



450 Rice Road, Welland Transportation Impact Assessment

Paradigm Transportation Solutions Limited

October 2024
240535



Project Number
240535

450 Rice Road, Welland Transportation Impact Assessment

Date: October 2024
Version 2.0.0

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Executive Summary

Content

Paradigm Transportation Solutions Limited (Paradigm) was retained to conduct this Transportation Impact Study (TIS) for a proposed residential development at 450 Rice Road in Welland, Niagara Region.

The study aims to assess current traffic and the additional traffic generated by the proposed development, analyze the traffic impact on the adjacent roadway network and provide the municipality and owner with any improvements required to mitigate the identified effects of the site-generated traffic.

Conclusions

This study evaluates the impacts of background traffic growth and projects the impacts of the development with the construction of 139 townhouse units. Access to the site is proposed via a new driveway connection to Rice Road, located 195 metres north of the Rice Road and Quaker Road intersection.

Full-build out of the development is projected to generate approximately 67 new vehicle trips during the weekday AM peak hour and 79 new vehicle trips during the weekday PM peak hour. A left-turn lane warrant analysis was conducted at the proposed development driveway to Rice Road and determined that a southbound left-turn lane is not warranted.

The traffic analysis conducted as part of this assessment indicates that development volumes will result in minor increases in the surrounding study area intersection volumes under peak conditions, which should not be perceptible.

Deficiencies currently exist at the intersection of Rice Road and Highway 20. Operations at this intersection are projected to degrade further as a result of the general growth in traffic to the area, independent of the development. Niagara Region has completed a Municipal Class Environmental Assessment Study to identify improvements to Merritt Road and Rice Road due to proposed developments in the Town of Pelham, the City of Thorold and the City of Welland. As part of the Class EA, to provide additional capacity improvements for the overall area, Merritt Road between Cataract Road and Highway 406 is recommended to be extended. Through this extension, traffic volumes along Rice Road are projected to decrease by approximately 25%. However, until this occurs, an interim improvement option would be to optimize the signal timings.



The all-way stop-controlled intersection of Rice Road and Quaker Road is also projected to experience increased demand due to the general traffic growth projected for the area. A traffic signal warrant analysis was conducted for this intersection to determine if projected traffic conditions would satisfy the warrants. However, the warrant criteria for signalization are not satisfied. To determine the extent of the queues created by the all-way stop configuration, a SimTraffic simulation was completed for the 2033 Total Horizon.

Reviewing these results indicates that during the respective peak hours, a queue length of 51 metres is expected for the intersection's southbound approach. The proposed Driveway to Rice Road is approximately 195 metres north of the Rice Road and Quaker Road intersection; vehicle blockage is not projected to occur.

Concerning the northbound approach, a queue length of 74 metres is projected during the weekday PM peak hour, which would block the Niagara Catholic School Board's north Driveway. It is noted, however, that the school board has two additional driveways, one to Quaker Road and an additional driveway to Rice Road, which the queue lengths will not impact. As the property has multiple access points, access to/from the property is still available during peak congestion at Rice Road and Quaker Road intersection. Driver courtesy will also be expected to allow space in the queue for vehicles to/from the school board's north Driveway.

Given that the queue lengths will not impact adjacent intersections/major driveways, the increased delay is considered tolerable until the intersection is widened and upgraded to traffic control signals.

Recommendations

Based on the findings of this study, the following recommendations are identified:

- ▶ The Region optimizes the traffic signal timings at the intersection of Rice Road with Highway 20 and Woodlawn Road as an interim solution until the preferred improvements as per the Merritt Road/Rice Road Class EA are implemented.



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1 Introduction

1.1 Overview

Paradigm Transportation Solutions Limited (Paradigm) was retained to conduct this Transportation Impact Study (TIS) for a proposed residential development at 450 Rice Road in Welland, Niagara Region. **Figure 1.1** details the location of the subject development.

The study aims to assess current traffic and the additional traffic generated by the proposed development, analyze the traffic impact on the adjacent roadway network and provide the municipality and owner with any improvements required to mitigate the identified effects of the site-generated traffic.

More specifically, the scope of this study is to:

- ▶ Forecast traffic from the proposed development;
- ▶ Assign the projected volumes to the surrounding road network based on the existing traffic patterns at the driveway connections;
- ▶ Assess total future traffic within the study area. The following horizons have been considered: Five (2033) Years after Full-Build-OUT.
- ▶ Identify operational concerns and any mitigation measures that may be required to improve operations and

This report adhered to the terms of reference Paradigm and Niagara Region developed. **Appendix A** contains the pre-study consultation material.

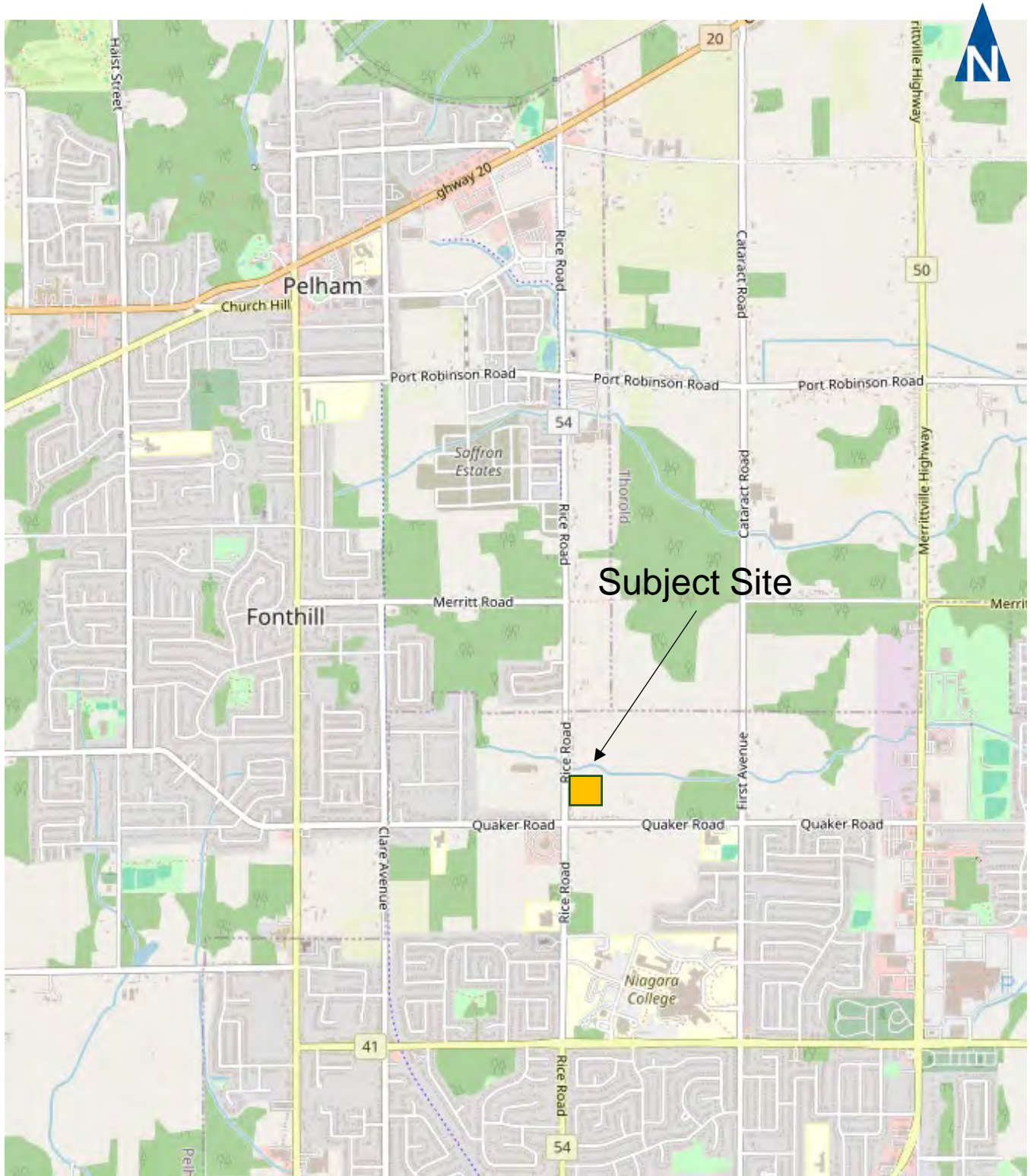
1.2 Study Area

The study area intersections assessed in this study include:

- ▶ Rice Road at Quaker Road (all-way stop)
- ▶ Rice Road at Highway 20 (signalized)
- ▶ Rice Road at Woodlawn Road (signalized)
- ▶ One driveway connection

Figure 1.1 illustrates the study area location.





Location of Subject Site

450 Rice Road, Welland - TIA
240535

Figure 1.1

2 Existing Conditions

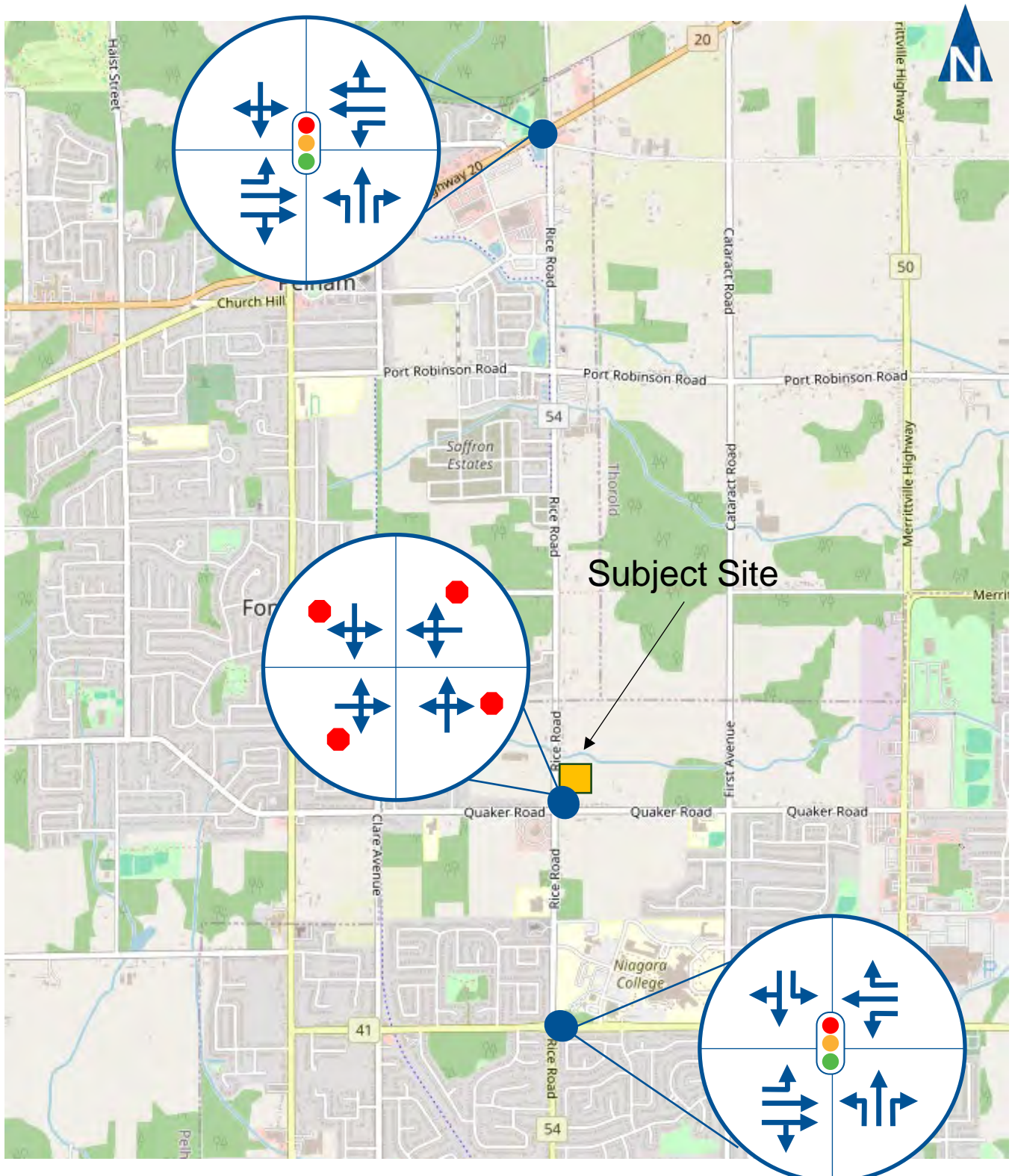
2.1 Roadway Characteristics

The roadways of interest within the study area include:

- ▶ **Rice Road (Regional Road 54)** is a two-lane, 50 km/h arterial roadway under the jurisdiction of Niagara Region. No sidewalks or cycling lanes are provided on either side of the roadway adjacent to the proposed development.
- ▶ **Quaker Road** is a two-lane, 50 km/h arterial roadway under the jurisdiction of the City of Welland. No sidewalks or cycling lanes are provided on either side of the roadway within the study area.
- ▶ **Woodlawn Road (Regional Road 41)** is a two-lane road west of Rice Road and a four-lane road east of Rice Road. The speed limit is 50 km/h and is an arterial road under the jurisdiction of the Niagara Region. Sidewalks are located on the south side of the road throughout the study area, while a sidewalk on the north side is located for the portion east of Rice Road. No cycling lanes are provided on either side of the roadway within the study area.
- ▶ **Highway 20** is a five-lane road west of Rice Road and a four-lane road east of Rice Road. The speed limit is 50 km/h and is an arterial road under the jurisdiction of the Niagara Region. Sidewalks are located on the north and south sides of the road for the section of Highway 20 west of Rice Road. No cycling lanes are provided on either side of the roadway within the study area.

Figure 2.1 illustrates the study area's existing land configuration and traffic control.





Existing Lane Configuration and Traffic Control

2.2 Existing Transit Service

Transit service in Welland is provided by Niagara Region Transit (NRT). NRT is the result of an effort from the Niagara Region and the 12 local municipalities to connect all of Niagara by combining the existing Niagara Region Transit, Niagara Falls Transit, St. Catharines Transit, Welland Transit and Fort Erie Transit systems into one transit operator that began on January 1, 2023.

NRT operates local transit routes within the city and regional services between various municipalities. The following routes, which provide connections with proximity to the subject site, are as follows:

- ▶ **502 Rice Road** operates along Rice Road between Talbot Trail and Fitch Street. Headways are approximately 30 minutes. Service is provided Monday to Friday, approximately 6:00 AM to 11:00 PM.

Figure 2.2 illustrates the existing public transit network within the study area. The closest bus stops are approximately 750 metres south of the proposed development at the intersection of Rice Road and Talbot Trail.





Existing Transit Network

Figure 2.2

2.3 Traffic Volumes

Turning movement counts (TMC) quantify vehicle movement through the area to assess intersection operation. Existing traffic data at an intersection or road section forms the foundation for analysis. The counts are usually taken during peak periods at an intersection to complete the level of service analysis. **Appendix B** contains the traffic data utilized in this report.

2.3.1 Traffic Data

The Region provided existing traffic counts from August 2023 at the intersections of Rice Road with Highway 20 and Woodlawn Road. With respect to the intersection of Rice Road and Quaker Road, Paradigm completed traffic counts in September 2024. **Table 2.1** provides a summary of traffic count locations and dates.

TABLE 2.1: TRAFFIC COUNT SUMMARY

Intersection	Count Date
Rice Road at Quaker Road	September 10, 2024
Rice Road at Highway 20	August 9, 2023
Rice Road at Woodlawn Road	August 9, 2023

2.3.2 Volume Adjustments and Balancing

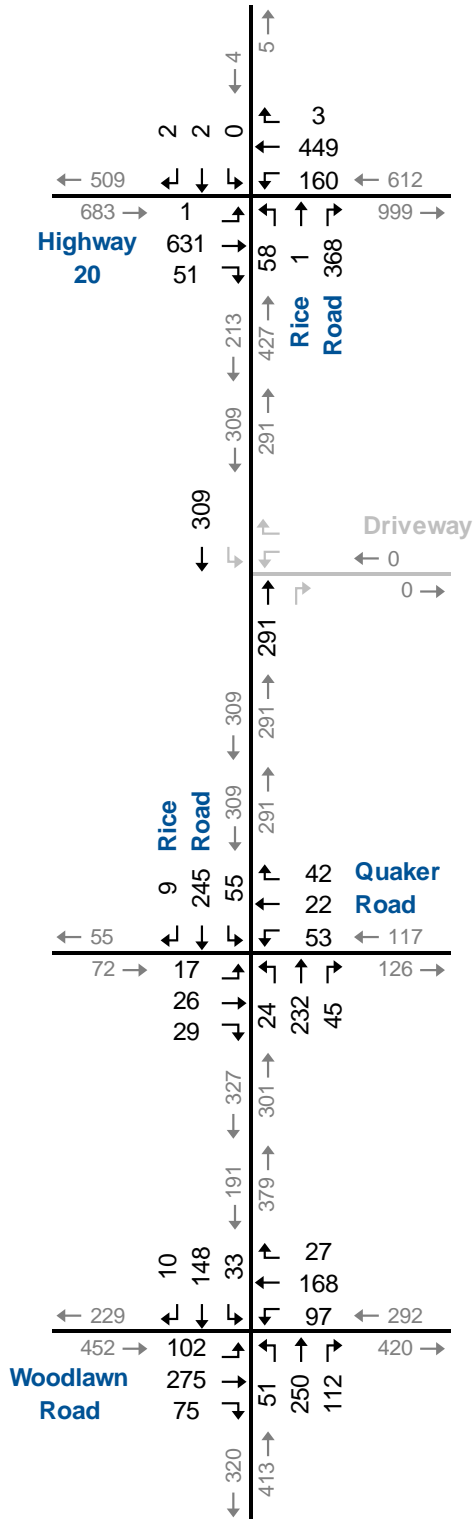
As several major intersections exist between the study area intersections, volume balancing has not been accounted for between the various intersections.

Figure 2.3 illustrates the adjusted base year traffic volumes during the weekday AM and PM peak hours.

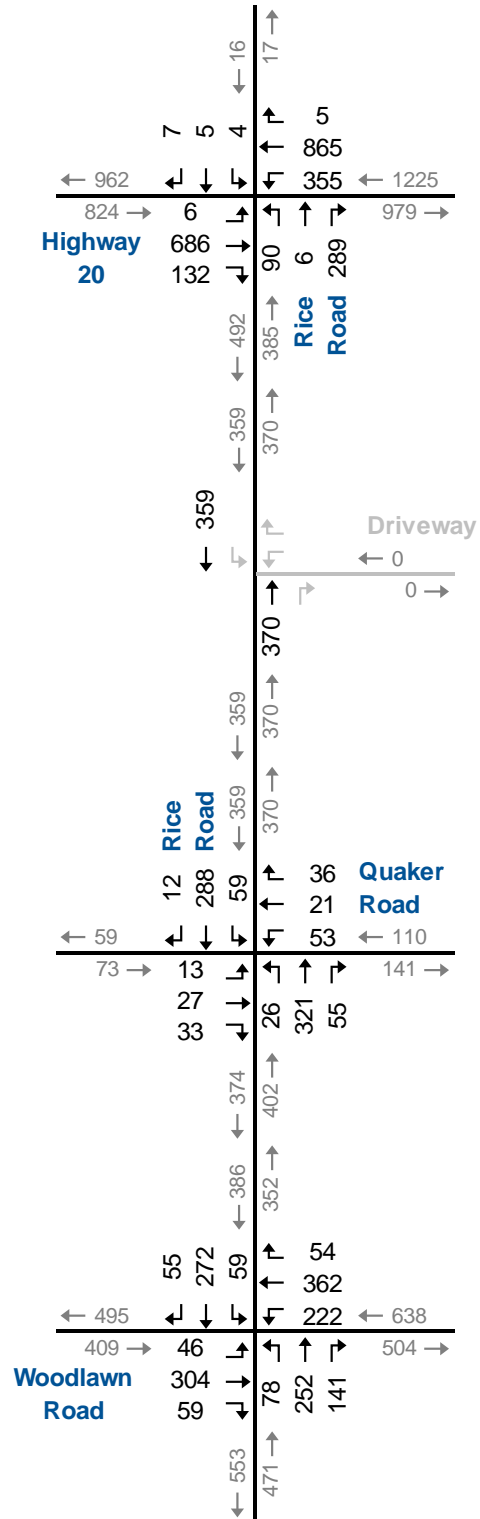




Weekday AM Peak Hour



Weekday AM Peak Hour



**Base Year
Traffic Volumes**

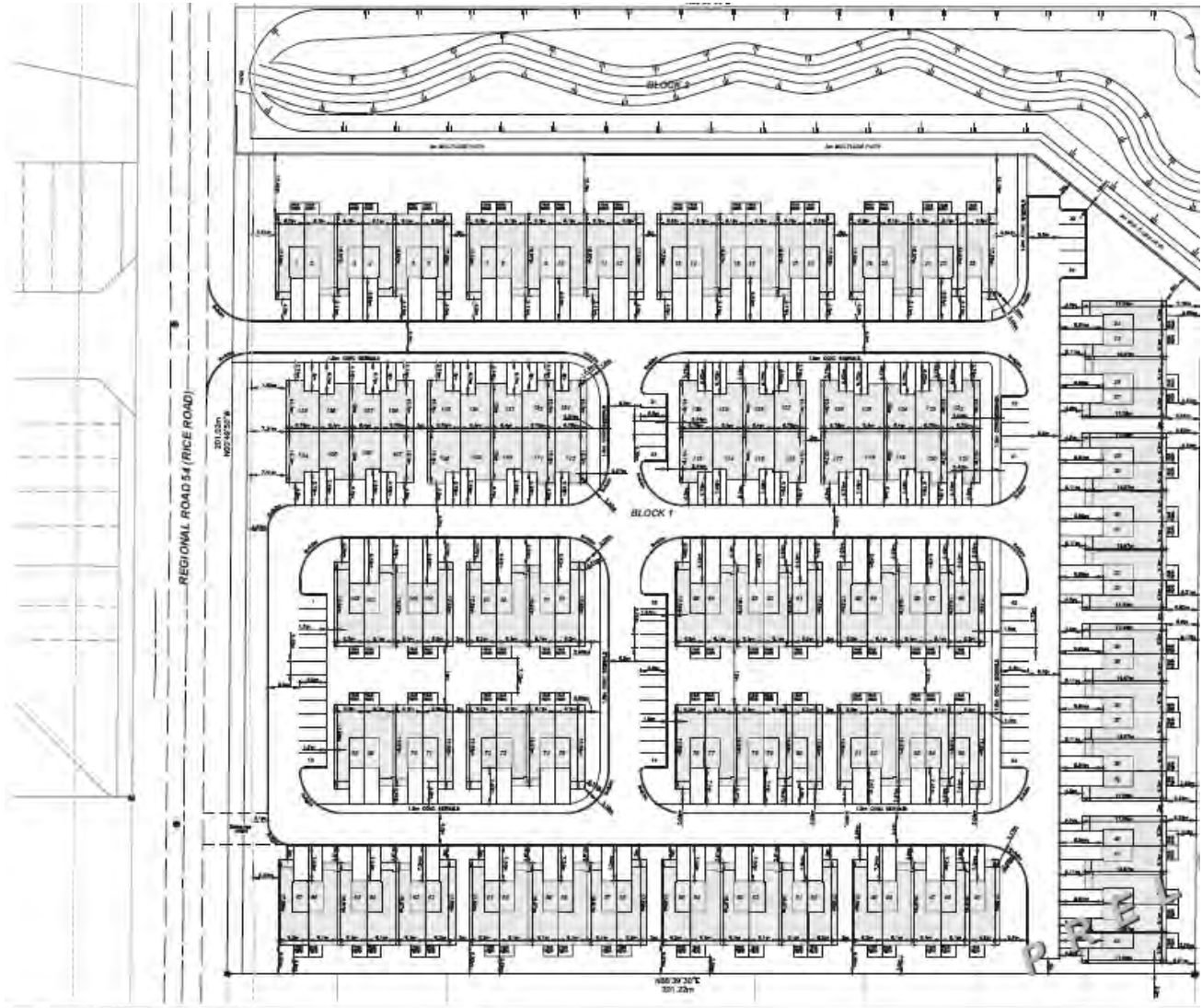
3 Development Proposal Review

3.1 Programme Elements

The 1.26-hectare site will be developed into a residential development with 139 townhouse units. Vehicular access is proposed via a new driveway connection to Rice Road, located approximately 195 metres north of the Rice Road and Quaker Road intersection (curb return to curb return). The proposed development is anticipated to be fully built by 2028.

Figure 3.1 illustrates the site plan.





Site Plan

3.2 Development Trip Generation

Trip generation information is used to forecast the anticipated level of traffic activity because of the development. Trip generation for each land use type was summed to establish total site trip generation for the respective peak hours.

The rate at which any development generates traffic depends upon several factors, such as size, location, and concentration of surrounding developments. To estimate the traffic volume generated by the development components, traffic projections were based on trip generation data published in the Institute for Transportation Engineer's (ITE) Trip Generation Manual, 11th Edition¹. The following land uses (LUC) have been used:

- ▶ **LUC 215 – Single Family Attached** – Single-family attached housing includes any single-family housing unit that shares a wall with an adjoining dwelling unit, whether the walls are for living space, a vehicle garage, or storage space. The database for this land use includes duplexes (defined as a single structure with two distinct dwelling units, typically joined side-by-side and each with at least one outside entrance) and townhouses/rowhouses (defined as a single structure with three or more distinct dwelling units, joined side-by-side in a row and each with an outside entrance)

The estimated total trip generation for the proposed development is displayed in **Table 3.1**, which indicates that 67 and 79 new vehicle trips are forecast to be generated during the AM and PM peak hours.

TABLE 3.1: ESTIMATED TRIP GENERATION

Use	Units	Trips	Weekday AM Peak				Weekday PM Peak			
			Rate	Enter	Exit	Total	Rate	Enter	Exit	Total
LUC 215 - Single-Family Attached Housing	139	Total	Eq.	17	50	67	Eq.	47	32	79
			Eq.	T = 0.52(X) - 5.70			T = 0.60(X) - 3.93			

¹ Trip Generation Eleventh Edition, Institute of Transportation Engineers, Washington D.C., 2021



3.3 Development Trip Distribution

The directional distribution of traffic approaching and departing the development is a function of several variables: population densities, existing travel patterns, and the efficiency of the roadways leading to the site. Trip distribution for the proposed development was estimated based on a review of the existing trip patterns within the study area.

Table 3.2 summarizes the trip distribution used in this study.

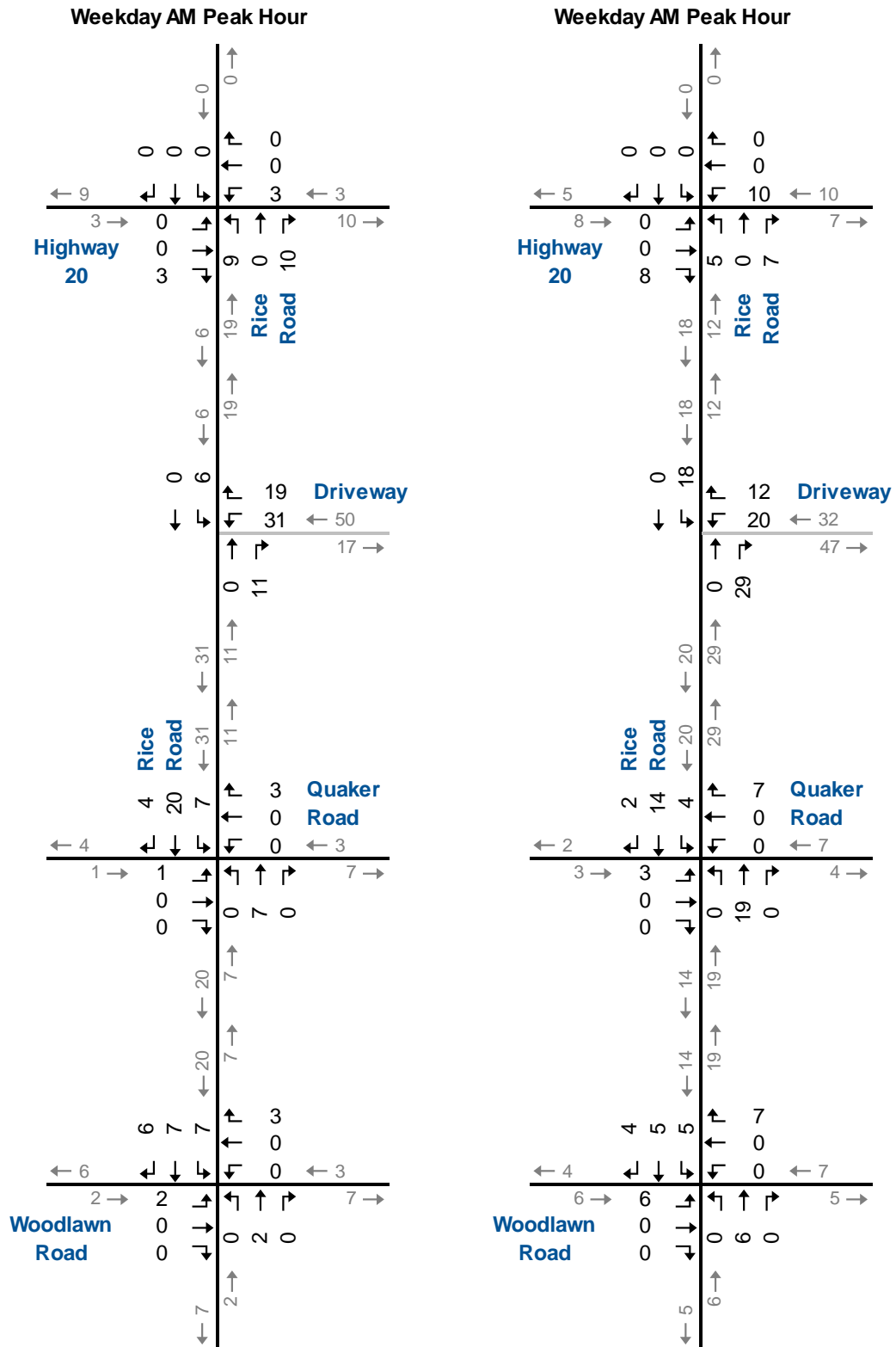
Appendix C includes the calculations.

TABLE 3.2: TRIP DISTRIBUTION

Direction (To/From)	Travel Route	Percent Assigned To Route
East	Highway 20	21%
	Quaker Road	14%
	Woodlawn Road	15%
West	Highway 20	17%
	Quaker Road	7%
	Woodlawn Road	12%
South	Rice Road	14%
Total		100%

The trips projected from the proposed development have been assigned to the roadway network based on the trip distribution noted above. **Figure 3.2** illustrates the trip assignment.





Site Trip Generation

4 Future Conditions

The following horizon years have been utilized to analyze future traffic conditions:

- ▶ 2033: Five Years after Full-Build Out

4.1 Future Traffic Growth

Traffic growth on area roadways is a function of the expected land development, economic activity, and demographic changes. A frequently used procedure estimates an annual percentage increase and applies that increase to the study area traffic volumes. An alternative approach is to identify estimated traffic generated by specific planned significant developments that would be expected to affect the project study area roadways. For this assessment, an annual percentage has been utilized.

4.2.1 General Growth Rate

Niagara Region has completed a Municipal Class Environmental Assessment Study to identify improvements to Merritt Road and Rice Road as a result of proposed developments in the Town of Pelham, the City of Thorold and the City of Welland. Through the Class EA, growth rates along Rice Road and Quaker Road have been developed based on travel demand forecasting model output from the Region's EMME model². Utilizing this information, the following growth rates have been assumed:

- ▶ Quaker Road – 3% Eastbound, 1.9% Westbound
- ▶ Rice Road – 3% Northbound, 1.5% Southbound

As the Class EA did not provide any growth projections for Woodlawn Road or Highway 20, a growth rate of 2% per annum has been utilized for these roadways.

² Schedule 'C' Municipal Class Environmental Assessment for Merritt Road (Regional Road 37) and Rice Road (Regional Road 54) in the Town of Pelham, the City of Thorold and the City of Welland, Transportation Assessment Report, February 2024



4.2.2 Background Developments

The non-site traffic increase (background traffic) represents generalized traffic growth. The background traffic projections for the 2033 horizon are illustrated in **Figure 4.1**.

4.2.3 Total Projections

The projected site-generated traffic volumes were added to the background projections to develop the total traffic volume. The total traffic projections for the 2033 horizon are illustrated in **Figure 4.2**.

4.2 Roadway Improvements

As part of the Class EA completed for Rice Road, the following improvements have been identified for the study area:

- ▶ Rice Road Corridor
 - Five Lane Cross-Section
- ▶ Rice Road at Quaker Road
 - Signalization of Intersection
 - Separate Left-Turn lanes for all approaches
 - Separate Right-Turn Lane for north and south approaches

However, given that the timing of improvements for implementation is currently unknown, no roadway improvements have been considered as part of the analysis for future conditions.



5 Operational Assessment

5.1 Level of Service Criteria

Level of service (LOS) is used to denote the different operating conditions that occur on a given roadway segment under various traffic volume loads. It is a qualitative measure that indexes the operational qualities of a roadway segment or an intersection with designations ranging from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions.

For signalized intersections, the analysis considered the operation of each lane or lane group entering the intersection and the level of service for the overall conditions at the intersection. At signalized intersections, intersections with movements operating with a v/c ratio of 0.84 or less are classified as within capacity, a v/c ratio of 0.85-1.00 as approaching capacity and a v/c ratio over 1.00 as exceeding capacity.

For unsignalized intersections, the analysis assumes that traffic on the mainline is not affected by the traffic on the side streets. The level of service is only determined for left turns from the main street and all movements from the minor street. At unsignalized intersections, an overall LOS between A-C is classified as tolerable delays; an overall LOS D-E is classified as an increased delay and an overall LOS F is classified as Significant Delays.

The evaluation criteria for analyzing intersections are based on the 2010 Highway Capacity Manual (HCM)³.

³ Transportation Research Board, Highway Capacity Manual, Washing, D.C. 2003.



5.2 Intersection Capacity Analysis

Intersection capacity analyses were conducted at all intersections in the study area. Analyses were conducted for the Base Conditions and five years after build-out (2033). Optimization of signal timings has occurred between the various horizon years.

Tables 5.1 through **5.4** summarize the capacity analyses for the study area intersections for all horizon years. The capacity analysis results are included in **Appendix D**. The following sub-sections outline the critical movements of the study area intersections.

5.2.1 Rice Road at Highway 20 (Signalized)

2024 Base Year Operations	Approaching Capacity	●
2033 Background Operations:	Approaching Capacity	●
2033 Total Operations	Approaching Capacity	●

At Rice Road and Highway 20, the eastbound shared through/right turn movement and westbound left turn movement is operating at LOS D with a v/c ratio of 0.88 during the weekday PM peak hour.

Under the 2033 Background horizon, an additional delay is projected; however, no significant change in LOS is projected. It is noted that the v/c ratio for the eastbound shared through/right turn movement and westbound left turn movement is projected to increase to 0.95/0.94 during the weekday PM peak hour.




In terms of development traffic implications, similar levels of operation are generally expected under the 2033 Total conditions with only minor increases in delay resulting from site-generated traffic volumes.

Critical Movements (V/C over 0.85)

- ▶ Eastbound Shared Through/Right (2024 Base)
- ▶ Westbound Left (2024 Base)



5.2.2 Rice Road at Quaker Road (AWS)

2024 Base Year Operations	Tolerable Delays	
2033 Background Operations:	Increased Delays	
2033 Total Operations	Increased Delays	

At the intersection of Rice Road and Quaker Road, individual movements operate at LOS C or better during the weekday AM and PM peak hours.

Under the 2033 Background horizon, increased delay is projected for the northbound approach, which is projected to operate at LOS D during the weekday PM peak hour.

Regarding development traffic implications, increased delay is projected for the northbound approach, which is projected to operate at LOS E, and the southbound approach, which is projected to operate at LOS D during the weekday PM peak hour.

Critical Movements (LOS D)

- ▶ Northbound Movement (2033 Background)
- ▶ Southbound Movement (2033 Total)



TABLE 5.2: RICE ROAD AT QUAKER ROAD OPERATIONS

Analysis Period	Intersection	Control Type	Horizon	MOE	Direction / Movement / Approach																Overall	
					Eastbound				Westbound				Northbound				Southbound					
					Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach		
AM Peak Hour	2 - Rice Road at Quaker Road	AWS	2024 Base Year	LOS Delay V/C	A 10 0.13	A 10 0.13	A 10 0.13	A 10 0.13	A 10 0.20	A 10 0.20	A 10 0.20	A 10 0.20	A 10 0.45	B 12 0.45	B 12 0.45	B 12 0.45	B 12 0.47	B 13 0.47	B 13 0.47	B 13 0.47	B 13 0.47	
		AWS	2033 Background	LOS Delay V/C	B 11 0.18	B 11 0.18	B 11 0.18	B 11 0.18	B 11 0.26	B 11 0.26	B 11 0.26	B 11 0.26	B 11 0.63	C 17 0.63	C 17 0.63	C 17 0.63	C 17 0.58	C 16 0.58	C 16 0.58	C 16 0.58	C 16 0.58	C 16 0.58
		AWS	2033 Total	LOS Delay V/C	B 11 0.19	B 11 0.19	B 11 0.19	B 11 0.19	B 12 0.27	B 12 0.27	B 12 0.27	B 12 0.27	B 12 0.65	C 18 0.65	C 18 0.65	C 18 0.65	C 18 0.64	C 18 0.64	C 18 0.64	C 18 0.64	C 18 0.64	C 18 0.64
PM Peak Hour	2 - Rice Road at Quaker Road	AWS	2024 Base Year	LOS Delay V/C	B 10 0.14	B 10 0.14	B 10 0.14	B 10 0.14	B 11 0.20	B 11 0.20	B 11 0.20	B 11 0.20	B 11 0.61	C 16 0.61	C 16 0.61	C 16 0.61	C 16 0.57	B 15 0.57	B 15 0.57	B 15 0.57	B 15 0.57	
		AWS	2033 Background	LOS Delay V/C	B 12 0.20	B 12 0.20	B 12 0.20	B 12 0.20	B 12 0.27	B 12 0.27	B 12 0.27	B 12 0.27	D 34 0.87	D 34 0.87	D 34 0.87	D 34 0.72	C 22 0.72	C 22 0.72	C 22 0.72	C 22 0.72	C 22 0.72	
		AWS	2033 Total	LOS Delay V/C	B 12 0.22	B 12 0.22	B 12 0.22	B 12 0.22	B 13 0.29	B 13 0.29	B 13 0.29	B 13 0.29	E 43 0.92	E 43 0.92	E 43 0.92	E 43 0.77	D 26 0.77	D 26 0.77	D 26 0.77	D 26 0.77	D 26 0.77	

MOE - Measure of Effectiveness
 LOS - Level of Service
 Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length
 Ex. - Existing Available Storage
 Avail. - Available Storage

TCS - Traffic Control Signal
 TWSC - Two-Way Stop Control
 AWS - All-Way Stop Control

RBT - Roundabout



5.2.3 Rice Road at Woodlawn Road (Signalized)

2024 Base Year Operations	Within Capacity	●
2033 Background Operations:	Approaching Capacity	●
2033 Total Operations	Approaching Capacity	●

At Rice Road and Woodlawn Road, individual movements are currently operating at LOS D or better with a v/c ratio no greater than 0.72 during the weekday AM and PM peak hours.

Under the 2033 Background horizon, an additional delay is projected; however, no significant change in LOS is projected. It is noted that the v/c ratio for the westbound left turn movement is projected to increase to 0.89 during the weekday PM peak hour.

In terms of development traffic implications, similar levels of operation are generally expected under the 2033 Total conditions with only minor increases in delay resulting from site-generated traffic volumes.

Critical Movements (V/C over 0.85)

- ▶ Westbound Left (2033 Background)



TABLE 5.3: RICE ROAD AT WOODLAWN ROAD OPERATIONS

Analysis Period	Intersection	Control Type	Horizon	MOE	Direction / Movement / Approach																Overall				
					Eastbound				Westbound				Northbound				Southbound								
					Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach					
AM Peak Hour	3 - Rice Road at Woodlawn Road	TCS	2024 Base Year	LOS	D	C	C	C	C	C	B	C	A	B	B	B	B	B	B	B	C				
				Delay	35	33	33	33	22	22	19	22	10	12	10	10	12	10	10	17	17	17	17	17	
				V/C	0.59	0.61	0.61	0.61	0.37	0.34	0.02	0.37	0.11	0.31	0.10	0.11	0.31	0.10	0.10	0.10	0.29	0.29	0.29	0.29	0.29
PM Peak Hour	3 - Rice Road at Woodlawn Road	TCS	2033 Background	LOS	D	C	C	C	C	C	B	C	B	B	B	B	B	B	B	B	C				
				Delay	37	33	33	33	22	21	19	21	11	15	12	11	15	12	12	12	12	21	21	21	21
				V/C	0.64	0.66	0.66	0.66	0.46	0.38	0.03	0.46	0.14	0.41	0.15	0.14	0.41	0.15	0.15	0.15	0.15	0.37	0.37	0.37	0.37
PM Peak Hour	3 - Rice Road at Woodlawn Road	TCS	2033 Total	LOS	D	C	C	C	C	C	B	C	B	B	B	B	B	B	B	B	C				
				Delay	37	33	33	33	22	21	19	21	11	15	12	11	15	12	12	12	12	21	21	21	21
				V/C	0.65	0.66	0.66	0.66	0.46	0.38	0.03	0.46	0.14	0.42	0.15	0.14	0.42	0.15	0.15	0.15	0.15	0.40	0.40	0.40	0.40
PM Peak Hour	3 - Rice Road at Woodlawn Road	TCS	2024 Base Year	LOS	C	D	D	D	C	C	B	C	B	B	B	B	B	B	B	B	C				
				Delay	33	37	37	37	29	26	19	29	13	14	12	13	14	12	12	12	20	28	28	28	
				V/C	0.34	0.68	0.68	0.68	0.72	0.64	0.05	0.72	0.21	0.32	0.12	0.21	0.32	0.12	0.12	0.12	0.18	0.63	0.63	0.63	
PM Peak Hour	3 - Rice Road at Woodlawn Road	TCS	2033 Background	LOS	C	D	D	D	D	C	B	C	B	B	B	B	B	B	B	C					
				Delay	34	40	40	40	47	29	19	47	14	17	14	14	17	14	14	14	21	34	34	34	
				V/C	0.41	0.76	0.76	0.76	0.89	0.74	0.06	0.89	0.31	0.42	0.19	0.31	0.42	0.19	0.19	0.19	0.23	0.74	0.74	0.74	
PM Peak Hour	3 - Rice Road at Woodlawn Road	TCS	2033 Total	LOS	C	D	D	D	D	C	B	C	B	B	B	B	B	B	B	C					
				Delay	34	40	40	40	47	29	19	47	14	17	14	14	17	14	14	14	22	35	35	35	
				V/C	0.45	0.76	0.76	0.76	0.89	0.74	0.06	0.89	0.32	0.43	0.19	0.32	0.43	0.19	0.19	0.19	0.24	0.76	0.76	0.76	

MOE - Measure of Effectiveness
 LOS - Level of Service
 Delay - Average Delay per Vehicle in Seconds
 Q - 95th Percentile Queue Length
 Ex. - Existing Available Storage
 Avail. - Available Storage
 TCS - Traffic Control Signal
 TWSC - Two-Way Stop Control
 AWSC - All-Way Stop Control
 RBT - Roundabout



5.2.4 Rice Road at Driveway

| 2033 Total Operations

| Tolerable Delays



Individual movements at Rice Road and the Driveway are forecast to operate at LOS C or better during the weekday peak hours for 2033, Total horizon. Delays from the site driveway are not expected to exceed 18 seconds.



TABLE 5.4: RICE ROAD AT DRIVEWAY OPERATIONS

Analysis Period	Intersection	Control Type	Horizon	MOE	Direction / Movement / Approach																Overall			
					Eastbound				Westbound				Northbound				Southbound							
					Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach				
AM Peak	4 - Rice Road at Driveway	TWSC	2024 Base Year	LOS Delay V/C Q					B 15 0.13 4					B 15		A 0 0.25 0	A 0 0.25 0	A 0	A 0 0.01 0	A 0 0.01 0			A 0	
PM Peak	4 - Rice Road at Driveway	TWSC	2024 Base Year	LOS Delay V/C Q					C 18 0.11 3					C 18		A 0 0.33 0	A 0 0.33 0	A 0	A 1 0.02 1	A 1 0.02 1			A 1	

MOE - Measure of Effectiveness
 LOS - Level of Service
 Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length
 Ex. - Existing Available Storage
 Avail. - Available Storage

TCS - Traffic Control Signal
 TWSC - Two-Way Stop Control
 AWSC - All-Way Stop Control

RBT - Roundabout



6 Mitigation

As summarized in the analysis tables in the previous chapter, the signalized intersections within the study area are currently projected to experience operational deficiencies independent of the development.

The analysis also identified that the development would have minimal impact on the study area's traffic conditions.

6.1 Intersection Improvements

The following section discusses the potential remedial measures that could be considered to accommodate better the forecast traffic volumes at the study area intersections.

6.1.1 Rice Road at Highway 20

With future growth in general traffic, the signalized intersection of Rice Road and Highway 20 will experience increased demand. Improvements to the signal timing could be provided as an interim solution. Ultimately, the future extension of Merritt Road between Rice Road and Cataract Road will be required to provide increased capacity through other alternative routes. Based on the Merritt Road/Rice Road Class EA estimates, volumes along Rice Road could be reduced by approximately 25%.

6.1.2 Rice Road at Quaker Road

With future growth in general traffic, the all-way stop-controlled intersection of Rice Road and Quaker Road will experience increased demand.

A traffic signal warrant analysis was conducted for this intersection to determine if projected traffic conditions would satisfy the warrants. The weekday afternoon peak hour turning movement volume forecast was considered, and Traffic Signal Justification 7 from "Ontario Traffic Manual for Traffic Signals" was applied. This method estimates average hourly volumes for turning movement volumes based on a peak hour forecast.

To apply this analysis method, the average hourly volumes are compared for the Minimum Vehicular Volume and Delay to cross-traffic criteria for traffic signal justification. The Ontario Traffic Manual (OTM) Book 12 dictates that minimum vehicular volume (1A and 1B) or the delay in crossing traffic warrant (2A and 2B) be met to 120% for traffic control signals to be warranted for existing intersections with forecast



traffic volumes. **Table 6.1** summarizes the traffic signal warrant. **Appendix E** provides the warrant analysis worksheets for reference.

TABLE 6.1: RICE AT QUAKER SIGNAL WARRANT SUMMARY

Horizon Year	Minimum Vehicular Volume		Delay to Cross Traffic		120% Warranted
	All Approaches (1A)	Minor Street Approaches (1B)	Major Street Approaches (2A)	Traffic Major Street (2B)	
2033 Background	73%	242%	16%	295%	No
2033 Total	77%	258%	16%	317%	No

The signal warrant analysis indicates that traffic control signals are not warranted at the intersection under 2033 Background or Total Horizon.

A SimTraffic simulation has been completed for the queue created at the Rice Road and Quaker Road intersection to determine whether the queues would block an adjacent intersection or a major driveway connection.

SimTraffic was utilized rather than Synchro in this assessment as microscopic models, such as Sim Traffic, individually track each vehicle in the traffic system through the model and collect comprehensive operational measures of effectiveness for every vehicle during each 0.1 seconds of the simulation. The analysis consisted of ten (10) iterations of sixty (60) minute simulations to forecast the delay per vehicle in seconds. **Appendix F** provides the SimTraffic results.

Reviewing these results indicates that during the respective peak hours, a queue length of 51 metres is expected for the intersection's southbound approach. The proposed Driveway to Rice Road is approximately 195 metres north of the Rice Road and Quaker Road intersection; vehicle blockage is not projected to occur.

Concerning the northbound approach, a queue length of 74 metres is projected during the weekday PM peak hour, which would block the Niagara Catholic School Board's north Driveway. It is noted, however, that the school board has two additional driveways, one to Quaker Road and an additional driveway to Rice Road, which the queue lengths will not impact. As the property has multiple access points, access to/from the property is still available during peak congestion at the intersection of Rice Road and Quaker Road. Driver courtesy will also be expected to allow space in the queue for vehicles to/from the school board's north Driveway.



6.2 Auxiliary Turn Lane Requirements

A review of potential auxiliary turn lanes along Rice Road at the proposed development driveway connection has been assessed.

6.2.1 Left-Turn Lane

The proposed new unsignalized intersections with Rice Road were assessed to determine if the future traffic volumes warrant the installation of a left-turn lane along Rice Road. The warrants for left-turn lanes follow the Ministry of Transportation's (MTO) Design Supplement to the Transportation Association of Canada (TAC) *Geometric Design Guide for Canadian Roads* (GDGCR)⁴ requirements, which provides guidance on the assessment of and/or need for auxiliary left-turn lanes at unsignalized intersections. The warrant analysis to determine if a left-turn lane is needed is based on the following criteria:

- ▶ Design speed of the road (posted speed + 10 km/h⁵);
- ▶ Advancing Volume;
- ▶ Opposing Volume; and
- ▶ Percent of advancing vehicles performing a left-turn maneuver.

The percentages of left-turning vehicles in the approaching volume were rounded to the nearest five percent, as warrant nomographs are only provided for five percent increments. **Table 6.2** summarizes the results of the left-turn lane warrant analysis. The results indicate an auxiliary left-turn lane is not warranted along Rice Road at the site driveway under the 2033 Total horizon. **Appendix G** provides the left-turn lane nomographs.

⁴ Transportation Association of Canada, *MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads – Appendix 9A*, Ministry of Transportation of Ontario, 2023.

⁵ Niagara Region, Schedule 'C' Municipal Class Environmental Assessment for Merritt Road (Regional Road 37) and Rice Road (Regional Road 54), Table 8-3, March 2024



TABLE 6.2: LEFT-TURN LANE WARRANT SUMMARY

	Rice Road at Driveway	
Approach Direction	Southbound	
Design Speed	60 km/h	
Horizon	2033 Total	
Peak Hour	AM	PM
Advancing Volume	358	427
Opposing Volumes	389	510
Left Turning Traffic	6	18
% of Left Turning Traffic	1.7%	4.2%
Figure Used*	9A-7 (5%)	9A-7 (5%)
Warranted	No	No
Storage Length Required	-	-

Based on MTO Design Supplement for TAC Geometric Design Guide for Canadian Road - 2023



6.2.2 Deceleration Right-Turn Lane

Right turn lanes are exclusive vehicle lanes allowing a right turn movement to occur outside the through lane. Deceleration lanes are advantageous on higher-speed roads because the driver of a vehicle leaving the highway has no choice but to slow down on the through-traffic lane if a deceleration lane is not provided. The failure to brake by the following drivers, because of a lack of alertness may result in rear-end collisions.

The Federal Highway Administration (FHWA) studied the safety impact of exclusive right turn lanes, and based on their review, collisions can be expected to decrease from 4% to 27%, depending on the circumstances.⁶ The proposed new driveway to Rice Road were assessed to determine if the forecasted traffic volumes warrant installing a northbound right-turn lane along Rice Road. TAC *GDGCR*⁷ details the requirements for auxiliary right-turn lanes and recommends a right-turn taper and/or a right-turn lane at unsignalized intersections when “*the volume of decelerating or accelerating vehicles compared with the through traffic volume causes undue hazard.*”

MTO guidelines (Geometric Design Standards for Ontario Highways)⁸ note that right-turn lanes or tapers may be considered at channelized intersections where right-turn volumes exceed 60 vehicles per hour (vph) and where right-turning vehicles create a hazard or reduce capacity at the intersection. Although this guideline is noted for channelized intersections and the reference pertains to best practices at the time (1976), it provides a benchmark guideline for the volume of right-turning vehicles that may benefit from a right-turn lane.

The northbound right-turning volumes at the proposed site driveway connection to Rice Road are less than 30 vehicles per peak hour under the 2033 Total horizon, equivalent to approximately one vehicle every two minutes over a peak hour. This turning movement is considered insignificant, accounting for less than 5% of the approaching volumes. As a result, the northbound right-turn movements are anticipated not to cause undue hazard, and an auxiliary right-turn lane is not recommended along Rice Road at the proposed site driveway to the development.

⁶ Federal Highway Administration, Safety Effectiveness of Intersection Left-and Right-Turn Lanes.

⁷ Transportation Association of Canada, *Geometric Design Guide for Canadian Roads*, 2017, p99.

⁸ Geometric Design Standards for Ontario Highways, Ministry of Transportation, Surveys & Design Office, Chapter E7.2.



7 Conclusions and Recommendations

7.1 Conclusions

This study evaluates the impacts of background traffic growth and projects the impacts of the development with the construction of 139 townhouse units. Access to the site is proposed via a new driveway connection to Rice Road, located 195 metres north of the Rice Road and Quaker Road intersection.

Full-build out of the development is projected to generate approximately 67 new vehicle trips during the weekday AM peak hour and 79 new vehicle trips during the weekday PM peak hour. A left-turn lane warrant analysis was conducted at the proposed development driveway to Rice Road and determined that a southbound left-turn lane is not warranted.

The traffic analysis conducted as part of this assessment indicates that development volumes will result in minor increases in the surrounding study area intersection volumes under peak conditions, which should not be perceptible.

Deficiencies currently exist at the intersection of Rice Road and Highway 20. Operations at this intersection are projected to degrade further as a result of the general growth in traffic to the area, independent of the development. Niagara Region has completed a Municipal Class Environmental Assessment Study to identify improvements to Merritt Road and Rice Road due to proposed developments in the Town of Pelham, the City of Thorold and the City of Welland. As part of the Class EA, to provide additional capacity improvements for the overall area, Merritt Road between Cataract Road and Highway 406 is recommended to be extended. Through this extension, traffic volumes along Rice Road are projected to decrease by approximately 25%. However, until this occurs, an interim improvement option would be to optimize the signal timings.

The all-way stop-controlled intersection of Rice Road and Quaker Road is also projected to experience increased demand as a result of the general traffic growth project for the area. A traffic signal warrant analysis was conducted for this intersection to determine if projected traffic conditions would satisfy the warrants. However, the warrant criteria for signalization are not satisfied. To determine the extent of the queues created by the all-way stop configuration, a SimTraffic simulation was completed for the 2033 Total Horizon.

Reviewing these results indicates that during the respective peak hours, a queue length of 51 metres is expected for the intersection's



southbound approach. The proposed Driveway to Rice Road is approximately 195 metres north of the Rice Road and Quaker Road intersection; vehicle blockage is not projected to occur.

Concerning the northbound approach, a queue length of 74 metres is projected during the weekday PM peak hour, which would block the Niagara Catholic School Board's north Driveway. It is noted, however, that the school board has two additional driveways, one to Quaker Road and an additional driveway to Rice Road, which the queue lengths will not impact. As the property has multiple access points, access to/from the property is still available during peak congestion at Rice Road and Quaker Road intersection. Driver courtesy will also be expected to allow space in the queue for vehicles to/from the school board's north Driveway.

Given that the queue lengths will not impact adjacent intersections/major driveways, the increased delay is considered tolerable until the intersection is widened and upgraded to traffic control signals.

7.2 Recommendations

Based on the findings of this study, the following recommendations are identified:

- ▶ The Region optimizes the traffic signal timings at the intersection of Rice Road with Highway 20 and Woodlawn Road as an interim solution until the preferred improvements as per the Class EA are implemented.



Appendix A

Terms of Reference



From: [Dunsmore, Susan](#)
To: [Adam Makarewicz](#)
Cc: [Wilson, Josh](#); [McGowan, Jake](#)
Subject: RE: 240535: 450 Rice Road, Welland - TIA Scope of Work
Date: September 16, 2024 7:22:57 AM
Attachments: [image002.png](#)
[image003.png](#)
[image004.png](#)
[image005.png](#)
[image006.png](#)
[image007.png](#)

Good Morning

Transportation planning staff have reviewed the scope provided and have provided their comments in red below. For regional traffic data please use the following link: <https://www.niagararegion.ca/living/roads/permits/traffic-data-requests.aspx>. If the TIS requires improvements to Regional Roads or intersections the TIS is to include functional drawings for the improvements.

If you require anything further please contact either Josh Wilson or myself at your convenience.

Thank you

Susan M. Dunsmore, P.Eng.

ACTING DIRECTOR, INFRASTRUCTURE PLANNING & DEVELOPMENT ENGINEERING
Niagara Region, 1815 Sir Isaac Brock Way, Thorold, ON, L2V 4T7

P : (905) 980 - 6000 ext. 3661
W : www.niagararegion.ca
E : susan.dunsmore@niagararegion.ca



From: Adam Makarewicz <amakarewicz@ptsl.com>
Sent: Friday, September 6, 2024 10:39 AM
To: Dunsmore, Susan <Susan.Dunsmore@niagararegion.ca>
Subject: 240535: 450 Rice Road, Welland - TIA Scope of Work

CAUTION EXTERNAL EMAIL: This email originated from outside of the Niagara Region email system. Use caution when clicking links or opening attachments unless you recognize the sender and know the content is safe.

Hi Susan

We've been retained to complete a traffic study for a proposed residential development on the east side of Rice Road and north of Quaker Road; the municipal address is 450 Rice

Road in Welland, Ontario.

The applicant proposes an Official Plan Amendment to develop the property with 139 residential units (low-density) and 193 parking spaces. Vehicle access to the site is proposed through a new driveway connection to Rice Road, located at the northern limit of the property.

It is understood that the Niagara Region has completed a Schedule C Municipal Class Environmental Assessment, including a detailed transportation assessment of Merritt Road (Regional Road 37) and Rice Road (Regional Road 54) in Pelham, Thorold, and Welland. Based on the completed EA, the preferred design is to widen Rice Road north of Quaker Road from a two-lane cross-section to a five-lane cross-section. Based on the pre-consultation that has occurred for this development application, the Region has requested a Transportation Impact Assessment for the short-term condition where the road remains as a two-lane cross-section to determine what facilities/improvements will be required in the interim.

Based on this, would the following scope of work be acceptable?

We've been retained to complete a traffic study for a proposed residential development on the east side of Rice Road and north of Quaker Road; the municipal address is 450 Rice Road in Welland, Ontario.

The applicant proposes an Official Plan Amendment to develop the property with 139 residential units (low-density) and 193 parking spaces. Vehicle access to the site is proposed through a new driveway connection to Rice Road, located at the northern limit of the property.

It is understood that the Niagara Region has completed a Schedule C Municipal Class Environmental Assessment, including a detailed transportation assessment of Merritt Road (Regional Road 37) and Rice Road (Regional Road 54) in Pelham, Thorold, and Welland. Based on the completed EA, the preferred design is to widen Rice Road north of Quaker Road from a two-lane cross-section to a five-lane cross-section. Based on the pre-consultation that has occurred for this development application, the Region has requested a Transportation Impact Assessment for the short-term condition where the road remains as a two-lane cross-section to determine what facilities/improvements will be required in the interim.

For further updates on the Environmental Assessment and the improvements along Rice Road, please refer to the EA webpage at:

<https://niagararegion.ca/projects/regional-road-37/>

Based on this, would the following scope of work be acceptable?

Scope of Work

- Study Area
 - Rice Road at Quaker Road
 - Proposed Development Driveway
 - Rice Road at Highway 20 – TMC available August 2023

Rice Road at Woodlawn Road – TMC available August 2023

- Peak Hours
 - Weekday AM
 - Weekday PM
- Traffic Data
 - New Counts will be completed in September 2024.
- Horizon Years
 - Existing Year (2024)
 - **At Full Buildout, a rough estimate of the buildout year should be identified in the TIS analysis because the study horizon is based on development' buildout year.**
 - Five Years After Full Build-Out
- Analysis
 - Synchro 11
 - HCM 2000
- Background Traffic
 - Generalized growth rate will be based on the growth rates contained in the [Merritt Road/Rice Road EA \(2024-02-15\)](#)
 - Quaker Road – 3% EB, 1.9% WB
 - Rice Road – 3% NB, 1.5% SB
- Site Traffic Estimates
 - ITE Trip Generation (11th Edition)
- Site Traffic Distribution
 - Existing travel patterns based on Rice Road and Quaker Road count.
- Mitigation Assessment
 - Left-turn lane Warrants at Rice Road and Proposed Driveway

Thanks,

Adam J. Makarewicz

Senior Project Manager, Associate



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Appendix B

Existing Traffic Data



Location..... Highway 20 East @ Rice Road

GeoID..... 00389

Municipality. PELHAM

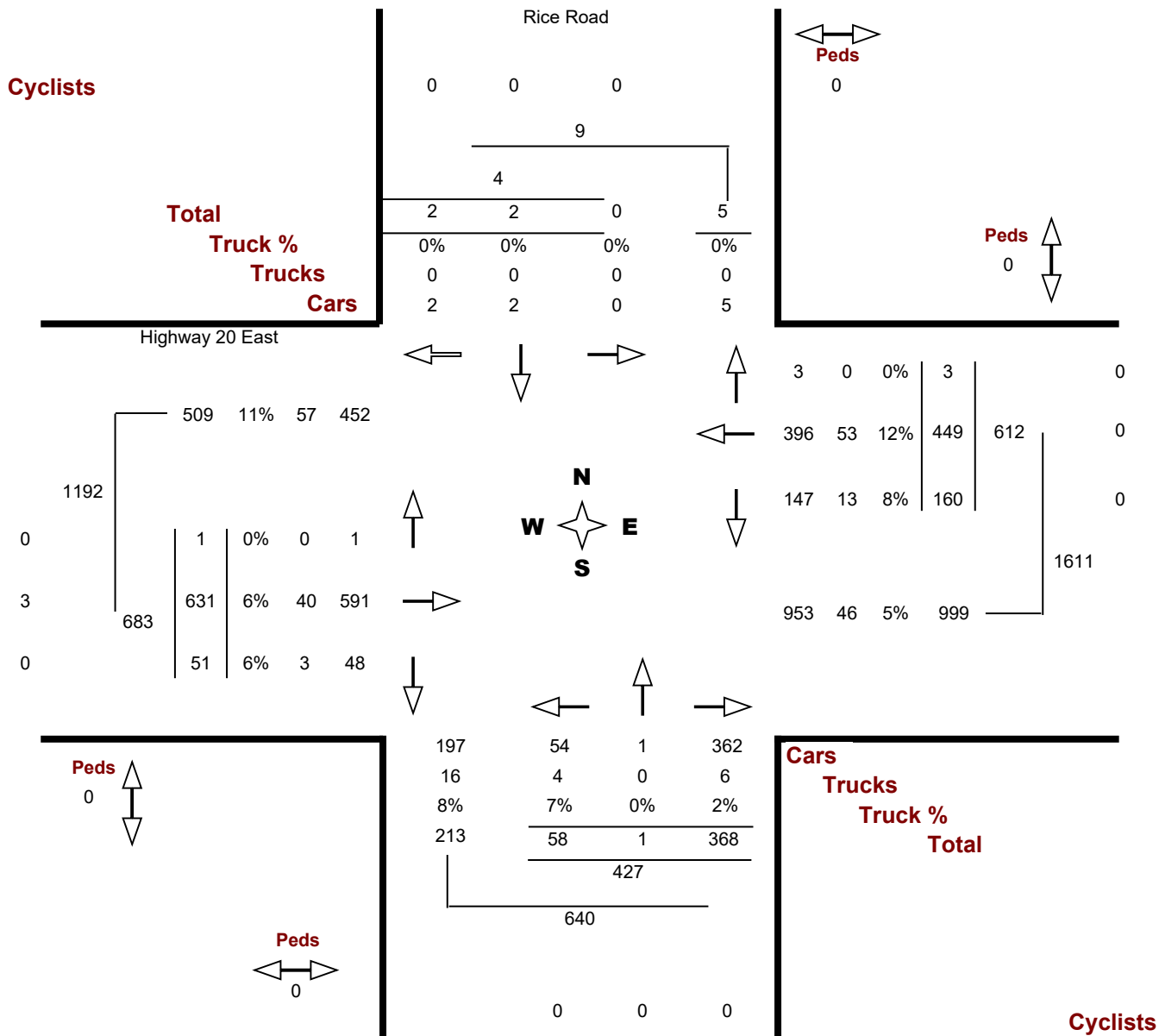
Count Date. Wednesday, 09 August, 2023

Traffic Cont. Traffic signal

Count Time. 07:00 AM — 09:00 AM

Major Dir..... East west

Peak Hour.. 08:00 AM — 09:00 AM



Location..... Highway 20 East @ Rice Road

GeoID..... 00389

Municipality. PELHAM

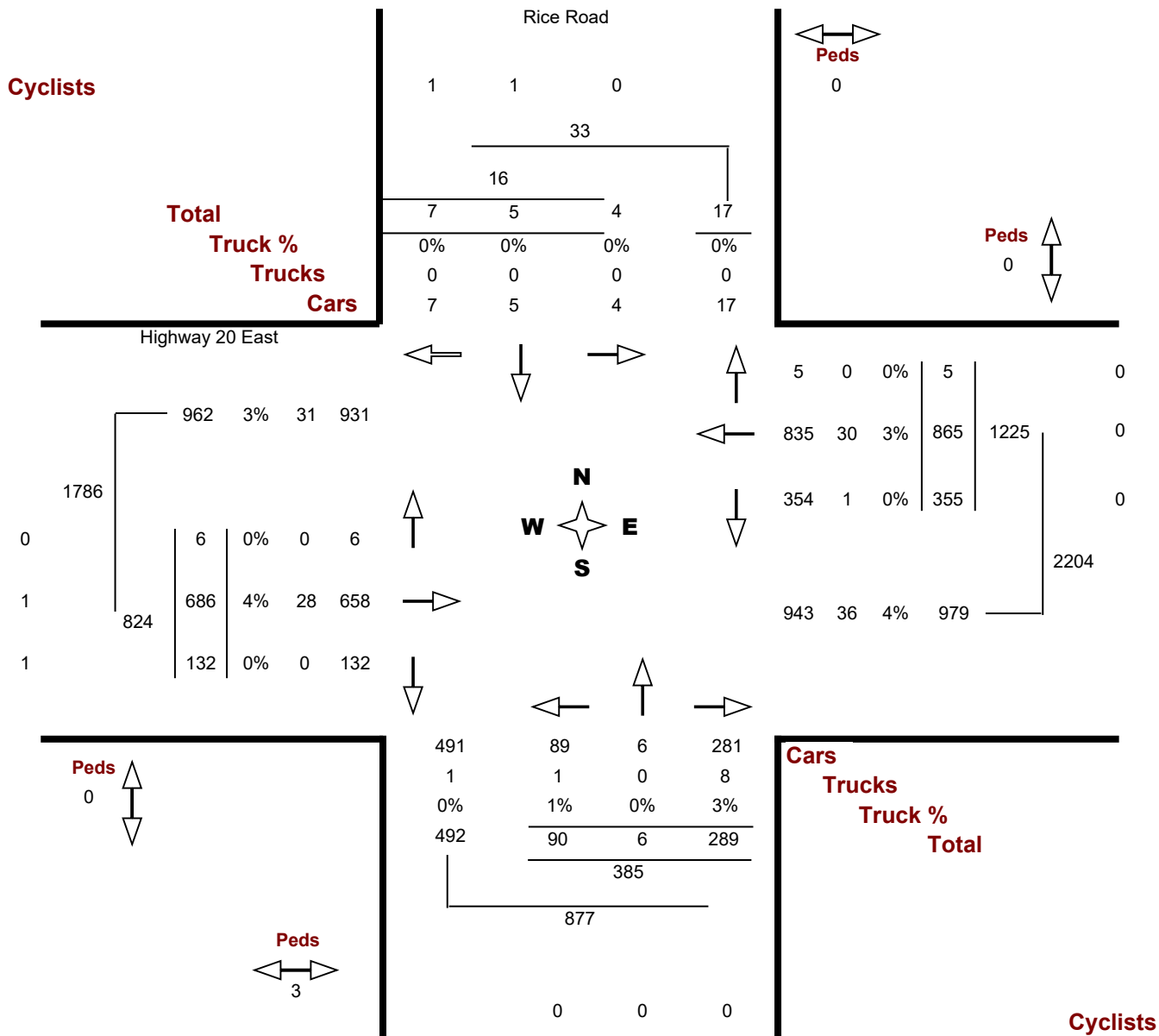
Count Date. Wednesday, 09 August, 2023

Traffic Cont. Traffic signal

Count Time. 03:00 PM — 06:00 PM

Major Dir..... East west

Peak Hour.. 04:00 PM — 05:00 PM

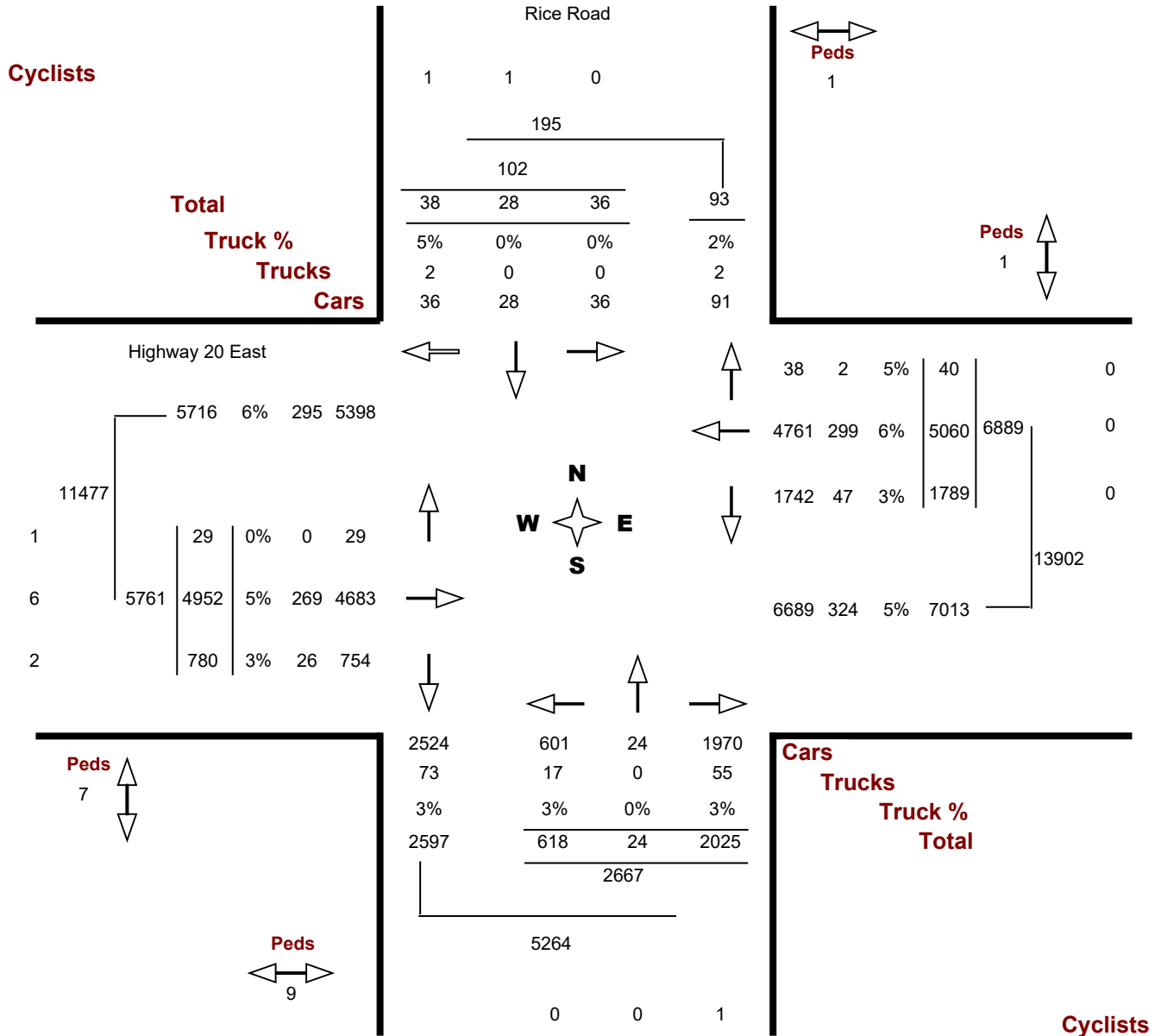


Location..... Highway 20 East @ Rice Road

Municipality..... PELHAM

GeoID..... 00389

Count Date..... Wednesday, 09 August, 2023



Turning Movement Count - Details Report (15 min)

Location..... Highway 20 East @ Rice Road
Municipality..... PELHAM
Count Date..... Wednesday, August 09, 2023

Rice Road

Highway 20 East

North Approach

South Approach

East Approach

West Approach

Time Period	LT	TH	RT	U-Turn	TOT	LT	TH	RT	U-Turn	TOT	LT	TH	RT	U-Turn	TOT	LT	TH	RT	U-Turn	TOT
07:00 07:15	0	0	0	0	0	4	0	56	0	60	30	55	0	0	85	0	88	10	0	98
07:15 07:30	0	0	0	0	0	3	0	72	0	75	30	71	1	0	102	0	115	13	0	128
07:30 07:45	0	0	0	0	0	5	2	72	0	79	31	94	0	0	125	0	153	5	0	158
07:45 08:00	0	0	1	0	1	10	0	87	0	97	39	113	3	0	155	1	131	12	0	144
Hourly Total	0	0	1	0	1	22	2	287	0	311	130	333	4	0	467	1	487	40	0	528
08:00 08:15	0	0	0	0	0	9	0	105	0	114	38	81	0	0	119	0	148	7	0	155
08:15 08:30	0	0	2	0	2	10	0	81	0	91	39	116	1	0	156	0	166	11	0	177
08:30 08:45	0	1	0	0	1	17	0	98	0	115	50	130	1	0	181	0	178	16	0	194
08:45 09:00	0	1	0	0	1	22	1	84	0	107	33	122	1	0	156	1	139	17	0	157
Hourly Total	0	2	2	0	4	58	1	368	0	427	160	449	3	0	612	1	631	51	0	683
11:00 11:15	0	0	1	0	1	18	2	48	0	68	42	145	3	0	190	1	135	18	0	154
11:15 11:30	0	1	2	0	3	17	0	49	0	66	31	119	0	0	150	0	144	22	0	166
11:30 11:45	1	1	1	0	3	25	0	49	0	74	54	173	0	0	227	3	161	20	0	184
11:45 12:00	0	0	2	0	2	25	0	67	0	92	49	155	1	0	205	1	174	32	0	207
Hourly Total	1	2	6	0	9	85	2	213	0	300	176	592	4	0	772	5	614	92	0	711
12:00 12:15	1	0	0	0	1	18	0	52	0	70	49	161	1	0	211	1	150	26	0	177
12:15 12:30	4	0	2	0	6	20	3	51	0	74	36	158	4	0	198	2	154	30	0	186
12:30 12:45	1	0	3	0	4	23	0	43	0	66	53	157	1	0	211	1	169	31	0	201
12:45 13:00	3	0	1	0	4	35	3	54	0	92	45	170	0	0	215	1	152	30	0	183
Hourly Total	9	0	6	0	15	96	6	200	0	302	183	646	6	0	835	5	625	117	0	747
13:00 13:15	0	1	0	0	1	16	1	57	0	74	46	135	2	0	183	1	167	35	0	203
13:15 13:30	2	2	2	0	6	20	0	53	0	73	48	157	4	0	209	0	176	25	0	201
13:30 13:45	0	1	2	0	3	25	1	52	0	78	39	169	0	0	208	3	155	25	0	183
13:45 14:00	4	3	0	0	7	28	1	41	0	70	61	138	1	0	200	1	154	32	0	187
Hourly Total	6	7	4	0	17	89	3	203	0	295	194	599	7	0	800	5	652	117	0	774
15:00 15:15	2	2	2	0	6	14	0	63	0	77	50	176	2	0	228	1	153	22	0	176
15:15 15:30	1	1	2	0	4	19	0	46	0	65	62	180	1	0	243	1	132	28	0	161
15:30 15:45	4	3	2	0	9	24	1	65	0	90	63	192	0	0	255	1	153	28	0	182
15:45 16:00	1	0	1	0	2	20	2	55	0	77	67	214	3	0	284	0	163	32	0	195
Hourly Total	8	6	7	0	21	77	3	229	0	309	242	762	6	0	1010	3	601	110	0	714
16:00 16:15	1	3	1	0	5	20	1	95	0	116	71	203	3	0	277	1	193	36	0	230

Rice Road

Highway 20 East

Time Period	North Approach					South Approach					East Approach					West Approach				
	LT	TH	RT	U-Turn	TOT	LT	TH	RT	U-Turn	TOT	LT	TH	RT	U-Turn	TOT	LT	TH	RT	U-Turn	TOT
16:15 16:30	2	0	1	0	3	22	2	68	0	92	91	217	2	0	310	1	180	32	0	213
16:30 16:45	1	1	1	0	3	22	1	62	0	85	91	231	0	0	322	2	153	32	0	187
16:45 17:00	0	1	4	0	5	26	2	64	0	92	102	214	0	0	316	2	160	32	0	194
Hourly Total	4	5	7	0	16	90	6	289	0	385	355	865	5	0	1225	6	686	132	0	824
17:00 17:15	2	2	0	0	4	27	0	64	0	91	90	214	2	0	306	1	166	27	0	194
17:15 17:30	3	1	3	0	7	26	0	61	0	87	95	187	2	0	284	1	176	29	0	206
17:30 17:45	1	1	1	0	3	15	1	66	0	82	90	232	1	0	323	1	175	35	0	211
17:45 18:00	2	2	1	0	5	33	0	45	0	78	74	181	0	0	255	0	139	30	0	169
Hourly Total	8	6	5	0	19	101	1	236	0	338	349	814	5	0	1168	3	656	121	0	780
Grand Total	36	28	38	0	102	618	24	2025	0	2667	1789	5060	40	0	6889	29	4952	780	0	5761
Truck %	0%	0%	5%	0%	2%	3%	0%	3%	0%	3%	3%	6%	5%	0%	5%	0%	5%	3%	0%	5%

Location..... Rice Road @ Woodlawn Road

GeoID..... 00265

Municipality. WELLAND

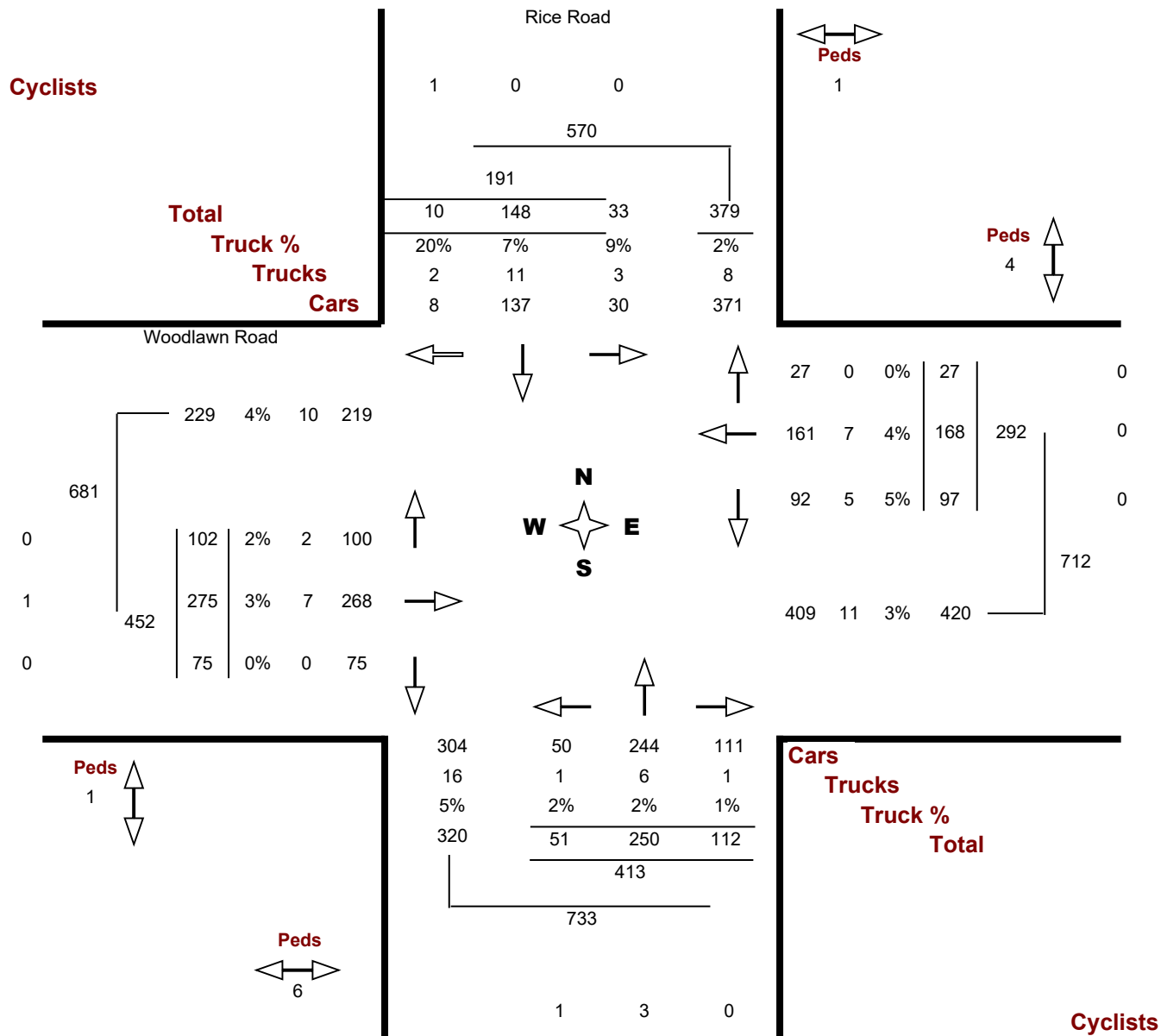
Count Date. Wednesday, 09 August, 2023

Traffic Cont. Traffic signal

Count Time. 07:00 AM — 09:00 AM

Major Dir..... East west

Peak Hour.. 08:00 AM — 09:00 AM



Location..... Rice Road @ Woodlawn Road

GeoID..... 00265

Municipality. WELLAND

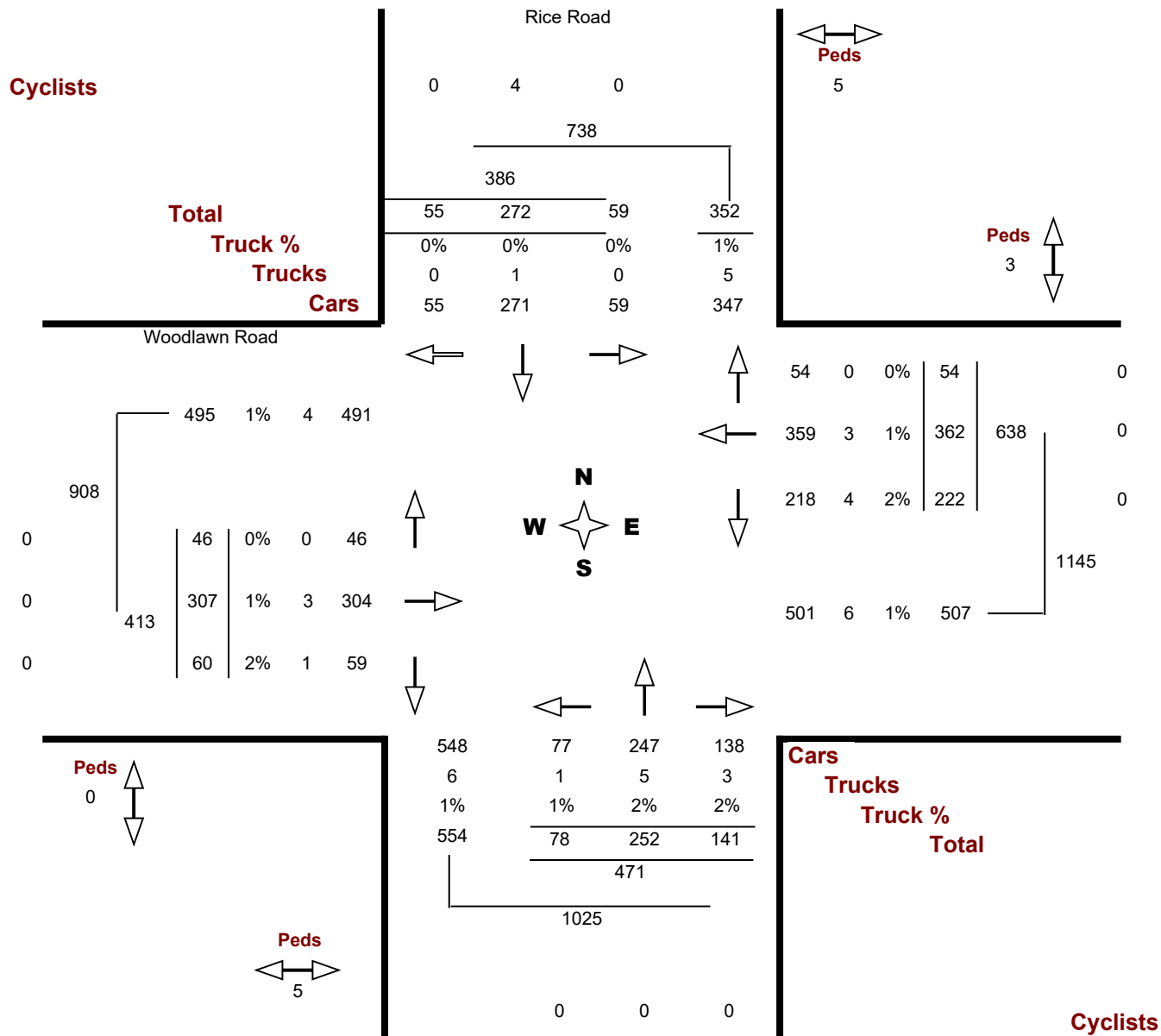
Count Date. Wednesday, 09 August, 2023

Traffic Cont. Traffic signal

Count Time. 03:00 PM — 06:00 PM

Major Dir..... East west

Peak Hour.. 04:00 PM — 05:00 PM

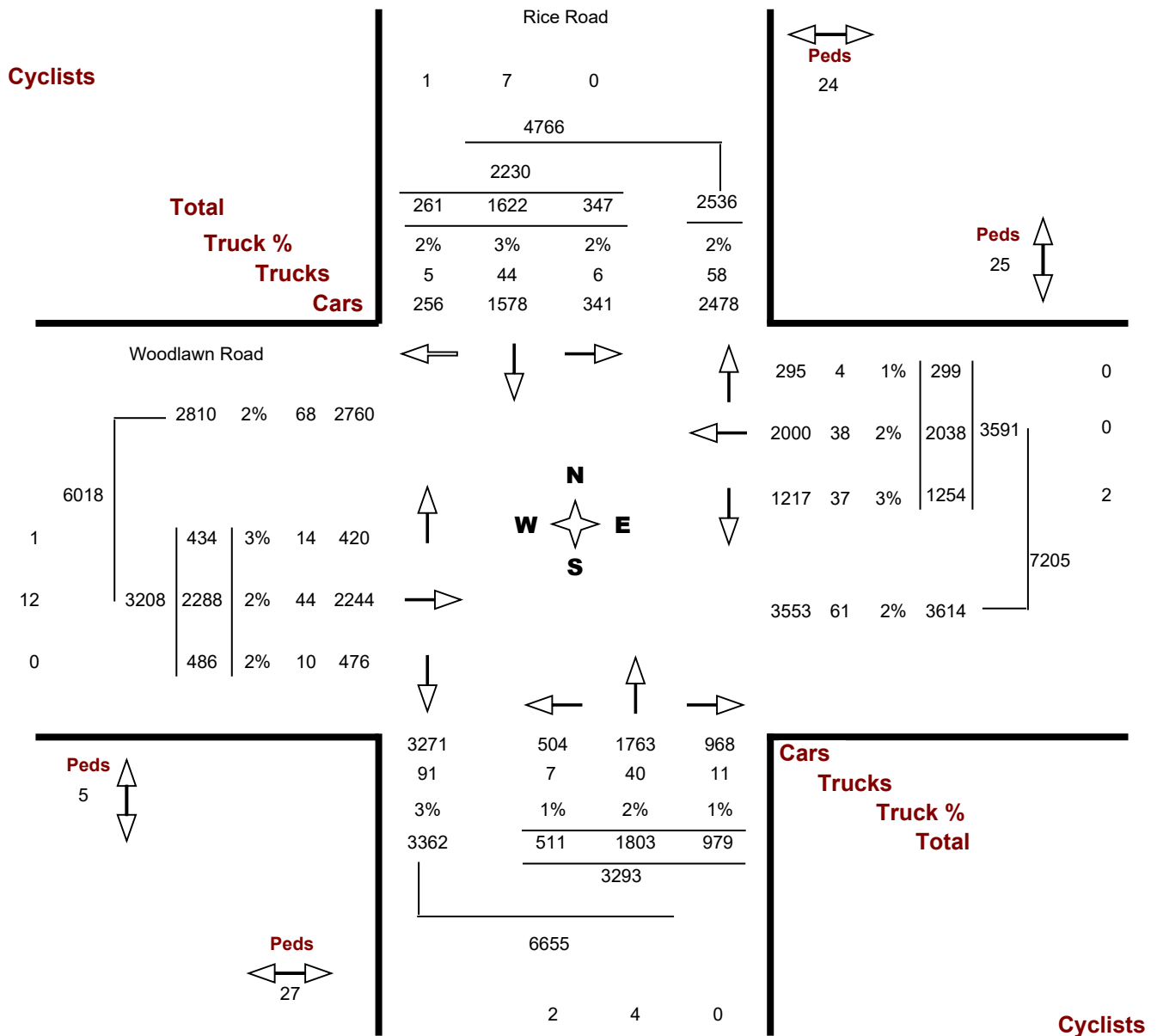


Location..... Rice Road @ Woodlawn Road

Municipality..... WELLAND

GeoID..... 00265

Count Date..... Wednesday, 09 August, 2023



Turning Movement Count - Details Report (15 min)

Location..... Rice Road @ Woodlawn Road
Municipality..... WELLAND
Count Date..... Wednesday, August 09, 2023

Rice Road

Woodlawn Road

North Approach

South Approach

East Approach

West Approach

Time Period	LT	TH	RT	U-Turn	TOT	LT	TH	RT	U-Turn	TOT	LT	TH	RT	U-Turn	TOT	LT	TH	RT	U-Turn	TOT
07:00 07:15	4	15	2	0	21	7	32	17	0	56	15	14	3	0	32	12	38	6	0	56
07:15 07:30	4	18	1	0	23	8	31	23	0	62	12	28	1	0	41	7	56	6	0	69
07:30 07:45	6	34	1	0	41	15	60	24	0	99	16	25	4	0	45	10	68	15	0	93
07:45 08:00	8	27	5	0	40	11	53	21	0	85	14	35	4	0	53	15	75	14	0	104
Hourly Total	22	94	9	0	125	41	176	85	0	302	57	102	12	0	171	44	237	41	0	322
08:00 08:15	9	42	2	0	53	11	66	18	0	95	19	37	5	0	61	34	66	18	0	118
08:15 08:30	6	30	5	0	41	11	53	34	0	98	25	51	7	0	83	24	65	21	0	110
08:30 08:45	12	35	3	0	50	15	69	34	0	118	26	43	6	0	75	17	60	14	0	91
08:45 09:00	6	41	0	0	47	14	62	26	0	102	27	37	9	0	73	27	84	22	0	133
Hourly Total	33	148	10	0	191	51	250	112	0	413	97	168	27	0	292	102	275	75	0	452
11:00 11:15	8	51	8	0	67	14	40	31	0	85	31	63	8	0	102	14	55	12	0	81
11:15 11:30	15	46	10	0	71	9	47	26	0	82	28	54	8	0	90	10	79	17	0	106
11:30 11:45	17	47	5	0	69	19	47	38	0	104	33	52	12	0	97	11	67	15	0	93
11:45 12:00	10	50	8	0	68	18	58	30	0	106	48	55	10	0	113	9	77	13	0	99
Hourly Total	50	194	31	0	275	60	192	125	0	377	140	224	38	0	402	44	278	57	0	379
12:00 12:15	9	36	13	0	58	14	54	37	0	105	34	69	8	0	111	15	97	12	0	124
12:15 12:30	13	53	10	0	76	12	55	26	0	93	46	57	13	0	116	9	74	14	0	97
12:30 12:45	7	51	5	0	63	19	64	32	0	115	42	47	14	0	103	21	88	17	0	126
12:45 13:00	14	54	10	0	78	18	65	38	0	121	51	64	7	0	122	14	77	16	0	107
Hourly Total	43	194	38	0	275	63	238	133	0	434	173	237	42	0	452	59	336	59	0	454
13:00 13:15	12	55	15	0	82	22	50	31	0	103	50	63	13	0	126	14	70	19	0	103
13:15 13:30	9	62	10	0	81	13	67	40	0	120	42	59	6	0	107	13	64	13	0	90
13:30 13:45	10	57	8	0	75	13	56	38	0	107	38	64	7	0	109	22	72	8	0	102
13:45 14:00	10	57	6	0	73	15	56	25	0	96	27	69	8	0	104	13	69	29	0	111
Hourly Total	41	231	39	0	311	63	229	134	0	426	157	255	34	0	446	62	275	69	0	406
15:00 15:15	12	51	4	0	67	20	51	41	0	112	51	82	12	0	145	10	74	8	0	92
15:15 15:30	15	62	10	0	87	23	62	33	0	118	49	83	9	0	141	17	84	13	0	114
15:30 15:45	18	60	6	0	84	18	51	34	0	103	56	67	10	0	133	8	71	11	0	90
15:45 16:00	10	46	8	0	64	21	64	40	0	125	56	107	8	0	171	9	62	10	0	81
Hourly Total	55	219	28	0	302	82	228	148	0	458	212	339	39	0	590	44	291	42	0	377
16:00 16:15	15	67	14	0	96	21	61	41	0	123	54	70	15	0	139	9	65	16	0	90

Rice Road

Woodlawn Road

Time Period	North Approach					South Approach					East Approach					West Approach				
	LT	TH	RT	U-Turn	TOT	LT	TH	RT	U-Turn	TOT	LT	TH	RT	U-Turn	TOT	LT	TH	RT	U-Turn	TOT
16:15 16:30	17	65	15	0	97	20	61	33	0	114	63	99	15	0	177	14	85	13	0	112
16:30 16:45	13	77	14	0	104	16	59	36	0	111	64	92	12	0	168	8	74	19	0	101
16:45 17:00	14	63	12	0	89	21	71	31	0	123	41	101	12	0	154	15	83	12	0	110
Hourly Total	59	272	55	0	386	78	252	141	0	471	222	362	54	0	638	46	307	60	0	413
17:00 17:15	13	69	12	0	94	27	79	34	0	140	39	86	5	0	130	5	59	16	0	80
17:15 17:30	13	65	17	0	95	17	59	21	0	97	58	99	13	0	170	9	75	27	0	111
17:30 17:45	9	57	9	0	75	21	53	22	0	96	48	72	16	0	136	10	83	17	0	110
17:45 18:00	9	79	13	0	101	8	47	24	0	79	51	94	19	0	164	9	72	23	0	104
Hourly Total	44	270	51	0	365	73	238	101	0	412	196	351	53	0	600	33	289	83	0	405
Grand Total	347	1622	261	0	2230	511	1803	979	0	3293	1254	2038	299	0	3591	434	2288	486	0	3208
Truck %	2%	3%	2%	0%	2%	1%	2%	1%	0%	2%	3%	2%	1%	0%	2%	3%	2%	2%	0%	2%



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@ptsI.com

Count Name: Rice Road & Quaker Road
Site Code: 240535
Start Date: 09/10/2024
Page No: 1

Turning Movement Data

Start Time	Quaker Road Eastbound						Quaker Road Westbound						Rice Road Northbound						Rice Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:00 AM	0	6	2	0	0	8	3	2	1	0	0	6	3	19	6	0	0	28	5	23	0	0	0	28	70
7:15 AM	1	3	6	0	0	10	5	3	3	0	0	11	6	47	10	0	0	63	5	24	1	0	0	30	114
7:30 AM	4	4	5	0	0	13	8	3	5	0	0	16	7	53	7	0	0	67	11	31	4	0	0	46	142
7:45 AM	6	5	0	0	0	11	3	6	7	0	0	16	7	53	10	0	0	70	12	49	5	0	0	66	163
Hourly Total	11	18	13	0	0	42	19	14	16	0	0	49	23	172	33	0	0	228	33	127	10	0	0	170	489
8:00 AM	8	17	16	0	0	41	9	14	10	0	0	33	14	66	10	0	0	90	15	56	2	0	0	73	237
8:15 AM	4	7	7	0	0	18	14	5	12	0	0	31	5	57	10	0	0	72	8	75	1	0	1	84	205
8:30 AM	2	1	1	0	0	4	12	0	7	0	0	19	3	53	11	0	0	67	16	58	2	0	0	76	166
8:45 AM	3	1	5	0	0	9	18	3	13	0	0	34	2	56	14	0	0	72	16	56	4	0	1	76	191
Hourly Total	17	26	29	0	0	72	53	22	42	0	0	117	24	232	45	0	0	301	55	245	9	0	2	309	799
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	1	1	1	0	0	3	7	2	17	0	0	26	2	45	10	0	0	57	13	41	2	0	0	56	142
11:15 AM	1	2	1	0	0	4	10	1	12	0	0	23	5	57	15	0	0	77	17	47	0	0	0	64	168
11:30 AM	1	3	2	0	0	6	11	2	20	0	0	33	4	52	16	0	0	72	12	43	2	0	0	57	168
11:45 AM	2	3	3	0	0	8	12	2	20	0	0	34	9	51	7	0	0	67	14	31	1	0	0	46	155
Hourly Total	5	9	7	0	0	21	40	7	69	0	0	116	20	205	48	0	0	273	56	162	5	0	0	223	633
12:00 PM	0	6	5	0	0	11	11	1	21	0	0	33	2	47	8	0	0	57	16	39	1	0	0	56	157
12:15 PM	1	2	2	0	0	5	12	2	13	0	0	27	8	61	13	0	0	82	19	61	2	0	0	82	196
12:30 PM	0	2	4	0	0	6	6	1	17	0	0	24	4	59	20	0	0	83	15	46	0	0	0	61	174
12:45 PM	0	1	6	0	0	7	16	5	8	0	0	29	3	45	13	0	0	61	12	56	3	0	0	71	168
Hourly Total	1	11	17	0	0	29	45	9	59	0	0	113	17	212	54	0	0	283	62	202	6	0	0	270	695
1:00 PM	2	2	2	0	0	6	8	5	15	0	0	28	0	46	9	0	0	55	19	50	0	0	0	69	158
1:15 PM	2	3	1	0	0	6	13	2	20	0	0	35	1	48	9	0	0	58	16	51	1	0	0	68	167
1:30 PM	0	4	3	0	0	7	7	3	17	0	0	27	8	38	9	0	0	55	12	47	0	0	1	59	148
1:45 PM	3	3	0	0	0	6	14	2	13	0	0	29	3	37	10	0	0	50	18	49	1	0	0	68	153
Hourly Total	7	12	6	0	0	25	42	12	65	0	0	119	12	169	37	0	0	218	65	197	2	0	1	264	626
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	3	1	4	0	0	8	19	3	16	0	0	38	4	63	12	0	0	79	16	46	0	0	0	62	187
3:15 PM	1	1	4	0	0	6	17	4	12	0	0	33	5	79	19	0	0	103	21	69	3	0	0	93	235
3:30 PM	1	3	5	0	0	9	15	5	17	0	0	37	5	90	31	0	1	126	18	57	2	0	0	77	249
3:45 PM	1	5	2	0	0	8	4	5	24	0	0	33	12	80	18	0	0	110	12	57	3	0	0	72	223
Hourly Total	6	10	15	0	0	31	55	17	69	0	0	141	26	312	80	0	1	418	67	229	8	0	0	304	894
4:00 PM	6	3	11	0	0	20	14	8	6	0	0	28	7	69	16	0	0	92	15	64	2	0	0	81	221
4:15 PM	4	7	6	0	0	17	15	5	7	0	0	27	6	80	15	0	0	101	20	77	0	0	0	97	242
4:30 PM	2	8	4	0	0	14	17	8	5	0	0	30	7	93	21	0	0	121	8	66	6	0	0	80	245

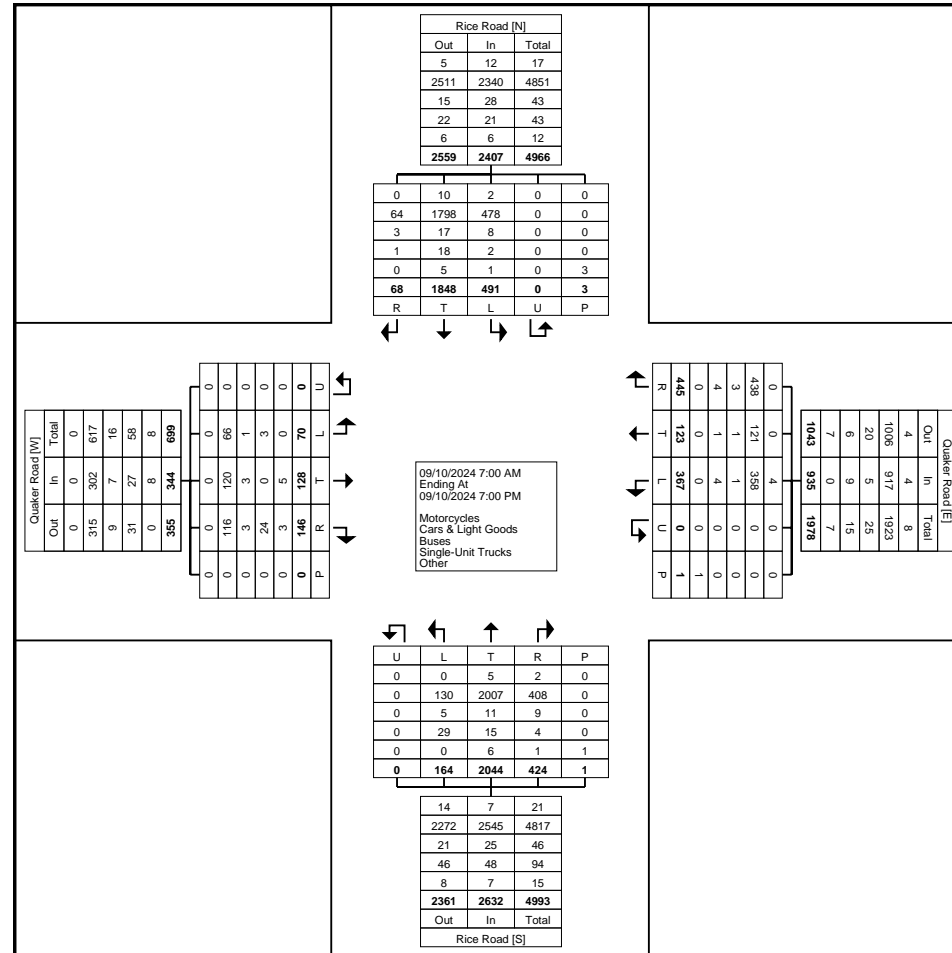
4:45 PM	5	6	14	0	0	25	10	4	5	0	0	19	8	81	9	0	0	98	19	67	4	0	0	90	232
Hourly Total	17	24	35	0	0	76	56	25	23	0	0	104	28	323	61	0	0	412	62	274	12	0	0	348	940
5:00 PM	2	6	9	0	0	17	11	4	19	0	0	34	5	67	10	0	0	82	12	78	2	0	0	92	225
5:15 PM	0	2	8	0	0	10	5	3	16	0	0	24	2	52	9	0	0	63	8	71	5	0	0	84	181
5:30 PM	1	3	3	0	0	7	12	2	11	0	0	25	2	78	7	0	0	87	8	61	2	0	0	71	190
5:45 PM	1	0	0	0	0	1	4	2	14	0	1	20	0	47	8	0	0	55	13	35	1	0	0	49	125
Hourly Total	4	11	20	0	0	35	32	11	60	0	1	103	9	244	34	0	0	287	41	245	10	0	0	296	721
6:00 PM	0	5	2	0	0	7	8	3	10	0	0	21	1	42	8	0	0	51	14	50	3	0	0	67	146
6:15 PM	0	0	0	0	0	0	11	1	12	0	0	24	2	47	12	0	0	61	16	45	0	0	0	61	146
6:30 PM	1	1	0	0	0	2	3	1	13	0	0	17	1	41	4	0	0	46	10	38	1	0	0	49	114
6:45 PM	1	1	2	0	0	4	3	1	7	0	0	11	1	45	8	0	0	54	10	34	2	0	0	46	115
Hourly Total	2	7	4	0	0	13	25	6	42	0	0	73	5	175	32	0	0	212	50	167	6	0	0	223	521
Grand Total	70	128	146	0	0	344	367	123	445	0	1	935	164	2044	424	0	1	2632	491	1848	68	0	3	2407	6318
Approach %	20.3	37.2	42.4	0.0	-	-	39.3	13.2	47.6	0.0	-	-	6.2	77.7	16.1	0.0	-	-	20.4	76.8	2.8	0.0	-	-	-
Total %	1.1	2.0	2.3	0.0	-	5.4	5.8	1.9	7.0	0.0	-	14.8	2.6	32.4	6.7	0.0	-	41.7	7.8	29.2	1.1	0.0	-	38.1	-
Motorcycles	0	0	0	0	-	0	4	0	0	0	-	4	0	5	2	0	-	7	2	10	0	0	-	12	23
% Motorcycles	0.0	0.0	0.0	-	-	0.0	1.1	0.0	0.0	-	-	0.4	0.0	0.2	0.5	-	-	0.3	0.4	0.5	0.0	-	-	0.5	0.4
Cars & Light Goods	66	120	116	0	-	302	358	121	438	0	-	917	130	2007	408	0	-	2545	478	1798	64	0	-	2340	6104
% Cars & Light Goods	94.3	93.8	79.5	-	-	87.8	97.5	98.4	98.4	-	-	98.1	79.3	98.2	96.2	-	-	96.7	97.4	97.3	94.1	-	-	97.2	96.6
Buses	1	3	3	0	-	7	1	1	3	0	-	5	5	11	9	0	-	25	8	17	3	0	-	28	65
% Buses	1.4	2.3	2.1	-	-	2.0	0.3	0.8	0.7	-	-	0.5	3.0	0.5	2.1	-	-	0.9	1.6	0.9	4.4	-	-	1.2	1.0
Single-Unit Trucks	3	0	24	0	-	27	4	1	4	0	-	9	29	15	4	0	-	48	2	18	1	0	-	21	105
% Single-Unit Trucks	4.3	0.0	16.4	-	-	7.8	1.1	0.8	0.9	-	-	1.0	17.7	0.7	0.9	-	-	1.8	0.4	1.0	1.5	-	-	0.9	1.7
Articulated Trucks	0	0	3	0	-	3	0	0	0	0	-	0	0	6	0	0	-	6	1	5	0	0	-	6	15
% Articulated Trucks	0.0	0.0	2.1	-	-	0.9	0.0	0.0	0.0	-	-	0.0	0.0	0.3	0.0	-	-	0.2	0.2	0.3	0.0	-	-	0.2	0.2
Bicycles on Road	0	5	0	0	-	5	0	0	0	0	-	0	0	0	1	0	-	1	0	0	0	0	-	0	6
% Bicycles on Road	0.0	3.9	0.0	-	-	1.5	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.2	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.1
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	1	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	33.3	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	100.0	-	-	-	-	-	66.7	-	-



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@ptsl.com

Count Name: Rice Road & Quaker Road
Site Code: 240535
Start Date: 09/10/2024
Page No: 3



Turning Movement Data Plot



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@pts1.com

Count Name: Rice Road & Quaker Road
Site Code: 240535
Start Date: 09/10/2024
Page No: 4

Turning Movement Peak Hour Data (8:00 AM)

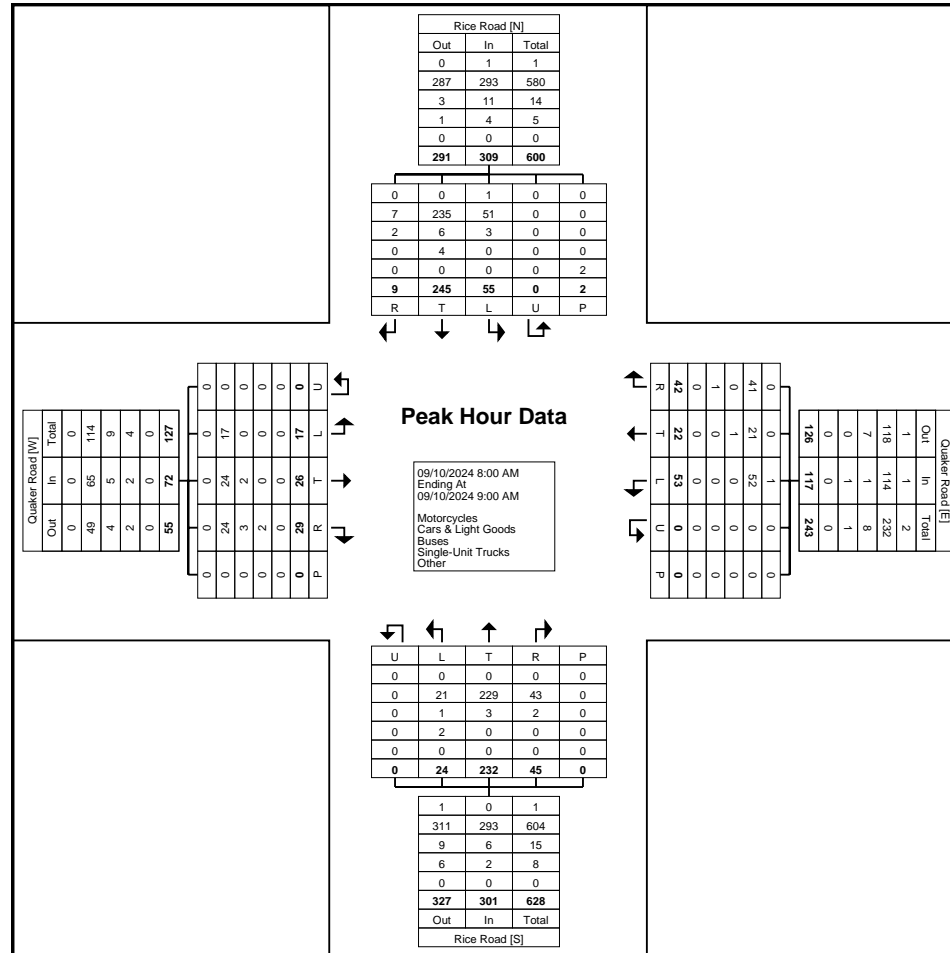
Start Time	Quaker Road Eastbound						Quaker Road Westbound						Rice Road Northbound						Rice Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
8:00 AM	8	17	16	0	0	41	9	14	10	0	0	33	14	66	10	0	0	90	15	56	2	0	0	73	237
8:15 AM	4	7	7	0	0	18	14	5	12	0	0	31	5	57	10	0	0	72	8	75	1	0	1	84	205
8:30 AM	2	1	1	0	0	4	12	0	7	0	0	19	3	53	11	0	0	67	16	58	2	0	0	76	166
8:45 AM	3	1	5	0	0	9	18	3	13	0	0	34	2	56	14	0	0	72	16	56	4	0	1	76	191
Total	17	26	29	0	0	72	53	22	42	0	0	117	24	232	45	0	0	301	55	245	9	0	2	309	799
Approach %	23.6	36.1	40.3	0.0	-	-	45.3	18.8	35.9	0.0	-	-	8.0	77.1	15.0	0.0	-	-	17.8	79.3	2.9	0.0	-	-	-
Total %	2.1	3.3	3.6	0.0	-	9.0	6.6	2.8	5.3	0.0	-	14.6	3.0	29.0	5.6	0.0	-	37.7	6.9	30.7	1.1	0.0	-	38.7	-
PHF	0.531	0.382	0.453	0.000	-	0.439	0.736	0.393	0.808	0.000	-	0.860	0.429	0.879	0.804	0.000	-	0.836	0.859	0.817	0.563	0.000	-	0.920	0.843
Motorcycles	0	0	0	0	-	0	1	0	0	0	-	1	0	0	0	0	-	0	1	0	0	0	-	1	2
% Motorcycles	0.0	0.0	0.0	-	-	0.0	1.9	0.0	0.0	-	-	0.9	0.0	0.0	0.0	-	-	0.0	1.8	0.0	0.0	-	-	0.3	0.3
Cars & Light Goods	17	24	24	0	-	65	52	21	41	0	-	114	21	229	43	0	-	293	51	235	7	0	-	293	765
% Cars & Light Goods	100.0	92.3	82.8	-	-	90.3	98.1	95.5	97.6	-	-	97.4	87.5	98.7	95.6	-	-	97.3	92.7	95.9	77.8	-	-	94.8	95.7
Buses	0	2	3	0	-	5	0	1	0	0	-	1	1	3	2	0	-	6	3	6	2	0	-	11	23
% Buses	0.0	7.7	10.3	-	-	6.9	0.0	4.5	0.0	-	-	0.9	4.2	1.3	4.4	-	-	2.0	5.5	2.4	22.2	-	-	3.6	2.9
Single-Unit Trucks	0	0	2	0	-	2	0	0	1	0	-	1	2	0	0	0	-	2	0	4	0	0	-	4	9
% Single-Unit Trucks	0.0	0.0	6.9	-	-	2.8	0.0	0.0	2.4	-	-	0.9	8.3	0.0	0.0	-	-	0.7	0.0	1.6	0.0	-	-	1.3	1.1
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-



Paradigm Transportation Solutions Limited
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Count Name: Rice Road & Quaker Road
Site Code: 240535
Start Date: 09/10/2024
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Turning Movement Peak Hour Data Plot (8:00 AM)



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
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Count Name: Rice Road & Quaker Road
Site Code: 240535
Start Date: 09/10/2024
Page No: 6

Turning Movement Peak Hour Data (12:15 PM)

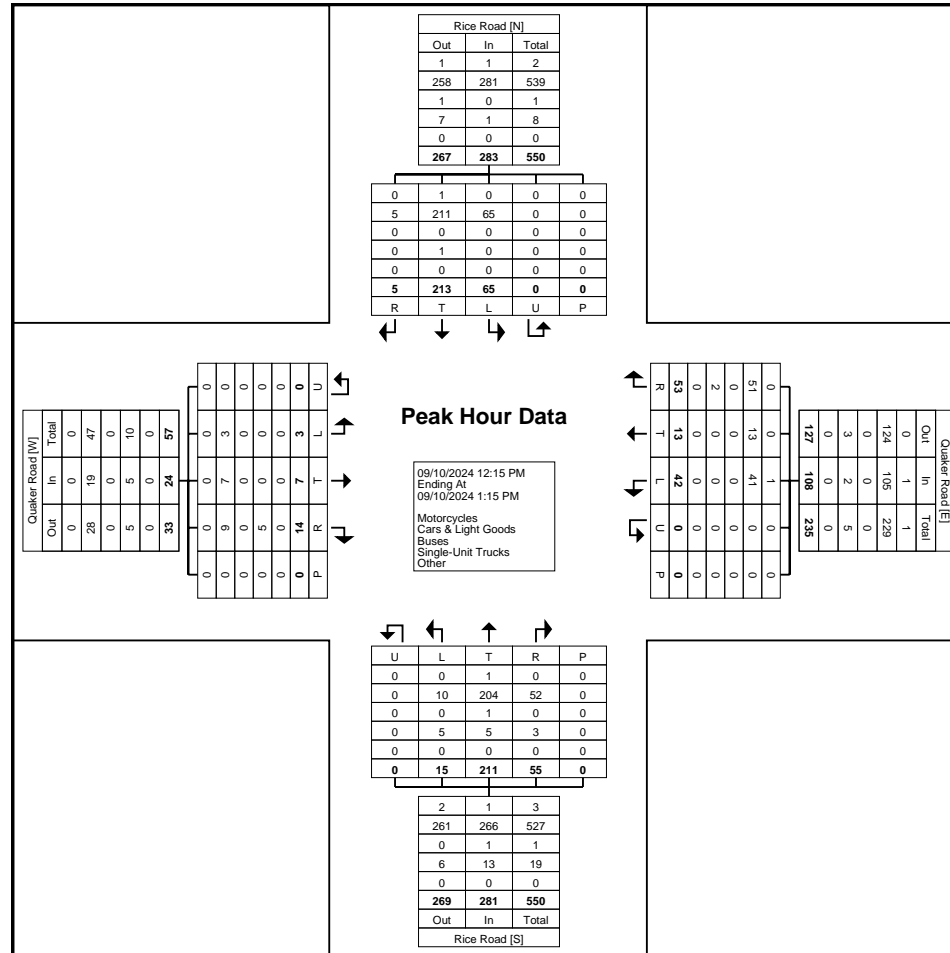
Start Time	Quaker Road Eastbound						Quaker Road Westbound						Rice Road Northbound						Rice Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
12:15 PM	1	2	2	0	0	5	12	2	13	0	0	27	8	61	13	0	0	82	19	61	2	0	0	82	196
12:30 PM	0	2	4	0	0	6	6	1	17	0	0	24	4	59	20	0	0	83	15	46	0	0	0	61	174
12:45 PM	0	1	6	0	0	7	16	5	8	0	0	29	3	45	13	0	0	61	12	56	3	0	0	71	168
1:00 PM	2	2	2	0	0	6	8	5	15	0	0	28	0	46	9	0	0	55	19	50	0	0	0	69	158
Total	3	7	14	0	0	24	42	13	53	0	0	108	15	211	55	0	0	281	65	213	5	0	0	283	696
Approach %	12.5	29.2	58.3	0.0	-	-	38.9	12.0	49.1	0.0	-	-	5.3	75.1	19.6	0.0	-	-	23.0	75.3	1.8	0.0	-	-	-
Total %	0.4	1.0	2.0	0.0	-	3.4	6.0	1.9	7.6	0.0	-	15.5	2.2	30.3	7.9	0.0	-	40.4	9.3	30.6	0.7	0.0	-	40.7	-
PHF	0.375	0.875	0.583	0.000	-	0.857	0.656	0.650	0.779	0.000	-	0.931	0.469	0.865	0.688	0.000	-	0.846	0.855	0.873	0.417	0.000	-	0.863	0.888
Motorcycles	0	0	0	0	-	0	1	0	0	0	-	1	0	1	0	0	-	1	0	1	0	0	-	1	3
% Motorcycles	0.0	0.0	0.0	-	-	0.0	2.4	0.0	0.0	-	-	0.9	0.0	0.5	0.0	-	-	0.4	0.0	0.5	0.0	-	-	0.4	0.4
Cars & Light Goods	3	7	9	0	-	19	41	13	51	0	-	105	10	204	52	0	-	266	65	211	5	0	-	281	671
% Cars & Light Goods	100.0	100.0	64.3	-	-	79.2	97.6	100.0	96.2	-	-	97.2	66.7	96.7	94.5	-	-	94.7	100.0	99.1	100.0	-	-	99.3	96.4
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	1	0	0	-	1	0	0	0	0	-	0	1
% Buses	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.5	0.0	-	-	0.4	0.0	0.0	0.0	-	-	0.0	0.1
Single-Unit Trucks	0	0	5	0	-	5	0	0	2	0	-	2	5	5	3	0	-	13	0	1	0	0	-	1	21
% Single-Unit Trucks	0.0	0.0	35.7	-	-	20.8	0.0	0.0	3.8	-	-	1.9	33.3	2.4	5.5	-	-	4.6	0.0	0.5	0.0	-	-	0.4	3.0
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Turning Movement Peak Hour Data Plot (12:15 PM)



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Count Name: Rice Road & Quaker Road
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Turning Movement Peak Hour Data (4:15 PM)

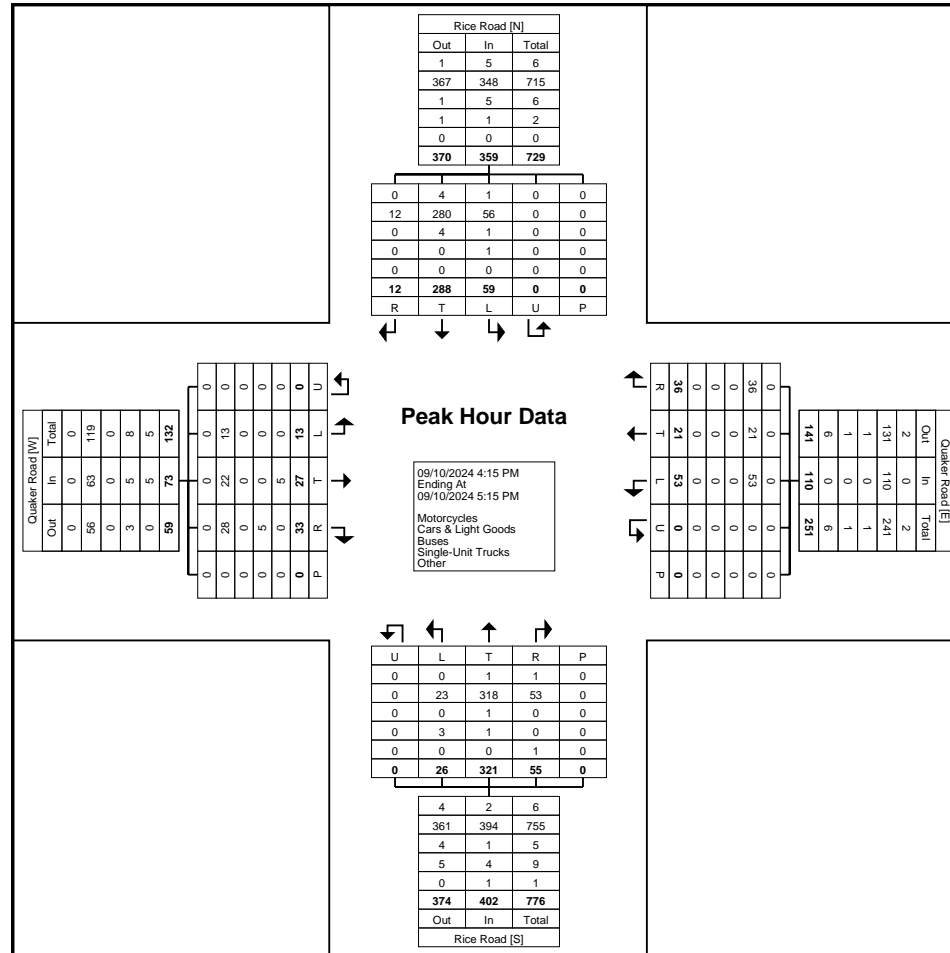
Start Time	Quaker Road Eastbound						Quaker Road Westbound						Rice Road Northbound						Rice Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
4:15 PM	4	7	6	0	0	17	15	5	7	0	0	27	6	80	15	0	0	101	20	77	0	0	0	97	242
4:30 PM	2	8	4	0	0	14	17	8	5	0	0	30	7	93	21	0	0	121	8	66	6	0	0	80	245
4:45 PM	5	6	14	0	0	25	10	4	5	0	0	19	8	81	9	0	0	98	19	67	4	0	0	90	232
5:00 PM	2	6	9	0	0	17	11	4	19	0	0	34	5	67	10	0	0	82	12	78	2	0	0	92	225
Total	13	27	33	0	0	73	53	21	36	0	0	110	26	321	55	0	0	402	59	288	12	0	0	359	944
Approach %	17.8	37.0	45.2	0.0	-	-	48.2	19.1	32.7	0.0	-	-	6.5	79.9	13.7	0.0	-	-	16.4	80.2	3.3	0.0	-	-	-
Total %	1.4	2.9	3.5	0.0	-	7.7	5.6	2.2	3.8	0.0	-	11.7	2.8	34.0	5.8	0.0	-	42.6	6.3	30.5	1.3	0.0	-	38.0	-
PHF	0.650	0.844	0.589	0.000	-	0.730	0.779	0.656	0.474	0.000	-	0.809	0.813	0.863	0.655	0.000	-	0.831	0.738	0.923	0.500	0.000	-	0.925	0.963
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	1	1	0	-	2	1	4	0	0	-	5	7
% Motorcycles	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.3	1.8	-	-	0.5	1.7	1.4	0.0	-	-	1.4	0.7
Cars & Light Goods	13	22	28	0	-	63	53	21	36	0	-	110	23	318	53	0	-	394	56	280	12	0	-	348	915
% Cars & Light Goods	100.0	81.5	84.8	-	-	86.3	100.0	100.0	100.0	-	-	100.0	88.5	99.1	96.4	-	-	98.0	94.9	97.2	100.0	-	-	96.9	96.9
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	1	0	0	-	1	1	4	0	0	-	5	6
% Buses	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.3	0.0	-	-	0.2	1.7	1.4	0.0	-	-	1.4	0.6
Single-Unit Trucks	0	0	5	0	-	5	0	0	0	0	-	0	3	1	0	0	-	4	1	0	0	0	-	1	10
% Single-Unit Trucks	0.0	0.0	15.2	-	-	6.8	0.0	0.0	0.0	-	-	0.0	11.5	0.3	0.0	-	-	1.0	1.7	0.0	0.0	-	-	0.3	1.1
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Road	0	5	0	0	-	5	0	0	0	0	-	0	0	0	1	0	-	1	0	0	0	0	-	0	6
% Bicycles on Road	0.0	18.5	0.0	-	-	6.8	0.0	0.0	0.0	-	-	0.0	0.0	0.0	1.8	-	-	0.2	0.0	0.0	0.0	-	-	0.0	0.6
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Count Name: Rice Road & Quaker Road
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Turning Movement Peak Hour Data Plot (4:15 PM)

Appendix C

Distribution Calculations



Rice at Quaker	Two-Way Link Volumes			
	AM Peak Hour	PM Peak Hour	Total	%
North	600	729	1329	38.1%
South	628	776	1404	40.3%
East	243	251	494	14.2%
West	127	132	259	7.4%
Total	1598	1888	3486	100.0%

Rice at Highway 20	Two-Way Link Volumes				Intersection Distribution
	AM Peak Hour	PM Peak Hour	Total	%	
North	9	33	42	0.61%	0.2%
East	1611	2204	3815	55.82%	21.3%
West	1192	1786	2978	43.57%	16.6%
Total	2812	4023	6835	100.00%	38.1%

Rice at Woodlawn	Two-Way Link Volumes				Intersection Distribution
	AM Peak Hour	PM Peak Hour	Total	%	
East	712	1142	1854	35.68%	14.4%
West	681	904	1585	30.50%	12.3%
South	733	1024	1757	33.81%	13.6%
Total	1393	2046	5196	100.00%	40.3%

Appendix D

Operational Reports



Lanes, Volumes, Timings
1: Rice Road & Highway 20

1 Base Year AM
10-17-2024

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1	1	1	1	1	1	1	1	1	1	1	1
Traffic Volume (vph)	631	51	160	449	3	58	1	368	0	2	2	2
Future Volume (vph)	631	51	160	449	3	58	1	368	0	2	2	2
Ideal Flow (vphpl)	1651	1776	1535	1651	1776	1535	1651	1776	1498	1630	1630	1630
Storage Length (m)	60.0	0.0	100.0	0.0	65.0	0.0	65.0	0.0	65.0	0.0	0.0	0.0
Taper Length (m)	7.5	0.0	7.5	0.0	7.5	0.0	7.5	0.0	7.5	0.0	0.0	0.0
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.989		0.999		0.850		0.932					
Flt Protected	0.950		0.950		0.950		0.950					
Satd. Flow (prot)	1568	3148	0	1452	3012	0	1466	1776	1248	0	1519	0
Flt Permitted	0.473		0.182		0.755							
Satd. Flow (perm)	781	3148	0	278	3012	0	1165	1776	1248	0	1519	0
Right Turn on Red		Yes		Yes		Yes		Yes		Yes		Yes
Satd. Flow (RTOR)	10		50		50		50		368		2	
Link Speed (k/h)	50		50		50		50		50		50	
Link Distance (m)	302.4		531.3		2985.6						100.9	
Travel Time (s)	21.8		38.3		215.0						7.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	6%	8%	12%	0%	7%	0%	2%	0%	0%	0%	0%
Adj. Flow (vph)	1	686	55	174	488	3	63	1	400	0	2	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1	741	0	174	491	0	63	1	400	0	4	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Left	Right	Right
Median Width (m)	3.6		3.6		3.6		3.6		3.6		3.6	
Link Offset (m)	0.0		0.0		0.0		0.0		0.0		0.0	
Crosswalk Width (m)	4.8		4.8		4.8		4.8		4.8		4.8	
Two way Left Turn Lane												
Headway Factor	1.20	1.09	1.31	1.20	1.09	1.31	1.20	1.09	1.35	1.22	1.22	1.22
Turning Speed (k/h)	25	15	25	15	25	15	25	15	25	15	25	15
Number of Detectors	1	2	1	2	1	2	1	2	1	1	2	2
Detector Template	Left	Thru	Left	Thru	Left	Thru	Right	Left	Left	Thru	Left	Thru
Leading Detector (m)	2.0	10.0	2.0	10.0	2.0	10.0	2.0	10.0	2.0	2.0	10.0	10.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size (m)	2.0	0.6	2.0	0.6	2.0	0.6	2.0	0.6	2.0	0.6	2.0	0.6
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position (m)	9.4		9.4		9.4		9.4		9.4		9.4	
Detector 2 Size (m)	0.6		0.6		0.6		0.6		0.6		0.6	
Detector 2 Type	Cl+Ex		Cl+Ex		Cl+Ex		Cl+Ex		Cl+Ex		Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)	0.0		0.0		0.0		0.0		0.0		0.0	
Turn Type	Perm	NA	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		3		8		2		6		6	

1 Base Year AM 1:26 pm 09:27-2024 Baseline
Synchro 11 Report
Page 1

Lanes, Volumes, Timings
1: Rice Road & Highway 20

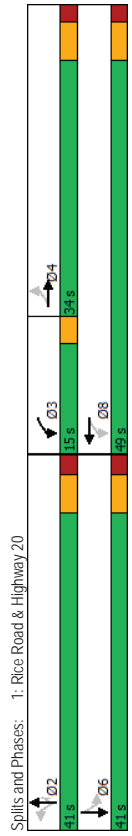
1 Base Year AM
10-17-2024

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4	4	4	8	3	8	2	2	2	2	6	6
Detector Phase	4	4	4	3	8	8	2	2	2	2	6	6
Switch Phase												
Minimum Initial (s)	8.0	8.0	10.0	8.0	10.0	8.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	24.2	24.2	13.0	24.1	24.4	24.4	24.4	24.4	24.4	30.0	30.0	30.0
Total Split (s)	34.0	34.0	15.0	49.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0
Total Split (%)	37.8%	37.8%	16.7%	54.4%	45.6%	45.6%	45.6%	45.6%	45.6%	45.6%	45.6%	45.6%
Maximum Green (s)	27.8	27.8	12.0	42.9	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6
Yellow Time (s)	4.2	4.2	3.0	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	2.0	2.0	0.0	2.0	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	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 Lost Time (s)	6.2	6.2	3.0	6.1	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag	Lag	Lag	Lead									
Lead-Lag Optimize?	Yes	Yes	Yes									
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Act Effct Green (s)	24.0	24.0	41.3	38.1	34.7	34.7	34.7	34.7	34.7	34.7	34.7	34.7
Actuated g/C Ratio	0.28	0.28	0.48	0.45	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
v/c Ratio	0.00	0.83	0.61	0.36	0.13	0.00	0.55	0.01	0.01	0.01	0.01	0.01
Control Delay	22.0	37.5	22.3	16.2	18.5	17.0	6.4	14.2	14.2	14.2	14.2	14.2
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	22.0	37.5	22.3	16.2	18.5	17.0	6.4	14.2	14.2	14.2	14.2	14.2
LOS	C	D	C	B	B	B	A	A	A	A	B	B
Approach Delay	37.5		17.8		8.0		14.3					
Approach LOS	D		B		A		B					
Queue Length 50th (m)	0.1	62.1	16.7	28.1	7.0	0.1	3.4	0.2	0.2	0.2	0.2	0.2
Queue Length 95th (m)	1.3	84.7	29.5	39.8	16.2	1.1	26.4	2.4	2.4	2.4	2.4	2.4
Internal Link Dist (m)	278.4		507.3		2961.6		65.0				76.9	
Turn Bay Length (m)	60.0		100.0		650		650				650	
Base Capacity (vph)	255	1034	299	1518	473	721	725	618	618	618	618	618
Stenallion 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	0.00	0.72	0.58	0.32	0.13	0.00	0.55	0.01	0.01	0.01	0.01	0.01
Intersection Summary												
Area Type:	Other											
Cycle Length:	90											
Actuated Cycle Length:	85.4											
Natural Cycle:	70											
Control Type:	Actuated-Uncoordinated											
Maximum v/c Ratio:	0.83											
Intersection Signal Delay:	23.2											
Intersection Capacity Utilization:	73.5%											
Analysis Period (min):	15											
ICU Level of Service D												
Intersection LOS: C												

1 Base Year AM 1:26 pm 09:27-2024 Baseline
Synchro 11 Report
Page 2

Lanes, Volumes, Timings
1: Rice Road & Highway 20

1 Base Year AM
10-17-2024



HCM Signalized Intersection Capacity Analysis
1: Rice Road & Highway 20

1 Base Year AM
10-17-2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR	SBR	
Lane Configurations	1	1	1	1	1	1	1	1	1	1	1	1	
Traffic Volume (vph)	631	51	160	449	3	58	1	368	0	2	2	2	
Future Volume (vph)	631	51	160	449	3	58	1	368	0	2	2	2	
Ideal Flow (vphpl)	1651	1776	1535	1651	1776	1535	1651	1776	1498	1630	1630	1630	
Total Lost time (s)	6.2	6.2	6.2	6.1	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.85	0.93	1.00	1.00	1.00	
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	
Satd. Flow (prot)	1568	3148	1452	3012	1466	1776	1248	1520	1520	1520	1520	1520	
Flt Permitted	0.47	1.00	0.18	1.00	0.76	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Satd. Flow (perm)	781	3148	278	3012	1165	1776	1248	1520	1520	1520	1520	1520	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	1	666	55	174	488	3	63	1	400	0	2	2	
RTOR Reduction (vph)	0	7	0	0	1	0	0	218	0	1	0	0	
Lane Group Flow (vph)	1	734	0	174	490	0	63	1	182	0	3	0	
Heavy Vehicles (%)	0%	6%	6%	8%	12%	0%	7%	0%	2%	0%	0%	0%	
Turn Type	Perm	NA	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	
Protected Phases	4	3	8	2	2	2	2	2	2	6	6	6	
Permitted Phases	4	8	8	2	2	2	2	2	2	6	6	6	
Actuated Green, G (s)	24.0	24.0	38.2	38.2	38.2	34.7	34.7	34.7	34.7	34.7	34.7	34.7	
Effective Green, g (s)	24.0	24.0	38.2	38.2	34.7	34.7	34.7	34.7	34.7	34.7	34.7	34.7	
Actuated g/C Ratio	0.28	0.28	0.45	0.45	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	
Clearance Time (s)	6.2	6.2	6.1	6.1	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	219	884	276	1347	473	721	507	617	617	617	617	617	
v/s Ratio Prot	c0.23	c0.08	0.16	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
v/s Ratio Perm	0.00	0.20	0.20	0.05	0.05	0.15	0.15	0.15	0.15	0.15	0.15	0.15	
v/c Ratio	0.00	0.83	0.63	0.36	0.13	0.00	0.36	0.00	0.36	0.00	0.00	0.00	
Uniform Delay, d1	22.1	28.8	16.4	15.6	15.9	15.1	17.6	15.1	17.6	15.1	15.1	15.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	6.7	4.6	0.2	0.6	0.0	2.0	0.0	2.0	0.0	0.0	0.0	
Delay (s)	22.1	35.5	21.1	15.7	16.5	15.1	19.6	15.1	19.6	15.1	15.1	15.1	
Level of Service	C	D	C	B	B	B	B	B	B	B	B	B	
Approach Delay (s)	35.4	17.1	19.2	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	
Approach LOS	D	B	B	B	B	B	B	B	B	B	B	B	
Intersection Summary													
HCM 2000 Control Delay	24.9											HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.56												
Actuated Cycle Length (s)	86.4											Sum of lost time (s)	15.6
Intersection Capacity Utilization	73.5%											ICU Level of Service	D
Analysis Period (min)	15												
c. Critical Lane Group													

Lanes, Volumes, Timings
2: Rice Road & Quaker Road

1 Base Year AM
10-17-2024

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	17	26	29	53	22	42	24	232	45	55	245	9
Traffic Volume (vph)	17	26	29	53	22	42	24	232	45	55	245	9
Future Volume (vph)	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630
Ideal Flow (vphpl)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.945	0.951	0.951	0.951	0.951	0.951	0.980	0.980	0.996	0.996	0.991	0.991
Ped Bike Factor	0.989	0.978	0.978	0.978	0.978	0.978	0.996	0.996	0.991	0.991	0.991	0.991
Flt Protected	0	1381	0	0	1478	0	0	1555	0	0	1531	0
Satd. Flow (prot)	0	0.989	0	0	0.978	0	0	0.996	0	0	0.991	0
Flt Permitted	0	1381	0	0	1478	0	0	1555	0	0	1531	0
Satd. Flow (perm)	50	50	50	50	50	50	50	50	50	50	50	50
Link Speed (k/h)	556.9	693.9	693.9	693.9	693.9	693.9	1030.4	1030.4	235.8	235.8	235.8	235.8
Link Distance (m)	40.1	50.0	50.0	50.0	50.0	50.0	74.2	74.2	17.0	17.0	17.0	17.0
Travel Time (s)	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Peak Hour Factor	2%	8%	17%	2%	5%	2%	12%	1%	4%	7%	4%	22%
Heavy Vehicles (%)	18	28	32	58	24	46	26	252	49	60	266	10
Adj. Flow (vph)	0	78	0	0	128	0	0	327	0	0	336	0
Shared Lane Traffic (%)	No	No	No	No	No	No	No	No	No	No	No	No
Enter Blocked Intersection	Left	Left	Right	Left	Right	Left	Left	Right	Left	Left	Right	Right
Lane Alignment	0.0	0.0	0.0	0.0	0.0	0.0	3.6	3.6	3.6	3.6	3.6	3.6
Median Width(m)	0.0	0.0	0.0	0.0	0.0	0.0	4.8	4.8	4.8	4.8	4.8	4.8
Crosswalk Width(m)	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22
Two way Left Turn Lane	25	15	25	15	25	15	25	15	25	15	25	15
Headway Factor	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Turning Speed (k/h)	15	25	15	25	15	25	15	25	15	25	15	25
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop

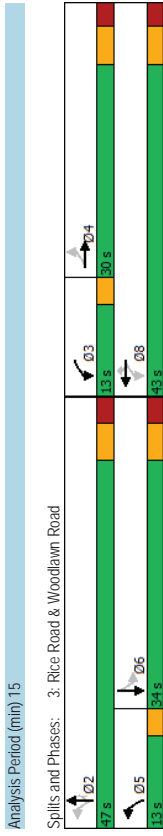
Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	54.8%
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
2: Rice Road & Quaker Road

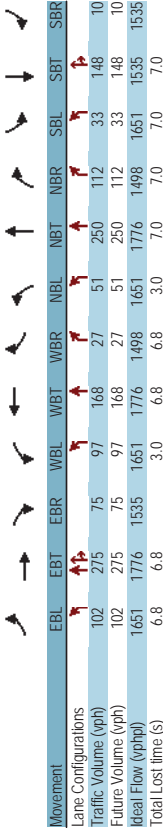
1 Base Year AM
10-17-2024

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	17	26	29	53	22	42	24	232	45	55	245	9
Traffic Volume (vph)	17	26	29	53	22	42	24	232	45	55	245	9
Future Volume (vph)	17	26	29	53	22	42	24	232	45	55	245	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	28	32	58	24	46	26	252	49	60	266	10
Direction_Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	78	128	327	336								
Volume Left (vph)	18	58	26	60								
Volume Right (vph)	32	46	49	10								
Head (s)	-0.02	-0.08	-0.03	0.10								
Departure Headway (s)	5.8	5.6	4.9	5.1								
Degree Utilization, x	0.13	0.20	0.45	0.47								
Capacity (veh/h)	536	564	698	682								
Control Delay (s)	9.6	10.0	11.9	12.5								
Approach Delay (s)	A	B	B	B								
Approach LOS	A	B	B	B								
Intersection Summary												
Delay	11.7											
Level of Service	B											
Intersection Capacity Utilization	54.8%											
ICU Level of Service	A											
Analysis Period (min)	15											

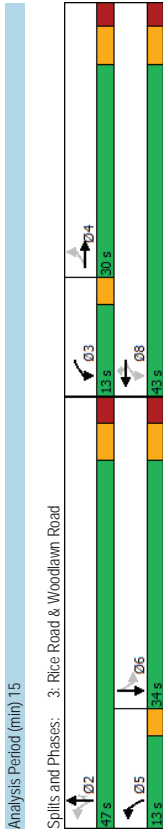
Lanes, Volumes, Timings
 3: Rice Road & Woodlawn Road



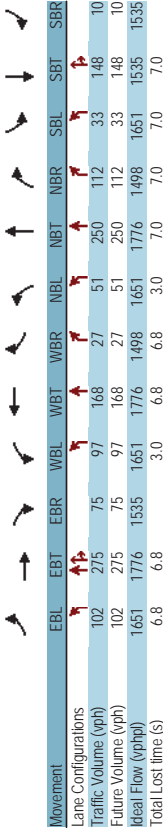
HCM Signalized Intersection Capacity Analysis
 3: Rice Road & Woodlawn Road



Lanes, Volumes, Timings
 1 Base Year AM
 10-17-2024



HCM Signalized Intersection Capacity Analysis
 1 Base Year AM
 10-17-2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations											
Traffic Volume (vph)	102	275	75	97	168	27	51	250	112	33	148
Future Volume (vph)	102	275	75	97	168	27	51	250	112	33	148
Ideal Flow (vphpl)	1651	1776	1535	1651	1776	1498	1651	1776	1498	1651	1535
Total Lost time (s)	3.0	6.8	6.8	3.0	6.8	6.8	3.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99	1.00	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00
Flt	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.99
Satd. Flow (prot)	1535	3168	1534	1741	1233	1492	1708	1251	1434	1408	1408
Flt Permitted	0.64	1.00	0.39	1.00	1.00	0.59	1.00	1.00	0.59	1.00	1.00
Satd. Flow (perm)	1037	3168	632	1741	1233	935	1708	1251	893	1408	1408
Peak-Hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	111	299	82	105	183	29	55	272	122	36	161
RTOR Reduction (vph)	0	30	0	0	0	0	20	0	0	59	0
Lane Group Flow (vph)	111	351	0	105	183	9	55	272	63	36	170
Confl. Peds. (#/hr)	1	6	6	6	6	1	1	1	4	4	4
Heavy Vehicles (%)	2%	3%	0%	2%	2%	1%	5%	4%	0%	9%	20%
Turn Type	Perm	NA	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA
Protected Phases	4	3	8	8	2	5	2	6	6	6	6
Permitted Phases	4	8	8	8	2	8	2	2	2	2	6
Actuated Green, G (s)	14.6	14.6	25.2	25.2	25.2	25.2	41.9	41.9	41.9	33.3	33.3
Effective Green, g (s)	14.6	14.6	25.2	25.2	25.2	25.2	41.9	41.9	41.9	33.3	33.3
Actuated g/C Ratio	0.18	0.18	0.31	0.31	0.31	0.31	0.52	0.52	0.52	0.41	0.41
Clearance Time (s)	6.8	6.8	3.0	6.8	6.8	3.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	187	571	281	542	384	522	884	647	367	367	579
v/s Ratio Prot	c0.11	c0.04	0.11	c0.04	0.11	0.01	c0.16	0.11	0.05	0.05	0.12
v/s Ratio Perm	0.11	0.08	0.37	0.34	0.02	0.11	0.31	0.10	0.10	0.10	0.29
v/c Ratio	0.59	0.61	20.7	21.4	19.3	9.8	11.2	9.9	14.6	15.9	15.9
Uniform Delay, d1	30.4	30.6	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.0	2.0	0.8	0.4	0.0	0.1	0.9	0.3	0.5	1.3	1.3
Delay (s)	35.4	32.5	21.6	21.8	19.3	9.9	12.1	10.2	15.1	17.2	17.2
Level of Service	D	C	C	C	B	A	B	B	B	B	B
Approach Delay (s)	33.2	33.2	21.5	21.5	11.3	11.3	11.3	11.3	16.8	16.8	16.8
Approach LOS	C	C	C	C	B	B	B	B	B	B	B
Intersection Summary											
HCM 2000 Control Delay	21.6										
HCM 2000 Volume to Capacity ratio	0.41										
Actuated Cycle Length (s)	80.9										
Intersection Capacity Utilization	63.9%										
Analysis Period (min)	15										
c Critical Lane Group	B										

Lanes, Volumes, Timings
1: Rice Road & Highway 20

1 Base Year PM
10-17-2024

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	5	4	4	5	5	5	5	5	5	5	5	5
Traffic Volume (vph)	686	132	355	865	90	6	289	4	5	7	4	5
Future Volume (vph)	686	132	355	865	90	6	289	4	5	7	4	5
Ideal Flow (vphpl)	1651	1776	1535	1651	1776	1498	1498	1630	1630	1630	1630	1630
Storage Length (m)	60.0	0.0	100.0	0.0	65.0	0.0	65.0	0.0	0.0	0.0	0.0	0.0
Storage Lanes	1	0	1	0	1	0	1	0	1	0	1	0
Taper Length (m)	7.5	0	7.5	0	7.5	0	7.5	0	7.5	0	7.5	0
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00											
Frt	0.976		0.999				0.850			0.936		
FRT Protected	0.950		0.950		0.950		0.988			0.988		
Satd. Flow (prot)	1568	3172	0	1568	3273	0	1553	1776	1236	0	1507	0
FRT Permitted	0.303		0.136		0.746					0.962		
Satd. Flow (perm)	500	3172	0	225	3273	0	1219	1776	1236	0	1468	0
Right Turn on Red			Yes		Yes		Yes		Yes		Yes	
Satd. Flow (RTOR)	26		1		314		314		8		8	
Link Speed (kph)	50		50		50		50		50		50	
Link Distance (m)	302.4		531.3		2985.6		100.9		100.9		100.9	
Travel Time (s)	21.8		38.3		215.0		7.3		7.3		7.3	
Confl. Peds. (#/hr)	3		3		3		3		3		3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	4%	0%	0%	3%	0%	1%	0%	3%	0%	0%	0%
Adj. Flow (vph)	7	746	143	386	940	5	98	7	314	4	5	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	7	889	0	386	945	0	98	7	314	0	17	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Right	Left	Left	Right	Left	Left	Right	Right
Median Width(m)	3.6		3.6		3.6		3.6		3.6		3.6	
Link Offset(m)	0.0		0.0		0.0		0.0		0.0		0.0	
Crosswalk Width(m)	4.8		4.8		4.8		4.8		4.8		4.8	
Two way Left Turn Lane												
Headway Factor	1.20	1.09	1.31	1.20	1.09	1.31	1.20	1.09	1.35	1.22	1.22	1.22
Turning Speed (k/h)	25	15	25	25	15	25	25	15	25	25	25	15
Number of Detectors	1	2	1	2	1	2	1	2	1	1	2	1
Detector Template	Left	Thru	Left	Thru	Left	Thru	Right	Left	Right	Left	Thru	Thru
Leading Detector (m)	2.0	10.0	2.0	10.0	2.0	10.0	2.0	2.0	2.0	10.0	10.0	10.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	0.6	2.0	0.6	2.0	0.6	2.0	2.0	0.6	0.6
Detector 1 Type	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex
Detector 1 Channel												
Detector 1 Extend(s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue(s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)	9.4		9.4		9.4		9.4		9.4		9.4	
Detector 2 Size(m)	0.6		0.6		0.6		0.6		0.6		0.6	
Detector 2 Type	Ch+Ex		Ch+Ex		Ch+Ex		Ch+Ex		Ch+Ex		Ch+Ex	
Detector 2 Channel												
Detector 2 Extend (s)	0.0		0.0		0.0		0.0		0.0		0.0	

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Synchro 11 Report
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Lanes, Volumes, Timings
1: Rice Road & Highway 20

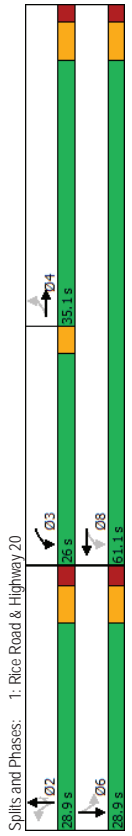
1 Base Year PM
10-17-2024

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	NA	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	4	4	4	3	8	8	2	2	2	2	6	6
Permitted Phases	4	4	4	8	8	8	2	2	2	2	6	6
Detector Phase	4	4	4	3	8	8	2	2	2	2	6	6
Switch Phase												
Minimum Initial (s)	8.0	8.0	10.0	8.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Spill (s)	24.2	24.2	13.0	24.1	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4
Total Spill (s)	35.1	35.1	26.0	61.1	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9
Total Spill (%)	39.0%	39.0%	28.9%	67.9%	32.1%	32.1%	32.1%	32.1%	32.1%	32.1%	32.1%	32.1%
Maximum Green (s)	28.9	28.9	23.0	55.0	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Yellow Time (s)	4.2	4.2	3.0	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	2.0	2.0	0.0	2.0	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	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 Lost Time (s)	6.2	6.2	3.0	6.1	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lead	Lead	Lead	Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Act Effct Green (s)	26.2	26.2	51.7	48.6	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7
Actuated g/C Ratio	0.31	0.31	0.62	0.58	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
v/c Ratio	0.04	0.88	0.87	0.50	0.30	0.01	0.56	0.04	0.56	0.04	0.56	0.04
Control Delay	22.2	38.5	39.2	11.2	29.9	25.7	7.8	7.8	7.8	19.1	19.1	19.1
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	22.2	38.5	39.2	11.2	29.9	25.7	7.8	7.8	7.8	19.1	19.1	19.1
LOS	C	D	D	D	B	B	C	C	C	A	A	B
Approach Delay	38.3		19.3		13.2		13.2		13.2		19.1	
Approach LOS	D		B		B		B		B		B	
Queue Length 50th (m)	0.9	75.6	46.2	45.0	14.3	0.9	0.0	0.0	1.2		1.2	
Queue Length 95th (m)	4.2	#111.2	#92.5	59.1	29.1	4.5	22.2		6.5		6.5	
Internal Link Dist (m)	278.4		507.3		2961.6		2961.6		76.9		76.9	
Turn Bay Length (m)	60.0		100.0		65.0		65.0		65.0		65.0	
Base Capacity (vph)	174	1120	510	2167	330	481	563		403		403	
Starvation Cap Reductn	0	0	0	0	0	0	0		0		0	
Spillback Cap Reductn	0	0	0	0	0	0	0		0		0	
Storage Cap Reductn	0	0	0	0	0	0	0		0		0	
Reduced v/c Ratio	0.04	0.79	0.76	0.44	0.30	0.01	0.56		0.04		0.04	
Intersection Summary												
Area Type:	Other											
Cycle Length:	90											
Actuated Cycle Length:	83.9											
Natural Cycle:	65											
Control Type:	Actuated-Uncoordinated											
Maximum v/c Ratio:	0.88											
Intersection Signal Delay:	24.8											
Intersection Capacity Utilization:	73.7%											
Intersection LOS:	C											
ICU Level of Service:	D											

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Synchro 11 Report
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Lanes, Volumes, Timings
1: Rice Road & Highway 20

Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



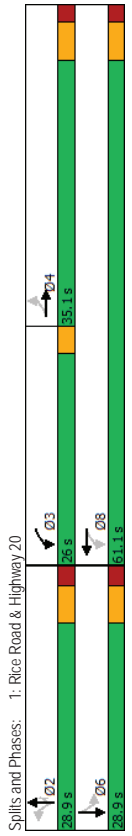
HCM Signalized Intersection Capacity Analysis
1: Rice Road & Highway 20

10-17-2024
1 Base Year PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	6	686	132	355	865	5	90	6	289	4	5
Future Volume (vph)	6	686	132	355	865	5	90	6	289	4	5
Ideal Flow (vphpl)	1651	1776	1535	1651	1776	1535	1651	1776	1498	1630	1630
Total Lost time (s)	6.2	6.2	3.0	6.1	6.4	6.4	6.4	6.4	6.4	6.4	6.4
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
Frb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frb. ped/bikes	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.85	0.94
Fill Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00	0.99	0.99
Satd. Flow (prot)	1568	3172	1568	3274	1553	1776	1236	1509	1509	1509	1509
Fill Permitted	0.30	1.00	0.14	1.00	0.75	1.00	1.00	1.00	1.00	0.96	0.96
Satd. Flow (perm)	500	3172	225	3274	225	3274	1220	1776	1236	1468	1468
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	746	143	386	940	5	98	7	314	4	5
RTOR Reduction (vph)	0	18	0	0	0	0	0	0	229	0	6
Lane Group Flow (vph)	7	871	0	386	945	0	98	7	85	0	11
Confl. Peds. (#/hr)	3	3	3	3	3	3	3	3	3	3	3
Heavy Vehicles (%)	0%	4%	0%	0%	3%	0%	1%	0%	3%	0%	0%
Turn Type	Perm	NA	NA	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4	4	4	8	8	8	8	8	8	8	8
Permitted Phases	4	8	8	8	8	8	8	8	8	8	8
Actuated Green, G (s)	26.3	26.3	48.6	48.6	48.6	22.7	22.7	22.7	22.7	22.7	22.7
Effective Green, g (s)	26.3	26.3	48.6	48.6	48.6	22.7	22.7	22.7	22.7	22.7	22.7
Actuated g/C Ratio	0.31	0.31	0.58	0.58	0.58	0.27	0.27	0.27	0.27	0.27	0.27
Clearance Time (s)	6.2	6.2	3.0	6.1	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	156	995	438	1898	438	330	481	334	397	397	397
v/s Ratio Prot	0.27	c0.20	0.29								
v/s Ratio Perm	0.01	c0.31				c0.08			0.07		0.01
v/c Ratio	0.04	0.88	0.88	0.50	0.30	0.30	0.01	0.25	0.03	0.03	0.03
Uniform Delay, d1	20.0	27.2	20.8	10.4	24.2	24.2	24.2	23.9	22.4	22.4	22.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	8.7	18.3	0.2	2.3	0.1	1.8	0.1	1.8	0.1	0.1
Delay (s)	20.1	35.9	39.2	10.6	26.5	22.4	25.8	22.6	22.6	22.6	22.6
Level of Service	C	D	D	B	C	C	C	C	C	C	C
Approach Delay (s)	35.8		18.9		25.9		22.6		22.6		22.6
Approach LOS	D		B		C		C		C		C
Intersection Summary											
HCM 2000 Control Delay	25.7 HCM 2000 Level of Service C										
HCM 2000 Volume to Capacity ratio	0.72										
Actuated Cycle Length (s)	83.8										
Intersection Capacity Utilization	73.7% Sum of lost time (s) 15.6										
Analysis Period (min)	15 ICU Level of Service D										
c Critical Lane Group	15										

Lanes, Volumes, Timings
1: Rice Road & Highway 20

Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Lanes, Volumes, Timings
2: Rice Road & Quaker Road

1 Base Year PM
10-17-2024

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	13	27	33	53	21	36	26	321	55	59	288	12
Traffic Volume (vph)	13	27	33	53	21	36	26	321	55	59	288	12
Future Volume (vph)	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630
Ideal Flow (vphpl)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.938	0.991	0.956	0.956	0.981	0.997	0.997	0.992	0.992	0.992	0.992	0.992
Ped Bike Factor	0.991	0.976	0.976	0.976	0.997	0.997	0.997	0.992	0.992	0.992	0.992	0.992
Flt Protected	0	1336	0	0	1521	0	0	1562	0	0	1559	0
Satd. Flow (prot)	0	0.991	0.976	0.976	0.997	0.997	0.997	0.992	0.992	0.992	0.992	0.992
Flt Permitted	0	1336	0	0	1521	0	0	1562	0	0	1559	0
Satd. Flow (perm)	50	50	50	50	50	50	50	50	50	50	50	50
Link Speed (k/h)	556.9	693.9	693.9	693.9	1030.4	1030.4	1030.4	235.8	235.8	235.8	235.8	235.8
Link Distance (m)	40.1	50.0	50.0	50.0	74.2	74.2	74.2	17.0	17.0	17.0	17.0	17.0
Travel Time (s)	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Conf. Peds. (#/hr)	0%	18%	15%	0%	0%	0%	11%	1%	4%	5%	3%	0%
Peak Hour Factor	14	29	36	58	23	39	28	349	60	64	313	13
Heavy Vehicles (%)	Shared Lane Traffic (%)											
Adj. Flow (vph)	0	79	0	0	120	0	0	437	0	0	390	0
Lane Group Flow (vph)	No	No	No	No	No	No	No	No	No	No	No	No
Enter Blocked Intersection	Left	Left	Right	Left	Right	Left	Left	Right	Left	Left	Right	Right
Lane Alignment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	3.6	3.6	3.6	3.6
Median Width(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.8	4.8	4.8	4.8	4.8
Crosswalk Width(m)	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22
Two way Left Turn Lane	25	15	25	25	25	15	25	15	25	25	15	25
Headway Factor	Sign Control											
Turning Speed (k/h)	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	61.4%
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
2: Rice Road & Quaker Road

1 Base Year PM
10-17-2024

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	13	27	33	53	21	36	26	321	55	59	288	12
Sign Control	13	27	33	53	21	36	26	321	55	59	288	12
Traffic Volume (vph)	13	27	33	53	21	36	26	321	55	59	288	12
Future Volume (vph)	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630
Ideal Flow (vphpl)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	29	36	58	23	39	28	349	60	64	313	13
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	79	120	437	390								
Volume Left (vph)	14	58	28	64								
Volume Right (vph)	36	39	60	13								
Head (s)	-0.01	-0.10	-0.03	0.07								
Departure Headway (s)	6.3	6.1	5.1	5.2								
Degree Utilization, x	0.14	0.20	0.61	0.57								
Capacity (veh/h)	477	509	683	664								
Control Delay (s)	10.3	10.6	15.8	14.8								
Approach Delay (s)	10.3	10.6	15.8	14.8								
Approach LOS	B	B	C	B								
Intersection Summary												
Delay	14.4											
Level of Service	B											
Intersection Capacity Utilization	61.4%											
ICU Level of Service	B											
Analysis Period (min)	15											

Lanes, Volumes, Timings
3: Rice Road & Woodlawn Road

1 Base Year PM
10-17-2024

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	4	4	4	4	4	4	4	4	4	4	4
Traffic Volume (vph)	46	304	59	222	362	54	78	252	141	59	272
Future Volume (vph)	46	304	59	222	362	54	78	252	141	59	272
Ideal Flow (vphpl)	1651	1776	1535	1651	1776	1498	1651	1776	1498	1651	1535
Storage Length (m)	25.0	30.0	30.0	55.0	30.0	20.0	20.0	25.0	30.0	30.0	0.0
Storage Lanes	1	1	1	1	1	1	1	1	1	1	0
Taper Length (m)	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99	0.99	0.99	0.99	0.97	0.97	0.98	0.98	1.00	1.00	1.00
Frt	0.976	0.976	0.976	0.950	0.950	0.950	0.850	0.850	0.975	0.975	0.975
Flt Protected	1568	3239	0	1538	1758	1273	1553	1741	1248	1568	1497
Satd. Flow (prot)	0.530	0.357	0.357	0.399	0.399	0.399	0.591	0.591	0.591	0.591	0
Right Turn on Red	869	3239	0	574	1758	1232	652	1741	1228	973	1497
Satd. Flow (RTOR)	22	50	50	85	85	85	153	153	153	12	12
Link Speed (k/h)	50	50	50	50	50	50	50	50	50	50	50
Link Distance (m)	589.4	876.0	876.0	706.2	706.2	706.2	1030.4	1030.4	1030.4	74.2	74.2
Travel Time (s)	42.4	63.1	63.1	50.8	50.8	50.8	74.2	74.2	74.2	74.2	74.2
Confl. Peds. (#/hr)	5	5	5	5	5	5	3	3	3	3	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	1%	2%	2%	1%	0%	1%	2%	2%	0%	0%
Adj. Flow (vph)	50	330	64	241	393	59	85	274	153	64	296
Shared Lane Traffic (%)	50	394	0	241	393	59	85	274	153	64	356
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Link Offset(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crosswalk Width(m)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Two way Left Turn Lane	1.20	1.09	1.31	1.20	1.09	1.35	1.20	1.09	1.35	1.20	1.31
Headway Factor	25	15	25	25	15	25	15	25	15	25	15
Turning Speed (k/h)	1	2	1	2	1	2	1	2	1	2	1
Number of Detectors	Left	Thru	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Detector Template	2.0	10.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	10.0
Leading Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	2.0	0.6	2.0	0.6	2.0	0.6	2.0	0.6	2.0	0.6	2.0
Detector 1 Size(m)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Detector 1 Type	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex
Detector 1 Channel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Extend(s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue(s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4
Detector 2 Position(m)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Detector 2 Size(m)	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex
Detector 2 Type	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Channel											
Detector 2 Extend (s)											

Lanes, Volumes, Timings
3: Rice Road & Woodlawn Road

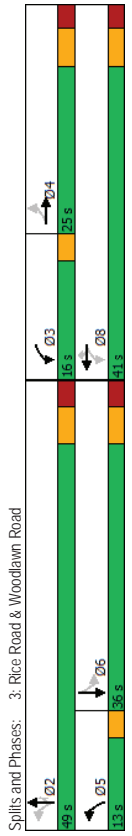
1 Base Year PM
10-17-2024

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Turn Type	Perm	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	Perm	Perm	NA
Protected Phases	4	4	4	3	8	8	2	2	2	6	6
Permitted Phases	4	4	4	8	8	8	2	2	2	6	6
Detector Phase	4	4	4	3	8	8	5	2	2	6	6
Switch Phase											
Minimum Initial (s)	8.0	8.0	10.0	8.0	8.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Spill (s)	24.8	24.8	13.0	24.8	24.8	13.0	25.0	25.0	25.0	25.0	25.0
Total Spill (s)	25.0	25.0	16.0	41.0	41.0	13.0	49.0	49.0	49.0	36.0	36.0
Total Split (%)	27.8%	27.8%	17.8%	45.6%	45.6%	14.4%	54.4%	54.4%	40.0%	40.0%	40.0%
Maximum Green (s)	18.2	18.2	13.0	34.2	34.2	10.0	42.0	42.0	29.0	29.0	29.0
Yellow Time (s)	4.1	4.1	3.0	4.1	4.1	3.0	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	2.7	2.7	0.0	2.7	2.7	0.0	2.9	2.9	2.9	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.8	3.0	6.8	6.8	3.0	7.0	7.0	7.0	7.0	7.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lag	Lag
Lead/Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0
Act Effic Green (s)	14.8	14.8	33.9	30.1	30.1	46.1	42.1	42.1	31.9	31.9	31.9
Actuated Q/C Ratio	0.17	0.17	0.39	0.35	0.35	0.54	0.49	0.49	0.37	0.37	0.37
v/c Ratio	0.34	0.69	0.66	0.64	0.12	0.19	0.32	0.23	0.18	0.63	0.63
Control Delay	38.0	38.2	28.3	28.7	2.7	11.9	15.4	3.3	23.3	30.1	30.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.0	38.2	28.3	28.7	2.7	11.9	15.4	3.3	23.3	30.1	30.1
LOS	D	D	C	C	C	A	B	B	A	C	C
Approach Delay	38.2	38.2	26.3	26.3	26.3	11.2	11.2	11.2	29.1	29.1	29.1
Approach LOS	D	D	C	C	C	B	B	B	C	C	C
Queue Length 50th (m)	7.8	32.4	29.2	56.0	0.0	7.0	28.2	0.0	7.9	52.0	52.0
Queue Length 95th (m)	18.8	47.7	48.6	86.1	4.6	15.4	48.6	10.3	18.7	90.5	90.5
Internal Link Dist (m)	565.4	565.4	852.0	852.0	852.0	682.2	682.2	682.2	1006.4	1006.4	1006.4
Turn Bay Length (m)	25.0	25.0	55.0	55.0	20.0	20.0	25.0	25.0	30.0	30.0	30.0
Base Capacity (vph)	184	704	372	700	541	454	852	679	360	562	562
Starvation Cap Reductn	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
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.56	0.65	0.56	0.11	0.19	0.32	0.23	0.18	0.63	0.63
Intersection Summary											
Area Type:	Other										
Cycle Length:	90										
Actual Cycle Length:	86										
Natural Cycle:	80										
Control Type:	Actuated-Uncoordinated										
Maximum v/c Ratio:	0.69										
Intersection Signal Delay:	25.7										
Intersection LOS:	C										
Intersection Capacity Utilization:	77.7%										
ICU Level of Service:	D										

Lanes, Volumes, Timings
3: Rice Road & Woodlawn Road

1 Base Year PM
10-17-2024

Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



HCM Signalized Intersection Capacity Analysis
3: Rice Road & Woodlawn Road

1 Base Year PM
10-17-2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	46	304	59	222	362	54	78	252	141	59	272	55
Future Volume (vph)	46	304	59	222	362	54	78	252	141	59	272	55
Ideal Flow (vphpl)	1651	1776	1535	1651	1776	1498	1651	1776	1498	1651	1535	1535
Total Lost time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99	1.00	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	1.00
Fltb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98	1.00	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	1.00
Flt Protected	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1558	3238	1535	1758	1233	1553	1741	1228	1564	1496	1496	1496
Flt Permitted	0.53	1.00	0.36	1.00	1.00	0.40	1.00	1.00	0.59	1.00	0.59	1.00
Satd. Flow (perm)	869	3238	577	1758	1233	652	1741	1228	973	1496	1496	1496
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	50	330	64	241	393	59	85	274	153	64	296	60
RTOR Reduction (vph)	0	18	0	0	0	39	0	0	77	0	8	0
Lane Group Flow (vph)	50	376	0	241	393	20	85	274	76	64	348	0
Confl. Peds. (#/hr)	5	5	5	5	5	5	5	5	3	3	3	3
Heavy Vehicles (%)	0%	1%	2%	2%	2%	0%	1%	2%	2%	0%	0%	0%
Turn Type	Perm	NA	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	NA
Protected Phases	4	3	8	8	5	2	2	6	6	6	6	6
Permitted Phases	4	8	8	8	2	2	2	2	2	2	2	2
Actuated Green, G (s)	14.8	14.8	30.1	30.1	30.1	42.8	42.8	42.8	31.9	31.9	31.9	31.9
Effective Green, g (s)	14.8	14.8	30.1	30.1	30.1	42.8	42.8	42.8	31.9	31.9	31.9	31.9
Actuated g/C Ratio	0.17	0.17	0.35	0.35	0.35	0.49	0.49	0.49	0.37	0.37	0.37	0.37
Clearance Time (s)	6.8	6.8	3.0	6.8	6.8	3.0	6.8	3.0	7.0	7.0	3.0	3.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	148	552	336	610	428	403	859	606	358	358	550	550
v/s Ratio Prot	0.12	0.12	0.10	0.22	0.02	0.02	0.16	0.02	0.23	0.02	0.23	0.23
v/s Ratio Perm	0.06	0.06	0.15	0.02	0.08	0.02	0.08	0.02	0.06	0.06	0.07	0.07
v/c Ratio	0.34	0.68	0.72	0.64	0.05	0.21	0.32	0.12	0.18	0.18	0.63	0.63
Uniform Delay, d1	31.6	33.7	22.2	23.8	18.8	12.3	13.2	11.8	18.5	22.6	22.6	22.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4	3.4	7.1	2.3	0.0	0.3	1.0	0.4	1.1	5.5	5.5	5.5
Delay (s)	33.0	37.2	29.3	26.1	18.8	12.6	14.2	12.3	19.6	28.1	28.1	28.1
Level of Service	C	D	C	C	B	B	B	B	B	B	B	C
Approach Delay (s)	36.7	36.7	26.6	26.6	13.3	13.3	13.3	13.3	26.8	26.8	26.8	26.8
Approach LOS	D	D	C	C	B	B	B	B	C	C	C	C
Intersection Summary												
HCM 2000 Control Delay	25.5 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.66											
Actuated Cycle Length (s)	86.7											
Intersection Capacity Utilization	77.7%											
Analysis Period (min)	15											
c Critical Lane Group	19.8 D											

Lanes, Volumes, Timings
1: Rice Road & Highway 20

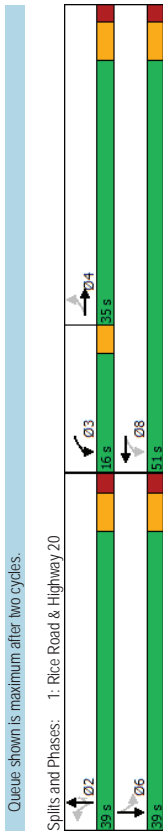
2 2033 Background AM
10-17-2024

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	1	1	1	1	1	1	1	1	1	1	1
Traffic Volume (vph)	751	61	190	534	4	75	1	478	0	2	2
Future Volume (vph)	751	61	190	534	4	75	1	478	0	2	2
Ideal Flow (vphpl)	1651	1776	1535	1651	1776	1535	1651	1776	1498	1630	1630
Storage Length (m)	60.0	0.0	100.0	0.0	65.0	0.0	65.0	0.0	0.0	0.0	0.0
Taper Length (m)	7.5	0.0	7.5	0.0	7.5	0.0	7.5	0.0	1.0	7.5	0.0
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr	0.989		0.999		0.850		0.932				
Flt Protected	0.950		0.950		0.950		0.950				
Satd. Flow (prot)	1568	3148	0	1452	3012	0	1466	1776	1248	0	1519
Flt Permitted	0.432		0.133		0.755						
Satd. Flow (perm)	713	3148	0	203	3012	0	1165	1776	1248	0	1519
Right Turn on Red		Yes		Yes		Yes		Yes		Yes	
Satd. Flow (RTOR)	10		50		50		363		2		
Link Speed (k/h)	50		50		50		50		50		50
Link Distance (m)	302.4		531.3		2985.6		100.9		100.9		100.9
Travel Time (s)	21.8		38.3		215.0		7.3		7.3		7.3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	6%	8%	12%	0%	7%	0%	2%	0%	0%	0%
Adj. Flow (vph)	1	816	66	207	580	4	82	1	520	0	2
Shared Lane Traffic (%)											
Lane Group Flow (vph)	1	882	0	207	584	0	82	1	520	0	4
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Left	Right
Median Width (m)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Link Offset (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crosswalk Width (m)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Two way Left Turn Lane											
Headway Factor	1.20	1.09	1.31	1.20	1.09	1.31	1.20	1.09	1.35	1.22	1.22
Turning Speed (k/h)	25	15	25	15	25	15	25	15	25	25	15
Number of Detectors	1	2	1	2	1	2	1	2	1	1	2
Detector Template	Left	Thru	Left	Thru	Left	Thru	Right	Left	Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	10.0	2.0	10.0	2.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size (m)	2.0	0.6	2.0	0.6	2.0	0.6	2.0	0.6	2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel											
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position (m)	9.4		9.4		9.4		9.4		9.4		9.4
Detector 2 Size (m)	0.6		0.6		0.6		0.6		0.6		0.6
Detector 2 Type	Cl+Ex		Cl+Ex		Cl+Ex		Cl+Ex		Cl+Ex		Cl+Ex
Detector 2 Channel											
Detector 2 Extend (s)	0.0		0.0		0.0		0.0		0.0		0.0
Turn Type	Perm	NA	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	4		3		8		2		2		6

Lanes, Volumes, Timings
1: Rice Road & Highway 20

2 2033 Background AM
10-17-2024

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Permitted Phases	4	4	4	8	3	8	2	2	2	2	6
Detector Phase	4		4		3		2		2		6
Switch Phase											
Minimum Initial (s)	8.0	8.0	10.0	8.0	10.0	8.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	24.2	24.2	13.0	24.1	24.4	24.4	24.4	24.4	24.4	30.0	30.0
Total Split (s)	35.0	35.0	16.0	51.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
Total Split (%)	38.9%	38.9%	17.8%	56.7%	43.3%	43.3%	43.3%	43.3%	43.3%	43.3%	43.3%
Maximum Green (s)	28.8	28.8	13.0	44.9	32.6	32.6	32.6	32.6	32.6	32.6	32.6
Yellow Time (s)	4.2	4.2	3.0	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	2.0	2.0	0.0	2.0	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	3.0	6.1	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag	Lag	Lag	Lag	Lead							
Lead-Lag Optimize?	Yes	Yes	Yes	Yes							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (/hr)	0	0	0	0	0	0	0	0	0	0	0
Act Effct Green (s)	27.1	27.1	45.3	42.2	32.7	32.7	32.7	32.7	32.7	32.7	32.7
Actuated g/C Ratio	0.31	0.31	0.52	0.48	0.37	0.37	0.37	0.37	0.37	0.37	0.37
v/c Ratio	0.00	0.90	0.75	0.40	0.19	0.00	0.75	0.01	0.01	0.01	0.01
Control Delay	21.0	41.9	34.2	15.3	21.1	18.0	15.5	15.2	15.2	15.2	15.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.0	41.9	34.2	15.3	21.1	18.0	15.5	15.2	15.2	15.2	15.2
LOS	C	D	C	B	C	B	C	B	B	B	B
Approach Delay	41.9	20.2	16.3								
Approach LOS	D	C	B								
Queue Length 50th (m)	0.1	78.1	19.7	33.1	10.1	0.1	22.5	0.3	0.3	0.3	0.3
Queue Length 95th (m)	1.2	#113.2	#52.1	45.7	20.9	1.2	69.4	2.5	2.5	2.5	2.5
Internal Link Dist (m)	278.4		507.3		2961.6		65.0		65.0		76.9
Turn Bay Length (m)	60.0		100.0		65.0		65.0		65.0		65.0
Base Capacity (vph)	235	1046	291	1551	435	663	693	568	568	568	568
Stantion Cap Reductn	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
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.84	0.71	0.38	0.19	0.00	0.75	0.01	0.01	0.01	0.01
Intersection Summary											
Area Type:	Other										
Cycle Length:	90										
Actuated Cycle Length:	87.4										
Natural Cycle:	75										
Control Type:	Actuated-Uncoordinated										
Maximum v/c Ratio:	0.90										
Intersection Signal Delay:	27.6										
Intersection Capacity Utilization:	86.0%										
Analysis Period (min):	15										
# 95th percentile volume exceeds capacity, queue may be longer.											



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	1	1	1	1	1	1	1	1	1	1	1
Traffic Volume (vph)	751	61	190	534	4	75	478	0	2	2	2
Future Volume (vph)	751	61	190	534	4	75	478	0	2	2	2
Ideal Flow (vphpl)	1651	1776	1535	1651	1776	1535	1651	1776	1498	1630	1630
Total Lost time (s)	6.2	6.2	6.1	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.85	1.00	0.93	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1568	3148	1452	3012	1466	1776	1248	1520	1520	1520	1520
Flt Permitted	0.43	1.00	0.13	1.00	0.76	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	713	3148	203	3012	1165	1776	1248	1520	1520	1520	1520
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	816	66	207	580	4	82	1	520	0	2
RTOR Reduction (vph)	0	7	0	1	0	0	0	0	227	0	1
Lane Group Flow (vph)	1	875	0	207	583	0	82	1	293	0	3
Heavy Vehicles (%)	0%	6%	6%	8%	12%	0%	7%	0%	2%	0%	0%
Turn Type	Perm	NA	NA	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4	3	8	2	2	2	2	2	2	6	6
Permitted Phases	4	8	8	2	2	2	2	2	2	6	6
Actuated Green, G (s)	27.1	27.1	42.2	42.2	32.7	32.7	32.7	32.7	32.7	32.7	32.7
Effective Green, g (s)	27.1	27.1	42.2	42.2	32.7	32.7	32.7	32.7	32.7	32.7	32.7
Actuated g/C Ratio	0.31	0.31	0.48	0.48	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Clearance Time (s)	6.2	6.2	6.1	6.1	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	221	976	269	1454	435	664	466	568	568	568	568
v/s Ratio Prot	0.00	c0.28	c0.11	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00
v/s Ratio Perm	0.00	0.90	0.77	0.40	0.19	0.00	0.63	0.00	0.63	0.00	0.00
Uniform Delay, d1	20.8	28.8	17.1	14.5	18.4	17.1	22.4	17.1	22.4	17.1	17.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	10.7	12.4	0.2	1.0	0.0	6.3	0.0	6.3	0.0	0.0
Delay (s)	20.8	39.5	29.5	14.7	19.4	17.1	28.7	17.2	28.7	17.2	17.2
Level of Service	C	D	C	B	B	B	C	B	C	B	B
Approach Delay (s)	39.5	18.6	27.4	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2
Approach LOS	D	B	C	B	B	B	C	B	C	B	B

Intersection Summary	Value	Unit
HCM 2000 Control Delay	29.0	s
HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.75	
Actuated Cycle Length (s)	87.4	s
Sum of lost time (s)	15.6	s
Intersection Capacity Utilization	86.0%	%
ICU Level of Service	E	
Analysis Period (min)	15	min
c. Critical Lane Group		

Lanes, Volumes, Timings
2: Rice Road & Quaker Road

2 2033 Background AM
10-17-2024

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	22	34	38	26	50	31	302	59	63	279	10	10
Future Volume (vph)	22	34	38	26	50	31	302	59	63	279	10	10
Ideal Flow (vphpl)	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt	0.946			0.951			0.980				0.996	
Flt Protected	0.988			0.978			0.996				0.991	
Satd. Flow (prot)	0	1382	0	0	1478	0	0	1555	0	0	1531	0
Flt Permitted	0.988			0.978			0.996				0.991	
Satd. Flow (perm)	0	1382	0	0	1478	0	0	1555	0	0	1531	0
Link Speed (kph)	50			50			1030.4				50	
Link Distance (m)	556.9			693.9			74.2				235.8	
Travel Time (s)	40.1			50.0			74.2				17.0	
Conf. Peds. (#/hr)									2		2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	8%	17%	2%	5%	2%	12%	1%	4%	7%	4%	22%
Adj. Flow (vph)	24	37	41	68	28	54	34	328	64	68	303	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	102	0	0	150	0	0	426	0	0	382	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Right	Left	Left	Right	Left	Left	Right	Right
Median Width(m)	0.0	0.0	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.0	3.6	0.0
Link Offset(m)	0.0	0.0	0.0	0.0	0.0	0.0	4.8	0.0	0.0	0.0	4.8	0.0
Crosswalk Width(m)	4.8			4.8			4.8				4.8	
Two way Left Turn Lane												
Headway Factor	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22
Turning Speed (k/h)	25	15	25	15	25	15	25	15	25	15	25	15
Sign Control	Stop			Stop			Stop				Stop	

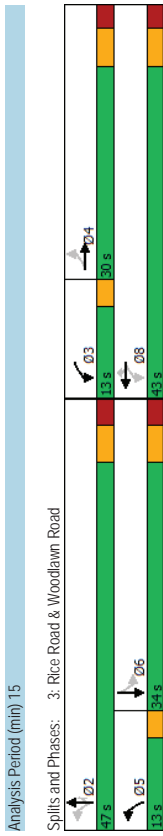
Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	61.5%
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
2: Rice Road & Quaker Road

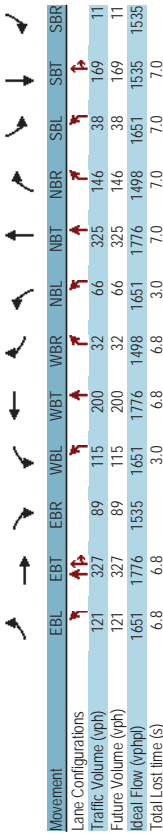
2 2033 Background AM
10-17-2024

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Sign Control	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	22	34	38	26	50	31	302	59	63	279	10	10
Future Volume (vph)	22	34	38	26	50	31	302	59	63	279	10	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	24	37	41	68	28	54	34	328	64	68	303	11
Direction_Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	102	150	426	382								
Volume Left (vph)	24	68	34	68								
Volume Right (vph)	41	54	64	11								
Head (s)	-0.02	-0.08	-0.03	0.10								
Departure Headway (s)	6.4	6.2	5.3	5.5								
Degree Utilization, x	0.18	0.26	0.63	0.58								
Capacity (veh/h)	466	500	649	628								
Control Delay (s)	10.8	11.4	16.7	15.8								
Approach Delay (s)	10.8	11.4	16.7	15.8								
Approach LOS	B	B	C	C								
Intersection Summary												
Delay									15.1			
Level of Service									C			
Intersection Capacity Utilization									61.5%			
Analysis Period (min)									15			

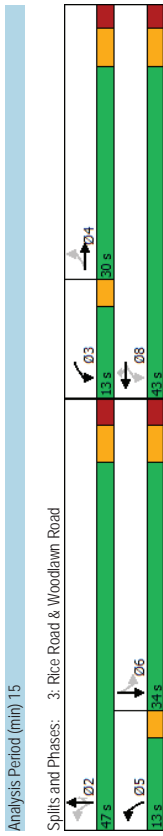
Lanes, Volumes, Timings
 3: Rice Road & Woodlawn Road



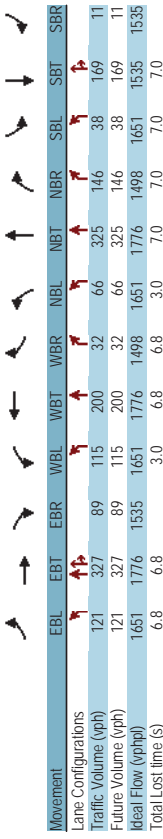
HCM Signalized Intersection Capacity Analysis
 3: Rice Road & Woodlawn Road



Lanes, Volumes, Timings
 2 2033 Background AM



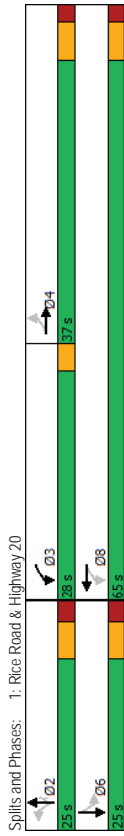
HCM Signalized Intersection Capacity Analysis
 2 2033 Background AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	121	327	89	115	200	32	66	325	146	38	169	11
Future Volume (vph)	121	327	89	115	200	32	66	325	146	38	169	11
Ideal Flow (vphpl)	1651	1776	1535	1651	1776	1498	1651	1776	1498	1651	1535	1535
Total Lost time (s)	3.0	6.8	6.8	6.8	6.8	3.0	7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00
Flt	1.00	0.97	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85	1.00	0.99
Flt Protected	0.95	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1535	3168	1535	1741	1233	1492	1708	1251	1434	1434	1409	1409
Flt Permitted	0.62	1.00	0.34	1.00	1.00	0.58	1.00	1.00	0.55	1.00	0.55	1.00
Satd. Flow (perm)	1006	3168	545	1741	1233	908	1708	1251	830	1409	1409	1409
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	132	355	97	125	217	35	72	353	159	41	184	12
RTOR Reduction (vph)	0	29	0	0	0	23	0	0	67	0	3	0
Lane Group Flow (vph)	132	423	0	125	217	12	72	353	92	41	193	0
Confl. Peds. (#/hr)	1	6	6	6	6	1	1	1	4	4	4	1
Heavy Vehicles (%)	2%	3%	0%	2%	2%	1%	5%	4%	0%	9%	7%	20%
Turn Type	Perm	NA	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	NA
Protected Phases	4	3	8	8	8	5	2	2	6	6	6	6
Permitted Phases	4	8	8	8	8	2	2	2	2	2	6	6
Actuated Green, G (s)	16.8	16.8	27.4	27.4	27.4	41.2	41.2	41.2	41.2	30.6	30.6	30.6
Effective Green, g (s)	16.8	16.8	27.4	27.4	27.4	41.2	41.2	41.2	41.2	30.6	30.6	30.6
Actuated g/C Ratio	0.20	0.20	0.33	0.33	0.33	0.50	0.50	0.50	0.50	0.37	0.37	0.37
Clearance Time (s)	6.8	6.8	3.0	6.8	6.8	3.0	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	205	645	272	578	410	507	854	625	308	523	523	523
v/s Ratio Prot	c0.13	c0.13	c0.04	0.12	0.12	0.01	c0.21	0.14	0.14	0.14	0.14	0.14
v/s Ratio Perm	0.13	0.13	0.11	0.38	0.03	0.14	0.41	0.15	0.13	0.37	0.37	0.37
v/c Ratio	0.64	0.66	0.46	0.38	0.03	0.14	0.41	0.15	0.13	0.37	0.37	0.37
Uniform Delay, d1	30.1	30.1	20.3	21.0	18.5	10.9	13.0	11.1	17.1	18.9	18.9	18.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.8	2.4	1.2	0.4	0.0	0.1	1.5	0.5	0.9	2.0	2.0	2.0
Delay (s)	36.8	32.5	21.5	21.4	18.6	11.0	14.5	11.6	18.0	20.9	20.9	20.9
Level of Service	D	C	C	C	B	B	B	B	B	B	C	C
Approach Delay (s)	33.5	33.5	21.2	21.2	13.3	20.4	20.4	20.4	20.4	20.4	20.4	20.4
Approach LOS	C	C	C	C	B	B	B	B	B	C	C	C
Intersection Summary												
HCM 2000 Control Delay	22.5 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.50											
Actuated Cycle Length (s)	82.4											
Intersection Capacity Utilization	68.9%											
Analysis Period (min)	15											
c Critical Lane Group												

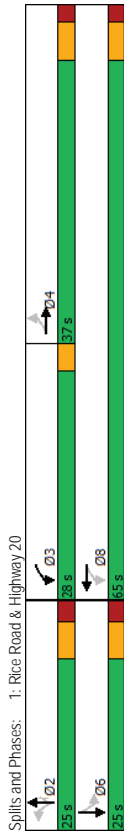
Lanes, Volumes, Timings
1: Rice Road & Highway 20

Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



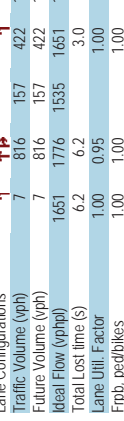
Lanes, Volumes, Timings
1: Rice Road & Highway 20

Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



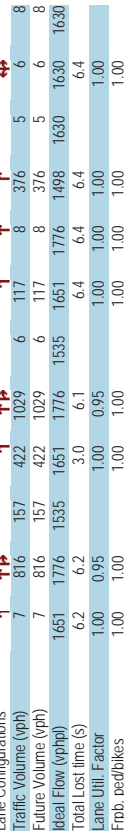
HCM Signalized Intersection Capacity Analysis
1: Rice Road & Highway 20

Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



HCM Signalized Intersection Capacity Analysis
1: Rice Road & Highway 20

Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	7	816	157	422	1029	6	117	8	376	5	6
Future Volume (vph)	7	816	157	422	1029	6	117	8	376	5	6
Ideal Flow (vphpl)	1651	1776	1535	1651	1776	1535	1651	1776	1498	1630	1630
Total Lost time (s)	3.0	6.2	3.0	6.1	6.4	6.4	6.4	6.4	6.4	6.4	6.4
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
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00	0.85	0.99	0.94
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	1.00	1.00	0.99	1.00	0.99
Satd. Flow (prot)	1568	3172	1568	3274	1553	1776	1236	1518	1518	1518	1518
Flt Permitted	0.25	1.00	0.12	1.00	0.74	1.00	1.00	0.95	0.95	0.95	0.95
Satd. Flow (perm)	418	3172	197	3274	1216	1776	1236	1464	1464	1464	1464
Peak-Hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	887	171	459	1118	7	127	9	409	5	7
RTOR Reduction (vph)	0	18	0	0	0	0	0	0	322	0	7
Lane Group Flow (vph)	8	1040	0	459	1125	0	127	9	87	0	14
Confl. Peds. (#/hr)	3	3	3	3	3	3	3	3	3	3	3
Heavy Vehicles (%)	0%	4%	0%	3%	0%	1%	0%	3%	0%	0%	0%

Turn Type	Perm	NA	pm+pl	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4	4	8	8	8	8	8	8	8	8
Permitted Phases	4	4	8	8	8	8	8	8	8	8
Actuated Green, G (s)	30.4	30.4	56.8	56.8	18.6	18.6	18.6	18.6	18.6	18.6
Effective Green, g (s)	30.4	30.4	56.8	56.8	18.6	18.6	18.6	18.6	18.6	18.6
Actuated g/C Ratio	0.35	0.35	0.65	0.65	0.21	0.21	0.21	0.21	0.21	0.21
Clearance Time (s)	6.2	6.2	3.0	6.1	6.4	6.4	6.4	6.4	6.4	6.4
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	144	1097	490	2115	257	375	261	309	309	309
v/s Ratio Prot	0.33	0.33	0.25	0.34	0.10	0.01	0.07	0.01	0.07	0.01
v/s Ratio Perm	0.06	0.95	0.94	0.53	0.49	0.02	0.33	0.04	0.33	0.04
Uniform Delay, d1	19.2	28.0	23.7	8.4	30.5	27.5	29.4	27.6	27.6	27.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	16.1	25.5	0.3	6.6	0.1	3.4	0.3	3.4	0.3
Delay (s)	19.3	44.1	49.2	8.6	37.2	27.6	32.8	27.9	27.9	27.9
Level of Service	B	D	D	A	D	C	C	C	C	C
Approach Delay (s)	43.9	20.4	33.7	27.9	27.9	27.9	27.9	27.9	27.9	27.9
Approach LOS	D	C	C	C	C	C	C	C	C	C

Intersection Summary	Value	Level of Service
HCM 2000 Control Delay	30.5	C
HCM 2000 Volume to Capacity ratio	0.86	
Actuated Cycle Length (s)	87.9	
Intersection Capacity Utilization	84.4%	E
Analysis Period (min)	15	
c Critical Lane Group		

Lanes, Volumes, Timings
2: Rice Road & Quaker Road

2 2033 Background PM
10-17-2024

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	35	43	63	25	42	34	417	72	67	328	14
Future Volume (vph)	17	35	43	63	25	42	34	417	72	67	328	14
Ideal Flow (vphpl)	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt	0.938			0.956				0.981				0.995
Flt Protected	0.991			0.976				0.997				0.992
Satd. Flow (prot)	0	1335	0	0	1521	0	0	1562	0	0	1559	0
Flt Permitted	0.991			0.976				0.997				0.992
Satd. Flow (perm)	0	1335	0	0	1521	0	0	1562	0	0	1559	0
Link Speed (kph)	50			50				50				50
Link Distance (m)	556.9			693.9				1030.4				235.8
Travel Time (s)	40.1			50.0				74.2				17.0
Conf. Peds. (#/hr)									2			2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	18%	15%	0%	0%	0%	11%	1%	4%	5%	3%	0%
Adj. Flow (vph)	18	38	47	68	27	46	37	453	78	73	357	15
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	103	0	0	141	0	0	568	0	0	445	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Right	Left	Left	Right	Left	Left	Right	Right
Median Width(m)	0.0	0.0	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.0	3.6	0.0
Link Offset(m)	0.0	0.0	0.0	0.0	0.0	0.0	4.8	0.0	0.0	0.0	4.8	0.0
Crosswalk Width(m)	4.8			4.8				4.8				4.8
Two way Left Turn Lane												
Headway Factor	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22
Turning Speed (k/h)	25	15	25	15	25	15	25	15	25	15	25	15
Sign Control	Stop			Stop			Stop			Stop		Stop

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	68.2%
Analysis Period (min)	15

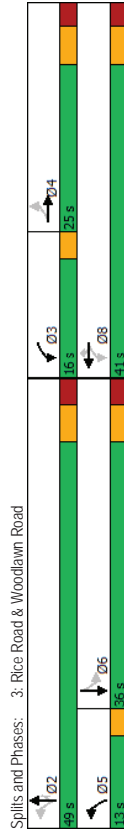
HCM Unsignalized Intersection Capacity Analysis
2: Rice Road & Quaker Road

2 2033 Background PM
10-17-2024

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Stop			Stop		Stop
Traffic Volume (vph)	17	35	43	63	25	42	34	417	72	67	328	14
Future Volume (vph)	17	35	43	63	25	42	34	417	72	67	328	14
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	38	47	68	27	46	37	453	78	73	357	15
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	103	141	568	445								
Volume Left (vph)	18	68	37	73								
Volume Right (vph)	47	46	78	15								
Head (s)	-0.01	-0.10	-0.03	0.07								
Departure Headway (s)	7.1	6.9	5.5	5.8								
Degree Utilization, x	0.20	0.27	0.87	0.72								
Capacity (veh/h)	454	475	643	598								
Control Delay (s)	11.9	12.4	34.2	22.0								
Approach Delay (s)	11.9	12.4	34.2	22.0								
Approach LOS	B	B	D	C								
Intersection Summary												
Delay	25.6											
Level of Service	D											
Intersection Capacity Utilization	68.2%											
Analysis Period (min)	15											
ICU Level of Service	C											

Lanes, Volumes, Timings
 3: Rice Road & Woodlawn Road

Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.



HCM Signalized Intersection Capacity Analysis
 3: Rice Road & Woodlawn Road

Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	55	362	70	264	431	64	101	328	183	67	310	63
Future Volume (vph)	55	362	70	264	431	64	101	328	183	67	310	63
Ideal Flow (vphpl)	1651	1776	1535	1651	1776	1498	1651	1776	1498	1651	1535	1535
Total Lost time (s)	6.8	6.8	6.8	3.0	6.8	6.8	3.0	6.8	3.0	6.8	3.0	6.8
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99	1.00	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98	1.00	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.97
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1558	3238	1536	1758	1232	1553	1741	1228	1564	1496	1496	1496
Flt Permitted	0.49	1.00	0.29	1.00	1.00	0.34	1.00	1.00	0.34	1.00	0.55	1.00
Satd. Flow (perm)	811	3238	468	1758	1232	550	1741	1228	902	1496	1496	1496
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	60	393	76	287	468	70	110	357	199	73	337	68
RTOR Reduction (vph)	0	18	0	0	0	0	45	0	0	89	0	8
Lane Group Flow (vph)	60	451	0	287	468	25	110	357	110	73	397	0
Confl. Peds. (#/hr)	5	5	5	5	5	5	5	5	5	3	3	3
Heavy Vehicles (%)	0%	1%	2%	2%	0%	1%	0%	1%	2%	0%	0%	0%
Turn Type	Perm	NA	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	NA
Protected Phases	4	3	8	8	2	5	2	6	6	6	6	6
Permitted Phases	4	8	8	2	8	2	2	2	2	2	2	2
Actuated Green, G (s)	16.2	16.2	32.0	32.0	32.0	42.7	42.7	42.7	42.7	31.8	31.8	31.8
Effective Green, g (s)	16.2	16.2	32.0	32.0	32.0	42.7	42.7	42.7	42.7	31.8	31.8	31.8
Effective G/C Ratio	0.18	0.18	0.36	0.36	0.36	0.48	0.48	0.48	0.48	0.36	0.36	0.36
Clearance Time (s)	6.8	6.8	3.0	6.8	6.8	3.0	6.8	3.0	6.8	3.0	6.8	3.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	148	592	323	635	445	354	840	592	324	537	537	537
v/s Ratio Prot	0.14	0.13	0.27	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
v/s Ratio Perm	0.07	0.41	0.76	0.89	0.74	0.06	0.31	0.42	0.19	0.23	0.74	0.74
Uniform Delay, d1	31.9	34.3	22.8	24.6	18.4	13.8	14.9	13.0	19.8	24.7	24.7	24.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	5.8	24.2	4.5	0.1	0.5	1.6	0.7	1.6	8.9	8.9	8.9
Delay (s)	33.7	40.1	47.0	29.0	18.5	14.3	16.5	13.7	21.4	33.6	33.6	33.6
Level of Service	C	D	D	C	B	B	B	B	B	C	C	C
Approach Delay (s)	39.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4
Approach LOS	D	D	D	C	C	C	C	C	C	C	C	C
Intersection Summary												
HCM 2000 Control Delay	29.8											
HCM 2000 Volume to Capacity ratio	0.80											
Actuated Cycle Length (s)	88.5											
Intersection Capacity Utilization	84.7%											
Analysis Period (min)	15											
c Critical Lane Group	15.3											

Lanes, Volumes, Timings
1: Rice Road & Highway 20

3 2033 Total AM
10-17-2024

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	1	1	1	1	1	1	1	1	1	1	1
Traffic Volume (vph)	751	64	193	534	4	84	488	0	2	2	2
Future Volume (vph)	751	64	193	534	4	84	488	0	2	2	2
Ideal Flow (vphpl)	1651	1776	1535	1651	1776	1535	1498	1630	1630	1630	1630
Storage Length (m)	60.0	0.0	100.0	0.0	65.0	0.0	65.0	0.0	0.0	0.0	0.0
Taper Length (m)	7.5	0.0	7.5	0.0	7.5	0.0	7.5	0.0	0.0	0.0	0.0
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.988		0.999		0.850		0.932				
Flt Protected	0.950		0.950		0.950		0.950				
Satd. Flow (prot)	1568	3145	0	1452	3012	0	1466	1776	1248	0	1519
Flt Permitted	0.432		0.132		0.755		0.755				
Satd. Flow (perm)	713	3145	0	202	3012	0	1165	1776	1248	0	1519
Right Turn on Red		Yes		Yes		Yes		Yes		Yes	
Satd. Flow (RTOR)	10		1		363		2				
Link Speed (k/h)	50		50		50		50				
Link Distance (m)	302.4		531.3		2985.6		100.9				
Travel Time (s)	21.8		38.3		215.0		7.3				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	6%	8%	12%	0%	7%	0%	2%	0%	0%	0%
Adj. Flow (vph)	1	816	70	210	580	4	91	1	530	0	2
Shared Lane Traffic (%)											
Lane Group Flow (vph)	1	886	0	210	584	0	91	1	530	0	4
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Left	Left	Right	Left	Left	Right
Median Width (m)	3.6		3.6		3.6		3.6		3.6		3.6
Link Offset (m)	0.0		0.0		0.0		0.0		0.0		0.0
Crosswalk Width (m)	4.8		4.8		4.8		4.8		4.8		4.8
Two way Left Turn Lane											
Headway Factor	1.20	1.09	1.31	1.20	1.09	1.31	1.20	1.09	1.35	1.22	1.22
Turning Speed (k/h)	25	15	25	15	25	15	25	15	25	15	15
Number of Detectors	1	2	1	2	1	2	1	2	1	1	2
Detector Template	Left	Thru	Left	Thru	Left	Thru	Right	Left	Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	10.0	2.0	10.0	2.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size (m)	2.0	0.6	2.0	0.6	2.0	0.6	2.0	0.6	2.0	0.6	
Detector 1 Type	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	Ch+Ex	
Detector 1 Channel											
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position (m)	9.4		9.4		9.4		9.4		9.4		9.4
Detector 2 Size (m)	0.6		0.6		0.6		0.6		0.6		0.6
Detector 2 Type	Ch+Ex		Ch+Ex		Ch+Ex		Ch+Ex		Ch+Ex		Ch+Ex
Detector 2 Channel											
Detector 2 Extend (s)	0.0		0.0		0.0		0.0		0.0		0.0
Turn Type	Perm	NA	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	4		3		8		2		4		6

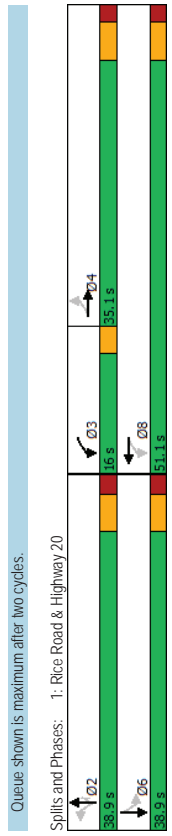
3 2033 Total AM 2:16 pm 09:27:2024
Synchro 11 Report
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Lanes, Volumes, Timings
1: Rice Road & Highway 20

3 2033 Total AM
10-17-2024

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Permitted Phases	4	4	4	8	3	8	2	2	2	2	6
Detector Phase	4	4	4	3	8	8	2	2	2	2	6
Switch Phase											
Minimum Initial (s)	8.0	8.0	10.0	8.0	10.0	8.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	24.2	24.2	13.0	24.1	24.4	24.4	24.4	24.4	24.4	30.0	30.0
Total Split (s)	35.1	35.1	16.0	51.1	38.9	38.9	38.9	38.9	38.9	38.9	38.9
Total Split (%)	39.0%	39.0%	17.8%	56.8%	43.2%	43.2%	43.2%	43.2%	43.2%	43.2%	43.2%
Maximum Green (s)	28.9	28.9	13.0	45.0	32.5	32.5	32.5	32.5	32.5	32.5	32.5
Yellow Time (s)	4.2	4.2	3.0	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	2.0	2.0	0.0	2.0	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	3.0	6.1	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag	Lag	Lag	Lead								
Lead-Lag Optimize?	Yes	Yes	Yes								
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (/hr)	0	0	45.4	42.3	32.6	32.6	32.6	32.6	32.6	32.6	32.6
Act Effct Green (s)	27.2	27.2	0.0	42.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Actuated g/C Ratio	0.31	0.31	0.52	0.48	0.37	0.37	0.37	0.37	0.37	0.37	0.37
v/c Ratio	0.00	0.90	0.76	0.40	0.21	0.00	0.77	0.01	0.01	0.01	0.01
Control Delay	21.0	42.0	35.2	15.2	21.4	18.0	16.6	15.2	15.2	15.2	15.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.0	42.0	35.2	15.2	21.4	18.0	16.6	15.2	15.2	15.2	15.2
LOS	C	D	D	B	C	B	C	B	B	B	B
Approach Delay	42.0	20.5	17.3								
Approach LOS	D	C	C								
Queue Length 50th (m)	0.1	78.5	20.4	33.0	11.3	0.1	24.8	0.3	0.3	0.3	0.3
Queue Length 95th (m)	1.2	#113.8	#53.7	45.6	22.9	1.2	#79.0	2.5	2.5	2.5	2.5
Internal Link Dist (m)		278.4		507.3			2961.6				
Turn Bay Length (m)	60.0		100.0		65.0		65.0		65.0		65.0
Base Capacity (vph)	235	1048	291	1553	433	661	692	661	692	661	661
Stantion Cap Reductn	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
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.85	0.72	0.38	0.21	0.00	0.77	0.01	0.01	0.01	0.01
Intersection Summary											
Area Type:	Other										
Cycle Length:	90										
Actuated Cycle Length:	87.4										
Natural Cycle:	80										
Control Type:	Actuated-Uncoordinated										
Maximum v/c Ratio:	0.90										
Intersection Signal Delay:	27.9										
Intersection Capacity Utilization:	86.9%										
Analysis Period (min):	15										
# 95th percentile volume exceeds capacity, queue may be longer.											

3 2033 Total AM 2:16 pm 09:27:2024
Synchro 11 Report
Page 2



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	1	1	1	1	1	1	1	1	1	1	1
Traffic Volume (vph)	751	64	193	534	4	84	84	1	488	0	2
Future Volume (vph)	751	64	193	534	4	84	84	1	488	0	2
Ideal Flow (vphpl)	1651	1776	1535	1651	1776	1535	1651	1776	1498	1630	1630
Total Lost time (s)	6.2	6.2	6.1	6.1	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	0.85	1.00	0.93
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1568	3146	1452	3012	1466	1776	1466	1776	1248	1520	1520
Flt Permitted	0.43	1.00	0.13	1.00	0.76	1.00	0.76	1.00	1.00	1.00	1.00
Satd. Flow (perm)	713	3146	202	3012	1165	1776	1165	1776	1248	1520	1520
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	816	70	210	580	4	91	1	530	0	2
RTOR Reduction (vph)	0	7	0	1	0	0	0	0	228	0	1
Lane Group Flow (vph)	1	879	0	210	583	0	91	1	302	0	3
Heavy Vehicles (%)	0%	6%	6%	8%	12%	0%	7%	0%	2%	0%	0%
Turn Type	Perm	NA	NA	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4	3	8	2	2	2	2	2	2	6	6
Permitted Phases	4	8	8	8	8	8	8	8	8	8	8
Actuated Green, G (s)	27.2	27.2	42.3	42.3	42.3	42.3	32.6	32.6	32.6	32.6	32.6
Effective Green, g (s)	27.2	27.2	42.3	42.3	42.3	32.6	32.6	32.6	32.6	32.6	32.6
Actuated g/C Ratio	0.31	0.31	0.48	0.48	0.48	0.37	0.37	0.37	0.37	0.37	0.37
Clearance Time (s)	6.2	6.2	6.1	6.1	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	221	979	269	1457	434	662	465	465	566	566	566
v/s Ratio Prot	c0.28	c0.11	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
v/s Ratio Perm	0.00	0.27	0.27	0.08	0.08	0.24	0.24	0.24	0.24	0.24	0.24
v/c Ratio	0.00	0.90	0.78	0.40	0.21	0.00	0.65	0.65	0.65	0.65	0.65
Uniform Delay, d1	20.8	28.8	17.5	14.4	18.6	17.2	22.7	22.7	17.2	17.2	17.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	10.8	13.6	0.2	1.1	0.0	6.9	6.9	0.0	0.0	0.0
Delay (s)	20.8	39.6	31.1	14.6	19.7	17.2	29.6	29.6	17.2	17.2	17.2
Level of Service	C	D	C	B	B	B	C	C	B	B	B
Approach Delay (s)	39.5	19.0	28.1	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2
Approach LOS	D	B	C	B	B	B	C	C	B	B	B
Intersection Summary											
HCM 2000 Control Delay	29.4 HCM 2000 Level of Service C										
HCM 2000 Volume to Capacity ratio	0.77										
Actuated Cycle Length (s)	87.4 Sum of lost time (s) 15.6										
Intersection Capacity Utilization	86.9% ICU Level of Service E										
Analysis Period (min)	15										
c. Critical Lane Group											

Lanes, Volumes, Timings
2: Rice Road & Quaker Road

3 2033 Total AM
10-17-2024

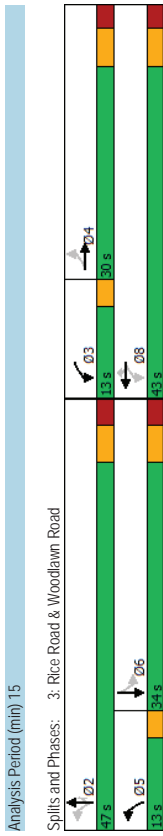
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	23	34	38	63	26	53	31	309	59	70	299	14
Future Volume (vph)	23	34	38	63	26	53	31	309	59	70	299	14
Ideal Flow (vphpl)	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt	0.946			0.949				0.980				0.995
Flt Protected	0.988			0.978				0.996				0.991
Satd. Flow (prot)	0	1383	0	0	1475	0	0	1555	0	0	1528	0
Flt Permitted	0.988			0.978				0.996				0.991
Satd. Flow (perm)	0	1383	0	0	1475	0	0	1555	0	0	1528	0
Link Speed (k/h)	50			50				50				50
Link Distance (m)	556.9			693.9				1030.4				235.8
Travel Time (s)	40.1			50.0				74.2				17.0
Conf. Peds. (#/hr)									2			2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	8%	17%	2%	5%	2%	12%	1%	4%	7%	4%	22%
Adj. Flow (vph)	25	37	41	68	28	58	34	336	64	76	325	15
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	103	0	0	154	0	0	434	0	0	416	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Right	Left	Left	Right	Left	Left	Right	Right
Median Width(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	0.0	0.0	3.6	0.0
Link Offset(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.8	0.0	0.0	4.8	0.0
Crosswalk Width(m)	4.8			4.8				4.8				4.8
Two way Left Turn Lane												
Headway Factor	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22
Turning Speed (k/h)	25	15	25	15	25	15	25	15	25	15	25	15
Sign Control	Stop			Stop				Stop			Stop	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	65.9%
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
2: Rice Road & Quaker Road

3 2033 Total AM
10-17-2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Sign Control		Stop		Stop			Stop		Stop		Stop	
Traffic Volume (vph)	23	34	38	63	26	53	31	309	59	70	299	14
Future Volume (vph)	23	34	38	63	26	53	31	309	59	70	299	14
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	37	41	68	28	58	34	336	64	76	325	15
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	103	154	434	416								
Volume Left (vph)	25	68	34	76								
Volume Right (vph)	41	58	64	15								
Head (s)	-0.02	-0.09	-0.03	0.10								
Departure Headway (s)	6.6	6.3	5.4	5.5								
Degree Utilization, x	0.19	0.27	0.65	0.64								
Capacity (veh/h)	451	477	638	624								
Control Delay (s)	11.1	11.7	17.9	17.9								
Approach Delay (s)	11.1	11.7	17.9	17.9								
Approach LOS	B	B	C	C								
Intersection Summary												
Delay												
Level of Service												
Intersection Capacity Utilization												
Analysis Period (min)												



Splits and Phases: 3: Rice Road & Woodlawn Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	123	327	89	115	200	35	66	327	146	45	176
Future Volume (vph)	123	327	89	115	200	35	66	327	146	45	176
Ideal Flow (vphpl)	1651	1776	1535	1651	1776	1498	1651	1776	1498	1651	1535
Total Lost time (s)	3.0	6.8	6.8	3.0	6.8	6.8	3.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00
Flt	1.00	0.97	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	1.00
Flt Protected	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.99
Satd. Flow (prot)	1535	3168	1535	1741	1233	1492	1708	1251	1434	1399	1535
Flt Permitted	0.62	1.00	0.34	1.00	1.00	0.57	1.00	1.00	0.55	1.00	1.00
Satd. Flow (perm)	1006	3168	545	1741	1233	897	1708	1251	828	1399	1399
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	134	355	97	125	217	38	72	355	159	49	191
RTOR Reduction (vph)	0	29	0	0	0	25	0	0	67	0	3
Lane Group Flow (vph)	134	423	0	125	217	13	72	355	93	49	206
Confl. Peds. (#/hr)	1	6	6	6	6	1	1	1	4	4	4
Heavy Vehicles (%)	2%	3%	0%	2%	2%	1%	5%	4%	0%	9%	20%
Turn Type	Perm	NA	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA
Protected Phases	4	3	8	8	5	2	2	6	6	6	6
Permitted Phases	4	8	8	2	8	2	2	2	2	2	6
Actuated Green, G (s)	16.8	16.8	27.4	27.4	27.4	41.2	41.2	41.2	41.2	30.6	30.6
Effective Green, g (s)	16.8	16.8	27.4	27.4	27.4	41.2	41.2	41.2	41.2	30.6	30.6
Actuated g/C Ratio	0.20	0.20	0.33	0.33	0.33	0.50	0.50	0.50	0.50	0.37	0.37
Clearance Time (s)	6.8	6.8	3.0	6.8	6.8	3.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	205	645	272	578	410	503	854	625	307	519	519
v/s Ratio Prot	c0.13	c0.04	0.12	0.11	0.01	0.01	c0.21	0.15	0.15	0.15	0.15
v/s Ratio Perm	0.13	0.11	0.11	0.11	0.01	0.06	0.07	0.06	0.06	0.06	0.06
v/c Ratio	0.65	0.66	0.46	0.38	0.03	0.14	0.42	0.15	0.16	0.40	0.40
Uniform Delay, d1	30.1	30.1	20.3	21.0	18.5	10.9	13.0	11.1	17.3	19.1	19.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.3	2.4	1.2	0.4	0.0	0.1	1.5	0.5	1.1	2.3	2.3
Delay (s)	37.4	32.5	21.5	21.4	18.6	11.0	14.5	11.6	18.4	21.4	21.4
Level of Service	D	C	C	C	B	B	B	B	B	B	C
Approach Delay (s)	33.7	C	21.1	C	13.3	C	20.8	C	C	C	C
Approach LOS	C	C	C	C	B	B	C	C	C	C	C
Intersection Summary											
HCM 2000 Control Delay	22.6	HCM 2000 Level of Service									
HCM 2000 Volume to Capacity ratio	0.51	C									
Actuated Cycle Length (s)	82.4	Sum of lost time (s)									
Intersection Capacity Utilization	69.0%	ICU Level of Service									
Analysis Period (min)	15	C									
c Critical Lane Group											

Lanes, Volumes, Timings
4: Rice Road & Driveway

3 2033 Total AM
10-17-2024

	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W					4
Traffic Volume (vph)	31	19	378	11	6	352
Future Volume (vph)	31	19	378	11	6	352
Ideal Flow (vphpl)	1630	1630	1535	1535	1375	1375
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Flt	0.948		0.996			
Flt Protected	0.970					0.999
Satd. Flow (prot)	1469	0	1499	0	0	1347
Flt Permitted	0.970					0.999
Satd. Flow (perm)	1469	0	1499	0	0	1347
Link Speed (k/h)	50		50			50
Link Distance (m)	169.9		235.8			2985.6
Travel Time (s)	12.2		17.0			215.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	34	21	411	12	7	383
Shared Lane Traffic (%)						
Lane Group Flow (vph)	55	0	423	0	0	390
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width (m)	3.6		3.6			3.6
Link Offset (m)	0.0		0.0			0.0
Crosswalk Width (m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.22	1.22	1.31	1.31	1.50	1.50
Turning Speed (k/h)	25	15	15	15	25	25
Sign Control	Stop		Free		Free	Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	42.3%					
Analysis Period (min)	15					
	ICU Level of Service A					

HCM Unsignalized Intersection Capacity Analysis
4: Rice Road & Driveway

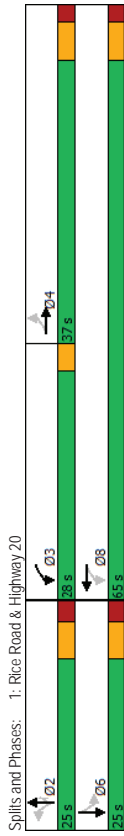
3 2033 Total AM
10-17-2024

	WBL	WBR	NBT	NBR	SBL	SBT
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W					4
Traffic Volume (veh/h)	31	19	378	11	6	352
Future Volume (Veh/h)	31	19	378	11	6	352
Sign Control	Stop		Free		Free	Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	34	21	411	12	7	383
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)			None			None
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
PX platoon unblocked						
VC conflicting volume	814	417			423	
VC1 stage 1 conf vol						
VC2 stage 2 conf vol						
VCu unblocked vol	814	417			423	
IC single (s)	6.4	6.2			4.1	
IC 2 stage (s)						
IF (s)	3.5	3.3			2.2	
p0 queue free %	90	97			99	
p0 capacity (veh/h)	345	636			1136	
Direction_Lane #	WBL	NB	1	SB	1	
Volume Total	55	423	390			
Volume Left	34	0	7			
Volume Right	21	12	0			
ESH	418	1700	1136			
Volumes to Capacity	0.13	0.25	0.01			
Queue Length 95th (m)	3.6	0.0	0.1			
Control Delay (s)	14.9	0.0	0.2			
Lane LOS	B		A			
Approach Delay (s)	14.9	0.0	0.2			
Approach LOS	B		A			
Intersection Summary						
Average Delay	1.0					
Intersection Capacity Utilization	42.3%					
ICU Level of Service	A					
Analysis Period (min)	15					

Lanes, Volumes, Timings
1: Rice Road & Highway 20

3 2033 Total PM
10-17-2024

Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



HCM Signalized Intersection Capacity Analysis
1: Rice Road & Highway 20

3 2033 Total PM
10-17-2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	7	816	165	432	1029	6	122	8	383	5	6	8
Future Volume (vph)	7	816	165	432	1029	6	122	8	383	5	6	8
Ideal Flow (vphpl)	1651	1776	1535	1651	1776	1535	1651	1776	1498	1630	1630	1630
Total Lost time (s)	3.0	6.2	3.0	6.1	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
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
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fltb, ped/bikes	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.85	0.94	0.99
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00	0.99	0.99	0.99
Satd. Flow (prot)	1568	3169	1568	3274	1553	1776	1553	1776	1236	1518	1518	1518
Flt Permitted	0.25	1.00	0.12	1.00	0.74	1.00	0.74	1.00	1.00	0.95	0.95	0.95
Satd. Flow (perm)	418	3169	196	3274	1216	1776	1216	1776	1236	1464	1464	1464
Peak-Hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	887	179	470	1118	7	133	9	416	5	7	9
RTOR Reduction (vph)	0	18	0	0	0	0	0	0	329	0	7	0
Lane Group Flow (vph)	8	1048	0	470	1125	0	133	9	87	0	14	0
Confl. Peds. (#/hr)	3	3	3	3	3	3	3	3	3	3	3	3
Heavy Vehicles (%)	0%	4%	0%	0%	3%	0%	1%	0%	3%	0%	0%	0%
Turn Type	Perm	NA	NA	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	4	4	4	8	8	8	8	8	8	8	8	8
Permitted Phases	4	8	8	8	8	8	2	2	2	6	6	6
Actuated Green, G (s)	30.6	30.6	57.4	57.4	57.4	18.6	18.6	18.6	18.6	18.6	18.6	18.6
Effective Green, g (s)	30.6	30.6	57.4	57.4	57.4	18.6	18.6	18.6	18.6	18.6	18.6	18.6
Actuated g/C Ratio	0.35	0.35	0.65	0.65	0.65	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Clearance Time (s)	6.2	6.2	3.0	6.1	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	144	1095	494	2123	255	373	259	307	307	307	307	307
v/s Ratio Prot	0.33	0.33	c0.25	0.34	0.34	0.01	0.01	0.01	0.01	0.01	0.01	0.01
v/s Ratio Perm	0.02	0.02	c0.36	0.36	0.36	c0.11	0.11	0.11	0.11	0.11	0.11	0.11
v/c Ratio	0.06	0.06	0.95	0.53	0.53	0.52	0.02	0.34	0.34	0.05	0.05	0.05
Uniform Delay, d1	19.3	28.3	24.2	8.3	31.0	27.7	29.7	27.9	27.9	27.9	27.9	27.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	17.6	28.5	0.2	7.4	0.1	3.5	0.3	0.3	0.3	0.3	0.3
Delay (s)	19.5	45.9	52.7	8.6	38.4	27.9	33.2	28.1	28.1	28.1	28.1	28.1
Level of Service	B	D	D	A	D	D	C	C	C	C	C	C
Approach Delay (s)	45.7	45.7	21.6	21.6	34.4	34.4	28.1	28.1	28.1	28.1	28.1	28.1
Approach LOS	D	D	C	C	C	C	C	C	C	C	C	C
Intersection Summary												
HCM 2000 Control Delay	31.8 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.88											
Actuated Cycle Length (s)	88.5											
Intersection Capacity Utilization	85.6%											
Analysis Period (min)	15											
c Critical Lane Group												

Lanes, Volumes, Timings
2: Rice Road & Quaker Road

3 2033 Total PM
10-17-2024

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	35	43	63	25	49	34	436	72	71	342	16
Future Volume (vph)	20	35	43	63	25	49	34	436	72	71	342	16
Ideal Flow (vphpl)	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.941	0.990	0.952	0.952	0.952	0.952	0.982	0.997	0.992	0.992	0.992	0.992
Flt Protected	0	1344	0	0	1518	0	0	1564	0	0	1559	0
Satd. Flow (prot)	0.990	0.978	0.978	0.978	0.978	0.978	0.997	0.997	0.992	0.992	0.992	0.992
Flt Permitted	0	1344	0	0	1518	0	0	1564	0	0	1559	0
Satd. Flow (perm)	50	50	50	50	50	50	50	50	50	50	50	50
Link Speed (kph)	556.9	693.9	693.9	693.9	693.9	693.9	1030.4	1030.4	235.8	235.8	235.8	235.8
Link Distance (m)	40.1	50.0	50.0	50.0	50.0	50.0	74.2	74.2	17.0	17.0	17.0	17.0
Travel Time (s)	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Conf. Peds. (#/hr)	0	18%	15%	0%	0%	0%	11%	1%	4%	5%	3%	0%
Peak Hour Factor	22	38	47	68	27	53	37	474	78	77	372	17
Heavy Vehicles (%)	0	107	0	0	148	0	0	589	0	0	466	0
Adj. Flow (vph)	No	No	No	No	No	No	No	No	No	No	No	No
Shared Lane Traffic (%)	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right
Enter Blocked Intersection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane Alignment	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Median Width(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Link Offset(m)	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22
Crosswalk Width(m)	25	15	25	15	25	15	25	15	25	15	25	15
Two way Left Turn Lane	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Headway Factor	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22
Turning Speed (k/h)	15	15	25	15	25	15	25	15	25	15	25	15
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	71.8%
ICU Level of Service	C
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
2: Rice Road & Quaker Road

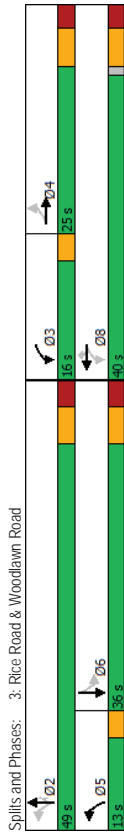
3 2033 Total PM
10-17-2024

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop											
Traffic Volume (vph)	20	35	43	63	25	49	34	436	72	71	342	16
Future Volume (vph)	20	35	43	63	25	49	34	436	72	71	342	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	38	47	68	27	53	37	474	78	77	372	17
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	107	148	589	466								
Volume Left (vph)	22	68	37	77								
Volume Right (vph)	47	53	78	17								
Head (s)	0.00	-0.12	-0.03	0.07								
Departure Headway (s)	7.3	7.1	5.7	5.9								
Degree Utilization, x	0.22	0.29	0.92	0.77								
Capacity (veh/h)	447	469	625	589								
Control Delay (s)	12.4	12.9	43.1	25.8								
Approach Delay (s)	12.4	12.9	43.1	25.8								
Approach LOS	B	B	E	D								
Intersection Summary												
Delay	31.0											
Level of Service	D											
Intersection Capacity Utilization	71.8%											
ICU Level of Service	C											
Analysis Period (min)	15											

Lanes, Volumes, Timings
3: Rice Road & Woodlawn Road

3 2033 Total PM
10-17-2024

Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



HCM Signalized Intersection Capacity Analysis
3: Rice Road & Woodlawn Road

3 2033 Total PM
10-17-2024

EBL EBT EBR WBL WBT WBR NBL NBT NBR SBL SBT SBR

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	61	362	70	264	431	71	101	334	183	72	315	67
Future Volume (vph)	61	362	70	264	431	71	101	334	183	72	315	67
Ideal Flow (vphpl)	1651	1776	1535	1651	1776	1498	1651	1776	1498	1651	1535	1535
Total Lost time (s)	6.8	6.8	6.8	3.0	6.8	6.8	3.0	6.8	3.0	6.8	3.0	6.8
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99	1.00	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes	0.99	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98	1.00	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	1.00
Flt Protected	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1558	3238	1536	1758	1232	1553	1741	1228	1564	1494	1494	1494
Flt Permitted	0.49	1.00	0.29	1.00	1.00	0.33	1.00	1.00	0.54	1.00	0.54	1.00
Satd. Flow (perm)	811	3238	468	1758	1232	532	1741	1228	897	1494	1494	1494
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	66	393	76	287	468	77	110	363	199	78	342	73
RTOR Reduction (vph)	0	18	0	0	0	0	49	0	0	88	0	8
Lane Group Flow (vph)	66	451	0	287	468	28	110	363	111	78	407	0
Confl. Peds. (#/hr)	5	5	5	5	5	5	5	5	5	5	5	5
Heavy Vehicles (%)	0%	1%	2%	2%	0%	1%	0%	1%	2%	2%	0%	0%
Turn Type	Perm	NA	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	NA
Protected Phases	4	3	8	8	2	5	2	2	6	6	6	6
Permitted Phases	4	8	8	8	2	8	2	2	2	2	6	6
Actuated Green, G (s)	16.2	16.2	32.0	32.0	32.0	32.0	42.7	42.7	42.7	31.8	31.8	31.8
Effective Green, g (s)	16.2	16.2	32.0	32.0	32.0	32.0	42.7	42.7	42.7	31.8	31.8	31.8
Effective g/C Ratio	0.18	0.18	0.36	0.36	0.36	0.36	0.48	0.48	0.48	0.36	0.36	0.36
Clearance Time (s)	6.8	6.8	3.0	6.8	6.8	3.0	6.8	3.0	6.8	3.0	6.8	3.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	148	592	323	635	445	347	840	592	322	536	322	536
v/s Ratio Prot	0.14	0.14	0.13	0.27	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
v/s Ratio Perm	0.08	0.45	0.76	0.89	0.74	0.06	0.32	0.43	0.19	0.24	0.76	0.76
Uniform Delay, d1	32.2	34.3	22.8	24.6	18.5	13.8	15.0	13.0	19.9	25.0	25.0	25.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.1	5.8	24.2	4.5	0.1	0.5	1.6	0.7	1.8	9.7	9.7	9.7
Delay (s)	34.3	40.1	47.0	29.0	18.5	14.4	16.6	13.7	21.7	34.7	34.7	34.7
Level of Service	C	D	D	C	B	B	B	B	B	C	C	C
Approach Delay (s)	39.4	39.4	34.3	34.3	15.4	15.4	15.4	15.4	32.6	32.6	32.6	32.6
Approach LOS	D	D	C	C	B	B	B	B	C	C	C	C
Intersection Summary												
HCM 2000 Control Delay	30.0 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.81											
Actuated Cycle Length (s)	88.5											
Intersection Capacity Utilization	85.3%											
Analysis Period (min)	15											
c Critical Lane Group	E											

Lanes, Volumes, Timings
4: Rice Road & Driveway

3 2033 Total PM
10-17-2024

	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group	W					
Lane Configurations	W					
Traffic Volume (vph)	20	12	481	29	18	409
Future Volume (vph)	20	12	481	29	18	409
Ideal Flow (vphpl)	1630	1630	1535	1535	1375	1375
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Flt	0.950		0.992			
Flt Protected	0.970					0.998
Satd. Flow (prot)	1473	0	1493	0	0	1345
Flt Permitted	0.970					0.998
Satd. Flow (perm)	1473	0	1493	0	0	1345
Link Speed (k/h)	50		50			50
Link Distance (m)	169.9		235.8			2985.6
Travel Time (s)	12.2		17.0			215.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	13	523	32	20	445
Shared Lane Traffic (%)						
Lane Group Flow (vph)	35	0	555	0	0	465
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.6		3.6			3.6
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.22	1.22	1.31	1.31	1.50	1.50
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop	Free	Free	Free	Free	Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	59.9%					
Analysis Period (min)	15					
	ICU Level of Service B					

HCM Unsignalized Intersection Capacity Analysis
4: Rice Road & Driveway

3 2033 Total PM
10-17-2024

	WBL	WBR	NBT	NBR	SBL	SBT
Movement	W					
Lane Configurations	W					
Traffic Volume (veh/h)	20	12	481	29	18	409
Future Volume (Veh/h)	20	12	481	29	18	409
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	13	523	32	20	445
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)			None			None
Median type						
Median storage (veh)						
Upstream signal (m)						
PX platoon unblocked						
VC conflicting volume	1024	539			555	
VC1 stage 1 conf vol						
VC2 stage 2 conf vol						
VCu unblocked vol	1024	539			555	
IC single (s)	6.4	6.2			4.1	
IC 2 stage (s)						
IF (s)	3.5	3.3			2.2	
p0 queue free %	91	98			98	
p0 capacity (veh/h)	256	542			1075	
Direction_Lane #	WB 1	NB 1	SB 1			
Volume Total	35	555	465			
Volume Left	22	0	20			
Volume Right	13	32	0			
ESH	318	1700	1015			
Volumes to Capacity	0.11	0.33	0.02			
Queue Length 95th (m)	2.9	0.0	0.5			
Control Delay (s)	17.7	0.0	0.6			
Lane LOS	C		A			
Approach Delay (s)	17.7	0.0	0.6			
Approach LOS	C		C			
Intersection Summary						
Average Delay	0.8					
Intersection Capacity Utilization	59.9%					
ICU Level of Service	B					
Analysis Period (min)	15					

Appendix E

Traffic Control Signal Warrant



Signal Justification Calculation for Forecasted Volumes (OTM Book 12 - Justification 7)



Horizon Year: 2033 Background
 Region/City/Township: Welland

Major Street: Rice Road
 Minor Street: Quaker Road

North/South?: N

Number of Approach Lanes: 1
 Tee Intersection?: N
 Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results			
150% Satisfied	No	Justification for new intersections with forecast traffic	
120% Satisfied	No	Justification for existing intersections with forecast traffic	

Time Period	Major Street Rice Road						Minor Street Quaker Road						Peds Crossing Main Road
	Eastbound			Westbound			Northbound			Southbound			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
AM Peak Hour	22	34	38	63	26	50	31	302	59	63	279	10	
PM Peak Hour	17	35	43	63	25	42	34	417	72	37	328	14	
Average Hourly Volume	10	17	20	32	13	23	16	180	33	25	152	6	0

Warrant	AHV
1A - All	526
1B - Minor	412
2A - Major	115
2B - Cross	221

Warrant 1 - Minimum Vehicular Volume

1A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	All Approaches	480	720	600	900	

1B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	Minor Street Approaches	120	170	120	170	

Warrant 2 - Delay To Cross Traffic

2A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	Major Street Approaches	480	720	600	900	

2B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	Traffic Crossing Major Street	50	75	50	75	

Signal Justification Calculation for Forecasted Volumes (OTM Book 12 - Justification 7)



Horizon Year: 2033 Total
 Region/City/Township: Welland

Major Street: Rice Road
 Minor Street: Quaker Road

North/South?: N

Number of Approach Lanes: 1
 Tee Intersection?: N
 Flow Conditions: Restricted
 PM Forecast Only? N

Warrant Results			
150% Satisfied	No	Justification for new intersections with forecast traffic	
120% Satisfied	No	Justification for existing intersections with forecast traffic	

Time Period	Major Street Rice Road						Minor Street Quaker Road						Peds Crossing Main Road
	Eastbound			Westbound			Northbound			Southbound			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
AM Peak Hour	23	34	38	63	26	53	31	309	59	70	299	14	
PM Peak Hour	20	35	43	63	25	49	34	436	72	71	342	16	
Average Hourly Volume	11	17	20	32	13	26	16	186	33	35	160	8	0

Warrant	AHV
1A - All	556
1B - Minor	438
2A - Major	118
2B - Cross	238

Warrant 1 - Minimum Vehicular Volume

1A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	All Approaches	480	720	600	900	

1B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	Minor Street Approaches	120	170	120	170	

Warrant 2 - Delay To Cross Traffic

2A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	Major Street Approaches	480	720	600	900	

2B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	Traffic Crossing Major Street	50	75	50	75	

Appendix F

SimTraffic Simulation Results



SimTraffic Simulation Summary

2033 Total AM Peak (SimTraffic)
10-01-2024

Summary of All Intervals

Run Number	1	2	3	4	5	6	7
Start Time	6:57	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	3504	3602	3561	3471	3549	3551	3667
Vehs Exited	3512	3634	3540	3491	3568	3535	3700
Starting Vehs	181	189	179	186	183	173	209
Ending Vehs	173	157	200	166	164	189	176
Travel Distance (km)	6963	7079	6941	6853	6896	6898	7295
Travel Time (hr)	178.6	181.4	179.2	175.3	177.1	175.1	189.0
Total Delay (hr)	35.1	35.5	35.8	33.7	34.7	33.0	38.2
Total Stops	3663	3745	3778	3685	3688	3551	3867
Fuel Used (l)	521.2	533.2	519.5	508.3	513.2	514.8	546.8

Summary of All Intervals

Run Number	8	9	10	Avg
Start Time	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	3666	3514	3664	3576
Vehs Exited	3660	3483	3657	3580
Starting Vehs	179	174	189	183
Ending Vehs	185	205	196	181
Travel Distance (km)	7297	6824	7102	7015
Travel Time (hr)	189.3	174.4	181.6	180.1
Total Delay (hr)	38.6	33.8	35.1	35.4
Total Stops	3950	3623	3682	3722
Fuel Used (l)	545.4	506.1	529.0	523.8

Interval #0 Information Seeding

Start Time	6:57
End Time	7:12
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

SimTraffic Simulation Summary

2033 Total AM Peak (SimTraffic)
10-01-2024

Interval #1 Information Recording

Run Number	1	2	3	4	5	6	7
Start Time	7:12						
End Time	8:12						
Total Time (min)	60						
Volumes adjusted by Growth Factors.							
Vehs Entered	3504	3602	3561	3471	3549	3551	3667
Vehs Exited	3512	3634	3540	3491	3568	3535	3700
Starting Vehs	181	189	179	186	183	173	209
Ending Vehs	173	157	200	166	164	189	176
Travel Distance (km)	6963	7079	6941	6853	6896	6898	7295
Travel Time (hr)	178.6	181.4	179.2	175.3	177.1	175.1	189.0
Total Delay (hr)	35.1	35.5	35.8	33.7	34.7	33.0	38.2
Total Stops	3663	3745	3778	3685	3688	3551	3867
Fuel Used (l)	521.2	533.2	519.5	508.3	513.2	514.8	546.8

Interval #1 Information Recording

Run Number	8	9	10	Avg
Start Time	7:12			
End Time	8:12			
Total Time (min)	60			
Volumes adjusted by Growth Factors.				
Vehs Entered	3666	3514	3664	3576
Vehs Exited	3660	3483	3657	3580
Starting Vehs	179	174	189	183
Ending Vehs	185	205	196	181
Travel Distance (km)	7297	6824	7102	7015
Travel Time (hr)	189.3	174.4	181.6	180.1
Total Delay (hr)	38.6	33.8	35.1	35.4
Total Stops	3950	3623	3682	3722
Fuel Used (l)	545.4	506.1	529.0	523.8

Queuing and Blocking Report

2033 Total AM Peak (SimTraffic)
10-01-2024

Intersection: 2: Rice Road & Quaker Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	22.4	25.2	47.9	54.7
Average Queue (m)	11.8	13.2	26.3	27.0
95th Queue (m)	19.2	20.8	41.4	44.4
Link Distance (m)	546.7	683.6	1007.6	217.2
Upstream Blk. Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk. Time (%)				
Queuing Penalty (veh)				

SimTraffic Simulation Summary

2033 Total PM (SimTraffic)
10-01-2024

Summary of All Intervals

Run Number	1	2	3	4	5	6	7
Start Time	6:57	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	4765	4748	4765	4699	4729	4848	4699
Vehs Exited	4815	4840	4776	4716	4706	4782	4731
Starting Vehs	262	289	239	304	231	233	232
Ending Vehs	212	197	228	227	254	299	200
Travel Distance (km)	9311	9458	9176	9237	9314	9364	9183
Travel Time (hr)	253.0	253.5	243.5	247.1	250.4	256.8	245.4
Total Delay (hr)	61.4	58.4	54.9	56.9	58.2	63.7	56.5
Total Stops	5268	5275	4973	5057	5146	5455	5040
Fuel Used (l)	706.1	722.2	690.5	701.2	702.7	712.1	692.0

Summary of All Intervals

Run Number	8	9	10	Avg
Start Time	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	4775	4708	4752	4749
Vehs Exited	4742	4722	4764	4766
Starting Vehs	240	244	256	253
Ending Vehs	273	230	244	237
Travel Distance (km)	9429	9336	9410	9322
Travel Time (hr)	256.8	249.0	255.0	251.0
Total Delay (hr)	62.4	56.7	61.4	59.1
Total Stops	5361	5143	5253	5199
Fuel Used (l)	721.3	703.2	711.2	706.3

Interval #0 Information Seeding

Start Time	6:57
End Time	7:12
Total Time (min)	15
Volumes adjusted by Growth Factors	
No data recorded this interval.	

SimTraffic Simulation Summary

2033 Total PM (SimTraffic)
10-01-2024

Interval #1 Information Recording

Start Time	7:12						
End Time	8:12						
Total Time (min)	60						
Volumes adjusted by Growth Factors.							
Run Number	1	2	3	4	5	6	7
Vehs Entered	4765	4748	4765	4699	4729	4848	4699
Vehs Exited	4815	4840	4776	4776	4706	4782	4731
Starting Vehs	262	289	239	304	231	233	232
Ending Vehs	212	197	228	227	254	299	200
Travel Distance (km)	9311	9458	9176	9237	9314	9364	9183
Travel Time (hr)	253.0	253.5	243.5	247.1	250.4	256.8	245.4
Total Delay (hr)	61.4	58.4	54.9	56.9	58.2	63.7	56.5
Total Stops	5248	5275	4973	5057	5146	5455	5040
Fuel Used (l)	706.1	722.2	690.5	701.2	702.7	712.1	692.0

Interval #1 Information Recording

Start Time	7:12						
End Time	8:12						
Total Time (min)	60						
Volumes adjusted by Growth Factors.							
Run Number	8	9	10	Avg			
Vehs Entered	4775	4708	4752	4749			
Vehs Exited	4742	4722	4764	4766			
Starting Vehs	240	244	256	253			
Ending Vehs	273	230	244	237			
Travel Distance (km)	9429	9336	9410	9322			
Travel Time (hr)	256.8	249.0	255.0	251.0			
Total Delay (hr)	62.4	56.7	61.4	59.1			
Total Stops	5361	5143	5253	5199			
Fuel Used (l)	721.3	703.2	711.2	706.3			

Queuing and Blocking Report

2033 Total PM (SimTraffic)
10-01-2024

Intersection: 2: Rice Road & Quaker Road

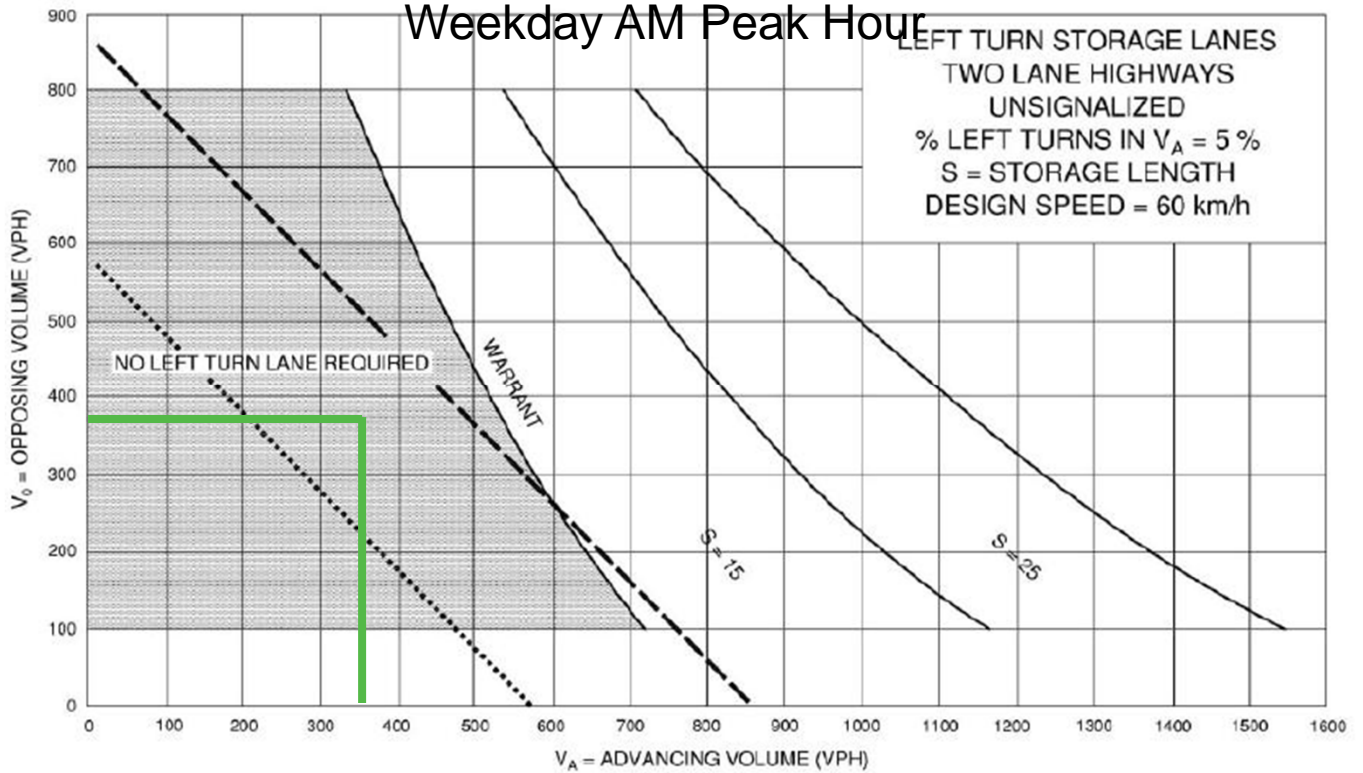
Movement	EB	WB	NB	SB
	LTR	LTR	LTR	LTR
Directions Served	27.0	23.9	84.9	61.5
Maximum Queue (m)	12.9	12.3	41.9	29.9
Average Queue (m)	22.1	19.6	73.5	50.6
95th Queue (m)	546.7	683.6	1007.6	277.2
Link Distance (m)				
Upstream Blk Time (%)				
Queueing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queueing Penalty (veh)				

Appendix G

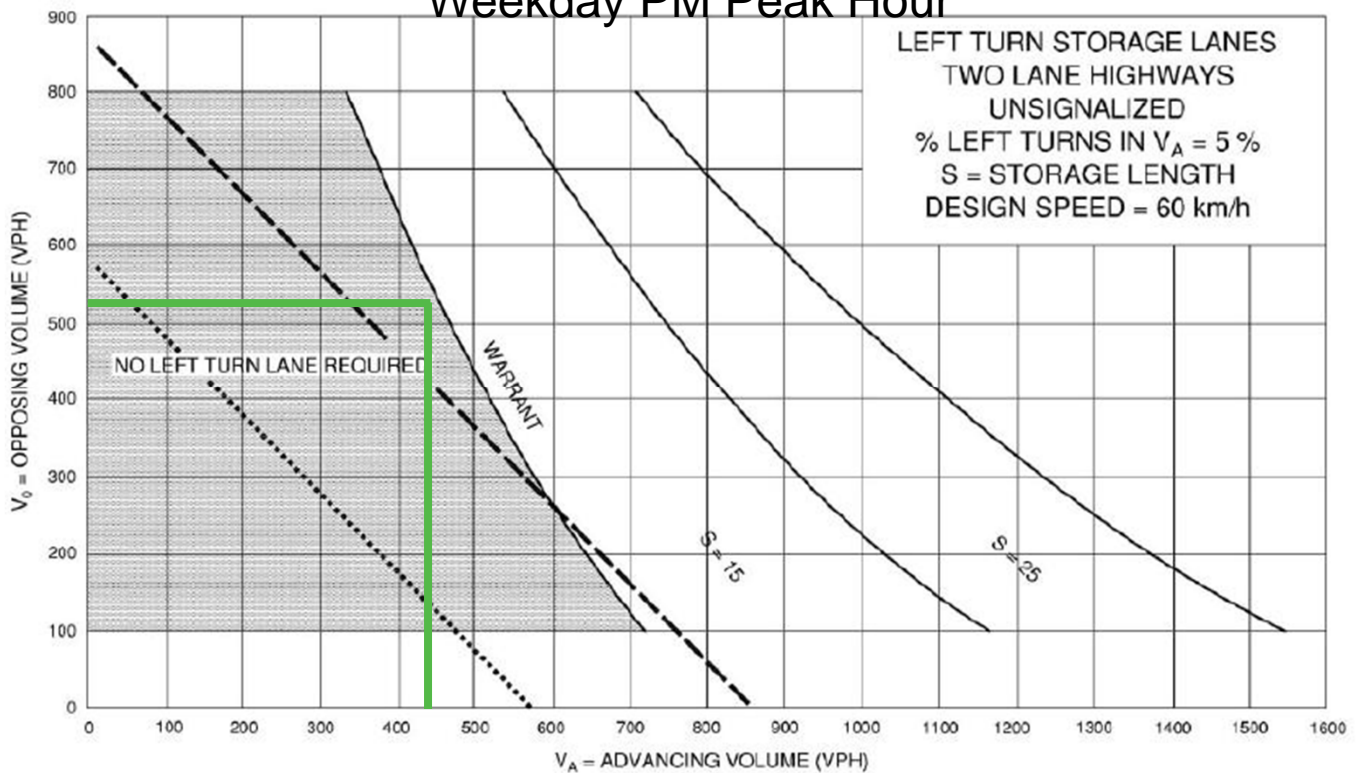
Left-Turn Lane Warrant



Weekday AM Peak Hour



Weekday PM Peak Hour



Rice Road at Driveway Left Turn Lane Warrants