



THE COURTYARDS ON LAWYERS ROAD

Transportation Impact Analysis

Stallings, North Carolina

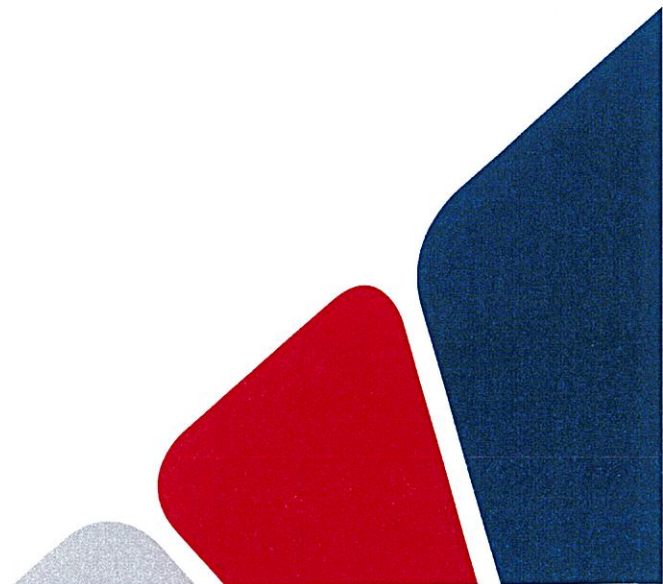
Prepared for:

Epcon Communities Carolinas, LLC

Charlotte, North Carolina

October 2018

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Prepared for:

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Charlotte, North Carolina**

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**October 2018
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10/31/18

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1.0 Executive Summary

The purpose of this Traffic Impact Analysis (TIA) is to review vehicular traffic impacts as a result of the proposed The Courtyards on Lawyers Road development. The primary objectives are:

- To estimate trip generation and distribution for the proposed development.
- To perform intersection capacity analyses for the identified study area.
- To determine the potential traffic impacts of the proposed development.
- To develop recommendations for needed roadway and operational improvements to accommodate the proposed development's traffic impacts.

The proposed site is located in Stallings, North Carolina, in the northeast quadrant of the Lawyers Road and Allen Black Road intersection. The proposed development consists of 146 age-restricted single-family homes. Anticipated build-out of the site is in 2022. Two access points are proposed, one right-in/right-out access on Lawyers Road and one full-movement access on Allen Black Road.

This TIA evaluates the traffic operations under existing 2018 conditions, 2022 background conditions (without the proposed development), and 2022 build-out conditions (with the proposed development), during the AM and PM peak hours. Through coordination with the Town of Stallings, Town of Mint Hill, and North Carolina Department of Transportation (NCDOT) staff, the following study intersections are included:

1. Lawyers Road and Allen Black Road
2. Lawyers Road and Stevens Mill Road
3. Lawyers Road and Site Access #1
4. Allen Black Road and Site Access #2

Kimley-Horn was retained to determine the potential traffic impacts of this development (in accordance with the traffic study guidelines in the *NCDOT Policy on Street and Driveway Access to North Carolina Highways*), and to identify transportation improvements that may be required to mitigate these impacts. This report presents trip generation, distribution, capacity analyses, and identified transportation improvements required to mitigate anticipated traffic demands produced by the subject development. Based on the capacity analyses and the review of unsignalized auxiliary turn-lane warrants contained herein, the following transportation improvements are recommended for 2022 build-out conditions:

Lawyers Road and Site Access #1

- Construction of a right-in/right-out intersection with one ingress lane and one shared left-right egress lane.
- Construction of a westbound right-turn lane with a minimum of 100 feet of storage.

Allen Black Road and Site Access #2

- Construction of a full-movement intersection with one ingress lane and one shared left-right egress lane.

Based on coordination with NCDOT, a westbound right-turn lane will be required at Site Access #1 on Lawyers Road; however, this turning movement does not meet NCDOT turn lane warrants.

Based on discussion with NCDOT, the following improvements are recommended to accommodate 2018 existing, 2022 background, and 2022 build-out conditions:

Lawyers Road and Allen Black Road

- Restriping the westbound right-turn lane to provide a shared through-right lane
- Restriping of the western leg of the intersection to provide two westbound receiving lanes.
- Extension of the southbound right-turn lane to provide 175' of storage

As outlined in Section 6.1, with the proposed site traffic and these improvements, the intersection is expected to operate with less delay than the existing condition. Further, based on conversations with NCDOT, installation of a traffic signal or roundabout at this intersection would not be recommended due to proximity to the interchange. Note that all recommended improvements are subject to NCDOT approval.

It is noted that the developer has committed to contribute \$250,000 toward offsite transportation improvements for the study intersections, beyond the recommended improvements at the site access points. The transportation improvements are subject to approval by NCDOT and local municipalities. All additions and attachments to the State roadway system shall be properly permitted, designed, and constructed in conformance to standards maintained by the agencies.

2.0 Introduction

The proposed The Courtyard on Lawyers Road development is located in Stallings, North Carolina, in the northeast quadrant area of the Lawyers Road and Allen Black Road intersection. **Figure 2.1** shows the site location.

The proposed development consists of 146 age-restricted single-family homes. Anticipated build-out of the site is in 2022. Two access points are proposed, one right-in/right-out access on Lawyers Road and one full-movement access on Allen Black Road.

Figure 2.2 shows the proposed site plan for the development.

This TIA evaluates the traffic operations under existing 2018 conditions, 2022 background conditions (without the proposed development), and 2022 build-out conditions (with the proposed development), during the AM and PM peak hours. Through coordination with the Town of Stallings, Town of Mint Hill, and NCDOT staff, the following study intersections are included:

1. Lawyers Road and Allen Black Road
2. Lawyers Road and Stevens Mill Road
3. Lawyers Road and Site Access #1
4. Allen Black Road and Access #2

The study area intersection of Lawyers Road and Stevens Mill Road was added at the request of The Courtyards on Lawyers Road developer.

Kimley-Horn was retained to determine the potential traffic impacts of this development (in accordance with the traffic study guidelines in the *NCDOT Policy on Street and Driveway Access to North Carolina Highways*), and to identify transportation improvements that may be required to mitigate these impacts. This report presents trip generation, distribution, capacity analyses, and identified transportation improvements required to mitigate anticipated traffic demands produced by the subject development.



3.0 Existing Traffic Conditions

Existing traffic conditions were coordinated with Town of Stallings, Town of Mint Hill, and NCDOT staff and collected through a desktop review and turning-movement counts to establish the existing conditions baseline analysis.

3.1 STUDY AREA

The study area for this TIA consists of the following intersections:

1. Lawyers Road and Allen Black Road
2. Lawyers Road and Stevens Mill Road
3. Lawyers Road and Site Access #1
4. Allen Black Road and Site Access #2

Figure 3.1 shows the roadway geometry at the existing study intersections.

The primary roadways in the vicinity of the site are Lawyers Road, Stevens Mill Road, and Allen Black Road.

Lawyers Road is a two-lane divided major collector with a posted speed limit of 45 miles per hour (mph) and a 2016 NCDOT average daily traffic (ADT) volume of 20,000 vehicles per day (vpd) west of Allen Black Road and 19,000 vpd east of Allen Black Road.

Stevens Mill Road is a two-lane undivided, major collector with a posted speed limit of 45 mph south of Lawyers Road. It is a local, neighborhood street with a posted speed limit of 25 mph north of Lawyers Road. South of Lawyers Road, Stevens Mill Road has an NCDOT 2017 ADT of 6,400 vpd.

Allen Black Road is a two-lane undivided local roadway with a posted speed limit of 55 mph. There is no available NCDOT ADT data on-line for this roadway.

3.2 EXISTING TRAFFIC CONDITIONS

AM (7-9) and PM (4-6) peak-hour intersection turning-movement counts were collected by National Data & Surveying Services on Thursday, August 30, 2018 at the intersection of Lawyers Road and Allen Black Road.

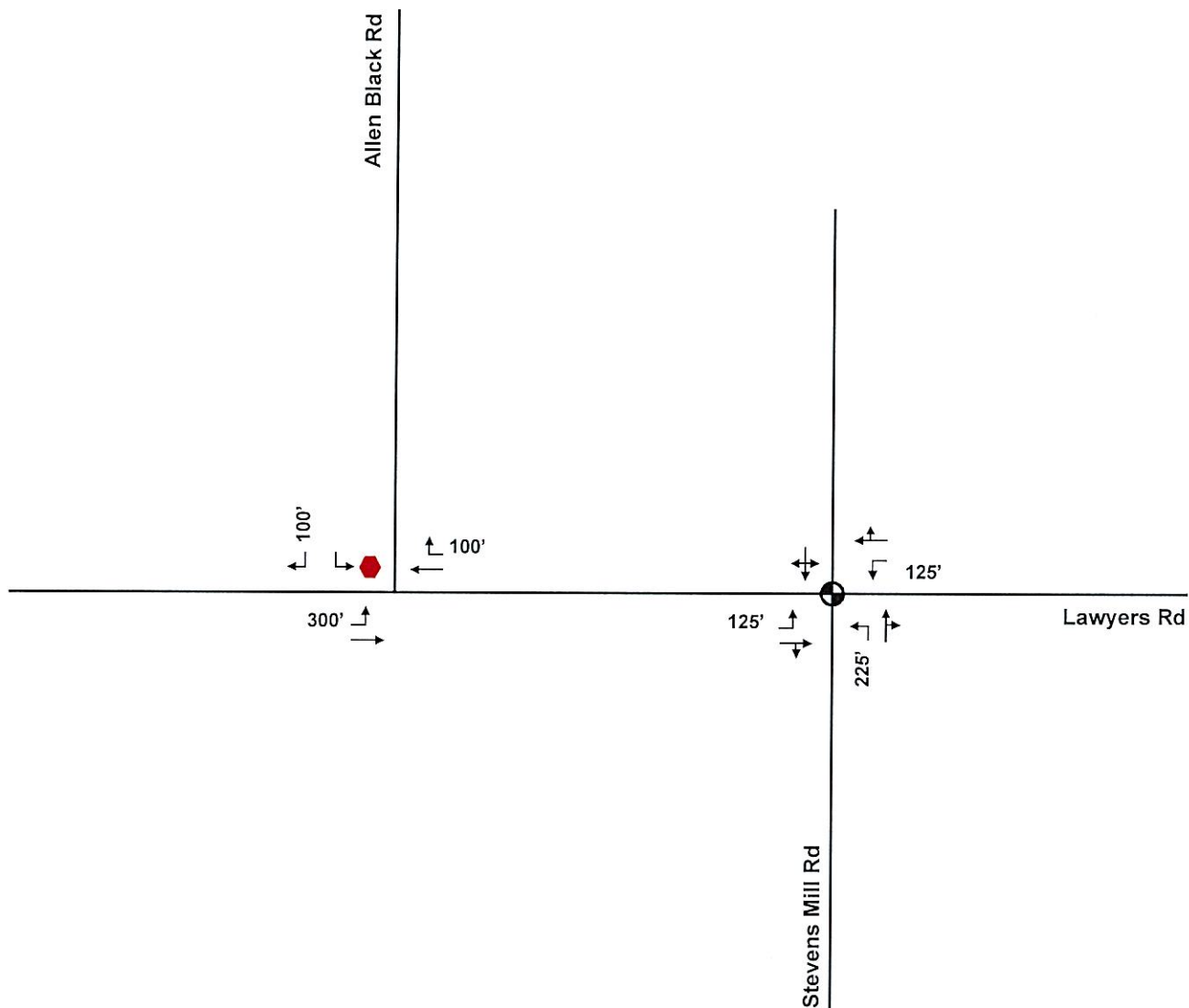
AM (7-9) and PM (4-6) peak-hour intersection turning-movement counts were collected by National Data & Surveying Services on Tuesday, October 2, 2018 at the intersection of Lawyers Road and Stevens Mill Road.

Raw peak-hour intersection turning-movement count data is provided in the **Appendix**.

Figure 3.2 illustrates the 2018 existing AM and PM peak-hour traffic volumes.



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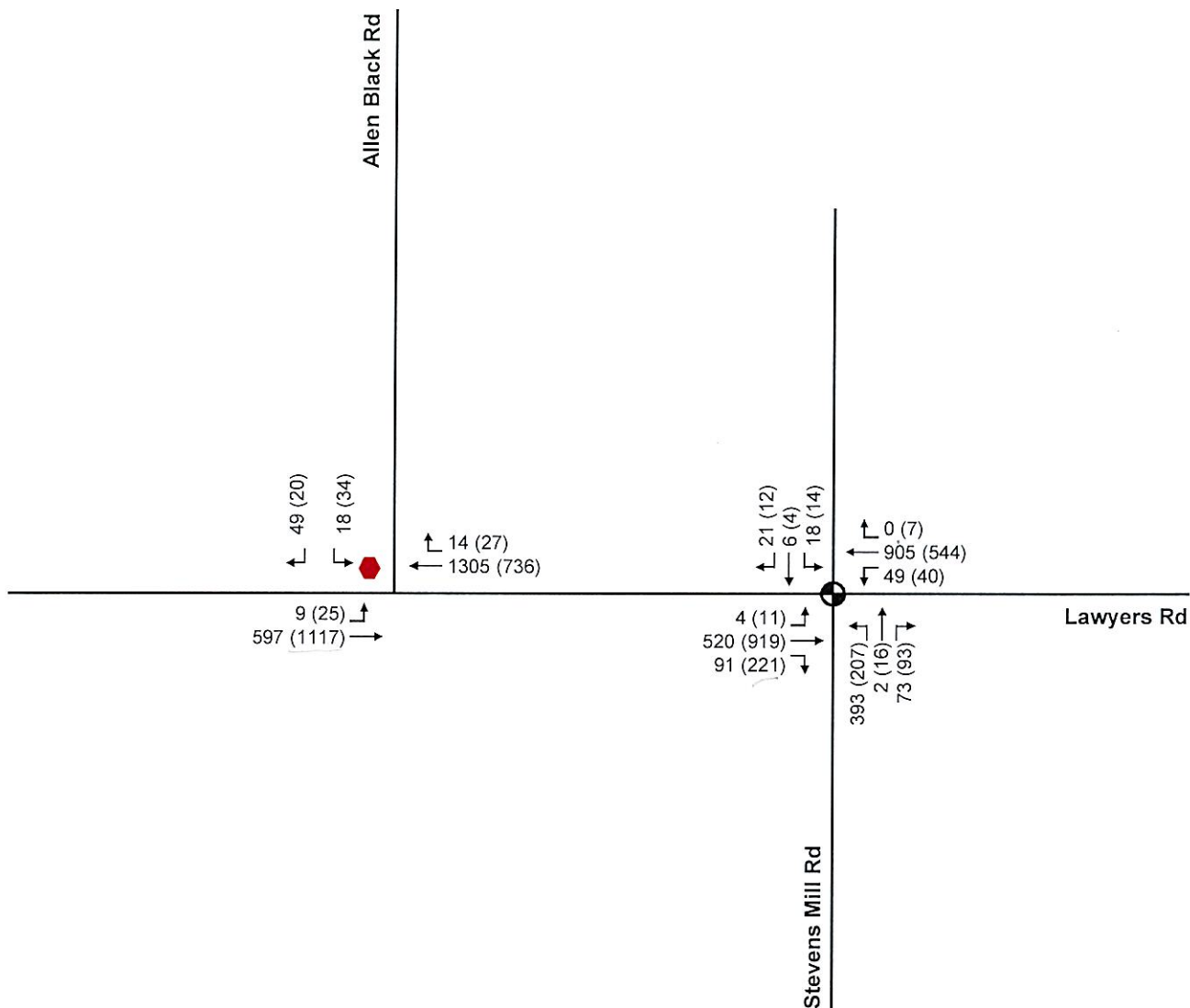


LEGEND

- Laneage
- XX' Storage Length
- Stop Control
- ⊕ Traffic Signal



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LEGEND	
	Turning Movement
XX	AM Peak Hour Traffic Volumes
(XX)	PM Peak Hour Traffic Volumes
	Stop Control
	Traffic Signal

4.0 Background Traffic Conditions

Projected background (non-project) traffic is defined as the expected growth or change in traffic volumes on the surrounding roadway network between the year the existing counts were collected and the expected build-out year absent the construction and opening of the proposed project. This includes both non-specific general growth based on historical increase in local traffic volumes (historical background growth) and specific growth in traffic volumes caused by off-site approved developments within the relative vicinity of the proposed development.

4.1 HISTORICAL GROWTH TRAFFIC

Historical background growth is the increase in existing traffic volumes due to usage increases and non-specific growth throughout the area, and accounts for growth that is independent of specific approved off-site developments. Historical background growth traffic is calculated using an annual growth rate, which is applied to the existing traffic volumes up to the future horizon year. An annual growth rate of 2% was used in this analysis based on historical ADT data and coordination with NCDOT, the Town of Stallings, and the Town of Mint Hill.

These growth rates were applied to the 2018 existing peak-hour traffic volumes to calculate base 2022 historical growth traffic volumes.

4.2 APPROVED OFFSITE DEVELOPMENT TRAFFIC

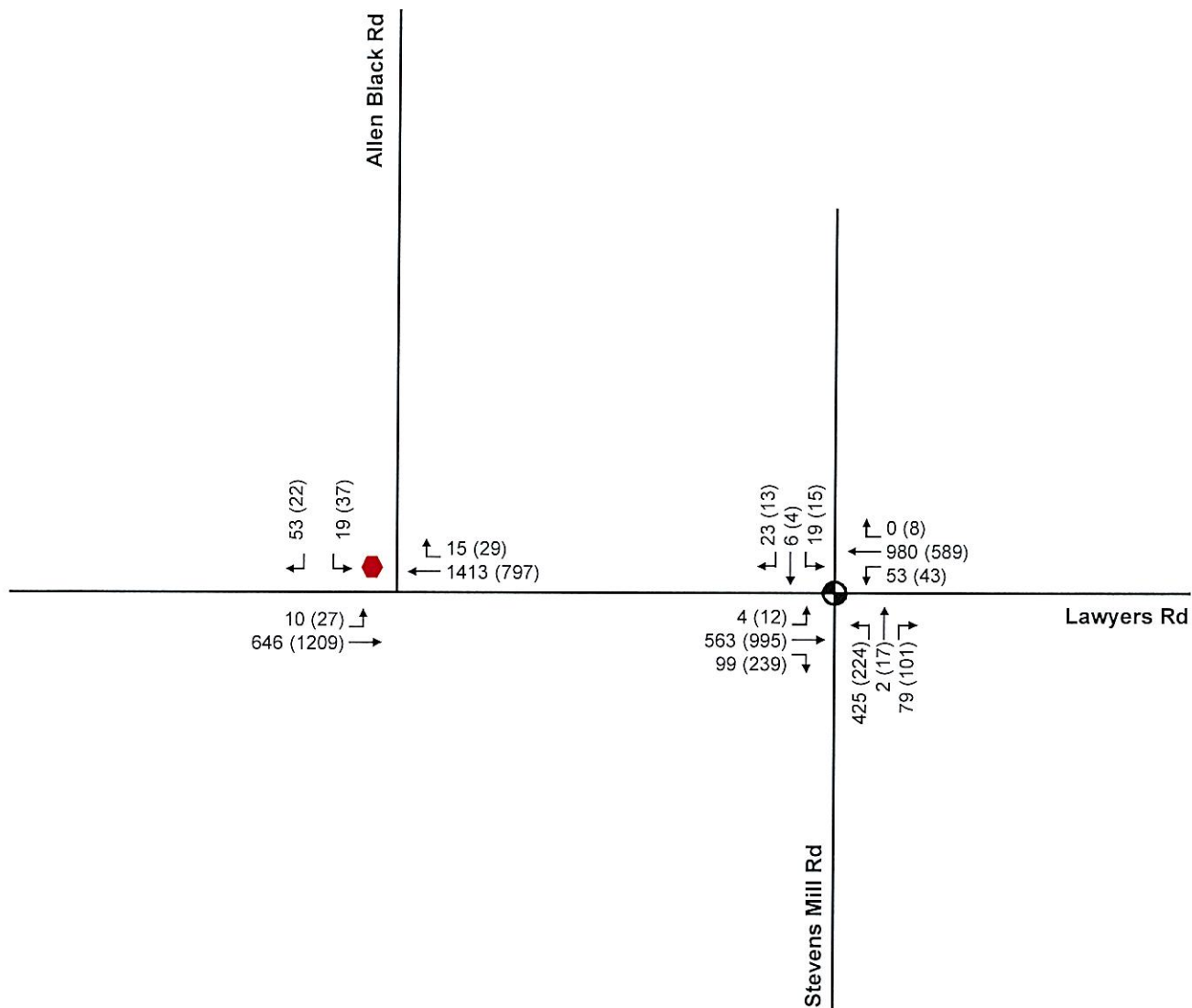
Based on coordination with Town of Stallings, Town of Mint Hill, and NCDOT staff, no approved off-site developments were included in this analysis.

4.3 2022 BACKGROUND TRAFFIC

2022 background traffic consists of existing 2018 traffic and 2022 historical growth traffic. **Figure 4.1** shows the 2022 background AM and PM peak-hour traffic volumes.



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LEGEND	
	Turning Movement
XX	AM Peak Hour Traffic Volumes
(XX)	PM Peak Hour Traffic Volumes
	Stop Control
	Traffic Signal

114

146

5.0 Site Traffic Volume Development

Site traffic developed for this TIA is defined as the vehicle trips expected to be generated and added to the study area by the construction of the proposed development, and the distribution and assignment of that traffic within the identified study area.

5.1 TRAFFIC GENERATION

The traffic generation potential of the proposed development was determined using the trip generation rates published in *Trip Generation* (Institute of Transportation Engineers, 10th Edition). **Table 5.1** summarizes the projected trip generation for the proposed development.

Table 5.1 - Trip Generation								
Land Use	Intensity	Daily	AM Peak Hour			PM Peak Hour		
			Total	In	Out	Total	In	Out
Senior Adult Housing – Detached [ITE 251]	146 DU	785	54	18	36	65	40	25

It should be noted that per the current site plan, as shown in Figure 2.2, 108 single family lots, 24 duplex lots, and 14 flex lots are planned within the development, all age-restricted. Should those duplex and flex lots be considered attached housing (Senior Adult Housing – Attached [ITE 252]) for trip generation purposes, a lower overall trip generation would be expected. Therefore, the trip generation shown in Table 5.1 should be considered a conservative representation of the anticipated site trips.

5.2 TRIP GENERATION COMPARISON

As currently zoned, the site has the potential to develop 64 single family detached homes. During a typical weekday by-right, the site has the potential to generate 50 and 66 net new external trips during the AM and PM peak hours respectively. **Table 5.2** summarizes the by-right trip generation of the site.

Table 5.2 - Trip Generation (By-Right)								
Land Use	Intensity	Daily	AM Peak Hour			PM Peak Hour		
			Total	In	Out	Total	In	Out
Single-Family Homes [ITE 210]	64 DU	690	50	13	37	66	42	24

A comparison of the proposed and by-right trip generation can be seen in **Table 5.3**. The proposed site is anticipated to generate 95 more daily trips and four more AM peak hour trips than the by-right zoning. However, the proposed site is anticipated to generate one less trip than the by-right zoning during the PM peak hour.

Table 5.3 - Trip Generation Comparison							
Land Use	Daily	AM Peak Hour			PM Peak Hour		
		Total	In	Out	Total	In	Out
Single-Family Homes (By Right)	690	50	13	37	66	42	24
Senior Adult Housing - Detached (Proposed)	785	54	18	36	65	40	25
Change in Number of trips	95	4	5	-1	-1	-2	1
% change from By-Right	14%	8%	38%	-3%	-2%	-5%	4%

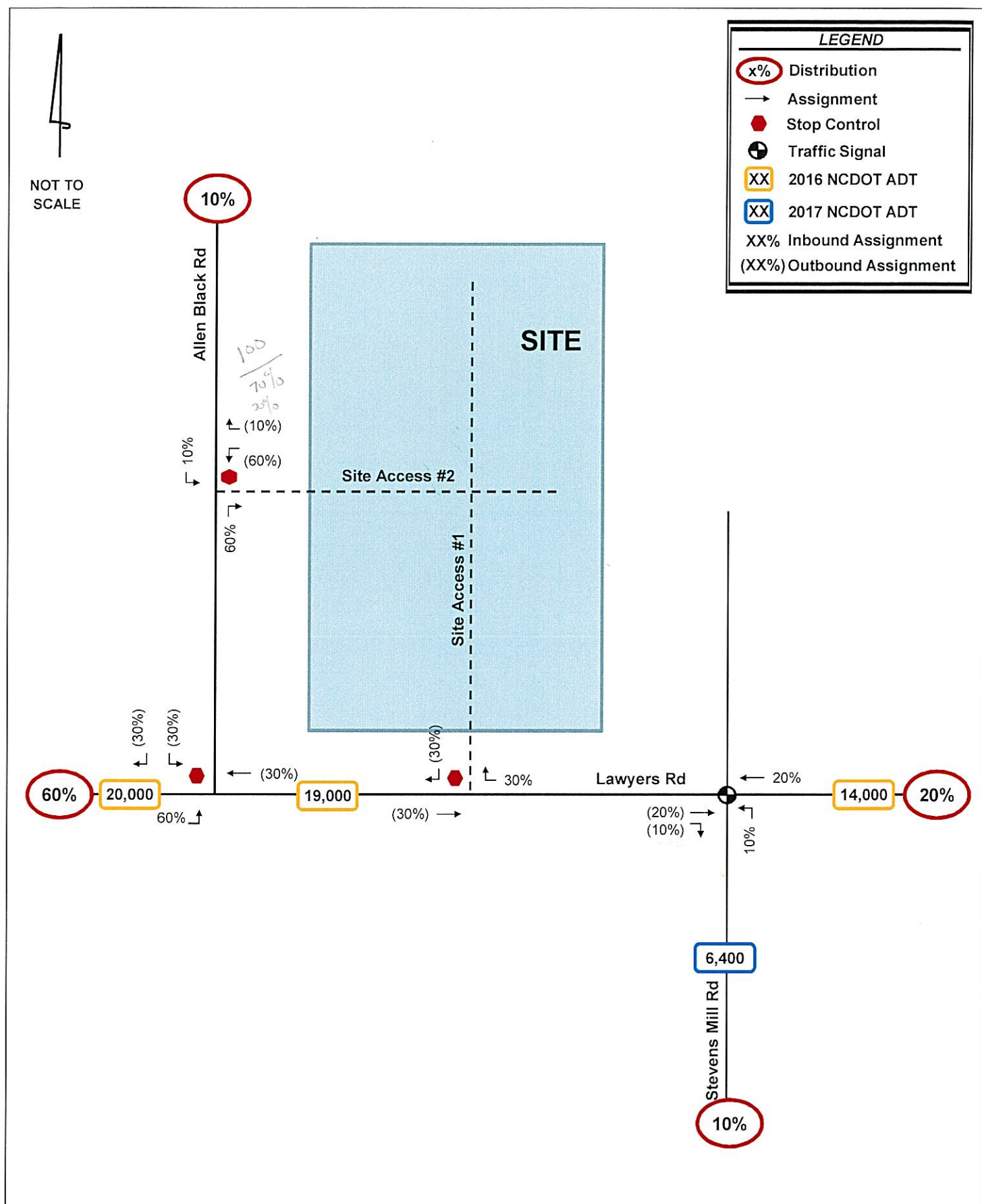
5.3 SITE TRAFFIC DISTRIBUTION AND ASSIGNMENT

The proposed development's trips were assigned to the surrounding network based on surrounding land uses, existing peak-hour turning movements, and the proposed site layout. The overall site traffic distribution and assignment, coordinated with the agencies, are shown in **Figure 5.1**.

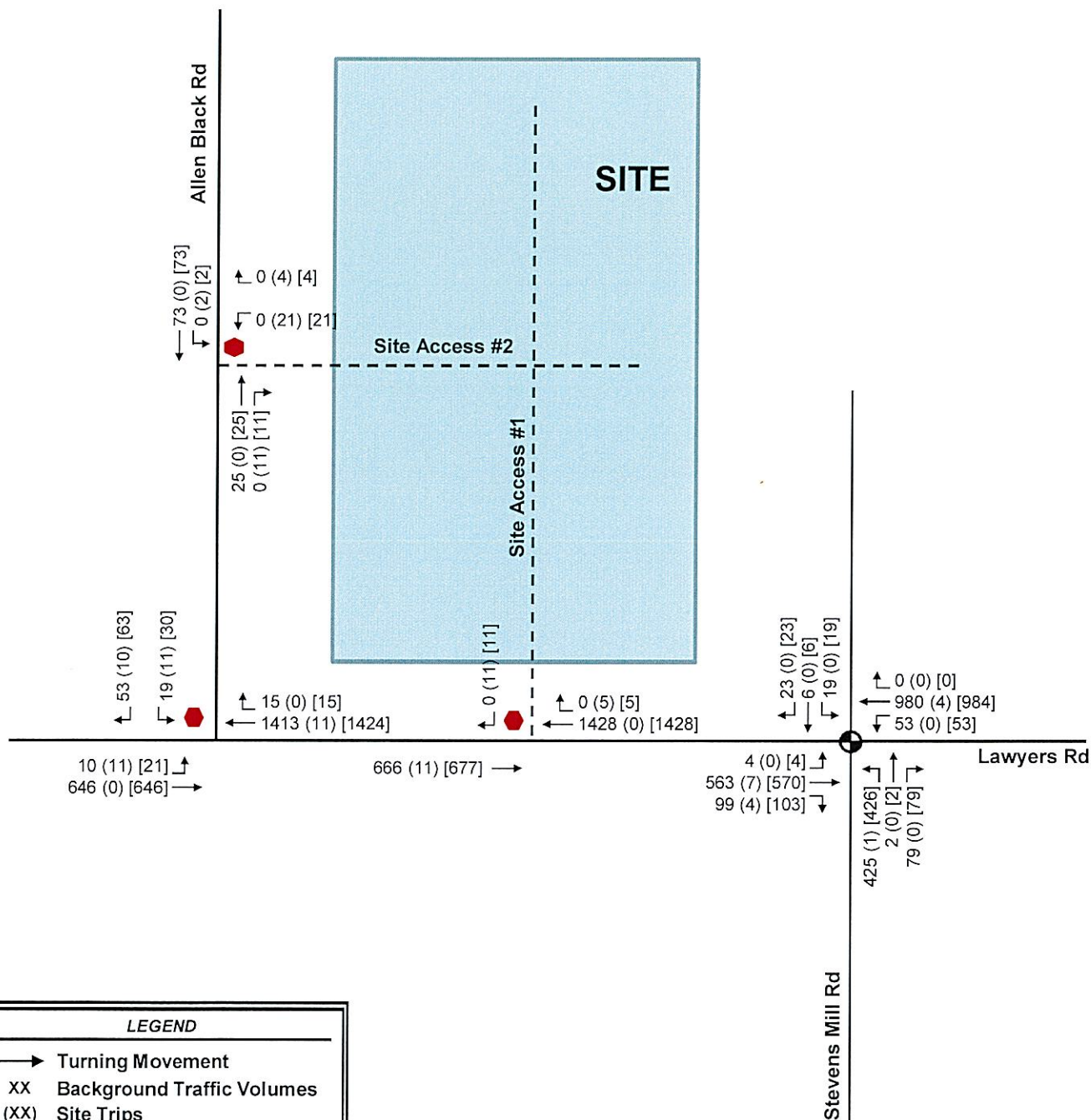
5.4 2022 BUILD-OUT TRAFFIC VOLUMES

The 2022 build-out traffic volumes include the assignment of the projected site traffic generation and 2022 background traffic volumes. **Figures 5.2 and 5.3** show the projected 2022 build-out traffic volumes for the AM and PM peak-hours, respectively.

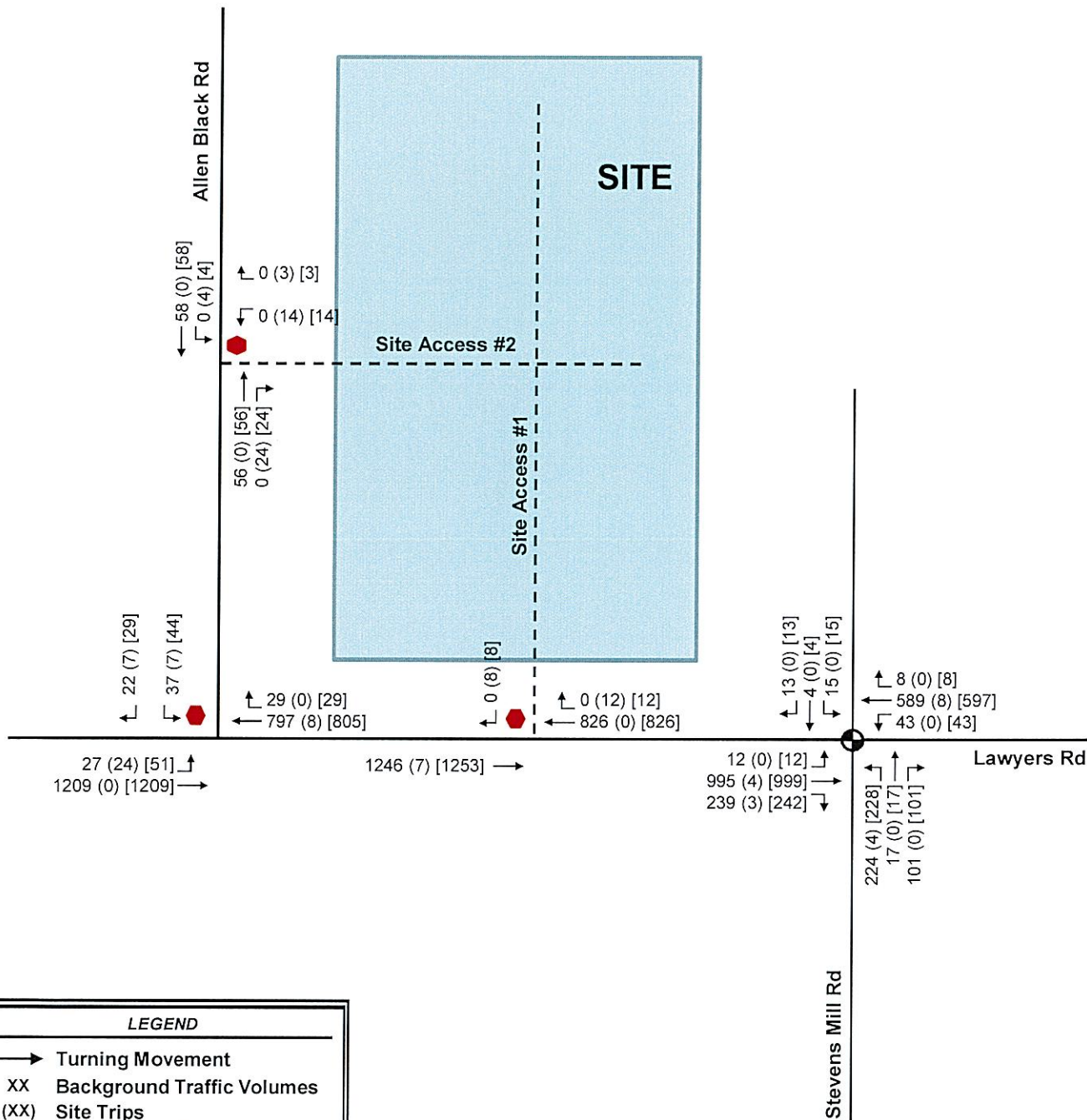
Intersection volume development worksheets for study area intersections are provided in the **Appendix**.



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6.0 Capacity Analysis

Capacity analyses were performed for the AM and PM peak hours using the Synchro Version 9 software to determine the operating characteristics at the signalized and stop-controlled intersections of the adjacent street network and to evaluate the impacts of the proposed development. Capacity is defined as the maximum number of vehicles that can pass over a particular road segment, or through a particular intersection, within a specified period of time under prevailing operational, geometric and controlling conditions within a set time duration. SIDRA Version 8 software was used to determine operating characteristics, Level-of-Service (LOS) and delay for the roundabout analysis. SIDRA is typically used to analyze roundabout operations using a macroscopic model that uses gap acceptance and lane utilization to determine capacity, where capacity is based on the size of time gaps between vehicles that motorists choose when entering a roundabout.

The *Highway Capacity Manual* (HCM) defines level of service (LOS) as a “quantitative stratification of a performance measure or measures representing quality of service”, and is used to “translate complex numerical performance results into a simple A-F system representative of travelers’ perceptions of the quality of service provided by a facility or service”. The HCM defines six levels of service, LOS A through LOS F, with A having the best operating conditions from the traveler’s perspective and F having the worst. However, it must be understood that “the LOS letter result hides much of the complexity of facility performance”, and that “the appropriate LOS for a given system element in the community is a decision for local policy makers”. According to the HCM, “for cost, environmental impact, and other reasons, roadways are typically designed not to provide LOS A conditions during peak periods but instead to provide some lower LOS that balances individual travelers’ desires against society’s desires and financial resources. Nevertheless, during low-volume periods of the day, a system element may operate at LOS A.”

LOS for a two-way stop-controlled (TWSC) intersection is determined by the control delay at the side-street approaches, typically during the highest volume periods of the day, the AM and PM peak periods. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. With respect to field measurements, control delay is defined as the total elapsed time from the time a vehicle stops at the end of the queue to the time the vehicle departs from the stop line. It is typical for stop sign-controlled side streets and driveways intersecting major streets to experience long delays during peak hours, particularly for left-turn movements. The majority of the traffic moving through the intersection on the major street experiences little or no delay.

LOS for signalized intersections is reported for the intersection as a whole, also typically during the highest volume periods of the day, the AM and PM peak periods. One or more movements at an intersection may experience a low level-of-service, while the intersection as a whole may operate acceptably.

LOS for roundabout intersections is also reported for the intersection as a whole, but uses the same control delay thresholds as the stop-controlled intersections. However, if the volume-to-capacity ratio on an approach of the intersection is greater than 1.0, that approach or intersection is reported as LOS F regardless of the reported control delay.

Table 6.0-A and **6.0-B** list the LOS control delay thresholds published in the HCM for unsignalized and signalized intersections, respectively, as well as the unsignalized operational descriptions assumed herein.

Table 6.0-A Level-of-Service Control Delay Thresholds for Unsignalized Intersections		
Level-of-Service	Average Control Delay per Vehicle [sec/veh]	
A	≤ 10	Short Delays
B	> 10 – 15	
C	> 15 – 25	
D	> 25 – 35	Moderate Delays
E	> 35 – 50	
F	> 50	Long Delays

Table 6.0-B Level-of-Service Control Delay Thresholds for Signalized Intersections	
Level-of-Service	Control Delay per Vehicle [sec/veh]
A	≤ 10
B	> 10 – 20
C	> 20 – 35
D	> 35 – 55
E	> 55 – 80
F	> 80

A PHF of 0.9 was assumed for all analyses during both peak hours. Heavy vehicle percentages were taken directly from field observations, subject to a two-percent minimum. Zero vehicle traffic movements were modeled with 4 vehicles per NCDOT Congestion Management guidelines.

At the signalized intersection of Lawyers Road and Stevens Mill Road, a lost time of 5 seconds was used in all analysis scenarios. Right-turn On Red and permitted-protected phasing were allowed in all scenarios to reflect field conditions.

Capacity analyses were performed for existing 2018 conditions, 2022 background conditions, and 2022 build-out conditions. When determining the proposed development's traffic impact to the study area intersections, the 2022 background and 2022 build-out conditions were compared.

Capacity analysis reports generated by Synchro and SIDRA software are included in the **Appendix**.

6.1 LAWYERS ROAD AND ALLEN BLACK ROAD

Table 6.1 summarizes the LOS, control delay, and 95th percentile queue lengths at the unsignalized intersection.

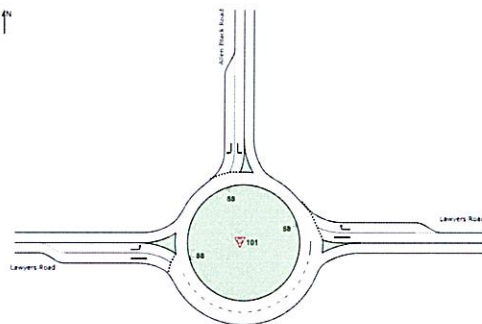
Table 6.1 – Lawyers Road and Allen Black Road								
Condition	Measure	EB		WB		SB		Intersection
		EBL	EBT	WBT	WBR	SBL	SBR	
AM Peak Hour								
2018 Existing	LOS (Delay)	A (0.4)		A (0.0)		F (Err)		-
	Synchro 95th Q	5'	0'	0'	0'	Err	Err	
2022 Background	LOS (Delay)	A (0.6)		A (0.0)		F (Err)		-
	Synchro 95th Q	8'	0'	0'	0'	Err	Err	
2022 Background Improved – Signal*	LOS (Delay)	A (3.0)		A (1.5)		C (30.7)		A (3.0)
	Synchro 95th Q	4'	174'	38'	-	45'	45'	
2022 Background Improved – Roundabout *	LOS (Delay)	A (8.1)		F (86.0)		B (11.3)		F (59.8)
	Synchro 95th Q	1'	102'	12036'	2'	5'	13'	
2022 Background Improved – Roundabout (two receiving lanes)	LOS (Delay)	A (4.9)		A (9.4)		B (13.0)		A (8.2)
	Synchro 95th Q	35'	35'	128'	124'	6'	14'	
2022 Build-out	LOS (Delay)	A (1.5)		A (0.0)		F (Err)		-
	Synchro 95th Q	19'	0'	0'	0'	Err	Err	
2022 Build-out – Signal*	LOS (Delay)	A (3.2)		A (1.5)		C (32.7)		A (3.4)
	Synchro 95th Q	9'	182'	36'	-	62'	48'	
2022 Build-out Improved – Roundabout*	LOS (Delay)	A (8.1)		F (94.3)		B (11.6)		F (64.7)
	Synchro 95th Q	2'	103'	9625'	2'	8'	16'	
2022 Build-out Improved – Roundabout (two receiving lanes)	LOS (Delay)	A (5.0)		A (9.7)		B (13.8)		A (8.5)
	Synchro 95th Q	36'	36'	131'	128'	9'	16'	
2022 Build-out Improved - Unsignalized	LOS (Delay)	A (0.4)		A (0.0)		F (152.0)		-
	Synchro 95th Q	4'	0'	0'	0'	96'	20'	
	SimTraffic Max Q	62'	0'	11'	11'	162'	81'	
PM Peak Hour								
2018 Existing	LOS (Delay)	A (0.2)		A (0.0)		F (457.9)		-
	Synchro 95th Q	3'	0'	0'	0'	152'	152'	
2022 Background	LOS (Delay)	A (0.2)		A (0.0)		F (1080.4)		-
	Synchro 95th Q	4'	0'	0'	0'	202'	202'	
2022 Background Improved – Signal*	LOS (Delay)	A (9.0)		A (1.1)		E (56.4)		A (7.3)
	Synchro 95th Q	7'	649'	30'	-	80'	31'	
2022 Background Improved – Roundabout *	LOS (Delay)	E (42.2)		B (10.5)		A (6.5)		D (28.8)
	Synchro 95th Q	3'	3964'	156'	3'	6'	4'	
2022 Background Improved – Roundabout (two receiving lanes)	LOS (Delay)	A (8.0)		A (5.9)		A (6.4)		A (7.2)
	Synchro 95th Q	95'	95'	48'	47'	6'	4'	
2022 Build-out	LOS (Delay)	A (0.5)		A (0.0)		F (Err)		-
	Synchro 95th Q	7'	0'	0'	0'	Err	Err	
2022 Build-out – Signal*	LOS (Delay)	A (9.1)		A (1.2)		E (55.8)		A (7.6)
	Synchro 95th Q	12'	649'	30'	-	91'	35'	
2022 Build-out Improved – Roundabout*	LOS (Delay)	E (43.6)		B (11.2)		A (6.7)		D (29.9)
	Synchro 95th Q	5'	3553'	163'	3'	8'	5'	
2022 Build-out Improved – Roundabout (two receiving lanes)	LOS (Delay)	A (8.3)		A (6.1)		A (6.7)		A (7.4)
	Synchro 95th Q	100'	100'	50'	49'	7'	5'	
2022 Build-out Improved - Unsignalized	LOS (Delay)	A (0.4)		A (0.0)		F (428.0)		-
	Synchro 95th Q	6'	0'	0'	0'	147'	5'	
	SimTraffic Max Q	475'	1156'	4'	4'	765'	52'	

*Assumes existing turn lanes on each approach

As shown in Table 6.1, the stop-controlled southbound approach currently operates at LOS F during both peak hours. Under both 2022 background and build-out conditions, the overall intersection is expected to continue to operate at LOS F during both peak hours. Per NCDOT guidelines if the background LOS is at LOS F, the TIA “shall identify mitigation improvements.”

As turn lanes are already present on each approach at the intersection, adding lanes in its stop-controlled operation is not an alternative to improve the side street delays and LOS. Based on review of 2022 Background and Build-out peak hour volumes, peak-hour signal warrants would not be met at this intersection. Further, there is currently about 500 feet of available spacing between this intersection and the adjacent Lawyers Road/I-485 traffic signal; less than the NCDOT-preferred 1000 feet. Capacity analysis with a signal at this intersection was analyzed for comparison purposes and is included in Table 6.1.

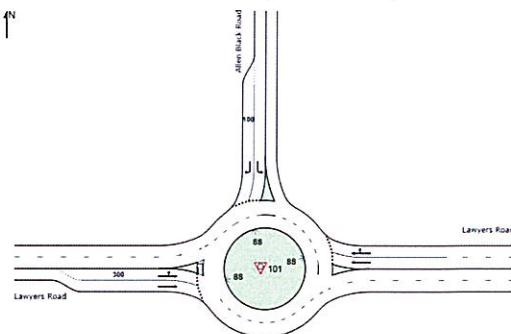
To improve existing, background, and build-out conditions, the installation of a roundabout at this intersection was analyzed. With the existing laneage and the addition of a roundabout (as shown in the SIDRA layout to the right), the roundabout is expected to operate with moderate to long delays and queues on the westbound approach in the AM peak and the eastbound approach in the PM in both the 2022 Background and Build-out conditions.



With the addition of an eastbound and westbound receiving lane, the overall intersection and its approaches are expected to operate at LOS B or better in both peak hours. This layout is projected to reach a 0.85 volume to capacity ratio (v/c) due to AM traffic volumes after 20 years based on Background traffic volumes and after 15 years based on Build-out traffic volumes.

Therefore, to improve existing and background conditions, the following improvements were analyzed for the dual-lane roundabout scenario (as shown in the SIDRA layout below):

- Installation of a multilane roundabout.
- Construction of a shared eastbound through-left lane with 100 feet of storage.
- Construction of a shared westbound through-right lane to extend back to Stevens Mill Road.
- Restriping of the western leg of the intersection to provide two westbound receiving lanes.
- Construction of an additional eastbound receiving lane.



However, based on conversations with NCDOT, the installation of a signal or roundabout at this intersection are not recommended due to the proximity to the I-485 interchange.

Therefore, the following improvements are recommended:

- Restriping the westbound right-turn lane to provide a shared through-right lane
- Restriping of the western leg of the intersection to provide two westbound receiving lanes.
- Extension of the southbound right-turn lane to provide 175' of storage

With these improvements in place, while the stop-controlled approach is expected to continue to operate at LOS F, it is projected to operate with less delay in both peaks than the existing and background condition. It should be noted that it is not uncommon for stop-controlled side street approaches to operate with long-delays in peak-hours.

As shown in Table 6.1, Synchro 95th percentile and SimTraffic Max queues for the westbound shared through-right lane are anticipated to fit within the current storage of the dedicated right-turn lane (which will be restriped). Therefore, no extension of this turn-lane is recommended to accommodate queues.

In the AM peak-hour, with the extension of the southbound right-turn lane to provide 175 feet of storage, southbound right-turn queues are expected to fit within the proposed storage length and are not projected to be blocked by vehicles queueing in the southbound left-turn lane. In the PM peak-hour, observation of the SimTraffic simulations show that the long southbound left-turn queues are caused by the limited gaps heading eastbound on Lawyers Road; widening to provide additional capacity along Lawyers Road would be needed to reduce these queues. Therefore, extension of the southbound right-turn lane beyond the recommended 175 feet to accommodate this 765 foot queue is not recommended. It should be noted that the southbound right-turn Synchro 95th percentile and SimTraffic Max queues in the PM peak-hour are anticipated to fit within the proposed 175 feet of storage.

Synchro and SimTraffic reports can be found in the **Appendix**.

6.2 LAWYERS ROAD AND STEVENS MILL ROAD

Table 6.2 summarizes the LOS, control delay and 95th percentile queue lengths at the signalized, full-movement intersection.

Table 6.2 - Lawyers Road and Stevens Mill Road										
Condition	Measure	EB			WB		NB		SB	Intersection
		EBL	EBT	EBR	WBL	WBTR	NBL	NBTR	SBLTR	LOS (Delay)
AM Peak Hour										
2018 Existing	LOS (Delay)	E (63.2)			F (113.7)		F (244.5)		D (50.9)	F (126.8)
	Synchro 95th Q	11'	#989'	-	58'	#1456'	#792'	37'	69'	
2022 Background	LOS (Delay)	F (80.7) 4.1			F (150.5)		F (304.9)		D (50.0)	F (162.4)
	Synchro 95th Q	12'	#1112'	-	63'	#1626'	#874'	38'	71'	
2022 Background Improved	LOS (Delay)	D (51.3) 5.2			C (34.4)		D (46.5)		D (46.2)	D (42.4)
	Synchro 95th Q	12'	#1017'	46'	70'	#627'	239'	32'	67'	
2022 Build-out	LOS (Delay)	F (84.8)			F (152.3)		F (306.3)		D (50.0)	F (164.4)
	Synchro 95th Q	12'	#1136'	-	63'	#1632'	#876'	38'	71'	
2022 Build-out Improved	LOS (Delay)	D (52.5)			C (34.6)		D (46.5)		D (46.2)	D (42.8)
	Synchro 95th Q	12'	#1031'	50'	70'	#632'	239'	32'	67'	
PM Peak Hour										
2018 Existing	LOS (Delay)	F (117.2)			B (15.0)		F (147.6)		D (54.4)	F (92.0)
	Synchro 95th Q	13'	#1792'	-	32'	406'	#452'	71'	55'	
2022 Background	LOS (Delay)	F (158.1) 2.7			B (16.0)		F (174.1)		D (54.3)	F (118.8)
	Synchro 95th Q	14'	#2007'	-	39'	460'	#493'	75'	57'	
2022 Background Improved	LOS (Delay)	D (44.3) 1.7%			B (11.7)		D (53.1)		D (54.3)	D (36.6)
	Synchro 95th Q	16'	#1537'	149'	44'	203'	157'	70'	57'	
2022 Build-out	LOS (Delay)	F (160.8)			B (16.2)		F (180.7)		D (54.3)	F (121.2)
	Synchro 95th Q	14'	#2021'	-	39'	470'	#503'	75'	57'	
2022 Build-out Improved	LOS (Delay)	D (45.8)			B (11.9)		D (53.1)		D (54.3)	D (37.4)
	Synchro 95th Q	16'	#1550'	152'	45'	207'	159'	70'	57'	

The overall intersection and several of its approaches are expected to operate at a failing LOS in both 2018 Existing and 2022 Background conditions. To improve the background condition, the following improvements would be required:

- Construction of an eastbound right-turn lane that will operate as a drop lane from the upstream roundabout.
- Construction of a westbound through-right lane with 650 feet of storage.
- Construction of a second northbound left-turn lane to create dual left-turn lanes with 250 feet of storage.
- Construction of an additional westbound receiving lane to extend to Allen Black Road.

With the addition of site traffic, assuming 2022 Background laneage, the overall intersection and its approaches are expected to continue to operate at the same LOS. Further, all approaches and the overall intersection are expected to increase in delay by 1.5 seconds/vehicle or less.

As shown in Table 6.2, the Build-out Improved scenario reflects the background improved laneage (outlined above) with the addition of site traffic. When comparing these scenarios, no additional mitigation is needed for capacity purposes.

However, and conversations with NCDOT, these improvements are not recommended as the widening of Lawyers Road would be required to accommodate several of these improvements. Further, the projected site traffic is not anticipated to add significant delays to this intersection.

6.3 LAWYERS ROAD AND SITE ACCESS #1

Table 6.3 summarizes the LOS, control delay and 95th percentile queue lengths at the unsignalized, right-in/right-out intersection.

Table 6.3 – Lawyers Road and Site Access #1				
Condition	Measure	EB	WB	SB
		EBT	WBTR	SBR
AM Peak Hour				
2022 Build-out	LOS (Delay)	A (0.0)	A (0.0)	F (172.7)
	Synchro 95th Q	0'	0'	30'
PM Peak Hour				
2022 Build-out	LOS (Delay)	A (0.0)	A (0.0)	C (16.6)
	Synchro 95th Q	0'	0'	2'

As shown in Table 6.3, the stop-controlled southbound approach of Site Access #1 is expected to operate with long delays during the AM peak-hour. It is not uncommon for stop-controlled, minor-street approaches to experience long-delays in peak hours. Further, vehicles would be queued on-site and have the option to reroute to the access on Allen Black Road should long delays occur at this access point. Therefore, no improvements are recommended at this intersection for capacity purposes.

6.4 ALLEN BLACK ROAD AND SITE ACCESS #2

Table 6.4 summarizes the LOS, control delay and 95th percentile queue lengths at the unsignalized, full-movement intersection.

Table 6.4 – Allen Black Road and Site Access #2				
Condition	Measure	WB	NB	SB
		WBLR	NBTR	SBTL
AM Peak Hour				
2022 Build-out	LOS (Delay)	A (9.1)	A (0.0)	A (0.2)
	Synchro 95th Q	2'	0'	0'
PM Peak Hour				
2022 Build-out	LOS (Delay)	A (9.3)	A (0.0)	A (0.5)
	Synchro 95th Q	2'	0'	0'

As shown in Table 6.4, the stop-controlled westbound approach of Site Access #2 is expected to operate with short delays during both peak hours. Therefore, no improvements are recommended at this intersection for capacity purposes.

7.0 Auxiliary Turn Lane Warrants

Warrants for additional turn-lane improvements beyond those necessary for capacity were determined based on a review of the figure titled 'Warrant for Left and Right-Turn Lanes' found on page 80 in the NCDOT Policy On Street And Driveway Access to North Carolina Highways. Per these guidelines, no turn lanes are warranted at the site access points. The results of the warrants for left and right-turn lanes under 2022 build-out conditions at the study area intersections are included in the **Appendix**.

8.0 Intersection Spacing and Sight Distance Review

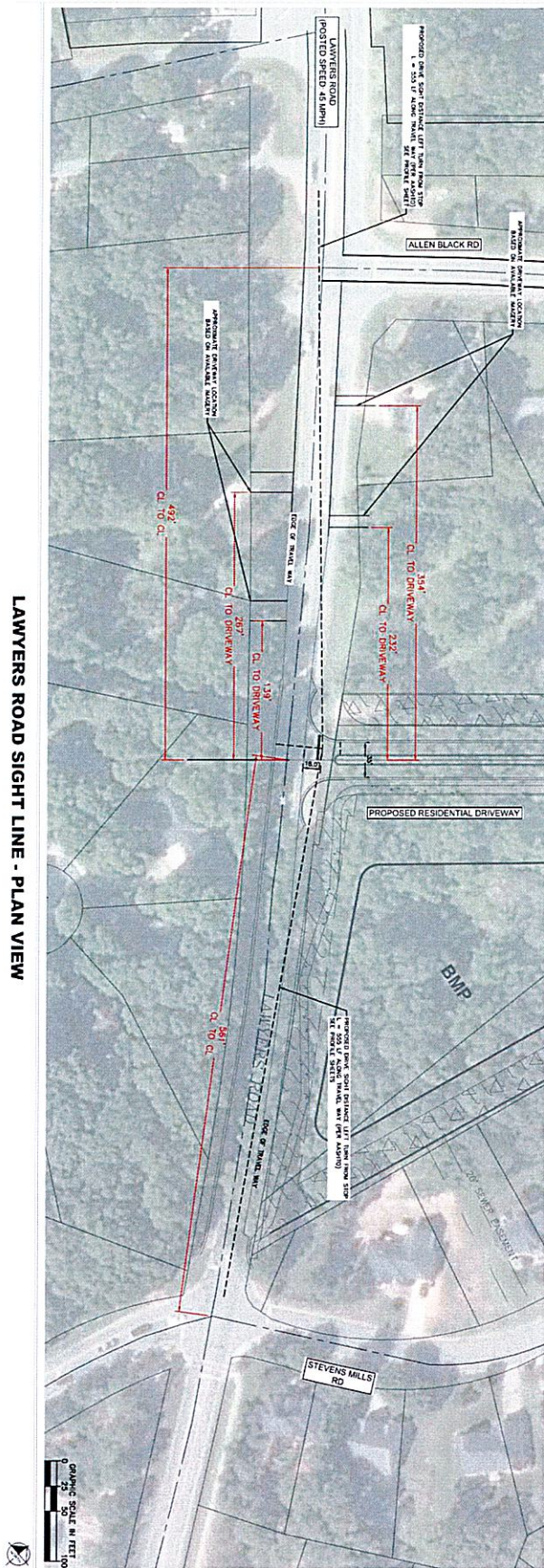
A review of intersection spacing and intersection sight distance (ISD) at the project driveways using available GIS data was performed.

Per the NCDOT *Policy on Street and Driveway Access to North Carolina Highways*, approximately 600 feet should be provided between the centerlines of full-movement driveways. Available intersection spacing along Lawyers Road and Allen Black Road can be seen in **Figure 8.1** and **Figure 8.2** respectively. Based on coordination with NCDOT, the proposed Site Access #1 along Lawyers Road will be restricted to right-in/right-out. Due to low volumes on Allen Black Road, a full-movement access will be allowed on Allen Black Road at Site Access #2.

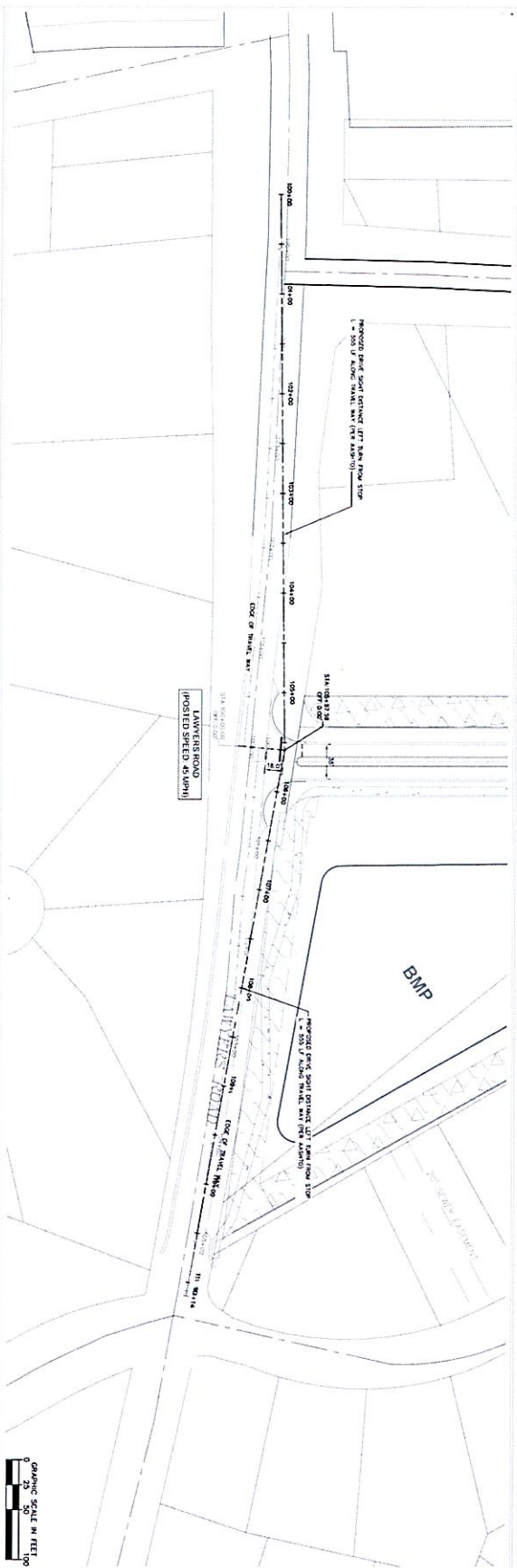
ISD along Lawyers Road and Allen Black Road can be seen in **Figure 8.3** and **Figure 8.4**, respectively. Based on this preliminary review, ISD will be met at both driveways at their proposed locations. The need for the clearing of vegetation within these sight distance triangles should be verified based on survey data. Should clearing be needed on adjacent properties, coordination with neighboring land owners will be needed.

Both intersection spacing and ISD should be verified with ground-shot topography from a licensed surveyor during the design process due to accuracy variability of GIS data.

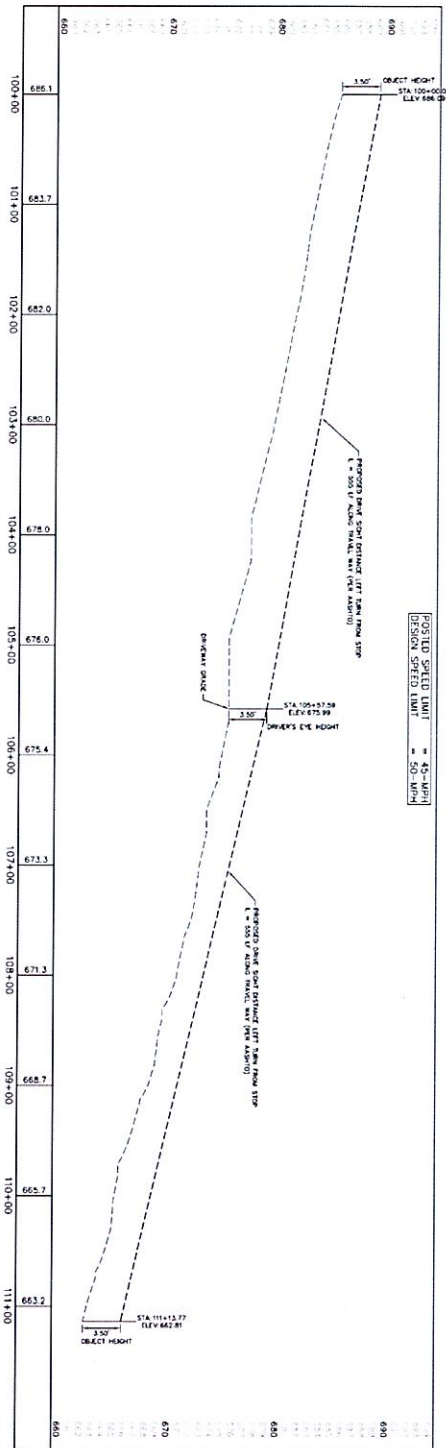
LAWYERS ROAD SIGHT LINE - PLAN VIEW



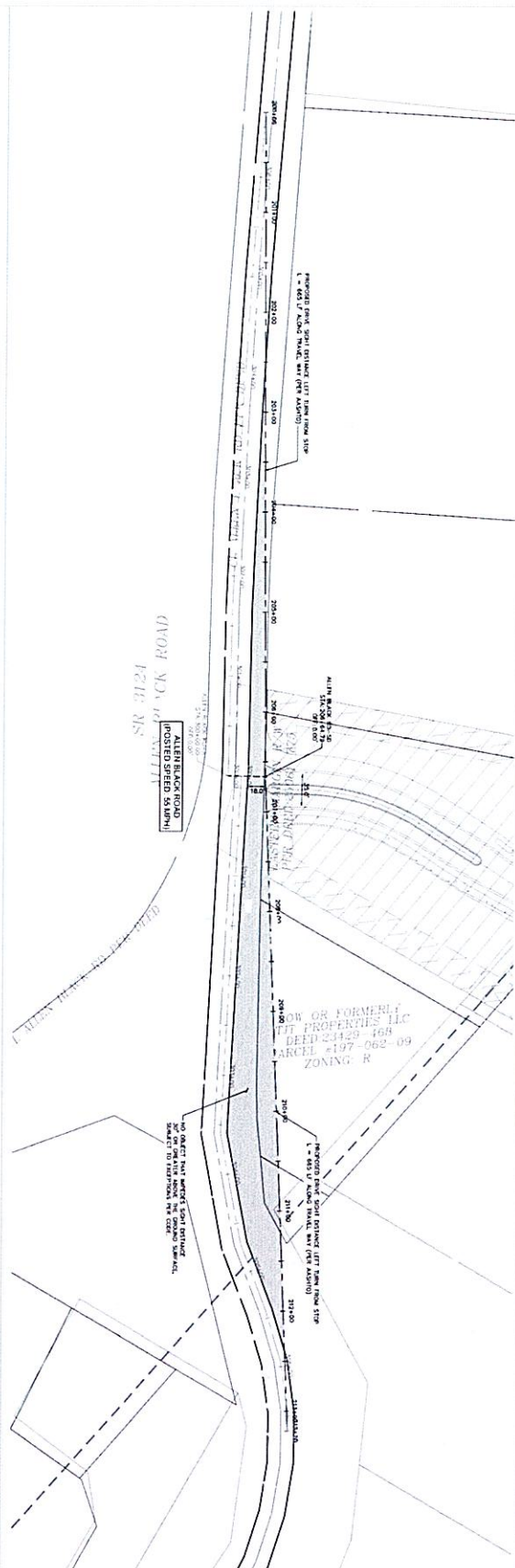
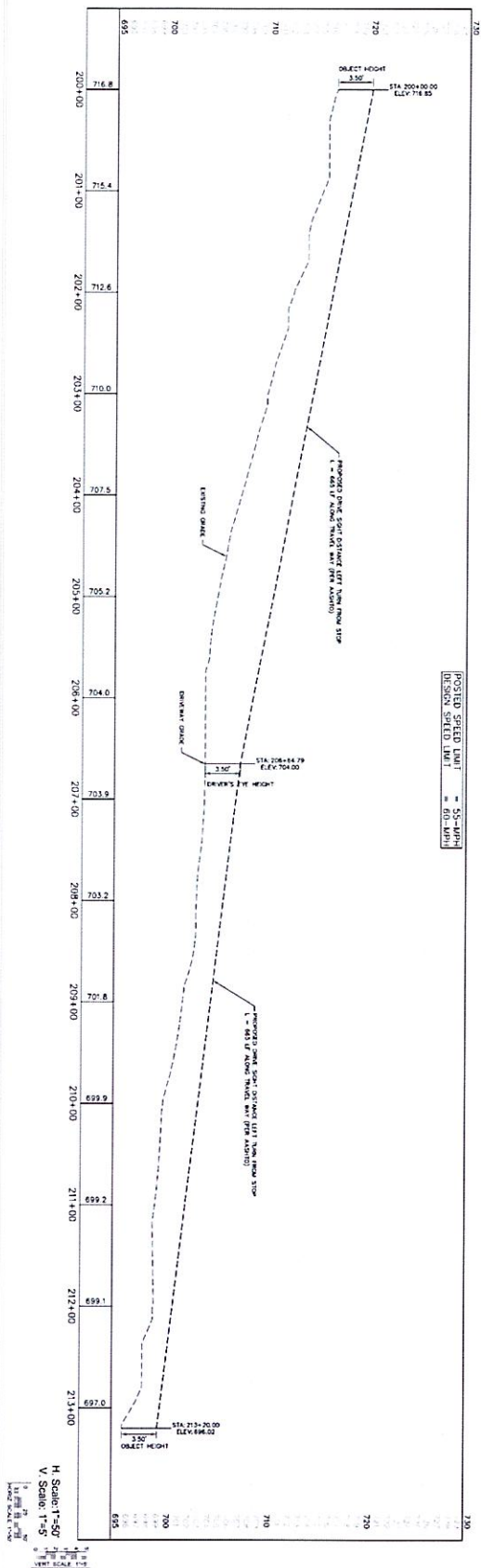




LAWYERS ROAD SIGHT LINE - PLAN VIEW



LAWYERS ROAD SIGHT LINE - PROFILE VIEW



9.0 Conclusions

Recommendations for transportation improvements to the study area intersections to improve 2022 build-out conditions are summarized in the following listing, based on the traffic analyses contained herein.

Lawyers Road and Site Access #1

- Construction of a right-in/right-out intersection with one ingress lane and one shared left-right egress lane.
- Construction of a westbound right-turn lane with a minimum of 100 feet of storage.

Allen Black Road and Site Access #2

- Construction of a full-movement intersection with one ingress lane and one shared left-right egress lane.

Based on coordination with NCDOT, a westbound right-turn lane will be required at Site Access #1 on Lawyers Road; however, this turning movement does not meet NCDOT turn lane warrants.

Based on discussion with NCDOT, the following improvements are recommended to accommodate 2018 existing, 2022 background, and 2022 build-out conditions:

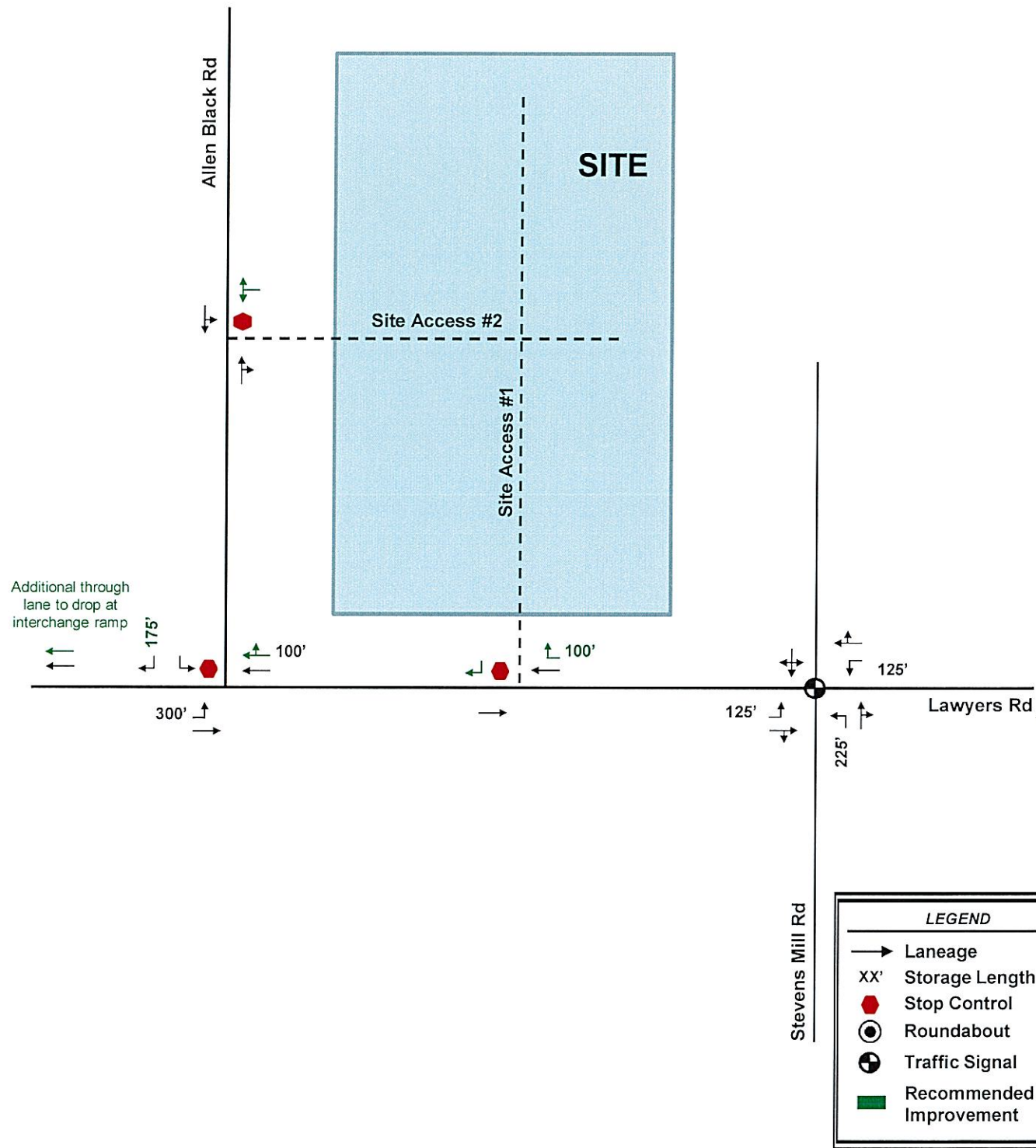
Lawyers Road and Allen Black Road

- Restriping the westbound right-turn lane to provide a shared through-right lane
- Restriping of the western leg of the intersection to provide two westbound receiving lanes.
- Extension of the southbound right-turn lane to provide 175' of storage

As outlined in Section 6.1, with the proposed site traffic and these improvements, the intersection is expected to operate with less delay than the existing condition. Further, based on conversations with NCDOT, installation of a traffic signal or roundabout at this intersection would not be recommended due to proximity to the interchange. Note that all recommended improvements are subject to NCDOT approval.

It is noted that the developer has committed to contribute \$250,000 toward offsite transportation improvements for the study intersections, beyond the recommended improvements at the site access points. The transportation improvements are subject to approval by NCDOT and local municipalities. All additions and attachments to the State roadway system shall be properly permitted, designed, and constructed in conformance to standards maintained by the agencies.

NOT TO
SCALE



Appendix

Turning Movement Counts

Project ID: 18-09457-001
Location: Allen Black Rd & Lawyers Rd
City: Stallings

Day: Thursday
Date: 08/30/2018

Groups Printed - Cars, PU, Vans - Heavy Trucks

	Allen Black Rd Northbound						Allen Black Rd Southbound						Lawyers Rd Eastbound						Lawyers Rd Westbound							
Start Time	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Int. Total	
7:00 AM	0	0	0	0	0	0	8	0	6	0	0	14	2	138	0	0	0	140	0	347	4	0	0	351	505	
7:15 AM	1	0	0	0	0	1	5	0	16	0	0	21	2	162	0	0	0	164	0	317	3	0	0	320	506	
7:30 AM	0	0	0	0	0	0	5	0	17	0	0	22	2	164	0	0	0	166	0	324	3	0	0	327	515	
7:45 AM	0	0	0	0	0	0	0	0	10	0	0	10	3	133	0	1	0	137	0	317	4	0	0	321	488	
Total	1	0	0	0	0	1	18	0	49	0	0	67	9	597	0	1	0	607	0	1305	14	0	0	1319	1994	
8:00 AM	0	0	0	0	0	0	4	0	3	0	0	7	4	120	0	0	0	124	0	292	3	0	0	295	426	
8:15 AM	0	0	0	0	0	0	2	0	7	0	0	9	0	118	0	0	0	118	0	281	6	0	0	287	414	
8:30 AM	0	0	0	0	0	0	5	0	10	0	0	15	0	89	0	1	0	90	0	202	5	0	0	207	312	
8:45 AM	0	0	0	0	0	0	2	0	5	0	0	7	4	97	0	0	0	101	0	170	7	0	0	177	285	
Total	0	0	0	0	0	0	13	0	25	0	0	38	8	424	0	1	0	433	0	945	21	0	0	966	1437	
BREAK																										
4:00 PM	0	0	0	0	0	0	4	0	4	0	0	8	6	246	0	3	0	255	0	141	4	0	0	145	408	
4:15 PM	0	0	0	0	0	0	2	0	2	0	0	4	9	278	0	1	0	288	0	131	5	0	0	136	428	
4:30 PM	0	0	0	0	0	0	4	0	6	0	0	10	4	279	0	1	0	284	0	143	5	0	0	148	442	
4:45 PM	0	0	0	0	0	0	7	0	1	0	0	8	3	278	0	1	0	282	0	190	7	0	0	197	487	
Total	0	0	0	0	0	0	17	0	13	0	0	30	22	1081	0	6	0	1109	0	605	21	0	0	626	1765	
5:00 PM	0	0	0	0	0	0	3	0	7	0	0	10	5	287	0	2	0	294	0	160	3	0	0	163	467	
5:15 PM	0	0	0	0	0	0	15	0	5	0	0	20	6	286	0	0	0	292	0	178	10	0	0	188	500	
5:30 PM	0	0	0	0	0	0	9	0	7	0	0	16	11	266	0	0	0	277	0	208	7	0	0	215	508	
5:45 PM	0	0	0	0	0	0	12	0	10	0	0	22	12	276	0	2	0	290	0	167	9	0	0	176	488	
Total	0	0	0	0	0	0	39	0	29	0	0	68	34	1115	0	4	0	1153	0	713	29	0	0	742	1963	
Grand Total	1	0	0	0	0	1	87	0	116	0	0	203	73	3217	0	12	0	3302	0	3568	85	0	0	3653	7159	
Approach %	100.0	0.0	0.0	0.0	0.0	0.0	42.9	0.0	57.1	0.0	0.0	23	22	97.4	0.0	0.4	0.0	0.0	0.0	97.7	2.3	0.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	1.6	0.0	0.0	2.8	1.0	44.9	0.0	0.2	0.0	46.1	0.0	49.8	1.2	0.0	0.0	51.0		
Cars, PU, Vans	1	0	0	0	0	1	87	0	115	0	0	202	72	3179	0	12	0	3263	0	3537	84	0	0	3621	7087	
% Cars, PU, Vans	100.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	99.1	0.0	0.0	99.5	98.6	98.8	0.0	100.0	0.0	98.8	0.0	99.1	98.8	0.0	0.0	99.1	99.0	
Heavy Trucks	0	0	0	0	0	0	0	0	1	0	0	1	1	38	0	0	0	39	0	31	1	0	0	32	72	
% Heavy Trucks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.5	1.4	1.2	0.0	0.0	0.0	1.2	0.0	0.9	1.2	0.0	0.0	0.9	1.0	

Project ID: 18-09457-001
Location: Allen Black Rd & Lawyers Rd
City: Stallings

PEAK HOURS

Day: Thursday
Date: 08/30/2018

Start Time	Allen Black Rd Northbound					Allen Black Rd Southbound					Lawyers Rd Eastbound					Lawyers Rd Westbound					Int. Total
	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	
Peak Hour Analysis from 07:00 AM to 09:00 AM																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
7:00 AM	0	0	0	0	0	8	0	6	0	14	2	138	0	0	140	0	347	4	0	351	505
7:15 AM	1	0	0	0	1	5	0	16	0	21	2	162	0	0	164	0	317	3	0	320	506
7:30 AM	0	0	0	0	0	5	0	17	0	22	2	164	0	0	166	0	324	3	0	327	515
7:45 AM	0	0	0	0	0	0	0	10	0	10	3	133	0	1	137	0	317	4	0	321	488
Total Volume	1	0	0	0	1	18	0	49	0	67	9	597	0	1	607	0	1305	14	0	1319	1994
% App. Total	100.0	0.0	0.0	0.0	100	26.9	0.0	73.1	0.0	100	1.5	98.4	0.0	0.2	100	0.0	98.9	1.1	0.0	100	
PHF	0.250					0.761					0.914					0.939					0.968
Cars, PU, Vans	1	0	0	0	1	18	0	49	0	67	9	589	0	1	599	0	1297	14	0	1311	1978
% Cars, PU, Vans	100.0	0.0	0.0	0.0	100.0	100.0	0.0	100.0	0.0	100.0	100.0	98.7	0.0	100.0	98.7	0.0	99.4	100.0	0.0	99.4	99.2
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	8	0	0	8	0	8	0	0	8	16
% Heavy Trucks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	1.3	0.0	0.6	0.0	0.0	0.6	0.8
PM																					
Start Time	Allen Black Rd Northbound					Allen Black Rd Southbound					Lawyers Rd Eastbound					Lawyers Rd Westbound					Int. Total
	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	
Peak Hour Analysis from 04:00 PM to 06:00 PM																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
5:00 PM	0	0	0	0	0	3	0	7	0	10	5	287	0	2	294	0	160	3	0	163	487
5:15 PM	0	0	0	0	0	15	0	5	0	20	6	286	0	0	292	0	178	10	0	188	500
5:30 PM	0	0	0	0	0	9	0	7	0	16	11	266	0	0	277	0	208	7	0	215	508
5:45 PM	0	0	0	0	0	12	0	10	0	22	12	276	0	2	290	0	167	9	0	176	488
Total Volume	0	0	0	0	0	39	0	29	0	68	34	1115	0	4	1153	0	713	29	0	742	1963
% App. Total	0.0	0.0	0.0	0.0	0	57.4	0.0	42.6	0.0	100	2.9	98.7	0.0	0.3	100	0.0	96.1	3.9	0.0	100	
PHF						0.773					0.980					0.863					0.966
Cars, PU, Vans	0	0	0	0	0	39	0	29	0	68	34	1104	0	4	1142	0	707	29	0	736	1946
% Cars, PU, Vans	0.0	0.0	0.0	0.0	0.0	100.0	0.0	100.0	0.0	100.0	100.0	99.0	0.0	100.0	99.0	0.0	99.2	100.0	0.0	99.2	99.1
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	11	0	0	11	0	6	0	0	6	17
% Heavy Trucks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.6	0.0	0.0	0.6	0.9

Signal Timing Plan

Intersection Volume Development

INTERSECTION VOLUME DEVELOPMENT

Lawyers Rd and Site Allen Black Road AM PEAK HOUR

Description	-			Allen Black Road			Lawyers Rd			Lawyers Rd		
	<u>Northbound</u>			<u>Southbound</u>			<u>Eastbound</u>			<u>Westbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Observed Volumes	1	0	0	18	0	49	9	597	0	0	1,305	14
Balanced Volumes	-1	0	0	0	0	0	0	0	0	0	0	0
2018 Existing Traffic	0	0	0	18	0	49	9	597	0	0	1,305	14
2018 PHF	0.25	0.90	0.90	0.56	0.90	0.72	0.75	0.91	0.90	0.90	0.94	0.88
2022 PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicle %	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
2022 Background Traffic	0	0	0	19	0	53	10	646	0	0	1,413	15
Percent Inbound Assignment	0%	0%	0%	0%	0%	0%	60%	0%	0%	0%	0%	0%
Percent Outbound Assignment	0%	0%	0%	30%	0%	30%	0%	0%	0%	0%	30%	0%
Total Project Trips	0	0	0	11	0	10	11	0	0	0	11	0
2022 Buildout Total	0	0	0	30	0	63	21	646	0	0	1,424	15

PM PEAK HOUR

Description	-			Allen Black Road			Lawyers Rd			Lawyers Rd		
	<u>Northbound</u>			<u>Southbound</u>			<u>Eastbound</u>			<u>Westbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Observed Volumes	0	0	0	34	0	20	25	1,117	0	0	736	27
Balanced Volumes	0	0	0	0	0	0	0	0	0	0	0	0
2018 Existing Traffic	0	0	0	34	0	20	25	1,117	0	0	736	27
2018 PHF	0.90	0.90	0.90	0.57	0.90	0.71	0.57	0.97	0.90	0.90	0.89	0.68
2022 PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicle %	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
2022 Background Traffic	0	0	0	37	0	22	27	1,209	0	0	797	29
Percent Inbound Assignment	0%	0%	0%	0%	0%	0%	60%	0%	0%	0%	0%	0%
Percent Outbound Assignment	0%	0%	0%	30%	0%	30%	0%	0%	0%	0%	30%	0%
Total Project Trips	0	0	0	7	0	7	24	0	0	0	8	0
2022 Buildout Total	0	0	0	44	0	29	51	1,209	0	0	805	29

INTERSECTION VOLUME DEVELOPMENT

Allen Black Rd and Site Access #2 AM PEAK HOUR

Description	Allen Black Rd <u>Northbound</u>			Allen Black Rd <u>Southbound</u>			- <u>Eastbound</u>			Site Access #2 <u>Westbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Observed Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Balanced Volumes	0	23	0	0	67	0	0	0	0	0	0	0
2018 Existing Traffic	0	23	0	0	67	0	0	0	0	0	0	0
2018 PHF	0.25	0.90	0.90	0.56	0.90	0.72	0.75	0.91	0.90	0.90	0.94	0.88
2022 PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicle %	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
2022 Background Traffic	0	25	0	0	73	0	0	0	0	0	0	0
Percent Inbound Assignment	0%	0%	60%	10%	0%	0%	0%	0%	0%	0%	0%	0%
Percent Outbound Assignment	0%	0%	0%	0%	0%	0%	0%	0%	0%	60%	0%	10%
Total Project Trips	0	0	11	2	0	0	0	0	0	21	0	4
2022 Buildout Total	0	25	11	2	73	0	0	0	0	21	0	4

PM PEAK HOUR

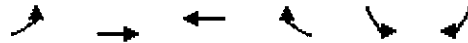
Description	Allen Black Rd <u>Northbound</u>			Allen Black Rd <u>Southbound</u>			- <u>Eastbound</u>			Site Access #2 <u>Westbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Observed Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Balanced Volumes	0	52	0	0	54	0	0	0	0	0	0	0
2018 Existing Traffic	0	52	0	0	54	0	0	0	0	0	0	0
2018 PHF	0.90	0.90	0.90	0.57	0.90	0.71	0.57	0.97	0.90	0.90	0.89	0.68
2022 PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicle %	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
2022 Background Traffic	0	56	0	0	58	0	0	0	0	0	0	0
Percent Inbound Assignment	0%	0%	60%	10%	0%	0%	0%	0%	0%	0%	0%	0%
Percent Outbound Assignment	0%	0%	0%	0%	0%	0%	0%	0%	0%	60%	0%	10%
Total Project Trips	0	0	24	4	0	0	0	0	0	14	0	3
2022 Buildout Total	0	56	24	4	58	0	0	0	0	14	0	3

Intersection Capacity Analysis

2018 Existing Conditions

Lanes, Volumes, Timings
1: Lawyers Rd & Allen Black Rd

The Courtyards on Lawyers
2018 Existing AM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↑	↑	↗	↖	↗
Traffic Volume (vph)	9	597	1305	14	18	49
Future Volume (vph)	9	597	1305	14	18	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			100	0	100
Storage Lanes	1			1	1	1
Taper Length (ft)	175				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1863	1583	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1863	1863	1583	1770	1583
Link Speed (mph)		45	45		55	
Link Distance (ft)		1147	446		1232	
Travel Time (s)		17.4	6.8		15.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	10	663	1450	16	20	54
Shared Lane Traffic (%)						
Lane Group Flow (vph)	10	663	1450	16	20	54
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 78.7%
Analysis Period (min) 15

ICU Level of Service D

Lanes, Volumes, Timings

The Courtyards on Lawyers

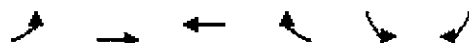
4: Stevens Mill Road & Lawyers Rd

2018 Existing AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	520	91	49	905	4	393	2	73	18	6	21
Future Volume (vph)	4	520	91	49	905	4	393	2	73	18	6	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-1%			0%			-2%			2%	
Storage Length (ft)	125		0	125		0	225		0	0		0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (ft)	100			75			100			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.978			0.999			0.854			0.938	
Flt Protected	0.950			0.950			0.950				0.980	
Satd. Flow (prot)	1778	1831	0	1770	1861	0	1787	1607	0	0	1695	0
Flt Permitted	0.060			0.067			0.400				0.833	
Satd. Flow (perm)	112	1831	0	125	1861	0	753	1607	0	0	1441	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6						81			23	
Link Speed (mph)		45			45			45			25	
Link Distance (ft)		585			557			625			740	
Travel Time (s)		8.9			8.4			9.5			20.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	4	578	101	54	1006	4	437	2	81	20	7	23
Shared Lane Traffic (%)												
Lane Group Flow (vph)	4	679	0	54	1010	0	437	83	0	0	50	0
Turn Type	D.Pm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			3			4	
Permitted Phases	6			6			3			4		
Detector Phase	6	2		1	6		3	3		4	4	
Switch Phase												
Minimum Initial (s)	12.0	12.0		7.0	12.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	22.5	22.5		12.6	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	61.0	48.0		13.0	61.0		60.0	60.0		24.0	24.0	
Total Split (%)	42.1%	33.1%		9.0%	42.1%		41.4%	41.4%		16.6%	16.6%	
Maximum Green (s)	54.8	41.8		7.4	54.8		54.3	54.3		17.9	17.9	
Yellow Time (s)	4.6	4.6		3.0	4.6		4.7	4.7		4.3	4.3	
All-Red Time (s)	1.6	1.6		2.6	1.6		1.0	1.0		1.8	1.8	
Lost Time Adjust (s)	-1.2	-1.2		-0.6	-1.2		-0.7	-0.7			-1.1	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0			5.0	
Lead/Lag		Lag		Lead			Lead	Lead		Lag	Lag	
Lead-Lag Optimize?		Yes		Yes			Yes	Yes		Yes	Yes	
Vehicle Extension (s)	6.0	6.0		2.0	6.0		2.0	2.0		2.0	2.0	
Minimum Gap (s)	3.0	3.0		2.0	3.0		2.0	2.0		2.0	2.0	
Time Before Reduce (s)	15.0	15.0		0.0	15.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	45.0	45.0		0.0	45.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Min	C-Min		None	C-Min		None	None		None	None	
Walk Time (s)							7.0	7.0				
Flash Dont Walk (s)							7.0	7.0				
Pedestrian Calls (#/hr)							0	0				
Act Effct Green (s)	68.2	57.4		68.2	68.2		55.0	55.0			9.4	
Actuated g/C Ratio	0.47	0.40		0.47	0.47		0.38	0.38			0.06	

Lanes, Volumes, Timings
1: Lawyers Rd & Allen Black Rd

The Courtyards on Lawyers
2018 Existing PM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	25	1117	736	27	34	20
Future Volume (vph)	25	1117	736	27	34	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			100	0	100
Storage Lanes	1			1	1	1
Taper Length (ft)	175				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1863	1583	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1863	1863	1583	1770	1583
Link Speed (mph)		45	45		55	
Link Distance (ft)		1147	446		1232	
Travel Time (s)		17.4	6.8		15.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	28	1241	818	30	38	22
Shared Lane Traffic (%)						
Lane Group Flow (vph)	28	1241	818	30	38	22
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 68.8%
Analysis Period (min) 15

ICU Level of Service C

Lanes, Volumes, Timings
4: Stevens Mill Road & Lawyers Rd

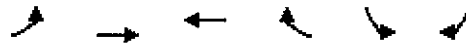
The Courtyards on Lawyers
2018 Existing PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	919	221	40	544	7	207	16	93	14	4	12
Future Volume (vph)	11	919	221	40	544	7	207	16	93	14	4	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-1%			0%			-2%			2%	
Storage Length (ft)	125		0	125		0	225		0	0		0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (ft)	100			75			100			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.971			0.998			0.872			0.947	
Flt Protected	0.950			0.950			0.950				0.976	
Satd. Flow (prot)	1778	1818	0	1770	1859	0	1787	1641	0	0	1704	0
Flt Permitted	0.337			0.046			0.485				0.785	
Satd. Flow (perm)	631	1818	0	86	1859	0	912	1641	0	0	1371	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			1			103			13	
Link Speed (mph)		45			45			45			25	
Link Distance (ft)		585			557			625			740	
Travel Time (s)		8.9			8.4			9.5			20.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	12	1021	246	44	604	8	230	18	103	16	4	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	12	1267	0	44	612	0	230	121	0	0	33	0
Turn Type	D.Pm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			3			4	
Permitted Phases	6			6			3			4		
Detector Phase	6	2		1	6		3	3		4	4	
Switch Phase												
Minimum Initial (s)	12.0	12.0		7.0	12.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	22.5	22.5		12.6	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	89.0	76.0		13.0	89.0		33.0	33.0		23.0	23.0	
Total Split (%)	61.4%	52.4%		9.0%	61.4%		22.8%	22.8%		15.9%	15.9%	
Maximum Green (s)	82.8	69.8		7.4	82.8		27.3	27.3		16.9	16.9	
Yellow Time (s)	4.6	4.6		3.0	4.6		4.7	4.7		4.3	4.3	
All-Red Time (s)	1.6	1.6		2.6	1.6		1.0	1.0		1.8	1.8	
Lost Time Adjust (s)	-1.2	-1.2		-0.6	-1.2		-0.7	-0.7			-1.1	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0			5.0	
Lead/Lag		Lag		Lead			Lead	Lead		Lag	Lag	
Lead-Lag Optimize?		Yes		Yes			Yes	Yes		Yes	Yes	
Vehicle Extension (s)	6.0	6.0		2.0	6.0		2.0	2.0		2.0	2.0	
Minimum Gap (s)	3.0	3.0		2.0	3.0		2.0	2.0		2.0	2.0	
Time Before Reduce (s)	15.0	15.0		0.0	15.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	45.0	45.0		0.0	45.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Min	C-Min		None	C-Min		None	None		None	None	
Walk Time (s)							7.0	7.0				
Flash Dont Walk (s)							7.0	7.0				
Pedestrian Calls (#/hr)							0	0				
Act Effct Green (s)	95.7	85.6		95.7	95.7		28.0	28.0			8.9	
Actuated g/C Ratio	0.66	0.59		0.66	0.66		0.19	0.19			0.06	

2022 Background Conditions

Lanes, Volumes, Timings
1: Lawyers Rd & Allen Black Rd

The Courtyards on Lawyers
2022 Background AM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↑	↑	↗	↖	↗
Traffic Volume (vph)	10	646	1413	15	19	53
Future Volume (vph)	10	646	1413	15	19	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			100	0	100
Storage Lanes	1			1	1	1
Taper Length (ft)	175				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1863	1583	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1863	1863	1583	1770	1583
Link Speed (mph)		45	45		55	
Link Distance (ft)		1147	446		1232	
Travel Time (s)		17.4	6.8		15.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	718	1570	17	21	59
Shared Lane Traffic (%)						
Lane Group Flow (vph)	11	718	1570	17	21	59
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 84.4%
Analysis Period (min) 15

ICU Level of Service E

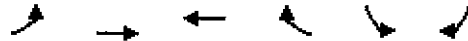
Lanes, Volumes, Timings
4: Stevens Mill Road & Lawyers Rd

The Courtyards on Lawyers
2022 Background AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	563	99	53	980	4	425	2	79	19	6	23
Future Volume (vph)	4	563	99	53	980	4	425	2	79	19	6	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-1%			0%			-2%			2%	
Storage Length (ft)	125		0	125		0	225		0	0		0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (ft)	100			75			100			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.978			0.999			0.853			0.935	
Flt Protected	0.950			0.950			0.950				0.981	
Satd. Flow (prot)	1778	1831	0	1770	1861	0	1787	1605	0	0	1691	0
Flt Permitted	0.060			0.068			0.389				0.833	
Satd. Flow (perm)	112	1831	0	127	1861	0	732	1605	0	0	1436	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6					88				26	
Link Speed (mph)		45			45		45				25	
Link Distance (ft)		585			557		625				740	
Travel Time (s)		8.9			8.4		9.5				20.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	4	626	110	59	1089	4	472	2	88	21	7	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	4	736	0	59	1093	0	472	90	0	0	54	0
Turn Type	D.Pm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6		3			4		
Permitted Phases	6			6			3			4		
Detector Phase	6	2		1	6		3	3		4	4	
Switch Phase												
Minimum Initial (s)	12.0	12.0		7.0	12.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	22.5	22.5		12.6	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	61.0	48.0		13.0	61.0		60.0	60.0		24.0	24.0	
Total Split (%)	42.1%	33.1%		9.0%	42.1%		41.4%	41.4%		16.6%	16.6%	
Maximum Green (s)	54.8	41.8		7.4	54.8		54.3	54.3		17.9	17.9	
Yellow Time (s)	4.6	4.6		3.0	4.6		4.7	4.7		4.3	4.3	
All-Red Time (s)	1.6	1.6		2.6	1.6		1.0	1.0		1.8	1.8	
Lost Time Adjust (s)	-1.2	-1.2		-0.6	-1.2		-0.7	-0.7			-1.1	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0			5.0	
Lead/Lag		Lag		Lead			Lead	Lead		Lag	Lag	
Lead-Lag Optimize?		Yes		Yes			Yes	Yes		Yes	Yes	
Vehicle Extension (s)	6.0	6.0		2.0	6.0		2.0	2.0		2.0	2.0	
Minimum Gap (s)	3.0	3.0		2.0	3.0		2.0	2.0		2.0	2.0	
Time Before Reduce (s)	15.0	15.0		0.0	15.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	45.0	45.0		0.0	45.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Min	C-Min		None	C-Min		None	None		None	None	
Walk Time (s)							7.0	7.0				
Flash Dont Walk (s)							7.0	7.0				
Pedestrian Calls (#/hr)							0	0				
Act Effct Green (s)	68.0	57.1		68.0	68.0		55.0	55.0			9.6	
Actuated g/C Ratio	0.47	0.39		0.47	0.47		0.38	0.38			0.07	

Lanes, Volumes, Timings
1: Lawyers Rd & Allen Black Rd

The Courtyards on Lawyers
2022 Background PM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↑	↑	↗	↖	↗
Traffic Volume (vph)	27	1209	797	29	37	22
Future Volume (vph)	27	1209	797	29	37	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			100	0	100
Storage Lanes	1			1	1	1
Taper Length (ft)	175				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1863	1583	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1863	1863	1583	1770	1583
Link Speed (mph)		45	45		55	
Link Distance (ft)		1147	446		1232	
Travel Time (s)		17.4	6.8		15.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	30	1343	886	32	41	24
Shared Lane Traffic (%)						
Lane Group Flow (vph)	30	1343	886	32	41	24
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 73.6%

ICU Level of Service D

Analysis Period (min) 15

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	995	239	43	589	8	224	17	101	15	4	13
Future Volume (vph)	12	995	239	43	589	8	224	17	101	15	4	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-1%			0%			-2%			2%	
Storage Length (ft)	125		0	125		0	225		0	0		0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (ft)	100			75			100			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.971			0.998			0.872			0.946	
Flt Protected	0.950			0.950			0.950				0.976	
Satd. Flow (prot)	1778	1818	0	1770	1859	0	1787	1641	0	0	1703	0
Flt Permitted	0.306			0.046			0.486				0.780	
Satd. Flow (perm)	573	1818	0	86	1859	0	914	1641	0	0	1361	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			1			112			14	
Link Speed (mph)		45			45			45			25	
Link Distance (ft)		585			557			625			740	
Travel Time (s)		8.9			8.4			9.5			20.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	13	1106	266	48	654	9	249	19	112	17	4	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	13	1372	0	48	663	0	249	131	0	0	35	0
Turn Type	D.Pm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			3			4	
Permitted Phases	6			6			3			4		
Detector Phase	6	2		1	6		3	3		4	4	
Switch Phase												
Minimum Initial (s)	12.0	12.0		7.0	12.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	22.5	22.5		12.6	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	89.0	76.0		13.0	89.0		33.0	33.0		23.0	23.0	
Total Split (%)	61.4%	52.4%		9.0%	61.4%		22.8%	22.8%		15.9%	15.9%	
Maximum Green (s)	82.8	69.8		7.4	82.8		27.3	27.3		16.9	16.9	
Yellow Time (s)	4.6	4.6		3.0	4.6		4.7	4.7		4.3	4.3	
All-Red Time (s)	1.6	1.6		2.6	1.6		1.0	1.0		1.8	1.8	
Lost Time Adjust (s)	-1.2	-1.2		-0.6	-1.2		-0.7	-0.7			-1.1	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0			5.0	
Lead/Lag		Lag		Lead			Lead	Lead		Lag	Lag	
Lead-Lag Optimize?		Yes		Yes			Yes	Yes		Yes	Yes	
Vehicle Extension (s)	6.0	6.0		2.0	6.0		2.0	2.0		2.0	2.0	
Minimum Gap (s)	3.0	3.0		2.0	3.0		2.0	2.0		2.0	2.0	
Time Before Reduce (s)	15.0	15.0		0.0	15.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	45.0	45.0		0.0	45.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Min	C-Min		None	C-Min		None	None		None	None	
Walk Time (s)							7.0	7.0				
Flash Dont Walk (s)							7.0	7.0				
Pedestrian Calls (#/hr)							0	0				
Act Effct Green (s)	95.6	85.4		95.6	95.6		28.0	28.0			9.0	
Actuated g/C Ratio	0.66	0.59		0.66	0.66		0.19	0.19			0.06	

2022 Background Conditions
Improved

Lanes, Volumes, Timings
1: Lawyers Rd & Allen Black Rd

The Courtyards on Lawyers
2022 Background IMP AM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔↔	↔↔		↔	↔
Traffic Volume (vph)	10	646	1413	15	19	53
Future Volume (vph)	10	646	1413	15	19	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			0	0	100
Storage Lanes	0			0	1	1
Taper Length (ft)	175				25	
Lane Util. Factor	0.95	0.95	0.95	0.95	1.00	1.00
Frt			0.998			0.850
Flt Protected		0.999			0.950	
Satd. Flow (prot)	0	3536	3532	0	1770	1583
Flt Permitted		0.999			0.950	
Satd. Flow (perm)	0	3536	3532	0	1770	1583
Link Speed (mph)		45	45		55	
Link Distance (ft)		1147	446		1232	
Travel Time (s)		17.4	6.8		15.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	718	1570	17	21	59
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	729	1587	0	21	59
Sign Control		Yield	Yield		Yield	

Intersection Summary

Area Type: Other

Control Type: Roundabout

Intersection Capacity Utilization 49.5%

ICU Level of Service A

Analysis Period (min) 15

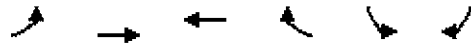
Lanes, Volumes, Timings
4: Stevens Mill Road & Lawyers Rd

The Courtyards on Lawyers
2022 Background IMP AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	563	99	53	980	4	425	2	79	19	6	23
Future Volume (vph)	4	563	99	53	980	4	425	2	79	19	6	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-1%			0%			-2%			2%	
Storage Length (ft)	125		0	125		650	400		0	0		0
Storage Lanes	1		1	1		1	2		0	0		0
Taper Length (ft)	100			75			100			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	0.97	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.999			0.853			0.935	
Flt Protected	0.950			0.950			0.950				0.981	
Satd. Flow (prot)	1778	1872	1591	1770	3536	0	3467	1605	0	0	1691	0
Flt Permitted	0.130			0.076			0.389				0.833	
Satd. Flow (perm)	243	1872	1591	142	3536	0	1420	1605	0	0	1436	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			116					88			26	
Link Speed (mph)		45			45			45			25	
Link Distance (ft)		585			557			625			740	
Travel Time (s)		8.9			8.4			9.5			20.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	4	626	110	59	1089	4	472	2	88	21	7	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	4	626	110	59	1093	0	472	90	0	0	54	0
Turn Type	D.Pm	NA	Perm	pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			3			4	
Permitted Phases	6		2	6			3			4		
Detector Phase	6	2	2	1	6		3	3		4	4	
Switch Phase												
Minimum Initial (s)	12.0	12.0	12.0	7.0	12.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	22.5	22.5	22.5	12.6	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	44.0	31.0	31.0	13.0	44.0		68.0	68.0		23.0	23.0	
Total Split (%)	32.6%	23.0%	23.0%	9.6%	32.6%		50.4%	50.4%		17.0%	17.0%	
Maximum Green (s)	37.8	24.8	24.8	7.4	37.8		62.3	62.3		16.9	16.9	
Yellow Time (s)	4.6	4.6	4.6	3.0	4.6		4.7	4.7		4.3	4.3	
All-Red Time (s)	1.6	1.6	1.6	2.6	1.6		1.0	1.0		1.8	1.8	
Lost Time Adjust (s)	-1.2	-1.2	-1.2	-0.6	-1.2		-0.7	-0.7			-1.1	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0			5.0	
Lead/Lag		Lag	Lag	Lead			Lead	Lead		Lag	Lag	
Lead-Lag Optimize?		Yes	Yes	Yes			Yes	Yes		Yes	Yes	
Vehicle Extension (s)	6.0	6.0	6.0	2.0	6.0		2.0	2.0		2.0	2.0	
Minimum Gap (s)	3.0	3.0	3.0	2.0	3.0		2.0	2.0		2.0	2.0	
Time Before Reduce (s)	15.0	15.0	15.0	0.0	15.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	45.0	45.0	45.0	0.0	45.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Min	C-Min	C-Min	None	C-Min		None	None		None	None	
Walk Time (s)							7.0	7.0				
Flash Dont Walk (s)							7.0	7.0				
Pedestrian Calls (#/hr)							0	0				
Act Effct Green (s)	61.4	50.3	50.3	61.4	61.4		51.8	51.8			9.4	
Actuated g/C Ratio	0.45	0.37	0.37	0.45	0.45		0.38	0.38			0.07	

Lanes, Volumes, Timings
1: Lawyers Rd & Allen Black Rd

The Courtyards on Lawyers
2022 Background IMP AM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	←	↑	↑↑		←	←
Traffic Volume (vph)	10	646	1413	15	19	53
Future Volume (vph)	10	646	1413	15	19	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			0	0	100
Storage Lanes	1			0	1	1
Taper Length (ft)	175				25	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt			0.998			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	3532	0	1770	1583
Flt Permitted	0.144				0.950	
Satd. Flow (perm)	268	1863	3532	0	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			3			59
Link Speed (mph)		45	45		55	
Link Distance (ft)		1147	446		1232	
Travel Time (s)		17.4	6.8		15.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	718	1570	17	21	59
Shared Lane Traffic (%)						
Lane Group Flow (vph)	11	718	1587	0	21	59
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		2	6		4	
Permitted Phases	2					4
Detector Phase	2	2	6		4	4
Switch Phase						
Minimum Initial (s)	12.0	12.0	12.0		7.0	7.0
Minimum Split (s)	19.0	19.0	19.0		14.0	14.0
Total Split (s)	115.0	115.0	115.0		20.0	20.0
Total Split (%)	85.2%	85.2%	85.2%		14.8%	14.8%
Maximum Green (s)	108.0	108.0	108.0		13.0	13.0
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0		-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	C-Min	C-Min	C-Min		None	None
Act Effct Green (s)	119.0	119.0	119.0		9.8	9.8
Actuated g/C Ratio	0.88	0.88	0.88		0.07	0.07
v/c Ratio	0.05	0.44	0.51		0.16	0.35
Control Delay	2.1	3.1	1.5		61.3	19.8
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	2.1	3.1	1.5		61.3	19.8
LOS	A	A	A		E	B
Approach Delay		3.0	1.5		30.7	
Approach LOS		A	A		C	

LANE SUMMARY

 **Site: 101 [Lawyers/Allen Black AM - Background]**

New Site
Site Category: (None)
Roundabout

Lane Use and Performance													
	Demand Flows			Deg.	Lane	Average	Level of	95% Back of Queue		Lane	Lane	Cap.	Prob.
	Total	HV	Cap.	Satn	Util.	Delay	Service	Veh	Dist	Config	Length	Adj.	Block.
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
East: Lawyers Road													
Lane 1 ^d	1570	2.0	1379	1.139	100	86.9	LOS F	473.9	12036.0	Full	1600	0.0	100.0
Lane 2	17	2.0	1310	0.013	100	2.8	LOS A	0.0	1.2	Short	100	0.0	NA
Approach	1587	2.0		1.139		86.0	LOS F	473.9	12036.0				
North: Allen Black Road													
Lane 1	21	2.0	385	0.055	100	10.1	LOS B	0.2	4.5	Full	1600	0.0	0.0
Lane 2 ^d	59	2.0	385	0.153	100	11.7	LOS B	0.5	12.8	Short	100	0.0	NA
Approach	80	2.0		0.153		11.3	LOS B	0.5	12.8				
West: Lawyers Road													
Lane 1	11	2.0	1365	0.008	100	2.7	LOS A	0.0	0.8	Short	300	0.0	NA
Lane 2 ^d	718	2.0	1365	0.526	100	8.2	LOS A	4.0	101.8	Full	1600	0.0	0.0
Approach	729	2.0		0.526		8.1	LOS A	4.0	101.8				
Intersection	2396	2.0		1.139		59.8	LOS F	473.9	12036.0				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

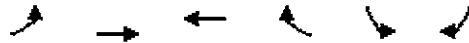
Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Lanes, Volumes, Timings
1: Lawyers Rd & Allen Black Rd

The Courtyards on Lawyers
2022 Background IMP PM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔↔	↔↔		↔	↔
Traffic Volume (vph)	27	1209	797	29	37	22
Future Volume (vph)	27	1209	797	29	37	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			0	0	100
Storage Lanes	0			0	1	1
Taper Length (ft)	175				25	
Lane Util. Factor	0.95	0.95	0.95	0.95	1.00	1.00
Frt			0.995			0.850
Flt Protected		0.999			0.950	
Satd. Flow (prot)	0	3536	3522	0	1770	1583
Flt Permitted		0.999			0.950	
Satd. Flow (perm)	0	3536	3522	0	1770	1583
Link Speed (mph)		45	45		55	
Link Distance (ft)		1147	446		1232	
Travel Time (s)		17.4	6.8		15.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	30	1343	886	32	41	24
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1373	918	0	41	24
Sign Control		Yield	Yield		Yield	

Intersection Summary

Area Type: Other

Control Type: Roundabout

Intersection Capacity Utilization 62.7%

ICU Level of Service B

Analysis Period (min) 15

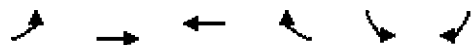
Lanes, Volumes, Timings
4: Stevens Mill Road & Lawyers Rd

The Courtyards on Lawyers
2022 Background IMP PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	995	239	43	589	8	224	17	101	15	4	13
Future Volume (vph)	12	995	239	43	589	8	224	17	101	15	4	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-1%			0%			-2%			2%	
Storage Length (ft)	125		0	125		650	400		0	0		0
Storage Lanes	1		1	1		1	2		0	0		0
Taper Length (ft)	100			75			100			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	0.97	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.998			0.872			0.946	
Flt Protected	0.950			0.950			0.950				0.976	
Satd. Flow (prot)	1778	1872	1591	1770	3532	0	3467	1641	0	0	1703	0
Flt Permitted	0.372			0.045			0.486				0.780	
Satd. Flow (perm)	696	1872	1591	84	3532	0	1774	1641	0	0	1361	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			108		1			112			14	
Link Speed (mph)		45			45			45			25	
Link Distance (ft)		585			557			625			740	
Travel Time (s)		8.9			8.4			9.5			20.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	13	1106	266	48	654	9	249	19	112	17	4	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	13	1106	266	48	663	0	249	131	0	0	35	0
Turn Type	D.Pm	NA	Perm	pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			3			4	
Permitted Phases	6		2	6			3			4		
Detector Phase	6	2	2	1	6		3	3		4	4	
Switch Phase												
Minimum Initial (s)	12.0	12.0	12.0	7.0	12.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	22.5	22.5	22.5	12.6	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	69.0	56.0	56.0	13.0	69.0		53.0	53.0		23.0	23.0	
Total Split (%)	47.6%	38.6%	38.6%	9.0%	47.6%		36.6%	36.6%		15.9%	15.9%	
Maximum Green (s)	62.8	49.8	49.8	7.4	62.8		47.3	47.3		16.9	16.9	
Yellow Time (s)	4.6	4.6	4.6	3.0	4.6		4.7	4.7		4.3	4.3	
All-Red Time (s)	1.6	1.6	1.6	2.6	1.6		1.0	1.0		1.8	1.8	
Lost Time Adjust (s)	-1.2	-1.2	-1.2	-0.6	-1.2		-0.7	-0.7			-1.1	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0			5.0	
Lead/Lag		Lag	Lag	Lead			Lead	Lead		Lag	Lag	
Lead-Lag Optimize?		Yes	Yes	Yes			Yes	Yes		Yes	Yes	
Vehicle Extension (s)	6.0	6.0	6.0	2.0	6.0		2.0	2.0		2.0	2.0	
Minimum Gap (s)	3.0	3.0	3.0	2.0	3.0		2.0	2.0		2.0	2.0	
Time Before Reduce (s)	15.0	15.0	15.0	0.0	15.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	45.0	45.0	45.0	0.0	45.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Min	C-Min	C-Min	None	C-Min		None	None		None	None	
Walk Time (s)							7.0	7.0				
Flash Dont Walk (s)							7.0	7.0				
Pedestrian Calls (#/hr)							0	0				
Act Effct Green (s)	97.7	87.4	87.4	97.7	97.7		25.9	25.9			9.0	
Actuated g/C Ratio	0.67	0.60	0.60	0.67	0.67		0.18	0.18			0.06	

Lanes, Volumes, Timings
1: Lawyers Rd & Allen Black Rd

The Courtyards on Lawyers
2022 Background IMP PM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↗	↖↗		↖	↗
Traffic Volume (vph)	27	1209	797	29	37	22
Future Volume (vph)	27	1209	797	29	37	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			0	0	100
Storage Lanes	1			0	1	1
Taper Length (ft)	175				25	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt			0.995			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	3522	0	1770	1583
Flt Permitted	0.307				0.950	
Satd. Flow (perm)	572	1863	3522	0	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			13			24
Link Speed (mph)		45	45		55	
Link Distance (ft)		1147	446		1232	
Travel Time (s)		17.4	6.8		15.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	30	1343	886	32	41	24
Shared Lane Traffic (%)						
Lane Group Flow (vph)	30	1343	918	0	41	24
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		2	6		4	
Permitted Phases	2					4
Detector Phase	2	2	6		4	4
Switch Phase						
Minimum Initial (s)	12.0	12.0	12.0		7.0	7.0
Minimum Split (s)	19.0	19.0	19.0		14.0	14.0
Total Split (s)	131.0	131.0	131.0		14.0	14.0
Total Split (%)	90.3%	90.3%	90.3%		9.7%	9.7%
Maximum Green (s)	124.0	124.0	124.0		7.0	7.0
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0		-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	C-Min	C-Min	C-Min		None	None
Act Effct Green (s)	129.4	129.4	129.4		9.4	9.4
Actuated g/C Ratio	0.89	0.89	0.89		0.06	0.06
v/c Ratio	0.06	0.81	0.29		0.36	0.19
Control Delay	1.6	9.2	1.1		74.2	25.9
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	1.6	9.2	1.1		74.2	25.9
LOS	A	A	A		E	C
Approach Delay		9.0	1.1		56.4	
Approach LOS		A	A		E	

LANE SUMMARY

 **Site: 101 [Lawyers/Allen Black PM - Background]**

New Site

Site Category: (None)

Roundabout

Lane Use and Performance

	Demand Flows		Deg.	Lane	Average	Level of	95% Back of Queue		Lane	Lane	Cap.	Prob.
	Total	HV	Satn	Util.	Delay	Service	Veh	Dist	Config	Length	Adj.	Block.
	veh/h	%	v/c	%	sec			ft		ft	%	%
East: Lawyers Road												
Lane 1 ^d	886	2.0	0.653	100	10.8	LOS B	6.1	155.1	Full	1600	0.0	0.0
Lane 2	32	2.0	0.025	100	3.0	LOS A	0.1	2.4	Short	100	0.0	NA
Approach	918	2.0	0.653		10.5	LOS B	6.1	155.1				
North: Allen Black Road												
Lane 1 ^d	41	2.0	0.067	100	6.6	LOS A	0.2	6.0	Full	1600	0.0	0.0
Lane 2	24	2.0	0.040	100	6.3	LOS A	0.1	3.5	Short	100	0.0	NA
Approach	66	2.0	0.067		6.5	LOS A	0.2	6.0				
West: Lawyers Road												
Lane 1	30	2.0	0.022	100	2.9	LOS A	0.1	2.2	Short	300	0.0	NA
Lane 2 ^d	1343	2.0	1.002	100	43.1	LOS F	156.0	3963.4	Full	1600	0.0	49.6
Approach	1373	2.0	1.002		42.2	LOS E	156.0	3963.4				
Intersection	2357	2.0	1.002		28.8	LOS D	156.0	3963.4				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

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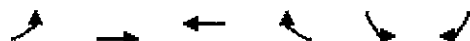
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2022 Build-out Conditions

Lanes, Volumes, Timings
1: Lawyers Rd & Allen Black Rd

The Courtyards on Lawyers

2022 Build AM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↑	↑	↗	↖	↗
Traffic Volume (vph)	21	646	1424	15	30	63
Future Volume (vph)	21	646	1424	15	30	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			100	0	100
Storage Lanes	1			1	1	1
Taper Length (ft)	175				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1863	1583	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1863	1863	1583	1770	1583
Link Speed (mph)		45	45		55	
Link Distance (ft)		1147	446		1232	
Travel Time (s)		17.4	6.8		15.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	23	718	1582	17	33	70
Shared Lane Traffic (%)						
Lane Group Flow (vph)	23	718	1582	17	33	70
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

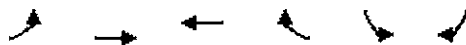
Intersection Capacity Utilization 85.5%

ICU Level of Service E

Analysis Period (min) 15

Lanes, Volumes, Timings
2: Lawyers Rd & Site Access

The Courtyards on Lawyers
2022 Build AM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Volume (vph)	0	677	1428	5	0	11
Future Volume (vph)	0	677	1428	5	0	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.999			0.865
Flt Protected						
Satd. Flow (prot)	0	1863	1861	0	0	1611
Flt Permitted						
Satd. Flow (perm)	0	1863	1861	0	0	1611
Link Speed (mph)		45	45		25	
Link Distance (ft)		446	585		793	
Travel Time (s)		6.8	8.9		21.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	752	1587	6	0	12
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	752	1593	0	0	12
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 85.5%
Analysis Period (min) 15
ICU Level of Service E

Lanes, Volumes, Timings
3: Allen Black Rd & Site Access

The Courtyards on Lawyers
2022 Build AM

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	LT		TH		LT	RT
Traffic Volume (vph)	21	4	25	11	2	73
Future Volume (vph)	21	4	25	11	2	73
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.980		0.959			
Flt Protected	0.959					0.999
Satd. Flow (prot)	1751	0	1786	0	0	1861
Flt Permitted	0.959					0.999
Satd. Flow (perm)	1751	0	1786	0	0	1861
Link Speed (mph)	25		55			55
Link Distance (ft)	1054		1232			1027
Travel Time (s)	28.7		15.3			12.7
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	23	4	28	12	2	81
Shared Lane Traffic (%)						
Lane Group Flow (vph)	27	0	40	0	0	83
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 15.5%
Analysis Period (min) 15
ICU Level of Service A

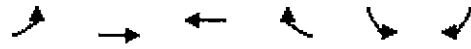
Lanes, Volumes, Timings
4: Stevens Mill Road & Lawyers Rd

The Courtyards on Lawyers
2022 Build AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	570	103	53	984	4	426	2	79	19	6	23
Future Volume (vph)	4	570	103	53	984	4	426	2	79	19	6	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-1%			0%			-2%			2%	
Storage Length (ft)	125		0	125		0	225		0	0		0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (ft)	100			75			100			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.977			0.999			0.853			0.935	
Flt Protected	0.950			0.950			0.950				0.981	
Satd. Flow (prot)	1778	1829	0	1770	1861	0	1787	1605	0	0	1691	0
Flt Permitted	0.060			0.068			0.389				0.833	
Satd. Flow (perm)	112	1829	0	127	1861	0	732	1605	0	0	1436	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6					88				26	
Link Speed (mph)		45			45			45			25	
Link Distance (ft)		585			557			625			740	
Travel Time (s)		8.9			8.4			9.5			20.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	4	633	114	59	1093	4	473	2	88	21	7	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	4	747	0	59	1097	0	473	90	0	0	54	0
Turn Type	D.Pm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			3			4	
Permitted Phases	6			6			3			4		
Detector Phase	6	2		1	6		3	3		4	4	
Switch Phase												
Minimum Initial (s)	12.0	12.0		7.0	12.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	22.5	22.5		12.6	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	61.0	48.0		13.0	61.0		60.0	60.0		24.0	24.0	
Total Split (%)	42.1%	33.1%		9.0%	42.1%		41.4%	41.4%		16.6%	16.6%	
Maximum Green (s)	54.8	41.8		7.4	54.8		54.3	54.3		17.9	17.9	
Yellow Time (s)	4.6	4.6		3.0	4.6		4.7	4.7		4.3	4.3	
All-Red Time (s)	1.6	1.6		2.6	1.6		1.0	1.0		1.8	1.8	
Lost Time Adjust (s)	-1.2	-1.2		-0.6	-1.2		-0.7	-0.7			-1.1	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0			5.0	
Lead/Lag		Lag		Lead			Lead	Lead		Lag	Lag	
Lead-Lag Optimize?		Yes		Yes			Yes	Yes		Yes	Yes	
Vehicle Extension (s)	6.0	6.0		2.0	6.0		2.0	2.0		2.0	2.0	
Minimum Gap (s)	3.0	3.0		2.0	3.0		2.0	2.0		2.0	2.0	
Time Before Reduce (s)	15.0	15.0		0.0	15.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	45.0	45.0		0.0	45.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Min	C-Min		None	C-Min		None	None		None	None	
Walk Time (s)							7.0	7.0				
Flash Dont Walk (s)							7.0	7.0				
Pedestrian Calls (#/hr)							0	0				
Act Effct Green (s)	68.0	57.1		68.0	68.0		55.0	55.0			9.6	
Actuated g/C Ratio	0.47	0.39		0.47	0.47		0.38	0.38			0.07	

Lanes, Volumes, Timings
1: Lawyers Rd & Allen Black Rd

The Courtyards on Lawyers
2022 Build PM



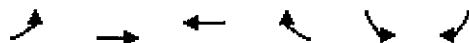
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	←	→	←	→	←	→
Traffic Volume (vph)	51	1209	805	29	44	29
Future Volume (vph)	51	1209	805	29	44	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			100	0	100
Storage Lanes	1			1	1	1
Taper Length (ft)	175				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1863	1583	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1863	1863	1583	1770	1583
Link Speed (mph)		45	45		55	
Link Distance (ft)		1147	446		1232	
Travel Time (s)		17.4	6.8		15.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	57	1343	894	32	49	32
Shared Lane Traffic (%)						
Lane Group Flow (vph)	57	1343	894	32	49	32
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 73.6%
Analysis Period (min) 15
ICU Level of Service D

Lanes, Volumes, Timings
2: Lawyers Rd & Site Access

The Courtyards on Lawyers
2022 Build PM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Volume (vph)	0	1253	826	12	0	8
Future Volume (vph)	0	1253	826	12	0	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.998			0.865
Flt Protected						
Satd. Flow (prot)	0	1863	1859	0	0	1611
Flt Permitted						
Satd. Flow (perm)	0	1863	1859	0	0	1611
Link Speed (mph)		45	45		25	
Link Distance (ft)		446	585		793	
Travel Time (s)		6.8	8.9		21.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	1392	918	13	0	9
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1392	931	0	0	9
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 69.3%
Analysis Period (min) 15
ICU Level of Service C

Lanes, Volumes, Timings
3: Allen Black Rd & Site Access

The Courtyards on Lawyers
2022 Build PM

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	WT		NT			ST
Traffic Volume (vph)	14	3	56	24	4	58
Future Volume (vph)	14	3	56	24	4	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.979		0.959			
Flt Protected	0.960					0.997
Satd. Flow (prot)	1751	0	1786	0	0	1857
Flt Permitted	0.960					0.997
Satd. Flow (perm)	1751	0	1786	0	0	1857
Link Speed (mph)	25		55			55
Link Distance (ft)	1054		1232			1027
Travel Time (s)	28.7		15.3			12.7
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	16	3	62	27	4	64
Shared Lane Traffic (%)						
Lane Group Flow (vph)	19	0	89	0	0	68
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 16.3%
Analysis Period (min) 15

ICU Level of Service A

Lanes, Volumes, Timings
4: Stevens Mill Road & Lawyers Rd

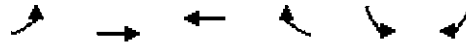
The Courtyards on Lawyers
2022 Build PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	999	242	43	597	8	228	17	101	15	4	13
Future Volume (vph)	12	999	242	43	597	8	228	17	101	15	4	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-1%			0%			-2%			2%	
Storage Length (ft)	125		0	125		0	225		0	0		0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (ft)	100			75			100			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.971			0.998			0.872			0.946	
Flt Protected	0.950			0.950			0.950				0.976	
Satd. Flow (prot)	1778	1818	0	1770	1859	0	1787	1641	0	0	1703	0
Flt Permitted	0.300			0.046			0.486				0.780	
Satd. Flow (perm)	562	1818	0	86	1859	0	914	1641	0	0	1361	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			1			112			14	
Link Speed (mph)		45			45			45			25	
Link Distance (ft)		585			557			625			740	
Travel Time (s)		8.9			8.4			9.5			20.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	13	1110	269	48	663	9	253	19	112	17	4	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	13	1379	0	48	672	0	253	131	0	0	35	0
Turn Type	D.Pm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			3			4	
Permitted Phases	6			6			3			4		
Detector Phase	6	2		1	6		3	3		4	4	
Switch Phase												
Minimum Initial (s)	12.0	12.0		7.0	12.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	22.5	22.5		12.6	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	89.0	76.0		13.0	89.0		33.0	33.0		23.0	23.0	
Total Split (%)	61.4%	52.4%		9.0%	61.4%		22.8%	22.8%		15.9%	15.9%	
Maximum Green (s)	82.8	69.8		7.4	82.8		27.3	27.3		16.9	16.9	
Yellow Time (s)	4.6	4.6		3.0	4.6		4.7	4.7		4.3	4.3	
All-Red Time (s)	1.6	1.6		2.6	1.6		1.0	1.0		1.8	1.8	
Lost Time Adjust (s)	-1.2	-1.2		-0.6	-1.2		-0.7	-0.7			-1.1	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0			5.0	
Lead/Lag		Lag		Lead			Lead	Lead		Lag	Lag	
Lead-Lag Optimize?		Yes		Yes			Yes	Yes		Yes	Yes	
Vehicle Extension (s)	6.0	6.0		2.0	6.0		2.0	2.0		2.0	2.0	
Minimum Gap (s)	3.0	3.0		2.0	3.0		2.0	2.0		2.0	2.0	
Time Before Reduce (s)	15.0	15.0		0.0	15.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	45.0	45.0		0.0	45.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Min	C-Min		None	C-Min		None	None		None	None	
Walk Time (s)							7.0	7.0				
Flash Dont Walk (s)							7.0	7.0				
Pedestrian Calls (#/hr)							0	0				
Act Effct Green (s)	95.6	85.4		95.6	95.6		28.0	28.0			9.0	
Actuated g/C Ratio	0.66	0.59		0.66	0.66		0.19	0.19			0.06	

2022 Build-out Conditions
Improved

Lanes, Volumes, Timings
1: Lawyers Rd & Allen Black Rd

The Courtyards on Lawyers
2022 Build IMP AM - unsignalized



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	←	↑	↑↑		←	↑
Traffic Volume (vph)	21	646	1424	15	30	63
Future Volume (vph)	21	646	1424	15	30	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			100	0	100
Storage Lanes	1			0	1	0
Taper Length (ft)	175				25	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt			0.998			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	3532	0	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1863	3532	0	1770	1583
Link Speed (mph)		45	45		55	
Link Distance (ft)		1147	446		1232	
Travel Time (s)		17.4	6.8		15.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	23	718	1582	17	33	70
Shared Lane Traffic (%)						
Lane Group Flow (vph)	23	718	1599	0	33	70
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

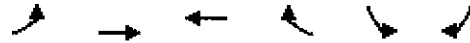
Intersection Capacity Utilization 50.4%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
1: Lawyers Rd & Allen Black Rd

The Courtyards on Lawyers
2022 Background IMP AM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↕		↗	↗
Traffic Volume (vph)	21	646	1424	15	30	63
Future Volume (vph)	21	646	1424	15	30	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			0	0	100
Storage Lanes	0			0	1	1
Taper Length (ft)	175				25	
Lane Util. Factor	0.95	0.95	0.95	0.95	1.00	1.00
Frt			0.998			0.850
Flt Protected		0.998			0.950	
Satd. Flow (prot)	0	3532	3532	0	1770	1583
Flt Permitted		0.998			0.950	
Satd. Flow (perm)	0	3532	3532	0	1770	1583
Link Speed (mph)		45	45		55	
Link Distance (ft)		1147	446		1232	
Travel Time (s)		17.4	6.8		15.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	23	718	1582	17	33	70
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	741	1599	0	33	70
Sign Control		Yield	Yield		Yield	

Intersection Summary

Area Type: Other
Control Type: Roundabout
Intersection Capacity Utilization 50.4%
Analysis Period (min) 15
ICU Level of Service A

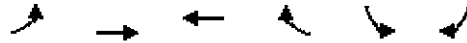
Lanes, Volumes, Timings
4: Stevens Mill Road & Lawyers Rd

The Courtyards on Lawyers
2022 Background IMP AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	570	103	53	984	4	426	2	79	19	6	23
Future Volume (vph)	4	570	103	53	984	4	426	2	79	19	6	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-1%			0%			-2%			2%	
Storage Length (ft)	125		0	125		650	400		0	0		0
Storage Lanes	1		1	1		1	2		0	0		0
Taper Length (ft)	100			75			100			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	0.97	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.999			0.853			0.935	
Flt Protected	0.950			0.950			0.950				0.981	
Satd. Flow (prot)	1778	1872	1591	1770	3536	0	3467	1605	0	0	1691	0
Flt Permitted	0.129			0.076			0.389				0.833	
Satd. Flow (perm)	241	1872	1591	142	3536	0	1420	1605	0	0	1436	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			116					88			26	
Link Speed (mph)		45			45			45			25	
Link Distance (ft)		585			557			625			740	
Travel Time (s)		8.9			8.4			9.5			20.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	4	633	114	59	1093	4	473	2	88	21	7	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	4	633	114	59	1097	0	473	90	0	0	54	0
Turn Type	D.Pm	NA	Perm	pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			3			4	
Permitted Phases	6		2	6			3			4		
Detector Phase	6	2	2	1	6		3	3		4	4	
Switch Phase												
Minimum Initial (s)	12.0	12.0	12.0	7.0	12.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	22.5	22.5	22.5	12.6	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	44.0	31.0	31.0	13.0	44.0		68.0	68.0		23.0	23.0	
Total Split (%)	32.6%	23.0%	23.0%	9.6%	32.6%		50.4%	50.4%		17.0%	17.0%	
Maximum Green (s)	37.8	24.8	24.8	7.4	37.8		62.3	62.3		16.9	16.9	
Yellow Time (s)	4.6	4.6	4.6	3.0	4.6		4.7	4.7		4.3	4.3	
All-Red Time (s)	1.6	1.6	1.6	2.6	1.6		1.0	1.0		1.8	1.8	
Lost Time Adjust (s)	-1.2	-1.2	-1.2	-0.6	-1.2		-0.7	-0.7			-1.1	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0			5.0	
Lead/Lag		Lag	Lag	Lead			Lead	Lead		Lag	Lag	
Lead-Lag Optimize?		Yes	Yes	Yes			Yes	Yes		Yes	Yes	
Vehicle Extension (s)	6.0	6.0	6.0	2.0	6.0		2.0	2.0		2.0	2.0	
Minimum Gap (s)	3.0	3.0	3.0	2.0	3.0		2.0	2.0		2.0	2.0	
Time Before Reduce (s)	15.0	15.0	15.0	0.0	15.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	45.0	45.0	45.0	0.0	45.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Min	C-Min	C-Min	None	C-Min		None	None		None	None	
Walk Time (s)							7.0	7.0				
Flash Dont Walk (s)							7.0	7.0				
Pedestrian Calls (#/hr)							0	0				
Act Effct Green (s)	61.3	50.2	50.2	61.3	61.3		51.9	51.9			9.4	
Actuated g/C Ratio	0.45	0.37	0.37	0.45	0.45		0.38	0.38			0.07	

Lanes, Volumes, Timings
1: Lawyers Rd & Allen Black Rd

The Courtyards on Lawyers
2022 Background IMP AM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	←	→	←	→	←	→
Traffic Volume (vph)	21	646	1424	15	30	63
Future Volume (vph)	21	646	1424	15	30	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			0	0	100
Storage Lanes	1			0	1	1
Taper Length (ft)	175				25	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt			0.998			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	3532	0	1770	1583
Flt Permitted	0.141				0.950	
Satd. Flow (perm)	263	1863	3532	0	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			3			70
Link Speed (mph)		45	45		55	
Link Distance (ft)		1147	446		1232	
Travel Time (s)		17.4	6.8		15.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	23	718	1582	17	33	70
Shared Lane Traffic (%)						
Lane Group Flow (vph)	23	718	1599	0	33	70
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		2	6		4	
Permitted Phases	2					4
Detector Phase	2	2	6		4	4
Switch Phase						
Minimum Initial (s)	12.0	12.0	12.0		7.0	7.0
Minimum Split (s)	19.0	19.0	19.0		14.0	14.0
Total Split (s)	115.0	115.0	115.0		20.0	20.0
Total Split (%)	85.2%	85.2%	85.2%		14.8%	14.8%
Maximum Green (s)	108.0	108.0	108.0		13.0	13.0
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0		-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	C-Min	C-Min	C-Min		None	None
Act Effct Green (s)	118.5	118.5	118.5		10.3	10.3
Actuated g/C Ratio	0.88	0.88	0.88		0.08	0.08
v/c Ratio	0.10	0.44	0.52		0.24	0.38
Control Delay	2.9	3.2	1.5		62.6	18.6
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	2.9	3.2	1.5		62.6	18.6
LOS	A	A	A		E	B
Approach Delay		3.2	1.5		32.7	
Approach LOS		A	A		C	

LANE SUMMARY

 **Site: 101 [Lawyers/Allen Black AM]**

New Site

Site Category: (None)

Roundabout

Lane Use and Performance

	Demand Flows			Deg.	Lane	Average	Level of	95% Back of Queue		Lane	Lane	Cap.	Prob.
	Total	HV	Cap.	Satn	Util.	Delay	Service	Veh	Dist	Config	Length	Adj.	Block.
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
East: Lawyers Road													
Lane 1 ^d	1582	2.0	1364	1.160	100	95.2	LOS F	378.9	9624.6	Full	1600	0.0	100.0
Lane 2	17	2.0	1295	0.013	100	2.9	LOS A	0.0	1.2	Short	100	0.0	NA
Approach	1599	2.0		1.160		94.3	LOS F	378.9	9624.6				
North: Allen Black Road													
Lane 1	33	2.0	390	0.085	100	10.5	LOS B	0.3	7.1	Full	1600	0.0	0.0
Lane 2 ^d	70	2.0	390	0.179	100	12.1	LOS B	0.6	15.2	Short	100	0.0	NA
Approach	103	2.0		0.179		11.6	LOS B	0.6	15.2				
West: Lawyers Road													
Lane 1	23	2.0	1350	0.017	100	2.8	LOS A	0.1	1.7	Short	300	0.0	NA
Lane 2 ^d	718	2.0	1350	0.532	100	8.3	LOS A	4.0	102.8	Full	1600	0.0	0.0
Approach	741	2.0		0.532		8.1	LOS A	4.0	102.8				
Intersection	2443	2.0		1.160		64.7	LOS F	378.9	9624.6				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

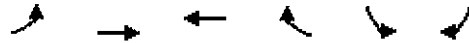
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Organisation: KIMLEY-HORN & ASSOCIATES INC | Processed: Wednesday, October 3, 2018 9:31:16 AM

Project: K:\CHL_PRJ\011523 Epcon Communities\001 Courtyards on Lawyers Rd\08B_SIDRA\Courtyards on Lawyers RAB.sip8

Lanes, Volumes, Timings
1: Lawyers Rd & Allen Black Rd

The Courtyards on Lawyers
2022 Build IMP PM - unsignalized



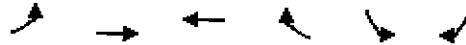
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	←	→	←	→	←	→
Traffic Volume (vph)	51	1209	805	29	44	29
Future Volume (vph)	51	1209	805	29	44	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			100	0	100
Storage Lanes	1			0	1	0
Taper Length (ft)	175				25	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt			0.995			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	3522	0	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1863	3522	0	1770	1583
Link Speed (mph)		45	45		55	
Link Distance (ft)		1147	446		1232	
Travel Time (s)		17.4	6.8		15.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	57	1343	894	32	49	32
Shared Lane Traffic (%)						
Lane Group Flow (vph)	57	1343	926	0	49	32
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 73.6%
Analysis Period (min) 15
ICU Level of Service D

Lanes, Volumes, Timings
1: Lawyers Rd & Allen Black Rd

The Courtyards on Lawyers
2022 Background IMP PM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↕		↕	↕
Traffic Volume (vph)	51	1209	805	29	44	29
Future Volume (vph)	51	1209	805	29	44	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			0	0	100
Storage Lanes	0			0	1	1
Taper Length (ft)	175				25	
Lane Util. Factor	0.95	0.95	0.95	0.95	1.00	1.00
Frt			0.995			0.850
Flt Protected		0.998			0.950	
Satd. Flow (prot)	0	3532	3522	0	1770	1583
Flt Permitted		0.998			0.950	
Satd. Flow (perm)	0	3532	3522	0	1770	1583
Link Speed (mph)		45	45		55	
Link Distance (ft)		1147	446		1232	
Travel Time (s)		17.4	6.8		15.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	57	1343	894	32	49	32
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1400	926	0	49	32
Sign Control		Yield	Yield		Yield	

Intersection Summary

Area Type: Other

Control Type: Roundabout

Intersection Capacity Utilization 71.4%

ICU Level of Service C

Analysis Period (min) 15

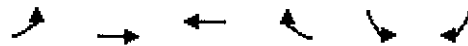
Lanes, Volumes, Timings
4: Stevens Mill Road & Lawyers Rd

The Courtyards on Lawyers
2022 Background IMP PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	999	242	43	597	8	228	17	101	15	4	13
Future Volume (vph)	12	999	242	43	597	8	228	17	101	15	4	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-1%			0%			-2%			2%	
Storage Length (ft)	125		0	125		650	400		0	0		0
Storage Lanes	1		1	1		1	2		0	0		0
Taper Length (ft)	100			75			100			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	0.97	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.998			0.872			0.946	
Flt Protected	0.950			0.950			0.950				0.976	
Satd. Flow (prot)	1778	1872	1591	1770	3532	0	3467	1641	0	0	1703	0
Flt Permitted	0.368			0.045			0.486				0.780	
Satd. Flow (perm)	689	1872	1591	84	3532	0	1774	1641	0	0	1361	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			108		1			112			14	
Link Speed (mph)		45			45			45			25	
Link Distance (ft)		585			557			625			740	
Travel Time (s)		8.9			8.4			9.5			20.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	13	1110	269	48	663	9	253	19	112	17	4	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	13	1110	269	48	672	0	253	131	0	0	35	0
Turn Type	D.Pm	NA	Perm	pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			3			4	
Permitted Phases	6		2	6			3			4		
Detector Phase	6	2	2	1	6		3	3		4	4	
Switch Phase												
Minimum Initial (s)	12.0	12.0	12.0	7.0	12.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	22.5	22.5	22.5	12.6	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	69.0	56.0	56.0	13.0	69.0		53.0	53.0		23.0	23.0	
Total Split (%)	47.6%	38.6%	38.6%	9.0%	47.6%		36.6%	36.6%		15.9%	15.9%	
Maximum Green (s)	62.8	49.8	49.8	7.4	62.8		47.3	47.3		16.9	16.9	
Yellow Time (s)	4.6	4.6	4.6	3.0	4.6		4.7	4.7		4.3	4.3	
All-Red Time (s)	1.6	1.6	1.6	2.6	1.6		1.0	1.0		1.8	1.8	
Lost Time Adjust (s)	-1.2	-1.2	-1.2	-0.6	-1.2		-0.7	-0.7			-1.1	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0			5.0	
Lead/Lag		Lag	Lag	Lead			Lead	Lead		Lag	Lag	
Lead-Lag Optimize?		Yes	Yes	Yes			Yes	Yes		Yes	Yes	
Vehicle Extension (s)	6.0	6.0	6.0	2.0	6.0		2.0	2.0		2.0	2.0	
Minimum Gap (s)	3.0	3.0	3.0	2.0	3.0		2.0	2.0		2.0	2.0	
Time Before Reduce (s)	15.0	15.0	15.0	0.0	15.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	45.0	45.0	45.0	0.0	45.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Min	C-Min	C-Min	None	C-Min		None	None		None	None	
Walk Time (s)							7.0	7.0				
Flash Dont Walk (s)							7.0	7.0				
Pedestrian Calls (#/hr)							0	0				
Act Effct Green (s)	97.3	87.1	87.1	97.3	97.3		26.2	26.2			9.0	
Actuated g/C Ratio	0.67	0.60	0.60	0.67	0.67		0.18	0.18			0.06	

Lanes, Volumes, Timings
1: Lawyers Rd & Allen Black Rd

The Courtyards on Lawyers
2022 Background IMP PM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↑	↑↑		↗	↗
Traffic Volume (vph)	51	1209	805	29	44	29
Future Volume (vph)	51	1209	805	29	44	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			0	0	100
Storage Lanes	1			0	1	1
Taper Length (ft)	175				25	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt			0.995			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	3522	0	1770	1583
Flt Permitted	0.304				0.950	
Satd. Flow (perm)	566	1863	3522	0	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			13			32
Link Speed (mph)		45	45		55	
Link Distance (ft)		1147	446		1232	
Travel Time (s)		17.4	6.8		15.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	57	1343	894	32	49	32
Shared Lane Traffic (%)						
Lane Group Flow (vph)	57	1343	926	0	49	32
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		2	6		4	
Permitted Phases	2					4
Detector Phase	2	2	6		4	4
Switch Phase						
Minimum Initial (s)	12.0	12.0	12.0		7.0	7.0
Minimum Split (s)	19.0	19.0	19.0		14.0	14.0
Total Split (s)	131.0	131.0	131.0		14.0	14.0
Total Split (%)	90.3%	90.3%	90.3%		9.7%	9.7%
Maximum Green (s)	124.0	124.0	124.0		7.0	7.0
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0		-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	C-Min	C-Min	C-Min		None	None
Act Effct Green (s)	129.1	129.1	129.1		9.7	9.7
Actuated g/C Ratio	0.89	0.89	0.89		0.07	0.07
v/c Ratio	0.11	0.81	0.30		0.42	0.24
Control Delay	1.9	9.4	1.2		76.4	24.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	1.9	9.4	1.2		76.4	24.3
LOS	A	A	A		E	C
Approach Delay		9.1	1.2		55.8	
Approach LOS		A	A		E	

LANE SUMMARY

 Site: 101 [Lawyers/Allen Black PM]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance													
	Demand Flows			Deg.	Lane	Average	Level of	95% Back of Queue		Lane	Lane	Cap.	Prob.
	Total	HV	Cap.	Satn	Util.	Delay	Service	Veh	Dist	Config	Length	Adj.	Block.
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
East: Lawyers Road													
Lane 1 ^d	894	2.0	1325	0.675	100	11.5	LOS B	6.4	162.7	Full	1600	0.0	0.0
Lane 2	32	2.0	1255	0.026	100	3.1	LOS A	0.1	2.4	Short	100	0.0	NA
Approach	927	2.0		0.675		11.2	LOS B	6.4	162.7				
North: Allen Black Road													
Lane 1 ^d	49	2.0	607	0.081	100	6.9	LOS A	0.3	7.2	Full	1600	0.0	0.0
Lane 2	32	2.0	607	0.053	100	6.5	LOS A	0.2	4.7	Short	100	0.0	NA
Approach	81	2.0		0.081		6.7	LOS A	0.3	7.2				
West: Lawyers Road													
Lane 1	57	2.0	1330	0.043	100	3.0	LOS A	0.2	4.2	Short	300	0.0	NA
Lane 2 ^d	1343	2.0	1329 ¹	1.011	100	45.3	LOS F	139.9	3552.8	Full	1600	0.0	39.4
Approach	1400	2.0		1.011		43.6	LOS E	139.9	3552.8				
Intersection	2408	2.0		1.011		29.9	LOS D	139.9	3552.8				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

d Dominant lane on roundabout approach

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Organisation: KIMLEY-HORN & ASSOCIATES INC | Processed: Wednesday, October 3, 2018 9:31:37 AM

Project: K:\CHL_PRJ\011523 Epcon Communities\001 Courtyards on Lawyers Rd\08B_SIDRA\Courtyards on Lawyers RAB.sip8

Queuing and Blocking Reports

2022 Build-out Conditions
Improved

Intersection: 1: Lawyers Rd & Allen Black Rd

Movement	EB	WB	SB	SB
Directions Served	L	TR	L	R
Maximum Queue (ft)	62	11	162	81
Average Queue (ft)	15	0	66	28
95th Queue (ft)	42	5	167	59
Link Distance (ft)		378	1151	1151
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	300			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Turn Lane Warrants

LAWREN'S Rd & SHS Access

AM

$V_R = 5$

$\rightarrow S = 0$

PM

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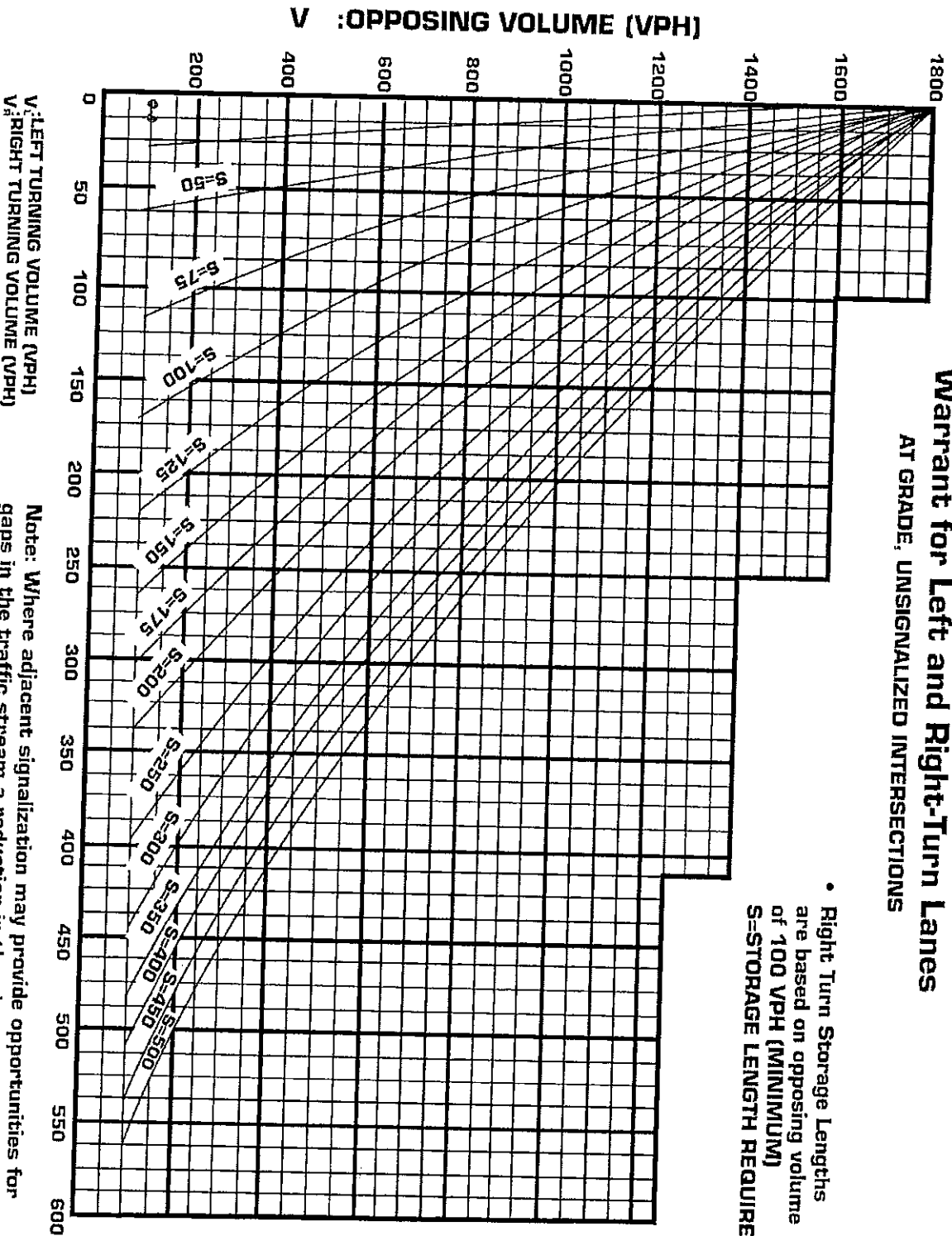
$V_R = 12$

$\rightarrow S = 0$

July 2003

Warrant for Left and Right-Turn Lanes AT GRADE, UNSIGNALIZED INTERSECTIONS

- Right Turn Storage Lengths are based on opposing volume of 100 VPH (MINIMUM)
S=STORAGE LENGTH REQUIRED



Note: Where adjacent signalization may provide opportunities for gaps in the traffic stream a reduction in the above storage values can be considered on a case by case basis.