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Traffic Impact Analysis

For

Lyle Wilson Road Residential Development

Located in
Cullowhee, North Carolina

Prepared For:
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University Property Group
1944 Hendersonville Road, Suite E-1
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November 2019

JMTE WAYN 0995

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Documentation Prepared by:

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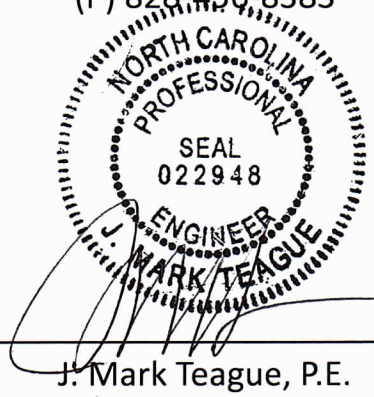

J. Mark Teague, P.E.

11/27/2019

Date

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Introduction and Background

This report summarizes the findings of the traffic impact analysis (TIA) that was performed for a residential subdivision development proposed along Lyle Wilson Road (SR 1329) in Cullowhee, Jackson County, North Carolina. *(Figures 1 & 2)* The purpose of this study is to determine the impact of the anticipated traffic associated with this development on the adjacent road network.

Figure 1 – Region of Proposed Site Location

Figure 2 – Proposed Site

Proposed Site Use and Access

The site plan consists of 50 buildings, 27 single-family units, 23 twin homes containing a total of 73 units. The residential development will have five access points onto Lyle Wilson Road (SR 1329). *Figure 3* shows the proposed site layout of the development. This proposed site plan can be found in Appendix A.

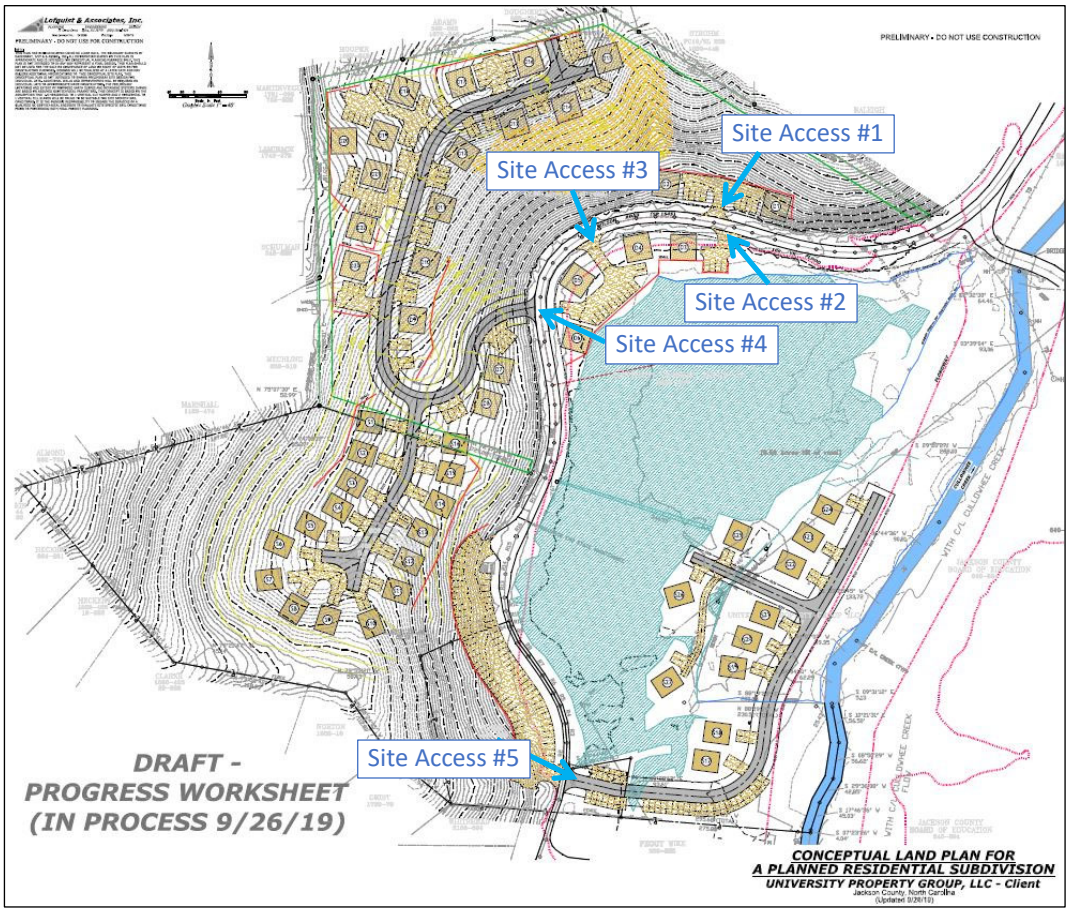


Figure 3 – Preliminary Site Plan
Site Plan Provided by Lofquist & Associates, Inc.

Parameters and Study Area

As determined through discussions with NCDOT along with engineering judgment, the study area of this TIA includes:

- NC 107 @ Lyle Wilson Road (SR 1329)

Peak hour turning movement counts (7:00 – 9:00 AM & 4:00 – 6:00 PM) were obtained at the existing studied intersection. AM and PM peak hours were determined between the AM and PM peak periods. AM and PM peak hours for the intersection were analyzed for existing, background, and full build-out traffic conditions.

The AM and PM peak hours for the studied intersection are as follows:

- NC 107 @ Lyle Wilson Road (SR 1329)
    - AM Peak Hour – 7:15 AM – 8:15 AM || PM Peak Hour – 5:00 PM – 6:00 PM

Other parameters include:

- 2022 Build-out Year
- Background Traffic Growth Factor of 2% per year
    - NCDOT standard growth factor
- Peak Hour Factor (PHF) of 0.90 for projected conditions
- Proposed site access to Lyle Wilson Road

Surrounding Land Uses

The proposed site is located within Jackson County, North Carolina southeast of the Forest Hills. The immediate area surrounding the proposed site consists of student housing, single-family homesites, undeveloped land, and woodland.

Surrounding Roadways

According to NCDOT's Online GIS, NC 107 is classified as "other principal arterial". NC 107 is a divided four-lane road with a posted speed limit of 45 mph. NC 107 allows traffic to travel north/south between Cullowhee and East Laport as well as other destinations to the south. According to NCDOT data, the Average Annual Daily Traffic (AADT) on NC 107 was 19,000 vehicles per day (vpd) north of Western Carolina University in 2017 and 9,500 vpd south of Lyle Wilson Road in 2018.

NCDOT's Online GIS classifies Lyle Wilson Road (SR 1329) as a local road. Lyle Wilson Road (SR 1329) is a two-lane road with a posted speed limit of 35 mph. According to NCDOT data, there is no AADT provided for Lyle Wilson Road (SR 1329).

Method of Analysis

A traffic impact analysis is a method of determining the impacts of new development traffic on the surrounding roadway. This is done by comparing the effects of additional traffic generated by the site to the traffic that would normally utilize the road network upon completion of the development. This traffic is defined as background traffic.

Background traffic is defined as the traffic that would be at the studied intersections at the time of anticipated project completion (build-out), without this proposed development. Background traffic is comprised of existing traffic and any increase or decrease in volumes which might occur from general growth trends in the surrounding area or from nearby specific developments. It also assumes no significant roadway geometric changes from the existing condition scenario. A growth factor of 2% was utilized for this study up to the anticipated project completion year (build-out) of 2022. The site generated traffic is added to the background traffic in order to determine the build-out traffic for this project. These two numbers, background and build-out, are then compared to determine the overall impact that the proposed development traffic has on the roadway.

The studied intersections were analyzed using Synchro. Synchro is a specialized software package that allows the user to model intersections and roadway networks to determine levels of service (LOS), based on the thresholds specified in the Highway Capacity Manual (HCM) published by the Transportation Research Board. Synchro also provides analysis of capacity, vehicle delay, volume to capacity ratio (v/c), queue lengths, traffic signal timing, and vehicle flow rate.

Sim Traffic was also utilized, which is an extension of Synchro that allows the user to more accurately model closely spaced intersections. This animation software allows the user to view traffic circulation through the study intersections.

The HCM defines capacity as "the maximum sustainable hourly rate at which persons or vehicles reasonably can be expected to traverse a point or uniform segment of a lane or roadway during a given time period under prevailing roadway, environmental, traffic, and control conditions". LOS is a term used to represent different driving conditions, primarily with respect to traffic congestion. It is defined as a "qualitative measure describing operational and perceptional conditions within a traffic stream". LOS "A" represents free flow traffic conditions with no congestion. LOS "F" represents severely impacted traffic flow due to vehicle congestion. LOS is

generally determined by the total "Control Delay" experienced by drivers. Control delay is vehicle delay that is ultimately caused by the traffic control device. This includes deceleration delay, queue move-up time delay, stopped delay, and acceleration delay. (*Table 1)*

Highway Capacity Manual
Level of Service and Delay

Un-signalized 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

<Table 1>

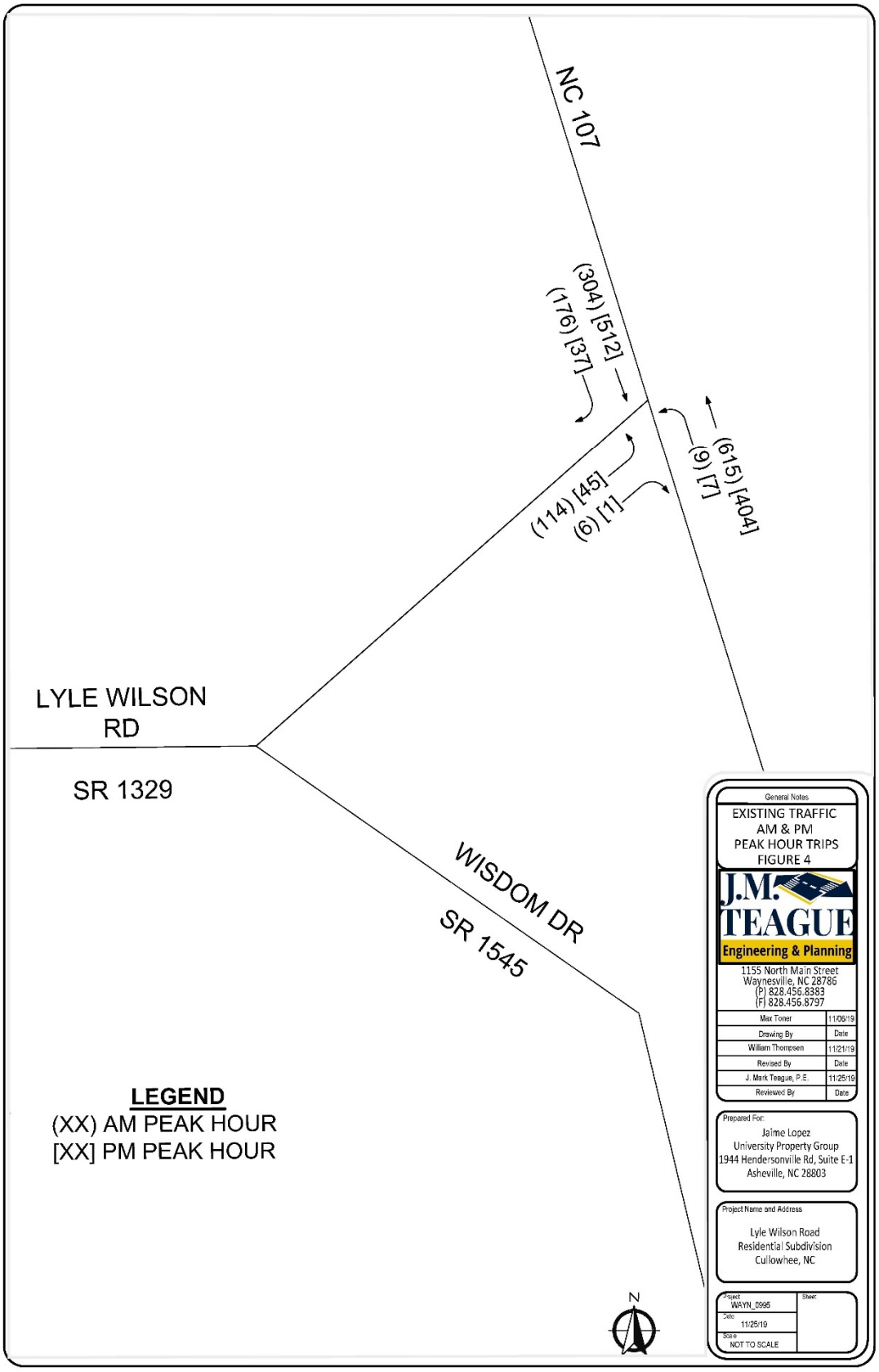
Like with most infrastructure, it is desirable and most effective to design the roadway network in an optimal manner, while promoting travel and minimizing the environmental footprint. With this in mind, it is desirable for roads to operate at volumes consistent with lower levels of delay during non-peak times as well as higher levels of delay during peak periods.

The analysis for un-signalized intersections can project very high delays on the side street, thus it is recommended to use LOS measurements as a comparative tool rather than a design tool. The 95th Queue is defined to be the vehicle queue (back-up) that has only a 5% probability of being exceeded during the analysis period. At un-signalized intersections, p0 is the probability of a queue-free state.

Existing Traffic

In order to determine existing traffic, a peak period turning movement count was conducted at NC 107 and Lyle Wilson Road and in accordance with the methodology previously explained.

The existing peak hour volumes are shown in *Figure 4.* The existing lane diagram is shown in *Figure 5.* The existing turning movement counts can be found in Appendix B.


NC 107
(304) [512]
(176) [37]
(615) [404]
(9) [7]
(114) [45]
(6) [1]
LYLE WILSON RD
SR 1329
WISDOM DR
SR 1545
LEGEND
(XX) AM PEAK HOUR
[XX] PM PEAK HOUR
N
General Notes
EXISTING TRAFFIC
AM & PM
PEAK HOUR TRIPS
FIGURE 4
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1155 North Main Street
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(P) 828.456.8383
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Max Toner 11/06/19
Drawing By Date
William Thompsen 11/21/19
Revised By Date
J. Mark Teague, P.E. 11/25/19
Reviewed By Date
Prepared For:
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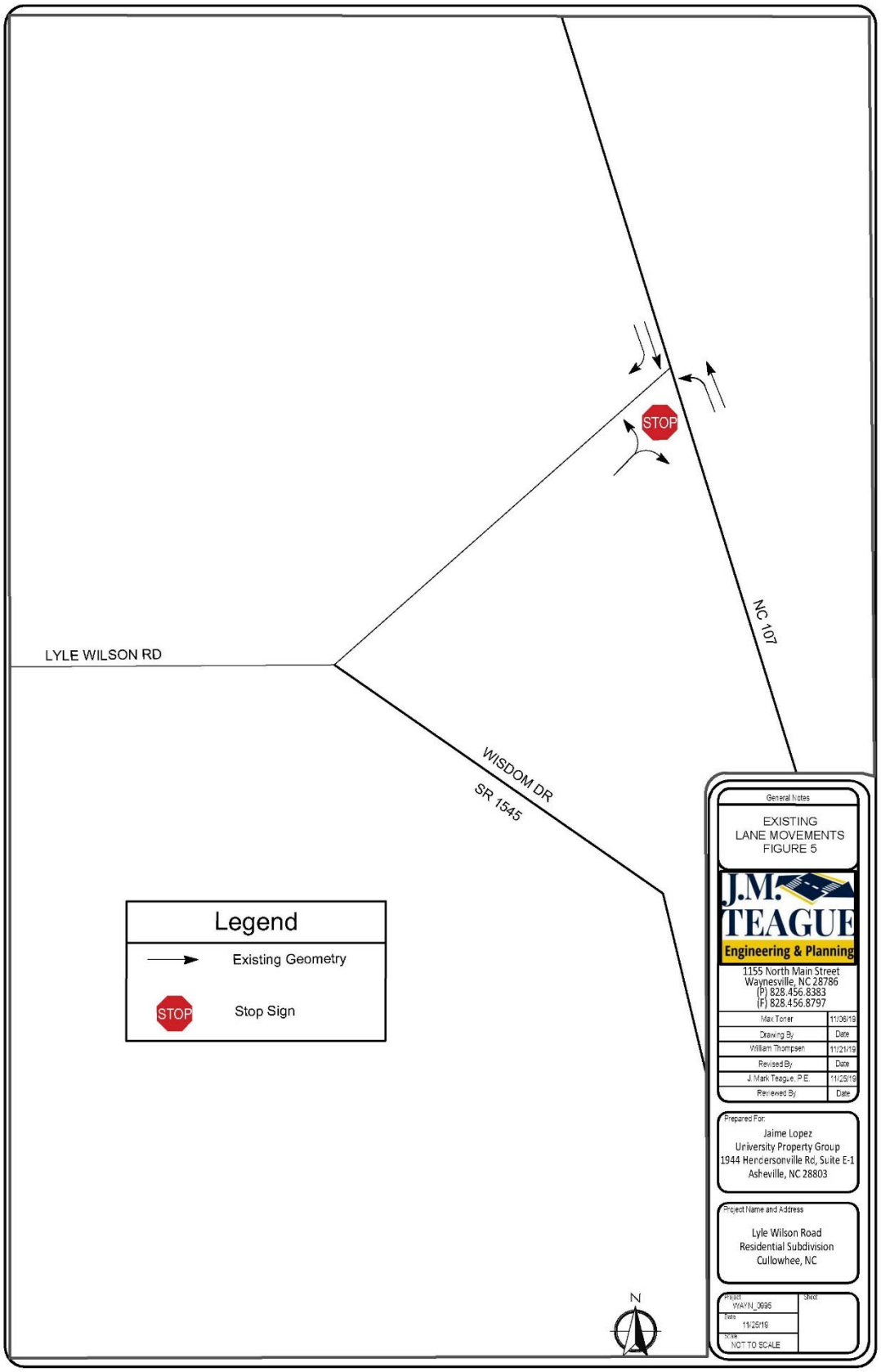
Project Name and Address
Lyle Wilson Road
Residential Subdivision
Cullowhee, NC
Project WAYN_0995
Sheet
Date 11/25/19
Scale NOT TO SCALE


STOP
NC 107
LYLE WILSON RD
WISDOM DR
SR 1545
Legend
Existing Geometry
STOP
Stop Sign
N
General Notes
EXISTING
LANE MOVEMENTS
FIGURE 5
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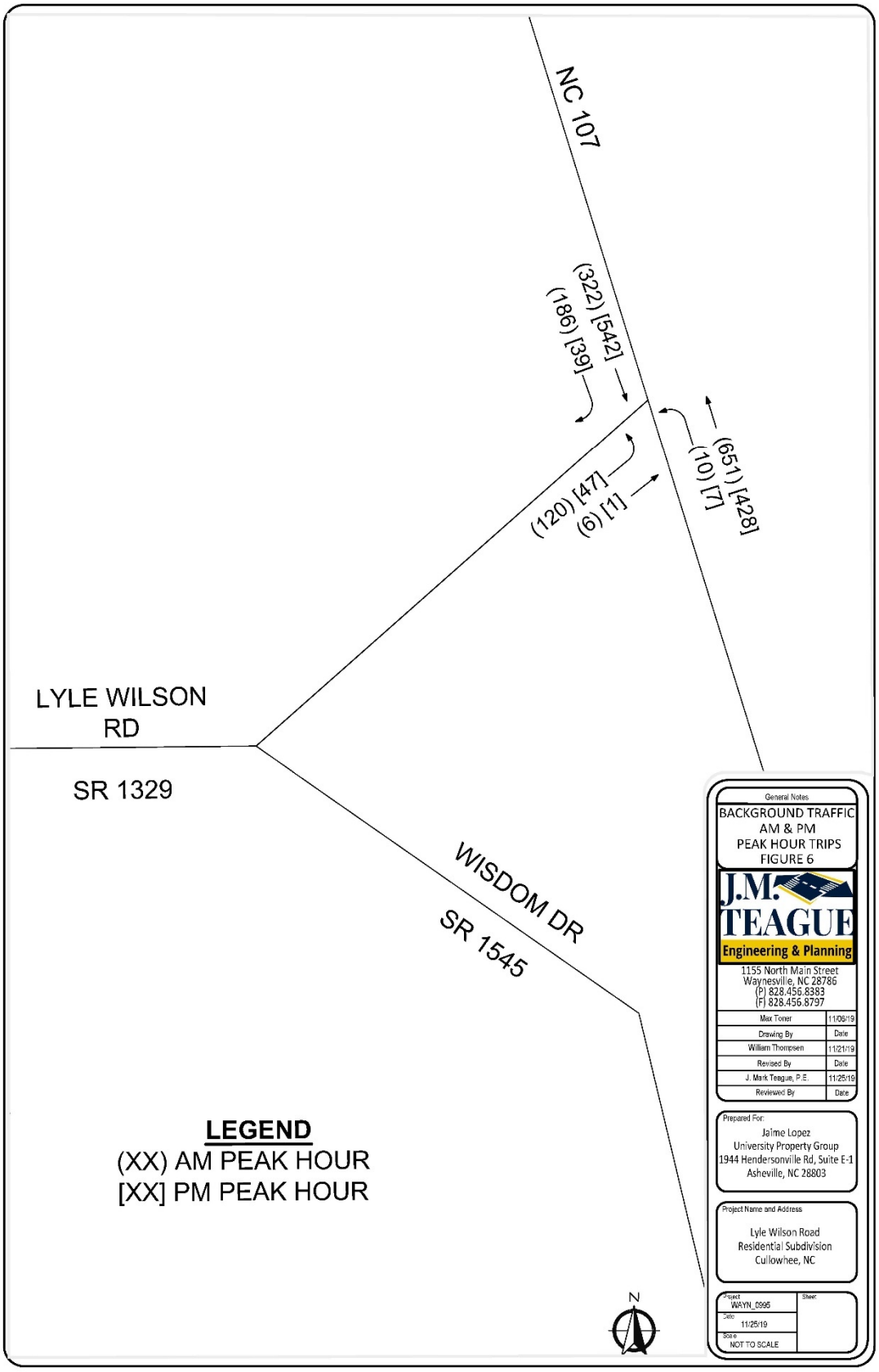
Project WAYN_0995
Sheet
Date 11/25/19
Scale NOT TO SCALE

Background Traffic

Background traffic is defined as the traffic that would be at the studied intersections at the time of anticipated project completion (build-out), without the proposed development. Background traffic is comprised of existing traffic and any increase or decrease in volumes which might occur from general growth trends in the surrounding area or from nearby specific developments. A growth factor of 2% was utilized for this study up to the anticipated project completion year (build-out) of 2022. The anticipated background traffic is shown in *Figure 6.*


NC 107
(322) [542]
(186) [39]
(651) [428]
(10) [7]
(120) [47]
(6) [1]
LYLE WILSON RD
SR 1329
WISDOM DR
SR 1545
LEGEND
(XX) AM PEAK HOUR
[XX] PM PEAK HOUR
N
General Notes
BACKGROUND TRAFFIC
AM & PM
PEAK HOUR TRIPS
FIGURE 6
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Trip Generation

The 10th edition of the Trip Generation Manual published by the Institute of Transportation Engineers (ITE) was used as a baseline to determine site generated traffic. As there is no land use code for twin homes the two ITE land use codes were utilized for the proposed development which is Land Use Code 210 – Single-family Housing and LUC 220 – Multifamily Housing (Low-Rise). The ITE 10th edition trip manual defines LUC 210 as "Single-family detached housing includes all single-family detached homes on individual lots." According to ITE's Trip Generation manual, LUC 220 – Multifamily Housing is described as "Low-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have one or two levels (floors)."

Trip generation volumes were calculated utilizing the fitted curve equation for LUC 210 and LUC 220 for the peak hours of adjacent street traffic according to the NCDOT guidelines. The ITE equations for weekday total, AM peak hour, and PM peak hour are as follows:

- **LUC 210 Single-Family Housing (Low Rise)**
  - Weekday Equation
    - Ln(T) = 0.92 Ln(X) + 2.71 : 50% Entering / 50% Exiting
  - AM Peak Hour of Adjacent Street Traffic
    - T = 0.71(X) + 4.80 : 25% Entering / 75% Exiting
  - PM Peak Hour of Adjacent Street Traffic
    - Ln(T) = 0.96 Ln(X) + 0.20 : 63% Entering / 37% Exiting

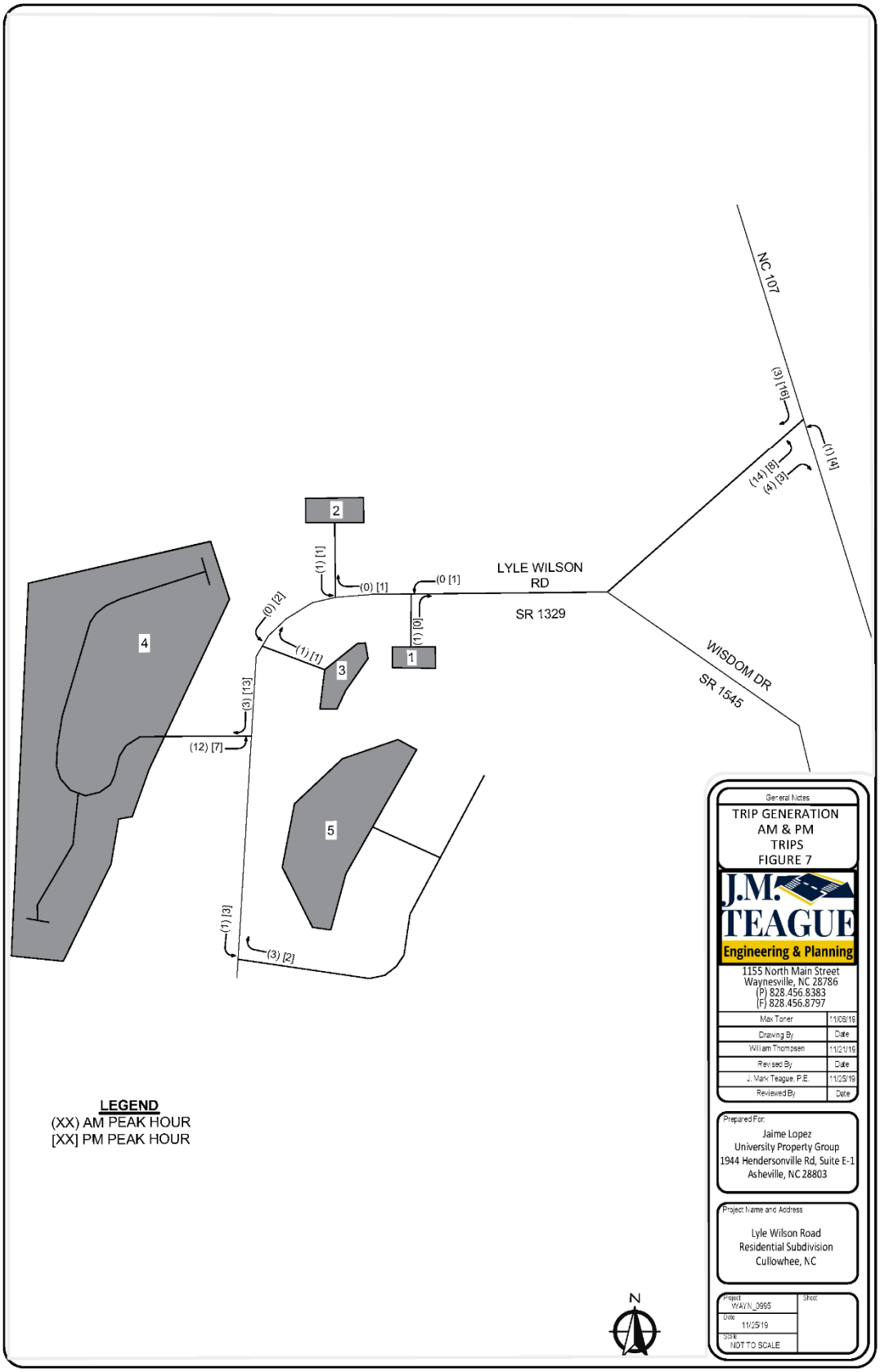
- **LUC 220 Multifamily Housing (Low Rise)**
  - Weekday Equation
    - T= 7.56(X) – 40.86 : 50% Entering / 50% Exiting
  - AM Peak Hour of Adjacent Street Traffic
    - Ln(T) = 0.95 Ln(X) - 0.51 : 23% Entering / 77% Exiting
  - PM Peak Hour of Adjacent Street Traffic
    - Ln(T) = 0.89 Ln(X) - 0.02 : 63% Entering / 37% Exiting

The typical weekday trip generation volumes are shown below in *Table 2*

ITE Land Use Code	Size	Unit	ADT (vpd)	AM Peak (vph)		PM Peak (vph)	
				IN	OUT	IN	OUT
210 – Single Family	27	Dwelling units	312	6	18	18	11
220 – Multifamily	46	Dwelling units	307	5	18	19	11
		Totals	**619**	**11**	**36**	**37**	**22**

<Table 2>

The peak hour trips were assigned to the roadway network using the distribution percentages found in *Figure 8* and shown as AM & PM Peak Hour ingress and egress site generated trips in *Figure 7*.


NC 107
(3) [16]
(1) [4]
(14) [8]
(4) [3]
2
(1) [1]
(0) [1]
(0 [1]
LYLE WILSON
RD
SR 1329
(0) [2]
(1) [0]
1
4
(1) [1]
3
WISDOM DR
SR 1545
(3) [13]
(12) [7]
5
(1) [3]
(3) [2]
LEGEND
(XX) AM PEAK HOUR
[XX] PM PEAK HOUR
N
General Notes
TRIP GENERATION
AM & PM
TRIPS
FIGURE 7
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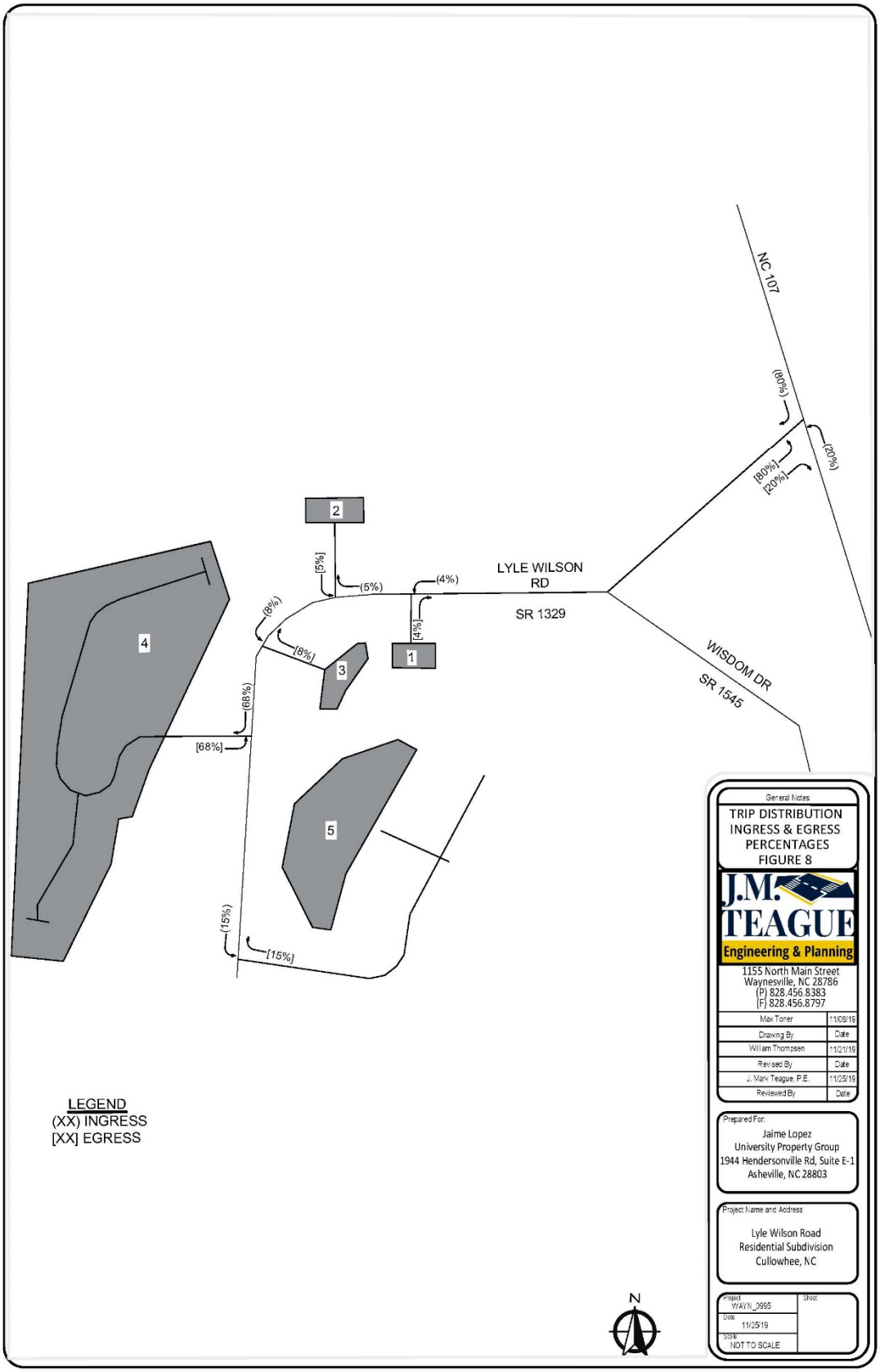
Sheet
Date 11/25/19
Scale NOT TO SCALE

Trip Distribution

The trip distribution for this development was estimated from the existing traffic volume patterns within the surrounding roadway network, the surrounding population densities, the location of the proposed development, and engineering judgment. Trip distribution percentages can be seen in *Figure 8.*


NC 107
(80%)
(20%)
[80%]
[20%]
LYLE WILSON
RD
SR 1329
WISDOM DR
SR 1545
2
1
3
4
5
[5%]
(5%)
(4%)
[4%]
(8%)
[8%]
(68%)
[68%]
(15%)
[15%]
LEGEND
(XX) INGRESS
[XX] EGRESS
N
General Notes
TRIP DISTRIBUTION
INGRESS & EGRESS
PERCENTAGES
FIGURE 8
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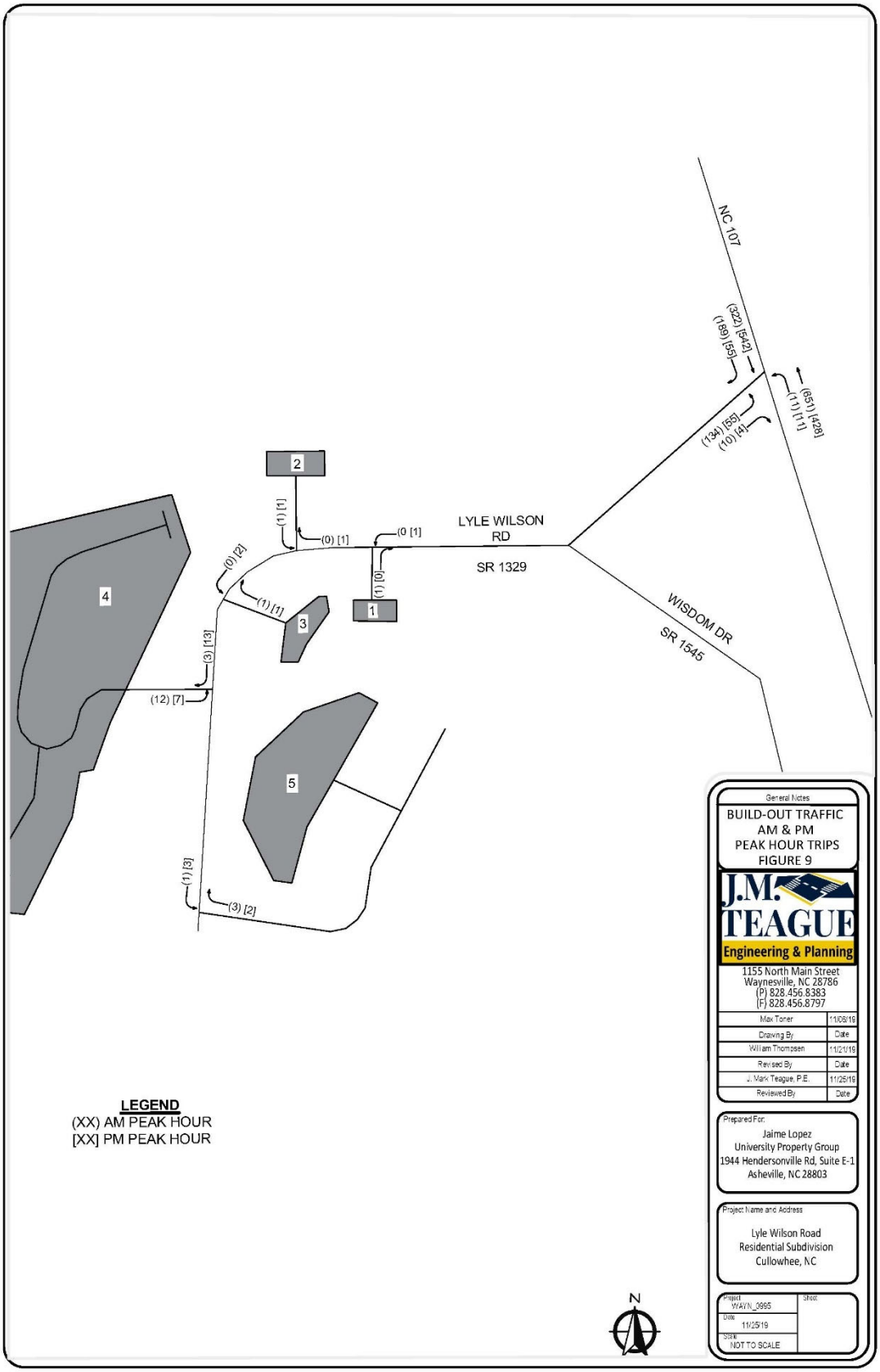
Build-Out Traffic

Build-out traffic is defined as the total traffic volume that will be present on the surrounding roadway network at the time of project completion and full occupancy. The build-out year is projected to be 2022. Build-out traffic was calculated by adding the background traffic and the proposed site traffic, which is distributed in the AM & PM peak hour periods according to the entering and exiting percentages listed above in (*Table 2)* and found in the ITE trip generation manual. *Figure 9* shows the anticipated build-out AM & PM Peak Hour traffic.


NC 107
(322) [542]
(189) [55]
(651) [428]
(11) [11]
(134) [55]
(10) [4]
LYLE WILSON RD
SR 1329
WISDOM DR
SR 1545
2
1
3
4
5
(1) [1]
(0) [1]
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(0) [2]
(1) [1]
(3) [13]
(12) [7]
(1) [3]
(3) [2]
LEGEND
(XX) AM PEAK HOUR
[XX] PM PEAK HOUR
N
General Notes
BUILD-OUT TRAFFIC
AM & PM
PEAK HOUR TRIPS
FIGURE 9
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Analysis of Existing Traffic Conditions

The analysis of existing conditions was based on the methodology presented in NCDOT's Congestion Management Capacity Analysis Guidelines. In order to estimate the existing LOS, delay, v/c ratio, and queue at the study intersections, the existing traffic volumes from the AM & PM peak hours were analyzed using existing lane configurations and traffic control conditions *(Table 3).* Since existing turning movement count data was collected, the existing peak hour factor (PHF) was utilized for analyzing existing conditions.

The capacity analysis (Synchro Reports) for the existing conditions can be found in Appendix C.

Analysis of Existing AM/PM Peak Hour Traffic Conditions

Intersection	Approach	Lane	Queue Length (ft) [AM]	LOS [AM]	Delay (sec) [AM]	V/C Ratio [AM]	Queue Length (ft) [PM]	LOS [PM]	Delay (sec) [PM]	V/C Ratio [PM]
Old Cullowhee Road (NC 107) @ Lyle Wilson Road (SR 1329)	Northbound	Left	14	A	8.7	0.02	17	A	8.8	0.01
	Northbound	Thru	0	--	0	0.41	0	--	0	0.26
	Southbound	Thru	0	--	0	0.19	0	--	0	0.32
	Southbound	Right	0	--	0	0.15	0	--	0	0.05
	NE bound	Left/Right	102	E	42.7	0.65	38	D	25.8	0.35

<Table 3>

Analysis of Background Traffic Conditions

The analysis of background conditions was based on the methodology presented in NCDOT's *Congestion Management Capacity Analysis Guidelines.* In order to estimate the background LOS, delay, v/c ratio, and queue at the study intersections, the background traffic was analyzed using existing lane configurations and traffic control conditions *(Table 4).* A PHF of 0.90 was utilized for all background conditions in accordance with NCDOT guidelines.

The capacity analysis (Synchro Reports) for the existing conditions can be found in Appendix C.

Analysis of Background AM/PM Peak Hour Traffic Conditions

Intersection	Approach	Lane	Queue Length (ft) [AM]	LOS [AM]	Delay (sec) [AM]	V/C Ratio [AM]	Queue Length (ft) [PM]	LOS [PM]	Delay (sec) [PM]	V/C Ratio [PM]
Old Cullowhee Road (NC 107) @ Lyle Wilson Road (SR 1329)	Northbound	Left	14	A	8.6	0.01	14	A	8.9	0.01
	Northbound	Thru	0	--	0	0.43	0	--	0	0.28
	Southbound	Thru	0	--	0	0.21	0	--	0	0.35
	Southbound	Right	0	--	0	0.12	0	--	0	0.03
	NE bound	Left/Right	83	E	39.3	0.59	42	C	24.5	0.22

<Table 4>

Analysis of Build-out Traffic Conditions

The analysis of build-out conditions was based on the methodology presented in NCDOT's Congestion Management Capacity Analysis Guidelines. In order to estimate the build-out LOS, delay, v/c ratio, and queue at the study intersections, the build-out traffic was analyzed using existing lane configurations and traffic control conditions as well as the addition of the proposed site access points. A PHF of 0.90 was utilized for all build-out conditions in accordance with NCDOT guidelines. The build-out LOS, delay, v/c ratio, and queue at the study intersections in the AM and PM peak hours are below *(Table 5).* The capacity analysis (Synchro Reports) for the build-out conditions can be found in Appendix C.

Analysis of Build-out AM/PM Peak Hour Traffic Conditions

Intersection	Approach	Lane	Queue Length (ft) [AM]	LOS [AM]	Delay (sec) [AM]	V/C Ratio [AM]	Queue Length (ft) [PM]	LOS [PM]	Delay (sec) [PM]	V/C Ratio [PM]
Old Cullowhee Road (NC 107) @ Lyle Wilson Road (SR 1329)	Northbound	Left	31	A	8.6	0.01	21	A	8.9	0.01
	Northbound	Thru	0	--	0	0.43	0	--	0	0.28
	Southbound	Thru	0	--	0	0.21	0	--	0	0.35
	Southbound	Right	0	--	0	0.12	0	--	0	0.04
	NE bound	Left/Right	136	E	45	0.66	49	D	25.6	0.27
Lyle Wilson Road (SR 1329) @ Site Access #1	Eastbound	Thru/**(Right)**	0	--	0	0	0	--	0	0
	Westbound	**(Left)**/Thru	0	--	0	0	0	A	7.2	0
	Northbound	**(Left/Right)**	0	A	8.3	0	0	A	0	0
Lyle Wilson Road (SR 1329) @ Site Access #2	Eastbound	**(Left/Right)**	0	--	0	0	0	--	0	0
	Westbound	**(Left)**/Thru	0	--	0	0	0	--	0	0
	Southbound	Thru/**(Right)**	0	A	8.5	0	3	A	8.5	0
Lyle Wilson Road (SR 1329) @ Site Access #3	Eastbound	Thru/**(Right)**	0	--	0	0	0	--	0	0
	Westbound	**(Left)**/Thru	0	--	0	0	0	--	7.2	0
	Northbound	**(Left/Right)**	0	A	8.3	0	0	A	8.3	0
Lyle Wilson Road (SR 1329) @ Site Access #4	Eastbound	**(Left/Right)**	31	A	8.6	0.01	18	A	8.6	0.01
	Northbound	**(Left)**/Thru	0	--	0	0	0	--	0	0
	Southbound	Thru/**(Right)**	0	--	0	0	0	--	0	0.01
Lyle Wilson Road (SR 1329) @ Site Access #5	Westbound	**(Left/Right)**	0	A	8.3	0	11	A	8.3	0
	Northbound	Thru/**(Right)**	0	--	0	0	0	--	0	0
	Southbound	**(Left)**/Thru	0	--	7.2	0	0	--	7.2	0

(XXXX) Indicates build-out lane direction additions to existing and background movements

<Table 5>

CONCLUSIONS AND RECOMMENDATIONS

The mitigation recommendations for the studied intersection was based on NCDOT's *Policy on Street and Driveway Access to North Carolina Highways* (Driveway Manual) methodology and mitigation threshold requirements, and engineering judgment.

According to NCDOT, mitigation improvements are required to the studied roadway network if at least one of the following conditions exists when comparing base network conditions to project build-out conditions:

- Average intersection or approach delay increases by 25% or greater while maintaining the same LOS,
- LOS degrades by at least one level
- LOS is F

Old Cullowhee Road (NC 107) @ Lyle Wilson Road (SR 1329)

As can be seen in *Table 6*, the difference in LOS, delay, v/c ratio, and queue between background traffic and build-out traffic are only minimally increased for northeast bound during the AM and PM peak hours. In particular, the northeast bound left-turn movement LOS E remains the same in the AM peak hour, and the LOS declines from C to D in the PM peak hour. The LOS decreases remain at acceptable levels and these minor increases in delay are acceptable because the delay increase of 15 percent AM peak hour and the 4 percent PM peak hour increases are below NCDOT's mitigation thresholds.

The peak hours for data analysis were derived from the ITE Trip Generation 10th edition and the study times of 7 AM to 9AM and 4 PM to 6 PM of the LUC for the proposed development. The observed existing peak hour factors (PHF) of NC 107 were between the PHF values between 0.89 to 0.92. The NCDOT guidelines for future year analysis prescribe the use of PHF 0.90 which is in line with the observed valuesof NC 107. The existing analysis shows that the observed 7 AM to 9 AM peak hour traffic flow consists largely of school traffic which comes off of Wisdom Drive. The build-out conditions of the proposed project analysis shows the additional 18 projected AM trips and 11 PM trips contributing to the increase delay at Lyle Wilson Road at NC 107. In the AM build-out conditions, only 12 percent of the approach volume is proposed project generated trips while 88 percent of the volume is school generated trips at the intersection of Lyle Wilson Road and NC 107.

Comparison of Existing, Background, and Build-Out Peak Hour Traffic Conditions

				Existing				Background				Build-out					
Intersection	Approach	Lane	Hour	Queue Length (ft) [Exist]	LOS [Exist]	Delay (sec) [Exist]	V/C Ratio [Exist]	Queue Length (ft) [BG]	LOS [BG]	Delay (sec) [BG]	V/C Ratio [BG]	Queue Length (ft) [BO]	LOS [BO]	Delay (sec) [BO]	V/C Ratio [BO]	Background vs Build-out Delay Increase %	Background Queue & Build-Out Queue Difference (FT)
Old Cullowhee Road (NC 107) @ Lyle Wilson Road (SR 1329)	Northbound	Left	AM	14	A	8.7	0.02	14	A	8.6	0.01	31	A	8.6	0.01	0%	17
			PM	17	A	8.8	0.01	14	A	8.9	0.01	21	A	8.9	0.01	0%	7
	Northbound	Thru	AM	0	--	0	0.41	0	--	0	0.43	0	--	0	0.43	0%	0
			PM	0	--	0	0.26	0	--	0	0.28	0	--	0	0.28	0%	0
	Southbound	Thru	AM	0	--	0	0.19	0	--	0	0.21	0	--	0	0.21	0%	0
			PM	0	--	0	0.32	0	--	0	0.35	0	--	0	0.35	0%	0
	Southbound	Right	AM	0	--	0	0.15	0	--	0	0.12	0	--	0	0.12	0%	0
			PM	0	--	0	0.05	0	--	0	0.03	0	--	0	0.04	0%	0
	N.Eastbound	Left/Right	AM	102	E	42.7	0.65	83	E	39.3	0.59	136	E	45.0	0.66	15%	53
			PM	38	D	25.8	0.35	42	C	24.5	0.22	49	D	25.6	0.27	4%	7
Lyle Wilson Road (SR 1329) @ Site Access #1	Eastbound	Thru/(Right)	AM									0	--	0	0	0%	0
			PM									0	--	0	0	0%	0
	Westbound	(Left)/Thru	AM									0	--	0	0	0%	0
			PM									0	A	7.2	0	0%	0
	Northbound	(Left/Right)	AM									0	A	8.3	0	0%	0
			PM									0	A	0	0	0%	0
Lyle Wilson Road (SR 1329) @ Site Access #2	Eastbound	(Left/Right)	AM									0	--	0	0	0%	0
			PM									0	--	0	0	0%	0
	Westbound	(Left)/Thru	AM									0	--	0	0	0%	0
			PM									0	--	7.2	0	0%	0
	Southbound	Thru/(Right)	AM									0	A	8.3	0	0%	0
			PM									0	A	8.3	0	0%	0
Lyle Wilson Road (SR 1329) @ Site Access #3	Eastbound	Thru/(Right)	AM									0	A	8.3	0	0%	0
			PM									11	A	8.3	0	0%	11
	Westbound	(Left)/Thru	AM									0	--	0	0	0%	0
			PM									0	--	0	0	0%	0
	Northbound	(Left/Right)	AM									0	--	7.2	0	0%	0
			PM									0	--	7.2	0	0%	0
Lyle Wilson Road (SR 1329) @ Site Access #4	Eastbound	(Left/Right)	AM									0	0	0	0	0%	0
			PM									0	0	0	0	0%	0
	Northbound	(Left)/Thru	AM									0	0	0	0	0%	0
			PM									0	0	0	0	0%	0
	Southbound	Thru/(Right)	AM									0	0	0	0	0%	0
			PM									0	0	0	0	0%	0
Lyle Wilson Road (SR 1329) @ Site Access #5	Westbound	(Left/Right)	AM									0	0	0	0	0%	0
			PM									0	0	0	0	0%	0
	Northbound	Thru/(Right)	AM									0	0	0	0	0%	0
			PM									0	0	0	0	0%	0
	Southbound	(Left)/Thru	AM									0	0	0	0	0%	0
			PM									0	0	0	0	0%	0

(XXXX) Indicates build-out lane direction additions to existing and background movements

Appendix A

Proposed Site Plan

Lofquist & Associates, Inc.
PLANNING *ENGINEERING* *DESIGN*
11 Citrus Drive Sylva, NC 28779 (828) 586 - 1424
Firm License No.: C-2288 Plot Date: 9/26/19

PRELIMINARY - DO NOT USE FOR CONSTRUCTION

NOTE:
THIS PLAN HAS BEEN DEVELOPED USING NC LIDAR DATA, THE BOUNDARY SURVEYS BY DAVENPORT, IVEY & & ASSOC., INC. ALL INFORMATION SHOWN ON THIS PLAN IS APPROXIMATE AND IS INTENDED FOR CONCEPTUAL PLANNING PURPOSES ONLY. THIS PLAN IS NOT INTENDED TO IN ANY WAY REPRESENT A FINAL DESIGN. THIS PLAN SHOULD NOT BE USED FOR THE SALE OR CONVEYANCE OF LAND OR RIGHT OF WAYS OR FOR CONSTRUCTION PURPOSES. DESIGNS WILL BE FINALIZED AT A LATER DATE AND MAY REQUIRE ADDITIONAL MODIFICATIONS TO THIS CONCEPTUAL SITE PLAN. THIS CONCEPTUAL PLAN IS NOT INTENDED TO SHOWN PRELIMINARY SITE DESIGN FOR INDIVIDUAL LOTS. ADDITIONAL WALLS AND IMPROVEMENTS WILL BE REQUIRED ON INDIVIDUAL LOTS TO ACCOMMODATE HOME CONSTRUCTION. THE PRELIMINARY LOCATIONS AND EXTENT OF PROPOSED EARTH SLOPES AND RETAINING SYSTEMS SHOWN ARE BASED ON ASSUMED GEOTECHNICAL PARAMETERS. THIS CONCEPT IS BASED ON THE ASSUMPTION THAT 1.5 HORIZONTAL TO 1 VERTICAL CUT SLOPES AND 2 HORIZONTAL TO 1 VERTICAL FILL SLOPES WILL BE FOUND TO BE SUITABLE FOR SITE SPECIFIC SOIL CONDITIONS. IT IS THE OWNER'S RESPONSIBILITY TO ENGAGE THE SERVICES OF A QUALIFIED NC GEOTECHNICAL ENGINEER TO EVALUATE SITE SPECIFIC SOIL CONDITIONS PRIOR TO PROCEEDING WITH FINAL PROJECT PLANNING.

NORTH

40 20 0 40 80
Scale In Feet
Graphic Scale 1" = 40'

PRELIMINARY - DO NOT USE CONSTRUCTION

DRAFT - PROGRESS WORKSHEET (IN PROCESS 9/26/19)

CONCEPTUAL LAND PLAN FOR A PLANNED RESIDENTIAL SUBDIVISION

UNIVERSITY PROPERTY GROUP, LLC - Client

Jackson County, North Carolina
(Updated 9/26/19)

Appendix B

Turning Movement Counts

J.M. Teague Engineering & Planning

1155 N. Main Street, Waynesville, NC 28786

828-456-8383

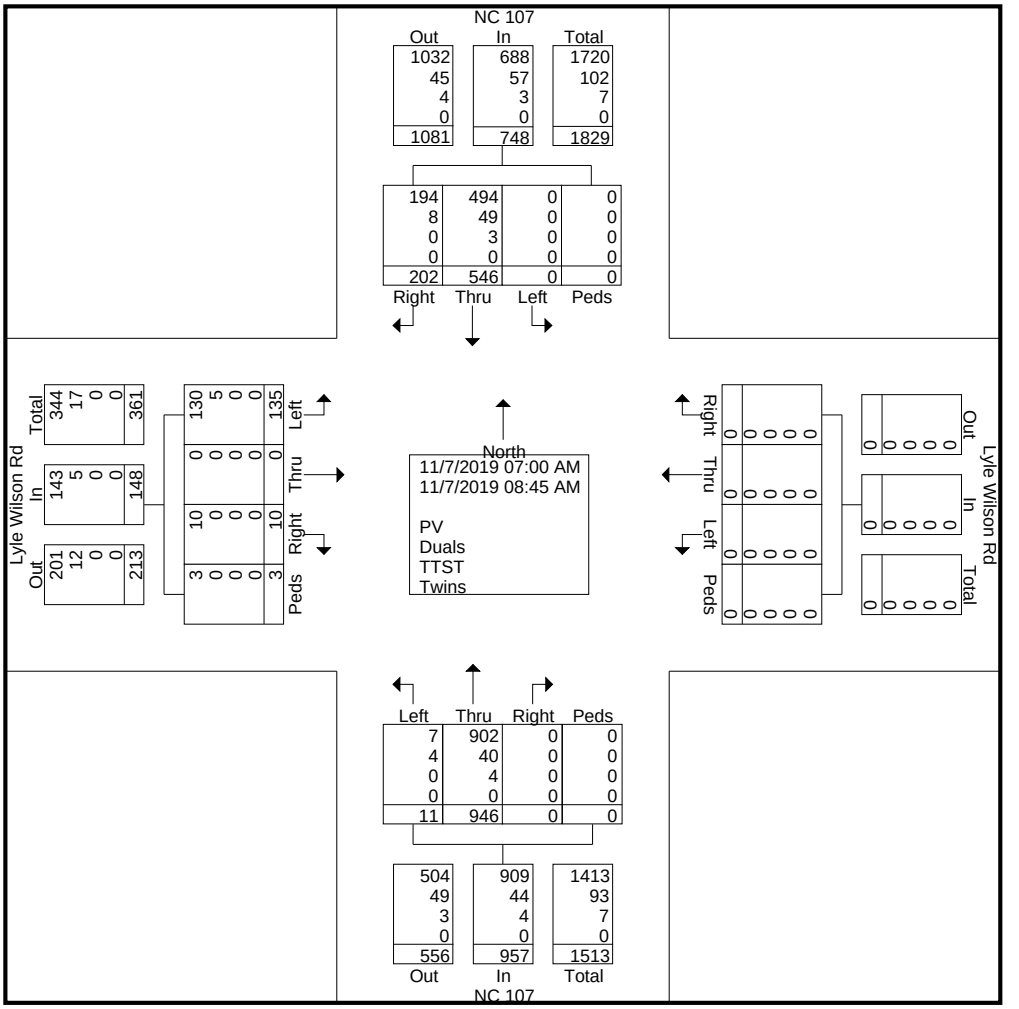
File Name : NC 107 @ Lyle Wilson Rd - Existing AM
Site Code : WAYN0995
Start Date : 11/7/2019
Page No : 1

Groups Printed- PV - Duals - TTST - Twins

	NC 107 Southbound					Lyle Wilson Rd Westbound					NC 107 Northbound					Lyle Wilson Rd Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	60	15	0	75	0	0	0	0	0	1	93	0	0	94	6	0	1	0	7	176
07:15 AM	0	72	36	0	108	0	0	0	0	0	6	148	0	0	154	18	0	3	0	21	283
07:30 AM	0	68	63	0	131	0	0	0	0	0	1	172	0	0	173	28	0	2	0	30	334
07:45 AM	0	83	56	0	139	0	0	0	0	0	2	173	0	0	175	30	0	1	0	31	345
Total	0	283	170	0	453	0	0	0	0	0	10	586	0	0	596	82	0	7	0	89	1138
08:00 AM	0	81	21	0	102	0	0	0	0	0	0	122	0	0	122	38	0	0	0	38	262
08:15 AM	0	58	4	0	62	0	0	0	0	0	0	74	0	0	74	2	0	0	0	2	138
08:30 AM	0	60	6	0	66	0	0	0	0	0	1	84	0	0	85	4	0	2	2	8	159
08:45 AM	0	64	1	0	65	0	0	0	0	0	0	80	0	0	80	9	0	1	1	11	156
Total	0	263	32	0	295	0	0	0	0	0	1	360	0	0	361	53	0	3	3	59	715
Grand Total	0	546	202	0	748	0	0	0	0	0	11	946	0	0	957	135	0	10	3	148	1853
Apprch %	0	73	27	0		0	0	0	0		1.1	98.9	0	0		91.2	0	6.8	2		
Total %	0	29.5	10.9	0	40.4	0	0	0	0	0	0.6	51.1	0	0	51.6	7.3	0	0.5	0.2	8	
PV	0	494	194	0	688	0	0	0	0	0	7	902	0	0	909	130	0	10	3	143	1740
% PV	0	90.5	96	0	92	0	0	0	0	0	63.6	95.3	0	0	95	96.3	0	100	100	96.6	93.9
Duals	0	49	8	0	57	0	0	0	0	0	4	40	0	0	44	5	0	0	0	5	106
% Duals	0	9	4	0	7.6	0	0	0	0	0	36.4	4.2	0	0	4.6	3.7	0	0	0	3.4	5.7
TTST	0	3	0	0	3	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	7
% TTST	0	0.5	0	0	0.4	0	0	0	0	0	0	0.4	0	0	0.4	0	0	0	0	0	0.4
Twins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Twins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

J.M. Teague Engineering & Planning
1155 N. Main Street, Waynesville, NC 28786
828-456-8383

File Name : NC 107 @ Lyle Wilson Rd - Existing AM
Site Code : WAYN0995
Start Date : 11/7/2019
Page No : 2



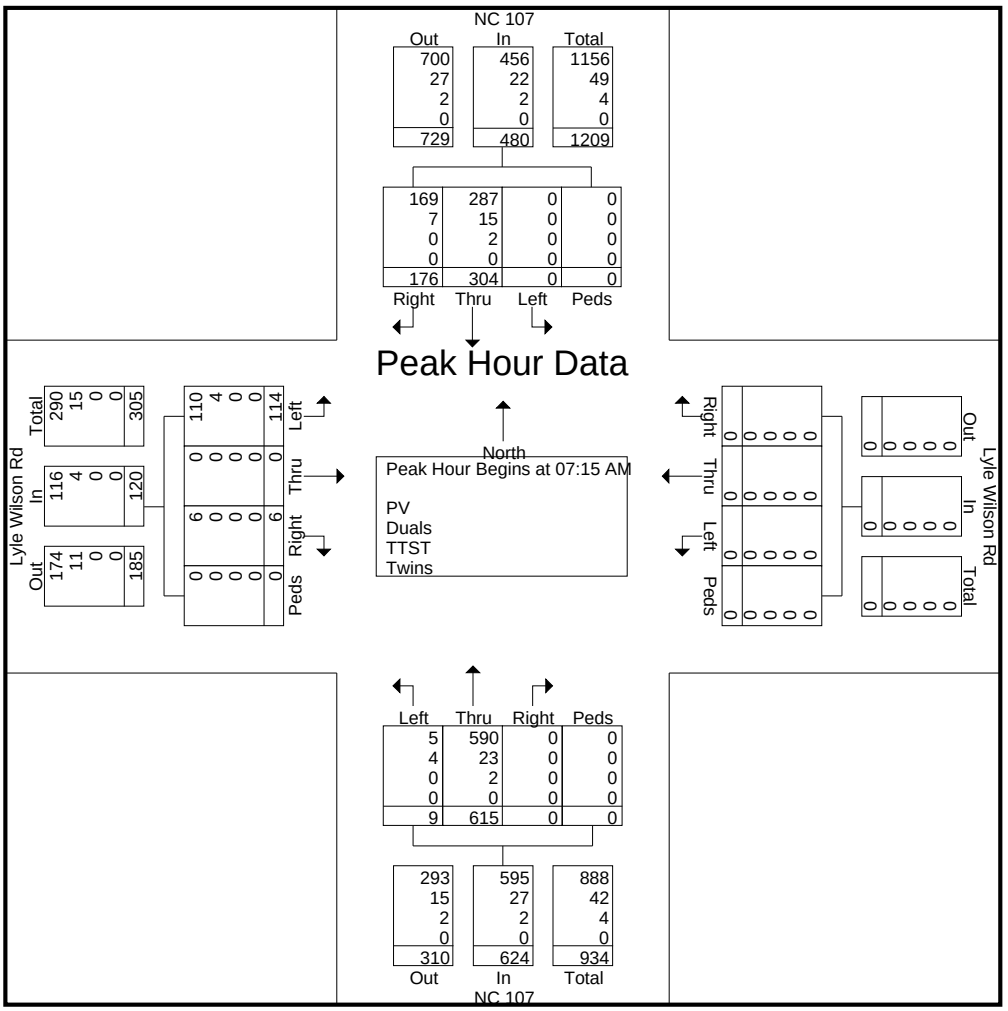
J.M. Teague Engineering & Planning

1155 N. Main Street, Waynesville, NC 28786

828-456-8383

File Name : NC 107 @ Lyle Wilson Rd - Existing AM
Site Code : WAYN0995
Start Date : 11/7/2019
Page No : 3

	NC 107 Southbound					Lyle Wilson Rd Westbound					NC 107 Northbound					Lyle Wilson Rd Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	72	36	0	108	0	0	0	0	0	6	148	0	0	154	18	0	3	0	21	283
07:30 AM	0	68	63	0	131	0	0	0	0	0	1	172	0	0	173	28	0	2	0	30	334
07:45 AM	0	83	56	0	139	0	0	0	0	0	2	173	0	0	175	30	0	1	0	31	345
08:00 AM	0	81	21	0	102	0	0	0	0	0	0	122	0	0	122	38	0	0	0	38	262
Total Volume	0	304	176	0	480	0	0	0	0	0	9	615	0	0	624	114	0	6	0	120	1224
% App. Total	0	63.3	36.7	0		0	0	0	0		1.4	98.6	0	0		95	0	5	0		
PHF	.000	.916	.698	.000	.863	.000	.000	.000	.000	.000	.375	.889	.000	.000	.891	.750	.000	.500	.000	.789	.887
PV	0	287	169	0	456	0	0	0	0	0	5	590	0	0	595	110	0	6	0	116	1167
% PV	0	94.4	96.0	0	95.0	0	0	0	0	0	55.6	95.9	0	0	95.4	96.5	0	100	0	96.7	95.3
Duals	0	15	7	0	22	0	0	0	0	0	4	23	0	0	27	4	0	0	0	4	53
% Duals	0	4.9	4.0	0	4.6	0	0	0	0	0	44.4	3.7	0	0	4.3	3.5	0	0	0	3.3	4.3
TTST	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	4
% TTST	0	0.7	0	0	0.4	0	0	0	0	0	0	0.3	0	0	0.3	0	0	0	0	0	0.3
Twins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Twins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



J.M. Teague Engineering & Planning

1155 N. Main Street, Waynesville, NC 28786

828-456-8383

File Name : NC 107 @ Lyle Wilson Rd - Existing PM
Site Code : WAYN0995
Start Date : 11/7/2019
Page No : 1

Groups Printed- PV - Duals - TTST - Twins

	NC 107 Southbound					Lyle Wilson Rd Westbound					NC 107 Northbound					Lyle Wilson Rd Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	109	3	0	112	0	0	0	0	0	2	82	0	0	84	1	0	0	0	1	197
04:15 PM	1	107	8	0	116	0	0	0	0	0	0	88	0	0	88	3	1	2	0	6	210
04:30 PM	0	105	13	0	118	0	0	0	0	0	2	86	0	0	88	5	0	0	0	5	211
04:45 PM	0	97	15	0	112	0	0	0	0	0	0	72	0	0	72	11	0	1	0	12	196
Total	1	418	39	0	458	0	0	0	0	0	4	328	0	0	332	20	1	3	0	24	814
05:00 PM	0	138	20	0	158	0	0	0	0	0	2	112	0	0	114	22	0	0	0	22	294
05:15 PM	0	128	4	0	132	0	0	0	0	0	3	99	0	0	102	15	0	0	0	15	249
05:30 PM	0	112	7	0	119	0	0	0	0	0	0	103	1	0	104	5	0	0	0	5	228
05:45 PM	0	134	6	0	140	0	0	0	0	0	2	90	0	0	92	3	0	1	0	4	236
Total	0	512	37	0	549	0	0	0	0	0	7	404	1	0	412	45	0	1	0	46	1007
Grand Total	1	930	76	0	1007	0	0	0	0	0	11	732	1	0	744	65	1	4	0	70	1821
Apprch %	0.1	92.4	7.5	0		0	0	0	0		1.5	98.4	0.1	0		92.9	1.4	5.7	0		
Total %	0.1	51.1	4.2	0	55.3	0	0	0	0	0	0.6	40.2	0.1	0	40.9	3.6	0.1	0.2	0	3.8	
PV	1	919	74	0	994	0	0	0	0	0	8	685	1	0	694	65	1	4	0	70	1758
% PV	100	98.8	97.4	0	98.7	0	0	0	0	0	72.7	93.6	100	0	93.3	100	100	100	0	100	96.5
Duals	0	11	2	0	13	0	0	0	0	0	3	44	0	0	47	0	0	0	0	0	60
% Duals	0	1.2	2.6	0	1.3	0	0	0	0	0	27.3	6	0	0	6.3	0	0	0	0	0	3.3
TTST	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3
% TTST	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0.4	0	0	0	0	0	0.2
Twins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Twins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

J.M. Teague Engineering & Planning
1155 N. Main Street, Waynesville, NC 28786
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File Name : NC 107 @ Lyle Wilson Rd - Existing PM
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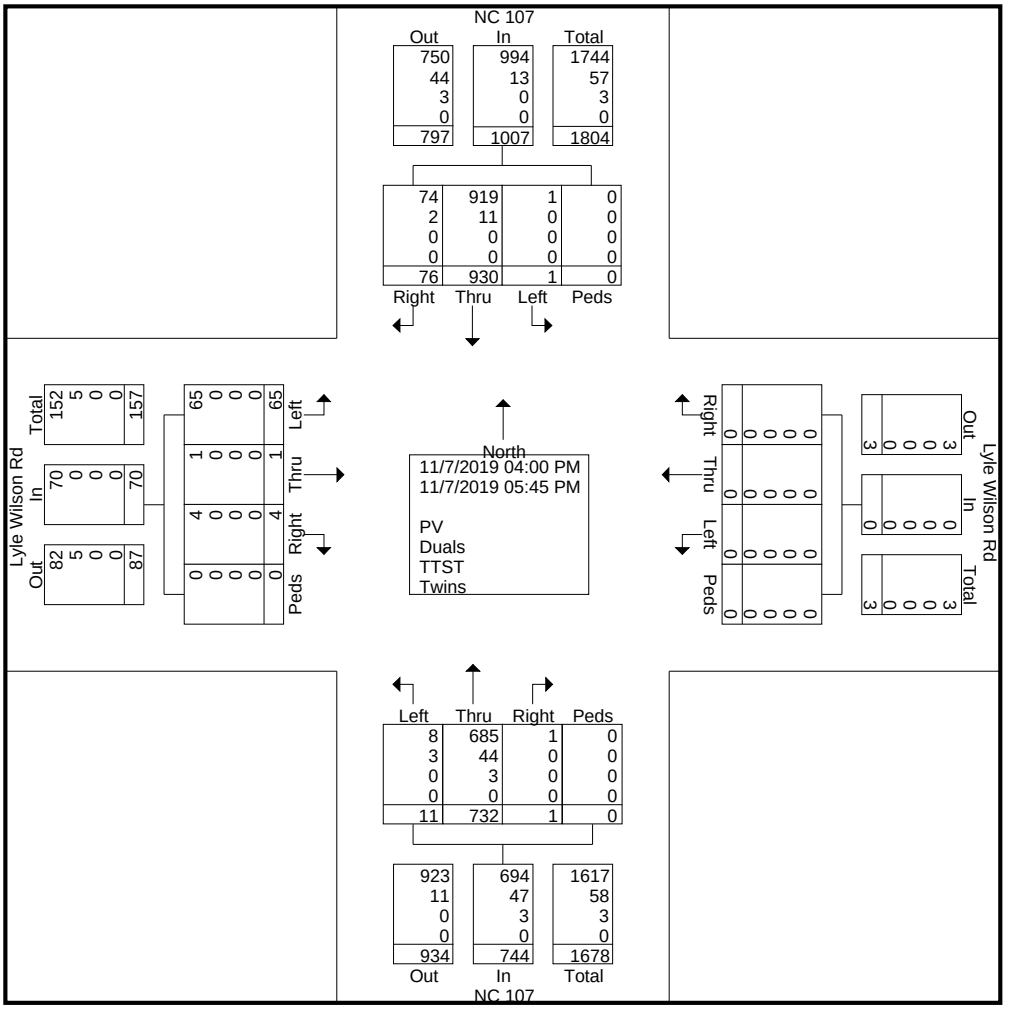

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1155 N. Main Street, Waynesville, NC 28786

828-456-8383

File Name : NC 107 @ Lyle Wilson Rd - Existing PM
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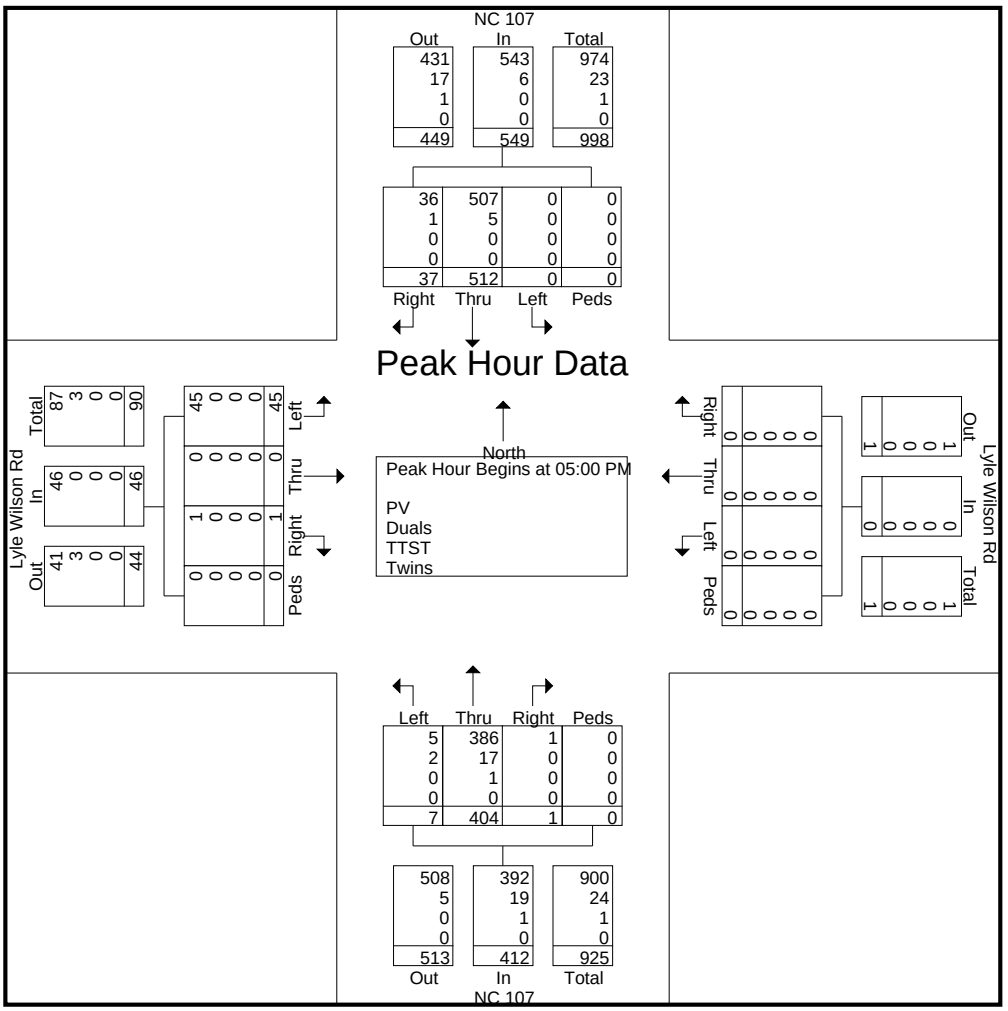
	NC 107 Southbound					Lyle Wilson Rd Westbound					NC 107 Northbound					Lyle Wilson Rd Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	138	20	0	158	0	0	0	0	0	2	112	0	0	114	22	0	0	0	22	294
05:15 PM	0	128	4	0	132	0	0	0	0	0	3	99	0	0	102	15	0	0	0	15	249
05:30 PM	0	112	7	0	119	0	0	0	0	0	0	103	1	0	104	5	0	0	0	5	228
05:45 PM	0	134	6	0	140	0	0	0	0	0	2	90	0	0	92	3	0	1	0	4	236
Total Volume	0	512	37	0	549	0	0	0	0	0	7	404	1	0	412	45	0	1	0	46	1007
% App. Total	0	93.3	6.7	0		0	0	0	0		1.7	98.1	0.2	0		97.8	0	2.2	0		
PHF	.000	.928	.463	.000	.869	.000	.000	.000	.000	.000	.583	.902	.250	.000	.904	.511	.000	.250	.000	.523	.856
PV	0	507	36	0	543	0	0	0	0	0	5	386	1	0	392	45	0	1	0	46	981
% PV	0	99.0	97.3	0	98.9	0	0	0	0	0	71.4	95.5	100	0	95.1	100	0	100	0	100	97.4
Duals	0	5	1	0	6	0	0	0	0	0	2	17	0	0	19	0	0	0	0	0	25
% Duals	0	1.0	2.7	0	1.1	0	0	0	0	0	28.6	4.2	0	0	4.6	0	0	0	0	0	2.5
TTST	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
% TTST	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0.2	0	0	0	0	0	0.1
Twins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Twins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Appendix C

Synchro & SimTraffic Reports

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	9	615	304	176	114	6
Future Volume (Veh/h)	9	615	304	176	114	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.38	0.89	0.92	0.70	0.75	0.50
Hourly flow rate (vph)	24	691	330	251	152	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	581				1069	330
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	581				1069	330
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				36	98
cM capacity (veh/h)	993				239	712

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	NE 1
Volume Total	24	691	330	251	164
Volume Left	24	0	0	0	152
Volume Right	0	0	0	251	12
cSH	993	1700	1700	1700	251
Volume to Capacity	0.02	0.41	0.19	0.15	0.65
Queue Length 95th (ft)	2	0	0	0	102
Control Delay (s)	8.7	0.0	0.0	0.0	42.7
Lane LOS	A				E
Approach Delay (s)	0.3		0.0		42.7
Approach LOS					E

Intersection Summary			
Average Delay	4.9		
Intersection Capacity Utilization	45.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	7	404	512	37	45	1
Future Volume (Veh/h)	7	404	512	37	45	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.58	0.90	0.93	0.46	0.51	0.25
Hourly flow rate (vph)	12	449	551	80	88	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	631				1024	551
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	631				1024	551
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				66	99
cM capacity (veh/h)	951				257	534

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	NE 1
Volume Total	12	449	551	80	92
Volume Left	12	0	0	0	88
Volume Right	0	0	0	80	4
cSH	951	1700	1700	1700	263
Volume to Capacity	0.01	0.26	0.32	0.05	0.35
Queue Length 95th (ft)	1	0	0	0	38
Control Delay (s)	8.8	0.0	0.0	0.0	25.8
Lane LOS	A				D
Approach Delay (s)	0.2		0.0		25.8
Approach LOS					D

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	36.9%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection: 1: Lyle Wilson Road & NC 107

Movement	NB	NE
Directions Served	L	LR
Maximum Queue (ft)	14	77
Average Queue (ft)	3	46
95th Queue (ft)	19	88
Link Distance (ft)		496
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	100	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Intersection: 1: Lyle Wilson Road & NC 107

Movement	NB	NE
Directions Served	L	LR
Maximum Queue (ft)	17	38
Average Queue (ft)	4	23
95th Queue (ft)	23	48
Link Distance (ft)		496
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	100	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	10	651	322	186	120	6
Future Volume (Veh/h)	10	651	322	186	120	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	11	723	358	207	133	7
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	565				1103	358
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	565				1103	358
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				43	99
cM capacity (veh/h)	1007				231	686

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	NE 1
Volume Total	11	723	358	207	140
Volume Left	11	0	0	0	133
Volume Right	0	0	0	207	7
cSH	1007	1700	1700	1700	239
Volume to Capacity	0.01	0.43	0.21	0.12	0.59
Queue Length 95th (ft)	1	0	0	0	83
Control Delay (s)	8.6	0.0	0.0	0.0	39.3
Lane LOS	A				E
Approach Delay (s)	0.1		0.0		39.3
Approach LOS					E

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	47.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	7	428	542	39	47	1
Future Volume (Veh/h)	7	428	542	39	47	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	8	476	602	43	52	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	645				1094	602
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	645				1094	602
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				78	100
cM capacity (veh/h)	940				235	500

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	NE 1
Volume Total	8	476	602	43	53
Volume Left	8	0	0	0	52
Volume Right	0	0	0	43	1
cSH	940	1700	1700	1700	237
Volume to Capacity	0.01	0.28	0.35	0.03	0.22
Queue Length 95th (ft)	1	0	0	0	21
Control Delay (s)	8.9	0.0	0.0	0.0	24.5
Lane LOS	A				C
Approach Delay (s)	0.1		0.0		24.5
Approach LOS					C

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	38.5%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection: 1: Lyle Wilson Road & NC 107

Movement	NB	NE
Directions Served	L	LR
Maximum Queue (ft)	14	79
Average Queue (ft)	4	49
95th Queue (ft)	22	93
Link Distance (ft)		496
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	100	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Intersection: 1: Lyle Wilson Road & NC 107

Movement	NB	NE
Directions Served	L	LR
Maximum Queue (ft)	14	42
Average Queue (ft)	3	24
95th Queue (ft)	19	51
Link Distance (ft)		496
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	100	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	11	651	322	189	134	10
Future Volume (Veh/h)	11	651	322	189	134	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	12	723	358	210	149	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	568				1105	358
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	568				1105	358
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				35	98
cM capacity (veh/h)	1004				230	686

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	NE 1
Volume Total	12	723	358	210	160
Volume Left	12	0	0	0	149
Volume Right	0	0	0	210	11
cSH	1004	1700	1700	1700	241
Volume to Capacity	0.01	0.43	0.21	0.12	0.66
Queue Length 95th (ft)	1	0	0	0	104
Control Delay (s)	8.6	0.0	0.0	0.0	45.0
Lane LOS	A				E
Approach Delay (s)	0.1		0.0		45.0
Approach LOS					E

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	49.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	11	428	542	55	55	4
Future Volume (Veh/h)	11	428	542	55	55	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	12	476	602	61	61	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	663				1102	602
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	663				1102	602
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				74	99
cM capacity (veh/h)	926				231	500

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	NE 1
Volume Total	12	476	602	61	65
Volume Left	12	0	0	0	61
Volume Right	0	0	0	61	4
cSH	926	1700	1700	1700	239
Volume to Capacity	0.01	0.28	0.35	0.04	0.27
Queue Length 95th (ft)	1	0	0	0	27
Control Delay (s)	8.9	0.0	0.0	0.0	25.6
Lane LOS	A				D
Approach Delay (s)	0.2		0.0		25.6
Approach LOS					D

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	38.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	0	1
Future Volume (Veh/h)	0	0	0	0	0	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	0	0	0	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			0		0	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		0	0
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1623		1023	1085

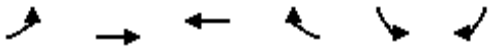
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	0	0	1
Volume Left	0	0	0
Volume Right	0	0	1
cSH	1700	1700	1085
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	8.3
Lane LOS			A
Approach Delay (s)	0.0	0.0	8.3
Approach LOS			A

Intersection Summary			
Average Delay	8.3		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	1	0	0	0
Future Volume (Veh/h)	0	0	1	0	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	1	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			0		2	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		2	0
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1623		1020	1085

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	0	1	0
Volume Left	0	1	0
Volume Right	0	0	0
cSH	1700	1623	1700
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	7.2	0.0
Lane LOS		A	A
Approach Delay (s)	0.0	7.2	0.0
Approach LOS			A

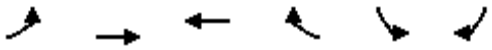
Intersection Summary			
Average Delay	7.2		
Intersection Capacity Utilization	6.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	1	0
Future Volume (Veh/h)	0	0	0	0	1	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	0	0	1	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	0				0	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0				0	0
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1623				1023	1085

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	0	1
Volume Left	0	0	1
Volume Right	0	0	0
cSH	1700	1700	1023
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	8.5
Lane LOS			A
Approach Delay (s)	0.0	0.0	8.5
Approach LOS			A

Intersection Summary			
Average Delay	8.5		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	1	1	0
Future Volume (Veh/h)	0	0	0	1	1	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	0	1	1	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1				0	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1				0	0
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1622				1023	1084

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	1	1
Volume Left	0	0	1
Volume Right	0	1	0
cSH	1700	1700	1023
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	8.5
Lane LOS			A
Approach Delay (s)	0.0	0.0	8.5
Approach LOS			A

Intersection Summary			
Average Delay	4.3		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	0	1
Future Volume (Veh/h)	0	0	0	0	0	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	0	0	0	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			0		0	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		0	0
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1623		1023	1085

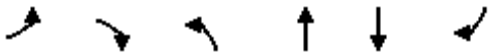
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	0	0	1
Volume Left	0	0	0
Volume Right	0	0	1
cSH	1700	1700	1085
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	8.3
Lane LOS			A
Approach Delay (s)	0.0	0.0	8.3
Approach LOS			A

Intersection Summary			
Average Delay	8.3		
Intersection Capacity Utilization	6.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	2	0	0	1
Future Volume (Veh/h)	0	0	2	0	0	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	2	0	0	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			0		4	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		4	0
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1623		1017	1085

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	0	2	1
Volume Left	0	2	0
Volume Right	0	0	1
cSH	1700	1623	1085
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	7.2	8.3
Lane LOS		A	A
Approach Delay (s)	0.0	7.2	8.3
Approach LOS			A

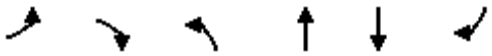
Intersection Summary			
Average Delay	7.6		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	12	0	0	0	0	3
Future Volume (Veh/h)	12	0	0	0	0	3
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	13	0	0	0	0	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2	2	3			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2	2	3			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	1021	1083	1619			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	13	0	3
Volume Left	13	0	0
Volume Right	0	0	3
cSH	1021	1700	1700
Volume to Capacity	0.01	0.00	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	8.6	0.0	0.0
Lane LOS	A		
Approach Delay (s)	8.6	0.0	0.0
Approach LOS	A		

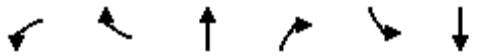
Intersection Summary			
Average Delay	7.0		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	0	0	0	0	13
Future Volume (Veh/h)	7	0	0	0	0	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	8	0	0	0	0	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	7	7	14			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	7	7	14			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	1014	1075	1604			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	8	0	14
Volume Left	8	0	0
Volume Right	0	0	14
cSH	1014	1700	1700
Volume to Capacity	0.01	0.00	0.01
Queue Length 95th (ft)	1	0	0
Control Delay (s)	8.6	0.0	0.0
Lane LOS	A		
Approach Delay (s)	8.6	0.0	0.0
Approach LOS	A		

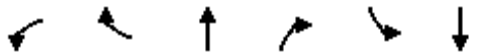
Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	3	0	0	1	0
Future Volume (Veh/h)	0	3	0	0	1	0
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	3	0	0	1	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2	0			0	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	1020	1085			1623	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	3	0	1
Volume Left	0	0	1
Volume Right	3	0	0
cSH	1085	1700	1623
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	8.3	0.0	7.2
Lane LOS	A		A
Approach Delay (s)	8.3	0.0	7.2
Approach LOS	A		

Intersection Summary			
Average Delay	8.1		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	2	0	0	3	0
Future Volume (Veh/h)	0	2	0	0	3	0
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	2	0	0	3	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	6	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	6	0			0	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	1014	1085			1623	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	2	0	3
Volume Left	0	0	3
Volume Right	2	0	0
cSH	1085	1700	1623
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	8.3	0.0	7.2
Lane LOS	A		A
Approach Delay (s)	8.3	0.0	7.2
Approach LOS	A		

Intersection Summary			
Average Delay	7.7		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection: 1: Access #1 & Lyle Wilson Road

Movement	NB
Directions Served	LR
Maximum Queue (ft)	2
Average Queue (ft)	0
95th Queue (ft)	7
Link Distance (ft)	232
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Lyle Wilson Road & Access #2

Movement	SB
Directions Served	LR
Maximum Queue (ft)	5
Average Queue (ft)	1
95th Queue (ft)	10
Link Distance (ft)	234
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: Access #3

Movement	NB
Directions Served	LR
Maximum Queue (ft)	11
Average Queue (ft)	3
95th Queue (ft)	16
Link Distance (ft)	208
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: Lyle Wilson Road & Access #4

Movement	EB
Directions Served	LR
Maximum Queue (ft)	28
Average Queue (ft)	7
95th Queue (ft)	29
Link Distance (ft)	420
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: Lyle Wilson Road & Access #5

Movement	WB
Directions Served	LR
Maximum Queue (ft)	11
Average Queue (ft)	3
95th Queue (ft)	17
Link Distance (ft)	359
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 6: Lyle Wilson Road & NC 107

Movement	NB	SB	NE
Directions Served	L	R	LR
Maximum Queue (ft)	27	5	94
Average Queue (ft)	7	1	59
95th Queue (ft)	30	13	110
Link Distance (ft)			475
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	100	200	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 0

Intersection: 1: Lyle Wilson Road & NC 107

Movement	NB	NE
Directions Served	L	LR
Maximum Queue (ft)	21	49
Average Queue (ft)	6	30
95th Queue (ft)	26	55
Link Distance (ft)		
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	100	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 2: Access #1 & Lyle Wilson Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 3: Lyle Wilson Road & Access #2

Movement	SB
Directions Served	LR
Maximum Queue (ft)	3
Average Queue (ft)	1
95th Queue (ft)	8
Link Distance (ft)	234
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: Access #3 & Lyle Wilson Road

Movement	NB
Directions Served	LR
Maximum Queue (ft)	12
Average Queue (ft)	2
95th Queue (ft)	16
Link Distance (ft)	208
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: Lyle Wilson Road & Access #4

Movement	EB
Directions Served	LR
Maximum Queue (ft)	18
Average Queue (ft)	4
95th Queue (ft)	20
Link Distance (ft)	420
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 6: Lyle Wilson Road & Access #5

Movement	WB
Directions Served	LR
Maximum Queue (ft)	11
Average Queue (ft)	3
95th Queue (ft)	18
Link Distance (ft)	359
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 0