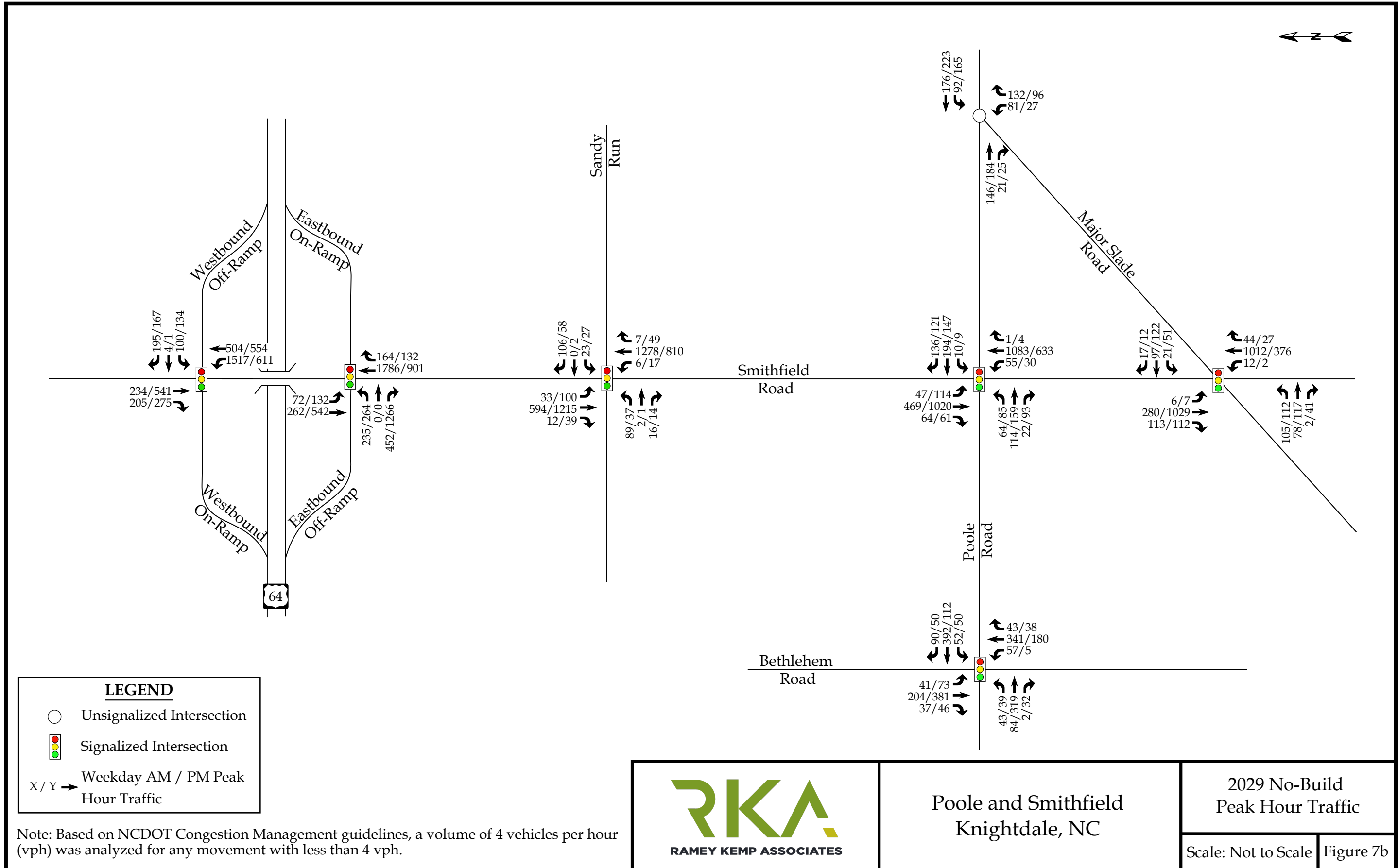
Peak Hour Adjacent
Development Trips

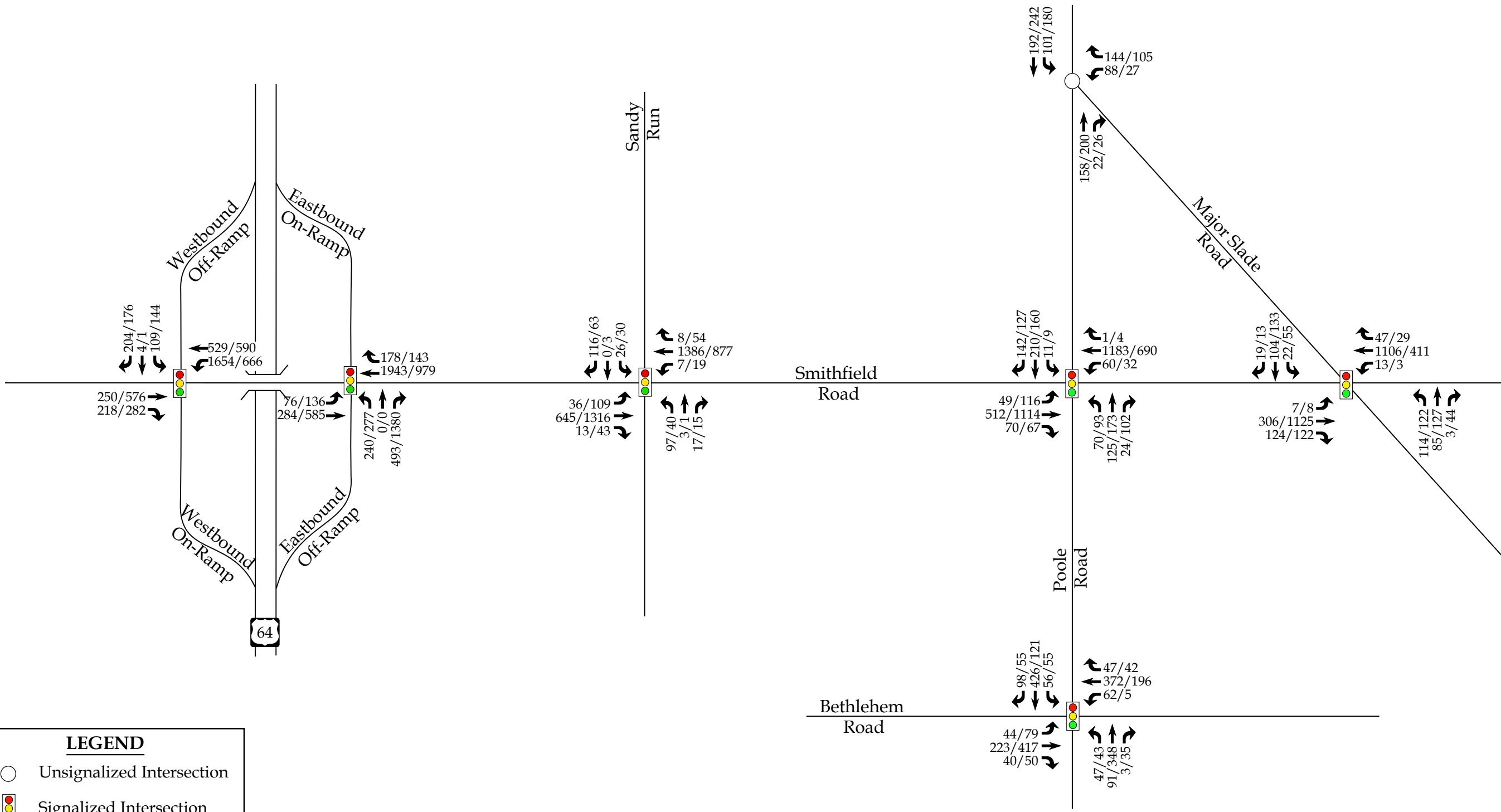
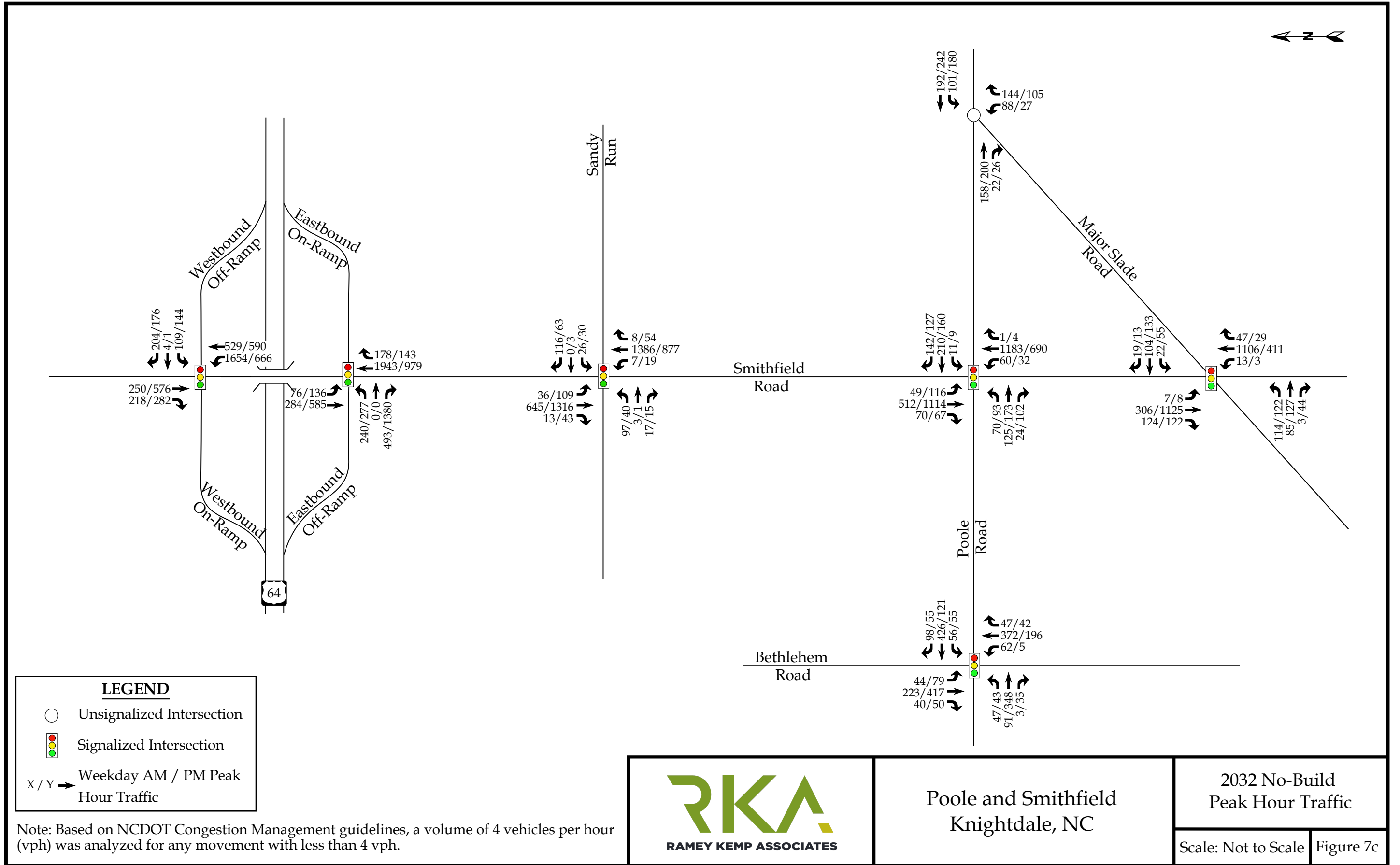
Scale: Not to Scale Figure 6



Note: Based on NCDOT Congestion Management guidelines, a volume of 4 vehicles per hour (vph) was analyzed for any movement with less than 4 vph.

	Poole and Smithfield Knightdale, NC	2026 No-Build Peak Hour Traffic	
		Scale: Not to Scale	Figure 7a





4. SITE TRIP GENERATION AND DISTRIBUTION

4.1. Trip Generation

Phase 1 of the proposed development is expected to consist of 187 townhomes and 47 single family homes. Phase 2 is expected to consist of 308 single family homes and 85 townhomes, in addition to Phase 1. The proposed development at full build out is expected to add 306 apartments, 101 townhomes, and 250,000 s.f. of retail land use in addition to Phase 1 and 2 for a maximum of 306 apartments, 355 single-family homes, 373 townhomes, and 250,000 s.f. of retail land use. 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*, 11th Edition. Refer to Table 3-5 for a detailed breakdown of the buildout site trip generation for Phase 1, Phase 2, and Full Build, respectively.

Table 3: Trip Generation Summary – Phase 1

Land Use (ITE Code)	Intensity	Daily Traffic (vpd)	AM Peak Hour Trips (vph)		PM Peak Hour Trips (vph)	
			Enter	Exit	Enter	Exit
Single-Family Homes (210)	47 units	504	9	28	31	18
Single-Family Attached Housing (215)	187 units	1,374	28	64	61	47
Phase 1 Total		1,878	37	92	92	65

Table 4: Trip Generation Summary – Phase 1 + Phase 2

Land Use (ITE Code)	Intensity	Daily Traffic (vpd)	AM Peak Hour Trips (vph)		PM Peak Hour Trips (vph)	
			Enter	Exit	Enter	Exit
Single-Family Homes (210)	355 units	3,237	61	175	206	121
Single-Family Attached Housing (215)	272 units	2,022	42	94	91	68
Phase 2 Total		5,259	103	269	297	189

Table 5: Trip Generation Summary – Full Build

Land Use (ITE Code)	Intensity	Daily Traffic (vpd)	AM Peak Hour Trips (vph)		PM Peak Hour Trips (vph)	
			Enter	Exit	Enter	Exit
Single-Family Homes (210)	355 units	3,237	61	175	206	121
Single-Family Attached Housing (215)	373 units	2,792	58	130	125	95
Multifamily Low-Rise (220)	306 units	2,037	28	90	96	56
Shopping Center (820)	250 k.s.f	12,391	174	107	524	568
Total Trips		20,457	321	502	951	840
<i>Internal Capture (2% AM, 2% PM)</i>			-6	-10	-19	-16
Total External Trips			315	492	932	824
<i>Pass-by Trips (34% PM)</i>			--	--	-182	-182
Total Primary Trips			315	492	750	642

It is estimated that the proposed development will generate approximately 20,457 total site trips on the roadway network during a typical 24-hour weekday period. Of the daily traffic volume, it is anticipated that 823 trips (321 entering and 502 exiting) would occur during the weekday AM peak hour and 1,791 trips (951 entering and 840 exiting) would occur during the weekday PM peak hour.

Internal capture of trips between the retail and residential uses is proposed to be considered in this study. Internal capture is the consideration for trips that will be made within the site between different land uses, so the vehicle technically never leaves the internal site but can still be considered as a trip to that specific land use. Internal capture typically only considered trips between residential, office, and retail/restaurant land uses. Based on NCHRP Report 684 methodology, a weekday AM peak hour internal capture rate of 2% and a weekday PM peak hour internal capture rate of 2% was applied to the total trips. The internal capture reductions are expected to account for approximately 16 trips (6 entering and 10 exiting) trips during the weekday AM peak hour and 35 trips (19 entering and 16 exiting) during the weekday PM peak hour.

Pass-by trips are also proposed to be taken into consideration in this study. Pass-by trips are made by the traffic already using the adjacent roadway, entering the site as an intermediate stop on their way to another destination. Pass-by trips are expected to amount for approximately 364 trips (182 entering and 182 exiting) during the weekday PM peak hour.

The total primary site trips are the calculated site trips after the reduction for internal capture and pass-by trips. Primary site trips are expected to generate approximately 807 trips (315 entering and 492 exiting) during the weekday PM peak hour and 1,392 trips (750 entering and 642 exiting) during the weekday PM peak hour.

4.2. Site Trip Distribution and Assignment

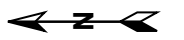
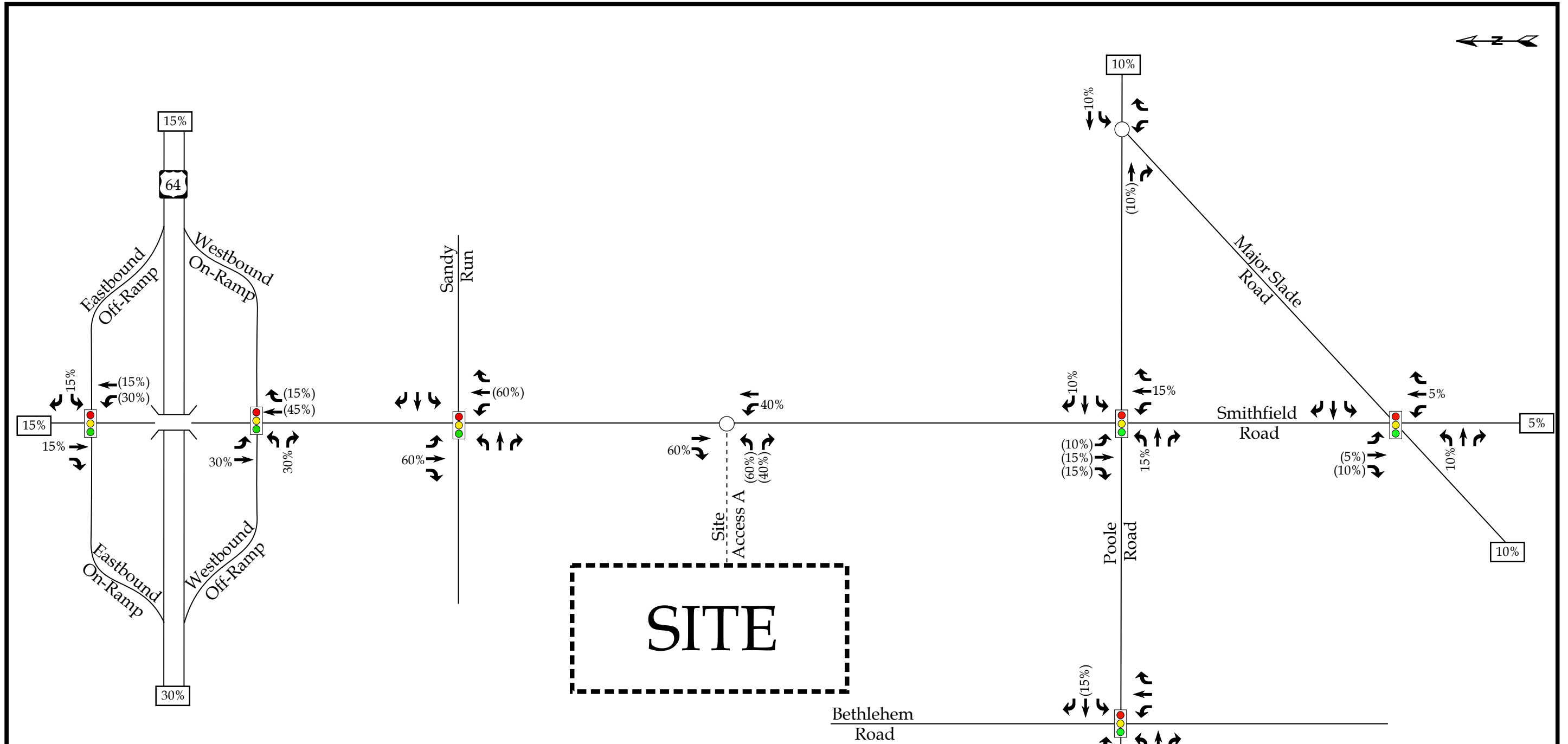
Trip distribution percentages used in assigning site traffic for this development were estimated based on a combination of existing traffic patterns, population centers adjacent to the study area, and engineering judgment. It is estimated that the residential and retail site trips will be regionally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

- 15% to/from the east via US 64
- 30% to/from the west via US 64
- 15% to/from the north via Smithfield Road
- 5% to/from the south via Smithfield Road
- 15% to/from the west via Poole Road
- 10% to/from the east via Poole Road
- 10% to/from the south via Major Slade Road

Refer to Figures 8a, 8b, and 8c for the residential site trip distribution for Phase 1, Phase 2, and Full Build, respectively. Figure 9 illustrates the retail site trip distribution under Full Build. Refer to Figures 10a, 10b, and 10c for the residential site trip assignment for Phase 1, Phase 2, and Full Build, respectively. Figure 11 illustrates the retail site trip assignment under Full Build.

The pass-by site trips were distributed under Full Build based on existing traffic patterns with consideration given to the proposed driveway access and site layout. Refer to Figure 12 for the pass-by site trip distribution. Full Build pass-by site trips are shown in Figure 13.

The Full Build total site trips were determined by adding the primary site trips and the pass-by site trips. Refer to Figure 14 for the total peak hour site trips at the study intersections.



LEGEND

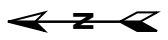
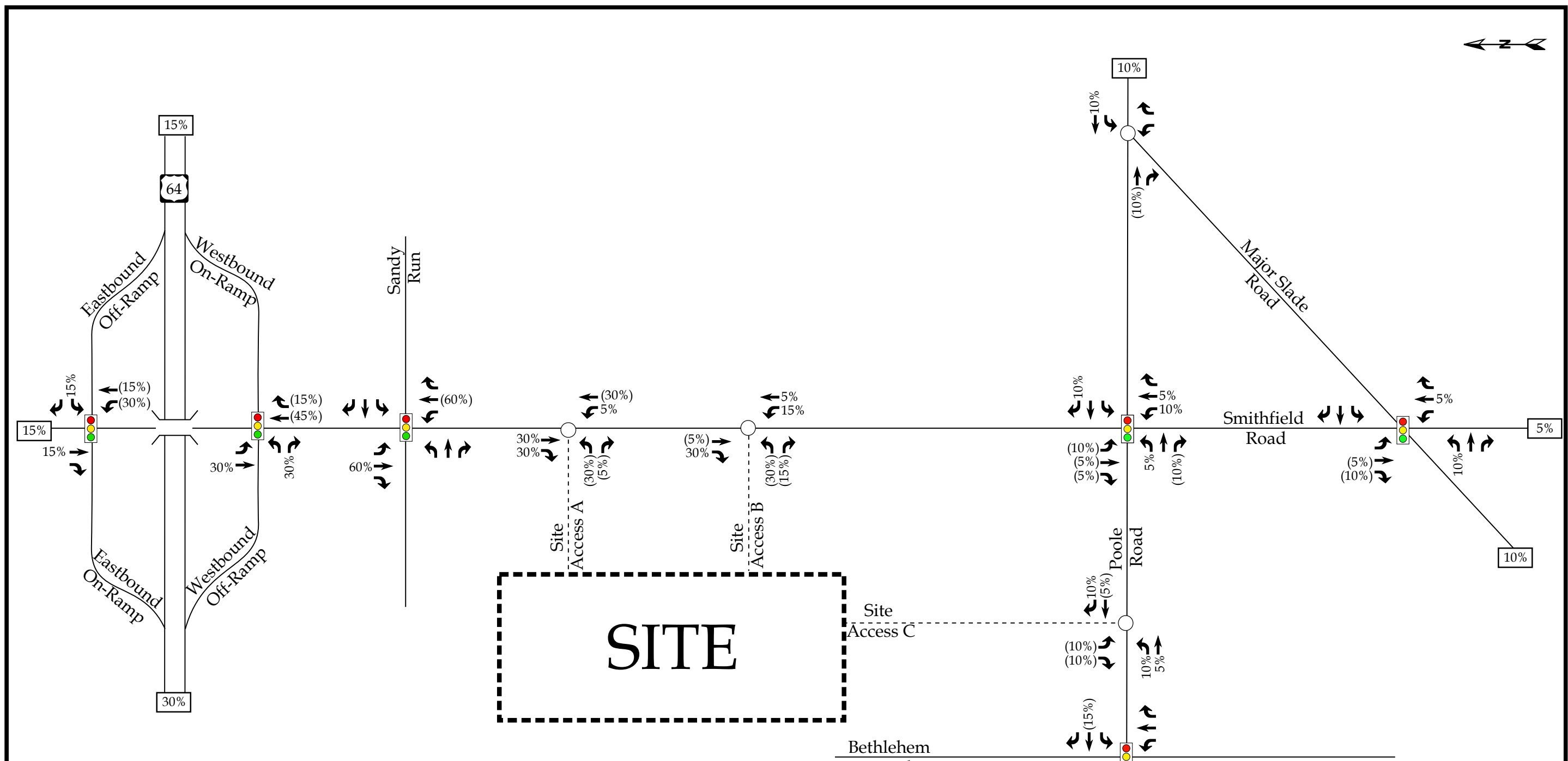
- Unsignalized Intersection
- 🚦 Signalized Intersection
- X% → Entering Trip Distribution
- (Y%) → Exiting Trip Distribution
- XX% Regional Trip Distribution



Poole and Smithfield
Knightdale, NC

Residential
Site Trip Distribution
-Phase 1

Scale: Not to Scale Figure 8a



LEGEND

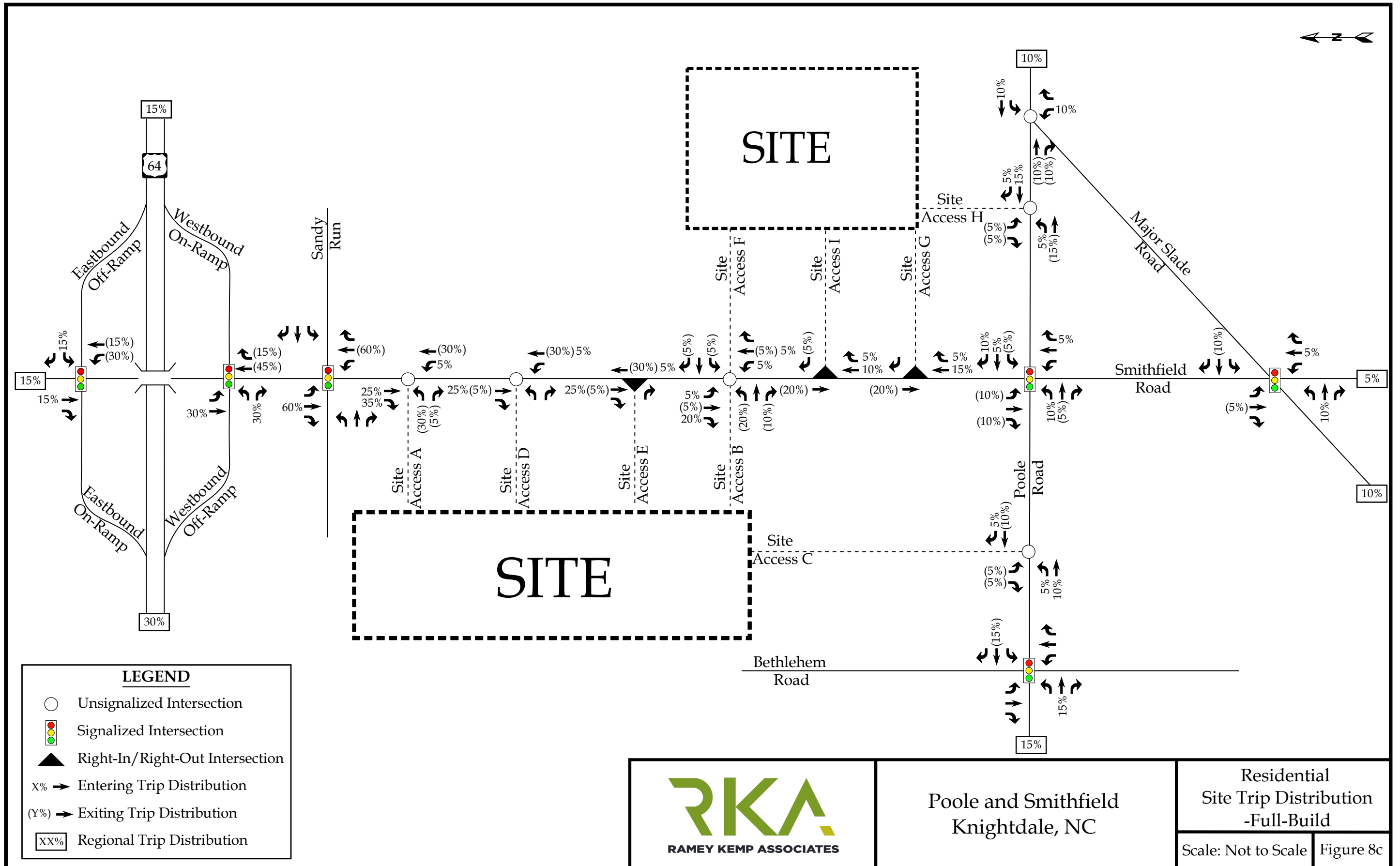
- Unsignalized Intersection
- 🚦 Signalized Intersection
- X% → Entering Trip Distribution
- (Y%) → Exiting Trip Distribution
- XX% Regional Trip Distribution

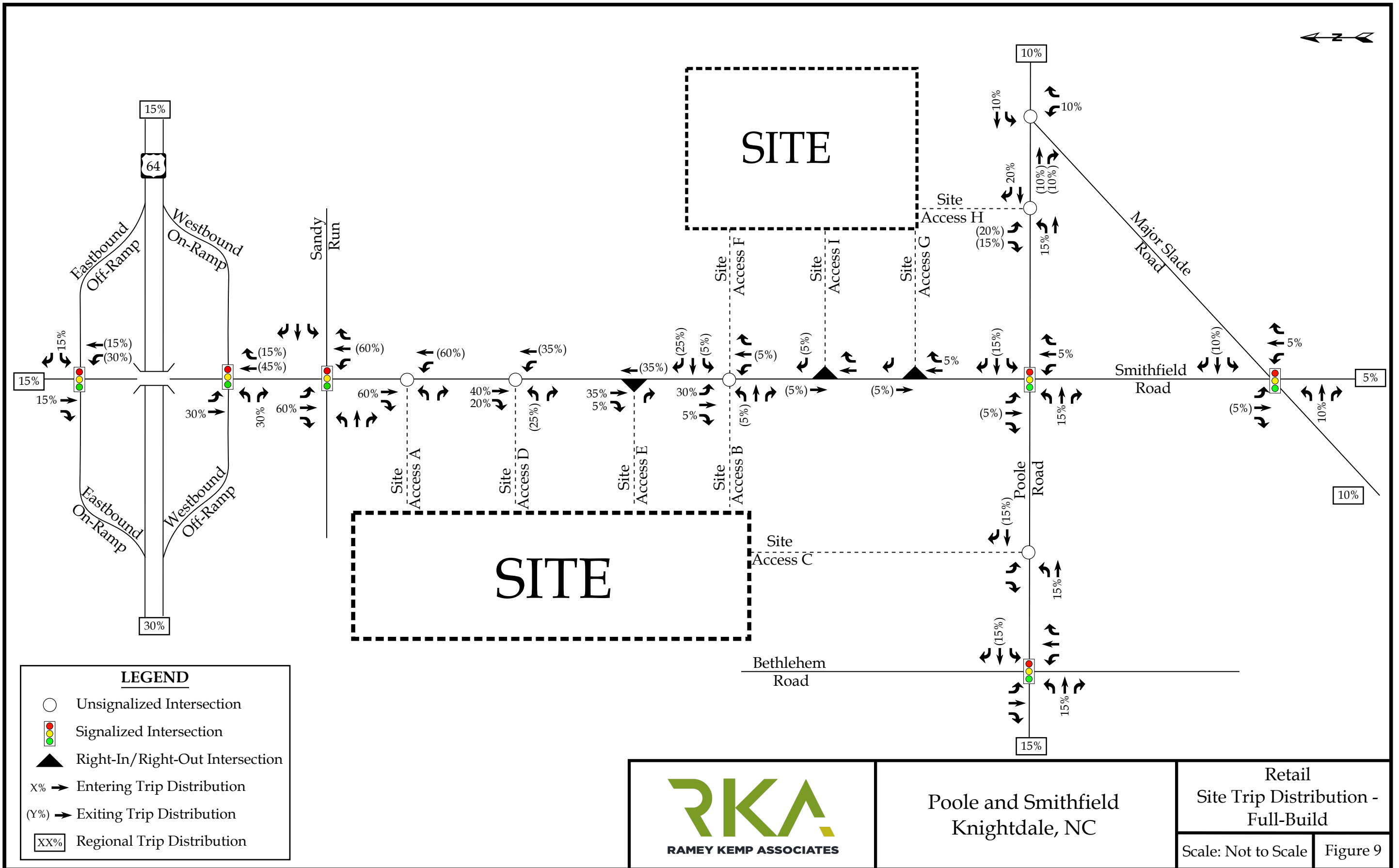


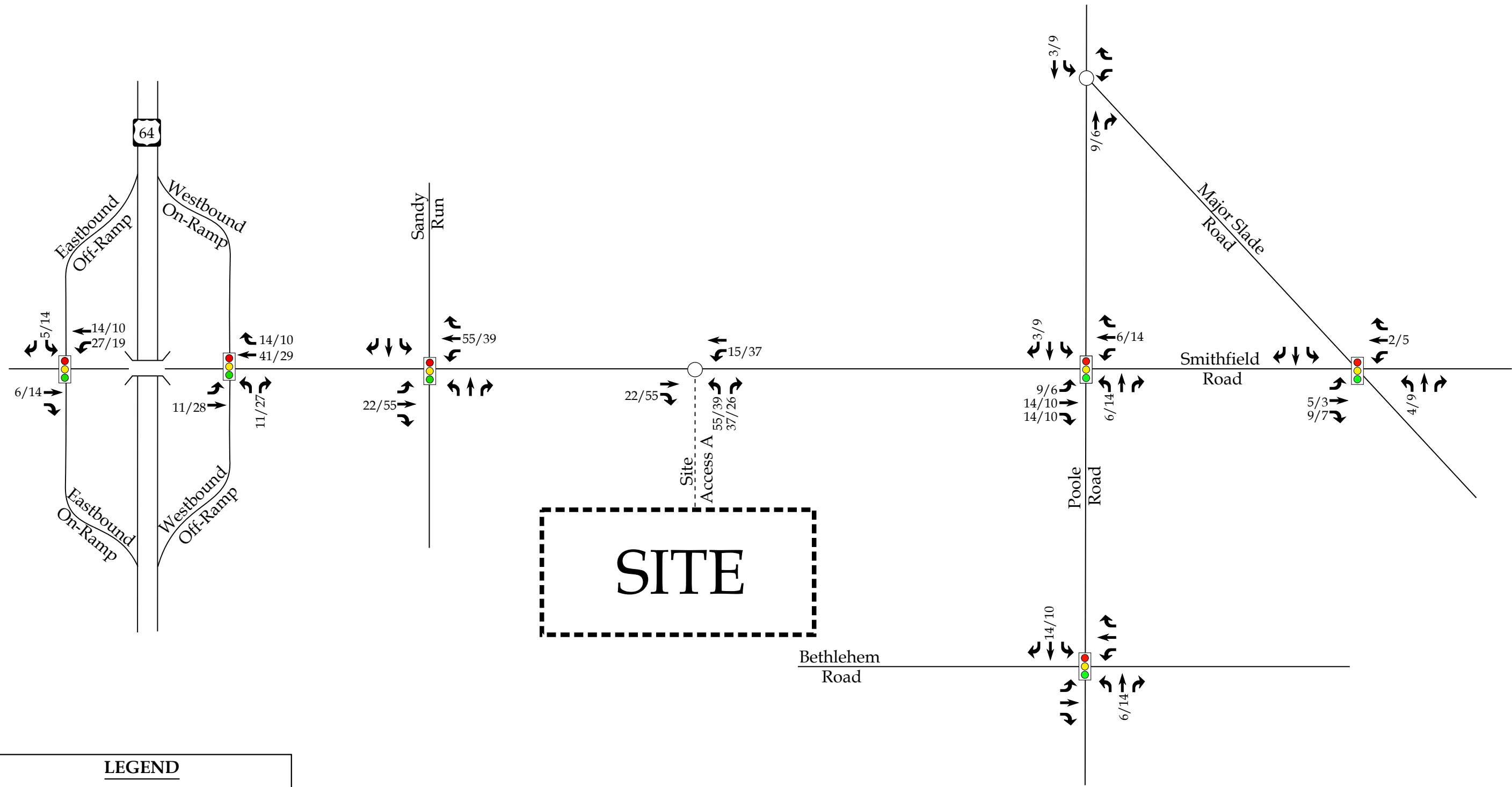
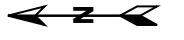
Poole and Smithfield
Knightdale, NC

Residential
Site Trip Distribution
-Phase 2

Scale: Not to Scale Figure 8b







LEGEND

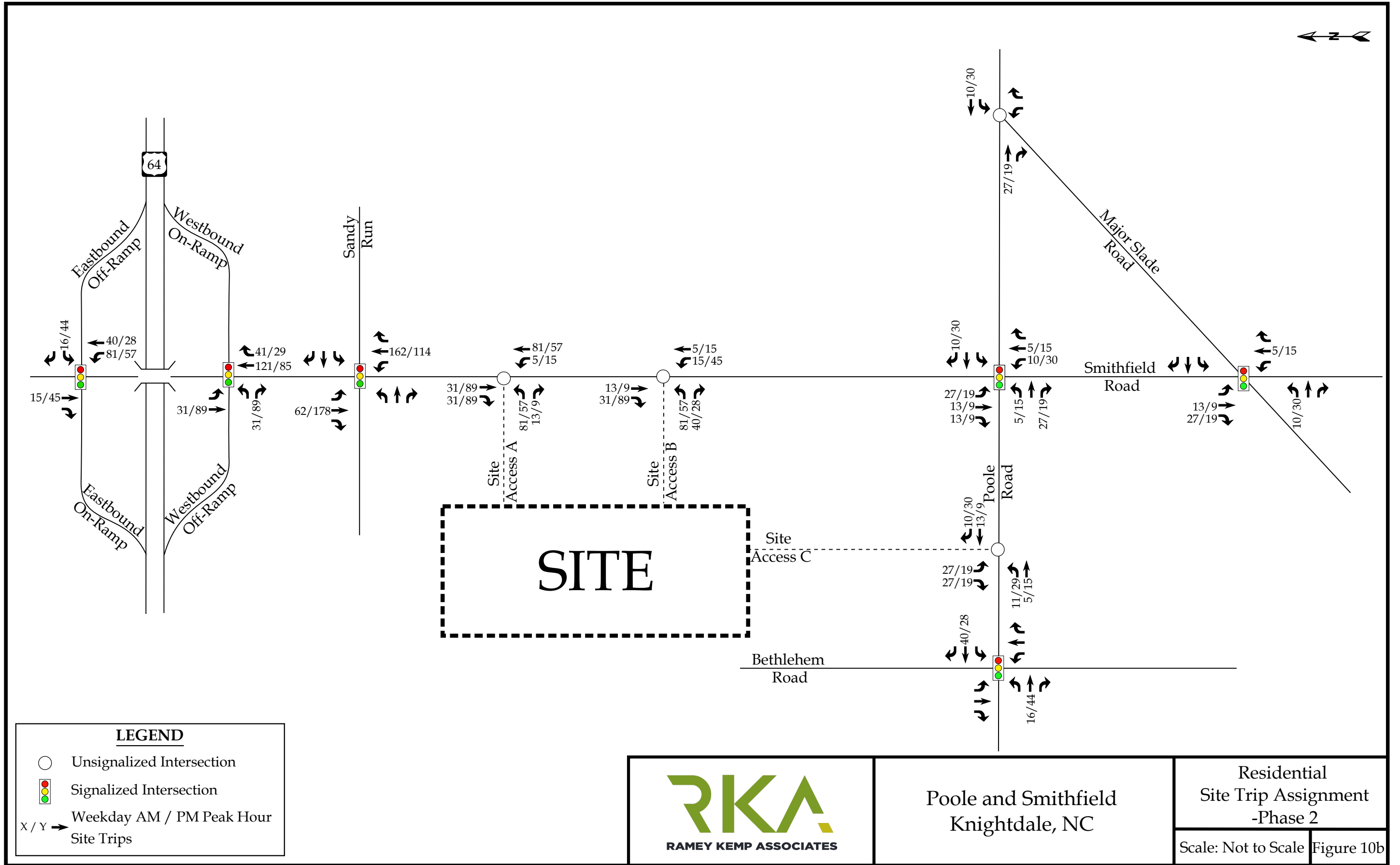
- Unsignalized Intersection
- ◫ Signalized Intersection
- X / Y → Weekday AM / PM Peak Hour Site Trips



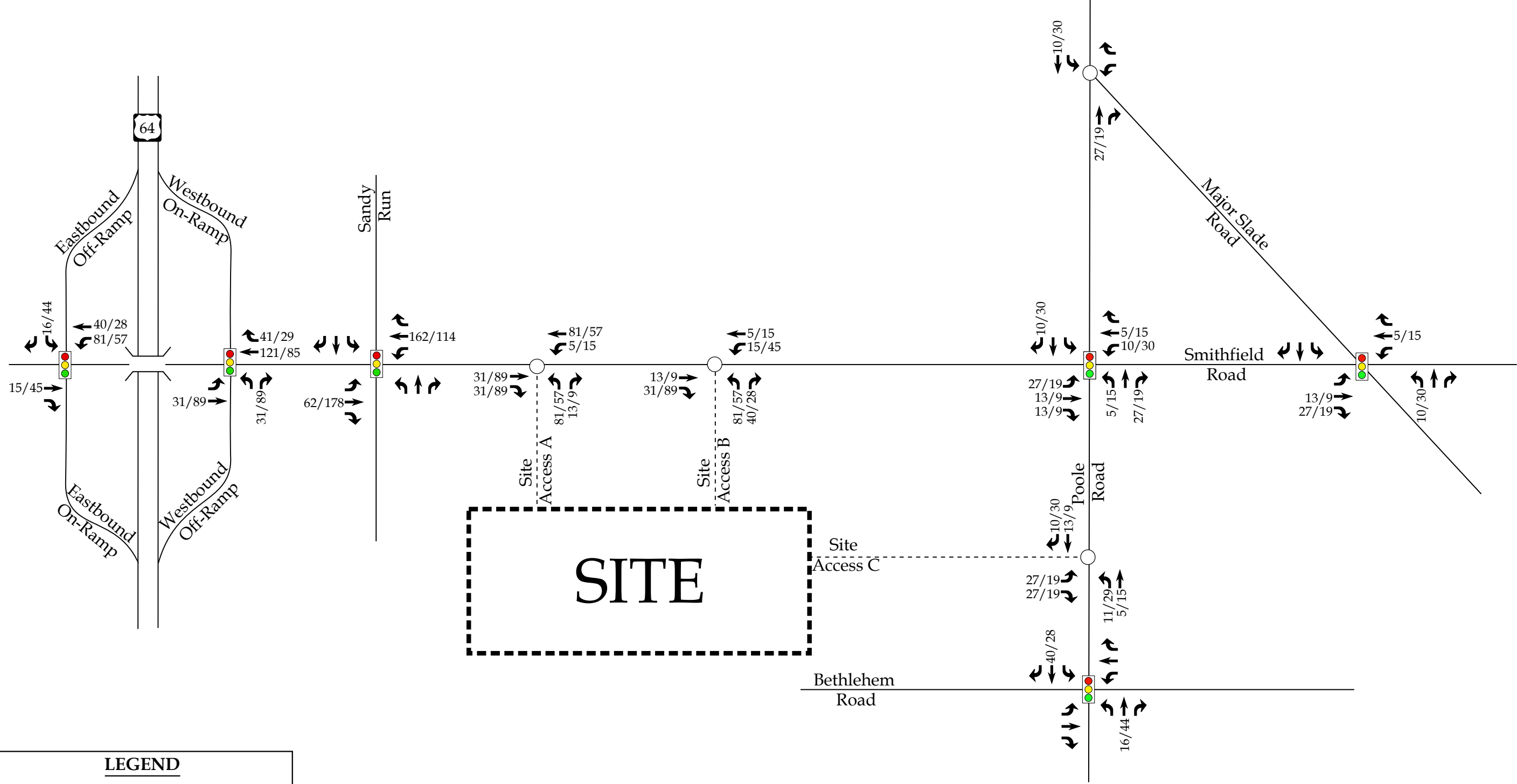
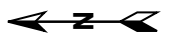
Poole and Smithfield
Knightdale, NC

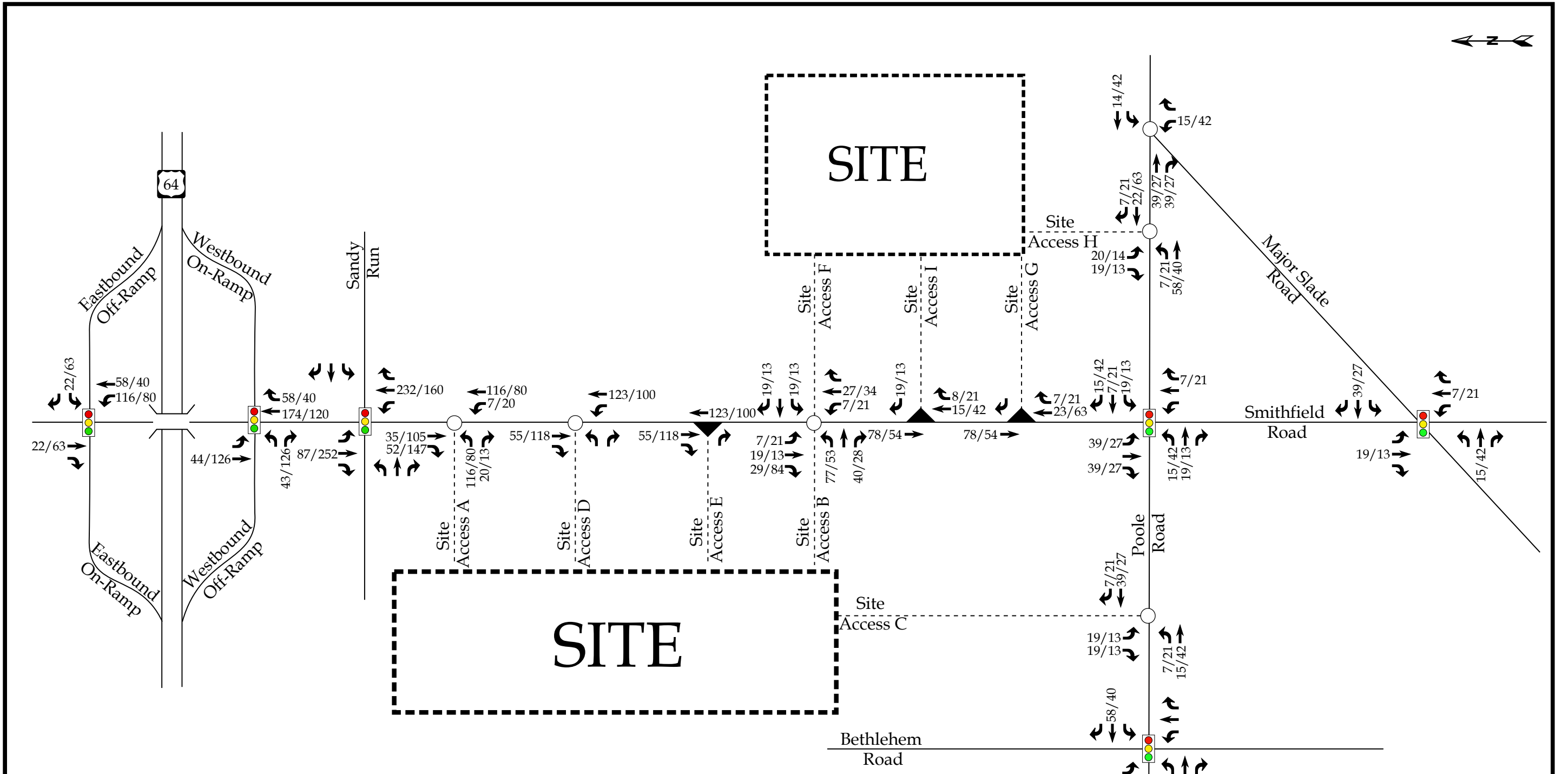
Residential
Site Trip Assignment
-Phase 1

Scale: Not to Scale | Figure 10a



SITE





LEGEND

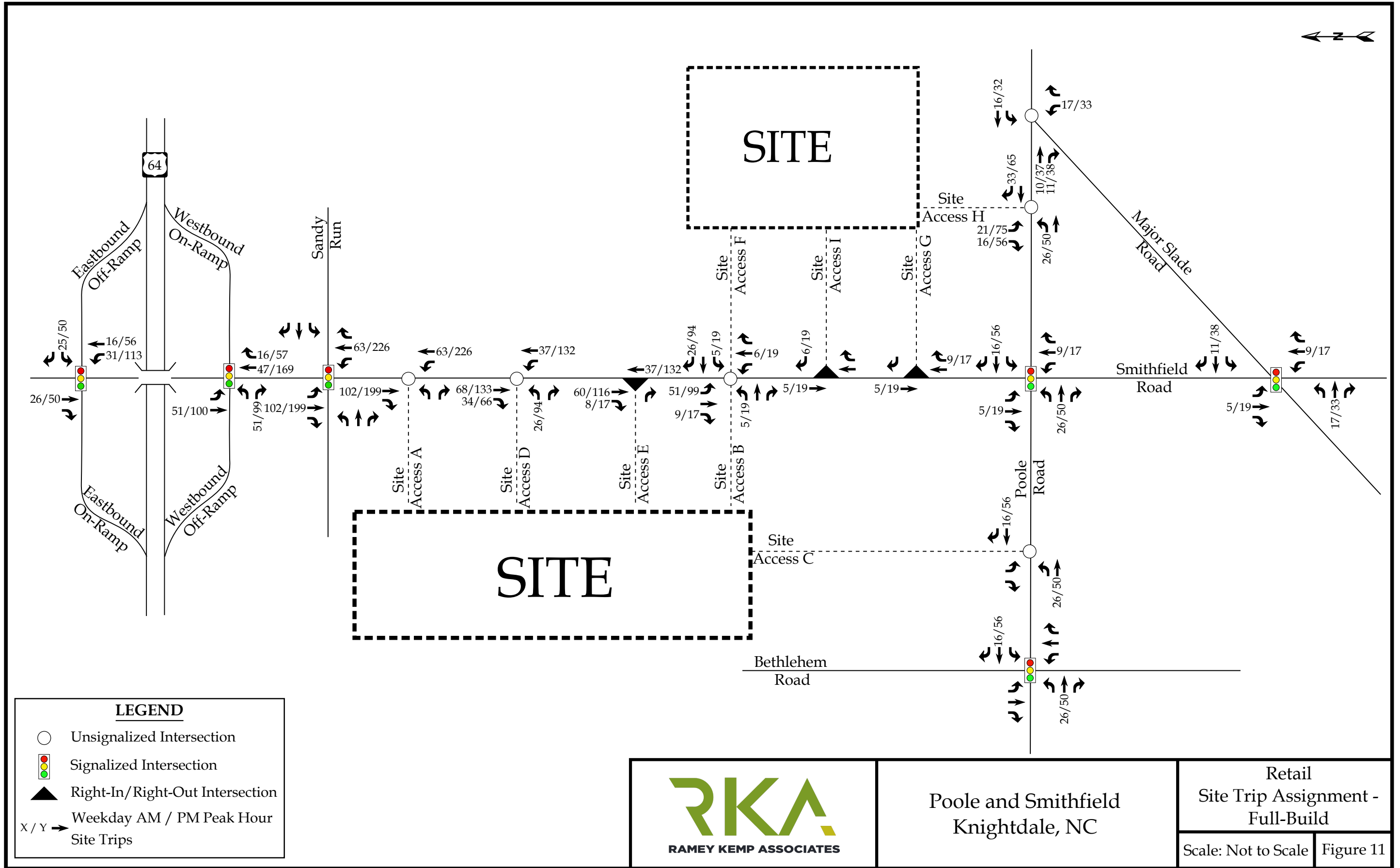
- Unsignalized Intersection
- Signalized Intersection
- ▲ Right-In/Right-Out Intersection
- X / Y → Weekday AM / PM Peak Hour Site Trips

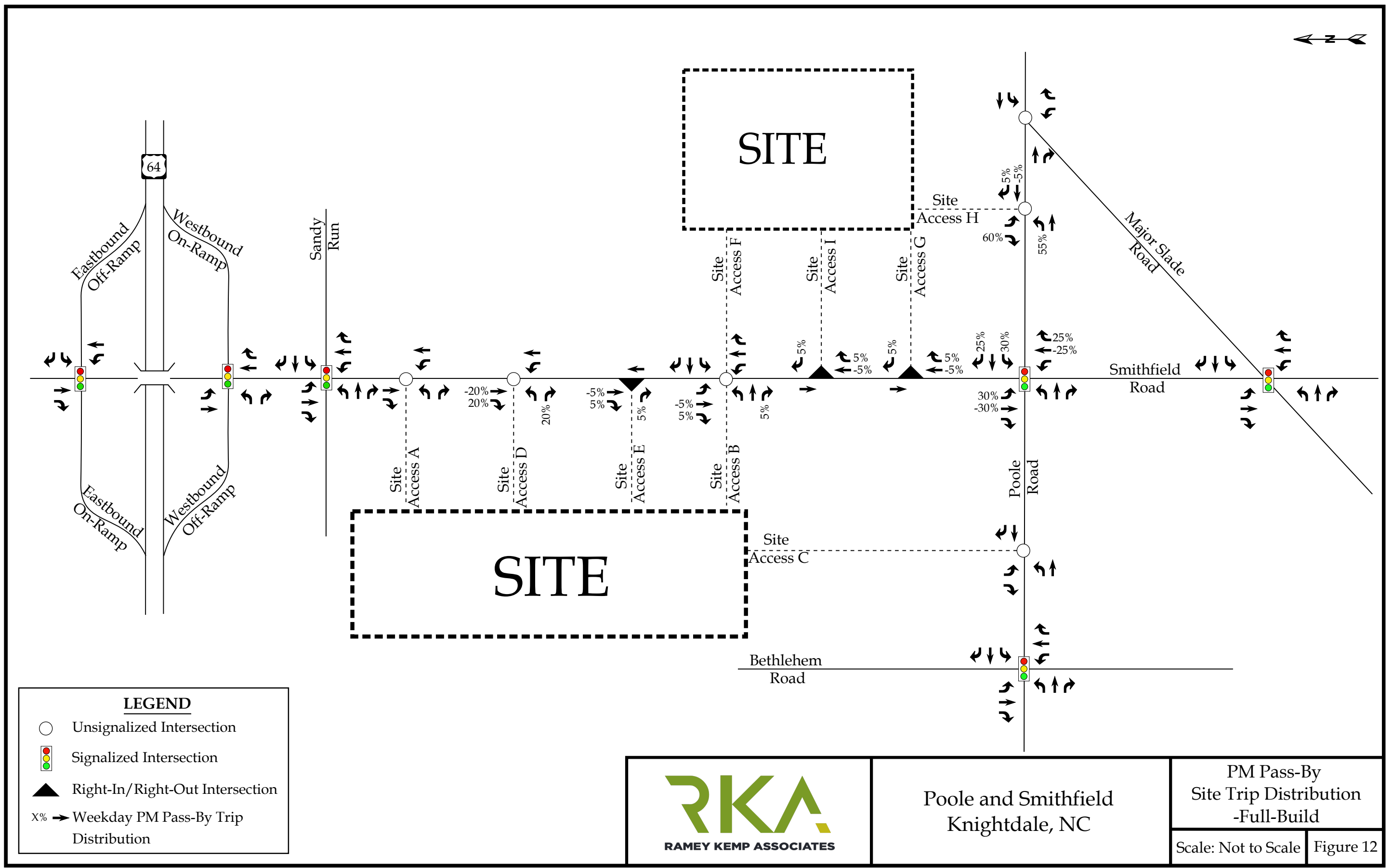
RKA
RAMEY KEMP ASSOCIATES

Poole and Smithfield
Knightdale, NC

Residential
Site Trip Assignment
- Full-Build

Scale: Not to Scale | Figure 10c

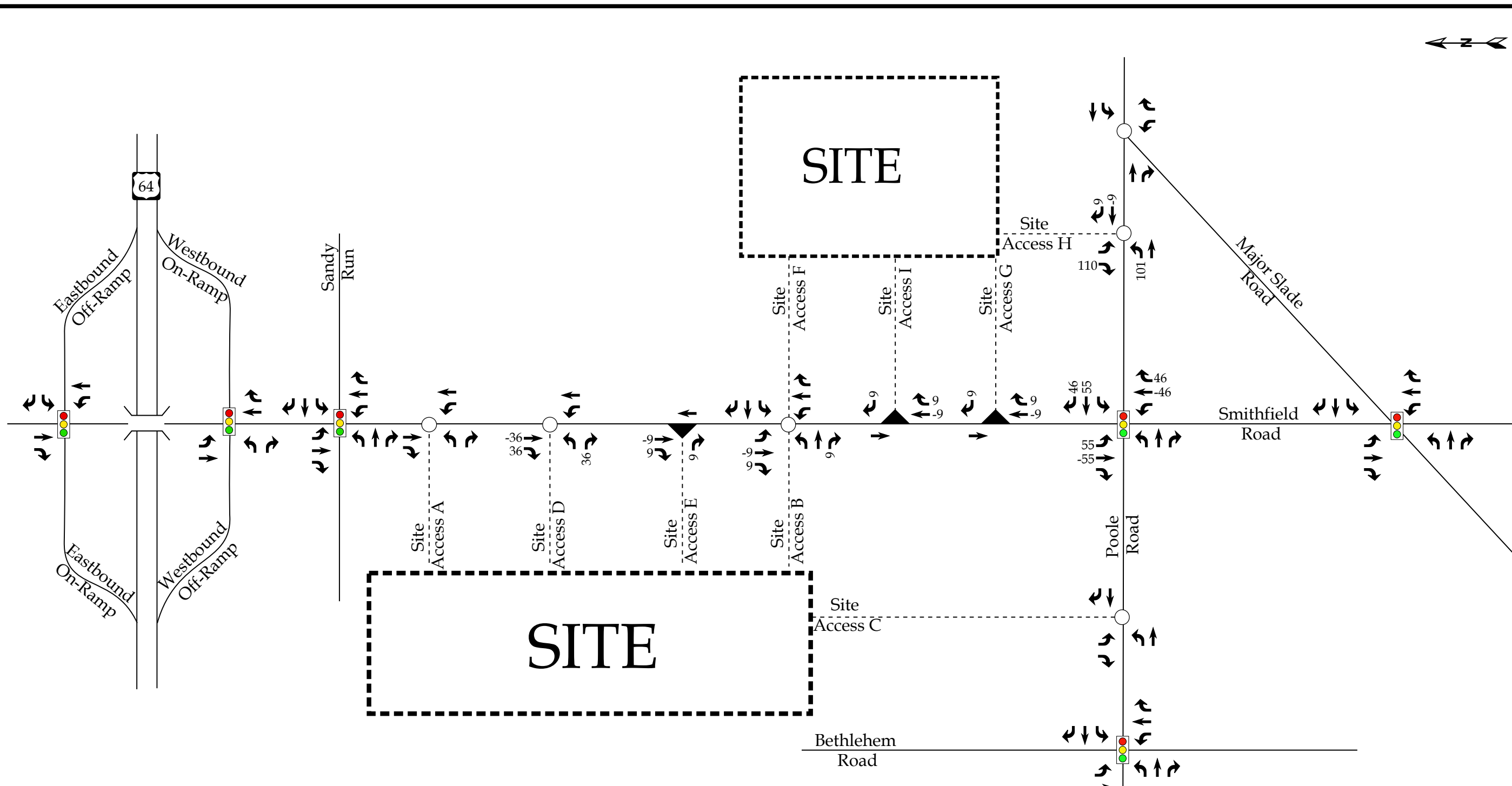




Poole and Smithfield
Knightdale, NC

PM Pass-By
Site Trip Distribution
-Full-Build

Scale: Not to Scale | Figure 12



LEGEND

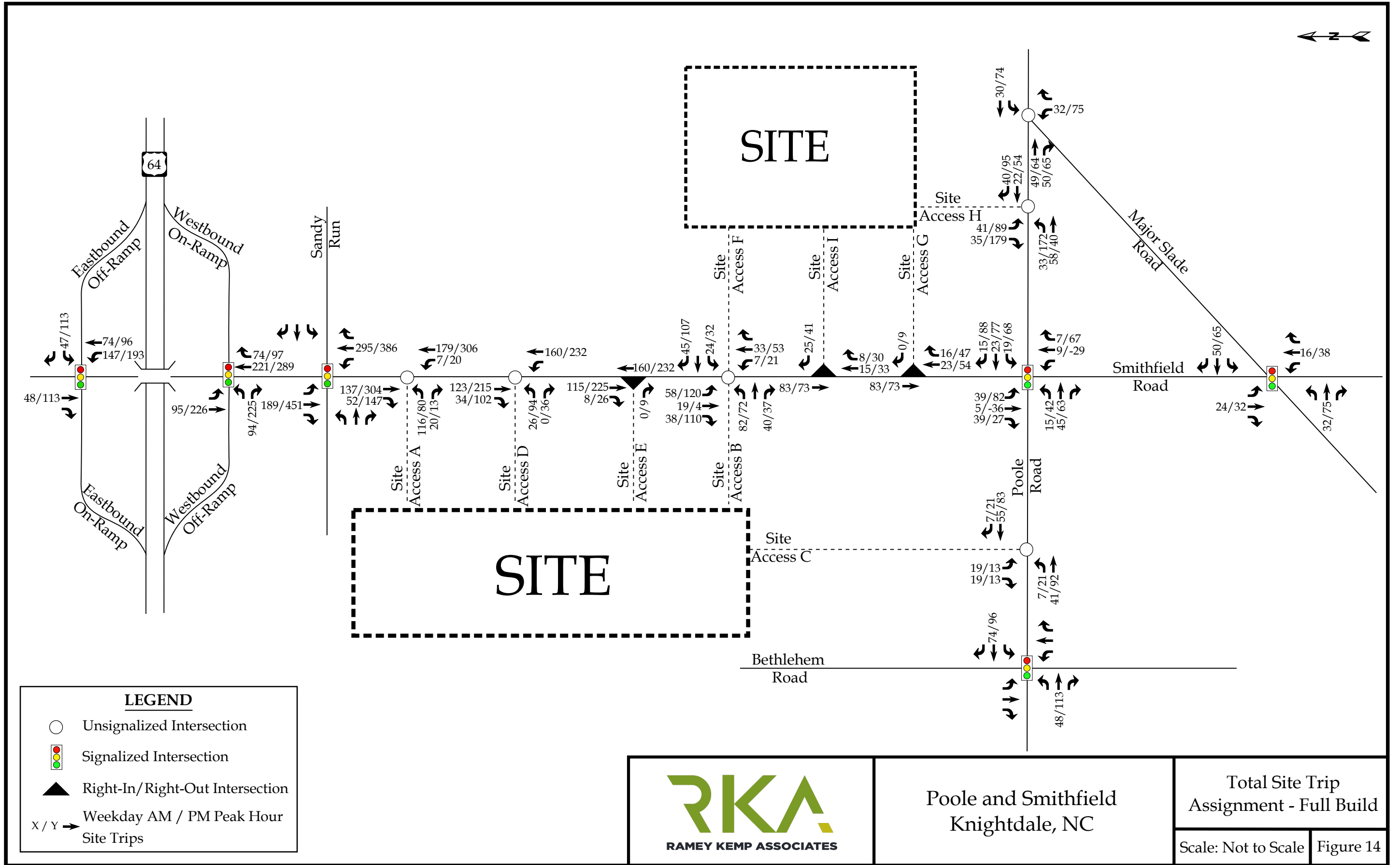
- Unsignalized Intersection
- 🚦 Signalized Intersection
- ▲ Right-In/Right-Out Intersection
- x → Weekday PM Peak Hour Site Trips



Pooler and Smithfield
Knightdale, NC

PM Pass-By
Site Trip Assignment -
Full Build

Scale: Not to Scale | Figure 13



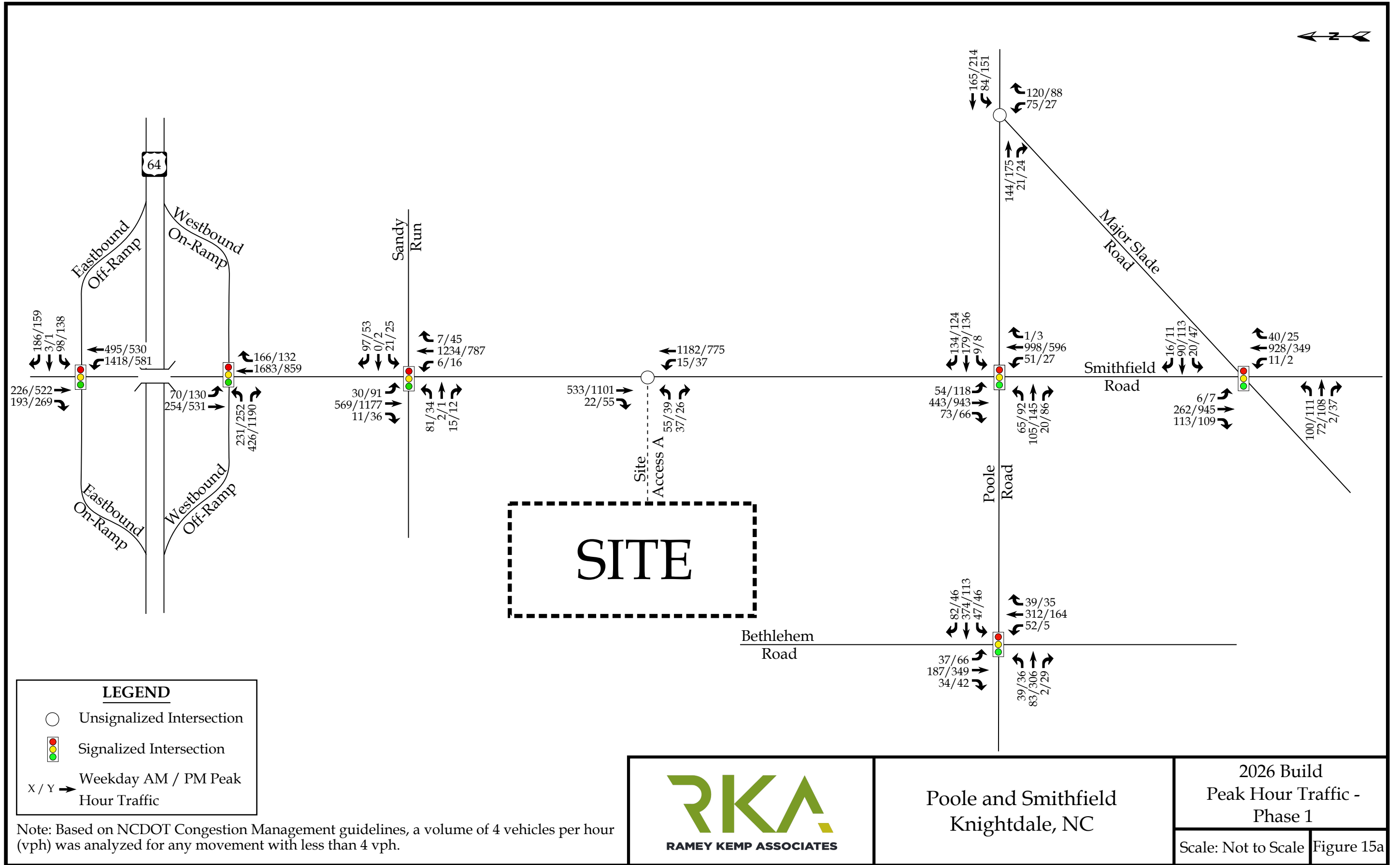
5. 2026/2029/2032 BUILD TRAFFIC CONDITIONS

5.1. 2026/2029/2032 Build Peak Hour Traffic Volumes

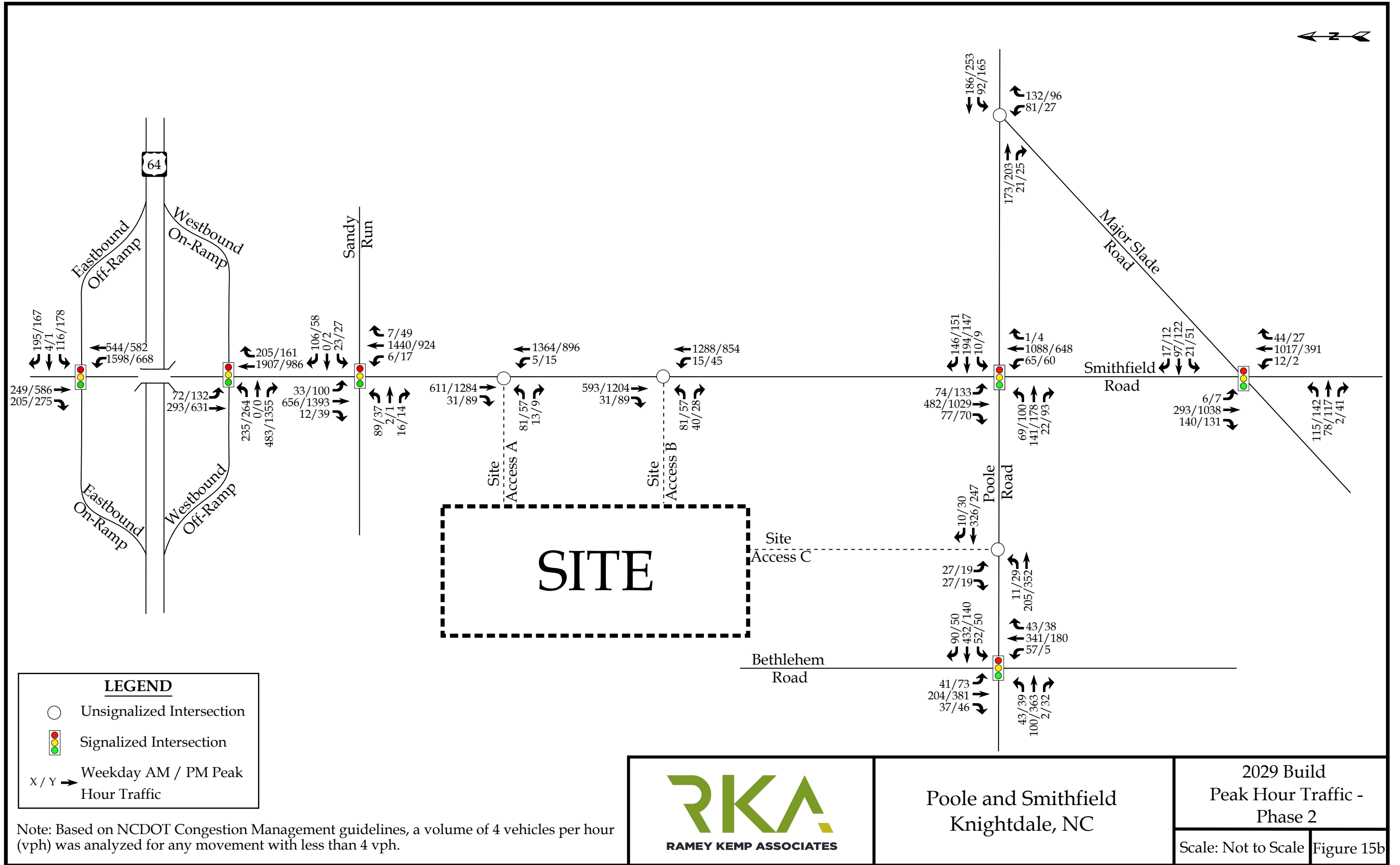
To estimate traffic conditions with the site fully built-out, the total site trips were added to the 2026/2029/2032 no-build traffic volumes to determine the 2026/2029/2032 build traffic volumes. Refer to Figures 15a, 15b, and 15c for an illustration of the 2026/2029/2032 build peak hour traffic volumes with the proposed site under Phase 1, Phase 2, and Full-Build, respectively.

5.2. Analysis of 2026/2029/2032 Build Peak Hour Traffic Conditions

Study intersections were analyzed with the 2026/2029/2032 build 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 8 of this report.



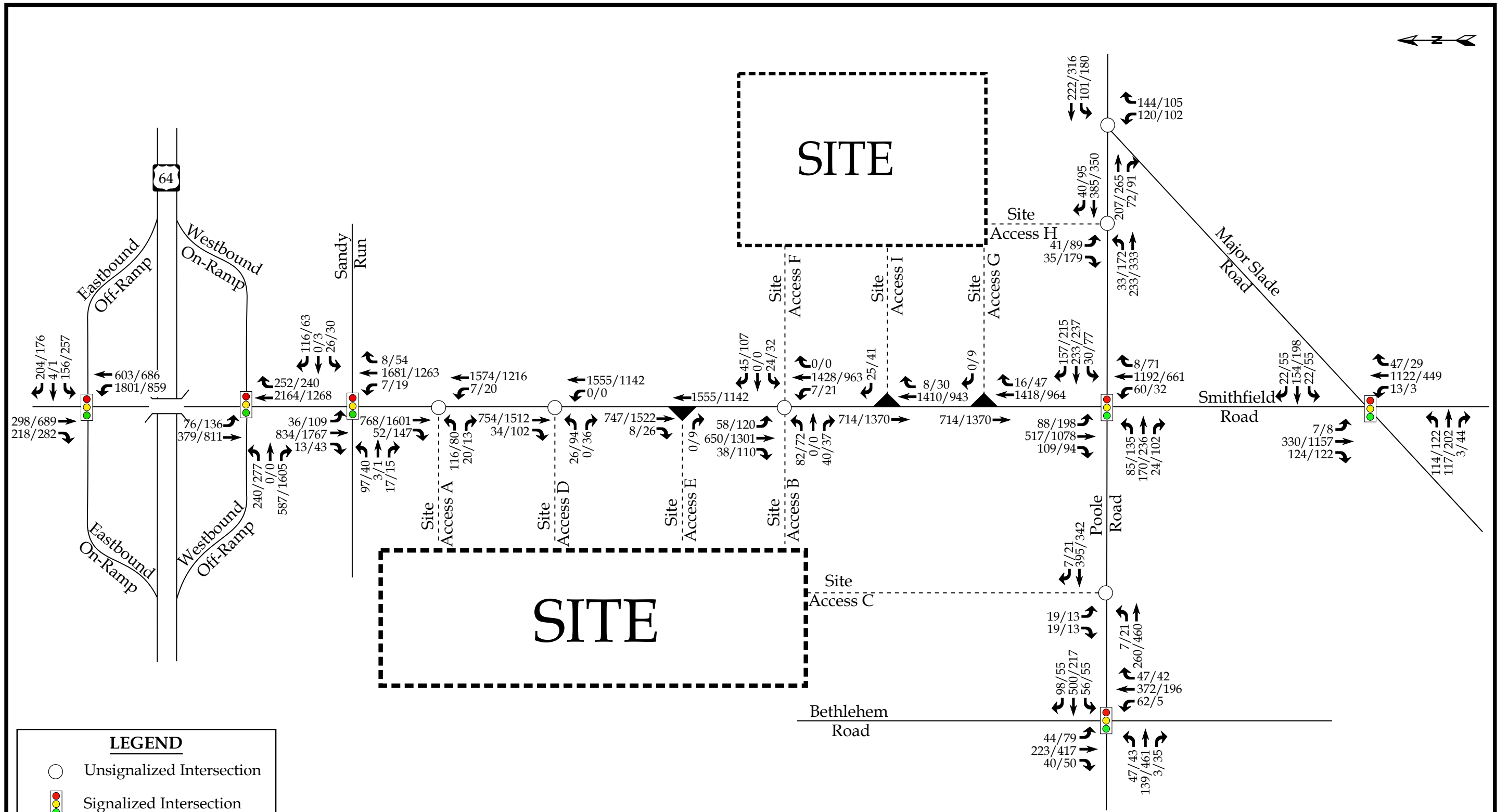
Note: Based on NCDOT Congestion Management guidelines, a volume of 4 vehicles per hour (vph) was analyzed for any movement with less than 4 vph.



Note: Based on NCDOT Congestion Management guidelines, a volume of 4 vehicles per hour (vph) was analyzed for any movement with less than 4 vph.



Poole and Smithfield
Knightdale, NC



LEGEND

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

Note: Based on NCDOT Congestion Management guidelines, a volume of 4 vehicles per hour (vph) was analyzed for any movement with less than 4 vph.



Poole and Smithfield
Knightdale, NC

2032 Build
Peak Hour Traffic -
Full Build

Scale: Not to Scale Figure 15c

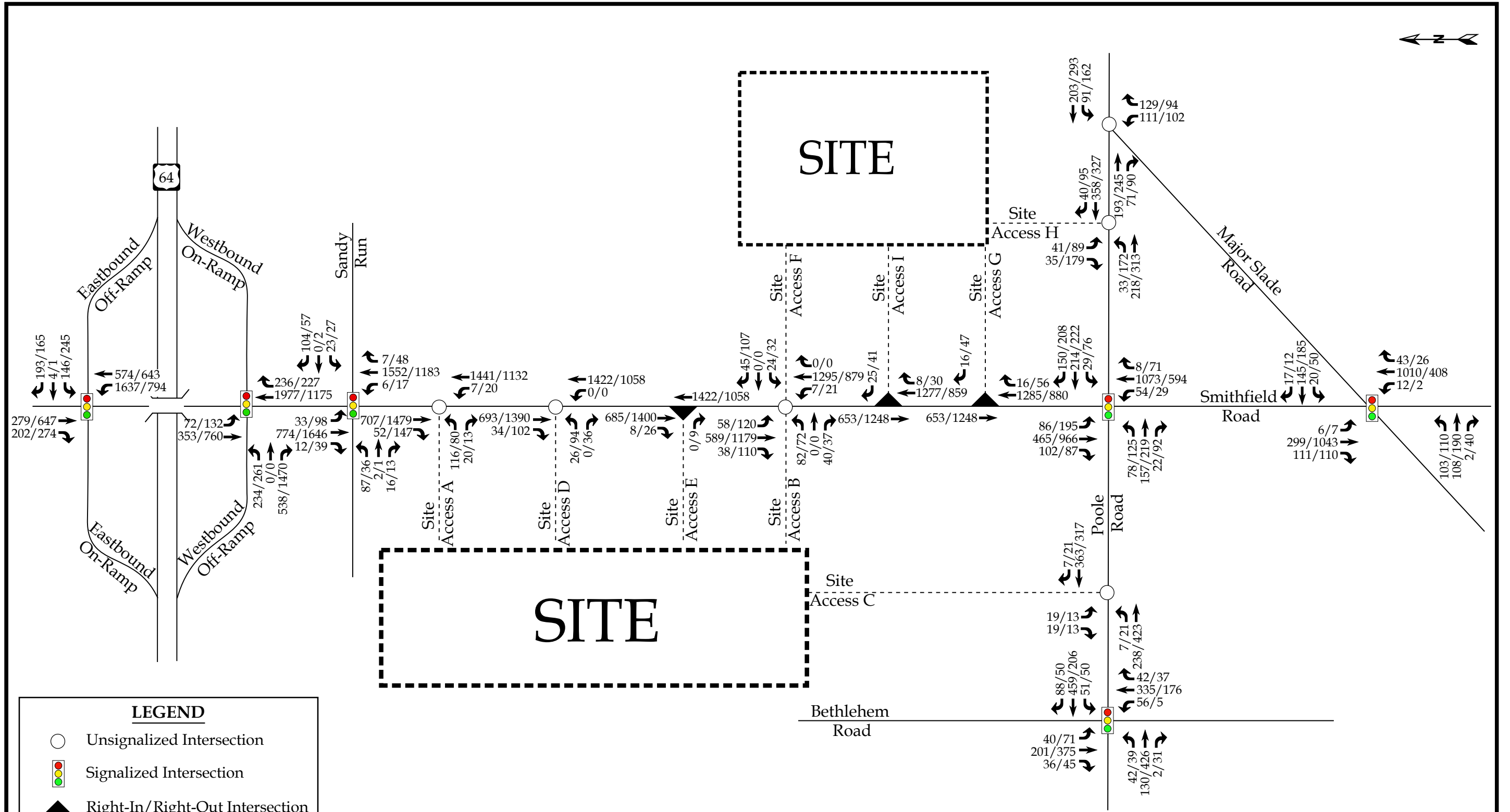
6. 2041 FUTURE TRAFFIC CONDITIONS

6.1. 2041 Future Peak Hour Traffic Volumes

Per the Town of Knightdale TIA guidelines, an analysis of the proposed development ten (10) years after build-out is required. In order to estimate traffic conditions ten years beyond build-out of the proposed development, 2022 existing volumes were grown to the future year 2041 using the NCDOT and Town approved 1% annual growth rate. Proposed development site trips [Figure 14] and adjacent development trips [Figure 6] were added to the projected traffic volumes to determine 2041 future traffic volumes. Refer to Figure 16 for an illustration of the 2041 future traffic volumes.

6.2. Analysis of 2041 Future Peak Hour Traffic

Study intersections were analyzed with the 2041 future traffic volumes using the same methodology previously discussed for existing, no-build, and build traffic conditions. The results of the capacity analysis for each intersection are presented in Section 8 of this report.



LEGEND

- Unsignalized Intersection
- 🚦 Signalized Intersection
- ▲ Right-In/Right-Out Intersection
- X / Y → Weekday AM / PM Peak Hour Traffic

Note: Based on NCDOT Congestion Management guidelines, a volume of 4 vehicles per hour (vph) was analyzed for any movement with less than 4 vph.



Poole and Smithfield
Knightdale, NC

2041 Future
Peak Hour Traffic

Scale: Not to Scale Figure 16

7. 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 6 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 6: 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

7.1. Adjustments to Analysis Guidelines

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

8. CAPACITY ANALYSIS

8.1. Poole Road [EB-WB] and Smithfield Road [NB-SB]

The existing signalized intersection of Poole Road and Smithfield Road was analyzed under 2022 existing, 2026/2029/2032 no-build, 2026/2029/2032 build, and 2041 future traffic conditions with lane configurations and traffic control shown in Table 7. It should be noted that under future conditions, STIP HL-0031 is expected to improve the intersection by addition exclusive left-turn lanes on all approaches. Refer to Table 7 for a summary of the analysis results. Refer to Appendix F for the Synchro capacity analysis reports. SimTraffic queuing reports can be found in Appendix U.

Table 7: Analysis Summary of Poole Road and Smithfield Road

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
2022 Existing	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	D D C A	C (24)	E D B C	C (29)
2026 No-Build	EB WB NB SB	<u>1 LT</u> , 1 TH-RT <i>1 LT</i> , 1 TH, <i>1 RT</i> <u>1 LT</u> , 1 TH-RT <u>1 LT</u> , 1 TH-RT	D D F C	E (66)	D D C E	D (55)
2029 No-Build	EB WB NB SB	<u>1 LT</u> , 1 TH-RT <u>1 LT</u> , 1 TH, <i>1 RT</i> <u>1 LT</u> , 1 TH-RT <u>1 LT</u> , 1 TH-RT	D D F C	F (87)	D D C F	E (77)
2032 No-Build	EB WB NB SB	<u>1 LT</u> , 1 TH-RT <u>1 LT</u> , 1 TH, <i>1 RT</i> <u>1 LT</u> , 1 TH-RT <u>1 LT</u> , 1 TH-RT	D D F C	F (112)	D D D F	F (98)
2026 Build - Phase 1	EB WB NB SB	<u>1 LT</u> , 1 TH-RT <u>1 LT</u> , 1 TH, <i>1 RT</i> <u>1 LT</u> , 1 TH-RT <u>1 LT</u> , 1 TH-RT	D D F C	E (68)	D D C F	E (64)
2029 Build - Phase 2	EB WB NB SB	<u>1 LT</u> , 1 TH-RT <u>1 LT</u> , 1 TH, <i>1 RT</i> <u>1 LT</u> , 1 TH-RT <u>1 LT</u> , 1 TH-RT	D D F C	F (88)	E D C F	F (91)

Background improvements to lane configurations by STIP HL-0031 shown underlined.

Background improvements to lane configurations by the Poole Road Assemblage development shown in *italics*.

Table 7: Analysis Summary of Poole Road and Smithfield Road
(continued)

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)
2032 Build - Full Build	EB	<u>1 LT</u> , 1 TH-RT	E	F (124)	F	F (118)
	WB	<u>1 LT</u> , 1 TH, <i>1 RT</i>	E			
	NB	<u>1 LT</u> , 1 TH-RT	F			
	SB	<u>1 LT</u> , 1 TH-RT	C			
2026 Build - Phase 1 - with Signal Timing Modifications	EB	<u>1 LT</u> , 1 TH-RT	D	D (50)	E	D (53)
	WB	<u>1 LT</u> , 1 TH, <i>1 RT</i>	E			
	NB	<u>1 LT</u> , 1 TH-RT	E			
	SB	<u>1 LT</u> , 1 TH-RT	C			
2029 Build - Phase 2 - with Improvements	EB	<u>1 LT</u> , 1 TH-RT	E	E (72)	E	E (62)
	WB	<u>1 LT</u> , 1 TH, <i>1 RT</i>	F			
	NB	<u>1 LT</u> , 1 TH-RT	F			
	SB	<u>1 LT</u> , 1 TH, 1 RT	C			
2032 Build - Full Build - with Improvements	EB	<u>1 LT</u> , 1 TH-RT	E	F (99)	F	F (89)
	WB	<u>1 LT</u> , 1 TH, <i>1 RT</i>	F			
	NB	<u>1 LT</u> , 1 TH-RT	F			
	SB	<u>1 LT</u> , 1 TH, 1 RT	C			
2041 Future	EB	<u>1 LT</u> , 1 TH-RT	E	E (72)	F	E (67)
	WB	<u>1 LT</u> , 1 TH, <i>1 RT</i>	E			
	NB	<u>1 LT</u> , 1 TH-RT	F			
	SB	<u>1 LT</u> , 1 TH, 1 RT	C			

Background improvements to lane configurations by STIP HL-0031 shown underlined.
Background improvements to lane configurations by the Poole Road Assemblage development shown in *italics*.
Improvements by Developer shown in **bold**.

Capacity analysis of 2022 existing traffic conditions indicates that the intersection of Poole Road and Smithfield Road is expected to operate at an overall LOS C during the weekday AM and PM peak hours. Under 2026 no-build conditions, the intersection is expected to operate at an overall LOS E during the weekday AM peak hour and an overall LOS D during the weekday PM peak hour. Capacity analysis of 2029/2032 no-build, 2026/2029/2032 build, and 2041 future build conditions indicates that the intersection is expected to operate at an overall poor level of service (LOS E or F) during the weekday AM and PM peak hours.

To mitigate poor levels of service experienced at the intersection under future conditions, an exclusive southbound right-turn lane was analyzed under 2029/2032 build conditions. An

exclusive southbound right-turn lane with a minimum of 75 feet of storage is expected to improve delays under 2029/2032 build conditions to be better than that of 2029/2032 no-build conditions and is recommended by the build-out of Phase 2 of the proposed development.

A single-lane roundabout with exclusive right-turn slip lanes on each approach was considered at this intersection under 2032 build conditions to further improve level of service during the weekday AM and PM peak hours. Due to heavy volumes on the major-street under future conditions, a roundabout is not recommended at this intersection as it is not expected to improve operations or have an adequate lifespan per NCDOT standards.

In order to improve operations at this intersection to an overall LOS D, per the Town's Unified Development Ordinance (UDO), additional thru capacity would be necessary to accommodate heavy volumes on the major thoroughfare. It should be noted that per the Comprehensive Transportation Plan (CTP), Smithfield Road is slated to become a four-lane divided roadway. Additionally, the proposed development is expected to provide approximately 0.6 miles of widening along its frontage on either side of Smithfield Road to construct a portion of the planned four-lane divided section. The future widening of Smithfield Road is expected to alleviate delays and queueing at this intersection.

8.2. Smithfield Road [NB-SB] and Sandy Run [EB-WB]

The existing signalized intersection of Smithfield Road and Sandy Run was analyzed under 2022 existing, 2026/2029/2032 no-build, 2026/2029/2032 build, and 2041 future traffic conditions with existing lane configurations and traffic control. Refer to Table 8 for a summary of the analysis results. Refer to Appendix G for the Synchro capacity analysis reports. SimTraffic queuing reports can be found in Appendix U.

Table 8: Analysis Summary of Smithfield Road and Sandy Run

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)
2022 Existing	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	E D C A	(21)	D D B A	B (12)
2026 No-Build	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	F E D A	(34)	D E C B	C (21)
2029 No-Build	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	F E E A	(52)	E E D C	C (31)
2032 No-Build	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	F E F A	(86)	E E D D	D (42)
2026 Build - Phase 1	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	F E D A	(40)	D E C B	C (25)
2029 Build - Phase 2	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	F E F A	(86)	E E D D	D (49)
2032 Build - Full Build	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	F E F B	(153)	E E F F	F (129)

Table 8: Analysis Summary of Smithfield Road and Sandy Run
(continued)

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)
2029 Build - Phase 2 - with Improvements*	EB	1 LT, 1 TH-RT	F	E (72)	F	C (25)
	WB	1 LT-TH-RT	C			
	NB	1 LT, 1 TH-RT	F			
	SB	1 LT, 1 TH-RT	A			
2032 Build - Full Build - with Improvements*	EB	1 LT, 1 TH-RT	F	F (124)	F	F (92)
	WB	1 LT-TH-RT	C			
	NB	1 LT, 1 TH-RT	F			
	SB	1 LT, 1 TH-RT	A			
2041 Future	EB	1 LT, 1 TH-RT	F	F (96)	F	E (69)
	WB	1 LT-TH-RT	F			
	NB	1 LT, 1 TH-RT	F			
	SB	1 LT, 1 TH-RT	A			

Improvements by Developer shown in bold.

*Right-Turn-On-Red turned on to analyze realistic operations.

Capacity analysis of 2022 existing, 2026/2029 no-build, and 2026 build traffic conditions indicates that the intersection of Smithfield Road and Sandy Run is expected to operate at an overall LOS D or better during the weekday AM and PM peak hours. Under 2032 no-build and 2029 build conditions, the intersection is expected to operate at an overall LOS F during the weekday AM peak hour and an overall LOS D during the weekday PM peak hour. Capacity analysis of 2032 build and 2041 future conditions indicates that the intersection is expected to operate at an overall LOS F or E during the weekday AM and PM peak hours.

In order to improve operations at this intersection to an overall LOS D, per the Town’s Unified Development Ordinance (UDO), an exclusive eastbound left-turn lane with a minimum of 275 feet of storage would be needed. Furthermore, additional thru capacity would be necessary to accommodate heavy volumes on the major thoroughfare. It should be noted that per the Comprehensive Transportation Plan (CTP), Smithfield Road is slated to become a four-lane divided roadway. Additionally, the proposed development is expected to provide approximately 0.6 miles of widening along its frontage on either side of Smithfield Road to

construct a portion of the planned four-lane divided section. Interconnectivity within the proposed development to surrounding existing residential developments is expected to provide alternative routes for traffic exiting the site to access Smithfield Road. The future widening of Smithfield Road as well as interconnectivity to existing residential streets is expected to alleviate traffic utilizing this intersection and decrease delays and queueing.

8.3. Smithfield Road [NB-SB] and I-87 (US 64/264) Eastbound Ramps [EB]

The existing signalized intersection of Smithfield Road and I-87 (US 64/264) Eastbound Ramps were analyzed under 2022 existing, 2026/2029/2032 no-build, 2026/2029/2032 build, and 2041 future traffic conditions with the lane configurations and traffic control shown in Table 9. Under 2045 future conditions, the intersection was analyzed as half of a diverging diamond interchange, per future roadway improvements associated with STIP I-6007. Refer to Table 9 for a summary of the analysis results. Refer to Appendix H for the Synchro capacity analysis reports. SimTraffic queuing reports can be found in Appendix U.

Table 9: Analysis Summary of Smithfield Road and I-87 (US 64/264) Eastbound Ramps

ANALYSIS SCENARIO	NODE	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
				Approach	Overall (seconds)	Approach	Overall (seconds)
2022 Existing	3	EB NB SB	1 LT, 1 RT 2 TH, 1 RT 1 LT, 1 TH	D A B	B (14)	F A D	D (51)
2026 No-Build	3	EB NB SB	1 LT, 1 RT 2 TH, 1 RT 1 LT, 1 TH	C B D	C (24)	F A D	F (118)
2029 No-Build	3	EB NB SB	1 LT, 1 RT 2 TH, 1 RT 1 LT, 1 TH	C B D	C (26)	F A D	F (151)
2032 No-Build	3	EB NB SB	1 LT, 1 RT 2 TH, 1 RT 1 LT, 1 TH	D C D	C (32)	F A D	F (190)
2026 Build - Phase 1	3	EB NB SB	1 LT, 1 RT 2 TH, 1 RT 1 LT, 1 TH	C B D	C (24)	F A D	F (129)
2029 Build - Phase 2	3	EB NB SB	1 LT, 1 RT 2 TH, 1 RT 1 LT, 1 TH	D B D	C (28)	F A D	F (190)
2032 Build - Full Build	3	EB NB SB	1 LT, 1 RT 2 TH, 1 RT 1 LT, 1 TH	E C D	D (41)	F A F	F (272)
2041 Future	3	EB NB SB	1 LT, 1 RT 2 TH, 1 RT 1 LT, 1 TH	D C D	C (30)	F A E	F (232)

**Table 9: Analysis Summary of Smithfield Road and I-87 (US 64/264)
Eastbound Ramps (continued)**

ANALYSIS SCENARIO	NODE	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
				Approach	Overall (seconds)	Approach	Overall (seconds)
2045 Future - with STIP I-6007 Improvements	33	EB SB	<u>2 RT</u> <u>1 TH</u>	C A	B (19)	E C	D (49)
	35	WB SB	<u>2 TH</u> <u>1 LT</u>	C D	C (24)	C C	C (21)
	38	EB NB	<u>1 LT</u> <u>2 TH</u>	D A	A (7)	C A	A (6)

Improvements to lane configurations by STIP I-6007 shown underlined.

Capacity analysis of 2022 existing traffic conditions indicates that the intersection of Smithfield Road and I-87 (US 64/264) Eastbound Ramps is expected to operate at an overall LOS D or better during the weekday AM and PM peak hours. Under 2026/2029/2032 no-build, 2026/2029/2032 build, and 2041 future conditions, the intersection is expected to operate at an overall LOS D or better during the weekday AM peak hour and LOS F during the weekday PM peak hour. This intersection was analyzed as half of a diverging diamond interchange under 2045 future conditions per future roadway improvements associated with STIP I-6007. Capacity analysis of 2045 future conditions indicates that 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 signal is currently operating in free run conditions, which means that there is not time of day signal timings that adjust the signal timings throughout the day to account for traffic pattern changes. Coordinated timings during the weekday peak hours would be beneficial by dedicating the appropriate green time to the heavier movements. Additionally, the improvements associated with STIP I-6007 are expected to convert this intersection to a diverging diamond interchange and relieve delays and queuing at the intersection.

Per the Comprehensive Transportation Plan (CTP), Smithfield Road is slated to become a four-lane divided roadway. Additionally, the proposed development is expected to provide approximately 0.6 miles of widening along its frontage on either side of Smithfield Road to construct a portion of the planned four-lane divided section. The future widening of Smithfield Road is expected to alleviate delays and queueing at this intersection. Due to these reasons and the expectation that improvements to I-540 will further improve traffic patterns along Smithfield Road, no further improvements are recommended by the proposed development.

8.4. Smithfield Road [NB-SB] and I-87 (US 64/264) Westbound Ramps [WB]

The existing signalized intersections of Smithfield Road and I-87 (US 64 / 264) WB Ramps were analyzed under 2022 existing, 2026/2029/2032 no-build, 2026/2029/2032 build, and 2041 future traffic conditions with the lane configurations and traffic control shown in Table 10. Refer to Table 10 for a summary of the analysis results. Under 2041 future, the intersection was analyzed as half of a diverging diamond interchange, per future roadway improvements associated with STIP I-6007. Refer to Table 10 for a summary of the analysis results. Refer to Appendix I for the Synchro capacity analysis reports. SimTraffic queuing reports can be found in Appendix U.

Table 10: Analysis Summary of Smithfield Road and I-87 (US 64 / 264) Westbound Ramps

ANALYSIS SCENARIO	NODE	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
				Approach	Overall (seconds)	Approach	Overall (seconds)
2022 Existing	4	WB NB SB	1 LT, 1 TH-RT 1 LT, 1 LT-TH 1 TH, 1 RT	D B B	B (16)	D A B	B (14)
2026 No-Build	4	WB NB SB	1 LT, 1 TH-RT <u>2</u> LT, 1 TH 1 TH, 1 RT	D D C	D (35)	D C B	C (26)
2029 No-Build	4	WB NB SB	1 LT, 1 TH-RT <u>2</u> LT, 1 TH 1 TH, 1 RT	D E C	D (53)	D C B	C (28)
2032 No-Build	4	WB NB SB	1 LT, 1 TH-RT <u>2</u> LT, 1 TH 1 TH, 1 RT	D F C	F (82)	D D B	C (33)
2026 Build - Phase 1	4	WB NB SB	1 LT, 1 TH-RT <u>2</u> LT, 1 TH 1 TH, 1 RT	D D C	D (39)	D C B	C (26)
2029 Build - Phase 2	4	WB NB SB	1 LT, 1 TH-RT <u>2</u> LT, 1 TH 1 TH, 1 RT	D F C	E (72)	D D B	C (35)
2032 Build - Full Build	4	WB NB SB	1 LT, 1 TH-RT <u>2</u> LT, 1 TH 1 TH, 1 RT	D F C	F (131)	E F C	F (122)

**Table 10: Analysis Summary of Smithfield Road and I-87 (US 64 / 264)
Westbound Ramps (continued)**

ANALYSIS SCENARIO	NODE	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
				Approach	Overall (seconds)	Approach	Overall (seconds)
2041 Future	4	WB NB SB	1 LT, 1 TH-RT <u>2 LT</u> , 1 TH 1 TH, 1 RT	D F C	F (89)	E D C	D (46)
2045 Future - with STIP I-6007 Improvements	43	WB NB	<u>1 RT</u> <u>1 TH</u>	C A	B (11)	C A	A (8)
	45	EB SB	<u>1 TH</u> <u>1 TH</u>	B B	B (15)	C C	C (23)
	48	WB SB	<u>1 LT</u> <u>1 TH</u>	C A	B (11)	C A	A (6)

Improvements to lane configurations by STIP I-6007 shown underlined.

Capacity analysis of 2022 existing, 2026/2029 no-build, 2026 build traffic conditions indicates that the intersection of Smithfield Road and I-87 (US 64/264) Westbound Ramps is expected to operate at an overall LOS D or better during the weekday AM and PM peak hours. Under 2032 no-build, 2029 build, and 2041 future conditions, the intersection is expected to operate at an overall poor LOS (E or F) during the weekday AM peak hour and an overall LOS D or better during the weekday PM peak hour. Capacity analysis of 2032 build conditions indicates that the intersection is expected to operate at an overall LOS F during the weekday AM and PM peak hours. This intersection was analyzed as half of a diverging diamond interchange under 2045 future conditions per future roadway improvements associated with STIP I-6007. Capacity analysis of 2045 future conditions indicates that the intersection is expected to operate at an overall LOS C or better during the weekday AM and PM peak hours.

It should be noted that this signal is currently operating in free run conditions, which means that there is not time of day signal timings that adjust the signal timings throughout the day to account for traffic pattern changes. Coordinated timings during the weekday peak hours would be beneficial by dedicating the appropriate green time to the heavier movements. Additionally, the improvements associated with STIP I-6007 are expected to convert this

intersection to a diverging diamond interchange and relieve delays and queuing at the intersection.

Per the Comprehensive Transportation Plan (CTP), Smithfield Road is slated to become a four-lane divided roadway. Additionally, the proposed development is expected to provide approximately 0.6 miles of widening along its frontage on either side of Smithfield Road to construct a portion of the planned four-lane divided section. The future widening of Smithfield Road is expected to alleviate delays and queuing at this intersection. Due to these reasons and the expectation that improvements to I-540 will further improve traffic patterns along Smithfield Road, no further improvements are recommended by the proposed development.

8.5. Smithfield Road [NB-SB] and Major Slade Road [EB-WB]

The existing signalized intersection of Smithfield Road and Major Slade Road was analyzed under 2022 existing, 2026/2029/2032 no-build, 2026/2029/2032 build, and 2041 future traffic conditions with existing lane configurations and traffic control. Refer to Table 11 for a summary of the analysis results. Refer to Appendix J for the Synchro capacity analysis reports. SimTraffic queuing reports can be found in Appendix U.

Table 11: Analysis Summary of Smithfield Road and Major Slade 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)
2022 Existing	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	D D B A	B (19)	E D A C	C (26)
2026 No-Build	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	E D C A	C (24)	E D B D	D (38)
2029 No-Build	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	E D C A	C (31)	E D B E	E (60)
2032 No-Build	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	E D E B	D (46)	E D B F	F (93)
2026 Build - Phase 1	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	E D C A	C (25)	E D B D	D (42)
2029 Build - Phase 2	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	E D C B	C (33)	E D B F	E (80)
2032 Build - Full Build	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	E D E B	E (60)	E D C F	F (129)

**Table 11: Analysis Summary of Smithfield Road and Major Slade Road
(continued)**

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)
2029 Build - Phase 2 - with Improvements	EB	1 LT-TH-RT	E	C (32)	E	D (48)
	WB	1 LT-TH-RT	D		D	
	NB	1 LT-TH-RT	C		C	
	SB	1 LT-TH, 1 RT	A		E	
2032 Build - Full Build - with Improvements	EB	1 LT, 1 TH-RT	E	D (36)	D	D (52)
	WB	1 LT-TH-RT	D		F	
	NB	1 LT-TH-RT	D		B	
	SB	1 LT-TH, 1 RT	A		E	
2041 Future	EB	1 LT, 1 TH-RT	D	C (25)	D	C (33)
	WB	1 LT-TH-RT	D		E	
	NB	1 LT-TH-RT	C		B	
	SB	1 LT-TH, 1 RT	A		C	

Improvements by Developer shown in bold.

Capacity analysis of 2022 existing, 2026 no-build, and 2026 build traffic conditions indicates that the intersection of Smithfield Road and Major Slade Road is expected to operate at an overall LOS D or better during the weekday AM and PM peak hours. Under 2029 no-build and 2029 build conditions, the intersection is expected to operate at an overall LOS C during the weekday AM peak hour and an overall LOS E during the weekday PM peak hour. Capacity analysis of 2032 no-build and 2032 build conditions indicates that the intersection is expected to operate at an overall LOS D or E during the weekday AM peak hour and an overall LOS F during the weekday PM peak hour.

Due to poor levels of service during the weekday PM peak hour under 2029 build conditions, an exclusive southbound right-turn lane was analyzed at the intersection. 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 is recommended that an exclusive southbound right-turn lane with a minimum of 125 feet of storage be constructed at this intersection with the build out of Phase 2 of the proposed development. Capacity analysis of 2041 future traffic

conditions indicates that the intersection is expected to operate at an overall LOS C during the weekday AM and PM peak hours.

In order to improve operations at this intersection to an overall LOS D, per the Town's Unified Development Ordinance (UDO), under 2032 build conditions, an exclusive eastbound left-turn lane was analyzed in addition to the exclusive southbound right-turn lane. With these improvements, the intersection is expected to operate at an overall LOS D during the weekday AM and PM peak hours. It should be noted that per the Comprehensive Transportation Plan (CTP), Smithfield Road is slated to become a four-lane divided roadway. Additionally, the proposed development is expected to provide approximately 0.6 miles of widening along its frontage on either side of Smithfield Road to construct a portion of the planned four-lane divided section. The future widening of Smithfield Road is expected to further alleviate delays and queueing at this intersection.

8.6. Poole Road [EB-WB] and Major Slade Road [NB]

The existing unsignalized intersection of Poole Road and Major Slade Road was analyzed under 2022 existing, 2026/2029/2032 no-build, 2026/2029/2032 build, and 2041 future traffic conditions with the lane configurations and traffic control shown in Table 12. Refer to Table 12 for a summary of the analysis results. Refer to Appendix K for the Synchro capacity analysis reports. SimTraffic queuing reports can be found in Appendix U.

Table 12: Analysis Summary of Poole Road and Major Slade 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)
2022 Existing	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A ¹ B ²	N/A	-- A ¹ A ²	N/A
2026 No-Build	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A ¹ B ²	N/A	-- A ¹ B ²	N/A
2029 No-Build	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A ¹ B ²	N/A	-- A ¹ B ²	N/A
2032 No-Build	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A ¹ C ²	N/A	-- A ¹ B ²	N/A
2026 Build - Phase 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
2029 Build - Phase 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
2032 Build - Full Build	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A ¹ C ²	N/A	-- A ¹ E ²	N/A
2032 Build - Full Build with Improvements	EB WB NB	1 TH-RT 1 LT-TH 1 LT, 1 RT	-- A ¹ B ²	N/A	-- A ¹ D ²	N/A
2041 Future	EB WB NB	1 TH-RT 1 LT-TH 1 LT, 1 RT	-- A ¹ B ²	N/A	-- A ¹ D ²	N/A

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

2. Level of service for minor-street approach.

Improvements by Developer shown in bold.

Capacity analysis of 2022 existing, 2026/2029/2032 no-build, 2026/2029 build, and 2041 future traffic conditions indicates that the major-street left-turn movement and the minor-street approach at the intersection of Poole Road and Major Slade Road is expected to operate at LOS C or better during the weekday AM and PM peak hours. Under 2032 build conditions, the northbound minor-street movement is expected to degrade to an LOS E during the weekday PM peak hour.

Poor levels of services are not uncommon on a stop-controlled minor-street approach when heavy volumes are experienced on the major thoroughfare (Poole Road). An exclusive northbound right-turn lane was analyzed to mitigate poor levels of service experienced on the minor-street approach during the weekday PM peak hour under 2032 build conditions. With this right-turn lane, the major-street left-turn movement and the minor-street approach are expected to operate at LOS D or better under 2032 build conditions. An exclusive northbound right-turn lane with a minimum of 100 feet of storage and appropriate taper is recommended at full build-out of the proposed development.

8.7. Poole Road [EB-WB] and Bethlehem Road [NB-SB]

The existing unsignalized intersection of Poole Road and Bethlehem Road was analyzed under 2022 existing, 2026/2029/2032 no-build, 2026/2029/2032 build, and 2041 future traffic conditions with the lane configurations and traffic control shown in Table 13. Refer to Table 13 for a summary of the analysis results. Refer to Appendix L for the Synchro capacity analysis reports. SimTraffic queuing reports can be found in Appendix U.

Table 13: Analysis Summary of Poole Road and Bethlehem 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)
2022 Existing	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A A E C	C (28)	A A B E	C (29)
2026 No-Build	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A A F D	E (55)	A A B F	D (45)
2029 No-Build	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A A F F	F (99)	A A B F	E (69)
2032 No-Build	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A A F F	F (147)	A A C F	F (99)
2026 Build - Phase 1	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A A F D	D (54)	A A B F	D (47)
2029 Build - Phase 2	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A B F F	F (101)	A A C F	E (73)
2032 Build - Full Build	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A B F F	F (155)	B A C F	F (118)

Table 13: Analysis Summary of Poole Road and Bethlehem Road
(continued)

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)
2029 Build - Phase 2 - with Signal Timing Modifications	EB	1 LT-TH-RT	B	C (27)	C	C (23)
	WB	1 LT-TH-RT	C			
	NB	1 LT-TH-RT	C			
	SB	1 LT-TH-RT	C			
2032 Build - Full Build - with Signal Timing Modifications	EB	1 LT-TH-RT	B	D (38)	C	C (28)
	WB	1 LT-TH-RT	C			
	NB	1 LT-TH-RT	D			
	SB	1 LT-TH-RT	D			
2041 Future	EB	1 LT-TH-RT	B	C (27)	C	C (25)
	WB	1 LT-TH-RT	C			
	NB	1 LT-TH-RT	D			
	SB	1 LT-TH-RT	C			

Capacity analysis of all analysis scenarios indicates that the intersection of Poole Road and Bethlehem Road is expected to operate at an overall poor LOS (E or F) during the weekday AM and PM peak hours. It should be noted that 2022 existing condition during the weekday AM and PM peak hours, 2026 no-build conditions during the weekday PM peak hour, 2026 build conditions during the weekday AM and PM peak hour, and 2041 future conditions during the weekday AM and PM peak hours are expected to operate at an overall LOS D or better.

Signal timing modifications were considered at this intersection in an effort to mitigate the poor levels of service experienced at this intersection during the weekday AM and PM peak hours under 2029/2032 no-build and 2029/2032 build conditions. With these signal timing modifications, the intersection is expected to operate at an overall LOS D or better during the weekday AM and PM peak hours under 2029/2032 build conditions. It should be noted that while this study analyzes the signal with modified signal timings, NCDOT typically updates all signals periodically to account for changes in traffic patterns as a part of signal maintenance.

8.8. Smithfield Road [NB-SB] and Site Access A [EB]

The proposed unsignalized intersection of Smithfield Road and Site Access A was analyzed under 2026/2029/2032 build traffic conditions with the lane configurations and traffic control shown in Table 14. Refer to Table 14 for a summary of the analysis results. Refer to Appendix M for the Synchro capacity analysis reports. SimTraffic queuing reports can be found in Appendix U.

Table 14: Analysis Summary of Smithfield Road and Site Access A

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)
2026 Build - Phase 1	EB NB SB	1 LT, 1 RT 1 LT, 1 TH 1 TH, 1 RT	F ² A ¹ --	N/A	F ² B ¹ --	N/A
2029 Build - Phase 2	EB NB SB	1 LT, 1 RT 1 LT, 1 TH 1 TH, 1 RT	F ² A ¹ --	N/A	F ² B ¹ --	N/A
2032 Build - Full Build	EB NB SB	1 LT, 1 RT 1 LT, 1 TH 1 TH, 1 RT	F ² A ¹ --	N/A	F ² C ¹ --	N/A
2041 Future	EB NB SB	1 LT, 1 RT 1 LT, 1 TH 1 TH, 1 RT	F ² A ¹ --	N/A	F ² C ¹ --	N/A

Improvements to lane configurations 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 2026/2029/2032 build and 2041 future traffic conditions indicates that the major-street left-turn movement at the intersection of Smithfield Road and Site Access A is expected to operate at LOS C or better during the weekday AM and PM peak hours while the minor-street approach is expected to operate at LOS F the weekday AM and PM peak hours. Poor levels of service are not uncommon on an unsignalized minor-street approach when heavy through volumes are experienced on the major thoroughfare (Smithfield Road).

A traffic signal was considered at this intersection to mitigate the poor levels of service experienced on the minor-street approach and 2026/2029/2032 build traffic volumes were analyzed using the criteria contained in the *Manual on Uniform Traffic Control Devices* (MUTCD). A traffic signal was warranted during the weekday AM and PM peak hours under 2032 build conditions. Although the intersection meets peak hour warrants, it is not expected to meet the 4 or 8-hour warrants for signalization, which NCDOT typically favors due to the mostly residential nature of this area and this portion of the development. These residential areas are expected to operate during two distinct peak periods. However, it is recommended that this intersection be monitored for future signalization.

Turn lanes were considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways* (Driveway Manual). Based on the Driveway Manual, an exclusive northbound left-turn lane with a minimum of 150 feet of storage and an exclusive southbound right-turn lane with a minimum of 100 feet of storage are recommended by the proposed development. It should be noted that two (2) eastbound egress lanes were analyzed under 2026/2029/2032 build conditions and are also recommended by the proposed development.

It should be noted that the proposed development is expected to provide approximately 0.6 miles of widening along its frontage on either side of Smithfield Road to construct a portion of the planned four-lane divided section, per the Comprehensive Transportation Plan (CTP). The future widening of Smithfield Road as well as the interconnectivity within the proposed development is expected to further alleviate delays and queueing at this intersection and provide multiple routes to exit the site to Smithfield Road.

8.9. Smithfield Road [NB-SB] and Site Access B [EB] / Site Access F [WB]

The proposed unsignalized intersection of Smithfield Road and Site Access B / Site Access F was analyzed under 2029/2032 build traffic conditions with the lane configurations and traffic control shown in Table 15. Refer to Table 15 for a summary of the analysis results. Refer to Appendix N for the Synchro capacity analysis reports. SimTraffic queuing reports can be found in Appendix U.

Table 15: Analysis Summary of Smithfield Road and Site Access B / Site Access F

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)
2029 Build - Phase 2	EB NB SB	1 LT-RT 1 LT, 1 TH 1 TH, 1 RT	F ² A ¹ --	N/A	F ² B ¹ --	N/A
2032 Build - Full Build	EB WB NB SB	1 LT-TH, 1 RT 1 LT-TH-RT 1 LT, 1 TH, 1 TH-RT 1 LT, 2 TH, 1 RT	F ² F ² A ¹ C ¹	N/A	F ² F ² B ¹ B ¹	N/A
2032 Build - Full Build Signalized	EB WB NB SB	1 LT-TH, 1 RT 1 LT-TH-RT 1 LT, 1 TH, 1 TH-RT 1 LT, 2 TH, 1 RT	C D B C	C (20)	D D C B	C (24)
2041 Future	EB WB NB SB	1 LT-TH, 1 RT 1 LT-TH-RT 1 LT, 1 TH, 1 TH-RT 1 LT, 2 TH, 1 RT	C D B C	B (20)	D D C B	C (23)

Improvements to lane configurations 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 2029/2032 build traffic conditions indicates that the major-street left-turn movements at the intersection of Smithfield Road and Site Access B / Site Access F are expected to operate at LOS C or better during the weekday AM and PM peak hours while the minor-street approaches are expected to operate at LOS F the weekday AM and PM peak

hours. Poor levels of service are not uncommon on an unsignalized minor-street approach when heavy through volumes are experienced on the major thoroughfare (Smithfield Road).

A traffic signal was considered at this intersection to mitigate the poor levels of service experienced on the minor-street approach and 2029/2032 build traffic volumes were analyzed using the criteria contained in the *Manual on Uniform Traffic Control Devices* (MUTCD). A traffic signal was warranted during the weekday AM peak hour under 2029 build conditions and during the weekday AM and PM peak hours under 2032 build conditions. Although the intersection meets AM peak hour warrants under 2029 build conditions, it is not expected to meet the 4 or 8-hour warrants for signalization, which NCDOT typically favors due to the mostly residential nature of this area and this portion of the development. These residential areas are expected to operate during two distinct peak periods. Under 2032 build conditions, a signal was analyzed at the intersection to improve intersection operations. With a signal, the intersection is expected to operate at an overall LOS C or better during the weekday AM and PM peak hours under 2032 build and 2041 future conditions. It is recommended that this intersection be monitored for signalization and that a signal be installed prior to the proposed development's full build-out.

Turn lanes were considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways* (Driveway Manual). Based on the Driveway Manual, an exclusive northbound left-turn lane with a minimum of 200 feet of storage, an exclusive southbound left-turn lane with a minimum of 250 feet of storage, and an exclusive right-turn lane with a minimum of 75 feet of storage are warranted and recommended by the proposed development. It should be noted that two (2) eastbound egress lanes were analyzed under 2029/2032 build conditions and are also recommended by the proposed development.

It should be noted that the proposed development is expected to provide approximately 0.6 miles of widening along its frontage on either side of Smithfield Road to construct a portion of the planned four-lane divided section, per the Comprehensive Transportation Plan (CTP). The future widening of Smithfield Road is expected to further alleviate delays and queueing at this intersection.

8.10. Poole Road [EB-WB] and Site Access C [SB]

The proposed unsignalized intersection of Poole Road and Site Access C was analyzed under 2029/2032 build traffic conditions with lane configurations and traffic control shown in Table 16. Refer to Table 16 for a summary of the analysis results. Refer to Appendix O for the Synchro capacity analysis reports. SimTraffic queuing reports can be found in Appendix U.

Table 16: Analysis Summary of Poole Road and Site Access C

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)
2029 Build - Phase 2	EB WB SB	1 LT, 1 TH 1 TH, 1 RT 1 LT-RT	A ¹ -- B ²	N/A	A ¹ -- B ²	N/A
2032 Build - Full Build	EB WB SB	1 LT, 1 TH 1 TH, 1 RT 1 LT-RT	A ¹ -- B ²	N/A	A ¹ -- B ²	N/A
2041 Future	EB WB SB	1 LT, 1 TH 1 TH, 1 RT 1 LT-RT	A ¹ -- B ²	N/A	A ¹ -- B ²	N/A

Improvements to lane configurations 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 2029/2032 build and 2041 future traffic conditions indicates that the major-street left-turn movement and the minor-street approach at the intersection of Poole Road and Site Access C are expected to operate at LOS B or better during the weekday AM and PM peak hours.

Turn lanes were considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways* (Driveway Manual). Based on the Driveway Manual, an exclusive eastbound left-turn lane and a westbound right-turn lane, both with a minimum of 50 feet of storage and appropriate deceleration and taper length, are warranted and recommended by the proposed development at full build-out.

8.11. Smithfield Road [NB-SB] and Site Access D [EB]

The proposed unsignalized intersection of Smithfield Road and Site Access D was analyzed under 2032 build traffic conditions with the lane configurations and traffic control shown in Table 17. Refer to Table 17 for a summary of the analysis results. Refer to Appendix P for the Synchro capacity analysis reports. SimTraffic queuing reports can be found in Appendix U.

Table 17: Analysis Summary of Smithfield Road and Site Access D

ANALYSIS SCENARIO	A P P R O A C H	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
2032 Build - Full Build	EB NB SB	1 LT-RT 1 LT-TH 2 TH, 1 RT	F ² A ¹ --	N/A	F ² C ¹ --	N/A
2041 Future	EB NB SB	1 LT-RT 1 LT-TH 2 TH, 1 RT	F ² A ¹ --	N/A	F ² B ¹ --	N/A

Improvements to lane configurations 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 2032 build and 2041 future traffic conditions indicates that the major-street left-turn movement at the intersection of Smithfield Road and Site Access D is expected to operate at LOS C or better during the weekday AM and PM peak hours while the minor-street approach is expected to operate at LOS F during the weekday AM and PM peak hours. Poor levels of service are not uncommon on an unsignalized minor-street approach when heavy through volumes are experienced on the major thoroughfare (Smithfield Road).

Turn lanes were considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways* (Driveway Manual). Based on the Driveway Manual, an exclusive southbound right-turn lane with a minimum of 75 feet of storage and appropriate deceleration and taper length is warranted and recommended at the build-out of the proposed development.

It should be noted that the proposed development is expected to provide approximately 0.6 miles of widening along its frontage on either side of Smithfield Road to construct a portion of the planned four-lane divided section, per the Comprehensive Transportation Plan (CTP). The future widening of Smithfield Road is expected to further alleviate delays and queueing at this intersection.

8.12. Smithfield Road [NB-SB] and Site Access E [EB]

The proposed right-in/right-out intersection of Smithfield Road and Site Access E was analyzed under 2032 build traffic conditions with the lane configurations and traffic control shown in Table 18. Refer to Table 18 for a summary of the analysis results. Refer to Appendix Q for the Synchro capacity analysis reports. SimTraffic queuing reports can be found in Appendix U.

Table 18: Analysis Summary of Smithfield Road and Site Access E

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)
2032 Build - Full Build	EB NB SB	1 RT 2 TH 2 TH, 1 RT	B ¹ -- --	N/A	C ¹ -- --	N/A
2041 Future	EB NB SB	1 RT 2 TH 2 TH, 1 RT	B ¹ -- --	N/A	C ¹ -- --	N/A

Improvements to lane configurations are shown in bold.

1. Level of service for minor-street approach.

Capacity analysis of 2032 build and 2041 future traffic conditions indicates that the minor-street approach at the intersection of Smithfield Road and Site Access E is expected to operate at LOS C or better during the weekday AM and PM peak hours.

Turn lanes were considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways* (Driveway Manual). Based on the Driveway Manual, an exclusive southbound right-turn lane with a minimum of 50 feet of storage and appropriate deceleration and taper length is warranted and recommended at the build-out of the proposed development.

It should be noted that the proposed development is expected to provide approximately 0.6 miles of widening along its frontage on either side of Smithfield Road to construct a portion

of the planned four-lane divided section, per the Comprehensive Transportation Plan (CTP). The future widening of Smithfield Road is expected to further alleviate delays and queueing at this intersection.

8.13. Smithfield Road [NB-SB] and Site Access G [WB]

The proposed right-in/right-out intersection of Smithfield Road and Site Access G was analyzed under 2032 build traffic conditions with the lane configurations and traffic control shown in Table 19. Refer to Table 19 for a summary of the analysis results. Refer to Appendix R for the Synchro capacity analysis reports. SimTraffic queuing reports can be found in Appendix U.

Table 19: Analysis Summary of Smithfield Road and Site Access G

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)
2032 Build - Full Build	WB NB SB	1 RT 2 TH, 1 RT 1 TH	C ¹ -- --	N/A	B ¹ -- --	N/A
2041 Future	WB NB SB	1 RT 2 TH, 1 RT 1 TH	B ¹ -- --	N/A	B ¹ -- --	N/A

Improvements to lane configurations are shown in bold.

1. Level of service for minor-street approach.

Capacity analysis of 2032 build and 2041 future traffic conditions indicates that the minor-street approach at the intersection of Smithfield Road and Site Access G is expected to operate at LOS C or better during the weekday AM and PM peak hours.

Turn lanes were considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways* (Driveway Manual). Based on the Driveway Manual, an exclusive northbound right-turn lane with a minimum of 50 feet of storage and appropriate deceleration and taper length is warranted and recommended at the build-out of the proposed development.

It should be noted that the proposed development is expected to provide approximately 0.6 miles of widening along its frontage on either side of Smithfield Road to construct a portion

of the planned four-lane divided section, per the Comprehensive Transportation Plan (CTP). The future widening of Smithfield Road is expected to further alleviate delays and queueing at this intersection.

8.14. Poole Road [EB-WB] and Site Access H [SB]

The proposed unsignalized intersection of Poole Road and Site Access H was analyzed under 2032 build traffic conditions with lane configurations and traffic control shown in Table 20. Refer to Table 20 for a summary of the analysis results. Refer to Appendix S for the Synchro capacity analysis reports. SimTraffic queuing reports can be found in Appendix U.

Table 20: Analysis Summary of Poole Road and Site Access H

ANALYSIS SCENARIO	A P P R O A C H	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
2032 Build - Full Build	EB WB SB	1 LT, 1 TH 1 TH, 1 RT 1 LT, 1 RT	A ¹ -- B ²	N/A	A ¹ -- C ²	N/A
2041 Future	EB WB SB	1 LT, 1 TH 1 TH, 1 RT 1 LT, 1 RT	A ¹ -- B ²	N/A	A ¹ -- C ²	N/A

Improvements to lane configurations 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 2032 build and 2041 future traffic conditions indicates that the major-street left-turn movement and the minor-street approach at the intersection of Poole Road and Site Access H is expected to operate at LOS C or better during the weekday AM and PM peak hours.

Turn lanes were considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways* (Driveway Manual). Based on the Driveway Manual, an exclusive eastbound left-turn lane with a minimum of 150 feet of storage and an exclusive westbound right-turn lane with a minimum of 75 feet of storage, both with appropriate deceleration and taper length, are warranted and recommended at the build out of the proposed development. It should be noted that two (2) southbound egress lanes were analyzed under 2032 build conditions and are also recommended by the proposed development.

8.15. Smithfield Road [NB-SB] and Site Access I [WB]

The proposed right-in/right-out intersection of Smithfield Road and Site Access I was analyzed under 2032 build traffic conditions with the lane configurations and traffic control shown in Table 21. Refer to Table 21 for a summary of the analysis results. Refer to Appendix T for the Synchro capacity analysis reports. SimTraffic queuing reports can be found in Appendix U.

Table 21: Analysis Summary of Smithfield Road and Site Access I

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)
2032 Build - Full Build	WB NB SB	1 RT 2 TH, 1 RT 1 TH	C ¹ -- --	N/A	B ¹ -- --	N/A
2041 Future	WB NB SB	1 RT 2 TH, 1 RT 1 TH	C ¹ -- --	N/A	B ¹ -- --	N/A

Improvements to lane configurations 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 2032 build and 2041 future traffic conditions indicates that the major-street left-turn movement and the minor-street approach at the intersection of Smithfield Road and Site Access I is expected to operate at LOS C or better during the weekday AM and PM peak hours.

Turn lanes were considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways* (Driveway Manual). Based on the Driveway Manual, an exclusive northbound right-turn lane with a minimum of 50 feet of storage and appropriate deceleration and taper length is warranted and recommended at the build-out of the proposed development.

It should be noted that the proposed development is expected to provide approximately 0.6 miles of widening along its frontage on either side of Smithfield Road to construct a portion of the planned four-lane divided section, per the Comprehensive Transportation Plan (CTP). The future widening of Smithfield Road is expected to further alleviate delays and queueing at this intersection.

9. CONCLUSIONS

This Traffic Impact Analysis was conducted to determine the potential traffic impacts of the proposed development, to be located north of Poole Road and along both sides of Smithfield Road in Knightdale, North Carolina. The proposed development is expected to be a mixed-use development and be built out by 2030. Access to the site is proposed via two (2) full-movement driveways along Poole Road and via two (2) full movement driveways, three (3) right-in/right-out driveways, and one (1) full movement intersection along Smithfield Road.

It should be noted that the Town of Knightdale (Town) requires a no-build/build analysis year one (1) year beyond the anticipated build-out year and a future analysis year ten (10) years beyond the anticipated build-out year for the proposed development; therefore, the analysis years considered for this study under full-build conditions are 2032 and 2041. An additional analysis scenario will be included in the study to analyze improvements associated with STIP I-6007. The study analyzes traffic conditions during the weekday AM and PM peak hours for the following scenarios:

- 2022 Existing Traffic Conditions
- 2025+1 No-Build Traffic Conditions
- 2028+1 No-Build Traffic Conditions
- 2031+1 No-Build Traffic Conditions
- 2025+1 Build Traffic Conditions - Phase 1
- 2028+1 Build Traffic Conditions - Phase 2
- 2031+1 Build Traffic Conditions - Full Build
- 2031+10 Future Traffic Conditions - Per Town UDO
- 2045 Future Traffic Conditions - (with STIP I-6007 Improvements)

Trip Generation

It is estimated that the proposed development will generate approximately 20,457 total site trips on the roadway network during a typical 24-hour weekday period. Of the daily traffic volume, it is anticipated that 823 trips (321 entering and 502 exiting) would occur during the weekday AM peak hour and 1,791 trips (951 entering and 840 exiting) would occur 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

A summary of the study area intersections that are expected to need improvements is shown in Section 8 of this report.

10. 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 17 for an illustration of the recommended lane configuration for the proposed development.

Background Improvements by Adjacent Developments

The following improvements have been committed to by the Baker Roofing HQ development.

Smithfield Road and I-87 (US 64 / 264) Westbound Ramps

- Extend the exclusive southbound right-turn lane to have full storage.
- Restripe the northbound left-through lane to provide an additional left-turn lane.
- Construct a northbound through lane with a minimum of 250 feet of storage and appropriate deceleration and taper length.

The following improvements have been committed to by the Poole Road Assemblage development.

Smithfield Road and Poole Road

- Construct a channelized westbound right-turn lane that operates under yield control with a minimum of 100 feet of storage and appropriate deceleration and taper length.
- Coordinate with NCDOT to develop a signal modification plan for the intersection.

Improvements by NCDOT STIP I-6007

STIP I-6007 is expected to convert the I-87 (US 64 / 264) interchange at Smithfield Road to a diverging diamond interchange.

Improvements by NCDOT STIP HL-0031

STIP HL-0031 is expected to improve the intersection of Poole Road and Smithfield Road by adding exclusive turn lanes on every approach.

Recommended Improvements by Developer

Poole Road and Smithfield Road

- Provide an exclusive southbound right-turn lane with a minimum of 75 feet of storage and appropriate deceleration and taper length. *[Phase 2]*

Smithfield Road and Major Slade Road

- Provide an exclusive southbound right-turn lane with a minimum of 125 feet of storage and appropriate deceleration and taper length. *[Phase 2]*

Poole Road and Major Slade Road

- Provide an exclusive northbound right-turn lane with a minimum of 100 feet of storage and appropriate deceleration and taper length. *[Full Build]*

Smithfield Road and Site Access A

The proposed development is expected to provide approximately 0.6 miles of widening along its frontage on either side of Smithfield Road to construct a portion of the planned four-lane divided section.

- Construct eastbound approach with one (1) ingress lane and two (2) egress lanes striped as one left-turn lane and one right-turn lane. *[Phase 1]*
- Provide an exclusive northbound left-turn lane with a minimum of 150 feet of storage and appropriate taper. *[Phase 1]*
- Provide an exclusive southbound right-turn lane with a minimum of 100 feet of storage and appropriate taper. *[Phase 1]*
- Monitor intersection for signalization and install traffic signal when warranted. *[Full Build]*

Smithfield Road and Site Access B / Site Access F

The proposed development is expected to provide approximately 0.6 miles of widening along its frontage on either side of Smithfield Road to construct a portion of the planned four-lane divided section.

- Construct eastbound approach with one (1) ingress lane and two (1) egress lanes striped as one left-turn lane and one right-turn. *[Phase 2]*
- Provide an exclusive northbound left-turn lane with a minimum of 200 feet of storage and appropriate taper. *[Phase 2]*
- Provide an exclusive southbound right-turn lane with a minimum of 75 feet of storage and appropriate taper. *[Phase 2]*
- Construct westbound approach with one (1) ingress lane and one (1) egress lane striped as a shared left-thru-right lane. *[Full Build]*
- Provide an exclusive southbound left-turn lane with a minimum of 250 feet of storage and appropriate taper. *[Full Build]*
- Monitor intersection for signalization and install traffic signal when warranted. *[Full Build]*

Poole Road and Site Access C

- Construct southbound approach with one (1) ingress lane and one (1) egress lane striped a shared left-right. *[Phase 2]*
- Provide an exclusive eastbound left-turn lane with a minimum of 50 feet of storage and appropriate taper. *[Phase 2]*
- Provide an exclusive westbound right-turn lane with a minimum of 50 feet of storage and appropriate taper. *[Phase 2]*
- Provide stop-control for the southbound approach *[Phase 2]*

Smithfield Road and Site Access D

The proposed development is expected to provide approximately 0.6 miles of widening along its frontage on either side of Smithfield Road to construct a portion of the planned four-lane divided section.

- Construct eastbound approach with one (1) ingress lane and one (1) egress lane striped a shared left-right. *[Full Build]*

- Provide an exclusive southbound right-turn lane with a minimum of 75 feet of storage and appropriate taper. *[Full Build]*
- Provide stop-control for the eastbound approach. *[Full Build]*

Smithfield Road and Site Access E

The proposed development is expected to provide approximately 0.6 miles of widening along its frontage on either side of Smithfield Road to construct a portion of the planned four-lane divided section.

- Construct eastbound approach with one (1) ingress lane and one (1) egress lane striped a right-in/ right-out. *[Full Build]*
- Provide an exclusive southbound right-turn lane with a minimum of 50 feet of storage and appropriate taper. *[Full Build]*
- Provide stop-control for the eastbound approach. *[Full Build]*

Smithfield Road and Site Access G

The proposed development is expected to provide approximately 0.6 miles of widening along its frontage on either side of Smithfield Road to construct a portion of the planned four-lane divided section.

- Construct westbound approach with one (1) ingress lane and one (1) egress lane striped a right-in/ right-out. *[Full Build]*
- Provide an exclusive northbound right-turn lane with a minimum of 50 feet of storage and appropriate taper. *[Full Build]*
- Provide stop-control for the westbound approach. *[Full Build]*

Poole Road and Site Access H

- Construct southbound approach with one (1) ingress lane and two (1) egress lanes striped as one left-turn lane and one right-turn lane. *[Phase 2]*
- Provide an exclusive eastbound left-turn lane with a minimum of 150 feet of storage and appropriate taper. *[Phase 2]*
- Provide an exclusive westbound right-turn lane with a minimum of 75 feet of storage and appropriate taper. *[Phase 2]*
- Provide stop-control for the southbound approach *[Phase 2]*

Smithfield Road and Site Access I

The proposed development is expected to provide approximately 0.6 miles of widening along its frontage on either side of Smithfield Road to construct a portion of the planned four-lane divided section.

- Construct westbound approach with one (1) ingress lane and one (1) egress lane striped a right-in/ right-out. *[Full Build]*
- Provide an exclusive northbound right-turn lane with a minimum of 50 feet of storage and appropriate taper. *[Full Build]*
- Provide stop-control for the westbound approach. *[Full Build]*

Improvements Needed to Meet Town's UDO Requirements

Smithfield Road and Sandy Run

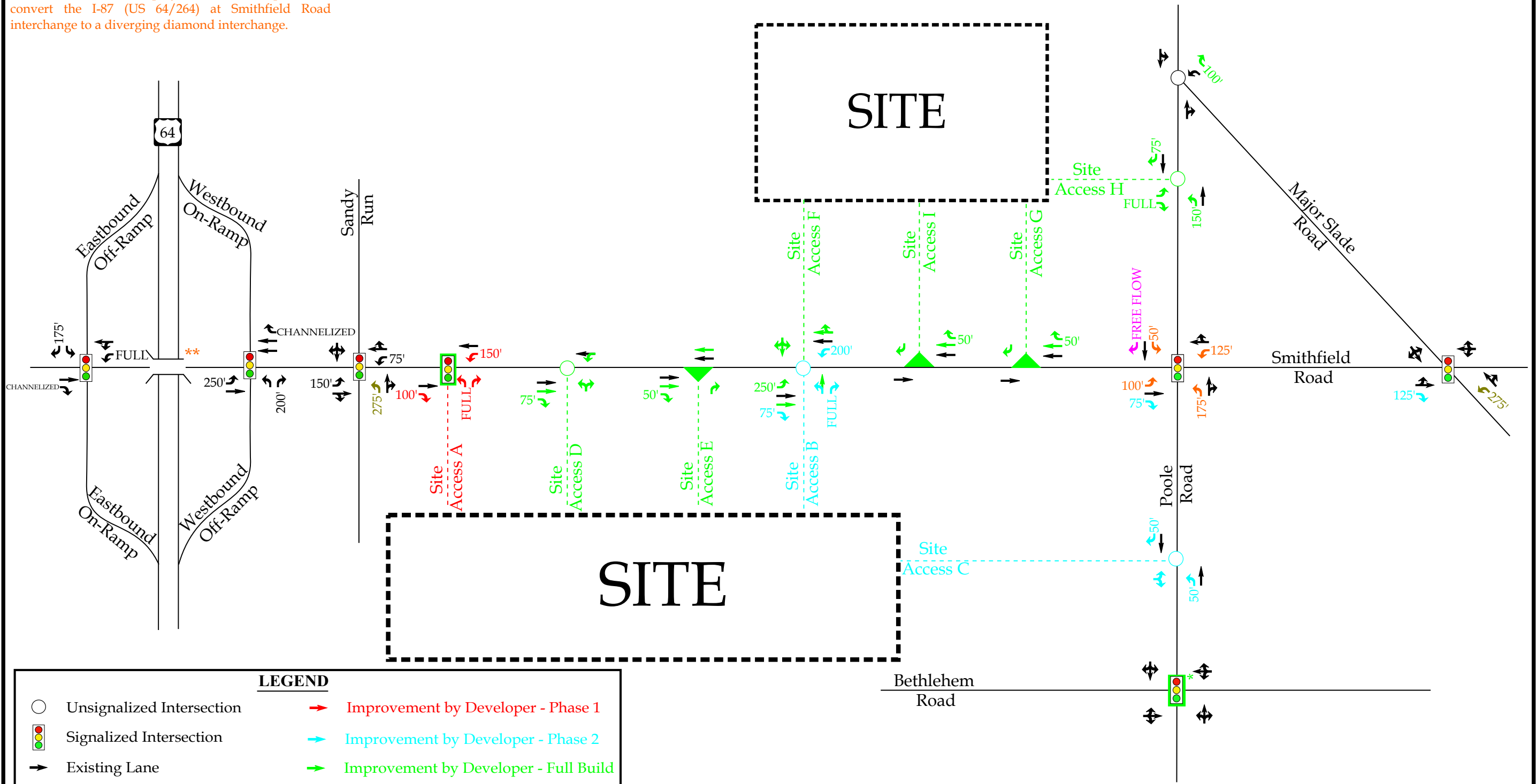
- Provide an exclusive eastbound left-turn lane with a minimum of 275 feet of storage and appropriate deceleration and taper length. *[Phase 2]*

Smithfield Road and Major Slade Road

- Provide an exclusive eastbound left-turn lane with a minimum of 275 feet of storage and appropriate deceleration and taper length. *[Full Build]*

*Modify Signal Timings

**Note: NCDOT STIP project I-6007 is expected to convert the I-87 (US 64/264) at Smithfield Road interchange to a diverging diamond interchange.



LEGEND

- Unsignalized Intersection
- ◫ Signalized Intersection
- Existing Lane
- ▲ Right-In/Right-Out Intersection
- Improvement by NCDOT STIP
- x' Storage (In Feet)
- ◫ Monitor for Signalization
- Improvement by Developer - Phase 1
- Improvement by Developer - Phase 2
- Improvement by Developer - Full Build
- Background Improvement by Adjacent Development
- Improvement to Meet Town's UDO Req



Poole and Smithfield
Knightdale, NC

Recommended Lane
Configurations

Scale: Not to Scale Figure 17