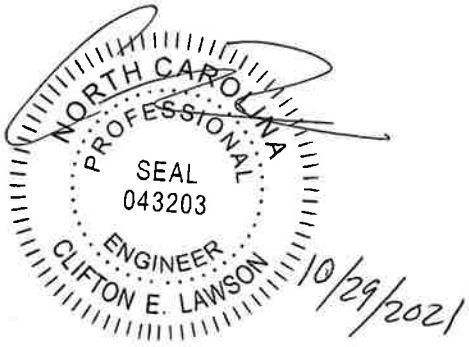
Haywood Glen Phase 4 Development

Traffic Impact Analysis

Knightdale, North Carolina

October 2021



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1 INTRODUCTION

This report presents the findings of the traffic impact analysis (TIA) for the proposed Haywood Glen Phase 4 Development. The Haywood Glen Phase 4 Development will be located in the southeastern quadrant of the Old Knight Road / Horton Road intersection, in Knightdale, NC (see **Figure 1-1**). A TIA for Phases 1-3* of the Haywood Glen Development was completed by Timmons Group (sealed 12/22/2020).

*Due to the nature of the development phasing, Haywood Glen Phases 1 – 3 were treated as an approved development.

The proposed development is planned for construction in 2024. Per the NCDOT and Town of Knightdale standards / guidelines, analyses were completed for the following scenarios:

- 2021 Existing traffic volumes
- 2025 Background traffic volumes (without Haywood Glen Phases 1 – 3 site trips)
- 2025 Background traffic volumes (with Haywood Glen Phases 1 – 3 site trips)
- 2025 Build traffic volumes (Background + site trips)
- 2034 Horizon Year traffic volumes

The purpose of this assessment is as follows:

1. Verify that the existing geometry provided within the study area is sufficient to accommodate the projected traffic volumes.

2. Determine what, if any, improvements are necessary at the proposed site driveway connections.

3. Provide an analysis of the future horizon year (2034).

The following steps were taken to determine the potential traffic impacts associated with this project:

1. Data Collection – Existing traffic counts from the Haywood Glen (Phases 1 – 3) TIA (sealed 12/22/2020) were used for this analysis. AM (7:00 – 9:00) and PM (4:00 – 6:00) peak hour turning movement counts were collected on November 18, 2020 at the following intersections:

   - SR 2049 (Old Knight Road) / SR 2049 (North 1st Avenue) / US 64 Business (Knightdale Boulevard);
   - SR 2232 (Old Knight Road) / SR 2049 (Forestville Road);
   - SR 2232 (Old Knight Road) / Star Ruby Drive;
   - SR 2232 (Old Knight Road) / Haywood Glen Drive;
   - SR 2232 (Old Knight Road) / SR 2231 (Horton Road); and
   - SR 2231 (Horton Road) / SR 2215 (Buffalo Road).

   48-hour tube counts were collected on November 18th and November 19th, 2020 along Horton Road west of Old Knight Road.

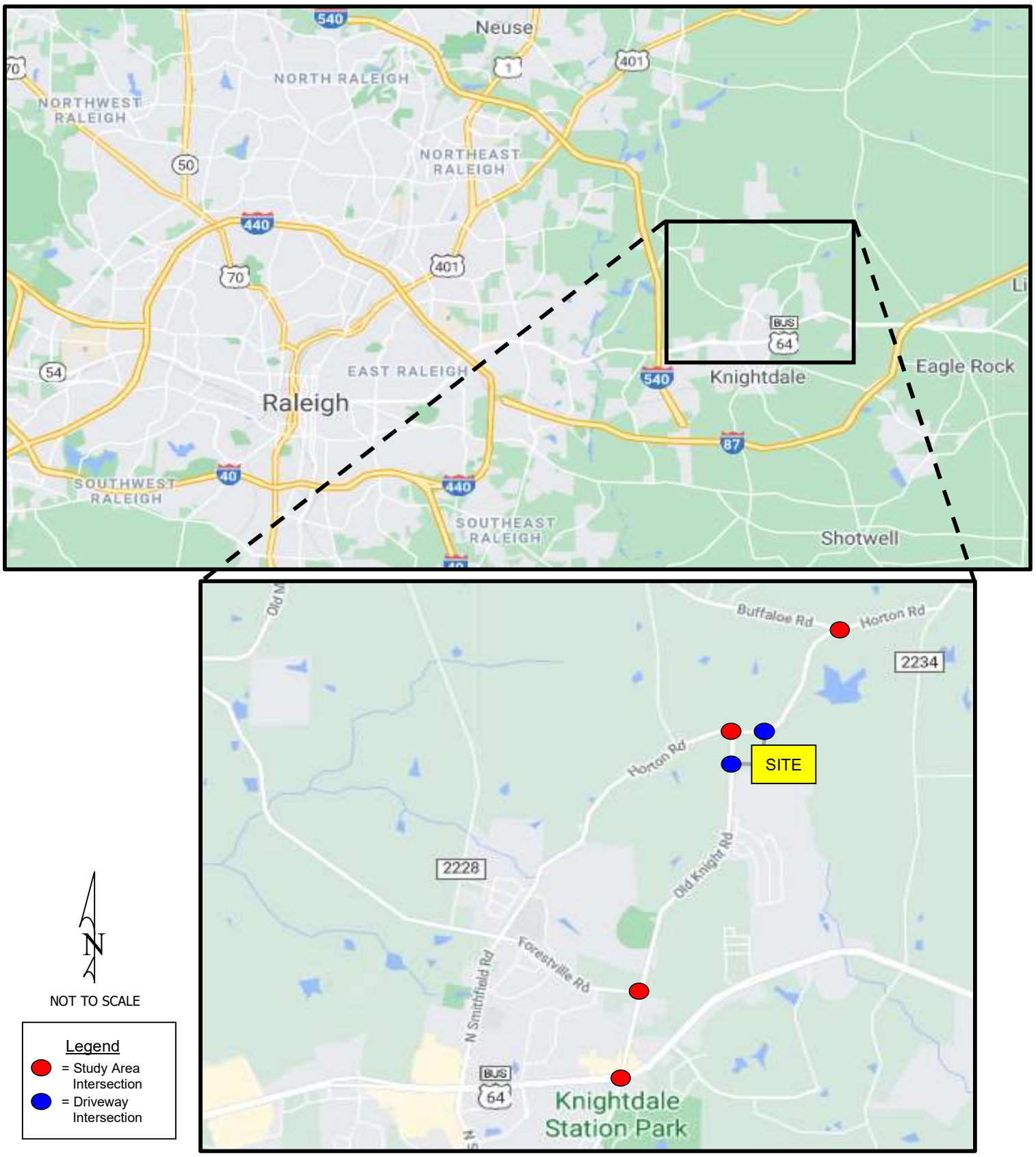
2. Trip Generation/Future Traffic – Traffic generated by the proposed development was estimated using the 10th Edition of the Institute of Transportation Engineer's (ITE) *Trip Generation Manual*. Trip generation was calculated for the development following the NCDOT standards and practices for trip generation. Projected traffic volumes were calculated using a 3% ambient growth rate. There are no approved developments in the project study area that will generate trips besides Phases 1 – 3 of the Haywood Glen Development. Per the Haywood Glen (Phases 1 – 3) TIA completed by Timmons Group, trips from the proposed Forestville Village Site and Watson Tract Residential Developments will be included with the ambient growth and will not be generated separately.

3. Trip Distribution and Projections – The distribution of site-generated trips was based on the distribution of existing area traffic, engineering judgement, and the Haywood Glen (Phases 1 – 3) TIA. It was assumed, for purposes of analysis, that projected trips would follow similar patterns as existing traffic.

4. Traffic Capacity Analysis – Level of service analyses were performed using Synchro Version 10.3 for the following intersections:

    - SR 2049 (Old Knight Road) / SR 2049 (North 1st Avenue) / US 64 Business (Knightdale Boulevard) – Signalized
    - SR 2232 (Old Knight Road) / SR 2049 (Forestville Road) - Unsignalized
    - SR 2232 (Old Knight Road) / Star Ruby Drive - Unsignalized
    - SR 2232 (Old Knight Road) / Haywood Glen Drive - Unsignalized
    - SR 2232 (Old Knight Road) / Site Access 1 - Unsignalized
    - SR 2232 (Old Knight Road) / SR 2231 (Horton Road) – Unsignalized
    - SR 2231 (Horton Road) / Site Access 2 - Unsignalized
    - SR 2231 (Horton Road) / SR 2215 (Buffalo Road) - Unsignalized

5. Review of Proposed Improvements – Roadway improvements proposed to accommodate projected site-generated traffic were evaluated.



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Haywood Glen
Traffic Impact Analysis
Site Location Map

Figure 1-1

2 EXISTING INFORMATION

The Haywood Glen Phase 4 Development will be located in the southeastern quadrant of the Old Knight Road / Horton Road intersection, in Knightdale, NC (see **Figure 1-1**). A TIA for Phases 1 – 3 of the Haywood Glen Development was completed by Timmons Group (sealed 12/22/2020). Phases 1 and 2 are currently being constructed east of Old Knight Road, while Phase 3 will be constructed west of Old Knight Road.

2.1 STUDY LIMITS

Access to the proposed site will be provided primarily via two (2) full movement site driveway connections.^ Site Access 1 will be located off Old Knight Road, approximately 500' (C/L to C/L) south of Horton Road. Site Access 2 will be located off Horton Road approximately 880' (C/L to C/L) east of Old Knight Road.

^Residents of Haywood Glen Phase 4 will be able to access the development via the Haywood Glen Phases 1 – 2 driveway connections (i.e. Star Ruby Drive and Haywood Glen Drive); however, for the purposes of analysis, it was assumed that all Phase 4 site traffic would utilize Haywood Glen Phase 4 Site Accesses 1 & 2 exclusively.

The entrances are shown graphically on **Figure 1-1** and on the preliminary site layout for the residential development on **Figure 2-1** (all figures are located at the end of their respective chapter).

The study limits include the following eight (8) intersections:

- Old Knight Road / North 1st Avenue / US 64 Business;
- Old Knight Road / Forestville Road;
- Old Knight Road / Star Ruby Drive;
- Old Knight Road / Haywood Glen Drive;
- Old Knight Road / Site Access 1;
- Old Knight Road / Horton Road;
- Horton Road / Site Access 2; and
- Horton Road / Buffalo Road.

All study area intersections and project assumptions were approved by the NCDOT / Town and are outlined in the scoping information (see **Appendix A**).

2.2 EXISTING ROADWAYS

SR 2232 (Old Knight Road) is a two-lane undivided facility that runs approximately north-south in the project study area. The facility will provide access to the proposed development and has a posted 45-mph speed limit (with a 35-mph school zone between Forestville Road and Star Ruby Drive). Old Knight Road connects Horton Road in the north to US 64 Business in the south. The facility primarily services residential, educational, and commercial land uses. Per 2015 NCDOT Average Annual Daily Traffic (AADT) count maps, Old Knight Road carries 6,800 Vehicles Per Day (VPD) north of US 64 Business.

SR 2231 (Horton Road) is a two-lane undivided facility that runs approximately east-west in the project study area. The facility is located north of the proposed development and has an assumed 55-mph speed limit. Horton Road connects Marks Creek Road in the northeast to Forestville Road in the southwest. The facility primarily services residential land uses. Per 2019 NCDOT AADT count maps, Horton Road carries 1,900 VPD west of Old Knight Road.

SR 2215 (Buffalo Road) is a two-lane undivided facility that runs approximately east-west in the project study area. The facility is located north of the proposed development and has a posted 45-mph speed limit. Buffalo Road connects Horton Road in the east to north Raleigh in the west. The facility primarily services residential land uses in the project study area. Per 2019 NCDOT AADT count maps, Buffalo Road carries 3,800 VPD west of Horton Road.

Haywood Glen Drive is a two-lane undivided facility that runs approximately east-west in the project study area. The facility will serve as a site driveway to the proposed development and has an assumed 15-mph speed limit. Haywood Glen Drive connects to Old Knight Road.

Star Ruby Drive is a two-lane undivided facility that runs approximately east-west in the project study area. The facility serves as a site driveway to an existing residential development and has a posted 15-mph speed limit. Star Ruby Drive connects to Old Knight Road.

SR 2049 (Forestville Road) is a two-lane undivided facility that runs approximately east-west in the project study area. The facility is located south of the proposed development and has a posted 45-mph speed limit. Forestville Road connects Old Knight Road in the east to I-540 in the west. The facility primarily services residential land uses. Per 2015 NCDOT AADT count maps, Forestville Road carries 2,500 VPD west of Old Knight Road.

US 64 Business (Knightdale Boulevard) is a four-lane median divided facility that runs approximately east-west in the project study area. The facility is located south of the proposed development and has a posted 45-mph speed limit. US 64 Business connects Zebulon in the east to Raleigh in the west. The facility primarily services residential and commercial land uses. Per 2019 NCDOT AADT count maps, US 64 Business carries 24,000 VPD west of Old Knight Road.

SR 2049 (North 1st Avenue) is a two-lane undivided facility that runs approximately north-south in the project study area. The facility is located south of the proposed development and has a posted 25-mph speed limit. North 1st Avenue connects US-64 Business in the north to downtown Knightdale in the south. The facility primarily services residential, commercial, and religious land uses. Per 2019 NCDOT AADT count maps, North 1st Avenue carries 7,500 VPD south of Knightdale Eagle Rock Road.

2.3 EXISTING INTERSECTIONS

Using available aerial imagery and site visits, Timmons Group compiled the existing geometry for each of the study area intersections. The existing intersection geometry is shown on **Figure 2-2**.

Old Knight Road / North 1st Avenue / US 64 Business is a five-phase signalized intersection with protected-only left-turn phasing on the east and westbound approaches and permitted-only left-turn phasing on the north and southbound approaches. The east and westbound approaches consist of an exclusive left-turn lane, two through lanes, and an exclusive right-turn lane. The north and southbound approaches consist of an exclusive left-turn lane, a through lane, and an exclusive right-turn lane.

Old Knight Road / Forestville Road is an unsignalized T-intersection with the eastbound Forestville Road approach encountering the stop condition. The northbound approach includes a shared through / left-turn lane. The southbound approach consists of a shared through / right-turn lane. The eastbound approach consists of a shared left / right-turn lane.

Old Knight Road / Star Ruby Drive is an unsignalized T-intersection with the westbound Star Ruby Drive approach encountering the stop condition. The northbound approach includes a shared through / right-

turn lane. The southbound approach consists of a shared through / left-turn lane. The westbound approach consists of a shared left / right-turn lane.
Old Knight Road / Haywood Glen Drive is an unsignalized T-intersection with the westbound Haywood Glen Drive approach encountering the stop condition. The northbound approach includes a shared through / right-turn lane. The southbound approach consists of a shared through / left-turn lane. The westbound approach consists of a shared left / right-turn lane.

Old Knight Road / Horton Road is an unsignalized T-intersection with the northbound Old Knight Road approach encountering the stop condition. The northbound approach includes a shared left / right-turn lane. The eastbound approach consists of a shared through / right-turn lane. The westbound approach consists of a shared left-turn / through lane.

Horton Road / Buffalo Road is an unsignalized T-intersection with the southbound Buffalo Road approach encountering the stop condition. The southbound approach includes a shared left / right-turn lane. The eastbound approach consists of a shared through / left-turn lane. The westbound approach consists of a shared through / right-turn lane.

2.4 TRAFFIC VOLUMES

Existing peak hour traffic volumes were determined using 2020 traffic counts (**Figure 2-3**) conducted for the Haywood Glen (Phases 1 – 3) TIA (sealed on 12/22/2020 by Timmons Group – see **Appendix B**). 2020 traffic volumes were grown using a 3% growth rate for one (1) year, to project 2021 ambient traffic volumes (**Figure 2-4**).

At the time 2020 counts were collected, COVID-19 restrictions were in place. To account for these restrictions, grown 2021 ambient traffic volumes were factored up utilizing a "*COVID-19 adjustment factor*". Per the Haywood Glen (Phases 1 – 3) TIA, the Knightdale area is currently experiencing an approximate 17% reduction in traffic volumes due to COVID-19 restrictions. To account for this discrepancy, all 2021 ambient traffic volumes were grown by 17%. The 2021 existing traffic volumes adjusted for COVID-19 are shown on **Figure 2-5**.

2.5 CAPACITY ANALYSIS

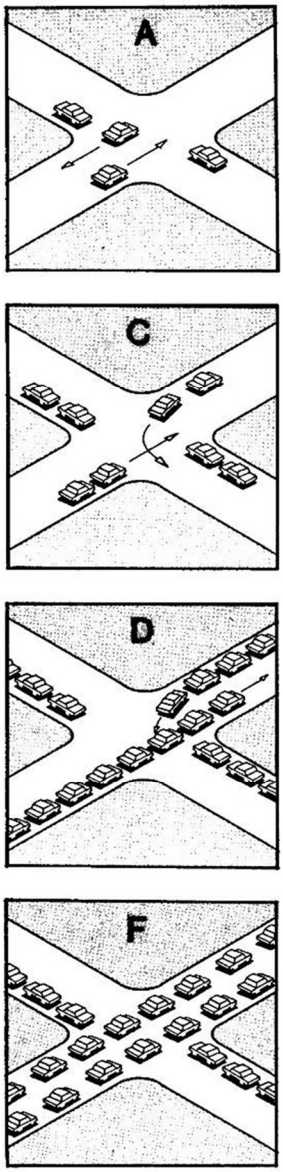
Using field observations, aerial photography, and traffic count data, traffic operations were analyzed during 2021 (existing), 2025 (without and with the proposed development site trips), and 2034 (with the proposed development site trips).

Capacity analysis allows traffic engineers to determine the impacts of traffic on the surrounding roadway network. The Transportation Research Board's (TRB) *Highway Capacity Manual* (HCM) methodologies govern how the capacity analyses are conducted and how the results are interpreted. There are six letter grades of Levels of Service (LOS) from A to F, with LOS A representing the best operating conditions and LOS F the worst operating conditions. At signalized intersections, an overall intersection LOS E is generally considered unacceptable. At unsignalized intersections, a LOS E is generally considered acceptable only if the side street encounters delay. Nevertheless, side streets typically function at a LOS F during peak traffic periods, because the traffic volumes often do not warrant a traffic signal to assist side street traffic. **Table 2-1** shows in detail how each of these levels of service are interpreted.

Table 2-1: Level of Service Definitions

Level of Service	Roadway Segments or Controlled Access Highways	Intersections
A	Free flow, low traffic density.	No vehicle waits longer than one signal indication.
B	Delay is not unreasonable, stable traffic flow.	On a rare occasion motorists wait through more than one signal indication.
C	Stable condition, movements somewhat restricted due to higher volumes, but not objectionable for motorists.	Intermittently drivers wait through more than one signal indication, and occasionally backups may develop behind left turning vehicles, traffic flow still stable and acceptable.
D	Movements more restricted, queues and delays may occur during short peaks, but lower demands occur often enough to permit clearing, thus preventing excessive backups.	Delays at intersections may become extensive with some, especially left-turning vehicles waiting two or more signal indications, but enough cycles with lower demand occur to permit periodic clearance, thus preventing excessive backups.
E	Actual capacity of the roadway invloves delay to all motorists due to congestion.	Very long queues may create lengthly delays, especially for left-turning vehicles.
F	Forced flow with demand volumes greater than capacity resulting in complete congestion. Volumes drop to zero in extreme cases.	Backups from locations downstream restrict or prevent movement of vehicles out of approach creating a storage ares during part or all of an hour.

SOURCE: *"A Policy on Design of Design of Urban Highways and Arterial Streets"* - AASHTO, 1973 based upon material published in *"Highway Capacity Manual"*, National Academy of Sciences, 1965.



For signalized and unsignalized intersections, level of service is defined in terms of **delay**, a measure of driver discomfort, frustration, fuel consumption and lost travel time. **Table 2-2** summarizes the delay associated with each LOS category:

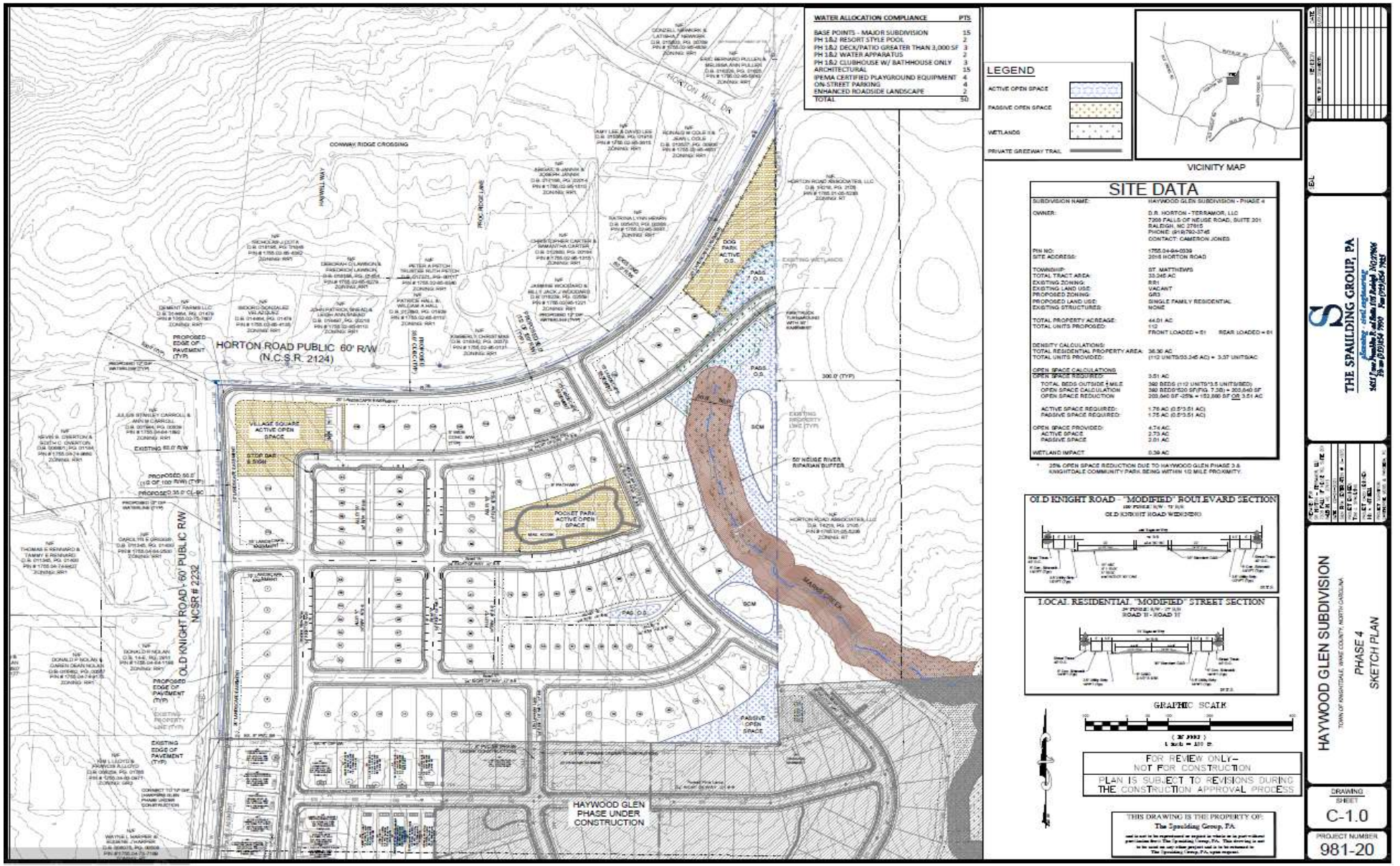
Table 2-2: Signalized and Unsignalized Intersection Level of Service Criteria

Signalized Intersections		Unsignalized Intersections	
Level of Service	Control Delay per Vehicle (sec/veh)	Level of Service	Average Control Delay (sec/veh)
A	≤ 10	A	0 to 10
B	> 10 to ≤ 20	B	> 10 to ≤ 15
C	> 20 to ≤ 35	C	> 15 to ≤ 25
D	> 35 to ≤ 55	D	> 25 to ≤ 35
E	> 55 to ≤ 80	E	> 35 to ≤ 50
F	> 80	F	> 50

Source: Exhibit 16-2 and Exhibit 17-2 from TRB's "Highway Capacity Manual 2000"

Capacity analyses were performed to assess operational conditions. Study area intersections were analyzed using Synchro Version 10.3 and Sidra 9.0.3. based on Highway Capacity Manual (HCM) methodologies with the following assumptions:

- Existing grades;
- 12-foot lane widths;
- No parking activity, bus stops, or pedestrians;
- PHFs of 0.90 were used for all analyses;
- A minimum of four (4) vehicles per analyzed intersection movement;
- Heavy vehicle percentages 2%; and
- Existing signal data / timing values found in the traffic signal plans (see **Appendix D**).



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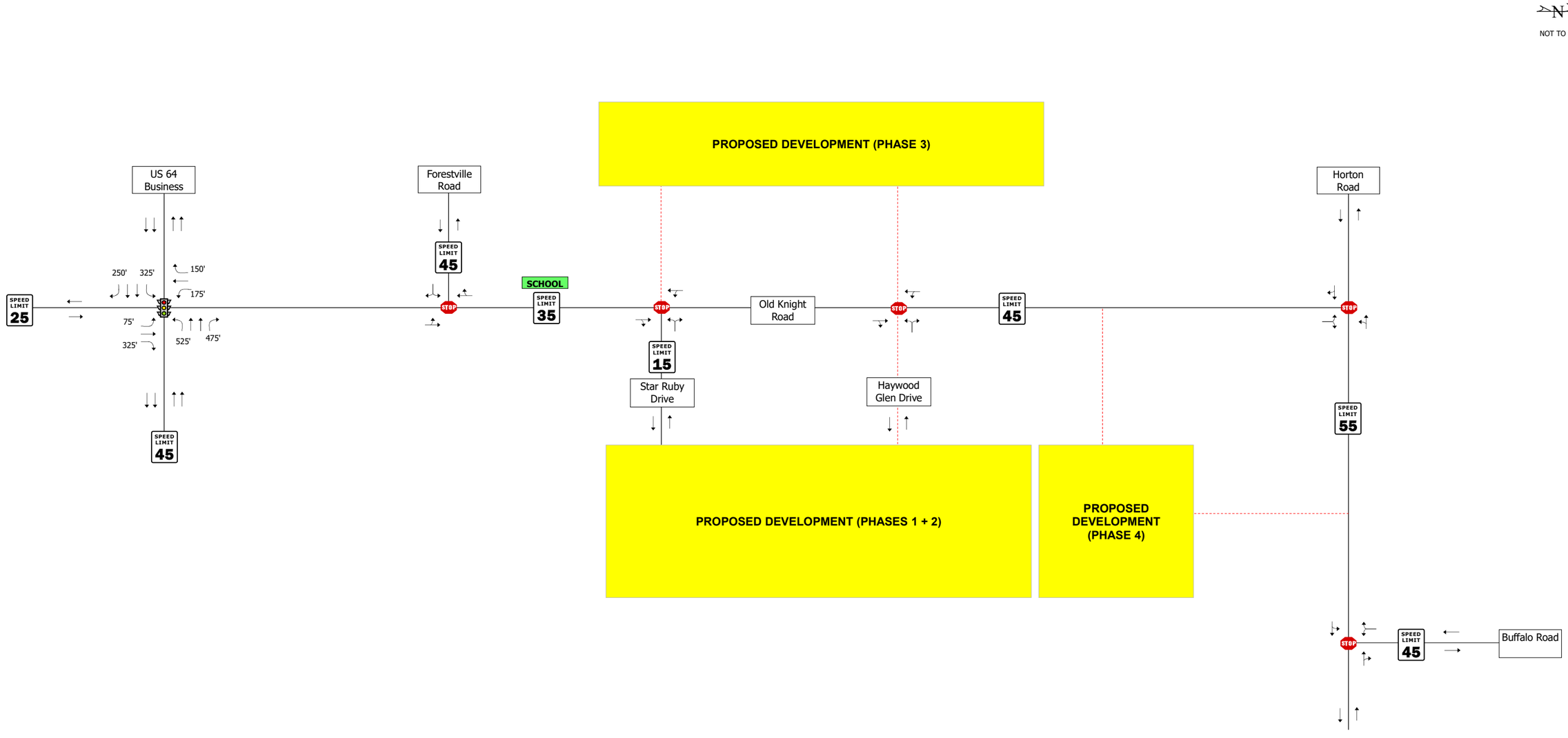
Haywood Glen -Phase 4
Traffic Impact Analysis
Site Plan (Phase 4)

Figure 2-1



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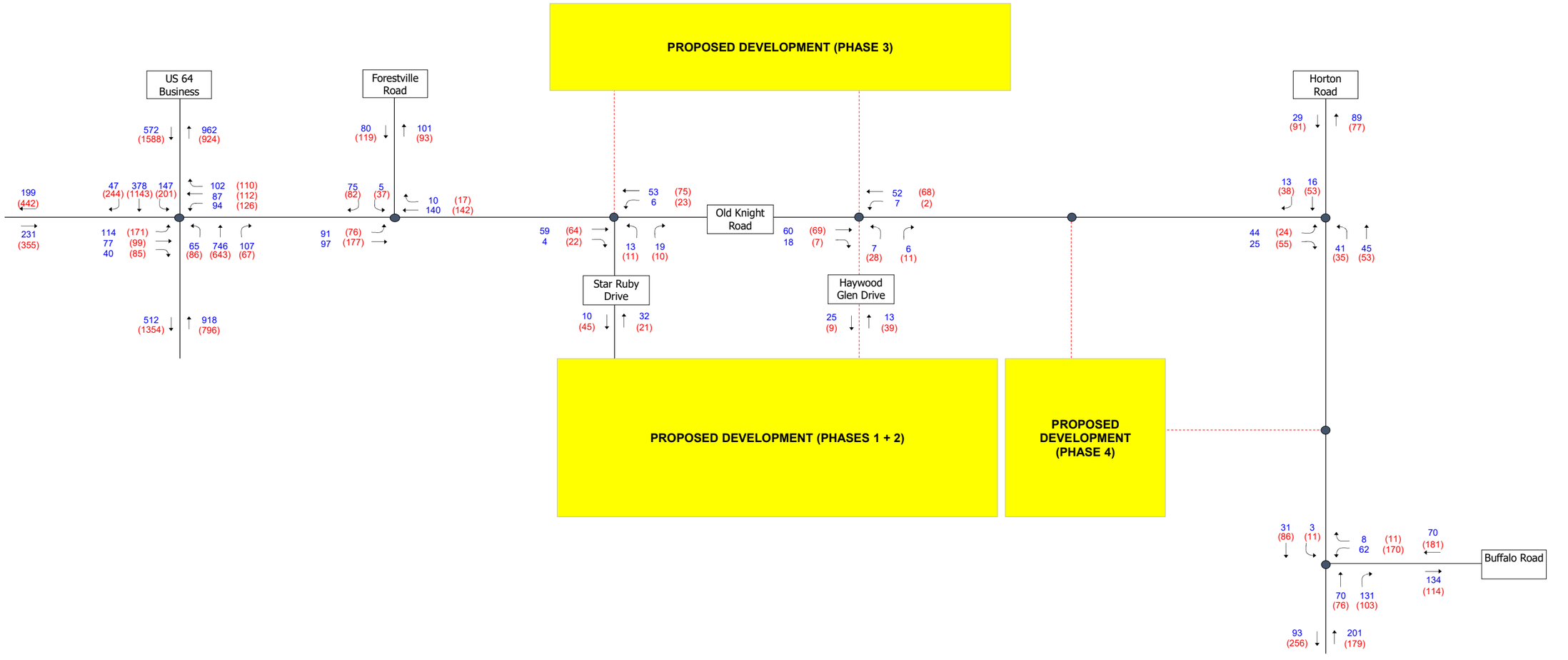
Haywood Glen - Phase 4
Traffic Impact Analysis
2021 Existing Lane Configuration

Figure 2-2

N

NOT TO SCALE



LEGEND:

- Existing Road
- Proposed Road
- XX AM Peak Hour Volume (vph)
- (XX) PM Peak Hour Volume (vph)

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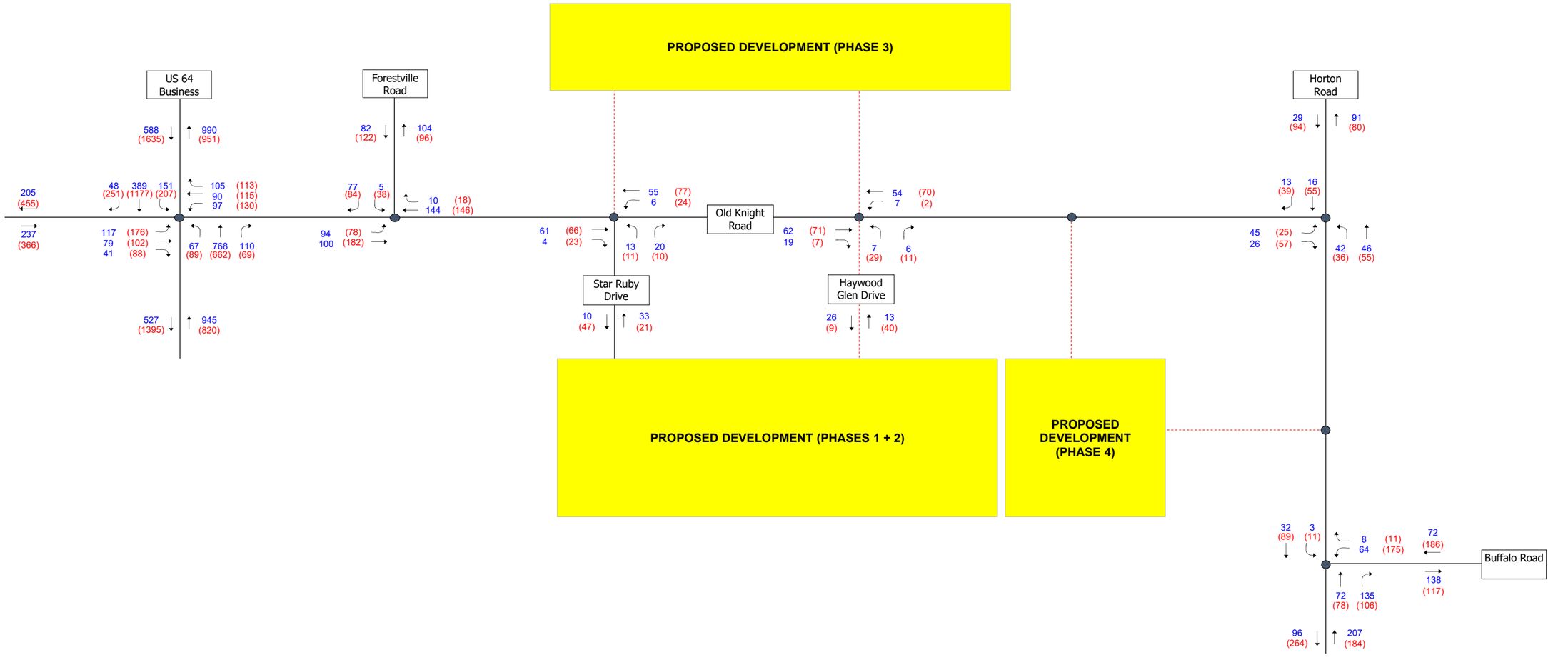
Haywood Glen - Phase 4
Traffic Impact Analysis
2020 Collected Traffic Volumes

Figure 2-3

N

NOT TO SCALE



LEGEND:

- Existing Road
- Proposed Road
- XX AM Peak Hour Volume (vph)
- (XX) PM Peak Hour Volume (vph)

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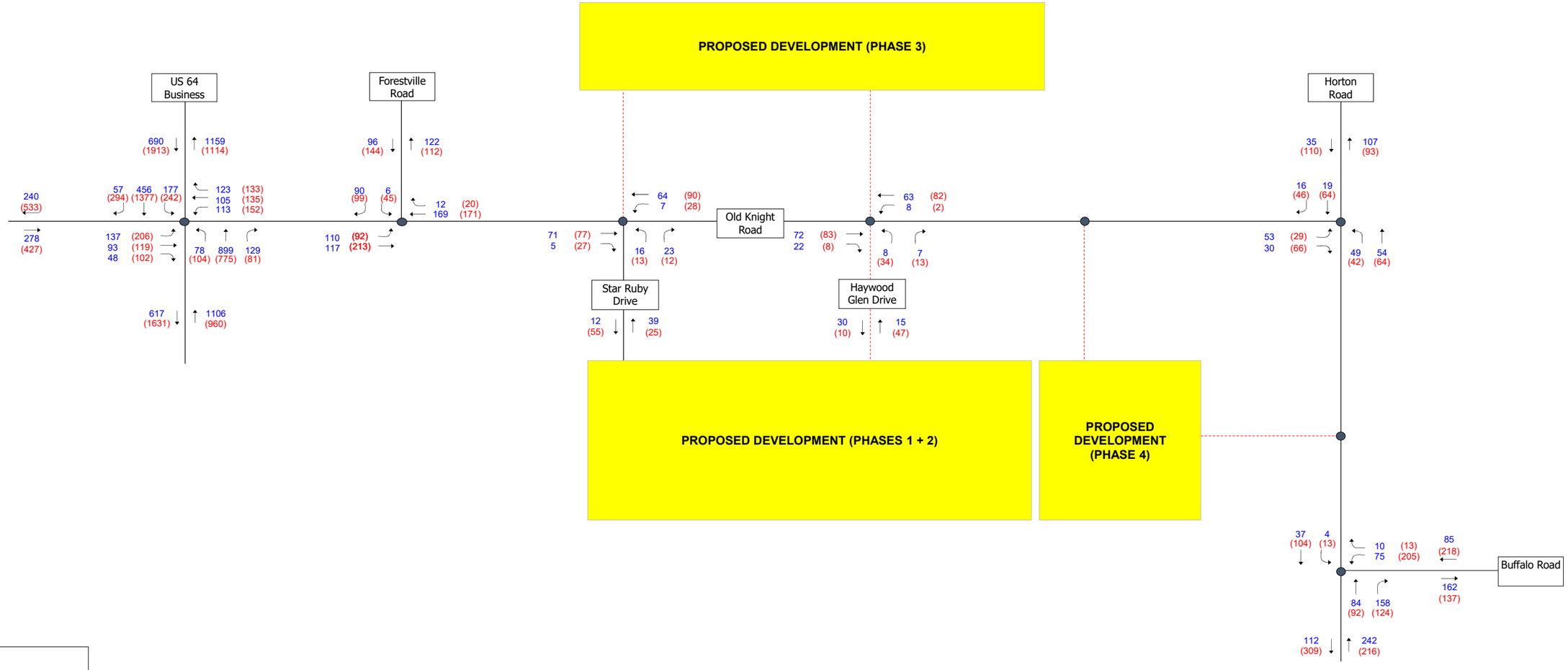
Haywood Glen - Phase 4
Traffic Impact Analysis
2021 Ambient Traffic Volumes

Figure 2-4

NOT TO SCALE



LEGEND:

- Existing Road
- Proposed Road
- XX AM Peak Hour Volume (vph)
- (XX) PM Peak Hour Volume (vph)

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Haywood Glen - Phase 4
Traffic Impact Analysis
2021 Existing Traffic Volumes
(With COVID-19 Factor)

Figure 2-5

3 EXISTING AND BACKGROUND CONDITIONS AND ANALYSIS

3.1 2021 EXISTING ANALYSES

Table 3-1 summarizes the 2021 Existing intersection LOS and delay based on the geometry shown on **Figure 2-2** and the 2021 traffic volumes shown on **Figure 2-5**. The corresponding Synchro and SimTraffic outputs are included in **Appendix C**.

The signalized intersection of Old Knight Road / North 1st Avenue / US 64 Business is currently operating at an overall LOS C during both 2021 Existing AM and PM peak hours. The northbound intersection approach currently operates at a LOS E during the PM peak hour. All other approaches are currently operating at a LOS D or better during both peak hours.

All approaches at the unsignalized intersection of Old Knight Road / Forestville Road are currently operating at a LOS B or better during both 2021 Existing AM and PM peak hours.

All approaches at the unsignalized intersection of Old Knight Road / Star Ruby Drive are currently operating at a LOS A during both 2021 Existing AM and PM peak hours.

All approaches at the unsignalized intersection of Old Knight Road / Haywood Glen Drive are currently operating at a LOS A during both 2021 Existing AM and PM peak hours.

All approaches at the unsignalized intersection of Old Knight Road / Horton Road are currently operating at a LOS A during both 2021 Existing AM and PM peak hours.

All approaches at the unsignalized intersection of Horton Road / Buffalo Road are currently operating at a LOS B or better during both 2021 Existing AM and PM peak hours.

Table 3-1: Intersection Level of Service and Delay Summary
2021 Existing Traffic Volumes

Intersection and Type of Control	Movement and Approach	AM PEAK HOUR		PM PEAK HOUR	
		Delay [1] (sec/veh)	LOS [1]	Delay [1] (sec/veh)	LOS [1]
1: North 1st Avenue/Old Knight Road & US 64 Business	EB Approach	20.9	C	32.0	C
	WB Approach	26.9	C	21.2	C
	NB Approach	26.4	C	*66.2*	*E*
	SB Approach	27.6	C	46.7	D
	Overall	25.2	C	34.8	C
2: Old Knight Road & Forestville Road	EB Approach	10.2	B	12.7	B
	NB Approach	3.8	A	2.4	A
	SB Approach	0.0	A	0.0	A
3: Old Knight Road & Star Ruby Drive	WB Approach	9.2	A	9.6	A
	NB Approach	0.0	A	0.0	A
	SB Approach	0.7	A	1.8	A
4: Old Knight Road & Haywood Glen Drive	WB Approach	9.2	A	9.6	A
	NB Approach	0.0	A	0.0	A
	SB Approach	0.8	A	0.3	A
6: Old Knight Road & Horton Road	EB Approach	0.0	A	0.0	A
	WB Approach	3.5	A	3.0	A
	NB Approach	9.8	A	9.8	A
8: Horton Road & Buffalo Road	EB Approach	0.8	A	0.9	A
	WB Approach	0.0	A	0.0	A
	SB Approach	10.4	B	13.2	B

[1] *Overall intersection LOS and delay reported for signalized intersections and roundabouts only.*

3.2 BACKGROUND TRAFFIC CONDITIONS

Per the scoping document (see **Appendix A**), there are no public improvement projects in the project study area that will be fully or partially built out by 2025. Additionally, there are no approved developments in the project study area that will be analyzed as part of the background analysis. Per the request of the NCDOT, two background scenarios were analyzed (with and without site trips from Haywood Glen Phases 1 – 3).

Figure 3-1 shows the 2025 background traffic volumes (without Haywood Glen Phases 1 – 3 site trips) calculated using a 3% annual growth rate for four (4) years. **Figure 3-2** shows the total site trips associated with the Haywood Glen Phases 1 – 3 development. Trip distribution volumes for Haywood Glen Phases 1 – 3 are found in the Haywood Glen (Phases 1 – 3) TIA completed by Timmons Group (sealed 12/22/2020). The Haywood Glen Phases 1 – 3 trip distribution volumes were added to the 2025 ambient traffic volumes to determine the 2025 background traffic volumes (with Haywood Glen Phases 1 – 3 site trips) shown on **Figure 3-3**.

Per discussions with the NCDOT / Town, Haywood Glen (Phases 1 – 3) will construct the following improvements:

- Old Knight Road / North 1st Avenue / US 64 Business
    - Extension of the eastbound left-turn lane

- Old Knight Road / Star Ruby Drive
    - Construction of a 50-foot northbound left-turn lane (with appropriate taper)
    - Construction of a 50-foot southbound left-turn lane (with appropriate taper)

- Old Knight Road / Haywood Glen Drive
    - Construction of a single-lane roundabout

The improvement requirements listed above were included in the future scenarios (as appropriate).

3.3 2025 BACKGROUND ANALYSIS SCENARIO 1 – WITHOUT HAYWOOD GLEN PHASES 1 – 3

Table 3-2 summarizes the 2025 Background (without Haywood Glen Phases 1 – 3 site trips) intersection LOS and delay based on the geometry shown in **Figure 2-2** and the 2025 Background traffic volumes shown on **Figure 3-1**. The corresponding Synchro and SimTraffic outputs are included in **Appendix C**.

The signalized intersection of Old Knight Road / North 1st Avenue / US 64 Business is projected to operate at an overall LOS C and D during the 2025 Background AM and PM peak hours, respectively. The northbound and southbound approaches are projected to operate unacceptably during the PM peak hour. All other intersection approaches are projected to operate at LOS D or better during both peak hours.

All approaches at the unsignalized intersection of Old Knight Road / Forestville Road are projected to operate at a LOS B or better during the 2025 Background AM and PM peak hours.

All approaches at the unsignalized intersection of Old Knight Road / Star Ruby Drive are projected to operate at a LOS A during both 2025 Background AM and PM peak hours.

All approaches at the unsignalized intersection of Old Knight Road / Haywood Glen Drive are projected to operate at a LOS A during both 2025 Background AM and PM peak hours.

All approaches at the unsignalized intersection of Old Knight Road / Horton Road are projected to operate at a LOS B or better during both 2025 Background AM and PM peak hours.

All approaches at the unsignalized intersection of Horton Road / Buffalo Road are projected to operate at a LOS B or better during both 2025 Background AM and PM peak hours.

Table 3-2: Intersection Level of Service and Delay Summary
2025 Background Traffic Volumes Scenario 1 – Without Haywood Glen Phases 1 – 3

Intersection and Type of Control	Movement and Approach	AM PEAK HOUR		PM PEAK HOUR	
		Delay [1] (sec/veh)	LOS [1]	Delay [1] (sec/veh)	LOS [1]
1: North 1st Avenue/Old Knight Road & US 64 Business	EB Approach	22.8	C	43.7	D
	WB Approach	27.3	C	21.1	C
	NB Approach	30.3	C	***157.9***	***F***
	SB Approach	31.2	C	***74.9***	***E***
	Overall	26.9	C	54.5	D
2: Old Knight Road & Forestville Road	EB Approach	10.6	B	14.1	B
	NB Approach	3.9	A	2.4	A
	SB Approach	0.0	A	0.0	A
3: Old Knight Road & Star Ruby Drive	WB Approach	9.3	A	9.8	A
	NB Approach	0.0	A	0.0	A
	SB Approach	0.7	A	1.8	A
4: Old Knight Road & Haywood Glen Drive	WB Approach	9.3	A	9.8	A
	NB Approach	0.0	A	0.0	A
	SB Approach	0.8	A	0.3	A
6: Old Knight Road & Horton Road	EB Approach	0.0	A	0.0	A
	WB Approach	3.5	A	3.0	A
	NB Approach	10.0	B	10.0	B
8: Horton Road & Buffalo Road	EB Approach	0.8	A	0.9	A
	WB Approach	0.0	A	0.0	A
	SB Approach	10.7	B	14.7	B

[1] *Overall intersection LOS and delay reported for signalized intersections and roundabouts only.*

3.4 2025 BACKGROUND ANALYSIS SCENARIO 2 – WITH HAYWOOD GLEN PHASES 1 – 3

Table 3-3 summarizes the 2025 Background (with Haywood Glen Phases 1 – 3 site trips) intersection LOS and delay based on the geometry shown in **Figure 2-2**, Haywood Glen Phases 1 – 3 improvements, and the 2025 Background traffic volumes shown on **Figure 3-3**. The corresponding Synchro, SimTraffic, and Sidra outputs are included in **Appendix C**.

The signalized intersection of Old Knight Road / North 1st Avenue / US 64 Business is projected to operate at an overall LOS C and E during the 2025 Background AM and PM peak hours, respectively. Multiple approaches are projected to operate unacceptably during the PM peak hour.

All approaches at the unsignalized intersection of Old Knight Road / Forestville Road are projected to operate at a LOS C or better during both 2025 Background AM and PM peak hours.

All approaches at the unsignalized intersection of Old Knight Road / Star Ruby Drive are projected to operate at a LOS B or better during both 2025 Background AM and PM peak hours.

All approaches at the roundabout intersection of Old Knight Road / Haywood Glen Drive are projected to operate at a LOS A during both 2025 Background AM and PM peak hours (see **Table 3-4**). All approaches are projected to have a maximum volume-to-capacity (V/C) ratio of 0.160 during both peak hours.

All approaches at the unsignalized intersection of Old Knight Road / Horton Road are projected to operate at a LOS B or better during both 2025 Background AM and PM peak hours.

All approaches at the unsignalized intersection of Horton Road / Buffalo Road are projected to operate at a LOS C or better during both 2025 Background AM and PM peak hours.

Table 3-3: Intersection Level of Service and Delay Summary
2025 Background Traffic Volumes Scenario 2 – With Haywood Glen Phases 1 – 3

Intersection and Type of Control	Movement and Approach	AM PEAK HOUR		PM PEAK HOUR	
		Delay [1] (sec/veh)	LOS [1]	Delay [1] (sec/veh)	LOS [1]
1: North 1st Avenue/Old Knight Road & US 64 Business	EB Approach	23.6	C	***64.7***	***E***
	WB Approach	27.1	C	20.8	C
	NB Approach	31.0	C	***173.0***	***F***
	SB Approach	34.0	C	***106.9***	***F***
	Overall	27.7	C	***71.0***	***E***
2: Old Knight Road & Forestville Road	EB Approach	11.9	B	17.9	C
	NB Approach	3.6	A	1.9	A
	SB Approach	0.0	A	0.0	A
3: Old Knight Road & Star Ruby Drive	EB Approach	10.0	B	11.0	B
	WB Approach	10.4	B	12.1	B
	NB Approach	0.4	A	0.7	A
	SB Approach	0.4	A	1.3	A
6: Old Knight Road & Horton Road	EB Approach	0.0	A	0.0	A
	WB Approach	3.7	A	3.5	A
	NB Approach	10.1	B	10.2	B
8: Horton Road & Buffalo Road	EB Approach	1.6	A	1.0	A
	WB Approach	0.0	A	0.0	A
	SB Approach	11.0	B	15.3	C

[1] *Overall intersection LOS and delay reported for signalized intersections and roundabouts only.*

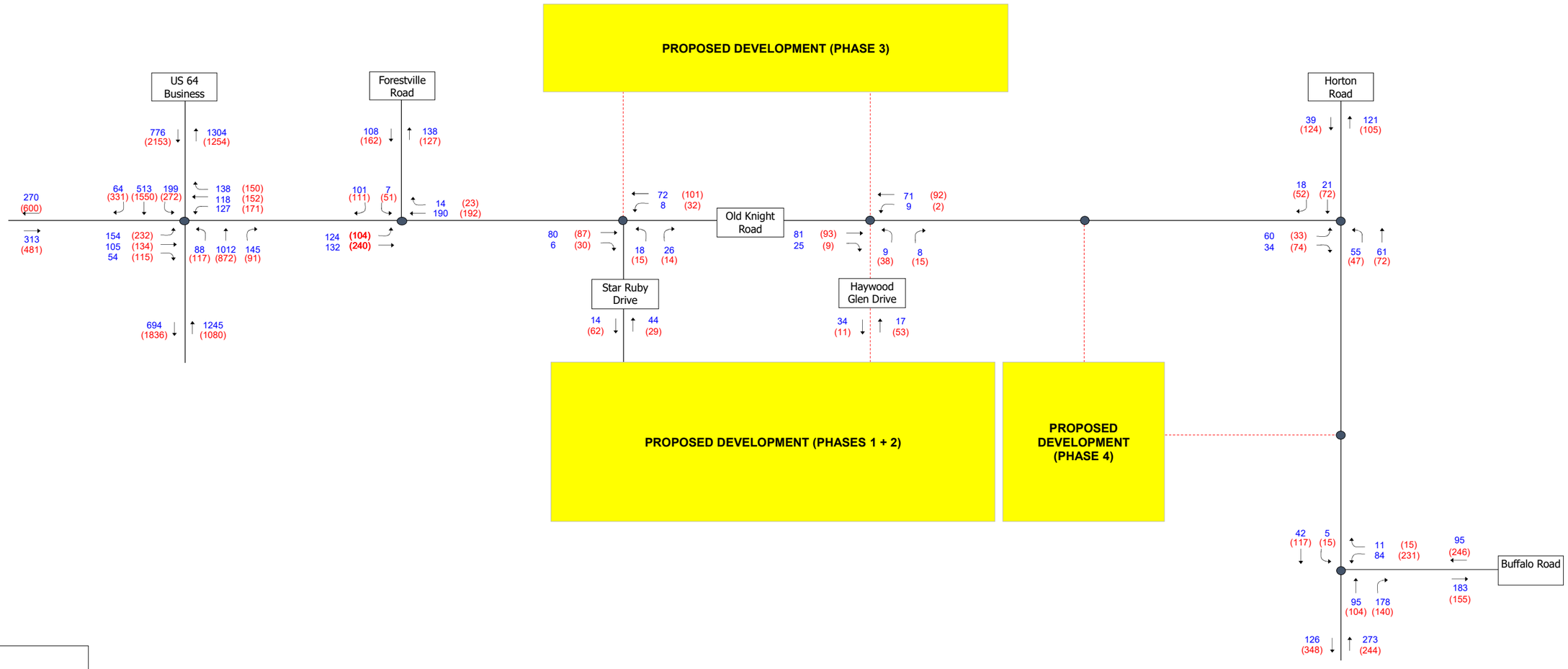
Table 3-4: Intersection Level of Service and Delay Summary
2025 Background Traffic Volumes Scenario 2 – With Haywood Glen Phases 1 – 3 – Roundabout Analysis

Intersection and Type of Control	Movement and Approach	AM PEAK HOUR			PM PEAK HOUR		
		Delay [1] (sec/veh)	LOS [1]	V/C Ratio[2]	Delay [1] (sec/veh)	LOS [1]	V/C Ratio[2]
4: Old Knight Road / Haywood Glen Drive	EB Approach	3.4	A	0.025	3.4	A	0.020
	WB Approach	3.6	A	0.082	3.8	A	0.096
	NB Approach	3.6	A	0.111	4.0	A	0.160
	SB Approach	3.6	A	0.078	3.8	A	0.101
	Overall	3.6	A	0.111	3.9	A	0.160

[1] *Overall intersection LOS and delay reported for signalized intersections and roundabouts only.*

[2] *V/C Ratio: Volume to Capacity Ratio, a V/C of greater than 0.85 at any approach is considered unaccpetable performance at roundabouts per NCDOT standards.*

NOT TO SCALE



LEGEND:

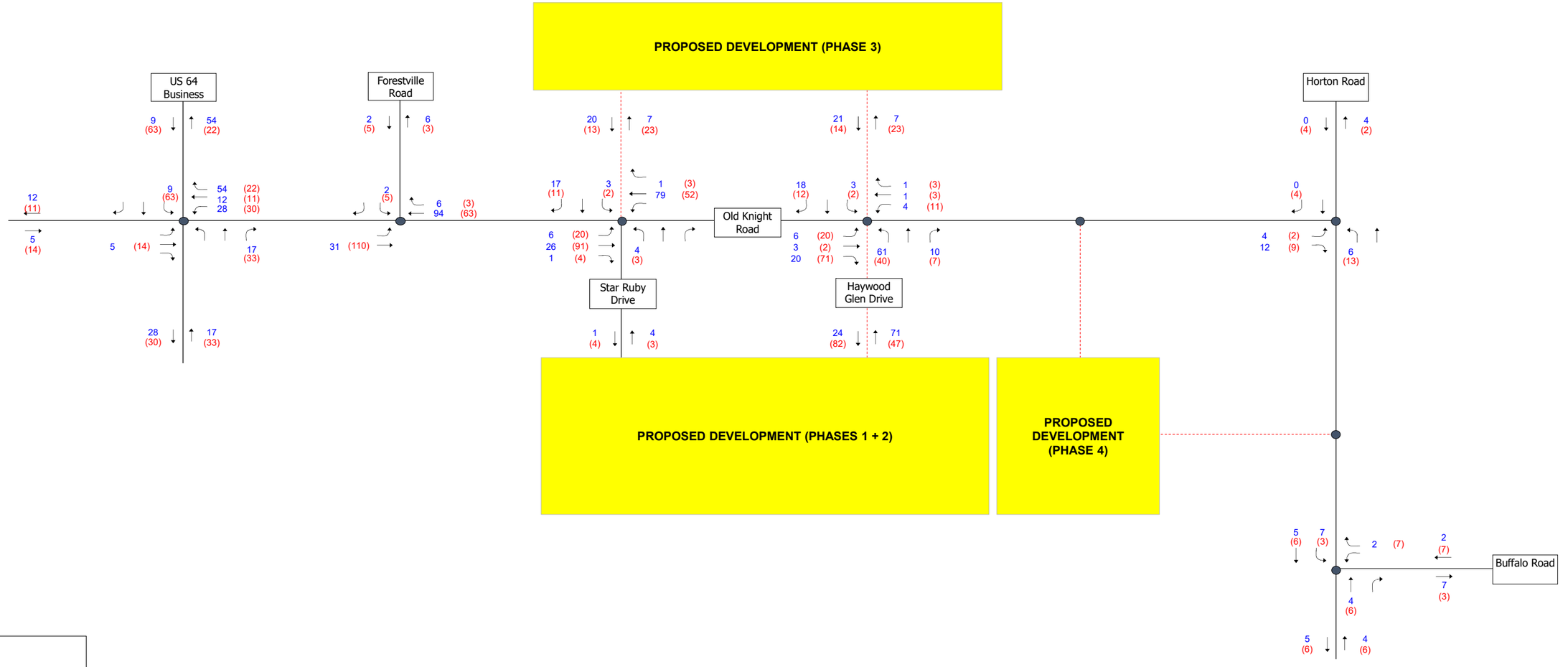
- Existing Road
- Proposed Road
- XX AM Peak Hour Volume (vph)
- (XX) PM Peak Hour Volume (vph)

TIMMONS GROUP
YOUR VISION ACHIEVED THROUGH OURS.

Haywood Glen - Phase 4
Traffic Impact Analysis
2025 Background Traffic Volumes
(Without Phases 1 - 3 Site Trips)

Figure 3-1

NOT TO SCALE



LEGEND:

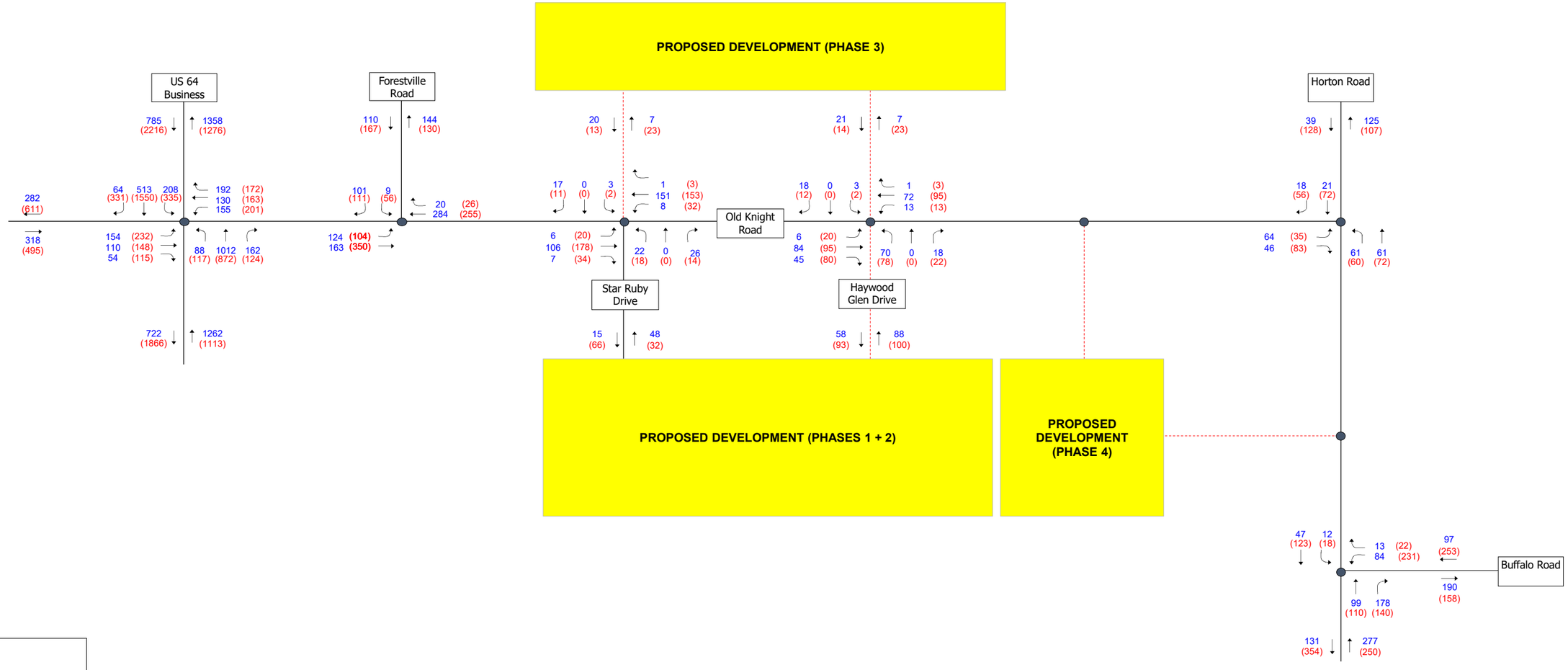
- Existing Road
- Proposed Road
- XX AM Peak Hour Volume (vph)
- (XX) PM Peak Hour Volume (vph)

TIMMONS GROUP
YOUR VISION ACHIEVED THROUGH OURS.

Haywood Glen - Phase 4
Traffic Impact Analysis
Phases 1-3 - Trip Distribution Volumes

Figure 3-2

NOT TO SCALE



LEGEND:

- Existing Road
- Proposed Road
- XX AM Peak Hour Volume (vph)
- (XX) PM Peak Hour Volume (vph)

TIMMONS GROUP
YOUR VISION ACHIEVED THROUGH OURS.

Haywood Glen - Phase 4
Traffic Impact Analysis
Background Traffic Volumes
(With Phases 1 - 3 Trips)

Figure 3-3

4 SITE TRIP GENERATION AND DISTRIBUTION

Site trips for the Haywood Glen Phase 4 Development were estimated based on the proposed land use supplied by the developer and subsequently distributed onto the surrounding roadway network.

4.1 TRIP GENERATION

The site-generated trips shown in **Table 4-1** are based on trip generation information provided in the 10th Edition of the ITE's *Trip Generation Manual* and the anticipated development of the residential land use. Trip generation was calculated using the provided equation and the proposed number of residential units as the independent variable (per NCDOT standards).

Table 4-1: Trip Generation Summary

ITE Land Use Code	Independent Variable	Daily	AM Peak Hour			PM Peak Hour		
		Total	In	Out	Total	In	Out	Total
210 – Single Family Detached Housing	112 Units	1154	21	63	84	71	42	113

SOURCE: Institute of Transportation Engineers' *Trip Generation Manual* 10th Edition (2017)

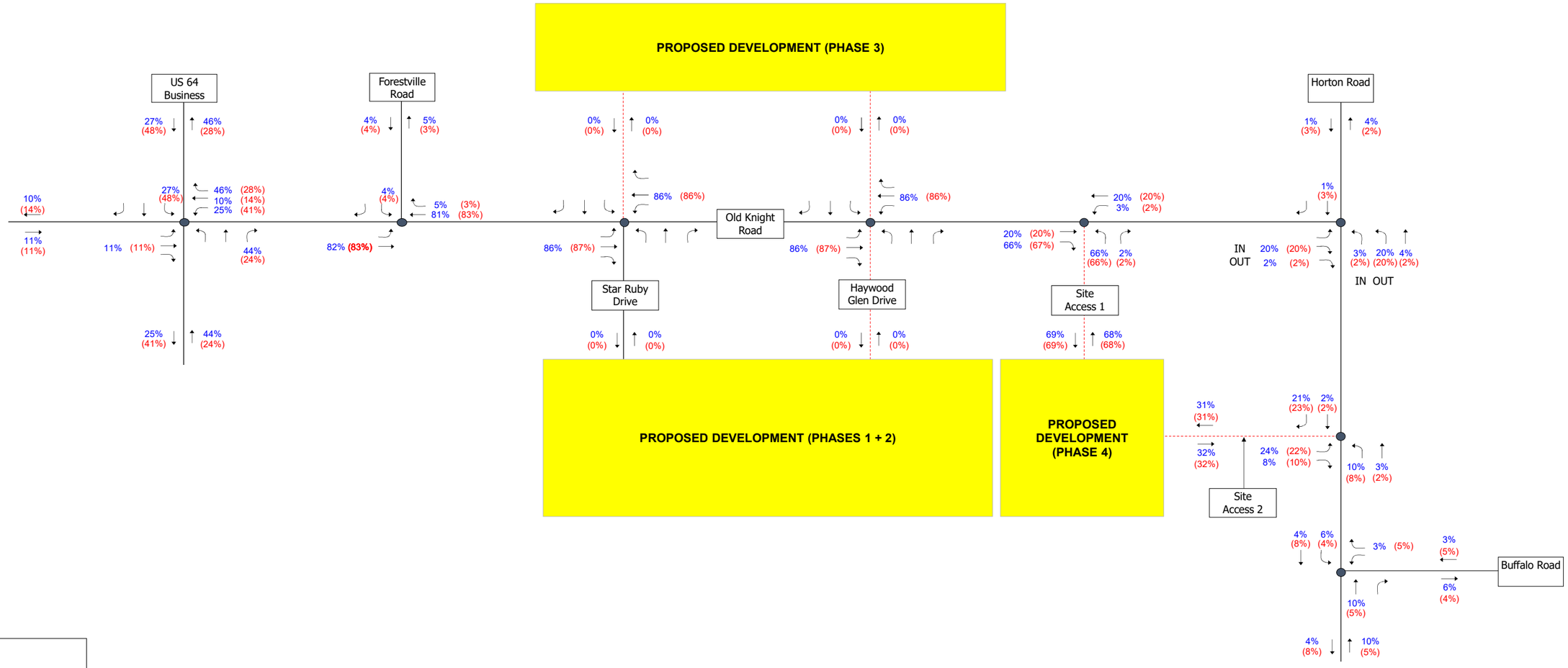
AM peak hour trips generated totaled 21 incoming and 63 outgoing where PM peak hour trips totaled 71 incoming and 42 outgoing. Average daily traffic (ADT) volumes generated by the development totaled 1,154 VPD. No reduction in trips was included due to internal capture and/or pass-by trips.

4.2 TRIP DISTRIBUTION

The directional traffic patterns, or trip distribution, of the site-generated traffic was determined using the existing AM and PM peak hour traffic characteristics, engineering judgment, and the Haywood Glen (Phases 1 – 3) TIA. It was assumed, for purposes of this study, that all site traffic would enter and exit the study area in the same manner as the existing traffic. The percentages were routed, via shortest path, to and from the proposed development. The distribution percentages were then applied to the generated trips to predict routes and project traffic volumes for the 2025 Build scenario. **Figure 4-1** shows the trip distribution percentages for Haywood Glen Phase 4. **Figure 4-2** shows the trip distribution volumes for Haywood Glen Phase 4.

As mentioned earlier in the document, residents of Haywood Glen Phase 4 will be able to access the development via the Haywood Glen Phases 1 – 2 driveway connections (i.e. Star Ruby Drive and Haywood Glen Drive); however, for the purposes of analysis, it was assumed that all Phase 4 site traffic would utilize Haywood Glen Phase 4 Site Accesses 1 & 2 exclusively.

NOT TO SCALE



LEGEND:

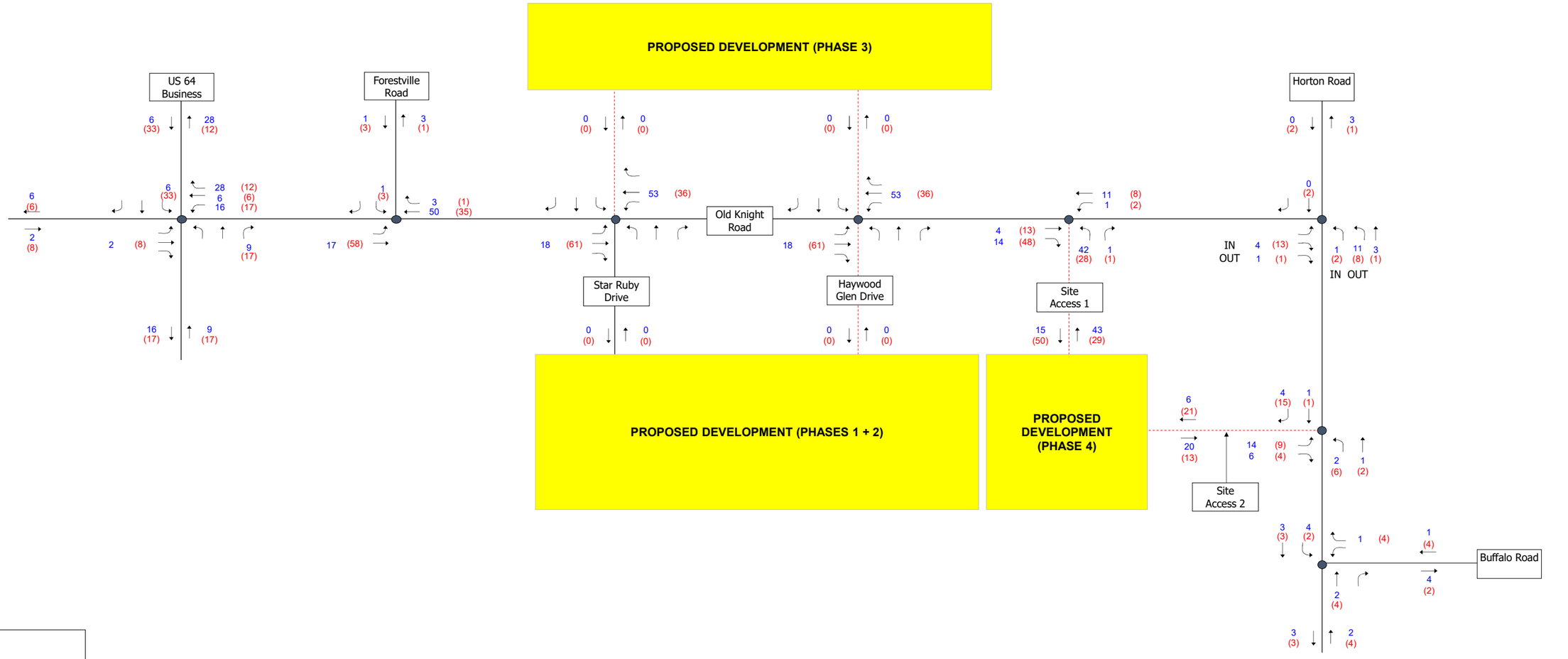
- Existing Road
- Proposed Road
- XX AM Peak Hour Volume (vph)
- (XX) PM Peak Hour Volume (vph)

TIMMONS GROUP
YOUR VISION ACHIEVED THROUGH OURS.

Haywood Glen - Phase 4
Traffic Impact Analysis
Phase 4 - Trip Distribution Percentages

Figure 4-1

NOT TO SCALE



LEGEND:

- Existing Road
- Proposed Road
- XX AM Peak Hour Volume (vph)
- (XX) PM Peak Hour Volume (vph)

TIMMONS GROUP
YOUR VISION ACHIEVED THROUGH OURS.

Haywood Glen - Phase 4
Traffic Impact Analysis
Phase 4 - Trip Distribution Volumes

Figure 4-2

5 BUILD CONDITION AND ANALYSIS

To complete the 2025 Build analyses (including the proposed development), the estimated site trips were added to the 2025 Background traffic volumes. The projected total volumes, along with the existing intersection geometry (and Haywood Glen Phases 1 -3 improvements), were used to complete the capacity and turn lane warrant analyses.

5.1 BUILD TRAFFIC VOLUMES

The Background traffic volumes were added to the projected site trips from the Haywood Glen Phase 4 Development to generate the Build traffic volumes (background + site).

The 2025 Build traffic volumes shown on **Figure 5-1** contain the following:

- Existing 2021 traffic volumes grown exponentially for 4 years at a 3% ambient growth rate (**Figure 3-1**);
- Total site trips generated by Haywood Glen Phases 1 – 3 (**Figure 3-2**); and
- Total site trips generated by the subject development (**Figure 4-2**).

5.2 2025 BUILD ANALYSIS

Table 5-1 summarizes the intersection LOS and delay based on the geometry shown in **Figure 2-2**, assumed Haywood Glen Phases 1 – 3 improvements, and the 2025 Build traffic volumes shown on **Figure 5-1**. The corresponding Synchro, SimTraffic, and Sidra outputs are included in **Appendix C**.

The signalized intersection of Old Knight Road / North 1st Avenue / US 64 Business is projected to operate at an overall LOS C and F during the 2025 Build AM and PM peak hours, respectively. Multiple approaches are projected to operate unacceptably during the PM peak hour. Despite the PM peak hour operating unacceptably, no improvements are recommended at this intersection due to the construction of the subject development. The intersection currently has turn lanes for each approach, and no geometric improvements, aside from additional through lanes along US 64 Business, would allow the intersection to operate acceptably. With viable businesses located in each intersection quadrant (and due to exorbitant costs too large for this development), the addition of a through lane is not recommended. It should be noted that the proposed intersection was analyzed using existing signal timings. As shown below in **Section 5.3**, with optimized signal timings, the intersection is projected to operate acceptably during the 2024 PM peak hour. Per comments received from the NCDOT (see **Appendix E**), the subject development is responsible for extending the existing eastbound left-turn lane to 600-feet of full width storage (with appropriate taper).

All approaches at the unsignalized intersection of Old Knight Road / Forestville Road are projected to operate at a LOS C or better during both 2025 Build AM and PM peak hours. No improvements are recommended at this intersection due to the construction of the subject development. Per comments received from the Town of Knightdale (dated 08/02/21), a roundabout will be constructed (by an adjacent development) at the Old Knight Road / Forestville Road intersection. Please see **Section 5.5** for roundabout analysis.

All approaches at the unsignalized intersection of Old Knight Road / Star Ruby Drive are projected to operate at a LOS B or better during both 2025 Build AM and PM peak hours. No improvements are recommended at this intersection due to the construction of the subject development.

All approaches at the roundabout intersection of Old Knight Road / Haywood Glen Drive are projected to operate at a LOS A during both 2025 Build peak hours (see **Table 5-2**). All approaches are projected to have a maximum V/C ratio of 0.211 during both peak hours. Per NCDOT guidelines, roundabouts are considered to operate unacceptably when the V/C ratio is greater than 0.85. Because the intersection is projected to operate acceptably, no additional improvements are recommended due to the construction of the subject development.

All approaches at the unsignalized intersection of Old Knight Road / Site Access 1 are projected to operate at a LOS B or better during both 2025 Build AM and PM peaks hours. Per the NCDOT Policy on Street and Driveway Access to North Carolina Highways Manual:

"Generally left and right turn lanes and tapers shall be considered when:

- *In accordance with G.S. 136-18(29), the average daily traffic meets or exceeds 4,000 vehicles per day on any secondary route (the average daily traffic should include both the existing traffic plus traffic generated by the proposed development)"*

Per the NCDOT AADT maps, there is no AADT information available for Old Knight Road; however, based on peak hour volumes, it is unlikely that Old Knight Road will exceed 4,000 VPD in 2025. No improvements are recommended at this intersection due to the construction of the subject project.

All approaches at the unsignalized intersection of Old Knight Road / Horton Road are projected to operate at LOS B or better during both 2025 Build AM and PM peak hours. No improvements are recommended at this intersection due to the construction of the subject development.

All approaches at the unsignalized intersection of Horton Road / Site Access 2 are projected to operate at a LOS B or better during both 2025 Build AM and PM peaks hours. Based on peak hour volumes, it is unlikely that Horton Road will exceed 4,000 VPD in 2025. No improvements are recommended at this intersection due to the construction of the subject development.

All approaches at the unsignalized intersection of Horton Road / Buffalo Road are projected to operate at a LOS C or better during both 2025 Build AM and PM peak hours. No improvements are recommended at this intersection due to the construction of the subject development.

Table 5-1: Intersection Level of Service and Delay Summary
2025 Build Traffic Volumes

Intersection and Type of Control	Movement and Approach	AM PEAK HOUR		PM PEAK HOUR	
		Delay [1] (sec/veh)	LOS [1]	Delay [1] (sec/veh)	LOS [1]
1: North 1st Avenue/Old Knight Road & US 64 Business	EB Approach	24.2	C	***78.5***	***E***
	WB Approach	27.1	C	20.8	C
	NB Approach	31.4	C	***183.2***	***F***
	SB Approach	36.3	D	***133.4***	***F***
	Overall	28.4	C	***82.7***	***F***
2: Old Knight Road & Forestville Road	EB Approach	12.7	B	21.2	C
	NB Approach	3.5	A	1.7	A
	SB Approach	0.0	A	0.0	A
3: Old Knight Road & Star Ruby Drive	EB Approach	10.4	B	11.8	B
	WB Approach	10.9	B	13.4	B
	NB Approach	0.3	A	0.5	A
	SB Approach	0.3	A	1.1	A
5: Old Knight Road & Phase 4 - Site Access 1	WB Approach	10.1	B	10.5	B
	NB Approach	0.0	A	0.0	A
	SB Approach	0.3	A	0.2	A
6: Old Knight Road & Horton Road	EB Approach	0.0	A	0.0	A
	WB Approach	4.0	A	3.7	A
	NB Approach	10.3	B	10.3	B
7: Phase 4 - Site Access 2 & Horton Road	EB Approach	0.0	A	0.0	A
	WB Approach	0.2	A	0.3	A
	NB Approach	9.5	A	10.2	B
8: Horton Road & Buffalo Road	EB Approach	1.9	A	1.1	A
	WB Approach	0.0	A	0.0	A
	SB Approach	11.1	B	15.7	C

[1] *Overall intersection LOS and delay reported for signalized intersections and roundabouts only.*

Table 5-2 Intersection Level of Service and Delay Summary
2025 Build Traffic Volumes – Roundabout Analysis

Intersection and Type of Control	Movement and Approach	AM PEAK HOUR			PM PEAK HOUR		
		Delay [1] (sec/veh)	LOS [1]	V/C Ratio[2]	Delay [1] (sec/veh)	LOS [1]	V/C Ratio[2]
4: Old Knight Road / Haywood Glen Drive	EB Approach	3.6	A	0.026	3.6	A	0.021
	WB Approach	3.7	A	0.084	4.1	A	0.102
	NB Approach	3.7	A	0.126	4.5	A	0.211
	SB Approach	4.0	A	0.125	4.1	A	0.133
	Overall	3.8	A	0.126	4.3	A	0.211

[1] *Overall intersection LOS and delay reported for signalized intersections and roundabouts only.*

[2] *V/C Ratio: Volume to Capacity Ratio, a V/C of greater than 0.85 at any approach is considered unaccpetable performance at roundabouts per NCDOT standards.*

5.3 2025 BUILD WITH IMPROVEMENTS (UDO REQUIRED)

As discussed, the signalized intersection of Old Knight Road / North 1st Avenue / US 64 Business is projected to operate at a LOS F during the 2025 Build PM peak hour. Per the Town's UDO, the following improvement was identified to either achieve an acceptable LOS or maintain the existing LOS (if existing LOS is E or worst) and delay (as close as possible) during the full build-out scenario for each traffic movement and approach:

- Signal timing optimization.

Following the construction of this improvement, the overall intersection is projected to operate at an acceptable level of service (see **Table 5-3**) during both peak hours. Additionally, all intersection movements and approaches are projected to either: 1) achieve acceptable levels of service or 2) achieve levels of service at or below those projected in the 2025 Background (without Haywood Glen Phases 1 – 3 site trips) scenario. **Figure 6-1** shows the UDO required improvements. The corresponding Synchro and SimTraffic outputs are provided in **Appendix C**.

Table 5-3: Intersection Level of Service and Delay Summary
2025 Build + UDO Required Improvements

Intersection and Type of Control	Movement and Approach	AM PEAK HOUR		PM PEAK HOUR	
		Delay [1] (sec/veh)	LOS [1]	Delay [1] (sec/veh)	LOS [1]
1: North 1st Avenue/Old Knight Road & US 64 Business	EB Approach	24.2	C	47.1	D
	WB Approach	27.1	C	54.1	D
	NB Approach	31.4	C	***62.1***	***E***
	SB Approach	36.3	D	***57.8***	***E***
	Overall	28.4	C	51.9	D

[1] *Overall intersection LOS and delay reported for signalized intersections and roundabouts only.*

** Delay greater than 9999.99 seconds cannot be calculated by SYNCHRO for signalized intersections.

+ Delay greater than 9999.99 seconds cannot be calculated by SYNCHRO for unsignalized intersections.

SYNCHRO does not provide level of service or delay for unsignalized movements with no conflicting volumes.

5.4 2034 HORIZON YEAR ANALYSIS

To complete the 2034 Horizon Year analyses (including the proposed development), the 2021 Existing traffic volumes were grown at a 3% ambient growth rate for thirteen (13) years and added to the estimated site trips for Haywood Glen Phases 1 – 4.

The 2034 Horizon Year traffic volumes shown on **Figure 5-2** contain the following:

- Existing 2021 traffic volumes (**Figure 2-5**) grown exponentially for 13 years at a 3% ambient growth rate;
- Total site trips generated by Haywood Glen Phases 1 – 3 (**Figure 3-2**); and
- Total site trips generated by the subject development (**Figure 4-2**).

Table 5-4 summarizes the intersection LOS and delay based on the geometry shown in **Figure 2-2**, assumed Haywood Glen Phases 1 – 3 improvements, and the 2034 Horizon Year traffic volumes shown on **Figure 5-2**. The corresponding Synchro, SimTraffic, and Sidra outputs are included in **Appendix C**.

Without the optimized signal timings proposed for the UDO analysis, the signalized intersection of Old Knight Road / North 1st Avenue / US 64 Business is projected to operate at an overall LOS D and F during the 2034 Horizon Year AM and PM peak hours, respectively. Multiple approaches are projected to operate unacceptably during at least one peak hour.

The eastbound approach at the unsignalized intersection of Old Knight Road / Forestville Road is projected to operate unacceptably during the 2034 Horizon Year PM peak hour. All other approaches are projected to operate at a LOS B or better during both 2034 Horizon Year AM and PM peak hours. Per comments received from the Town of Knightdale (dated 08/02/21), a roundabout will be constructed (by Haywood Glen Phase 3) at the Old Knight Road / Haywood Glen Road intersection. Please see **Section 5.5** for roundabout analysis.

All approaches at the unsignalized intersection of Old Knight Road / Star Ruby Drive are projected to operate at a LOS B or better during both 2034 Horizon Year AM and PM peak hours.

All approaches at the roundabout intersection of Old Knight Road / Haywood Glen Drive are projected to operate at a LOS A during both 2034 Horizon Year peak hours (see **Table 5-5**). All approaches are projected to have a maximum V/C ratio of 0.236 during both peak hours.

All approaches at the unsignalized intersection of Old Knight Road / Site Access 1 are projected to operate at a LOS B or better during both 2034 Horizon Year AM and PM peak hours.

All approaches at the unsignalized intersection of Old Knight Road / Horton Road are projected to operate at a LOS B or better during both 2034 Horizon Year AM and PM peak hours.

All approaches at the unsignalized intersection of Horton Road / Site Access 2 are projected to operate at a LOS B or better during both 2034 Horizon Year AM and PM peak hours.

All approaches at the unsignalized intersection of Horton Road / Buffalo Road are projected to operate at a LOS D or better during both 2034 Horizon Year AM and PM peak hours.

Table 5-4: Intersection Level of Service and Delay Summary
2034 Horizon Year Traffic Volumes

Intersection and Type of Control	Movement and Approach	AM PEAK HOUR		PM PEAK HOUR	
		Delay [1] (sec/veh)	LOS [1]	Delay [1] (sec/veh)	LOS [1]
1: North 1st Avenue/Old Knight Road & US 64 Business	EB Approach	45.8	D	***167.2***	***F***
	WB Approach	27.6	C	25.9	C
	NB Approach	***88.7***	***F***	***1391.2***	***F***
	SB Approach	***77.1***	***E***	***1059.9***	***F***
	Overall	47.9	D	***381.6***	***F***
2: Old Knight Road & Forestville Road	EB Approach	14.9	B	***48.1***	***E***
	NB Approach	3.8	A	1.9	A
	SB Approach	0.0	A	0.0	A
3: Old Knight Road & Star Ruby Drive	EB Approach	10.3	B	11.5	B
	WB Approach	11.2	B	14.3	B
	NB Approach	0.3	A	0.5	A
	SB Approach	0.3	A	1.3	A
5: Old Knight Road & Phase 4 - Site Access 1	WB Approach	10.5	B	11.0	B
	NB Approach	0.0	A	0.0	A
	SB Approach	0.2	A	0.2	A
6: Old Knight Road & Horton Road	EB Approach	0.0	A	0.0	A
	WB Approach	3.9	A	3.7	A
	NB Approach	11.2	B	11.3	B
7: Phase 4 - Site Access 2 & Horton Road	EB Approach	0.0	A	0.0	A
	WB Approach	0.2	A	0.3	A
	NB Approach	9.8	A	10.8	B
8: Horton Road & Buffalo Road	EB Approach	1.8	A	1.1	A
	WB Approach	0.0	A	0.0	A
	SB Approach	12.4	B	25.6	D

[1] *Overall intersection LOS and delay reported for signalized intersections and roundabouts only.*

Table 5-5: Intersection Level of Service and Delay Summary
2034 Horizon Year Traffic Volumes – Roundabout Analysis

Intersection and Type of Control	Movement and Approach	AM PEAK HOUR			PM PEAK HOUR		
		Delay [1] (sec/veh)	LOS [1]	V/C Ratio[2]	Delay [1] (sec/veh)	LOS [1]	V/C Ratio[2]
4: Old Knight Road / Haywood Glen Drive	EB Approach	3.7	A	0.027	3.8	A	0.022
	WB Approach	3.9	A	0.091	4.5	A	0.123
	NB Approach	4.0	A	0.154	4.8	A	0.236
	SB Approach	4.2	A	0.147	4.4	A	0.162
	Overall	4.0	A	0.154	4.6	A	0.236

[1] *Overall intersection LOS and delay reported for signalized intersections and roundabouts only.*

[2] *V/C Ratio: Volume to Capacity Ratio, a V/C of greater than 0.85 at any approach is considered unaccpetable performance at roundabouts per NCDOT standards.*

5.5 2044 HORIZON YEAR ANALYSIS

Per NCDOT standards, the proposed roundabout at Old Knight Road / Haywood Glen Drive was analyzed under projected 20-year (2044) traffic volumes. To complete the 2044 Horizon Year analyses (including the proposed development), the 2021 Existing traffic volumes were grown at a 3% ambient growth rate for twenty-three (23) years and added to the estimated site trips for Haywood Glen Phases 1 – 4.

The 2044 Horizon Year traffic volumes shown on **Figure 5-3** contain the following:

- Existing 2021 traffic volumes (**Figure 2-5**) grown exponentially for 23 years at a 3% ambient growth rate;
- Total site trips generated by Haywood Glen Phases 1 – 3 (**Figure 3-2**); and
- Total site trips generated by the subject development (**Figure 4-2**).

Table 5-6 summarizes the intersection LOS and delay based on the geometry shown in **Figure 2-2**, assumed Haywood Glen Phases 1 – 3 improvements, and the 2044 Horizon Year traffic volumes shown on **Figure 5-3**. The corresponding SimTraffic and Sidra outputs are included in **Appendix C**.

All approaches at the roundabout intersection of Old Knight Road / Haywood Glen Drive are projected to operate at a LOS A during both 2044 Horizon Year peak hours (see **Table 5-6**). All approaches are projected to have a maximum V/C ratio of 0.275 during both peak hours.

Table 5-6: Intersection Level of Service and Delay Summary
2044 Horizon Year Traffic Volumes – Roundabout Analysis

Intersection and Type of Control	Movement and Approach	AM PEAK HOUR			PM PEAK HOUR		
		Delay [1] (sec/veh)	LOS [1]	V/C Ratio[2]	Delay [1] (sec/veh)	LOS [1]	V/C Ratio[2]
4: Old Knight Road / Haywood Glen Drive	EB Approach	3.9	A	0.029	4.0	A	0.023
	WB Approach	4.1	A	0.103	4.9	A	0.153
	NB Approach	4.4	A	0.193	5.1	A	0.275
	SB Approach	4.5	A	0.179	4.9	A	0.204
	Overall	4.3	A	0.193	5.0	A	0.275

[1] *Overall intersection LOS and delay reported for signalized intersections and roundabouts only.*

[2] *V/C Ratio: Volume to Capacity Ratio, a V/C of greater than 0.85 at any approach is considered unaccpetable performance at roundabouts per NCDOT standards.*

5.6 ADDITIONAL ANALYSIS

Per comments received on 08/02/21, the intersection of Old Knight Road / Forestville Road will be configured as a single-lane roundabout (to be constructed by others). **Tables 5-7** – **5-9** summarizes the intersection LOS, delay, and V/C based on the assumed single-lane roundabout configuration and the 2025 Build, 2034 Horizon Year, and 2044 Horizon Year traffic volumes shown in **Figures 5-1**, **5-2**, and **5-3** (respectively). The corresponding SimTraffic and Sidra outputs are included in **Appendix C**.

All approaches at the roundabout intersection of Old Knight Road / Forestville Road are projected to operate at a LOS B or better with a maximum V/C ratio of 0.691 during all analyzed peak hours.

Table 5-7: Intersection Level of Service and Delay Summary
2025 Build Traffic Volumes – Roundabout Analysis

Intersection and Type of Control	Movement and Approach	AM PEAK HOUR			PM PEAK HOUR		
		Delay [1] (sec/veh)	LOS [1]	V/C Ratio[2]	Delay [1] (sec/veh)	LOS [1]	V/C Ratio[2]
2: Old Knight Road / Forestville Road	EB Approach	5.1	A	0.130	5.5	A	0.190
	NB Approach	4.8	A	0.247	7.3	A	0.440
	SB Approach	6.2	A	0.330	5.6	A	0.286
	Overall	5.5	A	0.330	6.4	A	0.440

[1] *Overall intersection LOS and delay reported for signalized intersections and roundabouts only.*

[2] *V/C Ratio: Volume to Capacity Ratio, a V/C of greater than 0.85 at any approach is considered unaccpetable performance at roundabouts per NCDOT standards.*

Table 5-8: Intersection Level of Service and Delay Summary
2034 Build Traffic Volumes – Roundabout Analysis

Intersection and Type of Control	Movement and Approach	AM PEAK HOUR			PM PEAK HOUR		
		Delay [1] (sec/veh)	LOS [1]	V/C Ratio[2]	Delay [1] (sec/veh)	LOS [1]	V/C Ratio[2]
2: Old Knight Road / Forestville Road	EB Approach	6.0	A	0.180	6.7	A	0.262
	NB Approach	5.5	A	0.311	8.9	A	0.540
	SB Approach	7.4	A	0.404	6.6	A	0.359
	Overall	6.4	A	0.404	7.8	A	0.540

[1] *Overall intersection LOS and delay reported for signalized intersections and roundabouts only.*

[2] *V/C Ratio: Volume to Capacity Ratio, a V/C of greater than 0.85 at any approach is considered unaccpetable performance at roundabouts per NCDOT standards.*

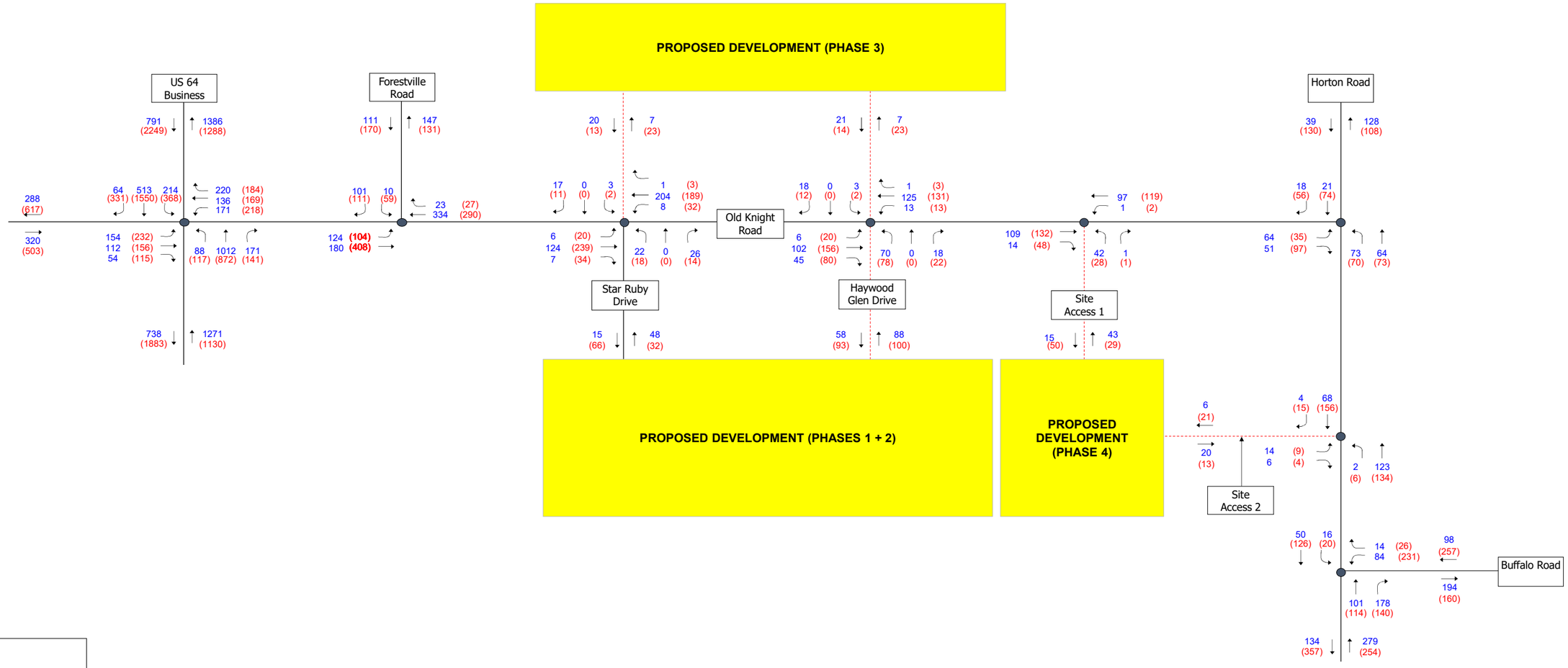
Table 5-9: Intersection Level of Service and Delay Summary
2044 Build Traffic Volumes – Roundabout Analysis

Intersection and Type of Control	Movement and Approach	AM PEAK HOUR			PM PEAK HOUR		
		Delay [1] (sec/veh)	LOS [1]	V/C Ratio[2]	Delay [1] (sec/veh)	LOS [1]	V/C Ratio[2]
2: Old Knight Road / Forestville Road	EB Approach	7.5	A	0.265	9.0	A	0.384
	NB Approach	6.6	A	0.405	12.8	B	0.691
	SB Approach	9.7	A	0.525	8.5	A	0.473
	Overall	8.1	A	0.525	10.7	B	0.691

[1] *Overall intersection LOS and delay reported for signalized intersections and roundabouts only.*

[2] *V/C Ratio: Volume to Capacity Ratio, a V/C of greater than 0.85 at any approach is considered unaccpetable performance at roundabouts per NCDOT standards.*

NOT TO SCALE



LEGEND:

- Existing Road
- Proposed Road
- XX AM Peak Hour Volume (vph)
- (XX) PM Peak Hour Volume (vph)

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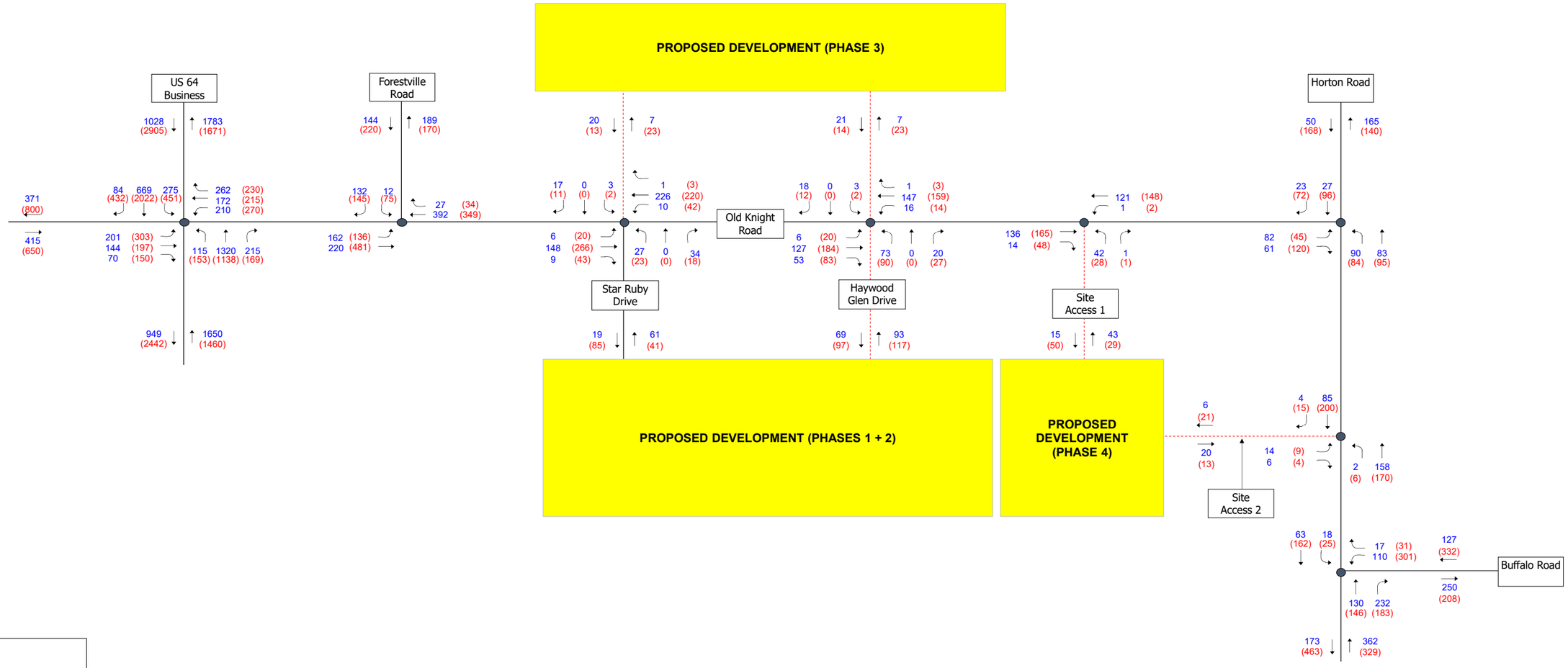
Haywood Glen - Phase 4
Traffic Impact Analysis
2025 Build Traffic Volumes

Figure 5-1

NOT TO SCALE



LEGEND:

- Existing Road
- Proposed Road
- XX AM Peak Hour Volume (vph)
- (XX) PM Peak Hour Volume (vph)

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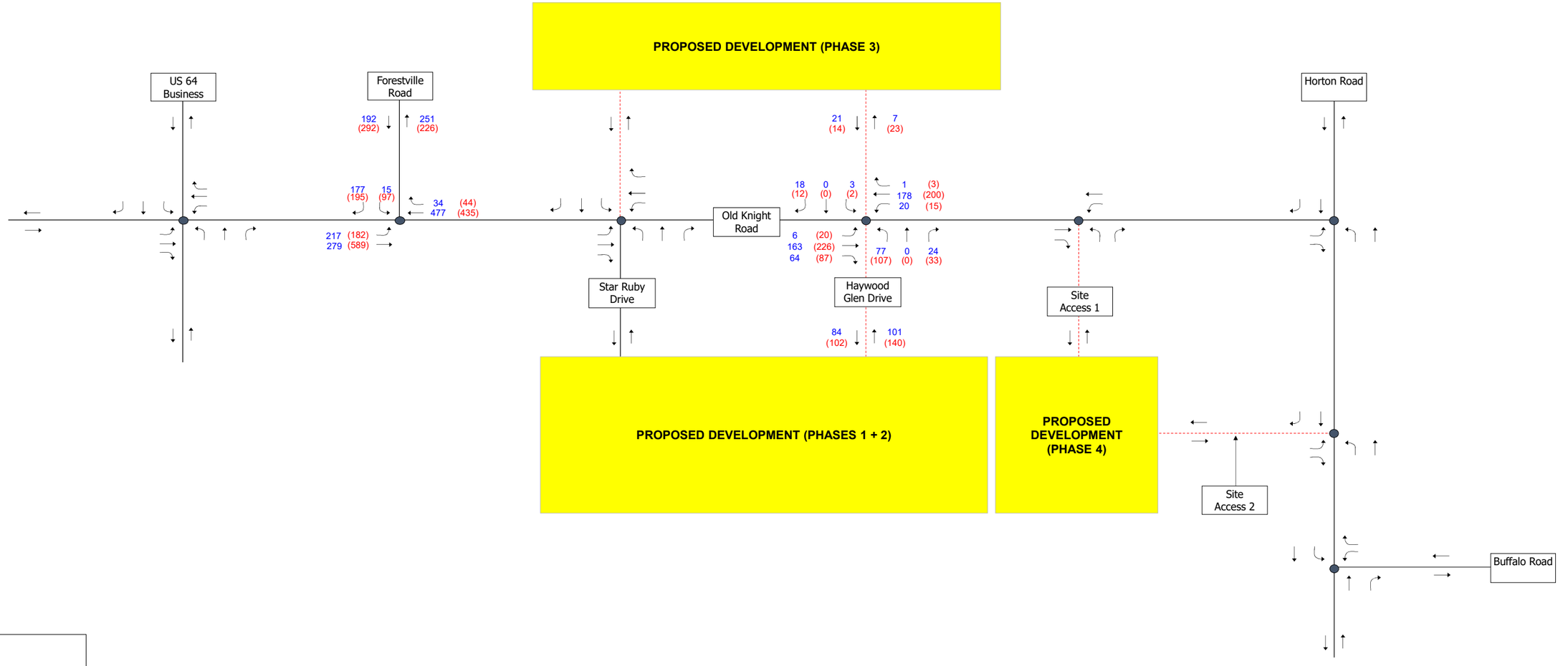
Haywood Glen - Phase 4
Traffic Impact Analysis
2034 Horizon Year Traffic Volumes

Figure 5-2

NOT TO SCALE



LEGEND:

- Existing Road
- Proposed Road
- XX AM Peak Hour Volume (vph)
- (XX) PM Peak Hour Volume (vph)

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Haywood Glen - Phase 4
Traffic Impact Analysis
2044 Horizon Year Traffic Volumes

Figure 5-3

6 CONCLUSIONS AND RECOMMENDATIONS

Capacity analyses were performed for 2021 Existing, 2025 Background, 2025 Build (Background + site trips), 2034 Horizon Year (2034 background + site trips), and 2044 Horizon Year (2034 background + site trips) traffic volumes. **Figure 6-1** shows the future lane configuration.

- The signalized intersection of Old Knight Road / North 1st Avenue / US 64 Business is projected to operate at an overall LOS C and F during the 2025 Build AM and PM peak hours, respectively. Per the UDO analysis, optimized signal timings will result in an acceptable overall intersection LOS during both peak hours. Because of this, no improvements are recommended at this intersection due to the construction of the subject development. Per NCDOT requirements, the subject development is responsible for extending the existing eastbound left-turn lane to 600-feet of full width storage (with appropriate taper).

- All approaches at the unsignalized intersection of Old Knight Road / Forestville Road are projected to operate at a LOS C or better during the 2025 Build AM and PM peak hours. No improvements are recommended at this intersection due to the construction of the subject development.

- All approaches at the unsignalized intersection of Old Knight Road / Star Ruby Drive are projected to operate at a LOS B or better during the 2025 Build AM and PM peak hours. No improvements are recommended at this intersection due to the construction of the subject development.

- All approaches at the roundabout intersection of Old Knight Road / Haywood Glen Drive are projected to operate at a LOS A during both 2025 Build AM and PM peak hours. All approaches are projected to have a maximum V/C ratio of 0.211 during both peak hours. No improvements are recommended at this intersection due to the construction of the subject development.

- All approaches at the unsignalized intersection of Old Knight Road / Site Access 1 are projected to operate at a LOS B or better during both 2025 Build AM and PM peak hours. No improvements are recommended at this intersection due to the construction of the subject development.

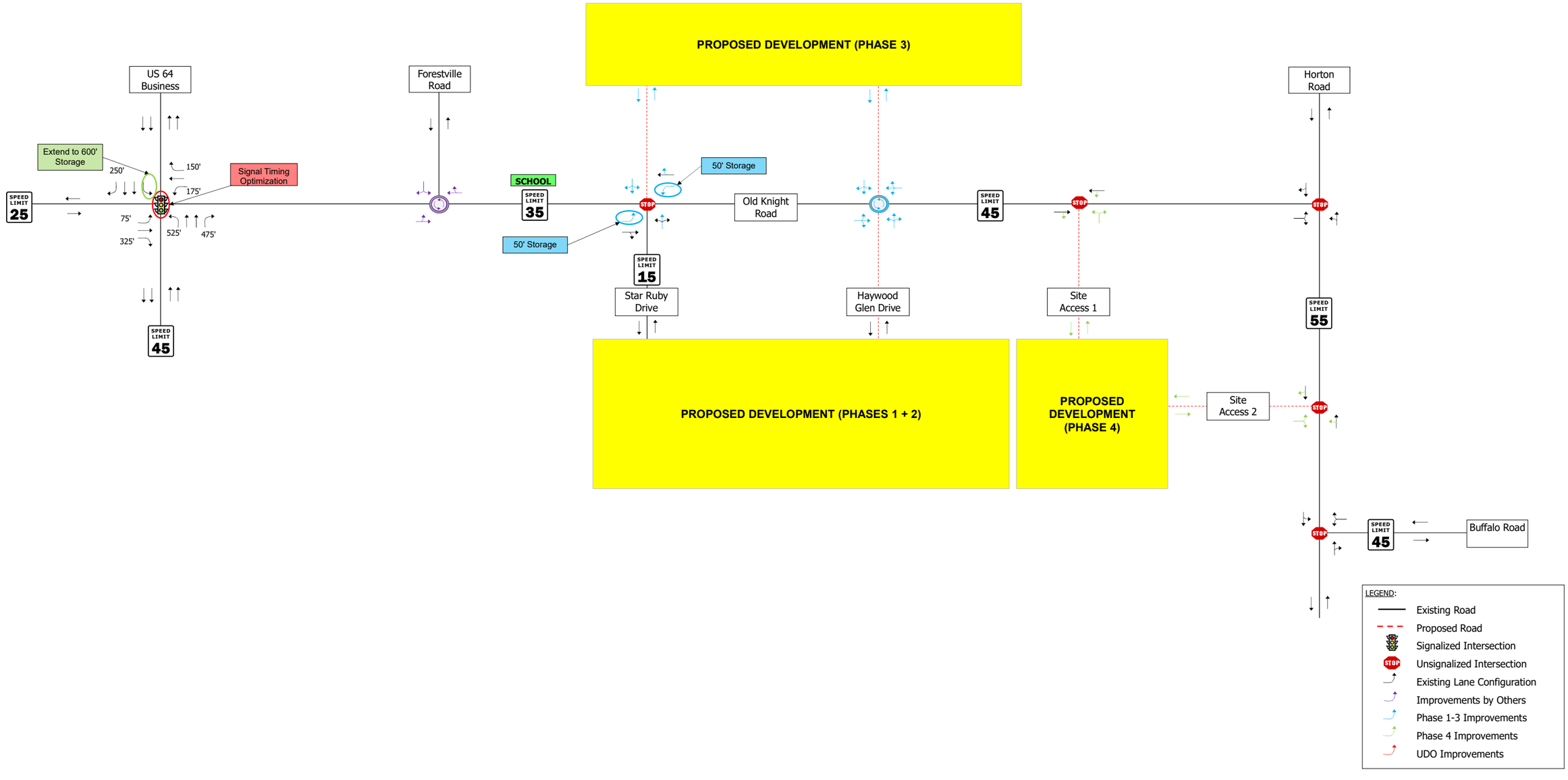
- All approaches at the unsignalized intersection of Old Knight Road / Horton Road are projected to operate at a LOS B or better during both 2025 Build AM and PM peak hours. No improvements are recommended at this intersection due to the construction of the subject development.

- All approaches at the unsignalized intersection of Horton Road / Site Access 2 are projected to operate at a LOS B or better during both 2025 Build AM and PM peak hours. No improvements are recommended due to the construction of the subject development.

- All approaches at the unsignalized intersection of Horton Road / Buffalo Road are projected to operate at a LOS C or better during both 2025 Build AM and PM peak hours. No improvements are recommended at this intersection due to the construction of the subject development.

- It was originally required that the Haywood Glen Phase 4 development widen Old Knight Road to one-half the ultimate cross-section along the Haywood Glen Phase 4 property frontage (four-lane median divided). Due to Town comments received on 08/02/21, widening will no longer be required as the ultimate cross-section of Old Knight Road has been updated to two-lane undivided with roundabouts along the corridor. As a result, a roundabout will be constructed at Old Knight Road / Forestville Road by an adjacent development. An additional roundabout will be constructed by Haywood Glen Phases 1 – 3 at Old Knight Road / Haywood Glen Drive.

NOT TO SCALE



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Haywood Glen - Phase 4
Traffic Impact Analysis
2025 Proposed Lane Configuration

Figure 6-1

Appendix A – Scoping Documents

NCDOT Traffic Impact Analysis Need Screening / Scoping Request

TIA Need Screening → TIA Scoping → TIA Submittal

A Traffic Impact Analysis (TIA) may be required for developments based on the site trip generation estimates, site context, or at the discretion of the NCDOT District Engineer. The Applicant or the TIA Consultant shall submit this form along with the site plan to the District Engineer to determine the TIA need and, if a TIA is required, initiate the TIA scoping process. Without an approved scope, the TIA is incomplete and will be rejected until the study is revised to conform to NCDOT's TIA requirements.

Project Name: Haywood Glen Phase 4 Tia **Previous Name:** If Applicable

Location: Old Knight Road **County:** Wake **Municipality:** Knightdale

Project Description: Residential development with 112 single-family residential units

Project Contact:	Applicant	TIA Consultant
Company Name	DR Horton-Terramor, LLC	Timmons Group
Contact Person	Jon Holtvedt, PE	Cliff Lawson
Phone Number	919-809-4207	919-866-4946
Email	JHoltvedt@terramorhomes.com	cliff.lawson@timmons.com
Mailing Address	7208 Falls of Neuse Road, Suite 201 Raleigh, NC 27615	5410 Trinty Road, Suite 102 Raleigh, NC 27607

Site Plan Prepared By: Timmons Group **Site Plan Date:** 02-24-2021

See site plan/vicinity map requirements on page 2.

Parcel Size: 33.25 Acre(s) **Anticipated Build-Out Year:** 2024

Weekday Site Trip Generation - Do NOT adjust for mode split, pass-by, internal capture, or diverted trips.

ITE LUC	Proposed Land Use	Size	Unit	Daily Trips	Peak Hour Type	AM Peak Hour Trips			PM Peak Hour Trips			Data Source
						Enter	Exit	Total	Enter	Exit	Total	
210	Single Family		112	1154	Adj. Street	21	63	84	71	42	113	ITE Equation
Total			112	1154		21	63	84	71	42	113	

Refer to the current *NCDOT Congestion Management Capacity Analysis Guidelines* for acceptable trip calculation methods and data sources.

**Explain local or other data sources, if used:

☐ The estimated site trips meet NCDOT's TIA trip threshold of 3,000 daily trips.

☐ The estimated site trips meet the municipal TIA trip threshold of 150 Peak Hour Trips

☐ This project is located in a known STIP and/ or local CIP project #

☐ This project includes a rezoning request.

☐ The proposed site access is located within 1,000 feet of an interchange.

☐ The Applicant requests for a new or modified control-of-access break.

☐ The Applicant requests for a new or modified median break.

Applicant's Signature	Cliff Lawson, PE, PTOE	04/16/2021
	Print Name	Date

NCDOT Traffic Impact Analysis Need Screening / Scoping Request

TIA Need Screening → TIA Scoping → TIA Submittal

Site Plan/Vicinity Map Requirement for TIA Need Screening: While the site plan may not be finalized during the TIA scoping stage, the graphic representation of the proposed development shall provide adequate details on the development scope and context. More specifically, the site plan/map shall clearly show the location and type of each access point, spacing to adjacent and opposing driveways or intersections, internal street network, proposed buildings/parcels with their anticipated uses and sizes at full build-out and, if applicable, any nearby interstate, US, NC or Secondary Roads (SR).

Project Name: _____ **Project Reference Number:** _____

☐ **A TIA is Required by the Local Government.** In addition, the study area is expected to include NCDOT maintained transportation facilities.

☐ **A TIA is Required by NCDOT,** per the *Policy on Street and Driveway Access to North Carolina Highways*.

If either or both of the boxes above are checked, the Applicant/TIA Consultant is hereby requested to fill out as much as possible of the following TIA scoping checklist, and return it along with the supporting documents to NCDOT prior to the scoping meeting.

☐ **A TIA is NOT required**. This decision is based on the development information presented above. Changes in the development plan will require re-evaluation of the TIA need, and may necessitate a TIA. The Applicant should inform the District Engineer of any significant changes in a timely fashion to avoid delays or rejections of the driveway permit / encroachment agreement applications.

Additional Comments:

The TIA need decision is made by the NCDOT Division ____ District____ on _____.

_____ _____

NCDOT District Representative's Signature | Print Name

Email concurrence may be used in lieu of the signature.

NCDOT TIA Scoping Checklist

TIA Need Screening → TIA Scoping → TIA Submittal

Project Name: Haywood Glen Phase 4 **TIA Scoping Date:** 04/16/21

☒ **TIA Need Screening Forms are Attached.** Project Reference #: _____ Decision Date: _____

☒ **Site Plan and Access**

☒ Provide a site plan illustrating site access, internal and external roadways, buildings and land uses.
Refer to NCDOT's *Policy on Street and Driveway Access to North Carolina Highways* pages 14 and 15 for site plan requirements.

☒ Identify site access.

New Access	On Road	Access Type		Driveway Spacing		
	Road Name	Permitted Movements	Traffic Control	Distance (ft)	Direction	Nearest Intersection / Access
Access A	Horton Road	Conventional Full-Mvmt	2-Way Stop	880	West	Old Knight Road
Access B	Old Knight Road	Conventional Full-Mvmt	2-Way Stop	510	North	Horton Road
Access C						
Access D						
Access E						
Access F						
Access G						
Access H						

Existing Access	Existing Intersection of		Access Modification	**Proposed Interconnectivity** (If Applicable)		
	Road A	Road B		Connector #	Road Connected	Adjacent Development
Access 1			Please Select	Connector 1		
Access 2				Connector 2		
Access 3				Connector 3		
Access 4				Connector 4		

☐ Additional access clarifications and provisions (e.g., proposed control-of-access or median breaks, modifications of existing access, loading/unloading area access, bike/pedestrian accommodation).

☐ **Proposed K-12 School Site**

☐ NCDOT MSTA School Traffic Calculator for Select School Type shall be used.

☐ Peak Hour Factors (PHFs) shall be adjusted/weighted for new school trips (0.5 PHF by default).

☐ Internal school circulation analysis is required, and should be submitted in advance or concurrent with the TIA submittal.

☐ Clarify traffic operation plans (e.g. traffic circulation pattern, pedestrian access, drop-off/pick-up zone location and configuration, queue storage area and, if applicable, staggered start times).

☒ Trip Generation

The TIA Consultant shall prepare trip generation estimates following the current *NCDOT Congestion Management Capacity Analysis Guidelines*, and submit the calculation sheets and supporting information to the District Engineer for approval prior to capacity analysis.

ITE LUC	Proposed Land Use	Size	Unit	Daily Trips	Peak Hour Type	AM Peak Hour Trips			PM Peak Hour Trips			Data Source
						Enter	Exit	Total	Enter	Exit	Total	
210	Single Family		112	1154	Adj. Street	21	63	84	71	42	113	ITE Equation
Unadjusted Site Trips						21	63	84	71	42	113	
Internal Capture Trips (Attach Calculation Sheets)												Please Select
Internal Capture % of Unadjusted Site Trips				%			%			%		
LUC	Proposed Land Use	Any Internal Trips?		Pass-By % of External Trips								
		Please Select		%			%			%		Please Select
				%			%			%		
				%			%			%		
				%			%			%		
				%			%			%		
Pass-By Trips (Attach Calculation Sheets)												
Adjacent Street Volumes												Please Select
Non-Pass-By Primary Trips												
Diverted Trips, if Applicable and Justifiable												Please Select

**Explain local or other data sources, if used:

☐ Existing Site Trip Information for Redevelopment Projects (Attach separate sheets as needed)

ITE LUC	Existing Land Use	Size	Unit	Daily Trips	Peak Hour Type	AM Peak Hour Trips			PM Peak Hour Trips			Data Source
						Enter	Exit	Total	Enter	Exit	Total	
					Please Select							Please Select
Total Existing Site Trips												

☒ **Trip Distribution**

☐ Trip distribution diagrams are submitted concurrently with this document (attach separate sheets).

☐ Trip distribution diagrams will be submitted separately, along with supporting information, to the District Engineer for review and approval prior to capacity analysis. The trip distribution shall be based on the current and anticipated traffic patterns, as well as instructions noted below.

Trip distribution wll be assumed to follow the same patterns as outlined in the Haywood Glen Phase 3 TIA completed by Timmons Group (sealed 12/22/20).

If required by the District Engineer, the following additional diagrams shall also be submitted:

☐ Mixed-Use Developments (separate diagrams for residential, commercial, and office trips)

☐ Inter-Development Trips (if 'internal" trips cross public streets)

☐ Pass-By Trips

☐ Diverted Trips

☐ Each Analysis Period

☐ **Mode Split**

☐ Provide Data Source and Justification

Mode / Period	Auto		
AM Peak	%	%	%
PM Peak	%	%	%
Daily	%	%	%
	%	%	%

☐ Identify proper infrastructure and accommodation for other modes of travel.

☒ **Analysis Peak Periods:**

☒ Weekday AM Peak 7:00 a.m. - 9:00 a.m.

☒ Weekday PM Peak 4:00 p.m. - 6:00 p.m.

☐ Weekday Midday Peak _____

☐ Weekday PM School Peak _____

☐ Weekend _____ Peak _____

☐ Other _____

☒ Study Area Intersections and Data Collection

The study area shall include the site access intersections (both new and existing) identified under "Site Plan and Access" on page 1, as well as the following external and, if applicable, internal intersections.

External Intersection	Intersection of		Traffic Control	Intersection Turning Movement Counts			Notes
	Road A	Road B		New / Existing	Date of Counts	Growth Adjustment	
#1	Horton Road	Old Knight Road	2-Way Stop	Use Existing Counts	Nov 2020	3%	From TG TIA
#2	Star Ruby Drive	Old Knight Road	2-Way Stop	Use Existing Counts	Nov 2020	3%	From TG TIA
#3	Forestville Road	Old Knight Road	2-Way Stop	Use Existing Counts	Nov 2020	3%	From TG TIA
#4	Horton Road	Buffaloe Road	2-Way Stop	Use Existing Counts	Nov 2020	3%	From TG TIA
#5	Haywood Glen	Old Knight Road	2-Way Stop	Use Existing Counts	Nov 2020	3%	From TG TIA
#6	US-64 Bus	Old Knight Road	Signal	Use Existing Counts	Nov 2020	3%	From TG TIA
#7							
#8							
#9							
#10							
#11							
#12							

Internal Intersection	Intersection of		Access Type		Intersection Spacing		
	Road A	Road B	Traffic Control	Permitted Movements	Distance (ft)	Direction	Nearest Intersection
#101	Site Driveway 1	Horton Road	2-Way Stop	Conventional Full-Mvmt	880	West	Old Knight
#102	Site Driveway 2	Old Knight Road	2-Way Stop	Conventional Full-Mvmt	510	North	Horton Road
#103							
#104							
#105							

The following data will be collected:

☒ New traffic turning movement counts in ☒ 15-min intervals ☐ 5-min intervals (near schools)
Unless otherwise noted above, new traffic counts shall be collected at the existing study intersections during the analysis periods. Weekday counts shall avoid Mondays, Fridays, holidays, school breaks, road closures, and major weather events.

☐ To account for the impact of existing and/or proposed school traffic, PHFs will be adjusted for:

intersections numbered: _____

and access points numbered: _____

☐ Traffic Forecast Data for TIP: _____

☐ Roadway/Intersection Configuration & Traffic Control

☐ Traffic Signal Phasing & Timing Data

☐ Crash Data: _____ Period: _____

☒ Other:

Timmons Group will use the the COVID-19 adjustment factor calculated in the Haywood Glen Phase 3 TIA. This adjustment factor will be applied to all turning movement traffic counts.

☒ Future Year Conditions

☒ Project Build-Out Year: 2024

☐ Future Analysis Year(s): _____

☐ Identify below any funded/committed future transportation improvements, as well as any approved but incomplete developments near the site.

Funded STIP / Local CIP Project	Project Description	Year Complete

Nearby Approved Development	Location	Future Land Use (exclude any completed phases)	Committed Improvements

☒ Annual Growth Factor: 3 %

Justification/Data Source: Provided by the Town of Knightdale / Found in the Forestville Village TIA

☐ Local Comprehensive Transportation Plan Compliance

☐ Identify Applicable Local Transportation Planning Documents

☐ Identify Applicable Roadways inside the Study Area

Road Name	Classification	Speed Limit	Proposed Cross-Section	Proposed Right-of-Way	Compliance Requirements	Affect Study Intersection #

☒ Study Method

The traffic analysis shall follow the current *NCDOT Congestion Management Capacity Analysis Guidelines*, *Policy on Street and Driveway Access to North Carolina Highways*, and use the current approved version of analysis software (e.g. Synchro/SimTraffic, HCS, Sidra Intersection, TransModeler).

The study shall include the following analysis scenarios for each analysis period.

1. Existing Conditions
2. Future No-Build Conditions (existing + background growth + approved developments + committed or funded improvements)
3. Future Build Conditions (future no-build + site trips)
4. Future Build with Improvements Conditions (future build traffic with improvements to mitigate the proposed development's impacts) and, if applicable:

☐ 5. TIP Design Year Analysis _____

☐ 6. Alternative Access Scenario (without proposed control-of-access or median break / modification)

The following additional analysis/outputs should be provided as warranted:

- ☐ Signal Warrant Analysis for accesses/intersections _____
- ☐ Multi-Modal Level of Service Analysis
- ☐ School Loading Zone Traffic Simulation
- ☐ Phasing Analysis (scope separately as needed)
- ☐ Safety/Crash Analysis
- ☐ Control-of-Access Modification Justification
- ☐ Median Break / Modification Justification
- ☐ Other _____

☒ Submittals

In addition to the hardcopies required below, the TIA Consultant shall provide the District Engineer and, if required, the local government an electronic copy of the study documents, including the latest site plan, figures and appendices, in searchable PDF files and the original traffic analysis files (e.g., Synchro, HCS). To expedite review, the NCDOT electronic submittals shall also be delivered concurrently to:

☐ Div. Traffic Engr ☐ Regional Traffic Engr ☒ Congestion Management ☒ Other District Office

Submittals	NCDOT		Local Government	
	Electronic	Hardcopy	Electronic	Hardcopy
Trip Generation & Distribution	Required	0	Required	0
Draft TIA Report	Required	0	Required	3
Final Sealed TIA Report	Required	0	Required	3

☐ **Additional Comments (**municipal TIA requirements, approved variations from NCDOT guidelines)

Agreement by All Parties

The undersigned agree to the contents and methodology described above for completing the required traffic impact analysis for the proposed development identified herein. Any changes to the above methodology contemplated by the Applicant or the TIA Consultant must be submitted to the District Engineer in writing. If approved by NCDOT, then such changes may be accepted for the TIA report. Subsequent revisions to the development plan (e.g. land use, density, site access, or schedule) may require additional scoping and analysis, and may modify the TIA requirements.

This agreement shall become effective on the date approved by NCDOT, and shall expire ____ months after the effective date or upon significant changes to the roadway network and/or development assumptions, whichever occurs first. Once expired, renewal or re-scoping will be required for subsequent TIA submittals.

APPLICANT

Signature	Print Name	Date

TIA CONSULTANT

Signature	Print Name	Date
	Cliff Lawson, PE, PTOE	04/16/2021

LOCAL GOVERNMENT REPRESENTATIVE (If Applicable)

Signature	Print Name	Date

Email concurrence may be used in lieu of the signature.

NCDOT DISTRICT REPRESENTATIVE

Reviewed and approved by the NCDOT Division ____District____ on _____.

Signature	Print Name

Email concurrence may be used in lieu of the signature.

NCDOT TIA Submittal Checklist

TIA Need Screening → TIA Scoping → TIA Submittal

Submittal: Please Select **Document Date:** _____

Project Name: _____ **Previous Name:** If Applicable _____

NCDOT Division: _____ **District:** _____ **County:** _____ **Municipality:** _____

TIA Consultant: _____ Submitted By: _____

Phone Number: _____ Email: _____

TIA Scoping Checklist Approval Date: _____ **Unadjusted Daily Site Trips:** _____

☒ The approved TIA Scoping Checklist is included in this submittal.

☒ LOS D or better is expected at all study intersections after proposed mitigations.

☒ The study report is sealed by a NC Professional Engineer with expertise in traffic engineering.

☒ This study has identified all known deficiencies with and without the proposed development.

☒ This study has identified mitigation measures to adequately accommodate the site trips.

Explain here if any of the boxes above are unchecked:

The undersigned affirms that, except for the deviations noted below, the TIA submittal conforms to the current *NCDOT Congestion Management Capacity Analysis Guidelines*, *Policy on Street and Driveway Access to North Carolina Highways*, and the TIA Scoping Checklist approved by the NCDOT District Office. The undersigned also acknowledges that the TIA will be rejected if the deviations and justifications are not properly documented and approved by NCDOT.

Deviations and Justifications (e.g., changes in site plan, development schedule, site trip and off-site trip estimates, study area, data collection, analysis period and method. Attached separate sheets if needed.)

TIA Consultant's Signature (Professional Engineer of TIA Record)	Print Name	Date

Cliff Lawson

From: Cliff Lawson
Sent: Monday, April 26, 2021 12:55 PM
To: Brennan, Sean P; Bunting, Clarence B
Cc: kevin.lewis@knightdalenc.gov; Ishak, Doumit Y; Walker, Braden M; Jeff Hochanadel; Tom Spaulding; Brian Duncan
Subject: RE: [External] Haywood Glen Phase 4 TIA

Clarence,

Thanks for taking my call earlier. Per our conversation, TG will include two Background scenarios (with and without Haywood Glen Phases 1 – 3).

Thanks,

Cliff Lawson, PE, PTOE
Senior Project Manager, Transportation
Office: 919.866.4946 | Fax: 919.859.5663

From: Brennan, Sean P <spbrennan@ncdot.gov>
Sent: Monday, April 19, 2021 7:20 AM
To: Cliff Lawson <Cliff.Lawson@timmons.com>
Cc: kevin.lewis@knightdalenc.gov; Ishak, Doumit Y <dishak@ncdot.gov>; Bunting, Clarence B <cbunting@ncdot.gov>; Walker, Braden M <bmwalker1@ncdot.gov>; Jeff Hochanadel <Jeff.Hochanadel@timmons.com>; Tom Spaulding <tom@spaulding-group.com>; Brian Duncan <brian@spaulding-group.com>
Subject: Fw: [External] Haywood Glen Phase 4 TIA

Cliff,

Please see Congestion's comment in the below email.

Regards,
Sean Brennan, PE
Senior Assistant District Engineer
Division 5/District 1
Department of Transportation

919-733-3213 office
919-715-5778 fax
spbrennan@ncdot.gov

4009 District Drive (Physical Address)
Raleigh, NC 27607

1575 Mail Service Center (Mailing Address)
Raleigh, NC 27699-1575

From: Bunting, Clarence B <cbunting@ncdot.gov>
Sent: Sunday, April 18, 2021 2:00 PM
To: Brennan, Sean P <spbrennan@ncdot.gov>; Neidringhaus, Amy N <anneidringhaus@ncdot.gov>
Cc: Ishak, Doumit Y <dishak@ncdot.gov>; Walker, Braden M <bmwalker1@ncdot.gov>
Subject: FW: [External] Haywood Glen Phase 4 TIA

Hi guys,

We'd like to make sure that background files don't contain traffic from the previous phases to limit the impact of development traffic.

Thanks,
Clarence

From: Cliff Lawson <Cliff.Lawson@timmons.com>
Sent: Saturday, April 17, 2021 3:13 PM
To: Neidringhaus, Amy N <anneidringhaus@ncdot.gov>; Brennan, Sean P <spbrennan@ncdot.gov>; Kevin Lewis <kevin.lewis@knightdalenc.gov>
Cc: Ishak, Doumit Y <dishak@ncdot.gov>; Bunting, Clarence B <cbunting@ncdot.gov>; Walker, Braden M <bmwalker1@ncdot.gov>; Jeff Hochanadel <Jeff.Hochanadel@timmons.com>; Tom Spaulding <tom@spaulding-group.com>; Brian Duncan <brian@spaulding-group.com>
Subject: [External] Haywood Glen Phase 4 TIA

All,

Timmons Group has been contracted to complete the TIA for the Haywood Glen – Phase 4 subdivision located off Horton Road in Knightdale, NC. The development will be located just north of Haywood Glen – Phase 3 (which Timmons Group recently completed the TIA for). The development will consist of 112-single family residential units and will have one site driveway connection to Horton Road and one site driveway connection to Old Knight Road. Seeing as how the phase 3 portion of Haywood Glen was scoped fairly recently I figured the scope for this project would be pretty close. My initial thoughts are shown below and are included in the attached scoping document. Please let me know if you believe a scoping meeting is required.

- Study area intersections:
  - Old Knight Road / Horton Road;
  - Horton Road / Buffalo Road;
  - Old Knight Road / Haywood Glen Drive;
  - Old Knight Road / Star Ruby Drive;
  - Old Knight Road / Forestville Road; and

- Old Knight Road / North 1st Avenue / US 64 Business
- Horton Road / Site Driveway 1
- Old Knight Road / Site Driveway 2

- Growth Rate → 3%
- No High Accident Locations
- No Public Improvement Projects
- No Approved Developments
- Buildout year → 2024
- Existing Counts from the Haywood Glen Phase 3 will be used
- The COVID-19 factor calculated in the Haywood Glen Phase 3 TIA will be applied to the existing counts
- Trip Distribution percentages will be similar to those calculated in the Haywood Glen Phase 3 TIA.

Let me know if you have any questions

Thanks,

Cliff Lawson, PE, PTOE
Senior Project Manager – Transportation

TIMMONS GROUP | www.timmons.com
5410 Trinity Rd, Suite 102 | Raleigh, NC 27607
Office: 919.866.4946 | Fax: 919.859.5663
cliff.lawson@timmons.com
Your Vision Achieved Through Ours

To send me files greater than 20MB click here.

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Appendix B – Traffic Counts

TRAFFIC DATA COLLECTION

File Name : Knightdale(Horton and Buffaloe)AM Peak
Site Code :
Start Date : 11/18/2020
Page No : 1

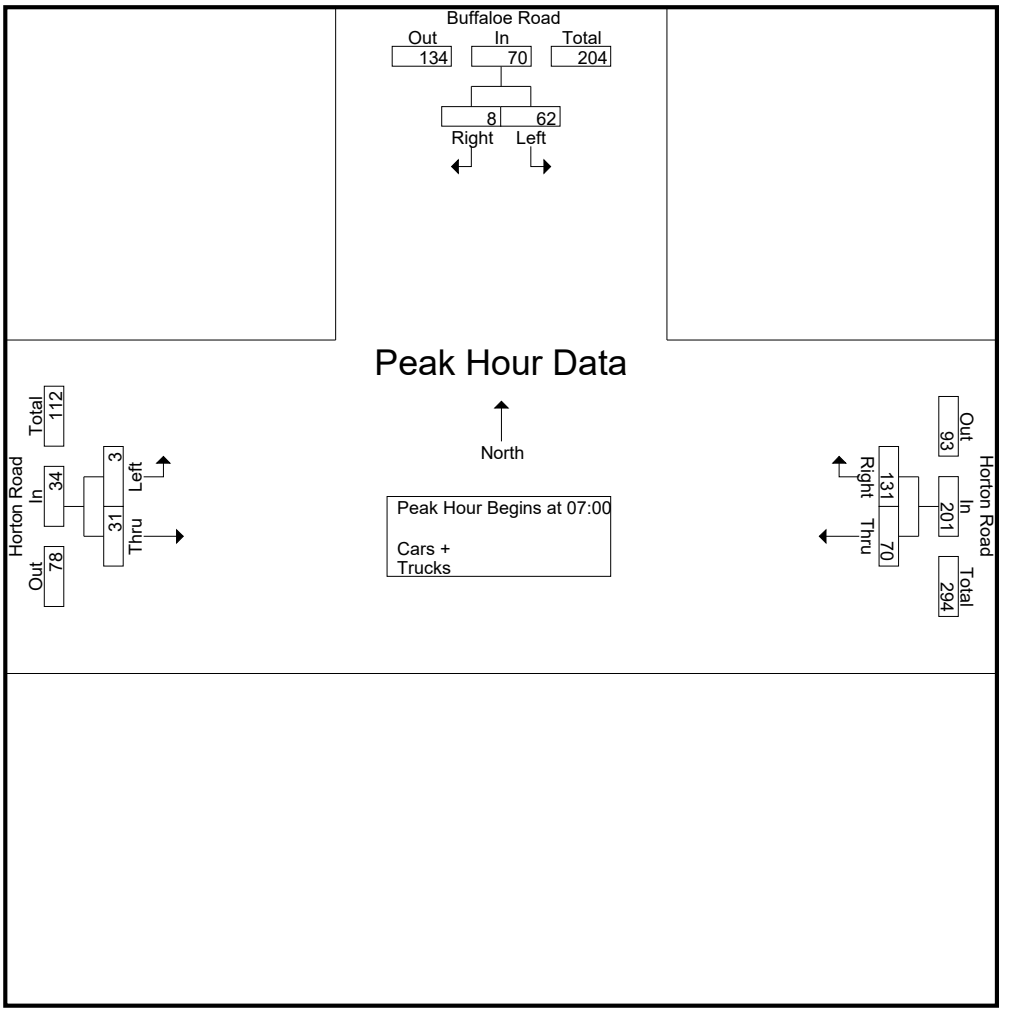
Groups Printed- Cars + - Trucks

	Buffaloe Road Southbound			Horton Road Westbound			Horton Road Eastbound			
Start Time	Right	Left	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	Int. Total
07:00	2	15	17	29	17	46	7	0	7	70
07:15	0	18	18	35	17	52	6	0	6	76
07:30	3	13	16	39	19	58	9	2	11	85
07:45	3	16	19	28	17	45	9	1	10	74
Total	8	62	70	131	70	201	31	3	34	305
08:00	2	16	18	23	15	38	10	1	11	67
08:15	2	14	16	27	18	45	6	3	9	70
08:30	1	15	16	19	10	29	10	2	12	57
08:45	5	21	26	32	7	39	12	1	13	78
Total	10	66	76	101	50	151	38	7	45	272
Grand Total	18	128	146	232	120	352	69	10	79	577
Apprch %	12.3	87.7		65.9	34.1		87.3	12.7		
Total %	3.1	22.2	25.3	40.2	20.8	61	12	1.7	13.7	
Cars +	18	127	145	232	120	352	69	10	79	576
% Cars +	100	99.2	99.3	100	100	100	100	100	100	99.8
Trucks	0	1	1	0	0	0	0	0	0	1
% Trucks	0	0.8	0.7	0	0	0	0	0	0	0.2

TRAFFIC DATA COLLECTION

File Name : Knightdale(Horton and Buffaloe)AM Peak
Site Code :
Start Date : 11/18/2020
Page No : 2

	Buffaloe Road Southbound			Horton Road Westbound			Horton Road Eastbound			
Start Time	Right	Left	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00										
07:00	2	15	17	29	17	46	7	0	7	70
07:15	0	**18**	18	35	17	52	6	0	6	76
07:30	**3**	13	16	**39**	**19**	**58**	**9**	**2**	**11**	**85**
07:45	3	16	**19**	28	17	45	9	1	10	74
Total Volume	8	62	70	131	70	201	31	3	34	305
% App. Total	11.4	88.6		65.2	34.8		91.2	8.8		
PHF	.667	.861	.921	.840	.921	.866	.861	.375	.773	.897



TRAFFIC DATA COLLECTION

File Name : Knightdale(Horton and Buffaloe)PM Peak
Site Code :
Start Date : 11/18/2020
Page No : 1

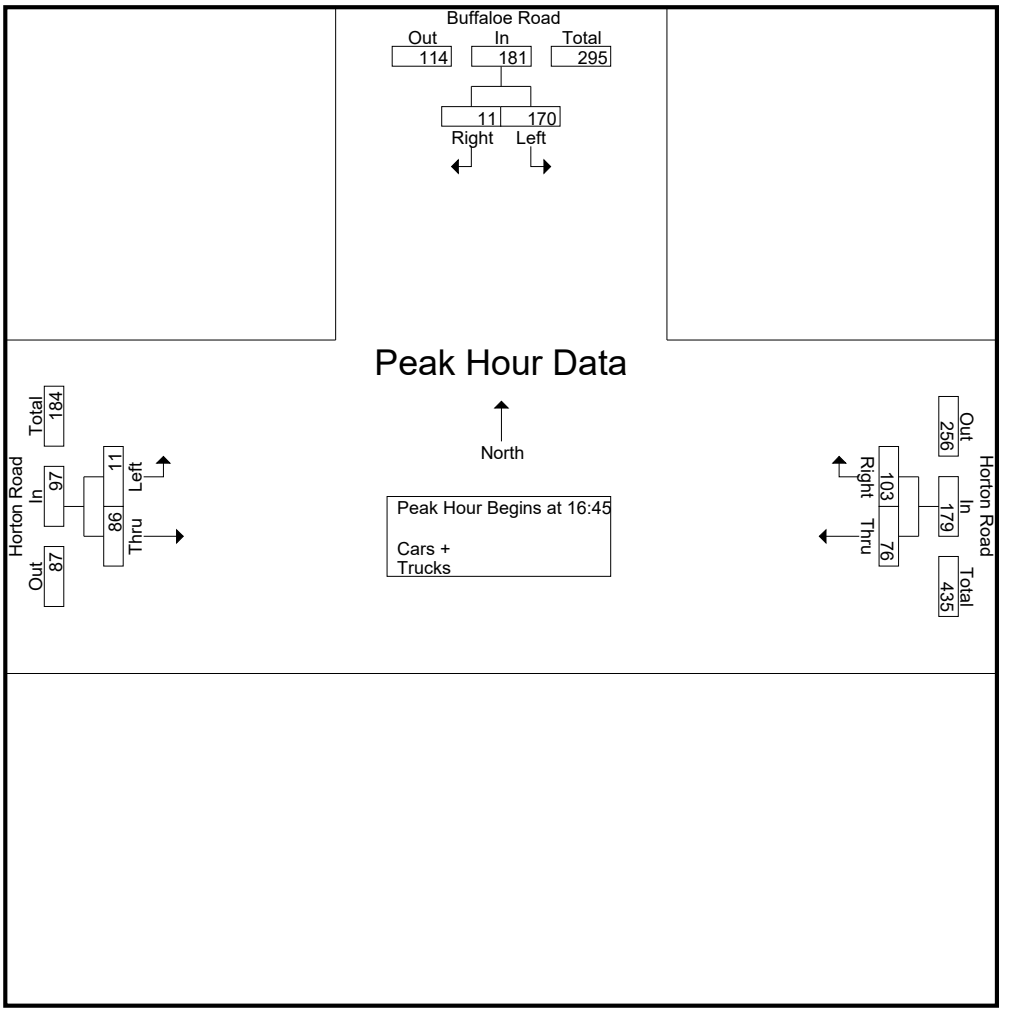
Groups Printed- Cars + - Trucks

	Buffaloe Road Southbound			Horton Road Westbound			Horton Road Eastbound			
Start Time	Right	Left	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	Int. Total
16:00	1	31	32	21	12	33	14	7	21	86
16:15	3	36	39	25	14	39	20	3	23	101
16:30	3	38	41	26	9	35	19	2	21	97
16:45	4	45	49	25	13	38	20	3	23	110
Total	11	150	161	97	48	145	73	15	88	394
17:00	2	35	37	24	20	44	22	4	26	107
17:15	3	56	59	24	21	45	25	2	27	131
17:30	2	34	36	30	22	52	19	2	21	109
17:45	2	33	35	18	15	33	20	5	25	93
Total	9	158	167	96	78	174	86	13	99	440
Grand Total	20	308	328	193	126	319	159	28	187	834
Apprch %	6.1	93.9		60.5	39.5		85	15		
Total %	2.4	36.9	39.3	23.1	15.1	38.2	19.1	3.4	22.4	
Cars +	20	306	326	193	126	319	159	28	187	832
% Cars +	100	99.4	99.4	100	100	100	100	100	100	99.8
Trucks	0	2	2	0	0	0	0	0	0	2
% Trucks	0	0.6	0.6	0	0	0	0	0	0	0.2

TRAFFIC DATA COLLECTION

File Name : Knightdale(Horton and Buffaloe)PM Peak
Site Code :
Start Date : 11/18/2020
Page No : 2

	Buffaloe Road Southbound			Horton Road Westbound			Horton Road Eastbound			
Start Time	Right	Left	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 16:45										
16:45	**4**	45	49	25	13	38	20	3	23	110
17:00	2	35	37	24	20	44	22	**4**	26	107
17:15	3	**56**	**59**	24	21	45	**25**	2	**27**	**131**
17:30	2	34	36	**30**	**22**	**52**	19	2	21	109
Total Volume	11	170	181	103	76	179	86	11	97	457
% App. Total	6.1	93.9		57.5	42.5		88.7	11.3		
PHF	.688	.759	.767	.858	.864	.861	.860	.688	.898	.872



TRAFFIC DATA COLLECTION

File Name : Knightdale(Old Knight and Forestville)AM Peak
Site Code :
Start Date : 11/18/2020
Page No : 1

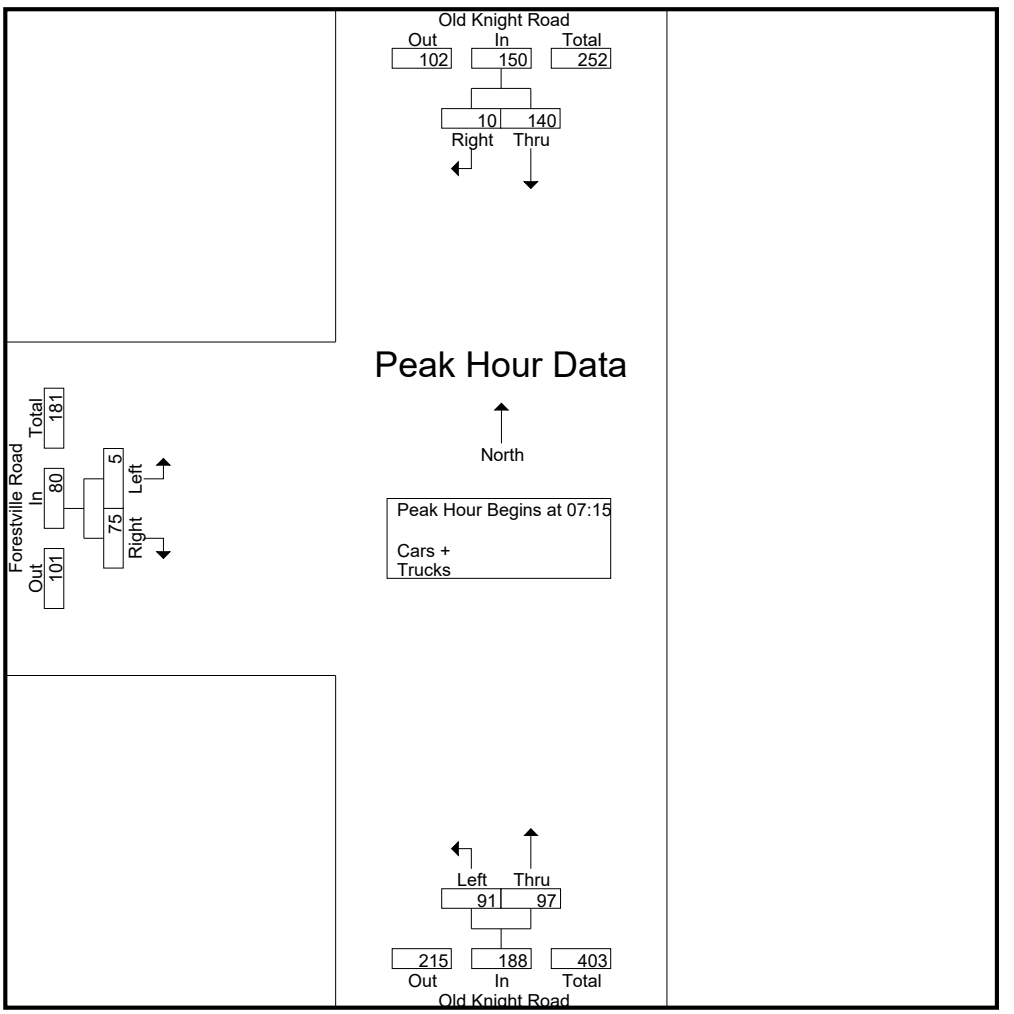
Groups Printed- Cars + - Trucks

	Old Knight Road Southbound			Old Knight Road Northbound			Forestville Road Eastbound			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
07:00	3	34	37	17	13	30	15	2	17	84
07:15	2	35	37	21	19	40	17	1	18	95
07:30	3	35	38	27	26	53	35	3	38	129
07:45	2	34	36	25	28	53	13	0	13	102
Total	10	138	148	90	86	176	80	6	86	410
08:00	3	36	39	24	18	42	10	1	11	92
08:15	2	28	30	12	16	28	28	1	29	87
08:30	7	24	31	15	17	32	13	3	16	79
08:45	1	24	25	11	15	26	11	2	13	64
Total	13	112	125	62	66	128	62	7	69	322
Grand Total	23	250	273	152	152	304	142	13	155	732
Apprch %	8.4	91.6		50	50		91.6	8.4		
Total %	3.1	34.2	37.3	20.8	20.8	41.5	19.4	1.8	21.2	
Cars +	23	249	272	149	147	296	138	13	151	719
% Cars +	100	99.6	99.6	98	96.7	97.4	97.2	100	97.4	98.2
Trucks	0	1	1	3	5	8	4	0	4	13
% Trucks	0	0.4	0.4	2	3.3	2.6	2.8	0	2.6	1.8

TRAFFIC DATA COLLECTION

File Name : Knightdale(Old Knight and Forestville)AM Peak
Site Code :
Start Date : 11/18/2020
Page No : 2

	Old Knight Road Southbound			Old Knight Road Northbound			Forestville Road Eastbound			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:15										
07:15	2	35	37	21	19	40	17	1	18	95
07:30	**3**	35	38	**27**	26	**53**	**35**	**3**	**38**	**129**
07:45	2	34	36	25	**28**	53	13	0	13	102
08:00	3	**36**	**39**	24	18	42	10	1	11	92
Total Volume	10	140	150	97	91	188	75	5	80	418
% App. Total	6.7	93.3		51.6	48.4		93.8	6.2		
PHF	.833	.972	.962	.898	.813	.887	.536	.417	.526	.810



TRAFFIC DATA COLLECTION

File Name : Knightdale(Old Knight and Forestville)PM peak
Site Code :
Start Date : 11/18/2020
Page No : 1

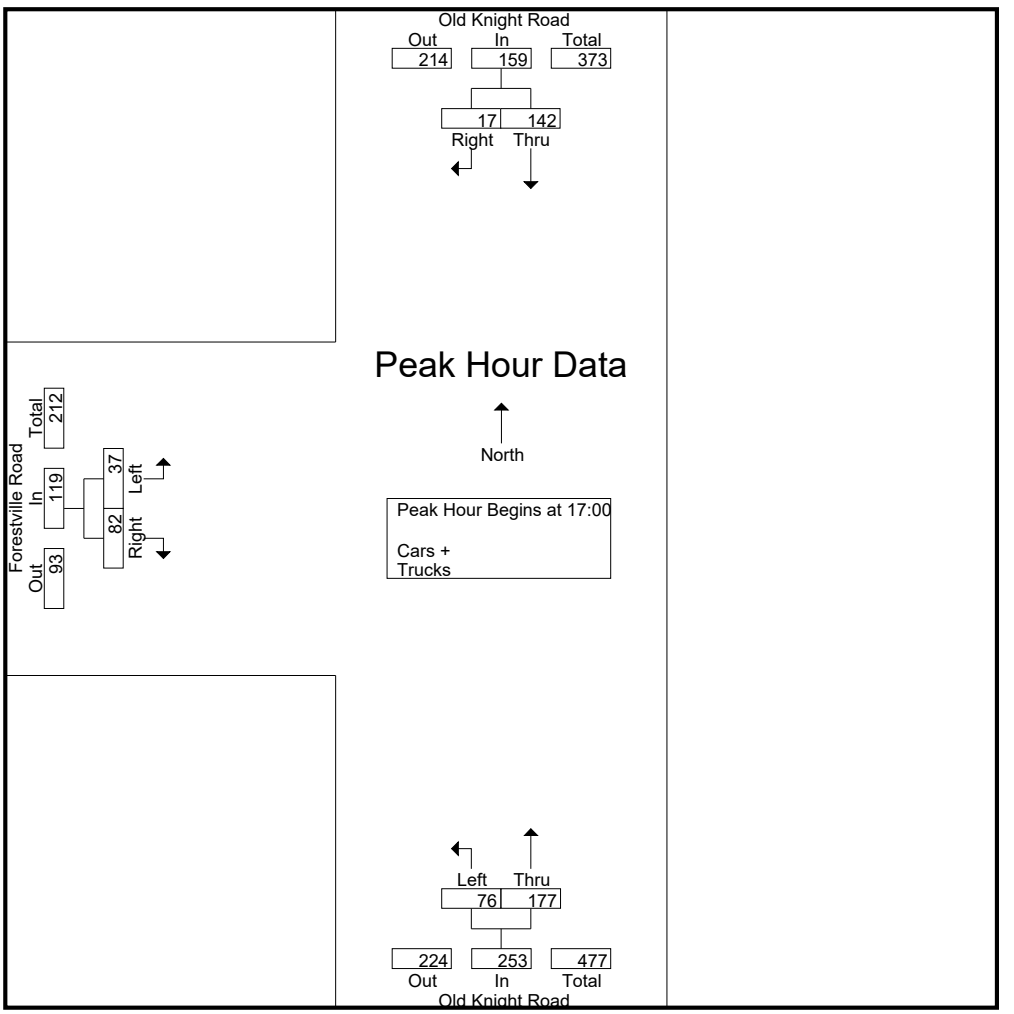
Groups Printed- Cars + - Trucks

	Old Knight Road Southbound			Old Knight Road Northbound			Forestville Road Eastbound			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
16:00	2	23	25	28	16	44	28	4	32	101
16:15	7	35	42	36	12	48	23	4	27	117
16:30	3	31	34	34	15	49	25	9	34	117
16:45	3	22	25	30	18	48	26	10	36	109
Total	15	111	126	128	61	189	102	27	129	444
17:00	3	35	38	34	17	51	22	8	30	119
17:15	8	40	48	44	15	59	25	13	38	145
17:30	5	28	33	51	29	80	18	10	28	141
17:45	1	39	40	48	15	63	17	6	23	126
Total	17	142	159	177	76	253	82	37	119	531
Grand Total	32	253	285	305	137	442	184	64	248	975
Apprch %	11.2	88.8		69	31		74.2	25.8		
Total %	3.3	25.9	29.2	31.3	14.1	45.3	18.9	6.6	25.4	
Cars +	32	252	284	303	137	440	182	64	246	970
% Cars +	100	99.6	99.6	99.3	100	99.5	98.9	100	99.2	99.5
Trucks	0	1	1	2	0	2	2	0	2	5
% Trucks	0	0.4	0.4	0.7	0	0.5	1.1	0	0.8	0.5

TRAFFIC DATA COLLECTION

File Name : Knightdale(Old Knight and Forestville)PM peak
Site Code :
Start Date : 11/18/2020
Page No : 2

	Old Knight Road Southbound			Old Knight Road Northbound			Forestville Road Eastbound			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 17:00										
17:00	3	35	38	34	17	51	22	8	30	119
17:15	**8**	**40**	**48**	44	15	59	**25**	**13**	**38**	**145**
17:30	5	28	33	**51**	**29**	**80**	18	10	28	141
17:45	1	39	40	48	15	63	17	6	23	126
Total Volume	17	142	159	177	76	253	82	37	119	531
% App. Total	10.7	89.3		70	30		68.9	31.1		
PHF	.531	.888	.828	.868	.655	.791	.820	.712	.783	.916



TRAFFIC DATA COLLECTION

File Name : Knightdale(Old Knight and Haywood)AM Peak
Site Code :
Start Date : 11/18/2020
Page No : 1

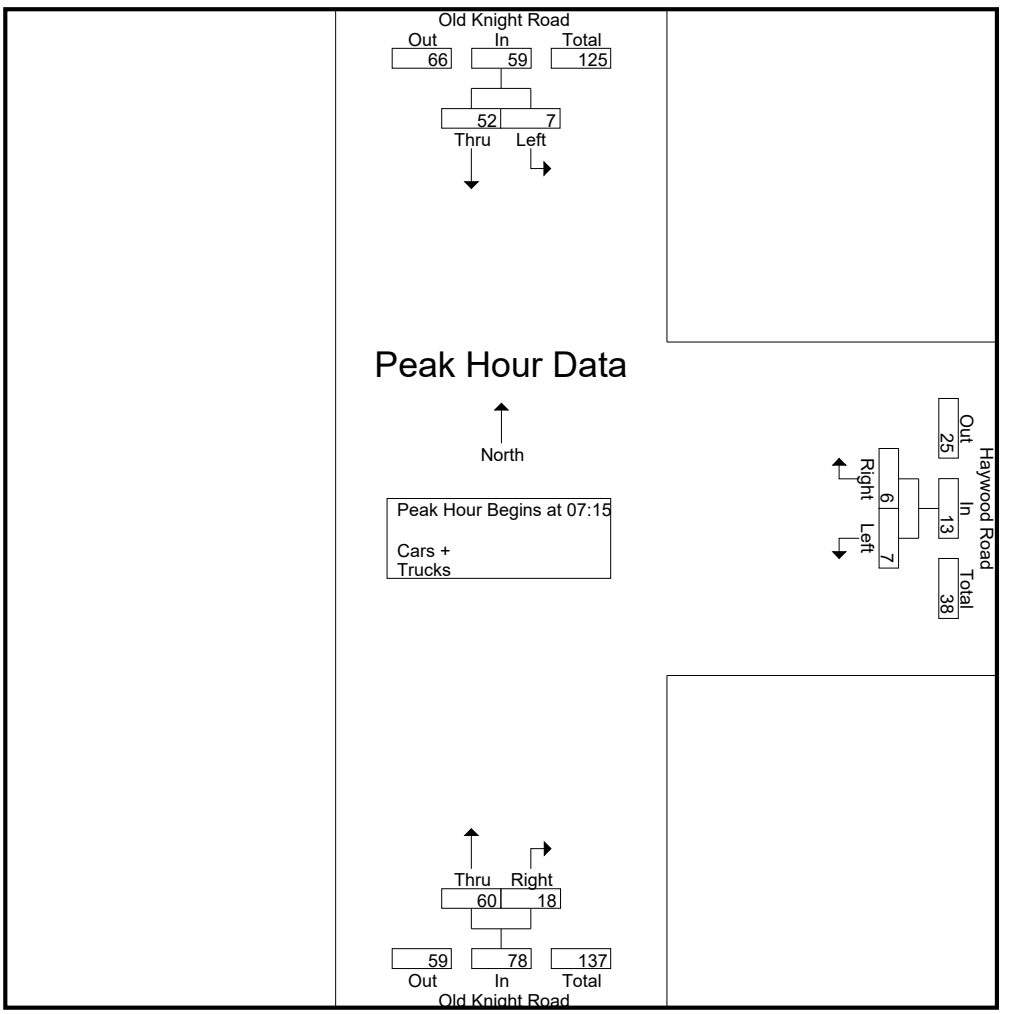
Groups Printed- Cars + - Trucks

	Old Knight Road Southbound			Haywood Road Westbound			Old Knight Road Northbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
07:00	17	1	18	1	1	2	4	9	13	33
07:15	11	1	12	4	3	7	5	11	16	35
07:30	15	1	16	0	1	1	2	22	24	41
07:45	12	4	16	2	1	3	3	10	13	32
Total	55	7	62	7	6	13	14	52	66	141
08:00	14	1	15	0	2	2	8	17	25	42
08:15	8	1	9	1	3	4	1	15	16	29
08:30	8	0	8	0	2	2	5	14	19	29
08:45	7	3	10	0	2	2	2	13	15	27
Total	37	5	42	1	9	10	16	59	75	127
Grand Total	92	12	104	8	15	23	30	111	141	268
Apprch %	88.5	11.5		34.8	65.2		21.3	78.7		
Total %	34.3	4.5	38.8	3	5.6	8.6	11.2	41.4	52.6	
Cars +	92	11	103	7	14	21	30	111	141	265
% Cars +	100	91.7	99	87.5	93.3	91.3	100	100	100	98.9
Trucks	0	1	1	1	1	2	0	0	0	3
% Trucks	0	8.3	1	12.5	6.7	8.7	0	0	0	1.1

TRAFFIC DATA COLLECTION

File Name : Knightdale(Old Knight and Haywood)AM Peak
Site Code :
Start Date : 11/18/2020
Page No : 2

	Old Knight Road Southbound			Haywood Road Westbound			Old Knight Road Northbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:15										
07:15	11	1	12	**4**	**3**	**7**	5	11	16	35
07:30	**15**	1	**16**	0	1	1	2	**22**	24	41
07:45	12	**4**	16	2	1	3	3	10	13	32
08:00	14	1	15	0	2	2	**8**	17	**25**	**42**
Total Volume	52	7	59	6	7	13	18	60	78	150
% App. Total	88.1	11.9		46.2	53.8		23.1	76.9		
PHF	.867	.438	.922	.375	.583	.464	.563	.682	.780	.893



File Name : Knightdale(Old Knight and Haywood)PM Peak
Site Code :
Start Date : 11/18/2020
Page No : 1

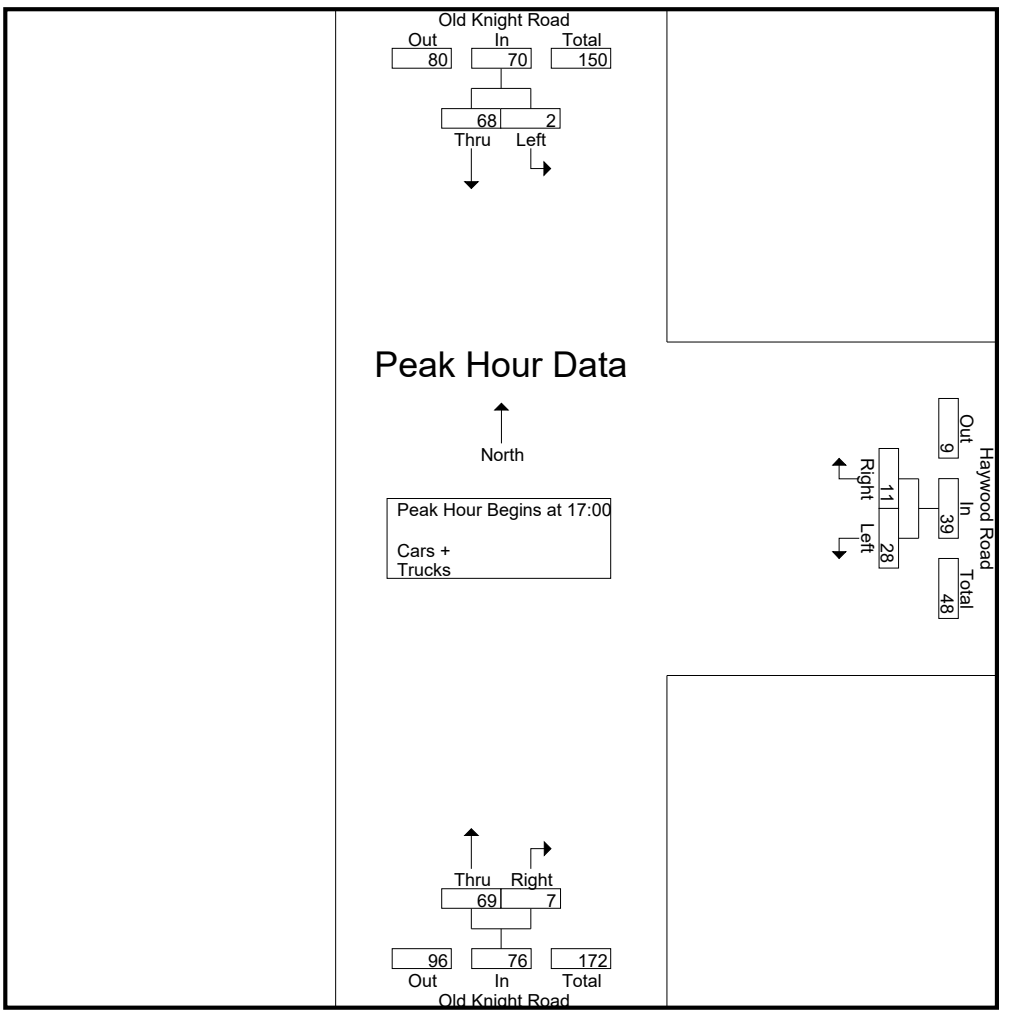
Groups Printed- Cars + - Trucks

	Old Knight Road Southbound			Haywood Road Westbound			Old Knight Road Northbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
16:00	10	1	11	2	3	5	2	13	15	31
16:15	19	0	19	2	4	6	1	13	14	39
16:30	14	1	15	3	4	7	3	20	23	45
16:45	8	0	8	4	5	9	1	10	11	28
Total	51	2	53	11	16	27	7	56	63	143
17:00	16	1	17	4	9	13	0	19	19	49
17:15	20	0	20	5	9	14	4	13	17	51
17:30	21	0	21	1	7	8	1	22	23	52
17:45	11	1	12	1	3	4	2	15	17	33
Total	68	2	70	11	28	39	7	69	76	185
Grand Total	119	4	123	22	44	66	14	125	139	328
Apprch %	96.7	3.3		33.3	66.7		10.1	89.9		
Total %	36.3	1.2	37.5	6.7	13.4	20.1	4.3	38.1	42.4	
Cars +	119	4	123	21	43	64	14	125	139	326
% Cars +	100	100	100	95.5	97.7	97	100	100	100	99.4
Trucks	0	0	0	1	1	2	0	0	0	2
% Trucks	0	0	0	4.5	2.3	3	0	0	0	0.6

TRAFFIC DATA COLLECTION

File Name : Knightdale(Old Knight and Haywood)PM Peak
Site Code :
Start Date : 11/18/2020
Page No : 2

	Old Knight Road Southbound			Haywood Road Westbound			Old Knight Road Northbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 17:00										
17:00	16	**1**	17	4	**9**	13	0	19	19	49
17:15	20	0	20	**5**	9	**14**	**4**	13	17	51
17:30	**21**	0	**21**	1	7	8	1	**22**	**23**	**52**
17:45	11	1	12	1	3	4	2	15	17	33
Total Volume	68	2	70	11	28	39	7	69	76	185
% App. Total	97.1	2.9		28.2	71.8		9.2	90.8		
PHF	.810	.500	.833	.550	.778	.696	.438	.784	.826	.889



TRAFFIC DATA COLLECTION

File Name : Knightdale(Old Knight and Horton)AM Peak
Site Code :
Start Date : 11/18/2020
Page No : 1

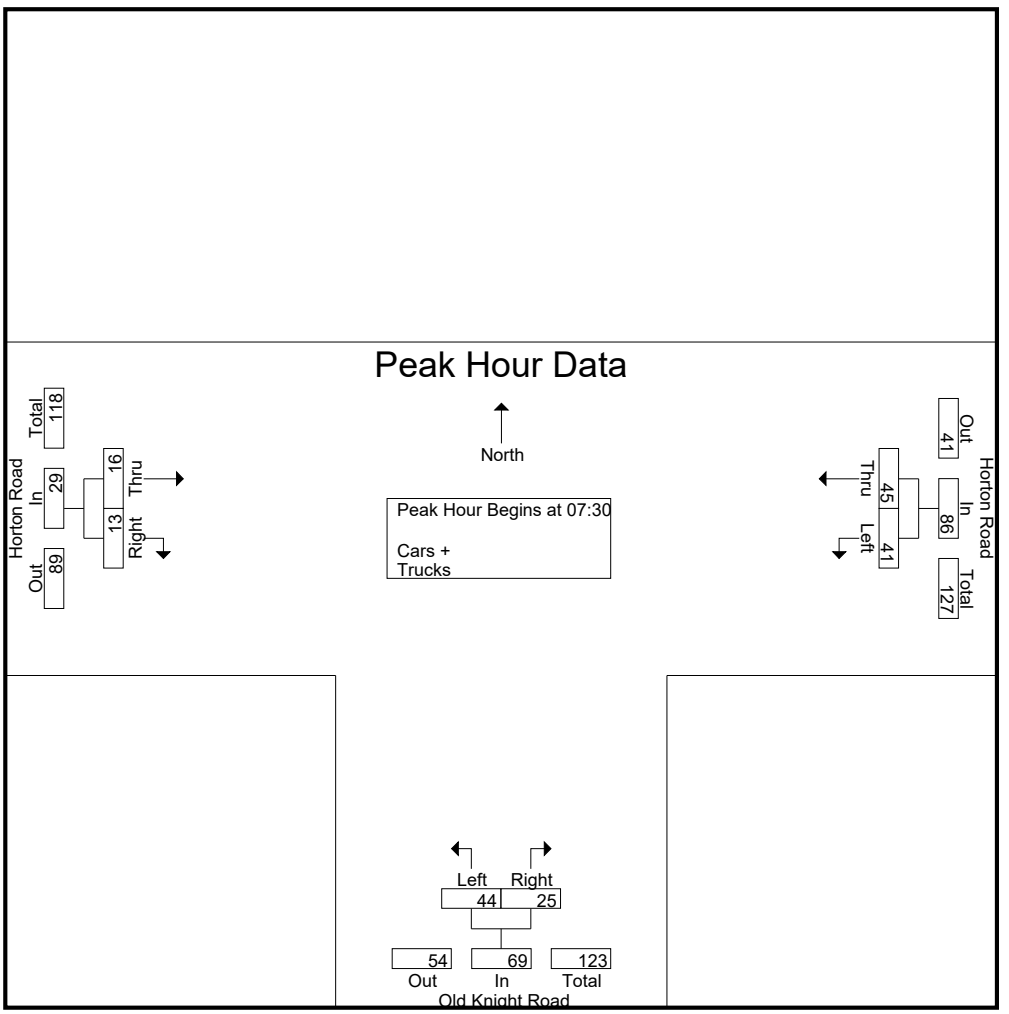
Groups Printed- Cars + - Trucks

	Horton Road Westbound			Old Knight Road Northbound			Horton Road Eastbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
07:00	6	15	21	4	8	12	1	3	4	37
07:15	7	9	16	5	10	15	4	2	6	37
07:30	9	12	21	8	12	20	2	2	4	45
07:45	13	11	24	6	10	16	5	6	11	51
Total	35	47	82	23	40	63	12	13	25	170
08:00	12	9	21	7	9	16	6	4	10	47
08:15	11	9	20	4	13	17	0	4	4	41
08:30	6	6	12	6	8	14	2	2	4	30
08:45	7	4	11	7	5	12	7	7	14	37
Total	36	28	64	24	35	59	15	17	32	155
Grand Total	71	75	146	47	75	122	27	30	57	325
Apprch %	48.6	51.4		38.5	61.5		47.4	52.6		
Total %	21.8	23.1	44.9	14.5	23.1	37.5	8.3	9.2	17.5	
Cars +	71	74	145	46	75	121	27	28	55	321
% Cars +	100	98.7	99.3	97.9	100	99.2	100	93.3	96.5	98.8
Trucks	0	1	1	1	0	1	0	2	2	4
% Trucks	0	1.3	0.7	2.1	0	0.8	0	6.7	3.5	1.2

TRAFFIC DATA COLLECTION

File Name : Knightdale(Old Knight and Horton)AM Peak
Site Code :
Start Date : 11/18/2020
Page No : 2

	Horton Road Westbound			Old Knight Road Northbound			Horton Road Eastbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:30										
07:30	9	**12**	21	**8**	12	**20**	2	2	4	45
07:45	**13**	11	**24**	6	10	16	5	**6**	**11**	**51**
08:00	12	9	21	7	9	16	**6**	4	10	47
08:15	11	9	20	4	**13**	17	0	4	4	41
Total Volume	45	41	86	25	44	69	13	16	29	184
% App. Total	52.3	47.7		36.2	63.8		44.8	55.2		
PHF	.865	.854	.896	.781	.846	.863	.542	.667	.659	.902



TRAFFIC DATA COLLECTION

File Name : Knightdale(Old Knight and Horton)PM Peak
Site Code :
Start Date : 11/18/2020
Page No : 1

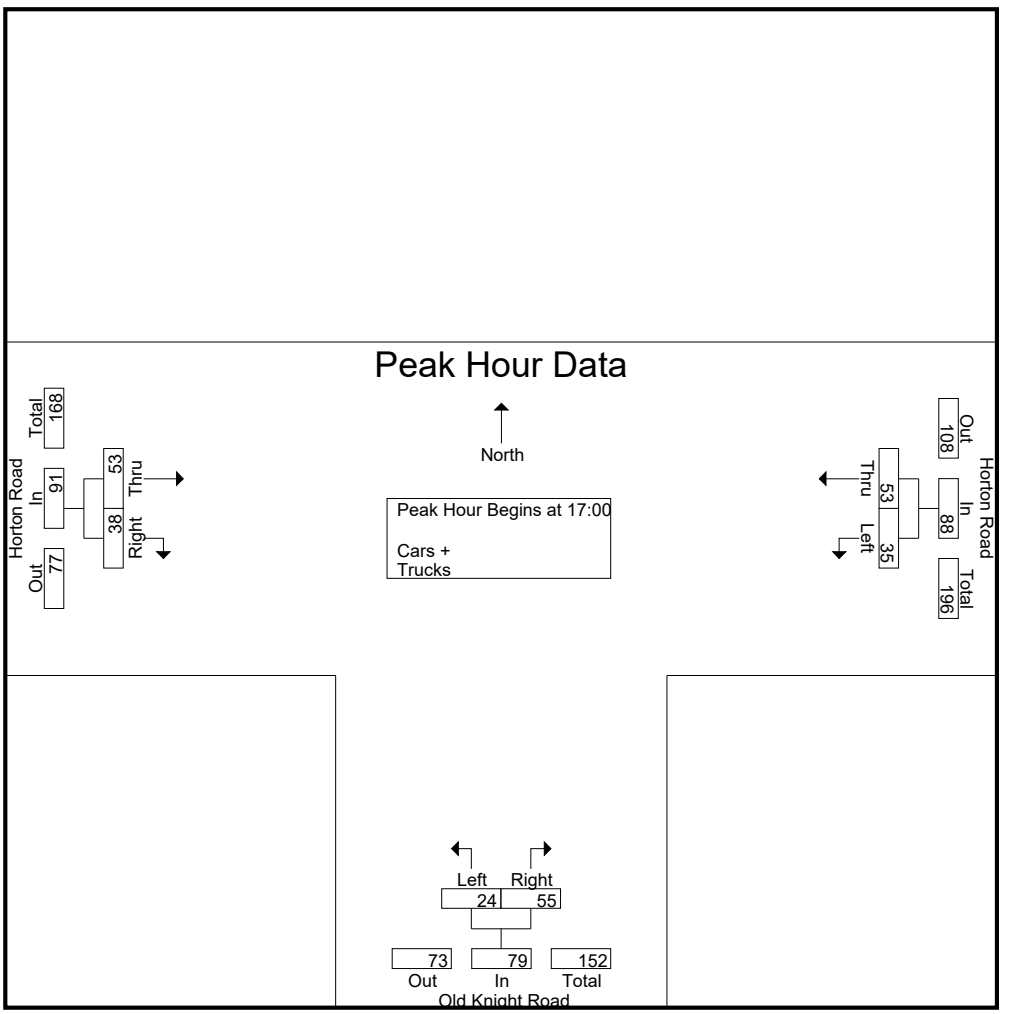
Groups Printed- Cars + - Trucks

	Horton Road Westbound			Old Knight Road Northbound			Horton Road Eastbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
16:00	7	4	11	7	6	13	7	13	20	44
16:15	12	10	22	10	5	15	10	14	24	61
16:30	6	6	12	16	7	23	8	8	16	51
16:45	13	4	17	9	4	13	5	14	19	49
Total	38	24	62	42	22	64	30	49	79	205
17:00	12	9	21	15	7	22	9	15	24	67
17:15	14	12	26	10	7	17	9	15	24	67
17:30	14	10	24	19	6	25	10	11	21	70
17:45	13	4	17	11	4	15	10	12	22	54
Total	53	35	88	55	24	79	38	53	91	258
Grand Total	91	59	150	97	46	143	68	102	170	463
Apprch %	60.7	39.3		67.8	32.2		40	60		
Total %	19.7	12.7	32.4	21	9.9	30.9	14.7	22	36.7	
Cars +	91	59	150	96	45	141	68	101	169	460
% Cars +	100	100	100	99	97.8	98.6	100	99	99.4	99.4
Trucks	0	0	0	1	1	2	0	1	1	3
% Trucks	0	0	0	1	2.2	1.4	0	1	0.6	0.6

TRAFFIC DATA COLLECTION

File Name : Knightdale(Old Knight and Horton)PM Peak
Site Code :
Start Date : 11/18/2020
Page No : 2

	Horton Road Westbound			Old Knight Road Northbound			Horton Road Eastbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 17:00										
17:00	12	9	21	15	**7**	22	9	**15**	**24**	67
17:15	**14**	**12**	**26**	10	7	17	9	15	24	67
17:30	14	10	24	**19**	6	**25**	**10**	11	21	**70**
17:45	13	4	17	11	4	15	10	12	22	54
Total Volume	53	35	88	55	24	79	38	53	91	258
% App. Total	60.2	39.8		69.6	30.4		41.8	58.2		
PHF	.946	.729	.846	.724	.857	.790	.950	.883	.948	.921



TRAFFIC DATA COLLECTION

File Name : Knightdale(Old Knight and Star Ruby)AM Peak
Site Code :
Start Date : 11/18/2020
Page No : 1

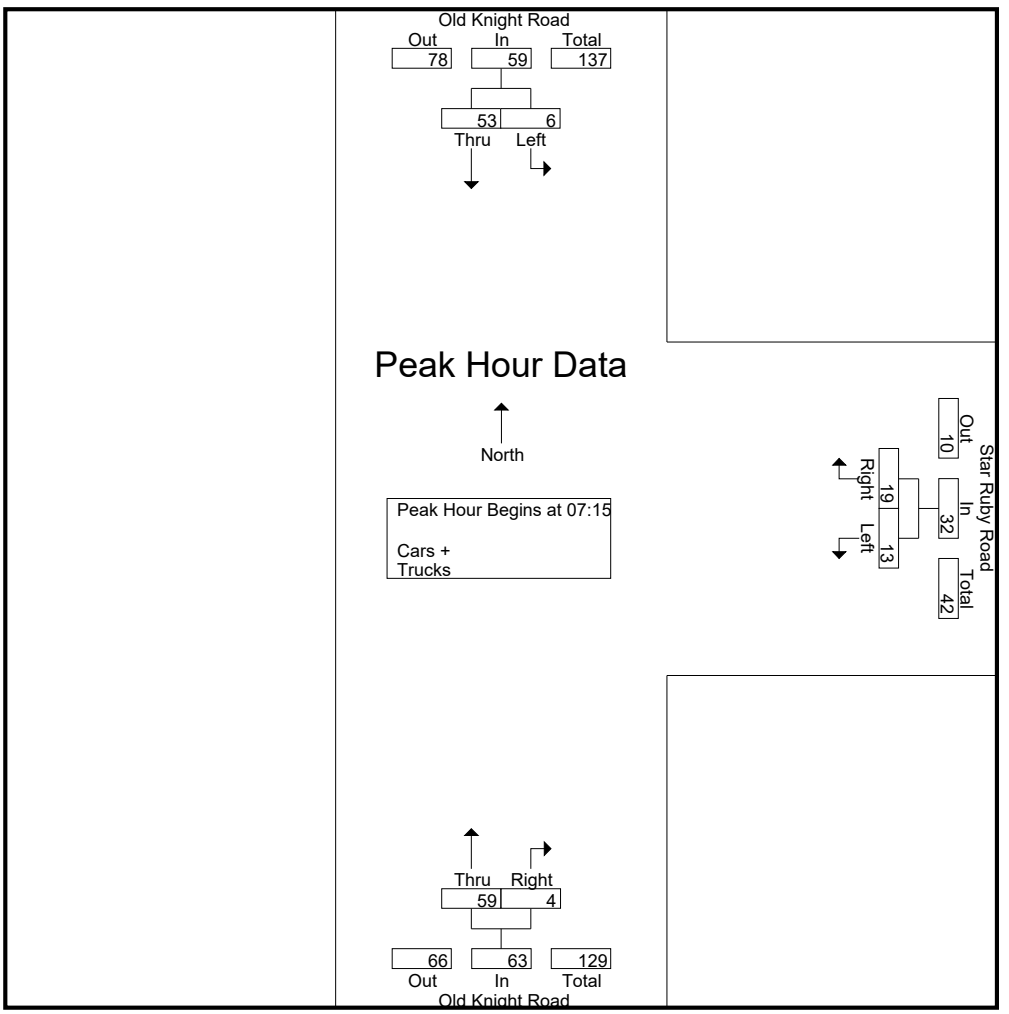
Groups Printed- Cars + - Trucks

	Old Knight Road Southbound			Star Ruby Road Westbound			Old Knight Road Northbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
07:00	16	2	18	7	3	10	0	9	9	37
07:15	13	1	14	4	7	11	2	11	13	38
07:30	15	0	15	10	2	12	1	16	17	44
07:45	12	2	14	1	0	1	1	11	12	27
Total	56	5	61	22	12	34	4	47	51	146
08:00	13	3	16	4	4	8	0	21	21	45
08:15	11	0	11	6	3	9	0	10	10	30
08:30	9	0	9	6	1	7	3	13	16	32
08:45	9	1	10	5	0	5	0	10	10	25
Total	42	4	46	21	8	29	3	54	57	132
Grand Total	98	9	107	43	20	63	7	101	108	278
Apprch %	91.6	8.4		68.3	31.7		6.5	93.5		
Total %	35.3	3.2	38.5	15.5	7.2	22.7	2.5	36.3	38.8	
Cars +	98	9	107	43	20	63	7	100	107	277
% Cars +	100	100	100	100	100	100	100	99	99.1	99.6
Trucks	0	0	0	0	0	0	0	1	1	1
% Trucks	0	0	0	0	0	0	0	1	0.9	0.4

TRAFFIC DATA COLLECTION

File Name : Knightdale(Old Knight and Star Ruby)AM Peak
Site Code :
Start Date : 11/18/2020
Page No : 2

	Old Knight Road Southbound			Star Ruby Road Westbound			Old Knight Road Northbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:15										
07:15	13	1	14	4	**7**	11	**2**	11	13	38
07:30	**15**	0	15	**10**	2	**12**	1	16	17	44
07:45	12	2	14	1	0	1	1	11	12	27
08:00	13	**3**	**16**	4	4	8	0	**21**	**21**	**45**
Total Volume	53	6	59	19	13	32	4	59	63	154
% App. Total	89.8	10.2		59.4	40.6		6.3	93.7		
PHF	.883	.500	.922	.475	.464	.667	.500	.702	.750	.856



TRAFFIC DATA COLLECTION

File Name : Knightdale(Old Knight and Star Ruby)PM Peak
Site Code :
Start Date : 11/18/2020
Page No : 1

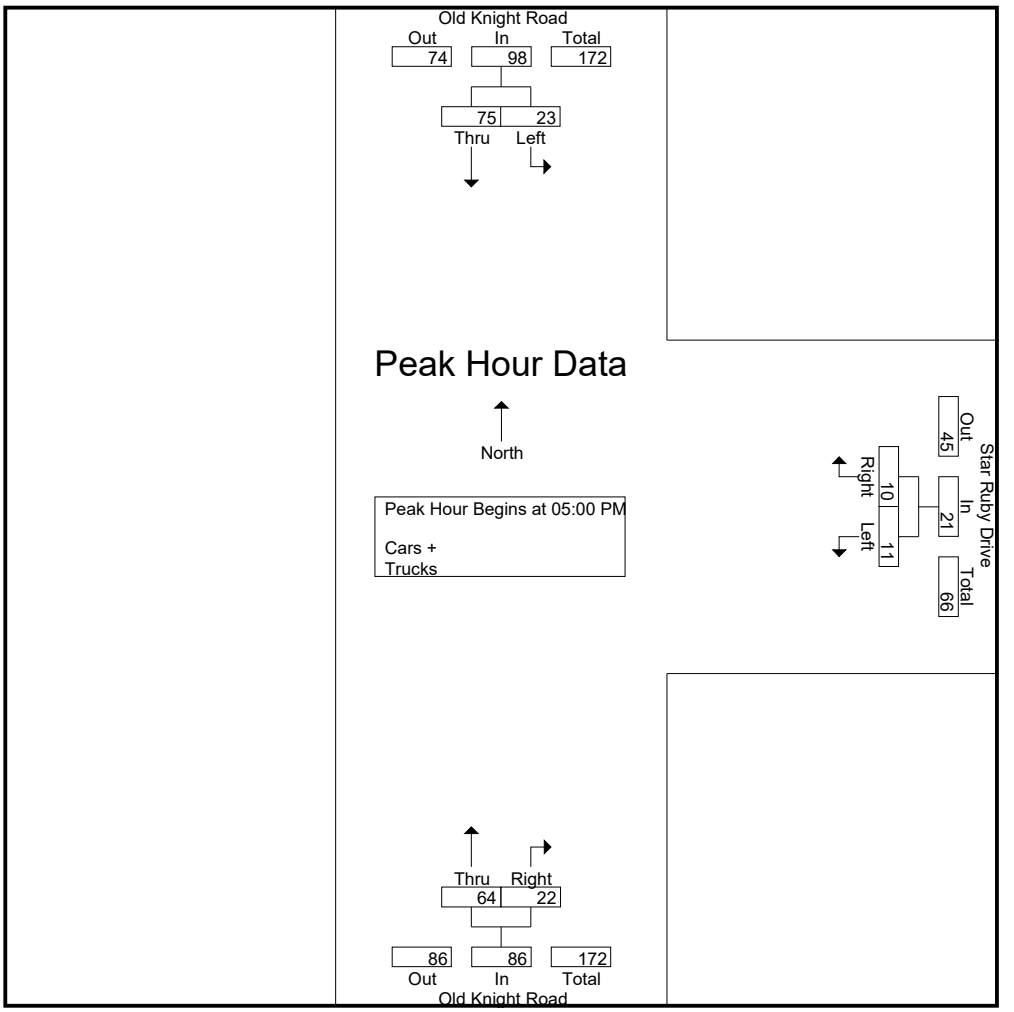
Groups Printed- Cars + - Trucks

	Old Knight Road Southbound			Star Ruby Drive Westbound			Old Knight Road Northbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
04:00 PM	7	3	10	5	1	6	1	10	11	27
04:15 PM	19	6	25	1	6	7	4	15	19	51
04:30 PM	14	5	19	0	3	3	2	21	23	45
04:45 PM	9	3	12	1	2	3	4	10	14	29
Total	49	17	66	7	12	19	11	56	67	152
05:00 PM	20	5	25	3	3	6	5	16	21	52
05:15 PM	25	6	31	1	2	3	3	15	18	52
05:30 PM	20	6	26	3	1	4	8	19	27	57
05:45 PM	10	6	16	3	5	8	6	14	20	44
Total	75	23	98	10	11	21	22	64	86	205
Grand Total	124	40	164	17	23	40	33	120	153	357
Apprch %	75.6	24.4		42.5	57.5		21.6	78.4		
Total %	34.7	11.2	45.9	4.8	6.4	11.2	9.2	33.6	42.9	
Cars +	124	40	164	17	23	40	33	120	153	357
% Cars +	100	100	100	100	100	100	100	100	100	100
Trucks	0	0	0	0	0	0	0	0	0	0
% Trucks	0	0	0	0	0	0	0	0	0	0

TRAFFIC DATA COLLECTION

File Name : Knightdale(Old Knight and Star Ruby)PM Peak
Site Code :
Start Date : 11/18/2020
Page No : 2

	Old Knight Road Southbound			Star Ruby Drive Westbound			Old Knight Road Northbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:00 PM										
05:00 PM	20	5	25	**3**	3	6	5	16	21	52
05:15 PM	**25**	**6**	**31**	1	2	3	3	15	18	52
05:30 PM	20	6	26	3	1	4	**8**	**19**	**27**	**57**
05:45 PM	10	6	16	3	**5**	**8**	6	14	20	44
Total Volume	75	23	98	10	11	21	22	64	86	205
% App. Total	76.5	23.5		47.6	52.4		25.6	74.4		
PHF	.750	.958	.790	.833	.550	.656	.688	.842	.796	.899



TRAFFIC DATA COLLECTION

File Name : Knightdale(Old Knight and US-64 Bus)AM peak
Site Code :
Start Date : 11/18/2020
Page No : 1

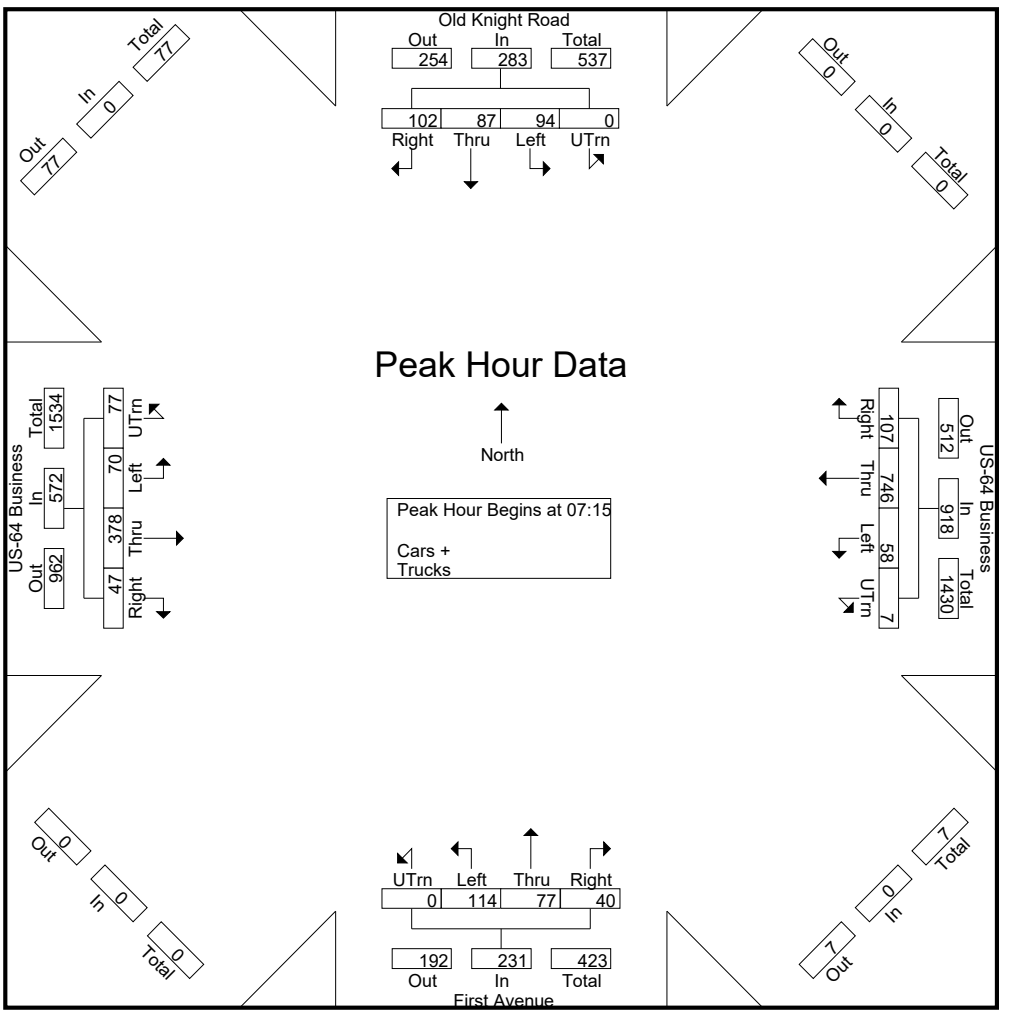
Groups Printed- Cars + - Trucks

	Old Knight Road Southbound					US-64 Business Westbound					First Avenue Northbound					US-64 Business Eastbound					
Start Time	Right	Thru	Left	UTrn	App. Total	Right	Thru	Left	UTrn	App. Total	Right	Thru	Left	UTrn	App. Total	Right	Thru	Left	UTrn	App. Total	Int. Total
07:00	25	11	16	0	52	20	138	12	2	172	6	11	18	0	35	4	70	16	17	107	366
07:15	18	25	28	0	71	25	171	17	1	214	11	11	21	0	43	9	94	13	14	130	458
07:30	23	33	28	0	84	34	225	17	2	278	10	23	33	0	66	11	108	16	19	154	582
07:45	34	13	16	0	63	30	178	15	2	225	12	31	35	0	78	13	95	30	26	164	530
Total	100	82	88	0	270	109	712	61	7	889	39	76	107	0	222	37	367	75	76	555	1936
08:00	27	16	22	0	65	18	172	9	2	201	7	12	25	0	44	14	81	11	18	124	434
08:15	24	20	30	0	74	17	132	7	3	159	17	22	27	0	66	12	75	13	16	116	415
08:30	24	14	15	0	53	20	164	8	1	193	12	13	21	0	46	9	83	20	11	123	415
08:45	21	22	14	0	57	17	180	15	1	213	18	13	22	0	53	11	72	8	16	107	430
Total	96	72	81	0	249	72	648	39	7	766	54	60	95	0	209	46	311	52	61	470	1694
Grand Total	196	154	169	0	519	181	1360	100	14	1655	93	136	202	0	431	83	678	127	137	1025	3630
Apprch %	37.8	29.7	32.6	0		10.9	82.2	6	0.8		21.6	31.6	46.9	0		8.1	66.1	12.4	13.4		
Total %	5.4	4.2	4.7	0	14.3	5	37.5	2.8	0.4	45.6	2.6	3.7	5.6	0	11.9	2.3	18.7	3.5	3.8	28.2	
Cars +	195	154	166	0	515	175	1296	95	14	1580	89	134	198	0	421	83	621	126	137	967	3483
% Cars +	99.5	100	98.2	0	99.2	96.7	95.3	95	100	95.5	95.7	98.5	98	0	97.7	100	91.6	99.2	100	94.3	96
Trucks	1	0	3	0	4	6	64	5	0	75	4	2	4	0	10	0	57	1	0	58	147
% Trucks	0.5	0	1.8	0	0.8	3.3	4.7	5	0	4.5	4.3	1.5	2	0	2.3	0	8.4	0.8	0	5.7	4

TRAFFIC DATA COLLECTION

File Name : Knightdale(Old Knight and US-64 Bus)AM peak
Site Code :
Start Date : 11/18/2020
Page No : 2

	Old Knight Road Southbound					US-64 Business Westbound					First Avenue Northbound					US-64 Business Eastbound					
Start Time	Right	Thru	Left	UTrn	App. Total	Right	Thru	Left	UTrn	App. Total	Right	Thru	Left	UTrn	App. Total	Right	Thru	Left	UTrn	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15																					
07:15	18	25	**28**	0	71	25	171	**17**	1	214	11	11	21	0	43	9	94	13	14	130	458
07:30	23	**33**	28	0	**84**	**34**	**225**	17	**2**	**278**	10	23	33	0	66	11	**108**	16	19	154	**582**
07:45	**34**	13	16	0	63	30	178	15	2	225	**12**	**31**	**35**	0	**78**	13	95	**30**	**26**	**164**	530
08:00	27	16	22	0	65	18	172	9	2	201	7	12	25	0	44	**14**	81	11	18	124	434
Total Volume	102	87	94	0	283	107	746	58	7	918	40	77	114	0	231	47	378	70	77	572	2004
% App. Total	36	30.7	33.2	0		11.7	81.3	6.3	0.8		17.3	33.3	49.4	0		8.2	66.1	12.2	13.5		
PHF	.750	.659	.839	.000	.842	.787	.829	.853	.875	.826	.833	.621	.814	.000	.740	.839	.875	.583	.740	.872	.861



TRAFFIC DATA COLLECTION

File Name : Knightdale(Old Knight and US-64 Bus)PM Peak
Site Code :
Start Date : 11/18/2020
Page No : 1

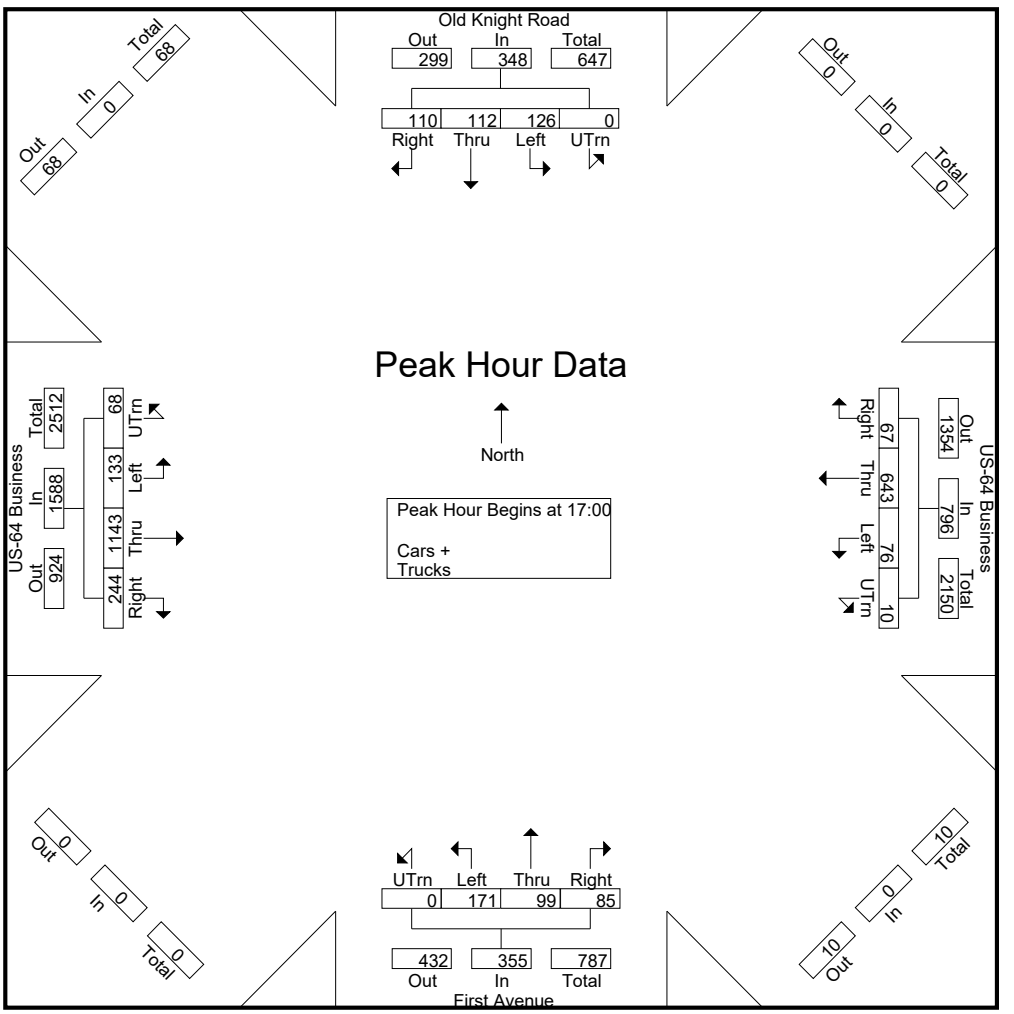
Groups Printed- Cars + - Trucks

	Old Knight Road Southbound					US-64 Business Westbound					First Avenue Northbound					US-64 Business Eastbound					
Start Time	Right	Thru	Left	UTrn	App. Total	Right	Thru	Left	UTrn	App. Total	Right	Thru	Left	UTrn	App. Total	Right	Thru	Left	UTrn	App. Total	Int. Total
16:00	23	29	23	0	75	13	154	10	1	178	11	15	35	0	61	30	224	19	20	293	607
16:15	19	21	29	0	69	9	162	15	12	198	12	19	28	0	59	29	206	22	14	271	597
16:30	26	29	17	0	72	15	148	20	0	183	19	16	33	0	68	32	258	36	27	353	676
16:45	18	33	21	0	72	16	197	28	1	242	17	16	27	0	60	43	271	21	16	351	725
Total	86	112	90	0	288	53	661	73	14	801	59	66	123	0	248	134	959	98	77	1268	2605
17:00	33	32	40	0	105	14	160	19	4	197	26	31	45	0	102	48	265	26	17	356	760
17:15	28	19	32	0	79	14	171	24	4	213	19	23	43	0	85	58	328	38	25	449	826
17:30	23	39	27	0	89	24	146	19	1	190	21	26	47	0	94	66	268	33	17	384	757
17:45	26	22	27	0	75	15	166	14	1	196	19	19	36	0	74	72	282	36	9	399	744
Total	110	112	126	0	348	67	643	76	10	796	85	99	171	0	355	244	1143	133	68	1588	3087
Grand Total	196	224	216	0	636	120	1304	149	24	1597	144	165	294	0	603	378	2102	231	145	2856	5692
Apprch %	30.8	35.2	34	0		7.5	81.7	9.3	1.5		23.9	27.4	48.8	0		13.2	73.6	8.1	5.1		
Total %	3.4	3.9	3.8	0	11.2	2.1	22.9	2.6	0.4	28.1	2.5	2.9	5.2	0	10.6	6.6	36.9	4.1	2.5	50.2	
Cars +	194	223	216	0	633	120	1280	148	24	1572	143	164	293	0	600	375	2060	231	145	2811	5616
% Cars +	99	99.6	100	0	99.5	100	98.2	99.3	100	98.4	99.3	99.4	99.7	0	99.5	99.2	98	100	100	98.4	98.7
Trucks	2	1	0	0	3	0	24	1	0	25	1	1	1	0	3	3	42	0	0	45	76
% Trucks	1	0.4	0	0	0.5	0	1.8	0.7	0	1.6	0.7	0.6	0.3	0	0.5	0.8	2	0	0	1.6	1.3

TRAFFIC DATA COLLECTION

File Name : Knightdale(Old Knight and US-64 Bus)PM Peak
Site Code :
Start Date : 11/18/2020
Page No : 2

	Old Knight Road Southbound					US-64 Business Westbound					First Avenue Northbound					US-64 Business Eastbound					
Start Time	Right	Thru	Left	UTrn	App. Total	Right	Thru	Left	UTrn	App. Total	Right	Thru	Left	UTrn	App. Total	Right	Thru	Left	UTrn	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 17:00																					
17:00	**33**	32	**40**	0	**105**	14	160	19	**4**	197	**26**	**31**	45	0	**102**	48	265	26	17	356	760
17:15	28	19	32	0	79	14	**171**	**24**	4	**213**	19	23	43	0	85	58	**328**	**38**	**25**	**449**	**826**
17:30	23	**39**	27	0	89	**24**	146	19	1	190	21	26	**47**	0	94	66	268	33	17	384	757
17:45	26	22	27	0	75	15	166	14	1	196	19	19	36	0	74	**72**	282	36	9	399	744
Total Volume	110	112	126	0	348	67	643	76	10	796	85	99	171	0	355	244	1143	133	68	1588	3087
% App. Total	31.6	32.2	36.2	0		8.4	80.8	9.5	1.3		23.9	27.9	48.2	0		15.4	72	8.4	4.3		
PHF	.833	.718	.788	.000	.829	.698	.940	.792	.625	.934	.817	.798	.910	.000	.870	.847	.871	.875	.680	.884	.934



Daily Vehicle Volume Report

Study Date: Wednesday, 11/18/2020
Unit ID: Knightdale 1
Location: Knightdale

	Eastbound Volume	Westbound Volume	Total Volume
00:00 - 00:59	2	0	**2**
01:00 - 01:59	0	5	**5**
02:00 - 02:59	3	1	**4**
03:00 - 03:59	1	1	**2**
04:00 - 04:59	0	6	**6**
05:00 - 05:59	2	22	**24**
06:00 - 06:59	13	56	**69**
07:00 - 07:59	26	76	**102**
08:00 - 08:59	31	71	**102**
09:00 - 09:59	29	48	**77**
10:00 - 10:59	35	54	**89**
11:00 - 11:59	45	53	**98**
12:00 - 12:59	38	55	**93**
13:00 - 13:59	50	51	**101**
14:00 - 14:59	57	60	**117**
15:00 - 15:59	65	61	**126**
16:00 - 16:59	77	60	**137**
17:00 - 17:59	91	74	**165**
18:00 - 18:59	94	51	**145**
19:00 - 19:59	49	20	**69**
20:00 - 20:59	29	16	**45**
21:00 - 21:59	20	12	**32**
22:00 - 22:59	15	15	**30**
23:00 - 23:59	4	6	**10**
Totals	**776**	**874**	**1650**
AM Peak Time	**10:34 - 11:33**	**07:26 - 08:25**	**07:22 - 08:21**
AM Peak Volume	**47**	**90**	**120**
PM Peak Time	**17:35 - 18:34**	**16:42 - 17:41**	**16:49 - 17:48**
PM Peak Volume	**98**	**78**	**170**

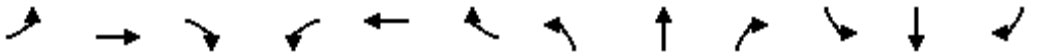
Daily Vehicle Volume Report

Study Date: Thursday, 11/19/2020
Unit ID: Knightdale 1
Location: Knightdale

	Eastbound Volume	Westbound Volume	Total Volume
00:00 - 00:59	2	3	**5**
01:00 - 01:59	0	1	**1**
02:00 - 02:59	3	2	**5**
03:00 - 03:59	0	2	**2**
04:00 - 04:59	1	4	**5**
05:00 - 05:59	0	24	**24**
06:00 - 06:59	24	50	**74**
07:00 - 07:59	45	87	**132**
08:00 - 08:59	38	88	**126**
09:00 - 09:59	41	43	**84**
10:00 - 10:59	33	51	**84**
11:00 - 11:59	30	62	**92**
12:00 - 12:59	55	60	**115**
13:00 - 13:59	60	56	**116**
14:00 - 14:59	64	45	**109**
15:00 - 15:59	65	72	**137**
16:00 - 16:59	81	66	**147**
17:00 - 17:59	84	78	**162**
18:00 - 18:59	65	45	**110**
19:00 - 19:59	37	25	**62**
20:00 - 20:59	21	11	**32**
21:00 - 21:59	23	8	**31**
22:00 - 22:59	9	8	**17**
23:00 - 23:59	12	5	**17**
Totals	**793**	**896**	**1689**
AM Peak Time	**07:23 - 08:22**	**07:43 - 08:42**	**07:24 - 08:23**
AM Peak Volume	**52**	**95**	**144**
PM Peak Time	**17:07 - 18:06**	**16:59 - 17:58**	**16:59 - 17:58**
PM Peak Volume	**90**	**80**	**166**

Appendix C – Synchro / SimTraffic / Sidra

2021 Existing Traffic Volumes

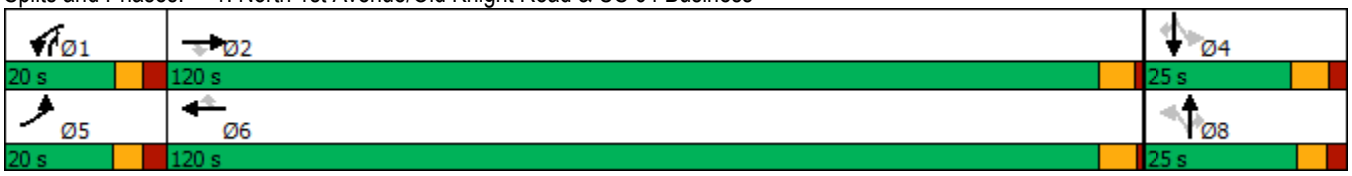


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	177	456	57	78	899	129	137	93	48	113	105	123
Future Volume (vph)	177	456	57	78	899	129	137	93	48	113	105	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			-2%			0%			0%	
Storage Length (ft)	325		250	525		475	75		325	175		150
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1787	3575	1599	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.682			0.690		
Satd. Flow (perm)	1770	3539	1583	1787	3575	1599	1270	1863	1583	1285	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			25			45	
Link Distance (ft)		514			774			489			2211	
Travel Time (s)		7.8			11.7			13.3			33.5	
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)	197	507	63	87	999	143	152	103	53	126	117	137
Shared Lane Traffic (%)												
Lane Group Flow (vph)	197	507	63	87	999	143	152	103	53	126	117	137
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases	5	2		1	6			8	1		4	
Permitted Phases			2			6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	1	4	4	4
Switch Phase												
Minimum Initial (s)	7.0	12.0	12.0	7.0	12.0	12.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	13.8	17.8	17.8	13.5	17.8	17.8	13.5	13.5	13.5	14.0	14.0	14.0
Total Split (s)	20.0	120.0	120.0	20.0	120.0	120.0	25.0	25.0	20.0	25.0	25.0	25.0
Total Split (%)	12.1%	72.7%	72.7%	12.1%	72.7%	72.7%	15.2%	15.2%	12.1%	15.2%	15.2%	15.2%
Maximum Green (s)	13.2	114.2	114.2	13.5	114.2	114.2	18.5	18.5	13.5	18.0	18.0	18.0
Yellow Time (s)	3.8	4.5	4.5	3.5	4.7	4.7	3.8	3.8	3.5	4.5	4.5	4.5
All-Red Time (s)	3.0	1.3	1.3	3.0	1.1	1.1	2.7	2.7	3.0	2.5	2.5	2.5
Lost Time Adjust (s)	-1.8	-0.8	-0.8	-1.5	-0.8	-0.8	-1.5	-1.5	-1.5	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes			
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0	6.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum Gap (s)	1.0	3.2	3.2	1.0	3.2	3.2	1.0	1.0	1.0	1.0	1.0	1.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	15.0	15.0	0.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	30.0	30.0	0.0	30.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Act Effct Green (s)	15.0	33.9	33.9	9.2	28.1	28.1	20.0	20.0	34.3	20.0	20.0	20.0
Actuated g/C Ratio	0.19	0.43	0.43	0.12	0.36	0.36	0.26	0.26	0.44	0.26	0.26	0.26
v/c Ratio	0.58	0.33	0.09	0.41	0.78	0.25	0.47	0.22	0.08	0.38	0.25	0.34
Control Delay	37.4	15.4	13.6	39.2	27.0	18.6	31.3	25.5	14.0	29.3	25.9	27.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.4	15.4	13.6	39.2	27.0	18.6	31.3	25.5	14.0	29.3	25.9	27.6
LOS	D	B	B	D	C	B	C	C	B	C	C	C
Approach Delay		20.9			26.9			26.4			27.6	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	87	81	17	40	223	48	62	39	14	50	45	54
Queue Length 95th (ft)	167	122	41	86	292	88	131	86	37	109	96	113
Internal Link Dist (ft)		434			694			409			2131	
Turn Bay Length (ft)	325		250	525		475	75		325	175		150
Base Capacity (vph)	340	3539	1583	343	3575	1599	325	477	811	329	477	405
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.14	0.04	0.25	0.28	0.09	0.47	0.22	0.07	0.38	0.25	0.34

Intersection Summary			
Area Type:	Other		
Cycle Length: 165			
Actuated Cycle Length: 78.2			
Natural Cycle: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 25.2		Intersection LOS: C	
Intersection Capacity Utilization 61.4%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 1: North 1st Avenue/Old Knight Road & US 64 Business



Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	90	110	117	169	12
Future Vol, veh/h	6	90	110	117	169	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	100	122	130	188	13

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	569	195	201	0	-	0
Stage 1	195	-	-	-	-	-
Stage 2	374	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	484	846	1371	-	-	-
Stage 1	838	-	-	-	-	-
Stage 2	696	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	438	846	1371	-	-	-
Mov Cap-2 Maneuver	438	-	-	-	-	-
Stage 1	758	-	-	-	-	-
Stage 2	696	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.2	3.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1371	-	799	-	-
HCM Lane V/C Ratio	0.089	-	0.134	-	-
HCM Control Delay (s)	7.9	0	10.2	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.3	-	0.5	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	16	23	71	5	7	64
Future Vol, veh/h	16	23	71	5	7	64
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	18	26	79	6	8	71

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	169	82	0	0	85	0
Stage 1	82	-	-	-	-	-
Stage 2	87	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	821	978	-	-	1512	-
Stage 1	941	-	-	-	-	-
Stage 2	936	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	816	978	-	-	1512	-
Mov Cap-2 Maneuver	816	-	-	-	-	-
Stage 1	941	-	-	-	-	-
Stage 2	930	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.2	0	0.7
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	904	1512	-
HCM Lane V/C Ratio	-	-	0.048	0.005	-
HCM Control Delay (s)	-	-	9.2	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	8	7	72	22	8	63
Future Vol, veh/h	8	7	72	22	8	63
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	8	80	24	9	70

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	180	92	0	0	104	0
Stage 1	92	-	-	-	-	-
Stage 2	88	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	810	965	-	-	1488	-
Stage 1	932	-	-	-	-	-
Stage 2	935	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	805	965	-	-	1488	-
Mov Cap-2 Maneuver	805	-	-	-	-	-
Stage 1	932	-	-	-	-	-
Stage 2	929	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.2	0	0.8
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	873	1488	-
HCM Lane V/C Ratio	-	-	0.019	0.006	-
HCM Control Delay (s)	-	-	9.2	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	5.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	19	16	49	54	53	30
Future Vol, veh/h	19	16	49	54	53	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	18	54	60	59	33

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	39	0	198	30
Stage 1	-	-	-	-	30	-
Stage 2	-	-	-	-	168	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1571	-	791	1044
Stage 1	-	-	-	-	993	-
Stage 2	-	-	-	-	862	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1571	-	763	1044
Mov Cap-2 Maneuver	-	-	-	-	763	-
Stage 1	-	-	-	-	993	-
Stage 2	-	-	-	-	831	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.5	9.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	845	-	-	1571	-
HCM Lane V/C Ratio	0.109	-	-	0.035	-
HCM Control Delay (s)	9.8	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	37	84	158	75	10
Future Vol, veh/h	4	37	84	158	75	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	41	93	176	83	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	269	0	-	0	230	181
Stage 1	-	-	-	-	181	-
Stage 2	-	-	-	-	49	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1295	-	-	-	758	862
Stage 1	-	-	-	-	850	-
Stage 2	-	-	-	-	973	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1295	-	-	-	756	862
Mov Cap-2 Maneuver	-	-	-	-	756	-
Stage 1	-	-	-	-	847	-
Stage 2	-	-	-	-	973	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	10.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1295	-	-	-	767
HCM Lane V/C Ratio	0.003	-	-	-	0.123
HCM Control Delay (s)	7.8	0	-	-	10.4
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.4

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	172	148	126	67	105	256	236	119	125	128	66	115
Average Queue (ft)	90	75	47	21	37	161	124	51	67	48	15	53
95th Queue (ft)	152	127	97	53	81	233	203	98	112	102	44	102
Link Distance (ft)		463	463			714	714			419		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	325			250	525			475	75		325	175
Storage Blk Time (%)									9	2		
Queuing Penalty (veh)									12	4		

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	110	107
Average Queue (ft)	38	42
95th Queue (ft)	81	90
Link Distance (ft)	2112	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		150
Storage Blk Time (%)	0	0
Queuing Penalty (veh)	0	0

Intersection: 2: Old Knight Road & Forestville Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	62	49	9
Average Queue (ft)	31	10	0
95th Queue (ft)	50	35	6
Link Distance (ft)	472	2112	164
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Old Knight Road & Star Ruby Drive

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	50	8
Average Queue (ft)	23	0
95th Queue (ft)	46	5
Link Distance (ft)	499	716
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Old Knight Road & Haywood Glen Drive

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	36	6
Average Queue (ft)	12	0
95th Queue (ft)	36	4
Link Distance (ft)	483	1421
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Old Knight Road & Horton Road

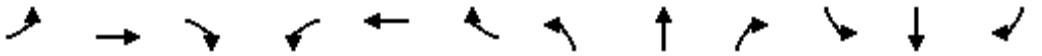
Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	19	58
Average Queue (ft)	1	28
95th Queue (ft)	11	47
Link Distance (ft)	2430	1421
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Horton Road & Buffalo Road

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	15	61
Average Queue (ft)	1	25
95th Queue (ft)	8	45
Link Distance (ft)	1545	500
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 16



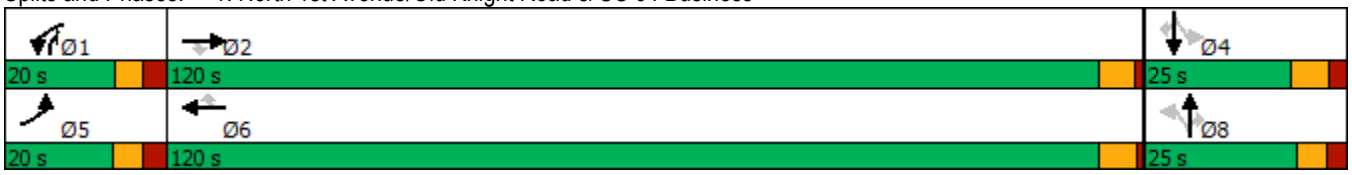
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	242	1377	294	104	775	81	206	119	102	152	135	133
Future Volume (vph)	242	1377	294	104	775	81	206	119	102	152	135	133
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			-2%			0%			0%	
Storage Length (ft)	325		250	525		475	75		325	175		150
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1787	3575	1599	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.595			0.635		
Satd. Flow (perm)	1770	3539	1583	1787	3575	1599	1108	1863	1583	1183	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			25			45	
Link Distance (ft)		514			774			489			2211	
Travel Time (s)		7.8			11.7			13.3			33.5	
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)	269	1530	327	116	861	90	229	132	113	169	150	148
Shared Lane Traffic (%)												
Lane Group Flow (vph)	269	1530	327	116	861	90	229	132	113	169	150	148
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases	5	2		1	6			8	1		4	
Permitted Phases			2			6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	1	4	4	4
Switch Phase												
Minimum Initial (s)	7.0	12.0	12.0	7.0	12.0	12.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	13.8	17.8	17.8	13.5	17.8	17.8	13.5	13.5	13.5	14.0	14.0	14.0
Total Split (s)	20.0	120.0	120.0	20.0	120.0	120.0	25.0	25.0	20.0	25.0	25.0	25.0
Total Split (%)	12.1%	72.7%	72.7%	12.1%	72.7%	72.7%	15.2%	15.2%	12.1%	15.2%	15.2%	15.2%
Maximum Green (s)	13.2	114.2	114.2	13.5	114.2	114.2	18.5	18.5	13.5	18.0	18.0	18.0
Yellow Time (s)	3.8	4.5	4.5	3.5	4.7	4.7	3.8	3.8	3.5	4.5	4.5	4.5
All-Red Time (s)	3.0	1.3	1.3	3.0	1.1	1.1	2.7	2.7	3.0	2.5	2.5	2.5
Lost Time Adjust (s)	-1.8	-0.8	-0.8	-1.5	-0.8	-0.8	-1.5	-1.5	-1.5	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes			
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0	6.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum Gap (s)	1.0	3.2	3.2	1.0	3.2	3.2	1.0	1.0	1.0	1.0	1.0	1.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	15.0	15.0	0.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	30.0	30.0	0.0	30.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Act Effct Green (s)	15.2	50.9	50.9	11.6	47.3	47.3	20.3	20.3	37.1	20.3	20.3	20.3
Actuated g/C Ratio	0.15	0.52	0.52	0.12	0.48	0.48	0.21	0.21	0.38	0.21	0.21	0.21
v/c Ratio	0.98	0.83	0.40	0.55	0.50	0.12	1.00	0.34	0.19	0.69	0.39	0.45
Control Delay	94.1	24.6	15.8	53.6	17.7	13.2	102.3	39.8	24.1	55.6	40.5	42.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	94.1	24.6	15.8	53.6	17.7	13.2	102.3	39.8	24.1	55.6	40.5	42.7
LOS	F	C	B	D	B	B	F	D	C	E	D	D
Approach Delay		32.0			21.2			66.2			46.7	
Approach LOS		C			C			E			D	
Queue Length 50th (ft)	170	401	117	69	182	29	~147	71	47	99	82	82
Queue Length 95th (ft)	#412	525	188	144	228	54	#368	151	105	#247	170	172
Internal Link Dist (ft)		434			694			409			2131	
Turn Bay Length (ft)	325		250	525		475	75		325	175		150
Base Capacity (vph)	275	3529	1578	277	3564	1594	229	386	656	245	386	328
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.43	0.21	0.42	0.24	0.06	1.00	0.34	0.17	0.69	0.39	0.45

Intersection Summary

Area Type: Other
Cycle Length: 165
Actuated Cycle Length: 98.1
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 34.8 Intersection LOS: C
Intersection Capacity Utilization 79.1% ICU Level of Service D
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: North 1st Avenue/Old Knight Road & US 64 Business



Intersection	
Int Delay, s/veh	4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	45	99	92	213	171	20
Future Vol, veh/h	45	99	92	213	171	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	50	110	102	237	190	22

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	642	201	212	0	-	0
Stage 1	201	-	-	-	-	-
Stage 2	441	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	438	840	1358	-	-	-
Stage 1	833	-	-	-	-	-
Stage 2	648	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	400	840	1358	-	-	-
Mov Cap-2 Maneuver	400	-	-	-	-	-
Stage 1	761	-	-	-	-	-
Stage 2	648	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.7	2.4	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1358	-	625	-	-
HCM Lane V/C Ratio	0.075	-	0.256	-	-
HCM Control Delay (s)	7.9	0	12.7	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.2	-	1	-	-

Intersection	
Int Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	12	77	27	28	90
Future Vol, veh/h	13	12	77	27	28	90
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	14	13	86	30	31	100

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	263	101	0	0	116	0
Stage 1	101	-	-	-	-	-
Stage 2	162	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	726	954	-	-	1473	-
Stage 1	923	-	-	-	-	-
Stage 2	867	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	710	954	-	-	1473	-
Mov Cap-2 Maneuver	710	-	-	-	-	-
Stage 1	923	-	-	-	-	-
Stage 2	848	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.6	0	1.8
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	809	1473	-
HCM Lane V/C Ratio	-	-	0.034	0.021	-
HCM Control Delay (s)	-	-	9.6	7.5	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

Intersection	
Int Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	34	13	83	8	4	82
Future Vol, veh/h	34	13	83	8	4	82
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	14	92	9	4	91

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	196	97	0	0	101	0
Stage 1	97	-	-	-	-	-
Stage 2	99	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	793	959	-	-	1491	-
Stage 1	927	-	-	-	-	-
Stage 2	925	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	791	959	-	-	1491	-
Mov Cap-2 Maneuver	791	-	-	-	-	-
Stage 1	927	-	-	-	-	-
Stage 2	922	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.6	0	0.3
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	831	1491	-
HCM Lane V/C Ratio	-	-	0.063	0.003	-
HCM Control Delay (s)	-	-	9.6	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	64	46	42	64	29	66
Future Vol, veh/h	64	46	42	64	29	66
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	71	51	47	71	32	73

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	122	0	262	97
Stage 1	-	-	-	-	97	-
Stage 2	-	-	-	-	165	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1465	-	727	959
Stage 1	-	-	-	-	927	-
Stage 2	-	-	-	-	864	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1465	-	703	959
Mov Cap-2 Maneuver	-	-	-	-	703	-
Stage 1	-	-	-	-	927	-
Stage 2	-	-	-	-	835	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3	9.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	863	-	-	1465	-
HCM Lane V/C Ratio	0.122	-	-	0.032	-
HCM Control Delay (s)	9.8	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-

Intersection	
Int Delay, s/veh	5.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	13	104	92	124	205	13
Future Vol, veh/h	13	104	92	124	205	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	14	116	102	138	228	14

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	240	0	-	0	315	171
Stage 1	-	-	-	-	171	-
Stage 2	-	-	-	-	144	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1327	-	-	-	678	873
Stage 1	-	-	-	-	859	-
Stage 2	-	-	-	-	883	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1327	-	-	-	671	873
Mov Cap-2 Maneuver	-	-	-	-	671	-
Stage 1	-	-	-	-	850	-
Stage 2	-	-	-	-	883	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	13.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1327	-	-	-	680
HCM Lane V/C Ratio	0.011	-	-	-	0.356
HCM Control Delay (s)	7.7	0	-	-	13.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	1.6

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	378	452	386	258	140	247	207	87	175	453	419	210
Average Queue (ft)	219	275	209	97	58	144	100	31	162	316	180	102
95th Queue (ft)	389	442	348	192	113	222	183	70	206	552	486	184
Link Distance (ft)		463	463			714	714			419		
Upstream Blk Time (%)		5	0							32	1	
Queuing Penalty (veh)		0	0							0	0	
Storage Bay Dist (ft)	325			250	525			475	75		325	175
Storage Blk Time (%)	10	2	2	0					81	14		4
Queuing Penalty (veh)	71	4	5	1					180	44		9

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	242	155
Average Queue (ft)	70	59
95th Queue (ft)	174	123
Link Distance (ft)	2112	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		150
Storage Blk Time (%)	1	0
Queuing Penalty (veh)	2	1

Intersection: 2: Old Knight Road & Forestville Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	81	67	16
Average Queue (ft)	38	14	1
95th Queue (ft)	63	47	9
Link Distance (ft)	472	2112	164
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Old Knight Road & Star Ruby Drive

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	39	30
Average Queue (ft)	17	3
95th Queue (ft)	42	16
Link Distance (ft)	499	716
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Old Knight Road & Haywood Glen Drive

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	60	15
Average Queue (ft)	27	0
95th Queue (ft)	53	6
Link Distance (ft)	483	1421
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Old Knight Road & Horton Road

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	2	34	61
Average Queue (ft)	0	4	29
95th Queue (ft)	2	21	47
Link Distance (ft)	406	2430	1421
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 8: Horton Road & Buffalo Road

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (ft)	34	2	97
Average Queue (ft)	3	0	41
95th Queue (ft)	19	2	75
Link Distance (ft)	1545	369	500
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 317

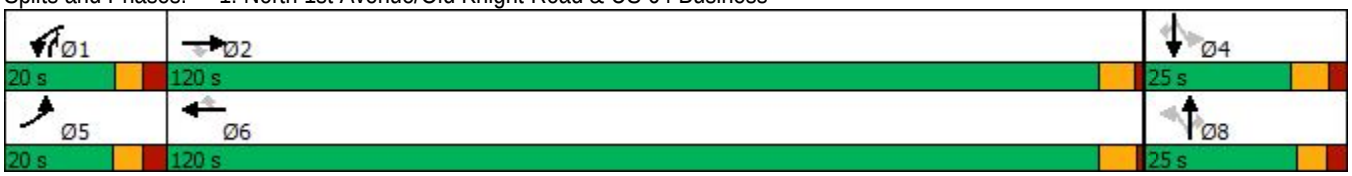
2025 Background Traffic Volumes (without Haywood Glen Phases 1-3 Site Trips)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	199	513	64	88	1012	145	154	105	54	127	118	138
Future Volume (vph)	199	513	64	88	1012	145	154	105	54	127	118	138
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			-2%			0%			0%	
Storage Length (ft)	325		250	525		475	75		325	175		150
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1787	3575	1599	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.673			0.682		
Satd. Flow (perm)	1770	3539	1583	1787	3575	1599	1254	1863	1583	1270	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			25			45	
Link Distance (ft)		514			774			489			2211	
Travel Time (s)		7.8			11.7			13.3			33.5	
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)	221	570	71	98	1124	161	171	117	60	141	131	153
Shared Lane Traffic (%)												
Lane Group Flow (vph)	221	570	71	98	1124	161	171	117	60	141	131	153
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases	5	2		1	6			8	1		4	
Permitted Phases			2			6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	1	4	4	4
Switch Phase												
Minimum Initial (s)	7.0	12.0	12.0	7.0	12.0	12.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	13.8	17.8	17.8	13.5	17.8	17.8	13.5	13.5	13.5	14.0	14.0	14.0
Total Split (s)	20.0	120.0	120.0	20.0	120.0	120.0	25.0	25.0	20.0	25.0	25.0	25.0
Total Split (%)	12.1%	72.7%	72.7%	12.1%	72.7%	72.7%	15.2%	15.2%	12.1%	15.2%	15.2%	15.2%
Maximum Green (s)	13.2	114.2	114.2	13.5	114.2	114.2	18.5	18.5	13.5	18.0	18.0	18.0
Yellow Time (s)	3.8	4.5	4.5	3.5	4.7	4.7	3.8	3.8	3.5	4.5	4.5	4.5
All-Red Time (s)	3.0	1.3	1.3	3.0	1.1	1.1	2.7	2.7	3.0	2.5	2.5	2.5
Lost Time Adjust (s)	-1.8	-0.8	-0.8	-1.5	-0.8	-0.8	-1.5	-1.5	-1.5	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes			
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0	6.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum Gap (s)	1.0	3.2	3.2	1.0	3.2	3.2	1.0	1.0	1.0	1.0	1.0	1.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	15.0	15.0	0.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	30.0	30.0	0.0	30.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Act Effct Green (s)	15.0	37.3	37.3	9.8	32.1	32.1	20.1	20.1	34.8	20.1	20.1	20.1
Actuated g/C Ratio	0.18	0.45	0.45	0.12	0.39	0.39	0.24	0.24	0.42	0.24	0.24	0.24
v/c Ratio	0.68	0.35	0.10	0.46	0.81	0.26	0.56	0.26	0.09	0.46	0.29	0.40
Control Delay	45.1	15.4	13.4	42.2	27.4	17.9	36.8	28.4	15.6	33.5	28.8	31.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.1	15.4	13.4	42.2	27.4	17.9	36.8	28.4	15.6	33.5	28.8	31.1
LOS	D	B	B	D	C	B	D	C	B	C	C	C
Approach Delay		22.8			27.3			30.3			31.2	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	106	94	20	48	264	55	76	48	18	61	54	65
Queue Length 95th (ft)	#228	141	45	100	338	97	157	103	45	130	114	135
Internal Link Dist (ft)		434			694			409			2131	
Turn Bay Length (ft)	325		250	525		475	75		325	175		150
Base Capacity (vph)	323	3539	1583	327	3575	1599	305	454	772	309	454	386
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.16	0.04	0.30	0.31	0.10	0.56	0.26	0.08	0.46	0.29	0.40

Intersection Summary			
Area Type:	Other		
Cycle Length: 165			
Actuated Cycle Length: 82.2			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.81			
Intersection Signal Delay: 26.9		Intersection LOS: C	
Intersection Capacity Utilization 66.7%		ICU Level of Service C	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: North 1st Avenue/Old Knight Road & US 64 Business



Intersection	
Int Delay, s/veh	3.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	7	101	124	132	190	14
Future Vol, veh/h	7	101	124	132	190	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	112	138	147	211	16

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	642	219	227	0	-	0
Stage 1	219	-	-	-	-	-
Stage 2	423	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	438	821	1341	-	-	-
Stage 1	817	-	-	-	-	-
Stage 2	661	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	389	821	1341	-	-	-
Mov Cap-2 Maneuver	389	-	-	-	-	-
Stage 1	725	-	-	-	-	-
Stage 2	661	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.6	3.9	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1341	-	766	-	-
HCM Lane V/C Ratio	0.103	-	0.157	-	-
HCM Control Delay (s)	8	0	10.6	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.3	-	0.6	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	18	26	80	6	8	72
Future Vol, veh/h	18	26	80	6	8	72
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	20	29	89	7	9	80

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	191	93	0	0	96	0
Stage 1	93	-	-	-	-	-
Stage 2	98	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	798	964	-	-	1498	-
Stage 1	931	-	-	-	-	-
Stage 2	926	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	793	964	-	-	1498	-
Mov Cap-2 Maneuver	793	-	-	-	-	-
Stage 1	931	-	-	-	-	-
Stage 2	920	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.3	0	0.7
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	886	1498	-
HCM Lane V/C Ratio	-	-	0.055	0.006	-
HCM Control Delay (s)	-	-	9.3	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	9	8	81	25	9	71
Future Vol, veh/h	9	8	81	25	9	71
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	9	90	28	10	79

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	203	104	0	0	118	0
Stage 1	104	-	-	-	-	-
Stage 2	99	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	786	951	-	-	1470	-
Stage 1	920	-	-	-	-	-
Stage 2	925	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	780	951	-	-	1470	-
Mov Cap-2 Maneuver	780	-	-	-	-	-
Stage 1	920	-	-	-	-	-
Stage 2	919	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.3	0	0.8
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	852	1470	-
HCM Lane V/C Ratio	-	-	0.022	0.007	-
HCM Control Delay (s)	-	-	9.3	7.5	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	5.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	21	18	55	61	60	34
Future Vol, veh/h	21	18	55	61	60	34
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	23	20	61	68	67	38

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	43	0	223	33
Stage 1	-	-	-	-	33	-
Stage 2	-	-	-	-	190	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1566	-	765	1041
Stage 1	-	-	-	-	989	-
Stage 2	-	-	-	-	842	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1566	-	734	1041
Mov Cap-2 Maneuver	-	-	-	-	734	-
Stage 1	-	-	-	-	989	-
Stage 2	-	-	-	-	808	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.5	10
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	822	-	-	1566	-
HCM Lane V/C Ratio	0.127	-	-	0.039	-
HCM Control Delay (s)	10	-	-	7.4	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	42	95	178	84	11
Future Vol, veh/h	5	42	95	178	84	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	47	106	198	93	12

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	304	0	-	0	264	205
Stage 1	-	-	-	-	205	-
Stage 2	-	-	-	-	59	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1257	-	-	-	725	836
Stage 1	-	-	-	-	829	-
Stage 2	-	-	-	-	964	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1257	-	-	-	721	836
Mov Cap-2 Maneuver	-	-	-	-	721	-
Stage 1	-	-	-	-	825	-
Stage 2	-	-	-	-	964	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	10.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1257	-	-	-	733
HCM Lane V/C Ratio	0.004	-	-	-	0.144
HCM Control Delay (s)	7.9	0	-	-	10.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.5

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	216	186	158	73	104	300	268	125	162	218	74	156
Average Queue (ft)	111	90	60	22	43	183	145	59	85	67	17	71
95th Queue (ft)	184	155	119	56	88	269	239	107	151	159	48	132
Link Distance (ft)		463	463			714	714			419		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	325			250	525			475	75		325	175
Storage Blk Time (%)	0								19	3		0
Queuing Penalty (veh)	0								30	6		1

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	124	136
Average Queue (ft)	44	50
95th Queue (ft)	93	108
Link Distance (ft)	2112	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		150
Storage Blk Time (%)	0	0
Queuing Penalty (veh)	0	1

Intersection: 2: Old Knight Road & Forestville Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	62	60	22
Average Queue (ft)	31	18	1
95th Queue (ft)	49	49	10
Link Distance (ft)	472	2112	164
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Old Knight Road & Star Ruby Drive

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	48	11
Average Queue (ft)	25	0
95th Queue (ft)	48	6
Link Distance (ft)	499	716
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Old Knight Road & Haywood Glen Drive

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	42	18
Average Queue (ft)	14	1
95th Queue (ft)	40	10
Link Distance (ft)	483	1421
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Old Knight Road & Horton Road

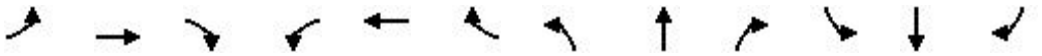
Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	26	60
Average Queue (ft)	2	29
95th Queue (ft)	13	46
Link Distance (ft)	2430	1421
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Horton Road & Buffalo Road

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	15	63
Average Queue (ft)	1	24
95th Queue (ft)	9	44
Link Distance (ft)	1545	500
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 37



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	272	1550	331	117	872	91	232	134	115	171	152	150
Future Volume (vph)	272	1550	331	117	872	91	232	134	115	171	152	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			-2%			0%			0%	
Storage Length (ft)	325		250	525		475	75		325	175		150
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1787	3575	1599	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.509			0.558		
Satd. Flow (perm)	1770	3539	1583	1787	3575	1599	948	1863	1583	1039	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			25			45	
Link Distance (ft)		514			774			489			2211	
Travel Time (s)		7.8			11.7			13.3			33.5	
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)	302	1722	368	130	969	101	258	149	128	190	169	167
Shared Lane Traffic (%)												
Lane Group Flow (vph)	302	1722	368	130	969	101	258	149	128	190	169	167
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases	5	2		1	6			8	1		4	
Permitted Phases			2			6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	1	4	4	4
Switch Phase												
Minimum Initial (s)	7.0	12.0	12.0	7.0	12.0	12.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	13.8	17.8	17.8	13.5	17.8	17.8	13.5	13.5	13.5	14.0	14.0	14.0
Total Split (s)	20.0	120.0	120.0	20.0	120.0	120.0	25.0	25.0	20.0	25.0	25.0	25.0
Total Split (%)	12.1%	72.7%	72.7%	12.1%	72.7%	72.7%	15.2%	15.2%	12.1%	15.2%	15.2%	15.2%
Maximum Green (s)	13.2	114.2	114.2	13.5	114.2	114.2	18.5	18.5	13.5	18.0	18.0	18.0
Yellow Time (s)	3.8	4.5	4.5	3.5	4.7	4.7	3.8	3.8	3.5	4.5	4.5	4.5
All-Red Time (s)	3.0	1.3	1.3	3.0	1.1	1.1	2.7	2.7	3.0	2.5	2.5	2.5
Lost Time Adjust (s)	-1.8	-0.8	-0.8	-1.5	-0.8	-0.8	-1.5	-1.5	-1.5	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes			
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0	6.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum Gap (s)	1.0	3.2	3.2	1.0	3.2	3.2	1.0	1.0	1.0	1.0	1.0	1.0

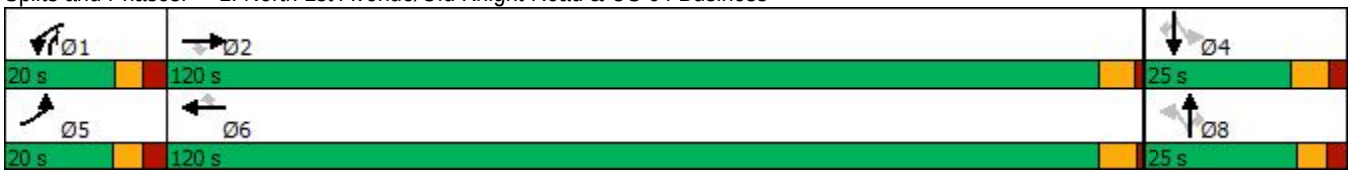
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	15.0	15.0	0.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	30.0	30.0	0.0	30.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Act Effct Green (s)	15.3	62.9	62.9	12.9	60.5	60.5	20.4	20.4	38.3	20.4	20.4	20.4
Actuated g/C Ratio	0.14	0.56	0.56	0.12	0.54	0.54	0.18	0.18	0.34	0.18	0.18	0.18
v/c Ratio	1.25	0.86	0.41	0.63	0.50	0.12	1.49	0.44	0.24	1.01	0.50	0.58
Control Delay	181.9	25.6	15.0	64.2	16.3	11.7	283.9	49.0	30.6	114.8	50.4	54.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	181.9	25.6	15.0	64.2	16.3	11.7	283.9	49.0	30.6	114.8	50.4	54.3
LOS	F	C	B	E	B	B	F	D	C	F	D	D
Approach Delay		43.7			21.1			157.9			74.9	
Approach LOS		D			C			F			E	
Queue Length 50th (ft)	~277	527	143	90	213	33	~261	97	65	~147	111	112
Queue Length 95th (ft)	#547	637	210	#183	259	57	#509	193	140	#355	216	#234
Internal Link Dist (ft)		434			694			409			2131	
Turn Bay Length (ft)	325		250	525		475	75		325	175		150
Base Capacity (vph)	242	3413	1526	244	3447	1542	173	340	578	189	340	289
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.25	0.50	0.24	0.53	0.28	0.07	1.49	0.44	0.22	1.01	0.50	0.58

Intersection Summary			
Area Type:	Other		
Cycle Length: 165			
Actuated Cycle Length: 111.4			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.49			
Intersection Signal Delay: 54.5		Intersection LOS: D	
Intersection Capacity Utilization 86.8%		ICU Level of Service E	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: North 1st Avenue/Old Knight Road & US 64 Business



Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	51	111	104	240	192	23
Future Vol, veh/h	51	111	104	240	192	23
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	57	123	116	267	213	26

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	725	226	239	0	-	0
Stage 1	226	-	-	-	-	-
Stage 2	499	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	392	813	1328	-	-	-
Stage 1	812	-	-	-	-	-
Stage 2	610	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	352	813	1328	-	-	-
Mov Cap-2 Maneuver	352	-	-	-	-	-
Stage 1	728	-	-	-	-	-
Stage 2	610	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.1	2.4	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1328	-	576	-	-
HCM Lane V/C Ratio	0.087	-	0.313	-	-
HCM Control Delay (s)	8	0	14.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.3	-	1.3	-	-

Intersection	
Int Delay, s/veh	1.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	15	14	87	30	32	101
Future Vol, veh/h	15	14	87	30	32	101
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	16	97	33	36	112

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	298	114	0	0	130	0
Stage 1	114	-	-	-	-	-
Stage 2	184	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	693	939	-	-	1455	-
Stage 1	911	-	-	-	-	-
Stage 2	848	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	675	939	-	-	1455	-
Mov Cap-2 Maneuver	675	-	-	-	-	-
Stage 1	911	-	-	-	-	-
Stage 2	826	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.8	0	1.8
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	781	1455	-
HCM Lane V/C Ratio	-	-	0.041	0.024	-
HCM Control Delay (s)	-	-	9.8	7.5	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

Intersection	
Int Delay, s/veh	2.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	38	15	93	9	4	92
Future Vol, veh/h	38	15	93	9	4	92
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	42	17	103	10	4	102

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	218	108	0	0	113	0
Stage 1	108	-	-	-	-	-
Stage 2	110	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	770	946	-	-	1476	-
Stage 1	916	-	-	-	-	-
Stage 2	915	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	768	946	-	-	1476	-
Mov Cap-2 Maneuver	768	-	-	-	-	-
Stage 1	916	-	-	-	-	-
Stage 2	912	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.8	0	0.3
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	811	1476	-
HCM Lane V/C Ratio	-	-	0.073	0.003	-
HCM Control Delay (s)	-	-	9.8	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	4.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	72	52	47	72	33	74
Future Vol, veh/h	72	52	47	72	33	74
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	80	58	52	80	37	82

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	138	0	293	109
Stage 1	-	-	-	-	109	-
Stage 2	-	-	-	-	184	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1446	-	698	945
Stage 1	-	-	-	-	916	-
Stage 2	-	-	-	-	848	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1446	-	671	945
Mov Cap-2 Maneuver	-	-	-	-	671	-
Stage 1	-	-	-	-	916	-
Stage 2	-	-	-	-	816	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3	10
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	839	-	-	1446	-
HCM Lane V/C Ratio	0.142	-	-	0.036	-
HCM Control Delay (s)	10	-	-	7.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0.1	-

Intersection	
Int Delay, s/veh	6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	15	117	104	140	231	15
Future Vol, veh/h	15	117	104	140	231	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	130	116	156	257	17

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	272	0	-	0	358	194
Stage 1	-	-	-	-	194	-
Stage 2	-	-	-	-	164	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1291	-	-	-	640	847
Stage 1	-	-	-	-	839	-
Stage 2	-	-	-	-	865	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1291	-	-	-	631	847
Mov Cap-2 Maneuver	-	-	-	-	631	-
Stage 1	-	-	-	-	827	-
Stage 2	-	-	-	-	865	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	14.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1291	-	-	-	641
HCM Lane V/C Ratio	0.013	-	-	-	0.426
HCM Control Delay (s)	7.8	0	-	-	14.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	2.1

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	425	504	482	312	164	250	215	106	175	460	419	267
Average Queue (ft)	392	449	308	70	74	150	112	34	172	422	302	154
95th Queue (ft)	526	573	596	206	140	232	195	84	186	521	599	269
Link Distance (ft)		463	463			714	714			419		
Upstream Blk Time (%)		52	1							80	1	
Queuing Penalty (veh)		0	0							0	0	
Storage Bay Dist (ft)	325			250	525			475	75		325	175
Storage Blk Time (%)	81	1	2	0					95	16		20
Queuing Penalty (veh)	632	3	8	0					236	56		62

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	540	231
Average Queue (ft)	168	90
95th Queue (ft)	522	181
Link Distance (ft)	2112	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		150
Storage Blk Time (%)	3	2
Queuing Penalty (veh)	10	6

Intersection: 2: Old Knight Road & Forestville Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	88	64	11
Average Queue (ft)	40	13	1
95th Queue (ft)	67	45	9
Link Distance (ft)	472	2112	164
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Old Knight Road & Star Ruby Drive

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	44	25
Average Queue (ft)	20	3
95th Queue (ft)	45	17
Link Distance (ft)	499	716
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Old Knight Road & Haywood Glen Drive

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	60	10
Average Queue (ft)	28	0
95th Queue (ft)	53	6
Link Distance (ft)	483	1421
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Old Knight Road & Horton Road

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	28	71
Average Queue (ft)	4	31
95th Queue (ft)	20	53
Link Distance (ft)	2430	1421
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

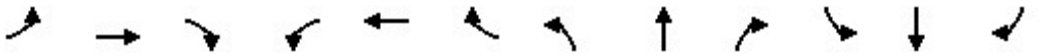
Intersection: 8: Horton Road & Buffalo Road

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	39	107
Average Queue (ft)	4	51
95th Queue (ft)	23	88
Link Distance (ft)	1545	500
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 1012

2025 Background Traffic Volumes (with Haywood Glen Phases 1-3 Site Trips)

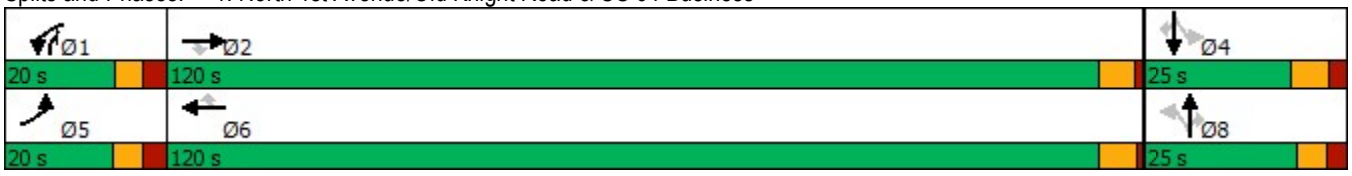


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	208	513	64	88	1012	162	154	110	54	155	130	192
Future Volume (vph)	208	513	64	88	1012	162	154	110	54	155	130	192
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			-2%			0%			0%	
Storage Length (ft)	325		250	525		475	75		325	175		150
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1787	3575	1599	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.651			0.679		
Satd. Flow (perm)	1770	3539	1583	1787	3575	1599	1213	1863	1583	1265	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			25			45	
Link Distance (ft)		514			774			489			2211	
Travel Time (s)		7.8			11.7			13.3			33.5	
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)	231	570	71	98	1124	180	171	122	60	172	144	213
Shared Lane Traffic (%)												
Lane Group Flow (vph)	231	570	71	98	1124	180	171	122	60	172	144	213
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases	5	2		1	6			8	1		4	
Permitted Phases			2			6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	1	4	4	4
Switch Phase												
Minimum Initial (s)	7.0	12.0	12.0	7.0	12.0	12.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	13.8	17.8	17.8	13.5	17.8	17.8	13.5	13.5	13.5	14.0	14.0	14.0
Total Split (s)	20.0	120.0	120.0	20.0	120.0	120.0	25.0	25.0	20.0	25.0	25.0	25.0
Total Split (%)	12.1%	72.7%	72.7%	12.1%	72.7%	72.7%	15.2%	15.2%	12.1%	15.2%	15.2%	15.2%
Maximum Green (s)	13.2	114.2	114.2	13.5	114.2	114.2	18.5	18.5	13.5	18.0	18.0	18.0
Yellow Time (s)	3.8	4.5	4.5	3.5	4.7	4.7	3.8	3.8	3.5	4.5	4.5	4.5
All-Red Time (s)	3.0	1.3	1.3	3.0	1.1	1.1	2.7	2.7	3.0	2.5	2.5	2.5
Lost Time Adjust (s)	-1.8	-0.8	-0.8	-1.5	-0.8	-0.8	-1.5	-1.5	-1.5	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes			
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0	6.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum Gap (s)	1.0	3.2	3.2	1.0	3.2	3.2	1.0	1.0	1.0	1.0	1.0	1.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	15.0	15.0	0.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	30.0	30.0	0.0	30.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Act Effct Green (s)	15.0	37.5	37.5	9.8	32.3	32.3	20.1	20.1	34.8	20.1	20.1	20.1
Actuated g/C Ratio	0.18	0.46	0.46	0.12	0.39	0.39	0.24	0.24	0.42	0.24	0.24	0.24
v/c Ratio	0.72	0.35	0.10	0.46	0.80	0.29	0.58	0.27	0.09	0.56	0.32	0.55
Control Delay	47.1	15.3	13.3	42.4	27.2	18.2	38.1	28.6	15.7	36.8	29.3	34.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.1	15.3	13.3	42.4	27.2	18.2	38.1	28.6	15.7	36.8	29.3	34.9
LOS	D	B	B	D	C	B	D	C	B	D	C	C
Approach Delay		23.6			27.1			31.0			34.0	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	113	94	20	48	264	62	78	51	18	78	61	96
Queue Length 95th (ft)	#242	141	45	100	338	107	#169	107	45	158	124	185
Internal Link Dist (ft)		434			694			409			2131	
Turn Bay Length (ft)	325		250	525		475	75		325	175		150
Base Capacity (vph)	322	3539	1583	326	3575	1599	295	453	770	307	453	385
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.72	0.16	0.04	0.30	0.31	0.11	0.58	0.27	0.08	0.56	0.32	0.55

Intersection Summary			
Area Type:	Other		
Cycle Length: 165			
Actuated Cycle Length: 82.4			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 27.7		Intersection LOS: C	
Intersection Capacity Utilization 71.5%		ICU Level of Service C	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: North 1st Avenue/Old Knight Road & US 64 Business



Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	9	101	124	163	284	20
Future Vol, veh/h	9	101	124	163	284	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	112	138	181	316	22

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	784	327	338	0	-	0
Stage 1	327	-	-	-	-	-
Stage 2	457	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	362	714	1221	-	-	-
Stage 1	731	-	-	-	-	-
Stage 2	638	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	316	714	1221	-	-	-
Mov Cap-2 Maneuver	316	-	-	-	-	-
Stage 1	639	-	-	-	-	-
Stage 2	638	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.9	3.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1221	-	647	-	-
HCM Lane V/C Ratio	0.113	-	0.189	-	-
HCM Control Delay (s)	8.3	0	11.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.4	-	0.7	-	-

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	4	17	22	4	26	6	106	7	8	151	4
Future Vol, veh/h	4	4	17	22	4	26	6	106	7	8	151	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	50	-	-	50	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	4	19	24	4	29	7	118	8	9	168	4

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	341	328	170	336	326	122	172	0	0	126	0	0
Stage 1	188	188	-	136	136	-	-	-	-	-	-	-
Stage 2	153	140	-	200	190	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	613	591	874	618	592	929	1405	-	-	1460	-	-
Stage 1	814	745	-	867	784	-	-	-	-	-	-	-
Stage 2	849	781	-	802	743	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	585	584	874	596	585	929	1405	-	-	1460	-	-
Mov Cap-2 Maneuver	585	584	-	596	585	-	-	-	-	-	-	-
Stage 1	810	741	-	863	780	-	-	-	-	-	-	-
Stage 2	814	777	-	775	739	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10	10.4	0.4	0.4
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1405	-	-	754	725	1460	-	-
HCM Lane V/C Ratio	0.005	-	-	0.037	0.08	0.006	-	-
HCM Control Delay (s)	7.6	-	-	10	10.4	7.5	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.3	0	-	-

Intersection	
Int Delay, s/veh	5.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	21	18	61	61	64	46
Future Vol, veh/h	21	18	61	61	64	46
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	23	20	68	68	71	51

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	43	0	237	33
Stage 1	-	-	-	-	33	-
Stage 2	-	-	-	-	204	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1566	-	751	1041
Stage 1	-	-	-	-	989	-
Stage 2	-	-	-	-	830	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1566	-	717	1041
Mov Cap-2 Maneuver	-	-	-	-	717	-
Stage 1	-	-	-	-	989	-
Stage 2	-	-	-	-	793	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.7	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	824	-	-	1566	-
HCM Lane V/C Ratio	0.148	-	-	0.043	-
HCM Control Delay (s)	10.1	-	-	7.4	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0.1	-

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	12	47	99	178	84	13
Future Vol, veh/h	12	47	99	178	84	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	52	110	198	93	14

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	308	0	-	0	287	209
Stage 1	-	-	-	-	209	-
Stage 2	-	-	-	-	78	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1253	-	-	-	703	831
Stage 1	-	-	-	-	826	-
Stage 2	-	-	-	-	945	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1253	-	-	-	695	831
Mov Cap-2 Maneuver	-	-	-	-	695	-
Stage 1	-	-	-	-	817	-
Stage 2	-	-	-	-	945	-

Approach	EB	WB	SB
HCM Control Delay, s	1.6	0	11
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1253	-	-	-	711
HCM Lane V/C Ratio	0.011	-	-	-	0.152
HCM Control Delay (s)	7.9	0	-	-	11
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.5

MOVEMENT SUMMARY

Site: 4 [2025 AM Background (with Phases 1-3) Old Knight Road / Haywood Glen Drive Roundabout (Site Folder: General)]

2025 AM Background (with Phases 1-3) Old Knight Road / Haywood Glen Drive Roundabout
Site Category: 2025 AM Background (with Phases 1-3)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Old Knight Road														
3	L2	6	2.0	7	2.0	0.111	3.6	LOS A	0.5	12.9	0.11	0.03	0.11	21.0
8	T1	84	2.0	91	2.0	0.111	3.6	LOS A	0.5	12.9	0.11	0.03	0.11	38.1
18	R2	45	2.0	49	2.0	0.111	3.6	LOS A	0.5	12.9	0.11	0.03	0.11	21.0
Approach		135	2.0	147	2.0	0.111	3.6	LOS A	0.5	12.9	0.11	0.03	0.11	29.1
East: Haywood Glen Drive														
1	L2	70	2.0	76	2.0	0.082	3.6	LOS A	0.4	9.1	0.24	0.11	0.24	21.1
6	T1	4	2.0	4	2.0	0.082	3.6	LOS A	0.4	9.1	0.24	0.11	0.24	14.7
16	R2	18	2.0	20	2.0	0.082	3.6	LOS A	0.4	9.1	0.24	0.11	0.24	20.6
Approach		92	2.0	100	2.0	0.082	3.6	LOS A	0.4	9.1	0.24	0.11	0.24	20.6
North: Old Knight Road														
7	L2	13	2.0	14	2.0	0.078	3.6	LOS A	0.3	8.7	0.22	0.10	0.22	21.0
4	T1	72	2.0	78	2.0	0.078	3.6	LOS A	0.3	8.7	0.22	0.10	0.22	38.0
14	R2	4	2.0	4	2.0	0.078	3.6	LOS A	0.3	8.7	0.22	0.10	0.22	21.0
Approach		89	2.0	97	2.0	0.078	3.6	LOS A	0.3	8.7	0.22	0.10	0.22	32.9
West: Haywood Glen Drive														
5	L2	4	2.0	4	2.0	0.025	3.4	LOS A	0.1	2.6	0.30	0.15	0.30	21.4
2	T1	4	2.0	4	2.0	0.025	3.4	LOS A	0.1	2.6	0.30	0.15	0.30	14.7
12	R2	18	2.0	20	2.0	0.025	3.4	LOS A	0.1	2.6	0.30	0.15	0.30	20.9
Approach		26	2.0	28	2.0	0.025	3.4	LOS A	0.1	2.6	0.30	0.15	0.30	19.7
All Vehicles		342	2.0	372	2.0	0.111	3.6	LOS A	0.5	12.9	0.19	0.08	0.19	26.0

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.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	236	174	147	81	117	332	280	136	171	211	72	189
Average Queue (ft)	122	85	55	24	48	192	152	65	84	72	16	85
95th Queue (ft)	203	144	110	61	100	280	238	118	147	157	45	157
Link Distance (ft)		463	463			714	714			419		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	325			250	525			475	75		325	175
Storage Blk Time (%)									18	4		1
Queuing Penalty (veh)									30	9		4

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	176	178
Average Queue (ft)	58	78
95th Queue (ft)	131	148
Link Distance (ft)	2112	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		150
Storage Blk Time (%)	1	1
Queuing Penalty (veh)	2	2

Intersection: 2: Old Knight Road & Forestville Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	70	86	20
Average Queue (ft)	33	26	1
95th Queue (ft)	56	66	11
Link Distance (ft)	472	2112	164
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Old Knight Road & Star Ruby Drive

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	L	L
Maximum Queue (ft)	42	59	16	11
Average Queue (ft)	17	27	1	1
95th Queue (ft)	43	53	8	7
Link Distance (ft)	528	493		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			50	50
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Old Knight Road & Haywood Glen Drive

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	31	50	23	27
Average Queue (ft)	2	7	2	2
95th Queue (ft)	15	31	14	16
Link Distance (ft)	388	438	670	1373
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: Old Knight Road & Horton Road

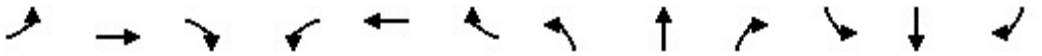
Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	30	56
Average Queue (ft)	3	30
95th Queue (ft)	17	47
Link Distance (ft)	2430	1373
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Horton Road & Buffalo Road

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (ft)	31	6	60
Average Queue (ft)	3	0	25
95th Queue (ft)	19	4	46
Link Distance (ft)	1545	369	500
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 48



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	335	1550	331	117	872	124	232	148	115	201	163	172
Future Volume (vph)	335	1550	331	117	872	124	232	148	115	201	163	172
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			-2%			0%			0%	
Storage Length (ft)	325		250	525		475	75		325	175		150
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1787	3575	1599	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.480			0.521		
Satd. Flow (perm)	1770	3539	1583	1787	3575	1599	894	1863	1583	970	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			25			45	
Link Distance (ft)		514			774			489			2211	
Travel Time (s)		7.8			11.7			13.3			33.5	
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)	372	1722	368	130	969	138	258	164	128	223	181	191
Shared Lane Traffic (%)												
Lane Group Flow (vph)	372	1722	368	130	969	138	258	164	128	223	181	191
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases	5	2		1	6			8	1		4	
Permitted Phases			2			6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	1	4	4	4
Switch Phase												
Minimum Initial (s)	7.0	12.0	12.0	7.0	12.0	12.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	13.8	17.8	17.8	13.5	17.8	17.8	13.5	13.5	13.5	14.0	14.0	14.0
Total Split (s)	20.0	120.0	120.0	20.0	120.0	120.0	25.0	25.0	20.0	25.0	25.0	25.0
Total Split (%)	12.1%	72.7%	72.7%	12.1%	72.7%	72.7%	15.2%	15.2%	12.1%	15.2%	15.2%	15.2%
Maximum Green (s)	13.2	114.2	114.2	13.5	114.2	114.2	18.5	18.5	13.5	18.0	18.0	18.0
Yellow Time (s)	3.8	4.5	4.5	3.5	4.7	4.7	3.8	3.8	3.5	4.5	4.5	4.5
All-Red Time (s)	3.0	1.3	1.3	3.0	1.1	1.1	2.7	2.7	3.0	2.5	2.5	2.5
Lost Time Adjust (s)	-1.8	-0.8	-0.8	-1.5	-0.8	-0.8	-1.5	-1.5	-1.5	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes			
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0	6.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum Gap (s)	1.0	3.2	3.2	1.0	3.2	3.2	1.0	1.0	1.0	1.0	1.0	1.0

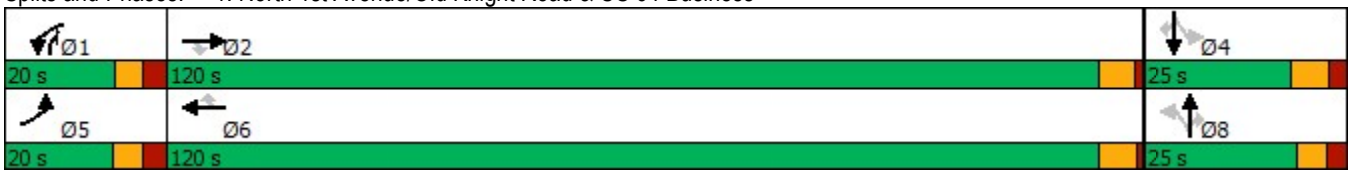
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	15.0	15.0	0.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	30.0	30.0	0.0	30.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Act Effct Green (s)	15.3	62.9	62.9	12.9	60.5	60.5	20.4	20.4	38.3	20.4	20.4	20.4
Actuated g/C Ratio	0.14	0.56	0.56	0.12	0.54	0.54	0.18	0.18	0.34	0.18	0.18	0.18
v/c Ratio	1.54	0.86	0.41	0.63	0.50	0.16	1.58	0.48	0.24	1.26	0.53	0.66
Control Delay	294.9	25.6	15.0	64.2	16.3	12.3	321.8	50.1	30.6	193.9	51.4	57.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	294.9	25.6	15.0	64.2	16.3	12.3	321.8	50.1	30.6	193.9	51.4	57.8
LOS	F	C	B	E	B	B	F	D	C	F	D	E
Approach Delay		64.7			20.8			173.0			106.9	
Approach LOS		E			C			F			F	
Queue Length 50th (ft)	~382	527	143	90	213	46	~269	108	65	~206	120	130
Queue Length 95th (ft)	#685	637	210	#183	259	76	#516	211	140	#434	230	#284
Internal Link Dist (ft)		434			694			409			2131	
Turn Bay Length (ft)	325		250	525		475	75		325	175		150
Base Capacity (vph)	242	3413	1526	244	3447	1542	163	340	578	177	340	289
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.54	0.50	0.24	0.53	0.28	0.09	1.58	0.48	0.22	1.26	0.53	0.66

Intersection Summary			
Area Type:	Other		
Cycle Length: 165			
Actuated Cycle Length: 111.4			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.58			
Intersection Signal Delay: 71.0		Intersection LOS: E	
Intersection Capacity Utilization 87.4%		ICU Level of Service E	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: North 1st Avenue/Old Knight Road & US 64 Business



Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	56	111	104	350	255	26
Future Vol, veh/h	56	111	104	350	255	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	62	123	116	389	283	29

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	919	298	312	0	-	0
Stage 1	298	-	-	-	-	-
Stage 2	621	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	301	741	1248	-	-	-
Stage 1	753	-	-	-	-	-
Stage 2	536	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	265	741	1248	-	-	-
Mov Cap-2 Maneuver	265	-	-	-	-	-
Stage 1	663	-	-	-	-	-
Stage 2	536	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.9	1.9	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1248	-	462	-	-
HCM Lane V/C Ratio	0.093	-	0.402	-	-
HCM Control Delay (s)	8.2	0	17.9	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.3	-	1.9	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↰	↱		↰	↱	
Traffic Vol, veh/h	4	4	11	18	4	14	20	178	34	32	153	4
Future Vol, veh/h	4	4	11	18	4	14	20	178	34	32	153	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	50	-	-	50	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	4	12	20	4	16	22	198	38	36	170	4

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	515	524	172	513	507	217	174	0	0	236	0	0
Stage 1	244	244	-	261	261	-	-	-	-	-	-	-
Stage 2	271	280	-	252	246	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	470	458	872	472	468	823	1403	-	-	1331	-	-
Stage 1	760	704	-	744	692	-	-	-	-	-	-	-
Stage 2	735	679	-	752	703	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	443	438	872	447	448	823	1403	-	-	1331	-	-
Mov Cap-2 Maneuver	443	438	-	447	448	-	-	-	-	-	-	-
Stage 1	748	685	-	732	681	-	-	-	-	-	-	-
Stage 2	705	668	-	717	684	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11	12.1	0.7	1.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1403	-	-	617	544	1331	-	-
HCM Lane V/C Ratio	0.016	-	-	0.034	0.074	0.027	-	-
HCM Control Delay (s)	7.6	-	-	11	12.1	7.8	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.2	0.1	-	-

Intersection	
Int Delay, s/veh	4.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	72	56	60	72	35	83
Future Vol, veh/h	72	56	60	72	35	83
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	80	62	67	80	39	92

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	142	0	325	111
Stage 1	-	-	-	-	111	-
Stage 2	-	-	-	-	214	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1441	-	669	942
Stage 1	-	-	-	-	914	-
Stage 2	-	-	-	-	822	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1441	-	636	942
Mov Cap-2 Maneuver	-	-	-	-	636	-
Stage 1	-	-	-	-	914	-
Stage 2	-	-	-	-	782	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.5	10.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	824	-	-	1441	-
HCM Lane V/C Ratio	0.159	-	-	0.046	-
HCM Control Delay (s)	10.2	-	-	7.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0.1	-

Intersection	
Int Delay, s/veh	6.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	18	123	110	140	231	22
Future Vol, veh/h	18	123	110	140	231	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	20	137	122	156	257	24

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	278	0	-	0	377	200
Stage 1	-	-	-	-	200	-
Stage 2	-	-	-	-	177	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1285	-	-	-	625	841
Stage 1	-	-	-	-	834	-
Stage 2	-	-	-	-	854	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1285	-	-	-	614	841
Mov Cap-2 Maneuver	-	-	-	-	614	-
Stage 1	-	-	-	-	820	-
Stage 2	-	-	-	-	854	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	15.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1285	-	-	-	629
HCM Lane V/C Ratio	0.016	-	-	-	0.447
HCM Control Delay (s)	7.8	0	-	-	15.3
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	2.3

MOVEMENT SUMMARY

Site: 4 [2025 PM Background (with Phases 1-3) Old Knight Road / Haywood Glen Drive Roundabout - Import (Site Folder: General)]

2025 PM Background (with Phases 1-3) Old Knight Road / Haywood Glen Drive Roundabout - Import
Site Category: 2025 PM Background (with Phases 1-3)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Old Knight Road														
3	L2	20	2.0	22	2.0	0.160	4.0	LOS A	0.8	19.7	0.11	0.03	0.11	20.8
8	T1	95	2.0	103	2.0	0.160	4.0	LOS A	0.8	19.7	0.11	0.03	0.11	37.5
18	R2	80	2.0	87	2.0	0.160	4.0	LOS A	0.8	19.7	0.11	0.03	0.11	20.8
Approach		195	2.0	212	2.0	0.160	4.0	LOS A	0.8	19.7	0.11	0.03	0.11	26.6
East: Haywood Glen Drive														
1	L2	78	2.0	85	2.0	0.096	3.8	LOS A	0.4	10.7	0.28	0.15	0.28	21.1
6	T1	4	2.0	4	2.0	0.096	3.8	LOS A	0.4	10.7	0.28	0.15	0.28	14.6
16	R2	22	2.0	24	2.0	0.096	3.8	LOS A	0.4	10.7	0.28	0.15	0.28	20.6
Approach		104	2.0	113	2.0	0.096	3.8	LOS A	0.4	10.7	0.28	0.15	0.28	20.6
North: Old Knight Road														
7	L2	13	2.0	14	2.0	0.101	3.8	LOS A	0.4	11.4	0.26	0.13	0.26	21.0
4	T1	95	2.0	103	2.0	0.101	3.8	LOS A	0.4	11.4	0.26	0.13	0.26	38.0
14	R2	4	2.0	4	2.0	0.101	3.8	LOS A	0.4	11.4	0.26	0.13	0.26	21.0
Approach		112	2.0	122	2.0	0.101	3.8	LOS A	0.4	11.4	0.26	0.13	0.26	33.8
West: Haywood Glen Drive														
5	L2	4	2.0	4	2.0	0.020	3.4	LOS A	0.1	2.0	0.33	0.17	0.33	21.4
2	T1	4	2.0	4	2.0	0.020	3.4	LOS A	0.1	2.0	0.33	0.17	0.33	14.7
12	R2	12	2.0	13	2.0	0.020	3.4	LOS A	0.1	2.0	0.33	0.17	0.33	20.8
Approach		20	2.0	22	2.0	0.020	3.4	LOS A	0.1	2.0	0.33	0.17	0.33	19.3
All Vehicles		431	2.0	468	2.0	0.160	3.9	LOS A	0.8	19.7	0.20	0.09	0.20	25.7

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.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	425	506	480	194	178	259	229	123	175	469	419	274
Average Queue (ft)	424	481	313	33	72	156	121	45	174	431	295	226
95th Queue (ft)	426	495	641	115	142	236	206	97	177	482	596	331
Link Distance (ft)		463	463			714	714			419		
Upstream Blk Time (%)		73	1							83	1	
Queuing Penalty (veh)		0	0							0	0	
Storage Bay Dist (ft)	325			250	525			475	75		325	175
Storage Blk Time (%)	98	0	1						94	20		58
Queuing Penalty (veh)	756	0	3						248	70		193

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	1042	246
Average Queue (ft)	499	105
95th Queue (ft)	1278	218
Link Distance (ft)	2112	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		150
Storage Blk Time (%)	7	8
Queuing Penalty (veh)	24	28

Intersection: 2: Old Knight Road & Forestville Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	110	72	9
Average Queue (ft)	44	17	0
95th Queue (ft)	82	54	6
Link Distance (ft)	472	2112	164
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Old Knight Road & Star Ruby Drive

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	L	L
Maximum Queue (ft)	38	54	21	29
Average Queue (ft)	15	24	2	3
95th Queue (ft)	41	49	13	17
Link Distance (ft)	528	493		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			50	50
Storage Blk Time (%)				0
Queuing Penalty (veh)				0

Intersection: 4: Old Knight Road & Haywood Glen Drive

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	27	62	22	34
Average Queue (ft)	2	10	1	4
95th Queue (ft)	12	39	10	21
Link Distance (ft)	388	438	670	1373
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: Old Knight Road & Horton Road

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	2	41	57
Average Queue (ft)	0	6	29
95th Queue (ft)	2	26	46
Link Distance (ft)	406	2430	1373
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

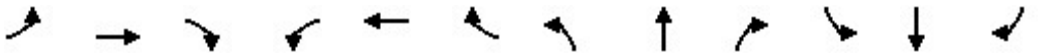
Intersection: 8: Horton Road & Buffalo Road

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (ft)	36	7	125
Average Queue (ft)	5	0	52
95th Queue (ft)	23	4	95
Link Distance (ft)	1545	369	500
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 1323

2025 Build Traffic Volumes

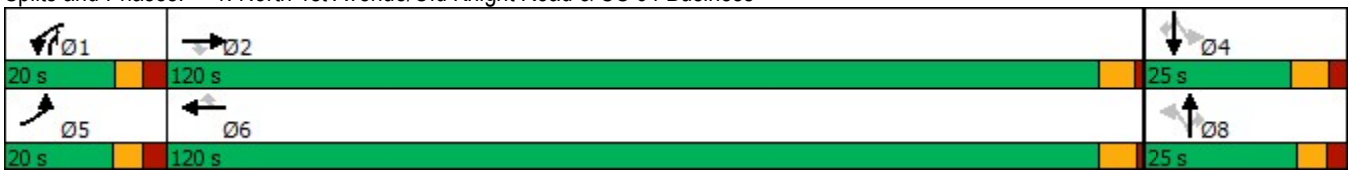


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	214	513	64	88	1012	171	154	112	54	171	136	220
Future Volume (vph)	214	513	64	88	1012	171	154	112	54	171	136	220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			-2%			0%			0%	
Storage Length (ft)	325		250	525		475	75		325	175		150
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1787	3575	1599	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.638			0.677		
Satd. Flow (perm)	1770	3539	1583	1787	3575	1599	1188	1863	1583	1261	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			25			45	
Link Distance (ft)		514			774			489			2211	
Travel Time (s)		7.8			11.7			13.3			33.5	
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)	238	570	71	98	1124	190	171	124	60	190	151	244
Shared Lane Traffic (%)												
Lane Group Flow (vph)	238	570	71	98	1124	190	171	124	60	190	151	244
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases	5	2		1	6			8	1		4	
Permitted Phases			2			6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	1	4	4	4
Switch Phase												
Minimum Initial (s)	7.0	12.0	12.0	7.0	12.0	12.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	13.8	17.8	17.8	13.5	17.8	17.8	13.5	13.5	13.5	14.0	14.0	14.0
Total Split (s)	20.0	120.0	120.0	20.0	120.0	120.0	25.0	25.0	20.0	25.0	25.0	25.0
Total Split (%)	12.1%	72.7%	72.7%	12.1%	72.7%	72.7%	15.2%	15.2%	12.1%	15.2%	15.2%	15.2%
Maximum Green (s)	13.2	114.2	114.2	13.5	114.2	114.2	18.5	18.5	13.5	18.0	18.0	18.0
Yellow Time (s)	3.8	4.5	4.5	3.5	4.7	4.7	3.8	3.8	3.5	4.5	4.5	4.5
All-Red Time (s)	3.0	1.3	1.3	3.0	1.1	1.1	2.7	2.7	3.0	2.5	2.5	2.5
Lost Time Adjust (s)	-1.8	-0.8	-0.8	-1.5	-0.8	-0.8	-1.5	-1.5	-1.5	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes			
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0	6.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum Gap (s)	1.0	3.2	3.2	1.0	3.2	3.2	1.0	1.0	1.0	1.0	1.0	1.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	15.0	15.0	0.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	30.0	30.0	0.0	30.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Act Effct Green (s)	15.0	37.5	37.5	9.8	32.3	32.3	20.1	20.1	34.8	20.1	20.1	20.1
Actuated g/C Ratio	0.18	0.46	0.46	0.12	0.39	0.39	0.24	0.24	0.42	0.24	0.24	0.24
v/c Ratio	0.74	0.35	0.10	0.46	0.80	0.30	0.59	0.27	0.09	0.62	0.33	0.63
Control Delay	48.6	15.3	13.3	42.4	27.2	18.5	38.9	28.7	15.7	39.6	29.5	37.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.6	15.3	13.3	42.4	27.2	18.5	38.9	28.7	15.7	39.6	29.5	37.9
LOS	D	B	B	D	C	B	D	C	B	D	C	D
Approach Delay		24.2			27.1			31.4			36.3	
Approach LOS		C			C			C			D	
Queue Length 50th (ft)	117	94	20	48	264	66	78	52	18	87	64	113
Queue Length 95th (ft)	#252	141	45	100	338	113	#173	109	45	#192	129	#227
Internal Link Dist (ft)		434			694			409			2131	
Turn Bay Length (ft)	325		250	525		475	75		325	175		150
Base Capacity (vph)	322	3539	1583	326	3575	1599	289	453	770	306	453	385
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.16	0.04	0.30	0.31	0.12	0.59	0.27	0.08	0.62	0.33	0.63

Intersection Summary			
Area Type:	Other		
Cycle Length: 165			
Actuated Cycle Length: 82.4			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 28.4		Intersection LOS: C	
Intersection Capacity Utilization 72.2%		ICU Level of Service C	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: North 1st Avenue/Old Knight Road & US 64 Business



Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	101	124	180	334	23
Future Vol, veh/h	10	101	124	180	334	23
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	112	138	200	371	26

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	860	384	397	0	-	0
Stage 1	384	-	-	-	-	-
Stage 2	476	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	326	664	1162	-	-	-
Stage 1	688	-	-	-	-	-
Stage 2	625	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	282	664	1162	-	-	-
Mov Cap-2 Maneuver	282	-	-	-	-	-
Stage 1	596	-	-	-	-	-
Stage 2	625	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.7	3.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1162	-	592	-	-
HCM Lane V/C Ratio	0.119	-	0.208	-	-
HCM Control Delay (s)	8.5	0	12.7	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.4	-	0.8	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↰	↑		↰	↑	
Traffic Vol, veh/h	4	4	17	22	4	26	6	124	7	8	204	4
Future Vol, veh/h	4	4	17	22	4	26	6	124	7	8	204	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	50	-	-	50	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	4	19	24	4	29	7	138	8	9	227	4

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	420	407	229	415	405	142	231	0	0	146	0	0
Stage 1	247	247	-	156	156	-	-	-	-	-	-	-
Stage 2	173	160	-	259	249	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	544	533	810	548	535	906	1337	-	-	1436	-	-
Stage 1	757	702	-	846	769	-	-	-	-	-	-	-
Stage 2	829	766	-	746	701	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	519	527	810	527	529	906	1337	-	-	1436	-	-
Mov Cap-2 Maneuver	519	527	-	527	529	-	-	-	-	-	-	-
Stage 1	753	698	-	842	765	-	-	-	-	-	-	-
Stage 2	794	762	-	719	697	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.4	10.9	0.3	0.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1337	-	-	689	667	1436	-	-
HCM Lane V/C Ratio	0.005	-	-	0.04	0.087	0.006	-	-
HCM Control Delay (s)	7.7	-	-	10.4	10.9	7.5	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.3	0	-	-

Intersection	
Int Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	42	4	109	14	4	97
Future Vol, veh/h	42	4	109	14	4	97
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	47	4	121	16	4	108

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	245	129	0	0	137	0
Stage 1	129	-	-	-	-	-
Stage 2	116	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	743	921	-	-	1447	-
Stage 1	897	-	-	-	-	-
Stage 2	909	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	741	921	-	-	1447	-
Mov Cap-2 Maneuver	741	-	-	-	-	-
Stage 1	897	-	-	-	-	-
Stage 2	906	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.1	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	754	1447	-
HCM Lane V/C Ratio	-	-	0.068	0.003	-
HCM Control Delay (s)	-	-	10.1	7.5	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	21	18	73	64	64	51
Future Vol, veh/h	21	18	73	64	64	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	23	20	81	71	71	57

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	43	0	266	33
Stage 1	-	-	-	-	33	-
Stage 2	-	-	-	-	233	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1566	-	723	1041
Stage 1	-	-	-	-	989	-
Stage 2	-	-	-	-	806	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1566	-	684	1041
Mov Cap-2 Maneuver	-	-	-	-	684	-
Stage 1	-	-	-	-	989	-
Stage 2	-	-	-	-	762	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4	10.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	807	-	-	1566	-
HCM Lane V/C Ratio	0.158	-	-	0.052	-
HCM Control Delay (s)	10.3	-	-	7.4	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0.2	-

Intersection	
Int Delay, s/veh	1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	68	4	4	123	14	6
Future Vol, veh/h	68	4	4	123	14	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	76	4	4	137	16	7

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	80	0	223	78
Stage 1	-	-	-	-	78	-
Stage 2	-	-	-	-	145	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1518	-	765	983
Stage 1	-	-	-	-	945	-
Stage 2	-	-	-	-	882	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1518	-	763	983
Mov Cap-2 Maneuver	-	-	-	-	763	-
Stage 1	-	-	-	-	945	-
Stage 2	-	-	-	-	879	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	9.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	818	-	-	1518	-
HCM Lane V/C Ratio	0.027	-	-	0.003	-
HCM Control Delay (s)	9.5	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	16	50	101	178	84	14
Future Vol, veh/h	16	50	101	178	84	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	18	56	112	198	93	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	310	0	-	0	303	211
Stage 1	-	-	-	-	211	-
Stage 2	-	-	-	-	92	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1250	-	-	-	689	829
Stage 1	-	-	-	-	824	-
Stage 2	-	-	-	-	932	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1250	-	-	-	679	829
Mov Cap-2 Maneuver	-	-	-	-	679	-
Stage 1	-	-	-	-	812	-
Stage 2	-	-	-	-	932	-

Approach	EB	WB	SB
HCM Control Delay, s	1.9	0	11.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1250	-	-	-	697
HCM Lane V/C Ratio	0.014	-	-	-	0.156
HCM Control Delay (s)	7.9	0	-	-	11.1
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.6

MOVEMENT SUMMARY

Site: 4 [2025 AM Build Old Knight Road / Haywood Glen Drive Roundabout (Site Folder: General)]

2025 AM Build Old Knight Road / Haywood Glen Drive Roundabout
Site Category: 2025 AM Build
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Old Knight Road														
3	L2	6	2.0	7	2.0	0.126	3.7	LOS A	0.6	14.9	0.11	0.03	0.11	21.0
8	T1	102	2.0	111	2.0	0.126	3.7	LOS A	0.6	14.9	0.11	0.03	0.11	38.1
18	R2	45	2.0	49	2.0	0.126	3.7	LOS A	0.6	14.9	0.11	0.03	0.11	21.0
Approach		153	2.0	166	2.0	0.126	3.7	LOS A	0.6	14.9	0.11	0.03	0.11	29.9
East: Haywood Glen Drive														
1	L2	70	2.0	76	2.0	0.084	3.7	LOS A	0.4	9.3	0.27	0.13	0.27	21.1
6	T1	4	2.0	4	2.0	0.084	3.7	LOS A	0.4	9.3	0.27	0.13	0.27	14.6
16	R2	18	2.0	20	2.0	0.084	3.7	LOS A	0.4	9.3	0.27	0.13	0.27	20.6
Approach		92	2.0	100	2.0	0.084	3.7	LOS A	0.4	9.3	0.27	0.13	0.27	20.6
North: Old Knight Road														
7	L2	13	2.0	14	2.0	0.125	4.0	LOS A	0.6	14.5	0.23	0.11	0.23	21.0
4	T1	125	2.0	136	2.0	0.125	4.0	LOS A	0.6	14.5	0.23	0.11	0.23	38.0
14	R2	4	2.0	4	2.0	0.125	4.0	LOS A	0.6	14.5	0.23	0.11	0.23	21.0
Approach		142	2.0	154	2.0	0.125	4.0	LOS A	0.6	14.5	0.23	0.11	0.23	34.6
West: Haywood Glen Drive														
5	L2	4	2.0	4	2.0	0.026	3.6	LOS A	0.1	2.7	0.35	0.20	0.35	21.4
2	T1	4	2.0	4	2.0	0.026	3.6	LOS A	0.1	2.7	0.35	0.20	0.35	14.6
12	R2	18	2.0	20	2.0	0.026	3.6	LOS A	0.1	2.7	0.35	0.20	0.35	20.8
Approach		26	2.0	28	2.0	0.026	3.6	LOS A	0.1	2.7	0.35	0.20	0.35	19.6
All Vehicles		413	2.0	449	2.0	0.126	3.8	LOS A	0.6	14.9	0.20	0.09	0.20	27.5

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.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	249	199	162	75	114	314	285	149	165	250	79	225
Average Queue (ft)	122	90	61	25	43	199	158	68	91	76	19	103
95th Queue (ft)	209	160	123	61	87	287	253	126	156	180	52	192
Link Distance (ft)		463	463			714	714			419		
Upstream Blk Time (%)										0		
Queuing Penalty (veh)										0		
Storage Bay Dist (ft)	325			250	525			475	75		325	175
Storage Blk Time (%)	0	0							24	3		3
Queuing Penalty (veh)	0	0							40	6		11

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	291	199
Average Queue (ft)	73	88
95th Queue (ft)	203	171
Link Distance (ft)	2112	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		150
Storage Blk Time (%)	1	3
Queuing Penalty (veh)	3	8

Intersection: 2: Old Knight Road & Forestville Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	84	79	26
Average Queue (ft)	34	28	2
95th Queue (ft)	60	68	13
Link Distance (ft)	472	2112	164
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Old Knight Road & Star Ruby Drive

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	L	L
Maximum Queue (ft)	41	56	23	19
Average Queue (ft)	17	28	1	1
95th Queue (ft)	43	51	11	10
Link Distance (ft)	528	493		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			50	50
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Old Knight Road & Haywood Glen Drive

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	30	42	25	40
Average Queue (ft)	2	8	1	3
95th Queue (ft)	15	30	11	20
Link Distance (ft)	388	438	670	942
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Old Knight Road & Phase 4 - Site Access 1

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	54	8
Average Queue (ft)	25	0
95th Queue (ft)	49	6
Link Distance (ft)	556	372
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Old Knight Road & Horton Road

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	2	25	64
Average Queue (ft)	0	2	32
95th Queue (ft)	2	14	50
Link Distance (ft)	406	870	372
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 7: Phase 4 - Site Access 2 & Horton Road

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	10	36
Average Queue (ft)	0	14
95th Queue (ft)	5	38
Link Distance (ft)	1488	364
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Horton Road & Buffalo Road

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (ft)	37	4	63
Average Queue (ft)	4	0	26
95th Queue (ft)	22	3	49
Link Distance (ft)	1545	369	500
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 69

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	368	1550	331	117	872	141	232	156	115	218	169	184
Future Volume (vph)	368	1550	331	117	872	141	232	156	115	218	169	184
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			-2%			0%			0%	
Storage Length (ft)	325		250	525		475	75		325	175		150
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1787	3575	1599	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.463			0.499		
Satd. Flow (perm)	1770	3539	1583	1787	3575	1599	862	1863	1583	930	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			25			45	
Link Distance (ft)		514			774			489			2211	
Travel Time (s)		7.8			11.7			13.3			33.5	
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)	409	1722	368	130	969	157	258	173	128	242	188	204
Shared Lane Traffic (%)												
Lane Group Flow (vph)	409	1722	368	130	969	157	258	173	128	242	188	204
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases	5	2		1	6			8	1		4	
Permitted Phases			2			6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	1	4	4	4
Switch Phase												
Minimum Initial (s)	7.0	12.0	12.0	7.0	12.0	12.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	13.8	17.8	17.8	13.5	17.8	17.8	13.5	13.5	13.5	14.0	14.0	14.0
Total Split (s)	20.0	120.0	120.0	20.0	120.0	120.0	25.0	25.0	20.0	25.0	25.0	25.0
Total Split (%)	12.1%	72.7%	72.7%	12.1%	72.7%	72.7%	15.2%	15.2%	12.1%	15.2%	15.2%	15.2%
Maximum Green (s)	13.2	114.2	114.2	13.5	114.2	114.2	18.5	18.5	13.5	18.0	18.0	18.0
Yellow Time (s)	3.8	4.5	4.5	3.5	4.7	4.7	3.8	3.8	3.5	4.5	4.5	4.5
All-Red Time (s)	3.0	1.3	1.3	3.0	1.1	1.1	2.7	2.7	3.0	2.5	2.5	2.5
Lost Time Adjust (s)	-1.8	-0.8	-0.8	-1.5	-0.8	-0.8	-1.5	-1.5	-1.5	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes			
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0	6.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum Gap (s)	1.0	3.2	3.2	1.0	3.2	3.2	1.0	1.0	1.0	1.0	1.0	1.0

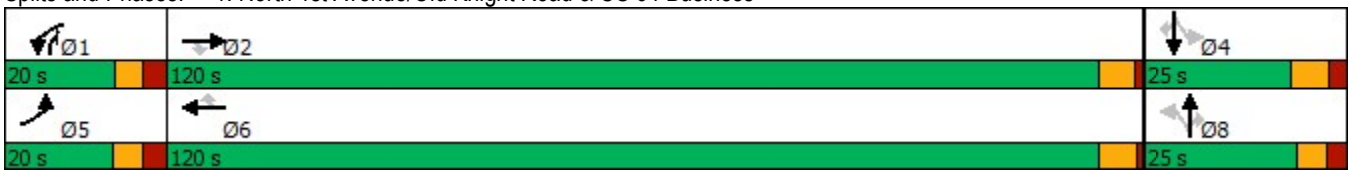
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	15.0	15.0	0.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	30.0	30.0	0.0	30.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Act Effct Green (s)	15.3	62.9	62.9	12.9	60.5	60.5	20.4	20.4	38.3	20.4	20.4	20.4
Actuated g/C Ratio	0.14	0.56	0.56	0.12	0.54	0.54	0.18	0.18	0.34	0.18	0.18	0.18
v/c Ratio	1.69	0.86	0.41	0.63	0.50	0.18	1.64	0.51	0.24	1.42	0.55	0.71
Control Delay	358.4	25.6	15.0	64.2	16.3	12.5	347.6	50.7	30.6	258.2	52.1	60.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	358.4	25.6	15.0	64.2	16.3	12.5	347.6	50.7	30.6	258.2	52.1	60.2
LOS	F	C	B	E	B	B	F	D	C	F	D	E
Approach Delay		78.5			20.8			183.2			133.4	
Approach LOS		E			C			F			F	
Queue Length 50th (ft)	~438	527	143	90	213	53	~273	114	65	~240	125	140
Queue Length 95th (ft)	#758	637	210	#183	259	86	#520	221	140	#479	239	#311
Internal Link Dist (ft)		434			694			409			2131	
Turn Bay Length (ft)	325		250	525		475	75		325	175		150
Base Capacity (vph)	242	3413	1526	244	3447	1542	157	340	578	170	340	289
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.69	0.50	0.24	0.53	0.28	0.10	1.64	0.51	0.22	1.42	0.55	0.71

Intersection Summary			
Area Type:	Other		
Cycle Length: 165			
Actuated Cycle Length: 111.4			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.69			
Intersection Signal Delay: 82.7		Intersection LOS: F	
Intersection Capacity Utilization 87.7%		ICU Level of Service E	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: North 1st Avenue/Old Knight Road & US 64 Business



Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	59	111	104	408	290	27
Future Vol, veh/h	59	111	104	408	290	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	66	123	116	453	322	30

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1022	337	352	0	-	0
Stage 1	337	-	-	-	-	-
Stage 2	685	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	261	705	1207	-	-	-
Stage 1	723	-	-	-	-	-
Stage 2	500	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	228	705	1207	-	-	-
Mov Cap-2 Maneuver	228	-	-	-	-	-
Stage 1	630	-	-	-	-	-
Stage 2	500	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	21.2	1.7	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1207	-	408	-	-
HCM Lane V/C Ratio	0.096	-	0.463	-	-
HCM Control Delay (s)	8.3	0	21.2	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.3	-	2.4	-	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	4	11	18	4	14	20	239	34	32	189	4
Future Vol, veh/h	4	4	11	18	4	14	20	239	34	32	189	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	50	-	-	50	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	4	12	20	4	16	22	266	38	36	210	4

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	623	632	212	621	615	285	214	0	0	304	0	0
Stage 1	284	284	-	329	329	-	-	-	-	-	-	-
Stage 2	339	348	-	292	286	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	398	398	828	400	407	754	1356	-	-	1257	-	-
Stage 1	723	676	-	684	646	-	-	-	-	-	-	-
Stage 2	676	634	-	716	675	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	373	380	828	377	389	754	1356	-	-	1257	-	-
Mov Cap-2 Maneuver	373	380	-	377	389	-	-	-	-	-	-	-
Stage 1	711	656	-	673	636	-	-	-	-	-	-	-
Stage 2	647	624	-	681	655	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.8	13.4	0.5	1.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1356	-	-	550	470	1257	-	-
HCM Lane V/C Ratio	0.016	-	-	0.038	0.085	0.028	-	-
HCM Control Delay (s)	7.7	-	-	11.8	13.4	7.9	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	0.3	0.1	-	-

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	28	4	132	48	4	119
Future Vol, veh/h	28	4	132	48	4	119
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	31	4	147	53	4	132

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	314	174	0	0	200	0
Stage 1	174	-	-	-	-	-
Stage 2	140	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	679	869	-	-	1372	-
Stage 1	856	-	-	-	-	-
Stage 2	887	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	677	869	-	-	1372	-
Mov Cap-2 Maneuver	677	-	-	-	-	-
Stage 1	856	-	-	-	-	-
Stage 2	884	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.5	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	696	1372	-
HCM Lane V/C Ratio	-	-	0.051	0.003	-
HCM Control Delay (s)	-	-	10.5	7.6	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	4.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	74	56	70	73	35	97
Future Vol, veh/h	74	56	70	73	35	97
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	82	62	78	81	39	108

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	144	0	350	113
Stage 1	-	-	-	-	113	-
Stage 2	-	-	-	-	237	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1438	-	647	940
Stage 1	-	-	-	-	912	-
Stage 2	-	-	-	-	802	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1438	-	610	940
Mov Cap-2 Maneuver	-	-	-	-	610	-
Stage 1	-	-	-	-	912	-
Stage 2	-	-	-	-	756	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.7	10.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	822	-	-	1438	-
HCM Lane V/C Ratio	0.178	-	-	0.054	-
HCM Control Delay (s)	10.3	-	-	7.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0.2	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	156	15	6	134	9	4
Future Vol, veh/h	156	15	6	134	9	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	173	17	7	149	10	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	190	0	345	182
Stage 1	-	-	-	-	182	-
Stage 2	-	-	-	-	163	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1384	-	652	861
Stage 1	-	-	-	-	849	-
Stage 2	-	-	-	-	866	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1384	-	648	861
Mov Cap-2 Maneuver	-	-	-	-	648	-
Stage 1	-	-	-	-	849	-
Stage 2	-	-	-	-	861	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	10.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	701	-	-	1384	-
HCM Lane V/C Ratio	0.021	-	-	0.005	-
HCM Control Delay (s)	10.2	-	-	7.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	6.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	20	126	114	140	231	26
Future Vol, veh/h	20	126	114	140	231	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	140	127	156	257	29

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	283	0	-	0	389	205
Stage 1	-	-	-	-	205	-
Stage 2	-	-	-	-	184	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1279	-	-	-	615	836
Stage 1	-	-	-	-	829	-
Stage 2	-	-	-	-	848	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1279	-	-	-	603	836
Mov Cap-2 Maneuver	-	-	-	-	603	-
Stage 1	-	-	-	-	813	-
Stage 2	-	-	-	-	848	-

Approach	EB	WB	SB
HCM Control Delay, s	1.1	0	15.7
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1279	-	-	-	620
HCM Lane V/C Ratio	0.017	-	-	-	0.461
HCM Control Delay (s)	7.9	0	-	-	15.7
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	2.4

MOVEMENT SUMMARY

Site: 4 [2025 PM Build Old Knight Road / Haywood Glen Drive Roundabout - Import (Site Folder: General)]

2025 PM Build Old Knight Road / Haywood Glen Drive Roundabout
Site Category: 2025 PM Build
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Old Knight Road														
3	L2	20	2.0	22	2.0	0.211	4.5	LOS A	1.1	27.5	0.12	0.03	0.12	20.8
8	T1	156	2.0	170	2.0	0.211	4.5	LOS A	1.1	27.5	0.12	0.03	0.12	37.4
18	R2	80	2.0	87	2.0	0.211	4.5	LOS A	1.1	27.5	0.12	0.03	0.12	20.8
Approach		256	2.0	278	2.0	0.211	4.5	LOS A	1.1	27.5	0.12	0.03	0.12	28.5
East: Haywood Glen Drive														
1	L2	78	2.0	85	2.0	0.102	4.1	LOS A	0.4	11.3	0.35	0.21	0.35	21.0
6	T1	4	2.0	4	2.0	0.102	4.1	LOS A	0.4	11.3	0.35	0.21	0.35	14.6
16	R2	22	2.0	24	2.0	0.102	4.1	LOS A	0.4	11.3	0.35	0.21	0.35	20.5
Approach		104	2.0	113	2.0	0.102	4.1	LOS A	0.4	11.3	0.35	0.21	0.35	20.6
North: Old Knight Road														
7	L2	13	2.0	14	2.0	0.133	4.1	LOS A	0.6	15.5	0.27	0.14	0.27	21.0
4	T1	131	2.0	142	2.0	0.133	4.1	LOS A	0.6	15.5	0.27	0.14	0.27	37.9
14	R2	4	2.0	4	2.0	0.133	4.1	LOS A	0.6	15.5	0.27	0.14	0.27	21.0
Approach		148	2.0	161	2.0	0.133	4.1	LOS A	0.6	15.5	0.27	0.14	0.27	34.7
West: Haywood Glen Drive														
5	L2	4	2.0	4	2.0	0.021	3.6	LOS A	0.1	2.1	0.36	0.21	0.36	21.3
2	T1	4	2.0	4	2.0	0.021	3.6	LOS A	0.1	2.1	0.36	0.21	0.36	14.6
12	R2	12	2.0	13	2.0	0.021	3.6	LOS A	0.1	2.1	0.36	0.21	0.36	20.8
Approach		20	2.0	22	2.0	0.021	3.6	LOS A	0.1	2.1	0.36	0.21	0.36	19.3
All Vehicles		528	2.0	574	2.0	0.211	4.3	LOS A	1.1	27.5	0.21	0.10	0.21	27.3

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.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	425	508	478	151	148	248	213	136	175	462	419	275
Average Queue (ft)	423	479	293	31	70	155	120	54	172	422	313	248
95th Queue (ft)	441	519	632	95	131	228	201	110	193	530	600	333
Link Distance (ft)		463	463			714	714			419		
Upstream Blk Time (%)		74	1							79	1	
Queuing Penalty (veh)		0	0							0	0	
Storage Bay Dist (ft)	325			250	525			475	75		325	175
Storage Blk Time (%)	96	0	1						91	25		75
Queuing Penalty (veh)	747	0	2						246	85		263

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	1502	239
Average Queue (ft)	817	103
95th Queue (ft)	1762	213
Link Distance (ft)	2112	
Upstream Blk Time (%)	1	
Queuing Penalty (veh)	4	
Storage Bay Dist (ft)		150
Storage Blk Time (%)	5	5
Queuing Penalty (veh)	20	20

Intersection: 2: Old Knight Road & Forestville Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	133	79	32
Average Queue (ft)	50	20	3
95th Queue (ft)	103	59	30
Link Distance (ft)	472	2112	164
Upstream Blk Time (%)			0
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Old Knight Road & Star Ruby Drive

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	L	L
Maximum Queue (ft)	36	52	25	29
Average Queue (ft)	16	23	2	6
95th Queue (ft)	42	48	14	22
Link Distance (ft)	528	493		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			50	50
Storage Blk Time (%)				0
Queuing Penalty (veh)				0

Intersection: 4: Old Knight Road & Haywood Glen Drive

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	24	53	34	30
Average Queue (ft)	2	10	2	5
95th Queue (ft)	12	36	16	22
Link Distance (ft)	388	438	670	942
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Old Knight Road & Phase 4 - Site Access 1

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	48	12
Average Queue (ft)	20	0
95th Queue (ft)	46	6
Link Distance (ft)	556	372
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Old Knight Road & Horton Road

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	43	60
Average Queue (ft)	8	31
95th Queue (ft)	30	49
Link Distance (ft)	870	372
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: Phase 4 - Site Access 2 & Horton Road

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	12	30
Average Queue (ft)	0	9
95th Queue (ft)	6	30
Link Distance (ft)	1488	364
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

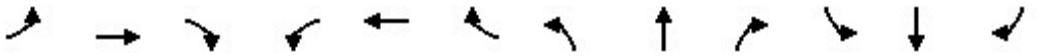
Intersection: 8: Horton Road & Buffalo Road

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	49	126
Average Queue (ft)	6	54
95th Queue (ft)	27	98
Link Distance (ft)	1545	500
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 1388

2025 Build + UDO Improvements Traffic Volumes

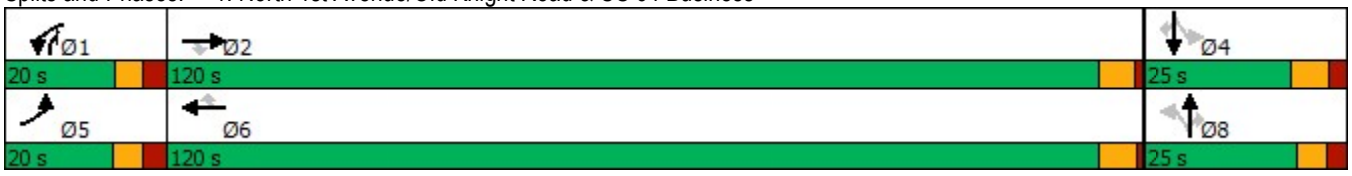


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	214	513	64	88	1012	171	154	112	54	171	136	220
Future Volume (vph)	214	513	64	88	1012	171	154	112	54	171	136	220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			-2%			0%			0%	
Storage Length (ft)	325		250	525		475	75		325	175		150
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1787	3575	1599	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.638			0.677		
Satd. Flow (perm)	1770	3539	1583	1787	3575	1599	1188	1863	1583	1261	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			25			45	
Link Distance (ft)		1035			774			489			2211	
Travel Time (s)		15.7			11.7			13.3			33.5	
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)	238	570	71	98	1124	190	171	124	60	190	151	244
Shared Lane Traffic (%)												
Lane Group Flow (vph)	238	570	71	98	1124	190	171	124	60	190	151	244
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases	5	2		1	6			8	1		4	
Permitted Phases			2			6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	1	4	4	4
Switch Phase												
Minimum Initial (s)	7.0	12.0	12.0	7.0	12.0	12.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	14.0	18.0	18.0	14.0	18.0	18.0	14.0	14.0	14.0	14.0	14.0	14.0
Total Split (s)	20.0	120.0	120.0	20.0	120.0	120.0	25.0	25.0	20.0	25.0	25.0	25.0
Total Split (%)	12.1%	72.7%	72.7%	12.1%	72.7%	72.7%	15.2%	15.2%	12.1%	15.2%	15.2%	15.2%
Maximum Green (s)	13.2	114.2	114.2	13.5	114.2	114.2	18.5	18.5	13.5	18.0	18.0	18.0
Yellow Time (s)	3.8	4.5	4.5	3.5	4.7	4.7	3.8	3.8	3.5	4.5	4.5	4.5
All-Red Time (s)	3.0	1.3	1.3	3.0	1.1	1.1	2.7	2.7	3.0	2.5	2.5	2.5
Lost Time Adjust (s)	-1.8	-0.8	-0.8	-1.5	-0.8	-0.8	-1.5	-1.5	-1.5	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes			
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0	6.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum Gap (s)	1.0	3.2	3.2	1.0	3.2	3.2	1.0	1.0	1.0	1.0	1.0	1.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	15.0	15.0	0.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	30.0	30.0	0.0	30.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Act Effct Green (s)	15.0	37.5	37.5	9.8	32.3	32.3	20.1	20.1	34.8	20.1	20.1	20.1
Actuated g/C Ratio	0.18	0.46	0.46	0.12	0.39	0.39	0.24	0.24	0.42	0.24	0.24	0.24
v/c Ratio	0.74	0.35	0.10	0.46	0.80	0.30	0.59	0.27	0.09	0.62	0.33	0.63
Control Delay	48.6	15.3	13.3	42.4	27.2	18.5	38.9	28.7	15.7	39.6	29.5	37.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.6	15.3	13.3	42.4	27.2	18.5	38.9	28.7	15.7	39.6	29.5	37.9
LOS	D	B	B	D	C	B	D	C	B	D	C	D
Approach Delay		24.2			27.1			31.4			36.3	
Approach LOS		C			C			C			D	
Queue Length 50th (ft)	117	94	20	48	264	66	78	52	18	87	64	113
Queue Length 95th (ft)	#252	141	45	100	338	113	#173	109	45	#192	129	#227
Internal Link Dist (ft)		955			694			409			2131	
Turn Bay Length (ft)	325		250	525		475	75		325	175		150
Base Capacity (vph)	322	3539	1583	326	3575	1599	289	453	770	306	453	385
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.16	0.04	0.30	0.31	0.12	0.59	0.27	0.08	0.62	0.33	0.63

Intersection Summary			
Area Type:	Other		
Cycle Length: 165			
Actuated Cycle Length: 82.4			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 28.4		Intersection LOS: C	
Intersection Capacity Utilization 72.2%		ICU Level of Service C	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: North 1st Avenue/Old Knight Road & US 64 Business

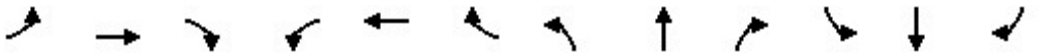


Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	246	159	136	84	118	332	288	142	168	257	101	228
Average Queue (ft)	116	82	58	28	44	199	160	67	89	78	23	101
95th Queue (ft)	200	138	111	69	92	287	253	123	156	208	94	185
Link Distance (ft)		984	984			714	714			419		
Upstream Blk Time (%)										0	0	
Queuing Penalty (veh)										0	0	
Storage Bay Dist (ft)	325			250	525			475	75		325	175
Storage Blk Time (%)	0								24	4		2
Queuing Penalty (veh)	0								39	9		8

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	245	199
Average Queue (ft)	71	95
95th Queue (ft)	176	175
Link Distance (ft)	2112	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		150
Storage Blk Time (%)	1	3
Queuing Penalty (veh)	4	10

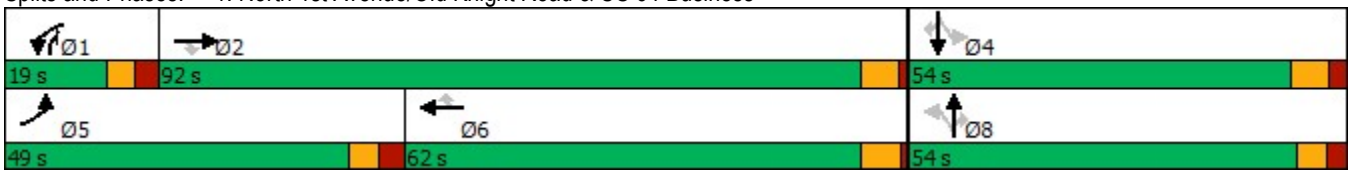


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	368	1550	331	117	872	141	232	156	115	218	169	184
Future Volume (vph)	368	1550	331	117	872	141	232	156	115	218	169	184
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			-2%			0%			0%	
Storage Length (ft)	325		250	525		475	75		325	175		150
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1787	3575	1599	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.528			0.552		
Satd. Flow (perm)	1770	3539	1583	1787	3575	1599	984	1863	1583	1028	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			25			45	
Link Distance (ft)		1108			774			489			2211	
Travel Time (s)		16.8			11.7			13.3			33.5	
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)	409	1722	368	130	969	157	258	173	128	242	188	204
Shared Lane Traffic (%)												
Lane Group Flow (vph)	409	1722	368	130	969	157	258	173	128	242	188	204
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases	5	2		1	6			8	1		4	
Permitted Phases			2			6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	1	4	4	4
Switch Phase												
Minimum Initial (s)	7.0	12.0	12.0	7.0	12.0	12.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	14.0	18.0	18.0	14.0	18.0	18.0	14.0	14.0	14.0	14.0	14.0	14.0
Total Split (s)	49.0	92.0	92.0	19.0	62.0	62.0	54.0	54.0	19.0	54.0	54.0	54.0
Total Split (%)	29.7%	55.8%	55.8%	11.5%	37.6%	37.6%	32.7%	32.7%	11.5%	32.7%	32.7%	32.7%
Maximum Green (s)	42.2	86.2	86.2	12.5	56.2	56.2	47.5	47.5	12.5	47.0	47.0	47.0
Yellow Time (s)	3.8	4.5	4.5	3.5	4.7	4.7	3.8	3.8	3.5	4.5	4.5	4.5
All-Red Time (s)	3.0	1.3	1.3	3.0	1.1	1.1	2.7	2.7	3.0	2.5	2.5	2.5
Lost Time Adjust (s)	-1.8	-0.8	-0.8	-1.5	-0.8	-0.8	-1.5	-1.5	-1.5	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes			
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0	6.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum Gap (s)	1.0	3.2	3.2	1.0	3.2	3.2	1.0	1.0	1.0	1.0	1.0	1.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	15.0	15.0	0.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	30.0	30.0	0.0	30.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Act Effct Green (s)	39.1	79.0	79.0	13.5	53.4	53.4	43.5	43.5	62.2	43.5	43.5	43.5
Actuated g/C Ratio	0.26	0.52	0.52	0.09	0.35	0.35	0.29	0.29	0.41	0.29	0.29	0.29
v/c Ratio	0.89	0.93	0.45	0.82	0.77	0.28	0.91	0.32	0.20	0.82	0.35	0.45
Control Delay	78.0	44.4	25.2	105.4	49.7	38.9	88.7	45.6	31.0	74.2	46.1	49.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	78.0	44.4	25.2	105.4	49.7	38.9	88.7	45.6	31.0	74.2	46.1	49.0
LOS	E	D	C	F	D	D	F	D	C	E	D	D
Approach Delay		47.1			54.1			62.1			57.8	
Approach LOS		D			D			E			E	
Queue Length 50th (ft)	425	882	240	141	495	123	267	146	88	242	160	179
Queue Length 95th (ft)	#608	1005	328	#269	582	188	#440	218	140	#388	235	263
Internal Link Dist (ft)		1028			694			409			2131	
Turn Bay Length (ft)	325		250	525		475	75		325	175		150
Base Capacity (vph)	526	2079	929	168	1376	615	325	616	658	340	616	524
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.78	0.83	0.40	0.77	0.70	0.26	0.79	0.28	0.19	0.71	0.31	0.39

Intersection Summary			
Area Type:	Other		
Cycle Length: 165			
Actuated Cycle Length: 151.4			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.93			
Intersection Signal Delay: 51.9		Intersection LOS: D	
Intersection Capacity Utilization 87.7%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: North 1st Avenue/Old Knight Road & US 64 Business



Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	425	802	772	350	226	481	449	219	175	435	312	269
Average Queue (ft)	344	455	421	244	119	299	265	91	155	265	107	176
95th Queue (ft)	490	695	650	420	224	431	399	177	207	482	332	281
Link Distance (ft)		1057	1057			714	714			419		
Upstream Blk Time (%)		0								12	0	
Queuing Penalty (veh)		0								0	0	
Storage Bay Dist (ft)	325			250	525			475	75		325	175
Storage Blk Time (%)	14	15	22	1		0	0		61	23		20
Queuing Penalty (veh)	110	56	72	8		0	0		166	80		72

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	649	241
Average Queue (ft)	207	105
95th Queue (ft)	588	205
Link Distance (ft)	2112	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		150
Storage Blk Time (%)	5	4
Queuing Penalty (veh)	20	17

2025 Build Traffic Volumes –
Old Knight Road / Forestville Road
Roundabout Analysis

MOVEMENT SUMMARY

Site: 2 [2025 AM Build Old Knight Road / Forestville Road Roundabout (Site Folder: General)]

Old Knight Road / Forestville Road Roundabout 2025 AM Build
Site Category: 2025 AM Build
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Old Knight Road														
3	L2	124	2.0	135	2.0	0.247	4.8	LOS A	1.3	33.9	0.08	0.02	0.08	36.4
8	T1	180	2.0	196	2.0	0.247	4.8	LOS A	1.3	33.9	0.08	0.02	0.08	36.4
Approach		304	2.0	330	2.0	0.247	4.8	LOS A	1.3	33.9	0.08	0.02	0.08	36.4
North: Old Knight Road														
4	T1	334	2.0	363	2.0	0.330	6.2	LOS A	1.9	47.0	0.36	0.22	0.36	37.0
14	R2	23	2.0	25	2.0	0.330	6.2	LOS A	1.9	47.0	0.36	0.22	0.36	35.9
Approach		357	2.0	388	2.0	0.330	6.2	LOS A	1.9	47.0	0.36	0.22	0.36	36.9
West: Forestville Road														
5	L2	10	2.0	11	2.0	0.130	5.1	LOS A	0.6	14.1	0.48	0.38	0.48	37.2
12	R2	101	2.0	110	2.0	0.130	5.1	LOS A	0.6	14.1	0.48	0.38	0.48	36.2
Approach		111	2.0	121	2.0	0.130	5.1	LOS A	0.6	14.1	0.48	0.38	0.48	36.2
All Vehicles		772	2.0	839	2.0	0.330	5.5	LOS A	1.9	47.0	0.27	0.16	0.27	36.6

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.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection: 2: Old Knight Road & Forestville Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	52	51	85
Average Queue (ft)	12	7	26
95th Queue (ft)	39	31	68
Link Distance (ft)	431	2060	125
Upstream Blk Time (%)			0
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

MOVEMENT SUMMARY

Site: 2 [2025 PM Build Old Knight Road / Forestville Road Roundabout - Copy - Import (Site Folder: General)]

Old Knight Road / Forestville Road Roundabout 2025 PM Build
Site Category: 2025 PM Build
Roundabout

Vehicle Movement Performance

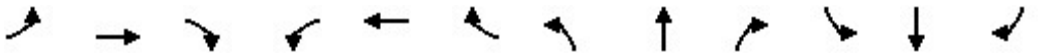
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Old Knight Road														
3	L2	104	2.0	113	2.0	0.440	7.3	LOS A	3.0	76.3	0.29	0.13	0.29	35.6
8	T1	408	2.0	443	2.0	0.440	7.3	LOS A	3.0	76.3	0.29	0.13	0.29	35.7
Approach		512	2.0	557	2.0	0.440	7.3	LOS A	3.0	76.3	0.29	0.13	0.29	35.7
North: Old Knight Road														
4	T1	290	2.0	315	2.0	0.286	5.6	LOS A	1.5	39.2	0.32	0.18	0.32	37.3
14	R2	27	2.0	29	2.0	0.286	5.6	LOS A	1.5	39.2	0.32	0.18	0.32	36.2
Approach		317	2.0	345	2.0	0.286	5.6	LOS A	1.5	39.2	0.32	0.18	0.32	37.2
West: Forestville Road														
5	L2	59	2.0	64	2.0	0.190	5.5	LOS A	0.9	21.8	0.47	0.37	0.47	36.1
12	R2	111	2.0	121	2.0	0.190	5.5	LOS A	0.9	21.8	0.47	0.37	0.47	35.1
Approach		170	2.0	185	2.0	0.190	5.5	LOS A	0.9	21.8	0.47	0.37	0.47	35.5
All Vehicles		999	2.0	1086	2.0	0.440	6.4	LOS A	3.0	76.3	0.33	0.19	0.33	36.1

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.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection: 2: Old Knight Road & Forestville Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	82	58	74
Average Queue (ft)	22	10	17
95th Queue (ft)	74	38	54
Link Distance (ft)	431	2060	125
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

2034 Horizon Year Traffic Volumes



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	275	669	84	115	1320	215	201	144	70	210	172	262
Future Volume (vph)	275	669	84	115	1320	215	201	144	70	210	172	262
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			-2%			0%			0%	
Storage Length (ft)	325		250	525		475	75		325	175		150
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1787	3575	1599	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.506			0.573		
Satd. Flow (perm)	1770	3539	1583	1787	3575	1599	943	1863	1583	1067	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			25			45	
Link Distance (ft)		514			774			489			2211	
Travel Time (s)		7.8			11.7			13.3			33.5	
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)	306	743	93	128	1467	239	223	160	78	233	191	291
Shared Lane Traffic (%)												
Lane Group Flow (vph)	306	743	93	128	1467	239	223	160	78	233	191	291
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases	5	2		1	6			8	1		4	
Permitted Phases			2			6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	1	4	4	4
Switch Phase												
Minimum Initial (s)	7.0	12.0	12.0	7.0	12.0	12.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	13.8	17.8	17.8	13.5	17.8	17.8	13.5	13.5	13.5	14.0	14.0	14.0
Total Split (s)	20.0	120.0	120.0	20.0	120.0	120.0	25.0	25.0	20.0	25.0	25.0	25.0
Total Split (%)	12.1%	72.7%	72.7%	12.1%	72.7%	72.7%	15.2%	15.2%	12.1%	15.2%	15.2%	15.2%
Maximum Green (s)	13.2	114.2	114.2	13.5	114.2	114.2	18.5	18.5	13.5	18.0	18.0	18.0
Yellow Time (s)	3.8	4.5	4.5	3.5	4.7	4.7	3.8	3.8	3.5	4.5	4.5	4.5
All-Red Time (s)	3.0	1.3	1.3	3.0	1.1	1.1	2.7	2.7	3.0	2.5	2.5	2.5
Lost Time Adjust (s)	-1.8	-0.8	-0.8	-1.5	-0.8	-0.8	-1.5	-1.5	-1.5	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes			
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0	6.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum Gap (s)	1.0	3.2	3.2	1.0	3.2	3.2	1.0	1.0	1.0	1.0	1.0	1.0

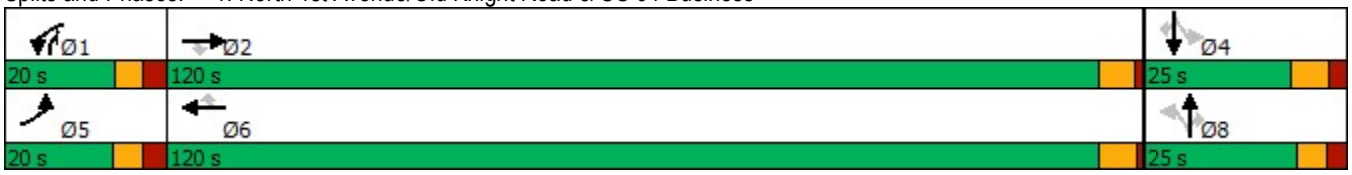
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	15.0	15.0	0.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	30.0	30.0	0.0	30.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Act Effct Green (s)	15.1	50.0	50.0	12.2	47.0	47.0	20.2	20.2	37.3	20.2	20.2	20.2
Actuated g/C Ratio	0.16	0.51	0.51	0.13	0.48	0.48	0.21	0.21	0.38	0.21	0.21	0.21
v/c Ratio	1.12	0.41	0.11	0.58	0.85	0.31	1.14	0.42	0.13	1.06	0.50	0.89
Control Delay	129.5	15.4	12.8	52.3	27.4	16.1	147.5	39.5	21.7	117.0	41.3	68.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	129.5	15.4	12.8	52.3	27.4	16.1	147.5	39.5	21.7	117.0	41.3	68.7
LOS	F	B	B	D	C	B	F	D	C	F	D	E
Approach Delay		45.8			27.6			88.7			77.1	
Approach LOS		D			C			F			E	
Queue Length 50th (ft)	~218	142	28	75	400	86	~162	86	30	~158	105	175
Queue Length 95th (ft)	#446	194	57	148	491	135	#356	169	71	#356	199	#387
Internal Link Dist (ft)		434			694			409			2131	
Turn Bay Length (ft)	325		250	525		475	75		325	175		150
Base Capacity (vph)	274	3539	1583	277	3575	1599	195	385	655	220	385	327
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.12	0.21	0.06	0.46	0.41	0.15	1.14	0.42	0.12	1.06	0.50	0.89

Intersection Summary			
Area Type:	Other		
Cycle Length: 165			
Actuated Cycle Length: 97.4			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.14			
Intersection Signal Delay: 47.9		Intersection LOS: D	
Intersection Capacity Utilization 88.6%		ICU Level of Service E	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: North 1st Avenue/Old Knight Road & US 64 Business



Intersection	
Int Delay, s/veh	3.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	12	132	162	220	392	27
Future Vol, veh/h	12	132	162	220	392	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	147	180	244	436	30

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1055	451	466	0	-	0
Stage 1	451	-	-	-	-	-
Stage 2	604	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	250	608	1095	-	-	-
Stage 1	642	-	-	-	-	-
Stage 2	546	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	203	608	1095	-	-	-
Mov Cap-2 Maneuver	203	-	-	-	-	-
Stage 1	520	-	-	-	-	-
Stage 2	546	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.9	3.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1095	-	521	-	-
HCM Lane V/C Ratio	0.164	-	0.307	-	-
HCM Control Delay (s)	8.9	0	14.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.6	-	1.3	-	-

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↰	↱		↰	↱	
Traffic Vol, veh/h	4	0	17	27	0	34	6	148	9	10	226	4
Future Vol, veh/h	4	0	17	27	0	34	6	148	9	10	226	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	50	-	-	50	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	0	19	30	0	38	7	164	10	11	251	4

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	477	463	253	468	460	169	255	0	0	174	0	0
Stage 1	275	275	-	183	183	-	-	-	-	-	-	-
Stage 2	202	188	-	285	277	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	498	496	786	505	498	875	1310	-	-	1403	-	-
Stage 1	731	683	-	819	748	-	-	-	-	-	-	-
Stage 2	800	745	-	722	681	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	472	490	786	488	492	875	1310	-	-	1403	-	-
Mov Cap-2 Maneuver	472	490	-	488	492	-	-	-	-	-	-	-
Stage 1	727	678	-	815	744	-	-	-	-	-	-	-
Stage 2	761	741	-	699	676	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.3	11.2	0.3	0.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1310	-	-	698	648	1403	-	-
HCM Lane V/C Ratio	0.005	-	-	0.033	0.105	0.008	-	-
HCM Control Delay (s)	7.8	-	-	10.3	11.2	7.6	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.3	0	-	-

Intersection	
Int Delay, s/veh	1.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	42	4	136	14	4	121
Future Vol, veh/h	42	4	136	14	4	121
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	47	4	151	16	4	134

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	301	159	0	0	167	0
Stage 1	159	-	-	-	-	-
Stage 2	142	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	691	886	-	-	1411	-
Stage 1	870	-	-	-	-	-
Stage 2	885	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	689	886	-	-	1411	-
Mov Cap-2 Maneuver	689	-	-	-	-	-
Stage 1	870	-	-	-	-	-
Stage 2	882	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.5	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	703	1411	-
HCM Lane V/C Ratio	-	-	0.073	0.003	-
HCM Control Delay (s)	-	-	10.5	7.6	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	6.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	27	23	90	83	82	61
Future Vol, veh/h	27	23	90	83	82	61
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	30	26	100	92	91	68

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	56	0	335	43
Stage 1	-	-	-	-	43	-
Stage 2	-	-	-	-	292	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1549	-	660	1027
Stage 1	-	-	-	-	979	-
Stage 2	-	-	-	-	758	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1549	-	615	1027
Mov Cap-2 Maneuver	-	-	-	-	615	-
Stage 1	-	-	-	-	979	-
Stage 2	-	-	-	-	706	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.9	11.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	742	-	-	1549	-
HCM Lane V/C Ratio	0.214	-	-	0.065	-
HCM Control Delay (s)	11.2	-	-	7.5	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.8	-	-	0.2	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	85	4	4	158	14	6
Future Vol, veh/h	85	4	4	158	14	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	94	4	4	176	16	7

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	98	0	280	96
Stage 1	-	-	-	-	96	-
Stage 2	-	-	-	-	184	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1495	-	710	960
Stage 1	-	-	-	-	928	-
Stage 2	-	-	-	-	848	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1495	-	708	960
Mov Cap-2 Maneuver	-	-	-	-	708	-
Stage 1	-	-	-	-	928	-
Stage 2	-	-	-	-	845	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	9.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	769	-	-	1495	-
HCM Lane V/C Ratio	0.029	-	-	0.003	-
HCM Control Delay (s)	9.8	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	18	63	130	232	110	17
Future Vol, veh/h	18	63	130	232	110	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	20	70	144	258	122	19

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	402	0	-	0	383	273
Stage 1	-	-	-	-	273	-
Stage 2	-	-	-	-	110	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1157	-	-	-	620	766
Stage 1	-	-	-	-	773	-
Stage 2	-	-	-	-	915	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1157	-	-	-	609	766
Mov Cap-2 Maneuver	-	-	-	-	609	-
Stage 1	-	-	-	-	759	-
Stage 2	-	-	-	-	915	-

Approach	EB	WB	SB
HCM Control Delay, s	1.8	0	12.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1157	-	-	-	626
HCM Lane V/C Ratio	0.017	-	-	-	0.225
HCM Control Delay (s)	8.2	0	-	-	12.4
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.9

MOVEMENT SUMMARY

Site: 4 [2034 AM Build Old Knight Road / Haywood Glen Drive Roundabout - Import (Site Folder: General)]

2034 AM Build Old Knight Road / Haywood Glen Drive Roundabout
Site Category: 2034 AM Build
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Old Knight Road														
3	L2	6	2.0	7	2.0	0.154	4.0	LOS A	0.7	18.7	0.12	0.03	0.12	20.9
8	T1	127	2.0	138	2.0	0.154	4.0	LOS A	0.7	18.7	0.12	0.03	0.12	38.0
18	R2	53	2.0	58	2.0	0.154	4.0	LOS A	0.7	18.7	0.12	0.03	0.12	20.9
Approach		186	2.0	202	2.0	0.154	4.0	LOS A	0.7	18.7	0.12	0.03	0.12	30.2
East: Haywood Glen Drive														
1	L2	73	2.0	79	2.0	0.091	3.9	LOS A	0.4	10.1	0.30	0.16	0.30	21.1
6	T1	4	2.0	4	2.0	0.091	3.9	LOS A	0.4	10.1	0.30	0.16	0.30	14.6
16	R2	20	2.0	22	2.0	0.091	3.9	LOS A	0.4	10.1	0.30	0.16	0.30	20.6
Approach		97	2.0	105	2.0	0.091	3.9	LOS A	0.4	10.1	0.30	0.16	0.30	20.6
North: Old Knight Road														
7	L2	16	2.0	17	2.0	0.147	4.2	LOS A	0.7	17.5	0.24	0.11	0.24	21.0
4	T1	147	2.0	160	2.0	0.147	4.2	LOS A	0.7	17.5	0.24	0.11	0.24	37.8
14	R2	4	2.0	4	2.0	0.147	4.2	LOS A	0.7	17.5	0.24	0.11	0.24	21.0
Approach		167	2.0	182	2.0	0.147	4.2	LOS A	0.7	17.5	0.24	0.11	0.24	34.5
West: Haywood Glen Drive														
5	L2	4	2.0	4	2.0	0.027	3.7	LOS A	0.1	2.8	0.38	0.22	0.38	21.3
2	T1	4	2.0	4	2.0	0.027	3.7	LOS A	0.1	2.8	0.38	0.22	0.38	14.6
12	R2	18	2.0	20	2.0	0.027	3.7	LOS A	0.1	2.8	0.38	0.22	0.38	20.8
Approach		26	2.0	28	2.0	0.027	3.7	LOS A	0.1	2.8	0.38	0.22	0.38	19.6
All Vehicles		476	2.0	517	2.0	0.154	4.0	LOS A	0.7	18.7	0.21	0.10	0.21	27.9

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.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	425	502	469	67	158	396	376	185	175	460	419	275
Average Queue (ft)	381	384	161	15	68	255	219	82	162	341	173	230
95th Queue (ft)	507	640	462	50	128	360	332	149	207	566	491	339
Link Distance (ft)		463	463			714	714			419		
Upstream Blk Time (%)		54	0							49	1	
Queuing Penalty (veh)		0	0							0	0	
Storage Bay Dist (ft)	325			250	525			475	75		325	175
Storage Blk Time (%)	71	0	0						83	20		58
Queuing Penalty (veh)	236	0	0						177	53		252

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	1411	250
Average Queue (ft)	774	174
95th Queue (ft)	1689	287
Link Distance (ft)	2112	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		150
Storage Blk Time (%)	6	29
Queuing Penalty (veh)	27	111

Intersection: 2: Old Knight Road & Forestville Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	92	106	45
Average Queue (ft)	41	40	3
95th Queue (ft)	69	87	23
Link Distance (ft)	472	2112	164
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Old Knight Road & Star Ruby Drive

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	L	L
Maximum Queue (ft)	38	74	18	14
Average Queue (ft)	16	31	1	1
95th Queue (ft)	42	58	9	9
Link Distance (ft)	528	493		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			50	50
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Old Knight Road & Haywood Glen Drive

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	28	50	40	32
Average Queue (ft)	2	10	3	4
95th Queue (ft)	15	36	19	20
Link Distance (ft)	388	438	670	942
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Old Knight Road & Phase 4 - Site Access 1

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	51	12
Average Queue (ft)	26	1
95th Queue (ft)	49	7
Link Distance (ft)	556	372
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Old Knight Road & Horton Road

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	38	80
Average Queue (ft)	4	35
95th Queue (ft)	22	59
Link Distance (ft)	870	372
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: Phase 4 - Site Access 2 & Horton Road

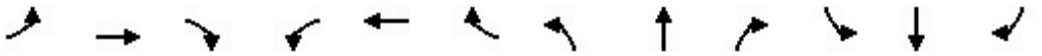
Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	5	33
Average Queue (ft)	0	14
95th Queue (ft)	4	37
Link Distance (ft)	1488	364
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Horton Road & Buffalo Road

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (ft)	36	2	77
Average Queue (ft)	6	0	32
95th Queue (ft)	25	2	59
Link Distance (ft)	1545	369	500
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 857



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	451	2022	432	153	1138	169	303	197	150	270	215	230
Future Volume (vph)	451	2022	432	153	1138	169	303	197	150	270	215	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			-2%			0%			0%	
Storage Length (ft)	325		250	525		475	75		325	175		150
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1787	3575	1599	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.199			0.199		
Satd. Flow (perm)	1770	3539	1583	1787	3575	1599	371	1863	1583	371	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			25			45	
Link Distance (ft)		514			774			489			2211	
Travel Time (s)		7.8			11.7			13.3			33.5	
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)	501	2247	480	170	1264	188	337	219	167	300	239	256
Shared Lane Traffic (%)												
Lane Group Flow (vph)	501	2247	480	170	1264	188	337	219	167	300	239	256
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases	5	2		1	6			8	1		4	
Permitted Phases			2			6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	1	4	4	4
Switch Phase												
Minimum Initial (s)	7.0	12.0	12.0	7.0	12.0	12.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	13.8	17.8	17.8	13.5	17.8	17.8	13.5	13.5	13.5	14.0	14.0	14.0
Total Split (s)	20.0	120.0	120.0	20.0	120.0	120.0	25.0	25.0	20.0	25.0	25.0	25.0
Total Split (%)	12.1%	72.7%	72.7%	12.1%	72.7%	72.7%	15.2%	15.2%	12.1%	15.2%	15.2%	15.2%
Maximum Green (s)	13.2	114.2	114.2	13.5	114.2	114.2	18.5	18.5	13.5	18.0	18.0	18.0
Yellow Time (s)	3.8	4.5	4.5	3.5	4.7	4.7	3.8	3.8	3.5	4.5	4.5	4.5
All-Red Time (s)	3.0	1.3	1.3	3.0	1.1	1.1	2.7	2.7	3.0	2.5	2.5	2.5
Lost Time Adjust (s)	-1.8	-0.8	-0.8	-1.5	-0.8	-0.8	-1.5	-1.5	-1.5	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes			
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0	6.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum Gap (s)	1.0	3.2	3.2	1.0	3.2	3.2	1.0	1.0	1.0	1.0	1.0	1.0

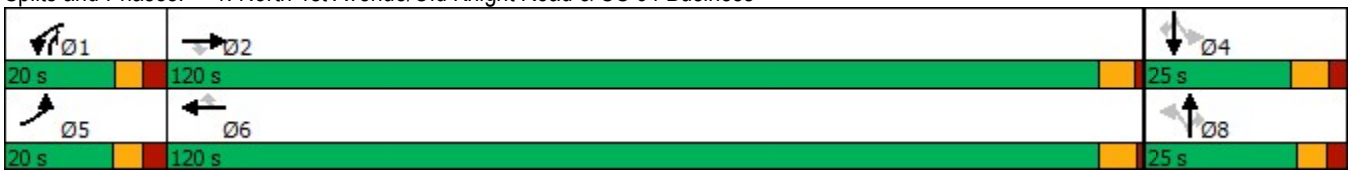
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	15.0	15.0	0.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	30.0	30.0	0.0	30.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Act Effct Green (s)	15.1	108.2	108.2	15.1	108.2	108.2	20.2	20.2	40.3	20.2	20.2	20.2
Actuated g/C Ratio	0.10	0.68	0.68	0.10	0.68	0.68	0.13	0.13	0.25	0.13	0.13	0.13
v/c Ratio	2.98	0.93	0.44	1.00	0.52	0.17	7.33	0.93	0.42	6.52	1.01	1.28
Control Delay	930.8	30.0	12.8	139.7	13.0	9.2	2885.3	110.9	55.2	2526.7	129.1	209.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	930.8	30.0	12.8	139.7	13.0	9.2	2885.3	110.9	55.2	2526.7	129.1	209.8
LOS	F	C	B	F	B	A	F	F	E	F	F	F
Approach Delay		167.2			25.9			1391.2			1059.9	
Approach LOS		F			C			F			F	
Queue Length 50th (ft)	~941	991	211	~199	314	65	~704	240	154	~621	~282	~358
Queue Length 95th (ft)	#1176	1125	282	#362	363	97	#881	#419	233	#790	#468	#548
Internal Link Dist (ft)		434			694			409			2131	
Turn Bay Length (ft)	325		250	525		475	75		325	175		150
Base Capacity (vph)	168	2586	1156	170	2612	1168	46	236	402	46	236	200
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	2.98	0.87	0.42	1.00	0.48	0.16	7.33	0.93	0.42	6.52	1.01	1.28

Intersection Summary			
Area Type:	Other		
Cycle Length: 165			
Actuated Cycle Length: 158.6			
Natural Cycle: 140			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 7.33			
Intersection Signal Delay: 381.6		Intersection LOS: F	
Intersection Capacity Utilization 109.1%		ICU Level of Service H	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: North 1st Avenue/Old Knight Road & US 64 Business



Intersection	
Int Delay, s/veh	9.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	75	145	136	481	349	34
Future Vol, veh/h	75	145	136	481	349	34
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	83	161	151	534	388	38

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1243	407	426	0	-	0
Stage 1	407	-	-	-	-	-
Stage 2	836	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	193	644	1133	-	-	-
Stage 1	672	-	-	-	-	-
Stage 2	425	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	156	644	1133	-	-	-
Mov Cap-2 Maneuver	156	-	-	-	-	-
Stage 1	544	-	-	-	-	-
Stage 2	425	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	48.1	1.9	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1133	-	312	-	-
HCM Lane V/C Ratio	0.133	-	0.783	-	-
HCM Control Delay (s)	8.7	0	48.1	-	-
HCM Lane LOS	A	A	E	-	-
HCM 95th %tile Q(veh)	0.5	-	6.2	-	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	0	11	23	0	18	20	266	43	42	220	4
Future Vol, veh/h	4	0	11	23	0	18	20	266	43	42	220	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	50	-	-	50	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	0	12	26	0	20	22	296	48	47	244	4

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	714	728	246	710	706	320	248	0	0	344	0	0
Stage 1	340	340	-	364	364	-	-	-	-	-	-	-
Stage 2	374	388	-	346	342	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	346	350	793	348	361	721	1318	-	-	1215	-	-
Stage 1	675	639	-	655	624	-	-	-	-	-	-	-
Stage 2	647	609	-	670	638	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	322	331	793	328	341	721	1318	-	-	1215	-	-
Mov Cap-2 Maneuver	322	331	-	328	341	-	-	-	-	-	-	-
Stage 1	664	614	-	644	613	-	-	-	-	-	-	-
Stage 2	619	599	-	634	613	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.5	14.3	0.5	1.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1318	-	-	570	431	1215	-	-
HCM Lane V/C Ratio	0.017	-	-	0.029	0.106	0.038	-	-
HCM Control Delay (s)	7.8	-	-	11.5	14.3	8.1	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	0.4	0.1	-	-

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	28	4	165	48	4	148
Future Vol, veh/h	28	4	165	48	4	148
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	31	4	183	53	4	164

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	382	210	0	0	236	0
Stage 1	210	-	-	-	-	-
Stage 2	172	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	620	830	-	-	1331	-
Stage 1	825	-	-	-	-	-
Stage 2	858	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	618	830	-	-	1331	-
Mov Cap-2 Maneuver	618	-	-	-	-	-
Stage 1	825	-	-	-	-	-
Stage 2	855	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	638	1331	-
HCM Lane V/C Ratio	-	-	0.056	0.003	-
HCM Control Delay (s)	-	-	11	7.7	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	4.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	96	72	84	95	45	120
Future Vol, veh/h	96	72	84	95	45	120
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	107	80	93	106	50	133

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	187	0	439	147
Stage 1	-	-	-	-	147	-
Stage 2	-	-	-	-	292	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1387	-	575	900
Stage 1	-	-	-	-	880	-
Stage 2	-	-	-	-	758	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1387	-	534	900
Mov Cap-2 Maneuver	-	-	-	-	534	-
Stage 1	-	-	-	-	880	-
Stage 2	-	-	-	-	704	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.7	11.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	758	-	-	1387	-
HCM Lane V/C Ratio	0.242	-	-	0.067	-
HCM Control Delay (s)	11.3	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.9	-	-	0.2	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	200	15	6	170	9	4
Future Vol, veh/h	200	15	6	170	9	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	222	17	7	189	10	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	239	0	434	231
Stage 1	-	-	-	-	231	-
Stage 2	-	-	-	-	203	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1328	-	579	808
Stage 1	-	-	-	-	807	-
Stage 2	-	-	-	-	831	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1328	-	576	808
Mov Cap-2 Maneuver	-	-	-	-	576	-
Stage 1	-	-	-	-	807	-
Stage 2	-	-	-	-	826	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	10.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	632	-	-	1328	-
HCM Lane V/C Ratio	0.023	-	-	0.005	-
HCM Control Delay (s)	10.8	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	10.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	25	162	146	183	301	31
Future Vol, veh/h	25	162	146	183	301	31
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	28	180	162	203	334	34

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	365	0	-	0	500	264
Stage 1	-	-	-	-	264	-
Stage 2	-	-	-	-	236	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1194	-	-	-	530	775
Stage 1	-	-	-	-	780	-
Stage 2	-	-	-	-	803	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1194	-	-	-	516	775
Mov Cap-2 Maneuver	-	-	-	-	516	-
Stage 1	-	-	-	-	760	-
Stage 2	-	-	-	-	803	-

Approach	EB	WB	SB
HCM Control Delay, s	1.1	0	25.6
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1194	-	-	-	533
HCM Lane V/C Ratio	0.023	-	-	-	0.692
HCM Control Delay (s)	8.1	0	-	-	25.6
HCM Lane LOS	A	A	-	-	D
HCM 95th %tile Q(veh)	0.1	-	-	-	5.3

MOVEMENT SUMMARY

Site: 4 [2034 PM Build Old Knight Road / Haywood Glen Drive Roundabout - Import - Import (Site Folder: General)]

2034 PM Build Old Knight Road / Haywood Glen Drive Roundabout
Site Category: 2034 PM Build
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Old Knight Road														
3	L2	20	2.0	22	2.0	0.236	4.8	LOS A	1.3	31.8	0.12	0.04	0.12	20.7
8	T1	184	2.0	200	2.0	0.236	4.8	LOS A	1.3	31.8	0.12	0.04	0.12	37.3
18	R2	83	2.0	90	2.0	0.236	4.8	LOS A	1.3	31.8	0.12	0.04	0.12	20.7
Approach		287	2.0	312	2.0	0.236	4.8	LOS A	1.3	31.8	0.12	0.04	0.12	29.0
East: Haywood Glen Drive														
1	L2	90	2.0	98	2.0	0.123	4.5	LOS A	0.5	13.7	0.38	0.25	0.38	21.0
6	T1	4	2.0	4	2.0	0.123	4.5	LOS A	0.5	13.7	0.38	0.25	0.38	14.6
16	R2	27	2.0	29	2.0	0.123	4.5	LOS A	0.5	13.7	0.38	0.25	0.38	20.5
Approach		121	2.0	132	2.0	0.123	4.5	LOS A	0.5	13.7	0.38	0.25	0.38	20.6
North: Old Knight Road														
7	L2	14	2.0	15	2.0	0.162	4.4	LOS A	0.8	19.3	0.29	0.16	0.29	20.9
4	T1	159	2.0	173	2.0	0.162	4.4	LOS A	0.8	19.3	0.29	0.16	0.29	37.7
14	R2	4	2.0	4	2.0	0.162	4.4	LOS A	0.8	19.3	0.29	0.16	0.29	20.9
Approach		177	2.0	192	2.0	0.162	4.4	LOS A	0.8	19.3	0.29	0.16	0.29	34.9
West: Haywood Glen Drive														
5	L2	4	2.0	4	2.0	0.022	3.8	LOS A	0.1	2.2	0.40	0.24	0.40	21.3
2	T1	4	2.0	4	2.0	0.022	3.8	LOS A	0.1	2.2	0.40	0.24	0.40	14.6
12	R2	12	2.0	13	2.0	0.022	3.8	LOS A	0.1	2.2	0.40	0.24	0.40	20.8
Approach		20	2.0	22	2.0	0.022	3.8	LOS A	0.1	2.2	0.40	0.24	0.40	19.3
All Vehicles		605	2.0	658	2.0	0.236	4.6	LOS A	1.3	31.8	0.23	0.12	0.23	27.6

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.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	425	509	480	234	233	321	291	142	175	461	419	275
Average Queue (ft)	424	482	285	36	107	200	173	62	174	436	323	273
95th Queue (ft)	424	496	632	129	195	289	262	122	178	448	605	285
Link Distance (ft)		463	463			714	714			419		
Upstream Blk Time (%)		76	1							85	2	
Queuing Penalty (veh)		0	0							0	0	
Storage Bay Dist (ft)	325			250	525			475	75		325	175
Storage Blk Time (%)	98	0	0						93	25		91
Queuing Penalty (veh)	989	0	2						323	111		405

Intersection: 1: North 1st Avenue/Old Knight Road & US 64 Business

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	2000	248
Average Queue (ft)	1501	120
95th Queue (ft)	2243	240
Link Distance (ft)	2112	
Upstream Blk Time (%)	8	
Queuing Penalty (veh)	41	
Storage Bay Dist (ft)		150
Storage Blk Time (%)	12	13
Queuing Penalty (veh)	59	64

Intersection: 2: Old Knight Road & Forestville Road

Movement	EB	NB	SB	B15
Directions Served	LR	LT	TR	T
Maximum Queue (ft)	305	131	128	62
Average Queue (ft)	131	27	32	6
95th Queue (ft)	383	82	149	58
Link Distance (ft)	472	2112	164	2180
Upstream Blk Time (%)	11		6	
Queuing Penalty (veh)	0		15	
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Old Knight Road & Star Ruby Drive

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	L	L
Maximum Queue (ft)	39	55	28	36
Average Queue (ft)	12	25	2	5
95th Queue (ft)	38	50	15	23
Link Distance (ft)	528	493		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			50	50
Storage Blk Time (%)				0
Queuing Penalty (veh)				0

Intersection: 4: Old Knight Road & Haywood Glen Drive

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	20	51	32	33
Average Queue (ft)	1	14	2	5
95th Queue (ft)	10	43	16	24
Link Distance (ft)	388	438	670	942
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Old Knight Road & Phase 4 - Site Access 1

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	53	12
Average Queue (ft)	19	1
95th Queue (ft)	46	7
Link Distance (ft)	556	372
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Old Knight Road & Horton Road

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	6	47	70
Average Queue (ft)	0	12	32
95th Queue (ft)	4	38	53
Link Distance (ft)	406	870	372
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 7: Phase 4 - Site Access 2 & Horton Road

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	19	33
Average Queue (ft)	1	9
95th Queue (ft)	10	30
Link Distance (ft)	1488	364
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Horton Road & Buffalo Road

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (ft)	51	5	182
Average Queue (ft)	8	0	77
95th Queue (ft)	32	6	142
Link Distance (ft)	1545	369	500
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 2010

2034 Horizon Year Traffic Volumes – Old Knight Road / Forestville Road Roundabout Analysis

MOVEMENT SUMMARY

Site: 2 [2034 AM Build Old Knight Road / Forestville Road Roundabout - Import (Site Folder: General)]

Old Knight Road / Forestville Road Roundabout 2034 AM Build
Site Category: 2034 AM Build
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Old Knight Road														
3	L2	162	2.0	176	2.0	0.311	5.5	LOS A	1.8	46.4	0.10	0.02	0.10	35.9
8	T1	220	2.0	239	2.0	0.311	5.5	LOS A	1.8	46.4	0.10	0.02	0.10	36.0
Approach		382	2.0	415	2.0	0.311	5.5	LOS A	1.8	46.4	0.10	0.02	0.10	36.0
North: Old Knight Road														
4	T1	392	2.0	426	2.0	0.404	7.4	LOS A	2.4	61.4	0.45	0.31	0.45	36.3
14	R2	27	2.0	29	2.0	0.404	7.4	LOS A	2.4	61.4	0.45	0.31	0.45	35.2
Approach		419	2.0	455	2.0	0.404	7.4	LOS A	2.4	61.4	0.45	0.31	0.45	36.2
West: Forestville Road														
5	L2	12	2.0	13	2.0	0.180	6.0	LOS A	0.8	19.9	0.53	0.46	0.53	36.7
12	R2	132	2.0	143	2.0	0.180	6.0	LOS A	0.8	19.9	0.53	0.46	0.53	35.7
Approach		144	2.0	157	2.0	0.180	6.0	LOS A	0.8	19.9	0.53	0.46	0.53	35.8
All Vehicles		945	2.0	1027	2.0	0.404	6.4	LOS A	2.4	61.4	0.32	0.21	0.32	36.0

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.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection: 2: Old Knight Road & Forestville Road

Movement	EB	NB	SB	B15
Directions Served	LR	LT	TR	T
Maximum Queue (ft)	87	50	116	6
Average Queue (ft)	18	9	40	0
95th Queue (ft)	80	35	97	8
Link Distance (ft)	431	2060	125	2180
Upstream Blk Time (%)			1	
Queuing Penalty (veh)			2	
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

MOVEMENT SUMMARY

Site: 2 [2034 PM Build Old Knight Road / Forestville Road Roundabout - Copy - Import - Import (Site Folder: General)]

Old Knight Road / Forestville Road Roundabout 2034 PM Build
Site Category: 2034 PM Build
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Old Knight Road														
3	L2	136	2.0	148	2.0	0.540	8.9	LOS A	4.3	108.4	0.38	0.20	0.38	34.7
8	T1	481	2.0	523	2.0	0.540	8.9	LOS A	4.3	108.4	0.38	0.20	0.38	34.7
Approach		617	2.0	671	2.0	0.540	8.9	LOS A	4.3	108.4	0.38	0.20	0.38	34.7
North: Old Knight Road														
4	T1	349	2.0	379	2.0	0.359	6.6	LOS A	2.1	52.5	0.39	0.25	0.39	36.7
14	R2	34	2.0	37	2.0	0.359	6.6	LOS A	2.1	52.5	0.39	0.25	0.39	35.6
Approach		383	2.0	416	2.0	0.359	6.6	LOS A	2.1	52.5	0.39	0.25	0.39	36.6
West: Forestville Road														
5	L2	75	2.0	82	2.0	0.262	6.7	LOS A	1.2	31.2	0.54	0.46	0.54	35.5
12	R2	145	2.0	158	2.0	0.262	6.7	LOS A	1.2	31.2	0.54	0.46	0.54	34.5
Approach		220	2.0	239	2.0	0.262	6.7	LOS A	1.2	31.2	0.54	0.46	0.54	34.8
All Vehicles		1220	2.0	1326	2.0	0.540	7.8	LOS A	4.3	108.4	0.42	0.26	0.42	35.3

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.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection: 2: Old Knight Road & Forestville Road

Movement	EB	NB	SB	B15
Directions Served	LR	LT	TR	T
Maximum Queue (ft)	217	74	123	11
Average Queue (ft)	52	14	29	1
95th Queue (ft)	208	51	92	12
Link Distance (ft)	431	2060	125	2180
Upstream Blk Time (%)	3		1	
Queuing Penalty (veh)	0		3	
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

2044 Horizon Year Traffic Volumes

MOVEMENT SUMMARY

Site: 4 [2044 AM Build Old Knight Road / Haywood Glen Drive Roundabout (Site Folder: General)]

2044 AM Build Old Knight Road / Haywood Glen Drive Roundabout
Site Category: 2044 AM Build
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Old Knight Road														
3	L2	6	2.0	7	2.0	0.193	4.4	LOS A	1.0	24.6	0.14	0.04	0.14	20.9
8	T1	163	2.0	177	2.0	0.193	4.4	LOS A	1.0	24.6	0.14	0.04	0.14	37.8
18	R2	64	2.0	70	2.0	0.193	4.4	LOS A	1.0	24.6	0.14	0.04	0.14	20.9
Approach		233	2.0	253	2.0	0.193	4.4	LOS A	1.0	24.6	0.14	0.04	0.14	30.4
East: Haywood Glen Drive														
1	L2	77	2.0	84	2.0	0.103	4.1	LOS A	0.4	11.4	0.34	0.21	0.34	21.0
6	T1	4	2.0	4	2.0	0.103	4.1	LOS A	0.4	11.4	0.34	0.21	0.34	14.6
16	R2	24	2.0	26	2.0	0.103	4.1	LOS A	0.4	11.4	0.34	0.21	0.34	20.5
Approach		105	2.0	114	2.0	0.103	4.1	LOS A	0.4	11.4	0.34	0.21	0.34	20.6
North: Old Knight Road														
7	L2	20	2.0	22	2.0	0.179	4.5	LOS A	0.9	21.9	0.26	0.13	0.26	20.9
4	T1	178	2.0	193	2.0	0.179	4.5	LOS A	0.9	21.9	0.26	0.13	0.26	37.6
14	R2	4	2.0	4	2.0	0.179	4.5	LOS A	0.9	21.9	0.26	0.13	0.26	20.9
Approach		202	2.0	220	2.0	0.179	4.5	LOS A	0.9	21.9	0.26	0.13	0.26	34.4
West: Haywood Glen Drive														
5	L2	4	2.0	4	2.0	0.029	3.9	LOS A	0.1	2.9	0.41	0.26	0.41	21.3
2	T1	4	2.0	4	2.0	0.029	3.9	LOS A	0.1	2.9	0.41	0.26	0.41	14.6
12	R2	18	2.0	20	2.0	0.029	3.9	LOS A	0.1	2.9	0.41	0.26	0.41	20.8
Approach		26	2.0	28	2.0	0.029	3.9	LOS A	0.1	2.9	0.41	0.26	0.41	19.6
All Vehicles		566	2.0	615	2.0	0.193	4.3	LOS A	1.0	24.6	0.23	0.11	0.23	28.3

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.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [2044 AM Build Old Knight Road / Forestville Road Roundabout (Site Folder: General)]

2044 AM Build Old Knight Road / Forestville Road Roundabout
Site Category: 2044 AM Build
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Old Knight Road														
3	L2	217	2.0	236	2.0	0.405	6.6	LOS A	2.7	69.4	0.13	0.03	0.13	35.3
8	T1	279	2.0	303	2.0	0.405	6.6	LOS A	2.7	69.4	0.13	0.03	0.13	35.3
Approach		496	2.0	539	2.0	0.405	6.6	LOS A	2.7	69.4	0.13	0.03	0.13	35.3
North: Old Knight Road														
4	T1	477	2.0	518	2.0	0.525	9.7	LOS A	3.5	88.5	0.59	0.46	0.59	35.0
14	R2	34	2.0	37	2.0	0.525	9.7	LOS A	3.5	88.5	0.59	0.46	0.59	34.0
Approach		511	2.0	555	2.0	0.525	9.7	LOS A	3.5	88.5	0.59	0.46	0.59	34.9
West: Forestville Road														
5	L2	15	2.0	16	2.0	0.265	7.5	LOS A	1.2	30.0	0.60	0.58	0.60	35.8
12	R2	177	2.0	192	2.0	0.265	7.5	LOS A	1.2	30.0	0.60	0.58	0.60	34.8
Approach		192	2.0	209	2.0	0.265	7.5	LOS A	1.2	30.0	0.60	0.58	0.60	34.9
All Vehicles		1199	2.0	1303	2.0	0.525	8.1	LOS A	3.5	88.5	0.40	0.30	0.40	35.1

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.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection: 2: Old Knight Road & Forestville Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	72	71	122
Average Queue (ft)	23	18	59
95th Queue (ft)	56	54	109
Link Distance (ft)	431	2136	124
Upstream Blk Time (%)			0
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Old Knight Road & Haywood Glen Drive

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	31	57	44	41
Average Queue (ft)	3	12	4	6
95th Queue (ft)	17	41	23	27
Link Distance (ft)	388	438	673	976
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

MOVEMENT SUMMARY

Site: 4 [2044 PM Build Old Knight Road / Haywood Glen Drive Roundabout (Site Folder: General)]

2044 PM Build Old Knight Road / Haywood Glen Drive Roundabout
Site Category: 2044 PM Build
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Old Knight Road														
3	L2	20	2.0	22	2.0	0.275	5.1	LOS A	1.5	38.8	0.13	0.04	0.13	20.7
8	T1	226	2.0	246	2.0	0.275	5.1	LOS A	1.5	38.8	0.13	0.04	0.13	37.2
18	R2	87	2.0	95	2.0	0.275	5.1	LOS A	1.5	38.8	0.13	0.04	0.13	20.7
Approach		333	2.0	362	2.0	0.275	5.1	LOS A	1.5	38.8	0.13	0.04	0.13	29.6
East: Haywood Glen Drive														
1	L2	107	2.0	116	2.0	0.153	4.9	LOS A	0.7	17.3	0.43	0.31	0.43	20.9
6	T1	4	2.0	4	2.0	0.153	4.9	LOS A	0.7	17.3	0.43	0.31	0.43	14.5
16	R2	33	2.0	36	2.0	0.153	4.9	LOS A	0.7	17.3	0.43	0.31	0.43	20.4
Approach		144	2.0	157	2.0	0.153	4.9	LOS A	0.7	17.3	0.43	0.31	0.43	20.5
North: Old Knight Road														
7	L2	15	2.0	16	2.0	0.204	4.9	LOS A	1.0	25.2	0.33	0.19	0.33	20.9
4	T1	200	2.0	217	2.0	0.204	4.9	LOS A	1.0	25.2	0.33	0.19	0.33	37.5
14	R2	4	2.0	4	2.0	0.204	4.9	LOS A	1.0	25.2	0.33	0.19	0.33	20.9
Approach		219	2.0	238	2.0	0.204	4.9	LOS A	1.0	25.2	0.33	0.19	0.33	35.1
West: Haywood Glen Drive														
5	L2	4	2.0	4	2.0	0.023	4.0	LOS A	0.1	2.3	0.44	0.29	0.44	21.3
2	T1	4	2.0	4	2.0	0.023	4.0	LOS A	0.1	2.3	0.44	0.29	0.44	14.6
12	R2	12	2.0	13	2.0	0.023	4.0	LOS A	0.1	2.3	0.44	0.29	0.44	20.7
Approach		20	2.0	22	2.0	0.023	4.0	LOS A	0.1	2.3	0.44	0.29	0.44	19.2
All Vehicles		716	2.0	778	2.0	0.275	5.0	LOS A	1.5	38.8	0.26	0.15	0.26	28.0

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.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [2044 PM Build Old Knight Road / Forestville Road Roundabout (Site Folder: General)]

2044 PM Build Old Knight Road / Forestville Road Roundabout
Site Category: 2044 PM Build
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Old Knight Road														
3	L2	182	2.0	198	2.0	0.691	12.8	LOS B	7.1	181.1	0.58	0.34	0.58	32.7
8	T1	589	2.0	640	2.0	0.691	12.8	LOS B	7.1	181.1	0.58	0.34	0.58	32.8
Approach		771	2.0	838	2.0	0.691	12.8	LOS B	7.1	181.1	0.58	0.34	0.58	32.8
North: Old Knight Road														
4	T1	435	2.0	473	2.0	0.473	8.5	LOS A	3.0	77.0	0.52	0.37	0.52	35.6
14	R2	44	2.0	48	2.0	0.473	8.5	LOS A	3.0	77.0	0.52	0.37	0.52	34.6
Approach		479	2.0	521	2.0	0.473	8.5	LOS A	3.0	77.0	0.52	0.37	0.52	35.5
West: Forestville Road														
5	L2	97	2.0	105	2.0	0.384	9.0	LOS A	2.0	49.7	0.64	0.62	0.66	34.3
12	R2	195	2.0	212	2.0	0.384	9.0	LOS A	2.0	49.7	0.64	0.62	0.66	33.4
Approach		292	2.0	317	2.0	0.384	9.0	LOS A	2.0	49.7	0.64	0.62	0.66	33.7
All Vehicles		1542	2.0	1676	2.0	0.691	10.7	LOS B	7.1	181.1	0.57	0.40	0.58	33.7

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.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection: 2: Old Knight Road & Forestville Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	96	223	126
Average Queue (ft)	37	55	49
95th Queue (ft)	74	152	104
Link Distance (ft)	431	2136	124
Upstream Blk Time (%)			0
Queuing Penalty (veh)			1
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Old Knight Road & Haywood Glen Drive

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	22	62	53	46
Average Queue (ft)	2	21	5	10
95th Queue (ft)	14	52	28	34
Link Distance (ft)	388	438	673	976
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

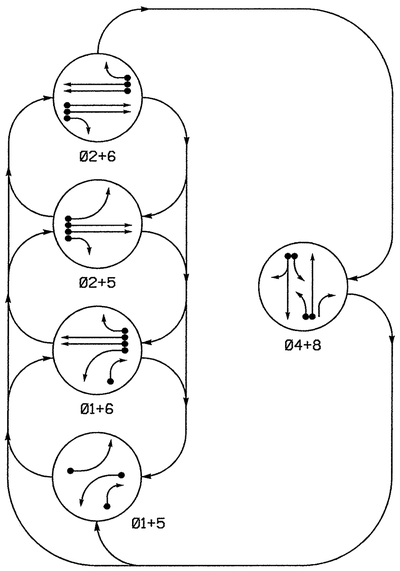
Network Summary

Network wide Queuing Penalty: 1

Appendix D – Signal Plans

PROJECT REFERENCE NO.	SHEET NO.
N/A	SIG-1

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 0 1 + 5	0 1 + 6	0 2 + 5	0 2 + 6	0 4 + 8	FLASH
11	←	←	R	R	R	R
21, 22	R	R	G	G	R	Y
41, 42, 43	R	R	R	R	G	R
51	←	R	←	R	R	R
61, 62	R	G	R	G	R	Y
81, 82	R	R	R	R	G	R
83	R/←	R/←	R	R	G	R

SIGNAL FACE I.D.

Denotes L.E.D.

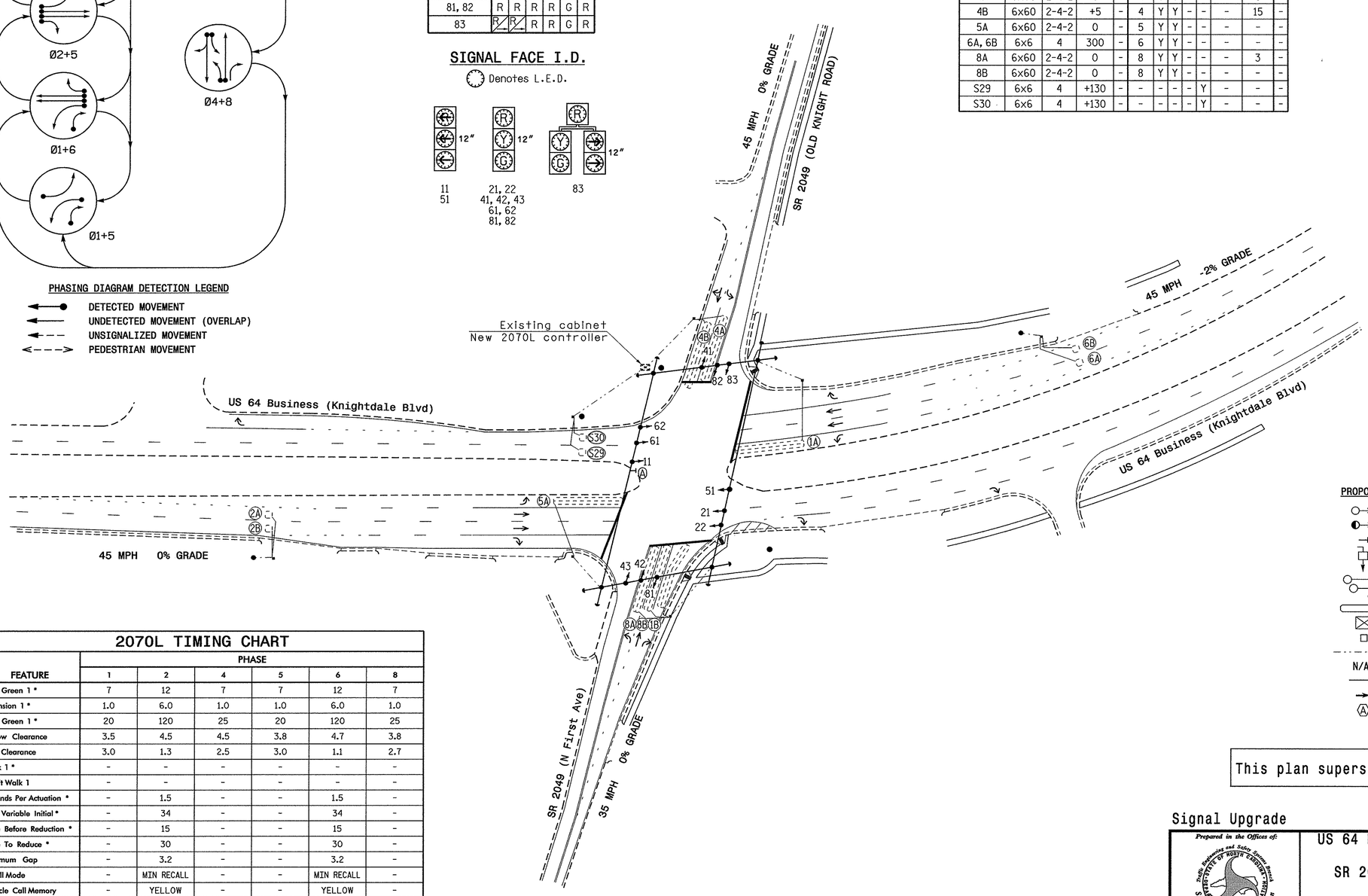
11
51

21, 22
41, 42, 43
61, 62
81, 82

83

2070L LOOP & DETECTOR INSTALLATION

INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	TURNS	DISTANCE FROM STOPBAR (FT)	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	SYSTEM LOOP	STRETCH TIME	DELAY TIME	NEW CARD
1A	6x60	2-4-2	0	-	1	Y	Y	-	-	-	-	-
1B	6x60	2-4-2	0	-	1	Y	Y	-	-	-	20	-
2A, 2B	6x6	4	300	-	2	Y	Y	-	-	-	-	-
4A	6x60	2-4-2	0	-	4	Y	Y	-	-	-	3	-
4B	6x60	2-4-2	+5	-	4	Y	Y	-	-	-	15	-
5A	6x60	2-4-2	0	-	5	Y	Y	-	-	-	-	-
6A, 6B	6x6	4	300	-	6	Y	Y	-	-	-	-	-
8A	6x60	2-4-2	0	-	8	Y	Y	-	-	-	3	-
8B	6x60	2-4-2	0	-	8	Y	Y	-	-	-	-	-
S29	6x6	4	+130	-	-	-	-	-	Y	-	-	-
S30	6x6	4	+130	-	-	-	-	-	Y	-	-	-



2070L TIMING CHART

FEATURE	PHASE 1	2	4	5	6	8
Min Green 1 *	7	12	7	7	12	7
Extension 1 *	1.0	6.0	1.0	1.0	6.0	1.0
Max Green 1 *	20	120	25	20	120	25
Yellow Clearance	3.5	4.5	4.5	3.8	4.7	3.8
Red Clearance	3.0	1.3	2.5	3.0	1.1	2.7
Walk 1 *	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-
Seconds Per Actuation *	-	1.5	-	-	1.5	-
Max Variable Initial *	-	34	-	-	34	-
Time Before Reduction *	-	15	-	-	15	-
Time To Reduce *	-	30	-	-	30	-
Minimum Gap	-	3.2	-	-	3.2	-
Recall Mode	-	MIN RECALL	-	-	MIN RECALL	-
Vehicle Call Memory	-	YELLOW	-	-	YELLOW	-
Dual Entry	-	-	ON	-	-	ON
Simultaneous Gap	ON	ON	ON	ON	ON	ON

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

5 Phase
Fully Actuated
US 64-Knightdale Closed Loop System

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
5. Pavement markings are existing.
6. Clearance Interval timings may be adjusted incrementally until required values are reached.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
8. Closed loop system data: Controller Asset #0885.

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
□	Junction Box	■
	2-in Underground Conduit	
N/A	Right of Way	
→	Directional Arrow	→
→	Pavement Marking Arrow	→
Ⓐ	U-Turn "MUST YIELD" Sign (R3-27)	Ⓐ

This plan supersedes plan sealed on 1/10/2007

Signal Upgrade

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
NCDEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
122 N. McDowell St., Raleigh, NC 27603

US 64 Bus. (Knightdale Blvd)
at
SR 2049 (Old Knight Rd/
N First Ave)

Division 5 Wake County Knightdale

PLAN DATE: January 2007 REVIEWED BY: N Bitting
PREPARED BY: L Boyer REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 0 50 1"=50'

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 25463 ENGINEER NATHANIEL BITTING
SIGNATURE DATE 10/2/07
SIG. INVENTORY NO. 05-0885

02-OCT-2007 09:15
s:\mts signal\workgroups\safety group\division05\40_us 64 cls\#050885_sig_dsn_2006mndd.dgn
mwhboddy

Appendix E – NCDOT Requirements

Cliff Lawson

From: Jon Holtvedt <JHoltvedt@terramorhomes.com>
Sent: Thursday, September 30, 2021 4:04 PM
To: Brennan, Sean P; Neidringhaus, Amy N; Cliff Lawson; Fenner, Edwin F
Cc: Bunting, Clarence B; Brian Duncan; Jeff Hochanadel; Cameron M Jones
Subject: RE: [External] Haywood Glen Phase 4 Meeting

Good Afternoon Sean and NCDOT Team:

Thank you for your review and consideration. We accept the NCDOT proposed alternate.

Thanks,

JON HOLTVEDT, PE
Entitlements Manager

Terramor Homes | A D.R. Horton Company
7208 Falls of Neuse Rd | Suite 201 | Raleigh, NC 27615
M: 919.809.4207
TerramorHomes.com

From: Brennan, Sean P <spbrennan@ncdot.gov>
Sent: Thursday, September 30, 2021 4:01 PM
To: Neidringhaus, Amy N <anneidringhaus@ncdot.gov>; Cliff Lawson <cliff.lawson@timmons.com>; Fenner, Edwin F <effenner@ncdot.gov>
Cc: Bunting, Clarence B <cbunting@ncdot.gov>; Jon Holtvedt <JHoltvedt@terramorhomes.com>; Brian Duncan <brian@spaulding-group.com>; Jeff Hochanadel <Jeff.Hochanadel@timmons.com>
Subject: Re: [External] Haywood Glen Phase 4 Meeting

[External]

Cliff,

After further discussion we have determined that an alternative improvement that NCDOT will accept is extending the eastbound left turn lane on Knightdale Blvd to 600'. Let me know what you think.

Regards,

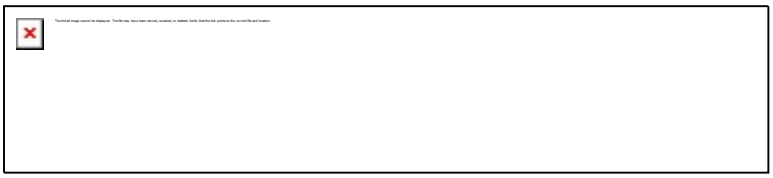
Sean Brennan, PE
Senior Assistant District Engineer
Division 5/District 1
Department of Transportation

919-733-3213 office

919-715-5778 fax
spbrennan@ncdot.gov

4009 District Drive (Physical Address)
Raleigh, NC 27607

1575 Mail Service Center (Mailing Address)
Raleigh, NC 27699-1575



From: Neidringhaus, Amy N <anneidringhaus@ncdot.gov>
Sent: Wednesday, September 22, 2021 1:21 PM
To: Cliff Lawson <cliff.lawson@timmons.com>; Brennan, Sean P <spbrennan@ncdot.gov>; Fenner, Edwin F <effenner@ncdot.gov>
Cc: Bunting, Clarence B <cbunting@ncdot.gov>; Jon Holtvedt <JHoltvedt@terramorhomes.com>; Brian Duncan <brian@spaulding-group.com>; Jeff Hochanadel <Jeff.Hochanadel@timmons.com>
Subject: RE: [External] Haywood Glen Phase 4 Meeting

That would be awesome! Thank you!!

Amy N. Neidringhaus, P.E. (FL)
Wake County District Engineer
Division 5 / District 1
North Carolina Department of Transportation

919.733.3213 office
anneidringhaus@ncdot.gov

4009 District Drive (Physical Address)
Raleigh, NC 27607

1575 Mail Service Center (Mailing Address)
Raleigh, NC 27699-1575

From: Cliff Lawson <Cliff.Lawson@timmons.com>
Sent: Wednesday, September 22, 2021 1:16 PM

To: Neidringhaus, Amy N <anneidringhaus@ncdot.gov>; Brennan, Sean P <spbrennan@ncdot.gov>; Fenner, Edwin F <effenner@ncdot.gov>
Cc: Bunting, Clarence B <cbunting@ncdot.gov>; Jon Holtvedt <JHoltvedt@terramorhomes.com>; Brian Duncan <brian@spaulding-group.com>; Jeff Hochanadel <Jeff.Hochanadel@timmons.com>
Subject: RE: [External] Haywood Glen Phase 4 Meeting

Hello Amy,

We would like to lock in Monday at 8 am. Would you like for me to send out the Teams invite?

Thanks,

Cliff Lawson, PE, PTOE
Senior Project Manager, Transportation
Office: 919.866.4946 | Fax: 919.859.5663

From: Neidringhaus, Amy N <anneidringhaus@ncdot.gov>
Sent: Wednesday, September 22, 2021 11:44 AM
To: Cliff Lawson <cliff.lawson@timmons.com>; Brennan, Sean P <spbrennan@ncdot.gov>; Fenner, Edwin F <effenner@ncdot.gov>
Cc: Bunting, Clarence B <cbunting@ncdot.gov>; Jon Holtvedt <JHoltvedt@terramorhomes.com>; Brian Duncan <brian@spaulding-group.com>; Jeff Hochanadel <Jeff.Hochanadel@timmons.com>
Subject: RE: [External] Haywood Glen Phase 4 Meeting

Aside from 10:30 to 11:30, we can do any time on Monday.

Amy N. Neidringhaus, P.E. (FL)
Wake County District Engineer
Division 5 / District 1
North Carolina Department of Transportation

919.733.3213 office
anneidringhaus@ncdot.gov

4009 District Drive (Physical Address)
Raleigh, NC 27607

1575 Mail Service Center (Mailing Address)
Raleigh, NC 27699-1575

From: Cliff Lawson <Cliff.Lawson@timmons.com>
Sent: Wednesday, September 22, 2021 10:25 AM
To: Neidringhaus, Amy N <anneidringhaus@ncdot.gov>; Brennan, Sean P <spbrennan@ncdot.gov>; Fenner, Edwin F <effenner@ncdot.gov>
Cc: Bunting, Clarence B <cbunting@ncdot.gov>; Jon Holtvedt <JHoltvedt@terramorhomes.com>; Brian Duncan <brian@spaulding-group.com>; Jeff Hochanadel <Jeff.Hochanadel@timmons.com>
Subject: [External] Haywood Glen Phase 4 Meeting

All,

This is a follow-up to our earlier email regarding NCDOT's requirement of a second eastbound left-turn lane at the US-64 Business / Old Knight Road intersection. Our team has done some investigating and would like to discuss our findings with you. Could you all please provide your availability over the next week or so? I am pretty much available anytime next week except for Monday before 2.

Thanks,

Cliff Lawson, PE, PTOE
Senior Project Manager – Transportation

TIMMONS GROUP | www.timmons.com
5410 Trinity Rd, Suite 102 | Raleigh, NC 27607
Office: 919.866.4946 | Fax: 919.859.5663
cliff.lawson@timmons.com
Your Vision Achieved Through Ours

To send me files greater than 20MB click here.

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

J. ERIC BOYETTE
SECRETARY

July 22, 2021

Haywood Glen Development Phase 4

Traffic Impact Analysis Review Report
Congestion Management Section

TIA Project: SC-2021-015R1
Division: 5
County: Wake

Doumit Y. Ishak, Regional Engineer
Clarence B. Bunting, IV, P.E. Project Engineer
Braden M. Walker, P.E. Project Design Engineer

Mailing Address:
NC DEPARTMENT OF TRANSPORTATION
TRANSPORTATION MOBILITY & SAFETY DIVISION
1561 MAIL SERVICE CENTER
RALEIGH, NC 27699-1561

Telephone: (919) 814-5000
Fax: (919) 771-2745
Customer Service: 1-877-368-4968

Website: www.ncdot.gov

Location:
750 N. GREENFIELD PARKWAY
GARNER, NC 27529

Haywood Glen Development Phase 4

SC-2021-015R1	Knightdale	Wake County

Per your request, the Congestion Management Section (CMS) of the Transportation Mobility and Safety Division has completed a review of the subject site. The comments and recommendations contained in this review are based on data for background conditions presented in the Traffic Impact Analysis (TIA) and are subject to the approval of the local District Engineer's Office and appropriate local authorities.

Date Initially Received by CMS	06/23/21	Date of Site Plan	N/A
Date of Complete Information	06/23/21	Date of Sealed TIA	06/23/21

Proposed Development

The TIA assumes the development is to be completed by 2024 and consist of the following:

Land Use	Land Use Code	Size
Single-Family Detached Housing	210	112 d.u.

Trip Generation - Unadjusted Volumes During a Typical Weekday

	IN	OUT	TOTAL
AM Peak Hour	21	63	84
PM Peak Hour	71	42	113
Daily Trips			1,154

General Reference

For reference to various documents applicable to this review please reference the following link: *http://www.ncdot.org/doh/preconstruct/traffic/teppl/Topics/C-37/C-37.html*

Once the driveway permit has been approved and issued, a copy of the final driveway permit requirements should be forwarded to this office. If we can provide further assistance, please contact the Congestion Management Section.

NCDOT is supportive of the Town's requirement for the developer to install a roundabout in lieu of the recommended turn lanes at this intersection.

SITE
(Phase 3)

SITE
(Phases 1 + 2)

SITE
(Phase 4)

Old Knight Rd

US-64 Bus

300

<2,200>

1,200

Forestville Rd

<4,800>

50

(Frontage Widening)

Star Ruby Dr

50

<800>

50

50

(Frontage Widening)

50

Haywood Glen Dr

<1,050>

Haywood Glen Dr

100 IPS

<450>

Horton Rd

<950>

Site Access 2

100 IPS

<3,150>

Buffalo Rd

Haywood Glen Development
Knightdale, Wake County
SC-2021-015R1

- Existing Laneage
- Recommended Laneage
- Laneage Built By Others
- NCDOT Recommendation
- Existing Signal
- Signal Proposed By Others
- Developer Proposed Signal
- Monitor for Signal
- XXX Storage
- XXX NCDOT Recommended Storage
- <XXX> Distance Between Intersections
- IPS Internal Protected Stem
- All Distances in Feet
- Drawing Not to Scale